Technical Management Team
1999 WATER MANAGEMENT PLAN
For The Federal Columbia River Power System

Draft / April 26~~15~~, 1999

I. Introduction

This Water Management Plan (Plan) describes the measures needed in 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*. 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.

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. Recurring Issues Faced by the TMT and Possible Options for Resolution
- Appendix 7. Operation-related BiOp Provisions

II. Water Supply Forecasts

The (April Final) January - July forecast for the Columbia River at The Dalles is 128 million acre-feet (maf), 121% of normal. Runoff forecasts for Reclamation reservoirs above Brownlee are in the 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 1998 is also given for comparison purposes.

Table 1. April Final 1999 (and May Final 1998) Runoff Volume Forecasts

Location	April Final '99	% of Normal April Fin. '99	May Final 1998 (actual)	% of Normal 1998 (actual)
	Maf	%	Maf	%
Libby (Jan-Jul) *	**7.13**	**111**	5.20 (5.99)	81 (94)
Libby (Apr-Aug) *	**7.09**	**111**	5.06 (5.84)	79 (92)
Libby (Apr-Sep) *	**7.53**	**111**	5.38	79
Hungry Horse (Jan-Jul)	**2.44**	**108**	1.61 (1.79)	71 (79)
Hungry Horse (Apr-Sep)	**2.35**	**108**	1.50	69
Grand Coulee (Jan-Jul)	**73.8**	**117**	53.2 (59.0)	84 (93)
Dworshak (Apr-Jul) *	**3.40**	**126**	1.73 (2.86)	64 (81)
Lower Granite (Jan-Jul)	**36.5**	**123**	25.0 (31.3)	84 (105)
Lower Granite (Apr-Jul)	**26.2**	**121**	17.4	80
Lower Granite (Apr-Aug)			(25.0)	(109)
Lower Granite (Apr-Sep)				
The Dalles (Jan-Jul)	**128.0**	**121**	89.1 (104.0)	84 (98)
The Dalles (Apr-Sep)	**120.0**	**121**	79.9	81
The Dalles (Apr-Aug)			(90.1)	(97)
Brownlee (Jan-Jul)	**12.9**	**132**	8.90 (13.59)	91 (139)
Brownlee (Apr-Jul)	**7.36**	**127**		
Brownlee (Apr-Aug)			5.99 (.98)	82 (154)
Brownlee (Apr-Sep)			5.99	82

(*) Should use COE Forecast

III. Winter Operations (September 1998 - March 1999)

Reservoir Refill

During the winter season leading up to the 1999 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 1999 maximum flood control requirements at each project and the date of maximum draft at each project.

Table 3. Flood Control (FC) Requirements (*based on 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	2310.9	2287.0	2459.0
Hungry Horse	30 April	3491.0	3336.0	3560.0
Albeni Falls	30 April	2055.0	2051.0	2062.5
Grand Coulee	30 April	1220.2	1208.0	1290.0
Brownlee	30 April	1976.0	1976.0	2077.0
Dworshak	31 March	1445.0	1445.0	1600.0

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

Reservoir and Reservoir-Related Operations

Libby. Libby was operated for power in the September through December period, and for flood control in the January-March period. Lake Koocanusa was near elevation 2405 feet. The end of January, February, and March flood control evacuation elevations were 2375.5, 2333.8, and 2310.9 feet respectively based on each respective water supply forecast. The reservoir was at the end of January and February flood control elevations. The reservoir was at elevation 2323 feet at the end of March after releasing minimum outflow for most of March. The BiOp's objective is to achieve the April 15 flood control evacuation point with 75% confidence.

Hungry Horse. Hungry Horse also operated for power needs and was mostly on minimum outflow to meet Columbia Falls minimum flow requirements in the fall. The reservoir was near elevation 3540 feet on September 1 and drafted to elevation 3522 feet on December 31. Because of reduced powerhouse capacity of about 8 kcfs (due to ongoing automation work) and high April inflow forecasts, the reservoir was evacuated towards the end of April flood control elevation prior to April to avoid spilling at Hungry Horse in April. As a result, the project elevation on April 10 is below the interpolated April 10 upper rule curve.

Albeni Falls. During the winter of 1998-1999, Albeni Falls is completing the third year of a three-year test where the winter lake elevation is kept near 2055 feet throughout the winter. Lake Pend Oreille was near full elevation of 2062.5 feet on September 1 and evacuated to elevation 2055.0 feet by November 20. During December 1998 Lake Pend Oreille operated between elevation 2055.0 feet and 2055.5 feet. In January the lake began operations between elevations 2055.0 and 2056.0 feet. This operation continued through April 30.

Grand Coulee. Grand Coulee project began September near elevation 1279 feet as agreed by upstream and downstream fish managers. It remained near elevation 1280 through September, filled to near elevation 1283 feet by the end of October, and remained above elevation 1280 until mid-December. Grand Coulee assisted in establishing the Vernita Bar protection levels in November. In 1999 that level will be 55 kcfs with best effort to maintain 60 kcfs. The project also operated near its March 31 flood control elevation of 1247.7 feet to help provide stable flows below the Hanford reach. The flood control evacuation requirement on April 30 is elevation 1220.2 feet. The interpolated upper rule curve on April 10 is 1237 feet.

Brownlee. Brownlee began September near elevation 2042 feet. The pool continued to draft to

elevation 2004 feet by November 18 when the outflow from Hells Canyon was reduced and held near 9.5 kcfs to promote spawning downstream, protect redds and assist with juvenile outmigration. This release rate was maintained until December 6 when Brownlee was nearly full. In general, Idaho Power Company anticipates actions consistent with the Settlement Agreement, the "Strategy for Salmon," and the reservoir operations specified in the BiOp. By December 31 Brownlee was near elevation 2072 feet. Idaho Power Company will evacuate Brownlee project per the Corps' end of month flood control requirements to elevation 1976 feet by the end of April.

