April 5,2000

Technical Management Team
DRAFT 2000 WATER MANAGEMENT PLAN
For The Federal Columbia River Power System

April 3,2000

I. Introduction

This Water Management Plan (Plan) describes the measures needed in 2000~~1999~~ to provide the fish passage conditions called for in the National Marine Fisheries Service's (NMFS) *Biological Opinion (BiOp) on the operation of the Federal Columbia River Power System (FCRPS) and Juvenile Transportation Program in 1995 and Future Years*, ~~and~~ the *1998 Supplemental BiOp*, *and the 1999 Supplemental BiOp* . It covers relevant factors affecting the operation of FCRPS, including federal reservoir and dam operations to augment flows for fish, power generation, turbine outage and spill scheduling; water temperature control; total dissolved gas management and special operation for research and other purposes. The Plan is updated annually by April 15 of each year by the Technical Management Team (TMT). It is consistent with the TMT Guidelines and gives full consideration to the provisions of and effects on the Northwest Power Planning Council's Fish and Wildlife Program, other biological opinions, state and tribal plans and programs, the Endangered Species Act (ESA), the Clean Water Act (CWA), and other relevant operational requirements. It expected that an new BiOp will be issued later this year which may cause changes in the operations specified in the current water management plan.

Seven appendices are attached to the Plan:

- Appendix 1. Dissolved Gas Management Plan
- Appendix 2: Emergency Protocols
- Appendix 3: Load Shaping Guidelines for Turbine Operation Outside 1% Peak Efficiency
- Appendix 4: TMT Guidelines
- Appendix 5: Maintenance Schedule Outages of Generating Units

- Appendix 6. TMT Goals, Objectives and Triggers~~Recurring Issues Faced by the TMT and Possible Options for Resolution~~
- Appendix 7. Operation-related BiOp Provisions

II. Water Supply Forecasts

The (March ~~April~~ Final) January - July forecast for the Columbia River at The Dalles is 105~~128~~ million acre-feet (maf), 99~~121~~% of normal. Runoff forecasts for Reclamation reservoirs above Brownlee are in the 67 - 89~~116-127~~ percent of normal range. Pertinent water supply forecasts issued by the River Forecast Center are summarized in Table 1 for key locations on the Columbia and Snake Rivers. The final observed water supply for 199~~98~~ is also given for comparison purposes.

Table 1. March~~April~~ Final 2000~~1999~~ (and May Final 199~~98~~) Runoff Volume Forecasts

Location	**March~~April~~ Final '00~~99~~**	**% of Normal March~~April~~ Fin. '00~~99~~**	**May Final 199~~98~~ (actual)**	**% of Normal 199~~98~~ (actual)**
	Maf	%	Maf	%
Libby (Jan-Jul) *	6.87	107	6.80 (6.95)	106 (109)
Libby (Apr-Aug) *	6.68	105	6.76 (7.13)	106 (112)
Libby (Apr-Sep) ~~*~~	7.10	107		
Hungry Horse (Jan-Jul)	2.16	95	2.37 (2.24)	104 (99)
Hungry Horse (Apr-Sep)	2.10	95		
Grand Coulee (Jan-Jul)	65.0	103	72.4 (71.3)	114 (113)
Dworshak (Apr-Jul) *	2.70	100	3.24 (3.19)	120 (118)
Lower Granite (Jan-Jul)	27.6	93	35.8 (36.1)	120 (121)
Lower Granite (Apr-Jul)	20.2	93	25.5(25.8)	118(119)
Lower Granite (Apr-Aug)	21.4	93	27.2 (27.3)	118 (119)
Lower Granite (Apr-Sep)				
The Dalles (Jan-Jul)	105	99	124.0 (124.1)	117 (117)
The Dalles (Apr-Sep)	98.3	99		
The Dalles (Apr-Aug)	92.6	99	108.0 (110.3)	116 (118)
Brownlee (Jan-Jul)	7.61	78	12.90 (13.60)	132 (139)
Brownlee (Apr-Jul)	4.06	70	7.32(8.05)	126(139)

Brownlee (Apr-Aug)	4.53	70	8.18 (8.84	126(137)
Brownlee (Apr-Sep)				

(*) Should use COE Forecast

III. Winter Operations (September 1998 - March 20001999)

Reservoir Refill

During the winter season leading up to the 20001999 fish passage season, the Federal projects were operated with best efforts to meet the BiOp's recommendations on reservoir refill. The objective was to achieve the levels of confidence of refill summarized in Table 2 to April 10 flood control at Grand Coulee, and April 20 flood control at Libby, Hungry Horse and Albeni Falls. A 59-year modeling run is routinely used to predict the expected refill probability of each of the reservoirs involved. The results of the model runs are described in more detail in Section VI, Outlook for Meeting Flow Objectives.

Table 2. Required Confidence Levels for Reservoir Refill (Source: 1995 BiOp)

Libby and Hungry Horse	Grand Coulee	Albeni Falls
75%	85%	90%

The maximum flood control draft varied at each project. The timing of the maximum draft also varied for each project. Table 3 provides the 20001999 maximum flood control requirements at each project and the date of maximum draft at each project.

Table 3. Flood Control (FC) Requirements (*based on March April final forecast)*

Projects	Date of Max. FC Draft	Max. FC Draft Elev.	Min. Pool Elevation	Max. Pool Elevation
Mica	31 March	2080.0*	2320.0	2475.0
Arrow	31 March	1399.9	1377.9	1444.0
Duncan	28 February	1807.7	1794.2	1892.0
Libby	15 March	2331.3	2287.0	2459.0
Hungry Horse	30 April	3501.6	3336.0	3560.0
Albeni Falls	30 April	2056.0	2051.0	2062.5
Grand Coulee	30 April	1238.6	1208.0	1290.0
Brownlee	15 March	2053.1	1976.0	2077.0
Dworshak	15 April	1498.3**	1445.0	1600.0

(*) in kaf. Mica flood control evacuation requirements are defined in kaf space required rather than a corresponding elevation in feet.

(**) includes partial flood control shift from Dworshak to Grand Coulee to provide additional lower Snake flow augmentation in April.

Reservoir and Reservoir-Related Operations

Libby. Libby ended August with and elevation of 2455.7 feet. Libby was operated for power in the September through December period, and for flood control in the January-March period. The end of December flood control target was elevation 2411 feet. Toward the end of December Libby was drafted below 2411 feet in an attempt to try to provide low flows for burbot study. Unfortunately due to high inflows it was not possible to provide for the low flows requested. Libby's end of December elevation was 2408.1 The end of January, February, and March flood control elevation targets were 2370.9, 2338.3, 2331.3 feet respectively based on each respective water supply forecast. Libby's end of January, February elevations were 2370.13, 2341.13 feet. respectively. The end of February flood control elevation was not met because it was felt that the March final forecast would be lower than the February forecast and to help in making the April 15th 95% confidence of refill goal. The BiOp's objective is to achieve the April 15 flood control evacuation point with 75% confidence.

Hungry Horse. Hungry Horse ended August at elevation.3554.39 feet. It continued to draft until the early part of November. It then filled to elevation 3544.63 near the end of November 29th. The end of January, February, March and April flood control elevations were 3545.9, 3529.5, 3516.5, and 3501.6 feet respectively based on each respective water supply forecast. End of January and February elevation was 3526.18 and 3513.06 .

Albeni Falls. Albeni Falls ended August with an elevation of elevation of 2061.87 feet. Going into September the Lake Pend Oreille elevation operation range was 2062 – 2062.5 feet.. The lake was drafted to elevation 2062 feet by September 30th. It was intended to draft the lake elevation 2056 feet by October 31st. The elevation target was later changed to 2055 by October 20 – 25 and 2051 feet by mid November. The planned 2051 feet elevation was the second part of a five year test where the first three years (completed last year) the lake was to operated at elevation 2055 feet during the winter and then for the next two years the lake was to be operated at elevation 2051 feet. In an agreement reached on November 1, the decision was made for the lake to be drafted to elevation 2053 – 2053.5 by November 20th. The operating range was changed to 2053 – 2054 at the end of ~~Sept~~December.

