Annual Report on Resident Fish Activities

U.S. Department of Energy
Bonneville Power Administration
Division of Fish & Wildlife

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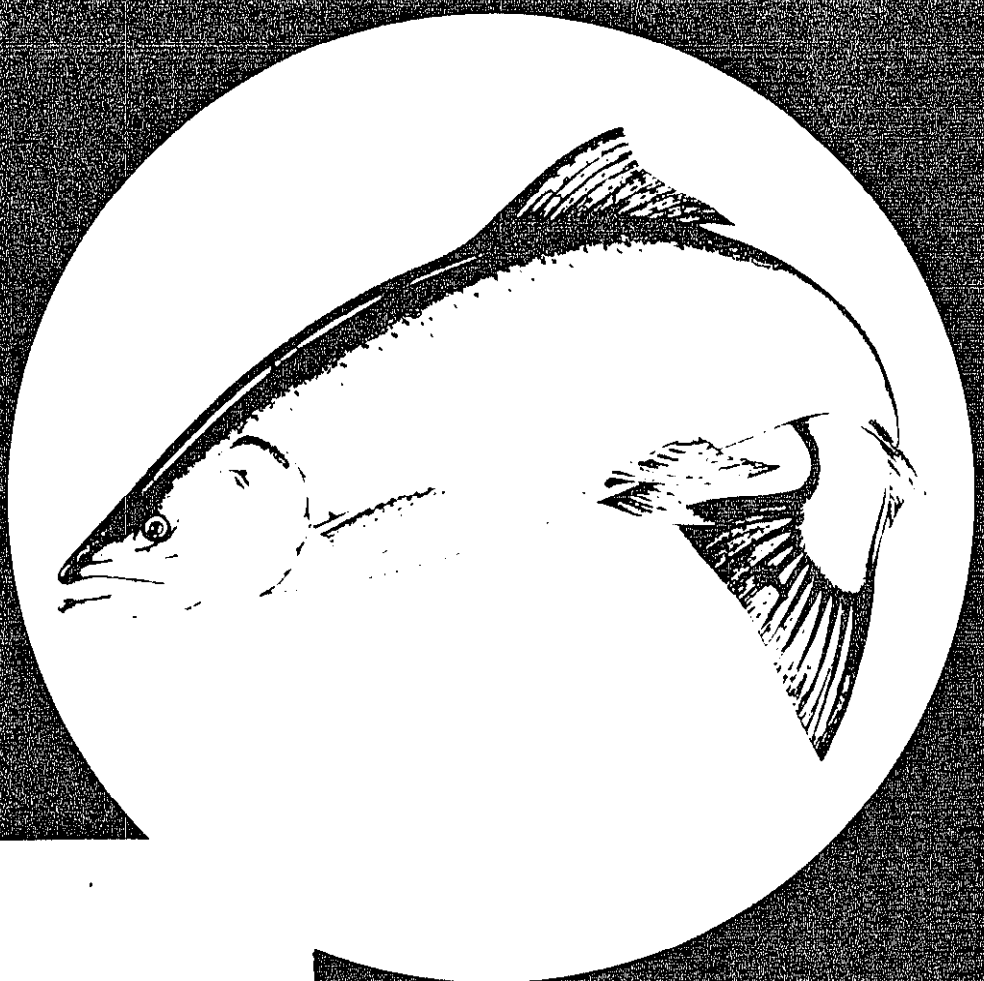

1986

ANNUAL REPORT ON RESIDENT FISH ACTIVITIES

FISCAL YEAR 1986

Columbia River Basin
Fish and Wildlife Program
Action Item 41.8

Prepared by
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife

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RESIDENT FISH ANNUAL REPORT - 1986

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INTRODUCTION

This report addresses the status of resident fish projects currently funded by the Bonneville Power Administration (BPA) under the Columbia River Basin Fish and Wildlife Program (Program) established pursuant to the Northwest Power Act (P.L. 96-501). The report provides a brief synopsis, review and discussion of 13 resident fish projects funded during September 1985 to May 1986.

The resident fish section of the Program addresses measures which are intended to protect resident fish, mitigate fishery losses caused by hydroelectric projects, and compensate for past losses through enhancement measures. These measures include, but are not limited to: flow requirements, drawdown requirements, temperature control, and streambed protection.

Annual and completion reports are required for the projects and are available from BPA. A bibliography for these is included as Appendix A to this report.

The projects are described here in the same order that the measures, under which they fall, are presented in the Program.

PROJECTS

MEASURES (804)(a)(1-10)
FLOW REQUIREMENTS

oject: Flathead System Kokanee Study (81S-5)

ogram Measure: 804(a)(1-2) and (b)(5).

ntractor: Montana Department of Fish, Wildlife, and Parks.

oject Manager: Tom Vogel.

oject Status: Ongoing ; initiated September 1981, completion is scheduled for early 1988.

oject Summary:
Scope:
The overall purpose of the project is to evaluate and document the effects of hydroelectric operations of Kerr and Hungry Horse Dam on kokanee reproduction in the upper Flathead River and shoreline areas of Flathead Lake. The project was designed on the system approach, recognizing that declining kokanee population in the Flathead System resulted from several problems that exist in the lake as well as the Flathead River. However, to facilitate data collection and analyses the project was divided into two segments, the Flathead River segment and the Flathead Lake segment. The River segment of the study began in 1979 under the U.S. Bureau of Reclamation (Bureau) funding and continued in 1982 with funding provided by the BPA. The Flathead Lake segment of the study began in 1981 with BPA funding.

Objectives:
Flathead River Segment

1. Develop stock recruitment relationship for kokanee in the river system.

2. Quantify the effect of controlled flows on distribution and reproductive success of kokanee in the regulated portion of the Flathead River. Determine the relative contributions of day and nighttime spawning.

3. Determine relative contributions of major river system spawning areas to total kokanee populations.

4. Identify timing and destination of successive runs of kokanee spawners in the Flathead River and their use by fishermen, and determine if migration timing is affected by discharge from Hungry Horse Dam.

Flathead Lake Segment

1. Determine the production potential of Flathead Lake shoreline areas for kokanee salmon.

2. Determine the impacts of the historical and present operation of Kerr and Hungry Horse Dam and Reservoir and groundwater storage, velocity and quality and other factors on kokanee reproduction in Flathead Lake.