Upper Snake River. [USBR 4/15/99: 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 minimum outflows or passing inflows. Irrigation demands during the previous summer and fall have drafted all of these reservoirs below their winter flood control space requirements. Maximum flood control space for the upper Snake River reservoirs is typically reached late May to early June at which point the reservoirs start refill reaching full typically by late June or early July. With the high snow-pack this year the upper Snake reservoirs were at minimum outflows or passing inflows until the end of January. Between the end of January and the end of February most of the projects increased releases to start drafting the reservoirs in anticipation of high runoff.]

Dworshak. The Dworshak project was evacuated to elevation 1520 feet at the end of August. The project outflow was then reduced to 1,300 kcfs and maintained at that rate until January (except for a few days in December to respond to the cold snap). Dworshak's January final water supply forecast was in excess of 3 maf, which requires Dworshak to draft empty by March 31 for flood control. Dworshak reached elevation 1445 by April 8.

Lower Snake River Projects. Lower Granite, Little Goose, and Lower Monumental projects operated within the normal operating range. Ice Harbor remained in the lower two feet of its operating range through January to allow for the completion of flow deflector construction.

Bonneville. Minimum instantaneous flows of 125 kcfs were maintained below Bonneville, starting in early November 1998. This was made at the Salmon managers' request and with an agreement with the Federal parties to use Grand Coulee as needed. Grand Coulee began drafting in early November to enhance flows, however heavy rainfall by mid-November significantly moderated the need to draft.

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 April final runoff forecasts (April-July runoff forecast of 26.2 maf at Lower Granite and January-July runoff forecast of 128 maf at The Dalles).

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

Lower Granite		McNary	
Period	**Flows (kcfs)**	**Period**	**Flows (kcfs)**
4/3-6/20	100	4/20-6/30	260

As called for in the BiOp (Page 96), 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.

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.

Dworshak, Libby, Hungry Horse, and Grand Coulee are also expected to be full on June 30. Operations to refill Libby may result in refill at a date later than June 30 [or deeper draft below the interim draft limit, ODFW] depending on flow augmentation requirements for listed Kootenai River sturgeon. However, with above average flow projected for 1999, deeper draft at Libby below the interim draft limit should not be necessary. [ODFW]

Brownlee is expected to operate to guarantee refill to at least 2069 feet by June 7 and full pool by June 30. The Dworshak project will operate to refill near the end of June. During the period April through June the outflow from Dworshak will be mostly at the minimum flow of 1.3 kcfs, except during periods when it may be increased for flow augmentation purposes.

Idaho stresses prioritizing available flow augmentation for the spring migration period. In 1998, Idaho did not believe the June 30 refill goal should override the need to ensure Lower Granite flows do not drop below 100 kcfs during the spring migration period.

As stated in the 1998 Supplemental BiOp, the actual timing of spring flow augmentation and the degree to which the June 30 refill objective is met will be determined by the TMT.

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 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.

Snake Reservoirs at MOP

The lower Snake River reservoirs will be operated within one foot of the minimum operating pool (MOP) from April 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 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.

In 1999 it is expected there will be one pulsing operation, where the powerhouse outflow will be increased up to full powerhouse capacity of approximately 25 kcfs for three days. This pulse may occur sometime in late May or early June when the water temperature at Bonners Ferry reaches 10 degrees Celsius. After the pulsing operation, the Libby outflow will be reduced to maintain an incubation flow of approximately 30 kcfs measured at Bonners Ferry for 21 days. After the pulsing and incubation flow periods, the Libby outflow may be ramped down to as low as 10 kcfs to enhance refill. During any sturgeon operation described above, consideration will be given to take advantage of the local inflow from Libby to Bonners Ferry without compromising other project purposes.

The Federal operating agencies (COE, BPA and BOR) are preparing a biological assessment on the effects of the Federal Columbia River Power System on bull trout. It is likely that the USFWS will also prepare a biological opinion for operation of the FCRPS on bull trout.

At Hungry Horse during the period April through June, the project will attempt to [RECLAMATION: reach IRC elevations when consistent with with Biological Opinion flow objectives, while meeting ~~refill and meet~~ Columbia Falls minimum flow requirements of 3,500 cfs as well as the ~~or greater or~~ local and system emergency power needs. Preemptive drafts may be performed in order to avoid spill in subsequent day(s), considering that ~~As noted earlier,~~ the project's powerhouse capacity is ~~may still be~~ limited to 8 kcfs this year. The project will also attempt to reach full elevation on June 30 consistent with the Biological Opinion's refill goal.]

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 1998-99 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.

During the storage period May 1 through July 5, 1999, water may be stored into Mica Active storage space by BPA and/or BCH consistent with the Non-Treaty Storage Agreement. Stored water will be released during the return period, July 6 through August 31, 1998. The intent is to

release all of the water stored by BPA and one-half of the water stored by BCH during the July/August period. However, water releases will not occur such that they cause spill at Mica or Revelstoke, or create flooding downstream of Arrow Dam

Based on the operations described above, the seasonal flow (April 20 - June 30) at McNary may be around 300 kcfs. The COE will operate John Day pool between elevation 262.5 feet (5.5 feet above minimum operating pool) and 264.0 feet from May 1 until August 31. This elevation range will be maintained for as long as possible without impacting irrigators around the reservoir. The pool will be raised as needed to ensure that irrigators are not adversely affected. The John Day pool may also be fluctuated as needed for short duration flood control. Use of the John Day pool to help in controlling TDG conditions downstream from the project will also be considered.

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 by the 120% TDG limit. 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 1900 to 0600 from May 15 to July 31 and from 1~~9~~800-0600 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). Limit to 30% spill for approximately 50% of the 1998 fish passage season (based on additional tests). Note that this requirement may be modified for 1999 (see below).

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 30% level on the days when the Dalles is spilling at 30%. At Bonneville, nighttime spill will be up to the 115/120% TDG level, and daytime spill will be 75 kcfs.