Grand Coulee. Grand Coulee started September at elevation 1286.56 feet. It ended September at elevation 1284.99 feet. In October and November, Grand Coulee operated between elevations 1283 and 1288 feet. In December, the project drafted to elevation 1272.10 as needed to produce power and to maintain the minimum discharge requirements for chum below Bonneville while inflows to Lake Roosevelt receded. In January, the project drafted to elevation 1263.3 feet, the flood control elevation was 1290 feet, and the draft limit to assure an 85% confidence of filling was 1225.0 feet.

The January draft was, again, for the purpose producing power and maintaining the minimum discharge for Chum below Bonneville. The project ended February at elevation 1262.7 feet with a flood control elevation of 1290 feet and a draft limit of 1232.2 feet to assure 85% confidence of refill. In March, the project filled slightly to elevation 1264.XX in preparation for reaching the April 10 target elevation of 1258.8 while still maintaining the minimum discharge for chum below Bonneville. On March 17 the region agreed upon a partially shifted flood control operation, where Dworshak would shift about 65 kcfs of April flood control to Grand Coulee. This lowered the March 31 flood control elevation about two feet.

Brownlee. Brownlee ended August with an elevation of 2045.3 feet. It ended September at elevation of 2038.5 feet and continued to draft until the middle of October at which point it began to fill with a steady release of 9,500 cfs, which is a downstream spawning operation. Brownlee reached a maximum elevation of 2075.20 feet January 3rd. Brownlee's end of January, February, March and April flood control elevations were 2077.0, 2056.7, 2053.1 and 2053.9 feet respectively based on each respective water supply forecast. Brownlee's end of January and February elevation was 2063.36 and 2059.95 feet. A variance was given to Brownlee for their end of February flood control elevations because of high inflows to the project.

Upper Snake River.

"Reclamation's reservoirs in the upper Snake River continued to draft for irrigation through the middle of October at which time they either went to winter stream maintenance flows or passing inflows. Irrigation demands and augmentation releases during the previous summer and fall drafted all of these reservoirs well below their winter flood control space requirements. Maximum flood control space for the upper Snake River reservoirs is typically required by early May at which point the reservoirs start refill, reaching full typically by late June or early July. With the near to below average snowpack this year the upper Snake reservoirs remained at their winter outflow levels through February before increasing releases to pass inflow and/or draft slightly during March and April to reach May 1 flood control space requirements."

Dworshak. Dworshak ended August at an elevation of 1527.04 feet. At the beginning of September Dworshak was still releasing water for flow augmentation and temperature control. It's end of September elevation was 1256.7 feet. Dworshak went to minimum project release 14 September when elevation reached 1520 feet and stayed there until around January 6th. The end of January, February, March and April flood control elevations were 1530.6, 1523.6, 1512.2, and 1516.6 feet respectively based on each respective water supply forecast. Dworshak's end of January and February elevations were 1529.73 and 1524.27 feet. On March 17, the region agreed to shifted flood control operation from Dworshak to Grand Coulee. Approximately 65 ksfd (out of a possible 30 kcfs) was shifted at the end of March to enhance April flow in the lower Snake River.

Lower Snake River Projects. Lower Granite went off MOP November 15th. ~~Lower Granite,~~ Little Goose, ~~and~~ Lower Monumental, and Ice Harbor projects operated within the normal operating range after August.

Bonneville. Bonneville's outflow was controlled to provide protection for spawning Chum and Fall Chinook.. The minimum flow level was set at 125 kcfs 15 October. The protection level was set at 140 kcfs (+-10 kcfs) November 10th. TMT set the protection level at 150 kcfs at the December 15th meeting. This level was increased to 160 kcfs in mid-February. Protection will be provided until emergence in completed in April. ~~held until the current time.~~

John Day. A spill test was held at John Day dam in early February to test the effect of tailwater elevation on the flow defectors.

IV. Spring Operations (April-June)

Spring Flow Objectives at Lower Granite and McNary

The spring flow objectives at Lower Granite and McNary are to be calculated based on the May final volume runoff forecast, using a sliding scale defined in the BiOp. Values shown in Table 4 resulted from an early determination based on the March ~~April~~ final runoff forecasts (April-July runoff forecast of 20.2~~26.2~~ maf at Lower Granite and January-July runoff forecast of 105~~128~~ maf at The Dalles).

Table 4. BiOp Spring Flow Objectives (based on March~~May~~ final runoff forecast)

Lower Granite		McNary	
Period	**Flows (kcfs)**	**Period**	**Flows (kcfs)**
4/3-6/20	100.0	4/20-6/30	260

As called for in the BiOp (Page 96), the FCRPS will be operated to meet the spring flow objectives, with reservoirs at flood control elevations on April 10 (or April 20, as the case may be) and full on June 30. Dworshak will operate to a partially shifted flood control elevation on April 3, and meet April 30 flood control level. During April 3 to June 20, Dworshak may be used to help meet the spring seasonal flow objective, subject to meeting applicable downstream TDG limits. If drafts from Dworshak are used for flow augmentation prior to April 10th the elevation that the Dworshak would have been at without the drafts will be used for April 10th flood control elevation mentioned above. Given the ~~above~~ average runoff forecast at The Dalles, it is anticipated there will be no need to limit the spring flow augmentation in order to refill the reservoirs by June 30.

~~Idaho recommends examining the requirement to be at April 10 flood control. Having reservoirs at flood control on April 10 does not allow for any provision to "fill in the holes" from delayed spring snowmelt to benefit migrating smolts. Shifting the timing of meeting final flood control elevations would provide this flexibility.~~

Spring Flow Objective for the Mid-Columbia River

The recommended average flow objective at Priest Rapids is 135 kcfs during the April 10 - June 30 period. The shaping of the flows will be guided by the desire to refill Grand Coulee by June 30, timing and magnitude of the juvenile migration, water temperature, spill and total dissolved gas levels, adult fish and other requirements for improved survival of listed fish. Flows greater than the objective may be provided on a weekly basis during key points in the migration if this does not jeopardize reservoir refill and summer flow augmentation. Flows lower than the objective may occur some weeks during the migration due to hydrologic conditions.

Snake Reservoirs at MOP

The lower Snake River reservoirs will be operated within one foot of the minimum operating pool (MOP) from April 3~~10~~ until adult fall chinook salmon begin entering the lower Snake River (late August). The operating ranges are shown in Table 5.

Table 5. Lower Snake River Reservoirs Operating Ranges

Reservoirs	MOP Range(ft)	Normal Operating Range (ft)
Lower Granite	733 - 734	733 - 738
Little Goose	633 - 634	633 - 638
Lower Monumental	537 - 538	537 - 540
Ice Harbor	437 - 438	437 - 440

MOP draft and refill operations will be determined by TMT and done in a manner that provides fish benefits, while avoiding exceedence of state TDG standards, if possible. This will be accomplished through proper timing of the draft at each individual reservoir, proper sequencing of the operation, and controlling the draft rate. Detailed draft operation will be discussed in-season.

Other Reservoir Spring Operation

Libby will be operated for Kootenai River sturgeon, using operational guidelines for Kootenai River white sturgeon prepared by USFWS in coordination with NMFS. The Service will also make recommendations for operation of the Libby Project and Hungry Horse for bull trout, which has been listed under the Endangered Species Act. These recommendations may be in the form of operational guidelines. Specific requests for

project and reservoir operations at the Libby Project will be made by System Operational Requests.

~~Albeni Falls will start April near its winter elevation of 2055 feet. The end of April maximum elevation is 2056 feet. Lake Pend Oreille will be operated to be full by the end of June.~~

Canadian Treaty projects will operate consistent with the 1999~~8~~-2000~~99~~ Detailed Operating Plan (DOP) and related operating agreements such as the Non-Power Uses Agreement and the Non Treaty Storage Agreement. The Operating Rule Curve for the whole of Canadian Storage shall be the sum of the Operating Rule Curves for each of Duncan, Arrow, and Mica. Mica will operate consistent with the Mica Project Operating Criteria table as shown in the DOP. More detailed information on the DOP will be available via the TMT homepage.

