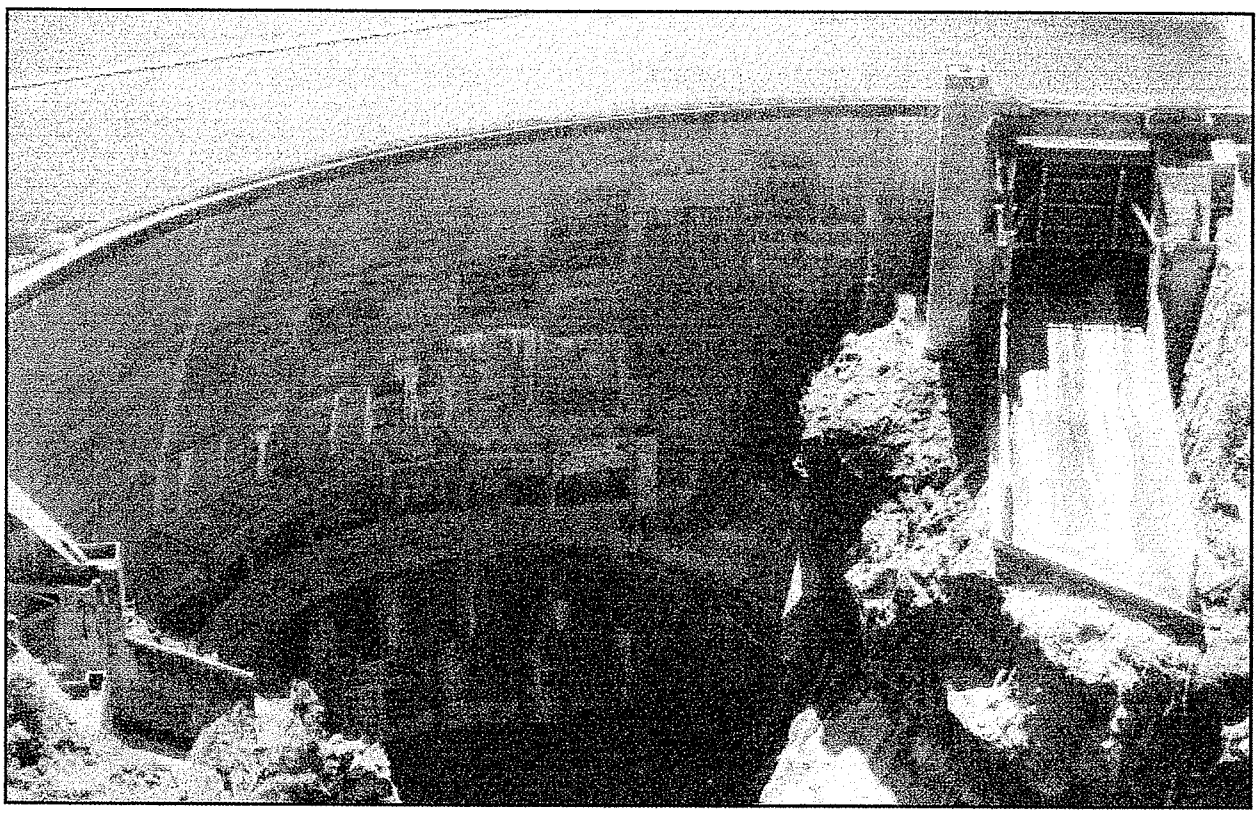
Compilation and Summary of Natural Resource Information Boundary Hydroelectric Project

FINAL REPORT



Prepared for:
The City of Seattle, City Light Department
Environment and Safety Division
700 Fifth Avenue, Suite 3360
Seattle, Washington 98104-5031

Prepared by:
R2 Resource Consultants, Inc.
15250 NE 95th Street
Redmond, Washington 98052-2518

In Association with:
EDAW, Inc.
Herrera Environmental Consultants, Inc.
Larson Archaeological and Anthropological

February 27, 1998
Project: 1061.01

CONTENTS

EXECUTIVE SUMMARY iii

1. INTRODUCTION 1
   1.1 PURPOSE AND OBJECTIVES OF REPORT 1

2. METHODS 4
   2.1 LITERATURE GATHERING AND COMPILATION 4
   2.2 LITERATURE REVIEW 6
   2.3 DOCUMENT DATABASE DEVELOPMENT 6

3. REFERENCES 7

APPENDIX A: Document Review Summaries
APPENDIX B: Bibliography
APPENDIX C: Report of Contacts
APPENDIX D: Boundary Project Contacts List

EXECUTIVE SUMMARY

The Boundary Hydroelectric Project, owned and operated by the City of Seattle (Seattle City Light - SCL) represents the largest generation plant in SCL's electrical system; the facility nominally supplies about half of the total power needs for the City of Seattle. The original application to construct the Project was filed by SCL to the Federal Energy Regulatory Commission (FERC) in 1960, with a 50 year license (FERC Project No. 2144-001) being granted in 1961. This license provided for the construction of four 155 megawatt (MW) capacity generating units. The license was amended in 1982 (April 26, 1982) to allow the construction (completed in 1982) of two additional units having a capacity of 200 MW each; total Project capacity is presently 1020 MW. The existing license will expire in the year 2011. Because of the importance of the Boundary Project to SCL and in anticipation of the need to complete a comprehensive assessment of environmental issues, both in the relicense application as required in the Exhibit E, and resulting from the NEPA (National Environmental Policy Act of 1969) process, the SCL contracted with R2 Resource Consultants, Inc. (R2) to in part, begin assembling and reviewing natural resource information relevant to the Project. The initial effort, designated Task 1 - Literature Review (under SCL Contract #C95-377) included three sub-tasks: 1) Literature Gathering and Compilation; 2) Literature Review; and 3) Preliminary Resource Issue Identification. This report presents the results of the literature compilation and review components (Sub- tasks 1 and 2). The information presented herein coupled with the results of a technical review meeting will subsequently be used to identify and prioritize resource issues and gaps in information (sub-task 3), and to identify the necessary baseline studies (and costs) for addressing such issues. The results of that evaluation will be presented in a separate document.

1. INTRODUCTION

The Boundary Hydroelectric Project, owned and operated by the City of Seattle (Seattle City Light - SCL) represents the largest generation plant in SCL's electrical system; the facility nominally supplies about half of the total power needs for the City of Seattle. The Project (consisting of a dam, powerhouse and reservoir) is located on the Pend Oreille River, approximately one mile south of the U.S.-Canadian border, in Pend Oreille County, Washington. Operationally, the Project has the potential for influencing a variety of natural resources that hold local and regional significance by state and federal resource agencies, tribes and other stakeholders.

The original application to construct the Project was filed by SCL to the Federal Energy Regulatory Commission (FERC) in 1960, with a 50 year license (FERC Project No. 2144-001) being granted in 1961 (Jordan and Starkey 1984). This license provided for the construction of four 155 megawatt (MW) capacity generating units. However, the license was amended in 1982 (April 26, 1982) to allow the construction (completed in 1982) of two additional units having a capacity of 200 MW each; total Project capacity is presently 1020 MW. SCL will need to commence activities related to the relicensing of the Project.

1.1 PURPOSE AND OBJECTIVES OF REPORT

The existing license of the Boundary Project will expire in the year 2011. Prior to that time, SCL will need to commence activities leading to the preparation and submittal of a relicensing application to the FERC. This will invoke the rules and regulations for relicensing hydroelectric projects as specified by the FERC (see final rule Docket No. RM87-33-000, Order No. 513, 1989; final order published in Federal Register - Tuesday, January 2, 1990) and provided for under the Federal Power Act (FPA). Specific dates related to this process include the filing of Notice of Intent to file an application for a new license - required at least 5 but not more than 5 ½ years before license expiration (year - 2006), and the actual filing of the application - required at least 24 months (year - 2009) before license expiration (FERC 1990). The FERC allows and is supportive of applicants commencing Prefiling Consultation with agencies and stakeholders at any time. This latter process is especially important for identifying resource issues, developing environmental and engineering study programs, and defining specific licensing strategies.

Because of the importance of the Boundary Project to SCL and in anticipation of the need to complete a comprehensive assessment of environmental issues, both in the relicense application as required in the Exhibit E (which addresses environmental impacts and mitigation measures of the Project), and resulting from the NEPA (National Environmental Policy Act of 1969) process,

the SCL contracted with R2 Resource Consultants, Inc. (R2)[1] to in part, begin assembling and reviewing natural resource information relevant to the Project. The initial effort, designated Task 1 - Literature Review (under SCL Contract #C95-377) included three sub-tasks: 1) Literature Gathering and Compilation; 2) Literature Review; and 3) Preliminary Resource Issue Identification. The review of existing information was considered especially important for identifying any issues that may warrant immediate attention, such as those involving the Endangered Species Act (ESA) which may influence both existing and future operations of the Project.

This report presents the results of the literature compilation and review components (Sub- tasks 1 and 2) as primarily completed through July 1996. Some additional information and data were compiled and reviewed by Larson Anthropological Archaeological Services (LAAS) in January-February 1998 related to Historical and Archaeological resources; summaries of that information are also included in this document. The information presented herein, coupled with the results of a technical review meeting were subsequently used to identify and prioritize resource issues and gaps in information (sub-task 3), and to identify necessary baseline studies (and costs) for addressing such issues. The results of that evaluation were presented in R2 (1998).

Specific objectives of the literature review were to:

- Identify and obtain copies of all readily available information, data and reports (pertaining to natural resources[2]) specific or of relevancy to the Boundary Project area;

- Review and evaluate importance of documents/information compiled relative to existing and future operations of the Boundary Project; and

- Develop and maintain a document/report database that contains summaries of all data and information compiled on the Project.

This report presents the results of this initial compilation and review process. Organizationally, the report contains three sections (Sections 1 - INTRODUCTION, 2 - METHODS, and 3 - REFERENCES), and four appendices. The appendices include: Appendix A - DOCUMENT

[1] The R2 Resource Consultants, Inc. (R2) Boundary Project Team includes the following sub-contractors that contributed significantly to this report: EDAW, Inc., Herrera Environmental Consultants, Inc. (HEC), and Larson Anthropological/Archaeological Services (LAAS).

[2] Natural resources addressed in this report include; water use and quality, fish, wildlife and botanical, historical and archaeological, recreation, and visual. Information was not compiled for land use and comprehensive plans, geology and soils, or socioeconomics.

REVIEW SUMMARIES, which contains completed summary forms of all information gathered and reviewed, and entered into the Boundary Project Document Database; Appendix B - BIBLIOGRAPHY, which alphabetically lists all documents and information contained in the database; Appendix C - REPORT OF CONTACT FORMS, which contains copies of Report of Contact (ROC) forms completed by the project team that document personal contacts; and Appendix D - PROJECT CONTACTS LIST, which provides names, affiliations, addresses, phone numbers and other information of agency, stakeholder, and other entity personnel who have been or will likely be contacted regarding the Boundary Project. This latter list will be periodically updated with new and/or missing information as it becomes available. Periodic supplements to the report and database updates will be completed as new information develops.

2. METHODS

There were three general steps (corresponding to the above noted sub-tasks) involved in completing the literature review: 1) literature gathering and compilation; 2) literature review; and 3) database development and entry of information. These are described below.

2.1 LITERATURE GATHERING AND COMPILATION

As an initial step, members of the R2 Project Team (EDAW, HEC, LAAS, R2) met with SCL staff on May 30, 1996, to review and discuss the Boundary Project and procedures for requesting, acquiring and reviewing information. SCL also provided copies of reports, data, and other information specific to the Boundary Project to the Project Team for review. The Project Team subsequently compiled a list of agencies and stakeholders who would likely be contacted for information (see Appendix D).

Subsequent to the meeting, the Project Team began to actively request and assemble information related to the Boundary Project. This was completed via; 1) direct acquisition of reports and data readily available from agencies and institutions (e.g., visits to libraries, universities, agency offices); 2) personal contacts with representatives from respective agencies and institutions; and 3) computerized data searches via the Internet and through various scientific databases. Table 1 provides a general listing of the agency/institution/stakeholder contacts made for obtaining natural resources information; details of specific contacts are provided in the ROCs contained in Appendix C. Databases queried for resource information related to the Boundary Project included:

- ABSEARCH Database - Transactions of the American Fisheries Society, N.A. Journal of Fisheries Management, Canadian Journal of Fisheries and Aquatic Sciences (abstracts)
- AGRICOLA
- American Society of Fisheries Abstracts (ASFA)
- AQUATIC SCIENCES AND FISHERIES ABSTRACTS
- DISSERTATION ABSTRACTS
- LIFE SCIENCES
- STORET - U.S. Environmental Protection Agency: Water Quality Data

- WATER RESOURCES ABSTRACTS.
- WATSTORE - U.S. Geological Survey: Discharge and flow data
- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database
- Washington Rivers Information System (WRIS)

Copies of all documents, reports, etc. compiled through this process have been retained and filed by R2 into a Boundary Project Library. This library will be maintained and updated as new materials are identified and received.

Table 1. List of state and federal agencies, institutions and stakeholders providing natural resources information related to the Boundary Hydroelectric Project, 1996 (and January 1998) (information obtained via report or personal contact).

Agency/Institution/Stakeholder	Type of Resource Information *
U.S. Fish and Wildlife Service (USFWS)	F, W, B
U.S. Geological Survey (USGS)	WQN, WQL
U.S. Environmental Protection Agency (EPA), Region 10	WQL
U.S. Forest Service - Colville National Forest (CNF)	F, W, B, R, V
U.S. Forest Service - (CNF) Sullivan Lake Ranger District	W, R, V, B
Bonneville Power Administration (BPA) - Portland	F, WQL, WQN, W
Northwest Power Planning Council (NWPPC) - Portland	F, W
Idaho Department of Fish and Game (IDFG)	F, W
Idaho Department of Health and Welfare, Division of Water Quality (DEQ)	WQL
University of Idaho - Moscow, Idaho	F, WQL
Washington State Department of Ecology (WDOE)	WQL, WQN
Washington Department of Fish and Wildlife (WDFW)	F, W, B
Washington Department of Natural Resources (WDNR)	B
Washington Water Research Center - Pullman, WA	WQL, WQN
University of Washington - Seattle	F, W, H
Washington State Office of Archaeology and Historic	H
Eastern Washington University, Upper Columbia United Tribes Fisheries Center	F, WQL
Montana Fish Wildlife and Parks (MFWP)	F
Kalispel Tribe	H, B, F, W, WQL
Tri-State Implementation Council - Sand Point, Idaho	WQL
Pend Oreille Historical Society	H
Pend Oreille Public Utility District	F, W, WQL, WQN, B

* WQN - Water Quantity; WQL - Water Quality; F - Fish; W - Wildlife; B - Botanical; H-Historical and Archaeological; R - Recreation; V - Visual

2.2 LITERATURE REVIEW

The information compiled and assembled was subsequently reviewed by appropriate Project Team technical specialists. The review process was designed to: 1) identify all information pertaining to the Project (including maps, reports, data, scientific journal articles, brochures, correspondence, etc.); 2) screen the information as to its relevancy to the Project; and 3) identify and summarize resource issues that will likely need to be addressed as part of the relicensing process.

To ensure consistency in content and to expedite the review process, an electronic form was developed and used for completing the reviews of all information. This form was designed using Microsoft ACCESS database software to enable direct integration into the Boundary Document Database. Copies of all completed document review forms (organized by Project Team affiliation) are presented in Appendix A.

2.3 DOCUMENT DATABASE DEVELOPMENT

The completed electronic review forms were merged into a common document database for the Project. The database was created using Microsoft ACCESS (version 7.0). ACCESS was selected as the database platform since it is readily adaptable, easy to use, and allows for the import of information from other database systems. Furthermore, it is recognized that specific format elements of the existing database will likely require modification as new information becomes available. ACCESS allows modifications/additions to be made to the database without compromising existing entries.

The Document Database is a dynamic system and will be periodically updated to integrate new materials. Copies of the existing database (as well as subsequent revisions) will be distributed to SCL and other members of the Project Team.

3. REFERENCES

Federal Energy Regulatory Commission. 1990. Hydroelectric project relicensing handbook. Planning and Support Branch of the Division of Project Review, Office of Hydropower Licensing.

Jordan, M. and R. Starkey. 1984. Boundary Dam and reservoir - status report on wildlife mitigation. *In:* Status review of wildlife mitigation at Columbia Basin Hydroelectric Projects, Washington facilities. BPA Report DE-A179-84BP12914.

R2 Resource Consultants, Inc. 1998. Identification and summary of resource issues for the Boundary Hydroelectric Project. Final Report. Prepared for The City of Seattle, City Light Department.

APPENDIX A

Document Review Summaries

This section contains the document review forms completed by the Project Team and which are contained in the Boundary Project Document Database. For purposes of this report, the forms have been organized by reviewer's affiliation and are presented in the following sequence: R2, EDAW, HEC, and LAAS. Document numbers were assigned at the time the documents were entered into the database.

Document Review - Seattle City Light Boundary Project

Document Number 1 **Review Date:** 7/10/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bennett, D. and M. Liter

Year of Publication: 1991 **Geographic Area:** Box Canyon Reservoir

Title: Water Quality, Fish, and Wildlife Characteristics of Box Canyon Reservoir, Washington Section 3: Fish.

Source: University of Idaho. 94 p.

Abstract: Box Canyon Reservoir, the most upstream reservoir on the Pend Oreille River in Washington, was impounded in 1952 with completion of Box Canyon Dam. The reservoir extends 55.8 miles (89.8 km) and has a total surface area of 7,371 acres (2,983 ha). A two year fishery survey was conducted to evaluate the fish community in Box Canyon Reservoir, sloughs and major tributaries and Power Lake. A total of 29,213 fish representing 21 species were collected in 1989 and 1990.

Review: Box Canyon Reservoir is a shallow impoundment with macrophytic growth. Presently a fishery dominated by warm water species; historically (pre-impoundment) dominated by coolwater species. Non-game species dominate including suckers, tench, squawfish, perch, and pumpkinseed, Trout and bass comprise about 10% of the fishery. Study looked at bass growth, diet, and year class strength. Study also investigate aquatic vegetation fish community associations. Tributaries were also studies. Species in tributaries included; rainbow, brown brook cutthroat, whitefish, sculpin, squawfish, perch, bass, and pumpkinseed. Brook trout were the dominant salmonid encountered. Lots of juveniles encountered. Possible adfluvial populations of brown trout and rainbow trout. Power Lake studied also. Lots of logs along shoreline. Emaciated fish. Poor condition. Dying bullhead observed.

Comments:

Keywords: abundance, growth, mortality, species composition, macroinvertebrates, largemouth bass, IFIM

Primary Topics: Abundance

Secondary Topics: Growth

Document Review - Seattle City Light Boundary Project

Document Number 2 **Review Date:** 7/10/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Barber, M.R. and R.A. Wilms, A.T.Scholz, L.O. Clark, B.L. Renberg, K.O'Laughlin, K.L. Woodward, and R.D. Heaton

Year of Publication: 1989 **Geographic Area:** Box Canyon portion of the Pend Oreille River

Title: Assessment of Fishery Improvement Opportunities on the Pend Oreille River - Annual Report 1988.

Source: U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 374 p.

Abstract: The purpose of this study is to assess the fishery improvement opportunities on the Box Canyon portion of the Pend Oreille River. This three year study was initiated as part of the Northwest Power Planning Council's 1987 Columbia River Basin Fish and Wildlife Program. This report contains the findings of the first year of the study.

Review: Native resident fish in the Box Canyon reach included cutthroat trout and Bull trout. Gilbert and Evermann (1894) reported bull trout are abundant in the Pend Oreille River. Prior to the construction of Box Canyon Dam, concerns were expressed about the potential impacts of Box Canyon Dam. "From the dam site upstream for approximately 25 miles is found the majority of the riffle and fishable pool area of the entire Pend Oreille River. The pool elevation of 2025 ft al will inundate all the good riffle and pool area in the 25 miles of Box Canyon. Fish populations in the Pend Oreille River are relatively heavy. Good populations of large rainbow, cutthroat and brown trout inhabit the riffle and pool areas principally. Whitefish are found in countless thousands throughout all riffle and pool areas...When Box Canyon Dam is built at least 75% of the best water in the Pend Oreille River will be destroyed as trout and whitefish habitat" (Letter from Don Earnest (WDG, Spokane) to R Miens (WDG, Seattle). With the construction of Box Canyon Dam in 1955, the most productive was inundated". Following the construction of the dam the trout fishery declined and the populations of spiny ray fish and rough fish increased. Creel census data collected by the WDW from 1946 to 1985 demonstrates the decline in the trout fishery in the Pend Oreille River. Prior to 1958, the river was primarily a cold water fishery with cutthroat trout, rainbow trout, brown trout, and whitefish making up most of the creel. The dam construction resulted in the river being converted from a free flowing system to a slow moving reservoir. The Pend Oreille River between Albino Falls and Box canyon dams contains no riffle habitat and most of the river resembles a sluggish run which provides little trout habitat. The flooding resulted in the formation of shallow sloughs that provide spawning areas for warm water species such as largemouth bass, pumpkinseeds, and black crappie. The proliferation of aquatic macrophytes provided yellow perch with ample spawning habitat and cover form predators and led to increased numbers of herbivorous (i.e., tench) and detrivorous fishes (i.e., suckers). The substrate in the reservoir is dominated by mud and silt with a few areas having sand, gravel, or cobble. The physical changes in the habitat, resulting from dam construction, has led to a change in the creel to warm water species since

1958 (WDW files). Good trout populations are found in tributary systems however, the contribution of these fisheries to the reservoir fishery in not known. Study investigated 1) relative abundance in the river, 2) population levels, 3) fish growth rate, 4) feeding habits and abundance of preferred prey, 5) migration patterns, and 6) fishing pressure. Catch composed of 42.1% yellow perch, 19.0% pumpkinseed, 9.6% tench, 7.2% largemouth bass, 5.3% northern squawfish, 4.8% largescale sucker, and 4.3% mountain whitefish. Trout were rare with brown trout being the most abundant at 0.6% of the total catch.

Comments: A comprehensive report investigating the Pend Oreille River fishery upstream of Box Canyon Dam. Appendices bound under separate cover. Note: While physically dissimilar, there may be similarities in the fisheries between Box Canyon and Boundary reservoirs. The fishery present in Box Canyon Reservoir may influence the fishery found downstream in Boundary Reservoir.

Keywords: abundance, population, growth, feeding, migration, harvest

Primary Topics: population abundance, species composition

Secondary Topics: growth rates, feeding habits, movements

Document Review - Seattle City Light Boundary Project

Document Number 3 **Review Date:** 7/11/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Barber, M.R. and R.A. Wilms, A.T.Scholz, L.O. Clark, B.L. Renberg, K.O'Laughlin, K.L. Woodward, and R.D. Heaton

Year of Publication: 1989 **Geographic Area:** Box Canyon reach of the Pend Oreille River

Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Appendices.

Source: U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 374 p.

Abstract:

Review: no review conducted on data (see review of report)

Comments:

Keywords: abundance, growth, macroinvertebrate, zooplankton, migration, habitat, angler

Primary Topics: data tables

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 4 **Review Date:** 7/11/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Barber, M.R., B.L. Renberg, J.J.Vella, A.T. Scholz, K.L. Woodward, and S. Graves

Year of Publication: 1990 **Geographic Area:** Pend Oreille River upstream of Box Canyon Dam

Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Annual Report 1989.

Source: U.S. Department of Energy, Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 206 p.

Abstract: The purpose of this study was to assess the fishery improvement opportunities on the Box Canyon portion of the Pend Oreille River. The three year study was initiated as part of the Northwest Power Planning Council's 1987 Columbia River Basin Fish and Wildlife Program. This report contains the findings of the second year of the study.

Review: Conclusions: The habitat in the Pend Oreille River does not appear to be suitable for the production of trout. Trout require more habitat diversity than Box Canyon reach of the Pend Oreille River provides. The tributaries also have limited potential to produce large numbers of trout that could be recruited into the fishery in the reservoir. Recommendations for enhancement include discontinuing stocking of brook trout in tributaries and striving to reestablish the original native species composition (cutthroat and bull trout). Recommendations for enhancement of the river fishery are centered on the largemouth bass fishery. The bass fishery on the Pend Oreille River is increasing in popularity.

Comments: Second year study results presented. Results build upon those presented in the 1988 Annual Report. Extremely comprehensive fisheries investigation. Appendices included.

Keywords: abundance, population, growth, feeding, migration, harvest

Primary Topics: population abundance, species composition

Secondary Topics: growth rates, feeding habits, movements

Document Review - Seattle City Light Boundary Project

Document Number 5 **Review Date:** 7/11/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ashe, B.L. and A.T. Scholz

Year of Publication: 1992 **Geographic Area:** Box Canyon Reach of the Pend Oreille River

Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River: Recommendations for Fisheries Enhancement - Final Report.

Source: U.S. Department of Energy, Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 295 p.

Abstract: This report recommends resident fish substitution projects to partially replace anadromous fish losses caused by construction of Grand Coulee and Chief Joseph Dams. These recommendations involve enhancing the resident fishery in the Pend Oreille River as a substitute for anadromous fish losses. In developing these recommendations we (the authors) have intentionally attempted to minimize the impact upon the hydroelectric system and anadromous fish recovery plans. In this report we are recommending that the Northwest Power Planning Council direct Bonneville Power Administration to fund the proposed enhancement under the NPPC's Columbia Basin Fish and Wildlife Program. The objective of this study was to examine the existing fishery, identify fishery improvement opportunities and recommend fishery enhancement projects. Three years of baseline data were collected from the Box Canyon portion of the Pend Oreille River to assess population dynamics, growth rates, feeding habits, behavior patterns and factors limiting the fishery. Fishery improvement opportunities were identified based on the results of these data.

Review: The objective of this study was to examine the existing fishery, identify fishery improvement opportunities and recommend fishery enhancement projects. Three years of baseline data were collected from the Box Canyon portion of the Pend Oreille River to assess population dynamics, growth rates, feeding habits, behavior patterns and factors limiting the fishery. Fishery improvement opportunities were identified based on the results of these data.

Relative abundance surveys in the reservoir resulted in the capture of 47,415 fish during the study. The most abundant species in the reservoir were yellow perch, composing 44% of the fish captured. The perch population in the river is stunted and therefore not popular with anglers. Pumpkinseed composed 16% of the total catch, followed by tench (9%), largemouth bass (8%), mountain whitefish (6%), largescale sucker (5%), northern squawfish (4%) and longnose sucker (3%).

Largemouth bass were the largest game fish captured in the reservoir and currently the only species of sufficient size and population to provide a recreational fishery. Current biomass of largemouth bass, age 1+ and older, in the river is 8 lbs/acre. Production of a quality bass fishery is around 15-20 lbs/acre, so, despite the apparent optimal habitat of the Pend Oreille River, bass production is limited. Based on

habitat utilization (determined by sonic and radio telemetry), the amount of available habitat and the abundance of preferred prey species (yellow perch) in the reservoir, the Pend Oreille River could support a much larger bass population.

Of all the fish captured, trout species were the rarest; composing less than 1 percent of the total abundance. Brown trout were the most abundant trout species. Factors limiting trout production in the reservoir were identified as warm water temperatures, lack of habitat diversity and food availability.

Trout were more abundant in the tributaries to the Pend Oreille River, which supported mostly brook trout and brown trout, although cutthroat, rainbow and bull trout were also captured. Production potential of the tributaries is limited. The spawning habitat in most tributaries is of good quality, however the streams are high gradient and low order which are typically unproductive. Grazing and logging impacts present problems in several tributaries while immense beaver dams constitute migration barriers in others. Calispell Creek, the largest tributary to the river is not accessible to fish due to blockage by a hydro-project dam at the mouth.

Taking into account the available fish populations, existing habitat conditions and existing limiting factors, two biological objectives were developed for the Pend Oreille River fishery:

1) Restore tributary populations of native cutthroat and bull trout which were historically prominent in the Box Canyon reach of the Pend Oreille River; and

2) Enhance the largemouth bass population to provide a quality sport and subsistence fishery in the reservoir.

These objectives were identified as management goals for the Pend Oreille River fishery by the Kalispel Indian Tribe. These objectives were presented to the Washington Department of Wildlife (WDW) at a meeting January 28, 1992. The WDW representatives approved these fishery management objectives for the Pend Oreille River and it's tributaries. Based on these biological objectives we are making the following recommendations to the Northwest Power Planning Council for inclusion as amendments to the Columbia River Basin Fish and Wildlife Program in NPPC's Phase IV process.

Comments: Good historical information regarding the fishery present before and after the construction of Box Canyon Dam. Detailed review of factors influencing existing populations and the current composition of the fishery.

Keywords: enhancement, resident, largemouth bass, perch, trout, warm water

Primary Topics: Fishery improvement opportunities

Secondary Topics: fish population information

Document Review - Seattle City Light Boundary Project

Document Number 6 **Review Date:** 7/11/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ashe, B.L., K.L. Lillengreen, J.J.Vella, L.O.Clark, S.Graves, M.Barber, G.J. Nenema Jr., and A. Scholz

Year of Publication: 1991 **Geographic Area:** Pend Oreille River upstream of Box Canyon Dam

Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Annual Report Fiscal Year 1990.

Source: U.S. Department of Energy, Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-A179-88BP39339. 350 p.

Abstract: The purpose of this study was to assess the fishery improvement opportunities on the Box Canyon portion of the Pend Oreille River. The three year study was initiated as part of the Northwest Power Planning Council's 1987 Columbia River Basin Fish and Wildlife Program. This report contains the findings of the third and final year of the study.

Review: This report, the third of a series investigating opportunities for fishery improvement in the Pend Oreille River, summarizes the direction and focus of future management efforts. Given that the Box Canyon Reach of the Pend Oreille River is not suitable for trout production, direction is focused on areas where probability of success and acceptance would be maximized (i.e., management for largemouth bass). The Pend Oreille River appears to have optimal microhabitat for bass production, however, low water temperatures and water level fluctuations of the reservoir may limit reproduction, recruitment and growth. It appears that bass growth and possibly recruitment are also limited due to competition with yellow perch for zooplankton during the first few years of life, At about age 4, bass become piscivorous and at this time yellow perch are the primary food item in their diet. A habitat suitability study is being conducted to determine if conditions are present to accommodate a larger population. A hatchery facility for largemouth bass is mentioned as an enhancement option.

Comments: Appendices bound under separate cover.

Keywords: abundance, population, growth, feeding, migration, harvest

Primary Topics: population abundance, species composition

Secondary Topics: growth rates, feeding habits, movements

Document Review - Seattle City Light Boundary Project

Document Number 7 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): US Department of Agriculture - Forest Service

Year of Publication: 1995 **Geographic Area:** Salmo-Priest Wilderness

Title: Salmo-Priest Wilderness Guidebook.

Source: US Department of Agriculture - Forest Service. Pacific Northwest Region. Northern Region. 24 p.

Abstract:

Review: Guidebook for backcountry travel into the Salmo-Priest Wilderness

Comments:

Keywords: wilderness, guidebook

Primary Topics: Wilderness use

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 8 **Review Date:** 7/19/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Leary, R. F., F. W. Allendorf, and S. H. Forbes

Year of Publication: 1993 **Geographic Area:** western United States

Title: Conservation genetics of bull trout in the Columbia and Klamath River drainages.

Source: Conservation Biol. 7(4): 856-65.

Abstract: The authors used 51 isozyme loci to determine the population genetic structure of bull trout (Salvelinus confluentus) in the Columbia and Klamath River drainages. The sampled populations have little genetic variation within and significant genetic differences among themselves. Preserving the genetic diversity of bull trout will require the continued existence of many populations throughout this region. Bull trout from the Columbia and Klamath drainages would qualify as separate "species" under the United States Endangered Species Act according to criteria established for anadromous salmonid fishes. Genotype frequencies at the four variable loci in a group of bull trout used for artificial supplementation indicate an extremely small number of effective parents. The release of such fish into the wild could have harmful effects on native fish populations. Non-native brook trout (Salvelinus fontinalis) have been introduced throughout the range of bull trout, and hybridization between these species has been reported. Protein and mitochondrial DNA genotypes collected from one stream in western Montana over an eight-year period indicate the displacement of bull trout by brook trout. This rapid displacement was accompanied by extensive production of interspecific first-generation hybrids by both reciprocal crosses.

Review: This paper is a follow up of Leary's 1985 paper, which found that bull trout is more closely related to the arctic charr than to eastern brook or lake trout. This present study found that bull trout are genetically very similar within local populations, but is much higher between populations. Eastern brook trout, a non-native species, pose a severe threat to bull trout first by genetic introgression and subsequent loss of "pure" bull trout genetic stocks, and second by displacing bull trout from their original range. The genetic variability among bull trout populations, and similarities within population, strongly indicate that conservation efforts should be targeted to maintain as many populations or stocks as possible.

Comments: This is a critically important study, since it provides much of the genetic data required for listing bull trout as an endangered species. Findings of this study would suggest the establishment of two ESU's, one for the Columbia River drainage and the other for the Klamath River drainage. Conservation and recovery efforts should be targeted to maintain as many sub-populations as possible to maintain the genetic diversity of this species. Eastern brook trout are established as a major threat to bull trout, and important finding since brook trout are present in Boundary Reservoir and tributary streams. Management efforts to preserve this species in the future will need to

identify methods for eradicating brook trout from the system.

Keywords: Dolly Varden; genetics; polymorphism; hybridization; genetic analysis

Primary Topics: bull trout

Secondary Topics: conservation

Document Review - Seattle City Light Boundary Project

Document Number 9 **Review Date:** 7/19/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Thiesfeld, S.L., A.M. Stuart, D. E. Ratliff, and B.D. Lampman

Year of Publication: 1996 **Geographic Area:** Metolius River, Oregon

Title: Migration patterns of adult bull trout in the Metolius River and Lake Billy Chinook, Oregon.

Source: Information Report 96-1. Oregon Dept. of Fish and Wildlife, Fish Division, Portland, Oregon. 18 p.

Abstract: Twenty-two maturing adfluvial bull trout Salvelinus confluentus were captured, implanted with radio transmitters, and released where the Metolius River enters Lake Billy Chinook between April and July of 1994. Fourteen of the surgeries were successful. Nine transmitters remained functional in live fish, and these fish were monitored through December 1994. Fish locations were determined biweekly using an airplane from April through December. During September, the primary spawning season, fish locations were determined weekly using a helicopter. Most bull trout remained near the mouth of the Metolius River until mid-July when they initiated their upstream migration. After migration commenced, most fish quickly moved up the Metolius River and resided near the mouth of the intended spawning tributary. Migration into the spawning tributary stream, spawning, and migration back to the mainstem Metolius River was usually accomplished within one month. Three fish migrated into Whitewater River where bull trout spawning previously had not been documented, and are presumed to have spawned there. The Whitewater River bull trout migrated upstream faster and earlier than fish spawning in other tributary streams. All nine bull trout with functioning transmitters migrated back to Lake Billy Chinook by December.

Review: This report describes the results of an radio telemetry study conducted on an adfluvial bull trout population in the Metolius River and Lake Billy Chinook in Central Oregon. Bull trout spawn in small, cold water tributaries to the Metolius River from mid-July to early October. Juvenile bull trout rear in streams for two to three years before migrating to Lake Billy Chinook. After two or three years in reservoir (age 5 or 6), they migrate back to the Metolius River during April - July, and spawn during September. Approximately 1,000 bull trout are harvested annually in Lake Billy Chinook by recreational fishery. Bull trout in this system reach trophy size. Radio telemetry was used because 1) it appears to be well suited for studying bull trout spawning behavior over a wide range of habitats, 2) it can be used to document critical spawning habitat, and 3) it can be used to prioritize areas for spawning ground counts. Radio telemetry is very well suited to identify spawning use in inaccessible areas, since fish can be located from the air. Fish were surgically implanted with transmitters, and were anesthetized with Fintrol prior to surgery. Radio transmitters were implanted through 40 mm incision in the abdominal cavity posterior to and slightly dorsal to pelvic fin. A fish were numbered with Floy tags. Results of radio telemetry tracking suggest that substantial number of fish are missed during previous redd count surveys. Impetus for initiation of spawning not well understood; there was considerable variation in timing of upstream migration.

Comments: An excellent reference describing the procedures and use of radio telemetry techniques for bull trout.

Keywords: spawning; migration

Primary Topics: bull trout

Secondary Topics: radio telemetry

Document Review - Seattle City Light Boundary Project

Document Number 10 **Review Date:** 7/19/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Hillman, T.W., and W.S. Platts

Year of Publication: 1993 **Geographic Area:** Western United States

Title: Survey plan to detect the presence of bull trout.

Source: Don Chapman Consultants, Inc. Prepared for Intermountain Forest Industry Association, Coeur d'Alene, Idaho. 52 p.

Abstract: None provided.

Review: A methodology was developed for detecting the presence of bull trout. The plan assumes that bull trout are rare and therefore approximate a Poisson spatial distribution. The sampling plan focuses on the number of sampling sites needed to detect the presence of at least one bull trout given some target mean density, with some specified probability of detection. Two different procedures were developed: a watershed level approach and stream approach. Bull trout are sampled at a number of 100-m long sample sites. A 0.25 fish per 100-m length density value is recommended for the degree of rareness in the Poisson-based formula employed in this approach. Based upon this function, at least 12 sites, each 100-m long, bust be sampled to detect bull trout at this density with a 95% probability level. A watershed is assumed to be any land that drains a third-order stream or larger. Streams in a watershed are divided into 10-km reaches; any stream less than 10-m is treated as an independent reach. Each reach is then divided into 100-m sites using a topographic map; twelve (12) sites are randomly selected for sampling in each 10-km reach. With the stream approach, 12 sites are randomly selected for each of as many 10-km reaches are present. Twelve samples must also be applied to any reaches smaller than 10-km in length. Both fish and habitat variables are measured at each 100-m site. Physical descriptions of the stream channel and valley bottom type are observed and recorded. Fish presence/absence surveys are conducted using two person teams. The crew first uses snorkeling to detect fish. If no bull trout are detected, then a single pass using a backpack electrofisher is employed. Snorkel surveys are conducted on clear days during the daytime. The entire 100-m site is surveyed to determine an estimate of population size for the site. Each site is mapped for habitat types.

Comments: This is an important paper which is presently considered the "standard" method to detect the presence of bull trout in a watershed or stream. This method is being employed by the Colville Forest Service and the Kalispel Tribe in the Boundary Project area. The major problems of this method are a reliance upon daytime surveys only, and the use of survey team members who may not have acquired a "search image" for bull trout. Because of these factors, it is possible that bull trout may be present in a reach but not detected.

Keywords: sampling; habitat surveys

Primary Topics: bull trout

Secondary Topics: survey methods

Document Review - Seattle City Light Boundary Project

Document Number 11 **Review Date:** 7/19/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Kann, J. and C. M. Falter

Year of Publication: 1989 **Geographic Area:** Lake Pend Oreille

Title: Periphyton as indicators of enrichment in Lake Pend Oreille, Idaho.

Source: Lake and reservoir management 5(2):39-48. (NALMS)

Abstract: Periphyton in the littoral zone of Lake Pend Oreille were studied to compare pelagic productivity and to identify areas of degraded water quality. Periphyton growth was measured on natural and artificial substrates at 0.5 and 1.5 m depth. Periphyton production was greatest on natural substrates and in shallower waters. Growth in sheltered areas of the lake was greater than in exposed areas. Significant differences in between sites indicated that growth was greater in developed and confined bays. Periphyton biomass in Pend Oreille was comparable to other lakes showing accelerated eutrophication. In-shore water quality degradation was documented concurrent with meso-oligotrophic pelagic conditions.

Review: Lake Pend Oreille typically classified as oligo-mesotrophic. Shoreline development has accelerated eutrophication. Periphyton, rather than phytoplankton production was used as an indicator of eutrophication in littoral areas of the lake. Periphyton growth was greater on natural than artificial substrates. Algal growth was greater in shallower than deeper waters; however this difference was less apparent in exposed than confined areas, presumably due to wave activity. Methods and analyses were discussed relative to improved experimental design and measurement procedures. Blue-green algal biomass comprised a small component of the biomass measured. Periphyton monitoring in the littoral areas of the lake would provide valuable information on the lake trophic status. Results of these experiments indicate increase nutrient loading in Lake Pend Oreille.

Comments: Primarily an experimental methods paper; as such we can probably focus on the abstract and conclusions of this document unless specific values for periphyton productivity or species composition within Lake Pend Oreille is required.

Keywords: water quality, eutrophication, periphyton, productivity

Primary Topics: water quality and eutrophic indicators

Secondary Topics: periphyton growth

Document Review - Seattle City Light Boundary Project

Document Number 12 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Irving, David

Year of Publication: 1986 **Geographic Area:** Lake Pend Oreille

Title: Pend Oreille Trout and Char Life History Study.

Source: Idaho Department of Fish and Game in cooperation with Lake Pend Oreille Idaho Club. 78 p.

Abstract: A cooperative project was continued in 1985 to further evaluate the status of adfluvial stocks of Gerrard rainbow trout and bull trout in the Lake Pend Oreille drainage, Idaho.

Review: Rainbow, cutthroat, and bull trout in Lake Pend Oreille are adfluvial. Information collected for management purposes. Focus on rainbow trout primarily. Information on population composition and abundance and angler exploitation. Some information on bull trout (redd counts, escapement estimates) provided.

Comments: Fairly focused - not extremely relevant or applicable to Boundary Project.

Keywords: rainbow trout, bull trout, cutthroat trout, adfluvial

Primary Topics: Life history

Secondary Topics: Population characteristics

Document Review - Seattle City Light Boundary Project

Document Number 13 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Public Utility District No. 1 of Pend Oreille County.

Year of Publication: **Geographic Area:** Pend Oreille River, Box Canyon section

Title: Box Canyon Hydro-electric Project.

Source: Pend Oreille County Public Utility District. 4 p.

Abstract: Background information and physical statistics related to the construction and operation of the Box Canyon Hydro Project.

Review: Pend Oreille PUD was the first PUD in the nation to build its own dam. Box Canyon is a run-of-the-river powerplant with a small amount of storage for daily pondage for daily peaking

Comments:

Keywords: Box Canyon, hydroelectric

Primary Topics: Project statistics

Secondary Topics: Background information

Document Review - Seattle City Light Boundary Project

Document Number 14 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Seattle City Light.

Year of Publication: 1991 **Geographic Area:** Pend Oreille County

Title: Boundary Country - Discover the Secrets.

Source: Seattle City Light. 2 p.

Abstract:

Review: Tour and Recreation Information for Pend Oreille County

Comments:

Keywords:

Primary Topics:

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 15 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): USDA Forest Service - Newport Ranger District

Year of Publication: **Geographic Area:** Calispell Creek Watershed

Title: Middle Fork Calispell ORV Trail.

Source: USDA Forest Service. 2 p.

Abstract:

Review: Identification of land use conflicts and associated problems.

Comments:

Keywords:

Primary Topics:

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 16 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): USDA Forest Service

Year of Publication: 1995 **Geographic Area:** Colville National Forest

Title: Lake Fishing Opportunities of the Colville National Forest.

Source: USDA Forest Service. 4 p.

Abstract:

Review: Basic biological information related to high mountain lake fisheries is presented.

Comments:

Keywords: Lakes, trout, fishing

Primary Topics: fishing opportunities

Secondary Topics: fish biology

Document Review - Seattle City Light Boundary Project

Document Number 17 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Newsletter

Author(s): Pend Oreille County PUD

Year of Publication: **Geographic Area:** Pend Oreille County

Title: People and Power - A Special Edition Publication of the Pend Oreille PUD.

Source: Pend Oreille County PUD. 2 p.

Abstract:

Review: Information is provided related to the construction of a 115 kv Power Line by the Pend Oreille PUD.

Comments:

Keywords: powerline

Primary Topics: new powerline justification

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 18 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): The Newport and Gem State Miner

Year of Publication: 1996 **Geographic Area:** Pend Oreille River Valley

Title: Pend Oreille River Valley 1996 Fishing Guide.

Source: The Newport and Gem State Miner. 8 p.

Abstract:

Review: A guide describing fishing opportunities in the Pend Oreille River Valley.

Comments: An anglers guide - not highly technical

Keywords: fishing, guide, lakes

Primary Topics: fishing opportunities

Secondary Topics: map

Document Review - Seattle City Light Boundary Project

Document Number 19 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** _____

Author(s): USDA Forest Service

Year of Publication: 1992 **Geographic Area:** Colville National Forest

Title: Colville National Forest Map.

Source: USDA Forest Service. 2 p.

Abstract:

Review:

Comments:

Keywords:

Primary Topics:

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 20 **Review Date:** 7/19/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Pend Oreille County Economic Development Council

Year of Publication: 1994 **Geographic Area:** Pend Oreille County

Title: Pend Oreille County Travel Guide.

Source: Pend Oreille County Economic Development Council. 8 p.

Abstract: Tourist Information

Review: Maps, phone numbers, and miscellaneous information

Comments:

Keywords: Travel Guide

Primary Topics:

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 21 **Review Date:** 7/20/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Federal Register

Author(s): U.S. Forest Service

Year of Publication: 1995 **Geographic Area:** Upper Columbia River drainage

Title: Inland native fish strategy.

Source: Federal Register 60(49):13697-13698.

Abstract: None provided.

Review: Notice is given that an environmental impact statement (EIS) will be prepared by the U.S. Forest Service, in cooperation with the Bureau of Land Management and U.S. Fish and Wildlife Service, for a proposal to protect the habitat and populations of native inland fish. The areas covered by this EIS will include the Upper Columbia River drainage (including the Colville National Forest).

Comments: This notice establishes that the federal government is developing actions and management options to protect the populations and habitat of native inland fishes. This is important, since federal agencies including the USFS and BLM have authority over the majority of lands surrounding the Boundary Project. It will be important to follow the progress of these actions, since they will provide the riparian management objectives, standards and guidelines, and monitoring requirements for protection of native fish species (including bull trout).

Keywords: Upper Columbia River; native fish

Primary Topics: bull trout

Secondary Topics: native fish species

Document Review - Seattle City Light Boundary Project

Document Number 22 **Review Date:** 7/22/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bennett, D.H. and J. M. DuPont

Year of Publication: 1993 **Geographic Area:** Pend Oreille River upstream of Albeni Falls

Title: Fish Habitat Associations of the Pend Oreille River, Idaho.

Source: IDF&G and University of Idaho. Project F-73-R-15, Subproject VI, Study VII. 123 p.

Abstract: The Pend Oreille River, in northwestern Idaho, was impounded in 1952 by Albeni Falls Dam located 44 km downstream of the outlet of Pend Oreille Lake, Idaho. Poor fishing success and limited knowledge of the Pend Oreille River lead to a study in 1991 and 1992 to evaluate the fish community, physiochemical and biologic parameters to provide information for the development of a management plan.

Review: The depth of the Pend Oreille River (POR) is variable and provides opportunities for many fishes. Shallow sloughs provide habitat for centrarchids and deep pools provide sanctuary for large salmonids. The POR is meso-oligotrophic with temperatures ranging from 0 to 24 deg C. Water temperatures in the POR are not ideal for centrarchids or salmonid fishes. Temperatures greater than 21 deg C make survival for salmonids difficult. Without a thermocline for sanctuary, as occurred in 1991, the POR provides little suitable habitat for salmonids. Brown trout appear to fair well being present in all strata (but not in great numbers) but in good condition. The river may stratify during low flow years and did stratify during one of the two years of the study. Substrates in the river are dominated by silt and sand (Silt 66.9%, sand 19.5%, gravel 10.8%, cobble 1.2%, boulder and bedrock 1.6%). Velocities are generally less than 30 cm/s but may exceed 70 cm/s below Priest River and may be near zero in sloughs. Submerged aquatic macrophytes occupy 14% of the surface area of POR. Macrophytes are generally distributed in depths greater than 3 m as annual drawdown exposes the vegetation to freezing and desiccation. Macrophytes are found in areas with small substrates and water depths ranging from 3 to 6 m. Macrophyte densities in Box Canyon are 5 times those in the POR u/s of Albeni because Box Canyon is not drawn down and also milfoil is present in Box Canyon. Perch, peamouth, and squawfish dominate the POR fishery. Trout are few in numbers. Some largemouth bass and black crappie are present. High annual mortality (> 60%) for yellow perch, largemouth bass, and crappie is associated with a lack of overwintering habitat combined with harsh conditions. Drawdown is hard on centrarchids as they are forced to occupy riverine habitats in the absence of littoral habitats. Conversely, during high pool, increased surface area and retention time of water led to higher temperatures not suitable for salmonids.

Comments: A detailed investigation of fish population / habitat associations in the Pend Oreille River upstream of Albeni Falls. Prior to 1952, the POR was considered a good cutthroat fishery (Horner 1989). Rainbow trout, bull trout, and mountain whitefish were commonly caught in the system. The

historical river channel consisted of deep holes and runs with cobble and gravel substrates. These substrates provided spawning habitat for salmonids and numerous springs and creeks provided cool water temperatures during warm months.

Keywords: drawdown, habitat,

Primary Topics: habitat associations

Secondary Topics: fish abundance

Document Review - Seattle City Light Boundary Project

Document Number 23 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Moring, J. R.

Year of Publication: 1993 **Geographic Area:** Oregon

Title: Effect of angling effort on catch rate of wild salmonids in streams stocked with catchable-size trout.

Source: N. Am. J. Fish. Manage. 13(2): 234-37.

Abstract: Angler catches of wild salmonids (cutthroat trout Oncorhynchus clarki, rainbow trout O. mykiss, kokanee O. nerka, and bull trout Salvelinus confluentus) changed in direct response to changes in angler effort during two or more years on three of four Oregon streams stocked with rainbow trout. Percentages of wild fish in the catch were highest in the smallest streams (overall range, 3-19%). Increased catchability of wild salmonids may be due to synchronous behavior in the presence of stocked fish, but this was not tested in this study. There are, however, direct links between stocking of legal-size rainbow trout in streams, changes in angler effort, and harvest of wild populations.

Review:

Comments: This report is relevant because many of the same factors impacting bull trout in this system (hydropower, logging, mining, introduced species) are also present in the Boundary Project areas.

Keywords: wild population; recreational fishing

Primary Topics: recreational fishing

Secondary Topics: bull trout

Document Review - Seattle City Light Boundary Project

Document Number 24 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Washington Department of Wildlife

Year of Publication: 1992 **Geographic Area:** Washington

Title: Bull trout/Dolly Varden management and recovery plan.

Source: Fisheries Management Division Rept. 92-22. Washington Dept. of Wildlife, Olympia. 125 p.

Abstract: The plan consists of three major parts which satisfy the requirements of the Department of Wildlife's (WDW) policy on management plans (POL-4002), legislative mandates, Commission and Department mission statements and policies, and the formal Principles of Fisheries Management. The plan details management objectives and methods, monitoring and evaluation of objectives and met hods, and enforcement strategies. The plan's overall thrust is that WDW will endeavor to maintain and enhance where possible, every existing native charr population in the state. The management plan does not differentiate between Dolly Varden and bull trout, and where necessary for purposes of the Endangered Species Act (ESA), considers Washington's native charr populations to be predominately bull trout. Only nine of 77 native charr populations are believed in danger of extirpation in the near term and in need of immediate total protection from harvest or habitat disturbances. Some of these critical populations are already protected from recreational harvest by closed water regulations, but little has been accomplished to address habitat problems.

The appendices offer compiled and annotated scientific detail supporting the native charr plan. In Appendix A, the zoogeography and life history of bull trout and Dolly Varden across their natural range is discussed in detail, The literature review is extensive, leading to a large volume of discussion and citations. Because of the amount of researched scientific detail, this information is attached to the plan as a compiled reference rather than incorporated into it. Appendix B consists of a large compilation of information on the known status and distribution of native charr in Washington (Appendix B). Again, rather than embellish the plan document with voluminous details, the plan refers to this most recent status information, which is available to anyone desiring specific details.

Habitat

Cooperation between WDW and land managers to achieve protection and enhancement of native charr habitats is stressed. Substrate standards for healthy fluvial ecosystems are proposed for bull trout and Dolly Varden spawning and rearing streams. The need for meeting the proposed standards (fine sediment content and substrate embeddedness) must be impressed upon land management authorities in a cooperative atmosphere. However, the final responsibility for maintaining native charr habitat lies with the land managers. While WDW can effectively manage recreational harvest, without full interagency cooperation, our habitat maintenance or enhancement options are relatively important.

Harvest Management

High risk native charr populations are threatened with extinction and will remain closed or will be closed to angling until each is elevated to at least a low risk category. Moderate risk populations and all populations which fall into an unknown risk category will be protected by basin- or water-specific native charr species closures. only native charr populations classified as at no immediate risk or at low risk are proposed for recreational fisheries, and then only with restrictive, trophy fishing objectives. The basic stream management strategy of guaranteed recruitment through minimum size regulation is the management tool proposed for bull trout or Dolly Varden recreational angling, The recommended minimum sizes which will allow for recreation with no impact to native charr population stability are 24 inches for adfluvial populations, 20 inches for anadromous or fluvial populations, and at least 8 inches for headwater stream-resident populations.

Review: This report describes Washington State's current management and recovery plans for bull trout and Dolly Varden. Habitat degradation, overharvest, and introduced non-native species are identified as key factors to the current decline of bull trout in the state. Habitat protection, law enforcement, baseline monitoring of populations, and recreational management form key components of the State's current recovery plan.

Comments: This report is extremely important because it outlines Washington's management and recovery objectives for bull trout. The Pend Oreille River is identified as a high risk population requiring immediate and total protection.

Keywords: conservation; management; sensitive species

Primary Topics: bull trout

Secondary Topics: management

Document Review - Seattle City Light Boundary Project

Document Number 25 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Letter

Author(s): U.S. Fish and Wildlife Service

Year of Publication: 1995 **Geographic Area:** Western United States

Title: Recycling petition finding on a petition to list bull trout under the endangered species act.

Source: Letter dated May 31, 1995. Regional Director, U.S. Fish and Wildlife Service, Portland, Oregon. 33 p.

Abstract: None provided.

Review: This recycling petition found bull trout "warranted, but precluded" for listing as an Endangered Species under the ESA. Bull trout were given a priority listing number of 3, the highest attainable for a widely distributed resident fish species. This higher priority was established because threats to bull trout previously considered moderate in several watersheds were now considered of high magnitude. The USFWS concluded that the majority of bull trout sub-populations were subject to imminent threats of high magnitude. The following threats, in order of their impact to bull trout, were identified in this recycling petition: 1) forest management practices, 2) dams and impoundments, 3) agricultural practices, 4) mining, 5), illegal harvest, and 6) competition, hybridization, and predation associated with presence of non-native fish species.

Bull Trout populations in the Pend Oreille River in Washington are considered to be a single population. The status of this populations (i.e., increasing, stable, declining) is unknown. The bull trout population in this system is considered to be remnant, i.e., "known to be present in very low numbers or well below historical levels". There are presently 54 hydroelectric projects, either proposed or proposed in Washington that are located in watersheds with bull trout.

Comments: This letter provides details for consideration of bull trout as an Endangered Species. Based upon the information and conclusions provided in this recycling petition, the listing of bull trout as an Endangered Species appears to be imminent.

Keywords: Pend Oreille River; Idaho; Montana; Oregon; Washington

Primary Topics: bull trout

Secondary Topics: ESA status

Document Review - Seattle City Light Boundary Project

Document Number 26 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Marotz, B., and J. Fraley

Year of Publication: 1986 **Geographic Area:** Kootenai River, Idaho

Title: Instream Flows Needed for Successful Migration Spawning and Rearing of Rainbow and Westslope Cutthroat Trout in Selected Tributaries of the Kootenai River.

Source: DOE Report No. DOE/BP/23666--1; Bonneville Power Administration BPA 85-6. Dept. of Energy. 177 p.

Abstract: The Kootenai River fishery is threatened by microhydro and other water use development which reduce tributary habitat critical for maintaining a healthy spawning and rearing environment. Electrofishing in stream reaches where instream flow measurements were made indicates the relative recruit production value of the various streams. Of all reservoir tributaries investigated, Bristow Creek contained the greatest number of trout (Salmo spp. > or = 75 mm) per km (12,179 + or - 143). Quartz Creek, containing an estimated 853 + or - 438 Salmo spp. (> or = 75 mm) per km, ranked highest among the main stem Kootenai River tributaries. Migrant Salmo spp. utilizing Bristow and Quartz creeks during spring were captured and released through a bi-directional fish trap. Schnabel 's multiple census estimate was used to quantify the total migrant populations. An estimated 285 adult fish (range 224 to 336, P > or = 0.95) migrated into Bristow Creek to spawn. Quart Creek was used by an estimated 280 migrants (range 177 to 444). The timing of the run correspond with increasing water temperatures in both creeks. Fluvial bull trout enter spawning areas in Grave, Quartz, and Pipe creeks during fall. A total of 24 large adult bull trout were captured and released while migrating into Quartz Creek. Kokanee salmon migrated during fall to spawn in the Tobacco River and its major tributaries, Fortine and Grave creeks, as well as the Fisher River and Libby Creek below Libby Dam. Log and debris jams are obstacles to migrant fish in Barron, Bobtail , Bristow, Deep, Fivemile, Pinkham, Pipe and Quartz creeks. Periodic debris removal may be needed to maintain access to spawning gravels. Sediment pollution and channel instability continue to threaten the health of the fishery resource.

Review:

Comments:

Keywords: migration; rainbow trout; cutthroat trout; water temperature; instream flow

Primary Topics: spawning

Secondary Topics: bull trout

Document Review - Seattle City Light Boundary Project

Document Number 27 **Review Date:** 7/22/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): US Forest Service - Pacific Northwest Region

Year of Publication: 1996 **Geographic Area:** Colville National Forest

Title: The Batey-Bould ORV Trail.

Source: US Forest Service - Pacific Northwest Region. 1 p.

Abstract: The Batey-Bould ORV Trail system is located on the Newport Ranger District of the Colville National Forest. t contains 38.5 miles of motorcycle trails and connects to the north with the Little Pend Oreille Trail System

Review:

Comments: miscellaneous information

Keywords: Trail, ORV

Primary Topics: Map

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 28 **Review Date:** 7/22/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): US Army Corps of Engineers - Seattle District

Year of Publication: 1977 **Geographic Area:** Pend Oreille River, Northern Idaho

Title: Albeni Falls Dam - Pend Oreille River, Northern Idaho.

Source: US Army Corp of Engineers. 2 p.

Abstract: A pamphlet distributed to the general public describing the Albeni Falls Project and recreational opportunities in the project area.

Review: A document for public distribution primarily describing recreational opportunities in the project area.

Comments:

Keywords: Albeni Falls Dam, hydroelectric, recreation

Primary Topics: Description of Albeni Falls Project

Secondary Topics: Recreational Opportunities

Document Review - Seattle City Light Boundary Project

Document Number 29 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Kitano, S., K. Maekawa, S. Nakano, and K. D. Fausch

Year of Publication: 1994 **Geographic Area:** Flathead River, Montana

Title: Spawning behavior of bull trout in the upper Flathead drainage, Montana, with special reference to hybridization with brook trout.

Source: Trans. Am. Fish. Soc. 123(6): 988-92.

Abstract: We observed spawning behavior of adfluvial bull trout Salvelinus confluentus in a stream in the Flathead River basin where this species coexists with resident brook trout S. fontinalis. Bull trout were much larger in total length than brook trout. During spawning activities of bull trout, smaller paired males or females were displaced by larger individuals. Smaller satellite males, especially brook trout, remained near spawning bull trout pairs for long periods. During these periods, the smaller brook trout were attacked by the paired male as frequently as were larger bull trout satellite males. In one case, a small satellite male brook trout was observed to release sperm after sneaking into a redd during spawning by a pair of large bull trout. This activity may account for some instances of hybridization observed in these populations.

Review: The behavior roots of hybridization between bull trout and eastern brook trout are explored in this study. Hybridization by eastern brook trout poses a serious threat to bull trout.

Comments: This article is important in understanding the high potential for inbreeding and genetic introgression between bull trout and eastern brook trout. The threat to bull trout by eastern brook trout in the Boundary Project area should be considered to be very serious. Future management programs should be identified which eliminate this non-native species from streams bearing bull trout.

Keywords: brook trout; interspecific competition; spawning; introduced species; hybridization

Primary Topics: bull trout

Secondary Topics: spawning

Document Review - Seattle City Light Boundary Project

Document Number 30 **Review Date:** 7/22/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pelletier, G. and R. Coots

Year of Publication: 1990 **Geographic Area:** Pend Oreille River between Albeni Falls and Box

Title: Progress Report No. 1 - Pend Oreille River Water Quality Study.

Source: Washington Department of Ecology. Environmental Investigations and Laboratory Services Program. Surface Water Investigation Section. Olympia, Washington. 61 p.

Abstract: A study was conducted by the Washington State Department of Ecology to address water quality concerns of the Pend Oreille River between Albeni Falls and Box Canyon dams. Five stations were sampled every three weeks between July and November 1988. Water quality is generally good and well below the threshold of eutrophic conditions. Phytoplankton species were typical of oligotrophic to mesotrophic waters. Periphyton concentrations were well below nuisance levels for aesthetic impairment. Macrophytes are responsible for water quality violations for pH and total dissolved gases during the peak of the growing season. There was no significant difference between sample stations for nutrients, suggesting macrophyte occurrence and sediments do not elevate instream nutrient loads. Brackett Creek, Skookum Creek, and South Fork Lost Creek exceeded Class A water quality standards for fecal coliform.

Review: In Washington, the Pend Oreille River between Albeni Falls Dam (RM 90) and Box Canyon Dam (RM 34) is a slow-moving, relatively flat reach with a worsening Eurasian water milfoil problem. Migration of Eurasian milfoil upstream from RM 72 is occurring at a rate of approximately 6 miles per year, probably due to boating activities (Water 1988). Water quality was well below the threshold indicative of eutrophic conditions. Nitrogen and phosphorous may be limiting. Dissolved oxygen and pH were in violation of water quality standards in 33 and 31 percent of all measurements, respectively. Twenty two tributaries inputs discharging a total of 97 +/- 15 cfs were identified in the study area. Inputs of total N and total P from tributaries within the study area accounted for less than four percent of the total river loading. The Newport Waste treatment Plant, the only permitted NPDES source with the reach, contributes 8% total local N and 50% of total local P. Calispell Creek contributes approximately half of the total N load and 18 percent of the local total P load. Trimble Creek contributes approximately 20 percent of the local total N load and six percent of the local total P load. Periphyton concentrations generally were well below nuisance levels for aesthetic impairment. Phytoplankton community structure was indicative of unpolluted waters. The general composition of phytoplankton present are indicative of oligotrophic to mesotrophic water quality, which is consistent with the generally low nutrient and chlorophyll a concentrations in the water column.

Comments: Excellent background information describing the habitat and water quality conditions in the Albeni Falls to Box Canyon reach of the Pend Oreille River.

Keywords: water quality, Pend Oreille River

Primary Topics: trophic conditions

Secondary Topics: nutrients, plant growth

Document Review - Seattle City Light Boundary Project

Document Number 31 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Fraley, J., D. Read, and P. Graham

Year of Publication: 1981 **Geographic Area:** Flathead River, Montana

Title: Flathead River fishery study.

Source: Montana Dep. Fish, Wildlife and Parks, Fishery Division, Helena. 212 p.

Abstract: A baseline environmental assessment of the North and Middle Forks of the Flathead River drainage concerns the analysis of cutthroat and bull trout distribution and abundance, movement, age and growth, fish habitat, spawning, and food habits. A major objective of the study was to assess existing fish habitat of tributaries in the North and Middle Forks drainages and to identify important habitat components that affect fish densities. A survey of bull trout spawning sites was conducted to provide information on the importance of each tributary for spawning and long-term trends in population abundance and stability. Food habits of cutthroat and bull trout were studied to determine the relationship between trout diet and the available insect food supply. More restrictive regulations alone will not protect the fishery.

Review:

Comments: This is an important study which describes the life history, distribution, and spawning behavior of an adfluvial bull trout population in the Flathead River basin.

Keywords: diet; population structure; habitat; rainbow trout

Primary Topics: bull trout

Secondary Topics: cutthroat trout

Document Review - Seattle City Light Boundary Project

Document Number 32 **Review Date:** 7/22/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pine, R.E., E. Asselstine, H. Sparrow, and L. Hiebert

Year of Publication: 1964 **Geographic Area:** Lower Pend d'Oreille River

Title: An Investigation of the Water Quality of the Lower Pend d' Oreille River, 1962-1963.

Source: Research Bulletin 64-1. Washington Pollution Control Commission. British Columbia Department of Recreation and Conservation, Fish and Game Branch. West Kootenay Health Unit, Trail, B.C. 27 p.

Abstract:

Review: The topography of the river lower river is rather flat from Albeni Falls to Metaline Falls where it flows through a relatively wide, deep valley. At the tailwater of Albeni Falls Dam (mile 88), the elevation is 2,035 feet (asl) at mean low flow. At Box Canyon Dam (mile 32.5) the elevation is 2,000 feet (asl). From Albeni Falls to Metaline Falls it requires 63 miles to accomplish a 60 foot drop in elevation. At Metaline Falls, the river characteristics quickly change from a relatively placid pool to a rapid flowing turbulent stream. From here the river flows through a deep, narrow gorge with steep canyon walls to an elevation of 1,300 feet at its confluence with the Columbia River. This drop in elevation of 675 feet over a distance of only 25 miles is indicative of the characteristics of this section of the river. The largest tributary to the lower Pend d'Oreille River is the Salmo River. Two water quality sampling stations were established on the Pend d'Oreille River in 1959, an upstream site near Newport, WA and a downstream site near Metaline Falls. In 1962, the Metaline Falls site was terminated and sampling was transferred to Waneta, British Columbia, below the Consolidated Mining Company Limited power dam. Studies were initiated in 1962 to evaluate the effects of the milling wastes from three zinc and lead mines. Polluted conditions at Waneta from zinc and lead mining operations were determined by benthic invertebrate analysis. Live box studies using trout indicated no toxic problems in the river from zinc and lead mine effluents. Four major sources of industrial waste discharge into the Pend d'Oreille River; 1) the Lehigh Cement Company (near Metaline Falls), 2) the American Zinc, Lead, and Smelting Co. (near Metaline Falls), 3) the Pend d'Oreille Mines and Metals Co. (near Metaline Falls), and 4) Reeves - MacDonald Mines Ltd. (near International Boundary in British Columbia).

Comments: A good pre-Boundary Project description.

Keywords: water quality

Primary Topics: Water Quality

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 33 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Paragamian, V. L., V.L. Ellis, and S. Andersen

Year of Publication: 1993 **Geographic Area:** Lake Pend Oreille, lower Clark Fork River

Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.

Source: Annual Progress Report for FY 1991, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 73 p.

Abstract: The kokanee population in Lake Pend Oreille is probably operating below carrying capacity. Hatchery fry comprised 59% of total kokanee recruitment in 1991. Two hatchery release strategies were evaluated for kokanee fry. Better survival was associated with larger size of fry at release, warmer water temperatures in July, and higher cladoceran densities compared to June. Lower survival of kokanee released in the Clark Fork River was attributed to higher flows and reduced zooplankton densities. Total fishing effort was about 460,00 h, with an estimated 276,457 fish harvested. About 227,140 were kokanee, 14,800 rainbow trout, and 2,157 Gerrard rainbow (>610 mm).

Review: Researchers evaluated various stocking strategies for releases of kokanees into Lake Pend Oreille. Several factors identified at release appeared to improve survival of kokanee fry. The relative composition of hatchery and wild kokanee, and survival by cohort was monitored. Information on naturally spawning kokanee populations was obtained. The zooplankton population was monitored with respect to changes in the kokanee abundance in the lake. Contains limited water quality data (transparency, temperature).

Comments: See also Paragamian and Bowles 1995. North American Journal of Fisheries Management 15: 208-219.

Keywords: kokanee, rainbow trout, zooplankton, stocking, survival

Primary Topics: kokanee stocking strategies

Secondary Topics: contributions by cohort

Document Review - Seattle City Light Boundary Project

Document Number 34 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ebasco Environmental

Year of Publication: 1992 **Geographic Area:** Boundary Reservoir and Wildlife Preserve

Title: Hydrologic and erosion processes affecting the Boundary Wildlife Preserve.

Source: Interim report prepared by Ebasco Environmental for Seattle City Light, November, 1992. 149 p.

Abstract: Identifies the hydrologic and erosional processes affecting the Boundary Wildlife Preserve. Basin hydrology, project operations, and site-specific conditions at the wildlife preserve are identified and evaluated in relation to Boundary dam operations, upstream project operations, and observed site impacts.

Review: Impacts of the Boundary Hydroelectric operation on the Boundary Wildlife Preserve include sloughing and erosion along the riverbank and inlet channel, and reduced waterfowl habitat due to reduced vegetation caused by reservoir water level fluctuations. Side channel floods and upstream sediment supply are greatly reduced by upstream regulation. Erosion in the reservoir is greatest when reservoir levels are dropping, and wave activity appears to be of secondary erosion importance.

Comments: Contains numerous monthly hydrographs

Keywords: hydrology, power production, shoreline

Primary Topics: basin description, project hydrology

Secondary Topics: project operations

Document Review - Seattle City Light Boundary Project

Document Number 35 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Paragamian, V. L. and E. C. Bowles

Year of Publication: 1995 **Geographic Area:** Lake Pend Oreille

Title: Factors affecting survival of kokanees stocked in Lake Pend Oreille, Idaho.

Source: North American Journal of Fisheries Management 15: 208-219.

Abstract: Age-0 kokanees stocked into Lake Pend Oreille were evaluated to determine contribution of hatchery fish to the population, and to estimate survival and factors affecting survival to autumn. Post-release survival of kokanees to end of first growing season ranged from 5-43% for individual sample sites, and averaged 23%. From 1988-91, fry released in July survived better than fry released in June. Survival of hatchery-reared kokanees was related to mean total zooplankton density, and size and density of Daphnia. Stocking of kokanees in the lake did not restore historic numbers, and hatchery releases may provide only short-term benefits.

Review: In response to declines in historic harvests from 1 million kokanee annually during the 1940-70's to less than 100,000 by the 1980's, Cabinet Gorge hatchery was established on the Clark Fork River in 1985 to stabilize kokanee numbers in Lake Pend Oreille. This paper investigates factors influencing survival of Age-0 hatchery kokanees released in summer into the lake. Hatchery releases of age-0 kokanees has increased the population of kokanees in this age class, but contributions to the kokanee fishery cannot be determined. Post release survival of age-0 kokanees was related to mean May-October zooplankton densities, and earlier thermal stratification appeared to enhance both zooplankton densities and kokanee survival. Stocking fish will not offset problems caused by water-level reductions after spawning, and deterioration of spawning habitat. Age-0 hatchery fish contributed to over 50% of age-0 kokanees in the lake, and may enhance the fishery. Releases of hatchery kokanees should occur in July to take advantage of peak cladoceran densities and stratified water temperatures.

Comments: Besides a discussion of the implications of hatchery operations on the kokanee fishery, this paper also provides several years of summer limnological information for Lake Pend Oreille.