Details worked out at this writing for spill at The Dalles and John Day are as follows:

SPRING

	The Dalles		John Day				The Dalles		John Day		
	Block	Spill level	Block	Day	Night		Block	Spill Level	Block	Day	Night
4/22	1	64		0*	60[2]	6/3	1	64	1	0	60
4/23		64		0*	60[2]	6/4		64		0	60
4/24		64		0*	60[2]	6/5		64		0	60
4/25		30		0*	60[2]	6/6		30		30	60
4/26		30		0*	60[2]	6/7		30		30	60
4/27		30		0*	60[2]	6/8		30		30	60
4/28	2	64		0*	60[2]	6/9	2	64	2	0	60
4/29		64		0*	60[2]	6/10		64		0	60
4/30		64		0*	60[2]	6/11		64		0	60
5/1		30	1	30	60	6/12		30		30	60
5/2		30		30	60	6/13		30		30	60
5/3		30		30	60	6/14		30		30	60
5/4	3	64		0*	60	6/15	3	64	3	0	60
5/5		64		0*	60	6/16		64		0	60
5/6		64		0*	60	6/17		64		0	60
5/7		30	2	30	60	6/18		30		30	60
5/8		30		30	60	6/19		30		30	60
5/9		30		30	60	6/20		30		30	60
5/10	4	64		0*	60	6/21	4	64	4	0	60
5/11		64		0*	60	6/22		64		0	60
5/12		64		0*	60	6/23		64		0	60
5/13		30	3	30	60	6/24		30		30	60

5/14		30		30	60	6/25		30		30	60
5/15		30		30	60	6/26		30		30	60
5/16	5	64		0*	60	6/27	5	64	5	0	60
5/17		64		0*	60	6/28		64		0	60
5/18		64		0*	60	6/29		64		0	60
5/19		30	4	30	60	6/30		30		30	60
5/20		30		30	60						
5/21		30		30	60						
5/22	6	64		0*	60						
5/23		64		0*	60						
5/24		64		0*	60						
5/25		30	5	30	60						
5/26		30		30	60						
5/27		30		30	60						
5/28		64		0*	60						
5/29		64		0*	60						
5/30		64		0*	60						
5/31		30		0*	60						
6/1		30		0*	60						
6/2		30		0*	60						

Changes will be made at 0600 on the date shown. For example, at 0600 on 1 May spill will change from 64% to 30% at The Dalles and 30% spill will begin at John Day Dam.
[2] Night spill at 60% begins at 1800 through 30 April.
JDA night spill at 60% will begin at 1900 beginning on 1 May.
0* denotes zero voluntary spill; however forced spill may occur.
0 denotes zero spill; forced spill shall be actively avoided.

Changes between different spill levels will be made at 0500 h the date shown. For example, at 0500 on 1 May spill will change from 64% to 30% at The Dalles and 30% spill will begin at John Day Dam. Night 60% will begin at 1900h from 1 – 30 May. 0* denotes zero voluntary spill; however forced spill may also occur. At all times a minimum generation requirement for system stability of 50 kcfs must be maintained. Note that spill at The Dalles is around the clock, while spill at John Day is normally between 1800-0600 hours. Actual spill amounts will not exceed the spill caps provided to limit TDG to the 115/120% saturation levels.

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 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	54.2	7/1-8/31	200

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."

Based on the April final water supply forecasts, 1999 is not one in a series of low water years, April 10 flood control was met at Grand Coulee and Albeni Falls, ~~nor~~ and it does not ~~it~~ have an unregulated runoff less than 65 maf at The Dalles for the April through August period.

Table 8. BiOp Interim Summer Reservoir Draft Limits (in feet) Through August 31

Grand Coulee	Libby	Hungry Horse	Dworshak
1280	2439	3540	1520

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*."

Libby may not be full on July 1, 1999. The project will operate in July to the highest level possible and provide operations for listed bull trout to the fullest extent practicable while operating consistent with the July IRC elevation of 2459 feet. In August Libby will operate to provide flow for listed bull trout and salmon and to the fullest extent practicable operate consistent with the end of August IRC elevation of 2449 feet.

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 1999, 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.

It is anticipated that any decision that would involve drafting Libby below its interim draft limit will have to be resolved at the IT or higher level.

Hungry Horse will operate in July and August to meet salmon needs while considering the end of August IRC (~~of~~ elevation 3550 feet).

Upper Snake River Reservoir Operation

As recommended in the 1995 BiOp (page 101), the TMT will coordinate with IPC the release of a total of 237 kaf during the summer from Brownlee Reservoir in addition to water that might be drafted from Brownlee to deliver 427 kaf from USBR projects in the Snake River. TMT will also coordinate with IPC alternative operations during the summer, fall, and winter to optimize migration and spawning conditions in the lower Snake River and below Hells Canyon Dam. Delivery details of the 427 kaf of Upper Snake River water will be worked out between the state of Idaho, USBR, IPC, BPA, and the Salmon Managers. The TMT will provide recommendations on the actual delivery of the Reclamation 427 kaf water to optimize downstream migration conditions for migrating listed salmon while minimizing fishery and recreational impacts in Brownlee Reservoir, which is an ODFW recommendation.

On April 12, 1999, the Bureau of Reclamation released a list of the five expected sources of water for summer flow augmentation. The sources are ~~relied on four sources of water for Snake River flow augmentation, as~~ shown in Table 9. ~~This information will be updated as soon as possible for use in 1999. [NMFS: It is anticipated the sources will be similar in 1999.~~

Table 9. Sources of **1999** Water for Snake River Flow Augmentation

Source	Acre-Feet	Prospects as of 4/1/99
Oregon	17,847	OWRD transfer order has been granted.
Boise	40,932	USBR storage.
Payette	150,000	95,000 af of USBR storage plus rental pool rentals
Upper Snake	180,221	23,000 af of USBR storage plus rental pool rentals limited to amount needed to complete 427,000 af.

Shoshone-Bannock	38,000	Shoshone-Bannock tribes rental pool.

[NMFS: ~~For 1998, the actual amount of augmentation water provided from each basin will depend on the amounts of water consigned for rentals from the three Idaho Rental Pools.~~ Reclamation plans to make 1999 releases in patterns similar to those of 1996, 1997 and 1998. Implementing this strategy would result in flows in the range of 1,500 cfs at Milner, 400 cfs above irrigation flow from Lucky Peak, and 1,000 cfs above irrigation flow from Cascade and Deadwood. The Payette water releases will likely be split with a summer and winter release, assuming that Idaho Power shapes flows. In each case, Reclamation will work closely with the watermaster and other parties on the specific timing and volume of releases. Augmentation releases are driven by stream flow conditions and fish movement.