3. Develop a recovery plan for kokanee shoreline spawning in Flathead Lake.

Results/Discussion:

Results of the first two field seasons of the Flathead River segment can be found in the 1983 annual report (Fraley and McMullin, 1983) and the 1984 annual report (Fraley, 1985). Results of the first two field seasons of the Flathead Lake segment are found in the 1983 annual report (Decker-Hess and McMullin, 1983) and the 1984 annual report (Decker-Hess and Clancey, 1984).

Kokanee salmon were introduced into Flathead Lake in 1916. By 1933, a sport fishery had developed that included a summer troll fishery in the lake and an intense fall snag fishery in the river system. In Flathead Lake, MDFWP records indicate large numbers of kokanee spawners were using 30 shoreline spawning areas in 1952. In a lake-wide creel census in the mid- 1960's snagging of lakeshore kokanee spawners accounted for 11 to 12 percent of the total kokanee harvest in Flathead Lake. MDFWP records also indicate that kokanee comprised over 90 percent of an estimated annual harvest of 719,000 gamefish in the Flathead Lake-River system during the 1981-1982 season.

Hungry Horse Dam was completed on the South Fork of the Flathead River in 1953. Its early operation altered natural flow and temperature regimes in the South Fork and in the mainstem Flathead downstream of the South Fork. The warmer waters favored kokanee spawning success and from the late 1950's through mid 1970's strong runs of kokanee reproduced in the river below the South Fork of the Flathead River. Recent trends in abundance of kokanee spawning indicate a significant decline.

This decrease in kokanee spawning success appears to be the result of changing operations of Hungry Horse Dam and heavy angler harvest pressure. Kokanee spawn primarily along stream margins and in side channels in the Flathead River. Vertical water level fluctuations, caused by Hungry Horse Dam operation, have resulted in high river flows during the fall kokanee spawning period and lower flows during the winter incubation period. Redds left exposed during low flow periods are subject to dewatering and freezing of incubating kokanee eggs.

The operation of Kerr Dam, located below Flathead Lake on the Flathead River, has also altered seasonal fluctuations of Flathead Lake. Lake levels presently remain high during kokanee spawning in November and decline during incubation and emergence periods. This drawdown generally limits successful kokanee reproduction in Flathead Lake to a few areas wetted by groundwater seeps and some limited areas below minimum pool.

As a result of findings from this project, as well as information gained from the Bureau of Reclamation study on the Flathead River 1979 to 1981, measures have been identified and implemented to promote recovery of the Flathead System kokanee population. MDFWP has reduced limits and eliminated snagging of kokanee throughout the drainage in an effort to facilitate restoration of the kokanee population. Mainstem spawning flows of 3,500 – 4,500 cfs (October 15 – December 15) and minimum incubation flow; of 3,500 cfs (December 15 – April 15) were recommended. Through cooperative efforts of BPA, the Bureau of Reclamation and MDFWP, the recommended flows have been implemented.

Information from each study segment will be combined to establish system escapement goals that will result in kokanee spawners averaging 300 mm to 330 mm mean length. This size was selected by the Montana Department of Fish, Wildlife, and Parks (MDFWP) based on an assumed density dependent relationship that will produce a kokanee fishery balanced between total harvest , catch rates, and average size.

Recovery of the kokanee population, as a result of flow and angler harvest management, remains to be documented and will be part of future project efforts. Egg to fry survival has increased, however, and there are good indications that the population should recover to optimum levels by the late 1990's. Timing of the recovery could vary depending on natural fluctuations in kokanee egg to fry and fry to adult survival rates. The recovery rate also may be affected by the level of implementation of recommended mitigation measures for lost kokanee spawning habitat in Flathead Lake.

Another potential problem that may adversely impact the recovery rate of the Flathead kokanee population has been identified as a result of this study. The problem is associated with recent indications that the Mysis shrimp (Mysis relicta) population in Flathead Lake is expanding at a relatively rapid rate. The status of the zooplankton populations, particularly the Mysis, is being studied by MDFWP and the University of Montana at the University's Yellow Bay Laboratory. The rationale for concern over an expanding Mysis shrimp population is the inference that in many lake systems the Mysis appears to compete for food with young kokanee, leading to low survival of fry to adult kokanee. By observing changes in the lake's zooplankton population, and kokanee growth rates and/or year class strength as related to increased numbers of Mysis shrimp, one might be able to predict the impact on recovery of the kokanee population.

Project: Lower Flathead System Fisheries Study, BPA 83-1

Program Measures: 804(a)(3) and 804(b)(6).

Contractor: Salish-Kootenai Tribes.

Project Manager: Tom Vogel.

Project status: Ongoing; initiated November 1982, completion is scheduled for December 1987.

Project Summary:

Scope:

The purpose of the study is to evaluate the impacts of Hungry Horse and Kerr dams on the fisheries resources of the Lower Flathead System. The study focuses on three distinct portions of the Lower Flathead System: the lower Flathead River, lower Flathead River tributaries, and the South Bay of Flathead Lake. From data collected during the project, an array of management/mitigation alternatives will be developed covering the present status of hydroelectric development and operation.

Objectives:

1. Assess existing aquatic habitat in the lower Flathead River and its tributaries and its relationship to the present size, distribution, and maintenance of all salmonid species, northern pike (Esox lucius), and largemouth bass (Micropterus salmoides) populations.

2. Assess how and to what extent hydroelectric development and operation affects the quality and quantity of aquatic habitat in the lower Flathead River and its tributaries and life stages of existing trout, pike, and largemouth bass populations. Evaluate the potential for increasing quality habitat, and thus food and game fist. production, through mitigation.

3. Assess existing aquatic habitat in the South Bay of Flathead Lake and its relationship to the present size, distribution, and maintenance of yellow perch (Perca flavescens), largemouth bass, northern pike, mountain whitefish (Prosopium williamsoni), and lake whitefish (Coregonus clupeaforms) populations in the bay.

4. Assess how and to what extent hydroelectric development and operation affects the quality and quantity of aquatic habitat in South Bay and life stages of existing target fish populations.

5. Develop an array of fisheries management options to mitigate the impacts of present hydroelectric operations, demonstrating under each management option how fish populations and hydroelectric generation capabilities would be modified.

Results/Discussion:

Results of the first three years of the project can be found in the 1983 annual report (Dos Santos, et al., 1983), the 1984 annual report (Darling, et al., 1984), and the 1985 annual report (Pajak, et al., 1985). Preliminary study observations have indicated water level fluctuations in the main river, due to daily peaking operations, may have a significant negative impact upon reproductive success and recruitment of important fish species utilized by the Salish-Kootenai Tribes. Presently the hydroelectric operational regime involves rapid changes in river discharge during spawning and incubation periods. This operating regime causes water velocity and depth to constantly vary over spawning gravels. Redds are dewatered, and eggs and fry are stranded. Constant water level fluctuations over backwater vegetation have been identified as creating major problems in successful northern pike spawning and recruitment by preventing access to spawning sites, and dewatering nests and stranding fry. Additional degradation of fish habitat is due to land use practices and irrigation development on tributary streams to the lower river.

