

DWORSHAK OPERATION PLAN



Idaho Water Resource Board

ADOPTED DECEMBER 21, 2000

DWORSHAK OPERATION PLAN

Prepared by: Idaho Department of Water Resources
Water Planning Bureau

Prepared for: Idaho Water Resource Board

Joseph L. Jordan, Chairman
Jerry R. Rigby, Vice-Chairman
J. David Erickson, Secretary
Robert Graham
L. Claude Storer
Terry T. Uhling
D. Richard Wyatt



Adopted December 21, 2000

Acknowledgements

The Idaho Water Resource Board would like to acknowledge the Dworshak Operation Plan Committee and key contributors for their efforts in formulation of the Dworshak Operation Plan.

I. Dworshak Operation Plan Committee

Mayor Roy Clay, City of Orofino
Roger Colgan, Board of County Commissioners, Clearwater County
Rep. Charles D. Cuddy, Idaho State Legislature
Alex Irby, Orofino Chamber of Commerce
Rick Laam, City of Orofino
Sen. Marguerite McLaughlin, Idaho State Legislature
Sandy Medley, Orofino Chamber of Commerce
Earl Pickett, Board of County Commissioners, Clearwater County
D. Richard Wyatt, Idaho Water Resource Board, Lewiston, Ad Hoc Member

II. Key Contributors

Jim Bellatty, Idaho Department of Environmental Quality, Lewiston
Rick Eichstaedt, Nez Perce Tribe Office of Legal Council
Greg Haller, Nez Perce Tribe Water Resource Department
Charles Krahenbuhl, Corps of Engineers, Clarkston, Washington
Erik Petersen, Corps of Engineers, Dworshak Project
Ed Schriever, Idaho Department of Fish and Game, Lewiston
Dave Statler, Nez Perce Tribe Fisheries Department
Steven J. Wright, Professor of Civil and Environmental Engineering,
University of Michigan
Peter Goodwin, Ecohydraulics Research Group, College of Engineering, University of
Idaho

TABLE OF CONTENTS

INTRODUCTION.....	1
PLAN OBJECTIVE	1
CURRENT OPERATIONS	2
IMPACTS OF PROJECT OPERATIONS.....	3
Resident Fishery.....	3
Dworshak Reservoir Productivity	3
Fisheries Mitigation.....	3
Fisheries Enhancement.....	3
Bull Trout	5
Anadromous Fishery	5
Wildlife	6
Recreation.....	6
Recreation Facilities	6
Economics	6
Commercial Navigation	7
Power Production	7
Flood Control	8
Water Quality	8
Short Term Activity Exemption.....	9
Gas Bubble Trauma Monitoring.....	9
ONGOING ACTIVITIES.....	11
Total Dissolved Gas Activity Exemption.....	11
Technical Basis for Flow Augmentation (temperature modeling).....	11
Integrated Rule Curve	14
Multi-Species Framework.....	15
The Clearwater Focus Program.....	15
National Recreation Lakes Pilot Program	16
RECOMMENDATIONS	17
ACTION.....	18
IMPLEMENTATION	18
REFERENCES.....	19
APPENDIX A: LETTER AND ATTACHMENT REGARDING SHORT TERM ACTIVITY EXEMPTION OF TOTAL DISSOLVED GAS SUPERSATURATION STANDARD.....	21
APPENDIX B: COMMENT LETTER FROM SENATOR MARGUERITE MCLAUGHLIN..	26

FIGURES

Figure 1. Log Transportation on the Dworshak Pool.....	7
Figure 2. Annual Power Production for the Dworshak Project, 1974-1998.	7
Figure 3. Average Monthly Power Production for the Dworshak Project, 1974-1998.....	8
Figure 4. Scenario A, 1994.....	13
Figure 5. Scenario A, 1995.....	13
Figure 6. Scenario A, 1996.....	13
Figure 7. Scenario A, 1997.....	13
Figure 8. Scenario B, 1994.....	13
Figure 9. Scenario B, 1995.....	13
Figure 10. Scenario B, 1996.....	14
Figure 11. Scenario B, 1997.....	14

TABLE

Table 1. Summarization of days by year with total dissolved gas exceeding Idaho state water quality standard and the percentage of gas bubble trauma observed for selected fish species.	10
---	----

INTRODUCTION

The Idaho Water Resource Board (Board) adopted the Comprehensive State Water Plan – North Fork Clearwater River Basin in January 1996. The plan contains a series of policies formulated by the Board, in consultation with local citizens and public officials, to provide direction to the Corps of Engineers (CoE) and other federal agencies regarding the operation of the Dworshak Project (dam and reservoir). The sixth policy in the Plan calls for a committee consisting of state and local representatives, to develop a management plan, in consultation with the CoE, for the Dworshak Project that fully addresses the other five policies, listed below:

(1) The Dworshak Project will be operated as a multiple use project in full consideration of the current authorizations of flood control, navigation (log transport), recreation, power production and fish and wildlife conservation.

(2) Summer reservoir levels will be managed to optimize the seasonal beneficial uses of recreation and log transportation.

(3) Dworshak Project outflows, other than during the summer months, will be configured to benefit the Clearwater River population of B-run steelhead.

(4) Dworshak Pool will be managed to support reservoir and upper basin fish and wildlife, and to provide a high-quality source of water to the Ahsahka fish hatcheries.

(5) Water released from the Dworshak Project will be in compliance with state water quality standards.

Consistent with this policy, the Dworshak Operation Plan is formulated as an amendment to the North Fork Clearwater River Basin plan.

PLAN OBJECTIVE

The objective of the Dworshak Operation Plan is to implement procedures that optimize the use of Dworshak water for all beneficial uses, including flood control, power production, recreation, commercial

navigation, fish (both anadromous and resident populations), wildlife, and water quality. The operation plan recognizes the management policies set forth in the North Fork Clearwater Plan.

CURRENT OPERATIONS

Commencing in 1992, spring and summer flow releases from the Dworshak Project were modified to improve out migration conditions for juvenile anadromous fish. Populations of concern are chinook salmon, sockeye salmon, and steelhead originating from Idaho, Oregon and Washington tributaries, as well as the mainstem Snake River. Dworshak releases subsequently contributed to flow objectives for the lower Snake River set out in the 1995 Columbia River Power System Biological Opinion, and in the 1998 supplement to that document. The flow objectives as measured at Lower Granite Dam are:

85,000 – 100,000 cfs from April 1 to June 20.

50,000 – 55,000 cfs from June 21 to August 31.

Within this framework, spring augmentation usually commences around April 10 with Dworshak releases approaching 20,000 cfs. Duration of spring augmentation is normally around 30 days. Releases are then reduced in an attempt to fill the Dworshak pool by June 30. Summer releases typically approach 20,000 cfs by mid-July and often remain high until the end of August. Reservoir elevations begin to decline from the full pool elevation in early July, and continue to recede to elevation 1520 feet. Summer augmentation provides 1.2 million acre-feet of Dworshak storage in addition to reservoir inflows. During six of the nine flow augmentation years, the reservoir pool was lowered to elevation 1,520 feet by August 31. During the remaining three years, the reservoir was lowered to elevation 1,520 feet no later than September 12.