Keywords: kokanees, stocking, survival, zooplankton

Primary Topics: survival of hatchery kokanees in Lake Pend Oreille

Secondary Topics: zooplankton densities in Lake Pend Oreille

Document Review - Seattle City Light Boundary Project

Document Number 36 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Rieman, B.E. and C. M. Falter

Year of Publication: 1981 **Geographic Area:** Lake Pend Oreille

Title: Effects of the establishment of Mysis relicta on the macrozooplankton of a large lake.

Source: Transactions of the American Fisheries Society 110: 613-620.

Abstract: Recent and historic zooplankton data were used to study the effect of Opossum shrimp (Mysis relicta) introduction in Lake Pend Oreille. Mysis establishment was associated with a temporal displacement in the seasonal occurrence of Daphnia and Bosmina species, and a change in the species composition of Daphnia present. Interaction between cladocerans and mysis was related to the vertical distribution of each. Cladocerans became more abundant as mysis were seasonally isolated from surface waters by increasing thermal stratification. Introduction of mysis may reduce food available to plankton-feeding fishes such as kokanee.

Review: Lake Pend Oreille historically supported fisheries for bull trout, rainbow, and kokanee. IDF&G introduced mysis from 1966-70. Average density of mysis estimated to be 1,980/m2 in 1978. Species composition and relative abundance of copepods in 1978 similar to historic information. Historic composition of Daphnia in the lake not available. Although the Pend Oreille system is physically and chemically stable, several changes in macrozzoplankton occurred in the 1970's. Establishment in mysids may have caused a shift in dominance and seasonality of daphnids. Vertical distribution of mysis appears limited by thermal stratification and light. These findings suggest that changes in the cladoceran community may decrease food available to kokanees. Introduction of mysis into Lake Pend Oreille has likely had a negative impact on kokanee growth through reduced availability of cladocerans.

Comments: A very important research paper with implications to fishery management. One of the first publications to ascribe negative impacts of mysis introductions to lake and reservoir fisheries in western North America. Also contains comparative information on the macrozooplankton community in Lake Pend Oreille.

Keywords: mysis, macrozooplankton, kokanee, copepods, cladocerans

Primary Topics: macrozooplankton, mysis introduction

Secondary Topics: kokanee growth

Document Review - Seattle City Light Boundary Project

Document Number 37 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Paragamian, V. L., V.L. Ellis, and R. Gariss

Year of Publication: 1991 **Geographic Area:** Lake Pend Oreille, Lower Clark Fork River

Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.

Source: Annual Progress Report for FY 1990, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 69 p.

Abstract: Rehabilitation of kokanee in Lake Pend Oreille produced unexpected results. Kokanee abundance during late August 1990 was estimated to be 6.9 million, a decline of 19% from 1989. The decreased population was attributed to low stocking of hatchery fry, lower fry survival, and exceptionally poor survival of ages 3+ and 4+ fish. Survival of older fish was 11% in 1990, compared to 72% in prior years. Hatchery fry comprised 47% of total kokanee fry recruitment in 1990. Hatchery release strategies were evaluated for kokanee fry. Better survival was associated with larger size of fry at release, warmer water temperatures in July, and higher cladoceran densities compared to June. Lower survival of kokanee released in the Clark Fork River was attributed to higher flows and reduced zooplankton densities. Also contains angler harvest data for rainbow trout, bull trout, and kokanee.

Review: Researchers evaluated various stocking strategies for releases of kokanees into Lake Pend Oreille. Several factors identified at release appeared to improve survival of kokanee fry. The relative composition of hatchery and wild kokanee, and survival by cohort was monitored. Information on naturally spawning kokanee populations was obtained. The zooplankton population was monitored with respect to changes in the kokanee abundance in the lake. Annual survival rates for different life stages are compared. Contains limited water quality data (transparency, temperature).

Comments: See also Paragamian and Bowles 1995, North American Journal of Fisheries Management 15: 208-219, and other BPA reports of same title. Bull trout catch for Lake Pend Oreille on page 39.

Keywords: kokanee, rainbow trout, bull trout, zooplankton, stocking, survival

Primary Topics: kokanee stocking strategies

Secondary Topics: contributions by cohort

Document Review - Seattle City Light Boundary Project

Document Number 38 **Review Date:** 7/22/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Platts, W. S.

Year of Publication: 1979 **Geographic Area:**

Title: Relationships among stream order, fish populations, and aquatic geomorphology in an Idaho River drainage.

Source: Fisheries 4(2): 5-9.

Abstract: As stream order (1-5) increased, width and depth and percent of channel containing rubble increased. With increasing order, channel gradient, channel elevation, and percent of channel composed of gravel decreased. As stream order increased, the number of fish species, summer water space (depth times surface area) for fish, and the total numbers of fish increased. With increasing order, the numbers of chinook salmon, rainbow trout, and sculpin increased, but the numbers of cutthroat trout and Dolly Varden decreased. The analysis demonstrated the value of headwater streams to Dolly Varden and to cutthroat and rainbow trout and resulted in management's emphasizing protection of such waters. Stream order can be used to determine approximate stream size by providing estimate of width and depth.

Review:

Comments: This report describes changes in the relative abundance of Dolly Varden (i.e., bull trout) with stream order. Bull trout are found in greatest abundance in headwater streams. This report presumably addresses resident rather than fluvial bull trout populations.

Keywords: population abundance; distribution; cutthroat trout; rainbow trout.

Primary Topics: bull trout

Secondary Topics: geomorphology

Document Review - Seattle City Light Boundary Project

Document Number 39 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ebasco Environmental

Year of Publication: 1993 **Geographic Area:** Boundary Reservoir and Wildlife Preserve

Title: Boundary Reservoir hydrology and erosion survey report.

Source: Report prepared by Ebasco Environmental for Seattle City Light, October, 1993. 143 p.

Abstract: Identifies the hydrologic and erosional processes affecting the Boundary Wildlife Preserve. Basin hydrology, project operations, and site-specific conditions at the wildlife preserve are identified and evaluated in relation to Boundary dam operations, upstream project operations, and observed site impacts.

Review: Report is intended to provide an understanding of the hydrological and erosional processing affecting the reservoir and the wildlife preserve, and to allow biological impacts of the hydroproject operations to be evaluated. Reservoir level fluctuations occur primarily because of daily changes in reservoir outflow which results form peaking operations. Shoreline erosion within the reservoir as a whole is not considered to be a serious problem. Banks in the lower reservoir are eroding due to rapid toeslope removal, whereas the upper reservoir erosion results from small scale slumping and moderate toeslope removal. Erosion is expected to continue until the shoreline reaches equilibrium. Reservoir level fluctuations reduce the quality of wetland habitat due to reduced vegetation.

Comments: Final report of interim report with similar title.

Keywords: hydrology, power production, shoreline

Primary Topics: basin description, project hydrology

Secondary Topics: project operations

Document Review - Seattle City Light Boundary Project

Document Number 40 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Letter

Author(s): Olmsted, T (Hart Crowser & Associates)

Year of Publication: 1984 **Geographic Area:** Lake Pend Oreille basin

Title: Slope stability/erosion assessment, Boundary Project, Seattle City Light.

Source: Letter of comments from Hart Crowser & Associates to Shapiro and Associates, April 27, 1984. 15 p.

Abstract: Summarizes observations and opinions regarding slope stability and soil erosion conditions for areas adjacent to the west and east access roads to the Boundary Project. Discusses mechanisms of slope activity and whether a long-term or short-term problem, and the severity of the problem with recommendations for further action.

Review: Reviews potential for significant damage to property or significant erosion and water quality damage observed from areas along access roads around lake Pend Oreille and the Boundary Dam Project

Comments: Probably little information relevant to fisheries. May identify some point sources of sediment input into the lake and near the dam, although information is dated.

Keywords: slope stability, erosion

Primary Topics: erosion, slope stability

Secondary Topics: water quality

Document Review - Seattle City Light Boundary Project

Document Number 41 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Hoelscher, B., E. C. Bowles and V.L. Ellis

Year of Publication: 1990 **Geographic Area:** Lake Pend Oreille, lower Clark Fork River

Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.

Source: Annual Progress Report for FY 1989, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 62 p.

Abstract: Decreased kokanee population size in Lake Pend Oreille results form low hatchery and wild fry recruitment, and low age 1+ survival. Hatchery fry comprised 50% of total kokanee fry recruitment in 1989. High hatchery fry abundance results from high releases of fry in 1989 (11.7 million from Cabinet Gorge Hatchery). Six hatchery release strategies were evaluated for kokanee fry. Two groups were released in the Clark Fork River to try to improve the spawning run to Cabinet Gorge Hatchery. Evaluation of release strategies will be based on adult returns in 1992 and 1993.

Review: Researchers evaluated various stocking strategies for releases of kokanees into Lake Pend Oreille. Several factors identified at release appeared to improve survival of kokanee fry. The relative composition of hatchery and wild kokanee, and survival by cohort was monitored. Information on naturally spawning kokanee populations was obtained. The zooplankton population was monitored with respect to changes in the kokanee abundance in the lake. Annual survival rates for different life stages are compared. Contains limited water quality data (transparency, temperature).

Comments: See also Paragamian and Bowles 1995, North American Journal of Fisheries Management 15: 208-219, and other BPA reports of same title.

Keywords: kokanee, zooplankton, stocking, survival

Primary Topics: kokanee stocking strategies

Secondary Topics: contributions by cohort, zooplankton sampling

Document Review - Seattle City Light Boundary Project

Document Number 42 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Harza Engineering Co.

Year of Publication: 1981 **Geographic Area:** Boundary Hydroelectric Project

Title: Expansion of the Boundary Hydroelectric Project, Project planning report

Source: Prepared by Harza Engineering Co for Seattle City Light, March, 1981. 162 p.

Abstract: Reviews preferred and three alternatives for expansion of hydropower facilities in the Boundary Project. Limited discussion of environmental impacts associated with expansion scenarios.

Review: Study reviews the optimum size of units that can be feasibly installed in existing skeleton bays at the Boundary Hydroelectric Project. Report contains the method of analysis, determination of additional sustained peaking capacity and secondary energy available at Boundary, evaluation of costs and benefits from three alternatives to expansion, and the environmental impacts of recommended expansion.

Comments: Feasibility level study. Primarily engineering and economic information and recommendations. Contains limited water quality and fisheries information.

Keywords: environmental impact, expansion, water quality, water quantity

Primary Topics: recommended expansion plan, environmental impact

Secondary Topics: power and energy operations, economic evaluation

Document Review - Seattle City Light Boundary Project

Document Number 43 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Job Performance Reports

Author(s): Horner, N. J., L. D. LaBolle, and C. A. Robertson

Year of Publication: 1987 **Geographic Area:** Idaho Panhandle lakes and rivers

Title: Idaho Department of Fish and Game regional fisheries management investigations; Region 1 mountain lakes, lowland lakes investigations, rivers and streams investigations, and technical guidance.

Source: Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-11, Job Nos.1a-d. 149 p.

Abstract: Job 1a: Mountain lake releases of westslope cutthroat trout, golden trout, and grayling within Region 1 are summarized for l0 years. Job 1b: Research on the population dynamics of westslope cutthroat and lake trout are evaluated with respect to stocking strategies in Priest Lake. Also reviewed efficacy of brook trout removals to increase cutthroat production. Research on Gerrard rainbow trout in Lake Pend Oreille attempted to estimate potential production, impacts of angling, and habitat quality and quantity. Angling effort and harvest in Lake Coeur d'Alene. Other data from Hayden Lake, Spirit Lake, Kelso Lake, Cocolalla Lake, and CDR lateral lakes. Job 1c: Creel census information for lower Spokane River trout, Kootenai River kokanee, St. Joe River cutthroat, Lake Pend Oreille adfluvial trout and char, creel surveys on Grouse and Lightning Creeks, status of fish populations in the lower Priest River, Wolf Lodge Creek cutthroat. This report contains data on the fish species composition, relative abundance, and limnological characteristics of the Pend Oreille River above Albeni Falls Dam. Job 1d: Summary of technical guidance provided by IDFG to land owners in Region 1 to protect lands associated with stream habitats.

Review: May provide some comparative data for fish populations in the vicinity of the Pend Oreille basin. Job 1c contains potentially useful fish and water quality data from the Pend Oreille River above Albeni Falls Dam (See last two paragraphs of report abstract).

Comments: Report 1c most relevant to Boundary Project.

Keywords: salmonids, Pend Oreille River

Primary Topics: fish populations, creel surveys, fish stocking

Secondary Topics: water quality, fish growth

Document Review - Seattle City Light Boundary Project

Document Number 44 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bowles, E. C., V.L. Ellis, and B. Hoelscher

Year of Publication: 1989 **Geographic Area:** Lake Pend Oreille, lower Clark Fork River

Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.

Source: Annual Progress Report for FY 1988, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 60 p.

Abstract: Decreased kokanee population size in Lake Pend Oreille results form low hatchery and wild fry recruitment, and low age 1+ survival. Hatchery fry comprised 51% of total kokanee fry recruitment in 1988. Estimated kokanee abundance in the lake is 10.2 million for September, 1988. Two groups were released in the Clark Fork River to try to improve the spawning run to Cabinet Gorge Hatchery. High river flows during release appeared to increase survival after release by flushing fry quickly into Lake Pend Oreille.

Review: Researchers evaluated various stocking strategies for releases of kokanees into Lake Pend Oreille. Several factors identified at release appeared to improve survival of kokanee fry. The relative composition of hatchery and wild kokanee, and survival by cohort was monitored. Information on naturally spawning kokanee populations was obtained. The zooplankton population was monitored with respect to changes in the kokanee abundance in the lake. Annual survival rates for different life stages are compared. Contains limited water quality data (transparency, temperature).

Comments: See also Paragamian and Bowles 1995, North American Journal of Fisheries Management 15: 208-219, and other BPA reports of same title.

Keywords: kokanee, zooplankton, stocking, survival

Primary Topics: kokanee stocking strategies

Secondary Topics: contributions by cohort, zooplankton sampling

Document Review - Seattle City Light Boundary Project

Document Number 45 **Review Date:** 7/22/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bowles, E. C., V.L. Ellis, and D. Hatch

Year of Publication: 1988 **Geographic Area:** Lake Pend Oreille, lower Clark Fork River

Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.

Source: Annual Progress Report for FY 1987, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 50 p.

Abstract: Estimated kokanee abundance in Lake Pend Oreille was 6.0 million during late summer, 1987. This estimate is 40% higher than the 1986 estimate and is the second largest estimate since 1977. Higher abundance is predominantly the result of enhanced fry survival and recruitment. Hatchery-reared fry contribution was 22% of total fry recruitment in 1987, compared to 8% in 1986, and resulted form a fivefold increase in survival. Wild fry survival was enhanced by early availability of cladoceran zooplankton during emergence in late spring. Kokanee fry otolith marking was evaluated to provide a reliable long-term mark. Analysis of growth increments was used to distinguish between fry from different release sites.

Review: Researchers evaluated various stocking strategies for releases of kokanees into Lake Pend Oreille. Several factors identified at release appeared to improve survival of kokanee fry. The relative composition of hatchery and wild kokanee, and survival by cohort was monitored. Information on naturally spawning kokanee populations was obtained. The zooplankton population was monitored with respect to changes in the kokanee abundance in the lake. Annual survival rates for different life stages are compared. Contains limited water quality data (transparency, temperature). Otolith marks were used to distinguish between fry from different release sites.

Comments: See also Paragamian and Bowles 1995, North American Journal of Fisheries Management 15: 208-219, and other BPA reports of same title.

Keywords: kokanee, zooplankton, stocking, survival

Primary Topics: kokanee stocking strategies

Secondary Topics: contributions by cohort, zooplankton sampling

Document Review - Seattle City Light Boundary Project

Document Number 46 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Rieman, B. E., and J. D. McIntyre

Year of Publication: 1993 **Geographic Area:** western United States

Title: Demographic and habitat requirements for conservation of bull trout.

Source: Gen. Tech. Rept. INT-302. U.S. Dept. of Agriculture, Forest Service, Intermountain Research Station. Ogden, Utah. 38 p.

Abstract: Elements in bull trout biology, population dynamics, habitat, and biotic interactions important to conservation of the species are identified. Bull trout appear to have more specific habitat requirements than other salmonids, but no critical thresholds of acceptable habitat condition were found. Size, temporal variation, and spatial distribution are likely to influence the stability of local and regional populations. Disruption of key habitat characteristics threatens the persistence of local populations, and isolated populations are not likely to persist indefinitely. Conservation of bull trout will require maintenance or restoration of multiple, high-quality, connected habitats distributed throughout conservation areas, which in turn should be distributed throughout the species' range.

Review: The future of declining bull trout populations has become a concern to fish biologists and managers. These declines can be attributed to land-use practices, the introduction of exotic species, and harvesting of fish. Hybridization appears to be a common problem where isolated or remnant fish populations overlap with brook trout. The patchy distribution of bull trout in relation to other salmonid species suggest that bull trout have relatively specific habitat requirements. Subsequently, bull trout are especially sensitive to habitat disruption and fragmentation. Five habitat characteristics are particularly important to bull trout: channel stability, substrate composition, cover, temperature, and migratory corridors. Land-use disturbance, especially sedimentation and increased water temperatures, have an adverse affect on bull trout. Extinction risks in bull trout populations are high due to the fragmented or isolated nature of present populations, and due to their susceptibly to human and natural disturbances. Recovery plans for this species must allow for migration and population exchange between isolated populations, both to reduce the risk of local extinctions as well as to provide for genetic diversity.

Comments: This is one of the most important articles on the conservation of bull trout to date. The authors suggest that bull trout are presently found in isolated sub-populations, which make them highly susceptible to extinction. Opening of migration corridors to allow for recolonization and dispersion is important to maintain populations of this species in the future. The principle of the "metapopulation" concept by this article has been widely adopted in conservation and recovery plans for bull trout by the State of Montana, and will likely be addressed in those developed by other states in the future.

Keywords: habitat; population dynamics; sensitive species; metapopulation

Primary Topics: bull trout

Secondary Topics: conservation

Document Review - Seattle City Light Boundary Project

Document Number 47 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Thomas, Ginger

Year of Publication: 1992 **Geographic Area:** Montana

Title: Status report: Bull trout in Montana.

Source: Report prepared for Montana Dept. of Parks, Fish, Wildlife and Parks. Ginger Thomas, Consultant, Livingston, Montana. 67 p.

Abstract: Bull trout are highly sensitive to environmental disturbance. In most areas of Montana, bull trout populations are clearly in decline. Only the upper Flathead drainage and the Swan River drainage still support relatively healthy populations of large adfluvial and fluvial bull trout that are able to complete long migrations to their spawning tributaries. Even these two populations are not safe from the impacts of dam building, habitat degradation, over-harvest, hybridization with brook trout, and competition with other non-native species. Particularly in the upper Flathead system, concern has been expressed about the status of this population given the low redd counts found the last year or two. The Rock Creek drainage (tributary to the upper Clark Fork River) seems to have relatively abundant numbers of bull trout. While man-caused habitat alterations in this drainage have been relatively minor, brook trout are found in the main river and many of its tributaries. Some hybridization is suspected to have occurred. This drainage does not contain any large lakes which could support large adfluvial bull trout, such as are found in the Flathead system. In the rest of the historic range of bull trout within Montana, bull trout are largely relegated to small, isolated, resident populations. The Blackfoot River and the Kootenai River still support small populations of fluvial bull trout, but the number of tributaries supporting these populations is low. They appear to be at a relatively high risk of becoming extinct. Bull trout are rare in most of the other large rivers in western Montana.

Review:

Comments: This report documents the overall decline in bull trout populations in Montana, and those factors thought to be responsible for this decline. The current population status and distribution of bull trout in Montana are reviewed and discussed.

Keywords:

Primary Topics: bull trout

Secondary Topics: management

Document Review - Seattle City Light Boundary Project

Document Number 48 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Stelfox, J. D., and K. L. Egan

Year of Publication: 1995 **Geographic Area:** Alberta, Canada

Title: Bull trout investigations in the Smith-Dorrien Creek/Lower Kananaskis Lake System.

Source: Alberta Environmental Protection, Fisheries Management Division, Calgary, Alberta. 148 p.

Abstract: Lower Kananaskis Lake, a 646-ha hydroelectric reservoir in southwestern Alberta, contains an adfluvial bull trout (Salvelinus confluentus) population. Test netting of Lower Kananaskis Lake revealed a substantial and continuous decline in bull trout numbers, from 11% of the fish population in 1954 to 2% in 1986. Before 1991, little else was known about this population except that some spawning occurred in Smith-Dorrien Creek, an 18-km long tributary to the lake. From 1991 to 1993, a three year study was conducted to obtain data to (1) support the implementation of interim regulations intended to prevent any further decline in Lower Kananaskis Lake's bull trout population, and (2) determine the appropriateness and effectiveness of regulation changes and management strategies designed to help the population recover. Bull trout were primarily trapped while migrating in Smith-Dorrien Creek and occasionally captured by angling and seining. Juvenile bull trout distribution and abundance were determined by electrofishing.

Review: The results of the 1991 study showed that (1) there were only about 54 to 80 adult adfluvial bull trout in Lower Kananaskis Lake, virtually all of which spawned in Smith-Dorrien Creek, and (2) none of the adfluvial spawners captured were shorter than 510 mm. Based on these findings, Smith-Dorrien Creek and the northwest bay of Lower Kananaskis Lake were permanently closed to angling, and a bait ban and zero bag limit for bull trout were implemented on the remainder of the lake on 1 April 1992.

Data obtained in 1992 and 1993, and from a winter creel survey, showed that (1) there were probably fewer than 100 small (<400 mm) bull trout/km in most of Smith-Dorrien Creek and only about 200/km in areas of high density, (2) most juvenile bull trout entered Lower Kananaskis Lake at age 3 (when about 151-200 mm long), (3) bull trout grow rapidly in Lower Kananaskis Lake (up to 1240 g/year), (4) adult males grow more rapidly than females and are larger than females, on average, (5) first-time spawners were at least 495 mm long and averaged about 600 mm, (6) about 70% of the legal-sized (> 400 mm) bull trout harvested in Lower Kananaskis Lake during the 1991-92 winter fishery were juveniles (<510 mm), and (7) between 22% and 72% of the adult (>510 mm) adfluvial bull trout population was harvested during the 1991-92 winter fishery.

Evidence suggests that angler harvest was a major factor in the decline of this bull trout population. Only 52% of the adfluvial spawners captured in 1991 returned to spawn in 1992, whereas 82% of the adfluvial spawners captured in 1992 returned to spawn in 1993. The lower return rate in 1992 was

attributed to angler harvest that occurred prior to implementation of the zero bag limit for bull trout on I April 1992. Increases also occurred in numbers of spawners and redds: only 60 spawners were captured in 1992, whereas 155 were captured in 1993; and 33, 68 and 188 adfluvial bull trout redds were counted in 1992, 1993 and 1994, respectively. The vulnerability of bull trout to overharvest, and the potential for bull trout to provide a trophy fishery, was amply demonstrated by a 660-mm female weighing almost 3400 g. This fish was caught three times over a four-day period by the same angler on the same fly, completed spawning and returned to spawn the next year after gaining 610 g.

Comments: This document is relevant because it is a more recent, comprehensive study of an adfluvial bull trout population in a reservoir system. This could serve as a good example of what types of studies are required to study bull trout populations in a larger hydroelectric reservoir.

Keywords: reservoirs; Alberta; spawning; recreational fishing

Primary Topics: bull trout

Secondary Topics: reservoirs

Document Review - Seattle City Light Boundary Project

Document Number 49 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Rieman, B. E., and J. D. McIntyre

Year of Publication: 1995 **Geographic Area:** Boise River, Idaho

Title: Occurrence of bull trout in naturally fragmented habitat patches of varied size.

Source: Trans. Am. Fish. Soc. 124(3): 285-96.

Abstract: Bull trout Salvelinus confluentus and other salmonids in the Pacific Northwest are believed at risk of local and regional extinctions because of ongoing habitat loss and fragmentation. Biologists have focused on defining and protecting critical stream channel characteristics, but there is little information regarding the scale or spatial geometry of habitat that may be necessary for the species' long-term persistence. We investigated the influence of habitat patch size on the occurrence of bull trout by determining the presence or absence of fish in naturally fragmented watersheds of the Boise River basin in Idaho. We defined patches of potential habitat for bull trout as watersheds above 1,600 m elevation, a criterion based on the presumed restriction of local populations by stream temperature. We used logistic regression to investigate the possible influence of patch size as well as stream width and gradient on the occurrence of bull trout at reach, stream, and patch scales of analysis. Both stream width and patch size were significant in the models, but individual effects could not be clearly resolved because of collinearity. The predicted probability of occurrence based on patch size alone was less than 0.10 for patches smaller than about 1,000 ha and more than 0.50 for patches larger than about 2,500 ha. Our results support the hypothesis that area of available habitat influences the distribution of disjunct populations of bull trout. An area effect is consistent with the predictions of island biogeography and metapopulation theory, and our work suggests that larger-scale spatial processes may be important to the persistence of species like bull trout.

Review: This article follows concepts provided in Rieman and McIntyre (1993) on metapopulations.

Comments: This article is important because bull trout conservation and recovery plans must be based on large-scale management units, not on a "patchwork" basis towards individual streams or stream segments. Maintaining population interchange between isolated or remnant populations within large management areas will be important for maintaining viability of bull trout populations.

Keywords: distribution; habitat; Boise River; Idaho; ecological distribution

Primary Topics: bull trout

Secondary Topics: conservation

Document Review - Seattle City Light Boundary Project

Document Number 50 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Leathe, S. A., and P. J Graham

Year of Publication: 1981 **Geographic Area:** Flathead Lake, Montana

Title: Flathead Lake fish food habits study.

Source: Montana Department of Fish, Wildlife and Parks, Helena. 105 p.

Abstract: This report is part of the Flathead River Basin Impact Study which is a federally funded project concerned with potential adverse affects of accelerated resource development on the air, land, and water of the Flathead River Basin. This document summarizes the results of the first half of a two year baseline environmental assessment concerning aspects of the biology of three important gamefish species in Flathead Lake. Two of these fish species, the westslope cutthroat trout (Salmo clarki lewisi) and bull trout (Salvelinus confluentus), are highly migratory and depend upon spawning and rearing areas in numerous tributaries of the Flathead River system. A large number of kokanee salmon (Oncorhynchus nerka) also utilize the river system for spawning purposes and provide the basis for a popular fall snagging fishery. The study was designed to assess the seasonal food habits of westslope cutthroat trout, bull trout, and kokanee salmon in representative areas of Flathead Lake.

Review: The season food habits of bull trout are explored in this report. Bull trout are considered to be highly opportunistic feeders, whose diet is composed of fish, benthic invertebrates, and zooplankton. Larger bull trout in Flathead Lake are highly piscivorous, and fish are found in approximately 91 percent of stomachs of fish sampled. Three species of whitefish are the most important year-round items to bull trout in the lake. Kokanee were the most important food item during the spring. Smaller bull trout feed extensively on sculpins.

Comments: This is a good study describing the diet of lake-resident bull trout.

Keywords: feeding behavior; diet; growth; kokanee; cutthroat trout

Primary Topics: bull trout

Secondary Topics: diet

Document Review - Seattle City Light Boundary Project

Document Number 51 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Montana Bull Trout Restoration Team

Year of Publication: 1995 **Geographic Area:** Clark Fork River, Montana

Title: Upper Clark Fork River drainage bull trout status report (including Rock Creek).

Source: Report prepared by the Montana Bull Trout Scientific Group. Montana Bull Trout Restoration Team, Helena, Montana. 40 p.

Abstract: Bull trout are one of three salmonids native to the Clark Fork River. It is believed bull trout were once widely distributed in the mainstem and tributary streams. The present distribution of bull trout is much reduced from historic levels in this drainage. The migratory bull trout life form in the Upper Clark Fork River above Milltown Dam has disappeared. At present, bull trout populations in the upper Clark Fork River drainage, except for Rock Creek, are composed of small sized, resident fish inhabiting tributary streams. These populations are isolated, from one another as a result of a variety of human created barriers to fish movement. The migratory bull trout life form persists in the Rock Creek drainage.

The over-riding high risk factor is mining, including historical and current. Water pollution occurring prior to the turn of the century essentially eliminated fluvial bull trout from most of the drainage except Rock Creek. Dewatering from agriculture and interactions with introduced species also ranked as high concerns in the basin. Other major risk factors include habitat degradation from grazing in riparian areas and roads associated with forestry and mining. Warm water temperatures in the river and the Milltown Dam are major factors affecting distribution and fragmentation.

The most serious threat to restoration of bull trout in this drainage is fragmentation of bull trout populations into isolated units. Because most of the remaining bull trout populations are fragmented, they are at a high risk of extinction and the effects of other risk factors such as mining, grazing, agricultural impacts on water quantity and quality and introduced species are locally exacerbated. When isolated populations become extinct, the probability of recolonization is low. In addition, the high number of risk factors and the interactions between risk factors complicate restoration efforts.

Core areas (those which currently support the strongest remaining populations of bull trout) are Rock Creek and its tributaries, Boulder Creek drainage, Warm Sp rings Creek drainage, Harvey Creek drainage, and the Racetrack Creek drainage. The Little Blackfoot River drainage is also identified as a core area at this time but the population is small and likely declining.
The nodal habitat (waters containing migratory corridors and overwintering areas) is the Clark Fork River from Warm Springs Creek downstream to Milltown Dam.

The restoration goal for bull trout in the Upper Clark Fork drainage is to establish a self reproducing migratory population in the Clark Fork River which spawns in tributary streams. Specifically, a preliminary goal is to have at least 100 redds or 2000 total individuals in the migratory population over a period of 15 years (3 generations), with spawning distributed among all the core watersheds. This preliminary goal is a minimum that would likely be at risk due to instability. If the preliminary goal is reached, an increasing trend and a higher, more stable number of fish would be the ultimate goal. Maintenance of self-sustaining bull trout populations in all the watersheds where they presently exist and maintenance of the population genetic structure throughout the watershed is part of the restoration goal. Under this goal, all existing populations will at least remain stable or will increase from current numbers in the future. Reestablishment of a migratory corridor through Milltown Dam between the upper Clark Fork and middle Clark Fork is also part of the goal.

Review: Bull trout populations in the Clark Fork drainage are highly depressed compared to historical levels. The over-riding high risk factor to bull trout in this drainage is mining; water pollution prior to the turn of the century essentially eliminated fluvial bull trout from most of this drainage except Rock Creek. The most serious threat to restoration of bull trout in this drainage is fragmentation of bull trout into isolated units. Because they are isolated, bull trout sub-populations are at a high risk of extinction from factors including agricultural impacts on water quality (excessive nutrients), introduced species, grazing, and mining.

Comments: This report is relevant because many of the same factors impacting bull trout in this system (hydropower, logging, mining, introduced species) are also present in the Boundary Project areas.

Keywords: introduced species; forest impacts; hydropower development

Primary Topics: bull trout

Secondary Topics: environmental impacts

Document Review - Seattle City Light Boundary Project

Document Number 52 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Haas, G. R., and J. D. McPhail

Year of Publication: 1991 **Geographic Area:** western North America

Title: Systematics and distributions of dolly varden (Salvelinus malma) and bull trout (Salvelinus confluentus) in North America.

Source: Can. J. Fish. Aquat. Sci. 48(11): 2191-211.

Abstract: Dolly Varden char in North America separate into 2 species: Dolly Varden (Salvelinus malma (Walbaum)) and bull trout (S. confluentus (Suckley)). Principal component analyses reveal two distinct morphotypes, and a linear discriminant function is derived (based on 3 field measurable variables) for their consistent classification. No single character can always distinguish both species, although branchiostegal ray number often will. The morphology of the 2 species remains relatively constant across their large ranges. The 2 species occur in strict sympatry in several areas with no evidence of interbreeding. The 2 species also exist parapatrically or sympatrically and appear to exhibit broad scale competitive exclusion in these situations. Dolly Varden are distributed largely along the coast and range further north, while bull trout are mostly interior and range further south.

Review: The systematic and morphological differences between bull trout and Dolly Varden originally described by Cavender are investigated in this study. Dolly Varden and bull trout are identified here as two different species which spatially separated during glacial periods. The two species can be differentiated in the field using a simple method based upon meristic measurements. However, no single feature can be used to distinguish these species. The number of branchiostegal rays can be used to best differentiate these species; a greater ray count is found in bull trout. A high level of discrimination can be attained by a discriminant function which combines measurements of anal fin rays, brachiostegal rays, and the ratio of upper maxillary length to standard length.

Comments: This is an important reference which describes the historic and present distribution of bull trout and Dolly Varden in western North America. The linear discriminant function is widely used by the Washington Dept. of Fish and Wildlife and U.S. Forest Service to differentiate bull trout from Dolly Varden. This method can be used on live fish.

Keywords: taxonomy; distribution; Dolly Varden; Canada; Washington; morphology

Primary Topics: bull trout

Secondary Topics: taxonomy

Document Review - Seattle City Light Boundary Project

Document Number 53 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): CH2M Hill

Year of Publication: 1983 **Geographic Area:** Boundary hydroelectric project

Title: Geotechnical investigations and analysis; Boundary Dam Access Road.

Source: Prepared by CH2M Hill for Seattle City Light, May, 1983. 64 p.

Abstract: Report summarizes the results of surface exploration, laboratory testing, engineering analysis, and design assumption related to construction of a new access road to Boundary dam. Landslides destroyed segments of existing access roads in 1983. Evaluation of three alternative access routes to the dam, and preparation of specifications for constructing a road was provided.

Review: Contains plan drawings, particle size distribution analyses, local geologic information, and soil boring logs related to construction plan for an alternative access road to the Boundary Dam.

Comments: Contains no specific fisheries information.

Keywords: Boundary Dam, road, access

Primary Topics: construction of access road to Boundary Dam

Secondary Topics: local geologic conditions

Document Review - Seattle City Light Boundary Project

Document Number 54 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Mongillo, P.

Year of Publication: 1992 **Geographic Area:** Washington State

Title: The distribution and status of bull trout/Dolly Varden in Washington State.

Source: Washington Fisheries Management Division Rept. #92-22, Appendix B. Washington Dept. of Wildlife, Fisheries Management Division, Olympia.

Abstract: Bull trout (Salvelinus confluentus) and Dolly Varden (Salvelinus malma) are generally present in all parts of Washington State except the area south and east of the Columbia River and north of the Snake River in eastern Washington (Columbia Basin) and the southwest portion of the state. Distribution losses from historical levels have been confined mainly to eastern Washington. Most of the Columbia River was previously bull trout/Dolly Varden habitat, but today, much of that river is no longer utilized. In addition to a reduced distribution from historical levels, several populations in both eastern and western Washington have become fragmented because lower river reaches are no longer utilized. A total of three population. have become extinct. It is estimated that a minimum of 77 distinct bull trout/Dolly Varden populations remain in Washington. Nine re at, high risk of extinction, six are at moderate risk of extinction, 14 are at low risk of extinction and six are believed to be at ,o immediate risk of extinction. The remaining 42 populations do not have sufficient data on them to assign a level of risk. Additionally, the habitat and non-habitat factors affecting each population are identified and summarized

Review: Bull trout and Dolly Varden are both native to the northwest. The state of Washington classifies each as Priority Species, due to the concern for their population status and their sensitivity to habitat alteration. Bull trout are also a Category 2 species under the Endangered Species Act. The Washington Wildlife Commission recently prohibited the recreational harvest in eastern and southern Washington, and severely restricted harvest in the Puget Sound and the coast. These represent interim measures while management and recovery plans are developed by WDW. Distribution losses of bull trout are mainly confined to eastern Washington. Whole populations have been lost on the Okanogan River, Lake Chelan, and Lower Yakima River. Other populations have become fragmented or isolated. The are 77 known bull trout/Dolly Varden populations remaining in Washington. Of these, 32 are considered resident, 20 fluvial, 16 adfluvial, and 28 anadromous (the latter are considered to be Dolly Varden). The status of 42 of these populations is unknown. Twenty five are considered to be stable, nine are declining, and only one is increasing. Twenty one of these populations are considered to be remnant. Factors thought to most impact bull trout populations include habitat degradation, poaching, and the presence of non-native fish. Brook trout is the non-native fish species most adversely impacting bull trout. In terms of habitat degradation, physical habitat problems are the most common, followed by flow and water quality problems. Bull trout are known for their need for cold, pristine headwater areas

during critical spawning and early life history stages. Twelve percent of Washington's bull trout/Dolly Varden populations are considered to be at high risk.

The Pend Oreille River in Washington is considered to possess a high risk population. The current status of this population is unknown. Bull trout in the Pend Oreille River are considered to have a fluvial life history strategy. Factors thought to be suppressing the population in this river include poaching, forest management, non-native species, and hydropower development.

Comments: This report identifies the bull trout population in the Pend Oreille to be one of considerable concern. It is considered a population of high risk. However, there is very little information regarding the population status and distribution of this species in the river drainage.

Keywords: population status; distribution

Primary Topics: bull trout

Secondary Topics: Dolly Varden trout

Document Review - Seattle City Light Boundary Project

Document Number 55 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Job Performance Reports

Author(s): Irizarry, R. A.

Year of Publication: 1974 **Geographic Area:** Priest Lake, Lake Pend Oreille

Title: Survival, distribution, and use of Mysis relicta by game fish species in north Idaho lakes.

Source: Idaho Department of Fish and Game, Lake and Reservoir Investigations, Job Performance Report, Project F-53-R-9, Job No. VI-a. 62 p.

Abstract: Mysis shrimp were collected in Pend Oreille, Priest, and Upper Priest Lakes. No shrimp were recovered in Lake Coeur d'Alene. Mysis were most abundant in June, decreasing in July and August. Six percent of kokanees sampled from Pend Oreille and Priest Lakes used shrimp. Utilization by cutthroat was 38%. Dolly varden and lake trout also used shrimp. Mysis may have contributed to an increase in size of kokanee at Priest Lake. Trophy sized kokanee (22 inches) have been creeled from Priest Lake.

Review: Contains results of trawl sampling for mysis in Priest, Upper Priest, Pend Oreille, and Coeur d'Alene Lakes. Includes information on life history, vertical migrations, thermal tolerances, and utilization of mysis by several salmonid species. Includes limited information on kokanee growth.

Comments:

Keywords: mysis, kokanee, Priest Lake, Lake Pend Oreille

Primary Topics: mysis introduction survival rates

Secondary Topics: mysis utilization by salmonids

Document Review - Seattle City Light Boundary Project

Document Number 56 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Job Performance Reports

Author(s): Irizarry, R. A.

Year of Publication: 1971 **Geographic Area:** Lake Pend Oreille, lower Clark Fork River

Title: Idaho Department of Fish and Game, Lake and Reservoir Investigations; Lake Pend Oreille creel census, Clark Fork River fishery investigations.

Source: Idaho Department of Fish and Game, Job Performance Reports, Project F-53-R-6, Jobs IV-a-b. 29 p.

Abstract: Job IV-a: Lake Pend Oreille creel census with harvest estimates for rainbow trout and kokanee. Includes total estimated effort and catch, resident/non-resident sport harvest, commercial harvest, effort and catch by kokanee and trout anglers, age composition of kokanee catch, size range of trout, intensive creel census. Contains historical catch data. Job IV-b: results of creel census to estimate angler effort and harvest of trophy Kamloops trout and "Dolly varden" char in the lower Clark Fork River.

Review: Information in Job IV-a is contained in later JPR's for Lake Pend Oreille. Information for harvests of trophy salmonids in the lower Clark Fork River is limited to 1970-71 and contains only effort and number harvested.

Comments: Harvest information in Job IV-b only for "trophy fish" greater than 17 inches length.

Keywords: harvest, creel survey, trophy

Primary Topics: sport harvest, commercial harvest

Secondary Topics: angling effort

Document Review - Seattle City Light Boundary Project

Document Number 57 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Job Performance Reports

Author(s): Irizarry, R. A. and Bowler, B.

Year of Publication: 1974 **Geographic Area:** Lake Pend Oreille, Clark Fork River

Title: Idaho Department of Fish and Game, Lake and reservoir investigations; Lake Pend Oreille creel census, Clark Fork River Census, and Kokanee spawning trends.

Source: Idaho Department of Fish and Game, Job Performance Reports, Project F-53-R-9, Jobs IV-a-c. 15 p.

Abstract: Job IV-a: Lake Pend Oreille creel census of kokanee and trout landed in 1973. Historical kokanee harvests, including commercial. Historical harvests of rainbow, cutthroat and char. Job IV-b: Length/weight data for trophy rainbow and char. Job IV-c: Kokanee spawning trends and estimates of abundance for 1973-74 in Lake Pend Oreille and tributaries.

Review: Contains potentially useful data on harvests and sizes of trout and char from Lake Pend Oreille from 1960-73. Numerous data tables, graphics, and appendices.

Comments: Contains length/weight data on "dolly varden" from Lake Pend Oreille.

Keywords: char, kokanee, harvest, Lake Pend Oreille, Clark Fork River

Primary Topics: fish harvests, creel surveys, kokanee spawning

Secondary Topics: length, weight, age

Document Review - Seattle City Light Boundary Project

Document Number 58 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Heimer, J. T.

Year of Publication: 1969 **Geographic Area:** Upper Priest Lake, Priest Lake,

Title: Idaho Department of Fish and Game, Lake and Reservoir Investigations; Survival and growth of resident and stocked cutthroat trout in Priest and Upper Priest Lakes, Introduction of opossum shrimp into Idaho Lakes.

Source: Idaho Department of Fish and Game, Annual Completion Report, Project F-53-R-4, Jobs 6 & 10. 29 p.

Abstract: Job 6: results of survival of cutthroat trout planted in incubation channels in Kalispell and Hunt Creeks. Limited length and survival data presented for cutthroat. Releases of cutthroat trout into Upper Priest Lake. Results of a boat-count/interview creel survey on Priest lake. Results of a check-station/interview creel survey on Upper Priest Lake. Length frequencies of kokanees in Priest and Upper Priest Lakes. Includes estimated harvests of cutthroat, kokanee and dolly varden. Job 10: reviews stocking of mysis shrimp into Idaho lakes during 1968-69.

Review: Job 6 contains numerous tables and graphics of creel survey data for kokanee, cutthroat, and dolly varden in Priest and Upper Priest Lakes. Eyed-egg planting survival of cutthroat trout in Priest Lake is given. Table 1 in Job 10 is a list of Idaho lakes that received mysis introductions in 1968.

Comments:

Keywords: mysis, dolly varden, kokanee, cutthroat trout,

Primary Topics: cutthroat planting, harvests, mysis introduction

Secondary Topics: incubation survival of cutthroat

Document Review - Seattle City Light Boundary Project

Document Number 59 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Enserch Environmental Corp

Year of Publication: 1994 **Geographic Area:** Boundary Reservoir and Wildlife Preserve

Title: Boundary Reservoir: Hydrologic and erosion processes affecting the Boundary Wildlife Preserve.

Source: Prepared by Enserch Environmental Co for Seattle City Light, September, 1994. 172 p.

Abstract: identifies the hydrologic and erosional processes affecting the Boundary Wildlife Preserve. Basin hydrology, project operations, and site-specific conditions at the wildlife preserve are identified and evaluated in relation to Boundary dam operations, upstream project operations, and observed site impacts.

Review: Final version of this report is intended to provide an understanding of the hydrological and erosional processing affecting the reservoir and the wildlife preserve, and to allow biological impacts of the hydroproject operations to be evaluated. Reservoir level fluctuations occur primarily because of daily changes in reservoir outflow which results form peaking operations. Shoreline erosion within the reservoir as a whole is not considered to be a serious problem. Banks in the lower reservoir are eroding due to rapid toeslope removal, whereas the upper reservoir erosion results from small scale slumping and moderate toeslope removal. Erosion is expected to continue until the shoreline reaches equilibrium. Reservoir level fluctuations reduce the quality of wetland habitat due to reduced vegetation.

Comments: Report contains maps, hydrographs, and color photos

Keywords: erosion, sediment, hydrology, shoreline, power production

Primary Topics: basin description, project hydrology

Secondary Topics: project operations

Document Review - Seattle City Light Boundary Project

Document Number 60 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Homa, J. Jr.

Year of Publication: 1982 **Geographic Area:** Boundary Reservoir

Title: Feasibility report and plan, Seattle City Light Boundary Reservoir, FERC Project No. 2144 License article 51 -- reservoir fluctuations, Pend Oreille River, Pend Oreille County, Washington.

Source: Prepared by Ichthyological Associates, Inc for Seattle City Light, October 1982. 239 p.

Abstract: Feasibility report recommending use of an artificial slough as a mitigation option to provide fish, waterfowl, and aquatic vegetation habitat. Effects of Boundary Project operations on the Clark Fork - Pend Oreille watersheds' water quality and hydrographs is considered. Benefits of sub-impoundments to fish and other aquatic resources is discussed.

Review: Feasibility report concerning reservoir fluctuations and effects on the establishment of aquatic vegetation, suitable spawning habitat for fishes and nesting habitat for waterfowl. Areas of Boundary Reservoir suitable for spawning habitat for waterfowl and largemouth bass were identified. Literature was reviewed, local biologists were consulted, and flow data was analyzed and to evaluate the suitability of spawning conditions for largemouth bass in the reservoir. Habitat and water quality suitabilities for trout and walleyes was reviewed, and waterfowl brooding habitat evaluations were conducted. Several habitat improvement options were discussed and a recommended option identified.

Comments: Contains lists of species of plants and animals, water temperatures, hydrographs, maps, and color photos.

Keywords: Boundary Reservoir, water quality, habitat, fluctuation

Primary Topics: fish and waterfowl reproduction mitigation

Secondary Topics: aquatic vegetation

Document Review - Seattle City Light Boundary Project

Document Number 61 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Montana Bull Trout Restoration Team

Year of Publication: 1995 **Geographic Area:**

Title: Blackfoot River bull trout status report.

Source: Report prepared by the Montana Bull Trout Scientific Group. Montana Bull Trout Restoration Team, Helena, Montana. 38 p.

Abstract: Bull trout were one of three salmonids native to the Blackfoot River. It is believed bull trout were once widely distributed in the tributary streams. The present distribution of bull trout is much reduced from historic levels in this drainage. Mining and introduced species are rated as the two predominant risks to bull trout restoration. Mining impacts include the direct loss of habitat, particularly in the upper and southern portions of the basin - as well as water quality effects (lowered pH - sulfates) that pervade the system. These impacts persist and new mines may be developed in the future, potentially leading to further losses of habitat and more water quality degradation.

Introduced species (brook, brown and rainbow trout) were identified as a high risk to bull trout through hybridization (brook), predation (brown) and possible competition (brook, brown and rainbow). Since habitat availability and quality has been reduced through several factors (mining, forestry, agriculture, etc.), and since brook trout and brown trout habitat preferences overlap with bull trout, these processes/interactions may synergistically act to reduce carrying capacity for bull trout. Other risk factors identified by the Montana Bull Trout Scientific Group include habitat impacts from forest practices (sedimentation from roads, loss of woody debris), grazing and rural residential development. Also, the Milltown Dam and irrigation diversions in the basin were considered risks since they directly remove fish from the population.

The local basin scoping group disagreed with the science team on one issue relative to the risk ratings. The scoping team identified residential development as a very high risk to bull trout restoration, whereas the science team did not.
Further research is needed to determine if thermal problems and conflicts with sport fish management are risks to bull trout recovery.

Core areas (those which currently support the strongest remaining populations of bull trout) are the North Fork of the Blackfoot River drainage, Monture Creek drainage, Copper Creek drainage, Gold Creek drainage, Cottonwood Creek drainage, the Clearwater River drainage above Rainy Lake, Deer Creek drainage, Placid Creek drainage, Belmont Creek drainage, Linders Fork drainage, East Fork Clearwater River drainage, West Fork Clearwater River drainage, and Morrell Creek drainage. Other watersheds are being considered as core area and may be added to the list when more information

becomes available. Nodal habitats (containing critical overwintering areas and migratory corridors) are the Blackfoot River, Clearwater River, and the Clearwater chain of takes (Salmon, Seeley, Placid, Inez, Alva, Rainy, and Clearwater).

Maintenance of self-sustaining bull trout populations in all the watersheds where they presently exist and maintenance of the population genetic structure throughout the watershed is the first component of the restoration goal. Under this goal, the objectives are for all existing populations to at least remain stable or increase from current numbers in the future.

Increasing and maintaining the connectivity between the Blackfoot River and its tributaries is considered imperative for the long term survival of the species in this drainage. A key component of the restoration goal is to maintain the self-reproducing migratory life form in the Blackfoot River, with spawning distributed among all core drainages. Restoring the connectivity between the Blackfoot drainage and the Clark Fork River is also a component of the restoration goal.
Specifically, a baseline of redd counts should be established in all drainages that presently support spawning migratory fish.

Review: Historically, bull trout were widely distributed throughout the Blackfoot drainage. Historical migratory connections probably existed between bull trout in the Clark Fork and Blackfoot rivers. This historical connection was broken by the construction of Milltown Dam in 1906. Bull trout were also thought to be widely distributed in tributaries of the Blackfoot River. The mainstem Blackfoot presently contains migratory (fluvial) bull trout. In winter, bull trout appear to congregate in boulder dominated reaches of the Blackfoot River. Preliminary results of a radio-tagging study indicate that bull trout move extensively within this system. Based upon redd counts, bull trout populations may be increasing, perhaps due to more restrictive angling regulations. The primary risks to bull trout populations in this system are mining and introduced species. Introduce species is believed to be the greatest threat to bull trout. Hybridization by brook trout, and predation and competition by brown trout are a threat to this species. Habitat impacts to bull trout include those from forest practices (sedimentation, woody debris removal) and grazing.

Comments: This report is relevant because many of the same factors impacting bull trout in this system (hydropower, logging, mining, introduced species) are also present in the Boundary Project areas.

Keywords: introduced species; forest impacts; hydropower development

Primary Topics: bull trout

Secondary Topics: conservation plan

Document Review - Seattle City Light Boundary Project

Document Number 62 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bonneville Power Administration

Year of Publication: 1989 **Geographic Area:** Pend Oreille River, Washington

Title: Assessment of the fishery improvement opportunities on the Pend Oreille River. 1988 Annual report.

Source: U.S. Dept. of Energy Rept DOE/BP/39339-1 . Bonneville Power Admin., Div. of Fish and Wildlife, Portland, Oregon. 381 p.

Abstract: The purpose of this study is to assess the fishery improvement opportunities on the Box Canyon portion of the Pend Oreille River. This report contains the findings of the first year of the study. Chinook salmon (Oncorhynchus tshawytscha) and steelhead (Oncorhynchus mykiss) were present in the Pend Oreille River prior to the construction of Grand Coulee Dam. The river also contained native cutthroat trout (Oncorhynchus clarki), bull trout (Salvelinus confluentus) and mountain whitefish (Prosopium williamsoni). Rainbow trout were planted in the river and some grew to lengths in excess of 30 inches. With the construction of Box Canyon Dam, in 1955, the most productive section of the river was inundated.

Review: This report documents the fish resources which were present prior to and after the construction of Box Canyon Dam. This reach of the river was considered to be the most productive prior to inundation by Box Canyon Reservoir.

Comments: An important report documenting the fisheries and impacts in the vicinity of Box Canyon Dam.

Keywords: dams; population-number; Salmonidae; freshwater fish; Pend Oreille; Box Canyon

Primary Topics: Box Canyon Dam

Secondary Topics: Bull Trout

Document Review - Seattle City Light Boundary Project

Document Number 63 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Brown, L. G.

Year of Publication: 1992 **Geographic Area:** Washington State

Title: On the zoogeography and life history of Washington's native charr; Dolly Varden Salvelinus malma (Walbaum) and Bull Trout Salvelinus confluentus (Suckley).

Source: Washington Fisheries Management Division Rept. #92-22, Appendix A. Washington Dept. of Wildlife, Olympia.

Abstract: None provided.

Review: This report provides a review of the life history and distribution of bull trout and Dolly Varden trout in Washington State. Most char in Washington state which were previously regarded to be Dolly Varden are more appropriately called bull trout. A large geographic zone of genetic introgression between bull trout and Dolly Varden is found throughout the Puget Sound and north coastal drainages of Washington. Bull trout, as a species distinct from Dolly Varden, have only recently come under increased scrutiny by federal and state fish management agencies. The state of Montana has the longest and most complete record of bull trout studies. The largest adfluvial bull trout population in the United States is located in the Flathead River, Montana. The majority of bull trout and Dolly Varden populations in Washington State are considered to be "vulnerable populations". As such, the WDFW considers resource protection to be the primary management emphasis for bull trout.

The Columbia River is considered to be the center of the distribution of bull trout. In eastern Washington, the distribution of bull trout is strongly influenced by human disturbance to the environment, most specifically the construction of hydropower, water storage, and diversion dams. Most populations of bull trout in the mainstem Columbia and Snake rivers were thought to be restricted to isolated stocks in headwaters of major tributaries. Pockets of bull trout exist in the remainder of eastern Washington, particularly in the Pend Oreille River drainage and Roosevelt Lake. Four population types of bull trout/Dolly Varden are recognized: anadromous, adfluvial, fluvial, and resident. Bull trout are anadromous in coastal and Puget Sound drainages. Bull trout are strongly influence by temperature, and are seldom found in streams with summer temperatures exceeding 18 C. Preferred temperatures may increased with increasing age. Most bull trout spawning occurs during the months of September and October. The long overwinter incubation and development phase of bull trout embryos and alevins leaves to particularly vulnerable to sedimentation and degradation in water quality. Bull trout adults move upstream to spawning tributaries as early as April, arriving to more spawning streams in June and July. Migration corresponds with maximum water temperatures and minimum flows. Pre-spawning bull trout are extremely vulnerable to angling mortality. Increased fishing pressure is though to be a major contributor to charr mortality. One of the most successful tools

for sampling bull trout is hook-and-line fishing. The preservation of the genetic variation of bull trout in the Columbia River drainage will require the continued existence of many locally adapted populations throughout the drainage.

Comments: An excellent review article on the life history and distribution of bull trout and Dolly Varden in Washington State.

Keywords: life history; Dolly Varden; spawning; diet; habitat requirements; genetics; systematics

Primary Topics: bull trout

Secondary Topics: life history

Document Review - Seattle City Light Boundary Project

Document Number 64 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Donald, D. B., and D. J. Alger

Year of Publication: 1993 **Geographic Area:** western North America

Title: Geographic Distribution, Species Displacement, and Niche Overlap for Lake Trout and Bull Trout in Mountain Lakes.

Source: Canadian Journal of Zoology 71(2): 238-47.

Abstract: Indigenous lacustrine populations of bull trout (Salvelinus confluentus) and lake trout (S. namaycush) are spatially separated within the southern part of the zone of distribution overlap (northern Montana, southwestern Alberta, and east-central British Columbia). In this area, lake trout occurred primarily in mountain lakes of 1032 to 1500 m elevation, while bull trout were found primarily in lakes between 1500 and 2200 m. Introductions of lake trout in the twentieth century and data obtained from beyond the study area indicated that both fishes can establish significant allopatric populations (> 5% of the catch) in large, deep lakes (> 8 ha in area and >8 m deep) over a wide elevation range. The hypothesis that lake trout could displace or exclude bull trout from lakes was tested by determining the outcome of introductions of lake trout into two lakes that supported indigenous bull trout. Lake trout were introduced into Bow Lake in 1964, and by 1992 the bull trout population was decimated there and in another lake (Hector) situated 15 km downstream. Thus, lake trout can displace bull trout and may prevent bull trout from becoming established in certain low elevation lakes. Population age-structure analyses also indicated that lake trout adversely affected bull trout. Bull trout populations in sympatry with lake trout, including the one extirpated from Hector Lake, had few old fish (18% were more than 5 years old; N = 40 fish from three lakes) compared with allopatric populations (49% were more than 5 years old; n = 225 fish from seven lakes). Niche overlap and the potential for competition between the two trout species were substantial. Bull trout and lake trout fed on similar foods and had similar ecological efficiencies (growth rates) in lakes with trophic structure ranging from simple to complex.

Review: This article demonstrates that Lake trout and bull trout possess similar habitat and food requirements in lakes. Lake trout may be a superior competitor to bull trout. The introduction of lake trout in into lakes and reservoirs in northern Montana, southwestern Alberta, and east-central British Columbia probably to reductions in the populations, and ultimately the displacement, of bull trout in these systems.

Comments: This article provides strong evidence of the threat of non-native species introductions to Bull Trout. Lake trout may pose a serious threat to bull trout in Boundary Reservoir.

Keywords: Alberta; British Columbia; introduced species; distribution; population dynamics

Primary Topics: bull trout

Secondary Topics: introduced species

Document Review - Seattle City Light Boundary Project

Document Number 65 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): DosSantos, J. M., J. E. Darling, and D. Cross

Year of Publication: 1988 **Geographic Area:** Flathead River, Montana

Title: Lower Flathead system fisheries study: Main river and tributaries, Volume 2: Final report, FY 1983-1987.

Source: U.S. Dept. of Energy, Contract AI79-83BP39830. Bonneville Power Adm., Div. of Fish and Wildlife, Portland, Oregon. 236 p.

Abstract: We believe our results have clearly shown Kerr hydroelectric operations and operational constraints have negatively affected Flathead River trout and northern pike populations and the aquatic habitat which support them. Even so, it is possible to mitigate many of these impacts and develop a very important fishery. Trout abundance in the lower Flathead averaged only 19 fish per kilometer, the lowest abundance of trout for a river of this size in Montana. Little main channel spawning by trout was observed and most spawning probably occurs in tributaries. Lower river tributaries support resident populations of brook (Salvelinus fontinalis), rainbow, brown, and cutthroat trout (Salmo gairdneri, S. trutta, S. clarki); and a small resident population of bull trout is present in the South Fork of the Jocko River. Using weirs, spawning runs of rainbow and brown trout from the main river were monitored entering the Jocko River and the Post/Mission Creek system.

Review: This report mentions that bull trout and other fish populations may be negatively impacted by hydroelectric operations on the Flathead River in Montana.

Comments:

Keywords: hydropower; dams; fishways; Flathead River; rainbow trout; cutthroat trout

Primary Topics: Hydropower impacts

Secondary Topics: Bull Trout

Document Review - Seattle City Light Boundary Project

Document Number 66 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Elliott, S. T.

Year of Publication: 1986 **Geographic Area:** Southeast Alaska

Title: Reduction of a Dolly Varden population and macrobenthos after removal of logging debris.

Source: Trans. Am. Fish. Soc. 115(3): 392-400.

Abstract: Logging debris resident for five or more years in small streams of southeastern Alaska is frequently removed to improve salmonid habitat. This practice was evaluated for its effects on juvenile anadromous Dolly Varden Salvelinus malma and macrobenthos populations in a small spring-fed stream during 1973-1981. Debris, consisting of limbs, needles, and fragmented logs, was removed by hand from the entire stream in July 1976. The surface area, number, and size of pools was reduced thereafter, and the water velocity increased. Macrobenthos density and invertebrate drift decreased 60-90% immediately after debris removal but returned to pretreatment levels in 1977. The Dolly Varden population decreased from 900 to less than 100 fish by 1978 and then fluctuated sharply between late 1978 and 1981. Removal of old logging debris does not improve habitat and can result in smaller rearing populations. Old debris should not be removed unless a block to migrating adult spawners or impairment of water quality can be demonstrated.

Review: Removal of logging debris may has an adverse impact to Dolly Varden trout in southeast Alaska. Substantial reductions in char populations were observed after removal of woody debris from streams. These findings probably apply to bull trout populations in interior streams of the western United States. Woody debris may be a limiting habitat feature to char in streams.

Comments: This article describes the serious impacts of removal of woody debris from streams in Southeast Alaska. Removal of woody debris resulted in a substantially decline in Dolly Varden densities in the streams studied. These impacts likely apply to bull trout populations as well.

Keywords: habitat; benthos; population dynamics; Alaska

Primary Topics: Dolly varden

Secondary Topics: forest impacts

Document Review - Seattle City Light Boundary Project

Document Number 67 **Review Date:** 7/23/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): City of Seattle, Washington - City Light Department

Year of Publication: 1981 **Geographic Area:** Boundary Reservoir and tailrace

Title: Application for Amendment to License for The Boundary Hydroelectric Development Project No. 2144.

Source: Seattle City Light.

Abstract: This document presents the results of the environmental investigations conducted for the proposed expansion of the Boundary Dam Hydroelectric Project, Pend Oreille County, Washington. These investigations were conducted in compliance with Federal Energy Regulatory Commission (FERC) regulations governing applications for License of Major Projects - Existing Dams (Federal Register, Vol. 44, No. 229, 67644-67655, Tues., Nov. 27, 1979).

Review: Limited to fisheries only. A partial list of fish species found in Boundary Reservoir includes the following species: largemouth bass, brown trout, dolly varden (bull trout), mountain whitefish, lake whitefish, pygmy whitefish (possible) yellow perch (dominant species found), rainbow trout, cutthroat trout, carp, suckers, squawfish, tench, and shiners. Two concerns were expressed by resource agencies: 1) related to the potential impact of reservoir fluctuations on shoreline spawning fishes and 2) the impact of powerhouse releases on downstream fish populations primarily through gas supersaturation.

Comments: virtually identical to the Review Draft of Exhibit E Environmental Report. very general - little information available for the project area

Keywords: FERC, fisheries, investigation

Primary Topics: fisheries

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 68 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Fraley, J., B. Marotz, J. Decker Hess, W. Beattie, and R. Zubik

Year of Publication: 1989 **Geographic Area:**

Title: Mitigation, Compensation, and Future Protection for Fish Populations Affected by Hydropower Development in the Upper Columbia System, Montana, U.S.A.

Source: Regulated Rivers Research and Management 3(1-4): 3-18.

Abstract: The construction of Hungry Horse Dam resulted in estimated annual losses of 65,500 migratory juvenile westslope cutthroat and 1965 adult migratory bull trout from the Flathead Lake and River system. In addition, operations of Hungry Horse and Kerr dams caused annual losses conservatively estimated at 96,300 river-spawning and 131,000 lakeshore-spawning kokanee adults. Water level fluctuations caused by dam operations at Libby and Hungry Horse reservoirs result in: (1) altered thermal stratification; (2) indirect losses in phytoplankton and zooplankton production, (3) direct washout of phytoplankton and zooplankton through dam penstocks; (4) reductions in standing crop of benthic organisms and of insects on the water surface; and (5) reduced fish growth in the late summer and fall. Mitigative measures include: (1) 99.2 and 113.3 cu m/s minimum flows in the Flathead and Kootenai rivers respectively, to protect salmonid eggs and juveniles; (2) improvement of fish passage to restore migrations between the Flathead and Swan systems; and (3) biological rule curves for operations at Libby and Hungry Horse reservoirs. To compensate for fisheries losses, enhancement of spawning and rearing habitat, introductions of hatchery juveniles, and spawning channels are recommended. In addition, protection from further hydropower development for 100 stream reaches for fish species of special concern, and for outstanding sport fisheries is recommended. These and other measures will be considered by various agencies in developing an overall fisheries restoration plan which should be flexible, and employ principles of adaptive management.

Review: Describes impacts of hydroelectric development on bull trout in the upper Flathead River system. Impacts to fluvial and adfluvial populations are attributed to changes in water temperature, phytoplankton and zooplankton production, reductions in benthic organisms, and migration blockage.

Comments: This article may provide a good example of how upstream reservoirs (i.e., Box Canyon) may adversely impact bull trout populations in Boundary Reservoir.

Keywords: hydroelectric power; reservoir operation; fish migration; plankton; trout; benthos

Primary Topics: bull trout

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 69 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Mallet, J.

Year of Publication: 1968 **Geographic Area:** Lake Pend Oreille

Title: Biological and economic survey of fishery resources in Lake Pend Oreille; the Lake Pend Oreille creel census and life history studies, 1967.

Source: Idaho Department of Fish and Game, Annual Report, Boise. May 20, 1968. 18 p.

Abstract: Creel census at Lake Pend Oreille was designed to determine the size and quality of the annual fish harvest and to establish catch by resident, non-resident, and commercial fishermen. Of 908,293 fish caught, 99% were kokanees, 0.5% were trout, and 0.5% were other species. Residents comprise 37% of total fishers, non-residents 56%, and commercial about 7 %.

Review: Contains results of creel surveys in Lake Pend Oreille, including total estimated catch, utilization by residents, utilization by non-residents, utilization by commercial fishers, catch for interviewed anglers by species, length frequency distributions of kokanees, and estimated kokanee catch by cohort.

Comments:

Keywords: harvest, effort, trout, kokanee

Primary Topics: Lake Pend Oreille fish harvests and creel efforts

Secondary Topics: length frequency, cohort contributions

Document Review - Seattle City Light Boundary Project

Document Number 70 **Review Date:** 7/23/9

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 69 **Review Date:** 7/23/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Mallet, J.

Year of Publication: 1968 **Geographic Area:** Lake Pend Oreille

Title: Biological and economic survey of fishery resources in Lake Pend Oreille; the Lake Pend Oreille creel census and life history studies, 1967.

Source: Idaho Department of Fish and Game, Annual Report, Boise. May 20, 1968. 18 p.

Abstract: Creel census at Lake Pend Oreille was designed to determine the size and quality of the annual fish harvest and to establish catch by resident, non-resident, and commercial fishermen. Of 908,293 fish caught, 99% were kokanees, 0.5% were trout, and 0.5% were other species. Residents comprise 37% of total fishers, non-residents 56%, and commercial about 7 %.

Review: Contains results of creel surveys in Lake Pend Oreille, including total estimated catch, utilization by residents, utilization by non-residents, utilization by commercial fishers, catch for interviewed anglers by species, length frequency distributions of kokanees, and estimated kokanee catch by cohort.

Comments:

Keywords: harvest, effort, trout, kokanee

Primary Topics: Lake Pend Oreille fish harvests and creel efforts

Secondary Topics: length frequency, cohort contributions

Document Review - Seattle City Light Boundary Project

Document Number 70 **Review Date:** 7/23/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): City of Seattle, Washington - City Light Department

Year of Publication: 1981 **Geographic Area:** Boundary Reservoir and tailrace

Title: Review Draft of Exhibit E Environmental Report to Support Application for Amendment to License for The Boundary Hydroelectric Development Project No. 2144.

Source: Seattle City Light.

Abstract: This document presents the results of the environmental investigations conducted for the proposed expansion of the Boundary Dam Hydroelectric Project, Pend Oreille County, Washington. These investigations were conducted in compliance with Federal Energy Regulatory Commission (FERC) regulations governing applications for License of Major Projects - Existing Dams (Federal Register, Vol. 44, No. 229, 67644-67655, Tues., Nov. 27, 1979).

Review: Review limited to fisheries only. A partial list of fish species found in Boundary Reservoir includes the following species: largemouth bass, brown trout, dolly varden (bull trout), mountain whitefish, lake whitefish, pygmy whitefish (possible) yellow perch (dominant species found), rainbow trout, cutthroat trout, carp, suckers, squawfish, tench, and shiners. Two concerns were expressed by resource agencies: 1) related to the potential impact of reservoir fluctuations on shoreline spawning fishes and 2) the impact of powerhouse releases on downstream fish populations primarily through gas supersaturation.

Comments: very general - little information available for the project area

Keywords: FERC, fisheries, investigation

Primary Topics: fisheries

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 71 **Review Date:** 7/23/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Sheehan, S.W. and M. Lamb

Year of Publication: 1987 **Geographic Area:** Columbia and Pend d'Oreille near the Int. Boundary

Title: Water Chemistry of the Columbia and Pend d'Oreille Rivers near the International Boundary (Data Report)

Source: Inland Waters and Lands. Pacific and Yukon Region. Vancouver, B.C. 311 p.

Abstract: During the mid-1970's, concerns were raised about discharges of industrial effluents into the Columbia River. As a result of these concerns, the Water Quality Branch began a study to assess levels of nutrients, metals and other parameters near the international border. From 1978 to 1984 detailed studies of temporal and cross-sectional variability were undertaken. This report presents the data from these studies.

Review: no review or interpretation presented (data report only)

Comments:

Keywords: water quality, phosphorous

Primary Topics: water quality

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 72 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Cavender, T. M.

Year of Publication: 1978 **Geographic Area:**

Title: Taxonomy and distribution of the bull trout, Salvelinus confluentus (Suckley), from the American northwest.

Source: Calif. Fish-Game 64(3): 139-74.

Abstract: Morphological and distributional evidence is presented favoring the specific distinction of the bull trout, S. confluentus, a currently unrecognized form of Salvelinus native to western North America. This species has been confused with the Dolly Varden, S. malma (Walbaum). Separation of the two is based primarily on characters of the head and cranial skeleton. Diagnosis and description are given for the bull trout along with a history of its early taxonomy. Past and present distribution of the bull trout ranges between latitude 41-degree- and 60-degree- N. North of the 49th parallel it is found in most of the major drainages originating on both sides of the Continental Divide. The bull trout is or at one time was sympatric with the Dolly Varden in at least three major river systems, as well as the waters of Puget Sound.

Review: Bull trout diverged from a Dolly Varden type ancestor by evolving into a piscavore. The Columbia River was considered to be the center of the distribution of Bull Trout; the species was anadromous earlier in it's history. Spatial isolation between bull trout and Dolly Varden is achieved by bull trout occupying colder, headwater streams, and Dolly Varden occupying warmer, coastal streams in the Pacific Northwest. The range of these two species overlaps in the Puget Sound northward along the coast of British Columbia. Bull trout is considered to be a distinct species from Dolly Varden based upon morphometric and osteological features, as well as their historic distribution. This conclusion is supported by more recent chromosomal analysis.

Comments: This is the study which identified bull trout as a separate species from Dolly Varden trout.

Keywords: taxonomy; distribution; morphology; sympatric populations; Dolly Varden trout

Primary Topics: bull trout

Secondary Topics: taxonomy

Document Review - Seattle City Light Boundary Project

Document Number 73 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Fraley, J. J., and B. B. Shepard

Year of Publication: 1989 **Geographic Area:** Flathead River, Montana

Title: Life History, Ecology and Population Status of Migratory Bull Trout (Salvelinus confluentus) in the Flathead Lake and River System, Montana.

Source: Northwest Science 63(4): 133-42.

Abstract: Life history, ecology, and population trends of migratory bull trout (Salvelinus confluentus) were investigated in the Flathead Lake and River system of northwest Montana and southeast British Columbia. These studies were conducted to obtain information to manage the species in light of threats posed by timber harvest, hydropower development, and a proposed coal mine. It was estimated that about half the adult bull trout in Flathead Lake embarked on a spawning migration from May through July, swimming 88-250 km to reach tributaries of the North and Middle Forks of the Flathead River. Bull trout entered the tributaries when water temperatures dropped below 12 C, and spawned from late August through early October after water temperatures were below 9 C. They spawned in areas of tributaries with low gradient, loosely compacted gravel, groundwater influence, and cover. After spawning, females left the tributaries and returned to the lake sooner than males. Most spawners were 6 or 7 years old and they averaged 628 mm in length. Juveniles were found close to the substrate in streams in streams with summer maximum temperatures less than 15 C. Juveniles migrated out of the tributaries to the river systems from June through August, at age I (18%), II (49%), III (32%), and IV (1%). Population status was monitored through redd counts and estimates of juvenile abundance in natal tributaries. The population may be limited by quantity and quality of rearing and spawning habitat, and spawning escapement. Specific requirements for spawning and rearing habitat, and general sensitivity of each life stage, make the bull trout an excellent indicator of environmental disturbance.