Spring Spill for ~~–~~fish ~~-~~passage

Planning dates for spring spill are April 3 to June 20 in the Snake River; April 20 to June 30 in the lower Columbia River. A summary of the general guidance on spill requirements and other considerations provided in the 1998 Supplemental BiOp is listed in Table 6. Spill will be up to the level of~~by~~ the 120% TDG limit where waivers or exceptions to the 110% standard are in effect. Prior to initiating spill to the 115/120% total dissolved gas level (TDG) a "waiver" is sought from the State and/or tribal agency that has water quality regulatory authority for the affected reach. The waiver request for the 2,000 season was made in February by NMFS to Idaho, Oregon, and the Nez Perce Tribe. The State of Washington has approved spill for the purpose of improving juvenile fish survival through 2003.
Spill will also be implemented at all three Snake River collector projects "*when seasonal average flows are projected to meet or exceed 85 kcfs*". In-season adjustments of the spill caps will be made based on actual TDG levels measured below the projects.

NMFS has requested the necessary state waivers to allow spill for-fish-passage to occur up to the recommended 120% TDG level. A letter response was received from Washington Department of Ecology dated ~~April 1, 1999~~?. The Oregon Department of Environmental Quality issued a waiver dated ~~March 19, 1999~~?.

If needed to provide the best condition for an evaluation of the effects and efficacy of spill to improve in-river survival, the TMT may recommend that a single spill regime prevail throughout the spring migration season. This action will depend on when the numbers of fish arriving at the projects are significant and when the flows are expected to reach trigger levels during the spring season.

Table 6. Summary of Spill Requirements and Other Considerations (1998 Supplemental BiOp)

Project	Flow trigger	Spill Duration	Recommended Min/Max Powerhouse Capacity [1]	Spill Cap for 120% TDG [2] at the start of the spring season	Other Considerations (per 1998 Supplemental BiOp Appendix C) to prevent eddy formation, improve fish passage, etc.
	Kcfs	Hours	kcfs	kcfs	% of flow or kcfs
LWG	85	12 [4]	11.5/123	45	
LGS	85	12 [4]	11.5/123	60	35% max[3], page C-11
LMN	85	12 [4]	11.5/123	40	50% max [3] page C-11
IHR		24	7.5/94	75	
MCN		12 [4]	50/175	120-160	
JDA		12[5]	50/	180	60% max (for flows up to 250-300) or TDG cap (whichever is less); 25% min (due to eddy) See page C-13
TDA [6]		24	50/	230 [5]	[6]64% max 30% min (test). See page C-14
BON		24	30 min. (BPA); see page C-14. 60 min. (FPP)	120	50 kcfs min. spill (tailrace hydraulics); 75 kcfs max. daylight hours (adult fallback) See page C-14

1. Max. value is for powerhouse with units operating within 1% peak efficiency
2. Starting value subject to in-season adjustments based on real-time information
3. Levels provided in the 1998 BiOp to prevent eddy formation and maintain good adult passage conditions. May be adjusted in-season by TMT
4. Normally between 1800-0600 hours
5. From April 20th to May 14 1800 – 0600 from May 15 to July 31 1900 to 0600 ~~from May 15 to July 31~~ and from August 1 to August 31 1~~8~~900-0600 ~~in August~~ at John Day.
6. Spill at TDA is limited to the 1995 BiOp level of 64% (rather than spilling to the TDG cap). ~~Note that this requirement may be modified for 1999 (see below)~~.

Note – There is a potential to change spill at several projects to accommodate fish passage studies and preferred operations, as noted below: ~~are several spill related research activities planed for this spring / summer. The final details have not been worker out yet. Below is our current ideas on what might happen.~~

Bonneville – ~~It has been proposed this year to T~~test the fish passage effect of spilling to the gas cap 24 hours a day. Most likely there will a randomized block test consisting of a block of 2 days of spilling during the daylight hours to the gas cap followed by a block of limiting daytime spill to the 75 kcfs adult fallback cap, April 21 to August 30. See proposed spill schedule below.

Daytime Bonneville spill schedule for adult fallback evaluation. Daytime spill levels will alternate between 75 kcfs and levels up to the 120% TDG cap.

Date	Block	Spill Level	Date	Block	Spill Level	Date	Block	Spill Level
21-Apr	1	75 kcfs	04-Jun	12	120%	18-Jul	23	75 kcfs
22-Apr	1	75 kcfs	05-Jun	12	120%	19-Jul	23	75 kcfs
23-Apr	1	120%	06-Jun	12	75 kcfs	20-Jul	23	120%
24-Apr	1	120%	07-Jun	12	75 kcfs	21-Jul	23	120%
25-Apr	2	75 kcfs	08-Jun	13	75 kcfs	22-Jul	24	75 kcfs
26-Apr	2	75 kcfs	09-Jun	13	75 kcfs	23-Jul	24	75 kcfs
27-Apr	2	120%	10-Jun	13	120%	24-Jul	24	120%
28-Apr	2	120%	11-Jun	13	120%	25-Jul	24	120%
29-Apr	3	120%	12-Jun	14	75 kcfs	26-Jul	25	75 kcfs
30-Apr	3	120%	13-Jun	14	75 kcfs	27-Jul	25	75 kcfs
01-May	3	75 kcfs	14-Jun	14	120%	28-Jul	25	120%
02-May	3	75 kcfs	15-Jun	14	120%	29-Jul	25	120%
03-May	4	120%	16-Jun	15	75 kcfs	30-Jul	26	75 kcfs
04-May	4	120%	17-Jun	15	75 kcfs	31-Jul	26	75 kcfs
05-May	4	75 kcfs	18-Jun	15	120%	01-Aug	26	120%
06-May	4	75 kcfs	19-Jun	15	120%	02-Aug	26	120%
07-May	5	120%	20-Jun	16	75 kcfs	03-Aug	27	120%
08-May	5	120%	21-Jun	16	75 kcfs	04-Aug	27	120%
09-May	5	75 kcfs	22-Jun	16	120%	05-Aug	27	75 kcfs
10-May	5	75 kcfs	23-Jun	16	120%	06-Aug	27	75 kcfs
11-May	6	75 kcfs	24-Jun	17	75 kcfs	07-Aug	28	120%
12-May	6	75 kcfs	25-Jun	17	75 kcfs	08-Aug	28	120%
13-May	6	120%	26-Jun	17	120%	09-Aug	28	75 kcfs
14-May	6	120%	27-Jun	17	120%	10-Aug	28	75 kcfs
15-May	7	120%	28-Jun	18	120%	11-Aug	29	75 kcfs
16-May	7	120%	29-Jun	18	120%	12-Aug	29	75 kcfs
17-May	7	75 kcfs	30-Jun	18	75 kcfs	13-Aug	29	120%
18-May	7	75 kcfs	01-Jul	18	75 kcfs	14-Aug	29	120%
19-May	8	120%	02-Jul	19	75 kcfs	15-Aug	30	75 kcfs
20-May	8	120%	03-Jul	19	75 kcfs	16-Aug	30	75 kcfs
21-May	8	75 kcfs	04-Jul	19	120%	17-Aug	30	120%
22-May	8	75 kcfs	05-Jul	19	120%	18-Aug	30	120%
23-May	9	75 kcfs	06-Jul	20	75 kcfs	19-Aug	31	75 kcfs
24-May	9	75 kcfs	07-Jul	20	75 kcfs	20-Aug	31	75 kcfs
25-May	9	120%	08-Jul	20	120%	21-Aug	31	120%
26-May	9	120%	09-Jul	20	120%	22-Aug	31	120%
27-May	10	75 kcfs	10-Jul	21	75 kcfs	23-Aug	32	75 kcfs
28-May	10	75 kcfs	11-Jul	21	75 kcfs	24-Aug	32	75 kcfs
29-May	10	120%	12-Jul	21	120%	25-Aug	32	120%
30-May	10	120%	13-Jul	21	120%	26-Aug	32	120%
31-May	11	75 kcfs	14-Jul	22	75 kcfs	27-Aug	33	75 kcfs
01-Jun	11	75 kcfs	15-Jul	22	75 kcfs	28-Aug	33	75 kcfs
02-Jun	11	120%	16-Jul	22	120%	29-Aug	33	120%
03-Jun	11	120%	17-Jul	22	120%	30-Aug	33	120%

The Dalles – Recent research has shown that juvenile fish survival at TDA is better at 30% spill as opposed to 64% spill. Most likely the spill level will be between 30 - 50 % this year.

