Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Dworshak Impacts/M&E & Biological-Integrated Rule Curves

Bonneville project number, if an ongoing project 8740700

Business name of agency, institution or organization requesting funding
Nez Perce Tribe

Business acronym (if appropriate) NPT

Proposal contact person or principal investigator:

Name	David P. Statler
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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
Montana State University	Dept. of Biology MSU	Boseman, MT	Daniel Gustafson

NPPC Program Measure Number(s) which this project addresses.
5.5A.1, 5.5A.2, 10.3C.6, 10.3C.8

NMFS Biological Opinion Number(s) which this project addresses.

The National Marine Fisheries Service indicates that the BPA, BOR and COE should fund research, monitoring and evaluation activities needed to determine the potential impacts of salmon flow operations on resident fish and wildlife, particularly native species, in and around Hungry Horse, Libby, Grand Coulee, Brownlee, Dworshak and other reservoirs.

NMFS. 1994. Biological Opinion Regarding 1994-1998 Operation of the FCRPS and Juvenile Transportation Program.

Other planning document references.

The Northwest Power Planning Council's Strategy for Salmon calls to seek mitigation for lower water levels behind Dworshak Dam and to evaluate impacts of flow operations on resident fish at Dworshak Dam.

NPPC. 1992. Strategy for salmon. Document 92-21. Portland, Oregon..

Fickeisen and Geist (1993) indicate that a need exists for additional Dworshak Reservoir baseline information to provide an adequate understanding of the populations of interest. This is especially true of the physical-chemical environment under various operating conditions.

Fickeisen, D.H. and D.R. Geist. 1993. Resident fish planning:Dworshak Reservoir, Lake Roosevelt, and Lake Pend Oreille. Project No. 93-026, Bonneville Power Administration, Portland, OR.

Subbasin.

Clearwater

Short description.

Obtains data to monitor and evaluate the impacts of Dworshak Dam operations on the reservoir ecosystem and to formulate biological/integrated rule curves.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
*	Anadromous fish		Construction		Watershed
X	Resident fish		O & M		Biodiversity/genetics
	Wildlife		Production		Population dynamics
	Oceans/estuaries		Research	X	Ecosystems
	Climate	*	Monitoring/eval.		Flow/survival
	Other	X	Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

reservoir operations, rule curves

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
8709900	Dworshak Dam Impacts Assessment	Determines kokanee entrainment relationship to include in rule curve formulation.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Collect and assemble towards developing biological and integrated rule curves for Dworshak Reservoir that are intended to maintain the productivity of the reservoir ecosystem, while serving other multipurpose needs. Measurable operational objectives, such as preferred seasonal pool elevations, will be identified with rule curve development. Baseline data on primary and secondary production will be used to monitor response to operational changes.	a	Characterize reservoir thermodynamics.
		b	Characterize primary production and loss under various operating conditions.
		c	Characterize zooplankton densities and loss under various operating conditions.
		d	Characterize benthic invertebrate densities relative to reservoir operations.
2	Develop rule curve model.	a	Process subcontract for modeling efforts.
		b	Provide data, including kokanee entrainment data obtained by IDFG, to subcontracted modeler and work with modeler for biological and integrated rule

			curve development.
		c	Work with modeler to refine and calibrate rule curve modeling.
		d	Collect data and provide to modeler for refinement and calibration.
3	Implement rule curve.	a	Present proposed rule curve to NPPC for approval and adoption.
		b	Monitor rule curve implementation.
4	Monitor and evaluate the response of the reservoir ecosystem to rule curve implementation.	a	Monitor primary production, secondary production, and kokanee entrainment.
5	Promote informed fishery resource decisions pertaining to Dworshak Reservoir operations by providing technical input to pertinent regional water management fora.	a	Participate in pre-season planning and in-season meetings of the Fish Passage Advisory and other fora that have direct bearing on Dworshak Reservoir operations.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	03/1993	12/1999	50
2	06/1998	06/2000	15
3	09/2000	12/2073	15
4	01/2001	12/2073	10
5	01/1993	12/2010	10

Schedule constraints.