The project was divided into two phases. Phase I of the South Bay investigation was completed in 1984, resulting in a detailed study plan for the last three years of the project. Dominant habitat types were mapped, and physical habitat and biological monitoring methods were evaluated and selected. Permanent habitat transects, water quality stations, fish sampling, gill netting, seining, and trapping sites were established. The study plan included Phase II scheduling, funding estimates and personnel requirements.

During fiscal year 1985, Phase II work on the lake began and the second field season of Phase II work on the main river and tributaries was completed. Phase II of the lake work focuses on extensive evaluation of habitat and the spatial and temporal distribution of fish species in response to lake level fluctuation. Two tributaries ware confirmed as major spawning sites for river trout. The predominance of 1+ and 2+ rainbow and brown trout in the lower reaches of the tributaries may reflect the utilization of the tributaries by main river stocks. In 1986 different sampling techniques will be utilized to validate initial findings.

The Instrean Flow Incremental Methodology using the Water Surface Profile hydraulic model will be used to describe change in habitat due to discharge. Evaluations on the main river were to be initiated during 1985, but were postponed until 1986 due to high river flows. Data on the spatial and temporal distribution of target fish species in South Bay will be correlated with identified habitat types and changing lake levels. At that time an array of management/mitigation alternatives for the lower Flathead system will be proposed. Impacts to the fish resources of the Lower Flathead System do not result from Federal hydroelectric development and operation, but rather non-Federal hydroelectric operations and irrigation development. For this reason, BPA does not plan further involvement in the Lower Flathead System once this project is completed.

Project: Determination Instream Flow Needs and Fish Populations in Selected Kootenai River Drainage Tributaries, BPA 85-6,

Program Measure: 804(a)(9).

Contractor: Montana Department of Fish, Wildlife, and Parks.

Project Manager: Fred Holm.

Project Status: Ongoing; initiated August 1985, completion is scheduled for November 1986.

Project Summary:

Scope:

The purpose of the project is to determine instream flows required to ensure successful migration, spawning and rearing of rainbow and cutthroat trout in five tributaries of the Kootenai River and six tributaries of Lake Koocanusa. It is important that instream flows in Kootenai drainage tributaries be determined so that fisheries' needs can be balanced with power and irrigation. FERC applications for microhydro development are pending on ten tributaries of Lake Koocanusa and two tributaries of the Kootenai River. Irrigation diversions exist on at least two tributaries of the Kootenai River and on Graves Creek. Graves Creek is a major spawning tributary of Lake Koocanusa and is targeted for a microhydro development.

Objectives:

1. Determine instream flows needed to ensure successful migration, spawning and rearing in the following tributaries of the Kootenai River and Lake Koocanusa: Kootenai River tributaries – Callahan,' Quartz, Libby and O'Brien creeks, and the Fisher River; Lake Koocanusa tributaries – Graves, Deep, Big, Bristow, Barron and Five-Mile creeks.

2. Estimate fish populations or relative abundance in stream reaches where instream flow determinations are made.

Results/Discussion:

The Kootenai River below Libby Dam supports one of western Montana's most popular trout fisheries. A dense population of wild rainbow trout inhabits the 50 miles of river between Libby Dam and the Idaho border. Although a small population of native rainbow resides in Callahan Creek (near Troy, Montana), most of the Kootenai's rainbows are migratory fish that are derived from hatchery stocks. The migratory fish reside in the Kootenai River but spawn in tributary streams.

Preliminary instream flow work has been completed on nine streams (69 transects). Trout population estimates have been completed on two tributaries, and traps are being operated on six tributaries. Emphasis during the remainder of the project will be placed on trout population estimates, stream habitat assessment, stream trapping, completion of instream flow measurements and preparation of the final report. Recommendations will be made for instream flows which should maintain and enhance the Kootenai fishery.

MEASURES 804(b)(1-10)
DRAWDOWN REQUIREMENTS

Project: Quantification of Libby Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, BPA 83-467,

Program Measure: 804(b)(3).

contractor: Montana Department of Fish, Wildlife, and Parks.

Project Manager: John Ferguson.

Project status: Ongoing; initiated May 1983, completion is scheduled for March 1988.

Project summary:

Scope:

The purposes of this study are to determine how reservoir operations impact Libby Reservoir's fishery, and ultimately provide recommendations for operating Libby Dam to maintain or enhance the reservoir fishery. Libby Dam was constructed on the Kootenai River as part of the Columbia River Treaty between the United States and Canada to provide hydroelectric power and flood protection for the Kootenai and Columbia River basins. Construction began in 1966, impoundment was first achieved in March 1972, and a full pool elevation of 2,459 feet was first reached in July 1974.

The study was divided into two phases. Phase I of the study was planned to develop a data base for evaluating the impacts of reservoir operation on the reservoir fishery. Phase II of the study will involve developing a model for the prediction of reservoir operation effects on the reservoir fishery and cooperatively implementing a water management plan in conjunction with upper Columbia River Basin water, hydroelectric, and fish and wildlife managers.

Objectives:

1. Quantify available reservoir habitat seasonally dependent upon reservoir elevation.

2. Determine the abundance, growth, and distribution of fish within the reservoir and assess potential recruitment from reservoir tributaries.

3. Determine the abundance and availability of food organisms for fish in the reservoir.

4. Quantify fish use of available food items.

5. Develop relationships between reservoir drawdown and reservoir habitat for fish and fish food organisms.

6. Estimate impacts of reservoir operation on the reservoir fishery.

Results/Discussion:

Results for the first three wars of the study are found in the 1983 annual report (Sheppard and McMullin, 1984), the 1984 annual report (Sheppard, 1985), and the 1985 annual report (Chisholm and Fraley, 1986). Major impacts of reservoir operations on the fishery appear to be directly or indirectly associated with physical loss of surface area and habitat from drawdowns, and/or loss of thermal structure. Fish distribution in the reservoir appeared to be controlled primarily by water temperature and food availability. The relative abundance of fish species in Libby reservoir are changing. Kokanee (Oncorhynchus nerka) numbers have been steadily increasing and redside shiner (Richardsonius balteatus) and mountain whitefish numbers are declining. A winter burbot (Lota lota) fishery has developed in the reservoir. The 1985 spring - fall creel survey revealed that kokanee comprised 96 percent of the gamefish creeled, and trout comprised less than four percent.