Previous Payette seasonal splits have been 60/40 and 50/50 for summer/winter. The 1,500 cfs release past Milner also assumes Idaho Power Company will provide shaping. Releases would generally start when storage releases for irrigation commence. Reclamation will work closely with the appropriate watermaster and other parties on the specific timing and volume of releases. Reclamation will also work with the Idaho Power Company to manage flow augmentation flows through Brownlee.

Inasmuch as the watermasters are agents of the Department of Water Resources, Reclamation assumes that coordination with the watermasters will satisfy the seven-day notice provision in the June 6, 1995 order.

Reclamation, BPA, and Idaho Power Company will coordinate with TMT to manage delivery of flow augmentation from Brownlee.

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 a Dworshak draft only to a maximum of 1535 feet by the end of August to allow use of 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 1999, Idaho recommends that as best possible, Brownlee may be used to delay Dworshak drafting below 1580 feet until early to mid-August. It is expected that Brownlee will operate to guarantee refill to 2059 feet by the end of September.

Idaho recommends using the weekly TMT decision making process to develop a comple~~i~~mentary operation of Brownlee and Dworshak for the best use of flow and temperature in the lower Snake River in July and August. This may include [IDFG] ~~[Ed Bowles: Please keep in the paragraph on~~ using Brownlee as best possible to delay Dworshak drafts until early to mid-August].

As stated earlier, during the storage period May 1 through July 5, 1999, water may be stored into Mica Active storage space by BPA and/or BCH consistent with the Non-Treaty Storage Agreement. Stored water will be released during the return period, July 6 through August 31, 1999. The intent is to release all of the water stored by BPA and one-half of the water stored by BCH

during the July/August period. However, water releases will not occur such that they cause spill at Mica or Revelstoke, or create flooding downstream of Arrow Dam

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

[RECLAMATION: ~~Remove this paragraph.~~ 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. ~~is expected to be full by the beginning of July. The Grand Coulee summer draft limit is 10 feet to elevation 1280 feet. The BiOp stated that this draft limit might be exceeded if needed to meet the flow objective at McNary, or if the April 10 rule curve is not met; however Lake Roosevelt met the April 10 flood control elevation of 1237.2 feet on April 10.~~]

Summer Spill for-fish-passage

Planning dates for summer spill, where applicable, are the same as in the 1995 BiOp. Summer spill requirements/limitations would 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 19~~8~~00-0600 (May-July) and 1900-0600 (August) 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.

As stated above, summer spill will be at the same levels as spring spill. Spill at The Dalles Dam will vary between 64% (the BiOp level) and 30% in three day blocks. Spill at John Day Dam will evaluate daytime spill at a 30% level on the days when the Dalles is spilling at 30%. Further, spill at John Day Dam will evaluate daytime spill at a 0% level on the days when the Dalles is spilling at 64%. At Bonneville Dam, nighttime spill will be up to the 115/120% TDG levels, and daytime spill will be 75 kcfs.
~~depending on the outcome of on-going regional discussions, some spill changes may occur in 1999 at Bonneville, The Dalles and John Day.~~
Changes in spill levels at The Dalles and John Day ~~–~~will be in accordance with information provided earlier for spring spill. In other words, summer spill at The Dalles will be identical to spring spill at that project until July 27 (see table below). Likewise, spring spill at John Day will continue unchanged into the summer until July 15, 1999. Between those two end dates and August 31, 1999 summer spill at both The Dalles and John Day will be in accordance with the 1998 Supplemental BiOp (see Table 6).

SUMMER

	The Dalles		John Day		
	Block	Spill Level	Block	Day	Night
7/1		30		30	60
7/2		30		30	60
7/3	6	64	6	0	60
7/4		64		0	60
7/5		64		0	60
7/6		30		30	60
7/7		30		30	60

7/8		30		30	60
7/9	7	64	7	0	60
7/10		64		0	60
7/11		64		0	60
7/12		30		30	60
7/13		30		30	60
7/14		30		30	60
7/15	8	64		0*	60
7/16		64		0*	60
7/17		64		0*	60
7/18		30		0*	60
7/19		30		0*	60
7/20		30		0*	60
7/21	9	64		0*	60
7/22		64		0*	60
7/23		64		0*	60
7/24		30		0*	60
7/25		30		0*	60
7/26		30		0*	60

Changes will be made at 0600 on the date shown. For example, at 0600 on 1 May spill will change from 64% to 30% at The Dalles and 30% spill will begin at John Day Dam.
[2] Night spill at 60% begins at 1800 through 30 April.
JDA night spill at 60% will begin at 1900 beginning on 1 May.
0* denotes zero voluntary spill; however forced spill may occur.

VI. Outlook for Meeting Flow Objectives in 1999

Unregulated and Regulated Summary Hydrographs at Lower Granite and McNary

The weekly flow ordinates 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 data that were adjusted to match the March final April-September 1999 runoff volume forecasts.

Table 10. 1999 Average Summary Hydrographs at Lower Granite and McNary

Week ending	LWG unreg~~99~~	MCN unreg~~99~~	LWG reg	MCN reg	LWG Flow ~~Q~~OBJ	MCN Flow ~~Q~~OBJ
05-Apr	99	223	104	289	29	0
12-Apr	112	277	107	278	100	0
19-Apr	122	317	109	269	100	37
26-Apr	134	378	115	279	100	260
03-May	163	530	128	302	100	260
10-May	163	530	128	302	100	260
17-May	163	530	128	302	100	260
24-May	163	530	128	302	100	260
31-May	147	577	137	405	100	260
07-Jun	144	585	139	422	100	260
14-Jun	144	585	139	422	100	260

21-Jun	144	585	139	422	81	260
28-Jun	92	434	92	318	55	260
05-Jul	54	320	58	241	55	243
12-Jul	54	320	58	241	55	200
19-Jul	54	320	58	241	55	200
26-Jul	50	302	56	236	55	200
02-Aug	32	194	47	205	55	200
09-Aug	32	194	47	205	55	200
16-Aug	29	152	43	182	55	200
23-Aug	29	152	43	182	55	200
30-Aug	20	130	40	160	14	29