Successful scheduling may be influenced by the amount of effort required to calibrate the rule curve modeling effort to compensate for unforeseen influences on reservoir dynamics. Additional data needs for calibration or other purposes may extend the planning phase. Listing of weak native stocks (e.g., bull trout and westslope cutthroat trout) would increase ESA coordination costs, could increase the cost of fish sampling

Completion date.
2073

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel		116957
Fringe benefits		25712
Supplies, materials, non-expendable property		2110
Operations & maintenance		17388
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		
PIT tags	# of tags:	
Travel		1900
Indirect costs		47908
Subcontracts		38025
Other		
TOTAL		250000

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	250000	400000	250000	200000
O&M as % of total	7	5	7	10

Section 6. Abstract

The underlying goal for this project is to maintain the productive health of Dworshak Reservoir for resident fish while serving other multi-purpose needs, such as flood control, power production and flow augmentation for anadromous fish. This project is directly relevant to Section 10.3C.6 of the September 13, 1995, amended Columbia Basin Fish and Wildlife Program, which authorizes BPA to:

> "In consultation with the Nez Perce Tribe and appropriate state agencies, fund research, monitoring and evaluation activities to determine the potential impacts of multipurpose flow operations on resident fish in Dworshak Reservoir. This information will be used to develop analytical methods, such as biological and/or integrated rule curves for reservoir operations similar to those developed by the Montana Department of Fish, Wildlife and Parks (MDFWP) for Hungry Horse and Libby reservoirs."

We are applying HRMOD modeling/rule curve approach developed by the MDFWP for Hungry Horse Reservoir. The expected outcome is to identify an operational strategy for Dworshak Dam to mimic the downstream natural hydrograph (beneficial to endangered Snake River salmon spawning, rearing and migration) and maintain a productive reservoir environment for resident fish, including native bull trout and westslope cutthroat trout.

The target date for rule curve formulation and submittal to the Northwest Power Planning Council is 2001. After the proposed operational rule curve is officially adopted by the Northwest Power Planning Council, and the rule curve is applied, results will be monitored and evaluated by pre- and post-rule curve primary and secondary production indicators, and kokanee entrainment estimates.

Section 7. Project description

a. Technical and/or scientific background.

The 717 foot high Dworshak Dam is located within the Nez Perce Indian Reservation on the North Fork of the Clearwater River 1.9 miles upstream from its confluence with the Clearwater Mainstem, Clearwater, County, Idaho. Dworshak Reservoir is 53.6 miles long, and has 175 miles of shoreline and 17,090 surface acres at full pool (elevation 1600 ft msl). Dworshak Dam is a multi-purpose project built and operated by the U.S. Army Corps of Engineers, and is operated for flood control, power generation, recreation, water quality and fish and wildlife uses. Annual fall/winter drawdowns of up to 155 feet for flood control and power generation can reduce surface area by as much as 52%. In addition, the National Marine Fisheries Service's 1995 Biological Opinion on Operation of the Federal Columbia River Power System and Juvenile Transportation, pursuant to Section 7 of the Endangered Species Act, calls for an annual drawdown of 80 feet (elevation 1520 ft msl) through August 31 for flow augmentation. Therefore, current operational demands on Dworshak Reservoir include fall/winter drawdown for flood control and power generation and spring/summer drawdown for flow augmentation. During the last few years, Dworshak Reservoir has also been called upon to provide volumes of cold water during summer to reduce water temperatures in the Lower Snake River.