Review: The Flathead Lake system possesses the largest population of adfluvial bull trout in the United States. Adult bull trout migrate during the spring from Flathead Lake to tributary streams 88 to 250 km from the lake. The early migration timing is probably attributed to the considerable distance these fish must travel to headwater tributaries where they spawn. Spawning timing coincides with drops in water temperatures in tributary streams. Bull trout prefer to spawn in lower gradient tributaries possessing abundant gravels and relatively low water velocities. Fish mature at approximately 6 to 7 years in age. Most juveniles migrate from tributaries to Flathead Lake after two to three years of residence in natal streams

Comments: An excellent life history study of the largest adfluvial bull trout population in the United States.

Keywords: reservoirs; lake fisheries; trout; aquatic habitat; growth; population dynamics; fish management

Primary Topics: bull trout

Secondary Topics: ecology

Document Review - Seattle City Light Boundary Project

Document Number 74 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Fraley, J., T. Weaver, and J. Vashro

Year of Publication: 1989 **Geographic Area:** Flathead River, Montana

Title: Cumulative Effects of Human Activities on Bull Trout (Salvelinus confluentus) in the Upper Flathead Drainage, Montana.

Source: Proceedings of the Symposium on Headwaters Hydrology, Bethesda Maryland: American Water Resources Association.

Abstract: Bull trout are the largest fish native to the Flathead drainage area of Montana, attaining a length of up to one meter and a weight of 10 kg. This species migrates from Flathead Lake up to 250 km upstream to spawn in cold headwater tributaries with groundwater upwelling and clean gravels. Spawning and rearing habitats are limited and vulnerable to damage by deposition of fine sediments. Potential threats to bull trout habitat and populations include timber harvest, road building, mining, residential and agricultural development, hydropower construction and operation, harvest of fish by anglers, and non-native fish species. Management and mitigation options include application of best management practices and riparian guidelines for logging, habitat protection and improvement, improved fish passage to blocked areas, fishing regulations and integrative management of fish populations. Because of reduction in habitat, continued potential for habitat degradation, and limited options for management, the bull trout population is vulnerable and should be closely monitored to detect signs of decline.

Review: This article describes the impacts of habitat degradation and other human disturbances on bull trout populations in the Flathead Drainage, Montana. Sedimentation, removal of riparian vegetation, overharvest by fishing, and blockage of migration by dams are identified as factors threatening populations of bull trout in this drainage.

Comments: This article identifies a number of possible limiting factors to fluvial and adfluvial bull trout populations.

Keywords: spawning; hydrology; land-use; behavior; passage; logging; hydropower

Primary Topics: bull trout

Secondary Topics: management

Document Review - Seattle City Light Boundary Project

Document Number 75 **Review Date:** 7/23/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ashe, B.L., K.L. Lillengreen, J.J.Vella, L.O.Clark, G.J. Nenema Jr., D.L. Richards, T.H. Skillingstad, and A. Scholz

Year of Publication: 1990 **Geographic Area:** Box Canyon reach of the Pend Oreille River

Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Appendices.

Source: U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-A179-88BP39339. 338 p.

Abstract:

Review: no review conducted on data (see review of report)

Comments:

Keywords: abundance, growth, macroinvertebrate, zooplankton, migration, habitat, angler

Primary Topics: data tables

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 76 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Gaufin, A. R., G. W. Prescott, and J. F. Tibbs

Year of Publication: 1976 **Geographic Area:** Flathead Lake, Montana

Title: Limnological Studies of Flathead Lake, Montana: A Status Report.

Source: Report EPA-600/3-76-039. Environmental Protection Agency, Washington, D.C.. 92 p.

Abstract: Flathead Lake is a dimictic oligotrophic lake. The algal flora is classified as a Diatom-Cyanophyte moderately hard-water type and contains 102 Chlorophyta species, 40 Cyanophyta species, 12 Chrysophyceae species, 399 Bacillariophyceae species and varieties in 42 genera, 13 Pyrrophyta species, 4 Xanthophyceae species, 1 Euglenophyta species, and 2 Cryptophyta species. Nitrate and phosphate concentrations are relatively low but are occasionally high enough to support blue-green algal blooms, indicating gradual eutrophication in restricted areas. Low temperatures and low concentrations of organic acids and vitamins are deterrents to extensive blooms. The more common forms of zooplankton found are Daphnia species, Kellicottia longispina, Keratella cochlearis, Cyclops bicuspidatus thomasi, and Diaptomus ashlandi. Spatial and temporal distribution of Daphnia appears to be influenced primarily by temperature. A total of 8,912 fish were collected between November 1967-December 1971 consisting of 15 major species: lake whitefish, Kokanee salmon, Dolly Varden, and Lake trout were the most common game species. The future of the Flathead Lake fishery depends on natural reproduction in its waters and the quality of the aquatic habitat. Water development projects, housing projects, lumbering, and natural environmental variations will all be reflected in fish populations of this drainage system.

Review:

Comments: This is a good study which examines relationships between limnological characteristics, phytoplankton, zooplankton, and trout populations (including bull trout) in Flathead Lake, Montana.

Keywords: limnology; algae; limiting-factors; fish populations; trout; water temperature

Primary Topics: limnology

Secondary Topics: bull trout

Document Review - Seattle City Light Boundary Project

Document Number 77 **Review Date:** 7/23/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ellis, V., and B. Bowler

Year of Publication: 1981 **Geographic Area:** Pend Oreille Lake, Idaho

Title: Lake and Reservoir Investigations-Pend Oreille Lake Fisheries Investigations. Pend Oreille Lake Creel Census.

Source: Job Perform. Rept., Proj-F-73-R-3(3)2 , Idaho Department of Fish and Game, Boise. 61 p.

Abstract: In 1980 Pend Oreille Lake sport anglers fished an estimated 250,812 hours during 53,219 man-days to catch 196,975 fish. Fifty-four percent of the anglers fished for kokanee which comprised 93% of the estimated catch while 46% fished for trout, including Dolly Varden, which comprised 5% of the estimated catch. A small percentage of the anglers fished for whitefish and spiny-rayed species which made up 2% of the total catch. The 1980 kokanee catch and effort decreased from 1979 with a slight increase in catch rate. The lowest catch recorded since 1951 when the Pend Oreille census commenced was 1978 with an estimate of 165,000 kokanee. The estimated rainbow trout catch in Pend Oreille Lake during 1980 was 8,157. Of that total, 3,393 were trophy Kamloops (over 43.2 cm in length). Anglers expended an average of 61.6 hours to catch a trophy Kamloops. Kokanee sport catch in Pend Oreille Lake has averaged less than 200,000 fish since 1977 compared to traditional levels of 600,000 harvested in the early 1960's. Populations of the predator salmonids appear stable with potential problems of predator-prey imbalances. Kokanee mortality will increase if kokanee populations continue to decline in the lake. Kokanee consumption by salmonid predators was estimated to exceed 1 million annually.

Review: The main point of this article is that Dolly Varden (now considered bull trout) in constitute approximately 5% of the recreational sport catch in Pend Oreille Lake. The majority of fish caught by anglers in this lake are kokanee.

Comments: This article provides a description of the sport catch of bull trout in Pend Oreille Lake.

Keywords: sport fishing; economics; rainbow trout; kokanee; Idaho

Primary Topics: Pend Oreille Lake Fisheries

Secondary Topics: bull trout

Document Review - Seattle City Light Boundary Project

Document Number 78 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Young, M. K. (editor)

Year of Publication: 1995 **Geographic Area:** Rocky Mountain West, Intermountain West

Title: Conservation assessment for inland cutthroat trout.

Source: General Technical Report RM-256. Fort Collins, Co: U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Abstract: Focuses on five sub-species of cutthroat trout found mainly on public lands in the Rocky Mountain and Intermountain West. These subspecies are restricted to a fragment of their former range, and primarily occupy small, high-elevation streams. Little is known about the three rarest subspecies (Bonneville, Colorado River, and Rio Grande cutthroat), and the data on more abundant subspecies were obtained form relatively few areas. The historic diversity of life-history strategies has been reduced. All species suffer from non-native introductions, fragmentation, habitat degradation, and overfishing. Current management often centers on restrictive angling regulation, barricading streams to prevent invasion by nonnative fishes, and reintroductions into streams with existing barriers.

Review: A conservation assessment for managing and preventing the extinction of inland cutthroat trout.

Comments: Chapter 1 by McIntyre and Rieman deals with Westslope cutthroat trout.

Keywords: cutthroat trout, fishing, nonnative species, mountain streams

Primary Topics: cutthroat trout ecology

Secondary Topics: management and research considerations

Document Review - Seattle City Light Boundary Project

Document Number 79 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Klavano, W. C.

Year of Publication: 1960 **Geographic Area:** Lake Pend Oreille

Title: Biological and economic survey of fishery resources in Lake Pend Oreille: Creel census and limnological studies Lake Pend Oreille, 1951 to 1958.

Source: Idaho Department of Fish and Game, Federal Aid to Fish Restoration, Final Report, Project F 3-R-10. 42 p.

Abstract: An eight-year study was conducted from 1951-58 to evaluate the harvest and value of fishery resources in Lake Pend Oreille. This study concluded that: dam construction and operation during the study had no apparent detrimental effects on kokanee catch, and catch increased during the study; trout catch decrease and effort per trout increased from about 5 to 13 h/fish from 1953 to 1957. Kamloops trout catches were increasing, and may have resulted from intensified hatchery program; cutthroat and dolly varden (bull trout) catches decreased during the study and blockage to spawning areas of the Clark Fork River and tribs above Cabinet Gorge may be responsible for the decline; limnological studies showed no significant changes in abundance and composition of phytoplankton, zooplankton, water temperatures, and kokanee food habits during and after dam construction; changes to angling regulations have not had an apparent affect on kokanee harvests; no relation between numbers of kokanee and cutthroat planted and harvested was apparent; annual variation in the kokanee population appears to have the greatest effect on total catch.

Review: Provides a general historic account of the Lake PO fishery and impoundments. Reiwes results of an eight-year study conducted by the IDFG to detect changes in the Lae PO fishery due to construction of dams. An economic survey was conducted to evaluate the importance of the sport and commercial fishery to the nation. Spawning surveys and limnological surveys were also conducted.

Comments: Potentially useful document, especially text sections. Appendix B contains list of fish species.

Keywords: kokanee, bull trout, cutthroat, Kamloops, harvest

Primary Topics: harvest, economics, limnology, spawning

Secondary Topics: plankton, water level fluctuations

Document Review - Seattle City Light Boundary Project

Document Number 80 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Jeppson, P.

Year of Publication: 1955 **Geographic Area:** Lake Pend Oreille and tributaries

Title: Evaluation of spawning areas in Lake Pend Oreille and tributaries upstream from Albeni Falls Dam in Idaho, April 1, 1954 -- May 31, 1955, including supplemental information on the life history of kokanee.

Source: Idaho Department of Fish and Game, Annual Summary Report, Investigations Project F 3-R-4 and F 3-R-5 (Work Plan 2). 36 p.

Abstract: Water level fluctuations due to dams may contribute to a 60% loss of kokanee spawned along shorelines; fluctuating flows in the Clark Fork River may account for loss of 65% of kokanees spawned in the river and 40% loss may result from dam construction; total estimated of spawners could not be made; estimated number of kokanee spawners in tributaries was 56,300; about 90% of kokanee spawners sampled were age 4. Dam construction and operation are factors influencing natural reproduction and abundance of kokanee and trout in Lake Pend Oreille. Mitigation should include improved spawning areas in tribs, supplementation, and pollution control. Biological data section contains information on bull Trout, cutthroat trout, and whitefish spawning.

Review: Fourth in a series of reports dealing with a biological survey of spawning utilization of Lake Pend Oreille and tributaries by major game fish, and assessment of spawning. Provides recommendations regarding reservoir drawdown relative to kokanee spawning.

Comments: Contains limited bull trout information.

Keywords: spawning, kokanee, age, drawdown, bull trout

Primary Topics: salmonid spawning

Secondary Topics: age and growth of kokanee

Document Review - Seattle City Light Boundary Project

Document Number 81 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Wydoski, R.S. and R.R. Whitney

Year of Publication: 1979 **Geographic Area:** Washington

Title: Inland Fishes of Washington.

Source: University of Washington Press. Seattle and London. 220 p.

Abstract:

Review: Life history information is presented for all species of fish found in Washington. Morphological descriptions and aids to identification are also presented. Distribution and abundance information are presented.

Comments: An excellent reference

Keywords: life history, distribution, habitat

Primary Topics: life history

Secondary Topics: distribution

Document Review - Seattle City Light Boundary Project

Document Number 82 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Job Performance Report

Author(s): Irizarry, R., V. Ellis, B. Bowler, B. Rieman, M.C. Falter, B. Bowler

Year of Publication: 1976 **Geographic Area:** Lake Pend Oreille, Clark Fork River

Title: Lake and reservoir investigations: Job IV-a, Lake Pend Oreille creel census; Job IV-c, Kokanee spawning trends; Job IV-d, Lake Pend Oreille limnological studies; Job IV-e, Lake Pend Oreille kokanee life history studies.

Source: Idaho Department of Fish and Game, Job Performance Report, Project F-52-R-11, June, 1976. 209 p.

Abstract: Job IV-a: Kokanee comprise 98% of the estimated catch from Lake Pend Oreille, and Kamloops rainbow harvest was highest recorded since 1965 (1,101). Angler interviews indicated opposition to a commercial fishery for kokanee on Lake Pend Oreille. Contains historic data tables on angler harvest and effort for kokanee and bull trout (dolly varden) in the Lake. Job IV-c: Early-run kokanee spawn in Trestle Creek from August to October. Shoreline spawning occurred in the Bayview area and peaked in mid-December. Granite Creek supports a large (26, 453) run of late-run kokanee, with 14, 198 counted in Sullivan Springs Creek. Kokanee spawner abundance in years 1973-75 was about equal, and increased threefold over 1972. Job IV-d: Lake Pend Oreille is a temperate, dimictic system, moderately rich and primarily phosphate limited. Mean depth is 164 m and is important in maintaining the oligotrophic nature. Turbidity of the Clark Fork River may be important determinant of the plankton distribution. Primary productivity is lowest in the north end of the lake where flushing and turbidity are greatest. Mysis was introduced in 1966 and may have altered the plankton community, resulting in a net reduction of food available to kokanees. Job IV-e. Hydroacoustics and gill-netting was used to assess fish abundance and movement of kokanee within Lake Pend Oreille. Kokanee were sampled for age and stomach contents, and trawls were used to estimate densities of mysis in the lake. Fish abundance estimates declined from 12.1 million in 1974 to 9.2 million in 1975. Composition was estimated to be about 97% kokanee. Kokanee food preference shifted from Daphnia in summer 1974 to Epischura in summer 1975.

Review: Job IV-a reviews angler harvests, efforts, and satisfaction with regulations. Job IV-c assesses spawning escapements from both early and late-run kokanee in Lake PO and tribs during the 1975-76 spawning season. Job IV-d: summarizes the lake limnology and discusses changes in the plankton community that resulted from mysis introduction, including reduced food available to kokanees.

Comments: Reports are full of potentially useful fisheries data. Rieman report gives an excellent physical description of the lake.

Keywords: kokanee, mysis, plankton, bull trout, harvest, spawning

Document Review - Seattle City Light Boundary Project

Primary Topics: kokanee harvests and reproduction in Lake Pend Ore

Secondary Topics: lake limnology, water chemistry, plankton community

Document Review - Seattle City Light Boundary Project

Document Number 83 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Meeting Minutes

Author(s): Foster Wheeler Environmental

Year of Publication: 1995 **Geographic Area:** Chester Morse Lake, Masonry Pool

Title: Cedar River Watershed Bull Trout Workshop.

Source: Prepared by Foster Wheeler Environmental for Seattle Water Department, November 18, 1994. 112 p.

Abstract: Seattle Water department conducted a one-day workshop to evaluate information, mitigation, and need for additional studies related to bull trout and land management practices in the Upper Cedar River watershed. The purpose of the workshop was a round table discussion to identify new of unpublished information on bull trout ecology, assess the potential implications of reservoir operations and land management on bull trout ecology , and to generate ideas on ways to identify, protect, and restore important habitats. The meeting consisted of presentations on current watershed operations and findings of current studies. The Meeting Minutes contains a summary of the meeting and distributions of information that occurred during the meeting. In some cases, specific discussion points are selectively placed into the text at the appropriate place and identified as Post-Presentation Points.

Review: Meeting minutes contain information on bull trout redd inundation, restricted spawning access due to reservoir drawdown, shore-spawning, impacts on pygmy whitefish, water supply operations, entrainment, timber harvest impacts, poaching, tributary access, stream rehabilitation, and potential mitigation.

Comments: Contains abstracts from the Friends of Bull Trout Conference in Calgary, 1994.

Keywords: bull trout, ecology, redd inundation, spawning access, pygmy whitefish

Primary Topics: adfluvial bull trout ecology

Secondary Topics: reservoir operations, land management

Document Review - Seattle City Light Boundary Project

Document Number 84 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): BPA, USACOE, USBOR

Year of Publication: 1994 **Geographic Area:** Columbia basin

Title: Columbia River systems operations review, Appendix C-1, anadromous fish.

Source: Department of Energy, Environmental Impact Statement-0170, July 1994. 312 p.

Abstract: A detailed and technical description of the Anadromous Fish Workgroup's analysis of alternatives - from the scoping process through full-scale analysis. Provides a means to evaluate alternative system operating strategies in the EIS Main Report. Attempts to provide a comprehensive view of the potential impacts of different operating scenarios on the quality of habitats for anadromous fish in the Columbia basin.

Review: This appendix presents a review of the Anadromous Fish Workgroup's analysis of alternatives of Columbia River system operating strategies. Ten technical groups were appointed to represent user groups and resource areas within the Columbia basin. Each group was charged with developing hydrosystem operating strategies beneficial to its interest, as well as a means to analyze the scenarios of other groups. This document presents reviews of operating alternatives analyzed by the anadromous fish group.

Comments: See also under same title: Final EIS, Main Report, November 1995.

Keywords: salmon, Columbia River, hydropower operations, flow control, drawdown

Primary Topics: affects of hydropower operations on anadromous fish

Secondary Topics: fish harvests, agriculture

Document Review - Seattle City Light Boundary Project

Document Number 85 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Embody, D. R.

Year of Publication: 1956 **Geographic Area:** Lake Pend Oreille

Title: The resident sport catch for Pend Oreille Lake, 1951-1955.

Source: Idaho Department of Fish and Game, Federal Aid to Fisheries, Project F 3-R, September 15, 1956. 89 p.

Abstract: Provides a statistical analysis of the catch of salmonids from Pend Oreille Lake by resident sportsmen during 1951-55. Sport catch by residents occurs almost wholly within the months from April to October, and statistical analyses were limited to that period. Interpretation of analyses of catch data concluded that the effects of changes in census methods were tested and found to be significant, and the catch of salmonids by resident sportsmen declined by a significant amount in the year 1955.

Review: Contains extensive data tables with weekday and weekend estimated resident catches of salmonids in different sections of Lake Pend Oreille, 1951-55. Data are not separated by species, and lake areas sampled are not defined.

Comments: Probably not a useful document unless looking for gross trends in catch of all salmonids combined.

Keywords: creel survey, salmonid, harvest

Primary Topics: estimated resident harvest of salmonids

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 86 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): City of Seattle - Department of Lighting

Year of Publication: 1967 **Geographic Area:** Pend Oreille River, Washington

Title: Seattle City Light's Boundary Project

Source: Seattle City Light. 6 p.

Abstract:

Review: Boundary Project construction history presented

Comments:

Keywords: construction, powerhouse, dam

Primary Topics: construction progress

Secondary Topics: project specifications

Document Review - Seattle City Light Boundary Project

Document Number 87 **Review Date:** 7/24/96

Reviewer's Name: Randall Jeric **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): BPA, USACOE, USBOR

Year of Publication: 1995 **Geographic Area:** Columbia basin

Title: Columbia River systems operations review, Main Report.

Source: Department of Energy, Environmental Impact Statement-0170, November, 1995. 451 p.

Abstract: Document analyzes Columbia River system operating strategies including: system operation prior to ESA listing of salmon stocks; current operations; stable storage project operations; natural river operations; fixed drawdown; operating strategies proposed by the USFWS, NMFS, and Tribes and other agencies; and the Preferred Alternative. Decision making forum alternatives, power alternatives, and ownership alternatives are discussed, as well.

Review: Provides summary-level information that is supported by more technical appendices.

Comments: See also under same title: Draft EIS, July 1994.

Keywords: salmon, Columbia River, hydropower operations, flow control, drawdown

Primary Topics: affects of hydropower operations on anadromous fish

Secondary Topics: fish harvests, agriculture

Document Review - Seattle City Light Boundary Project

Document Number 88 **Review Date:** 7/24/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Goetz, F.

Year of Publication: 1989 **Geographic Area:** western North America

Title: Biology of the bull trout Salvelinus confluentus: A literature Review.

Source: Willamette National Forest, Eugene, Oregon. 53 p.

Abstract: The geographical distribution and preferred habitat of the endemic western brook charr, Salvelinus contents or bull trout, has become increasingly restricted in recent years. The attempt of this paper is to summarize previous research that may be of benefit to fishery biologists with bull trout populations in their management areas.

Historically, the bull trout was found in most major river systems in the Pacific Northwest. However, within the past 30 years its western and southern boundaries have been greatly reduced in area. The bull trout is now considered extinct in the McCloud River of California (Rode 1988). In the Willamette Basin of Oregon, it is now found only in the McKenzie watershed. Before 1979 its range included the Clackamas, North Santiam and the Middle Fork Willamette drainages within the basin. It may also have been exterminated from the upper Deschutes River Basin within the past 25 years (Oregon. State Game and Wildlife Commission 1947-74, Oregon Department of Fish and Wildlife 1975-79).

An explanation for this decline in distribution and numbers may be related to the special habitat requirements of spawning adults and rearing juveniles. In Montana for example, the bull trout is used as an environmental indicator because of the sensitivity of each life stage to disturbances (Fraley and Shepard 1988). The trout is also used as indicator for forest plans implementation in Oregon.

In the production of salmonids, two bottlenecks, are assumed - reproduction and juvenile mortality (McPhail and Murray 1979). According to Allen (1 969), each stream has its own carrying capacity that produces a finite number of young per species per year. The amount of living space, or cover, may be the main habitat feature determining capacity. For salmonid juveniles, if sufficient preferred cover is not available, surplus individuals are displaced through emigration or increased mortality (Bjornn 1971; Burns 1971). McPhail and Murray (1979) suggested the survival of bull trout fry is the 'bottleneck, that limits production of the population. Finite amounts of quality, juvenile rearing habitat may also be a primary factor restricting abundance in the Flathead River Basin (Fraley and Shepard 1988).

Fishery biologists in the Pacific Northwest are focusing more attention on declining bull trout populations within their management areas. They are considering plans to protect or augment existing

populations. To accomplish these plans, they have proposed improvements to juvenile rearing habitats and stock transfers. Before any alteration to habitats or introductions are undertaken, a thorough examination of bull trout behavior, habitat preferences and genetic variation is needed. Additionally, habitat alteration studies involving other salmonid young and their application to bull trout rearing areas need to be investigated.

Review: This report provides a comprehensive review of literature related to the taxonomy, distribution, life history, behavior, habitat requirements of bull trout. Effects of sport fishing and habitat alteration on bull trout are discussed, as are artificial propagation methods.

Before 1978, this species was regarded as Dolly Varden trout. Morphometric, meristic, and osteological characteristics were used to differentiate bull trout from Dolly Varden Trout by Cavender (1978). Bull trout are the native charr species that inhabit the eastern slope streams and lakes of the Cascade Mountains and eastern Washington. Leary (1985), based upon electrophoretic data, concluded that bull trout is more closely related to the arctic charr than to eastern brook or lake trout. This report also found that genetic variation in Columbia river stocks is low within populations but high among populations. Bull trout can be identified from Dolly Varden by head shape, coloration, and branchiostegal ray count. Bull trout have been found to hybridize with eastern brook trout. However, only male hybrids were only found in a Montana Study, indicating sterility in offspring in bull trout - brook trout crosses. Bull trout populations in areas where brook trout are also present appear to be on the decline.

The Columbia River drainage is considered the region of origin of bull trout. Dolly Varden have never been found in coastal Oregon stream, the southern limit of Dolly Varden appears to be the Quinalt River in Washington. Overlap in the range of Dolly Varden and bull trout occurs in the Puget Sound region and northward only the British Columbia coast.

Bull trout have three different life history patterns -- resident, fluvial, and adfluvial. Resident stocks typically inhabit headwater streams, mature at an early age, have a relatively small size, and have a low fecundity. Maximum sizes of resident bull trout range from 200 to 300 mm. In fluvial and adfluvial populations, adults undergo spawning migrations of up to 225 kilometers. For fluvial populations, smaller tributaries act as breeding grounds and rearing areas for juveniles. Adfluvial populations represent populations where adult fish reside in lakes or reservoirs, and in which fish spawn and rear in tributaries. In both fluvial and adfluvial populations, juveniles remain in smaller tributaries from one to six years before migrating downstream to the mainstem rivers or lakes. Historically, most bull trout populations in Oregon and Washington were fluvial. Dam construction has changed many populations to an adfluvial life history pattern.

Bull trout spawning usually takes place during September and October. Spawning has been observed as early as the first week of August in tributaries of the Metolius River, Oregon. Initiation of breeding appears to be related to declining water temperatures. Spawning occurs primarily at night. Age of maturity of bull trout ranges between 5 and 7 years. Review of literature suggests that bull trout prefer to spawn in lower gradient channel areas which possess greater amounts of loose gravels and rubble, and lower velocities. Areas favorable to spawning have maximum temperatures less than 18 C; spawning in some systems has been associated with groundwater recharge. Optimal temperatures for incubation range between 2 and 4 C, lowest survival rates were observed for temperatures of 8 to 10 C. Embryos emerge during the spring.

Juvenile bull trout are territorial, and focus on a fixed site in rearing streams. They tend to maintain these fixed sites as feeding stations throughout the summer. Juvenile bull trout are primarily bottom-dwellers. Young-of-years fish are typically found in shallow, slow backwater side channels or eddies,

and are often found in association with woody debris. Older individuals are found in deeper and faster water, especially in pools with shelter-providing woody debris materials. In larger rivers, the highest abundance of bull trout has been found among rocks along the stream margin or in side channels. Bull trout are strongly influenced by temperature. They are seldom found in tributaries with summer temperature exceeding 18 C, and are often found near cold perennial springs. Juveniles in most river systems migrate at 2 to 3 years of age.

Adult bull trout, like juveniles, are primarily bottom-dwellers. Adults prefer deep pools of cold rivers, lakes, and reservoirs. Adfluvial adults mature for two to three years in lakes and reservoirs before undergoing spawning migrations. Adults in some systems (e.g., Flathead Lake) initiate migration during April and May and arrive at tributary streams in July and August. Migration in Washington streams can occur between July to December. Bull trout adults have a strong homing instinct, some adult return to the same spawning area each year. Adults in lakes exhibit diverse habitat usage, and are found through the water column during the fall, winter, and spring. They move into deeper water of lakes and reservoirs during the summer. The thermal preference of bull trout has been report to be between 8 and 14 C. Diel (e.g., daily) migrations of bull trout within lakes have been noted in several studies; bull trout have been observed to move from deep to shallow water.

Larger bull trout are piscivorous, and adfluvial forms are considered to be highly piscivorous. Adfluvial fish have been found to forage largely on whitefish and kokanee in Priest Lake, Idaho. For this reason, may share little in food habits with other salmonids, which mainly feed upon invertebrates. Bull trout are thought to be opportunistic feeders. Juvenile bull trout feed primarily on insects. The northern squawfish have been found to compete with adult bull trout for food at sizes between 8 and 12 inches. Adult bull trout have been found to be more piscivorous in systems where rainbow trout are also present. Interspecific aggression has been observed between adult bull trout and cutthroat trout.

Bull trout can be aged with both scales and otoliths, though scales may be difficult to read for fish beyond age 4 to 5. Adult bull trout range in size from 350 to 900 mm, with resident fish in headwater streams the smallest in size and adfluvial fish the largest in size. The maximum size of a bull trout was observed in Pend Oreille Lake (1025 mm and 14.5 kg). Growth may be slow in the coldwater temperatures of streams.

Snorkeling is though to be the best method for sampling bull trout in streams. Sampling of lake individuals is best accomplished with sinking gill nets, with the greatest success observed using sinking gill nets set parallel to the shore.

Bull trout have been successfully reared in hatcheries located in California, British Columbia, Oregon, Idaho, and Wyoming. The main problem with propagating bull trout is capturing and holding adults, and collecting and transferring eggs. Egg sources have been difficult to obtain.

A wide data gap exists regarding information on bull trout in Oregon and Washington. With recent declines in the abundance and distribution of this species, this information is sorely needed to provide guidance to fish biologists.

Comments: This is probably the most widely cited literature review on bull trout to date. This review was prepared by Fred Goetz, who is now working for the Seattle District COE.

Keywords: habitat requirements; ecology; behavior; spawning; sport fishing; population dynamics

Primary Topics: bull trout

Secondary Topics: life history

Document Review - Seattle City Light Boundary Project

Document Number 89 **Review Date:** 7/24/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Phillips, R. B., S. A. Manley, and T. J. Daniels

Year of Publication: 1994 **Geographic Area:**

Title: Systematics of the salmonid genus Salvelinus inferred from ribosomal DNA sequences.

Source: Can. J. Fish. Aquat. Sci. 51(Suppl. 1): 198-204.

Abstract: DNA sequences of the second internal transcribed spacer (ITS2) of the nuclear ribosomal DNA were determined for six species of the genus Salvelinus: S. alpinus (Arctic char), S. malma (Dolly Varden), S. confluentus (bull trout), S. leucomaenis (Japanese char), S. fontinalis (brook trout), and S. namaycush (lake trout), and for Hucho perryi (huchen). The ITS2 sequence data (approximately 375 base pairs (bp)) were combined with previously determined sequence data for the ITS1 (approximately 575 bp), giving a total of 981 bp of aligned sequence for each species. Phylogenetic analysis of the aligned sequences was done using maximum parsimony, maximum likelihood, and distance matrix methods with H. perryi as an outgroup. The results were consistent with previous work based on comparisons of morphologies, allozymes, and karyotypes. Comparison of these results with those based on mitochondrial DNA sequences suggests that hybridization may have occurred between S. confluentus and S. alpinus or S. malma.

Review:

Comments: This article suggests that bull trout have hybridized with both arctic charr and Dolly Varden trout.

Keywords: genes; phylogeny; karyotypes; hybridization

Primary Topics: bull trout

Secondary Topics: genetics

Document Review - Seattle City Light Boundary Project

Document Number 90 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Brown, C.J.D.

Year of Publication: 1971 **Geographic Area:** Idaho

Title: Fishes of Montana.

Source: Big Sky Books. Montana State University, Bozeman, Montana. 207 p.

Abstract:

Review: Life history information is presented for all species of fish found in Idaho. Morphological descriptions and aids to identification are also presented. Distribution and abundance information are presented.

Comments: An excellent reference

Keywords: life history, distribution, habitat

Primary Topics: life history

Secondary Topics: distribution

Document Review - Seattle City Light Boundary Project

Document Number 91 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Stuber, R.J.

Year of Publication: 1982 **Geographic Area:** United States

Title: Habitat Suitability Index Models: Black Bullhead.

Source: U.S. Department of Interior, Fish and Wildlife Service. 26 p.

Abstract:

Review: Suitability variables used in HSI model include: % cover, maximum temperature, dissolved oxygen, pH, maximum salinity (adult and juvenile), maximum salinity (embryo and fry), maximum turbidity, average temperature (embryo), dominant substrate type (embryo), % cover, average TDS, % littoral area, reservoir size, and reservoir drawdown.

Comments: While black bullhead have not been documented in Boundary Reservoir, they have been found in low numbers upstream in Box Canyon Reservoir . This document provides valuable information regarding the life history and habitat requirements of black bullhead in both riverine and lacustrine environments.

Keywords: black bullhead, habitat, life history

Primary Topics: Black bullhead habitat requirements

Secondary Topics: Black bullhead life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 92 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Edwards, E.A., and K.A. Twomey

Year of Publication: 1982 **Geographic Area:** United States

Title: Habitat Suitability Index Models: Common Carp.

Source: U.S. Department of Interior, Fish and Wildlife Service. 28 p.

Abstract:

Review: Suitability variables used in HSI model include: % vegetative cover, % littoral, storage ratio, turbidity, temperature (adult), temperature (embryo), temperature (juvenile, fry), depth of littoral during spawning, salinity, dissolved oxygen (fry, juvenile, adult), dissolved oxygen (embryo), and pH

Comments:

Keywords: Common carp, habitat, life history

Primary Topics: Common carp habitat requirements

Secondary Topics: Common carp life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 93 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Raleigh, R.F., L.D. Zuckerman, and P.C. Nelson

Year of Publication: 1986 **Geographic Area:** United States

Title: Habitat Suitability Index Model and Instream Flow Suitability Curves: Brown trout, revised.

Source: U.S. Fish and Wildlife Service Biological Report 82(10.124). 64 p.

Abstract:

Review: As brown trout are primarily a river/stream dwelling species, the majority of the information presented in this document focuses on riverine habitat requirements. Optimal lacustrine brown trout habitat is characterized by clear, cool to cold, deep lakes that are typically oligotrophic, but may vary in size and chemical quality, particularly in reservoir habitats. Brown trout normally are stream spawners and require tributary streams with gravel substrate in riffle-run areas for optimal reproduction to occur.

Comments: Thermal conditions in Boundary Reservoir may favor brown trout over other trout species.

Keywords: brown trout, habitat, life history

Primary Topics: Brown trout habitat requirements

Secondary Topics: Brown trout life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 94 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): City of Seattle - Department of Lighting

Year of Publication: 1965 **Geographic Area:** Pend Oreille River, Washington

Title: Seattle City Light's Boundary Project

Source: Seattle City Light. 6 p.

Abstract:

Review: This progress report includes an accounting of construction progress, pictures of the construction process, construction schedule, expenditures, and project specifications. Francis hydraulic turbines (4) rated at 208,000 h.p. per unit at 250-ft head. Quantity of water per turbine equals 8,000 cfs

Comments: Solely construction related information - physical specifications useful

Keywords: construction, powerhouse, dam

Primary Topics: construction progress

Secondary Topics: project specifications

Document Review - Seattle City Light Boundary Project

Document Number 95 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Raleigh, R.F.

Year of Publication: 1982 **Geographic Area:** United States

Title: Habitat Suitability Index Models: Brook Trout

Source: U.S. Department of Interior, Fish and Wildlife Service FWS/OBS-82/10.24. 41 p.

Abstract:

Review: Optimal lacustrine habitat is characterized as clear, cold lakes and ponds that are typically oligotrophic. Brook trout are typically stream spawners, but spawning commonly occurs in gravels surrounding spring upwelling areas of lakes and ponds. Water quality and reproduction are the two components of the lacustrine model. In terms of water quality, suitability is dictated by water temperature, dissolved oxygen, and pH.

Comments: Brook trout have not been documented in Boundary Reservoir however, it is possible that they are present as they are found in tributaries to the Pend Oreille River upstream of the project area.

Keywords: Brook trout, habitat, life history

Primary Topics: Brook trout habitat requirements

Secondary Topics: Brook trout life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 96 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Gresswell, R.E.

Year of Publication: 1988 **Geographic Area:** Western U.S.

Title: Status and Management of Interior Stocks of Cutthroat Trout

Source: American Fisheries Society Symposium 4. 140 p.

Abstract: This book summarizes current information concerning the status and management of interior stocks of cutthroat trout.

Review:

Comments: some relevant articles are provided in this symposium

Keywords: cutthroat trout

Primary Topics: Cutthroat trout life history

Secondary Topics: Cutthroat status and management

Document Review - Seattle City Light Boundary Project

Document Number 97 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Simpson, J. and R. Wallace

Year of Publication: 1978 **Geographic Area:** Idaho

Title: Fishes of Idaho.

Source: The University Press of Idaho, A Division of The Idaho Research Foundation, Inc. Moscow. 237 p.

Abstract:

Review: Life history information is presented for all species of fish found in Idaho. Morphological descriptions and aids to identification are also presented. Distribution and abundance information are presented.

Comments: An excellent reference

Keywords: life history, distribution, habitat

Primary Topics: life history

Secondary Topics: distribution

Document Review - Seattle City Light Boundary Project

Document Number 98 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson

Year of Publication: 1984 **Geographic Area:** United States

Title: Habitat Suitability Information: Rainbow Trout.

Source: U.S. Fish and Wildlife Service FWS/OBS-82/10.60. 64 p.

Abstract:

Review: Optimal lacustrine habitat is characterized by clear, cold, deep lakes that are typically oligotrophic, but may vary in size and chemical quality, particularly in reservoir habitats. Rainbow trout are primarily stream spawners and generally require tributary streams with gravel substrate in riffle areas for reproduction to occur. Water quality and reproduction are the two components of the lacustrine model. In terms of water quality, suitability is dictated by water temperature and dissolved oxygen..

Comments:

Keywords: rainbow trout, habitat, life history

Primary Topics: Rainbow trout habitat requirements

Secondary Topics: Rainbow trout life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 99 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Scott, W.B. and E.J. Crossman

Year of Publication: 1973 **Geographic Area:** Canada

Title: Freshwater Fishes of Canada.

Source: Bulletin 184. Fisheries Research Board of Canada, Ottawa. 966 p.

Abstract:

Review: Life history information is presented for all species of fish found in Canada. Morphological descriptions and aids to identification are also presented. Distribution and abundance information are presented.

Comments: An excellent reference for fish species found at northern latitudes.

Keywords: life history, distribution, habitat

Primary Topics: life history

Secondary Topics: distribution

Document Review - Seattle City Light Boundary Project

Document Number 100 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Sigler W.F. and J.W. Sigler

Year of Publication: 1987 **Geographic Area:** Great Basin (Nevada and Utah)

Title: Fishes of the Great Basin - A Natural History.

Source: University of Nevada Press. 424 p.

Abstract:

Review: Life history information is presented for all species of fish found in Nevada and Utah. Morphological descriptions and aids to identification are also presented. Distribution and abundance information are presented.

Comments: A good reference of some relevance however, primarily applicable to areas outside of the geographic boundaries of the project.

Keywords: life history, distribution, habitat

Primary Topics: life history

Secondary Topics: distribution

Document Review - Seattle City Light Boundary Project

Document Number 101 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bonneville Power Administration

Year of Publication: 1981 **Geographic Area:** Columbia River drainage

Title: Columbia River Power for the People - A History of Policies of the Bonneville Power Administration.

Source: U.S. Department of Energy - Bonneville Power Administration. 338 p.

Abstract:

Review: Cursory review only. This book documents the history of the BPA and evolution of it's policies since the time of inception.

Comments:

Keywords: BPA, policy, dams, hydroelectric

Primary Topics: BPA policy

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 102 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Edwards, E.A., D.A. Kreiger, G. Gebhart, and O.E. Maughan.

Year of Publication: 1982 **Geographic Area:** United States

Title: Habitat Suitability Index Models: Black Crappie.

Source: U.S. Department of Interior, Fish and Wildlife Service. 25 p.

Abstract:

Review: Suitability variables used in HSI model include: % cover, % littoral area, pH range, temperature (adult-juvenile), temperature (fry), temperature (embryo), dissolved oxygen (summer), dissolved oxygen (spawning), turbidity, and average TDS.

Comments: While black crappie are not found in Boundary Reservoir, they are found upstream in Box Canyon Reservoir. This document provides valuable information regarding the life history and habitat requirements of black crappie in both riverine and lacustrine environments.

Keywords: black crappie, habitat, life history

Primary Topics: Black crappie habitat requirements

Secondary Topics: Black crappie life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 103 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Hall, G.E. and M.J. Van Den Avyle

Year of Publication: 1986 **Geographic Area:** United States

Title: Reservoir Fisheries Management - Strategies for the 80's.

Source: American Fisheries Society - Southern Division. A National Symposium on Managing. 327 p.

Abstract: This symposium allowed compilation of current reservoir research findings and provided a forum for the exchange of ideas concerning reservoir fisheries management. Specific objectives of the symposium were 1) to provide a critical assessment of current practices for managing reservoir fisheries; 2) to provide a forum for the exchange of information and ideas among users and managers of reservoir fishery resources; 3) to stimulate new ideas and approaches for managing reservoir fishery resources; 4) to identify critical research and management needs; and 5) to clarify the role of fishery management relative to reservoir planning, operation, and other recreational uses.

Review: Some of the articles presented in this symposium are of relevance to the Boundary Project.

Comments:

Keywords: reservoir, management

Primary Topics: reservoir fisheries management

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 104 **Review Date:** 7/24/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Stuber, R.J., G.Gebhart, and O.E. Maughan

Year of Publication: 1982 **Geographic Area:** United States

Title: Habitat Suitability Index Models: Largemouth Bass.

Source: U.S. Department of Interior, Fish and Wildlife Service. FWS/OBS-82/10.16. 33 p.

Abstract:

Review: Lacustrine environments are the preferred habitat of largemouth bass. Optimal conditions are lakes with extensive (> 25% of surface area) shallow (< 6 m depth) areas to support submergent vegetation, yet deep enough (3-15 m mean depth) to successfully overwinter bass. Thus, it is assumed that 40-60% of the lake area should be > 6 m depth to provide optimal overwintering habitat in northern latitudes. Habitat suitability parameters used in the HSI lacustrine model include: TDS, % area < 6 m deep (cover), % bottom cover, water level fluctuation, dissolved oxygen, pH range, temperature, turbidity, salinity, % area < 6 m deep (reproduction), and substrate.

Comments: The presence of Largemouth bass in Boundary Reservoir has been documented. HSI models may prove useful in determining if all habitat requirements for largemouth bass are met on a sustaining basis within Boundary Reservoir. Largemouth bass are present in the impounded areas upstream of Box canyon and Albeni Falls dams.

Keywords: Largemouth bass, habitat, life history

Primary Topics: Largemouth bass habitat requirements

Secondary Topics: Largemouth bass life history requirements

Document Review - Seattle City Light Boundary Project

Document Number 105 **Review Date:** 7/25/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Envirocon Limited, and Pearse-Bowden Economic Consultants Limited

Year of Publication: 1975 **Geographic Area:** Pend Oreille River d/s of Boundary and Salmo River

Title: Environmental and Resource Management Studies Seven Mile Project for B.C. Hydro.

Source: Envirocon Limited, and Pearse-Bowden Economic Consultants Limited, Vancouver, B.C. 187 p.

Abstract:

Review: This report reiterates much of what was stated in the 1973 Environmental Impact Report regarding fisheries in the Pend Oreille near the "proposed" (at the time of the report) Seven Mile Hydro Project. Plankton tows in Waneta Reservoir yielded densities of 379 to 3808 plankters per cubic meter, which is rather low in relation to other lakes. The low numbers are likely attributed to rapid replacement of turbid, unproductive water in the reservoir. In terms of benthos, Waneta Reservoir was dominated by oligochaetes. Mayflies and dragonflies were absent. Low species diversity is believed to be partially attributed to the effects of mine tailings. Fish present in Waneta reservoir included: squawfish, redside shiners, largescale suckers, peamouth chub, mountain whitefish, longnose sucker, and rainbow trout. No carp were caught in Waneta Reservoir. The catch data indicate a very small population of sports fish in the Waneta Reservoir. The Salmo River is the only significant stream used by salmonids in this stretch of the Pend d'Oreille River. Suitable areas for salmonid spawning are abundant throughout the Salmo River and Erie Creek. In 1974, the lower 10 miles of the Salmo River were surveyed by divers, The percentage numerical abundance of fish species counted was dominated by rainbow trout (74.5%), followed by mountain whitefish (9.3%), largescale sucker (8.8%), Dolly Varden char (4.6%), and northern squawfish (2.8%). Conclusions regarding fishery present after Seven Mile is complete suggest that it will be similar in composition and abundance to that found in Waneta Reservoir. The authors state that a major factor limiting sports fish production in the proposed (at the time) Seven Mile Reservoir will be that availability of major littoral feeding and nursery areas in the reservoir. The proposed reservoir will have few shallow areas of any significant size and probably little, if any, rooted aquatic vegetation.

Comments:

Keywords: Waneta Reservoir, biological conditions, fish, plankton

Primary Topics: Fisheries attributes near "Seven Mile"

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 106 **Review Date:** 7/25/96

Reviewer's Name: Keith Binkley **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Envirocon Limited, and Pearse-Bowden Economic Consultants Limited

Year of Publication: 1973 **Geographic Area:** Lower Pend d'Oreille River above Waneta

Title: Environmental Impact Report - Seven Mile Project for B.C. Hydro.

Source: Envirocon Limited, and Pearse-Bowden Economic Consultants Limited, Vancouver, B.C. 48 p.

Abstract: Pearse-Bowden Economic Consultants Ltd and Envirocon Ltd were commissioned to study the long-range environmental impacts of the development of hydro-electric generating facilities on the Pend d'Oreille River. The terms of reference were established as follows: 1) Identify and study the individual impacts of the proposed project, 2) Study the impact of the access road on deer, 3) Suggest mitigation possibilities, and 4) Provide a comprehensive report for submission to government agencies and environmental organizations.

Review: Review limited to fisheries - "The Pend d'Oreille River is the area of the "proposed" project has relatively little in the way of quiet pools and riffles. Most of the river bottom is coated with a layer of silt. This silt is mainly introduced in the tailings of an upstream mine and varies in thickness from 2-3 feet in slow, shallow backwaters or along the banks of the Waneta reservoir to a thin layer in the fastest parts of the river. The tributaries of the Pend d'Oreille River in Canada, with the possible exception of the Salmo River, have little or no value as spawning areas for salmonids. There is relatively little data available to establish a complete list of fish species present in the Pend d'Oreille River. Gill netting in the Waneta Reservoir yielded red side shiners, squawfish, and suckers. Anglers report catching rainbow and brook trout. Dolly Varden char (bull trout) are reported in the lower Salmo River which suggests that they also occur in the Pend d'Oreille River. Local residents have also reported the catch of an occasional sturgeon in Waneta Reservoir. Seining and SCUBA observations on August 26, 1973 when flow from the Boundary Dam was temporarily shut down confirmed these observations and revealed the presence of sculpins, whitefish and chub. Our (the authors) studies indicate that the Pend d'Oreille River supports a relatively small trout population and large numbers of squawfish, suckers, and shiners. The authors established that squawfish were widely distributed in the Waneta reservoir and the river upstream. Trout were only caught in the Pend d'Oreille within a mile or so of its confluence with the Salmo River. The author's observations and published information on the biology of salmonids in streams lead to the tentative conclusion that the Pend d'Oreille could only support a small population of trout or Dolly Varden char (bull trout). The authors conclude that the Pend d'Oreille River is unlikely to support a major sports fishery. It is their opinion that the trout populations are relatively small and slow growing, a possible consequence of a limited availability of spawning areas and the absence of riffles and quiet pools. The "construction" of the Seven Mile project would result in the elimination of the remaining free-flowing section of the Pend d'Oreille River in Canada. The resultant fishery would likely resemble that found in the Waneta Reservoir. The development would also flood out the lower

part of the Salmo River which supports a small sports fishery for Dolly Varden char (bull trout). Flooding of the lower Salmo River would allow the invasion of undesirables (carp) into this section of the river." Mining related concerns openly expressed within this document.

Comments:

Keywords: Seven Mile, hydro-electric, impacts, fish

Primary Topics: Environmental impacts

Secondary Topics: Mitigation

Document Review - Seattle City Light Boundary Project

Document Number 107 **Review Date:** 7/25/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pratt, K.L., and J.E. Huston

Year of Publication: 1993 **Geographic Area:** Pend Oreille Lake

Title: Status of bull trout (Salvelinus confluentus) in Lake Pend Oreille and the lower Clark Fork River.

Source: Report prepared for Washington Water Power Company, Spokane, Washington. 108 p.

Abstract: None provided by author.

Review: This draft report describes the status of adfluvial bull trout in Lake Pend Oreille, Cabinet Gorge Reservoir, and Noxon Rapids Reservoir. The report was prepared as a contribution to the evaluation of bull trout as an endangered species by the USFWS. Spawning migration in Lake Pend Oreille begins in March or April during spring runoff. Early season migration is an important feature of Pend Oreille Fish which spawn in large streams. Some bull trout may migrated later during mid-August into smaller tributaries. Fry emerge in tributaries and river during the spring. Fry and juveniles use unembedded substrate and dispersed woody debris for cover. Juvenile fish rear near spawning areas, usually in upper and middle reaches of tributaries accessible from Lake Pend Oreille. Lower reaches of the lake tend to be warmer than typical for bull trout habitat, and support higher densities of non-native fish species. Bull trout also rear in the middle and lower reaches of tributaries to the Clark Fork River below Thompson Falls. Juveniles typically migrate during the summer or fall of their second or third year. Bull trout grow rapidly in the lake, and can attain sizes of 20 to 35 inches within 3 years of residence in lake. About 6.5% of bull trout spawner observed in the Pend Oreille system are repeat spawners. Bull trout in Lake Pend Oreille were likely part of a large meta-population historically. Genetic interchange was likely between stocks in other parts of the Clark Fork River, Pend Oreille River, and Flathead River. Historical sources indicate that bull trout were common in Lake Pend Oreille, the Pend Oreille River, and parts of the Clark Fork River. Estimates of pre-development conditions suggest that Lake Pend Oreille might have supported 10,000 adfluvial spawners annually. Native predator species include the squawfish. Other native fish in this system include cutthroat trout, mountain whitefish, pygmy whitefish, sculpins, longnose dace, redside shiners, largescale and longnose suckers, and peamouth. Early settlers impacts bull trout populations in the basin as early as 1892. Population fragmentation resulted from log jams, mill ponds, and irrigation diversions. Forest fires impacted populations in the region in 1910. Present threats to bull trout include poaching, intermittent streamflow in nursery streams, sedimentation, hybridization with brook trout, disease, and predation and competition with other fish (squawfish, northern pike, smallmouth bass, largemouth bass, brown trout).

Comments: This is an excellent report which provides insight into historical trends of bull trout in the Pend Oreille drainage. However, the report focuses only on Lake Pend Oreille and the drainage above

the lake. The Pend Oreille River below the lake are not addressed in the report.

Keywords: habitat impacts; population trends

Primary Topics: bull trout

Secondary Topics: historical populations

Document Review - Seattle City Light Boundary Project

Document Number 108 **Review Date:** 7/25/96

Reviewer's Name: Ed Connor **Reviewer's Organization:** R2

Reviewer's Discipline: Fisheries **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Platts, W.S., M. Hill, T.W. Hillman, and M.D. Miller

Year of Publication: 1993 **Geographic Area:** western United States

Title: Preliminary status report on bull trout in California, Idaho, Nevada, Oregon, and Washington.

Source: Don Chapman Consultants. Prepared for Intermountain Forest Industry Association, Coeur d'Alene, Idaho. 129 p.

Abstract: The Intermountain Forestry Industry Association (IEFIA) asked us to review the status of bull trout in Oregon, Montana, Washington, Idaho, Nevada, and California. We examine the existing scientific literature and data (both published and unpublished) from these states to assist the U.S. Fish and Wildlife Service (USFWS) in its decision to list bull trout as endangered under the Endangered Species Act (ESA). This document is only a "preliminary" because more data and information are expected to be available prior to October 1993 to supplement this effort. The EFIA has implemented a study design (submitted under a separate cover) to determine the presence or absence of bull trout on streams on or near land owned by its members. These data will also be made available to the USFWS sometime in October 1993.

In this status report, we examine the taxonomic classification and genetic characteristics of bull trout as a distinct species. We also place the question of bull trout endangerment within the context of species and evolutionarily significant unit (ESU) definitions of the endangered species process. We describe bull trout life history (biology), distribution, abundance, and management with the historical and current literature and data base.

Bull trout life-history information is vague and incomplete. Adfluvial stocks, particularly in the Flathead Lake, Montana, system, have received the most recent and thorough study. However, virtually nothing is known about anadromous and resident stocks. While fluvial bull trout stocks have been studied in greater detail than anadromous and resident stocks, less is known about fluvial stocks than adfluvial ones. Spawning and rearing requirements are quite variable from one drainage to another and from one ecoregion to another. It is, therefore, difficult to identify common criteria that geographically typify bull trout.

There is no consensus in the scientific community on the phylogenetic classification of bull trout; the taxonomy of the genus is confused; the degree of genetic introgression and/or hybridization between bull trout and Dolly Varden is uncertain; and the boundaries of ESU's have not been evaluated or considered. The fundamental information needed to determine bull trout as a "species" and recognition of bull trout ESU's under the ESA are lacking.
insufficient data and information exist at this time to determine the true status of bull trout abundance

and distribution in the Western United States. The available data are sparse and generally focused on a limited number of drainages. The actual presence or absence of bull trout in most drainages of Oregon, Washington, Idaho, Montana, California, and Nevada is unknown. With the exception of Montana, the states have very little reliable and current bull trout density data for s within historic range of the species. Reliable density data are required to address not only the issue of endangerment but also to answer questions related to effective population size. The bull trout, as a single species, has not generated enough interest in the past to stimulate researchers and managers to acquire adequate population status information.

Natural and man-induced habitat alterations have affected all trout species. Environmental degradation that adversely affects bull trout will also reduce other trout species living in sympatry. While habitat degradation affects all species, the effect may not be felt equally by all species if they occupy broad niches. Bull trout may, in some s and lakes, already be forced into a narrow niche by competition with non-indigenous species and/or limited carrying capacity. The effects of natural variations (wet/dry years, warm/cold years) on bull trout populations have not been investigated; nor have the cumulative effects of natural plus man-made habitat alterations been investigated. Consequently, we cannot isolate the causes for decline in bull trout numbers in some regions.

Large areas of bull trout habitat occur within wilderness areas, backcountry roadless areas, national parks, wild and scenic rivers, natural research areas, and other protected land designations that tend to ensure that these habitats will remain in a natural or near-natural condition over time. However, even national parks have reported bull trout declines resulting from past introductions of exotic species. Pristine habitats, where streams have not
been affected by passive or active exotic introductions or landuse activities, should be an integral part of the ESA evaluation.

Management options are available to prevent harmful effects on bull trout populations and increase population abundance and distribution. Options include the application of best management logging practices, improved grazing systems, riparian buffers for all landuses, controlled stream diversions, improved fishing regulations, elimination of the indiscriminate stocking of exotic fish in bull trout waters, elimination of fish passage blocks, elimination of fish eradication projects in bull trout waters, reintroduction into waters now devoid of bull trout, and application of stricter enforcement to curtail illegal fishing. We suggest that adequate laws, regulations, and mandates exist to protect and enhance bull trout populations.

While bull trout numbers have declined from historic levels in certain drainages, we found no data that conclusively demonstrate that bull trout numbers have declined to an endangered level in all states and all drainages. It can also be said that all native trout populations have declined from historic levels. Density data by themselves do not demonstrate that bull trout are endangered; especially when so much information is missing throughout most of the range of bull trout. Bull trout should remain a Category 2 species until sufficient biological and management information is available to accurately determine their population status. Introduction of exotic trout and charrs should cease in areas where bull trout are of special concern.

Review: The author's of this study compiled existing information, critically evaluated available data, and provide further interpretation to "assist the USFWS in their final decision on listing" of bull trout. This report, which was prepared for the forest industry, was apparently prepared to encourage the USFWS not to list bull trout as an endangered species because 1) information on the population status and life history of this species is incomplete; and 2) the taxonomic classification of bull trout as a distinct species is still in question by some scientists. Although several investigators have no lack of evidence for introgression between Dolly Varden and bull trout, this report cites the WDW as finding intermediate morphological

forms between these two species in the Puget Sound region and along the Washington coast. The report brings up the hypothesis that both bull trout and Dolly Varden are morphological variations of the same species - arctic charr - and that char systematics in general is a contentious subject among taxonomists. However, other genetic and ontological evidence suggests that bull trout are a distinct species from other charr. This report further questions the distinction of bull trout as a definable "stock", and that genetic information is needed to define sub-populations of bull trout in different regions as individual stocks. The current distribution and life history of bull trout are reviewed in this report. Causes for the decline of bull trout cited in this report include reduced carrying capacity caused by habitat degradation (including sedimentation). Two bottlenecks to bull trout production may be reproduction and juvenile mortality. Other factors responsible for declining bull trout populations include hybridization with brook trout, competition with brook, brown, and cutthroat trout, angling pressure (bull trout are easily overfished). Sources of habitat degradation include non-point source pollution (e.g., sediment), livestock grazing, mining, and timber harvest. Hydroelectric dams and diversions have in many cases blocked adult bull trout from migrating to historically used natal streams. Good examples of this are Hungry Horse and Bigfork dams in Montana, which have reduced the spawning and rearing habitat available to bull trout in the Flathead Lake system by nearly 50%. Single purpose hydropower dams (run-of-river with little storage capacity) usually provide poor habitat to fish, and are characterized by high turnover rates and fluctuating pool levels which affect food production, spawning habitat, and cover availability. However, dams may also prevent the movement of non-native species which may pose a threat to isolated bull trout populations. Long-term climate changes may also be responsible for historical declines in bull trout abundance. The decline of bull trout can also be partially attributed to historic fish management practices, which encouraged stocking of non-native species (e.g., brown trout and brook trout) and discouraged the production of bull trout.

Comments: There is some excellent information and analysis presented in this report. However, the conclusions of the report seemed to be skewed toward the argument that since there is presently "insufficient data and information at this time to determine the true status of bull trout abundance and distribution in the Western United States", and for this reason listing of this species to the endangered species list is unwarranted. This is consistent with the position of the underwriter of this report.

Keywords: population status; life history; habitat impacts; introduced species

Primary Topics: bull trout

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 109 **Review Date:** 6/26/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Layser, E.F.

Year of Publication: 1980 **Geographic Area:** Pend Oreille County

Title: Flora of Pend Oreille County, Washington.

Source: Washington State University. 146 p.

Abstract: The document provides a brief discussion of the geology, climate, topography, geography, and soils found in the County, but focuses on vegetation plant communities and habitats and seral climax species. The plant communities include: Ponderosa Pine Forest (all is transitional) between 1800 and 3500 ft elevation., Douglas-fir forests (3 habitat types) between 1800 and 5000 ft, western hemlock and western redcedar forests between 1800 and 5500 ft (5 habitat types), subalpine fir and Engelmann spruce forests (7 types) between 5500 and 7000 ft, black cottonwood forest, alpine, 4 types of mountain parkland, rockland, acid bog, fens, marl fens, marsh, seeps, aquatic, vernal pools, swamp shrub or carr, avalanche chutes, and riparian communities. The document provides an artificial key to major vascular and nonvascular plants in the County and common species lists for various habitats. Lists 18 plant species of interest that are found along Boundary Reservoir, an area that is unique due to its low elevation and limestone, springs, and waterfalls (pg 134) and 5 species of interest found north of Boundary Dam.

Review: No specific issues relating to Boundary Reservoir were identified in this report. The document does provide potentially useful identification keys for plant species in the area.

Comments: Locational information is sure to be outdated. The document appears to be a useful resource for describing the general habitats in the region. It provides a framework of plant communities that can be used for SCL studies.

Keywords: botany, plants, identification, plant community

Primary Topics: plant identification and plant community descriptions

Secondary Topics: species list, geology, rare plants, climate

Document Review - Seattle City Light Boundary Project

Document Number 110 **Review Date:** 7/1/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Shapiro and Associates.

Year of Publication: 1983 **Geographic Area:** Transmission ROW and slough at Boundary Reservoir

Title: Final Boundary Hydroelectric Project Sensitive, Threatened, and Endangered Species Survey.

Source: Prepared by Shapiro and Associates for Seattle City Light. 62 p.

Abstract: The report documents vegetation and wildlife surveys conducted in 1983 for the proposed expansion of the Boundary Dam Project. The study area included 3,000 ft. of the transmission line right-of-way in T40N, R43E, Sec 10 for the turbine unit replacement and 30 acres along the west shore approximately 1 mile north of Box Canyon Dam (T38N, R43E, Sec. 18 and 7) for wildlife habitat enhancement. Upland plant communities in the vicinity of Boundary Dam are cedar-hemlock-Douglas-fir. Based on USFS land inventory maps, ponderosa pine occurs to the west of the river and Douglas-fir occurs east of the river. Shrub and second-growth conifer cover 30 percent of the ROW, while conifer forest represents 23 percent. Each of the 11 plant associations that occurs on the ROW has a number of plant species that are commonly found. None of the species reported by the Washington Natural Heritage Program or the USFWS as being sensitive, threatened, or endangered were identified in the powerline ROW or adjacent to it. However, Cryptogramma stelleri and Pellaea glabella var. simplex may occur on steeper inaccessible rocky knolls. The forest appears to be too dry to support the 5 species that require moist forests. A total of 18 species of birds, 6 mammals, and 5 butterflies were documented in the ROW portion of the study area, including the red-tailed chipmunk and osprey, two species of concern in 1983. There are 2 osprey nests northwest of Boundary Dam. The Mountain caribou was observed 6 miles south of the study area. There have been numerous sightings of gray wolf in the area. The grizzly bear has been observed within 0.5 mile of the study area. Bald eagles winter along the reservoir. Other species of interest that occur in the study area include: moose, mountain lions, rubber boa, goshawks and merlins (both nest along transmission line ROW). Black-backed woodpeckers and northern three-toed woodpeckers may also occur. Canarygrass is common in the slough along the river, comprising 42 percent of the study area. Sedges make up 10 percent and bentgrass/rye makes up 9 percent. None of the State or Federal plant species were noted in the study area. There were 26 species of wildlife observed in the slough. As many as 7 bald eagles winter between Newport and the Canadian border. Approximately 100 moose occur in the general area. The Compton's tortoiseshell butterfly is common near Ione. A detailed habitat enhancement proposal was to be submitted to FERC in January 1984.

Review: The report summarizes findings of surveys and agency consultation regarding plants and wildlife at two small specific areas of the Boundary Project Study Area. The information was used to assess effects of turbine upgrade and proposed wildlife habitat enhancement at the slough along the reservoir.

Comments: The red-tailed chipmunk (Eutamias ruficaudus) and tortoiseshell butterfly are not currently a Washington PHS species. The information is useful for historical occurrence of the species. The information will be useful as a starting point but will have to be updated based on new occurrences and changes in lists of Federal threatened and endangered species and Washington Priority Habitats and Species.

Keywords: Threatened and Endangered Wildlife and plants, Transmission right-of-way, habitat enhancement

Primary Topics: Project effects on biological resources from proposed turbine replacement

Secondary Topics: plant and wildlife descriptions

Document Review - Seattle City Light Boundary Project

Document Number 111 **Review Date:** 7/1/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Green, G.

Year of Publication: 1993 **Geographic Area:** east side of reservoir in T38N, R43E, Sec 8

Title: Wildlife Habitat Assessment Report LaFarge Corporation Property.

Source: Prepared by Ebasco Environmental for Seattle City Light. 8 p.

Abstract: The 95-acre parcel of land to the east of the Boundary Wildlife Preserve was assessed for wildlife habitat value in the fall of 1993. Over 90% of the parcel is forested, and is characterized by patches of varying forest communities. Western redcedar, Douglas-fir, grand fir, western larch, and western white pine are the dominant species. Much of the area is pole/sapling conifer that resulted from fire approximately 20-30 years ago. These stands currently provide little wildlife habitat value. Young mixed conifer/deciduous forests represent the redcedar/queencup beadlily habitat type. These stands were logged 80 and 15 years ago. Pileated woodpeckers were observed in this habitat even though few snags remain. Young Douglas-fir (undisturbed) occurs on the west-facing slope of Sand Creek and is 80-100 years old and represent some of the most important big game habitat, as well as cavity-nesting birds. Young Douglas-fir (Disturbed) occur in stands on drier south-facing slopes. Theses stands have ponderosa pine along with Douglas-fir and other species. Both stands of this type have been logged in the last 20 years and provide winter forage for deer and elk and habitat for cavity nesting birds. Deciduous riparian habitat occurs along two small ponds created by hydraulic dredging on a tributary of Sand Creek. Beaver historically used the ponds and waterfowl may also occur. Grassland habitat dominated by weedy species is found along the railroad tracks bisecting and bordering the property. Deer, elk, coyotes, and bear use of the area was documented. Use by neotropical migrant birds could not be determined due to the fall site visit. The LaFarge Corp. property provides isolated habitat, big game winter range, cavity-nesting bird habitat, a connection to the Boundary Wildlife Preserve and Colville National Forest, and pond habitat for amphibians. The upper reach of Sand Creek is particularly important. Logging by the LaFarge would remove a substantial amount of wildlife habitat. Based on the value of the property, the author recommended that SCL purchase the land. The site could be used for nesting by bald eagles and osprey.

Review: The report provides a limited amount of information regarding the wildlife habitat value of the LaFarge Corporation property in 1993. The property was determined to be of high value to big game and cavity-nesting birds and thus should be purchased by SCL.

Comments: Relying on only two days in the field during the fall limits the completeness of the assessment. Depending on what has happened to the land since the assessment, the value could be quite different now. No data on breeding birds was provided. No agency personnel familiar with the area were contacted and no delayed assessment of threatened and endangered species or Washington Priority

Habitats and Species was conducted.

Keywords: Boundary Wildlife Preserve, LaFarge Corporation, Big game Habitat, Forest Resources

Primary Topics: Wildlife habitat value of the LaFarge Corporation property adjacent to SCL's Boundary Wildlife Preserve

Secondary Topics: plant communities and plant species list

Document Review - Seattle City Light Boundary Project

Document Number 112 **Review Date:** 7/1/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Aesthetics/Recreation **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Beak Consultants, Inc. and Seattle City Light.

Year of Publication: 1986 **Geographic Area:** Boundary Dam to BPA Switching Station

Title: Clearing and Revegetation Plan For Transmission Line Right-of-Way, Boundary Hydroelectric 55/56 Turbine Additions Project.

Source: Seattle City Light. 170 p.

Abstract: This report is a joint SCL and Beak Consultants planning effort to develop an environmental assessment on existing conditions, proposed actions, environmental impacts, and mitigation measures for the extension of transmission lines from the existing Boundary Dam to the existing BPA Switching Station. Mitigation and enhancements are detailed in a Clearing and Revegetation Plan, to be incorporated into SCL general construction specifications for the addition of Units 55 and 56. Topics include wildlife mitigation, aesthetic mitigation, ROW maintenance, monitoring, and vegetation management. The Plan is to be used by construction personnel. The report reviews various biological and chemical methods of controlling vegetation on the transmission line ROW. One of the most promising non-chemical methods is grassland establishment. The report summarized social, biophysical, and economic criteria for ROW management alternatives.

Review: Relevance to the Boundary Project include existing condition information on the T-line route, including biological data, USFS visual resource management (VRM), erosion control measures, wildlife habitat enhancements, and vegetation management techniques.

Comments: Information is 10 years old but still mostly relevant. Would need to update case studies on T-line vegetative management techniques if needed. Information on biological resources in the T-line area primarily relies on Shapiro (1983), is useful as a guide but is likely outdated due to vegetation changes and species' Federal and State status changes.

Keywords: Toxics, Flora, Fauna, Aesthetics, Transmission Line

Primary Topics: Non-chemical methods of vegetation control, visual resources

Secondary Topics: Biological management, other utility case studies, water quality, and erosion

Document Review - Seattle City Light Boundary Project

Document Number 113 **Review Date:** 7/1/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Western Appraisals.

Year of Publication: 1994 **Geographic Area:** east side of reservoir in T38N, R43E, Sec 8

Title: Appraisal Report of LaFarge Property Located Adjacent to Seattle City Light Property Near Metaline in Pend Oreille County, Washington.

Source: Prepared by Western Appraisals for Seattle City Light. 66 p.

Abstract: The report estimates the market value of the 88.55-acre LaFarge Corporation property. The property included 198 million board feet (mbf) of white pine, 67 mbf of ponderosa pine, 577 mbf of Douglas-fir/western larch, 85 mbf of white fir/hemlock, 215 mbf of redcedar, and 28 mbf of lodgepole pine, for a total of 1,170 mbf.

Review: The document provides timber cruising data and market value estimation of the property. It documents volume of some of the common merchantable tree species on the land. It also discusses access issues for logging the property, such as the need for a new bridge over Sand Creek.

Comments: The report is of limited value for assess wildlife and botanical resources since it only describes the dominant tree species. There are several photos and maps that are useful.

Keywords: LaFarge Corporation property, wildlife preserve, timber resources, forestry, transportation

Primary Topics: Market value of LaFarge Corporation property, timber cruising

Secondary Topics: tree species, transportation issues relating to access of the property

Document Review - Seattle City Light Boundary Project

Document Number 114 **Review Date:** 7/1/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Land Use **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): George T.

Year of Publication: 1981 **Geographic Area:** Pend d'Oreille Valley, Canada

Title: Pend d'Oreille Valley, Canada, Resource and Land Use Planning Study.

Source: Prepared by Atamanenko & Associates for Regional District of Central Kootenay. 120 p.

Abstract: A Canadian consultant study regarding management of natural resources and settlement management in the Pend d'Oreille Valley (90 sq. mi. area) for the Regional District of Central Kootenay. The study provides an overview of available information in the Canadian study area, significance of the historical uses, and options for immediate and long-term planning by the Regional Districts of Central Kootenay and Kootenay Boundary.

Review: Provides a regional overview of the river valley north of the Boundary Project/Canadian border. Identifies public issues including proposed down zoning (minimum size lots), water level is controlled in the US, and the preservation of its rural and farming character. Recommendations to BC Hydro were included.

Comments: May be used for land use and management Exhibit E input. Focuses on the land use on the Canadian side of the border. Lands directly adjacent to the Canadian border are "Crown lands" (generally equivalent to US federal). Other lands downstream are private (such as Louisiana Pacific), BC Hydro, Crown lands assigned to the ministry of environment, and Ministry of Environment. Present population is 100 persons (1981).

Keywords: Pend d'Oreille Valley, Canada, Land Use

Primary Topics: Land Use in Canada along the Pend Oreille River

Secondary Topics: Water resources

Document Review - Seattle City Light Boundary Project

Document Number 115 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Jordan, M. and R. Starkey.

Year of Publication: 1984 **Geographic Area:** Boundary Reservoir and surrounding area

Title: Status Report on Wildlife Mitigation - Boundary Dam and Reservoir.

Source: Wa. Dept. Game/USFWS. 37p.