Data collection and analysis will continue into 1988. The predictive model which is being developed will allow decisionmakers to understand tradeoffs and opportunities provided by different reservoir operation regimes. A reduced level of evaluation/monitoring and model validation is scheduled beyond the March 31, 1988 completion date of the study.

Project: Quantification of Hungry Horse Dam and Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, BPA 83-465,

Program Measure: 804(b)(3).

Contractor: Montana Department of Fish, Wildlife, and Parks.

Project Manager: John Ferguson.

Project Status: Ongoing; initiated May 1983, completion is scheduled for March 1988.

Project Summary:

Scope:

The purpose of the project is to quantify seasonal water levels needed to maintain or enhance principal gamefish species in Hungry Horse Reservoir. Hungry Horse Dam was completed in 1952 and the reservoir reached full pool elevation of 3,560 feet msl in July 1953. The dam impounded the South Fork of the Flathead River eight kilometers upstream from its confluence with the Flathead River. Hungry Horse is a large storage reservoir whose primary benefits are flood control and power production. This project will provide decisionmakers with information describing impacts of various reservoir operational regimes on the reservoir fishery. Recommendations will be developed for the protection and enhancement of the fishery.

Objectives:

1. Quantify the amount of reservoir habitat available at different water level elevations.

2. Estimate recruitment of westslope cutthroat trout juveniles from important spawning and nursery tributaries.

3. Determine the abundance, growth, distribution and use of available habitat by major game fish species in the reservoir.

4. Determine the abundance and availability of fish food organisms in the reservoir.

5. Quantify the seasonal use of available food items by major fish species.

6. Develop relationships between reservoir drawdown and reservoir habitat used by fish and fish food organisms.

7. Estimate the impact of reservoir operation on major game fish species.

Results/Discussion:

Preliminary results of the first three years of the project can be found in the 1983 annual report (May and McMullin, 1984), the 1984 annual report (May and Zubik, 1985), and the 1985 annual report (May and Fraley, 1986). Data collection and analysis for these seven objectives will continue into 1988.

The annual drawdown and refill cycle in Hungry Horse Reservoir causes large changes in reservoir morphometrics. Drawdown reduces total reservoir volume, euphotic zone volume, surface area, wetted reservoir bed area, and weakens thermal structure. These changes appear to have a significant adverse impact on zooplankton, benthic macroinvertebrate populations, and the production of important gamefish species.

Progress has been made in developing a model which will predict the impacts of reservoir operation on habitat, primary production, secondary production, and fish populations. The approach selected entails the use of component models corresponding specifically to the mechanisms by which dam operation affects the reservoir biota. The strategy consists of a physical framework component of the reservoir's morphology and thermal structure within which the primary production, secondary production and fish component models operate. A rainbow trout population simulation model which has individual fish growth as its driving variable is being evaluated. The predictive model will allow decisionmakers to understand trade off and opportunities provided by different reservoir operation regimes. A reduced level of evaluation and validation of the fishery model is scheduled after the project completion.

Project: Determination of the Fishery Losses in the South Fork of the Flathead River and Tributaries Resulting from the Filling of Hungry Horse Dam and Reservoir, BPA 85-23.

Program Measure: 804(b)(4).

contractor: Montana Department of Fish, Wildlife, and Parks.

Project Manager: Fred Holm.

Project status: Ongoing; initiated August 1985, completion is scheduled for January 1987.

Project summary:

Scope:

The major goals of this study are to (1) provide estimates of fishery losses in the South Fork of the Flathead River and its tributaries as a result of the filling of Hungry Horse Reservoir and (2) propose mitigation alternatives for enhancing the fishery.

Construction of Hungry Horse Dam in 1952 flooded approximately 57 km of the South fork of the Flathead River and about 70 km of 37 tributary streams. The dam blocked access to approximately 40 percent of the drainage area available for spawning salmonids migrating upstream from Flathead Lake. Isolation of migratory salmonids (westslope cutthroat, bull trout and mountain whitefish) from Flathead Lake may not have been entirely mitigated by the creation of new lacustrine habitat in Hungry Horse Reservoir. Spawning and juvenile trout rearing habitat in the flooded portions of tributaries and the river was lost without replacement.

Section 804(b)(4) of the Columbia River Basin Fish and Wildlife Program calls for construction, operation and maintenance of a spawning channel along the Flathead River as mitigation for habitat loss in the South Fork and Flathead Rivers. The measure also calls for a study to determine levels of production necessary to mitigate the effects of the hydroelectric system.

Objectives:

1. Assess the quality and quantity of fish habitat lost in the South Fork and tributaries flooded by the reservoir.

2. Estimate fish losses:
   a) Populations that inhabited the river and tributaries before inundation.

   b) Adfluvial fish losses due to dam construction.

3. Evaluate alternatives to mitigate for lost fish production and determine the most desirable cost effective measures.

Results/Discussion:

A habitat-based approach will be used to estimate fishery losses due to the construction of Hungry Horse Dam. A model, based on gradient and stream order, will be developed to predict the potential number of cutthroat juveniles and bull trout redds lost in tributary reaches. Losses of westslope cutthroat trout will be determined using habitat and population estimates from 159 tributary reaches in the North, Middle and South Forks of the Flathead River. Losses of adult bull trout will be calculated using estimates from 94 North and Middle Fork reaches. Once fish losses have been determined, an array of mitigation alternatives will be developed. One possible alternative is the construction of a spawning channel, as called for in measure 804(b)(4). The alternatives will be evaluated for their cost effectiveness and ecological effects.

MEASUR(804)(e)(1-16)
ADDITIONAL RESTORATION MEASURES

Project: Evaluation of Management of Water Releases from Painted Rocks Reservoir, Bitterroot River, Montana, BPA 83-463.

Program Measure: 804(e)(1) and (2).

Contractor: Montana Department of Fish, Wildlife, and Parks.

Project Manager: Fred Holm.

Project Status: Ongoing; initiated July 1983, completion is scheduled for February 1987.