These various demands for Dworshak Reservoir to provide for flood control storage space and to provide water for flow augmentation and power generation result in pool drawdowns and fluctuations that may have profound adverse effects on reservoir biological productivity and fisheries. Marotz et al. (1996) reported that reservoir fluctuations affect primary production by changing the volume of water of optimal temperatures, nutrient cycling and light transmittance. Marotz et al. (1996) also indicated that zooplankton production was reduced with increased withdrawals, and that zooplankton loss was significant when the reservoir was isothermal and when surface elevation approached the outlet depth. Marotz et al. (1996) showed that benthic insects are most severely impacted by deep drawdown. Biomass of benthic insect larvae was least in the frequently dewatered zone and varied inversely with the frequency of dewatering. Marotz et al. (1996) also reported that less than full pool condition during July through September reduces the amount of terrestrial insect deposition that is available as food for fish.

The 1994 Fish and Wildlife Program recognized the potential impact to the Dworshak ecosystem as a result of multi-purpose operations. Section 5.5A.1 of this Program provides for the participation of appropriate Indian Tribes to:

> "...identify specific research, monitoring and evaluation activities needed to determine the potential impacts of salmon and steelhead flow operations on resident fish and wildlife, particularly native species in and around Hungry Horse, Libby, Grand Coulee, Brownlee and Dworshak reservoirs. Use this information to develop analytical methods or biological rule curves for reservoir operations, similar to those being developed by the Montana Department of Fish, Wildlife and Parks for Hungry Horse and Libby reservoirs."

Section 5.5A.2 provides for the Bonneville Power Administration (BPA) to:

> "Fund research, monitoring, and evaluation activities needed to determine the potential impacts of salmon and steelhead flow operations on resident fish and wildlife, particularly native species, in and around Hungry Horse, Libby, Brownlee, Dworshak and other reservoirs."

Additionally, Section 10.3C.6 of the September 13, 1995, amended Program authorizes BPA to:

> "In consultation with the Nez Perce Tribe and appropriate state agencies, fund research, monitoring and evaluation activities to determine the potential impacts of multipurpose flow operations on resident fish in Dworshak Reservoir. This information will be used to develop analytical methods, such as biological and/or integrated rule curves for reservoir operations similar to those developed by the Montana Department of Fish, Wildlife and Parks for Hungry Horse and Libby reservoirs."

The proposed project will ultimately provide for in-kind mitigation, by ameliorating disruptive actions to the Dworshak ecosystem and the array of species functioning within that ecosystem. The proposed work is a logical extension of the BPA funded MDFWP modeling efforts for Hungry Horse (HRMOD) and Libby (LRMOD) Reservoirs. The intent is to apply the methodology and approach developed for these projects to a similar problem at Dworshak Reservoir, modifying the effort as needed to account for conditions specific to Dworshak and the downstream Clearwater River.

b. Proposal objectives.

Objective 1: Collect and assemble data towards developing biological and integrated rule curves for Dworshak Reservoir that are intended to maintain the productivity of the reservoir ecosystem, while serving other multipurpose needs.

Measurable operational objectives, such as preferred seasonal pool elevations, will be identified with rule curve development. Resultant baseline data on primary and secondary production will also be used to monitor response to operational changes.

Objective 2: Develop rule curve model.

This objective entails working directly with a reputable modeler, using data collected from objective 1, to: (a) quantitatively simulate impacts to ecosystem components under alternative operations and (b) use these simulations as bases to construct biological/integrated operational rule curves.

Objective 3: Implement rule curve.

The proposed rule curve criteria developed under objective 2 would be submitted to the NPPC for formal approval/adoption. Implementation of the rule curve would require coordination with the Corps of Engineers, the operating agency, to assure the rule cure criteria are understood. Involvement in rule curve implementation would also invoke explanations regarding diversion from the adopted rule curve.

Objective 4: Monitor and evaluate the response of the reservoir ecosystem to rule curve implementation.

Specific biological relationships linked to pool/discharge conditions, as ascertained via Objectives 1 and 2 (i.e., primary production, zooplankton loss, benthic production, etc.) would be monitored after rule curve adoption to ground truth simulations and to evaluate the success of rule curve implementation.