Abstract: The report draws on various SCL and agency reports to summarize pre- and post-project conditions, operating history, and mitigation status. Prior to construction of the project the site occupied by the reservoir consisted of a narrow river channel and canyon and nearly continuous forests. The conifer species were typical of those found near the reservoir now. Riparian vegetation occurred upstream of Metaline Falls and consisted of black cottonwood, birch, black hawthorn, western choke cherry, and cascara. WDG (1966) reported that the area was used by white-tailed deer and bear (the south facing slope provided spring black and grizzly bear habitat), but that the habitat was poor quality. The area north of Metaline Falls was almost entirely bare and sparsely vegetative rock. The area from the mouth of Slate Creek to the dam site was reported to be of high value for deer winter range. Upland game birds (primarily blue and ruffed grouse) and some waterfowl were affected by the impoundment. Currently, the 4-7 feet daily fluctuations in water level preclude the establishment of riparian and wetland vegetation as does the developed nature of the shorelines. Winter habitat exists but is relatively unproductive. Deer population densities in Pend Oreille County are estimated to be 4.1 to 4.9 deer/sq. mile. Approximately 50-60 resident elk occur within 3 mile corridor along river. A few moose occur during the summer. Caribou were documented crossing the river north of Metaline. Bald eagle use is low, with a few individuals using the tailrace area in the winter. The original issues in Article 51 of the FERC license were the effects of reservoir fluctuations on aquatic vegetation establishment, suitable spawning habitat for reservoir fish, and waterfowl habitat. FERC changed the emphasis to waterfowl management. An Order Approving Fish and Wildlife Mitigation Plan was issued by FERC in 1983 for the construction of slough. As of the date of the report, no wildlife mitigation had occurred at Boundary Reservoir.

Review: This report provides a good summary of pre- and post-project wildlife resources and a history of the development of the wildlife mitigation plan for Boundary Reservoir. The report summarizes what the primary initial concerns were for developing the mitigation plan. These issues are likely to remain as some of the major ones to address in relicensing.

Comments: Good report to gain perspective although agency priorities have changed since 1984. USFWS and WDFW will continue to comment that hydroelectric projects need to mitigate for original impacts, even though the FERC typically does not require this.

Document Review - Seattle City Light Boundary Project

Keywords: Fish and Wildlife Mitigation, Pre-project Conditions, Post-Project Conditions, FERC

Primary Topics: Status of fish and wildlife mitigation in 1984 at Boundary Reservoir

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 116 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Seattle City Light

Year of Publication: 1984 **Geographic Area:** Boundary Reservoir slough at Site RM32.8W

Title: Plan for Providing Wildlife Mitigation: Planning Aspects of the Boundary Reservoir Waterfowl Habitat Improvement Project at Site 32.8 on the Pend Oreille River in Northeast Washington.

Source: Seattle City Light. 14p.

Abstract: The habitat enhancement plan complies with Article 51 of the amended license for expansion of the Boundary Project (Units 55 and 56). The plan describes the proposed construction of an artificial slough at RM 32.8W intended to provide waterfowl habitat. The proposed site was characterized as being primarily dominated by reed canarygrass that lacked nesting and foraging habitat for waterfowl and is flooded in mid-May at the time of peak goose nesting. Two concepts were evaluated: (1) dredge several sloughs with islands and (2) excavate three terraced pools within one slough. The second option was selected by SCL. The ponds would occupy 1.3 acres and would be maintained at 2000, 1999, and 1998 feet elevation. A monitoring and maintenance plan would be implemented with WDG and USFWS. The following components would be included: (1) goose brooding/grazing habitat, (2) elevated ponds, (3) wood duck and goose nesting structures, (4) raptor perches and osprey nesting structures, (5) aquatic duck foods, and (6) shelterbelt plantings. Construction was planned for 1984.

Review: The report provides detailed information on the proposed waterfowl habitat area.

Comments: Good report for history of the mitigation/enhancement action.

Keywords: Wildlife mitigation, waterfowl habitat, raptor habitat, osprey, Article 51

Primary Topics: The creation of an artificial slough to provide waterfowl habitat

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 117 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** FERC Order

Author(s): Federal Energy Regulatory Commission.

Year of Publication: 1983 **Geographic Area:** Boundary Reservoir slough, RM 32.8W

Title: Order Approving Fish and Wildlife Mitigation Plan and Amending License Project No. 2144-001 (attached to Jordan and Starkey (1984).

Source: Federal Energy Regulatory Commission. 7p.

Abstract: This Order specifies that SCL consult with WDG and USFWS to develop plan for improving waterfowl habitat at Site 32.8 W and file the plan with the FERC.

Review: Legal FERC Order

Comments: Historical reference

Keywords: FERC, Article 51, wildlife mitigation, waterfowl

Primary Topics: Development of the artificial slough for waterfowl habitat

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 118 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** Database Records

Author(s): Washington Department of Fish and Wildlife.

Year of Publication: 1996 **Geographic Area:** northern half of Boundary Reservoir

Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Boundary Dam Quadrangle.

Source: Washington Department of Fish and Wildlife. 1 p

Abstract: The data and maps indicate the following: (1) the nearest lynx habitat is approximately 3 miles east of the reservoir; (2) the entire section of the reservoir on this quad is considered important due to its riparian and wetland areas with native vegetation, wildlife diversity, year round bald eagle use, waterfowl nesting (including cavity nesters), and osprey nesting and foraging; (3) Rocky Mountain elk and white-tailed deer generally occur along the west side of the project (the Lead King Hills has low density resident elk and deer and winter range for both species); (4) there is a bald eagle nesting territory along the river approximately 2 miles south of the Boundary Dam; (5) 6 osprey nests occur along the reservoir and 2 downstream of the dam; (6) a three-toed woodpecker was recorded within 0.5 mile of the reservoir; (7) mountain caribou were seen at three locations on both sides of the reservoir; (8) gray wolves were observed near Crescent Lake, slightly more than 1 mile from the project; (9) a fisher was reported from Slate Creek, 1.5 miles to the east of the reservoir

Review: The maps and data provide up-to-date information on some of the species that will need to be addressed during relicensing.

Comments: These data do not necessarily indicate the only sites these species or habitats occur. Additional site-specific survey effort will be required for relicensing. The list of species is likely to change between now and the time SCL submits its license application. Other Federal or State-listed species could occur as well.

Keywords: Priority Habitats and Species, Bald Eagle, Osprey, Fisher, Caribou, Woodpecker, Gray Wolf, Threatened and Endangered Species

Primary Topics: Occurrences of Federal and State-listed species and State Priority Habitats and Species

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 119 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** Database Records

Author(s): Washington Department of Fish and Wildlife.

Year of Publication: 1996 **Geographic Area:** Southern half of Boundary Reservoir

Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Metaline Quadrangle.

Source: Washington Department of Fish and Wildlife. 1 p.

Abstract: The following is a summary of Priority Habitats and Species observations: (1) mountain goat winter range and kidding habitat occurs at higher elevations on Linton Mtn. approximately 1.5 miles to the west of the reservoir (approx. 40 goats in 1989); (2) lynx habitat occurs at higher elevations approximately 2 miles west of the reservoir; (3) elk and deer winter along the west side of the reservoir, including in the extremely important Clement Mtn./Lost Creek Winter Range, where large concentrations occur, and Deer Mtn Winter Range with medium concentrations of deer and light concentrations of elk; (4) there is a bald eagle nesting territory near the mouth of Sand Creek (T38N, R43E, S8) on Seattle City Light property (this territory is used year round and has a Site Management Plan [1989]); (5) there are 4 osprey territories; (6) long-legged myotis (previously a State Monitor Species) reported from near Ione; (7) gray wolf observed approximately 1.25 mile south of Box Canyon Dam, east of river; (8) northern goshawk was observed approximately 1.25 mile south of Box Canyon Dam, east of river;

Review: The maps and data provide an up-to-date records of some of the species that will need to be addressed during relicensing.

Comments: These data do not necessarily indicate the only sites these species or habitats occur. Additional site-specific survey effort will be required for relicensing. The list of species is likely to change between now and the time SCL submits its license application. Other Federal or State-listed species could occur as well.

Keywords: Bald Eagle, Lynx, Elk, Deer, Osprey, Wolf, Goshawk, Priority Habitats and Species, Threatened and Endangered Species

Primary Topics: Occurrences of Federal and State-listed species and State Priority Habitats and Species

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 120 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** Database Records

Author(s): Washington Department of Fish and Wildlife.

Year of Publication: 1996 **Geographic Area:** East of southern half of Boundary Reservoir

Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Metaline Falls Quadrangle.

Source: Washington Department of Fish and Wildlife. 1 p.

Abstract: See Metaline Quad for observations near the Reservoir. The following is a brief summary of PHS observations: (1) the area between Boundary Res. and Sullivan Lake has regular large concentrations of elk in the winter; (2) fisher have been reported from the Sullivan Lake/Creek and Mill Pond areas approx. 3.5 miles east of the Res.; (3) nesting northern goshawks have been reported from 1.5 miles SE of Box Canyon Dam and near Sand Creek 2 miles from Boundary Res.; (5) Common loons reported on Sullivan Lake; (6) Piute sculpin from Sullivan Creek at the powerhouse; (7) great gray owl seen just SE of Line Lake Rd. less than one mile from Boundary Res.; (8) mountain caribou one mile east of Lime Lake; (9) moose near Mill Pond 3 miles to the east; (10) spotted frogs occur in Mill Pond

Review: The maps and data provide an up-to-date records of some of the species that will need to be addressed during relicensing.

Comments: These data do not necessarily indicate the only sites these species or habitats occur. Additional site-specific survey effort will be required for relicensing. The list of species is likely to change between now and the time SCL submits its license application. Other Federal or State-listed species could occur as well.

Keywords: Bald Eagle, Fisher, Sculpin, Lynx, Loon, Elk, Deer, Caribou, Osprey, Wolf, Goshawk, Priority Habitats and Species, Threatened and Endangered Species

Primary Topics: Occurrences of Federal and State-listed species and State Priority Habitats and Species

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 121 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** Database Records

Author(s): Washington Department of Fish and Wildlife.

Year of Publication: 1996 **Geographic Area:** West of north portion of Res.

Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Metaline Falls Quadrangle.

Source: Washington Department of Fish and Wildlife. 1p.

Abstract: See Boundary Dam Quad. A grizzly bear was observed above Flume Creek in T39N R43E S8 approximately 1 mile from the Res. in July 1983.

Review: The maps and data provide an up-to-date records of some of the species that will need to be addressed during relicensing.

Comments: These data do not necessarily indicate the only sites these species or habitats occur. Additional site-specific survey effort will be required for relicensing. The list of species is likely to change between now and the time SCL submits its license application. Other Federal or State-listed species could occur as well.

Keywords: Grizzly Bear, Priority Habitats and Species, Threatened and Endangered Species

Primary Topics: Occurrences of Federal and State-listed species and State Priority Habitats and Species

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 122 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Boateng & Associates.

Year of Publication: 1994 **Geographic Area:** LaFarge Corporation property

Title: Preliminary Environmental Site Assessment LaFarge Corporation Property Pend Oreille County, Washington.

Source: Prepared by Boateng & Associates for Seattle City Light.

Abstract: The report summarizes a Phase I Environmental Site Assessment to identify potential environmental risks associated with the LaFarge Corporation property. All of Parcel A and most of Parcel B are part of the Ledbetter slate formation. The southern one-third of Parcel B is occupied by the Quaternary lake deposit sediments. The report describes the historical uses of the property. Parcel had no major development and was used only for timber. Parcel B had a shale quarry. Site investigations and water quality testing indicated no elevated levels of 23 metals or TPH.

Review: The report documents the condition of the parcel of land prior to SCL purchasing it. The information may indicate potential wildlife habitat enhancement opportunities at the abandoned quarry.

Comments: The report is of limited use for relicensing from terrestrial resources point of view.

Keywords: LaFarge Corporation, Environmental Contamination, Wildlife Preserve, Water Quality, metals, shale

Primary Topics: Assessment of environmental contamination on the LaFarge Corporation property.

Secondary Topics: geology

Document Review - Seattle City Light Boundary Project

Document Number 123 **Review Date:** 7/2/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Parametrix, Inc.

Year of Publication: 1987 **Geographic Area:** Boundary Wildlife Preserve at RM 32

Title: Boundary Dam Wildlife Mitigation Project Vegetation and Wildlife Survey Final Report.

Source: Prepared by Parametrix, Inc. for Seattle City Light.

Abstract: SCL purchased 155 acres of land adjacent to the reservoir to mitigate for impacts of Boundary Dam. SCL had investigated constructing sloughs but decided land purchase is more effective. The property was surveyed for plants and wildlife 19-21 May 1987 and vegetation mapped into 5 forested and 6 nonforested communities. These include: broadleaf forest (1 stand in SE corner dominated by black cottonwood and birch), riparian broadleaf forest (dominated by cottonwood and trembling aspen), pole stage conifer forest (covers large portion of area, west of the railroad track is mostly larch, while south of the railroad lodgepole and larch dominate), disturbed conifer forest (much of the forested area east of the railroad tracks and at the north end of the property have been selectively logged in the recent past, species composition is similar to pole stage forests, a population of mountain ladyslipper was found at the north end of the property and Virginia grapefern was found along Sand Creek), mixed conifer/broadleaf forest (2 areas at south end of the property and on the slope facing the slough, dominated by redcedar, lodgepole pine, grand fir, cottonwood, aspen, and paper birch), sedge meadow (occupies 1/3 of the lowland area, area has been affected by past grazing), successional shrub (occurs along the margin of broadleaf riparian forest adjacent to the slough), riparian shrub (dogwood and willow at mouth of Sandy Creek), riparian broadleaf forest/sedge meadow (along the river at south end of property), grassland (occurs in 2 small areas at north end), gravel bank/beach (along river south of Sand Creek), slough, and pond (slough and pond habitat have Eurasian milfoil). Mammals include deer, elk, bear, cougar, furbearers, northern pocket gopher, coyote, beaver. Threatened and endangered species known to occur near the site include gray wolf, grizzly bear, and woodland caribou. Goshawks and golden eagles may occur in the area. Three osprey nests within 2 miles of the site. Many of the 9 osprey nests along the river are on pilings intended for geese and forage for squawfish in the slough. The riparian broadleaf community has abundant snags and supports woodpeckers and neotropical migrant birds. Garter snake and painted turtle occur at the site. Potential management actions to prevent further reed canarygrass invasion, limit woody species encroachment, monitor effects of water levels on a population of least bladdery milk vetch on the gravel bank, and improve conifer forest conditions are discussed. A high concentration of rare plants occur in the vicinity of the Pend d'Oreille River. These include: Astragalus microcystis, Thalictrum dasycarpum, Sanicula marilandica, and Dryas drummondii, all of which were State Sensitive species in 1987.

Review: The information is very useful to help describe the biological resources on the SCL Boundary Wildlife

Preserve.

Comments: The level of survey effort was not sufficient to develop a complete species list or description of wildlife use on a habitat or seasonal basis. Information on amphibians and reptiles is lacking. The information will need to be supplemented since the list of Federal and State-listed plants and wildlife has changed.

Keywords: Rare plants, wildlife, mitigation, threatened and endangered species, vegetation, management recommendations

Primary Topics: An inventory of botanical and wildlife resources on the Boundary Dam Wildlife Preserve and an assessment of potential management actions

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 124 **Review Date:** 7/3/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Reese, K.P. and J. Hall.

Year of Publication: 1991 **Geographic Area:** Box Canyon Reservoir

Title: Water Quality, Fish and Wildlife Characteristics of Box Canyon Reservoir, Washington. Completion Report 1989-1990. Section 4: Wildlife and Riparian.

Source: University of Idaho. 93 p.

Abstract: A total of 115 species of birds was observed in the river corridor, with at least 83 breeding species. The shoreline is 53% forested, 40% open fields, 6% shrubs, and 1% cliffs. 50 osprey nests were monitored. Osprey density was 1 nest/504 acre. Five bald eagle nests showed high productivity, fledging 7 young. Waterfowl production included 150-200 geese and 256 ducks. At least 15 taxa of mammals occur at Box Canyon, including over 200 beaver. Possible enhancement actions include artificial nest structures, improving upland nesting habitat, altering grazing, revegetating erosion prone shorelines, and improving snag recruitment.

Review: The document provides a good species list and a source of comparison of habitat conditions (i.e., snag density) and osprey and eagle populations and productivity at the adjacent reservoir. The document also lists several possible management recommendations that may also be applicable to Boundary Res.

Comments: The document is thorough and summarizes a reasonable level of survey effort for birds and mammals at the reservoir. No effort was made to document amphibians and reptiles.

Keywords: Box Canyon, Wildlife Habitat, Bald Eagle, Osprey, Waterfowl

Primary Topics: Wildlife habitat characterization and use, bald eagle and osprey monitoring and habitat enhancement of the Box Canyon Reservoir

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 125 **Review Date:** 7/3/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Osborn, J.F.

Year of Publication: 1983 **Geographic Area:** Site RM32.8W

Title: Engineering Aspects of the Boundary Reservoir Waterfowl Habitat Improvement Project at Site RM32.8W on the Pend Oreille River in Northeast Washington.

Source: Seattle City Light, Office of Environmental Affairs. 51 p.

Abstract: The report addresses river mechanics, the hydrology of the site, dike and pond construction, and the interaction of the slough with the river. The advantages and disadvantages of the 2 slough concepts developed by Homa (1982) were presented. The natural spring high flow usually occurs between May 12 and June 12. In order to maximize the utility of the slough an elevated series of interconnected ponds should be constructed. It would be beneficial if water could be maintained in the slough through at least September. The plan would require the use of two pumps to maintain water during the summer. No islands would be constructed due to the narrow nature of the site. Rip-rap, bentonite, and possibly a liner would be required as well. If properly constructed, the ponds would be relatively maintenance free.

Review: The report describes the design in adequate detail to evaluate the effect on wildlife habitat if the proposed project were to be undertaken.

Comments: Additional information on the exact acreage of existing habitats that would be temporarily or permanently affected is needed.

Keywords: Wildlife Mitigation, Slough, Waterfowl, Hydrology

Primary Topics: The design of the proposed waterfowl ponds at Site RM32.8W

Secondary Topics: Wildlife habitat and water quality

Document Review - Seattle City Light Boundary Project

Document Number 126 **Review Date:** 7/3/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pacific Wetland Nursery, Inc.

Year of Publication: 1992 **Geographic Area:** Boundary Wildlife Preserve

Title: Boundary Wildlife Preserve 1992 Vegetation and Wildlife Monitoring and Photodocumentation.

Source: Prepared by Pacific Wetland Nursery, Inc. for Seattle City Light. 13 p.

Abstract: No significant changes were observed in the forest or meadow communities. The slough continues to erode. Moderate level of visitor use was observed in the meadow community and around the slough. These observations included vehicle tracks and trash in the meadow. The road used by the vehicles passes very close to the active bald eagle nest. Populations of 4 State-listed plant species, purple meadowrue (Thalictrum dasycarpum), mountain ladyslipper (Cypripedium montanum), Virginia grapefern (Botrychium virginianum), and least bladdery milk vetch (Astragalus microcystis) were found on the Preserve. Woolgrass (Scirpus cyperinus), a former State Monitor Species, was also found. Approximately 1,000 purple meadowrue plants occur in the riparian broadleaf forest and are not threatened by any activities. The least bladdery milk vetch is thriving along the river bank. A permanent monitoring program was established in 1992. The Virginia grapefern occurs throughout the riparian broadleaf forest in several populations. The mountain ladyslipper grows along the entrance road. Reed canarygrass has expanded at the site based on measurements at 3 plots established in 1988. Possible methods to limit this species include (1) mowing and covering the area with black plastic for at least 1 growing season and then planting Columbia sedge, (2) removing plants by hand or excavating equipment and planting sedge, (3) repeated burning on an experimental basis, (4) planting reed canarygrass areas with fast growing trees (this would result in the loss of meadow habitat), or (5) use of the herbicide Rodeo. All test plantings of willow, dogwood, cattail and bulrush in 1988 and 1989 were unsuccessful. The plants along the river grew but were eroded away by the river. Pond creation is not practical but protection from human degradation could be effective. The bald eagle nest was first used in 1989 and has produced young each year through 1992. Other wildlife include deer, elk, beaver, muskrat, Canada geese, ruffed grouse, yellow-rumped warbler, black-headed grosbeak, red-breasted nuthatch, hairy woodpecker, American redstarts, and northern flicker. The authors recommend wrapping large cottonwoods with plastic to prevent beaver damage, create wildlife exclosures to improve tree survival, control small patches of reed canarygrass with plastic and herbicides. Create natural barriers on the meadow access road near the eagle nest, and plant cottonwood, aspen, dogwood, and hawthorne within the sedge community. Photos are attached as appendix.

Review: Good summary of the conditions on the Preserve as of 1992.

Comments: Information is very useful for planning future enhancement activities although I disagree with the

recommendation to plant shrubs in the sedge community.

Keywords: Wildlife Mitigation, Rare Plants, Threatened and Endangered Species, Bald Eagle

Primary Topics: Record wildlife use and condition of vegetation, with emphasis on changes since 1987 and to survey for rare plant species near the powerhouse and visitor overlook

Secondary Topics: Management recommendations

Document Review - Seattle City Light Boundary Project

Document Number 127 **Review Date:** 7/3/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Seattle City Light.

Year of Publication: 1981 **Geographic Area:** Boundary Reservoir

Title: Review Draft of Exhibit E Environmental Report to Support Application for Amendment to License for the Boundary Hydroelectric Development Project No. 2144. Chapter 3. Report on Fish, Wildlife, and Botanical Resources.

Source: Seattle City Light. 33 p.

Abstract: The existing vegetative associations followed Kuchler (1966) and Baily (1976). The only significant occurrence of riparian vegetation is upstream of Metaline and Metaline Falls. Wetlands in the region were inventoried by the USFS. No Federally-listed Threatened or Endangered plant species occur near the reservoir. Thirteen species of plants that are listed by the State as unique or sensitive were documented. The potential effects of installing new turbine units is discussed and include disposal of excavated spoil and the clearing of 7 acres of forest adjacent to the transmission line. Mule deer and whitetail deer occur but the area is relatively unproductive. Winter habitat occurs in the river valley. Approximately 50-60 elk use the river valley near the project. Moose and black bear also occur in small numbers. Approximately 150 species of birds occur near the project. The primary species dependent on the reservoir include bald eagle, osprey, and Canada geese. Six species of amphibians and 8 reptiles have been identified within the Boundary Reservoir area. There are 6 threatened and endangered species that may occur. Numerous sightings of gray wolf have been reported to the USFS. Bald eagles frequent the reservoir. Golden eagles occur in the area but are not reservoir dependent. Grizzly bear have been reported from east of the reservoir but not near the project. Mountain caribou occur in the area.

Review: The report provides only general information on some of the high profile or Federal and State listed species that may occur in the area and the potential effects from a limited project expansion.

Comments: This information is outdated and of only limited historical reference use.

Keywords: Wildlife, Threatened and Endangered Species

Primary Topics: Effects of expansion of the project

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 105 **Review Date:** 7/3/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Envirocon, ltd.

Year of Publication: 1975 **Geographic Area:** Seven Mile Reservoir, British Columbia

Title: Environmental and Resource Management Studies Seven Mile Project.

Source: Prepared by Envirocon, ltd. for B.C. Hydro. 187 p.

Abstract: Snow depth is the major factor in determining limits of winter deer range in Pend d'Oreille valley. Winter range extends to 2,000 to 2,500 feet depending on aspect. The deer winter range habitat is excellent. Approximately 1500-1700 deer winter there and is expected to increase to 4000. Red-stem Ceanothus, chokecherry, Saskatoon, redcedar, and evergreen Ceanothus are preferred browse species. Cattle reduce the availability of forage species. The impacts of constructing the reservoir and transmission line are discussed.

Review: Potentially useful information for deer habitat management.

Comments: Information is for different location, is old, and follows a different set of environmental regulations than what Boundary will need to follow.

Keywords: Deer, Cattle, Habitat

Primary Topics: Assesses the proposed site of the Seven Mile Project for wildlife resources, primarily deer winter range.

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 128 **Review Date:** 7/3/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Envirocon, ltd.

Year of Publication: 1973 **Geographic Area:** Seven Mile Project, British Columbia

Title: Environmental Impact Report Seven Mile Project.

Source: Prepared by Envirocon, ltd. for BC Hydro. 48 p.

Abstract: The report documents the common plant and wildlife of the Seven Mile Project area. The focus is on the availability of deer winter range. The report concludes that areas below 2000 ft are the most important. Mitigation measures include: placing access road on south side of valley, study behavior of deer, improve remaining deer habitat, retain a biologist to regulate construction activities, maximize transmission line benefits, retire cattle grazing or improve selected areas for grazing, and conduct follow-up studies.

Review: Limited information on wildlife and botanical resources for that study area.

Comments: This information is of limited us for SCL activities.

Keywords: botanical and wildlife resources, mitigation measures, transmission line

Primary Topics: Effects of constructing the Seven Mile Project in British Columbia

Secondary Topics: Mitigation measures

Document Review - Seattle City Light Boundary Project

Document Number 105 **Review Date:** 7/3/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial/Recreation **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd.

Year of Publication: 1975 **Geographic Area:** Pend d'Oreille River, north

Title: Environmental and Resource Management Studies for Seven Mile Project for BC Hydro.

Source: Prepared by Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd. for BC Hydro. 191 p.

Abstract: This planning document is a resource management report to BC Hydro to support the Seven Mile hydro project prior to its construction. Includes an inventory of deer and grouse wildlife resources and hunting activities that would be affected by the construction and operation of the then proposed Seven Mile reservoir. It estimates deer and grouse hunting days annually. Recommends increased deer and grouse management to increase populations for hunting and to reduce impacts. The project would affect critical deer winter range, sport fishing, free-flowing river values, loss of wildlife viewing, and photo opportunities.

Review: Relevance to the Boundary Project includes an assessment of hunting activity to the north (pre-Seven Mile Project).

Comments: Data is pre-Seven Mile Project. Would change following the project.

Keywords: Deer, grouse, hunting, Seven Mile Project, BC Hydro,

Primary Topics: deer and grouse hunting

Secondary Topics: fishing, wildlife observation/photo,

Document Review - Seattle City Light Boundary Project

Document Number 129 **Review Date:** 7/3/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Recreation **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): McLaughlin, W. and N. Sanyal.

Year of Publication: 1991 **Geographic Area:** Box Canyon reservoir

Title: Regional Recreation and Tourism Characteristics of Box Canyon Reservoir, Completion Report 1989-1990, Section 1: Recreation.

Source: University of Idaho. Pend Oreille County PUD. 84 p.

Abstract: This report to Pend Oreille County PUD by the University of Idaho (Dept. of Resource Recreation and Tourism, College of Forestry, Wildlife & Range Sciences) is a recreation market analysis focusing on future actions the PUD might take at Box Canyon reservoir. The analysis used primarily existing data, with some interviews with recreation providers, Washington IAC data, Forest Service Rec. Opportunity Spectrum (ROS) information, and results from a boat shoreline inventory. Recommended actions by the PUD were identified. Identified needs in the SCORP document include trails (backpacking and bicycle) and 4x4 roads/trails. Recommended buying some State Parks property and developing it for recreation use.

Review: Relevance to the Boundary Project includes identification of needs in Washington SCORP Region 11 and needs at the adjacent Box Canyon reservoir. Boating is described as being better elsewhere, the area is avoided by many. Users are local landowners, not used by Spokane residents. Not a play area for the rich, recreation opportunities are inexpensive. The market is outdoor-oriented (hunting and fishing).

Comments: Report is good background data on the Pend Oreille County market and the adjacent reservoir. Focuses on the conditions at Box Canyon reservoir only. SCORP regional survey results are relatively current.

Keywords: recreation, Box Canyon, SCORP, boating, Pend Oreille County PUD

Primary Topics: Recreation needs at Box Canyon reservoir, regional needs

Secondary Topics: Shoreline landscape

Document Review - Seattle City Light Boundary Project

Document Number 130 **Review Date:** 7/3/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Recreation **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Seattle City Light.

Year of Publication: 1981 **Geographic Area:** Boundary Project

Title: Review Draft of Exhibit E -Environmental Report- to Support Application for Amendment to the License for the Boundary Hydro. Development Project No. 2144.

Source: Seattle City Light. 120 p.

Abstract: This review draft of Exhibit E to amend the FERC license was prepared by SCL. It describes recreation use and resources available at the project and in the region, popular activities, demand for recreation, available facilities, and aesthetics. In the 1980's, the WA State Parks and Recreation Commission and National Park Service agreed with SCL's proposed recreation enhancement measures. These measures were to be added in phases including: a 24-unit campground, additional picnic area, play areas, trail expansion, information center, boat ramp, parking area, and additional landscaping and grading. Recreation site and facility O&M would be done by SCL. There is no Wild & Scenic River and no wilderness areas near the Boundary Project. A potential impact to Crawford State Park from new powerlines to the BPA switchyard was identified. However, BPA was to be the lead on this. The aesthetic character of the river corridor is considered to be of high quality per the USFS. Timber harvests in the area are not evident from the river. Principal viewing areas are the 2 SCL view points/overlooks. Spoils from the installation of Units 55 and 56 are to be landscaped within the recreation areas.

Review: Describes the existing recreation facilities at the forebay and the 2 visitor centers. Identifies proposed recreation enhancement measures that were supported by NPS and WA State Parks and Rec. Commission. These measures are to be completed in phases. Aesthetics impacts to Crawford State Park were identified due to BPA T-line ROW widening (apparently a BPA issue). The spoils area from Unit 55/56 installation is to be relandscaped within the rec. area.

Comments: This is a review draft of the Exhibit E. Need to also review the final license amendment articles in the FERC Order of 1982.

Keywords: recreation, aesthetics, FERC compliance

Primary Topics: recreation at Boundary, aesthetics at Boundary, FERC enhancement measures for recreation

Secondary Topics: Wildlife relative to hunting

Document Review - Seattle City Light Boundary Project

Document Number 131 **Review Date:** 7/10/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** _____

Author(s): U.S. Fish and Wildlife Service.

Year of Publication: 1987 **Geographic Area:** Metaline Falls area

Title: National Wetland Inventory - Metaline Falls Quadrangle.

Source: U.S. Fish and Wildlife Service. 1 p.

Abstract: The map shows NWI wetlands on the 7.5 minute quadrangle. Classification follows Cowardin et al. (1979).

Review: There is a large complex of palustrine scrub-shrub and palustrine forested wetland near the mouth of Sullivan Creek.

Comments: The NWI maps are typically only partially accurate, as they miss most of the smaller wetlands. The information will need to be confirmed during relicensing cover type map studies.

Keywords: Wetlands, Wildlife Habitat

Primary Topics: Wetlands

Secondary Topics: Hydrology

Document Review - Seattle City Light Boundary Project

Document Number 132 **Review Date:** 7/10/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** _____

Author(s): U.S. Fish and Wildlife Service.

Year of Publication: 1987 **Geographic Area:** Southern 6 miles of reservoir

Title: National Wetland Inventory - Metaline Quadrangle.

Source: U.S. Fish and Wildlife Service. 1 p.

Abstract: The map shows NWI wetlands on the 7.5 minute quadrangle. Classification follows Cowardin et al. (1979).

Review: The map shows at least five patches of palustrine emergent wetland (seasonally or semi-permanently flooded)

Comments: The NWI maps are typically only partially accurate, as they miss most of the smaller wetlands. The information will need to be confirmed during relicensing cover type map studies.

Keywords: Wetlands, Wildlife Habitat

Primary Topics: Wetlands

Secondary Topics: Hydrology

Document Review - Seattle City Light Boundary Project

Document Number 133 **Review Date:** 7/10/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** _____

Author(s): U.S. Fish and Wildlife Service.

Year of Publication: 1987 **Geographic Area:** Southern 6 miles of reservoir

Title: National Wetland Inventory - Boundary Dam Quadrangle.

Source: U.S. Fish and Wildlife Service. 1 p.

Abstract: The map shows NWI wetlands on the 7.5 minute quadrangle. Classification follows Cowardin et al. (1979).

Review: The map shows one palustrine scrub-shrub wetland in Section 26.

Comments: The NWI maps are typically only partially accurate, as they miss most of the smaller wetlands. The information will need to be confirmed during relicensing cover type map studies.

Keywords: Wetlands, Wildlife Habitat

Primary Topics: Wetlands

Secondary Topics: Hydrology

Document Review - Seattle City Light Boundary Project

Document Number 134 **Review Date:** 7/10/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Letter

Author(s): Moody, S.S.

Year of Publication: 1996 **Geographic Area:** One mile within Boundary Reservoir

Title: Letter from S. Swope Moody, Washington Natural Heritage Program to R. Tressler, EDAW, Inc., July 3, 1996.

Source: Washington Natural Heritage Program. 4 p.

Abstract: The letter summarizes the Washington Natural Heritage Information system endangered, threatened, and sensitive plant species and high quality wetland and terrestrial ecosystems for the area within approximately one mile of the Boundary Reservoir. The WNHP database has 22 records of 10 Washington State Sensitive species in the identified area. These include: (1) Cryptogramma stelleri, (2) Thalictrum dasycarpum, (3) Dryas drummondii, (4) Geum rivale (historical record only), (5) Astragalus microcystis, (6) Cicuta bulbifera, (7) Sisyrinchium septentrionale, (8) Carex flava, (9) Muhlenbergia glomerata, and (10) Sanicula marilandica.

Review: Current information in the State database as of June 1996.

Comments: There may be other species on the State list that occur in the study area that have not been documented due to no survey effort. On-site surveys will be required for these species as well as species on the Colville National Forest list.

Keywords: Endangered, Threatened and Sensitive Plant Species; Botany

Primary Topics: Endangered, Threatened and Sensitive Plant Species; Botany

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 135 **Review Date:** 7/12/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Recreation/Aesthetics **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd.

Year of Publication: 1973 **Geographic Area:** Pend D' Oreille River, Canada

Title: EIR - Seven Mile Project for BC Hydro and Power Authority (BC Hydro), Vancouver, WA.

Source: Prepared by Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd for BC Hydro. 62 p.

Abstract: Historically, recreation activities downstream of the Boundary Project in Canada were centered on fish and wildlife resources. Deer hunting was most important, followed by grouse hunting. Spring and fall big game wildlife viewing and photography was important also. Fishing was meager, but was expected to improve with water quality improvements upstream (mining area enhancements). Views of the area from the adjacent roads were very attractive. Proposed project was expected to cause a reduction in big game habitat that would affect hunting. The reservoir would create some boating, sport fishing activity not currently available.

Review: Provides a discussion of downstream resources in Canada that would be affected by the then proposed Seven Mile Project, primarily hunting and fishing.

Comments: Seven Mile Project was constructed, therefore, this information is historical.

Keywords: Canada, Seven Mile Project, fishing, hunting

Primary Topics: hunting and fishing

Secondary Topics: fish and terrestrial wildlife

Document Review - Seattle City Light Boundary Project

Document Number 136 **Review Date:** 7/12/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Rominger, E.M., and J.L. Oldemeyer.

Year of Publication: 1989 **Geographic Area:** Selkirk Mountain, British Columbia

Title: Early-winter habitat of woodland caribou, Selkirk Mountains, British Columbia.

Source: J. Wildl. Manage. 53:238-243.

Abstract: We monitored early-winter habitat use by woodland caribou (Rangifer tarandus caribou) in the southern Selkirk Mountains, British Columbia, during November-December 1985-86. We compared biological and physical attributes of random locations within known early-winter caribou range to actual caribou use sites. Univariate and descriptive discriminant analysis indicated significant ($P<0.05$) separation of several habitat variables between random sites and sites used by caribou. We observed caribou in old-growth stands with moderate slopes (<30%); greater density of recently windthrown, lichen-bearing trees; higher elevations; and less canopy-cover and total tree basal area than measured at random plots. Because the Selkirk caribou use Engelmann spruce (Picea engelmanni)-subalpine fir (Abies lasiocarpa) and western red cedar (Thuja plicata)-western hemlock (Tsuga heterophylla) communities, we recommend maintenance of old-growth timber in these habitat types.

Review: Reference information for defining habitat of caribou that occasionally occur near the project.

Comments: Potentially useful information but is for a slightly different region.

Keywords: caribou, old-growth, winter range

Primary Topics: caribou ecology in nearby Selkirk Mountains of British Columbia

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 137 **Review Date:** 7/12/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Servheen, G., and L. J. Lyon.

Year of Publication: 1989 **Geographic Area:** British Columbia and Idaho Selkirk Mountains

Title: Habitat use by woodland caribou in the Selkirk Mountains.

Source: J. Wildl. Manage. 53:230-237.

Abstract: A small herd of woodland caribou (Rangifer tarandus caribou) in the southern Selkirk Mountains of British Columbia and Idaho are the only caribou in the United States outside of Alaska. We initiated studies to determine caribou habitat use in 6 time periods (seasons) and to develop standards for the protection of habitat essential for recovery of this endangered herd. We described habitats for each season by measurements of basal area, tree density, canopy cover, understory cover, lichen abundance, slope, aspect, elevation, and timber stand type. These parameters and the habitat components they described were then related to environmental variables, caribou behavior patterns and physiological requirements of caribou in each season. Snow cover and firmness, isolation of females during calving, and summer and winter forage requirements are discussed as they relate to use of habitat components. Recommendations for habitat management identify those components essential for recovery of caribou in the Selkirk Mountains.

Review: Reference information for defining habitat of caribou that occasionally occur near the project.

Comments: Potentially useful information but is for a slightly different region.

Keywords: caribou, winter range, forest management

Primary Topics: ecology of caribou in the Selkirk Mountains

Secondary Topics: habitat management options

Document Review - Seattle City Light Boundary Project

Document Number 138 **Review Date:** 7/12/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Wielgus, R.B., F.L. Bunnell, et al.

Year of Publication: 1994 **Geographic Area:** Selkirk Mountains

Title: Population dynamics of Selkirk Mountain grizzly bears.

Source: J. Wildl. Manage. 58:266-272.

Abstract: We investigated population dynamics of grizzly bears (Ursus arctos) in the Selkirk Mountains Grizzly Bear Ecosystem (SMGBE) of Idaho, Washington, and British Columbia to assist grizzly bear recovery from threatened status. We captured and radio monitored 28 bears from 1985 to 1990. Estimated densities were 1.41 + or - 0.14 (95% CL) and 2.33 + or - 0.36 bears/100 km^2 for the U.S. and Canadian portions of the SMGBE, respectively. Litter size (cubs < or =1.5 yr) was 2.22 + or - 0.26 and mean birth interval was 3.0 + or - 0.5 years for an estimated reproductive rate of 0.74 + or - 0.10 cubs/adult female per year. Age at first parturition was 7.3 + or - 0.38 years. Estimated annual survival rates were 0.96 + or - 0.05 for adult females, 0.81 + or - 0.20 for adult males, 0.78 + or - 0.22 for subadult females, 0.90 + or - 0.17 for subadult males, and 0.84 + or - 0.16 for cubs. The population appeared to be stable but growth was limited by illegal mortalities.

Review: Potential information on grizzly bear population that occurs in the region of Washington, Idaho, and British Columbia surrounding the project.

Comments: Reference information, but little relevance to SCL activities.

Keywords: grizzly bear

Primary Topics: Productivity and mortality of grizzly bears in the Selkirk Mountain Grizzly Bear Ecosystem

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 139 **Review Date:** 7/15/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Recreation, visual resou **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Amending License

Author(s): Federal Energy Regulatory Commission

Year of Publication: 1982 **Geographic Area:** Boundary Project vicinity

Title: Order Amending License, FERC Project No. 2144-001, Issued April 26, 1982

Source: Federal Energy Regulatory Commission. 50 p.

Abstract: Due to the addition of Units 55/56 and T-line modifications, this is an amendment to the original license from the FERC specifying articles to be changed or added to the existing license expiring 2011. Issues addressed include: reservoir fluctuations, cultural resources, transmission corridor, safety and adequacy, economic feasibility, and environmental impacts. Includes a Report on Recreation including regional resources in SCORP Planning District 11, recreation demand/needs assessment, management roles and responsibilities, opportunities in the project vicinity, existing levels of use, projected levels of use, proposed measures and development, design plans, and schedule and cost. Discussed potential visual impacts to Crawford State Park due to BPA T-line ROW expansion. This potential expansion would be a BPA lead.

Review: Most new measures focused on fishery and wildlife issues associated with construction of Units 55/56. However, recreation measures were also proposed by SCL and subsequently accepted by the NPS and WA State Parks and Rec. Commission. These measures included proposed development of a 24-unit campground/comfort station, 2 picnic areas and a shelter, play area, road and parking improvements, information/interpretive center, boat ramp improvements, and landscaping/grading within the forebay and spoils area. Phase I (initial development) was to be completed within one year from the start of construction of Units 55/56. Phase I was to include the completion of the forebay recreation area except for the expansion areas and 12 campsites, the downstream picnic site, and landscaping of the spoil material. Subsequent phases (undetermined #) were to include completion of the campground (add 12 more units), trail expansion, and completion of the lower level recreation area by the boat ramp. These subsequent phases would be completed as necessary to meet increased recreation demand.

Comments: The recreation measures were never fully implemented by SCL as described in the license amendment. SCL did construct a few campsites near the boat ramp at the lower level, but has not implemented the plans for the forebay area. SCL will be reassessing these measures and FERC compliance in 1996 and may construct the remaining measures as part of the upcoming comprehensive Rehabilitation Project.

Keywords: Recreation measures, license amendment (1982), City Ordinance 110571

Primary Topics: Fishery, wildlife, water quality

Secondary Topics: Recreation, visual resources

Document Review - Seattle City Light Boundary Project

Document Number 140 **Review Date:** 7/15/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Amending License

Author(s): Federal Energy Regulatory Commission.

Year of Publication: 1982 **Geographic Area:** Boundary Project vicinity

Title: Order Amending License, FERC Project No. 2144-001, Issued April 26, 1982.

Source: Federal Energy Regulatory Commission. 50 p.

Abstract: Due to the addition of Units 55/56 and T-line modifications, this is an amendment to the original license from the FERC specifying articles to be changed or added to the existing license expiring in 2011. Issues addressed include: reservoir fluctuations, transmission corridor management, effects to botanical resources, continuing effect of reduced winter range habitat due to the reservoir flooding habitat, effects to wetland and riparian habitat, and recommended mitigation measures. Article 51 stipulated that SCL consult with resource agencies to determine sites suitable for constructing fish spawning and waterfowl nesting impoundments. Article 53 required that SCL consult with agencies to determine appropriate grass/shrub revegetation mix for the transmission line ROW.

Review: The license articles pertaining to terrestrial resources describe the only two required mitigation actions: construction of artificial waterfowl nesting habitat and proper revegetation of the transmission line ROW.

Comments: The Article 51 study indicated that instead of attempting to construct spawning habitat impoundments, SCL should develop a waterfowl nesting area. The artificial impoundment was never constructed. Instead, SCL has purchased over 240 acres of wildlife habitat.

Keywords: FERC, Wildlife Mitigation, Transmission line, Waterfowl

Primary Topics: Fishery, wildlife, water quality, Transmission line management

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 141 **Review Date:** 7/17/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Fish and Wildlife Service.

Year of Publication: 1986 **Geographic Area:** western United States

Title: Recovery Plan for the Pacific Bald Eagle.

Source: U.S. Fish and Wildlife Service. 162 p.

Abstract: The Recovery Plan describes status of bald eagle populations as of 1986, recovery goals for each management zone, and management guidelines for nesting and wintering eagles.

Review: The Boundary Project is located within Bald Eagle Management Zone Number 7 (Upper Columbia Basin). As of 1986, there were 47 territories and 40 pairs. The recovery goal for the zone is 69 pairs. The document describes the general management guidelines for nesting and wintering eagles, both of which occur at Boundary Reservoir. The recovery plan will be useful in assessing management of the eagle nest on SCL property.

Comments: The information in the recovery is somewhat outdated, as eagle populations have continued to grow. Nonetheless, the management guidelines will be useful for assessing management options for the existing eagle nest as well as any future recreational or other development at the project.

Keywords: Bald Eagle, Threatened and Endangered Species

Primary Topics: Bald eagle ecology, management, and protection in the western United States

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 142 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Brown, H.A., R.B Bury, D.M. Darda, et al.

Year of Publication: 1995 **Geographic Area:** Washington and Oregon

Title: Reptiles of Washington and Oregon.

Source: Seattle Audubon Society, Seattle Washington. 176 p.

Abstract: Species' range maps indicate that the following species potentially occur in the region of the Boundary Project: (1) painted turtle, (2) northern alligator lizard, (3) western skink, (4) rubber boa, (5) gopher snake, (6) western terrestrial garter snake, (7) northwestern garter snake, and (8) common garter snake.

Review: The book is a very recent effort at providing a comprehensive reference on reptiles. The information will be useful in assessing species occurrence near the project and designing studies.

Comments: Although current, the range maps do not always reflect local distributions. Very little survey effort has occurred near the project.

Keywords: reptiles

Primary Topics: reptile identification and distribution

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 143 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Leonard W.P., H.A. Brown, et al.

Year of Publication: 1993 **Geographic Area:** Washington and Oregon

Title: Amphibians of Washington and Oregon.

Source: Seattle Audubon Society, Seattle Washington. 168 p.

Abstract: Species' range maps indicate that the following species potentially occur in the region of the Boundary Project: (1) long-toed salamander, (2) western toad, (3) Pacific chorus frogs, (4) spotted frog, and (5) bullfrog.

Review: The book is a very recent effort at providing a comprehensive reference on amphibians. The information will be useful in assessing species occurrence near the project and designing studies.

Comments: Although current, the range maps do not always reflect local distributions. Very little survey effort has occurred in the vicinity of the project.

Keywords: Amphibians

Primary Topics: amphibian identification and distribution

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 144 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Burke, T. and J. Nisbet.

Year of Publication: 1979 **Geographic Area:** Colville National Forest

Title: Birds of the Colville National Forest.

Source: Colville National Forest. 8 p.

Abstract: Checklist of bird species for the Colville National Forest

Review: Indicates the relative abundance, seasonal occurrence, and preferred habitat of birds for the Forest

Comments: May be somewhat outdated but will still be very useful.

Keywords: Birds

Primary Topics: Birds of the Colville National Forest

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 145 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Burke, T.

Year of Publication: 1976 **Geographic Area:** Colville National Forest

Title: Mammals of the Colville National Forest.

Source: Colville National Forest. 4 p.

Abstract: Checklist of bird species for the Colville National Forest

Review: Indicates the relative abundance in preferred habitats, life zone inhabited, and special habitat requirements of mammals.

Comments: May be somewhat outdated but will still be very useful.

Keywords: Mammals

Primary Topics: Mammals of the Colville National Forest

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 146 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Burke, T.

Year of Publication: 1976 **Geographic Area:** Colville National Forest

Title: Reptiles and Amphibians of the Colville National Forest.

Source: Colville National Forest. 5 p.

Abstract: Checklist of amphibian and reptile species for the Colville National Forest

Review: Indicates the County and habitat of amphibians and reptiles.

Comments: May be somewhat outdated but will still be very useful.

Keywords: Amphibians, Reptiles

Primary Topics: Amphibians and Reptiles of the Colville National Forest

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 147 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler/C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial/Recreation **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Washington Department of Wildlife.

Year of Publication: 1990 **Geographic Area:** Flume Creek

Title: Flume Creek Mountain Goat Viewing Area.

Source: Washington Department of Wildlife. 4 p.

Abstract: During March through early June, mountain goats may be seen foraging and resting on the cliffs above Flume Creek. The rest of the year they are typically on Linton Mountain. The pamphlet provides general life history and management information. The main purpose of the pamphlet is to provide information to recreationists visiting the viewing site, which is a cooperative effort by SCL, WDW, USFS, Pend Oreille County, and Inland Northwest Wildlife Council. The viewing area is west of the Pend Oreille River, north of Metaline and Flume Creek.

Review: Describes recreational opportunities for viewing mountain goats as well as some general information on the mountain goats in the area. SCL participated in developing the site.

Comments: Good documentation of SCL's efforts to provide recreational opportunities and wildlife education.

Keywords: Mountain goat viewing, Recreation

Primary Topics: Mountain goat viewing at Flume Creek

Secondary Topics: Recreation

Document Review - Seattle City Light Boundary Project

Document Number 148 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Forest Service, Idaho Panhandle Forests.

Year of Publication: 1981 **Geographic Area:** North Idaho

Title: Trees of North Idaho.

Source: U.S. Forest Service, Idaho Panhandle Forests. 17 p.

Abstract: Key of 15 common tree species in northern Idaho.

Review: Describes some key identifying characteristics for 15 species.

Comments: Although not for northeastern Washington, the information may be helpful in identifying species at Boundary.

Keywords: Trees

Primary Topics: Trees of northern Idaho

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 149 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): U.S. Forest Service, Colville National Forest.

Year of Publication: **Geographic Area:** Unknown

Title: Celebrating Wildflowers.

Source: U.S. Forest Service, Colville National Forest. 24 p.

Abstract: Descriptions and habitat information for 23 common wildflower species.

Review: Identification guide for a very limited number of species.

Comments: May be useful in identifying species observed in the field, although other keys are more extensive.

Keywords: Botanical resources

Primary Topics: Wildflower identification

Secondary Topics: Recreation

Document Review - Seattle City Light Boundary Project

Document Number 150 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler, C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial, Recreation, **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S.D.A., U.S. Forest Service.

Year of Publication: 1988 **Geographic Area:** Colville National Forest

Title: Land and Resource Management Plan (Forest Plan), Colville National Forest.

Source: U.S.D.A., U.S. Forest Service. 240 p.

Abstract: Terrestrial Wildlife: There are 73 species of mammals, 234 birds, nine reptiles, and 7 amphibians on the Forest. Elk were introduced onto the Forest. Management emphasizes elk east of the river and deer to the west of the river. Threatened, Endangered, and Sensitive Species include: grizzly bear, bald eagle, Selkirk Mountain caribou, peregrine falcon (only during fall migration), and gray wolf. The document indicates that the primary information needs include interactions between recreation and other resources, improve knowledge of distribution and habitat requirements of wildlife associated with old-growth forests as well as understanding the ecological diversity of these areas, improve data on grizzly bears with Selkirk Grizzly Bear Ecosystem, identify potential bald eagle and peregrine falcon nest sites, and inventory wildlife habitats (including wetlands, riparian vegetation, old-growth forest, snags, etc.). Recreation: The Forest Plan includes recreation supply and demand projections, issues and concerns, recreation program management objectives, recreation standards and guidelines, recreation prescriptions, and recreation and wilderness projects. In 1994, the Forest had 7.2 million recreation visits. About 49,000 acres are managed for recreation or recreation/wildlife. About 2,000 acres are managed for downhill skiing. Forest recreation facilities include 27 campgrounds (6,134 capacity), 2 group camps (100 capacity), 19 picnic areas (600 capacity), 15 boat launches, 4 wildlife viewing areas, 6 interpretive sites, 1 downhill skiing area (49 Degrees North), 509 miles of multi-use trails and 47 trailheads, 16 rec. residences, and 1 National Scenic Byway (Sherman Pass). Priorities were to develop or reconstruct more trails and retain backpacking/wilderness opportunities. Recreation projects for the next 10 years are listed. The Forest plans to reconstruct or expand campgrounds by 20 camp units per year. Over 200 miles of trails will be added over the next 20 years (to 2008). Trails will be reconstructed to new standards. An additional 51 miles of 4x4 vehicle trails will also be provided. The supply of dispersed recreation (roaded and unroaded conditions) exceeds projected use now. Visual: The Forest Plan includes visual resource management standards and guidelines, and prescriptions for scenic/timber and scenic/winter range areas. There are over 298,000 acres managed for scenic/timber or scenic/winter range in the Forest. Priorities were to better manage clearcutting and timber management along main travel route viewsheds. Up to 30% of the forest will be managed primarily for visual resources. Uneven-age timber management systems will be used in the foreground and middleground of primary viewsheds.

Review: Describes the management guidelines for the USFS lands that border the Boundary Project. USFS lands border SCL ownership.

Document Review - Seattle City Light Boundary Project

Comments: Somewhat old information (1988). Not all land bordering the reservoir is USFS land. The plan will be useful as a starting point for dialog with the USFS in designing studies and later for enhancement opportunities for terrestrial resources. Refer to Forest Facts 1995, Colville National Forest for up to date statistics.

Keywords: Bald Eagle, Grizzly Bear, Peregrine Falcon, Gray Wolf, Wetlands, Riparian Habitat, Deer, Elk, recreation, visual

Primary Topics: Provides general management programs for the Forest that addresses multiple use of the land.

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 151 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler, C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial, recreation, v **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S.D.A., U.S. Forest Service.

Year of Publication: 1988 **Geographic Area:** Colville National Forest

Title: Final Environmental Impact Statement, Land and Resource Management Plan, Colville National Forest.

Source: U.S.D.A., U.S. Forest Service. 2000 p.

Abstract: The Affected Environment Section (pages III-31 to III-44) describes the wildlife resources on the Colville National Forest. The ratio of white-tailed and mule deer is approximately 60:40. More effective fire management has reduced forage availability on deer winter range areas. Elk were introduced periodically between 1915 and 1970. The 1984 elk population was estimated at 380. Management emphasizes elk to the east of the river and deer to the west. The elk population is at carrying capacity. Bighorn sheep and mountain goats have been introduced. Moose are hunted on the east side of the river by permit. In terms of non-game species, nesting populations of golden eagles and osprey are of particular note. Forest Management Indicator Species include: (1) grizzly bear (specific habitat and seclusion), (2) caribou (specific habitat), (3) big game (deer and elk winter range), (4) blue grouse (mature ridgetop conifers and open forest with grass/shrub at lower elevations), (5) Franklin's grouse (lodgepole pine with mature spruce), (6) northern three-toed woodpecker (mature lodgepole pine), (7) pileated woodpecker (mature and old growth conifer), (8) woodpeckers (snags), (9) barred owl (lower elevation mature and old growth forest), (10) marten (moderate to high elevation old growth), (11) beaver (aquatic and riparian habitat), (12) large raptors/great blue herons (nest trees), (13) northern bog lemming (high elevation bog), and (14) trouts (aquatic and riparian). There are 11 species of wildlife that are on the Regional Forester's Sensitive Species List. Of these the Pacific Townsend's big-eared bat, common loon, greater sandhill crane, and bull trout have the greatest potential to occur near Boundary Reservoir. Twenty-nine species of sensitive plant species have been documented on the Forest. The Selected Alternative (Alt. G Modified) Management Area Descriptions near the project include: (1) large blocks of MA-3 (provide roaded and unroaded recreation opportunities in a natural-appearing setting) on the east side of the reservoir, (2) areas identified as MA-5 (provide natural-appearing foreground, middleground, and background along major scenic routes while providing wood products) and MA-6 (provide natural-appearing foreground, middleground, and background along major scenic routes while providing winter range), and (3) interspersed private land. The visual setting is generally pastoral through valleys where major roads traverse. Topography is generally rounded, with true alpine conditions only in the NE corner of the Forest. The major scenic viewshed in the area is Hwy. 31 east of the river. Projected recreation use in the Forest by USFS Recreation Opportunity Spectrum (ROS) class is predominately Roaded Natural/Roaded Modified, followed by Developed. The Forest goal is to provide a range of ROS opportunities. Sometimes there are conflicts between those wanting a wilderness experience and those who don't (motorized trails or developed campgrounds).

Document Review - Seattle City Light Boundary Project

Review: The EIS provides the documentation for the overall land management identified in the Land Management Plan. The maps give the general locations of the various management alternatives being used on the forest. This overall direction helps to assess the suitability of areas as wildlife habitat.

Comments: The information may be somewhat outdated.

Keywords: Deer, Elk, Threatened and Endangered Species, Recreation, Habitat Management, Visual Resources

Primary Topics: Effects of land management of the Colville National Forest on wildlife and botanical resources

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 152 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Fish and Wildlife Service.

Year of Publication: 1993 **Geographic Area:** Range of the Grizzly Bear

Title: Grizzly Bear Recovery Plan.

Source: U.S. Fish and Wildlife Service, Missoula, MT. 181 p.

Abstract: The document provides general ecology, past and present distribution, legal status, need for recovery, the recovery in each of the five zones (includes Selkirks Recovery), and implementation schedule. For the Selkirk Grizzly Bear Recovery Zone, 90 bears and six females with cubs over a running 6-year average both inside the recovery zone and within a 10 mile area immediately surrounding the zone is the goal. The number of bears is so small in this ecosystem that the mortality goal form human causes shall be zero. The zone includes 2,000 square miles in northeastern Washington (approximately following Highway 31 to the east of the reservoir), northern Idaho, and southern British Columbia. The recovery plan identifies guidelines for protecting and enhancing grizzly bear habitat throughout the zone.

Review: Good information on the grizzly bear and the goals for managing bears and their habitat in the Selkirk recovery zone, which within several miles of the reservoir.

Comments: Although the project is not within the recovery zone, the bear will need to be addressed and the management guidelines followed to the extent possible.

Keywords: Grizzly Bear

Primary Topics: Grizzly Bear Recovery

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 153 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Letter

Author(s): Schroeder, J.M.

Year of Publication: 1981 **Geographic Area:** BLM land near Boundary Reservoir

Title: Letter from J.M Schroeder to R. Burnell, Bureau of Land Management District Manager, Spokane, Wa. 27 October 1981.

Source: Private. 2 p.

Abstract: The author was under contract to the WNHP to do botanical surveys in the area. The area south of Boundary Dam to the mouth of State Creek is of great botanical and geological interest. (Sec. 10, 14, 15, 22, 23, 26, 34, and 35 T40N, R43E). Limestone cliffs support unique plants and wildlife. Aspenium trichomanes, Astragalus microcystis, Impatiens aurella, Cyripedium montanum, Dryas drummondii, and Thalictrum dasycarpum occur in the area. There are also 17 other species of interest that are known or potential occur at the site. The sloping hillsides to the west of the river are covered by relatively untouched forest zones of the Tsuga series and should be protected.

Review: Good documentation on some of the unique species that occur at Boundary Reservoir.

Comments: Very good information on rare plants. The surveys were conducted 15 years ago so changes in habitat may have occurred since then.

Keywords: Botanical Resources, Sensitive Plants

Primary Topics: The unique botanical resources of the BLM lands to the west of the river.

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 154 **Review Date:** 7/22/96

Reviewer's Name: R. Tressler **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Terrestrial **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Field notes

Author(s): Althauser.

Year of Publication: 1979 **Geographic Area:** Boundary Reservoir

Title: Information from the Althauser (1979) Botanical Survey (maps and field notes provided by K. Ahlenslager, Botanist, Colville National Forest).

Source: U.S. Forest Service. 11 p.

Abstract: Documents several locations on both sides of the river where rare plant species were found. Notes that fluctuating water levels present risk to the less numerous species that occur in wetland and riparian habitats along the river.

Review: Very good historical information on sensitive plant species that occur in the area.

Comments: The habitat where species were found could have been altered so it is uncertain whether the species still occur there.

Keywords: Botanical Resources, Rare Plants

Primary Topics: Records of rare plants near Boundary Reservoir

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 155 **Review Date:** 7/22/96

Reviewer's Name: C. Everett **Reviewer's Organization:** EDAW, Inc.

Reviewer's Discipline: Recreation **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Trail Guide

Author(s): USDA Forest Service.

Year of Publication: 1994 **Geographic Area:** Sullivan Lake Ranger District

Title: Sullivan Lake Ranger District Trail Guide.

Source: USDA Forest Service. 18 p.

Abstract: Provides a map of USFS campground and trails north of Ione, WA to Crawford State Park and Boundary Dam Vista House to the north. Shows trails and campgrounds accessed from area roads including County Roads 9345 and 2975, Highway 20, and Highway 31. Twenty trails (502 to 588) are identified, showing the use types including hiker only, horse trails, mtn. bikes, backpacking trips, and Salmo Priest Wilderness. Information on each trail is provided. No river edge trail exists, except for the Metaline Falls area.

Review: Shows trails in the area. Most are at the Sullivan Lake area. Some in the Metaline Falls area, but none along the river for any length.

Comments: Up to date trail information on USFS lands.

Keywords: Recreation, trails

Primary Topics: Trails

Secondary Topics: Campgrounds

Document Review - Seattle City Light Boundary Project

Document Number 156 **Review Date:** 6/20/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): City of Seattle.

Year of Publication: 1981 **Geographic Area:** Boundary Reservoir

Title: Review draft of exhibit E environmental report to support application for amendment to license for the Boundary Hydroelectric Development.

Source: Project No. 2144. City of Seattle, City Light Department. 30 p.

Abstract:

Review: Environmental report to support an Application for Expansion of the Boundary Hydroelectric Project. Includes brief water quality summaries for the Pend Oreille River at Newport and the international boundary, 1974 to 1978. Flow patterns for the Boundary Dam are also described. Report concludes that the high flushing rate and channel constrictions in the Metaline Falls and Z-Canyon areas cause the water in the Boundary Reservoir to be thoroughly mixed so there is no stratification of reservoir waters and water quality parameters are presumed to be the same upstream and downstream of the Boundary Dam. When high flows cause the hydroelectric capacity of the dam to be exceeded, supersaturated concentrations of dissolved gases were found in the tailwaters due to water being discharged through the spillway and sluicegates. Data sources are U.S.G.S. water quality monitoring stations and SCL.

Comments: Report identifies the following resource issues that relevant to the Boundary Project: 1) Supersaturation of gases downstream of gases downstream of dam when water must be released thorough spillways or sluicegates because the flow in the Pend Oreille River exceeds the hydroelectric capacity of the dam 2) Potential release of PCB's from transformers and capacitors during dam operations 3) Daily fluctuations in reservoir and tailwater elevations are not conducive to fish populations.

Keywords: water use, water quality

Primary Topics: Dam Licensing

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 157 **Review Date:** 6/21/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Environmental Protection Agency.

Year of Publication: 1993 **Geographic Area:** Clark Fork, Pend Oreille Lake, Pend Oreille River

Title: Clark Fork - Pend Oreille Basin water quality study: A summary of findings and a management plan.

Source: United States Environmental Protection Agency Regions VIII and X. Report for Section 525 of the Clean Water Act of 1987. 63 p.

Abstract:

Review: Summary of findings from three years of water quality research on the Clark Fork-Pend Oreille Basin and a management plan for protection of the basin's water quality. Water quality summaries and management plan objectives broken down by hydraulic subregions as follows: Clark Fork River, Pend Oreille Lake, and Pend Oreille River. Research findings showed that water quality in the Pend Oreille River is generally good and in the oligo-mesotrophic range. The primary water quality concern on the Pend Oreille is the proliferation of Eurasian watermilfoil. Roughly 75 percent of the external nitrogen and phosphorous loading to the Pend Oreille comes from the Newport wastewater treatment plant, Calispell Creek, and Trimble Creek. Several tributaries exceed standards for fecal coliform bacteria counts.

Comments:

Keywords: water quality, management plan, nuisance algae

Primary Topics: Water Quality

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 158 **Review Date:** 6/21/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Falter, C. M., C. Baines and J. W. Carlson.

Year of Publication: 1991 **Geographic Area:** Box Canyon Reservoir

Title: Water quality, fish and wildlife of Box Canyon Reservoir, Washington.

Source: Section 2: Water Quality. University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID. Final Report submitted to Pend Oreille County PUD, Newport, WA. 233 p.

Abstract: Box Canyon Reservoir on the Pend Oreille River, WA, formed by construction of Box Canyon Dam, was first filled in 1955. The Reservoir extends from Albeni Falls Dam at River Mile (RM) 90.3 to Box Canyon Dam at RM 34.5. A two-year water quality study was conducted by the University of Idaho on the river, seven selected sloughs, six major tributaries, and Power Lake during 1989 and 1990. Major emphasis was put on identifying any current water quality problems, determining the river's trophic status, and determining the extent of the aquatic macrophyte community. Zooplankton and phytoplankton communities were also sampled for composition and population trends. The Box Canyon Reach of Pend Oreille River is a cool-water (two year maximum mean of 72.2 F (21.75 C) mesotrophic system with high water quality. The reservoir is riverine with velocities ranging from 0.1 ft/s during summer low flows (two-year August mean of 18,284 cfs) up to 2.0 ft/s during spring high flows (two-year June mean of 53,437 cfs). Annual mean retention time during summer low flows for the two-year study was 4.2 days. The short retention time did not allow for vertical thermal stratification during the summer. Dissolved oxygen followed an orthograde pattern at levels of 100% saturation and higher throughout the growing season. The river is moderately hard-water with two-year August mean conductivity and alkalinity of 142.2 umhos and 92.9 mg/ respectively. Nutrients appear to be the limiting factor for productivity in Pend Oreille River. The two-year August mean for total phosphorous and total Kjeldahl nitrogen are 9.7 ug/l and 0.16 ug/l respectively. Chlorophyll a trends are converse to trends in aquatic macrophyte productivity. Minimum chlorophyll a values (two year August mean of 1.02 mg/l) correspond to maximum aquatic macrophyte biomass (August mean values of 200 to 1,000 mg/m2 in weeded littoral areas). Species composition (oven-dry weight) data indicated native plant species such as Elodea canadensis, Ceratophyllum demersum, Potamageton spp., and Myriophyllum spicatum exalbescens comprised the majority of the aquatic macrophyte community. Eurasian watermilfoil densities increased from Indian Island (RM 80.5) downstream to Reach 4 (RM 60.0 to 45.0) where it comprised 98.1% of the littoral aquatic macrophyte community. The sloughs on Pend Oreille River are mesotrophic to eutrophic. They warmed more quickly than the river in the spring (10.8 F (6.0 C) warmer in June) and were cooler than the main river in summer. They all showed slight thermal stratification in spring with Tiger Slough remaining strongly stratified through the growing season. Dissolved oxygen levels in the slough were at or above 100% saturation at the surface following a typical clinograde pattern to the bottom. Water quality in the sloughs was similar with the distinct exception of Calispel Creek and Trimble Sloughs which are soft-water (low

conductivity and total alkalinity). Power Lake is a soft-water, mesoeutrophic system. Power Lake was strongly stratified both years with dissolved oxygen levels following a positive heterograde in 1989. Power Lake benthos is dominated by large woody debris comprised of logs, stumps, and slash.

Review:

Comments:

Keywords: water quality, trophic status

Primary Topics: Water Quality

Secondary Topics: Trophic Status

Document Review - Seattle City Light Boundary Project

Document Number 159 **Review Date:** 7/2/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Coots, R. and R. Willms.

Year of Publication: 1991 **Geographic Area:** Box Canyon Reservoir and Tributaries

Title: Pend Oreille River primary productivity and water quality of selected tributaries.

Source: Washington State Department of Ecology, Olympia WA. 35 p.

Abstract: Ecology studied primary productivity in the Box Canyon reach of Washington's Pend Oreille River during the summer of 1990. Primary productivity was in the middle to upper range of reported in literature for larger rivers. Highest productivity was measured at River Mile 66.5 and attributed to extensive macrophyte beds. The productivity/respiration ratio indicates an autotrophic classification. Skookum, Bracket, and South Fork Lost Creek fecal coliform densities exceeded Class A water quality criteria. Recommendations are included to address non-point pollution problems from agricultural practices on specific tributaries.

Review: The study results presented in this report focus on primary productivity in the mainstem of the Pend Oreille River, and nutrient sources and water quality of selected tributaries identified as problematic in a 1988 water quality assessment. Diurnal rise and fall of D.O. was used to estimate productivity. Fecal coliform densities were found in the Skookum, Bracket, and South Fork Lost Creek that exceeded Class A water quality criteria. The high fecal coliform densities appear to be related to animal keeping practices. Total phosphorous concentrations in Calispell and Trimble Creek exceeded EPA's recommended guideline of 50 ug P/L for the protection of reservoirs from cultural eutrophication. Primary productivity by the biotic community within the Box Canyon Reach was in the middle to upper range reported by other investigators for larger rivers. The P/R ratio indicates an autotrophic classification for the biological community of the Pend Oreille River.

Comments:

Keywords: water quality, primary productivity

Primary Topics: Water Quality

Secondary Topics: Productivity

Document Review - Seattle City Light Boundary Project

Document Number 160 **Review Date:** 7/2/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pelletier, G. and R. Coots.

Year of Publication: 1990 **Geographic Area:** Pend Oreille River, Albeni Falls to Box Canyon Dam

Title: Pend Oreille River water quality study.

Source: Progress Report No. 1, Pend Oreille River water quality study. Washington State Department of Ecology, Olympia, WA. 61 p.

Abstract: A study was conducted by the Washington State Department of Ecology to address water quality concerns of the Pend Oreille River between Albeni Falls and Box Canyon dams. Five stations were sampled every three weeks between July and November 1988. Water quality is generally good and well below the threshold of eutrophic conditions. Phytoplankton species were typical of oligotrophic to mesotrophic waters. Periphyton concentrations were well below nuisance levels for aesthetic impairment. Macrophytes are responsible for water quality violations for pH and total dissolved gases during the peak of the growing season. There was no significant differences between sample stations for nutrients, suggesting macrophyte occurrences and sediments do not elevate instream nutrient loads. Brackett Creek, Skookum Creek, and South Fork Lost Creek exceeded Class A water quality standards for fecal coliform.

Review: Representative water quality parameters were sampled in the Pend Oreille River at five stations between Albeni Falls Dam and Box Canyon Dam at three week intervals between July 1988 and November 1988. Routine sampling of index tributaries and point sources, and random sampling of other inputs were also conducted. Samples of macrophyte and periphyton tissue were collected from four stations. Water quality was generally found to be good and below the threshold for eutrophic conditions. Phytoplankton species were typical of oligotrophic and mesotrophic waters and periphyton concentrations were well below nuisance levels. Macrophytes are responsible for water quality violations for pH and total dissolved gases during peak growing season.

Comments:

Keywords: trophic status, water quality

Primary Topics: Water Quality

Secondary Topics: Trophic Status

Document Review - Seattle City Light Boundary Project

Document Number 161 **Review Date:** 7/2/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Geiger, D. D., A. T. Scholz, C. S. Doughtie, H. G. Kube, and D.L. Richards.

Year of Publication: 1993 **Geographic Area:** Kalispel Indian Reservation

Title: Annotated bibliography of information about surface and groundwater quality and quantity on the Kalispel Indian Reservation, including reservation boundary waters on the Box Canyon Reservoir of the Pend Oreille River.

Source: (Fisheries Technical Report No. 47). Upper Columbia United Tribes Fisheries Center, Eastern Washington University, Cheney WA. 239 p.

Abstract: This report contains an annotated bibliography concerning surface water and groundwater quality and quantity on the Kalispel Indian Reservation, including reservation boundary water on the Box Canyon Reservoir of the Pend Oreille River. A summary of the bibliography contents and Kalispel Tribal water rights are also included.

Review:

Comments:

Keywords: water quality, surface water, groundwater

Primary Topics: Water Quality

Secondary Topics: Water Quantity

Document Review - Seattle City Light Boundary Project

Document Number 162 **Review Date:** 7/2/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Skillingstad, T. and A. T. Scholz.

Year of Publication: 1993 **Geographic Area:** Box Canyon Reservoir

Title: Trends in water quality in the Box Canyon Reservoir of the Pend Oreille River adjacent to the Kalispel Indian Reservation.

Source: (Fisheries Technical Report No. 44). Upper Columbia United Tribes Fisheries Center, Eastern Washington University, Cheney, WA. 78 p.