Project Summary:

Scope:

This project is concerned with Measure 804(e)(l) of the amended Columbia River Basin Fish and Wildlife Program (Program) which calls for the purchase of 10,000 acre-feet (AF) of water from Painted Rocks Reservoir to maintain summer and fall flows in the Bitterroot River for resident fish. BPA agreed to fund a study to determine the effects of additional flows and development of a water management plan. Water shortages that occur in the Bitterroot River during July, August, and September have been a persistent problem for both irrigators and recreationists. Demands for irrigation water from the river have often conflicted with the instream flow needs for trout and low flows have commonly forced irrigators to dike or channelize the streambed to obtain irrigation flows. The 10,000 AF potentially would enhance the fishery in the river and reduce the degradation of the channel due to diversion activities. This 10,000 AF is in addition to the 3,200 AF base flow and the 5,000 AF already purchased in perpetuity by MDFWP, Western Montana Fish and Game Association, and Ravalli County Fish and Wildlife Association.

Objectives:

1. Develop an implementable water management plan for supplemental releases from Painted Rocks Reservoir which would provide optimum benefits to the river.

2. Gather fisheries and habitat information to evaluate the effects of dewatering in the river.

3. Obtain needed baseline information that would aid in determining the effectiveness of supplemental water releases in improving the fisheries resource.

Results/Discussion:

Results from the first field season can be found in the 1984 and 1985 annual reports (Lere, 1985; 1986). A water management plan was formulated by

(1) determining a minimum flow recommendation within the dewatered reach; (2) determining the frequency of need for supplemental water to maintain adequate flows; (3) developing a release scheduled for purchased water which would maximize the time adequate flows are met. A minimum flow of 375 ft^3/sec was recommended for the dewatered reach of the river. Flows within this reach were estimated to exceed 375 ft^3/sec approximately 92, 28, and 26 percent of the time, respectively, in late July, August, and September. Additional reservoir water (5,000 AF controlled by MDFWP and a 10,000 AF proposed purchase) was predicted to maintain or exceed a 375 ft^3/sec flow within the dewatered reach for 53 percent of the time. About 63 and 99 percent, respectively, of test releases conducted during 1984 (average water year) and 1985 (low water year) were lost before reaching a target site within the dewatered reach. A majority of these depletions were due to irrigation withdrawal . The release schedule designates supplemental water will not be released until flows within the dewatered reach become less than the minimum recommendation. The schedule designates a maximum release of 50, 112, and 110 ft^3/sec for July 16-31, August, and September, respectively.

Since this measure is not related to a federal hydroelectric project, BPA has not pursued the water purchase issue. However, they have cooperated and assisted MDFWP in finding a solution to the water shortage problem. The result was that at the meeting of the Northwest Power Planning Council in Missoula, Montana on April 9 - 10, 1986, Montana Power Company (MPC) announced that it will purchase the 10,000 AF of water from Painted Rocks. This purchase will be made in perpetuity as mitigation for Thompson Falls and is scheduled to begin in 1987. Details of the purchase are being worked out between MPC and MDFWP, and BPA's role will be complete with receipt of the final report in February 1987.

Project: White Sturgeon Early Life History Requirements and Genetics Study, BPA83-316.

Program Measure: 804(e)(3) and (8).

Contractor: School of Fisheries, University of Washington.

Project Manager: Fred Holm

Project Status: Ongoing; initiated in 1983, completion is scheduled for 1988.

Project Summary:

Scope:

This study is directed at the early life history and at the genetic assessment of the Columbia River white sturgeon populations, with regard to production and enhancement strategies for management of the species. Understanding the distribution behavior of larvae, fry, and subadults, may show the influence of hydroelectric development on Columbia River white sturgeon populations. A genetic assessment will determine what distant populations, if any, must be considered if artificial propagation and stock supplementation are selected as a mitigation and enhancement technique for rebuilding the upriver white sturgeon population.

Objectives:

1. Characterize the distribution behavior of Columbia River Basin white sturgeon larvae and fry.

2. Determine the influence of certain environmental conditions on the survival and quality of white sturgeon larvae and fry in the Columbia River.

3. Characterize the feeding behavior of larvae and fry, their responses to the presence of food, time of feeding initiation, and how food is captured and consumed.

4. Examine the influence of hydroelectric development on isolation of Columbia River white sturgeon populations.

5. Determine if Columbia River white sturgeon are represented by genetically distinct stocks, and to assess the genetic stability of populations isolated between dams.

6. Identify the responses required by juvenile white sturgeon to feed successfully on different prey items and avoid predation under different conditions of cover and light.

Results/Discussion:

Spawned on the surface of substrate in high velocities, sturgeon eggs are exposed to losses from predation or dislodgement. It has been determined that after hatching and swimming up in the water column, the larvae enter a distribution phase for a period of hours. Later, they return to the bottom,

where they seek cover in coarser substrate during the remaining portion of larvae incubation. Higher velocity and cool temperatures induce the fry to hide, and areas of low dissolved oxygen are avoided. After a few days, fry emerge from hiding and henceforth continually forage for food. Feeding behavior is specialized for use in dark, bottom-oriented habitats where contact identity of their prey is necessary and facilitated by the evolution of highly sensitive taste receptors around their mouths. Activity never ceases among the juvenile stages, and their search for food encourages a general movement with the current. Salt water tolerance, however, was found to be very poor (-15%) at least during the first four to six months of their life, which would apparently limit early use of the estuary.

As the river has been developed for hydropower, the environment in which sturgeon historically migrated, spawned, and reared, has changed. Habitat changes are expected to reduce the fitness of populations and result in genetic changes. Genetic analysis of samples taken from various locations over the length of the Columbia River has suggested that some differences in genetic structure exist in the fish which reside above Grand Coulee dam. Observed gene frequencies in areas sampled were not in Hardy-Weinburg ‘equilibrium, which could indicate the general population is experiencing perturbation within the system.

Research will continue this year on the genetic characteristics of fish spread over the basin to further refine assessment of population differences by increasing the sample size and to examine traits which may be under genetic regulation rather than the result of environmental manipulation. Work on early life history will examine traits which may be under genetic regulation rather than the result of environmental manipulation. Work on early life history will examine the influence of cover and light in simulated river flows on the feeding success and predator avoidance of young white sturgeon.

Project: White Sturgeon Research Program Development, BPA 85-64,

Program Measure: 804(e)(3) and (8).

Contractor: Battelle Pacific Northwest Laboratories.

Project Manager: Fred Holm.

Project Status: Completed, March 1986.

Project Summary:

Scope:

The purpose of this project was to develop a comprehensive research plan that responded to the need for additional scientific information on the basic biology of the white sturgeon (Acipenser transmontanus) in the Columbia River Basin. The need arises from BPA's mandate to protect mitigate and enhance white sturgeon relative to impacts from the Columbia River hydroelectric system. The Regional Council's amended Program requires BPA to evaluate current activities on white sturgeon and to develop a work plan for future action (Action Plan Item 41.3).