John Day - ~~There will most likely be a test of~~ spilling two~~several different~~ levels during the daytime period. A randomized block design consisting of periods of 0% spill and 3~~2~~0% spill during daytime has been suggested. The daytime spill amount may be linked to the spill at Bonneville. John Day would spill during the day when Bonneville was spilling to the daytime 75 kcfs cap and not spill when Bonneville was spilling to the gas cap during the day.

Ice Harbor – There is a proposed spillway survival and adult test that mentions spilling at two different levels of 45 and 110 kcfs. My guess is that this test is similar in concept to the test at Bonneville. In that they would alternate daytime spill between the gas cap (last year around 100 kcfs) and 45 kcfs the adult fallback cap.

Lower Granite – In support of the Surface Bypass Collector testing Lower Granite will be spilling 20% 24 hours a day.

V. Summer Operations (July-August)

Summer Flow Objective at Lower Granite and McNary

The seasonal average flow objective for Lower Granite is to be based on the May final water supply forecasts, but the seasonal average flow objective for McNary is a fixed 200 kcfs regardless of the runoff forecasts. Summer flow objectives based on the March~~April~~ final April-July runoff forecast are shown in Table 7.

Table 7. Biological Opinion's Summer Flow Objectives

Lower Granite Period	Lower Granite Flows (kcfs)	McNary Period	McNary Flows (kcfs)
6/21-8/31	51.75	7/1-8/31	200

At Libby, draft to provide flows for white sturgeon spawning (RPA 1(a)) does not, in itself, preclude drafting below the interim draft limit to meet flow objectives for salmon in accordance with the conditions and process described in RPA 1(f) of the BiOp. The USFWS and NMFS, in coordination with the states and tribes, will make the best efforts to balance the flow requirements of both species and make recommendations to the TMT. The Corps will evaluate those recommendations consistent with its 1995 and 1997 Records of Decisions, and its 1998 Record of Consultation and Summary of

Decision, which state that *"the Corps will operate Libby Dam in an attempt to meet the sturgeon flow requirements consistent with existing treaties and laws, and will reduce releases if monitoring identifies potential adverse effects of flooding and/or bank erosion, or if requested to reduce releases by USFWS. If, at the conclusion of the operation for sturgeon, Lake Koocanusa is above elevation 2439 on or before August 31, the Corps may, if necessary lower Libby Reservoir to elevation 2439 by August 31 to meet salmon flow objectives without spilling at Libby*." Montana is expected to compute IRCs for Libby so that they can be considered in the TMT summer decision making.

In 1995, 1996, 1997 and 1998, the Libby-Arrow swap has been executed, which made it possible for Libby to stay full many more weeks into the summer. The potential for repeating this beneficial, volume neutral operation will be reexamined in 2000~~1999~~, since it is now part of the Libby Coordination Agreement with ~~subject to concurrence from~~ Canada. The exchange, if it occurs, will be fully documented. Provisions are in place in the DOP to provide for the optimal balancing of the storage of water in Libby and Arrow reservoirs, considering mutually beneficial power and non-power objectives. Storage and/or release rates may be modified at the appropriate reservoir should such modifications be necessary to protect fish or accommodate other operating constraints. Water stored in the Libby Account will be released later, according to a schedule agreed to by the U.S. and Canadian parties, and taking into account the project considerations on Canadian Treaty and Libby reservoirs as well as operation of Kootenay Lake under the International Joint Commission order. BPA and the Corps will coordinate Treaty operations with TMT.

Summer Reservoir Interim Draft Limits

The interim draft limits specified in the 1995 BiOp on reservoir elevations through August 31 are shown in Table 8 and are independent of the June 30 reservoir elevations. Reservoirs are not always required to be drafted to those draft limits because of potential adverse impacts on other portions of the Columbia Basin ecosystem and the resident fish and wildlife that rely on the reservoirs (1995 BiOp, page 96). On the other hand, the 1995 BiOp (Page 102) also stated that, under certain circumstances, lower summer reservoir elevations may be recommended to meet flow objectives. Examples of special circumstances include:

- a low water year that is one in a series of low water years and an outmigrating population of fish that represents a strong year class
- upper rule curve goals were not met on April 20 (later changed to April 10) at Grand Coulee and Albeni Falls, or
- The Dalles April-August unregulated runoff is expected to be less than 65 maf, determined as of June 30."

TABLE 8. BIOP INTERIM SUMMER RESERVOIR DRAFT LIMITS (IN FEET) THROUGH AUGUST 31

Grand Coulee	Libby	Hungry Horse	Dworshak
1280	2439	3540	1520

Upper Snake River Reservoir Operation

Operations of the Upper Snake Reservoirs is in question at this point in time because the Idaho legislation authorizing the use of 427 MAF of Snake River Water has not been renewed.

Summer Reservoir Operations

During the July - August period Dworshak will draft to as low as elevation 1520 feet. Note that this depends on the maximum allowable outflow. The maximum outflow without exceeding 110% and 120% TDG is about 14 and 22 kcfs respectively. ~~In 1998, the state of Idaho and CRITFC recommended~~ that ~~a Dworshak not draft to 1520 feet only to a maximum of 1535 feet by the end of August to allow use of additional approximately 15 feet of storage (200 kaf) for release in the fall and early winter to aid adult steelhead and fall chinook conversions.~~

~~Again in 2000 1999, Idaho recommends that as best possible, Brownlee may be used to delay Dworshak drafting below 1580 feet until early to mid-August. Idaho Power anticipates that Brownlee may operate to guarantee refill to 2059 feet by the end of September.~~

Albeni Falls will be full by the end of June and will pass inflow through July and August.

Reclamation will operate Grand Coulee and Hungry Horse consistent with the Biological Opinion and its stated limits of 1280 feet and 3540 feet, respectively, at these reservoirs. Outflows from Hungry Horse will include meeting the 3,500 cfs minimum flow requirement at Columbia Falls without drafting below the 3540 foot limit anytime in July-August. Reclamation will also attempt to reach IRC elevations at Hungry Horse depending on circumstances of runoff, with a higher priority for meeting the Biological Opinion flow objectives.

Summer Spill for ~~–~~fish ~~-~~passage

Planning dates for summer spill, where applicable, are the same as in the 1995 BiOp. Summer spill requirements/limitations will~~ould~~ be as shown previously for spring spill. Summer spill is only required at Ice Harbor, John Day, The Dalles and Bonneville. Daily spill periods are 24 hours at Ice Harbor, The Dalles and Bonneville, and 1800 – 0600 (April 20 – May 14), 1900-0600 (May 15-July 31) and 1~~8~~900-0600 (August1 – August 31) at John Day. Spill for-fish-passage will be subjected to the state standards

for TDG as determined by the spill caps, which will be adjusted in-season based on actual TDG readings.

VI. Fall Operations (September – March)

Operation for Chum Salmon Spawning in the Ives Island Area Below Bonneville Dam

This operation will be implemented as described below if the best hydrologic data available by mid-September indicate that precipitation, runoff, and reservoir storage are likely to support the operation from the start of spawning (late October or early November) until the end of emergence (generally through the start of the spring flow augmentation season in April) without adverse effect on implementation of the 1995 BiOp, the 1998 supplemental biological opinion, or the ability of parties to comply with the Vernita Bar agreement. The goal is to make sure that providing the flows for Chum salmon spawning will not jeopardize refilling the storage projects to April flood control elevations or meeting the seasonal flow objectives. If these conditions cannot be met, the TMT will recommend operations that will provide benefits to chum salmon while maintaining existing fish protection measures (i.e., 1995 BiOp, 1998 supplemental biological opinion, and Vernita Bar agreement).