IMPACTS OF PROJECT OPERATIONS

Resident Fishery

Dworshak Reservoir Productivity

The majority of the North Fork Clearwater River drainage is comprised of nutrient-poor granites of the Idaho batholith. Dworshak Reservoir, like most new reservoirs, experienced a few years of higher productivity. Since 1977 the reservoir has gradually become less productive and is now classified as oligotrophic (Reiman and Meyers, 1992). Most of the nutrient budget is probably comprised of recycled phosphorus and nitrogen and inputs from tributary streams and shoreline areas (Bennett, 1997). The current low-nutrient condition of the reservoir does not support rapid fish growth.

Fisheries Mitigation

The CoE has the legal responsibility to mitigate the effects of lost fishing opportunity created by Dworshak Reservoir. Originally that mitigation was defined as 100,000 pounds of hatchery-reared fish. Since 1972 that level of stocking has only been met three times. The average stocking level for those 25 years has been 38,500 lbs. In the past 10 years the stocking level has averaged less than 15,000 lbs. (IDFG stocking records).

When Dworshak Reservoir was new, productivity was relatively high, fish food was relatively abundant and rainbow trout dominated the sport fishery. These rainbow trout were stocked as part of a federal fisheries mitigation requirement. Smallmouth bass and kokanee salmon were

introduced to the reservoir a few years later. Originally, smallmouth bass performed very well on the abundant forage of red side shiners. In fact, Dworshak Reservoir produced an Idaho state record smallmouth bass in 1982. However, success and consistency of the two fisheries are limited and widely variable, largely due to the operational effects of Dworshak, and the lack of nutrients. Kokanee populations fluctuate wildly from year to year, mostly controlled by mortality (entrainment) caused by winter releases from Dworshak. Smallmouth bass in Dworshak Reservoir exhibit the slowest growth rate of any population in the region, due primarily to a lack of forage. Water level fluctuations have eliminated successful spawning of reidside shiners, the preferred forage of smallmouths in Dworshak. The smallmouth fishery currently produces only limited harvest to Dworshak anglers.

Trout stocking has shown mixed results over the history of Dworshak Reservoir. In years of low kokanee abundance, stocked trout provide the bulk of consumptive fishing opportunity in the reservoir. Hatchery trout also dominate the creel of shoreline anglers at Dworshak.

Fisheries Enhancement

The Idaho Department of Fish and Game (IDFG), CoE, U.S. Fish and Wildlife Service, and Nez Perce Tribe are attempting to work together to provide a reasonable and responsible fisheries program for Dworshak Reservoir. This program recognizes the importance of optimizing the kokanee fishery, enhancing the bass fishery, stocking

trout, and managing native species, primarily bull trout and westslope cutthroat.

Reservoir operation and integration of access, recreation, and anadromous fish all play important roles in the Dworshak resident fisheries program.

Historically, fry, fingerling, sub-catchable, and catchable size rainbow trout have been stocked. Rainbow trout stocking has associated risks to native populations and benefits to localized fishery opportunities. Most risks associated with stocking hatchery rainbow trout concern genetics of native cutthroat trout. Hatchery rainbow trout that leave Dworshak Reservoir and ascend tributaries could spawn with native cutthroat and contaminate the genetics of these native fishes. Earlier reservoir research indicates that size at stocking and stocking location are factors in rainbow trout movement (Ball and Pettit, 1974). Stocking catchable size fish downstream of the Dent Bridge may minimize hatchery fish movement into Dworshak tributaries (Maiolie et al., 1992). Stocking catchable size trout at major access points enhances harvest opportunity. Furthermore, development of sterilized rainbow trout to be stocked in Dworshak Reservoir was recently accomplished.

Total angler use averaged approximately 88,000 hours annually from 1972 through 1980. During these years rainbow trout dominated the fishery. Catch rates averaged less than one fish per hour. Following introduction in the 1970's, kokanee salmon became more prevalent in the reservoir and by the 1980's had replaced rainbow trout as the dominant fishery (Horton, 1981). Plentiful populations and liberal bag limits provided annual harvests of up to 200,000 kokanee per year from Dworshak. Harvest of kokanee was 206,000 in 1988 and fell to 98,000 in 1990. Creel surveys indicate the

kokanee decline advanced further in 1991 (Maiolie et al., 1992).

The Dworshak kokanee population has not been stable from year to year, and has exhibited exceedingly low annual survival rates, much lower than other kokanee populations in the same geographical region.

In some years over 80 percent of yearling kokanee have "died" before entering the fishery the following year, and may have resulted in up to a 60 percent reduction in fishing effort (Maiolie and Elam, 1994).

Research has shown a strong relationship between the quantity of water discharged through the dam on an annual basis and kokanee survival. Recent analysis suggests that dam discharge can be a more important factor in driving the population than the number of spawning fish (Fredricks, 1995). Years with high snow pack forced flood control rule curve evacuations that flushed kokanee from the reservoir because kokanee tend to congregate in the lower six reaches of the reservoir during winter and early spring. Powerhouse operation of up to 10,000 cfs generally flushed yearling fish. Spill during winter and early spring flushed all age classes (Maiolie et al., 1992).

Changes in dam operation associated with summer drafting of Dworshak Reservoir coupled with relatively low flow years have significantly increased kokanee survival and density in Dworshak Reservoir. Although removal of up to 80 feet of water from the reservoir is not popular with people that recreate on Dworshak Reservoir during the summer, it has reduced the loss of kokanee out of the reservoir. Bennett (1997) found a higher correlation between kokanee entrainment and mean daily discharge during January – March than during July – September. When water is released during

the summer kokanee are more active and are not congregated near the dam. Lower numbers of kokanee are lost through the dam under this scenario. In fact, annual kokanee survival during years of summer drafting has been as much as 10 times higher than in years of winter drafting. Unfortunately, this has generally resulted in over abundant kokanee populations, small fish and a decline in angler satisfaction.

Bull Trout

Dworshak Reservoir is in a key watershed for bull trout, currently listed under the Endangered Species Act as threatened, and may provide important over-wintering habitat. Kokanee is a primary food source of bull trout, and both species may congregate near the lower end of the reservoir in the winter. Late winter or early spring spills from the Dworshak Project have been linked to major losses of kokanee through entrainment, and may cause similar losses of bull trout.

Late summer drawdown of the Dworshak pool may also result in negative impacts to North Fork Clearwater bull trout population. Dewatered shorelines can decrease reservoir productivity. Low pool elevations can create both physical and thermal barriers, which may interfere with fall kokanee and bull trout spawning migration.

Anadromous Fishery

Dworshak Dam eliminated access of anadromous fish to all but the lower 1.9 miles of the North Fork Clearwater River. Dworshak hatchery was constructed to mitigate the loss of steelhead caused by the elimination of this production area. Dworshak Hatchery brood stock was developed from wild adult steelhead from

the North Fork Clearwater River population. A second hatchery became operational in 1991, primarily to produce B-run steelhead and spring chinook salmon for the Clearwater Basin. Returning adult hatchery steelhead were intended to perpetuate this genetically unique population and provide sport fishing and tribal harvest.