(*) average daily flows during the week indicated

FIGURE 1. AVERAGE WEEKLY FLOW HYDROGRAPH McNARY 1999

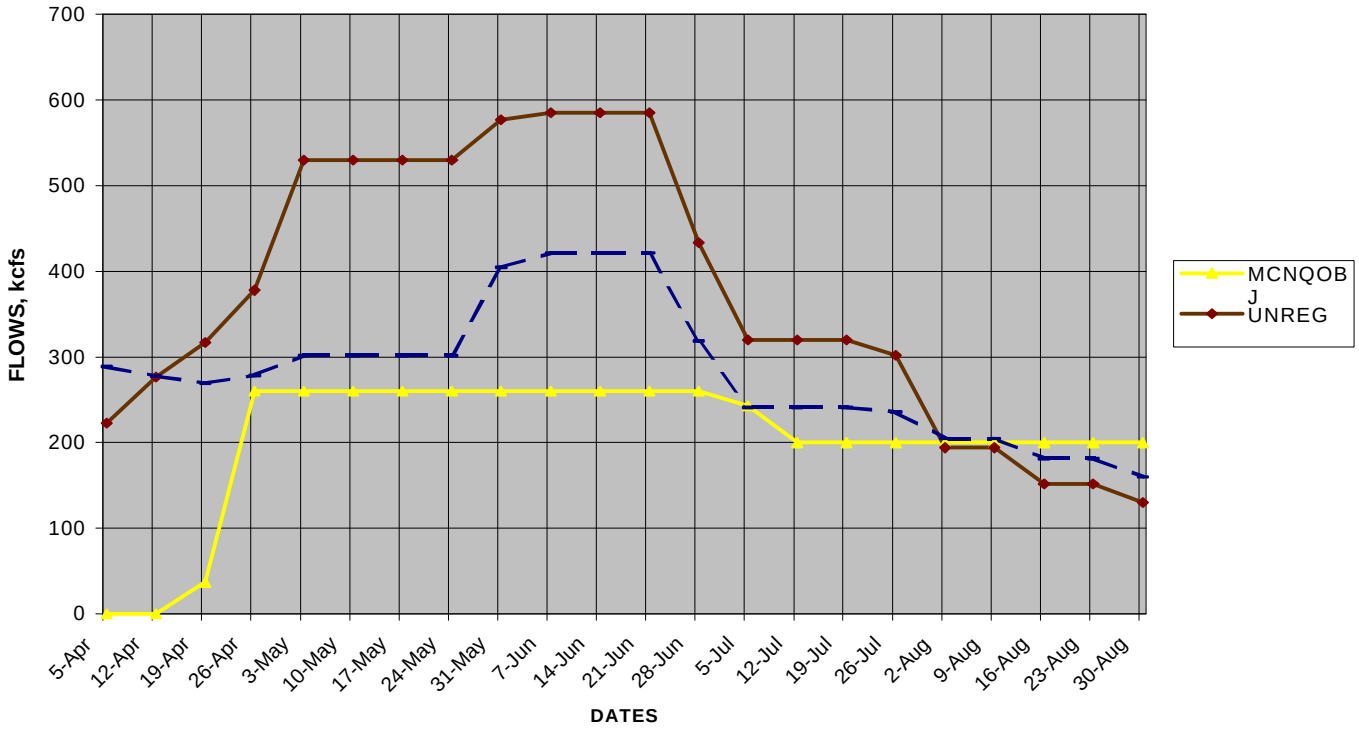
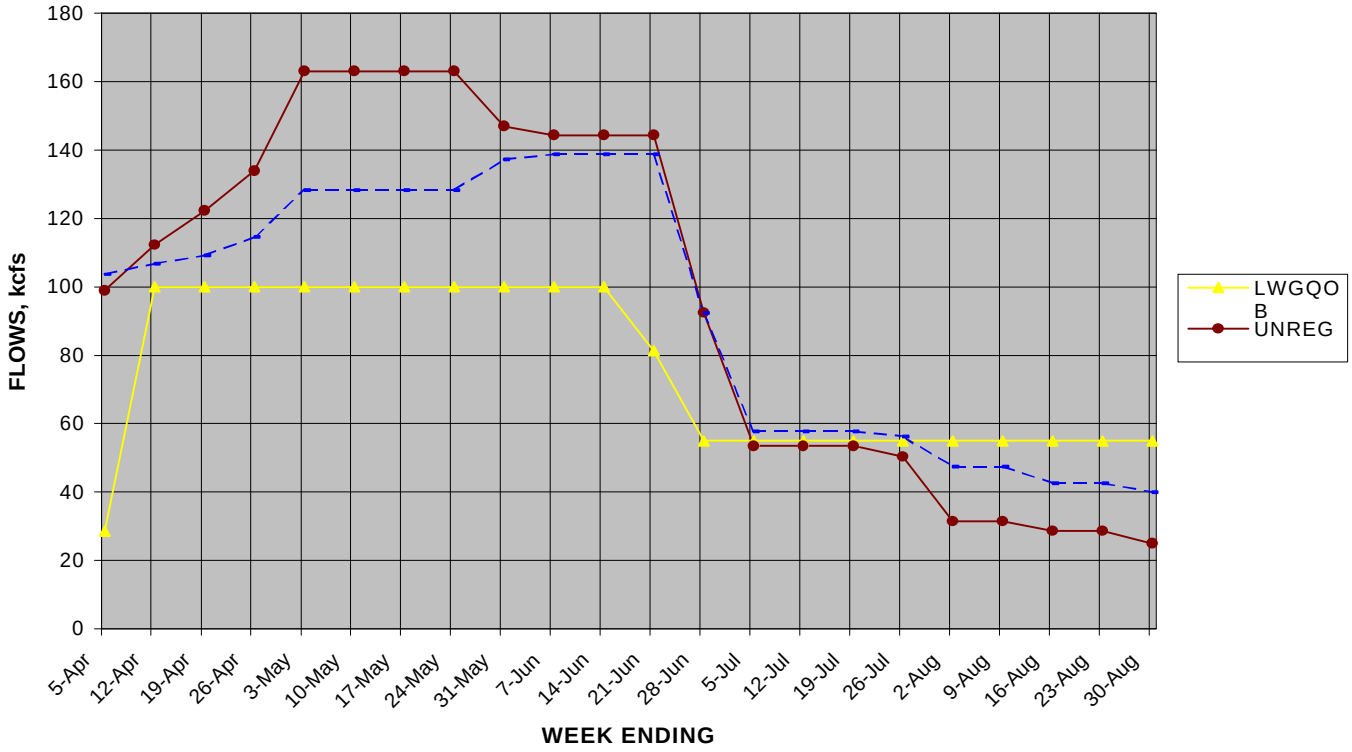