Objectives:

1. Assess the status of on-going and completed research related to the needs given highest priority by participants in the white sturgeon workshop.

2. Develop a comprehensive research plan for white sturgeon in the Columbia River Basin.

3. Develop a clearinghouse for information related to white sturgeon.

Results/Discussion:

The white sturgeon is an important resident fish in the Columbia River Basin and is subject to sport and commercial exploitation. The species is vulnerable to overexploitation and habitat destruction in the Columbia River Basin. Little information is available on the basic biology of the species (e.g., habitat requirements, population dynamics, fecundity, stock distribution, disease susceptibility) on which to base mitigative measures or management strategies.

A workgroup representing the fisheries agencies and Tribes, Universities, and the private sector involved in research, management or rearing of white sturgeon in the region, participated in two BPA-funded workshop sessions in 1983 and 1985. A workplan for white sturgeon research needs and a research implementation plan were developed from the workshops. The plans were submitted to the Northwest Power Planning Council (NPPC) pursuant to Action Item 41.3. The NPPC commented that the plans are consistent with the Program..

Sturgeon habitat assessment and sturgeon stock assessment were identified in the plans es the two top priority needs in FY 1986. A project addressing these, a cooperative endeavor by Oregon Department of Fish and Wildlife, Washington Department of Fisheries, and the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service, is scheduled to start July 1.

This project will be closely tied to the genetic stock assessment portion of Project 83-316 discussed previously. All tissue samples collected by the study will be sent to the University of Washington for electrophonetic analysis by the staff working on Project 83-316.

An updated computer bibliographic database on white sturgeon is operational. Computer readable media shall be supplied monthly for all inputs into the database. Enhancing communication among researchers and managers of the white sturgeon resource will help to avoid duplication of effort and facilitate information exchange.

Project: Construct Cabinet Gorge Hatchery, BPA 84-19,

Program Measure: 804(e)(5)

Contractor: Idaho Department of Fish and Game

Project Manager: Tom Clune

Project Status: Completed, November 1985.

Project Summary:

The Bonneville Power Administration (BPA), the Washington Water Power Company (WWPC), and Idaho Department of Fish and Game (IDFG), entered into a three-party agreement in 1984 to construct a hatchery that will annually produce 20 million kokanee fry to enhance the kokanee stocks in Lake Pend Oreille. The kokanee stocks have declined due to the decrease in shoreline spawning habitat, associated with fluctuating water levels from Cabinet Gorge and Albeni Falls dams, and the introduction of Mysis shrimp. The Mysis compete with the young kokanee for a particular size of plankton which is critical to the kokanee. The Cabinet Gorge Hatchery facility will enable the IDFG to rear the young kokanee to a size large enough so that small plankton are not their primary food source. BPA and WWPC shared the costs of constructing the facility, and IDFG will fund the operation and maintenance. The three-party cost sharing approach was developed to share the mitigation responsibilities of the three entities and, for BPA, ensure the best investment of ratepayer funds for the intended mitigation purpose.

The Cabinet Gorge Hatchery is now in operation. It will probably take several years for the hatchery to reach the 20 million kokanee annual production. This is because of inadequate numbers of spawners currently returning to the trapping facilities in tributaries, lake, and hatchery sites. The production will be increased as rapidly as possible toward the 20 million goal. Dedication of the hatchery is scheduled for July 12, 1986. The completion of the hatchery satisfies measure 804(e)(5), as written, but a hatchery evaluation has been put in place to measure the hatchery's effectiveness in improving the kokanee fishery in Lake Pend Oreille.

Project: Kokanee Stock Status and Evaluation of the Cabinet Gorge Hatchery, BPA85-339.

Program Measure: 804(e)(5)

Contractor: Idaho Department of Fish and Game

Project Manager: Fred Holm

Project status: Ongoing, initiated April 1985, completion is scheduled for 1990 or until the project objectives are met.

Project Summary:

Scope:

The purpose of this study is to evaluate the contribution of the Cabinet Gorge Hatchery to the Lake Pend Oreille kokanee stocks and fishery, and to provide feedback to optimize kokanee production and survival. Kokanee salmon production at the new Cabinet Gorge Hatchery will help rebuild the kokanee population in Lake Pend Oreille. Construction and evaluation of the hatchery is listed in the Northwest Power Planning Council (Council) Fish and Wildlife Program under measure 804(e)(5). Construction of the $2.2 million hatchery represents a cooperative effort among Bonneville Power Administration (BPA), Washington Water Power Company (WWP) and Idaho Department of Fish and Game (IDFG).

Objectives:

1. Monitor kokanee stock status and the contribution of hatchery fish.
2. Describe kokanee population dynamics in relation to population abundance and carrying capacity.
3. Enhance survival of fry by optimizing release strategies.
4. Monitor naturally spawning kokanee abundance in tributary and shoreline areas.
5. Monitor the zooplankton community in relation to fry release strategies and kokanee population abundance.
6. Monitor changes in the fishery with periodic creel surveys.

Results/Discussion:

Baseline data for objectives 1 through 6 were collected in 1985 and will be used with past research results to measure the success of the hatchery beginning in 1986. Objectives 1 through 5 will be addressed in 1986 and subsequent years as kokanee production at Cabinet Gorge Hatchery increases. The Lake Pend Oreille fishery was evaluated (Objective 6) in 1985 and will be reevaluated in 1989 when kokanee from Cabinet Gorge Hatchery enter the

fishery. The first kokanee releases from the hatchery will be midsummer, 1986. At full capacity, approximately 20 million kokanee will be produced annually.

Although data summary has not been completed, the 1985 creel survey indicated that kokanee harvest rates remain low, with approximately 1 kokanee harvested per hour of effort from April to August. Catch rates were as high as 3.5 fish per hour during the mid-60's. Potential benefits of the Cabinet Gorge Hatchery include supporting a kokanee fishery in Lake Pend Oreille with a yield of 1 million kokanee annually and catch rates in excess of 3 fish per hour.

Project: Post Construction of Cabinet Gorge Hatchery, BPA 86-120.

Program Measure: 804(e)(5).

contractor: Idaho Department of Fish and Game.

Project Manager: Tom Clune.

Project Status: Ongoing; initiated May 1986, completion is scheduled for June, 1987.