Water released from Dworshak Reservoir during April and May is primarily used to augment flows in the lower Snake River when necessary to meet the NMFS flow target of 85,000 – 100,000 cfs at Lower Granite Dam. In mid-summer, 1.2 million acre-feet (80 feet of pool elevation) from Dworshak Reservoir is used to help meet the NMFS 50,000 – 55,000 cfs flow target at Lower Granite Dam. Summer flow augmentation is for the benefit of juvenile fall chinook salmon. Mid-summer releases from Dworshak Reservoir also cool water temperatures in the lower Snake River. Both increased flow and cooler water temperatures are reported by NMFS to be beneficial for fall chinook salmon juveniles. NMFS uses reservoir elevation 1520 (80 feet down) at Dworshak Reservoir as a target regardless of lower Snake River conditions, fish presence or abundance (Columbia R. dart; Ed Shriever personal communication).

Historically, juvenile fall chinook would have left the lower Snake River by mid-July. Changes to the ecosystem caused by hydro-power development have shifted migration timing of juvenile fish from May-June to July. Providing artificially cold water conditions in the lower Snake River in the summer may further complicate the ecosystem and delay the out-migration of these fish. Some recent evidence indicates that cold-water releases from Dworshak in August and September may be beneficial to immigrating

adult fall chinook and steelhead (Karr et al., 1998). Fall chinook and steelhead upstream migration into the Snake River system begins in mid-August and continues through October 31. Declining water temperature in the lower Snake River result in lower residence time, and may increase adult survival. Releases from Dworshak in November and/or December likely benefit the steelhead sport fishery in the lower Clearwater River.

The Nez Perce Tribe is currently bringing new hatchery facilities near Lenore into production. This facility will produce juvenile fall chinook salmon to supplement the Clearwater stocks. Late summer flow augmentation in the lower Clearwater River would likely enhance out-migration of these fish.

Wildlife

Winter operation of the Dworshak Project may impact wildlife through related icing patterns. Deer and elk have been observed falling through the ice during attempted cross-reservoir migrations. Winter management to retard ice build-up, or to enhance early formation of safe ice cover may have a substantially positive impact on winter deer and elk survival.

Recreation

Recreation Facilities

Approximately 80 minicamp locations provide 125 sites for camping and day use. Two fee campgrounds have been developed. The CoE operates Dent Acres and Idaho Department of Parks and Recreation (IDPR) operates Dworshak State Park and Big Eddy Marina. There are seven improved boat launch facilities. Four facilities allow boats

to be launched with up to a 90-foot pool reduction, and three allow boats to be launched with up to a 110-foot pool reduction. CoE visitor surveys at Dworshak Reservoir indicate that the overwhelming reason people come to the reservoir is to fish.

Mid-summer water level reductions have negatively impacted visitor use at Dworshak Reservoir. Visitor days at CoE docks and camps averaged 131,425 from 1984-91 (Jaymi Osborne, CoE, personal communication, data provided). Visitor days at the same locations averaged 98,399 from 1992-94, a 25 percent reduction. Visitor days at Dworshak State Park averaged 36,960 during 1990 and 91. Use was at or above this average in 1992 and 93, but fell to 65 percent of average in 1994 (Mike McElhatton, Idaho Department of Parks and Recreation, personal communication, data provided). Regression analysis of visitor use and water level indicates that, except for June, from May to August the majority of the variation in user visits can be explained by reservoir elevation. Further analysis of use and water level indicates that minicamp use is virtually abandoned when drawdown exceeds 30 feet. Operation plan committee members also observed that boater use was substantially reduced when drawdown exceeded 30 feet.

Economics

Using the direct cost method, the fishery in Dworshak reservoir in the late 80's is valued at approximately \$620,000 annually (1985 dollars, Sorg et. al.). Multiplied by three for an estimated economic ripple effect, the reservoir fishery generates approximately \$1.8 million annually (1985 dollars). Applying visitation trends to the fishery indicates a 20-25 percent reduction in

participation due to reduced pool elevations in the summer months. However, the economic value of the steelhead sport fishery in the Clearwater River has been estimated at 10-14 million dollars annually. A four- percent increase in the economic value of the steelhead fishery may compensate for a 20 percent decline in the value of the reservoir fishery.

Commercial Navigation

Between 1988 and 1991, 81 million board feet of timber were transported from four dump sites on the Dworshak pool to takeout facilities located near Dworshak Dam (Fig. 1; BPA *et al.*, 1995a). Approximately 90 percent of this activity occurred in the months of June, July, and August. Logs have not been transported via the reservoir since 1991 due to early drafting for flow augmentation and resulting declines in reservoir elevations. The log dumpsites cannot be used when the reservoir elevation drops below 1570 ft. The added annual cost of truck transportation when the reservoir

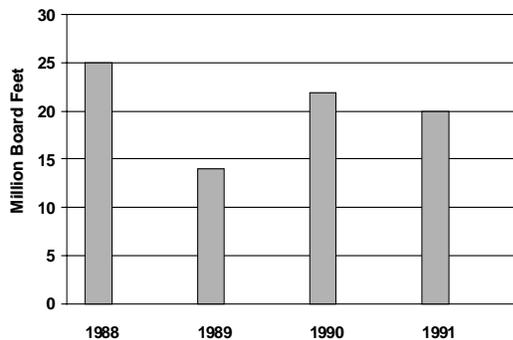


Figure 1. Log Transportation on the Dworshak Pool.

cannot be used has been estimated as high as \$470,000 when harvest is near the more distant dump sites.

Power Production

The average annual power production for the Dworshak Project between 1974 and 1991 was 1,769,000 megawatt hours (Fig. 2, CoE Power Production Records). At the Bonneville Power Administration preferred customer rate of 24 mills/kilowatt hour, the average annual power value was \$42.5 million. The average annual production between 1992 and 1998 was 1,418,000 megawatt hours, resulting in an average annual value of \$34.0 million. This represents a 20 percent reduction in power revenues under flow augmentation. During the pre flow augmentation period (1974-1991) one of the peak power production periods was November through January, which helped offset regional winter demands (Fig. 3). During the flow augmentation period, 1992-1998, peak production coincided with spring and summer augmentation releases. Power production during the winter months has been reduced substantially.

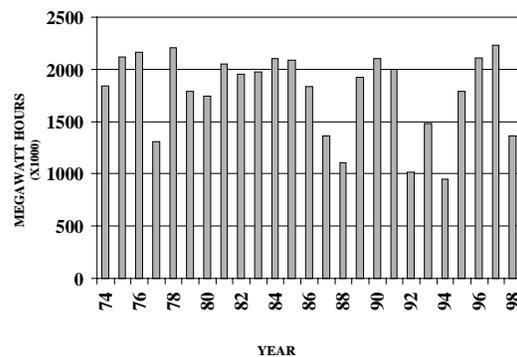


Figure 2. Annual Power Production for the Dworshak Project, 1974-1998.

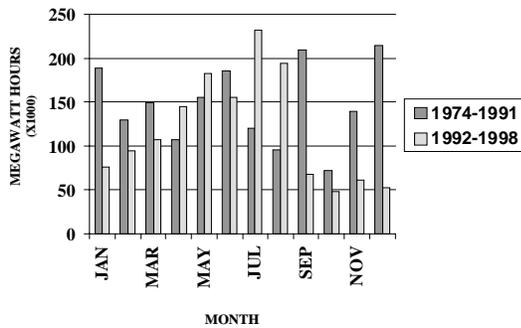


Figure 3. Average Monthly Power Production for the Dworshak Project, 1974-1998.