Abstract: Historical data for 23 water quality variables were compiled to determine trends over time (from 1957 to 1991) in the Box Canyon Reach of the Pend Oreille River and to determine the percentage of time each variable violated federal or state water quality criteria. Water quality variables (and numbers of samples) that were analyzed included: dissolved oxygen (743), carbon dioxide (346), turbidity (223), pH (600), alkalinity (351), hardness (35), ammonia nitrogen (396), magnesium (44), chloride (45), sulfate (44), sodium (44), potassium (44), arsenic (26), cadmium (26), chromium (50), copper (59), lead (59), mercury (49), silver (34) and zinc (34). The parameters that violated federal or state criteria were dissolved oxygen (64.4% of samples), pH (20.6%), ammonia (27.5%), cadmium (7.6%), chromium (2.0%) and mercury (22.4%). Except for oxygen and ammonia, none of these parameters exceeded criteria after 1979. Dissolved oxygen values, although below Washington Administrative Code Class A (8.5 mg/L) and Class AA (9.5 mg/L) in numerous samples, were never below U.S. Environmental Protection Agency Criteria for Protection of Aquatic Life (5.0 mg/l), so oxygen levels did not appear to pose a significant problem at present time. In the case of ammonia, it was undetermined if the unionized form was measured. If not, the number of violations could be significantly lower than reported here because the federal criteria are for unionized ammonia. Linear regression analysis indicated that only two variables evidenced trends: potassium (decreasing trend) and zinc (increasing trend). Zinc is not believed to be a toxic metal. Thus, this analysis did not reveal any significant water quality problems at the present time.

Review: Historical data for 23 water quality variables were compiled to determine trends over time (from 1957 to 1991) in the Box Canyon Reach of the Pend Oreille River and to determine the percentage of time each variable violated federal or state water quality criteria. Of the water quality variables analyzed, only dissolved oxygen and ammonia exceeded criteria after 1979. In general, the analysis did not reveal any significant water quality problems in the Box Canyon reach of the Pend Oreille River at this time.

Comments:

Keywords: water quality

Document Review - Seattle City Light Boundary Project

Primary Topics: Water Quality

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 163 **Review Date:** 7/2/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Skillingstad, T. H., B. L. Ashe and A. T. Scholz.

Year of Publication: 1993 **Geographic Area:** Box Canyon Reservoir

Title: An assessment of the Pend Oreille River, WA receiving effluent from a thermomechanical newsprint mill: 1991/92 post-operation report.

Source: (Fisheries Technical Report No. 47). Upper Columbia United Tribes Fisheries Center, Eastern Washington University, Cheney, WA. 291 p.

Abstract:

Review: The Pend Oreille Newsprint Company constructed a thermomechanical pulp mill on the Pend Oreille River within the reach called the Box Canyon Reservoir. In November of 1989 the mill was operational and began using the Pend Oreille River as its water source and point of discharge for its treated wastewater effluent. An initial investigation of the Box Canyon Reservoir was conducted between August 1987 to July 1988, prior to mill operation. This investigation replicated the initial study, however a new variable existed which was the presence of the mill effluent. As in the first study, limnological and biological data, collected at sites located above and below the diffuser site, were compared to identify any significant differences between sampling sites based on their location to the mill diffuser. Also, this post-investigation compared results from the first study to the present results to identify significant changes which have occurred since the mill began operations. The post-operational investigation showed no significant differences in the water quality of the Box Canyon reach since the pre-operational investigation.

Comments:

Keywords: water quality, news print mill effluent

Primary Topics: Water Quality

Secondary Topics: Fish and Macroinvertebrates

Document Review - Seattle City Light Boundary Project

Document Number 164 **Review Date:** 7/5/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Gibbons, H. L., M. L. Durando-Boehm, F. A. Verhalen, T.C. McKarns, J.T. Nyznyk, T.J. Belnick, W.H.Funk, E.E. Syms, A. Frankenfield, B.C. Moore, and M.V. Gibbons.

Year of Publication: 1983 **Geographic Area:** Pend Oreille River

Title: Refinement of control and management methodology for Eurasian water milfoil in the Pend Oreille River, Washington.

Source: State of Washington Water Research Center, Washington State University. 49 p.

Abstract:

Review: Report describes a study of treatment methodologies for possible adaptation in a Eurasian water milfoil (Myriophyllium spicatum) control program for the Pend Oreille River. Test plots on the Pend Oreille River were established to test the effectiveness of two 2, 4-D formulations that have shown promise in controlling Eurasian water milfoil. The report evaluates the effectiveness of the 2,4-D formulations and their environmental impacts. The Concentration of 2,4-D DMA was less than drinking water standards within 24 hours after application and drift from test plots did not exceed water quality standards. The most effective treatment was found to be 2,4-D DMA applied twice with the second application applied within 5 to 7 days of the first. A long term management strategy was also proposed.

Comments:

Keywords: eurasian milfoil, 2, 4-D

Primary Topics: Eurasian Milfoil

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 165 **Review Date:** 7/5/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Gibbons, H. L., W. H. Funk, M. Durando-Boehm and J.J. Eisenbeis

Year of Publication: 1983 **Geographic Area:** Pend Oreille River

Title: Investigation and control of Myriophyllum spicatum in the Pend Oreille River, Washington. (Report 47).

Source: State of Washington Water Research Center, Washington State University, Pullman, WA. 37 p.

Abstract:

Review: Report describes a study of treatment methodologies for possible adaptation in a Eurasian water milfoil (Myriophyllium spicatum) control program for the Pend Oreille River. Test plots on the Pend Oreille River were established to test the effectiveness of two 2, 4-D formulations that have shown promise in controlling Eurasian water milfoil. The report evaluates the effectiveness of the 2,4-D formulations and their environmental impacts. The concentration of 2,4-D DMA was found to be below required levels within 24 hours. Some drift of 2,4-D DMA along the bottom did occur but the degree of drift was not determined. Reductions in Eurasian milfoil densities of 78 to 87% were measured in the test plots.

Comments:

Keywords: eurasian milfoil, water quality

Primary Topics: Eurasian Milfoil

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 166 **Review Date:** 7/5/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Dames & Moore, Inc. and Cosmopolitan Engineering Group.

Year of Publication: 1995 **Geographic Area:** Pend Oreille River

Title: Initial watershed assessment, water resources inventory area 62, Pend Oreille River Watershed.

Source: (Open-File Technical Report 95-17). Prepared in cooperation with the Washington State Department of Ecology, Olympia, WA. 40 p.

Abstract:

Review: The goal of the report is document surface and groundwater resources in the Pend Oreille watershed, and to evaluate the information available for addressing regulatory concerns and for making appropriate water resource decisions. Information on hydrologic conditions within the watershed as a whole was compiled to broadly indicate the "health" of the resource. These hydrologic conditions include water quality, hydrogeology, water demand, water quality, and status of aquatic habitat and fish stocks. Watershed data and information was obtained from the statewide geographic information system (GIS) which was supplied by Ecology, a limited review of literature for the geographic area, NOAA climatologic data bases, U.S. Geological Survey streamflow data (obtained from a Hydrosphere Inc. CD-ROM compilation), the STORET water quality data base for the state (obtained from EarthInfo, Inc. CD-ROM compilation), and a limited survey of organizations, tribes and local, state and federal agencies serving the watershed.

Comments:

Keywords: surface water, ground water

Primary Topics: Water Quality

Secondary Topics: Fish Stocks

Document Review - Seattle City Light Boundary Project

Document Number 167 **Review Date:** 7/5/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmenal

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** Yes

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Washington State Department of Ecology.

Year of Publication: 1995 **Geographic Area:** Pend Oreille River at Metaline Falls

Title: Water quality data, Metaline Falls Station No. 62A090.

Source: Water quality data. (Metaline Falls Station No. 62A090, 10/94-9/95). Washington State Department of Ecology, Olympia, WA. 1 p.

Abstract:

Review: Water Quality data for the Pend Oreille River at Metaline Falls (RM 27). Data collected from 10/11/94 to 9/6/95 at monthly intervals for a total of 12 samples. Parameters measured are as follows: temperature, discharge, conductivity, dissolved oxygen, pH, suspended solids, TPH, NH3+NH4 nitrogen, total phosphorous, soluble reactive phosphorous, turbidity, fecal coliform, NO2+NO3 nitrogen.

Comments:

Keywords: water quality data

Primary Topics: Water Quality

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 168 **Review Date:** 7/16/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Idaho Department of Health and Welfare.

Year of Publication: 1989 **Geographic Area:** Pend Oreille Lake, Clark Fork River

Title: Compilation of water quality study efforts on Pend Oreille Lake 1984-'88.

Source: Idaho Department of Health and Welfare, Division of Environmental Quality, Boise, ID. 42 p.

Abstract:

Review: This report is a compilation of the results of studies on Pend Oreille Lake and the Clark Fork River conducted by DEQ and others in cooperation with DEQ. Five open-water sites on Pend Oreille Lake were sampled from 1984 to 1987 during the summer. In Clark Fork River inflow into Pend Oreille Lake monitoring began in water year 1995. Algal growth potential bioassays were conducted in 1984 and 1985. Benthic algae production around the lakeshore was assessed using artificial substrates in 1986, 1987 and 1988. Phytoplankton present in samples collected in the summers of 1985 and 1986 was also conducted. Results of preceding studies suggest that Lake Pend Oreille is currently oligotrophic but is tending toward mesotrophy. Phosphorous appears to be the most limiting to primary productivity. Total recoverable cadmium in Clark Fork inflow was consistently above EPA chronic and acute toxicity criteria.

Comments:

Keywords: Pend Oreille Lake, water quality

Primary Topics: Water Quality

Secondary Topics: Productivity

Document Review - Seattle City Light Boundary Project

Document Number 169 **Review Date:** 7/16/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Idaho Department of Health and Welfare.

Year of Publication: 1989 **Geographic Area:** Pend Oreille Lake

Title: Compilation of Water Quality Study Efforts on Pend Oreille Lake 1984-'88: Bonner & Kootenai Counties, Idaho.

Source: Department of Health and Welfare, Division of Environmental Quality, Boise, ID.

Abstract:

Review: Appendices to report that compiles the results from studies on Pend Oreille Lake and the Clark River conducted by DEQ and other in cooperation with DEQ. Document contains 14 appendices with data from water quality, bioassay, periphyton, and phytoplankton studies referenced in the report.

Comments:

Keywords: water quality, periphyton, phytoplankton

Primary Topics: Water Quality

Secondary Topics: Algae

Document Review - Seattle City Light Boundary Project

Document Number 170 **Review Date:** 7/19/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Hoelshcer, B., J. Skille and G. Rothrock.

Year of Publication: 1993 **Geographic Area:** Pend Oreille Lake

Title: Phase 1 Diagnostic and feasibility analysis: A strategy for managing the water quality of Pend Oreille Lake.

Source: Idaho Department of Health and Welfare, Division of Environmental Quality. 14 p.

Abstract:

Review: Very general summary of water quality studies conducted by lead water quality agencies in Montana, Idaho, and Washington under EPA guidance. Presents management goals to address specific water quality issues identified in studies.

Comments:

Keywords: water quality, phytoplankton, macrophytes, algae

Primary Topics: Water Quality

Secondary Topics: Fisheries

Document Review - Seattle City Light Boundary Project

Document Number 171 **Review Date:** 7/19/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Geological Survey.

Year of Publication: 1975 **Geographic Area:** Pend Oreille River

Title: Water resources data for Washington, water year 1975.

Source: U.S. Geological Survey. 684 p.

Abstract:

Review: Water quality and discharge data for the Pend Oreille River at the international boundary. Discharge data for the Pend Oreille at Newport, below Box Canyon, Sullivan Lake, Outlet Creek, and at the international boundary.

Comments:

Keywords: water quality data, discharge

Primary Topics: Discharge

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 172 **Review Date:** 7/19/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Geological Survey.

Year of Publication: 1977 **Geographic Area:** Pend Oreille River

Title: Water resources data for Washington, water year 1977: Volume 2. Eastern Washington.

Source: U.S. Geological Survey. 419 p.

Abstract:

Review: Water quality and discharge data for the Pend Oreille River at the international boundary. Discharge data for the Pend Oreille at Newport, below Box Canyon, Sullivan Lake, Outlet Creek, and at the international boundary.

Comments:

Keywords: water quality data, discharge, flow volume

Primary Topics: Discharge

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 173 **Review Date:** 7/19/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Geological Survey.

Year of Publication: 1976 **Geographic Area:** Pend Oreille River

Title: Water resources data for Washington, water year 1976: Volume 2. Eastern Washington.

Source: U.S. Geological Survey. 344 p.

Abstract:

Review: Water quality and discharge data for the Pend Oreille River at the international boundary. Discharge data for the Pend Oreille at Newport, below Box Canyon, Sullivan Lake, Outlet Creek, and at the international boundary.

Comments:

Keywords: water quality data, discharge, hydrology

Primary Topics: Discharge

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 174 **Review Date:** 7/19/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): U.S. Geological Survey.

Year of Publication: 1978 **Geographic Area:** Pend Oreille River

Title: Water resources data for Washington, water year 1978: Volume 2. Eastern Washington.

Source: U.S. Geological Survey. 360 p.

Abstract:

Review: Water quality and discharge data for the Pend Oreille River at the international boundary. Discharge data for the Pend Oreille at Newport, below Box Canyon, Sullivan Lake, Outlet Creek, and at the international boundary.

Comments:

Keywords: water quality, discharge

Primary Topics: Discharge

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 11 **Review Date:** 7/22/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Kann, J., and C. M. Falter.

Year of Publication: 1989 **Geographic Area:** Pend Oreille Lake

Title: Periphyton as indicators of Enrichment in Lake Pend Oreille, Idaho.

Source: Lake and Reservoir Management. 5(2). pp. 39-48.

Abstract: Periphyton in the littoral zone of Pend Oreille Lake, a large (383 km2, deep (Zmax - 380 m)) meso-oligotrophic lake in northern Idaho, were studied to compare with pelagic productivity and to identify areas of inshore degraded water quality. Periphyton growth was determined on artificial tiles and natural substrates at 0.5 and 1.5 m depths. Means for all measures of production on natural substrates were higher than means for artificial substrate. Indicators of biomass were higher on 0.5 m tiles than those at 1.5 m; exposed sites, however, showed less differences between depths than did the more sheltered sites. Because of inorganic interference, ash-free dry weight provided a better measure of periphyton biomass than dry weight. Significant differences existed between sites, indicating greater algal growths in developed and relatively confined bays. Cymbella was dominant on natural substrate, while Cymbella, Mougeotia, and Rhizoclonium were co-dominant on artificial substrate. Blue-green algae biomass comprised only a small part of the total biomass on either artificial or natural substrates. Periphyton biomass in Pend Oreille Lake was comparable to other lakes showing accelerated eutrophication. Despite Pend Oreille Lake's great depth and large profundal area, littoral productivity was similar to lakes more shallow in nature with higher overall productivity. In-shore water quality degradation was documented at a time when open-lake conditions indicated the lake was meso-oligotrophic. Given that changes in lake trophic status would first show up in littoral areas - compared to the relatively slow changes taking place in the phytoplankton of pelagic areas - periphyton monitoring should provide valuable refinement to in-depth limnological studies on open waters of lakes.

Review: Article presents findings from a study designed to assess the effectiveness of periphyton as indicators of productivity on Lake Pend Oreille.

Comments:

Keywords: periphyton, biomonitoring, productivity

Primary Topics: Periphyton

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 175 **Review Date:** 7/22/96

Reviewer's Name: John Lenth **Reviewer's Organization:** Herrera Environmental

Reviewer's Discipline: Water Quality **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Gibbons, H. L., and M. V. Gibbons.

Year of Publication: 1988 **Geographic Area:** Pend Oreille River

Title: Efficacy of rotovation in controlling eurasian water milfoil in the Pend Oreille River, Washington.

Source: In: Lake and Reservoir Management. North American Management Society v4:1. Washington, D.C. p. 153-160.

Abstract: Full-scale mechanical rotovation of Eurasian water milfoil (Myriophyllum spicatum) beds was conducted at selected sites along the Pend Oreille River in eastern Washington during the fall of 1986. Fifteen hectares (36 acres) of milfoil-infested river sediments were mechanically tilled to dislodge rootcrowns from the substrate. Treatment was performed by a prototype float-mounted rotovator equipped with a 2.5 m (8-foot) wide pivoting rototiller head. Treatment effectiveness was quantitatively assessed by comparing changes in stem density of M. spicatum in the plot area before and after rotovation. Milfoil stem density reductions of 63 to 90 percent were observed in the rotovated area immediately after treatment. Carryover stem density reduction of 25 to 70 percent measured in the growth season following the 1986 rotovation treatment suggested that control of M. spicatum growth for greater than the season of treatment is possible. Efficiency of milfoil root removal by rotovation was dependent on substrate type, operator skill, and adequately powered machinery. Rotovation appears to be a most promising control technology capable of achieving high rates of milfoil root removal and maintaining long-term reductions in plant growth.

Review: Review of the effectiveness of rotovation in controlling eurasian water milfoil on the Pend Oreille River.

Comments:

Keywords: rotovation, eurasian water milfoil

Primary Topics: Rotovation

Secondary Topics: Water Quality

Document Review - Seattle City Light Boundary Project

Document Number 176 **Review Date:** 7/11/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Site Form

Author(s): Matson, D.

Year of Publication: 1986 **Geographic Area:** Metaline Falls

Title: Russian Creek Mining Cabin Site Form.

Source: Colville National Forest. 6 p.

Abstract: Site Form describing Mining activity at turn of century.

Review: Provides minimal information.

Comments: This form is minimal.

Keywords: Mines, Archaeology,

Primary Topics: Historic Site

Secondary Topics: Mining

Document Review - Seattle City Light Boundary Project

Document Number 177 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Colville National Forest

Year of Publication: 1980 (ca. **Geographic Area:** Boundary Dam-BD

Title: Mining Cabin 45PO81H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 3 p.

Abstract: Gold was discovered in the Pend Oreille area in 1859 marking the beginning of mining in the project area. The gold deposits were depleted by 1880 and mining lead and zinc became the primary activity. This site consists of the remnants of a cabin, tunnel, and associated debris. The site was recorded during a cultural resource survey for a timber sale.

Review: Site form provides locational information and indicates types of historic archaeological resources expected in the area.

Comments: Adequate map of site attached and description of archaeological material. A citation to Park and Cannon (1937) indicates further documentation.

Keywords: Mining Cabin; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Cabins; Mining

Document Review - Seattle City Light Boundary Project

Document Number 178 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Barker, L.

Year of Publication: 1980 **Geographic Area:** Boundary Dam-BD

Title: Crescent Mining Cabin II 45PO82H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 6 p.

Abstract: This mining cabin is near Boundary Dam and appears to have been associated with metals mining in the 1920s. It is a two room structure of log construction. The site was recorded during a cultural resource survey for a timber sale.

Review: Site form provides locational information and indicates types of historic archaeological resources expected in the area. Also states that some of the claims associated with this structure were flooded by construction of the Boundary Dam and Reservoir.

Comments: Map, evaluation of significance by SHPO, and description attached. The Forest Service archaeologist concluded that the site met none of the criteria for eligibility to the National Register of Historic Places and the State Historic Preservation Officer concurred. Citation to 1926 Mining Plat indicates further documentation available.

Keywords: Crescent Cabin; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Structure

Secondary Topics: Cabins, mining

Document Review - Seattle City Light Boundary Project

Document Number 179 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1979 **Geographic Area:** Timber Hill-BD

Title: 45PO83H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 6 p.

Abstract: This form describes a mining cabin of frame construction covered with boards. The site was recorded during a cultural resource survey for a timber sale.

Review: The form is informative and thorough in its description and location of the site.

Comments: The form provides a map, evaluation of significance, and construction information. A citation to Dings and Whitehead associates the structure with a mining company known as Scandinavian, Inc. The Forest Service archaeologist concluded that the site met none of the criteria for eligibility to the National Register of Historic Places and the State Historic Preservation Officer concurred.

Keywords: Mining Cabin 83H; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site

Secondary Topics: Cabins; Mining

Document Review - Seattle City Light Boundary Project

Document Number 180 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Colville National Forest

Year of Publication: 1980 **Geographic Area:** Cresent Lake-BD

Title: Cresent Mining Tunnel 45PO84H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 3 p.

Abstract: The site, recorded during a cultural resource survey for a timber sale, consists of a mining tunnel and a machine shop.

Review: The document suggests that this was the remnants of lead and zinc mining operation and provides a partial ownership history. A description of construction materials and techniques is also provided.

Comments: The site form has a map and evaluation of eligibility form. The Forest Service archaeologist concluded that the site met none of the criteria for eligibility to the National Register of Historic Places and the State Historic Preservation Officer concurred.

Keywords: Cresent Tunnel; Historic Archaeology; Survey; Eval

Primary Topics: Historic Site

Secondary Topics: Mining, tunnel

Document Review - Seattle City Light Boundary Project

Document Number 181 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Colville National Forest

Year of Publication: 1980 **Geographic Area:** Lime Creek-BD

Title: Lime Creek Cabin 45PO85H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 3 p.

Abstract: A one story, one room, chinked log construction cabin with outbuilding remnants and outhouse. Probably recorded during cultural resource survey for timber sale.

Review: Demonstrates intensity of mining activity in this part of the project area.

Comments: Form only provides physical description. No mention of historic background or ownership. Evaluation sheet attached. The Forest Service archaeologist concluded that the site met none of the criteria for eligibility to the National Register of Historic Places and the State Historic Preservation Officer concurred.

Keywords: Lime Creek Cabin; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Cabins; Outhouses; Mining

Document Review - Seattle City Light Boundary Project

Document Number 182 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1979 **Geographic Area:** Slate Creek-BD

Title: Boundary Cabin 45PO86H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Document records and maps remnants of a cabin, outbuilding, and outhouse. Apparently recorded during a cultural resource survey for a timber sale.

Review: Minimal physical description and maps provided.

Comments: Document provides no historical background. Evaluation sheet attached. The Forest Service archaeologist concluded that the site met none of the criteria for eligibility to the National Register of Historic Places and the State Historic Preservation Officer concurred.

Keywords: Boundary Cabin; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Cabins; Outhouses; Mining

Document Review - Seattle City Light Boundary Project

Document Number 183 **Review Date:** 7/12/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Colville National Forest

Year of Publication: 1980 (ca. **Geographic Area:** Slate Creek-BD

Title: Lucky Strike 45PO87H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 2 p.

Abstract: This site was recorded during a cultural resource survey for a timber sale. It consists of 2 cabins, one of log construction and the other of frame construction. Three outbuildings include a woodshed, storage shed, and an unidentified outbuilding.

Review: Form provides minimal information about construction. A map is attached that shows location, geological features, and mining features such as faults. The geologic information is obtained from Dings et al. which refers to the site as "Buzzell Lucky Strike". This appears to be an excerpt from a mining study.

Comments: The site form gives basic data and has an interesting map. An evaluation sheet is attached. The Forest Service archaeologist concluded that the site met none of the criteria for eligibility to the National Register of Historic Places and the State Historic Preservation Officer concurred.

Keywords: Lucky Strike; Structures; Survey

Primary Topics: Historic Site

Secondary Topics: Mining, Cabins, Outhouses

Document Review - Seattle City Light Boundary Project

Document Number 184 **Review Date:** 7/15/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1979 **Geographic Area:** Sullivan Lake-MF

Title: Sullivan Creek Bridge 45PO103H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 1 p.

Abstract: The Sullivan Creek Bridge was recorded during a cultural resources survey for new dam construction according to the site form. The bridge was built in 1935 by the Civilian Conservation Corps (CCC) and no longer exists (Thompson 1994:17). According to Terrill (1979) the site met the criteria of significance for inclusion on the National Register of Historic Places and a recommendation was made for formal eligibility determination. The Forest Service archaeologist, Delbert Gilbow, was directed to initiate the eligibility determination process. A record of his conclusions has not been found.

Review: The site form provides information about construction and dimensions of the bridge. There is no map or other supporting documentation.

Comments: The original section number assigned by the field archaeologist was incorrect.

Keywords: Sullivan Creek Bridge; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Bridges; CCC

Document Review - Seattle City Light Boundary Project

Document Number 185 **Review Date:** 7/15/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1979 **Geographic Area:** Sullivan Creek-MF

Title: Diamond Mill Site 45PO104H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest.

Abstract: The Diamond Match Mill was a lumber mill constructed in 1946. The mill was closed in 1959 and the buildings and facility structures were removed (Thompson 1994:18). Remnants of the mill include a former log pond, now a depression, that was created through damming of Sullivan Creek, remnants of the log pond dam, a concrete boiler pad, and cement blocks.

Review: Site form provides minimal information concerning the Diamond Match Mill Site, as it is referred to in Thompson (1988:18). The site was determined not eligible for nomination to the NRHP because it lacks integrity according to Thomspon (1988:18).

Comments: Brief site form supplemented by the Thompson (1988) report.

Keywords: Diamond Mill Site

Primary Topics: Historic Site

Secondary Topics: Lumber Mill

Document Review - Seattle City Light Boundary Project

Document Number 186 **Review Date:** 7/15/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1979 **Geographic Area:** Sullivan Lake-MF

Title: Sullivan Lake Dam 45PO102H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 2 p.

Abstract: Site form describes the dimensions and construction details of Sullivan Lake Dam owned by the Pend Oreille County Public Utility District and built in 1921. It replaced the original log-crib and earthen dam built in 1910 by Inland (Lehigh) Portland Cement Company to supply power to their plant at Metaline Falls (Thoms 1987:27). The dam was built to regulate the level of Lake Sullivan and also to provide hydroelectric power. It is a concrete dam with wooden gates and two spillways. Lake Sullivan is a natural lake.

Review: Site form provides data concerning dam condition, construction, and use. Additional detailed information available in other documents. Although site is four miles from Metaline Falls and Pend Oreille River its construction had impact on project area because of its importance to the cement industry.

Comments: No information provided concerning eligibility.

Keywords: Sullivan Lake Dam; Structures; Inventory

Primary Topics: Historic Structure

Secondary Topics: Dam, hydroelectricity

Document Review - Seattle City Light Boundary Project

Document Number 187 **Review Date:** 7/15/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1980 **Geographic Area:** Box Canyon-M

Title: Mid-Mountain Housepits 45PO99 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 2 p.

Abstract: Site form describes a group of eleven circular cultural depressions with no associated artifacts. Depressions were identified during a survey for the Mid-Mountain Land Exchange.

Review: Site form provides dimensions of depressions, environmental features, and site map. DeLeon (1988) reexamined the eleven housepits for the Arden Lake Land Exchange and determined that the depressions were probably a result of mineral prospecting activity.

Comments: The DeLeon (1988) letter report is not attached to the site form.

Keywords: Mid-Mountain Housepit; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Mining; Housepits

Document Review - Seattle City Light Boundary Project

Document Number 188 **Review Date:** 7/15/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1980 **Geographic Area:** Box Canyon-M

Title: Solitary Housepit 45PO98 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site form describes one cultural depression, recorded as a housepit, with no associated artifacts. This survey was conducted to determine the presence of cultural resources in lands being considered for trade for the Mid-Mountain Land Exchange. It was recommended that the portion of land containing the site be excluded from the exchange.

Review: Form gives dimensions and location information. A letter report (DeLeon 1988) is attached describing a reexamination of 45PO99, a site with eleven housepits adjacent to 45PO98, concluding that it was not of hunter-gatherer origin. 45PO98, the individual housepit, was not reexamined but was considered to be of similar origin as 45PO99. DeLeon (1988) considered the housepits to be the result of mineral prospecting activity.

Comments: The site form, produced during a survey by Jill Strelnik and Delbert Gilbow in 1979 and 1980, gives minimal information. The letter report is more informative.

Keywords: Housepit; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Mining; Housepits

Document Review - Seattle City Light Boundary Project

Document Number 189 **Review Date:** 7/15/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Strelnik, J.

Year of Publication: 1979 **Geographic Area:** Sullivan Creek-MF

Title: White Warehouse Foundation 45PO105H USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 2 p.

Abstract: The White Warehouse was moved from the Tiger Civilian Conservation Corps (CCC) Camp to this location at an undetermined time. The site was used by the Forest Service for storage until 1961 when it was sold and moved away. Seven cement blocks remain from the original structure.

Review: The White Warehouse has been determined not eligible for nomination to the National Register of Historic Places (Thompson 1988).

Comments: Site form provides information regarding site dimensions and brief history. More information in Thompson (1988:18).

Keywords: White Warehouse; Historic Archaeology; Evaluation

Primary Topics: Historic site

Secondary Topics: CCC

Document Review - Seattle City Light Boundary Project

Document Number 190 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Gronski, A.

Year of Publication: 1985 **Geographic Area:** Sullivan Lake-MF

Title: Sullivan Lake Archaeological Site 45PO148 Washington Archaeological Site Inventory Form.

Source: Colville National Forest 13 p.

Abstract: The Sullivan Lake Archaeological Site was identified during a survey conducted by the Center for Northwest Anthropology in 1985 (Thoms and Burtchard 1985). The survey was conducted for a USFS boat ramp project. The site material consisted primarily of fire-cracked rocks, a basalt biface, and a petrified wood flake discovered on the surface.

Review: The site was preliminarily identified as a possible hunting camp and recommendations were made to formally assess its eligibility to the National Register of Historic Places (NRHP). The site was tested to assess impacts of a boat ramp construction project proposed by the USFS (Thoms 1987). The site was later determined eligible for inclusion on the NRHP.

Comments: Two site forms are included in the site file, the Washington Archaeological Site Inventory (Gronski 1985) and the USFS Cultural Resource Inventory Record Form (Thoms and Burtchard 1985). The former site form appears to have been submitted to obtain a site number.

Keywords: Sullivan Lake Archaeological Site; Survey; Evaluation

Primary Topics: Hunter-Gatherer Site

Secondary Topics: Hunting camp

Document Review - Seattle City Light Boundary Project

Document Number 191 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Higginbotham, F.

Year of Publication: **Geographic Area:** Russian Ridge-AM

Title: Mine Drilling Tower-Russian Creek CNF-135 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 7 p.

Abstract: This site recorded during the Russian Ridge Timber Sale. A 35 foot mine drilling tower, an apparent log flume and a log bridge were observed during the survey.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: Site form is thorough in description and documentation

Keywords: Mine Drilling Tower; Historic Structures; Survey; Evaluation

Primary Topics: Historic Structures

Secondary Topics: Mining, tower, flume

Document Review - Seattle City Light Boundary Project

Document Number 192 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J.

Year of Publication: 1986 **Geographic Area:** Cedar Creek-M

Title: McInnis Homestead CNF-482 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site recorded during Top of Cement Timber Sale survey. Site consists of a homesteader's cabin and a depression with associated metal roof remnants. Both structures have been almost completely destroyed. Appears to have been used until the 1930s based upon a 1935 photo of the area. Acquired by the USFS in 1938.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: Hand drawn map is attached.

Keywords: McInnis Homestead; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site

Secondary Topics: Cabins, Homesteads

Document Review - Seattle City Light Boundary Project

Document Number 193 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J.

Year of Publication: 1986 **Geographic Area:** Cedar Creek-M

Title: McInnis's Neighbor CNF-481 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 8 p.

Abstract: Site recorded during Top of Cement Timber Sale survey. Site consists of a collapsed notched log cabin, a crib enclosure, and a possible footbridge. It is assumed to be related to homestead activity.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: Detailed comments on cabin dimensions. Hand drawn map and photographs attached.

Keywords: McInnis's Neighbor Homestead; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site

Secondary Topics: Settlement; Homestead

Document Review - Seattle City Light Boundary Project

Document Number 194 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J.

Year of Publication: 1986 **Geographic Area:** Cedar Creek-M

Title: Siegel Homestead CNF-480 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 6 p.

Abstract: Site recorded during Top of Cement Timber Sale survey. Consists of remnants of a collapsed cabin and a depression. Site was inhabited in 1920-1938 based on homestead and subsequent sale to the federal government in 1938.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: A hand drawn map and photographs are attached to the site form.

Keywords: Siegel Homestead; Survey; Historic Archaeology; Evaluation

Primary Topics: Historic Site

Secondary Topics: Settlement; Cabins; Homestead

Document Review - Seattle City Light Boundary Project

Document Number 195 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Strelnik, J.

Year of Publication: 1987 **Geographic Area:** Cedar Creek-M

Title: Etta Cleary Homestead CNF-465 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 9 p.

Abstract: Site was identified during a survey for the Cedar Creek Cattle Guard Project. The site consists of two collapsed buildings, possibly two rooms of the same structure, with a cistern and an apple orchard.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: A hand drawn map and photographs are attached to the site form.

Keywords: Etta Cleary Homestead; Historic Archaeology; Survey, Evaluation

Primary Topics: Historic Site

Secondary Topics: Settlement; Homesteads

Document Review - Seattle City Light Boundary Project

Document Number 196 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Strelnik, J.

Year of Publication: 1982 **Geographic Area:** Sand Creek Mountain-MF

Title: Sand Creek Lookout CNF-150 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site recorded during survey for Upper Pocahantas Timber Sale. Site consists of a collapsed fire lookout structure with cement footings, boards, telephone wire, wash basin, and a bucket.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: A hand drawn map is attached to the site form.

Keywords: Sand Creek Lookout; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site

Secondary Topics: Fire lookouts

Document Review - Seattle City Light Boundary Project

Document Number 197 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Higginbotham, F.

Year of Publication: 1982 **Geographic Area:** Russian Ridge-AM

Title: Mining Cabin-Russian Creek CNF-137 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: This site recorded during the Russian Ridge Timber Sale. Remnants of a probable mining cabin, a steel plate and other historic refuse, apparently burned in a 1934 forest fire. A log bridge was also observed upstream from the former cabin site.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on to the National Register of Historic Places.

Comments: Site form includes hand-drawn map attached to the site form.

Keywords: Mining Cabin-Russian Creek; Historic Structures; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site; Structures

Secondary Topics: Cabins, Bridges

Document Review - Seattle City Light Boundary Project

Document Number 198 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Higginbotham, F.

Year of Publication: 1982 **Geographic Area:** Russian Ridge-AM

Title: Russian Creek Mining Camp CNF-136 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: This site recorded during the Russian Ridge Timber Sale. Two collapsed structures, an outhouse, refuse pile, and wood stove were identified. The site was either a mining or logging camp.

Review: An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: Parts of the site appear to have been so badly decayed that the site recorder could not identify construction techniques.

Keywords: Russian Creek Mining Camp

Primary Topics: Historic Site

Secondary Topics: Outhouses, Refuse, Mining, Logging

Document Review - Seattle City Light Boundary Project

Document Number 199 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Miss, C.

Year of Publication: 1981 **Geographic Area:** Pend Oreille River-BD

Title: Cabin 45PO121H Washington Archaeological Resource Center Master Site File.

Source: Bureau of Land Management, Spokane District. 3 p.

Abstract: The cabin site was recorded during a cultural resource survey during the Ledbetter Lake timber sale. The structure is of saddle notched construction with interior and exterior chinking and a cedar shake roof.

Review: Site form provides site location information and dimensions of cabin. No historical information on origin of cabin provided, presumably mining related.

Comments: Site form provides minimal information

Keywords: Cabin; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Cabins; Mining

Document Review - Seattle City Light Boundary Project

Document Number 200 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Holstine, C.

Year of Publication: 1983 **Geographic Area:** Lead King Hills-BD

Title: Lead King Mine 45PO131H Washington Archaeological Site Inventory Form.

Source: Archaeological and Historical Services. 4 p.

Abstract: 45PO131H consists of remnants of a burned structure, tow mining tunnels, mine tailings piles, tramway tracks and prospectors' holes. The site is estimated to date to approximately 1904.

Review: Site form provides locational map and brief site description.

Comments: Site form provides minimal historical background.

Keywords: Lead King Mine; Historic Archaeology; Inventory

Primary Topics: Historic Site

Secondary Topics: Tunnels; Mining

Document Review - Seattle City Light Boundary Project

Document Number 201 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Soderberg, L.

Year of Publication: 1979 **Geographic Area:** Box Canyon-M

Title: Idaho and Washington Northern Railroad 45PO132H Office of Archaeology and Historic Preservation Archaeological Site Form.

Source: Office of Archaeology and Historic Preservation. 2 p.

Abstract: The Idaho and Washington Northern Railroad bridge was built in 1911 to connect Ione and Metaline Falls.

Review: Location data is only information provided. Document refers reader to nomination form for the Idaho and Washington Northern Railroad Bridge. The Idaho and Washington Northern Railroad Bridge was listed on the National Register of Historic Places in 1982.

Comments: Site form appears to have been submitted to obtain site number.

Keywords: Bridges; Historic Structures; Inventory; Evaluation

Primary Topics: Historic Structure

Secondary Topics: Bridges, Railroads

Document Review - Seattle City Light Boundary Project

Document Number 202 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Nomination Form

Author(s): Vandermeer, J.H.

Year of Publication: 1978 **Geographic Area:** Metaline Falls-MF

Title: Lewis P. Larson House 45PO126H National Register of Historic Places--Nomination Form.

Source: Office of Archaeology and Historic Preservation. 16 p.

Abstract: Structure is the home of Lewis P. Larson, a Danish immigrant, who is known as the founder of Metaline Falls. Larson was had a background in metallurgy and was impressed with the potential of the Metaline Falls area to provide valuable minerals, especially lead and zinc. He promoted Metaline Falls effectively by convincing the Idaho and Washington Railroad to extend a line north to the settlement, founding the Pend Oreille Mines and Metals Company, and persuading the Inland Portland Cement Company to build a plant in town. He also started the Metaline Falls Light and Water Company to provide water and electric utility service to the settlement, founded the Larson Realty Company that later platted the townsite, and built the Washington Hotel. In 1910, Larson chose Kirtland Kelsey Cutter, a well-known Eastern Washington architect, to design his home. After Spokane's 1889 fire, Cutter's architectural expertise was in demand, and he was given the opportunity to design some of Spokane's finer residences. He also design several commercial buildings, including the Davenport Hotel and Seattle's Rainier Club. The house is reminiscent of English cottage architecture. The foundation is notable in its use of river washed stones joined with mortar.

Review: The Lewis P. Larson House was placed on the National Register of Historic Places in on March 9, 1979.

Comments: Nomination form has photographs of the house interior and exterior.

Keywords: Lewis Larson, Historic Structure

Primary Topics: Historic Structure, Larson House, Metaline Falls

Secondary Topics: Historic Architecture, Mining

Document Review - Seattle City Light Boundary Project

Document Number 203 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Vandermeer, J.H.

Year of Publication: 1978 **Geographic Area:** Metaline Falls-MF

Title: Lewis P. Larson House 45PO16H Washington Archaeological Resource Center Master Site File.

Source: Pend Oreille County Historical Society. 2 p.

Abstract: The Larson House is the former home of Lewis P. Larson, founder of Metaline Falls, who introduced the mining, cement, hydroelectric and railroad industries to the area.

Review: Location data is only information provided. Document refers reader to nomination form for the Larson House. The Larson House was listed on the National Register of Historic Places in 1979.

Comments: Site appears to have been recorded to obtain site number.

Keywords: Larson House

Primary Topics: Historic Structure

Secondary Topics: Residence

Document Review - Seattle City Light Boundary Project

Document Number 204 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Vandermeer, J.H.

Year of Publication: 1978 **Geographic Area:** Metaline Falls-MF

Title: Washington Hotel 45PO125H Washington Archaeological Resource Center Master Site File.

Source: Office of Archaeology and Historic Preservation. 2 p.

Abstract: The Washington Hotel was built in 1906 in Metaline Falls during a period of economic growth from its emergence as a mining and cement production center. The development of the Sullivan Creek Hydroelectric project and the extension of the Idaho and Washington Northern Railroad provided Metaline Falls with the electric power and transportation connection necessary for its industrial growth.

Review: Location data is only information provided. Document refers reader to nomination form for the Washington Hotel. The Washington Hotel was listed on the National Register of Historic Places in 1979.

Comments: Site appears to have been recorded to obtain site number.

Keywords: Washington Hotel; Historic Structures; Inventory; Evaluation

Primary Topics: Historic Structure

Secondary Topics: Settlement; Hotels; Towns

Document Review - Seattle City Light Boundary Project

Document Number 205 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Libra, J.

Year of Publication: 1971 (ca. **Geographic Area:** Metaline-M

Title: Metaline 45PO124H Washington Archaeological Resource Center Master Site File.

Source: Pend Oreille County Historical Society. 2 p.

Abstract: Document records the town of Metaline on the Pend Oreille River.

Review: Location data is only information provided. Document refers reader to nomination form for Metaline. Metaline is not listed on the National Register of Historic Places.

Comments: Site form appears to have been produced to obtain site number.

Keywords: Metaline; Historic Structures; Inventory

Primary Topics: Historic District

Secondary Topics: Settlement; Towns

Document Review - Seattle City Light Boundary Project

Document Number 206 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Miss, C.

Year of Publication: 1981 **Geographic Area:** Pend Oreille River-BD

Title: River Landing 45PO122H Washington Archaeological Resource Center Master Site File.

Source: Bureau of Land Management, Spokane District. 3 p.

Abstract: The historic river landing was recorded during a cultural resource survey for the Ledbetter Lake timber sale. The landing consists of several logs, metal cable, and wooden beams. The form suggests that the site may have been in use prior to 1910, before roads were built to the area.

Review: The site form provides information on site location with a map detailing a leveled area surrounding the landing.

Comments: Document suggests that further historical research is necessary to determine function.

Keywords: River Landing; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Landings; River Transportation

Document Review - Seattle City Light Boundary Project

Document Number 207 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** OAHP Site Form

Author(s): Knokey, J.

Year of Publication: 1988 **Geographic Area:** Lead King Hills-BD

Title: Historic Cabin, Mining Adit, and Tailings Pile 45PO199H Washington Archaeological Site Inventory Form.

Source: Bureau of Land Management. 5 p.

Abstract: The cabin walls were of logs with planked chinking and a cedar shake, gabled roof before it collapsed. The adit (tunnel) was not inspected thoroughly because of safety hazards. The tailings pile was measured.

Review: The site form provides a detailed description of the historic cabin's construction. Historic refuse was also identified.

Comments: The site form is useful in determining the types of historic sites in the project area vicinity.

Keywords: Historic Cabin, Mining Adit and Tailings Pile; Historic Site; Inventory

Primary Topics: Historic Site

Secondary Topics: Cabins; Tunnels; Mining

Document Review - Seattle City Light Boundary Project

Document Number 208 **Review Date:** 7/16/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Higginbotham, F.

Year of Publication: 1982 **Geographic Area:** Russian Ridge-AM

Title: Frisco Standard Cabin No. 1 CNF-134 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 6 p.

Abstract: This site was recorded during the Russian Ridge Timber Sale. Three logs were observed that were probable remnants of a cabin shown in 1934 aerial photos. The cabin was probably disturbed during road construction.

Review: Cabin is assumed to be related to mining activity. A map of the entire Russian Ridge Timber Sale is attached. An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: 1934 aerial photographs are not cited.

Keywords: Frisco Standard Cabin; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site

Secondary Topics: Cabins; Mining

Document Review - Seattle City Light Boundary Project

Document Number 209 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 (ca. **Geographic Area:** Lost Lake Creek-M

Title: Marie Reton Homestead CNF-705 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: This site was discovered during a survey for the Lower Cedar Timber Sale. It consists of a leveled area that formerly had a structure present in a 1935 aerial photo. Two pieces of historic refuse, a shred of broken china and a bucket and bail were associated with the leveled area.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: A sketch map indicates the site layout.

Keywords: Marie Reton Homestead; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement; Homesteads

Document Review - Seattle City Light Boundary Project

Document Number 210 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Miller, P. and J. Ogmundson

Year of Publication: 1991 **Geographic Area:** Box Canyon-M

Title: Box Canyon Mine Site CNF-808 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site observed during Exposure/Snyder Timber Sale. The site consists of eight features: a pit of unknown origin; a root cellar; a partial log structure: an earthen mound that was a probable front porch area; an outhouse and two apple trees; two ditches probably excavated as part of mining activity; and a mining pit.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: Sketch map of site layout attached.

Keywords: Box Canyon Mine; Historic Archaeology; Inventory

Primary Topics: Historic Site

Secondary Topics: Mining

Document Review - Seattle City Light Boundary Project

Document Number 211 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J. and J. Ogmundson

Year of Publication: 1990 **Geographic Area:** Jim Creek-M

Title: Mr. Blazers Place CNF-711 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: This site was identified during a survey for the Lower Cedar Timber Sale. Site consists of a square depression, probably from a former structure, with associated artifacts. Artifacts include stove remnants, a metal spoon, knife, spoon, and bucket. Material shows effects of the 1926 fire.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: Sketch map of site layout attached.

Keywords: Mr. Blazers Place; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement; Refuse; Foundations

Document Review - Seattle City Light Boundary Project

Document Number 212 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** a

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 **Geographic Area:** Jim Creek-M

Title: Mr. McKinnons House CNF-710 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: This site was identified during a survey for the Lower Cedar Timber Sale. The site consists of a leveled area with associated artifacts, including stove parts, a teapot, and a lard can. There were no structural remnants. Artifacts showed effects of a fire, probably the forest fire of 1926.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: A hand-drawn map gives overview of site layout.

Keywords: McKinnon's House; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement; Refuse

Document Review - Seattle City Light Boundary Project

Document Number 213 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 **Geographic Area:** Cedar Creek-M

Title: Cedar Creek Bridge CNF-709 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: This site was identified during the Lower Cedar Timber Sale. The bridge has been mostly destroyed by flooding and a portion remains. The remaining end consists of logs with notched supports and planked decking. It formerly crossed Cedar Creek and was part of a road system serving the group of homesteads.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: More information about the homesteads as a group is not presented.

Keywords: Cedar Creek Bridge; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement; Bridges

Document Review - Seattle City Light Boundary Project

Document Number 214 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 **Geographic Area:** Jim Creek-M

Title: Fred Carlson Homestead CNF-708 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: The site was recorded during the survey of the Lower Cedar Timber Sale. No structures are remaining on the site. Three features, a group of rotted beams that may have been a foundation; a historic dump; and two earthen mounds were identified.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: A hand-drawn map gives overview of site layout.

Keywords: Fred Carlson Homestead; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement Homesteads; Foundations

Document Review - Seattle City Light Boundary Project

Document Number 215 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 **Geographic Area:** Lost Lake Creek-M

Title: Edwin Wise Homestead CNF-706 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: The site was recorded during a survey for the Lower Cedar Timber Sale. There are no structures remaining on this site, but there are four features; two depressions from probable structures; a probable concrete house floor; and a dump with associated retaining walls. All four features had associated historic refuse of a domestic nature, such as bed springs and stove parts.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: Sketch map shows an overview of the features.

Keywords: Edwin Wise Homestead; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement; Homestead

Document Review - Seattle City Light Boundary Project

Document Number 216 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 **Geographic Area:** Sullivan Creek-MF

Title: Sullivan Creek Dump CNF-666 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site was recorded during a survey for the Threemile Timber Sale. Material observed included historic refuse, such as food containers and machinery parts, that indicate logging activity and a possible logging camp. The area dates from around the 1920s.

Review: Site form includes sketch of site materials in situ and individual artifacts. An attached evaluation summary sheet documents the determination that the site does not meet the criteria necessary for listing on the National Register of Historic Places.

Comments: None.

Keywords: Sullivan Creek Dump; Historic Archaeology; Survey; Evaluation

Primary Topics: Historic Site

Secondary Topics: Dumps, Logging, Mining

Document Review - Seattle City Light Boundary Project

Document Number 217 **Review Date:** 7/18/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): White, J.

Year of Publication: 1990 **Geographic Area:** Cedar Creek-M

Title: John McBrides Place CNF-707 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: The site was identified during a survey for the Lower Cedar Timber Sale. The site consists of a house foundation, a leveled clearing, fruit trees, and automobile parts dating from the 1920s and 1930s.

Review: An attached evaluation sheet states that there will be no effect on the site because it will be avoided. The site was therefore not evaluated for significance to the NRHP.

Comments: A hand-drawn map gives overview of site layout.

Keywords: John McBride Place; Historic Archaeology; Survey

Primary Topics: Historic Site

Secondary Topics: Settlement; Foundations; Clearings

Document Review - Seattle City Light Boundary Project

Document Number 218 **Review Date:** 7/19/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J.

Year of Publication: 1989 **Geographic Area:** Crescent Lake-BD

Title: Outhouse 5201-2 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Structure observed during the Timber Mite Timber Sale. The one-holer outhouse is made from rough-cut lumber with a gabled roof. Wooden box is attached to interior rear wall.

Review: The attached evaluation sheet states the site will not be affected because it will be protected through appropriate mitigation following evaluation actions.

Comments: Specific dimensions are provided, including helpful information on size of hole. Photos of structure are attached.

Keywords: Outhouse, Historic Archaeology, Survey, Evaluation

Primary Topics: Historic site

Secondary Topics: Outhouse

Document Review - Seattle City Light Boundary Project

Document Number 219 **Review Date:** 7/19/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J.

Year of Publication: 1990 (ca. **Geographic Area:** Lime Creek-BD

Title: Chinaman's Ditch 5101-1 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 7 p.

Abstract: Site was observed during a survey for the Timber Mite Timber Sale. The site consists of a linear combination of ditches and flume segments measuring approximately 4000 feet and a lean-to. The site dates from an occupation by Chinese miners from Canada in the 1870s.

Review: The attached evaluation sheet states the site will not be affected because it will be protected through appropriate mitigation following evaluation actions.

Comments: Site form has hand drawn sketch of the lean-to. Supplemental historic information is provided on Chinese occupation.

Keywords: Chinaman's Ditch, Historic Archaeology, Survey, Evaluation

Primary Topics: Historic Site

Secondary Topics: Chinese, flume, Mining

Document Review - Seattle City Light Boundary Project

Document Number 220 **Review Date:** 7/20/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): P.U.D. No. 1 of Pend Oreille County

Year of Publication: 1959 **Geographic Area:** Pend Oreille County

Title: The Pend Oreille Story.

Source: P.U.D. No. 1 of Pend Oreille County. 15 p.

Abstract: A description of the existing and future natural resources of Pend Oreille County.

Review: Mentions a small dam at Metaline Falls owned by the Pend Oreille Metals Company.

Comments: Good description of conditions in 1959. On file at Special Collections, University of Washington.

Agency, continued: Newport, WA

Keywords: Metaline Falls, Dams, County History

Primary Topics: Dams

Secondary Topics: Box Canyon, Metaline Falls

Document Review - Seattle City Light Boundary Project

Document Number 221 **Review Date:** 7/20/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Works Progress Administration

Year of Publication: 1937 **Geographic Area:** Pend Oreille County

Title: Inventory of County Archives of Washington.

Source: The Historical Records Survey, WPA. 82 p.

Abstract: Describes types of county records available from Pend Oreille County in 1959.

Review: Includes a short historical sketch of the county.

Comments: Might be useful for finding mining records. On file at Special Collections, University of Washington.

Keywords: Historic Records

Primary Topics: County History

Secondary Topics: Mining

Document Review - Seattle City Light Boundary Project

Document Number 222 **Review Date:** 7/20/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Benson, L. B.

Year of Publication: 1938 **Geographic Area:** Pend Oreille County

Title: Community Survey of Pend Oreille County, Washington.

Source: Wash. State Department of Social. 16 p.

Abstract: Provides a brief history with a description of population and economic conditions.

Review: Provides economic information from 1930s. Mentions CCC camp at Sullivan Lake.

Comments: Statistical Data provided in tables.

Agency, continued: Security, Olympia, WA

Keywords: County History, CCC, Economic Conditions

Primary Topics: County History

Secondary Topics: CCC

Document Review - Seattle City Light Boundary Project

Document Number 223 **Review Date:** 7/20/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Seattle City Light

Year of Publication: 1967 **Geographic Area:** Boundary Dam

Title: The Boundary in Seattle City Light News, September 1967.

Source: Seattle City Light. 12 p.

Abstract: Issue devoted to description of Boundary Dam project.

Review: Provides information about Pend Oreille River and the construction of the dam. Mentions coming dedication that month and minor completion details.

Comments: Good introduction to dam project.

Keywords: Boundary Dam

Primary Topics: Boundary Dam

Secondary Topics: Hydroelectricity, Dam Construction

Document Review - Seattle City Light Boundary Project

Document Number 224 **Review Date:** 7/20/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Washington State Historical Records Advisory Board

Year of Publication: 1981 **Geographic Area:** Pend Oreille County

Title: Historical Records of Washington State.

Source: Washington State, pp. 99, 102-103.

Abstract: A list of repositories with description of types of records for towns and counties throughout the state. Pend Oreille Historical Society Museum with its collection of oral history, maps, photos, scrapbooks, historical manuscripts and public records. Metaline's Recreation Club Public Library with a short draft history of the town of Metaline Falls. Colville National Forest has a repository with oral histories, photos, draft histories, the Charles Barker's 1970 draft history on northern Pend Oreille County, and Dick Cannon's draft history of the lumber industry, Felix La Sota's 5 page "Pend Oreille Experiences of Felix La Sota, Metaline Falls, as told by him," James Munro's 1972 Metaline reminiscences,

Review: Document useful for finding obscure draft histories of specific areas.

Comments: None.

Keywords: Metaline, Metaline Falls

Primary Topics: County Histories, Metaline

Secondary Topics: Repositories

Document Review - Seattle City Light Boundary Project

Document Number 225 **Review Date:** 7/20/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Barker, C. I.

Year of Publication: 1957 **Geographic Area:** Pend Oreille County

Title: A Summary History of Pend Oreille County, Washington.

Source: Newport Chamber of Commerce, Newport, Washington. 11 p.

Abstract: Paper documents history of Pend Oreille County through exploration, industry, transportation, and settlements.

Review: Provides good background information about early development, especially in description of the first mining activity in the "Metalines" dating from 1860 to 1890. A description of Chinaman's Bar is included that mentions a cabin with a stone fireplace that was used in the 1940s by a mining researcher. Describes Metaline as the center of the first mining activity beginning in 1860.

Comments: Brief, well written document. On file at Special Collections, University of Washington.

Keywords: County History, Mining, Chinaman's Bar, Metaline,

Primary Topics: Pend Oreille County

Secondary Topics: Metaline Falls, Metaline, Mining, Transportation

Document Review - Seattle City Light Boundary Project

Document Number 226 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1987 **Geographic Area:** Pocahontas Creek-MF

Title: IOOF Cemetery 5201-7 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 9 p.

Abstract: Site observed during survey for the Little Wolf timber sale. Site consists of three marked graves surrounded by a wooden fence that was built in the 1980s. The cemetery originally contained twelve graves in 1924 according to a special use permit granted to the Independent Order of Odd Fellows by the Forest Service. Only three graves are currently recognizable. Graves date from 1914 to 1924.

Review: Attached evaluation sheet states that site was determined not eligible for listing on the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits. Special use permit is still in effect, apparently protecting the site from Forest Service activities.

Comments: Special Use permit, photos, and sketch of site area is attached. Since marked graves are protected by laws other than NHPA, these recommendations are far from prudent.

Keywords: Historic Site, IOOF Cemetery, Historic Site, Survey, Evaluation

Primary Topics: Historic Site

Secondary Topics: Cemetery, IOOF

Document Review - Seattle City Light Boundary Project

Document Number 227 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1987 **Geographic Area:** Pocahontas Creek-MF

Title: Maggie Young Homestead 5201-8 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey for the Little Wolf Timber Sale. Site consists of a depression containing remnants of cement footings and a metal barrel. Site form refers to notes from US Surveyor General Survey which records that two acres were cultivated and there were two buildings. Aerial photos noted a second structure next to the main building, but the archaeologists saw no physical indication.

Review: Attached evaluation sheet states that site was determined not eligible for listing on the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits.

Comments: Hand-drawn sketch attached.

Keywords: Maggie Young Homestead, Historic Archaeology, Survey, Evaluation

Primary Topics: Historic Site, Homestead

Secondary Topics: Depression, Historic Refuse

Document Review - Seattle City Light Boundary Project

Document Number 228 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1987 **Geographic Area:** Pocahontas Creek -MF

Title: Pocahontas Cave 5201-4 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during the Little Wolf timber sale. The cave consists of two "rooms" and its opening overlooks the Pend Oreille River. There was no "obvious" indications of cultural use inside the cave. Cave was recorded because of its high potential for hunter-gatherer use.

Review: Attached evaluation sheet states that site was determined not eligible for listing on the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits.

Comments: Hand drawn sketch of site is attached. Observer recommends mitigation through further testing because new logging road will provide further access.

Keywords: Cave, Pocahontas Cave, survey, Evaluation

Primary Topics: Cave

Secondary Topics: Hunter-Gatherer site

Document Review - Seattle City Light Boundary Project

Document Number 229 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1987 **Geographic Area:** Wolf Creek-M

Title: Wolf Quarry 5201-3 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site observed during survey of the Little Wolf Timber Sale. Site consists of a rock quarry excavation into a hillside. Some timbers, possibly from a wooden ramp, were observed. The site dates from the 1950s.

Review: Site was recorded despite the observer's reluctance because of its age of less than fifty years. Attached evaluation sheet states that site was determined not eligible for listing on the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits.

Comments: Hand drawn sketch of site is attached.

Keywords: Quarry, Wolf Creek Quarry, Survey, Evaluation

Primary Topics: Quarry

Secondary Topics: Mining

Document Review - Seattle City Light Boundary Project

Document Number 230 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1987 **Geographic Area:** Sand Creek-MF

Title: Sawmill Meadow Site 5301-1 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site consists of a cleared area with one log, a hole with decayed lumber, stove remnants, and remains of a roadbed. Site appears to have been cleaned up after occupation. Use dates from the 1930s.

Review: Attached evaluation sheet states that site was determined not eligible for listing on the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits.

Comments: Hand drawn sketch map of site area is attached.

Keywords: Sawmill Meadow, Historic Archaeology, Survey, Evaluation

Primary Topics: Historic Site, Cabin

Secondary Topics: Historic refuse

Document Review - Seattle City Light Boundary Project

Document Number 231 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1989 **Geographic Area:** Sand Creek-MF

Title: Sand Creek Cabin 5201-2 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 5 p.

Abstract: Site was observed during survey of the Little Wolf Timber Sale. Site material consists of structural remnants and historic refuse from collapsed cabin structure. Use dates from the 1920s to 1930s.

Review: Attached evaluation sheet states that site was determined not eligible to the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits.

Comments: Hand drawn sketch of site area is attached.

Keywords: Sand Creek Cabin, Historic Archaeology, Survey, Evaluation

Primary Topics: Historic Site

Secondary Topics: Settlement, Cabin

Document Review - Seattle City Light Boundary Project

Document Number 232 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek I 5602-1 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek I consists of a root cellar and outhouse. Both are heavily weathered and have suffered damage. 1934 aerial photographs indicate that these are the remains of a larger complex which included a house that was used in maintenance of the flume system. Site dates between 1920-1930.

Review: Mitigation recommendations by site recorder state that "no direct impact will occur from sale." No evaluation sheet was attached.

Comments: An overview map of the historic site is attached. Reference to aerial photos states that they are on file at the district office.

Keywords: Flume I, Historic Archaeology, Survey

Primary Topics: Historic site, flume, logging

Secondary Topics: Mining, outhouse

Document Review - Seattle City Light Boundary Project

Document Number 233 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek XII 5602-12 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek XII consists of a headgate and holding dam for the log flume and a cabin. The cabin was for housing the gatekeeper. Site dates from between 1920-1937. The cabin's roof had collapsed and the flume gate was rotten, however the dam was still intact.

Review: No mitigative measures were offered. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Historic archaeology, Flume XII, Survey

Primary Topics: Historic site

Secondary Topics: Logging, Log Flume, dam

Document Review - Seattle City Light Boundary Project

Document Number 234 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek X 5602-10 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek X consists of a dump site with historic refuse. Site dates from between 1920-1937.

Review: No mitigative measures were offered. The author suggested that the dump is vulnerable to bottle hunters. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Flume X, Historic archaeology, Survey

Primary Topics: Historic site, dump

Secondary Topics: Logging, Historic refuse

Document Review - Seattle City Light Boundary Project

Document Number 235 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Nomination Form

Author(s): Garfield, L.

Year of Publication: 1988 **Geographic Area:** Metaline Falls School-M

Title: Metaline Falls School National Register of Historic Places Nomination Form.

Source: Office of Archaeology and Historic Preservation. 19 p.

Abstract: The Metaline Falls School was constructed in 1912 in anticipation of population growth expected after the mineral and cement industries were established by town founder Lewis P. Larson. The school has five classrooms. Two could be converted into an auditorium for town meetings. The school is built of brick with a Neo-Classical facade as designed by the firm of Cutter and Malmgren, an architectural team that designed several homes and commercial structures in Spokane and Eastern Washington.

Review: The Metaline Falls School was listed on the National Register of Historic Places on September 8, 1988.

Comments: Interior and exterior photos of the school and a second nomination form completed by Van H. Whysong in 1988 are attached to the nomination.

Keywords: Metaline Falls School; NRHP, Evaluation

Primary Topics: Historic Property, Schools, Metaline Falls

Secondary Topics: Nomination

Document Review - Seattle City Light Boundary Project

Document Number 236 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Nomination Form

Author(s): Libra, J.

Year of Publication: 1971 **Geographic Area:** Metaline-M

Title: Metaline 45PO124H National Register of Historic Places Inventory Nomination Form.

Source: Pend Oreille Historical Society. 7 p.

Abstract: Metaline was established as a base camp for placer miners after gold was discovered at the mouth of Sullivan Creek in 1859. It was also the last supply camp for rafts and river steamers. It was a mining camp in the 1860s, organized and platted as a townsite in 1885, and was issued a government patent in 1913 by President Wilson.

Review: It appears that Metaline has not been evaluated for eligibility for listing on the National Register of Historic Places by OAHP.

Comments: Photos, map, and a property map form are attached.

Keywords: Metaline, Historic Property, Inventory

Primary Topics: Historic District

Secondary Topics: Metaline, Mining

Document Review - Seattle City Light Boundary Project

Document Number 237 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Magazine article

Author(s): Pacific Builder and Engineer

Year of Publication: 1912 **Geographic Area:** Metaline Falls-MF

Title: Inland Portland Cement Plant at Metaline Falls.

Source: Pacific Builder and Engineer. January 6, 1912. 3 p.

Abstract: Description of Lehigh Cement Plant operation.

Review: Provides good background to plant operations.

Comments: Includes photographs of plant, flume, and power station.

Keywords: Metaline Falls

Primary Topics: Lehigh Cement Plant, Metaline Falls

Secondary Topics: Industry

Document Review - Seattle City Light Boundary Project

Document Number 238 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** HAER Inventory.

Author(s): Soderberg, L.

Year of Publication: 1982 **Geographic Area:** Metaline Falls-MF

Title: Inland Portland Cement Company or Lehigh Cement Company HAER Inventory.

Source: Office of Archaeology and Historic Preservation. 5 p.

Abstract: The Inland Portland Cement Company was built in 1911 and was purchased by the Lehigh Company in 1914. The plant used local deposits of limestone and shale, delivered via aerial tramways, to produce cement. Water necessary to generated needed electricity was taken from Sullivan Lake, which was dammed and also filled with water flumed from Sullivan Creek, to create a large reservoir. This water was then drained down Sullivan Creek to another reservoir where it was flumed to the plant powerhouse.

Review: The site does not appear to have been evaluated for significance to the NRHP.

Comments: Inventory includes photographs and fact sheet on cement plant.

Agency continued: HAER/Washington State Bridge Inventory

Keywords: Lehigh Cement Plant, Metaline Falls, Historic Structure, Inventory

Primary Topics: Historic property, Cement Plant, HAER

Secondary Topics: Metaline Falls, Sullivan Lake

Document Review - Seattle City Light Boundary Project

Document Number 239 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek XIII 5602-13 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek XIII consists of a dam head for the log flume. Site dates from between 1920-1937.

Review: No mitigative measures were offered. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Historic archaeology, Flume XIII, Survey

Primary Topics: Historic site, Log flume

Secondary Topics: Logging, Dam

Document Review - Seattle City Light Boundary Project

Document Number 240 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek XI 5602-11 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek XI consists of a bridge and a log flume. Site dates from between 1920-1937.

Review: No mitigative measures were offered. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Logging, Flume Creek XI, Historic Site, Survey

Primary Topics: Historic site, bridge, flume

Secondary Topics: Logging

Document Review - Seattle City Light Boundary Project

Document Number 241 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek VIII 5602-8 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek VIII consists of a bridge, flume, and the confluence of two flumes. The bridge carried traffic to the logging camp while the flume carried logs to the sawmill. Site dates from between 1920-1937.

Review: No mitigative measures were offered, except that the saw blades used to line the sides of the flume might become collectors items. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Flume VIII, Bridge, Survey

Primary Topics: Historic site, log flume, bridge

Secondary Topics: Logging

Document Review - Seattle City Light Boundary Project

Document Number 242 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek VII 5602-7 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek VII consists of two cabins that were nearly completely collapsed, but had some standing walls. The cabins were used to house loggers.

Review: No mitigative measures were offered, except that the cabins were next to the road and visible. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Historic archaeology, logging, Flume VI, Survey

Primary Topics: Historic site, logging

Secondary Topics: Cabins, logging camp

Document Review - Seattle City Light Boundary Project

Document Number 243 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek VI 5602-6 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek VI consists of a bridge and a flume that were weather damaged and rotting. The bridge was used to allow horses to cross the log flume. Site dates between 1920-1937.

Review: Mitigation recommendations by site recorder state that "no direct impact will occur from sale." No evaluation sheet was attached.

Comments: A overview map of the historic site is attached. Reference to aerial photos states that they are on file at the district office.

Keywords: Historic Archaeology, Flume VI, Survey

Primary Topics: Historic site, log flume, bridge

Secondary Topics: Logging

Document Review - Seattle City Light Boundary Project

Document Number 244 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek V 5602-5 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites of an approximately two mile long historic area. Flume Creek V consists of a few collapsed structures. The remnants relate to a probable skid track maintenance structure. Site dates from between 1920-1937.

Review: Mitigation recommendations by site recorder state that "no direct impact will occur from sale." No evaluation sheet was attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Historic Structure, Flume Creek V, Survey

Primary Topics: Historic Site

Secondary Topics: Logging, Flume

Document Review - Seattle City Light Boundary Project

Document Number 245 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1987 **Geographic Area:** check

Title: Flume Creek IV 5602-4 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 2 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek IV consists of two houses, joined by one roof, containing a table, stool and bench. The structures were part of a base camp for a logging operation. Site dates from 1920-1937.

Review: Mitigation recommendations by site recorder state that "no direct impact will occur from sale." No evaluation sheet was attached.

Comments: An overview map of the historic site is attached. Reference to aerial photos states that they are on file at the district office.

Keywords: Flume Creek IV, Historic Structure, Survey

Primary Topics: Historic site

Secondary Topics: Logging, flume

Document Review - Seattle City Light Boundary Project

Document Number 246 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1987 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek III 5602-3 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek III consists of timbers apparently from a broken dam. Site dates from 1920-1937.

Review: Mitigation recommendations by site recorder state that "no direct impact will occur from sale." No evaluation sheet was attached. Eligibility appears to have not been evaluated.

Comments: An overview map of the historic site is attached. Reference to aerial photos states that they are on file at the district office.

Keywords: Flume III, Historic Archaeology, Survey

Primary Topics: Historic site

Secondary Topics: Historic refuse, dam

Document Review - Seattle City Light Boundary Project

Document Number 247 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek II 5602-2 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek II consists of three structures, a house, barn, and an outhouse. Site dates between 1920-1930.

Review: Mitigation recommendations by site recorder state that "no direct impact will occur from sale." No evaluation sheet was attached.

Comments: An overview map of the historic site is attached. Reference to aerial photos states that they are on file at the district office.

Keywords: Historic structure, Flume Creek II, Survey

Primary Topics: Historic site

Secondary Topics: Homestead, Outhouse, Barn

Document Review - Seattle City Light Boundary Project

Document Number 248 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek IX 5602-9 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek IX consists of a log structure foundation, three outhouses, a structure with walls still standing, old roadbeds and historic refuse from the main logging campsite. Site dates from between 1920-1937.

Review: No mitigative measures were offered. No evaluation sheet is attached.

Comments: A overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Flume Creek IX, Logging flume, Historic Structure, Survey

Primary Topics: Historic Site, Logging camp

Secondary Topics: Logging, Outhouse

Document Review - Seattle City Light Boundary Project

Document Number 249 **Review Date:** 7/22/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Boldt, K.

Year of Publication: 1976 **Geographic Area:** Beaver Mountain-AM

Title: Flume Creek XIV 5602-14 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during survey of the Flume Creek timber sale. This is one of fourteen sites in an approximately two mile long historic area. Flume Creek XIV consists of a corduroy road and skid track for the logging operation. Site dates from between 1920-1937. Site was well preserved at time of operation.

Review: No mitigative measures were offered. No evaluation sheet is attached.

Comments: An overview map of the historic site is attached. Reference to 1934 aerial photos states that they are on file at the district office.

Keywords: Historic archaeology, Flume XIV, Survey

Primary Topics: Historic site, Logging

Secondary Topics: Skid road, corduroy road

Document Review - Seattle City Light Boundary Project

Document Number 250 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): City of Seattle, Washington, City Light Department

Year of Publication: 1981 **Geographic Area:** Boundary Reservoir

Title: Review Draft of Exhibit E Environmental Report to Support Application for Amendment to License for the Boundary Hydroelectric Development Project No. 2144.

Source: City of Seattle, Washington, City Light Department. 16 p.

Abstract: Included with description of reservoir, dam, topography, and land use is the Report on Historical and Archaeological Resources. This report indicates that a survey would be conducted for the transmission line between the powerstation and the BPA substation. Based on Daugherty's work in 1962, which is attached as an appendix, the author concludes that it is unlikely that hunter-gatherer sites exist in the proposed project. The author also concludes that no sites would be disturbed by expansion of the Boundary Hydroelectric Project through the installation of Units 55 and 56.

Review: The conclusion that the author reaches regarding the unlikely possibility of encountering hunter-gatherer cultural resources based on USFS records (which may or may not reflect whether a survey was conducted of the project area) and the work of an archaeologist in 1962, nearly twenty years earlier, would probably not be supported by the State Office of Archaeology and Historic Preservation. Generally, the OAHP does not accept surveys older than ten years old unless their methodology still meets industry standards.

Comments: Type of Document continued: Boundary Hydroelectric Project

Keywords: Survey, NRHP

Primary Topics: Cultural Resources Overview

Secondary Topics: Boundary Dam, transmission corridor

Document Review - Seattle City Light Boundary Project

Document Number 251 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Holstine, C.

Year of Publication: 1984 **Geographic Area:** Northeastern Washington

Title: A Cultural Resources Survey of the Bonneville Power Administration's Proposed Boundary-Spokane/Colville Valley Transmission Line Project, Pend Oreille, Stevens, and Spokane Counties, Washington.

Source: Archaeological and Historical Services. 59 p.

Abstract: An intensive survey was conducted along the existing transmission line between the Half Moon Substation and the Boundary Substation. Four historic sites and one burial were identified during the survey within the right-of-way. Twelve historic properties within the visual corridor were also identified. None of the historic sites or structures were considered to be eligible for listing on the NRHP. Recommendations for the burial which may have represented a cemetery, were for monitoring during construction.

Review: The Lead King Mine is the only historic resource near the project area and is north of Metaline Falls.

Comments: Agency Continued: Report Number 100-35, Eastern Washington University Reports in Archaeology and History, Cheney, Washington 99004

Keywords: Mining, Historic Site

Primary Topics: Survey, Lead King Mine

Secondary Topics: Historic Archaeology

Document Review - Seattle City Light Boundary Project

Document Number 252 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Boreson, K.