Objective 5: Promote informed fishery resource decisions pertaining to Dworshak Reservoir operations by providing technical input to pertinent regional water management fora.

Although the Corps of Engineers operates Dworshak Dam and Reservoir, annual and seasonal multi-purpose operations are influenced by an array of agencies (e.g., NMFS, USFWS, BPA, CBFWA member states and tribes) in various fora (Fish Passage Advisory Committee, NMFS Biological Opinion Regional Forum, Snake River Drawdown Evaluation, NPPC Fish and Wildlife Program implementation). Expertise and background regarding biological discharge/pool relationships is vital at these fora to effect sound ecosystem management at the regional level.

c. Rationale and significance to Regional Programs.

The rationale for biological/integrated rule curve formulation and adoption for Dworshak Dam and Reservoir is based on the recognition that multi-purpose uses of reservoir resources can conflict. The intent of this type of rule curve approach is to achieve a balanced approach to water resource management. The need for considering the productivity of the Dworshak ecosystem is heightened with the increased concern, and potential ESA listing, of native inhabitants, including bull trout and westslope cutthroat trout.

The 1994 Fish and Wildlife Program recognized the potential impact to the Dworshak ecosystem as a result of multi-purpose operations. Section 5.5A.1 of this

Program provides for the participation of appropriate Indian Tribes to:

> "...identify specific research, monitoring and evaluation activities needed to determine the potential impacts of salmon and steelhead flow operations on resident fish and wildlife, particularly native species in and around Hungry Horse, Libby, Grand Coulee, Brownlee and Dworshak reservoirs. Use this information to develop analytical methods or biological rule curves for reservoir operations, similar to those being developed by the Montana Department of Fish, Wildlife and Parks for Hungry Horse and Libby reservoirs."

Section 5.5A.2 provides for the Bonneville Power Administration (BPA) to:

> "Fund research, monitoring, and evaluation activities needed to determine the potential impacts of salmon and steelhead flow operations on resident fish and wildlife, particularly native species, in and around Hungry Horse, Libby, Brownlee, Dworshak and other reservoirs."

Additionally, Section 10.3C.6 of the September 13, 1995, amended Program authorizes BPA to:

> "In consultation with the Nez Perce Tribe and appropriate state agencies, fund research, monitoring and evaluation activities to determine the potential impacts of multipurpose flow operations on resident fish in Dworshak Reservoir. This information will be used to develop analytical methods, such as biological and/or integrated rule curves for reservoir operations similar to those developed by the Montana Department of Fish, Wildlife and Parks for Hungry Horse and Libby reservoirs."

This project furthers the ecosystem management approach supported in the 1994 FWP by integrating resident fish needs with anadromous fish needs, rather sacrificing one native fishery resource for another. The proposed work is a logical extension of the BPA funded MDFWP modeling efforts for Hungry Horse (HRMOD) and Libby (LRMOD) Reservoirs. The intent is to apply the methodology and approach developed for these projects to a similar problem at Dworshak Reservoir, modifying the effort as needed to account for conditions specific to Dworshak and the downstream Clearwater River.

d. Project history

Project History

BPA funded work on Dworshak Reservoir (Project 8740700) by the Nez Perce Tribe began in 1987, as authorized under the NPPC's FWP. From 1987 through 1991 the NPT investigated the status of smallmouth bass, rainbow trout and their fisheries. Incidental data on westslope cutthroat trout and bull trout were also collected. During this same period, the Idaho Department of Fish and Game investigated the status of

kokanee and reservoir limnology.

From 1993 through 1995 project personnel provided extensive input to the System Operation Review conducted by the BPA, U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation. This role was primarily as advisor, evaluator and contributor regarding impacts relative to Dworshak Reservoir fisheries. During this period, we assisted in the development of basic impact assessment models for evaluating over 100 operational alternatives.