Flood Control

The primary objective of Columbia River system flood control operations is to reduce peak flows on the lower Columbia River (BPA *et al.*, 1995b). This area includes parts of Portland, Oregon and an additional 120 river miles protected by 42 diking districts. Under traditional operations, the Dworshak pool was maintained at or near full until after September 1. Between September 1 and January 1, the pool was gradually drafted to pool elevations of 1550 to 1560 feet (this provided approximately 700,000 acre-feet of space). Drafting continued into early April resulting in low pool elevations approaching 1450 feet (1,970,000 acre-feet available storage). Spring runoff resulted in reservoir refill, and full pool, elevation 1600 feet, was typically attained around June 10th. The reservoir pool elevation was usually maintained at 1600 feet through September 1.

With the advent of flow augmentation in 1992, some of the flood control space could be transferred from Dworshak to the Grand Coulee project. In theory, this would leave more water in the Dworshak pool to support

spring flow augmentation while increasing the likelihood of full pool in late spring or early summer.

Water Quality

In 1998, the Idaho Division of Environmental Quality (IDEQ) issued a draft list of 19 stream segments in the Upper North Fork Clearwater (Hydrologic Unit Code 17060307), which are purportedly water quality limited due to excess sediment pollution. In addition, Osier Creek is also listed as water quality limited due to water temperature exceedances and flow/habitat alterations. A total daily maximum load (TMDL) analyses for the Upper North Fork Clearwater is scheduled for completion by December 31, 2000.

Water quality issues in the lower North Fork Clearwater River (Hydrologic Unit Code 17060308) and the mainstem Clearwater River (Hydrologic Unit Code 17060306) include both water temperature and total dissolved gas supersaturation. Specifically, IDEQ and IDFG are concerned about thermal shock and gas saturation created when 20,000 cfs of 8 deg C water is released from the dam during the summer low flow period. Releasing cold water from Dworshak Reservoir for the purpose of flow augmentation and water temperature control in Lower Granite Reservoir during the summer can have an adverse effect on the growth and the productivity of both resident and anadromous fish in the lower Clearwater River. A TMDL for the lower North Fork Clearwater River is due in the year 2002 and a TMDL for the mainstem Clearwater River is due in the year 2003.

Short Term Activity Exemption

Since April 1995, the National Marine Fisheries Service (NMFS) has sent annual requests to both the IDEQ and to the Nez Perce Tribe seeking approval for a short-term activity exemption to exceed the total dissolved gas standard of 110 percent supersaturation in the North Fork Clearwater and the mainstem Clearwater Rivers below Dworshak Dam. The basis for this request is to provide water from Dworshak Reservoir to augment flows in the lower Snake River for the purpose of improving migration conditions for juvenile chinook, steelhead, and sockeye salmon originating from Idaho, Oregon, and Washington tributaries as well as the mainstem Snake River. Dissolved gas monitoring information from the CoE indicates that the 110 percent standard is exceeded in the river below Dworshak Dam at approximately 4,000 to 5,000 cfs spillway flow, or 14,000 to 15,000 cfs total flow.

The Idaho Administrative Procedures Act (IDAPA 16, Title 01, Chapter 02, Section 080.02) provides that the Idaho Department of Health and Welfare or the Board of Health and Welfare may conditionally authorize short-term activities that may result in a violation of state water quality standards (rules). The Idaho Water Quality Standards provide state that no activity can be authorized unless:

- The activity is essential to the protection or promotion of public interest;
- No permanent or long-term injury of beneficial uses is likely as a result of the activity. The designated beneficial uses listed for the North Fork Clearwater and the Clearwater Rivers in the Idaho Water Quality Standards are:
- Cold Water Biota

- Salmonid Spawning
- Primary Contact Recreation
- Secondary Contact Recreation
- Special Resource Water

Gas Bubble Trauma Monitoring

Beginning in 1995, NMFS requested a variance from the total dissolved gas standard to allow flow augmentation spills that could result in total dissolved gas levels up to 120 percent saturation. A requirement imposed by IDEQ with the activity exemption was a monitoring program for fish populations in the affected waters to determine extent of gas bubble trauma (GBT) associated with elevated dissolved gas saturation levels. Over the course of the past five years (1995 through 1999), over 30,000 individual fish were examined for gas bubble trauma (Table 1; Cochnauer, 1999). The incidence of GBT was never greater than 1.0 percent of all fish examined in a given year. Over 95 percent of all GBT incidences were observed in the two monitoring areas closest to Dworshak Dam.

Wild rainbow trout showed the highest incidence of GBT in 1996 and 1997. The highest incidence of GBT for both an individual species and all species collectively occurred in 1997 when the greatest number of days exceeding the 110 percent and 120 percent total dissolved gas saturation occurred. Seventy-three percent of the fish exhibiting GBT were at the lowest trauma level. Fifty-three percent of GBT was observed during the summer flow augmentation interval.

Table 1. Summarization of days by year with total dissolved gas exceeding Idaho state water quality standard and the percentage of gas bubble trauma observed for selected fish species (Cochner, 1999).

	1995	1996	1997	1998	1999
Days TDG exceeding 110%	33	41	55	47	41
Days TDG exceeding 120%	10	17	20	0	0
Number of individual fish examined	4,752	5,773	8,557	5,474	5,935
Number of fish species with GBT	5	2	7	1	2
% GBT for all species	0.2	0.2	0.8	<0.1	<0.1
%GBT for wild rainbow trout	0.0	2.0	7.5	0.0	0.4
%GBT for mountain whitefish	1.0	0.1	0.7	0.0	0.0
%GBT for largescale sucker	0.1*	0.2*	1.3	0.0	<0.1

*May include some bridgelip suckers

ONGOING ACTIVITIES

Total Dissolved Gas Activity Exemption

In March 2000, the IDEQ and the Nez Perce Tribe worked together in a collaborative manner to prepare a joint response to the NMFS annual request for a short-term activity exemption (Appendix A). This approach provides for the State of Idaho and the Nez Perce Tribe to have a collective regional voice with the Federal Caucus.

The 2000 Activity Exemption also varies from past exemptions in that conditions are attached that pertain to summer water storage and release from the Dworshak Project. These conditions specify that the Dworshak Project will be at full pool by June 30th, that full pool will be maintained through July 31 and that 200,000 acre-feet of the flow augmentation water will be preserved for augmentation needs after August 31. The purpose of these conditions is to shape releases from Dworshak to better meet anadromous and resident fish needs, as well the other traditional beneficial uses of the Project.

Following issuance of the waiver on March 31, 2000, NMFS notified the Tribe and the State that the conditions of exemption were unacceptable. Spring releases from Dworshak were made at levels that were not supposed to exceed the 110 percent standard. Subsequent review of hourly recordings indicated that the CoE may have been in violation of the standard. Summer releases from Dworshak are also being shaped to not exceed the 110-percent saturation standard.