FIGURE 1. AVERAGE WEEKLY FLOW HYDROGRAPH, LOWER GRANITE 1999



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 1999. When more reliable information becomes available, the results of the 59-year monthly study were superceded by weekly flow projections made more specifically for 1999 (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 January-July volume;

- Starting elevation: Treaty projects use 02-23-99 TSR (Mica, Arrow, and Duncan). Other projects use actual 28 Feb 99 elevation at 2400 hours from CROHMS

- Flow Objectives (kcfs)::

Projects	**Apr1**	**Apr2**	**May**	**Jun**	**July**	**Aug1**	**Aug2**
Lower Granite	100	100	100	85	55	55	55
McNary		260	260	260	200	200	200
Vernita Bar	60	60	60				
Priest Rapids		135	135	135			

- Flood Control from Russ Morrow's Finals from 3/8/99 AER.

	MAR	APR1	APR2
BRN	2006.8	1194.0	1976.0
DWR	1445.0	1445.0	
HGH	3507.1	3496.7	3485.4
GCL	1247.4	1232.2	1220.2
LIB	2310.9	2323.6	

- Dworshak: will operate on Qmin or flood control in MAR. APR1-AUG2 (except June) operate to support the LWG flow objective. Operate to a target elevation of 1600' in June. Qmax is 14,000 cfs for augmenting LWG flow objectives, but can release 25,000 cfs for flood control. Qmin is 1,300 cfs all periods.

- Canadian operation using Feb. 23 TSR values - (local)

- HGH will operate -on flood control or Qmin for Columbia Falls requirement MAR-JUL. AUG1 and dAUG2 operate to support the MCN flow objective down to elevation 3550 and 3540' respectively.
- Grand Coulee will operate on flood control or Qmin in MAR-APR1. In APR2-MAY operate to support PRD flow objective. APR2-AUG2 (except June) operate to support MCN flow objective. PRD and MCN are subject to a draft limit of 1208' APR2-MAY and 1280 in JUL-AUG2. Operate to a target: elevation of 1290 in June which will override the flow augmentation operation described above.

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

May	June	July	Aug1	Aug2
2069	2077	2077	2067	2057

- Libby will operate on flood control or Qmin MAR-APR1. In APR2, MAY, JUN and JUL operate to support the BNF flow objective of 15000, 22742, 35000 and 8750 cfs respectively. If LIB is above elevation 2439' in JUL, AUG1 or AUG2, operate to support the MCN flow objective. At LIB 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. Max. release 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 1999 Seasonal Flow Objectives
(based on 1929-1987 monthly simulation - 59 years, and March final water supply forecast)

Lower Granite		
Periods:	4/03-6/20 (78 days)	6/21-8/31 (72 days)
Seasonal Flow Objective, kcfs	100.0	55.0
Projected Seasonal Average, kcfs	123.5	63.5
No. Years Seasonal Objective is Met	*59 (100%)	*48 (81%)
No. Years Ave. Flows > Seas. Objective:		
Apr1/Apr2/May/June	27/33/57/52	
June/July/Aug1/Aug2		59/37/02/01
McNary		
Periods:	4/20-6/30 (71 days)	7/1-8/31 (62 days)
Seasonal Flow Objective, kcfs	260.0	200.0
Projected Seasonal Average, kcfs	347.9	216.9
No. Years Seasonal Objective is Met	*59 (100%)	*37 (63%)
No. Years Ave. Flows > Seas. Objective:		
Apr2/May/June	29/54/59	
July/Aug1/Aug2		46/36/15
Priest Rapids		
Periods:	4/10-6/30	
Seasonal Flow Objective, kcfs	135	
Projected Seasonal Average, kcfs	195.6	
No. Years Seasonal Objective is Met	*59 (100%)	
No. Years Ave. Flows > Seas. Objective:		
Apr1/Apr2/May/June	55/32/55/59	

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:	4/03 - 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

VII. 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.

1999 Actions

Timely summer drafts of cold water from Dworshak, as done in the previous years, will be considered in 1999 to lower water temperatures in the lower Snake River. This will be accomplished in close coordination with the USFWS and Idaho Department of Fish and Game to ensure that the water temperature requirements of the Clearwater River fish, and affected [NMFS] hatcheries 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. Also, water temperature requirements associated with rearing conditions in the Clearwater River will be considered in cooperation with the Nez Perce Tribe. In the past, a release temperature of 50 degrees F. range (+or - 5 degrees F.) [NMFS] 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 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 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.

VIII. Total Dissolved Gas Management

Given the above -average runoff forecast, widespread spill is expected to prevail during a good portion of the 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. ~~As of March 30,~~

1999 discussions are still going on regarding the level of spill at Bonneville, The Dalles and John Day. The following questions are being addressed:

- Should daytime spill cap at Bonneville be raised from 75 kcfs to the spill level corresponding to 120% TDG?
- Should the alternating 64/30 % spill at The Dalles used in 1998 be changed to a static spill condition such as 30% spill in 1999?
- Should the duration of the spill for fish passage at John Day be increased from 12 to 24 hours?