If the operation is feasible (as described above), it will begin when chum salmon appear in the area around Ives and Pierce islands, but no later than November 1st. Based on recommendations developed by the regional fish and wildlife managers, TMT proposes to manage FCRPS storage with natural flow to achieve a 125 kcfs average daily discharge (+/- 5 kcfs) from Bonneville Dam from November 1 through December 31.

When reservoir storage, baseflows, and predicted hydrologic conditions permit, a higher managed daily average discharge may be adopted. The TMT will recommend the actual managed daily average discharge with a +/- 5 kcfs range.

At managed daily average flows of 160 kcfs or higher, the FCRPS will be managed to provide an instantaneous minimum discharge of 155 kcfs (i.e., 160 kcfs minus 5 kcfs) at Bonneville Dam, with a day average of at least 160 kcfs. In this case, the maximum instantaneous discharge would not be limited.

During incubation and emergence (January 1 through the start of the spring flow augmentation program for the lower Columbia River on April 20), TMT proposes to manage storage with natural flows to maintain the daily average discharge from Bonneville Dam needed to protect the highest redd established by the operation and to maintain connectivity between spawning habitat and the mainstem for outmigrants. If the daily average Bonneville outflow is between 125 kcfs and 134 kcfs during spawning, a discharge of at least 125 kcfs will be maintained through incubation and emergence. For all managed spawning flows of 135 kcfs and above, the highest spawning flow minus 10 kcfs will be the managed daily average discharge during

incubation and emergence. The highest managed daily average discharge that will be provided during the incubation and emergence period is 150 kcfs.

VII. Outlook for Meeting Flow Objectives in 2000

Unregulated and Regulated Summary Hydrographs at Lower Granite and McNary

The monthly flow values of the average summary unregulated and regulated hydrographs for Lower Granite and McNary are provided in Table 10, and the hydrographs themselves are shown in Figures 1 and 2. This material was based on 1929-1987 runoff shapes that were normalized to match the March final January-July 2000 runoff volume forecasts.

Table 10. 2000 Average Summary Hydrographs at Lower Granite and McNary

	LWG Unregulated Flow (kcfs)	MCN Unregulated Flow (kcfs)	LWG Regulated Flow (kcfs)	MCN Regulated Flow (kcfs)	LWG Flow Objective (kcfs)	MCN Flow Objective (kcfs)
Apr 1 - 15	67	185	68	220	- (Apr 1-2) 100 (Apr 3-15)	-
Apr 16 - 30	83	263	84	281	100	- (Apr 16-19) 260 (Apr 20-30)
May	110	438	97	287	100	260
Jun	98	483	87	316	100 (Jun 1-20) 51.8 (Jun 21-30)	260
Jul	36	264	48	196	51.8	200
Aug 1 - 15	21	160	31	160	51.8	200
Aug 16-31	19	125	24	138	51.8	200

(*) average flows during the month indicated

FIGURE 1. AVERAGE FLOW HYDROGRAPH FOR MCNARY 2000

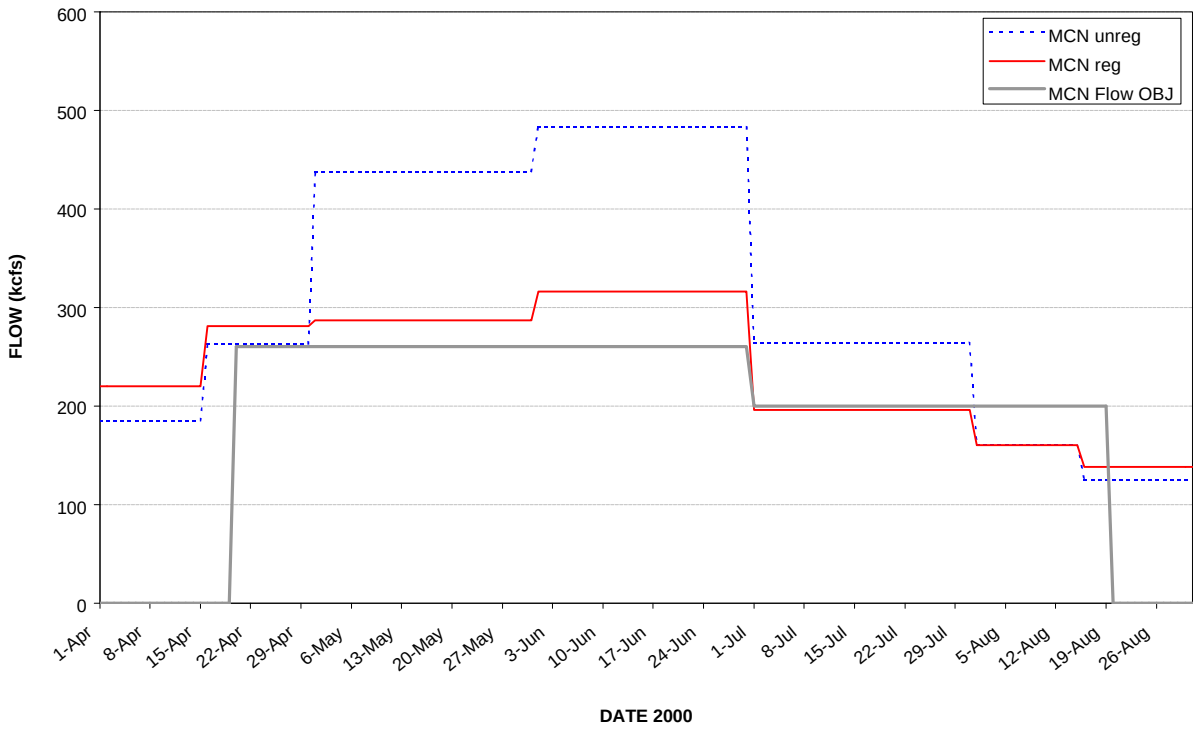
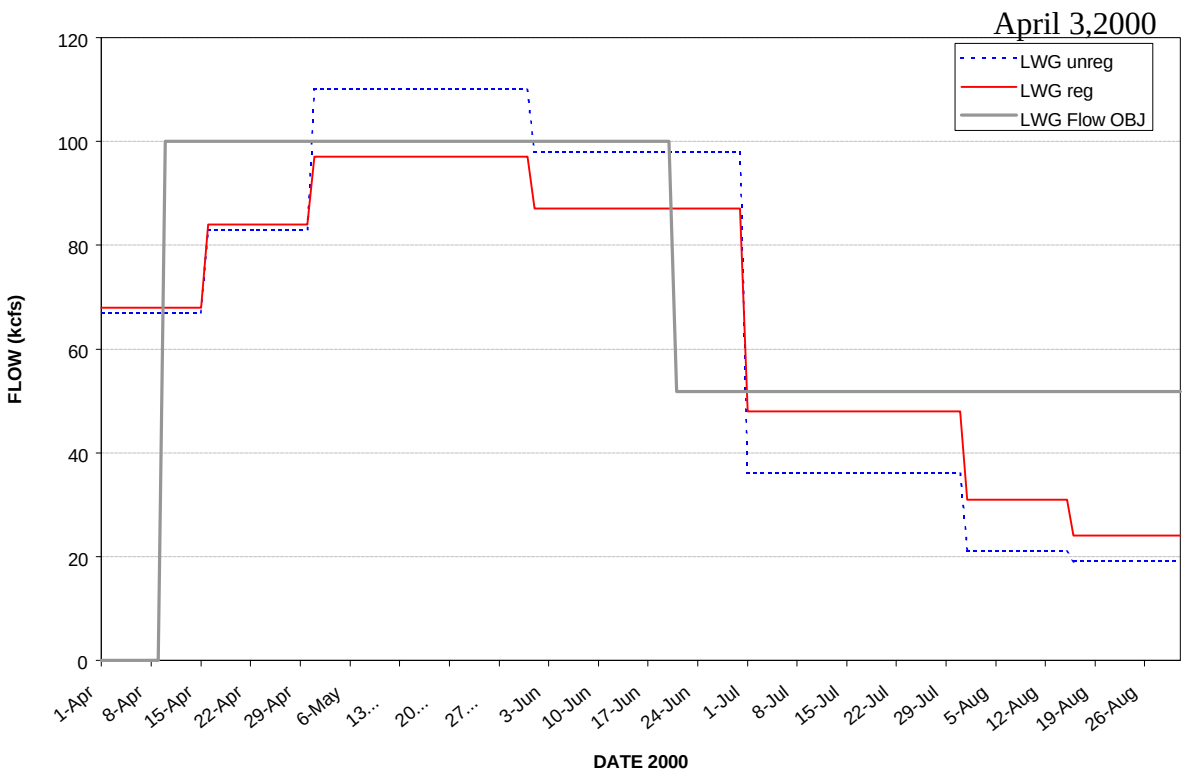