If flow augmentation is successful in 2000

without exceeding the total dissolved gas standard, annual activity exemptions may no longer be required on a regular basis. It is anticipated that any future requests for exemptions will be linked to the integrated rule curve currently being developed for the Dworshak Project (see page 18), and supported by flow, temperature, total dissolved gas, and fish passage monitoring and modeling.

Technical Basis for Flow Augmentation (temperature modeling)

Prior to formulation of the Dworshak Operation Plan, efforts to model water temperature have focussed on the Snake River from Lower Granite Reservoir to its confluence with the Columbia River. Water quality and flow parameters for the Snake and Clearwater Rivers above Lower Granite Reservoir are input as boundary conditions. Mixing processes at the confluence of the two rivers and the effect of cold water releases from Dworshak had not been modeled.

Dr. Steven Wright of the University of Michigan, working through the University of Idaho, provided hydrologic analysis and preliminary temperature modeling in support of the Dworshak Operation Plan. Dr. Wright's hydrologic analysis focused on the mixing processes at the confluence of the Snake and Clearwater Rivers. Subsequent modeling simulated the impact of cold water releases from Dworshak on Snake River

temperatures below the Clearwater confluence.

The hydrologic analysis of mixing processes at the confluence of the Snake and Clearwater Rivers relied heavily on thermal imagery developed for the Idaho Department of Environmental Quality (Wright, 2000a). In a thermal scan of the Snake and Clearwater confluence during 1999 summer flow augmentation, the colder Clearwater River water is shown diving under the warmer Snake River water. Warm surface water temperatures indicate that very little mixing occurs below the confluence. Water released from the bottom of pool at Lower Granite Dam is substantially cooler than water surface in the forebay. The cooler Clearwater River water flows along the bottom of the reservoir and out the intakes at Lower Granite. The warmer water occupies the upper portions of the water column and remains relatively stagnant. The degree of vertical stratification is reduced as water moves through the remaining lower Snake reservoirs. The difference between forebay surface and the bottom-of-pool temperature is about one degree at Ice Harbor Dam.

A numerical model developed by Dr. Wright used historical data for mainstem Clearwater and Snake River discharges and temperature along with two different scenarios for Dworshak releases (Wright, 2000b). Simulations were performed for the summer release seasons (6/1 to 8/31) for four years; 1994 (dry), 1995 (average), 1996 (wet), and 1997 (very wet). The numerical model was one-dimensional and predicted Snake River temperatures are based on an assumption of complete mixing with Clearwater River water.

Under the NMFS Scenario (Scenario A), release begins on July 1 with a reservoir

discharge of 14,500 cfs. This is the maximum discharge from Dworshak that remains at or below the state total dissolved gas saturation standard of 110 percent. Discharge then remains at 14,500 cfs until the full 1.2 million acre-feet of flow augmentation water are released (Fig. 4-7). The end of release date varies from August 16 (dry) to August 25 (very wet). The general effect of Dworshak augmentation under Scenario A is a reduction of temperature following the July 1 flow increase. Water temperature down-reservoir of the Snake confluence remains below 20 deg C (considered to be the upper limit of tolerance for migrating salmonids) until the 1.2 million acre-feet have been released (usually between 8/15 and 8/25). After augmentation, reservoir outflow is generally reduced to equal inflow. Mid to late August reductions are followed by Lower Granite temperatures exceeding 20 deg C. often into mid-September.

Under the Idaho Scenario (Scenario B), Dworshak remains at full pool from July 1 through July 31, then 1 million acre-feet are released from storage, along with natural inflow by August 31 (Fig. 8-11). This leaves 200,000 acre-feet of storage for late summer or early fall augmentation. In Scenario B the temperature reduction occurs later in summer, and remains in effect through August 31. The temperature reduction may be somewhat more pronounced due to a higher flow release from Dworshak, and the temperature reduction effect may be greater during dry years, such as 1994. Lower Granite water temperature may exceed 20 deg C in September, but this can be controlled through the use of the 200,000 acre-feet held in reserve, and by slight reductions in August release discharges from Dworshak.

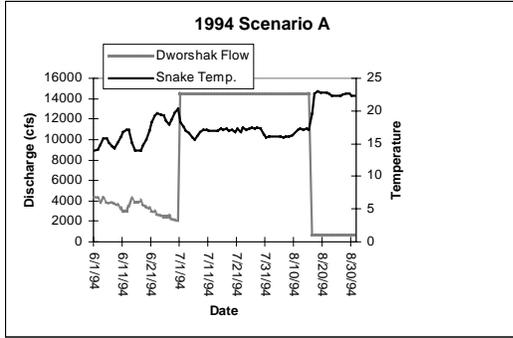


Figure 4. Scenario A, 1994.

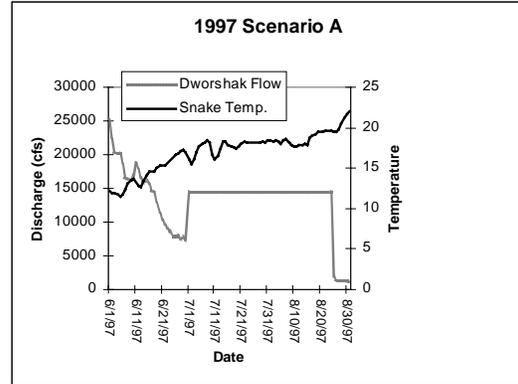


Figure 7. Scenario A, 1997.

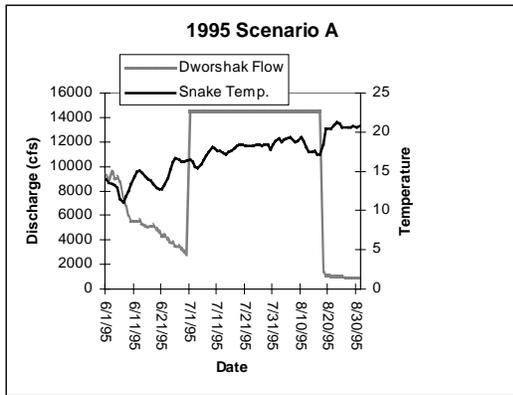


Figure 5. Scenario A, 1995

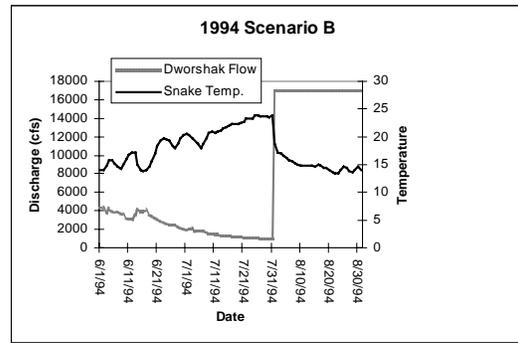


Figure 8. Scenario B, 1994.

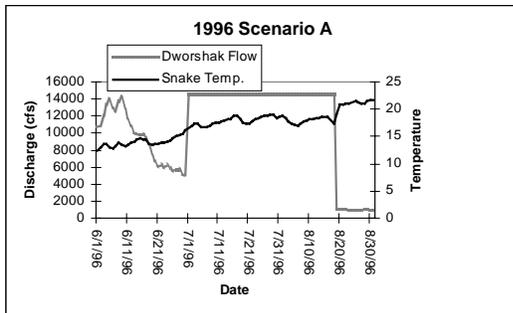


Figure 6. Scenario A, 1996.