The study is currently collecting data towards development of biological/integrated rule curves for Dworshak Reservoir, patterned after the MDFWP HRMOD and LRMOD,

Project Reports and Technical Papers

Statler, D.P. 1988, 1989, 1990. Dworshak Investigations: trout, bass and forage species. Nez Perce Tribe Department of Fisheries Resources Management, Annual Report to Bonneville Power Administration, Contract DE-AI79-87BP35165, Project 87-407, Portland, OR.

Juul, S.T.J. 1996. A limnological reevaluation of Dworshak Reservoir, Idaho. A Progress Report Prepared for the Nez Perce Tribe and the U.S. Army Corps of Engineers, WSU Project Numbers 11W-3815-2857 and 11W-3998-2628, Pullman, WA

Juul, S.T.J, and M.A. Hagerman. 1993. Primary productivity evaluation of Dworshak Reservoir: first interim report. Prepared for the Nez Perce Tribe, WSU Project Number 11W-3815-2857, Pullman, WA.

Maiolie, M.A., D.P. Statler, and S. Elam. 1993. Dworshak Dam impact assessment and fishery investigation and trout, bass, and forage species. Final Report. Bonneville Power Administration, Portland, OR.

USACE, USBR and BPA. 1994. Columbia River System Operation Review Draft Environmental Impact Statement, Appendix K - Resident Fish, DOE/BP-2409. Portland, OR.

USACE, USBR and BPA. 1995. Columbia River System Operation Review Final Environmental Impact Statement, Appendix K - Resident Fish, DOE/EIS-0170, Portland, OR.

Summary of Major Results Achieved

As a result of recommendations in a 1993 project report prepared jointly by the Nez Perce Tribe and the Idaho Department of Fish and Game, the stocking of rainbow trout in Dworshak Reservoir for resident fish mitigation has been limited pending investigation of rainbow trout-cutthroat trout hybridization (Project 9501600). Based on project studies, the 12-inch minimum size limit for smallmouth bass was withdrawn, thereby expanding harvest opportunities in Dworshak Reservoir for this popular self-sustaining non-native species.

As a result of our input in the NMFS Regional ESA Forum, flow augmentation

strategies from Dworshak have had less abrupt fluctuations in flows and temperatures and have resulted in higher Dworshak pool elevations later in the summer. Our input has also resulted in spring flows that are structured closer to the natural spring hydrograph. This has been achieved, in part, by promoting reservoir refill as early as possible in late winter and early spring, then matching reservoir outflow with inflow as close as possible during the peak hydrograph within flood discharge limits.

Adaptive Management Implications

Knowledge gained from this project will aid in the adaptive management for consideration of reservoir fish resource needs in conjunction with downstream needs for anadromous fish, flood control and power production. Biological information generated from this project data was used to evaluate over 90 operation strategies for the FCRPS as part of the SOR. These analyses indicated that operational criteria resulting in relatively stable pool levels are most conducive to maintaining productivity of the Dworshak Reservoir ecosystem. This information has been and is being applied within the Regional Forum established as part of the NMFS 1995 Biological Opinion on operation of the FCRPS. Within the broader program management framework, biological information from this project has increased the awareness and sensitivity of the Regional Forum process to resident fishery resources.

Years Underway and Past Costs

Year	1987	1988	1989	1990	1991	1992	1993
Costs	111,517	109,783	145,829	106,593			

Year	1994	1995	1996	1997	1998
Costs	159,969	163,596	172,554	143,392	174,677

e. Methods.

Objective 1 is to collect and assemble towards developing biological and integrated rule curves for Dworshak Reservoir that are intended to maintain the productivity of the reservoir ecosystem, while serving other multipurpose needs. Tasks and associated methodology for this objective are as follows:

One task under this objective is to characterize reservoir thermodynamics. This task is intended to link the pelagic thermal structure of the reservoir with reservoir operation. Thermal structure has an important influence on vertical distribution, growth and densities of phytoplankton, zooplankton, benthos and fishes. This task consists of collecting monthly pelagic temperature and oxygen profiles from 0 to 60 m depth at standardized sample stations RM 3.0, RM 19.0, and RM 35.