Year of Publication: 1982 **Geographic Area:** Northeastern Washington

Title: A Corridor Evaluation of the Boundary Integration Project, Pend Oreille, Stevens, and Spokane Counties, Washington.

Source: Cultural Resource Consultants, Sandpoint, Idaho. 41 p.

Abstract: A cultural resources overview of a BPA transmission line from Boundary Dam to Spokane was conducted using ethnographic, archaeological, and historic information, and consultation with agencies to determine the location of unrecorded cultural resources in the corridor. The transmission line corridor was divided into five segments which were designated with high, moderate, and low probabilities for cultural resources. The section between Boundary to Metaline Falls was rated with a moderate probability for cultural resources.

Review: The landforms in the project area (along the Pend Oreille River) may contain significant prehistoric archaeological remains, though none have been recorded. Logging and mining historic sites should also be present and may be significant, especially if they are related to Chinese mining.

Comments: Agency continued: Archaeological and Historical Services, Report Number 100-25, Eastern Washington University Reports in Archaeology and History, Cheney, Washington 99004

Keywords: Boundary Project, mining, Chinese

Primary Topics: Overview, Predictive Model

Secondary Topics: Mining, Chinese

Document Review - Seattle City Light Boundary Project

Document Number 253 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Osborn, J.

Year of Publication: 1983 **Geographic Area:** Boundary Dam

Title: Boundary Dam Access Road Seattle City Light, Cultural Resource Reconnaissance.

Source: Colville National Forest. 22 p.

Abstract: Cultural resources survey of a new access road west of the previous road which washed out, and three disposal areas for deposition of road spoils was undertaken. Two archaeological sites, a cabin and other structural remains, and a scatter of historic artifacts associated with a concrete foundation were identified but not recorded because SCL did not use these areas for their disposal activities.

Review: The archaeologists filled out "tickler" forms for the two historic sites, although it is not usual practice to forego filing a site form because the site will not be affected by an action and is not in compliance with federal laws.

Comments:

Keywords: Survey, Access Road, Boundary Dam

Primary Topics: Survey, Access Road

Secondary Topics: Boundary Dam

Document Review - Seattle City Light Boundary Project

Document Number 254 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Holstine, C.

Year of Publication: 1983 **Geographic Area:** Pend Oreille River

Title: Cultural Resources Surveys of Two Locations in the Seattle City Light Department's Boundary Hydroelectric Project, Pend Oreille County, Washington.

Source: Archaeological and Historical Services. 10 p.

Abstract: Cultural resources survey of two locations for Seattle City Light, one a 47-acre area of existing and proposed transmission line and the second, a 14-acre area proposed for waterfowl habitat on the west bank of the Pend Oreille River 16 miles south of Boundary Dam. No cultural resources were identified. One historic cabin has been moved to an interpretive location south of Boundary Dam and does not appear to be eligible for listing on the NRHP.

Review: NRHP determination was suggested by the author but no formal determination was made by the OAHP.

Comments: Agency continued: Short Report Number SR-49, Eastern Washington University Reports in Archaeology and History, Cheney, Washington

Keywords: Historic Archaeology

Primary Topics: Survey, Evaluation

Secondary Topics: Cabin, survey

Document Review - Seattle City Light Boundary Project

Document Number 255 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Daugherty, R. D.

Year of Publication: 1962 **Geographic Area:** Boundary Dam Reservoir

Title: Archaeological Research in the Boundary Dam Reservoir Area.

Source: Washington State University. 12 p.

Abstract: A cultural resources survey was conducted between Metaline Falls north to Boundary Dam along the Pend Oreille River. Any portion of the project area "upon which habitation could have been feasible" was further examined using test trenches. No cultural resources were identified within the proposed pool.

Review: No figures are recorded within the report documenting the transects of the archaeologists or the locations of the test trenches, although general locational descriptions are provided, e.g. mouth of Slate Creek.

Comments: Report would not meet the current standards of the OAHP or industry standards.

Keywords: Survey, Boundary Reservoir

Primary Topics: Survey

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 256 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Hudson, L. and S. Boswell,

Year of Publication: 1981 **Geographic Area:** NE Washington

Title: A Cultural Resource Overview for the Colville and Idaho Panhandle National forests and the Bureau of Land Management-Spokane and Coeur d'Alene Districts, Northeastern Washington/Northern Idaho, Volume 1, Cultural Resources Narrative.

Source: Cultural Resource Consultants, Inc. Sandpoint, ID. 368 p.

Abstract: Focuses on the ethnography, history, and oral history of several counties in Washington and Idaho, including Pend Oreille County, especially within the boundaries of the Colville National Forest. Includes the villages and campsites of the Kalispel based on Chalfant (1974) and Verne Ray's work from 1936. Also has an extensive annotated bibliography. Brief summary of previous cultural resources studies in northeastern Washington.

Review: Appears to have a comprehensive summary of the ethnography of the Kalispel, the native group that populated the Boundary Project area.

Agency continued: Sandpoint, ID

Comments: List of authors, continued: Caroline D. Carley, Wayne Choquette, Christian Miss, David H. Chance, and Michael A. Stamper

Keywords: Kalispel Indians

Primary Topics: Cultural Resources Overview, Pend Oreille County

Secondary Topics: Ethnography, History

Document Review - Seattle City Light Boundary Project

Document Number 257 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** HAER Inventory.

Author(s): Soderberg, L.

Year of Publication: 1979 **Geographic Area:** Box Canyon-M

Title: Idaho and Washington Northern Railroad Bridge 45PO132H Historic American Engineering Record (HAER) Inventory.

Source: Office of Archaeology and Historic Preservation. 14 p.

Abstract: The Idaho and Washington Northern Railroad Bridge was built in 1911 during the railroad's extension from Ione to Metaline Falls. The bridge is unique in its difficult construction because of the depth of the river and canyon chosen for the river crossing. Use of the cantilever construction method was necessary to avoid using falsework that would be vulnerable to washouts. However, the usual cantilever method of building the bridge from each bank and meeting mid-span could not be used and the bridge had to be projected completely across the canyon. The Idaho and Washington Northern Railroad was purchase by the Chicago, Milwaukee, and St. Paul Railroad in 1916.

Review: The Idaho and Washington Northern Railroad Bridge was listed on the National Register of Historic Places on July 16, 1982.

Comments: Articles on the bridge construction are in the NRHP file at OAHP. Photos and correspondence between OAHP and the Port of Pend Oreille, the bridge owner are also included.

Keywords: Idaho and Washington Northern Railroad Bridge; NRHP; Bridges: Nomination; HAER

Primary Topics: Historic Property; Bridges

Secondary Topics: Railroads; Transportation; Box Canyon

Document Review - Seattle City Light Boundary Project

Document Number 258 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Nomination Form

Author(s): Vandermeer, J.H.

Year of Publication: 1978 **Geographic Area:** Metaline Falls-MF

Title: Washington Hotel 45PO125H National Register of Historic Places Inventory--Nomination Form.

Source: Office of Archaeology and Historic Preservation. 14

Abstract: The Washington Hotel was built in 1910 through the efforts of Lewis P. Larson, the founder of the cement, lead and zinc mining, real estate, and utility service industries in Metaline Falls. The Washington Hotel served Metaline Falls' residents and their guests over a long period. The building was owned by Lewis P. Larson for only a short period because of debts incurred to the Inland Portland Cement Company which retained ownership to cover his obligations. The structure is three stories tall and is made from locally produced bricks. The hotel office has been occupied by United States Customs and Immigration Office for the border crossing at Nelway.

Review: The Washington Hotel was listed on the National Register of Historic Places on March 9, 1979.

Comments: Interior and exterior photographs are attached to the nomination form.

Keywords: Washington Hotel; NRHP; Nomination, Evaluation

Primary Topics: Historic Property; Hotels; Metaline Falls,

Secondary Topics: Lewis P. Larson; Cement Industry

Document Review - Seattle City Light Boundary Project

Document Number 259 **Review Date:** 7/23/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Letter

Author(s): Thompson, G.

Year of Publication: 1982 **Geographic Area:** Boundary Reservoir

Title: Cultural Resources Fieldwork for Five Proposed Rubble Disposal Areas near Boundary Dam.

Source: Ertec Northwest, Inc. 4 p.

Abstract: A cultural resources surveys of five proposed rubble disposal areas north and south of Boundary Dam. No cultural resources were identified although recommendations included placement of buffer zones and fill to avoid a cabin in Area A and a cave in Area B.

Review: No documentation was offered regarding the cabin although it appears to be a historic log cabin maintained by Seattle City Light and surrounded by a rail fence.

Comments:

Keywords: Survey, Boundary Reservoir

Primary Topics: Cultural Resource Survey

Secondary Topics: Disposal Areas

Document Review - Seattle City Light Boundary Project

Document Number 260 **Review Date:** 7/24/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** Yes ***Other:*** _____

Author(s): US Surveyor General

Year of Publication: 1913 **Geographic Area:** Pend Oreille River

Title: General Land Office Maps.

Source: Department of Natural Resources, WA State. 20 p.

Abstract: Maps were drawn from surveyor's notes when the state was surveyed in 1913. They show a number of mining claims, like the Monument Bar Placer, Flusey Lode, Hoopalula Lode, Hanley Lode, Leroy Lode, Iron Crown Lode on the Pend Oreille River in the current Boundary Dam Reservoir. These claims would be inundated now as would the Friday Mill Site, built right on the river bank.

Review: The GLOs indicate precise locations for historic activity on the banks of the Pend Oreille prior to inundation.

Comments: Oddly, none of the researchers in the last 25 years have consulted the General Land Office Maps or any other historic maps for the project area. The GLOs are on microfiche in Suzzallo Library, University of Washington.

Keywords: GLOs, Mining, Sawmills

Primary Topics: Placer Mining Claims, sawmill

Secondary Topics: Historic land use

Document Review - Seattle City Light Boundary Project

Document Number 261 **Review Date:** 7/24/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Proposal

Author(s): Hartmann, G. D.

Year of Publication: 1983 **Geographic Area:** Boundary Reservoir

Title: Proposal for a Cultural Resources Survey of Seattle City Lights Boundary Hydroelectric Project.

Source: Archaeological and Historical Services. 9 p.

Abstract: Proposal in response to a request for proposal from Seattle City Light for a cultural resource investigation of the Boundary Hydroelectric Project. Outlines methods, scope of survey, definitions of historic and prehistoric resources and procedures for compliance with Section 106 for survey of two areas, a transmission line right-of-way and 14 acres proposed as wildlife habitat.

Review:

Comments: Agency continued: Eastern Washington University, Cheney, Washington 99004

Keywords: Cultural resources proposal

Primary Topics: Boundary Reservoir, Proposal

Secondary Topics: Transmission corridor, wildlife habitat area

Document Review - Seattle City Light Boundary Project

Document Number 262 **Review Date:** 7/24/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Letter

Author(s): Larson, W. E.

Year of Publication: 1980 **Geographic Area:** Boundary Dam Project

Title: Request for Review and Comment on Expansion of Boundary Dam Project.

Source: Harza Engineering Company. 18 p.

Abstract: Request for comments from Office of Archaeology and Historic Preservation regarding cultural resources issues associated with installation of additional generating units at Boundary Dam. Attached is the environmental checklist, a letter from the Confederated Salish and Kootenai Tribes of the Flathead Reservation claiming interest on behalf of the Pend d' Oreille Tribe, and requesting appropriate surveys be conducted, a copy of the Commission Order from FERC dated July 10, 1961, issuing the license for the Boundary Hydroelectric Project, and the letter of concurrence by the OAHP regarding recommendations for the five rubble disposal areas.

Review: The interesting appended letter is that from the Confederated Salish and Kootenai Tribes of the Flathead Reservation, which states that there was no adequate reconnaissance for archaeological sites when the dam was built in the 1960s.

Comments: Agency Continued: 150 Wacker Drive, Chicago, Illinois 60606

Keywords: Concurrence, OAHP, Tribes

Primary Topics: OAHP concurrence, Tribes

Secondary Topics: FERC application, Exhibit E

Document Review - Seattle City Light Boundary Project

Document Number 263 **Review Date:** 7/24/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Jackson, B

Year of Publication: 1981 **Geographic Area:** Boundary Dam Reservoir

Title: Cultural Resources Evaluation of the Boundary Dam Reservoir.

Source: Laboratory of Archaeology and History. 5 p.

Abstract: Reconnaissance of the reservoir was undertaken in one day and consisted of examining level areas near the dam and at the mouth of Pewee Creek, including approximately five miles of the reservoir, upstream from the dam to Slate Creek. No cultural resources were identified.

Review: The report is basically a regurgitation of Daugherty's (1962) conclusions that either no one used the project area or the sites have been removed through erosion. No figures or maps are attached showing project location or survey areas.

Comments: Agency continued: Washington State University, Pullman

Keywords: Survey

Primary Topics: Cultural Resources survey

Secondary Topics: Boundary Dam Reservoir

Document Review - Seattle City Light Boundary Project

Document Number 264 **Review Date:** 7/24/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Giniger, J., J.A. Ross, and D.H. Stratton

Year of Publication: 1976 **Geographic Area:** research Center, Washington State

Title: Cultural Resources Inventory of the Colville National Forest.

Source: Project Reports 32. 277 p.

Abstract: A cultural resources overview of the Colville National Forest which includes sections on Plateau prehistory, aboriginal utilization of natural resources in the Colville National Forest, and historical resources of the Colville National Forest. Appendices consist of site forms, and history of the Forest, by the Republic District Ranger Office.

Review: Maps would have been helpful. Discussions are general, although the work of John Alan Ross is always a welcome addition. The Plateau prehistory section is not exactly relevant.

Comments: Authors continued: Glen W. Lindeman

Agency continued: Washington Archaeological Research Center, Washington State University, Pullman, WA

Keywords:

Primary Topics: Overview

Secondary Topics: Ethnography, Archaeology, History

Document Review - Seattle City Light Boundary Project

Document Number 265 **Review Date:** 7/24/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Yon, D.

Year of Publication: 1981 **Geographic Area:** Boundary Dam-BD

Title: Boundary Project: Units 55 and 56 Addition Environmental Checklist Form.

Source: City of Seattle, City Light Department. 11 p.

Abstract: Environmental checklist for addition of two units to the Boundary Dam addresses cultural resources by stating that the project may alter a significant archaeological site, structure, object or building. The project proponent states that a "complete survey of the area for the additional transmission line will be completed prior to clearing for construction." An attachment to the checklist briefly describes the cultural resources in the project area, including logger and trapper cabins. One of the cabins has been "removed and reconstructed" by City Light and placed upriver as a visitor attraction. The impending survey is mentioned again and likelihood for cultural resources being identified is considered very low.

Review: Cultural resources are not ignored but are considered an unlikely occurrence.

Comments: None.

Keywords: Checklist; Survey; Boundary Dam; Cabins

Primary Topics: Historic Site; Cabins

Secondary Topics: Dams, Logging, Trapping

Document Review - Seattle City Light Boundary Project

Document Number 266 **Review Date:** 7/21/96

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** USFS Site Form

Author(s): Ogmundson, J. and J. Strelnik

Year of Publication: 1989 (ca. **Geographic Area:** Sand Creek-MF

Title: Kelly Pole Camp 5201-5 USFS Cultural Resource Inventory Record Form.

Source: Colville National Forest. 4 p.

Abstract: Site observed during the Little Wolf timber sale. Site consists of a series of four depressions with scattered historic refuse, mostly tin. Use dates from the 1920s. Site related to sawmill according to Surveyor notes from US Surveyor General Land Office Survey.

Review: Attached evaluation sheet states that site was determined not eligible to the NRHP because of lack of structural integrity and the absence of undisturbed archaeological deposits.

Comments: Hand drawn sketch of depression locations attached.

Keywords: Kelly Pole Camp, Sawmill, Survey, Evaluation

Primary Topics: Sawmills, Historic Site

Secondary Topics: Lumber Industry

Document Review - Seattle City Light Boundary Project

Document Number 267 **Review Date:** 2/9/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bamonte, Tony and Suzanne Schaeffer Bamonte

Year of Publication: 1996 **Geographic Area:** Pend Oreille County

Title: History of Pend Oreille County

Source: Tornado Creek Publications

Abstract: A history of Pend Oreille County containing data on topics applicable to the Boundary Dam Reservoir including information on Chinese miners, hard rock mining, Z Canyon, Kalispel Indians, the Pend Oreille River, settlement on the river, Metaline, Metaline Falls, and logging.

Review: Highly valuable resource for providing leads for historic archaeological sites and for the provision of context for previously identified historic archaeological sites.

Comments: Although a local history, the authors have taken pains to ensure accuracy.

Keywords: Chinese, Indians

Primary Topics: History, Logging, Kalispel Indians, Mining

Secondary Topics: Z Canyon, Early Settlement

Document Review - Seattle City Light Boundary Project

Document Number 268 **Review Date:** 2/9/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1968 **Geographic Area:** Pend Oreille County

Title: The Big Smoke (1968)

Source: Pend Oreille Historical Society

Abstract: Contains local pioneer and settler anecdotes, including stories about Kalispel and Spokane Indians, their gatherings and gambling at the mouth of the Calispel River, the beginnings of the Kalispel Reservation, Indian leaders Massalau and Big Smoke and bits of information about settlers in Cusick and Locke.

Review: Because all of the information here is anecdotal, some provided by high school students, it should not be used without corroboration.

Comments: The information on the Kalispel Indians, reservation, and the Indian leaders is decidedly slanted. Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Indians, Early Settlement

Primary Topics: Cusick, Kalispel Indians, Kalispel Reservation

Secondary Topics: Indian Leaders

Document Review - Seattle City Light Boundary Project

Document Number 269 **Review Date:** 2/9/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1972 **Geographic Area:** Pend Oreille County

Title: The Big Smoke (1972)

Source: Pend Oreille Historical Society

Abstract: The journal contains articles concerning logging in Diamond City, with some discussion of other towns on the Pend Oreille River, with photographs, the resettlement of scattered families living on lands that would become Forest Service land in Pend Oreille County, a description of the Blister Point Camp in northern Idaho (including a photo of Italian prisoners of war), stories of interned Italians and Germans working out their confinement for the Forest Service, and the agriculture in Pend Oreille County.

Review: The Journal provides historic context for settlement on the Pend Oreille River.

Comments: Barely relevant to project area and highly anecdotal.
Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Logging, Early Settlement, World War II

Primary Topics: Italians, Germans, Prisoners of War

Secondary Topics: Agriculture, Historic Photographs

Document Review - Seattle City Light Boundary Project

Document Number 270 **Review Date:** 2/9/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1977 **Geographic Area:** Boundary Dam Reservoir, Sullivan Creek

Title: The Big Smoke (1977)

Source: Pend Oreille Historical Society

Abstract: Includes a history of Boundary Dam Road, which was a trail first used by non-Indians in 1889. It was called the "Boundary Trail" and was the only access into Canada from Metaline. People packed goods on horseback and used a conveyance called a "go-devil," comparable to a travois, dragged by a horse. The trail was less used after 1914, when another road was built. Prior to use of the trail by non-Indians, "it was used by the aborigines on their travels north and south over the rough and mountainous country in the extreme northeast corner of the state." Also includes a short history of the Kalispel Indian Tribe with the author's comments that "no salmon could get through 'Z' Canyon to reach Kalispel Waters." Includes a photo of the Z Canyon prior to inundation. The James A. Sewell's "History of the Electric Power Development in Pend Oreille County," pp. 3-6, discusses the powerhouse on Sullivan Creek in Metaline Falls. A stereotypical Indian skit is also depicted on p. 38.

Review: The mention of the Indian trail at Boundary Dam is good evidence of Indian presence in the Boundary Dam area.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Indians, Dam Construction, Transportation

Primary Topics: Boundary Dam Road, Indian Trials, Kalispel Indians

Secondary Topics: Ethnography, Ethnohistory

Document Review - Seattle City Light Boundary Project

Document Number 271 **Review Date:** 2/9/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1978 **Geographic Area:** Pend Oreille County

Title: The Big Smoke (1978)

Source: Pend Oreille Historical Society

Abstract: Includes an extensively researched article on the Hudson's Bay-Kalispel Trail south of Locke. The second part of the article is on the Kalispel Indian Tribe. The article begins with the return of the Kalispel Indians from the Flathead Lake region, to Usk in 1855. The author documents many of the problems the Kalispel Indians have had such as living on a reservation.

Review: Indian information is helpful, however, most of the data is from outside the project area.

Comments: Helpful details about the reservation, but these would need to be corroborated.
Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Indians, Indian Trails

Primary Topics: Kalispel Indians

Secondary Topics: Usk, Flathead Lake

Document Review - Seattle City Light Boundary Project

Document Number 272 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Local history file

Author(s): Margaret McInturff

Year of Publication: 1970 **Geographic Area:** Metaline, Metaline Falls, Boundary Dam Reservoir

Title: Juanita Samms Rogich

Source: Sullivan Lake Ranger District

Abstract: Story of Juanita Samms Rogich, whose family lived in Metaline and Metaline Falls. "The Samms family occupied the flat where the Circle L Motel is built, and the Pend Oreille Village flat. The log house was built by them. When they plowed up the village area for planting, two old stone pestles were uncovered, indicating that Indians had camped on the site."

Review: Valuable information about pre-contact occupation of Pend Oreille River along the shores of the Boundary Dam Reservoir.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Archaeology, Archaeological Sites, Indians

Primary Topics: Stone Pestles, Pend Oreille Village

Secondary Topics: Samms Family, Metaline, Metaline Falls

Document Review - Seattle City Light Boundary Project

Document Number 273 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Mason, Andrew C.

Year of Publication: 1988 **Geographic Area:** Box Canyon

Title: Cultural Resource Report Arden Tree Farms Land Exchange

Source: Colville National Forest, Sullivan Lake District

Abstract: Report of cultural resource reconnaissance of four parcels, including Box Canyon. No sites in the literature review were identified. Box Canyon was previously surveyed for cultural resources for the Little Ferret Timber Sale. Cultural depressions in the Box Canyon parcel were first discovered for the Mid-mountain Land Exchange study. The depressions were suspected to be aboriginal, therefore the parcel was retained by the Forest Service. Mark Deleon, Forest Archaeologist, visited the depressions in 1988 and determined that they are not significant (or aboriginal). Site numbers for the depressions are 45PO98 and 45PO99.

Review: One of the few possibly aboriginal sites in the Boundary Dam Reservoir vicinity.

Comments: Site number may have been assigned to a non-cultural feature.
Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeology, Archaeological Sites, Survey

Primary Topics: Box Canyon, Cultural Depressions

Secondary Topics: Archaeological Reports

Document Review - Seattle City Light Boundary Project

Document Number 274 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1996 **Geographic Area:** Lower Pend Oreille River

Title: Cominco Test Drilling CRM #5-125.

Source: 2360 Heritage Resources

Abstract: Report of cultural resource assessment of drill sites above the east bank of Pend Oreille, south of the Riverside Mine. Two cultural resources were noted, including a portion of the first road constructed from Metaline Falls to the Canadian border. This segment was abandoned when bypassed in the mid-1920s and has been designated as Noted Not Recorded (NNR) #74 Old Highway Segment. A tin and glass dump along NNR #74, classified as NNR #73 Tin and Glass Dump was also noted. Cultural resources were adversely affected by the project, but both were not significant.

Review: Old Highway segment to Canadian border represents the first motor vehicle traffic to Canada from Metaline Falls.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey, Transportation, Historic Archaeology

Primary Topics: Mining, Roads

Secondary Topics: Metaline Falls

Document Review - Seattle City Light Boundary Project

Document Number 275 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1997 **Geographic Area:** Slate Creek

Title: Cominco Test Drilling #2, CRM #5-139.

Source: 2360 Heritage Resources

Abstract: Cultural resources report for project above confluence of Slate Creek and Pend Oreille River. Two cultural resources were identified during reconnaissance, a Horse Skid Trail (CNF-1211) and NNR #76, a tin dump and mining corner. The area was historically used for hard rock mining. NNR #76 was not significant and would have been destroyed by the project. CNF-1211 was sufficiently removed from both drilling sites to be not affected. Protection of CNF-1211 was recommended by the archaeologist.

Review: Project near the Riverside Mine.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeological Sites, Horse Skid Trail, Survey

Primary Topics: Mining, Logging

Secondary Topics: Skid Roads

Document Review - Seattle City Light Boundary Project

Document Number 276 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1992 **Geographic Area:** Lower Pond Oreille River

Title: Del Norte Salvage Timber Sale

Source: 2360 Heritage Resources

Abstract: Cultural Resource report for timber salvage units above and below the confluence of Slate Creek and the Pend Oreille River. The East Boundary Timber Sale is north of Slate Creek above the Pend Oreille River. The Lucky Strike Mine (45PO87H) would not be adversely affected and individual buildings will be flagged for protection against machinery.

Review: Lucky Strike Mine is 1/4 miles east of the Pend Oreille River and the Boundary Dam Reservoir.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeological Sites, Historic Archaeology, Survey

Primary Topics: Mining, Historic Structures, Cabins

Secondary Topics: Lucky Strike Mine

Document Review - Seattle City Light Boundary Project

Document Number 277 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Miller, Penny

Year of Publication: 1991 **Geographic Area:** Box Canyon

Title: Exposure/Snyder Timber Sale

Source: Colville National Forest, Sullivan Lake District

Abstract: Cultural resource report for large timber sale north and south of Box Canyon above the east bank of the Pend Oreille River; no sites or cultural resources recorded near Box Canyon.

Review: No cultural resources were identified.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey

Primary Topics: Exposure/Snyder Timber Sale

Secondary Topics: Logging

Document Review - Seattle City Light Boundary Project

Document Number 278 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1994 **Geographic Area:** Metaline

Title: Flume Mountain Wildlife Burn, CRM #5-114

Source: 2360 Heritage Resources

Abstract: Cultural resource report (no fieldwork; literature review only) for seven units identified as suitable for burning to improve mountain goat habitat. Report contains good historical background on Flume Creek and Metaline, including settlers locations based partly on Old Forest Service maps (1927). Report conclusions suggest that there is a low probability for cultural resources in the steep, rocky units except for Section 8, which has a low to moderate probability because it is near a historic use area above Metaline.

Review: Historic USFS maps are demonstrated to be a useful tool for identifying historic use areas.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Literature Review

Primary Topics: Metaline, Flume Creek, Homesteads

Secondary Topics: Mountain Goats, Early Settlement

Document Review - Seattle City Light Boundary Project

Document Number 279 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1995 **Geographic Area:** Lime Creek

Title: Cultural Resource Reconnaissance Report for Precommmercial Thinning 1995

Source: 2360 Heritage Resources

Abstract: Eighteen former harvest units now overstocked were assessed for cultural resources. Thirteen were the subject of a survey or were included in former surveys. Five units were assessed through literature review, and three were surveyed. The three units in the vicinity of Lime Creek and the Lucky Strike Mine were previously surveyed.

Review: No cultural resources were identified.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey, Lucky Strike Mine

Primary Topics: Mining

Secondary Topics: Logging

Document Review - Seattle City Light Boundary Project

Document Number 280 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1981 **Geographic Area:** Lower Pend Oreille River

Title: Pocahontas Timber Sale Cultural Resource Inventory

Source: Colville National Forest, Sullivan Lake District

Abstract: Report of literature search and survey of Timber Sale (100 acres) above the east bank of the Pend Oreille River, south of Metaline Falls. No cultural resources were found.

Review: Low relevance due to lack of indentified cultural resources.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey

Primary Topics: Metaline Falls

Secondary Topics: Logging

Document Review - Seattle City Light Boundary Project

Document Number 281 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1991 **Geographic Area:** Lower Pend Oreille River

Title: Washington Resources Land Exchange

Source: 2360 Heritage Resources

Abstract: Reconnaissance report of two parcels proposed for exchange with the Washington Resources Land Exchange, adjacent to Highway 31 along ridges above the east bank of the Pend Oreille River. One parcel has unrecorded remains consisting of boards, galvinized roofing, concrete, and scattered tin. The remains were considered not significant and no recommendations were extended for protection.

Review: Historic refuse appears to be modern and therefore not significant.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey, Historic Archaeology

Primary Topics: Historic Refuse

Secondary Topics: Highway 31

Document Review - Seattle City Light Boundary Project

Document Number 282 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1997 **Geographic Area:** Boundary Dam

Title: Warner Bros. Film Sites, CRM #5-135

Source: 2360 Heritage Resources

Abstract: Two locations were surveyed, the Boundary Dam Adit, north of Boudary Dam and adjacent to County Road 2975, and the Vista House, on the east bank of the Pend Oreille River overlooking Boundary Dam. The Vista House was previously examined as part of the Timber Mountain Survey, CRM #5-79 (Ogmundson 1990). No cultural resources were found in the Adit Film Site. The Vista House was not examined again because no undisturbed ground would be affected.

Review: Survey conducted for impacts related to filming of "The Postman," a movie partially filmed at Boundary Dam.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey, Vista House

Primary Topics: Logging, Boundary Dam

Secondary Topics: Mining, Adits

Document Review - Seattle City Light Boundary Project

Document Number 283 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Osborn, Jill

Year of Publication: 1981 **Geographic Area:** Lower Pend Oreille River

Title: Top-of-Five Timber Sale Forest Service Cultural Resources Inventory Consultation

Source: Colville National Forest

Abstract: Project adjacent to Highway 31 east of Pend Oreille south of Riverside Mine. Literature review and survey found no cultural resources.

Review: No cultural resources were identified during the survey.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey

Primary Topics: Mining, Highway 31

Secondary Topics: Riverside Mine

Document Review - Seattle City Light Boundary Project

Document Number 284 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1988 **Geographic Area:** Box Canyon Area

Title: Top-of-Cement Timber Sale USDA Forest Service/Washington State Historic Preservation Office Cultural Resource Reconnaissance Report

Source: Forest Service/OAHP

Abstract: Five logging units west of Box Canyon were surveyed. Three historic sites were recorded, included the McInnis Homestead (CNF-482), Siegel Homestead (CNF-480), and McInnis' neighbor (CNF-481). All three sites were determined to be not significant based on lack of integrity. Several depressions were identified as "likely archaeological sites," pending further investigation. An apple tree was also noted but not formally recorded.

Review: Depressions are difficult to identify as cultural because of the absence of cultural material outside of the depression.

Comments: Box Canyon is the north boundary of the Boundary Dam Reservoir.

Keywords: Survey, Historic Archaeology

Primary Topics: Homesteads, Cultural Depressions

Secondary Topics: Early Settlement, Box Canyon

Document Review - Seattle City Light Boundary Project

Document Number 285 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1990 **Geographic Area:** Boundary Dam

Title: Cultural Resource Reconnaissance Report Timber Mite Timber Sale

Source: Forest Service/OAHP

Abstract: A three hundred ninety-two acre timber sale that bordered the east bank of the Pend Oreille River between Vista House above Boundary Dam south to Section 23. The field survey included banks of the Pend Oreille River through Z Canyon. Two cultural resources were recorded: Chinaman's Ditch (CNF-1035) and Outhouse (CNF-1036). The southernmost third of CNF-1035 will definitely be impacted because 1000 feet of the ditch would be within a cutting unit. Evaluation and mitigation of CNF-1035 were recommended. Appendix 1, the Cultural Resource Overview for the Riverside Boundary Transportation Plan, also has applicable mining history.

Review: Provides useful information about land use in the Boundary Dam Reservoir on the east bank between the dam area above Z Canyon.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Survey, Chinese, Chinaman's Ditch

Primary Topics: Chinese Miners

Secondary Topics: Mining, Z Canyon, Outhouse

Document Review - Seattle City Light Boundary Project

Document Number 286 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Mixed resources

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille County

Title: Metaline Falls Library History Files, Box 2

Source: Metaline Falls Library

Abstract: Box 2 contains correspondence between Mrs. Felix Lasota, Librarian, Metaline Falls Library and Pend Oreille Historical Society, and Mrs. Joe Libra, Librarian, Metaline Falls Library with people associated with Pend Oreille County history. Individuals include Stuart Bradley, past editor of The Big Smoke and J. C. Elliot, Eastern Washington State Historical Society, regarding David Thompson's route to Spokane House. Letters answer queries about specific historic events and people. Early correspondence concerning the placement of Metaline on the NRHP. An early day report on Metaline Mining District and a section map of Stevens and Pend Oreille County Mining Districts, Newport Mines are also stored in Box 2.

Review: Box contains a mixture of historical documents and photographs that are in the process of being indexed by Library volunteers.

Comments: Repository: Metaline Falls Library (History Files Box)

Keywords: Local History, Historic Documents

Primary Topics: Letters, Pend Oreille Historical Society

Secondary Topics: Felix Lasota, Stuart Bradley, Big Smoke

Document Review - Seattle City Light Boundary Project

Document Number 287 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Mixed resources

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille County

Title: Metaline Falls Library History Files, Box 3

Source: Metaline Falls Library

Abstract: Box 3 contains loose photos and photo albums with photos, newspaper articles, brochures, including folded brochure on Box Canyon, Metaline Falls, and Z Canyon prior to Boundary Dam. A copy of the Economic History of Pend Oreille County by Harvey Edwin Maier, M.A. Thesis, University of Washington, 1938, a postcard collection, and the Metaline 5 Community and the Metaline Development Program, "Prospecting for Progress," Study Phase Wind-up Meeting, 1960 are also stored in Box 3.

Review: Box contains a mixture of historical documents and photographs that are in the process of being indexed by Library volunteers.

Comments: Repository: Metaline Falls Library (History Files Box)

Keywords: Historic Photographs, News Articles

Primary Topics: Mining, Pre-dam environment

Secondary Topics: Z Canyon, Boundary Dam

Document Review - Seattle City Light Boundary Project

Document Number 288 **Review Date:** 1/29/98

Reviewer's Name: L. Larson **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Mixed resources

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille County

Title: Metaline Falls Library History Files, Box 4

Source: Metaline Falls Library

Abstract: Album No. 4 contains pictures of pioneers, miscellaneous notes of Margaret McInturff, photos of Z Canyon and the bridge across Pend Oreille River to Metaline Falls, issues of the Pend Oreille River News and The Miner, The Metaline Falls News, articles on Box Canyon Dam. Album No. 2 has a photo of Pee Wee Falls - Z Canyon, Indian Village on the Pend Oreille by Frank Palmer, Bunker Hill Mine Building, Lead Sill Adit on Slate Creek, ca. 1931, a ollection of letters from William in the C.C.C. to his family, 1933 to 1934, a history of the Metaline Falls water system (1990), obituaries, pictures of Metaline in 1960, and unidentified pictures in the Pend Oreille Tavern Building, a tape recording, and the Captain A. C. Flanders collection (1906) of photos.

Review: Box 4 contains historic photos and documents regarding Pend Oreille County that are currently being indexed by local volunteers.

Comments: Repository: Metaline Falls Library (History Files Box)

Keywords: Historic Photos, Historic Documents, Letters

Primary Topics: Z Canyon, Slate Creek, Pee Wee Falls

Secondary Topics: Metaline Falls, Indians

Document Review - Seattle City Light Boundary Project

Document Number 289 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Collection

Author(s): Boundary Dam Collection

Year of Publication: 1970 **Geographic Area:** Boundary Dam

Title: Boundary Dam Photograph Collection

Source: Pend Oreille Historical Society

Abstract: Collection of photographs of dam area prior to construction, including Z Canyon. The collection contains 30 photographs of pre-construction, construction, and dedication. The collection also contains photo sheets with additional information about images.

Review: Photo collection provides images of the Z Canyon area as it appeared prior to and during construction. The collection is helpful in understanding the characteristics of the landform prior to extensive alteration.

Comments: These are probably Seattle City Light photos.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Photographs, Boundary Dam

Primary Topics: Dam Construction, Z Canyon

Secondary Topics: Pre-construction Conditions; Environment

Document Review - Seattle City Light Boundary Project

Document Number 290 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Historical Notes

Author(s): N/A

Year of Publication: 1987 **Geographic Area:** Pend Oreille River

Title: Kristin: Pend Oreille River Notes

Source: Pend Oreille Historical Society

Abstract: The document mentions Indian presence in the Pend Oreille River area and notes photographs of the Pend Oreille River prior to dam construction. There is also discussion of high and low water levels on the river and a recollection of residents ice skating from Metaline to Newport.

Review: Document provides insight on recreation and environmental conditions.

Comments: One of the few documents that mentions natives in project area vicinity. The notes also indicate the existence of historic photographs held by Margaret McInturff, resident of Metaline Falls and historian.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Pend Oreille River, Indians

Primary Topics: Ice Skating, Pre-construction Conditions

Secondary Topics: Metaline, Newport

Document Review - Seattle City Light Boundary Project

Document Number 291 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Booklet

Author(s): Barker, Chas I.

Year of Publication: 1965 **Geographic Area:** Pend Oreille River

Title: Early Day Transportation in the Pend Oreille River Valley, and Steamboating on the Pend Oreille River

Source: Pend Oreille Historical Society

Abstract: A description of transportation histroy in the Pend Oreille River Valley including discussions of early trails, rafts, "bateau," and steamboats. Individual steamboats are discussed by name, e.g. "New Volunteer" and "The Ione."

Review: Document provides information regarding development of transportation on the Pend Oreille.

Comments: Primarily concerns steamboat history, but brief discussion of pre-navigation trails is valuable. Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Transportation, Pend Oreille River

Primary Topics: Steamboats, Trails

Secondary Topics: Historic Chronology

Document Review - Seattle City Light Boundary Project

Document Number 292 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Booklet

Author(s): Steen, Mabel

Year of Publication: ca. 1969 **Geographic Area:** Upper Pend Oreille River

Title: Settling of Land Along the Pend Oreille River

Source: Pend Oreille Historical Society

Abstract: Document discusses settlement, living conditions, and subsistence on the upper Pend Oreille River and Indians swimming horses across the river. The information pertains to Cusick and the Newport area. A ten page letter to Stewart Bradley from Mabel Steen with historical reminisinces (2/27/1968) is attached.

Review: Collection of historic anecdotes concerning the early development of the upper Pend Oreille River.

Comments: Pertains to area above Boundary Dam Reservoir in Cusick and Newport vicinity.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Indians, Pend Oreille River

Primary Topics: Settlement history

Secondary Topics: Cusick, Newport

Document Review - Seattle City Light Boundary Project

Document Number 293 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Barker, Chas I.

Year of Publication: 1968 **Geographic Area:** Lower Pend Oreille River

Title: Bridges and Ferries Built and Operated for Crossing the Pend Oreille River

Source: Pend Oreille Historical Society

Abstract: Document refers to a ferry at Metaline Falls in 1910.

Review: Short discussion of ferry boats.

Comments: One of a group of articles written by Charles Barker.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Transportation, Pend Oreille River

Primary Topics: Ferries, Metaline Falls

Secondary Topics: Historic Chronology

Document Review - Seattle City Light Boundary Project

Document Number 294 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Barker, Chas I.

Year of Publication: ca. 1968 **Geographic Area:** Upper Pend Oreille Rive

Title: Bridges Spanning the Pend Oreille River in Pend Oreille County

Source: Pend Oreille Historical Society

Abstract: Discusses ferry between Usk and Newport.

Review: Brief discussion of the first bridges of the Pend Oreille.

Comments: One of several articles by Charles I. Barker.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Transportation, Pend Oreille River

Primary Topics: Bridges

Secondary Topics: Ferries, Usk

Document Review - Seattle City Light Boundary Project

Document Number 295 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Document File

Author(s): N/A

Year of Publication: ca. 1960 **Geographic Area:** Pend Oreille River

Title: "Steamboats - Pend Oreille River" (File)

Source: Pend Oreille Historical Society

Abstract: Documents history of individual vessels on Pend Oreille River.

Review: File of documents primarily discussing history of individual vessels formerly operating on the Pend Oreille River.

Comments: Indicates that vessel traffic was heavy for several years on the Pend Oreille River.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Transportation, Pend Oreille River

Primary Topics: Steamboats

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 296 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Document File

Author(s): N/A

Year of Publication: ca. 1950 **Geographic Area:** Boundary Dam, Z Canyon

Title: "Pend Oreille River - Z Canyon" (File)

Source: Pend Oreille Historical Society

Abstract: Document includes handwritten description of Z Canyon prior to construction of Boundary Dam. It also contains a brief description of a former footbridge across Z Canyon.

Review: Document provides a written account of Z Canyon, present site of Boundary Dam.

Comments: Photographs of footbridge are available in other collections.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Bridges, Z Canyon

Primary Topics: Boundary Dam

Secondary Topics: Pre-construction Conditions, Z Canyon

Document Review - Seattle City Light Boundary Project

Document Number 297 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Brochure

Author(s): Seattle City Light

Year of Publication: ca. 1967 **Geographic Area:** Boundary Dam

Title: "Boundary Dam Project" (File)

Source: Pend Oreille Historical Society

Abstract: Brochure of newly opened Boundary Dam describing the history of dam construction and current operations using photos and diagrams.

Review: Brochure describes history and operations of Boundary Dam.

Comments: Brochure intended to provide information regarding the new hydroelectric project.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Boundary Dam

Primary Topics: Dam Operations, Diagrams

Secondary Topics: Seattle City Light, Photographs

Document Review - Seattle City Light Boundary Project

Document Number 298 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): N/A

Year of Publication: ca. 1960 **Geographic Area:** Pend Oreille County

Title: Facts of Pend Oreille County

Source: Pend Oreille Historical Society

Abstract: Document describes climate, industry, education, and other characteristics of Pend Oreille County. Information about Indian community is provided, including rock caves at Usk used by Father DeSmet for Indian church services.

Review: Broad description of county wide charateristics

Comments: Indian discussion pertains to area outside of Boundary Dam Reservoir.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Pend Oreille County

Primary Topics: Economic Statistics, Indians

Secondary Topics: Missionaries

Document Review - Seattle City Light Boundary Project

Document Number 299 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Dingse, Ruby Lusher

Year of Publication: 1930 **Geographic Area:** Pend Oreille County

Title: Historical Sketches of Pend Oreille County, Washington

Source: Miner Print, Newport

Abstract: Book contains anecdotes and descriptions of various people and places including Indians, Metaline Falls, Dead Man's Eddy, and Z Canyon.

Review: Small publication scattered descriptions of various aspects of Pend Oreille County History.

Comments: Rare discussion of Indian people in publication.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Indians, History

Primary Topics: Metaline Falls, Dead Man's Eddy

Secondary Topics: Pend Oreille County History

Document Review - Seattle City Light Boundary Project

Document Number 300 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Barker, Chas I.

Year of Publication: 1968 **Geographic Area:** Pend Oreille County

Title: Untitled

Source: Pend Oreille Historical Socerty

Abstract: Discussion of settlement and economic development of Pend Oreille County.

Review: Untitled document describes settlement and economic development of Pend Oreille County area.

Comments: One of several articles by Charles Barker, local historian.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Pend Oreille County History

Primary Topics: Economic Development

Secondary Topics: Newport

Document Review - Seattle City Light Boundary Project

Document Number 301 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Engelbrecht, A. W.

Year of Publication: 1910 **Geographic Area:** Metaline Falls

Title: In the Heart of the Mountains

Source: Pend Oreille Historical Society

Abstract: A promotional article in Opportunity magazine describing the benefits and potential of Metaline Falls.

Review: Opportunity magazine publishes articles for investors and individuals seeking information on places with economic potential.

Comments: Metaline-Metaline Falls file.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Metaline Falls, Metaline

Primary Topics: Economic Development

Secondary Topics: Promotional Brochures

Document Review - Seattle City Light Boundary Project

Document Number 302 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Barker, Chas I.

Year of Publication: ca. 1960 **Geographic Area:** Boundary Dam Reservoir

Title: People, Places, History, and Events Pertaining to the Metalines

Source: Pend Oreille Historical Socerty

Abstract: Document describes mining history and economic development in lower Pend Oreille River. Specific descriptions of Chinese mining camp and cabin at Chinaman's Bar on the east side of the Pend Oreille River, opposite Dead Man's Eddy in the Boundary Dam Reservoir.

Review: Document provides specific information concerning Chinese mining activity in Boundary Dam Reservoir. Barker (ca. 1960) states that a cabin and stone fireplace at the Chinese miner's camp was still standing in 1943 and 1944.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Mining, Chinese, Chinaman's Bar, Dead Man's Eddy

Primary Topics: Mining History

Secondary Topics: Pend Oreille River

Document Review - Seattle City Light Boundary Project

Document Number 303 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Barker, Chas I.

Year of Publication: ca. 1965 **Geographic Area:** Boundary Dam Reservoir

Title: Memories on Early Day Events: People and Development of Metaline Falls

Source: Pend Oreille Historical Socerty

Abstract: Document contains descriptions of the Chinese mining camp and cabin at Chinamen's Bar in the Boundary Dam Reservoir. A 100 foot horseshoe circle of rock piled by Chinese miners is also described.

Review: Chinese mining camp description similar to previous account, Document #132. This account describes rock feature assembled by Chinese miners.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Chinese, mining, Chinamen's Bar

Primary Topics: Mining Camps

Secondary Topics: Cabins

Document Review - Seattle City Light Boundary Project

Document Number 304 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Bamonte, Anthony

Year of Publication: 1988 **Geographic Area:** Metaline Falls

Title: Metaline Falls

Source: Pend Oreille Historical Socerty

Abstract: Publication primarily recounts history of Metaline Falls as it relates to the development of the Lehigh Portland Cement Company. Contains excellent historical photographs of Metaline Falls and a chronology of historic events in the community.

Review: Metaline Falls is a tribute to Lewis Larsen and his role in establishing the Metaline lead-zinc mining district and Inland Portland Cement Company.

Comments: Chronological history of Metaline Falls and the obituary for Lewis Larsen is provided.
Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Metaline Falls

Primary Topics: Leigh Cement Company

Secondary Topics: Economic Development

Document Review - Seattle City Light Boundary Project

Document Number 305 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Newspaper Article

Author(s): N/A

Year of Publication: 10/7/196 **Geographic Area:** Boundary Dam

Title: Boundary Dam to have largest underground powerhouse in the U.S.

Source: Newport Miner

Abstract: News article provides update of construction progress of Boundary Dam. Photographs of ongoing construction activities and statistics are presented in the article. The history of the development of Boundary Dam is also provided.

Review: In the discussion of historic development there is mention of the U.S. Army Corps of Engineers earlier 1947 attempt to construct a dam near Boundary Dam that would have raised the pool elevation to 2062.5 feet.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Boundary Dam, Dam Construction

Primary Topics: U.S. Army Corps of Engineers, Construction Photos

Secondary Topics: Pool Elevation

Document Review - Seattle City Light Boundary Project

Document Number 306 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Brochure

Author(s): Idaho and Washington Northern Railroad

Year of Publication: 1920 **Geographic Area:** Pend Oreille River

Title: Idaho & Washington Northern Railroad, Pend Oreille River Route

Source: Pend Oreille Historical Society

Abstract: Promotional brochure with map that discusses each town along the Pend Oreille River, including Metaline Falls.

Review: Brochure touts the advantages of the Idaho and Wisconsin Northern Railroad.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Railroads, Pend Oreille River

Primary Topics: Promotional Brochure, Transportation

Secondary Topics: Maps

Document Review - Seattle City Light Boundary Project

Document Number 307 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** News article

Author(s): Craig, John

Year of Publication: August 4 **Geographic Area:** Usk, Pend Oreille River

Title: Casino plan a bit of hope for Kalispels

Source: Spokesman Review

Abstract: News article recounts Kalispel history and contemporary problems, camas ovens, and gatherings.

Review: Article discusses proposed gaming facility with historic background and photo of Kalispel elder.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files

Keywords: Kalispel Indians, Ethnography

Primary Topics: Camas ovens

Secondary Topics: Ethnohistory

Document Review - Seattle City Light Boundary Project

Document Number 308 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Index Cards

Author(s): O'Brien, Father John

Year of Publication: 1968 **Geographic Area:** Boundary Dam, Metaline Falls

Title: Indian Lore

Source: Pend Oreille Historical Society

Abstract: Seventeen Parish cards with typewritten notes about Kalispel Indians. One card described the Kalispel superstition and fear of Z Canyon and Metaline Falls. Their belief was that thunder and lightning spirits lived at these places.

Review: These cards were used by Father O'Brien during an address to the Pend Oreille Historical Society meeting in 1968.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files (Kalispel File)

Keywords: Indians, Kalispel, Mythology

Primary Topics: Z Canyon, Metaline Falls

Secondary Topics: Boundary Dam, Legends

Document Review - Seattle City Light Boundary Project

Document Number 309 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Pamphlet

Author(s): Driver, Nema

Year of Publication: 1975 **Geographic Area:** Pend Oreille County

Title: The Kalispel Tribe

Source: Pend Oreille Historical Society

Abstract: A shory history of the Kalispel people; primarily addresses the missionary period.

Review: Publication has small bit of information concerning Kalispel land use.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files (Kalispel File).

Keywords: Kalispel, Indians

Primary Topics: Missionaries, Ethnohistory

Secondary Topics: Ethnography

Document Review - Seattle City Light Boundary Project

Document Number 310 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Article

Author(s): Barker, Chas I.

Year of Publication: ca. 1968 **Geographic Area:** Pend Oreille River

Title: Prospecting and Mining as carried on for the Past Century in the Pend Oreille River Valley

Source: Pend Oreille Historical Society

Abstract: Article describes Chinese miners and other claims.

Review: Brief article discusses mining history.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files (Historical Topics A-Z Drawer: Mining File)

Keywords: Chinese Mining

Primary Topics: Mining

Secondary Topics: Mining Claims

Document Review - Seattle City Light Boundary Project

Document Number 311 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Advertisement

Author(s): Ione Gazette

Year of Publication: 1935 **Geographic Area:** Lower Pend Oreille River

Title: Advertisement for Z Canyon Consolidated Mines Company

Source: Ione Gazette

Abstract: Advertisement encourages mineral excavation in Metaline area and discusses potential of lead and zinc over gold.

Review: Advertisement promotes the lead-zinc mining industry.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files.

Keywords: Mining, Economic History

Primary Topics: Z Canyon Consolidated Mines, Lead-zinc Mining

Secondary Topics: Ione

Document Review - Seattle City Light Boundary Project

Document Number 312 **Review Date:** 1/28/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Booklet/Guide

Author(s): Hobbs, June

Year of Publication: 1985 **Geographic Area:** Pend Oreille County

Title: Historic Site Guides of Pend Oreille County

Source: Pend Oreille Historical Society

Abstract: Booklet provides driving guides of local highways in Pend Oreille County that indentify places of historic interest. Booklet describes powerhouse at Pend Oreille village, Lehigh's lumber flume in Metaline Falls, Apple Brothers Mill at Pocahontas Creek, and World War II displaced Europeans who lived in Pend Oreille village.

Review: Extensive review of historic places in Pend Oreille County, based on driving routes in Pend Oreille County. Each route and some settlements are described by various local historians.

Comments: Repository: Pend Oreille Historical Society, Historic Information Files.

Keywords: Indians, Metaline Falls, Pend Oreille County History

Primary Topics: Historic Places, Settlement, Economic History

Secondary Topics: Metaline Falls, Ione, Metaline, Boundary Dam

Document Review - Seattle City Light Boundary Project

Document Number 313 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1981 **Geographic Area:** T40N, R43E, Section 35

Title: North 31 Timber Sale Cultural Resource Inventory

Source: Colville National Forest

Abstract: Report provides rare description of Kalispel ethnography, including accounts of Kalispel Indians passing through the Boundary Dam vicinity en route to the Salmo River, British Columbia.

Review: Cultural resource inventory in Boundary Dam Reservoir.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Kalispel, Indians, Mining

Primary Topics: Ethnography, Archaeological Survey

Secondary Topics: North 31 Timber Sale

Document Review - Seattle City Light Boundary Project

Document Number 314 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Strelnik, Jill

Year of Publication: 1980 **Geographic Area:** Box Canyon

Title: Complete Cultural Resources Survey Report, Lots 8 and 9, Section 19, T38N, R43E, Pend Oreille County Washington, Sullivan Lake District (Mid-mountain and Exchange File #80-03)

Source: Colville National Forest

Abstract: Archaeological sites, 45PO98 and 45PO99, west of Box Canyon Dam were identified during this survey. These were described as cultural depressions.

Review: Cultural resource inventory gives background on identification of two archaeological sites with characteristics indicating that they may be non-cultural.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeological Surveys, Archaeological Sites

Primary Topics: Cultural Depressions

Secondary Topics: 45PO98, 45PO99

Document Review - Seattle City Light Boundary Project

Document Number 315 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John and Jill Strelnik

Year of Publication: 1987 **Geographic Area:** Metaline Falls

Title: Little Wolf Timber Sale Cultural Reconnaissance Report

Source: Colville National Forest, Sullivan Lake District

Abstract: Survey of east side of the Pend Oreille River between Sullivan Creek and Sand Creek. Archaeological sites recorded during survey include CNF-686, 687, 688, 689, 690, 691, 692, 693. Possible prehistoric occupation at Pocahontas Cave were also identified.

Review: Survey identified historic cemetery, historic quarry, possible native rock quarry, homestead, and other sites identified south of Metaline Falls.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeological Sites, Archaeological Survey

Primary Topics: Historic Archaeology

Secondary Topics: Little Wolf Timber Sale

Document Review - Seattle City Light Boundary Project

Document Number 316 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Higginbotham, Fred

Year of Publication: 1983 **Geographic Area:** Lower Pend Oreille River

Title: Lehigh Cement Company Temporary Road Cultural Resource Reconnaissance Report

Source: Colville National Forest, Sullivan Lake District

Abstract: Cultural resource reconnaissance report did not identify cultural resources. Possible Indian homestead use in project area was speculated, but evidence was not present.

Review: No cultural resources detected

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeology, Archaeological Survey

Primary Topics: Lehigh Cement Company, Indians, Homesteads

Secondary Topics: Lehigh Hill Road

Document Review - Seattle City Light Boundary Project

Document Number 317 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1995 **Geographic Area:** Sullivan Creek

Title: Wolf Man Timber Sale Cultural Resource Reconnaissance Report

Source: Colville National Forest

Abstract: Cultural resource survey identified 11 of 19 expected (previously recorded or documented resources) sites in the Timber Sale project area. Resources identified during the survey included the Sullivan Creek Trail, a mine adit, a can dump, and some individual log cabins.

Review: Sites CNF 694, CNF 677, and CNF 1183 were revisited and/or recorded during survey.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Archaeological Sites

Primary Topics: Mining, Historic Refuse

Secondary Topics: Wolf Man Timber Sale

Document Review - Seattle City Light Boundary Project

Document Number 318 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): White, Jerry

Year of Publication: 1990 **Geographic Area:** Lower Pend Oreille River

Title: Three Mile Timber Sale

Source: Colville National Forest

Abstract: Cultural resource survey of proposed timber sale identified CNF 667, a cabin on Slate Creek and located CNF 666, a historic dump on Sullivan Creek. The west edge of the Three Mile Timber Sale follows Highway 31 between Metaline Falls and the Lucky Strike Mine.

Review: Survey was within one mile of east bank of Boundary Dam Reservoir.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Archaeological Survey

Primary Topics: Historic refuse, Slate Creek, Highway 31

Secondary Topics: Lucky Strike Mine, Metaline Falls

Document Review - Seattle City Light Boundary Project

Document Number 319 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John and Penny Miller

Year of Publication: 1991 **Geographic Area:** Boundary Dam

Title: Russian/Fence Timber Sale

Source: Colville National Forest

Abstract: Cultural resource inventory of three timber sales. The Russian/Fence Timber analysis area is west of Boundary Dam. The east boundary of this sale is Frisco Standard Road, 0.5 miles west of Boundary Dam. Twelve historic sites were recorded, including CNF 869, CNF 870, and CNF 871, which are west of Boundary Dam. Seven "noted but not formally recorded" (NNR) sites were also observed. Oral history interviews with local pioneers of the Boundary Homestead area were transcribed and attached to the report.

Review: Informative survey with interesting and valuable interviews with early Euroamerican residents. Several early homesteads were identified, some with cabins.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Archaeological Sites, Archaeological Survey

Primary Topics: Oral history, Homesteads, Logging, Log Flumes

Secondary Topics: Ohio Match Company,Flume Creek, Frisco Standard Rd

Document Review - Seattle City Light Boundary Project

Document Number 320 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Album

Author(s): Mrs. Lasota

Year of Publication: 1972 **Geographic Area:** Pend Oreille Village

Title: The Jens Jenson Collection

Source: Metaline Falls Library

Abstract: Photo album containing 42 images of Lower Pend Oreille River. Several photos of Pend Oreille powerhouse construction in 1937. These photos show the powerhouse at Pend Oreille Village in different construction phases. Other images show photos of the Pend Oreille Village townsite and Z Canyon. Some of the images were taken by Frank Palmer, a well-known Spokane photographer.

Review: Photos are of good quality and show the powerhouse before it was covered by Boundary Dam Reservoir.

Comments: Repository: Metaline Falls Library

Keywords: Historic Photographs, Pend Oreille Village

Primary Topics: Pend Oreille Powerhouse, Z Canyon, Photo Albums

Secondary Topics: Frank Palmer

Document Review - Seattle City Light Boundary Project

Document Number 321 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Notebook

Author(s): Local volunteers

Year of Publication: N/A **Geographic Area:** Pend Oreille River, Pend Oreille County

Title: Metaline Falls Library History Files, Box 1

Source: MFL Volunteer Association

Abstract: Box 1 contains a collection of documents and articles pertaining to the history of Pend Oreille County. The following documents were breifly reviewed: "Carl C. Harvey" notebook with photographs, letters, and biography of trapper/gold miner Carl. C. Harvey (1849 - 1926) 8 pages; Biography of early mining entrepreneurs, 1970, 8 pages; 6 news articles on Metaline Falls Bridge Dedication, 1952; History of Metaline Falls, intervew with Bertha L. Wilson, 13 pages; Master's Thesis of Harvey Edwin Maier, Economic History of Pend Oreille County, University of Washington, 1938, 86 pages; letter of James Shaw to Joe Libra at the Metaline Public Library concerning History of Lehigh and Metaline; discussion of hatchery on Sullivan Creek by Lehigh in 1920 by Robert Torke; CCC Camps; news articles on PUD and Box Canyon Dam; photos of early Metaline; photos of Box Canyon Bridge construction; Vance Conner's account of his father trading with Indians in Ruby; copies of news articles concerning explorer David Thompson.

Review: The Metaline Falls Library History Files consists of boxes and documents relating the history of Pend Oreille County. The boxes are partially indexed with a card catalog and ate stpred on an AV/Conference room in the main library.

Comments: Repository: Metaline Falls Library, Metaline Falls Library History Files, Box 1

Keywords: Mining, Trapping, Bridges

Primary Topics: Metaline, Metaline Falls, Lehigh Cement Company

Secondary Topics: Economic Development, Historic Photographs, CCC

Document Review - Seattle City Light Boundary Project

Document Number 322 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): Lasota, Felix, F. Libra and Margaret McInturff

Year of Publication: 1968 **Geographic Area:** Pend Oreille County

Title: The Metalines and Pend Oreille County

Source: Metaline Falls Library

Abstract: Photo album compiled for Pend Oreille Historical Society. Includes images of "Indian Village on Pend Oreille" and several photos by Frank Palmer, a well-known Spokane photographer.

Review: Photos are of good quality.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Indians, Historic Photographs, Photo Album

Primary Topics: Kalispel Indians

Secondary Topics: Frank Pamler

Document Review - Seattle City Light Boundary Project

Document Number 323 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille River

Title: "Holiday Classics"

Source: Metaline Falls Library

Abstract: Approximately 30 photographs with local images of Metaline Falls.

Review: Historic photos in a holiday themed photo album.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Photo Album, Historic Photographs

Primary Topics: Metaline Falls

Secondary Topics: Pend Oreille County

Document Review - Seattle City Light Boundary Project

Document Number 324 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s):

Year of Publication: 1910 **Geographic Area:** Metaline Falls

Title: Art and Gertrude Baker of Pend Oreille Tavern, Metaline Falls.

Source: Metaline Falls Library

Abstract: Photo album consisting mostly of family pictures.

Review: Family photos of Metaline Falls residents.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Photo Album, Historic Photographs

Primary Topics: Metaline Falls

Secondary Topics: Pend Oreille Tavern

Document Review - Seattle City Light Boundary Project

Document Number 325 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Lower Pend Oreille River

Title: Oscar Wolf Photo Album

Source: Metaline Falls Library

Abstract: Photo album contains several historic photographs of mining in Pend Oreille including Z Canyon, Box Canyon Dam, and Metaline.

Review: Photo album contains historic photographs of area within Boundary Dam Reservoir.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Photo Album, Historic Photographs

Primary Topics: Z Canyon, Box Canyon Dam, Metaline

Secondary Topics: Mining, Pre-construction, Boundary Dam

Document Review - Seattle City Light Boundary Project

Document Number 326 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): Marie Newman

Year of Publication: N/A **Geographic Area:** Metaline Falls, Boundary Dam Reservoir

Title: Photo Album Number 6

Source: Metaline Falls Library

Abstract: Photo album mostly contains family photographs. Some historic views of Metaline Falls are also included.

Review:

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Photo Album, Historic Photographs

Primary Topics: Metaline Falls, Pre-construction, Boundary Dam

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 327 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille County

Title: Photo Album (in notebook binder)

Source: Metaline Falls Library

Abstract: Two albums are within the binder. Some of the photos pertain to Pend Oreille County History.

Review: The albums consist primarily of xeroxed photos with captions and also include some historical transcripts compiled by Felix Lasota, an early settler of Tiger, Washington.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Photo Albums, Historic Photos

Primary Topics: Felix Lasota

Secondary Topics: Pend Oreille County History

Document Review - Seattle City Light Boundary Project

Document Number 328 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): Juhl, Maxine Howland

Year of Publication: N/A **Geographic Area:** Boundary Dam Reservoir

Title: Maxine Howland Juhl Photographs

Source: Metaline Falls Library

Abstract: Photo album contains historic images of Metaline Falls, Sullivan Lake Flume, and Indian Camp at Usk with tipis.

Review: One of a few Indian images in the Metaline Falls Library photo collection.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Photo Album, Historic Photographs, Indians

Primary Topics: Metaline Falls

Secondary Topics: Logging, Flume

Document Review - Seattle City Light Boundary Project

Document Number 329 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Notebook

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille County

Title: Personal Histories of North Pend Oreille County Residents

Source: Metaline Falls Library

Abstract: A blue binder notebook produced by the Pend Oreille Historical Society containing historical interviews with early pioneers. Also contains news articles and historic accounts.

Review: Notebook os alphabetized by letter

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Oral History

Primary Topics: Pioneers, Historic Accounts

Secondary Topics: News Articles

Document Review - Seattle City Light Boundary Project

Document Number 330 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Historic Photos collectio

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Boundary Dam Reservoir

Title: Various images from Wolf album #3

Source: Metaline Falls Library

Abstract: Collection consists of approximately 30 loose historical photographs in envelope. Photos depicting Metaline Falls, Z Canyon and Pee Wee Falls are included.

Review: Photos appear to be extras or attachments to Wolf album #3

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Historic Photographs

Primary Topics: Z Canyon, Metaline Falls, Pee Wee Falls

Secondary Topics: Pre-construction Boundary Dam

Document Review - Seattle City Light Boundary Project

Document Number 331 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** Photo Album

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Boundary Dam

Title: Photo Album

Source: Metaline Falls Library

Abstract: Black and white photographs of Boundary Dam construction.

Review: Photos show progress of construction of Boundary Dam

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Boundary Dam Construction, Historic Photographs

Primary Topics: Construction Techniques

Secondary Topics: Pre-dam Construction

Document Review - Seattle City Light Boundary Project

Document Number 332 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Photo Album

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Lower Pend Oreille River

Title: Untitled photo album

Source: Metaline Falls Library

Abstract: Historical images of construction activity at the Pend Oreille mines near Pend Oreille Village.

Review: Detailed black & white photographic images of construction and mining activity show varied aspects of mine industry.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Mining, Historic Photographs

Primary Topics: Pend Oreille Mine, Pend Oreille Village

Secondary Topics: Pre-construction Boundary Dam

Document Review - Seattle City Light Boundary Project

Document Number 333 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Newspaper article

Author(s): N/A

Year of Publication: 1996 **Geographic Area:** Metaline Falls

Title: Metaline Falls

Source: Pacific Magazine/Seattle Times

Abstract: Newspaper article on Metaline Falls includes remarks of lifelong resident of Metaline Falls.

Review: Description of character, history, and contemporary image of Metaline Falls. Discusses Metaline Falls reputation as a home to white supremacists.

Comments: Repository: Metaline Falls Library (Librarian's Shelf)

Keywords: Newspaper Articles

Primary Topics: Metaline Falls, History

Secondary Topics: White Supremacists

Document Review - Seattle City Light Boundary Project

Document Number 334 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: Yes ***Maps:*** No ***Other:*** _____

Author(s): N/A

Year of Publication: N/A **Geographic Area:** Pend Oreille River

Title: "Photos" envelope

Source: Metaline Falls Library

Abstract: An assorted collection of historic photos and postcards in envelope. Images include a Kalispel Indian with a bow and arrow and a photo of Box Canyon Dam under construction.

Review: The Indian photo shows a Kalispel posing with a bow and arrow.

Comments: Repository: Metaline Falls Library (History Files Box)

Keywords: Historic Photographs, Indians

Primary Topics: Box Canyon Dam, Kalispel Indians

Secondary Topics: Dam Construction

Document Review - Seattle City Light Boundary Project

Document Number 335 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1997 **Geographic Area:** Slate Creek

Title: Heritage Resources Report for Cominco Test Drilling #2, CRM #5-139

Source: Colville National Forest, Sullivan Lake District

Abstract: Archaeological site, CNF-1211, a horse skid trail, was indentified during this survey.

Review: A historic refuse scatter was identified but not recorded.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology

Primary Topics: Logging

Secondary Topics: Historic Refuse

Document Review - Seattle City Light Boundary Project

Document Number 336 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Site Form

Author(s): Ogmundson, John

Year of Publication: 1993 **Geographic Area:** Wolf Creek, Lower Pend Oreille River

Title: Wolf Creek Spring Boxes, Cultural Resource Inventory Site Form, CNF - 1098

Source: Colville National Forest, Sullivan Lake District

Abstract: Site form describes spring boxes in varying degree of deterioration used as water sources for early homesteaders.

Review: The spring boxes may be of recent construction

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Archaeological Sites

Primary Topics: Homesteads

Secondary Topics: Mining

Document Review - Seattle City Light Boundary Project

Document Number 337 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** Yes ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Ogmundson, John

Year of Publication: 1994 **Geographic Area:** Wolf Creek, Lower Pend Oreille River

Title: Heritage Report for R. Hanlin, Special Use Permit

Source: Colville National Forest, Sullivan Lake District

Abstract: Report for a proposed waterline resulted in CNF-1098 being recorded.

Review: Remnants of a bridge, noted as NNR 50, were recorded during the survey.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Archaeological Site

Primary Topics: Homesteads

Secondary Topics: Mining

Document Review - Seattle City Light Boundary Project

Document Number 338 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Site Form

Author(s): Ogmundson, John

Year of Publication: 1997 **Geographic Area:** Slate Creek, Boundary Dam Reservoir

Title: Horse Skid Trail Cultural Resource Inventory Record Form, Site Form Number CNF-1211.

Source: Colville National Forest, Sullivan Lake District

Abstract: Site Form describes a logging trail apparently used for skidding logs with horse teams.

Review: Site Form documents skid trail in great detail

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Archaeological Sites, Historic Archaeology

Primary Topics: Logging, Skid roads

Secondary Topics:

Document Review - Seattle City Light Boundary Project

Document Number 339 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** Yes ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Fahey, John

Year of Publication: 1986 **Geographic Area:** Lower Pend Oreille River

Title: The Kalispel Indians

Source: University of Oklahoma Press

Abstract: An ethnography and ethnohistory of the Kalispel Indians.

Review: Excellent and extensive account of Kalispel lifeways and struggle for sovereignty. Excellent and thorough bibliography included.

Comments: Repository: University of Washington Library.

Keywords: Indians, Ethnography, Ethnohistory

Primary Topics: Kalispel Indians, Lower Pend Oreille River

Secondary Topics: Metaline Falls, Z Canyon

Document Review - Seattle City Light Boundary Project

Document Number 340 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Site Form

Author(s): Miller, Penny

Year of Publication: 1991 **Geographic Area:** Lower Pend Oreille River

Title: H. Holtz Cabin, Cultural Resource Inventory Record Form, Site number CNF-871.

Source: Colville National Forest, Sullivan Lake District

Abstract: Site form documents five features: a log bridge, remnants of three log structures, and a cultural depression.

Review: Site form does not suggest possible land use indicated by historic archaeological resources.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Archaeological Sites

Primary Topics: Cabins, Bridges

Secondary Topics: H. Holtz, Homesteads

Document Review - Seattle City Light Boundary Project

Document Number 341 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Site Form

Author(s): Miller, Penny

Year of Publication: 1991 **Geographic Area:** Russian Creek

Title: Brick Kiln Cultural Resource Inventory Record Form, Site number CNF-869.

Source: Colville National Forest, Sullivan Lake District

Abstract: Site form documents a brick kiln with an associated historic refuse pile.

Review: Brick kiln may have been part of a Sawmill operation.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Historic Archaeology, Historic Archaeological Site

Primary Topics: Brick Kiln, Sawmills, Lumbering

Secondary Topics: Historic Refuse

Document Review - Seattle City Light Boundary Project

Document Number - 342 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** No ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** Site Form

Author(s): Miller, Penny

Year of Publication: 1991 **Geographic Area:** Pee Wee Creek

Title: Frank Smith's Cabin Cultural Resource Inventory Form, Site number CNF-870.

Source: Colville National Forest, Sullivan Lake District

Abstract: Site near Boundary Dam on west side of Pend Oreille River

Review: Remnants of cabin were visible in 1991.

Comments: Repository: Colville National Forest, Sullivan Lake District (Archaeological Site Forms and Inventory Reports)

Keywords: Homestead, Cabin

Primary Topics: Early Settlement

Secondary Topics: Frank Smith

Document Review - Seattle City Light Boundary Project

Document Number 343 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:***

Author(s): Pend Oreille Historical Society

Year of Publication: 1981 **Geographic Area:** Boundary Dam

Title: The Big Smoke (1981)

Source: Pend Oreille Historical Society

Abstract: Collection of articles on Pend Oreille County History. Pertinent article is "History of the Boundary Dam Project" by Kathy Sugiyama.

Review: The two page article discusses the permitting history of Boundary Dam including USACOE efforts to obtain a permit in 1947. Opposition groups and lawsuit against the Boundary Dam project are also documented.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Boundary Dam, Seattle City Light

Primary Topics: Dam Permitting, Mining, Boundary Dam Construction

Secondary Topics: Pool Elevation

Document Review - Seattle City Light Boundary Project

Document Number 344 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1983 **Geographic Area:** Lower Pend Oreille River

Title: The Big Smoke (1983)

Source: Pend Oreille Historical Society

Abstract: The 1983 issue has a group of articles regarding stills, moonshine, and bootlegging in Pend Oreille County. "Moonshiners in the Metalines" and other articles discuss sites of stills and bootlegging trails leading into Canada (pp. 11-19).