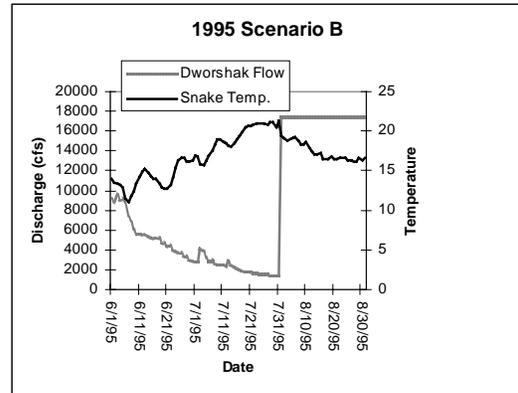


Figure 9. Scenario B, 1995

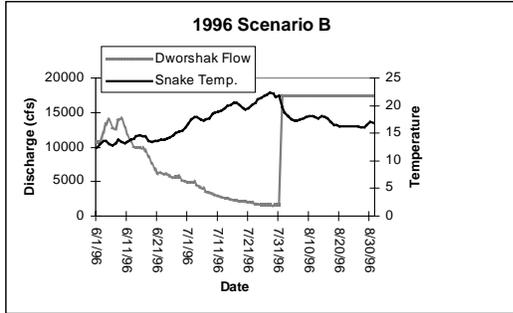


Figure 10. Scenario B, 1996

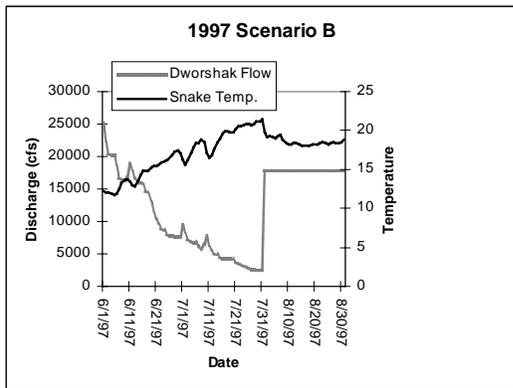


Figure 11. Scenario B, 1997.

Dr. Wright also provided an analysis of conditions that would be expected to result in thermal stratification in Lower Granite. Based on the depth and water velocity for a 14,500 cfs Clearwater flow at the confluence, Dr. Wright estimated that with a temperature difference of 6 deg C or greater between the Snake River and Clearwater temperatures, thermal stratification would develop in the Lower Granite pool.

The modeling support provided by Dr. Wright illustrates the importance of obtaining expertise in this area, and utilizing modeling capabilities to optimize the beneficial uses of Idaho's water. To this end, the Department of Water Resources, in partnership with the IDEQ and the University of Idaho, is obtaining the

capability to model water quality. Initially this effort will focus on TMDL development and flow augmentation in the Snake River below Hells Canyon Dam and the Clearwater below the Dworshak Project.

Integrated Rule Curve

The Dworshak Operation Plan Committee learned of the Nez Perce Tribe's integrated rule curve (IRC) development through a presentation at the Committee's June 16, 1999 meeting. The beneficial uses of significance to the Tribe are similar to the authorizations specified by the Dworshak Management Policies in the North Fork Clearwater Plan. This led to discussions of the benefits of state and tribal collaboration in the IRC modeling process. A verbal commitment to work together in developing a model that considered beneficial uses of importance to both Idaho and the Tribe was reached in October 1999. The Idaho Department of Fish and Game is currently cooperating with the Nez Perce Department of Fisheries in this effort.

The Tribe's Department of Fisheries is currently in the process of developing an IRC model for the Dworshak Project that optimizes project storage and outflows to meet multiple beneficial uses. The tribal fisheries agency received funding through the Northwest Power Planning Council to initiate the development of an IRC model for the Dworshak project in 1995. Extensive efforts to collect dissolved oxygen, temperature, photometry, and productivity data for the Dworshak pool were recently completed. Additional information regarding recreation, power production,

commercial navigation, flood control, resident and anadromous fish, and wildlife has also been pulled together.

The Nez Perce Tribe recently entered into a subcontract with Washington State University to apply the Montana Biological Rule Curve modeling template (Marotz *et al.*, 1996) to the Dworshak Project. Model development is scheduled for completion in early 2001.

Multi-Species Framework

The Columbia Multi-Species Framework Project is an ongoing effort by state, federal, and tribal resource managers to address fish and wildlife planning in the Columbia River Basin. The Framework provides a structure for regional planning, stressing ecological objectives, and strategies supported by a long-term science-based vision. The Multi-Species aspect reflects the emphasis on breaking down the usual demarcations between terrestrial and aquatic management and between management of anadromous versus resident fish.

The main application of the Framework Project will be the development of the fish and wildlife program for the Northwest Power Planning Council. The Council plans to structure the goals and actions of their next program, which directs the expenditure of \$127 million annually around the Framework. The Framework analysis will also be the basis for future watershed-level planning. This will be aimed at development of specific sub-basin plans to provide sub-basin objectives and guide annual prioritization and selection of actions. In the Clearwater River Basin, watershed level planning is being accomplished and co-coordinated by the Idaho Soil Conservation Commission and

the Nez Perce Tribe through a Clearwater Focus Program.

The Clearwater Focus Program

The Northwest Power Planning Council (NPPC), under the Northwest Power Act of 1980, developed a program to protect and enhance Columbia River Basin fish and wildlife, including threatened or endangered species. This program promotes protecting and improving anadromous and resident fish habitat and water quality. To facilitate this concept, the NPPC proposed in 1995 that Idaho, Montana, Oregon, and Washington each identify at least one basin in which to apply and implement the approach used in the Pacific Northwest Model Watershed Project. This process emphasizes local involvement in developing strategies to manage fish and wildlife. In June 1995, the NPPC recommended that a focus project be implemented in the Clearwater River subbasin.

The Clearwater Focus Program is co-coordinated by the Idaho Soil Conservation Commission and the Nez Perce Tribe. Input and assistance are provided by a policy advisory committee with representation from the Idaho Association of Soil Conservation Districts, the Idaho Department of Environmental Quality, the Idaho Department of Fish and Game, the Idaho Department of Lands, the Clearwater National Forest, the Potlatch Corporation, the Idaho County Commission, and the Nez Perce Tribe. To date, the Clearwater Focus Program has provided leadership, continuity, and a framework for water quality and fisheries habitat improvements in the Clearwater River subbasin. The project has been instrumental in developing an inventory of watershed projects and technical data sources, and in implementing

a comprehensive watershed assessment process. The ultimate goal of the Clearwater Focus Program is to develop a plan that identifies critical habitat protection and improvement needs, sets basin-wide priorities, and establishes funding strategies for plan implementation. The Dworshak Operation Plan is expected to be a key component of the integrated Clearwater Focus Project Plan.

Dworshak Dam and Reservoir were not selected for inclusion in the program during the current federal fiscal year.