In case regional agreement is still not reached on the specific spill conditions at Bonneville, The Dalles and John Day by the start up dates, spill will be provided according to the 1998 Supplemental Biological Opinion. [ODFW]the TMT will also have to specify temporary spill conditions at those projects. [NMFS: In 1999 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 30% level on the days when the Dalles is spilling at 30%. At Bonneville, nighttime spill will be up to the 115/120% TDG level, and daytime spill will be 75 kcfs.

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 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 Dissolved Gas Team (DGT) to explore other tools available to the TMT for TDG reduction across the season.

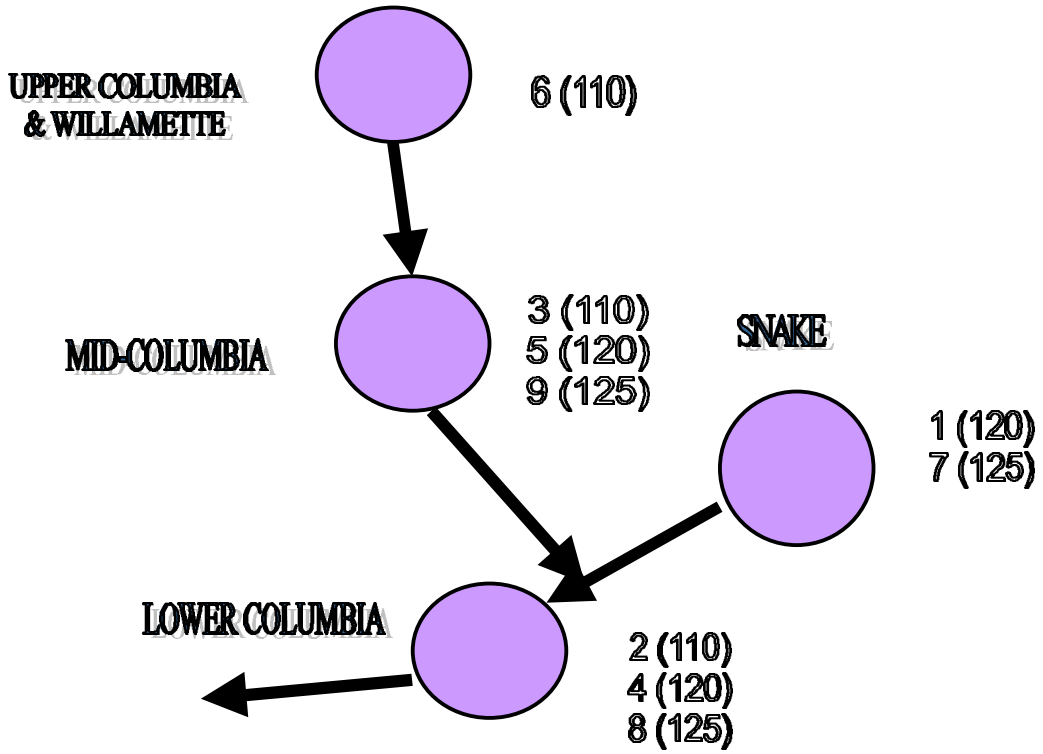


FIGURE 3
SPILL PRIORITY FOR APRIL 3 - APRIL 20
Priority (% TDG)

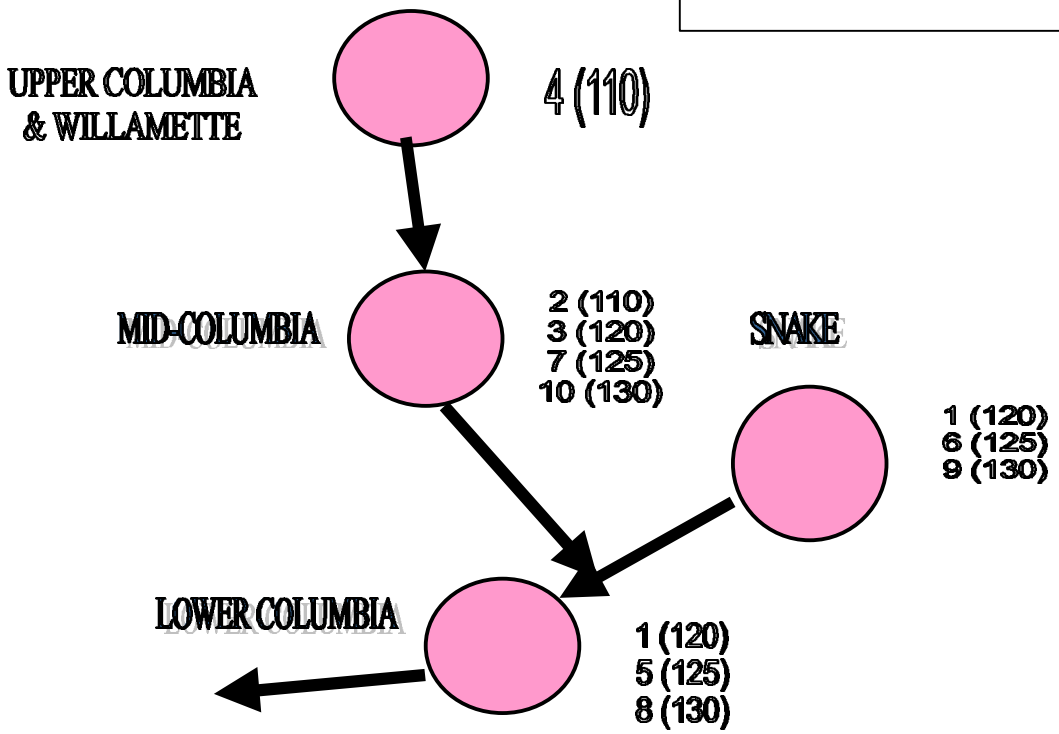


FIGURE 4. SPILL PRIORITY FOR APRIL 14~~20~~-AUGUST 31
Priority (% TDG)

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 1999.

IX. Transportation

The 1998 Supplemental BiOp states (Page III-8) that "All fish collected under the Action Agencies' proposed operation [at each Snake River Collector Projects] will be transported." 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…” See 1998 Supplemental BiOp, page III-8.