FIGURE 2. AVERAGE FLOW HYDROGRAPH FOR LOWER GRANITE 2000



The COE Power Branch made a 59-year (1929-1987) monthly flow computer simulation based on the March final runoff forecasts at Lower Granite and The Dalles. The model simulation provides an estimate of the expected flows at Lower Granite and McNary for any of the 59 years having the same January-July runoff volume as the water supply volume forecasted for 2000. When more reliable information becomes available, the results of the 59-year monthly study will be superceded by weekly flow projections made more specifically for 2000 (see below).

Study assumptions for the computer simulation run were as follows:

- Streamflows were adjusted based on the March final water supply forecast using The Dalles January - July volume.

- Starting elevation: Treaty projects use 23 Feb 00 TSR (Mica, Arrow, and Duncan). Other projects use actual 29 Feb 00 elevation at 2400 hours from CROHMS.

- Flow Objectives (kcfs):

Projects	**Apr1**	**Apr2**	**May**	**Jun**	**July**	**Aug1**	**Aug2**
Lower Granite	100	100	100	83.9	51.8	51.8	51.8
McNary		260	260	260	200	200	200
Vernita Bar	60	60	60				
Priest Rapids		135	135	135			

Flood Control levels based on the March final water supply forecast:

	MAR	APR1	APR2
BRN	2053.1	2054.0	2053.9
DWR	1512.2	1498.3*	1516.6
HGH	3516.5	3509.2	3501.6
GCL	1272.0	1254.6*	1238.6
LIB	2331.3	2340.4	2349.6

(**) includes partial flood control shift from Dworshak to Grand Coulee to provide additional lower Snake flow augmentation in April.

- Dworshak: will operate on Qmin or flood control in MAR – APR1 except as required to partially shift flood control to Grand Coulee. In APR - JUL (except June) operate to support the Lower Granite flow objectives. Operate to a target elevation of 1600' in June. Qmax is 14,000 cfs for augmenting LWG flow objectives, but can release to 25,000 cfs for flood control. Qmin is 1,300 cfs all periods.

- Canadian operation using 23 Feb 00 TSR values.

- Hungry Horse will operate on flood control in April only. Run on Columbia Falls requirement MAR - AUG. Target elevation of 3560.0’ in JUN. Help meet McNary flows in AG1 – AUG.

- Grand Coulee will augment for Vernita Bar requirements (65 kcfs) in MAR. Target elevation 1263.0’ in MAR and 1290’ in JUN. Meet flood control in APR1 – APR.. In MAY help support Priest Rapids flow objective. In MAY - JUL help support McNary flow objectives.

- Brownlee operates on flood control MAR - APR2. In MAY - AUG2 operate on target elevations:

May	June	July	Aug1	Aug2
2069	2077	2059	2059	2059

- Libby will operate on flood control MAR - APR1. In MAY, JUN and JUL operate to support the Bonners Ferry flow objectives of 9,800 cfs in MAY, 16,000 cfs in JUN, and 10,100 cfs in JUL. Help meet McNary flows in AG1 and AUG. At Libby discharge is limited by the maximum allowable lake level at Kootenay Lake (Corra Linn) of 1739.32’ MAR - MAY and 1743.32’ JUN - AUG2 when releasing more than inflow. Maximum release of 25,000 in JUN.

- Albeni Falls May elevation = 2062.5.

The analysis produced a wide range of flow conditions as a result of meeting the necessary system requirements for flood control, power, Libby sturgeon operation, and the BiOp seasonal flow objectives summarized above (see Table 11).

Table 11. Expectations for Meeting 2000 Seasonal Flow Objectives
(based on 1929-1987 monthly simulation - 59 years, and March final water supply forecast)

Lower Granite		
Periods:	Apr 3 – Jun 20	Jun 21 – 31 Aug
Seasonal Flow Objective, kcfs	100	51.8
Projected Seasonal Average, kcfs	89.7	44.6
No. Years Seasonal Objective is Met	*1 (2%)	*6 (10%)
No. Years Ave. Flows > Seas. Objective:		
Apr1/Apr2/May/June	3/13/27/14	
June/July/Aug1/Aug2		19/19/0/0
McNary		
Periods:	Apr 20 – Jun 30	Jul 1 – 31 Aug
Seasonal Flow Objective, kcfs	260	200
Projected Seasonal Average, kcfs	298	172
No. Years Seasonal Objective is Met	*57 (97%)	*8 (14%)
No. Years Ave. Flows > Seas. Objective:		
Apr2/May/June	35/54/51	
July/Aug1/Aug2		31/8/0
Priest Rapids		
Periods:	Apr 10 – Jun 30	
Seasonal Flow Objective, kcfs	135	
Projected Seasonal Average, kcfs	158.0	
No. Years Seasonal Objective is Met	*56 (95%)	
No. Years Ave. Flows > Seas. Objective:		
Apr1/Apr2/May/June	15/48/58/53	

More reliable flow projections will be made starting in late March, using the results of the SSARR run adjusted as needed to meet the seasonal flow objectives at Lower Granite, Priest Rapids and McNary. The projected seasonal average flows derived from the weekly flow projection spreadsheet will be shown in the following format:

Lower Granite: 4/3 - 6/20: X1 kcfs; 6/21 - 7/31: X2 kcfs
Priest Rapids: 4/10 - 6/30: Y1 kcfs

McNary: 4/20 - 6/30: Z1 kcfs 7/01 - 7/31: Z2 kcfs

VIII. Water temperature

Water quality standards have been developed by the states and tribes under the authority of the federal Clean Water Act to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. High water temperature is a basin-wide issue involving tributaries and mainstem watercourses and impoundments. The TMT recognizes that water temperature is important to the survival of fish and other aquatic life forms, and will recommend that every effort be made to meet the state and tribal water quality standards in the mainstem.

2000~~1999~~ Actions

Timely summer drafts of cold water from Dworshak, as done in the previous years, will be considered in 2000~~1999~~ to lower water temperatures in the lower Snake River. This will be accomplished in close coordination with the NMFS, USFWS, Idaho Department of Fish and Game, and the Nez Perce Tribe to ensure that the water temperature requirements of the Clearwater River fish hatcheries and rearing conditions in the Clearwater River are taken into account. This operation will need to be closely coordinated with flow augmentation from Brownlee Reservoir, in consultation with the USFWS and other salmon management agencies, to ensure that optimum use is made of both of these reservoirs. In the past, a release temperature of 50 degrees F. range (+or - 5 degrees F.) has been found acceptable by all parties. Unless otherwise agreed to by U.S. Fish and Wildlife, Idaho Department Of Fish and Game, and the Nez Perce Tribe, use of a similar water temperature level is anticipated for 2000~~1999~~.

The need for decreasing water temperature in fishways will be considered based on the results on-going mainstem adult passage studies. Real-time temperature monitoring in the lower Columbia and lower Snake Rivers will be continued as a part of the on-going, system-wide TDG monitoring program. Temperature monitoring in adult fishways will also continue. The emergency plan to address high water temperature incidences at McNary will be reviewed in the light of past experience in consultation with the salmon managers and other interested parties.