Project Summary:

Scope:

The purpose of this project is to conduct an engineering evaluation of the existing Cabinet Gorge Kokanee Hatchery. Specific items to be evaluated are as follows:

1. The effectiveness of the overall design of the hatchery including hydraulic system, electrical system, construction materials, flow patterns and effluent settling. Included also shall be a constructive critique on what would be done differently in a like situation.

2. Construction methods particularly concerning handling the numerous boulders. Also contract time frame.

3. Manpower requirements for operating the facility by month and function.

4. Methods for sealing the effluent pond bottom.

5. Methods for tempering incubation water against the 60" F.+ early winter temperatures and 36" F.+ late winter/early spring temperatures. Will include minor improvements to existing well systems for evaluation purposes.

Results/Discussion:

No results are available at this time.

Project: Colville Hatchery, BPA 85-38

Program Measures: 804(e)(15).

contractor: Colville Confederated Tribes.

Project Manager: Fred Holm.

Project status: Ongoing; initiated May 1985, completion is scheduled for FY 1988.

Project summary:

Construction of a trout hatchery downstream of Chief Joseph Dam has been proposed. The hatchery is being designed to annually rear 50,000 pounds of trout for stocking lakes and streams on the Colville Indian Reservation.

BPA formed a technical Workgroup representing the fisheries agencies, Colville Confederated Tribes (Tribes), Northwest Power Planning Council (Council), Pacific Northwest Utilities Conference Committee (PNUCC), and U.S. Army Corps of Engineers (Corps), to provide input to the hatchery design and construction process. The technical workgroup has been involved throughout the process, and has provided input to the predesign report.

Two potential hatchery sites were identified by the Workgroup. One is just downstream from Chief Joseph Dam on the right bank of the Columbia River. It would use water from the relief tunnel at the dam for a water supply. The other site is about three miles farther downstream, also on the right bank of the Columbia, at an old gravel pit site known as "the Big Hole." Groundwater would be the water supply at this site.

To obtain the best value for the ratepayers of the region, BPA contracts with an engineering firm to evaluate the water supplies of the two sites. The evaluation includes costs to supply water to the respective sites, and operation and maintenance over the life of the project. This information will be used in the final site selection, to be made in June 1986 after the preliminary design is complete.

An intergovernmental agreement was negotiated with the Tribes to conduct the preliminary design phase for the hatchery. The preliminary design effort will determine the most feasible site and establish a construction budget for subsequent funding of design, construction and operation of the proposed hatchery. Five engineering firms submitted proposals for the preliminary design phase and R.W. Beck and Associates was selected. The report, in draft form, has been received by BPA and the Workgroup and is currently being reviewed. The final report is scheduled for completion later in June. A final design contract for the hatchery will be let before September 30.

BPA contracted with Jones and Stokes Associates of Bellevue, Washington, to prepare the environmental assessment document for the hatchery . Their draft report also has been received and will be reviewed in early June.

The final design will be started in FY 1986 with construction scheduled for FY 1987 and FY 1988. Upon completion BPA will fund the operation and maintenance of the facility.

RESIDENT FISH PROGRAM SUMMARY

The major emphasis of the Fish and Wildlife Section of the Northwest Power Act is placed on the protection, mitigation, and enhancement of the anadromous fisheries resources in the Columbia River Basin. Consequently, the resident fish program is smaller in scope, but continues to grow with the rest of the Fish and Wildlife Program.

Eight Action Items, which the Council felt were the responsibility of BPA, are specified in Section 1500 of the Columbia Basin Fish and Wildlife Program (Program). All the Action Items have been initiated except Actions 41.6 and 41.7. Action 41.6 calls for the removal of accumulated materials in the Kootenai River, where appropriate. Initiation of this Action Item is presently unplanned and unbudgeted. It will be initiated when and if Montana Department of Fish, Wildlife, and Parks notifies BPA that the action is necessary. At that time BPA will begin planning for inclusion of the project in the next budgeting cycle. Action 41.7 calls for a study to assess the impacts of construction and operaton of Dworshak Dam on resident fish. The action will not be initiated until the issue of co-management between IDFG and the Nez Perce Tribe has been resolved. This problem has been discussed with the Council staff. It will be referred to them in a more formal manner for assistance in its resolution.

RESIDENT FISH PROGRAM DISCUSSION

The amended Columbia River Basin Fish and Wildlife Program is scheduled for adoption in the spring of 1987. BPA trusts that the scope and direction for the resident fish program will become more defined at that time. Currently, the resident fish program is disjointed, consisting of many unrelated projects. The exception to this is in the Flathead Basin of Montana, where the projects are coordinated, with results being included in Montana's and the Salish-Kootenai Tribes' management plans for fish and wildlife. Coordination with agency and tribal activities should be an objective of all resident fish projects.

Resident fish substitutions were identified in February 1985 in the goals work plan adopted by the Council. The decision criteria specified that resident fish substitutions will occur for salmon and steelhead losses in blocked areas above Chief Joseph and the Hells Canyon projects first. The resident fish substitutions in other parts of the basin will be considered later when the level of performance or accomplishment in anadromous fish rehabilitation is known. The Council stated that it would approve projects in blocked areas which: (1) incorporate adaptive management principles; (2) complement activities of fishery agencies and Tribes; (3) address unmitigated losses; (4) achieve significant biological results; (5) do not conflict with anadromous fish; and (6) otherwise meet the standards in the Pacific Northwest Power Act.

These criteria can be interpreted so generally that most proposals would be eligible for inclusion in the Program. However, if they are narrowly interpreted, as BPA feels they should be, many proposals would not qualify. For example, criteria (2) requires that the projects complement activities of fishery agencies and Tribes in order to be amended into the Program. This implies that a resident fish management plan has been adopted by these agencies and Tribes and that a program to carry out the plans is ongoing. BPA funding would be for projects that complement these activities. Also, amendment applications should meet all of these criteria to be included in the Fish and Wildlife Program.

Enhancement possibilities for most resident fish species are limited in the Columbia River downstream from Chief Joseph Dam because of conflicts with anadromous species. However, there appears to be the possibility that white sturgeon stocks can be enhanced in this area. The white sturgeon has become one of the most important species to the sports, commercial, and tribal fishermen in the river. BPA has funded the development of a research work plan to determine the impacts of development and operation of the hydroelectric power system on white sturgeon. Elements of the plan are being funded which will lead to an evaluation of the sturgeon stocks, its life history requirements, and methods to protect, mitigate, and enhance white sturgeon populations without conflicting with anadromous fish species.