[USFWS: The NMFS= 1998 Supplemental Biological Opinion states that all fish collected at Snake River dams should rather than will be transported. The reference to page III-8 of the Supplemental Biological Opinion is not clear. It does not contain statements referring to the objective of transportation.]

In the 1998 Supplemental BiOp NMFS has determined that the moratorium on spring collection and transportation from McNary adopted in 1995 should be continued in 1999. No change in operations is proposed for juvenile fish transportation during the 1999 summer migration. [USFWS: This section should be updated to describe proposed 1999 operations]

[IDFG: 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 inriver 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. [ODFW] As before, the transportation collector projects should be operated 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.

X. 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. Anticipated special operations for fish research and other activities.

Project	**Activity**	**Operational Requirements**	**Start/End Date**
Bonneville	Spring Creek NFH Release	24 hour spill	3/18 - 3/28
	Lamprey Study	Test Ladder in Adult Fish Monitoring Facility	3/1 – 9/30
First Powerhouse	Prototype ESBS Testing	Install ESBSs and VBSs	February
		Outages to remove and Inspect ESBSs	720-hour/1-month 2-3 hours at a time Fish passage season
	Bon Rehab / Minimum Gap Runner	Biological Testing Outages for MGR Testing May Need to Operate Outside 1%	9/1 – 10/31
		Unit Calibration and Index Testing (Unit 6) Unit Dewatered 7 – 10 days Calibration 4 – 6 Days	6/1 - 7/31
		1 Week Outages to Install Release Pipes (Units 5 and 6)	8/1 – 8/31
	Prototype Surface Collector	Testing Units 5 and 6 First On/ Last Off	4/19 – 7/16
		Construction Frequent Outages Required	1/15 – 3/1

		Modifications Diver Might be Needed	3/1 – 3/31
		Testing of Hydroacoustic Deployments Possible Outages of Units (2-5)	1/1 – 3/31
	Flat Plate Pit Tag Detection	Possible 1 – 2 Hours Reversal of Flow to Repair Problems	Juvenile Fish Passage Period
The Dalles	Spill and Survival Studies (Possible) FPE Evaluation	Spill 30% Alternate Between Adult and Juvenile Spill Patterns Possible Outages to Repair Equipment	4/20 – 8/31
		Test Equipment Testing May Require 8 Hours of Spill	3/1 – 3/31
		Install Equipment Spillway Spillway Outages for 1 Week	3/15 – 4/19
		Install Equipment Powerhouse Outages to Install Equipment (Three Units Out at a Time for 8 Hours)	3/16 – 3/27
		Install Equipment Fish Units Out (2000 – 0500)	3/16 – 3/17
		Install Release Equipment Four Spillbays 3 Days Each	3/27 – 4/15
		Remove Release Equipment	8/3 – 8/14
John Day	Fish Passage Efficiency Studies (Possible)	Special Spill Conditions (Not Set Yet)	4/20 – 8/31
		FPE Evaluations Possible Outages for Equipment Repair	5/1 – 7/31
		Transducer Installation Three Units Out of Service at a Time	3/16 – 3/27
		Transducer Removal Three Units Out of Service at a Time Spillbays 18 and 19 Out of Service	8/3 – 8/7
	ESBSs Testing	Special Operation of Units (6 – 8) Also Outages of Units (6 – 8)	4/26 – 7/31

	Lamprey Research Associated with Modified ESBS	One Unit May Need to be Dewatered for Installation of Antenna Arrays	4/20 – 8/31
	South Ladder Fish Behavior Monitoring	May Involve Holding Forebay at 266.5'	9/1 – 10/31
McNary	DACS Installation	One Unit at a Time Taken Out of Service	Ongoing
	Orifice Passage Efficiency	Fixed Discharge Units (3 + 4) Units Out of Service 2 – 3 During Test Days for Gatewell Dipping Units Out of Service 2 – 3 Hours Once a Week to Rotate Intakes	4/24 – 7/31
	Turbine Survival Study	Special Operation of Unit 9 Possible Outages to Repair Equipment	5/15 – 6/30
		Installation of Release Pipes Unit 9 Out of Service	4/24 - 5/14
		Removal of Release Pipes Unit 9 Out of Service	7/1 – 7/21
	Juvenile Fish Separator Evaluations	Possible Special Operation of Unit 6	Juvenile Fish Passage Season
Ice Harbor	Spilling Basin Survey	Minimize Flow Through Stilling Basin No Spill (1 – 2 days ?)	9/1 – 9/30
	Spillway Efficiency/ Effectiveness	Special Spill Volumes and Flow and Turbine Operations May be Needed	4/3 – 8/31
	High Velocity Prototype Separator Study	Juvenile Fish will be Periodically be Diverted Through Test Facility	Juvenile Fish Passage Season
Lower Monumental	Repair of Powerhouse Transformers	Units 5 + 6 Out of Service for Approximately 6 Weeks	8/1 – 9/15
	Juvenile Fish Bypass Study (Possible)		Juvenile Fish Passage Season
Little Goose	Stilling Basin Survey	Minimize Flow Through Stilling Basin No Spill Fishway Auxiliary Water may be Curtailed (1 – 2 days ?)	9/1 – 9/30
Lower Granite	Surface Bypass Collector Operation	4 Kcfs Through Bypass / Spillbay 1 2 Kcfs Through Spillbay 2	Juvenile Fish Passage Season
	Stilling Basin Survey	Minimize Flow Through Stilling Basin	9/1 – 9/31

		No Spill Fishway Auxiliary Water may be Curtailed (1 – 2 days ?)	
	Evaluation of Juvenile Fish Transportation	Operation of Adult Fish Trap Pit Tagging of Juvenile Fish	Juvenile Fish Passage Season

The list of Northwest Power Pool 1999 Maintenance Schedule Outages of Generating Units is provided in Appendix 5.

- **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)**

[USFWS: We recommend 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. In the past, scheduled outages for maintenance at the Hells Canyon Project were not known to the salmon management agencies. Planned augmentation flows could not be met because outages resulting from project maintenance reduced the volume of flow that could be passed without spilling. Project maintenance at the Hells Canyon Project should be coordinated with the TMT so that critical flow augmentation periods can be avoided.]

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

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