Additional activities for 2000~~1999~~ may also emerge as a result of on-going consultations and discussions between EPA, the states of Oregon, Idaho and Washington, and the Corps in an effort to develop a long-term strategy regarding water quality standards for TDG and water temperature.

IX~~VIII~~. Total Dissolved Gas Management

April 5,2000

Given the ~~above~~ average runoff forecast, normal amounts of ~~widespread~~ spill is expected to prevail during a ~~good portion of~~ the 2000~~1999~~ fish passage season. Assuming that the necessary State waivers for TDG will have been obtained by NMFS before the start dates, voluntary spill for ~~-~~ fish ~~-~~ passage will occur as called for in the 1998 Supplemental BiOp, subject to the 115%/120% TDG limits if they are in effect. In 2000~~1999~~ (note the following spill levels at Bonneville~~ON~~, The Dalles~~DA~~, and Jjohn Day~~DA~~ are based of our current best estimate of what will happen. Final spill amounts have not be finalized yet . At Bonneville~~ON~~ an in season test will be made comparing spilling during daytime hours to the gas cap as opposed to spilling at the 75 kcfs adult fallback cap. The Dalles~~DA~~ will spill at a level between 30 and 50% based on research that showed better juvenile survival at 30% than at the BiOp specified level. ~~the NMFS made a decision to proceed with a within season test of alternative spill levels at The Dalles Dam beginning April 19. Spill will vary between 64% (the BiOp level) and 30% in three day blocks at the Dalles this spring.~~ A study at John Day will evaluate daytime spill at a 20~~30~~% (?) level on the days when the Bonneville~~ON~~~~Dalles~~ is spilling during the daytime at the gas cap (?).~~30%.~~ At Bonneville, a test will be made to determine the effects of spilling during the daytime at the gas cap as opposed to spilling during the day to the 75 kcfs adult fallback cap.~~nighttime spill will be up to the 115/120% TDG level, and daytime spill will be 75 kcfs.~~ At Ice Harbor a similar test to the one at Bonneville is proposed alternating daytime spill between the gas cap and the 45 kcfs adult fallback cap. Because of the continuing testing of the surface bypass collector at Lower Granite spill will be set at a level of 20% for 24 hours a day.

The spill limitation to the 115/120% TDG will be met by specifying an appropriate spill cap depending on the project's propensity to create TDG. This spill cap will be adjusted in-season upon TMT recommendation based on actual TDG readings. A spill priority list will be developed and implemented, based on relevant information, including real-time and predicted TDG, flow, biological monitoring, and fish movement. The concept of the spill priority is illustrated in Figures 3 and 4.

TDG management options are limited. More water can be stored in the reservoirs behind the dams; the quantity of spill can be shifted to various periods within the day; more water can be put through the turbines; spill can be shifted within the system to avoid excessive local concentrations; spill can be transferred outside the system; and spill bays can be used more effectively. The TMT will work with the Water Quality Team (WQT) to explore other tools available to the TMT for TDG reduction across the season.

Beside the spill priority list, changing the spill from a crown to an uniform pattern, avoiding the use of spillway bays without deflectors, and allowing turbine units to operate outside their 1% peak efficiency flow range are additional management options. Proper scheduling of service and maintenance time tables, identifying additional energy

loads to serve, and displacing available thermal projects that are serving the same loads also help relieve the need for spill.

Normal operations and others that are required by research, construction, unit maintenance and services, etc. at COE and Reclamation projects will be managed to avoid causing TDG saturation levels above state standards to the extent feasible.

The COE and Reclamation will continue to monitor dissolved gas in the forebay and tailwater areas of all their mainstem Columbia and Snake Rivers projects and make them available to all interested parties through the TMT homepage. Other dams where spill is frequently scheduled will also be monitored. Winter monitoring may also be implemented below selected projects to establish baseline data. The COE will continue to develop and test regional dissolved gas abatement strategies and monitor their effects on the ecosystem in the framework of overall water resources management.

Appendix 1 provides more detailed information and discussions on total dissolved gas management in 2000~~1999~~.

April 5,2000

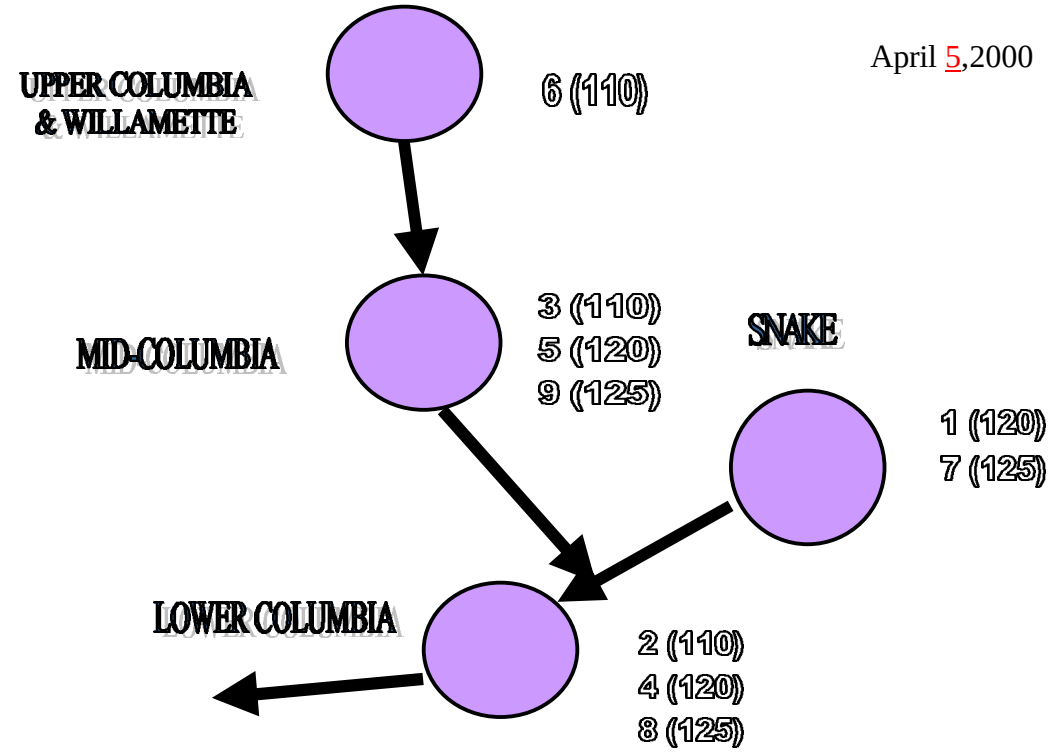


FIGURE 3
SPILL PRIORITY FOR APRIL 3 - APRIL 20
Priority (% TDG)