The amendments submitted for inclusion in the Program under the current amendment process vary greatly in detail. Some of them are very brief, while others are written as complete proposals for project implementation. Each of these proposals will have to be examined very closely to ensure that they:

1) will accomplish the desired protection, mitigation, and enhancement of resident fish.
2) can be assigned as mitigation for a federal hydroelectric project and be credited to the BPA Administrator's obligation.
3) are in addition to agency or tribal programs and responsibility, not in lieu of.
4) represent a best value approach for enhancing resident fish populations.

These criteria, along with those of the Council, should apply to the other resident fish amendment applications and measures as well. The criteria which the Council adopted were recommended by the resident fish substitutions' committee, which was formulated by the Council to address the resident fish program in the areas no longer accessible to anadromous fish. The committee is still active and with its input and application of the above listed criteria, a resident fish program that is viable and acceptable to the agencies and Tribes, as well as protecting the ratepayers' investment in the Program, will be developed.

APPENDIX A: RESIDENT FISH REPORTS

The following section lists the various reports summarizing the results of projects implemented by BPA under Section 800 of the Program. Copies of the following reports can be obtained from: Bonneville Power Administration, Division of Fish and Wildlife - PJ, P.O. Box 3621, Portland, Oregon, 97208.

Project 81S-5

Decker-Hess, J. and S. McMullin. 1983. Impacts of Water Level Fluctuations on Kokanee Reproduction in Flathead Lake, 1983 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 81S-5. (DOE/BP-204).

Decker-Hess, J. and P. Clancey. 1985. Impacts of Water Level Fluctuations on Kokanee Reproduction in Flathead Lake, 1984 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 81S-5. (DOE/BP-39641-1).

Fraley, J.J., and S.L. McMullin. 1983. Effects of Operation of Hungry Horse Dam on the Kokanee Fishery in the Flathead System, 1983 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 81S-5. (DOE/BP-200).

Fraley, J.J., and S.L. McMullin. 1985. Effects of Operation of Kerr and Hungry Horse Dam on the Kokanee Fishery in the Flathead System, 1984 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 81S-5. (DOE/BP-383).

Project 83-l

Dos Santos, J.M., J.E. Darling, and P.D. Cross. 1983. Lower Flathead River Fisheries Study, 1983 Annual Report. Confederated Salish & Kootenai Tribes. Bonneville Power Administration - Project 83-l. (DOE/BP-202).

Darling, J., P. Pajak, M.P. Wunderlich. and J.M. Dos Santos. 1984. Lower Flathead River Fisheries Study, 1984 Annual Report. Confederated Salish & Kootenai Tribes. Bonneville Power Administration - Project 83-l. (DOE/BP-362).

Pajak, P., W.H. Bradshaw, J.M. Dos Santos, and J.E. Darling. 1986. Lower Flathead River Fisheries Study, 1985 Annual Report. Confederated Salish & Kootenai Tribes. Bonneville Power Administration - Project 83-l. (DOE/BP-39830-1).

Project 83-467

Sheppard, B.B. and S.L. McMullin. 1984. Quantification of Libby Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1983 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 83-467. (DOE/BP-296).

Project 83-467 (Cont.)

Sheppard, B.B. 1985. Quantification of Libby Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1984 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 83-467. (DOE/BP-12660-l).

Sheppard, B.B. 1985. Quantification of Libby Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1984 Annual Report Appendix. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 83-467. (DOE/BP-12660-2).

Chisholm, I. and J.J. Fraley. 1986. Quantification of Libby Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1985 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration - Project 83-467. (In printing).

Project 83-465

May, B., and S.L. McMullin. 1984. Quantification of Hungry Horse Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1983 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 83-465. (DOE/BP-312).

May, B., and R.J. Zubik. 1984. Quantification of Hungry Horse Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1984 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 83-465. (DOE/BP-12695-l).

May, B., and J.J. Fraley. 1986. Quantification of Hungry Horse Reservoir Levels Needed to Maintain or Enhance Reservoir Fisheries, 1985 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 83-465. (In Printing).

Project 83-463

Lere, M.E. 1985. Evaluation of Management of Water Release for Painted Rocks Reservoir, Bitterroot River, Montana, 1984 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 83-463. (DOE/BP-13076).

Lere, M.E. 1986. Evaluation of Management of Water Release for Painted Rocks Reservoir, Bitterroot River, Montana, 1985 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 83-463. (Draft Report).

Project 83-316

Brannon, E.L., C.L. Melloy, and S.D. Brewer. 1984. Columbia River White Sturgeon Enhancement, 1984 Annual Report. University of Washington. Bonneville Power Administration Project 83-316. (DOE/BP-363).

Brannon, E.L., A. Setter, M. Miller, F. Utter, S.D. Brewer, and W. Heushberger. 1985. Columbia River White Sturgeon--Early Life History and Genetics Study, 1985 Annual Report. University of Washington. Bonneville Power Administration Project 83-316. (DOE/BP-18952-l).

Project 85-64

Fickeisen, D.H., D.A. Neitzel and D,D, Dauble. 1983. White Sturgeon Research Needs : Workshop Results, 1983. Seattle, Washington. Battelle Pacific Northwest Laboratories. Bonneville Power Administration Project 85-64. (DOE/BP-201).

Fickeisen, D.H. 1986. White Sturgeon Bibliography. Battelle Pacific Northwest Laboratories. Bonneville Power Administration Project 85-64. (DOE/BP-22209-l).

Project 82-19

Leathe, S.A., and P.J. Graham. 1984. Cumulative Impact Study of Microhydro Sites, Swan River [Montana], 1983 Annual Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 82-19. (DOE/BP-225).

Leathe, S.A., and M.D. Enk. 1985. Cumulative Effects of Microhydro Development on the Fisheries of the Swan River Drainage, Montana: Volume 1: 1984 Summary Report, Final Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 82-19. (DOE/BP-36717-l).

Leathe, S.A., and S. Bartelt, and L.M. Morris. 1985. Cumulative Effects of Microhydro Development on the Fisheries of the Swan River Drainage, Montana; Volume II 1984 Summary Report, Final Report. Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 82-19. (DOE/BP-36717-2).

Leathe, S.A., and S. Bartelt, and L.M. Morris. 1985. Cumulative Effects of Microhydro Development on the Fisheries of the Swan River Drainage, Montana; Volume III 1984 Summary Report, Final Report. Fish and Habitat Inventory, Montana Department of Fish, Wildlife, and Parks. Bonneville Power Administration Project 82-19. (DOE/BP-36717-3).

DOE/BP-662
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