Review: Entertaining stories of moonshiners and bootleggers during prohibition, including one from an anonymous former still operator.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Prohibition, Bootlegging

Primary Topics: Metaline, Metaline Falls

Secondary Topics: Boundary Dam, Alcohol

Document Review - Seattle City Light Boundary Project

Document Number 345 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1990 **Geographic Area:** Metaline Falls

Title: The Big Smoke (1990)

Source: Pend Oreille Historical Society

Abstract: The Big Smoke (1990) includes an article entitled "Memories of Juanita Samms Regich," pp. 42-44, by Margaret McInturff which discusses an archaeological discovery at Pend Oreille Village. The Samms family were plowing at their homesite and unearthed two stone pestles.

Review: Article disucsses the story of a family living in Metaline Falls in 1910. It provides information about different ethnic groups such as the Greeks, Poles, Bulgarians, and Yugoslavs who lived in Metaline.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Archaeology, Archaeological Sites, Indians

Primary Topics: Metaline Falls, Pend Oreille Village, Ethnic Group

Secondary Topics: Mining, Logging, Lehigh Cement Company

Document Review - Seattle City Light Boundary Project

Document Number 346 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** H

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1988 **Geographic Area:** Lower Pend Oreille River

Title: The Big Smoke (1988)

Source: Pend Oreille Historical Society

Abstract: Journal contains "A Glimpse of Old-time Kalispel Life" by Allan H. Smith, pp. 3-19. The article contains a fairly extensive ethnography of the Kalispel, including a description of the salmonberries at Metaline Falls and several photos of Indian canoes and sweatlodges.

Review: Allan H. Smith is a former WSU professor of Anthropology. He interviewed Kalispel elders in the 1930s to obtain information about Kalispel lifeways.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Indians, Ethnography, Ethnohistory

Primary Topics: Kalispel Indians, Metaline Falls, Z Canyon

Secondary Topics: Boundary Dam, Sweatlodge, Canoes, Historic Photos

Document Review - Seattle City Light Boundary Project

Document Number 347 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** M

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1991 **Geographic Area:** Pend Oreille River

Title: The Big Smoke (1991)

Source: Pend Oreille Historical Society

Abstract: The Big Smoke (1991) contains an article pertaining to archaeology by Alston Thoms entitled "The Roots of Village Life." It is primarily a discussion of camas oven excavations in the Calispel Valley outside of the Boundary Dam Reservoir. In addition, an autobiography entitled "Edward Alfred Franke" discusses early experiences in Metaline Falls.

Review: The Thoms article does not pertain to the project area, however, it does provide background on Kalispel lifeways.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Archaeology, Indians, Archaeological Sites

Primary Topics: Metaline Falls, Lehigh Cement Company

Secondary Topics: Camas, Logging, Mining, Lehigh Cement

Document Review - Seattle City Light Boundary Project

Document Number 348 **Review Date:** 1/29/98

Reviewer's Name: L. Forsman **Reviewer's Organization:** LAAS

Reviewer's Discipline: Archaeology **Document Relevance (L, M, H):** L

Type of Document: ***Report:*** No ***Journal:*** Yes ***Book:*** No ***Data:*** No

Photos: No ***Maps:*** No ***Other:*** _____

Author(s): Pend Oreille Historical Society

Year of Publication: 1979 **Geographic Area:** Metaline Falls, Ruby

Title: The Big Smoke (1979)

Source: Pend Oreille Historical Society

Abstract: Two articles of interest are contained within this 1979 issue of The Big Smoke. "Jack Perkins of the Metalines" by Jack Perkins contains logging and mining history of the Metaline Falls area and "The Conner Family" by Keith K. Conner has uncommon early ethnohistoric references and photos of the Kalispel Indians in the Ruby area.

Review: Articles in this journal provide minimal information about the reservoir, but has unusual photos of Kalispel Indians at the turn of the century.

Comments: Repository: Pend Oreille County Historical Society (Gift Shop)

Keywords: Indians, Mining, Logging

Primary Topics: Kalispel Indians, Ethnohistory

Secondary Topics: Metaline Falls, Metaline, Lehigh Cement

APPENDIX B

Bibliography
Alphabetical Listing of Documents
Contained in Boundary Document Database - February 27, 1998

Seattle City Light Boundary Project - Bibliography

Author(s):
Title: Art and Gertrude Baker of Pend Oreille Tavern, Metaline Falls.
Source: Metaline Falls Library
Year: 1910

Author(s): Althauser.
Title: Information from the Althauser (1979) Botanical Survey (maps and field notes provided by K. Ahlenslager, Botanist, Colville National Forest).
Source: U.S. Forest Service. 11 p.
Year: 1979

Author(s): Ashe, B.L. and A.T. Scholz
Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River: Recommendations for Fisheries Enhancement - Final Report.
Source: U.S. Department of Energy, Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 295 p.
Year: 1992

Author(s): Ashe, B.L., K.L. Lillengreen, J.J.Vella, L.O.Clark, G.J. Nenema Jr., D.L. Richards, T.H. Skillingstad, and A. Scholz
Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Appendices.
Source: U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-A179-88BP39339. 338 p.
Year: 1990

Author(s): Ashe, B.L., K.L. Lillengreen, J.J.Vella, L.O.Clark, S.Graves, M.Barber, G.J. Nenema Jr., and A. Scholz
Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Annual Report Fiscal Year 1990.
Source: U.S. Department of Energy, Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-A179-88BP39339. 350 p.
Year: 1991

Author(s): Bamonte, Anthony
Title: Metaline Falls
Source: Pend Oreille Historical Socerty
Year: 1988

Author(s): Bamonte, Tony and Suzanne Schaeffer Bamonte
Title: History of Pend Oreille County
Source: Tornado Creek Publications
Year: 1996

Author(s): Barber, M.R. and R.A. Wilms, A.T.Scholz, L.O. Clark, B.L. Renberg, K.O'Laughlin, K.L. Woodward, and R.D. Heaton
Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Appendices.
Source: U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 374 p.
Year: 1989

Author(s): Barber, M.R. and R.A. Wilms, A.T.Scholz, L.O. Clark, B.L. Renberg, K.O'Laughlin, K.L. Woodward, and R.D. Heaton
Title: Assessment of Fishery Improvement Opportunities on the Pend Oreille River - Annual Report 1988.
Source: U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 374 p.
Year: 1989

Author(s): Barber, M.R., B.L. Renberg, J.J.Vella, A.T. Scholz, K.L. Woodward, and S. Graves
Title: Assessment of the Fishery Improvement Opportunities on the Pend Oreille River - Annual Report 1989.
Source: U.S. Department of Energy, Bonneville Power Administration. Division of Fish and Wildlife. Project Number 88-66. Agreement DE-179-88BP39339. 206 p.
Year: 1990

Author(s): Barker, C. I.
Title: A Summary History of Pend Oreille County, Washington.
Source: Newport Chamber of Commerce, Newport, Washington. 11 p.
Year: 1957

Author(s): Barker, Chas I.
Title: Bridges Spanning the Pend Oreille River in Pend Oreille County
Source: Pend Oreille Historical Society
Year: ca. 1968

Author(s): Barker, Chas I.
Title: Early Day Transportation in the Pend Oreille River Valley, and Steamboating on the Pend Oreille River
Source: Pend Oreille Historical Society
Year: 1965

Author(s): Barker, Chas I.
Title: Bridges and Ferries Built and Operated for Crossing the Pend Oreille River
Source: Pend Oreille Historical Society
Year: 1968

Author(s): Barker, Chas I.
Title: People, Places, History, and Events Pertaining to the Metalines
Source: Pend Oreille Historical Socerty
Year: ca. 1960

Author(s): Barker, Chas I.
Title: Untitled
Source: Pend Oreille Historical Socerty
Year: 1968

Author(s): Barker, Chas I.
Title: Memories on Early Day Events: People and Development of Metaline Falls
Source: Pend Oreille Historical Socerty
Year: ca. 1965

Author(s): Barker, Chas I.
Title: Prospecting and Mining as carried on for the Past Century in the Pend Oreille River Valley
Source: Pend Oreille Historical Society
Year: ca. 1968

Author(s): Barker, L.
Title: Crescent Mining Cabin II 45PO82H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 6 p.
Year: 1980

Author(s): Beak Consultants, Inc. and Seattle City Light.
Title: Clearing and Revegetation Plan For Transmission Line Right-of-Way, Boundary Hydroelectric 55/56 Turbine Additions Project.
Source: Seattle City Light. 170 p.
Year: 1986

Author(s): Bennett, D. and M. Liter
Title: Water Quality, Fish, and Wildlife Characteristics of Box Canyon Reservoir, Washington Section 3: Fish.
Source: University of Idaho. 94 p.
Year: 1991

Author(s): Bennett, D.H. and J. M. DuPont
Title: Fish Habitat Associations of the Pend Oreille River, Idaho.
Source: IDF&G and University of Idaho. Project F-73-R-15, Subproject VI, Study VII. 123 p.
Year: 1993

Author(s): Benson, L. B.
Title: Community Survey of Pend Oreille County, Washington.
Source: Wash. State Department of Social. 16 p.
Year: 1938

Author(s): Boateng & Associates.
Title: Preliminary Environmental Site Assessment LaFarge Corporation Property Pend Oreille County, Washington.
Source: Prepared by Boateng & Associates for Seattle City Light.
Year: 1994

Author(s): Boldt, K.
Title: Flume Creek VI 5602-6 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek XIV 5602-14 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek IX 5602-9 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek II 5602-2 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek III 5602-3 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1987

Author(s): Boldt, K.
Title: Flume Creek IV 5602-4 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 2 p.
Year: 1987

Author(s): Boldt, K.
Title: Flume Creek V 5602-5 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek VIII 5602-8 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek XI 5602-11 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek XIII 5602-13 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek X 5602-10 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek XII 5602-12 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek I 5602-1 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Boldt, K.
Title: Flume Creek VII 5602-7 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Bonneville Power Administration
Title: Assessment of the fishery improvement opportunities on the Pend Oreille River. 1988 Annual report.
Source: U.S. Dept. of Energy Rept DOE/BP/39339-1 . Bonneville Power Admin., Div. of Fish and Wildlife, Portland, Oregon. 381 p.
Year: 1989

Author(s): Bonneville Power Administration
Title: Columbia River Power for the People - A History of Policies of the Bonneville Power Administration.
Source: U.S. Department of Energy - Bonneville Power Administration. 338 p.
Year: 1981

Author(s): Boreson, K.
Title: A Corridor Evaluation of the Boundary Integration Project, Pend Oreille, Stevens, and Spokane Counties, Washington.
Source: Cultural Resource Consultants, Sandpoint, Idaho. 41 p.
Year: 1982

Author(s): Boundary Dam Collection
Title: Boundary Dam Photograph Collection
Source: Pend Oreille Historical Society
Year: 1970

Author(s): Bowles, E. C., V.L. Ellis, and B. Hoelscher
Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.
Source: Annual Progress Report for FY 1988, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 60 p.
Year: 1989

Author(s): Bowles, E. C., V.L. Ellis, and D. Hatch
Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.
Source: Annual Progress Report for FY 1987, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 50 p.
Year: 1988

Author(s): BPA, USACOE, USBOR
Title: Columbia River systems operations review, Main Report.
Source: Department of Energy, Environmental Impact Statement-0170, November, 1995. 451 p.
Year: 1995

Author(s): BPA, USACOE, USBOR
Title: Columbia River systems operations review, Appendix C-1, anadromous fish.
Source: Department of Energy, Environmental Impact Statement-0170, July 1994. 312 p.
Year: 1994

Author(s): Brown, C.J.D.
Title: Fishes of Montana.
Source: Big Sky Books. Montana State University, Bozeman, Montana. 207 p.
Year: 1971

Author(s): Brown, H.A., R.B Bury, D.M. Darda, et al.
Title: Reptiles of Washington and Oregon.
Source: Seattle Audubon Society, Seattle Washington. 176 p.
Year: 1995

Author(s): Brown, L. G.
Title: On the zoogeography and life history of Washington's native charr; Dolly Varden Salvelinus malma (Walbaum) and Bull Trout Salvelinus confluentus (Suckley).
Source: Washington Fisheries Management Division Rept. #92-22, Appendix A. Washington Dept. of Wildlife, Olympia.
Year: 1992

Author(s): Burke, T.
Title: Reptiles and Amphibians of the Colville National Forest.
Source: Colville National Forest. 5 p.
Year: 1976

Author(s): Burke, T.
Title: Mammals of the Colville National Forest.
Source: Colville National Forest. 4 p.
Year: 1976

Author(s): Burke, T. and J. Nisbet.
Title: Birds of the Colville National Forest.
Source: Colville National Forest. 8 p.
Year: 1979

Author(s): Cavender, T. M.
Title: Taxonomy and distribution of the bull trout, Salvelinus confluentus (Suckley), from the American northwest.
Source: Calif. Fish-Game 64(3): 139-74.
Year: 1978

Author(s): CH2M Hill
Title: Geotechnical investigations and analysis; Boundary Dam Access Road.
Source: Prepared by CH2M Hill for Seattle City Light, May, 1983. 64 p.
Year: 1983

Author(s): City of Seattle - Department of Lighting
Title: Seattle City Light's Boundary Project
Source: Seattle City Light. 6 p.
Year: 1967

Author(s): City of Seattle - Department of Lighting
Title: Seattle City Light's Boundary Project
Source: Seattle City Light. 6 p.
Year: 1965

Author(s): City of Seattle, Washington - City Light Department
Title: Application for Amendment to License for The Boundary Hydroelectric Development Project No. 2144.
Source: Seattle City Light.
Year: 1981

Author(s): City of Seattle, Washington - City Light Department
Title: Review Draft of Exhibit E Environmental Report to Support Application for Amendment to License for The Boundary Hydroelectric Development Project No. 2144.
Source: Seattle City Light.
Year: 1981

Author(s): City of Seattle, Washington, City Light Department
Title: Review Draft of Exhibit E Environmental Report to Support Application for Amendment to License for the Boundary Hydroelectric Development Project No. 2144.
Source: City of Seattle, Washington, City Light Department. 16 p.
Year: 1981

Author(s): City of Seattle.
Title: Review draft of exhibit E environmental report to support application for amendment to license for the Boundary Hydroelectric Development.
Source: Project No. 2144. City of Seattle, City Light Department. 30 p.
Year: 1981

Author(s): Colville National Forest
Title: Mining Cabin 45PO81H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 3 p.
Year: 1980 (ca.)

Author(s): Colville National Forest
Title: Lucky Strike 45PO87H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 2 p.
Year: 1980 (ca.)

Author(s): Colville National Forest
Title: Cresent Mining Tunnel 45PO84H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 3 p.
Year: 1980

Author(s): Colville National Forest
Title: Lime Creek Cabin 45PO85H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 3 p.
Year: 1980

Author(s): Coots, R. and R. Willms.
Title: Pend Oreille River primary productivity and water quality of selected tributaries.
Source: Washington State Department of Ecology, Olympia WA. 35 p.
Year: 1991

Author(s): Craig, John
Title: Casino plan a bit of hope for Kalispels
Source: Spokesman Review
Year: August 4, 1996

Author(s): Dames & Moore, Inc. and Cosmopolitan Engineering Group.
Title: Initial watershed assessment, water resources inventory area 62, Pend Oreille River Watershed.
Source: (Open-File Technical Report 95-17). Prepared in cooperation with the Washington State Department of Ecology, Olympia, WA. 40 p.
Year: 1995

Author(s): Daugherty, R. D.
Title: Archaeological Research in the Boundary Dam Reservoir Area.
Source: Washington State University. 12 p.
Year: 1962

Author(s): Dingse, Ruby Lusher
Title: Historical Sketches of Pend Oreille County, Washington
Source: Miner Print, Newport
Year: 1930

Author(s): Donald, D. B., and D. J. Alger
Title: Geographic Distribution, Species Displacement, and Niche Overlap for Lake Trout and Bull Trout in Mountain Lakes.
Source: Canadian Journal of Zoology 71(2): 238-47.
Year: 1993

Author(s): DosSantos, J. M., J. E. Darling, and D. Cross
Title: Lower Flathead system fisheries study: Main river and tributaries, Volume 2: Final report, FY 1983-1987.
Source: U.S. Dept. of Energy, Contract AI79-83BP39830. Bonneville Power Adm., Div. of Fish and Wildlife, Portland, Oregon. 236 p.
Year: 1988

Author(s): Driver, Nema
Title: The Kalispel Tribe
Source: Pend Oreille Historical Society
Year: 1975

Author(s): Ebasco Environmental
Title: Hydrologic and erosion processes affecting the Boundary Wildlife Preserve.
Source: Interim report prepared by Ebasco Environmental for Seattle City Light, November, 1992. 149 p.
Year: 1992

Author(s): Ebasco Environmental
Title: Boundary Reservoir hydrology and erosion survey report.
Source: Report prepared by Ebasco Environmental for Seattle City Light, October, 1993. 143 p.
Year: 1993

Author(s): Edwards, E.A., and K.A. Twomey
Title: Habitat Suitability Index Models: Common Carp.
Source: U.S. Department of Interior, Fish and Wildlife Service. 28 p.
Year: 1982

Author(s): Edwards, E.A., D.A. Kreiger, G. Gebhart, and O.E. Maughan.
Title: Habitat Suitability Index Models: Black Crappie.
Source: U.S. Department of Interior, Fish and Wildlife Service. 25 p.
Year: 1982

Author(s): Elliott, S. T.
Title: Reduction of a Dolly Varden population and macrobenthos after removal of logging debris.
Source: Trans. Am. Fish. Soc. 115(3): 392-400.
Year: 1986

Author(s): Ellis, V., and B. Bowler
Title: Lake and Reservoir Investigations-Pend Oreille Lake Fisheries Investigations. Pend Oreille Lake Creel Census.
Source: Job Perform. Rept., Proj-F-73-R-3(3)2 , Idaho Department of Fish and Game, Boise. 61 p.
Year: 1981

Author(s): Embody, D. R.
Title: The resident sport catch for Pend Oreille Lake, 1951-1955.
Source: Idaho Department of Fish and Game, Federal Aid to Fisheries, Project F 3-R, September 15, 1956. 89 p.
Year: 1956

Author(s): Engelbrecht, A. W.
Title: In the Heart of the Mountains
Source: Pend Oreille Historical Society
Year: 1910

Author(s): Enserch Environmental Corp
Title: Boundary Reservoir: Hydrologic and erosion processes affecting the Boundary Wildlife Preserve.
Source: Prepared by Enserch Environmental Co for Seattle City Light, September, 1994. 172 p.
Year: 1994

Author(s): Envirocon Limited, and Pearse-Bowden Economic Consultants Limited
Title: Environmental and Resource Management Studies Seven Mile Project for B.C. Hydro.
Source: Envirocon Limited, and Pearse-Bowden Economic Consultants Limited, Vancouver, B.C. 187 p.
Year: 1975

Author(s): Envirocon Limited, and Pearse-Bowden Economic Consultants Limited
Title: Environmental Impact Report - Seven Mile Project for B.C. Hydro.
Source: Envirocon Limited, and Pearse-Bowden Economic Consultants Limited, Vancouver, B.C. 48 p.
Year: 1973

Author(s): Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd.
Title: Environmental and Resource Management Studies for Seven Mile Project for BC Hydro.
Source: Prepared by Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd. for BC Hydro. 191 p.
Year: 1975

Author(s): Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd.
Title: EIR - Seven Mile Project for BC Hydro and Power Authority (BC Hydro), Vancouver, WA.
Source: Prepared by Envirocon Ltd. and Pearse Bowden Econ. Consultants Ltd for BC Hydro. 62 p.
Year: 1973

Author(s): Envirocon, ltd.
Title: Environmental and Resource Management Studies Seven Mile Project.
Source: Prepared by Envirocon, ltd. for B.C. Hydro. 187 p.
Year: 1975

Author(s): Envirocon, ltd.
Title: Environmental Impact Report Seven Mile Project.
Source: Prepared by Envirocon, ltd. for BC Hydro. 48 p.
Year: 1973

Author(s): Fahey, John
Title: The Kalispel Indians
Source: University of Oklahoma Press
Year: 1986

Author(s): Falter, C. M., C. Baines and J. W. Carlson.
Title: Water quality, fish and wildlife of Box Canyon Reservoir, Washington.
Source: Section 2: Water Quality. University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID. Final Report submitted to Pend Oreille County PUD, Newport, WA. 233 p.
Year: 1991

Author(s): Federal Energy Regulatory Commission
Title: Order Amending License, FERC Project No. 2144-001, Issued April 26, 1982
Source: Federal Energy Regulatory Commission. 50 p.
Year: 1982

Author(s): Federal Energy Regulatory Commission.
Title: Order Amending License, FERC Project No. 2144-001, Issued April 26, 1982.
Source: Federal Energy Regulatory Commission. 50 p.
Year: 1982

Author(s): Federal Energy Regulatory Commission.
Title: Order Approving Fish and Wildlife Mitigation Plan and Amending License Project No. 2144-001 (attached to Jordan and Starkey (1984).
Source: Federal Energy Regulatory Commission. 7p.
Year: 1983

Author(s): Foster Wheeler Environmental
Title: Cedar River Watershed Bull Trout Workshop.
Source: Prepared by Foster Wheeler Environmental for Seattle Water Department, November 18, 1994. 112 p.
Year: 1995

Author(s): Fraley, J. J., and B. B. Shepard
Title: Life History, Ecology and Population Status of Migratory Bull Trout (Salvelinus confluentus) in the Flathead Lake and River System, Montana.
Source: Northwest Science 63(4): 133-42.
Year: 1989

Author(s): Fraley, J., B. Marotz, J. Decker Hess, W. Beattie, and R. Zubik
Title: Mitigation, Compensation, and Future Protection for Fish Populations Affected by Hydropower Development in the Upper Columbia System, Montana, U.S.A.
Source: Regulated Rivers Research and Management 3(1-4): 3-18.
Year: 1989

Author(s): Fraley, J., D. Read, and P. Graham
Title: Flathead River fishery study.
Source: Montana Dep. Fish, Wildlife and Parks, Fishery Division, Helena. 212 p.
Year: 1981

Author(s): Fraley, J., T. Weaver, and J. Vashro
Title: Cumulative Effects of Human Activities on Bull Trout (Salvelinus confluentus) in the Upper Flathead Drainage, Montana.
Source: Proceedings of the Symposium on Headwaters Hydrology, Bethesda Maryland: American Water Resources Association.
Year: 1989

Author(s): Garfield, L.
Title: Metaline Falls School National Register of Historic Places Nomination Form.
Source: Office of Archaeology and Historic Preservation. 19 p.
Year: 1988

Author(s): Gaufin, A. R., G. W. Prescott, and J. F. Tibbs
Title: Limnological Studies of Flathead Lake, Montana: A Status Report.
Source: Report EPA-600/3-76-039. Environmental Protection Agency, Washington, D.C.. 92 p.
Year: 1976

Author(s): Geiger, D. D., A. T. Scholz, C. S. Doughtie, H. G. Kube, and D.L. Richards.
Title: Annotated bibliography of information about surface and groundwater quality and quantity on the Kalispel Indian Reservation, including reservation boundary waters on the Box Canyon Reservoir of the Pend Oreille River.
Source: (Fisheries Technical Report No. 47). Upper Columbia United Tribes Fisheries Center, Eastern Washington University, Cheney WA. 239 p.
Year: 1993

Author(s): George T.
Title: Pend d'Oreille Valley, Canada, Resource and Land Use Planning Study.
Source: Prepared by Atamanenko & Associates for Regional District of Central Kootenay. 120 p.
Year: 1981

Author(s): Gibbons, H. L., and M. V. Gibbons.
Title: Efficacy of rotovation in controlling eurasian water milfoil in the Pend Oreille River, Washington.
Source: In: Lake and Reservoir Management. North American Management Society v4:1. Washington, D.C. p. 153-160.
Year: 1988

Author(s): Gibbons, H. L., M. L. Durando-Boehm, F. A. Verhalen, T.C. McKarns, J.T. Nyznyk, T.J. Belnick, W.H.Funk, E.E. Syms, A. Frankenfield, B.C. Moore, and M.V. Gibbons.
Title: Refinement of control and management methodology for Eurasian water milfoil in the Pend Oreille River, Washington.
Source: State of Washington Water Research Center, Washington State University. 49 p.
Year: 1983

Author(s): Gibbons, H. L., W. H. Funk, M. Durando-Boehm and J.J. Eisenbeis
Title: Investigation and control of Myriophyllum spicatum in the Pend Oreille River, Washington. (Report 47).
Source: State of Washington Water Research Center, Washington State University, Pullman, WA. 37 p.
Year: 1983

Author(s): Giniger, J., J.A. Ross, and D.H. Stratton
Title: Cultural Resources Inventory of the Colville National Forest.
Source: Project Reports 32. 277 p.
Year: 1976

Author(s): Goetz, F.
Title: Biology of the bull trout Salvelinus confluentus: A literature Review.
Source: Willamette National Forest, Eugene, Oregon. 53 p.
Year: 1989

Author(s): Green, G.
Title: Wildlife Habitat Assessment Report LaFarge Corporation Property.
Source: Prepared by Ebasco Environmental for Seattle City Light. 8 p.
Year: 1993

Author(s): Gresswell, R.E.
Title: Status and Management of Interior Stocks of Cutthroat Trout
Source: American Fisheries Society Symposium 4. 140 p.
Year: 1988

Author(s): Gronski, A.
Title: Sullivan Lake Archaeological Site 45PO148 Washington Archaeological Site Inventory Form.
Source: Colville National Forest 13 p.
Year: 1985

Author(s): Haas, G. R., and J. D. McPhail
Title: Systematics and distributions of dolly varden (Salvelinus malma) and bull trout (Salvelinus confluentus) in North America.
Source: Can. J. Fish. Aquat. Sci. 48(11): 2191-211.
Year: 1991

Author(s): Hall, G.E. and M.J. Van Den Avyle
Title: Reservoir Fisheries Management - Strategies for the 80's.
Source: American Fisheries Society - Southern Division. A National Symposium on Managing. 327 p.
Year: 1986

Author(s): Hartmann, G. D.
Title: Proposal for a Cultural Resources Survey of Seattle City Lights Boundary Hydroelectric Project.
Source: Archaeological and Historical Services. 9 p.
Year: 1983

Author(s): Harza Engineering Co.
Title: Expansion of the Boundary Hydroelectric Project, Project planning report
Source: Prepared by Harza Engineering Co for Seattle City Light, March, 1981. 162 p.
Year: 1981

Author(s): Heimer, J. T.
Title: Idaho Department of Fish and Game, Lake and Reservoir Investigations; Survival and growth of resident and stocked cutthroat trout in Priest and Upper Priest Lakes, Introduction of opossum shrimp into Idaho Lakes.
Source: Idaho Department of Fish and Game, Annual Completion Report, Project F-53-R-4, Jobs 6 & 10. 29 p.
Year: 1969

Author(s): Higginbotham, F.
Title: Russian Creek Mining Camp CNF-136 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1982

Author(s): Higginbotham, F.
Title: Frisco Standard Cabin No. 1 CNF-134 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 6 p.
Year: 1982

Author(s): Higginbotham, F.
Title: Mining Cabin-Russian Creek CNF-137 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1982

Author(s): Higginbotham, F.
Title: Mine Drilling Tower-Russian Creek CNF-135 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 7 p.
Year:

Author(s): Higginbotham, Fred
Title: Lehigh Cement Company Temporary Road Cultural Resource Reconnaissance Report
Source: Colville National Forest, Sullivan Lake District
Year: 1983

Author(s): Hillman, T.W., and W.S. Platts
Title: Survey plan to detect the presence of bull trout.
Source: Don Chapman Consultants, Inc. Prepared for Intermountain Forest Industry Association, Coeur d'Alene, Idaho. 52 p.
Year: 1993

Author(s): Hobbs, June
Title: Historic Site Guides of Pend Oreille County
Source: Pend Oreille Historical Society
Year: 1985

Author(s): Hoelscher, B., E. C. Bowles and V.L. Ellis
Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.
Source: Annual Progress Report for FY 1989, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 62 p.
Year: 1990

Author(s): Hoelshcer, B., J. Skille and G. Rothrock.
Title: Phase 1 Diagnostic and feasibility analysis: A strategy for managing the water quality of Pend Oreille Lake.
Source: Idaho Department of Health and Welfare, Division of Environmental Quality. 14 p.
Year: 1993

Author(s): Holstine, C.
Title: Cultural Resources Surveys of Two Locations in the Seattle City Light Department's Boundary Hydroelectric Project, Pend Oreille County, Washington.
Source: Archaeological and Historical Services. 10 p.
Year: 1983

Author(s): Holstine, C.
Title: Lead King Mine 45PO131H Washington Archaeological Site Inventory Form.
Source: Archaeological and Historical Services. 4 p.
Year: 1983

Author(s): Holstine, C.
Title: A Cultural Resources Survey of the Bonneville Power Administration's Proposed Boundary-Spokane/Colville Valley Transmission Line Project, Pend Oreille, Stevens, and Spokane Counties, Washington.
Source: Archaeological and Historical Services. 59 p.
Year: 1984

Author(s): Homa, J. Jr.
Title: Feasibility report and plan, Seattle City Light Boundary Reservoir, FERC Project No. 2144 License article 51 -- reservoir fluctuations, Pend Oreille River, Pend Oreille County, Washington.
Source: Prepared by Ichthyological Associates, Inc for Seattle City Light, October 1982. 239 p.
Year: 1982

Author(s): Horner, N. J., L. D. LaBolle, and C. A. Robertson
Title: Idaho Department of Fish and Game regional fisheries management investigations; Region 1 mountain lakes, lowland lakes investigations, rivers and streams investigations, and technical guidance.
Source: Idaho Department of Fish and Game, Job Performance Report, Project F-71-R-11, Job Nos.1a-d. 149 p.
Year: 1987

Author(s): Hudson, L. and S. Boswell,
Title: A Cultural Resource Overview for the Colville and Idaho Panhandle National forests and the Bureau of Land Management-Spokane and Coeur d'Alene Districts, Northeastern Washington/Northern Idaho, Volume 1, Cultural Resources Narrative.
Source: Cultural Resource Consultants, Inc. Sandpoint, ID. 368 p.
Year: 1981

Author(s): Idaho and Washington Northern Railroad
Title: Idaho & Washington Northern Railroad, Pend Oreille River Route
Source: Pend Oreille Historical Society
Year: 1920

Author(s): Idaho Department of Health and Welfare.
Title: Compilation of Water Quality Study Efforts on Pend Oreille Lake 1984-'88: Bonner & Kootenai Counties, Idaho.
Source: Department of Health and Welfare, Division of Environmental Quality, Boise, ID.
Year: 1989

Author(s): Idaho Department of Health and Welfare.
Title: Compilation of water quality study efforts on Pend Oreille Lake 1984-'88.
Source: Idaho Department of Health and Welfare, Division of Environmental Quality, Boise, ID. 42 p.
Year: 1989

Author(s): Ione Gazette
Title: Advertisement for Z Canyon Consolidated Mines Company
Source: Ione Gazette
Year: 1935

Author(s): Irizarry, R. A.
Title: Survival, distribution, and use of Mysis relicta by game fish species in north Idaho lakes.
Source: Idaho Department of Fish and Game, Lake and Reservoir Investigations, Job Performance Report, Project F-53-R-9, Job No. VI-a. 62 p.
Year: 1974

Author(s): Irizarry, R. A.
Title: Idaho Department of Fish and Game, Lake and Reservoir Investigations; Lake Pend Oreille creel census, Clark Fork River fishery investigations.
Source: Idaho Department of Fish and Game, Job Performance Reports, Project F-53-R-6, Jobs IV-a-b. 29 p.
Year: 1971

Author(s): Irizarry, R. A. and Bowler, B.
Title: Idaho Department of Fish and Game, Lake and reservoir investigations; Lake Pend Oreille creel census, Clark Fork River Census, and Kokanee spawning trends.
Source: Idaho Department of Fish and Game, Job Performance Reports, Project F-53-R-9, Jobs IV-a-c. 15 p.
Year: 1974

Author(s): Irizarry, R., V. Ellis, B. Bowler, B. Rieman, M.C. Falter, B. Bowler
Title: Lake and reservoir investigations: Job IV-a, Lake Pend Oreille creel census; Job IV-c, Kokanee spawning trends; Job IV-d, Lake Pend Oreille limnological studies; Job IV-e, Lake Pend Oreille kokanee life history studies.
Source: Idaho Department of Fish and Game, Job Performance Report, Project F-52-R-11, June, 1976. 209 p.
Year: 1976

Author(s): Irving, David
Title: Pend Oreille Trout and Char Life History Study.
Source: Idaho Department of Fish and Game in cooperation with Lake Pend Oreille Idaho Club. 78 p.
Year: 1986

Author(s): Jackson, B
Title: Cultural Resources Evaluation of the Boundary Dam Reservoir.
Source: Laboratory of Archaeology and History. 5 p.
Year: 1981

Author(s): Jeppson, P.
Title: Evaluation of spawning areas in Lake Pend Oreille and tributaries upstream from Albeni Falls Dam in Idaho, April 1, 1954 -- May 31, 1955, including supplemental information on the life history of kokanee.
Source: Idaho Department of Fish and Game, Annual Summary Report, Investigations Project F 3-R-4 and F 3-R-5 (Work Plan 2). 36 p.
Year: 1955

Author(s): Jordan, M. and R. Starkey.
Title: Status Report on Wildlife Mitigation - Boundary Dam and Reservoir.
Source: Wa. Dept. Game/USFWS. 37p.
Year: 1984

Author(s): Juhl, Maxine Howland
Title: Maxine Howland Juhl Photographs
Source: Metaline Falls Library
Year: N/A

Author(s): Kann, J. and C. M. Falter
Title: Periphyton as indicators of enrichment in Lake Pend Oreille, Idaho.
Source: Lake and reservoir management 5(2):39-48. (NALMS)
Year: 1989

Author(s): Kann, J., and C. M. Falter.
Title: Periphyton as indicators of Enrichment in Lake Pend Oreille, Idaho.
Source: Lake and Reservoir Management. 5(2). pp. 39-48.
Year: 1989

Author(s): Kitano, S., K. Maekawa, S. Nakano, and K. D. Fausch
Title: Spawning behavior of bull trout in the upper Flathead drainage, Montana, with special reference to hybridization with brook trout.
Source: Trans. Am. Fish. Soc. 123(6): 988-92.
Year: 1994

Author(s): Klavano, W. C.
Title: Biological and economic survey of fishery resources in Lake Pend Oreille: Creel census and limnological studies Lake Pend Oreille, 1951 to 1958.
Source: Idaho Department of Fish and Game, Federal Aid to Fish Restoration, Final Report, Project F 3-R-10. 42 p.
Year: 1960

Author(s): Knokey, J.
Title: Historic Cabin, Mining Adit, and Tailings Pile 45PO199H Washington Archaeological Site Inventory Form.
Source: Bureau of Land Management. 5 p.
Year: 1988

Author(s): Larson, W. E.
Title: Request for Review and Comment on Expansion of Boundary Dam Project.
Source: Harza Engineering Company. 18 p.
Year: 1980

Author(s): Lasota, Felix, F. Libra and Margaret McInturff
Title: The Metalines and Pend Oreille County
Source: Metaline Falls Library
Year: 1968

Author(s): Layser, E.F.
Title: Flora of Pend Oreille County, Washington.
Source: Washington State University. 146 p.
Year: 1980

Author(s): Leary, R. F., F. W. Allendorf, and S. H. Forbes
Title: Conservation genetics of bull trout in the Columbia and Klamath River drainages.
Source: Conservation Biol. 7(4): 856-65.
Year: 1993

Author(s): Leathe, S. A., and P. J Graham
Title: Flathead Lake fish food habits study.
Source: Montana Department of Fish, Wildlife and Parks, Helena. 105 p.
Year: 1981

Author(s): Leonard W.P., H.A. Brown, et al.
Title: Amphibians of Washington and Oregon.
Source: Seattle Audubon Society, Seattle Washington. 168 p.
Year: 1993

Author(s): Libra, J.
Title: Metaline 45PO124H Washington Archaeological Resource Center Master Site File.
Source: Pend Oreille County Historical Society. 2 p.
Year: 1971 (ca.)

Author(s): Libra, J.
Title: Metaline 45PO124H National Register of Historic Places Inventory Nomination Form.
Source: Pend Oreille Historical Society. 7 p.
Year: 1971

Author(s): Local volunteers
Title: Metaline Falls Library History Files, Box 1
Source: MFL Volunteer Association
Year: N/A

Author(s): Mallet, J.
Title: Biological and economic survey of fishery resources in Lake Pend Oreille; the Lake Pend Oreille creel census and life history studies, 1967.
Source: Idaho Department of Fish and Game, Annual Report, Boise. May 20, 1968. 18 p.
Year: 1968

Author(s): Margaret McInturff
Title: Juanita Samms Rogich
Source: Sullivan Lake Ranger District
Year: 1970

Author(s): Marie Newman
Title: Photo Album Number 6
Source: Metaline Falls Library
Year: N/A

Author(s): Marotz, B., and J. Fraley
Title: Instream Flows Needed for Successful Migration Spawning and Rearing of Rainbow and Westslope Cutthroat Trout in Selected Tributaries of the Kootenai River.
Source: DOE Report No. DOE/BP/23666--1; Bonneville Power Administration BPA 85-6. Dept. of Energy. 177 p.
Year: 1986

Author(s): Mason, Andrew C.
Title: Cultural Resource Report Arden Tree Farms Land Exchange
Source: Colville National Forest, Sullivan Lake District
Year: 1988

Author(s): Matson, D.
Title: Russian Creek Mining Cabin Site Form.
Source: Colville National Forest. 6 p.
Year: 1986

Author(s): McLaughlin, W. and N. Sanyal.
Title: Regional Recreation and Tourism Characteristics of Box Canyon Reservoir, Completion Report 1989-1990, Section 1: Recreation.
Source: University of Idaho. Pend Oreille County PUD. 84 p.
Year: 1991

Author(s): Miller, P. and J. Ogmundson
Title: Box Canyon Mine Site CNF-808 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1991

Author(s): Miller, Penny
Title: Brick Kiln Cultural Resource Inventory Record Form, Site number CNF-869.
Source: Colville National Forest, Sullivan Lake District
Year: 1991

Author(s): Miller, Penny
Title: Exposure/Snyder Timber Sale
Source: Colville National Forest, Sullivan Lake District
Year: 1991

Author(s): Miller, Penny
Title: H. Holtz Cabin, Cultural Resource Inventory Record Form, Site number CNF-871.
Source: Colville National Forest, Sullivan Lake District
Year: 1991

Author(s): Miller, Penny
Title: Frank Smith's Cabin Cultural Resource Inventory Form, Site number CNF-870.
Source: Colville National Forest, Sullivan Lake District
Year: 1991

Author(s): Miss, C.
Title: River Landing 45PO122H Washington Archaeological Resource Center Master Site File.
Source: Bureau of Land Management, Spokane District. 3 p.
Year: 1981

Author(s): Miss, C.
Title: Cabin 45PO121H Washington Archaeological Resource Center Master Site File.
Source: Bureau of Land Management, Spokane District. 3 p.
Year: 1981

Author(s): Mongillo, P.
Title: The distribution and status of bull trout/Dolly Varden in Washington State.
Source: Washington Fisheries Management Division Rept. #92-22, Appendix B. Washington Dept. of Wildlife, Fisheries Management Division, Olympia.
Year: 1992

Author(s): Montana Bull Trout Restoration Team
Title: Blackfoot River bull trout status report.
Source: Report prepared by the Montana Bull Trout Scientific Group. Montana Bull Trout Restoration Team, Helena, Montana. 38 p.
Year: 1995

Author(s): Montana Bull Trout Restoration Team
Title: Upper Clark Fork River drainage bull trout status report (including Rock Creek).
Source: Report prepared by the Montana Bull Trout Scientific Group. Montana Bull Trout Restoration Team, Helena, Montana. 40 p.
Year: 1995

Author(s): Moody, S.S.
Title: Letter from S. Swope Moody, Washington Natural Heritage Program to R. Tressler, EDAW, Inc., July 3, 1996.
Source: Washington Natural Heritage Program. 4 p.
Year: 1996

Author(s): Moring, J. R.
Title: Effect of angling effort on catch rate of wild salmonids in streams stocked with catchable-size trout.
Source: N. Am. J. Fish. Manage. 13(2): 234-37.
Year: 1993

Author(s): Mrs. Lasota
Title: The Jens Jenson Collection
Source: Metaline Falls Library
Year: 1972

Author(s): N/A
Title: Various images from Wolf album #3
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Metaline Falls Library History Files, Box 4
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Metaline Falls Library History Files, Box 3
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Metaline Falls Library History Files, Box 2
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: "Steamboats - Pend Oreille River" (File)
Source: Pend Oreille Historical Society
Year: ca. 1960

Author(s): N/A
Title: "Pend Oreille River - Z Canyon" (File)
Source: Pend Oreille Historical Society
Year: ca. 1950

Author(s): N/A
Title: Kristin: Pend Oreille River Notes
Source: Pend Oreille Historical Society
Year: 1987

Author(s): N/A
Title: Metaline Falls
Source: Pacific Magazine/Seattle Times
Year: 1996

Author(s): N/A
Title: Photo Album
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: "Photos" envelope
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Facts of Pend Oreille County
Source: Pend Oreille Historical Society
Year: ca. 1960

Author(s): N/A
Title: Personal Histories of North Pend Oreille County Residents
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Photo Album (in notebook binder)
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Boundary Dam to have largest underground powerhouse in the U.S.
Source: Newport Miner
Year: 10/7/1965

Author(s): N/A
Title: Oscar Wolf Photo Album
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: "Holiday Classics"
Source: Metaline Falls Library
Year: N/A

Author(s): N/A
Title: Untitled photo album
Source: Metaline Falls Library
Year: N/A

Author(s): O'Brien, Father John
Title: Indian Lore
Source: Pend Oreille Historical Society
Year: 1968

Author(s): Ogmundson, J.
Title: Siegel Homestead CNF-480 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 6 p.
Year: 1986

Author(s): Ogmundson, J.
Title: Chinaman's Ditch 5101-1 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 7 p.
Year: 1990 (ca.)

Author(s): Ogmundson, J.
Title: McInnis's Neighbor CNF-481 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 8 p.
Year: 1986

Author(s): Ogmundson, J.
Title: Outhouse 5201-2 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1989

Author(s): Ogmundson, J.
Title: McInnis Homestead CNF-482 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1986

Author(s): Ogmundson, J. and J. Strelnik
Title: Pocahontas Cave 5201-4 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1987

Author(s): Ogmundson, J. and J. Strelnik
Title: Sand Creek Cabin 5201-2 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1989

Author(s): Ogmundson, J. and J. Strelnik
Title: Wolf Quarry 5201-3 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1987

Author(s): Ogmundson, J. and J. Strelnik
Title: Maggie Young Homestead 5201-8 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1987

Author(s): Ogmundson, J. and J. Strelnik
Title: Kelly Pole Camp 5201-5 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1989 (ca.)

Author(s): Ogmundson, J. and J. Strelnik
Title: Sawmill Meadow Site 5301-1 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1987

Author(s): Ogmundson, J. and J. Strelnik
Title: IOOF Cemetery 5201-7 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 9 p.
Year: 1987

Author(s): Ogmundson, John
Title: Cultural Resource Reconnaissance Report Timber Mite Timber Sale
Source: Forest Service/OAHP
Year: 1990

Author(s): Ogmundson, John
Title: Top-of-Cement Timber Sale USDA Forest Service/Washington State Historic Preservation Office Cultural Resource Reconnaissance Report
Source: Forest Service/OAHP
Year: 1988

Author(s): Ogmundson, John
Title: Warner Bros. Film Sites, CRM #5-135
Source: 2360 Heritage Resources
Year: 1997

Author(s): Ogmundson, John
Title: Washington Resources Land Exchange
Source: 2360 Heritage Resources
Year: 1991

Author(s): Ogmundson, John
Title: Pocahontas Timber Sale Cultural Resource Inventory
Source: Colville National Forest, Sullivan Lake District
Year: 1981

Author(s): Ogmundson, John
Title: Cominco Test Drilling CRM #5-125.
Source: 2360 Heritage Resources
Year: 1996

Author(s): Ogmundson, John
Title: North 31 Timber Sale Cultural Resource Inventory
Source: Colville National Forest
Year: 1981

Author(s): Ogmundson, John
Title: Cominco Test Drilling #2, CRM #5-139.
Source: 2360 Heritage Resources
Year: 1997

Author(s): Ogmundson, John
Title: Del Norte Salvage Timber Sale
Source: 2360 Heritage Resources
Year: 1992

Author(s): Ogmundson, John
Title: Cultural Resource Reconnaissance Report for Precommmercial Thinning 1995
Source: 2360 Heritage Resources
Year: 1995

Author(s): Ogmundson, John
Title: Wolf Man Timber Sale Cultural Resource Reconnaissance Report
Source: Colville National Forest
Year: 1995

Author(s): Ogmundson, John
Title: Flume Mountain Wildlife Burn, CRM #5-114
Source: 2360 Heritage Resources
Year: 1994

Author(s): Ogmundson, John
Title: Heritage Resources Report for Cominco Test Drilling #2, CRM #5-139
Source: Colville National Forest, Sullivan Lake District
Year: 1997

Author(s): Ogmundson, John
Title: Wolf Creek Spring Boxes, Cultural Resource Inventory Site Form, CNF - 1098
Source: Colville National Forest, Sullivan Lake District
Year: 1993

Author(s): Ogmundson, John
Title: Heritage Report for R. Hanlin, Special Use Permit
Source: Colville National Forest, Sullivan Lake District
Year: 1994

Author(s): Ogmundson, John
Title: Horse Skid Trail Cultural Resource Inventory Record Form, Site Form Number CNF-1211.
Source: Colville National Forest, Sullivan Lake District
Year: 1997

Author(s): Ogmundson, John and Jill Strelnik
Title: Little Wolf Timber Sale Cultural Reconnaissance Report
Source: Colville National Forest, Sullivan Lake District
Year: 1987

Author(s): Ogmundson, John and Penny Miller
Title: Russian/Fence Timber Sale
Source: Colville National Forest
Year: 1991

Author(s): Olmsted, T (Hart Crowser & Associates)
Title: Slope stability/erosion assessment, Boundary Project, Seattle City Light.
Source: Letter of comments from Hart Crowser & Associates to Shapiro and Associates, April 27, 1984. 15 p.
Year: 1984

Author(s): Osborn, J.
Title: Boundary Dam Access Road Seattle City Light, Cultural Resource Reconnaissance.
Source: Colville National Forest. 22 p.
Year: 1983

Author(s): Osborn, J.F.
Title: Engineering Aspects of the Boundary Reservoir Waterfowl Habitat Improvement Project at Site RM32.8W on the Pend Oreille River in Northeast Washington.
Source: Seattle City Light, Office of Environmental Affairs. 51 p.
Year: 1983

Author(s): Osborn, Jill
Title: Top-of-Five Timber Sale Forest Service Cultural Resources Inventory Consultation
Source: Colville National Forest
Year: 1981

Author(s): P.U.D. No. 1 of Pend Oreille County
Title: The Pend Oreille Story.
Source: P.U.D. No. 1 of Pend Oreille County. 15 p.
Year: 1959

Author(s): Pacific Builder and Engineer
Title: Inland Portland Cement Plant at Metaline Falls.
Source: Pacific Builder and Engineer. January 6, 1912. 3 p.
Year: 1912

Author(s): Pacific Wetland Nursery, Inc.
Title: Boundary Wildlife Preserve 1992 Vegetation and Wildlife Monitoring and Photodocumentation.
Source: Prepared by Pacific Wetland Nursery, Inc. for Seattle City Light. 13 p.
Year: 1992

Author(s): Paragamian, V. L. and E. C. Bowles
Title: Factors affecting survival of kokanees stocked in Lake Pend Oreille, Idaho.
Source: North American Journal of Fisheries Management 15: 208-219.
Year: 1995

Author(s): Paragamian, V. L., V.L. Ellis, and R. Gariss
Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.
Source: Annual Progress Report for FY 1990, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 69 p.
Year: 1991

Author(s): Paragamian, V. L., V.L. Ellis, and S. Andersen
Title: Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho.
Source: Annual Progress Report for FY 1991, Bonneville Power Administration, Contract No. DE-A179-85BP22493, Project No. 85-339. 73 p.
Year: 1993

Author(s): Parametrix, Inc.
Title: Boundary Dam Wildlife Mitigation Project Vegetation and Wildlife Survey Final Report.
Source: Prepared by Parametrix, Inc. for Seattle City Light.
Year: 1987

Author(s): Pelletier, G. and R. Coots
Title: Progress Report No. 1 - Pend Oreille River Water Quality Study.
Source: Washington Department of Ecology. Environmental Investigations and Laboratory Services Program. Surface Water Investigation Section. Olympia, Washington. 61 p.
Year: 1990

Author(s): Pelletier, G. and R. Coots.
Title: Pend Oreille River water quality study.
Source: Progress Report No. 1, Pend Oreille River water quality study. Washington State Department of Ecology, Olympia, WA. 61 p.
Year: 1990

Author(s): Pend Oreille County Economic Development Council
Title: Pend Oreille County Travel Guide.
Source: Pend Oreille County Economic Development Council. 8 p.
Year: 1994

Author(s): Pend Oreille County PUD
Title: People and Power - A Special Edition Publication of the Pend Oreille PUD.
Source: Pend Oreille County PUD. 2 p.
Year:

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1979)
Source: Pend Oreille Historical Society
Year: 1979

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1991)
Source: Pend Oreille Historical Society
Year: 1991

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1988)
Source: Pend Oreille Historical Society
Year: 1988

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1990)
Source: Pend Oreille Historical Society
Year: 1990

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1983)
Source: Pend Oreille Historical Society
Year: 1983

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1981)
Source: Pend Oreille Historical Society
Year: 1981

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1978)
Source: Pend Oreille Historical Society
Year: 1978

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1968)
Source: Pend Oreille Historical Society
Year: 1968

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1972)
Source: Pend Oreille Historical Society
Year: 1972

Author(s): Pend Oreille Historical Society
Title: The Big Smoke (1977)
Source: Pend Oreille Historical Society
Year: 1977

Author(s): Phillips, R. B., S. A. Manley, and T. J. Daniels
Title: Systematics of the salmonid genus Salvelinus inferred from ribosomal DNA sequences.
Source: Can. J. Fish. Aquat. Sci. 51(Suppl. 1): 198-204.
Year: 1994

Author(s): Pine, R.E., E. Asselstine, H. Sparrow, and L. Hiebert
Title: An Investigation of the Water Quality of the Lower Pend d' Oreille River, 1962-1963.
Source: Research Bulletin 64-1. Washington Pollution Control Commission. British Columbia Department of Recreation and Conservation, Fish and Game Branch. West Kootenay Health Unit, Trail, B.C. 27 p.
Year: 1964

Author(s): Platts, W. S.
Title: Relationships among stream order, fish populations, and aquatic geomorphology in an Idaho River drainage.
Source: Fisheries 4(2): 5-9.
Year: 1979

Author(s): Platts, W.S., M. Hill, T.W. Hillman, and M.D. Miller
Title: Preliminary status report on bull trout in California, Idaho, Nevada, Oregon, and Washington.
Source: Don Chapman Consultants. Prepared for Intermountain Forest Industry Association, Coeur d'Alene, Idaho. 129 p.
Year: 1993

Author(s): Pratt, K.L., and J.E. Huston
Title: Status of bull trout (Salvelinus confluentus) in Lake Pend Oreille and the lower Clark Fork River.
Source: Report prepared for Washington Water Power Company, Spokane, Washington. 108 p.
Year: 1993

Author(s): Public Utility District No. 1 of Pend Oreille County.
Title: Box Canyon Hydro-electric Project.
Source: Pend Oreille County Public Utility District. 4 p.
Year:

Author(s): Raleigh, R.F.
Title: Habitat Suitability Index Models: Brook Trout
Source: U.S. Department of Interior, Fish and Wildlife Service FWS/OBS-82/10.24. 41 p.
Year: 1982

Author(s): Raleigh, R.F., L.D. Zuckerman, and P.C. Nelson
Title: Habitat Suitability Index Model and Instream Flow Suitability Curves: Brown trout, revised.
Source: U.S. Fish and Wildlife Service Biological Report 82(10.124). 64 p.
Year: 1986

Author(s): Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson
Title: Habitat Suitability Information: Rainbow Trout.
Source: U.S. Fish and Wildlife Service FWS/OBS-82/10.60. 64 p.
Year: 1984

Author(s): Reese, K.P. and J. Hall.
Title: Water Quality, Fish and Wildlife Characteristics of Box Canyon Reservoir, Washington. Completion Report 1989-1990. Section 4: Wildlife and Riparian.
Source: University of Idaho. 93 p.
Year: 1991

Author(s): Rieman, B. E., and J. D. McIntyre
Title: Occurrence of bull trout in naturally fragmented habitat patches of varied size.
Source: Trans. Am. Fish. Soc. 124(3): 285-96.
Year: 1995

Author(s): Rieman, B. E., and J. D. McIntyre
Title: Demographic and habitat requirements for conservation of bull trout.
Source: Gen. Tech. Rept. INT-302. U.S. Dept. of Agriculture, Forest Service, Intermountain Research Station. Ogden, Utah. 38 p.
Year: 1993

Author(s): Rieman, B.E. and C. M. Falter
Title: Effects of the establishment of Mysis relicta on the macrozooplankton of a large lake.
Source: Transactions of the American Fisheries Society 110: 613-620.
Year: 1981

Author(s): Rominger, E.M., and J.L. Oldemeyer.
Title: Early-winter habitat of woodland caribou, Selkirk Mountains, British Columbia.
Source: J. Wildl. Manage. 53:238-243.
Year: 1989

Author(s): Schroeder, J.M.
Title: Letter from J.M Schroeder to R. Burnell, Bureau of Land Management District Manager, Spokane, Wa. 27 October 1981.
Source: Private. 2 p.
Year: 1981

Author(s): Scott, W.B. and E.J. Crossman
Title: Freshwater Fishes of Canada.
Source: Bulletin 184. Fisheries Research Board of Canada, Ottawa. 966 p.
Year: 1973

Author(s): Seattle City Light
Title: The Boundary in Seattle City Light News, September 1967.
Source: Seattle City Light. 12 p.
Year: 1967

Author(s): Seattle City Light
Title: Plan for Providing Wildlife Mitigation: Planning Aspects of the Boundary Reservoir Waterfowl Habitat Improvement Project at Site 32.8 on the Pend Oreille River in Northeast Washington.
Source: Seattle City Light. 14p.
Year: 1984

Author(s): Seattle City Light
Title: "Boundary Dam Project" (File)
Source: Pend Oreille Historical Society
Year: ca. 1967

Author(s): Seattle City Light.
Title: Boundary Country - Discover the Secrets.
Source: Seattle City Light. 2 p.
Year: 1991

Author(s): Seattle City Light.
Title: Review Draft of Exhibit E Environmental Report to Support Application for Amendment to License for the Boundary Hydroelectric Development Project No. 2144. Chapter 3. Report on Fish, Wildlife, and Botanical Resources.
Source: Seattle City Light. 33 p.
Year: 1981

Author(s): Seattle City Light.
Title: Review Draft of Exhibit E -Environmental Report- to Support Application for Amendment to the License for the Boundary Hydro. Development Project No. 2144.
Source: Seattle City Light. 120 p.
Year: 1981

Author(s): Servheen, G., and L. J. Lyon.
Title: Habitat use by woodland caribou in the Selkirk Mountains.
Source: J. Wildl. Manage. 53:230-237.
Year: 1989

Author(s): Shapiro and Associates.
Title: Final Boundary Hydroelectric Project Sensitive, Threatened, and Endangered Species Survey.
Source: Prepared by Shapiro and Associates for Seattle City Light. 62 p.
Year: 1983

Author(s): Sheehan, S.W. and M. Lamb
Title: Water Chemistry of the Columbia and Pend d'Oreille Rivers near the International Boundary (Data Report)
Source: Inland Waters and Lands. Pacific and Yukon Region. Vancouver, B.C. 311 p.
Year: 1987

Author(s): Sigler W.F. and J.W. Sigler
Title: Fishes of the Great Basin - A Natural History.
Source: University of Nevada Press. 424 p.
Year: 1987

Author(s): Simpson, J. and R. Wallace
Title: Fishes of Idaho.
Source: The University Press of Idaho, A Division of The Idaho Research Foundation, Inc. Moscow. 237 p.
Year: 1978

Author(s): Skillingstad, T. and A. T. Scholz.
Title: Trends in water quality in the Box Canyon Reservoir of the Pend Oreille River adjacent to the Kalispel Indian Reservation.
Source: (Fisheries Technical Report No. 44). Upper Columbia United Tribes Fisheries Center, Eastern Washington University, Cheney, WA. 78 p.
Year: 1993

Author(s): Skillingstad, T. H., B. L. Ashe and A. T. Scholz.
Title: An assessment of the Pend Oreille River, WA receiving effluent from a thermomechanical newsprint mill: 1991/92 post-operation report.
Source: (Fisheries Technical Report No. 47). Upper Columbia United Tribes Fisheries Center, Eastern Washington University, Cheney, WA. 291 p.
Year: 1993

Author(s): Soderberg, L.
Title: Idaho and Washington Northern Railroad 45PO132H Office of Archaeology and Historic Preservation Archaeological Site Form.
Source: Office of Archaeology and Historic Preservation. 2 p.
Year: 1979

Author(s): Soderberg, L.
Title: Idaho and Washington Northern Railroad Bridge 45PO132H Historic American Engineering Record (HAER) Inventory.
Source: Office of Archaeology and Historic Preservation. 14 p.
Year: 1979

Author(s): Soderberg, L.
Title: Inland Portland Cement Company or Lehigh Cement Company HAER Inventory.
Source: Office of Archaeology and Historic Preservation. 5 p.
Year: 1982

Author(s): Steen, Mabel
Title: Settling of Land Along the Pend Oreille River
Source: Pend Oreille Historical Society
Year: ca. 1969

Author(s): Stelfox, J. D., and K. L. Egan
Title: Bull trout investigations in the Smith-Dorrien Creek/Lower Kananaskis Lake System.
Source: Alberta Environmental Protection, Fisheries Management Division, Calgary, Alberta. 148 p.
Year: 1995

Author(s): Strelnik, J.
Title: Sullivan Lake Dam 45PO102H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 2 p.
Year: 1979

Author(s): Strelnik, J.
Title: Diamond Mill Site 45PO104H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest.
Year: 1979

Author(s): Strelnik, J.
Title: Boundary Cabin 45PO86H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1979

Author(s): Strelnik, J.
Title: 45PO83H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 6 p.
Year: 1979

Author(s): Strelnik, J.
Title: Sullivan Creek Bridge 45PO103H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 1 p.
Year: 1979

Author(s): Strelnik, J.
Title: Mid-Mountain Housepits 45PO99 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 2 p.
Year: 1980

Author(s): Strelnik, J.
Title: White Warehouse Foundation 45PO105H USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 2 p.
Year: 1979

Author(s): Strelnik, J.
Title: Etta Cleary Homestead CNF-465 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 9 p.
Year: 1987

Author(s): Strelnik, J.
Title: Sand Creek Lookout CNF-150 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1982

Author(s): Strelnik, J.
Title: Solitary Housepit 45PO98 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1980

Author(s): Strelnik, Jill
Title: Complete Cultural Resources Survey Report, Lots 8 and 9, Section 19, T38N, R43E, Pend Oreille County Washington, Sullivan Lake District (Mid-mountain and Exchange File #80-03)
Source: Colville National Forest
Year: 1980

Author(s): Stuber, R.J.
Title: Habitat Suitability Index Models: Black Bullhead.
Source: U.S. Department of Interior, Fish and Wildlife Service. 26 p.
Year: 1982

Author(s): Stuber, R.J., G.Gebhart, and O.E. Maughan
Title: Habitat Suitability Index Models: Largemouth Bass.
Source: U.S. Department of Interior, Fish and Wildlife Service. FWS/OBS-82/10.16. 33 p.
Year: 1982

Author(s): The Newport and Gem State Miner
Title: Pend Oreille River Valley 1996 Fishing Guide.
Source: The Newport and Gem State Miner. 8 p.
Year: 1996

Author(s): Thiesfeld, S.L., A.M. Stuart, D. E. Ratliff, and B.D. Lampman
Title: Migration patterns of adult bull trout in the Metolius River and Lake Billy Chinook, Oregon.
Source: Information Report 96-1. Oregon Dept. of Fish and Wildlife, Fish Division, Portland, Oregon. 18 p.
Year: 1996

Author(s): Thomas, Ginger
Title: Status report: Bull trout in Montana.
Source: Report prepared for Montana Dept. of Parks, Fish, Wildlife and Parks. Ginger Thomas, Consultant, Livingston, Montana. 67 p.
Year: 1992

Author(s): Thompson, G.
Title: Cultural Resources Fieldwork for Five Proposed Rubble Disposal Areas near Boundary Dam.
Source: Ertec Northwest, Inc. 4 p.
Year: 1982

Author(s): U.S. Environmental Protection Agency.
Title: Clark Fork - Pend Oreille Basin water quality study: A summary of findings and a management plan.
Source: United States Environmental Protection Agency Regions VIII and X. Report for Section 525 of the Clean Water Act of 1987. 63 p.
Year: 1993

Author(s): U.S. Fish and Wildlife Service
Title: Recycling petition finding on a petition to list bull trout under the endangered species act.
Source: Letter dated May 31, 1995. Regional Director, U.S. Fish and Wildlife Service, Portland, Oregon. 33 p.
Year: 1995

Author(s): U.S. Fish and Wildlife Service.
Title: Grizzly Bear Recovery Plan.
Source: U.S. Fish and Wildlife Service, Missoula, MT. 181 p.
Year: 1993

Author(s): U.S. Fish and Wildlife Service.
Title: Recovery Plan for the Pacific Bald Eagle.
Source: U.S. Fish and Wildlife Service. 162 p.
Year: 1986

Author(s): U.S. Fish and Wildlife Service.
Title: National Wetland Inventory - Boundary Dam Quadrangle.
Source: U.S. Fish and Wildlife Service. 1 p.
Year: 1987

Author(s): U.S. Fish and Wildlife Service.
Title: National Wetland Inventory - Metaline Falls Quadrangle.
Source: U.S. Fish and Wildlife Service. 1 p.
Year: 1987

Author(s): U.S. Fish and Wildlife Service.
Title: National Wetland Inventory - Metaline Quadrangle.
Source: U.S. Fish and Wildlife Service. 1 p.
Year: 1987

Author(s): U.S. Forest Service
Title: Inland native fish strategy.
Source: Federal Register 60(49):13697-13698.
Year: 1995

Author(s): U.S. Forest Service, Colville National Forest.
Title: Celebrating Wildflowers.
Source: U.S. Forest Service, Colville National Forest. 24 p.
Year:

Author(s): U.S. Forest Service, Idaho Panhandle Forests.
Title: Trees of North Idaho.
Source: U.S. Forest Service, Idaho Panhandle Forests. 17 p.
Year: 1981

Author(s): U.S. Geological Survey.
Title: Water resources data for Washington, water year 1976: Volume 2. Eastern Washington.
Source: U.S. Geological Survey. 344 p.
Year: 1976

Author(s): U.S. Geological Survey.
Title: Water resources data for Washington, water year 1975.
Source: U.S. Geological Survey. 684 p.
Year: 1975

Author(s): U.S. Geological Survey.
Title: Water resources data for Washington, water year 1978: Volume 2. Eastern Washington.
Source: U.S. Geological Survey. 360 p.
Year: 1978

Author(s): U.S. Geological Survey.
Title: Water resources data for Washington, water year 1977: Volume 2. Eastern Washington.
Source: U.S. Geological Survey. 419 p.
Year: 1977

Author(s): U.S.D.A., U.S. Forest Service.
Title: Final Environmental Impact Statement, Land and Resource Management Plan, Colville National Forest.
Source: U.S.D.A., U.S. Forest Service. 2000 p.
Year: 1988

Author(s): U.S.D.A., U.S. Forest Service.
Title: Land and Resource Management Plan (Forest Plan), Colville National Forest.
Source: U.S.D.A., U.S. Forest Service. 240 p.
Year: 1988

Author(s): US Army Corps of Engineers - Seattle District
Title: Albeni Falls Dam - Pend Oreille River, Northern Idaho.
Source: US Army Corp of Engineers. 2 p.
Year: 1977

Author(s): US Department of Agriculture - Forest Service
Title: Salmo-Priest Wilderness Guidebook.
Source: US Department of Agriculture - Forest Service. Pacific Northwest Region. Northern Region. 24 p.
Year: 1995

Author(s): US Forest Service - Pacific Northwest Region
Title: The Batey-Bould ORV Trail.
Source: US Forest Service - Pacific Northwest Region. 1 p.
Year: 1996

Author(s): US Surveyor General
Title: General Land Office Maps.
Source: Department of Natural Resources, WA State. 20 p.
Year: 1913

Author(s): USDA Forest Service
Title: Colville National Forest Map.
Source: USDA Forest Service. 2 p.
Year: 1992

Author(s): USDA Forest Service
Title: Lake Fishing Opportunities of the Colville National Forest.
Source: USDA Forest Service. 4 p.
Year: 1995

Author(s): USDA Forest Service - Newport Ranger District
Title: Middle Fork Calispell ORV Trail.
Source: USDA Forest Service. 2 p.
Year:

Author(s): USDA Forest Service.
Title: Sullivan Lake Ranger District Trail Guide.
Source: USDA Forest Service. 18 p.
Year: 1994

Author(s): Vandermeer, J.H.
Title: Lewis P. Larson House 45PO126H National Register of Historic Places--Nomination Form.
Source: Office of Archaeology and Historic Preservation. 16 p.
Year: 1978

Author(s): Vandermeer, J.H.
Title: Washington Hotel 45PO125H National Register of Historic Places Inventory--Nomination Form.
Source: Office of Archaeology and Historic Preservation. 14
Year: 1978

Author(s): Vandermeer, J.H.
Title: Lewis P. Larson House 45PO16H Washington Archaeological Resource Center Master Site File.
Source: Pend Oreille County Historical Society. 2 p.
Year: 1978

Author(s): Vandermeer, J.H.
Title: Washington Hotel 45PO125H Washington Archaeological Resource Center Master Site File.
Source: Office of Archaeology and Historic Preservation. 2 p.
Year: 1978

Author(s): Washington Department of Fish and Wildlife.
Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Metaline Falls Quadrangle.
Source: Washington Department of Fish and Wildlife. 1p.
Year: 1996

Author(s): Washington Department of Fish and Wildlife.
Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Boundary Dam Quadrangle.
Source: Washington Department of Fish and Wildlife. 1 p
Year: 1996

Author(s): Washington Department of Fish and Wildlife.
Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Metaline Falls Quadrangle.
Source: Washington Department of Fish and Wildlife. 1 p.
Year: 1996

Author(s): Washington Department of Fish and Wildlife.
Title: Washington Department of Fish and Wildlife Priority Habitats and Species - Metaline Quadrangle.
Source: Washington Department of Fish and Wildlife. 1 p.
Year: 1996

Author(s): Washington Department of Wildlife
Title: Bull trout/Dolly Varden management and recovery plan.
Source: Fisheries Management Division Rept. 92-22. Washington Dept. of Wildlife, Olympia. 125 p.
Year: 1992

Author(s): Washington Department of Wildlife.
Title: Flume Creek Mountain Goat Viewing Area.
Source: Washington Department of Wildlife. 4 p.
Year: 1990

Author(s): Washington State Department of Ecology.
Title: Water quality data, Metaline Falls Station No. 62A090.
Source: Water quality data. (Metaline Falls Station No. 62A090, 10/94-9/95). Washington State Department of Ecology, Olympia, WA. 1 p.
Year: 1995

Author(s): Washington State Historical Records Advisory Board
Title: Historical Records of Washington State.
Source: Washington State, pp. 99, 102-103.
Year: 1981

Author(s): Western Appraisals.
Title: Appraisal Report of LaFarge Property Located Adjacent to Seattle City Light Property Near Metaline in Pend Oreille County, Washington.
Source: Prepared by Western Appraisals for Seattle City Light. 66 p.
Year: 1994

Author(s): White, J.
Title: Cedar Creek Bridge CNF-709 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990

Author(s): White, J.
Title: John McBrides Place CNF-707 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990

Author(s): White, J.
Title: Sullivan Creek Dump CNF-666 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 5 p.
Year: 1990

Author(s): White, J.
Title: Fred Carlson Homestead CNF-708 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990

Author(s): White, J.
Title: Mr. McKinnons House CNF-710 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990

Author(s): White, J.
Title: Marie Reton Homestead CNF-705 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990 (ca.)

Author(s): White, J.
Title: Edwin Wise Homestead CNF-706 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990

Author(s): White, J. and J. Ogmundson
Title: Mr. Blazers Place CNF-711 USFS Cultural Resource Inventory Record Form.
Source: Colville National Forest. 4 p.
Year: 1990

Author(s): White, Jerry
Title: Three Mile Timber Sale
Source: Colville National Forest
Year: 1990

Author(s): Wielgus, R.B., F.L. Bunnell, et al.
Title: Population dynamics of Selkirk Mountain grizzly bears.
Source: J. Wildl. Manage. 58:266-272.
Year: 1994

Author(s): Works Progress Administration
Title: Inventory of County Archives of Washington.
Source: The Historical Records Survey, WPA. 82 p.
Year: 1937

Author(s): Wydoski, R.S. and R.R. Whitney
Title: Inland Fishes of Washington.
Source: University of Washington Press. Seattle and London. 220 p.
Year: 1979

Author(s): Yon, D.
Title: Boundary Project: Units 55 and 56 Addition Environmental Checklist Form.
Source: City of Seattle, City Light Department. 11 p.
Year: 1981

Author(s): Young, M. K. (editor)
Title: Conservation assessment for inland cutthroat trout.
Source: General Technical Report RM-256. Fort Collins, Co: U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.
Year: 1995

APPENDIX C

Report of Contacts

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Curt Vail

Affiliation: Wash. Dept. of Fish and Wildlife

Phone Number: 509-684-5742

Copies to:

Contacted By: Ed Connor, Al Solonsky (jointly)

Affiliation: R2, SCL

Date of Contact: 6/20/96

Reason for Contact: Curt Vail is the District Fish Biologist for WDFW located in Colville, Washington. He was contacted to determine the extent of fish data collected in the Pend Oreille River in the Boundary Hydroelectric Project area by WDFW and other agencies, and to identify the fish species present in the reservoir and surrounding drainage. In particular, the status of bull trout in the system was an item for discussion.

Summary of Discussion: Not much data has been collected to date in Boundary Reservoir. Most fish collection efforts in the area have been conducted in Box Canyon Reservoir (Dave Bennett, Univ. of Idaho, was mentioned as the author of several studies conducted in Box Canyon Reservoir). A bull trout study is being presently being conducted by the B.C. Ministry of Environment on the Salmo River (tributary to Seven-mile Reservoir). Recent fish collection efforts in Boundary Reservoir have been limited to hook-and-line surveys conducted jointly by Curt Vail and Tom Shudha (USFS, Colville National Forest); this effort took place two years ago. A scuba survey was conducted at the mouth of Sullivan Creek in Boundary Reservoir by Cascade Environmental Services and the USFS. However, few fish were observed during these surveys. It was mentioned that several USFS volunteers on this effort were not adept at fish identification. Tom Shudha has conducted some electrofishing in tributaries of Boundary Reservoir.