National Recreation Lakes Pilot Program

In September 2000, the CoE, Walla Walla District nominated Dworshak Dam and Reservoir for inclusion in the National Recreation Lakes Pilot Program. Through this program, a commission appointed by the President will prepare reports for selected federally managed manmade lakes and reservoirs that:

1. Review the extent to which components identified in specific authorizations have been accomplished.
2. Evaluate the feasibility of enhancing recreation opportunities at federally managed lakes and reservoirs.
3. Consider legislative changes that would enhance recreation opportunities.
4. Make recommendations on alternatives for enhanced recreation opportunities.

RECOMMENDATIONS

Consistent with the Dworshak management policies and the objective of this plan, the Board makes the following recommendations:

1. The Board recommends that the CoE incorporate the integrated rule curve developed for the Dworshak Project by Nez Perce Tribe in collaboration with the Water Resource Board and the State of Idaho into the Dworshak Master Plan.
2. The Board recommends continued collaborative issuance of annual short-term activity exemptions for total dissolved gas that contain operating conditions consistent with the integrated rule curve for the Dworshak Project.
3. The Board recommends and supports continued water quality modeling, including temperature, by the State of Idaho to determine the quantity and timing of discharges from Dworshak to optimize anadromous fish migration through the lower Snake River, while providing favorable conditions for resident species of concern. Resident species of concern include bull trout and cutthroat trout. Future modeling efforts must include biological parameters to directly link fish migration data with water quality parameters.
4. The Board recommends continued support by the Northwest Power Planning Council of the Clearwater Focus Program to perform an ecological assessment and to formulate a plan for the Clearwater River subbasin. The assessment process will identify critical habitat, and the planning process will define implementation actions and strategies.
5. The Board recommends that the CoE review the Dworshak mitigation-stocking program with the Idaho Department of Fish and Game on an annual basis. The Board further recommends that this program be utilized to optimize the resident sport fishery in Dworshak Reservoir.
6. The Board recommends that the CoE study the following enhancements to the Dworshak Project through their master plan process:
 - A strobe light or equivalent system at the Dworshak outlet works to eliminate or reduce resident fish escapement from the reservoir.
 - Improved swimming and boating facilities that provide continued use of the reservoir under less than full conditions.
 - Processes, such as tributary fertilization, to enhance the resident sport fishery.
 - Funding mechanisms for the maintenance of Dent Bridge.
 - Enhancements to log transportation facilities that would provide for dumping and transport under drawdown conditions.
 - Processes that may improve reservoir shoreline vegetation.
 - Project landscaping enhancements.

Feasibility analysis of these enhancements must focus on the overall

benefit to the region and the nearby community of Orofino. The Board recommends that enhancements determined to have substantial positive benefits be implemented on a timely basis.

7. The Board recommends that the CoE resubmit the nomination of Dworshak Dam and Reservoir for inclusion in the

National Recreation Lakes Pilot Program prior to 2002 federal fiscal year.

8. The Board recommends that the Dworshak Project be operated in a manner that is consistent with Idaho Code and the Comprehensive State Water Plan.

ACTION

Pursuant to Policy 4B of the Comprehensive State Water Plan, Part A (the statewide water policy plan), the Board will meet

annually with the CoE to discuss spring and summer flow release strategies for the Dworshak Project.

IMPLEMENTATION

The Board requests the support of the Idaho congressional delegation in ensuring that the Dworshak Operation Plan is incorporated into the Dworshak Master Plan currently

being prepared by the CoE. The Board will then seek full implementation of the Master Plan.

REFERENCES

Ball, K., and S. Pettit. 1974. Evaluation of limnological characteristics and fisheries of Dworshak Reservoir. Idaho Department of Fish and Game, Job Performance Report, Project DSS-29-4 Job 4, Boise.

Bennett, David H. 1997. Evaluation of Current Environmental Conditions and Operations at Dworshak Reservoir, Clearwater River, Idaho, and an Analysis of Fisheries Management Alternatives. Final Report to U.S. Army Corps of Engineers, Walla Walla.

Bonneville Power Administration, Corps of Engineers and Bureau of Reclamation. 1995a. Columbia River System Operation Review – Final Environmental Impact Statement. Appendix H Navigation.

Bonneville Power Administration, Corps of Engineers and Bureau of Reclamation. 1995b. Columbia River System Operation Review – Final Environmental Impact Statement. Appendix E Flood Control.

Cochnauer, Tim. 1999. Summarization of Gas Bubble Trauma Monitoring in the Clearwater River, Idaho, 1995-2000. Report to Bonneville Power Administration, Contract 97BI31259.

Columbia River DART. 2000.
<http://www.cqs.washington.edu/dart/dart.html>

Fredericks, J.P., M. Maiolie, and S. Elam. 1995. Kokanee impacts assessment and monitoring on Dworshak Reservoir, Idaho. Idaho Department of Fish and Game. Prepared for Bonneville Power Administration, Portland.

Horton, W. D. 1981. Dworshak Reservoir fisheries investigations. Contract #DACW68-79-C-0034. Idaho Department of Fish and Game, Boise.

Idaho Water Resource Board . 1996. Comprehensive State Water Plan – North Fork Clearwater Basin.

Karr, Malcolm H., Jeffrey K. Fryer and Phillip R. Mundy. 1998. Snake River Water Temperature Control Project, Phase II, Methods for managing and monitoring water temperatures in relation to salmon in the lower Snake River. Columbia River Intertribal Fish Commission, Portland.

Maiolie, M. A., and S. Elam. 1994. Dworshak Dam impacts assessment and fishery investigation project. Idaho Department of Fish and Game. Annual Progress Report to Bonneville Power Administration, Project 87-99, Boise.

Maiolie, M. A., D. P. Statler, and S. Elam. 1992. Dworshak Dam impacts assessment and fishery investigation. Idaho Department of Fish and Game. Prepared for Bonneville Power Administration, Completion Report, Contract # DE-AI79-87BP35167 and DE-AI79-87BP35165, Boise.

Marotz, Brial L., Craig Althen and Bill Lonon. 1996. Model Development to Establish Integrated Operational Rule Curves for Hungry Horse and Libby Reservoirs – Montana. BPA Completion Report, Project #83-467.

Mausser, G., D. Cannamela and R. Downing. 1990. Dworshak Dam impact assessment and fishery investigation. Idaho Department of Fish and Game. Prepared for Bonneville Power Administration, Annual Report, Contract DE-A179-87BP35167, Project 87-89, Boise.

Rieman, B. E., and D. L. Meyers. 1992. Influence of Fish Density and Relative Productivity on Growth of Kokanee in Ten Oligotrophic Lakes and Reservoirs in Idaho. Transactions of the American Fisheries Society 121:178-191.

US Army Corps of Engineers, Bonneville Power Administration, US Bureau of Reclamation and National Marine Fisheries Service. 1995a. ESA Section 7 Consultation, Biological Opinion. Appendix H, Navigation.

US Army Corps of Engineers, Bonneville Power Administration, US Bureau of Reclamation and National Marine Fisheries Service. 1995b. ESA Section 7 Consultation, Supplemental Biological Opinion. Appendix E, Flood Control.

Wright, Steven J. 2000a. Written communication to Mr. William S. Whelan, dated March 20, 2000.