A second task is to characterize primary production and loss under various operating conditions. This tasks is intended to quantify autotrophic phytoplankton production under current operations, and will be completed using ^{14}C liquid scintillation. This work has been subcontracted and coordinated with the State of Washington Water Research Center (WRC), Pullman, WA, semi-monthly from 1993 - 1996. These data will be used to model total primary production in available reservoir volume per day through

an annual cycle. Vertical data and ^{14}C uptake in the forebay will be used in the interpretation of downstream losses. This task also involves collecting underwater photometric data at RM 3.0, RM 19.0, RM 35, RM 43.0, E 4.0 and LNF 1.0 to determine site specific euphotic zone depths and for primary production analyses. A recording light meter installed on Dworshak Dam collects data on solar input concurrent with primary production sampling for solar input corresponding with light/dark bottle incubation times. These data also assist in quantifying seasonal influences on primary productivity.

A third task is to characterize zooplankton densities and loss under various operating conditions. The intent is to characterize the densities of zooplankton, quantify zooplankton losses, and relate this information to reservoir operations. Vertical tows are taken through a 12.2 m column at RM 3.0 from April through October. Zooplankton are the primary food for all age classes of kokanee and are also important to other juvenile fishes. Length frequencies of zooplankton taxa important to fish diets are measured and dry weights obtained (Botrell et al. 1975) to determine relative biomass. Semi-monthly samples are collected immediately below Dworshak Dam to measure zooplankton losses through the dam under various operating conditions.

The fourth and final task under this objective is to characterize benthic densities and insect emergence relative to reservoir operations. Quantification of benthic densities at depth zones defined by the frequency of dewatering is accomplished via monthly PONAR dredging at standardized sample stations from April through September. Triplicate random sites are sampled within three strata: (1) permanently wetted; (2) infrequently dewatered and, (3) frequently dewatered.

Objective 2 is to apply the data from objective 1 to develop a rule curve model. A contracted modeler is necessary to accomplish this objective. Tasks include working directly with the modeler to help identify and interpret relationships.

Objective 3 consists of implementing the rule curve. Necessary tasks include presenting the proposal to NPPC and coordinating with operating agencies following formal adoption.

Objective 4 provides for monitoring and evaluation to determine if the rule curve is actually being applied and to follow the response of the ecosystem to the new operational criteria. Tasks include monitoring primary production, zooplankton production and loss, and kokanee entrainment.

Objective 5 promotes informed fishery resource decisions pertaining to Dworshak operations. This involves participation in pertinent regional water management fora, including in-season meetings of the Fish Passage Advisory Committee.

Primary concerns regarding factors that may affect the success of this project include whether the rule curve is formally adopted by the NPPC and, if adopted, whether operating agencies will adhere to rule curve operating criteria. If one overriding use (e.g., flow augmentation, power production, or flood control) assumes absolute dominance of reservoir operations, failure is likely.

Successful scheduling may be influenced by the amount of effort required to calibrate the rule curve modeling effort to compensate for unforeseen influences on reservoir dynamics. Additional data needs for calibration or other purposes may extend the planning phase. Listing of weak native stocks (e.g., bull trout and westslope cutthroat trout) would increase ESA coordination costs, could increase the cost of fish sampling

methodologies, and may affect scheduling.

f. Facilities and equipment.

Project personnel are stationed out of the NPT Department of Fisheries Resources field office at 3404 Highway 12, Orofino, ID, 83544. Dworshak Dam and Big Eddy Marina is located about 9 miles from the field office. The Orofino field station consists of office space, storage buildings, and a fenced compound to secure vehicles, boats and trailers.