Fish species present in the vicinity of the reservoir include lake trout, yellow perch, and smallmouth bass. Brown trout and brook trout are also present in the drainage. Rainbow trout have been stocked in Boundary Reservoir in recent years by a net-pen program operated by the city of Metaline Falls. No kokanee have been found to have washed downstream from Lake Pend Oreille. Walleye were introduced into Box Canyon Reservoir (fry and adults), but did not persist in the reservoir Habitat conditions in Box Canyon Reservoir are considered too clear and too shallow for walleye. The North Pend Oreille Walleye Club is currently wanting to introduce this species into Boundary Reservoir, which is a much deeper the Box Canyon Reservoir.

Fisheries studies have been recently conducted by Cascade Environmental Services (CES), a

consultant to the Pend Oreille PUD. The PUD is attempting to get a FERC license for the Sullivan Creek Hydroelectric Project. This project originally abandoned due to flume reliability problems. Snorkeling and electrofishing surveys conducted by CES failed to find any bull trout in sampled sections of Sullivan Creek. No night snorkeling was conducted by CES; night snorkeling would probably be a better method for detecting bull trout. A dead bull trout was found immediately below the abandoned Sullivan Creek Project powerhouse in 1994; this fish was gutted and presumably caught by a poacher. Water temperatures in Sullivan Creek can become warm (around 60°F). Results of CES's study of Sullivan Creek are currently being prepared in a report by John Blumm. Fish present in Sullivan Lake include kokanee, burbot, and German brown trout. Burbot range from 3 to 4 pounds, and fish up to 8 pounds have been captured in the lake. Brown trout and rainbow trout are the main target for recreational fishing in Sullivan Lake; the State of Washington record brown trout was captured here. Cutthroat and eastern brook trout are present in Sullivan Creek above Mill Pond, which is located several miles above the confluence of this stream with Boundary Reservoir.

The are currently no fish management plans developed specifically for Boundary Reservoir. The BPA has funded a largemouth bass hatchery for the Kalispel Tribe for Box Canyon Reservoir. The Kalispel Tribe will be studying overwintering habitat for largemouth in this reservoir in the future (NWPPC program). Box Canyon Reservoir currently possesses a high biomass of whitefish, yellow perch, and squawfish. These fish are very abundant, and tend to be stunted in size. In contrast, Boundary Reservoir has a much lower abundance of fish, and has much higher aesthetic qualities. Boundary Reservoir has lots of deep water, higher currents, a much more complex shoreline, and is not as accessible to recreational fishing as Box Canyon Reservoir. There are only two boat ramps on Boundary Reservoir: the most upstream is located at the town of Metaline, the most downstream is located just above Boundary Dam.

Bull trout appear to be very rare in this system. This species has been found in tributaries to Box Canyon Reservoir (e.g., Clear Creek drainage). Bull trout in this system might also be found in LeClerk Creek. However, only about a dozen bull trout have been found in tributary surveys conducted by the Kalispel Tribe and WDFW during recent years. Tributary surveys have been aimed at those situated along Box Canyon Reservoir, since the Kalispel Reservoir is situated adjacent to this reservoir. Fishing is closed for bull trout in the Pend Oreille River.

Curt recommended several tributaries to Boundary Reservoir for future bull trout surveys. Flume Creek was described as an interesting stream, as it is located in a narrow canyon adjacent to an old mine. The may be some impassible barriers in this stream due to nearly vertical canyon walls in some sections. A headgate for mining diversions is located on this stream above the highway. Other tributaries for consideration include Sullivan Creek, Slate Creek, and Sweet Creek. Chris Donnelly and Neil Lockwood were mentioned as two WDFW staff who were conducting tributary surveys in the Box Canyon section of the river. They may be of some use for tributary surveys conducted within the Boundary Reservoir area. Their office is located at the Kalispel Tribal office in Usk, Washington. They are currently working on developing instream enhancement and riparian vegetation plans for tributaries to Box Canyon Reservoir. Eastern brook trout are a major concern to bull trout populations in

these tributaries, as are logging impacts. Al Scholz has been conducting detailed research of historical fisheries on the Pend Oreille River for the BPA. In addition, Dave Bennett (U of I) has completed several fisheries reports for Box Canyon Reservoir

In discussing potential fish study plans for Boundary Reservoir, Curt emphasized that bull trout would "drive everything" in terms of fisheries issues for the reservoir. We mentioned several elements of the proposed study, including snorkeling, hook-and-line surveys, hydroaccoustics, and radio telemetry. Curt mentioned that sampling in the reservoir and tributaries might be a problem this year due to usually high flows. Curt stated that he would like to be closely involved with this study, along with Tom Shudha with the USFS. He will be generally available to participate in an studies, but mentioned that he would be working on the Salmo River in late August. He said that he might be able to send Chris and Neil out to assist on tributary surveys. Curt said that he thought there would be no problem getting a permit for sampling from WDFW. He thought that gill netting may not be too productive, and that boat electrofishing would also be inefficient except in shallower waters. Curt suggested that snorkeling and scuba were potential good methods to try out in Boundary Reservoir. The main problem with any study is the population of bull trout in the reservoir, which is thought to be very low. We discussed the potential use of other trapping methods; Curt mentioned that Oneida and Lake Merwyn traps could be used to some extent. Fyke nets might also be worth a try (contact Doug Fletcher and Dale Greg in Oregon for specifications on net designs).

Additional Notes/Comments: Curt Vail is the lead fish biologist with WDFW for the Pend Oreille area, and is very familiar with fish resources and management issues in this region. He should be kept in close contact in developing and conducting fisheries studies in Boundary Reservoir.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Tom Shudha

Affiliation: U.S. Forest Service,
Colville National Forest.

Phone Number: 509-684-7211

Copies to:

Contacted By: Ed Connor, Al Solonsky
(Jointly)

Affiliation: R2, SCL

Date of Contact: 6/20/96

Reason for Contact: Tom Shudha is the forest fisheries biologist for the Colville National Forest. He was contacted to determine the status of fisheries studies conducted in the Boundary Project Area by the USFS, the availability of any data for tributaries to Boundary Reservoir, as well as to discuss fisheries issues of concern in the region.

Summary of Discussion: In initiating our conversation with Tom, we stated that SCL was interested in developing fisheries studies for Boundary Reservoir, especially as related to investigating the life history, population status, and distribution of bull trout in the system. We mentioned the possibility of conducting hook-and-line, gill netting, hydroaccoustic, and radio tagging studies of bull trout in the reservoir. Tom said that radio tagging was an excellent idea, and that it could potential yield a valuable information regarding the life history and habitat preferences of bull trout in the reservoir. Tom said that he was very excited about the prospects about studies in Boundary Reservoir, and said that SCL's proactive approach to fisheries studies excellent. He mentioned that the licensing process for Pend Oreille PUD's Sullivan Creek Hydroelectric Project has been contentious. Tom said that he would very much like to participate in a hook-and-line sampling survey of Boundary Reservoir.

Tom mentioned that the historical use of anadromous fish in this region of the Pend Oreille River is the subject of some debate. Studies conducted by Al Scholz for the BPA have indicated that there was never a major anadromous fisheries above Metaline Falls; most fishing by the Kalispel Tribe prior to development was at the confluence of the Salmo River in British Columbia. Tom said that the remnants of a fish ladder were found at the Mill Creek pond on Sullivan Creek, and wondered to what purpose this ladder was used except allow passage of anadromous fish.

He said that the USFS has conducted Hankin-Reeves fish habitat surveys on many of the tributaries of Boundary Reservoir, and would be able to provide us copies of survey reports. In addition, some thermograph data had been collected in Sullivan Creek. The USFS has also

conducted electrofishing surveys in three tributaries to Boundary Reservoir, and would likewise provide us copies of the results of these surveys. He emphasized that the purpose of electrofishing surveys was to evaluate the presence and distribution of different fish species in these streams, and not to estimate population numbers in these streams. He said that a good place to look for bull trout in Sullivan Creek was in a 2-mile confined canyon section located just upstream from the abandoned Sullivan Creek Hydroelectric Project powerhouse. He mentioned that Cascade Environmental Services (CES) had previously conducted snorkeling surveys in this section of the stream, but only during daylight hours. Access to this section of Sullivan Creek could be difficult.

Tom said that he would strongly recommend that we conduct snorkeling surveys in the tributary streams. However, he would like these to be conducted following proper procedures, and recommended the Chapman Protocol for detecting the presence of bull trout for this purpose. He mentioned that Slate Creek, Sand Creek, and Flume Creek would be key areas for a snorkeling survey. Night snorkeling in Sullivan Creek would also be recommended. Tom emphasized that the end purpose of bull trout detection surveys using the Chapman Protocol is not to dismiss the possibility that bull trout are present in a system, but rather that they are not present in the densities which the method was developed to detect. In discussing this issue, Tom agreed that additional information (e.g., high water temperatures, barriers to migration) would be needed to conclude that bull trout are not present in a given stream. Tom suggested that it is possible that there may be resident bull trout populations present in streams above known barriers to migration. In addition, some of the larger bull trout observed in Boundary Reservoir could have migrated down the Pend Oreille River through Box Canyon Reservoir. Tom agreed that there was a good possibility that bull trout in Boundary Reservoir had an adfluvial life cycle.

Tom was agreeable to the idea of using hook-and-line, snorkeling, and minnow trapping methods to determine sample for bull trout in the reservoir and tributaries. When asked about previous hook-and-line surveys for bull trout conducted with Curt Vail (WDFW) in Boundary Reservoir, Tom said that fish were caught in the vicinity of Slate Creek. These fish were approximately 16 to 20 inches in size. Tom mentioned that a 21.5 inch bull trout was found in lower Sullivan Creek during September, 1994. This was fish captured and apparently abandoned by a poacher; the timing of this observation suggests that the fish was migrating up the stream from Boundary Reservoir to spawn. Eastern Brook trout are found in Sullivan Creek and tributaries above Sullivan Lake.

Al Solonsky stated that SCL would submit the agencies a study design for proposed fisheries studies on Boundary Reservoir for review purposes. Tom said that he liked the cooperative attitude of SCL in developing fisheries study plans for Boundary Reservoir. Tom mentioned that the USFS has no specific management plans for bull trout in the Colville National Forest at this time, but are developing a Memorandum of Understanding with WDFW at this time for this purpose. The central objective of the USFS is to protect and restore the habitat of native fish populations in the forest.

Tom stated that all correspondence with the Colville National Forest regarding the Boundary

Project should also be sent to Jerry Coleman, the hydropower coordinator for the forest. He mentioned that the Forest Service as been annoyed by the informality of agency consultation on the Sullivan Creek hydroelectric project.

Additional Notes/Comments: Tom Shuhda is a key agency contact person for fisheries issues for this project, and should be kept in close contact throughout the project. His involvement in, and approval of, the fish sampling program will be important for assuring the success of fisheries studies in Boundary Reservoir. It will be important to keep Jerry Coleman as part of the information and consultation "loop" throughout pre-licensing and formal licensing process.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Dave Bennett

Affiliation: University of Idaho

Phone Number: 208-885-6336

Copies to:

Contacted By: Dudley Reiser

Affiliation: R2

Date of Contact: 7/5/96

Reason for Contact: I called Dave Bennett to inquire about the studies he participated in related to the Box Canyon Project

---

Summary of Discussion: Dave Bennett referenced the fisheries and water quality reports prepared by he and Dr. Michael Falter specific to the Box Canyon reach of the Pend Oreille River, as well as a third report focused on the reach of the Pend Oreille immediately below Albeni Falls. This latter work was completed for the Idaho Department of Fish and Game (IDFG); he indicated he would send me a copy of the report. General comments/conclusions regarding his studies:

1) Species composition immediately below Albeni Falls differs dramatically from that in Box Canyon - he didn't elaborate, but suggested there were major differences in physical habitat between the two areas;

2) Box Canyon reach has extensive macrophytic plant growth within the reach. He mentioned that the only way to get through large sections of the river was to have a boat outfitted with a stainless steel prop and be moving at 40-50 mph; a jet boat fouls easily.

3) Species composition within the BC reach - primarily largemouth bass and other centrachids; he did not think they captured any bull trout within the river proper - I believe they did find a few in one of the tributaries;

4) BC reach differs from the Boundary Reach physically - he would not be surprised to find differing species composition;

5) He has not spent much time within the Boundary Reach but did note that during one visit he observed the release of rainbow trout that had been reared via net - pen culture in the Boundary reservoir. He thinks the net pen culture was being operated by a group of local sportsmen; the fish released looked in very good condition.

Additional Notes/Comments: Dave will be forwarding a copy of the Albeni Falls report to us soon. He also noted he would be open to a meeting to further discuss his report and data, as necessary.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Steve Elle

Affiliation: Idaho Dept. of Fish and Game

Phone Number: 208-334-3490

Copies to:

Contacted By: Dudley Reiser

Affiliation: R2

Date of Contact: 7/8/96

Reason for Contact: Steve Elle of the Idaho Department of Fish and Game IDFG) returned my call on July 8, 1996. Steve has been working extensively with bull trout radio tagging in Idaho and provided the following information:

Summary of Discussion:

1) Spawning migrations and spawning times can be highly variable - he cited systems in Idaho where majority of migrations occur in June and July and in other systems, August and September. He believes the length of streams used for spawning may influence run timing, with the longer the stream the earlier the migration period. With most of the tributaries in the Pend Oreille system being relatively short, it is possible migration timing may occur later in the year. However, this would be influenced by prevailing water temperatures.

2) Sampling techniques - has used variety of techniques successfully, including gill netting (1-2" experimental nets tended hourly), trap netting, hook and line. Recommended using different techniques to determine efficiency.

3) Radio tagging - uses ATS product - has ability to differentially sample during a 24 hour period to conserve battery power. Has not observed significant mortality due to surgery. One year sampled they recovered only 1/3 of tagged fish, but attributed this to low flow conditions.

4) Tag size - have taken a conservative approach toward tag selection; tag size based on 1.3 % of body weight rather than 2% of body weight. E.G. - a 6gm tag would be used in a 15 inch fish.

5) Tagging period - for most of his studies, they have tagged fish in May/June, prior to suspected spawning runs in July/August.

6) Given the uncertainties associated with the Boundary Project and the unknowns related to where, when and how many bull trout may be found within the system, Steve recommended

an initial effort focused on determining on species distribution and relative abundance. This would be important for determining future sampling strategies and for successfully capturing fish for more detailed radio tagging studies. He does believe that the information obtained from radio tagging is great, and was supportive of efforts to capture and tag at least a few fish this year, for purposes of tracking their behavior and identifying locations for sampling next year.

7) Application of radio tagging in reservoirs - in spite of having some depth limitations, Steve noted that the radio tags he used proved useful even in tracking fish within reservoir systems. Apparently, the tagged bull trout would routinely move to water depths at which detection could occur on a daily basis. He cited a case in which 80% of the tagged fish were detected within the reservoir.

8) Snorkeling at night remains the most reliable method for detecting and observing bull trout in streams. This contradicts the recently published work of Thurow. However, Steve stated that Russ Thurow already knew that the most effective time was at night, but published anyway because the results of the one study reported ran counter to the conventional thinking.

9) Minnow trapping - no experience with sampling technique.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*__

Person Contacted: Kathy Ahlenslager

Contacted By: R. Tressler

Affiliation: Colville National Forest

Affiliation: EDAW, Inc.

Phone Number: (509) 684-7000

Date of Contact: July 10, 1996

Copies to:

Reason for Contact: Botanical information

Discussed what information may be available for the Boundary Hydroelectric Project on botanical resources, especially the listed or sensitive species. I told her about the 10 species that WNHP reported as occurring within 1 mile of the reservoir and she verbally confirmed (with one exception) that those species do occur in the general area but that she doesn't believe any surveys by USFS have occurred within 1 mile of the reservoir. She was a little surprised that the bladdery milk-vetch was found on SCL property. She didn't know that it occurred up there and that sites she has visited previously were napeweed. She is going to review her site records for information on species near the reservoir, but did not think she would be adding any beyond the WNHP data which she says is pretty good there. She will send that information along with the Forest List of Sensitive Plant species possibly Friday or early next week. The best flora for the area is Hitchcock and the "Flora of Pend O'reille County.

I asked about BLM land. She said there is a little and that Barbara Benner is the seasonal botanist in the Spokane BLM office that handles the area.

Additional Notes/Comments:

Contact her again if information does not arrive.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*__

Person Contacted: Kaitlyn Watson

Affiliation: WDFW Habitat Division Spokane

Phone Number: (509) 935-8246

Copies to:

Contacted By: R. Tressler

Affiliation: EDAW, Inc.

Date of Contact: July 11, 1996

Reason for Contact: Wildlife information

Summary of Discussion: I called to find out if she or anyone in her office may have additional information beyond what Steve Zender can provide. She said she needs to ask her predecessor, John Whalen since she has only been on the job 8 months. She said she will get back to me next week. She also suggested we talk to Curt Vail for fisheries information (509) 684-5742.

Additional Notes/Comments:

Contact her again if information does not arrive

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*__

Person Contacted: Steve Zender

Contacted By: R. Tressler

Affiliation: WDFW District Biologist

Affiliation: EDAW, Inc.

Phone Number: (509) 935-6073

Date of Contact: July 11, 1996

Copies to:

Reason for Contact: Wildlife information

Summary of Discussion: Discussed what wildlife information may be available for the Boundary Hydroelectric Project. The only study that he is aware of is the work that Timber, Fish, and Wildlife (TFW) did on small mammals and amphibians and reptiles in logged and unlogged riparian areas in northeast Washington. He believes some are in the general vicinity of the Pend O'reille River. The information on deer and elk harvests is only kept at a gross level (Unit 113 includes everything to the east of the river) and would not tell us much. There are caribou, grizzly bear, bald eagles, and wolf near the project. Lynx only really occur above 4,000 feet so are not a concern at the reservoir. Marten occur along Slate Creek but at higher elevations. WDFW has been monitoring peregrine falcon habitat north of Metaline Falls but so far no nesting has been documented anywhere in northeastern Washington. The project does not represent a barrier to big game--caribou are known to swim the river. Goats are only at higher elevations on Linton Mtn. There are no major deer (mule and white-tail) or elk winter range areas although small concentrations occur throughout the area and use the transmission line ROW. The Lead King Hills has 25 elk. There are a few moose in the area. TFW found pygmy shrews in higher than expected numbers. Along the reservoir, the mouths of the tributaries provide important habitat. There are emergent wetlands south of Metaline Falls. The mouth of Sullivan Creek has cottonwood habitat. Good habitat exists at SCL property near Sand Creek and also near Sweet Creek. The San Creek bald eagle territory is active, while a second territory north of Metaline Falls has not been active for 4-5 years. There are approximately 6 osprey territories, but since the fish resources are much less than at Box Canyon, the densities of osprey and bald eagle is much lower.

Steve indicated that he cannot think of any significant issues relating to wildlife but that if habitat mitigation/enhancement is planned as part of relicensing the following are the highest priorities: (1) help to purchase and protect island habitat up stream of Box Canyon, (2) assist with habitat protection near Sullivan Lake for bighorn sheep herd, (3)

look into mountain goat habitat enhancement options, and (4) enhance habitat quality on the transmission line ROW

Additional Notes/Comments:

Contact Margaret O'Connell at Eastern Wash. Univ. to obtain TFW information.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number:

Person Contacted: Michelle Lynn

Contacted By: C. Everett

Affiliation: Seattle City Light

Affiliation: EDAW, Inc.

Phone Number: (206) 386-4578

Date of Contact: 7/12/96

Copies to:

Reason for Contact: Did SCL implement the recreation-related license articles in the FERC license amendment of 1983?

Summary of Discussion: The issue of compliance is somewhat unclear. There is internal discussion going on now within SCL to potentially implement the 1982 recreation measures as part of the upcoming comprehensive rehabilitation/rewinding project. SCL will be making a general determination of FERC compliance, probably in the fall of 1996, and will consult with the FERC thereafter. Following concurrence with the FERC, SCL will implement any recreation measures needed to be in compliance. A few dispersed campsites were constructed near the boat ramp in the 1980s and were thought to satisfy recreation demand at the time, thus meeting the spirit of the 1982 FERC measure. Phase I was to be constructed irregardless of demand. Phase II was to include the improvements that have already been constructed plus others not constructed. Phase II improvements were to be completed if a follow-on demand assessment (not done) indicated that there was demand for the improvement.

Additional Notes/Comments: Need to coordinate with SCL's ongoing discussions regarding compliance with the 1982 license amendment's recreation measure.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number:

Person Contacted: Al Solonsky

Contacted By: C. Everett

Affiliation: Seattle City Light

Affiliation: EDAW, Inc.

Phone Number: (206) 386-4578

Date of Contact: 7/12/96

Copies to:

Reason for Contact: Did SCL implement the recreation-related license articles in the 1983 FERC license amendment? What is the history? Why or why not were these measures never implemented?

Summary of Discussion: The issue is unclear and open to interpretation, including the history of events since 1981 to the present. The upcoming "rehabilitation/rewinding" project may include some recreation improvements. The issue of compliance or noncompliance needs to be answered. For further detail, contact Michelle Lynn at SCL.

Additional Notes/Comments: Need to coordinate with ongoing SCL discussions regarding compliance with the 1982 recreation measure.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number:

Person Contacted: Dan Haas

Contacted By: C. Everett

Affiliation: National Park Service

Affiliation: EDAW, Inc.

Phone Number: (206) 220-4079

Date of Contact: 7/12/96

Copies to:

Reason for Contact: National Park Service is a required agency consultation entity for recreation per CFRs.

Summary of Discussion: No issues are known at this time.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*_

Person Contacted: Steve Zender

Contacted By: P. Carr

Affiliation: WDFW, Chewelah Office, Wildlife Biologist

Affiliation: EDAW, Inc.

Phone Number: (509) 935-6073

Date of Contact: 7/15/96

Copies to:

Reason for Contact: The WDFW should have recreation data in the project vicinity, specifically relating to hunting and fishing.

Summary of Discussion: After starting with the Spokane office, I was referred to Steve. Reaching Steve, he informed me that Ron Tressler (EDAW) had already talked with him at length about the project area and potential issues. See Ron's contact sheet.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number:

Person Contacted: Rodney Smoldon

Contacted By: P. Carr

Affiliation: USFS, Colville National Forest, Recreation Specialist

Affiliation: EDAW, Inc.

Phone Number: (509) 684-7000

Date of Contact: 7/15/96

Copies to:

Reason for Contact: The USFS should have information on recreation use on Forest lands, Wilderness Areas, National Trails, and Wild and Scenic Rivers.

Summary of Discussion: Rodney is not particularly familiar with the project area. He recalls that there are potential issues regarding maintenance of existing boat ramps along the river, but cannot recall specific issues or locations. Although he can't recommend anyone else in his office (i.e., Colville) to address recreation issues, he recommends calling Tim Bertram @ the Sullivan Lake District. Tim is likely familiar with some of the issues.

He mentioned that if Tim is unavailable or just doesn't have the info, he would be willing to help track it down.

Additional Notes/Comments:

Based on this call, I contacted Tim Bertram.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*_

Person Contacted: Tim Bertram

Contacted By: P. Carr

Affiliation: USFS, Sullivan Lake District

Affiliation: EDAW, Inc.

Phone Number: (509) 446-2681

Date of Contact: 7/16/96

Copies to:

Reason for Contact: USFS should have information on use of Forest lands, Wilderness Areas, National Trails, and Wild and Scenic Rivers.

Summary of Discussion: Tim noted that recreation use in that particular area is extremely low. He was aware of no developed USFS recreation facilities in the immediate project vicinity; the closest developed facility is at Crescent Lake, which is not operating at capacity (with the possible exception of holiday weekends in the summer). There is dispersed use throughout the Forest in the project vicinity, but he would characterize such use as very, very low. In addition, the region's geography (e.g., steep canyons) generally prohibits direct use of the reservoir and/or shoreline by visitors to the Forest. At best, Forest visitors might get a glimpse of the reservoir. Therefore, the USFS has essentially no specific data on recreation use in the project vicinity. The USFS does have issues associated with Box Canyon, but this would be outside the project vicinity.

One potential issue raised - access to the reservoir via Forest land. That is, if an improved road were established, reservoir use could be expected to increase.

Additional Notes/Comments: I was referred to Tim by the recreation specialist at the Supervisor's Office (Rodney Smoldon)

Note: Tim also talked with Ron Tressler about wildlife use in the project vicinity; see Ron's contact report.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*__

Person Contacted: Peter Wood	***Contacted By:*** P. Carr
Affiliation: WA State Parks and Recreation Commission, Park Manager, NE WA	***Affiliation:*** EDAW, Inc.
Phone Number: (509) 456-4169	***Date of Contact:*** 7/16/96
Copies to:	

Reason for Contact: The Commission should have information on State recreation resources in the region and demand for State recreation facilities.

Summary of Discussion: **Issues:** Peter said the project vicinity is used for a wide variety of recreation use - power boating, canoeing, hiking and camping, jet skiing, cycling, tour boat, and cave tours (at the nearby State Park). Although he said current use is relatively low, he anticipated "explosive" growth in use in the future, characterizing the area as undiscovered but desirable. If additional facilities are developed in the future, he would anticipate heavy use levels, particularly by folks from Spokane. In general, he pointed to the region's exceptional scenic beauty and wealth of general public land. He did not, however, identify any specific issues related to project operations. He did mention a potential transmission line project in the region, jointly developed by BC Hydro and Washington Water Power; he did not recall the outcome of this proposal but thought it might have been routed through Northern Idaho instead of Washington. **Studies:** He remembered 2 specific studies addressing recreation use levels in the project vicinity but could not recall their names; he is mailing these to EDAW. **Future Development**: He is not aware of any planned facility development or improvement by State Parks.

Additional Notes/Comments: I initially tried to reach the Regional Supervisor in the Pasco office. I talked to Reed Obern, who said the Supervisor would not be the best person to provide this type of information. He recommended calling the Wenatchee office, which should have the data at hand. After talking to the Assistant Regional Manager (Bill Hutsinpiller, who is relatively new in the position), I was referred to Peter Wood.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*__

Person Contacted: Tim Bertram

Contacted By: R. Tressler

Affiliation: Biologist, USFS, Sullivan Lake District

Affiliation: EDAW, Inc.

Phone Number: (509) 446-2681

Date of Contact: 7/16/96

Copies to:

Reason for Contact: USFS should have information on wildlife and botanical resources of the area.

Summary of Discussion: Tim noted that there are no specific studies or reports that would address wildlife on or near the reservoir. There are old Biological Evaluations for timber sales, none of which are close to the reservoir, but these would not be useful due to their generic information. The Forest Plan would be the best source for a general overview of the area. Tim is sending me a species list for the Sullivan Lake Ranger District. Tim said that there is some winter range habitat between Highway 31 and the reservoir. Due to the rugged terrain the use is relative light. Boaters occasionally see elk above the canyon. Spotted frogs seem to be relatively common on the District, but essentially no amphibian survey work has occurred. The USFS has two management areas (#6 and #8) that represent winter range and scenic resources/winter range. The south-facing areas are important wintering habitat. The Grizzly Bear Recovery Plan indicates that Highway 31 forms the western boundary of the recovery zone, but radio-collared grizzly bears have been known to cross the river (unknown locations). He is surprised no peregrine falcons nest on the cliffs bordering the project. There is not good marten habitat.

The only potential issue Tim noted was that if recreational opportunities are increased, wildlife could be negatively affected.

Additional Notes/Comments: I was referred to Tim by Steve Zender of WDFW. Watch for Forest Plan and check for management area maps. Call Tim if maps are not detailed enough.

Note: Tim also talked with Peter Carr about recreation use in the project vicinity; see Peter's contact report.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*_

Person Contacted: Gary Fergen

Contacted By: P. Carr

Affiliation: Pend Oreille County, Planning Office

Affiliation: EDAW, Inc.

Phone Number: (509) 447-4821

Date of Contact: 7/16/96

Copies to:

Reason for Contact: The County should have information on recreation and/or visual resource policies or ordinances, as presented in their Comprehensive Plan and Shoreline Management Plan.

Summary of Discussion: **Potential Issues.** In general, he noted the reservoir's low use level and relatively pristine, aesthetically pleasing nature. Gary mentioned a few potential recreation and aesthetic related issues: (1) he was aware of the recreation improvements at the dam; (2) he mentioned a new tour boat that runs from Box Canyon downstream, and said it is becoming more and more popular; and (3) he mentioned that recreation use on the reservoir is very low and that only 3 public boat launches are available (1 at Metaline, 1 at Metaline Falls, and 1 at the Box Canyon Motel); he did not see a need for any additional public launches due to low population density and distance from major centers. **Studies**: He was not aware of any recreation-related studies being or previously conducted in the project vicinity.
New Facilities: He was not aware of any planned upgrades or new facilities. He recommended contacting the local governments at Metaline and Metaline Falls. He did mention that Box Canyon Motel might be adding an RV park. **Use Levels:** Not familiar with the existing recreation sites, he was unable to say whether use levels are increasing. He did say that use of the tour boat was increasing, as well as mention a potential for increased recreation use as word spread of the area's scenic beauty, as well as the Class 4 rapids downstream of Metaline. **Local Plans and Polices.** Pend Oreille is working on a Draft Comp. Plan - not finished yet. There is an existing Shoreline Management Plan. There are some specific policies that address recreation and river use. With the exception of areas in Metaline, Metaline Falls, and a brief stretch by the Box Canyon Motel (which are designated Urban), the entire shoreline is designated "Conservancy." He is sending a copy of the Shoreline Management Plan, as well as copies of recreation/river policies in the Draft Comp. Plan. **Visual Quality Issues:** He mentioned that the river reach is spectacular and will likely attract tourists in the future. **Water Levels:** He was not aware of any water level related issues.

Additional Notes/Comments: Additional Contacts include Ruth Rieber, Clerk, Metaline: (W/Th) 509/446-4641; and Cindy Vandenberg, Clerk, Metaline Falls (Tuesdays) 509/446-2211

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number:

Person Contacted: Greg Lovelady

Contacted By: P. Carr

Affiliation: IAC, Recreation Resource Planner

Affiliation: EDAW, Inc.

Phone Number: (360) 902-3000

Date of Contact: 7/16/96

Copies to:

Reason for Contact: The IAC should have information on WA SCORP Planning District 11, planned or funded IAC recreation projects in the region.

Summary of Discussion: Greg was not personally familiar with this particular region and therefore had no individual response to our key questions (e.g., potential issues). He did, however, search their project funding database for 3 parameters - Metaline, Pend Oreille County, and Colville National Forest. Metaline yielded 2 hits, both closed projects from the mid 1970s. Pend Oreille County yielded no hits on record (very rare according to Greg). Colville Nat'l Forest yielded several. He faxed the printout list to us, which denotes IAC project number, sponsor (e.g., USFS), project name, and status (i.e., active/closed/pending). At this time, this is the extent of info available.

Feel free to call with any questions.

Additional Notes/Comments: Original contact name is Jeff Frost, who no longer works with IAC.

IAC printout should be attached.

Ranger District Location Report

July 16, 1996

er		Project Name	Sponsor	Program	Proj Mgr	Status	IAC Amount	Sponsor Amount	Project Total
Ranger District: CNF-Colville RS									
	N	Little Pend Oreille Area Study	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	10,927.94	1,015.00	11,942.94
	D	Little Pend Oreille Trail Ph. 1	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	50,428.69	1,000.00	51,428.69
	N	Forest-Wide ORV Study	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	5,892.35	1,000.00	6,892.35
	D	Little Pend Oreille Trail Segment #2	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	39,877.43	1,500.00	41,377.43
	N	Little Pend Oreille Survey, Ph. 2	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	7,916.79		7,916.79
	D	Little Pend Oreille Trail Dev. Seg. #3	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	39,904.62	1,300.00	41,204.62
	D	Little Pend Oreille ORV Trail #4	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	91,158.10	1,975.00	93,133.10
	N	Little Pend Oreille ORV Trail #5	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	3,307.79	275.00	3,582.79
	N	Colville RD ORV Trail Ranger	USFS Colville NF	NOVA Education and	Don	Closed Completed	10,465.35	1,846.82	12,312.17
	D	Little Pend Oreille ORV Trail Segment #5	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	38,680.63	9,785.26	48,465.89
	D	North Fork Silver Creek Trail	USFS Colville NF	NOVA Nonhighway R	Don	Active	59,850.00	15,024.00	74,874.00
	N	North Fork Chewelah Creek	USFS Colville NF	NOVA Off-Road Vehi	Don	Active	7,850.00	2,444.00	10,294.00
	N	Colville NF ORV-E&E	USFS Colville NF	NOVA Education and	Don	Closed Completed	20,039.00	5,335.00	25,374.00
	N	ORV Education/Enforcement	USFS Colville NF	NOVA Education and	Don	Closed Completed	20,039.31	5,334.81	25,374.12
	N	Colville Ranger District M&O	USFS Colville NF	NOVA Maintenance a	Don	Closed Completed	19,280.00	6,511.00	25,791.00
	N	Colville Ranger Dist. ORV Trail Ranger	USFS Colville NF	NOVA Education and	Don	Active	36,584.00	6,010.00	42,594.00
	N	Education & Enforcement	USFS Colville NF	NOVA Education and	Scott	Committee Funded	19,679.00	5,231.00	24,910.00
	N	Maintenance & Operation	USFS Colville NF	NOVA Maintenance a	Don	Active	37,320.00	27,024.00	64,344.00
							519,201.00	92,610.89	611,811.89
Ranger District: CNF-Kettle Falls RS									
32	N	Scalawag Ridge 4x4 Survey & Design	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	14,074.79		14,074.79
							14,074.79		14,074.79
Ranger District: CNF-Newport RS									
2	N	Batey-Bould Area Comp. Plan	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	15,055.00	1,000.00	16,055.00
1	D	Batey-Bould Trail Development	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	127,080.94		127,080.94
23	N	Batey-Bould Survey & Design	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	6,203.32		6,203.32
12	D	Batey-Bould Trail Ph. 2	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	74,781.72		74,781.72
3	D	Batey-Bould Trail Phase 3	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	26,531.76		26,531.76
4	N	Batey-Bould Trailhead Plan	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	4,438.87		4,438.87
1	D	Batey-Bould Trailhead Dev.	USFS Colville NF	NOVA Off-Road Vehi	Don	Closed Completed	72,913.84		72,913.84
4	D	Batey Bould ORV Trail Improvement	USFS Colville NF	NOVA Off-Road Vehi	Don	Active	152,723.00	14,100.00	166,823.00
							479,728.45	15,100.00	494,828.45

ES: IAC Amount: Includes funding amount for program(s) selected.
Sponsor Amount: Total sponsor match.
Project Total: May not equal IAC Amt column + Sponsor Amt column. (May be additional IAC Amount within
+ means additional programs (/ sponsors) for this project are not shown on report.
* means project is also listed under additional programs (/ sponsors) on report.

S:\MDEV\REPORTS\rangdist.rpt

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1

To Peter Carr	From Greg Lovelady
Co. EDAW	Co. IAC
Dept.	Phone # 360/902-3008
Fax # 206/343-9809	Fax #

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

*Tracking Number:*__

Person Contacted: Suzanne Audet

Contacted By: R. Tressler

Affiliation: U.S. Fish and Wildlife Service

Affiliation: EDAW, Inc.

Phone Number: (509) 891-6839

Date of Contact: July 21, 1996

Copies to:

Reason for Contact: Caribou information

I called to obtain a copy of the caribou recovery plan. Suzanne is sending it to me. She indicated that the USFWS typically considers caribou habitat to be above 4,000 ft. The records of caribou crossing the Pend Oreille River were from one individual that was released in April in northern Idaho and proceeded to move westward across the river and then returned to east. Overall, caribou recovery has been mediocre. There are 60-75 animals in the recovery zone that includes northern Idaho, northeastern Washington, and portions of British Columbia. There are probably 10-15 reproducing females in Idaho. Predation by cougars and bears is the biggest problem.

Additional Notes/Comments:

I was referred to her by the Boise office of the USFWS.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Tom Luster

Affiliation: Washington State Dept. of Ecology

Phone Number: (360) 586-6828

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Contacted Tom Luster to obtain information on how to retreive water quality data for the Pend Oreille River system that is kept in the STORET data retrieval system.

Summary of Discussion:

Mr. Luster says that Jim Adamski of EPA in Seattle (553-1838) can set me up an account to access STORET from our office computers.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Donna Bates

Affiliation: U.S.G.S.

Phone Number: (206) 593-6510

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Called the U.S.G.S. to get information on publications and monitoring efforts on Pend Oreille River.

Summary of Discussion:

Receptionist, Donna Bates, suggested that I fax her a list of requested documents. She also said that any other general requests for information on monitoring efforts in the Pend Oreille River Basin could be included in the fax.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Donna Bates

Affiliation: U.S.G.S.

Phone Number: (206) 593-6510

Copies to: Project File

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Faxed receptionist, Donna Bates, request to speak to U.S.G.S. personnel with knowledge of monitoring efforts on Pend Oreille River system. Also requested information on the following references:

U.S. Geological Survey 1975-1978. Water Resources Data for Washington Vol. 2 Eastern Washington. WA-75-2, WA-76-2, WA-77-2, WA-78-2.

Summary of Discussion:

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Donna Bates

Affiliation: U.S.G.S.

Phone Number: (206) 593-6510

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Response to faxed request for U.S.G.S. documents containing water quality data for the Pend Oreille River

---

Summary of Discussion:

Donna Bates called. She stated that she is faxing my fax to Ray Smith of the U.S.G.S. field office in Spokane (509) 353-2633. She stated that Mr. Smith would be the appropriate person to talk to for water quality information on Pend Oreille River system. Mr. Smith is out of the office until June 24.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Ray Smith

Affiliation: U.S.G.S.

Phone Number: (509) 353-2633

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/24/96

Reason for Contact:

Response to faxed request for U.S.G.S. documents containing water quality data for the Pend Oreille River

---

Summary of Discussion:

Ray Smith called regarding my fax. He says there is water quality data from a U.S.G.S. station on the international border from October of 1960 to 1979. It is published in water resource data reports and can be obtained from the U.S.G.S. Tacoma office or the public library. Mr. Smith also suggested that I contact Valerie Kelly of Portland U.S.G.S. (503) 251-3244 who works in the National Stream Water Quality Monitoring (NSQWM) program under which the Pend Oreille station was monitored. The identification number for the international boundary station is 12398600. Metals data for the station have been discredited due to the sampling method used.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Louis Fuste

Affiliation: U.S.G.S.

Phone Number: (206) 593-6510

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/11/96

Reason for Contact:

Confirm that the following documents received from the U.S.G.S. do not need to be returned:

U.S. Geological Survey 1975-1978. Water Resources Data for Washington Vol. 2 Eastern Washington. WA-75-2, WA-76-2, WA-77-2, WA-78-2.

Summary of Discussion:

Documents referenced above do not need to be returned and can be regarded as property of Herrera Environmental Consultants.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Chuck Rice

Affiliation: EPA Region 10

Phone Number: (509) 625-5189

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Called Chuck Rice to see if he had any knowledge of EPA water quality monitoring efforts in the Pend Oreille River System.

Summary of Discussion:

Mr. Rice said he did not have any information regarding EPA water quality monitoring efforts on the Pend Oreille River but suggested that I contact Ruth Watkins of the Tri-State Implementation Council at (208) 256-9092.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Jeff Marti

Affiliation: Washington State Dept. of Ecology

Phone Number: (360) 407-6636

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Requested information on Department of Ecology monitoring efforts and water quality data for the Pend Oreiller River.

Summary of Discussion:

Mr. Marti is forwarding the following document:

Dames & Moore, Inc. and Cosmopolitan Engineering Group. 1995. Initial Watershed Assessment, Water Resources Inventory Area 62, Pend Oreille River Watershed. Open-File Technical Report 95-17. for Washington State Department of Ecology.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Mike Hart

Affiliation: Idaho Dept. of Health and Welfare

Phone Number: (208) 373-0502

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/11/95

Reason for Contact:

Contacted Idaho Dept. of Health and Welfare to obtain a copy of the following document:

Beckwith, M. 1989. Compilation of Water Quality Study Efforts on Pend Oreille Lake, 1984-88. Idaho Department Health and Welfare, Division Environmental Quality, Water Quality Status Report #90. Boise.

Summary of Discussion:

Mike Harts will see if they have an extra copy of the above document that they can send.

Suggested that I contact EPA and inquire about 314 documents to see if someone has a copy of it.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Brad Hopkins

Affiliation: Washington State Dept. of Ecology

Phone Number: (360) 407-6686

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/24/96

Reason for Contact:

Request for information on Washington State Department of Ecology water quality data for the Pend Oreille River

---

Summary of Discussion:

Water quality data from Metalline Falls from 1994 to 1995 and Newport from 1978 to present is available on STORET. Mr. Hopkins will fax me data for Metalline Falls. He suggested that it would be easier to obtain the data from Newport from STORET because of the paper work involved in the process.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Randy Coots

Affiliation: Washington State Dept. of Ecology

Phone Number: (360) 407-6690

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/21/96

Reason for Contact:

Contacted Randy Coots and requested the following three documents:

1. *Coots, R. and R. Willms. 1991. Pend Oreille River Primary Productivity and Water Quality of Selected Tributaries. Washington State Department of Ecology report. 35 pages plus appendices. November 1991.*

2. *Coots, R. 1992. Pend Oreille River Management Plan. Washington State Department of Ecology report. 32 pages plus appendices. July 1992.*

3. *Pelletier, G. and R. Coots, 1990. Progress Report No. 1 Pend Oreille River Water Quality Study. Washington State Department of Ecology report. 61 pages.*

Summary of Discussion:

Mr. Coots will send documents 1 and 3. Document 3 is unpublished and contains no new additional water quality data. He was not sure it could even be released to the public because it never completed the review process.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: David Bennett

Affiliation: Dept of Fish & Wildlife, U. of Idaho

Phone Number: (208) 885-6337

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/24/96

Reason for Contact:

Contacted David Bennet to see if he had any information on water quality data for the Pend Oreille River. Requested a copy of the following document:

Falter, C. M. and B. W. Riggers. 1993. Aquatic Community Responses to Aquatic Macrophyte Habitat alterations in box Canyon Reservoir, Washington. Univ. of Idaho. Moscow, ID.

Summary of Discussion:

Mr. Bennet state he would try to track the above document. If I don't receive it in the near future, he suggested that I contact Mike Falter (208) 885-7123 after July 14 and requested it from him directly.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Jamie Miller

Affiliation: Fisheries Center, Eastern Wash. U.

Phone Number: (509) 359-7498

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/25/96

Reason for Contact:

Called Ms. Miller and requested the following technical reports:

Gieger, D. D., A. T. Sholz, C. S. Doughtie, H. G. Kube, and D. L. Richards. 1993. Annotated bibliography of Information about Surface and Ground Water Quality and Quantity on the Kalispel Indian Reservation, Including Boundary Waters of the Box Canyon Reservoir of the Pend Oreille River. Upper Columbia United Tribes Fisheries Center. Tech. Rep. No. 41. Cheney, WA.

Skillingstad, T. H. and A. T. Scholz. 1993. Trends in Water Quality in the box Canyon Reservoir of the Pend Oreille River Adjacent to the Kalispel Indian Reservation. Upper Columbia United Tribes Fisheries Center. Fisheries Tech. Rep. No. 44. Cheney,

WA.Skillingstad, T. H., B. L. Ashe, and A. T. Scholz. 1994. An assessment of the Pend Oreille River, Washington Receiving Effluent from a Thermomechanical Newsprint Mill: 1991/92 Post Operation Report. Upper Columbia United Tribes Fisheries Center. Fisheries Tech. Rep. No. 47. Cheney, WA

Summary of Discussion:

Ms. Miller will send the documents referenced above on either 6/26 or 6/27 if she can locate them. She will call otherwise.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Jamie Miller

Affiliation: Fisheries Center, Eastern Wash. U.

Phone Number: (509) 359-7498

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/2/96

Reason for Contact:

Contacted Ms. Miller and requested the following document:

Carr, R. L. and R. A. Soltero. 1983. Report of Vegetation study and related matters on the Kalispel Indian Reservation, Pend Oreille County, WA. Department of Biology, Eastern Washington University, Cheney, WA. Final Report submitted to Pend Oreille County P.U.D. Newport, WA 38 pp.

Summary of Discussion:

Ms. Miller will send the above document if it can be located.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Joanne Jarwosky

Affiliation: Water Research Center, WSU

Phone Number: (509) 335-5531

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/24/96

Reason for Contact:

Contacted State of Washington Water Research Center to inquire about obtaining the following documents:

Gibbons, H. L., W. H. Funk, M. L. Durando Boehm and J. J. Eisenbies. 1983. Investigation and control of Myriophylum spicatum in the Pend Oreille River, Washington. Rep. 47. State of Washington Research Center, Washington State University. Pullman, WA. 37 pp.

Gibbons, H. L., M. L. Durando-Boehm, F. A. Verhalen, T. C. McKarns, J. P. Nyznyk, T. J. Belnick, W. H. Funk, E. E. Syms, A. Frankenfield, B. C. Moore, and M. V. Gibbons. 1983. Refinement of control and management methodology for Eurasian watermilfoil in the Pend Oreille River, Washington. Rep. No. 56. State of Washington Water Research Center, Washington State University. Pullman, WA.

Summary of Discussion:

Ms. Jarwosky stated that they can send Rep No. 47 to me immediately. Report No. 56 will have to be located and a charge levied for copying costs. She will have someone contact me either June 25 or 27 to describe the process for obtaining the requested document.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Diane Weber

Affiliation: Water Research Center, WSU

Phone Number: (509) 335-5531

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 6/26/96

Reason for Contact:

Response to request for documents.

Summary of Discussion:

Diane Weber called and said she is sending Rep. No. 47. She needs a check or purchase order for Rep. No.57 in the amount of $5.70. Check should be made out to State of Washington Water Research Center and sent to:

State of Washington Water Research Center
Washington State University
Pullman, WA 98164-3002

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Scott Hall

Affiliation: Kalispel Tribe, Natural Res. Dept.

Phone Number: (509) 445-1147

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/2/96

Reason for Contact:

Inquired about documents kept in the Kalispel Tribe's Natural Resources library.

Summary of Discussion:

Mr. Hall suggested that I fax him a list of the documents that I am requested so he can determine whether they are available. He stated that it might be easier to obtain some of the from another source.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Scott Hall

Affiliation: Kalispel Tribe, Natural Res. Dept.

Phone Number: (509) 445-1147

Copies to: Project File

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/2/96

Reason for Contact:

Faxed Scott Hall a request for six documents that are purportedly kept at the Kalispel Tribe's Department of Natural Resources library.

Summary of Discussion:

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Jim Adamski

Affiliation: EPA, Region 10

Phone Number: (206) 553-1838

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/15/96

Reason for Contact:

Inquired about getting an account for the STORET data retrieval system.

Summary of Discussion:

Mr. Adamski suggested that I contact Ted Enderle (553-6703) for account information. He stated that Mr. Enderle will need my full title, address of company, phone number to create the account

---

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Ted Enderle

Affiliation: EPA, Region 10

Phone Number: (206) 553-6703

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/15/96

Reason for Contact:

Inquired about an account for the STORET data retrieval system.

Summary of Discussion:

Mr. Enderle says that he will set up an account and call me back with my login in name and password. The process should take about three days. To use the system, I must access the EPA main frame computer in North Carolina.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Mike Hart

Affiliation: Idaho Dept. of Health and Welfare

Phone Number: (208) 373-0502

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/16/96

Reason for Contact:

Response to request for the following document:

Beckwith, M. 1989. Compilation of Water Quality Study Efforts on Pend Oreille Lake, 1984-88. Idaho Department Health and Welfare, Division Environmental Quality, Water Quality Status Report #90. Boise.

Summary of Discussion:

Mr. Harts called to say he could not locate the document referenced above. He is sending a recently published document that summarizes many of the water quality studies completed to date.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted:

Affiliation: Cascade Environmental Services

Phone Number: 360-671-1150

Copies to:

Contacted By: John Lenth

Affiliation: Herrera Env. Consultants

Date of Contact: 7/22/96

Reason for Contact:

Request documents relating to Box Canyon relicensing.

Summary of Discussion:

Informed that John Blum is the individual with information on that subject and he will be out of the office until tomorrow or possibly Wednesday, 7/24.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Dan Matson

Affiliation: Colville National Forest

Phone Number: (509) 684-7010

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 06-25-96

Reason for Contact: Request permission from Dan Matson, Forest Archaeologist, to review US Forest Service archaeological site and report records held at the Washington State Office of Archaeology and Historic Preservation (OAHP).

Summary of Discussion: Mr. Matson granted permission to review records.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Sara Steel

Affiliation: OAHP

Phone Number: (360) 753-7442

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 06-25-96

Reason for Contact: Search of archaeological site records, cultural resource reports, historic building surveys, National Regsiter of Historic Places nomination forms, and other research collections at Office of Archaeology and Historic Preservation (OAHP).

Summary of Discussion: Short meeting discussing types of records necessary for completion of literature review. Remainder of time spent retrieving and copying relevant records at OAHP.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Sara Steel

Affiliation: OAHP

Phone Number: (360) 753-7442

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 06-26-96

Reason for Contact: Search of archaeological site records, cultural resource reports, historic building surveys, National Regsiter of Historic Places nomination forms, and other research collections at Office of Archaeology and Historic Preservation (OAHP).

Summary of Discussion: Retrieval and copying of relevant records at OAHP.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Leonard Forsman

Affiliation: LAAS

Phone Number: (206) 782-0980

Copies to:

Contacted By: Sara Steel

Affiliation: OAHP

Date of Contact: 07-11-96

Reason for Contact: Informed LAAS that a OAHP file with historic and archaeological documentation at Boundary Dam had been located.

Summary of Discussion: Sara Steel asked if LAAS was interested in a retreiving the material. Leonard Forsman informed her that another visit to the OAHP would be necessary.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Leonard Forsman

Affiliation: LAAS

Phone Number: (206) 782-0980

Copies to:

Contacted By: Sara Steel

Affiliation: OAHP

Date of Contact: 07-11-96

Reason for Contact: Informed LAAS that a OAHP file with historic and archaeological documentation at Boundary Dam had been located.

Summary of Discussion: Sara Steel asked if LAAS was interested in a retreiving the material. Leonard Forsman informed her that another visit to the OAHP would be necessary.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Sara Steel

Affiliation: OAHP

Phone Number: (360) 753-7442

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 07-19-96

Reason for Contact: Copy documents from cultural resource file on Boundary Dam and copy cultural resource reports at Office of Archaeology and Historic Preservation (OAHP).

Summary of Discussion: Most of time spent copying documents.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Pam Maio

Affiliation: Pend Oreille Public Works

Phone Number: (509) 447-4821

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 07-22-96

Reason for Contact: Request copy of Pend Oreille County Historic Site Register.

Summary of Discussion: Pam Maio referred Leonard Forsman to the OAHP to obtain the County Historic Site Register and was told that research had already been conducted at that repository. She said that she would try to locate the list in her files and mail to LAAS.

Additional Notes/Comments: Pam Maio sent a letter with a copy of the OAHP list of NRHP sites in Pend Oreille, a list LAAS has in its possession.

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: David Harder

Affiliation: Washington State University

Phone Number: (509) 335-8078

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 07-24-96

Reason for Contact: Request copy of *Cultural Resources Evaluation of the Boundary Dam Reservoir* by J. Brantley Jackson.

Summary of Discussion: David Harder retrieved the report and said that he would fax a copy to LAAS.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Rob Whitlam

Affiliation: OAHP

Phone Number: (360) 753-4405

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 07-17-96

Reason for Contact: To schedule an appointment for records search on 07-19-96.

Summary of Discussion: Rob Whitlam scheduled the appointment for 07-19-96.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Evelyn Reid

Affiliation: Historian

Phone Number: (509) 447-2770

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 07-24-96

Reason for Contact: To request information on how to obtain the Pend Oreille County Historic Register.

Summary of Discussion: Evelyn Reid was unaware of an official register maintained by Pend Oreille County for historic places. However, she believes that the register mentioned in Thompson's (1994) report that the Washington Hotel is apparently listed on is from a series of plaques commissioned by Pend Oreille County during the Washington Centennial celebration in 1989. The plaques were placed on several buildings throughout the county by a local committee. She is going to try to obtain the list and send it to LAAS.

Additional Notes/Comments:

REPORT OF CONTACT FORM
SEATTLE CITY LIGHT BOUNDARY PROJECT

Tracking Number: _____

Person Contacted: Martha Taylor

Affiliation: Pend Oreille County Museum

Phone Number: (509) 447-5388

Copies to:

Contacted By: Leonard Forsman

Affiliation: LAAS

Date of Contact: 07-24-96

Reason for Contact: Requested copy of Pend Oreille County Historic Register.

Summary of Discussion: Martha Taylor had not heard of the inventory but referred Leonard Forsman to Evelyn Reid, a local historian.

Additional Notes/Comments:

APPENDIX D

Boundary Project Contacts List
(Revision No. 03 - July 25, 1996)

SCL BOUNDARY PROJECT CONTACTS - BY DISCIPLINE

DRAFT 7/25/1996 (Revision No. 03)

DISCIPLINE	CONTACT NAME	TITLE	AGENCY/ AFFILIATION	ADDRESS	PHONE	FAX	E-MAIL	TYPE OF INFORMATION TO BE OBTAINED
Cultural Resources	Rob Whitlam	State Archaeologist	Washington State Office of Archaeology and Historic Preservation	111 W. 21st; Box 483343; Olympia, WA 98504-8343	360-753-4405 x232	360-586-0250		
	Greg Griffiths	Comprehensive Plan Specialist	Washington State Office of Archaeology and Historic Preservation	111 W. 21st; Box 483343; Olympia, WA 98504-8343	360-753-4117	360-586-0250		
	Gary Fergen	Planning Director	County of Pend Oreille	POB 5066	509-447-4821	509-447-5890		
	Carla Rickerson	Special Collections Research Librarian	University of Washington Libraries, Special Collections	Box 352900; Seattle, WA 98195	206-543-1929	206-685-8049	speccoll@u.washington.edu	
	Lynn Barnes	Librarian	Metaline Falls Community Library	PO Box 111; 302 Park; Metaline Falls WA 99153	509-446-3232	509-446-4013	metslib@mail.iomet.com	
		Librarian	Colville Library	195 S. Oak; Colville, WA 99114	509-684-6620	509-684-3911		
	Dan Matson	Forest Archaeologist	Colville National Forest	765 S. Main; Colville WA 99114	509-447-7251	509-684-7280		
	Dean Osgerman	Tribal Anthropologist	Kalispel Tribe	PO Box 39; Usk WA 99180	509-445-1147	509-445-1147		
Terrestrial Resources	Ms. Sandy Norwood	Environmental Review Coordinator	Washington Dept of Natural Resources, Washington Natural Heritage Program (WNHP)	111 Washington St. SE; PO Box 47016; Olympia WA 98504-7016	360-902-1167	360-902-1787		Information on the occurrence of any plant species in the project vicinity with federal or state status (listed threatened, proposed endangered, etc.). Requires letter and payment to access WNHP database.
	Lori Adkins	Data Manager	Washington Dept of Natural Resources, Washington Natural Heritage Program (WNHP)	600 Capitol Way N.; Olympia WA 98501-1091	360-902-2243			Information on the occurrence of any plant species in the project vicinity with federal or state status (listed threatened, proposed endangered, etc.). Requires letter and payment to access WNHP database.
	Keitlyn Watson	Wildlife Biologist	Washington Dept of Fish and Wildlife	N 8702 Division St.; Spokane WA 99218	509-456-4082			Information on wildlife and habitats in the project vicinity; WDFW issues relating to wildlife and the Boundary Project. Phone call, not like sensitive.
		Wildlife Biologist and Botanist	U.S. Forest Service, Colville National Forest	765 S. Main; Colville WA 99114				Information on wildlife and plants in the project vicinity; USFS issues relating to wildlife and the Boundary Project. Phone call, not likely sensitive.
			U.S. Fish and Wildlife Service, National Wetlands Inventory	USGS/ESIC, Western Mapping Center; 345 Middlefield Rd.; Mail Stop 532; Menlo Park CA 94025	415-329-4309			Location of wetlands mapped by the USFWS in the project vicinity. Requires phone call and payment to order maps.
	Steve Zender		Washington Dept of Game		509-935-6073			Contacted 9/80 for available info on biol. resources of Boundary Reservoir area.
	Tom Burke		U.S. Forest Service, Colville NF		509-684-3711			Contacted 9/80 for available info on biol. resources at Boundary Reservoir area.
	Ms. Joyce Gebhardt	Grizzly bear specialist	USFWS-Boise Regional Office		208-334-1960			Contacted 7/81 for grizzly bear info
	Mr. Jim Bottorff		USFWS-Endangered Species Team, Olympia WA.					Contacted 6/81 regarding endangered species in Boundary Project area.

SCL BOUNDARY PROJECT CONTACTS - BY DISCIPLINE

DRAFT 7/25/1996 (Revision No. 03)

DISCIPLINE	CONTACT NAME	TITLE	AGENCY/ AFFILIATION	ADDRESS	PHONE	FAX	E-MAIL	TYPE OF INFORMATION TO BE OBTAINED
Recreation and Aesthetic/Visual Quality Resources	Dan Haas	FERC Projects	USDI, National Park Service	909 First Avenue, Suite 500, Seattle, WA 98104-1060	206-220-4079			Info on relicensing concerns relative to recreation issues that may need addressed on Pend Oreille R./Colville NF. Phone call or visit, not likely sensitive at this time.
		Regional Supervisor	Washington State Department of Parks and Recreation Commission	RR 9; Box 2501; Sacajawea Park Rd.; Pasco, WA 99381				Information on State recreation resources in the region and demand for State rec. facilities. Phone call or letter, not likely sensitive.
		Hunting/Fishing Rec. Planner, Regional Office	Washington Department of Fish and Wildlife	N 8702 Division Street; Spokane, WA 99218	509-456-4082			Information on hunting and fishing activities in NE Washington and Pend Oreille River, issues relative to recreation use and hunting/fishing resources. Phone call, not likely sensitive.
		Recreation Resource Specialist, Supervisor's Office	U.S. Forest Service Colville National Forest	765 S. Main; Colville, WA 99114				Information on recreation use on Forest land, Wilderness Areas, National Trails, and Wild and Scenic River. Acquire Forest LRMP. Phone call, not likely sensitive at this time.
	Mr. L.D. Fairleigh	Chief, Research and Long Range Planning	Washington State Department of Parks and Recreation Commission	P.O. Box 1128; Mail Stop KY-11; 7150 Clearwater Lane; Olympia, WA 98504				Information on planned State projects in the region. Phone call, not likely sensitive.
	Mr. Jeff Frost	Recreation Resource Planner	Interagency Committee for Outdoor Recreation	4800 Capitol Blvd.; P.O. Box 40917; Tumwater, WA 98504-0917	360-902-3000	360-902-3026		Information on Washington SCORP Planning District 11, planned or funded IAC recreation projects in the region. Phone call, not likely sensitive.
		Visual Resource Specialist, Supervisor's Office	U.S. Forest Service; Colville National Forest	765 S. Main; Colville, WA 99114				Information on visual resource management objectives in the Pend Oreille River corridor. Phone call, not likely sensitive.
	Mr. Gary Fergen	Planning Director	Pend Oreille County; Office of Planning	P.O. Box 5066; Newport, WA 99156				Information on visual resource policies or ordinances, updated County Comprehensive Plan - recreation and aesthetics policies and plans, Shoreline Management Master Plan, and tourism development. Phone call, not likely sensitive.
Fish Biology and Management	Tom Shuhda	Forest Fisheries Biologist	U.S. Forest Service, Supervisor's Office	Colville National Forest 765 S. Main Colville, WA 99114	509-684-7211			Lead fisheries biologist for forest. Will provide information on fisheries management programs and policies. Main USFS liason.
	Karen Honeycutt	Fisheries Biologist	U.S. Forest Service, Supervisor's Office	Colville National Forest 765 S. Main Colville, WA 99114	509-684-7224			Fisheries biologist. Will provide information on fish population and habitat surveys; district fisheries plans.
	Tim Burtram	Fisheries Biologist	U.S. Forest Service, Sullivan Lake District Office	Colville National Forest, Sullivan Lake Ranger District; Metaline Falls, WA 99153	509-446-7500			
	Curt Vail	Regional Fisheries Biologist	Wash. Dept. of Fish and Wildlife	1073 Starvation Lake Road Colville, WA 99114	509-684-5742			Regional fisheries biologist. Can provide information on WDFW fish surveys; district liaison.
	Paul Mongilla	WDFW Non-game Species Coordinator	Wash. Dept. of Fish and Wildlife	600 N. Capital Way, Olympia, WA 98504	360-902-2824			WDFW lead for management and research investigations of non-game fish species

SCL BOUNDARY PROJECT CONTACTS - BY DISCIPLINE

DRAFT 7/25/1996 (Revision No. 03)

DISCIPLINE	CONTACT NAME	TITLE	AGENCY/ AFFILIATION	ADDRESS	PHONE	FAX	E-MAIL	TYPE OF INFORMATION TO BE OBTAINED
'Fish Biology and Mgmt (Cont)	Carolyn Scafidi	Federal Bull Trout Coordinator	U.S. Fish and Wildlife Service	3704 Griffin Lane SE Suite 102 Olympia, WA 98501	360-753-9440			Federal coordinator for ESA listing of bull trout.
	Craig Burley	WDFW Bull Trout Coordinator	Wash. Dept. of Fish and Wildlife	600 N. Capital Way, Olympia, WA 98504	360-902-2406			WDFW lead for developing state management plans and policies for Bull Trout
	Chris Donnelly	Fisheries Biologist	Wash. Dept. of Fish and Wildlife	Box 39, Usk, WA 99180	509-445-1147			Fisheries biologist conducting field work on Pend Oreille River. Working on BPA funded project with Kalispel Tribe.
	Neil Lockwood	Fisheries Biologist	Wash. Dept. of Fish and Wildlife	Box 39, Usk, WA 99180	509-445-1147			Fisheries biologist conducting field work on Pend Oreille River. Working on BPA funded project with Kalispel Tribe.
	Jerry Smith	Hydropower Coordinator (fisheries)	Wash. Dept. of Fish and Wildlife	600 Capitol Way North Olympia, WA 98501				Hydropower coordinator for fisheries concerns
	Fred Goetz	Fisheries Biologist	U.S. Army Corps of Engineers	4735 E Marginal Way Seattle, WA 98134	206-764-3624	206-827-3243		Fisheries biologist for COE. Author of several comprehensive reports on bull trout.
	Don Ratliff	Fisheries Biologist	Portland General Electric	P.O Box 710 Madras, Oregon 97741	503-474-2277			Lead utility biologist for comprehensive study of bull trout in Oregon.
	Ned Horner		Idaho Department of Fish & Game	2750 Kathleen Avenue; Coeur d'Alene, ID 83814	208-769-1414	208-769-1418		
	Vaughn Paragamian		Idaho Department of Fish & Game	2751 Kathleen Avenue; Coeur d'Alene, ID 83814	208-769-1414	208-769-1418		
	Jim Davis		Idaho Department of Fish & Game	2752 Kathleen Avenue; Coeur d'Alene, ID 83814	208-769-1414	208-769-1418		
	Brent Mabbott		Montana Power Company	40 East Broadway; Butte, 59701	406-723-5421	406-782-4304		
	David Bennett		Department of Fish and Wildlife	University of Idaho; Moscow, ID 83844-1136	208-885-6337	208-885-6226		
	Bruce Rieman	Fisheries Biologist	U.S. Forest Service	Intermountain Research Station; 316 E. Myrtle; Boise ID 83702	208-364-4377	208-364-4346		Regional Bull Trout expert with U.S. Forest Service
	Russ Thoreau	Fisheries Biologist	U.S. Forest Service	Intermountain Research Station; 316 E. Myrtle; Boise ID 83703	208-364-4377	208-364-4346		Regional Bull Trout expert with U.S. Forest Service
	Joe Moroney	Fisheries Biologist	Kalispel Tribe	Box 39; Usk WA 99180	509-445-1147			Main fisheries contact with the Kalispel Tribe
	Bill Towey	Manager of Natural Resources	Kalispel Tribe	Box 39; Usk WA 99181	509-445-1147			
	Larry Brown	Fisheries Biologist	Wash. Dept. of Fish and Wildlife	1518 4th Street Wenatchee, WA 98801	509-662-2042			Bull trout expert with Wash. Dept. of Fish and Wildlife
	Joe Kelly	Fisheries Biologist	Bureau of Land Management	915 Walla Walla; Wenatchee, WA 98801	509-665-2100			
	Jerry Coleman	Hydropower Coordinator	U.S. Forest Service	Colville National Forest; 765 S. Main, Colville, WA 99114	509-684-7104			
Water Quantity and Quality	Jeff Marti	Hydropower Coordinator	Wash. State Dept. of Ecology	P.O. Box 47600 Olympia, WA 98504	360-493-9562			Hydropower coordinator for water quality concerns (including Section 401)
			U.S. Geological Survey				h20.usgs.gov/swr/wa/	Discharge records for gages within Boundary Project area.
	Luis A. Fuste		U.S. Geological Survey - Tacoma				smtp@dwatcm.wr.usgs.gov	

SCL BOUNDARY PROJECT CONTACTS - BY DISCIPLINE

DRAFT 7/25/1996 (Revision No. 03)

DISCIPLINE	CONTACT NAME	TITLE	AGENCY/ AFFILIATION	ADDRESS	PHONE	FAX	E-MAIL	TYPE OF INFORMATION TO BE OBTAINED
Water Quantity and Quality (Cont)	Chuck Rice		EPA Region 10	4601 N. Monroe; Suite 202; Spokane, WA 99205-1295	509-625-5189	509-456-6175		
	Greg Kruger		Wash. State Dept. of Ecology	PO Box 47600; Olympia, WA 98505	360-407-6455			NPDES permits
	Tom Luster		Wash. State Dept. of Ecology	PO Box 47600; Olympia, WA 98506	360-586-6828			Public information and document requests
	Brad Hopkins		Wash. State Dept. of Ecology	PO Box 47600; Olympia, WA 98507	360-753-2819			Freshwater data requests
	Mark Hicks		Wash. State Dept. of Ecology	PO Box 47600; Olympia, WA 98508	360-438-7087			Water quality regulations
	Debora Cornett		Wash. State Dept. of Ecology	4601 N. Monroe; Suite 202, Spokane, WA 99205-1295	509-456-2877	509-456-6175		
Miscellaneous			Upper Columbia Resource Conservation and Development	1101 N. Argonne, Su 215; Spokane WA 99212	509-353-2187			Resource development in Upper Columbia Basin
	Ruth Watkins		Tri-State Implementation Council	307 2nd Ave, Su 6; Sand Point ID 83864	208-265-9092			Issues on water quality within Pend Oreille River
Misc. Contacts from Box Canyon Consultation List		Regional Supervisor	Washington State Department of Parks and Recreation Commission	R.R. 9, Box 2501; Sacajawea Park Road; Pasco, WA 99381				
	Ms. Mary Thompson	State Historic Preservation Officer	Washington State Office of Archaeology and Historic Preservation	111 W. 21st Avenue; KL-11; Olympia, WA 98504-8343				
	Ms. Sandy Norwood		Washington State Department of Natural Resources	1111 Washington St. SE; P.O. Box 47016; Olympia, WA 98504-7016				
		Regional Supervisor	Idaho Department of Fish and Game	2320 Government Way; Coeur d'Alene, ID 83814				
	Mr. Lynn Childers	Field Supervisor	U.S. Fish and Wildlife Service	3704 Griffin Lane SE; Suite 102; Olympia, WA 98501				
	Mr. Phil Laumeyer	Field Supervisor	U.S. Fish and Wildlife Service	11103 E. Montgomery Dr.; Suite 2; Spokane, WA 99206				
		Project Supt., Resource Manager	Albeni Falls Dam	P.O. Box 310; Newport, WA 99156				
	Mr. Larry Brockman		U.S. Environmental Protection Agency	Region 10; 1200 - 6th Avenue; WD-136; Seattle, WA 98101				
	Mr. Thomas E. Mueller	Chief	Regulatory Branch; U.S. Army Corps of Engineers	P.O. Box 3755; Seattle, WA 98124-2255				
	Mr. Ed Schultz		U.S. Forest Service	Colville National Forest; 765 S. Main; Colville, WA 99114				
	Mr. Fred Gonzalez	District Ranger	U.S. Forest Service	Colville National Forest; Sullivan Lake Ranger Station; Metaline Falls, WA 99153				
	Mr. Richard Winters		U.S. Department of the Interior	National Park Service; 909 First Avenue, Suite 500; Seattle, WA 98104-1000				

SCL BOUNDARY PROJECT CONTACTS - BY DISCIPLINE

DRAFT 7/25/1996 (Revision No. 03)

DISCIPLINE	CONTACT NAME	TITLE	AGENCY/ AFFILIATION	ADDRESS	PHONE	FAX	E-MAIL	TYPE OF INFORMATION TO BE OBTAINED
Misc. Contacts from Box Canyon Consultation List (Cont)	Mr. Merrit Tuttle		National Marine Fisheries Service	911 NE 11th Avenue, Room 620; Portland, OR 97232				
			U.S. Geological Survey	W. 920 Riverside; Spokane, WA 99201				
		Wildlife Manager	Idaho Department of Fish and Game	2320 Government Way, Coeur d'Alene, ID 83814				
		Administrator	Division of Environmental Quality; Bureau of Water Quality; Idaho Department of Health and Welfare	1410 North Hilton; Boise, ID 83702				
	Mr. Bill Towey	Manager of Natural Resources	Kalispel Indian Tribe	Box 39; Usk, WA 99180				
	Mr. Glenn Nenema	Chairman	Kalispel Tribe	P.O. Box 39; Usk, WA 99180				
	Dr. Al Scholz	Upper Columbia United Tribes	Fisheries Center; Department of Biology; Eastern Washington University	Mail Stop #72; Cheney, WA 99004				
	Ms. Tamara Skillingstad	Upper Columbia United Tribes	Fisheries Center; Department of Biology; Eastern Washington University	Mail Stop #72; Cheney, WA 99004				
	Mr. Larry W. Weis	General Manager	Pend Oreille County	Public Utility District; P.O. Box 190; Newport, WA 99156-0190				
	Mr. Robert Geddes		Pend Oreille County	Public Utility District; P.O. Box 190; Newport, WA 99156-0190				
	Mr. John Blum		Cascades Environmental Services	1111 North Forest Street; Bellingham, WA 98225				
	Mr. Larry Brockman		U.S. Environmental Protection Agency	Region 10; 1200 - 6th Avenue, WD-136; Seattle, WA 98101				
	Ms. Margaret Cain		U.S. Forest Service; Colville National Forest; Newport Ranger Station	Box 770; Newport, WA 99156				