Wright, Steven J. 2000b. Written communication to Mr. Bill Graham, dated June 2, 2000.

**APPENDIX A: LETTER AND ATTACHMENT REGARDING SHORT
TERM ACTIVITY EXEMPTION OF TOTAL DISSOLVED GAS
SUPERSATURATION STANDARD**



March 31, 2000

William Stelle, Jr., Regional Director
United States Department of Commerce
National Marine Fisheries Service
525 NE Oregon Street
Portland, Oregon 97232-2737

Brigadier General Carl A. Strock
Commander, North Pacific Division
United States Army Corps of Engineers
P.O. Box 2870
Portland, Oregon 97208-2870

Re: Short Term Activity Exemption of Total Dissolved Gas Supersaturation Standard

Dear Gentlemen:

This letter is a joint response from the Nez Perce Tribe and the State of Idaho to a request on February 17, 2000 by the National Marine Fisheries Service (NMFS) for a short term activity exemption to allow exceedance of the water quality standard of 110% total dissolved gas (TDG) supersaturation in the North Fork of the Clearwater River below Dworshak Dam and the Clearwater River below the North Fork between April 3 and August 31, 2000. The stated reason for the NMFS request for exceedance of the TDG standard is to supplement flows in the lower Snake River to achieve flow objectives as set forth in the 1995 Federal Columbia River Power System Biological Opinion and the 1998 supplement to that document.

The Nez Perce Tribe and the State of Idaho, in consultation with various state and federal agencies, have reviewed the information provided by the referenced request for a short term activity exemption. The Nez Perce Tribe and the State of Idaho grant a short term activity exemption to allow exceedance of the TDG standard up to 120% for 12 of the highest hourly measurements during 24 hour spill, as measured at the U.S. Army Corps of Engineers Dworshak fish hatchery monitoring station, for the lower North Fork Clearwater and the mainstem Clearwater Rivers during the period April 3 through August 31, 2000. This short term activity exemption is granted by the Nez Perce Tribe and the State of Idaho under the conditions set forth in Attachment A.

This joint response to your request for a short term activity exemption represents a collaborative

effort between the Nez Perce Tribe and the State of Idaho and is designed to address the needs of migrating and resident fish and to optimize water management in the Snake and Clearwater River Basins. We look forward to working with you and other federal, tribal and state agencies to successfully implement this short term activity exemption process.

Sincerely,

Samuel N. Penney
Chairman
Nez Perce Tribe

C. Stephen Allred
Administrator
Idaho Division of Environmental Quality

cc: James Yost
Karl Dreher
Rod Sando
Chuck Clarke
Mike Field

**CONDITIONS OF THE SHORT TERM ACTIVITY EXEMPTION
TO THE STATE AND TRIBAL
TOTAL DISSOLVED GAS STANDARD
31 March 2000**

The Nez Perce Tribe (Tribe) and the State of Idaho (State) are jointly issuing a short term activity exemption, through their authorities, to the total dissolved gas standard of 110 percent of saturation. The short term activity exemption allows the standard to be exceeded up to 120 percent within the North Fork Clearwater River, Dworshak Project to mouth, and the main Clearwater River, North Fork confluence to mouth. The conditions of the short term activity exemption are set forth in this document.

Conditions of Short term activity exemption

1. The Dworshak Project will be at full pool (elevation 1600 ft) by June 30th.
2. The Dworshak Pool will be maintained at elevation 1600 ft through July 31st.
3. On August 31st, the Dworshak pool will be at or above elevation 1537 ft. This will provide 200,000 AF to meet late summer/fall augmentation needs.
4. All releases from Dworshak for the purposes of anadromous fish migration and water temperature control must first be approved by the State and the Tribe upon a finding that the release is supported by scientifically defensible water quality and fish migration studies and data.
 - Supporting studies and/or data must show that Dworshak releases will achieve their stated purpose(s).
 - Releases from Dworshak will not interfere with the rearing and migration of Clearwater River fall chinook smolts.
 - Specific flow augmentation releases will be authorized jointly in writing by the designated representatives of the Tribe and the State within this framework, after demonstration that there is scientifically defensible support for the release.

Releases will be approved only with the written concurrence of both parties.

5. The US Army Corps of Engineers will maintain the dissolved gas and temperature monitoring network, including monitoring stations at Dworshak, Peck and Lewiston. These stations will be operated and maintained on a continuous basis during the period of the short term activity exemption, except that the Dworshak station will be operated and maintained year-around.

Exceptions

Exceptions to these conditions may be granted under unusual circumstances (e.g. drought, specific fish passage needs, flood management requirements, etc.) if supported by scientifically defensible data and/or studies.

- The request for an exception will be made in writing to the Tribe and the State, and may result in a meeting with designated state and tribal representatives in Lewiston.
- Scientific data supporting the need for an exception will be attached to the request.
- A joint decision regarding the request for exception will be issued in writing by the designated state and tribal representatives.
- System operations requests for use of Dworshak water for flow augmentation and temperature control will not be presented to the NMFS Adaptive Management Process (TMT, IT) until after the request for exception is approved and issued by the designated state and tribal representatives.

Exceptions will be approved only with written concurrence of both parties.

**APPENDIX B: COMMENT LETTER FROM SENATOR
MARGUERITE MCLAUGHLIN**

MARGUERITE McLAUGHLIN

DISTRICT 7
BENEWAH, CLEARWATER,
IDAHO, LATAH, LEWIS
& NEZ PERCE COUNTIES

HOME ADDRESS
704 FLOYD
OROFINO, IDAHO 83544
HOME (208) 476-4136



COMMITTEES

FINANCE (JFAC)

COMMERCE & HUMAN RESOURCES

JLOC

Idaho State Senate

State Capitol
P.O. Box 83720
Boise, Idaho 83720-0081

Idaho Department of Water Resources
Idaho Water Resource Board
1301 North Orchard St.
P.O. Box 83720
Boise, Idaho 83720-0098

Dear Board Members:

I have reviewed your draft on management of the Dworshak Reservoir as recommended by the State of Idaho. I want to thank each of you and your staff for the support you have given the Clearwater Basin constituents on this critical issue. I only have one negative comment on the management of Dworshak and I do realize that you are not advocating the 80' proposed drawdown each summer.

At no time should the state agree to the 80' drawdown except in exceptional dry water and weather conditions. This mode of operation was called upon in extreme low water years and now after five years of ups and downs is being used as a goal instead of a last resort to reach flow targets for enough water to save fish.

During average or high water years Dworshak should have the same recreational potential as all other Snake and Columbia reservoirs have. To arbitrarily send water downstream in excess of true fish needs is detrimental to this beautiful area and does not help the fish. It then becomes a matter of greed on someone's part to allow or advocate such management. I hope that you will continue to do all you can to see that Dworshak drawdowns and management is in the best interest of the downriver endangered fisheries and this Clearwater Valley and not for downriver expansion and use.

I sincerely hope that we will once again, under ideal weather conditions, have the use of the reservoir as we enjoyed in the 1970s to the late 1980s.

Sincerely,

Senator Marguerite McLaughlin

Cc/Governor Kempthorne, U.S. Corp of Engineers, Northwest Power Planning Council,
Idaho Department of Environmental Quality.