Two vehicles, one four-wheel drive, are leased from GSA. Water transportation is provided by a 22-foot welded aluminum boat with 150 hp motor. One personal computer and laser printer are assigned to the project. Internet and e-mail capabilities are on-line. The computer is equipped with word processing, spreadsheet, data base, statistical and graphic software. Plankton netting (130-150 micron mesh with pygmy flow meter), benthic (PONAR) dredge, submarine photometer (KAHLSICO), and oxygen-temperature (YSI Model 50B) equipment are assigned to the project.

The project has established business relationships with several contractor and service entities to effect primary production, zooplankton, and benthic invertebrate laboratory analyses. No particular limitations regarding facilities and equipment are foreseen.

g. References.

Marotz, B.L., C. Althen, and B. Lonon, and D. Gustafson. 1996. Model Development to establish integrated operational rule curves for Hungry Horse and Libby Reservoirs - Montana. Final Report 1996. DOE/BP-92452-1, Bonneville Power Administration, Portland, Oregon.

Botrell, H.H., A. Duncan, Z.M. Gliwez, E. Grygierek, A. Herzig, A. Hillbricht-Ilkowska, H. Kurasawa, P. Larsson, and T. Weglenska. 1976. A review of some problems in zooplankton studies. Norwegian Journal of Zoology, 24:419-456.

Juul, S.T.J. 1996. A limnological reevaluation of Dworshak Reservoir, Idaho. A Progress Report Prepared for the Nez Perce Tribe and the U.S. Army Corps of Engineers, WSU Project Numbers 11W-3815-2857 and 11W-3998-2628, Pullman, WA.

Juul, S.T.J, and M.A. Hagerman. 1993. Primary productivity evaluation of Dworshak Reservoir: first interim report. Prepared for the Nez Perce Tribe, WSU Project Number 11W-3815-2857, Pullman, WA.

Maiolie, M.A., D.P. Statler, and S. Elam. 1993. Dworshak Dam impact assessment and fishery investigation and trout, bass, and forage species. Final Report. Bonneville Power Administration, Portland, OR.

Statler, D.P. 1988, 1989, 1990. Dworshak Investigations: trout, bass and forage species. Nez Perce Tribe Department of Fisheries Resources Management, Annual Report to Bonneville Power Administration, Contract DE-AI79-87BP35165, Project 87-407, Portland, OR.

USACE, USBR and BPA. 1994. Columbia River System Operation Review Draft Environmental Impact Statement, Appendix K - Resident Fish, DOE/BP-2409. Portland, OR.
USACE, USBR and BPA. 1995. Columbia River System Operation Review Final Environmental Impact Statement, Appendix K - Resident Fish, DOE/EIS-0170, Portland, OR.

Section 8. Relationships to other projects

Project 8709900, sponsored by the Idaho Department of Fish and Game, involves investigation of kokanee entrainment losses relative to Dworshak operations. Kokanee entrainment is influenced by operations. Operational relationships regarding kokanee entrainment will be incorporated in rule curve development.

Project 9501600, sponsored by the NPT, addresses the conservation of native westslope cutthroat trout genetics in the North Fork Clearwater Basin, and its relationship to Dworshak Reservoir fish stocking strategies. This project is an outgrowth of Project 8740700. Westslope cutthroat trout rear in Dworshak Reservoir, therefore, the productivity of the Dworshak ecosystem (and rule curve development and implementation) is also relevant to the conservation of this species.

The US Army Corps of Engineers Dworshak Resident Fish Mitigation Review has funded the University of Idaho to review the efficacy of current resident fish mitigation (rainbow trout stocking), funded by the USACE pursuant to the original USFWS Coordination Act Report. Dr. David Bennett of the U of I has coordinated directly with project personnel to formulate a revised Dworshak mitigation strategy.