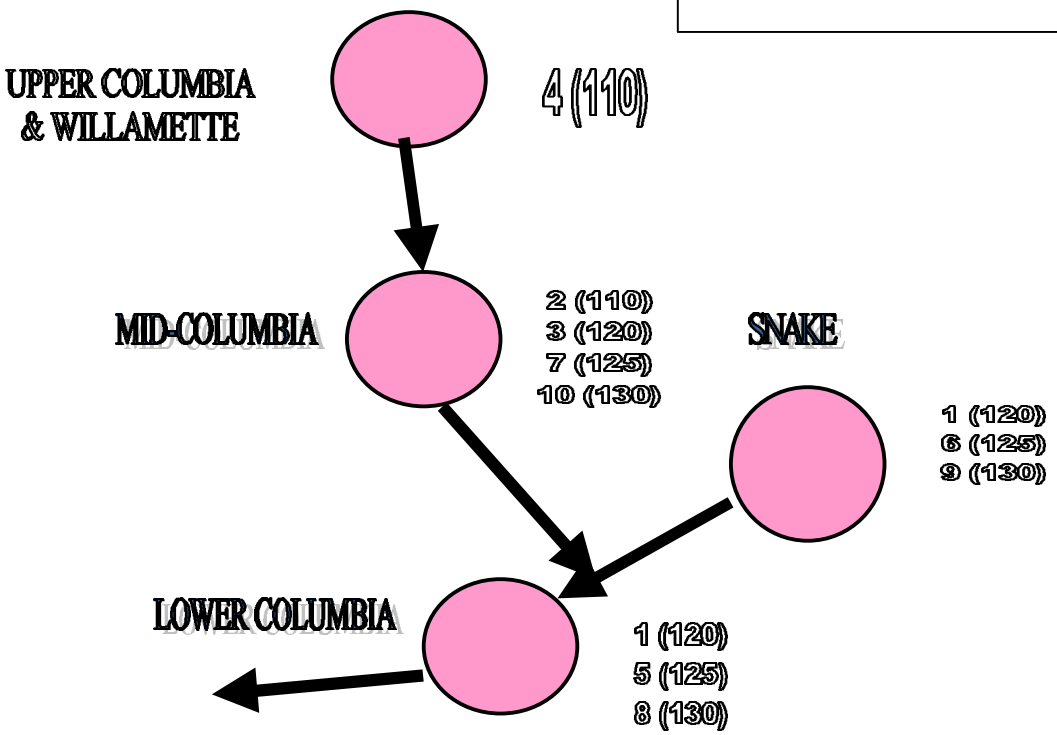


FIGURE 4. SPILL PRIORITY FOR APRIL 14-AUGUST 31
Priority (% TDG)

~~I~~X. Transportation

Juvenile fish transportation will occur as outlined in the 1995 NMFS BiOp and 1998 Supplemental BiOp, according to procedures described in the Corps of Engineers Fish Passage Plan, Appendix B. This will include fish collection and transportation in the spring and summer at Lower Granite, Little Goose, and Lower Granite Dams, and in the summer at McNary. TMT will evaluate biological, hydrologic, and water quality information to determine a date to initiate summer transportation at McNary. ~~In the 1998 Supplemental BiOp NMFS has determined that the moratorium on spring collection and transportation from McNary, adopted in 1995, should be continued. The Service wrote on Page III-8 that "all fish collected under the Action Agencies' proposed operation [at each Snake River Collector Projects] will be transported." Also, no change in operations is proposed for juvenile fish transportation during the 2000~~1999 ~~summer migration; all fish collected will be transported.~~

~~The decision is also consistent with the 1995 BiOp Page 110), which gave the TMT the flexibility to recommend "that fish be returned to the river... if credible evidence is presented that in-river migration will be beneficial". To date, however, no such evidence has been presented.~~

Comments offered by the Independent Scientific Advisory Board (ISAB) and IDFG are noted below.

The ISAB stated that spill is provided in the spring at Snake River collector projects to "spread the risk" between transportation and in-river migration. The objective of transport is “not recommending any specific proposition to limit transported fish. Rather, we [ISAB] were recommending that transportation not be maximized…”

IDFG recommends that the TMT should retain the flexibility to manage smolt transportation operations based on the real-time needs and performance of the fish, and the real-time conditions of the river. Spill is not used just to "spread-the-risk", it is primarily used to help optimize dam passage conditions for in-river migrants.

~~Summer Transportation~~

~~The Action Agencies do not propose any change from the operation for transporting juvenile summer migrants that was described in 1995 RPA Measure 3, but they propose to continue evaluating fall chinook transport.~~ Oregon recommends a spread-the-risk transport policy for Snake River fall chinook with transport of no more than 50% of fish. As before, the transportation collector projects will~~should be~~ operate~~d~~ to maximize collection and transportation (i.e., no voluntary spill except as needed for approved research) during the summer migration.

In general, the switch from spring to summer spill operation will occur on or about June 20. In practice, the TMT has the discretion to make the switch earlier or later based on monitoring of in-river conditions. When more favorable spring-like flow and temperatures either end before or extend after June 20, the actual date to end spill at collector projects should be modified, continuing to spread the risk of transport versus in-river passage for spring migrants so long as favorable flow and temperature conditions persist.

XI. Operations for Research & Other Activities

Project operations planned in conjunction with the activities listed below will be discussed and coordinated at the weekly TMT meetings as needed. In general, conduct of research at mainstem projects will be subordinate to the higher priority of ensuring the best possible downstream passage conditions for listed species. Details of project operations for fishery purposes at Corps projects are provided in the COE Fish Passage Plan. Special operations with potential impact to project performance are listed in Table 12. Implementation details may need to be worked on a case-by-case basis, based on specific river operation requirements for the specific activity, real-time river conditions and applicable test requirements, if any.

Table 12

Project	Activity	Operational Requirements	Start/End Date
Bonneville	Spring Creek NFH Release	24 hour spill	3/9 – 3/16
	ESBS Testing PH1	1 Unit shut down for removal and placement of Fyke nets, Outages for equipment Installation, removal, inspection and repair.	4/15 – 7/15
	Unit Rehab Biological Testing	Unit shutdown for equipment Installation Removal and Repair. Unit becomes priority unit.	9/1 – 12/1 ?
	Fallback Spill	Change in daytime	4/15 – 6/15 ?

	testing	spill level.	
	Lamprey passage study	Change in operation of fish ladders	4/4 – 9/30
	FPE studies	Outages for equipment installation and removal	3/1 – 8/14
	PH2 Vertical Distribution	Change in unit operating priority	4/1 – 8/31
	PH1 Prototype Surface Collector	Forebay limitations, Unit outages for equipment installation and removal, Change in unit operating priority and flow range	3/1 – 7/31
The Dalles	Spillway and Sluiceway Survival Studies	Possible flow restrictions because of boating in tailrace	4/20 – 7/31
	FPE Evaluation	Unit and spillway outages for equipment installation, repair and removal	4/20 – 7/31
	Behavioral studies	Possible outages for equipment installation, repair and removal	4/20 – 7/31
	Adult Salmon and Steelhead Passage Evaluations	Possible outages for equipment installation, repair and removal	4/1 – 10/31
John Day	FPE Studies	Alternating spill levels during daytime , Outages for equipment installation, repair and removal	5/1 – 8/31
	Adult Salmon and	Alternating spill	4/1 – 10/31

	Steelhead Passage Evaluations	**levels during daytime , Outages for equipment installation, repair and removal**	
McNary	**Turbine Passage/Survival Studies**	**Unit outage for equipment installation and removal. Possible Unit outage while equipment in place but no testing going on.**	**5/1 – 10/22**
	Effects of ESBS on Lamprey	**Unit outage to install video camera**	**4/1 – 10/31**
	Biological Performance of Plates of ESBS	**Unit outages for equipment installation, repair and removal and while screens are switched**	**6/1 – 8/31**
Ice Harbor	**Spillway Survival Study**	**Alternating Spill levels, stable flow conditions during fish release**	**4/1 – 7/31**
	Evaluation of Adult salmon and Steelhead Migration	**Alternating Spill levels**	**3/1 – 11/30**
Little Goose	**FGE Testing**	**Unit outages for screen swaps along with outages for equipment installation, repair and removal**	**4/1 – 12/15**
Lower Granite Dam	**Surface Bypass Collector Testing**	**20% spill during test**	**4/10 – 5/27**

APPENDICES

- **APPENDIX 1: 1999 Total Dissolved Gas Management Plan**
- **APPENDIX 2: Emergency Protocols**
- **APPENDIX 3: BPA's System Load Shaping Guidelines for Operating Turbines Outside 1% Peak Efficiency**
- **APPENDIX 4: TMT Guidelines**
- APPENDIX 5: Northwest Power Pool 1999 Maintenance Schedule Outages of Generating Units **(G:\rcc\tmt99\documents\wmp99_app5.doc)**
  USFW recommends that the scheduled outages of the Hells Canyon Complex projects be included because of their effect on delivery of Snake River flows in the summer. While IDPC is unable to share its maintenance schedule with the TMT, it will share information relevant to TMT on an as needed basis.

- **Appendix 6.** TMT Goals, Objectives and Triggers ~~**Recurring Issues Faced by the TMT and Possible Options for Resolution**~~
- **Appendix 7. Operation-related BiOp Provisions**

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