Section 9. Key personnel

Project leader David P. Statler is assigned full time (1 FTE) to Project 8740700. As project leader, Mr. Statler is responsible for sampling of physical, chemical and biological parameters in Dworshak Reservoir and in the downstream North Fork Clearwater River to support the formulation of a biological/integrated rule curve model. He attends regional meetings, symposia and workshops related to Project 8740700. He maintains computer data bases of pertinent physical, chemical and biological data for Dworshak Reservoir. He supervises all staff on the Dworshak Reservoir study effort, and helps supervise and coordinate Orofino Field Office activities with those of the Main Office in Lapwai. Mr. Statler's resume follows:

David P. Statler

3404 Highway 12
Orofino, ID 83544
208-476-7417

EXPERTISE

I have had 23 years experience as a professional fisheries biologist, during which I have worked for the Federal Power Commission (now the Federal Energy Regulatory Commission), the U.S. Fish and Wildlife Service and the Nez Perce Tribe. During this span, I have gained experience with an array of activities within the discipline, including early development and application of USFWS Habitat Evaluation Procedures, stream alteration impact assessments, coldwater fish culture (chinook salmon, steelhead, and rainbow trout) at Dworshak National Fish Hatchery, harvest management, population dynamics, limnology, NEPA statement preparation and review, preparation of Coordination Act Reports pursuant to the Fish and Wildlife Coordination Act, and technical report preparation. My experience as Project Leader with the Nez Perce Tribe has involved extensive contract, budgetary and programmatic duties. My involvement since 1991 in the Columbia River Fish & Wildlife Authority's Resident Fish Committee and Resident Fish Managers Caucus has provided a regional perspective of fisheries needs and issues within the Columbia Basin. Extensive technical input to the multi-agency System Operation Review of the Columbia Federal Power System from 1991 through 1995 has also provided a regional perspective on resident and anadromous fisheries needs and issues, especially those related to water management. Direct participation in in-season water management via the CBFWA Fish Passage Advisory Committee has provided further appreciation and understanding of the connectivity and complexity of water management actions within the Columbia Basin.

EMPLOYMENT

Project Leader - Dworshak Study **1987-present**
NEZ PERCE TRIBE DEPARTMENT OF FISHERIES RESOURCES MANAGEMENT OROFINO, ID

In addition to serving as Project Leader, I have been the Director of the Resident Fisheries Division since 1996. I have produced monthly, quarterly, annual and final reports for the Dworshak Study. I have applied knowledge of Dworshak fisheries resources to regional water management forums to promote watershed based ecosystem management.

Harvest Management Biologist **1986-1987**
NEZ PERCE TRIBE DEPARTMENT OF FISHERIES RESOURCES MANAGEMENT LAPWAI, ID

This position involved annual predictions of the number of chinook salmon available for harvest, harvest estimates, and post-season estimates of total fish returns. Duties included development of a model to predict total returns of spring chinook salmon to Rapid River, Idaho.

EDUCATION

B.S. in Wildlife Biology (Aquatic Option) **1972**
UNIVERSITY OF MONTANA MISSOULA, MONTANA

Major My major field of study was aquatic biology with a strong emphasis on ecology.
I was the recipient of a merit scholarship from the UM Excellence Fund and graduated with honors.

CERTIFICATION AND PUBLICATIONS

Certified Fisheries Scientist (American Fisheries Society) - 1989.
Certified Wildlife Biologist (Wildlife Society) - 1981.

Statler, D.P. 1988, 1989, 1990. Dworshak Investigations: trout, bass and forage species. Nez Perce Tribe Department of Fisheries Resources Management, Annual Report to Bonneville Power Administration, Contract DE-AI79-87BP35165, Project 87-407, Portland, OR.

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Section 10. Information/technology transfer

The primary documentation produced will be a final report to the Bonneville Power Administration that will include modeling data, modeling, and rule curve criteria. Information on Dworshak fisheries and operational impacts to these fisheries are applied on an on-going basis in regional water management forums. Examples where this information has previously been shared and applied is the System Operation Review of the Federal Columbia River Hydropower System and the Regional Forum to address fish listed under the Endangered Species Act. Dworshak rule curve development and implementation will function to provide additional quantitative information and criteria on which to base critical water management decisions.