

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

Draft/March 30~~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 all [NMFS] 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, sState and tribal plans and programs, the Endangered Species Act (ESA), the Clean Water Act (CWA), and other relevant operational requirements.

Seven ~~Five~~ 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

## ~~H. Operation-related BiOp Provisions~~

~~The 1995 BiOp and the 1998 Supplemental BiOp give general direction to the in-season management process on the factors to take into account in for making decisions about in-season operations in the migration corridor that will result in provide levels of flow, spill, and supporting operations expected to provide the greatest survival benefits to listed fish [NMFS]. Pertinent operation related provisions of the 1985 BiOp, supplemented or modified in the 1998 Supplemental BiOp, are summarized below. Practical implications of those provisions on the TMT are also outlined in this section.~~

~~[\[NMFS suggested rather than quoting selected portions of each Biological Opinion, hot link to the entire document. The 1998 supplemental Biological Opinion is available on the web\].](#)~~

#### ~~[1995 BiOp:](#)~~

~~Page 101: "TMT shall advise the operating agencies on dam and reservoir operations to optimize passage conditions for juvenile and adult anadromous salmonids."~~

~~Page 102: "In general, the [water management] plan should attempt to conserve water for flow augmentation in July and August, unless doing so would result in significant departures from spring flow objectives. To achieve the conservation of water for summer flows, the plan should generally include operation of all Columbia River reservoirs to refill by June 30, with gradual releases to the draft limits through July and August."~~

~~Page 102: " During the migration season, the TMT shall guide the use of water in the Snake and Columbia Rivers with the goal of creating hydrographic conditions that provide the greatest survivals for listed Snake River salmon, taking into account needs of other anadromous fish in the Basin." In-season adjustments will be made if and when allowed in the BiOp. Some examples of cases and conditions where the TMT was explicitly given in-season flexibility include the following:~~

- ~~—Adjust reservoir draft for flood control (page 95): "Flood control elevations in the Columbia River reservoirs above the confluence with the Snake River may need to be adjusted if flood control is shifted from Snake River reservoirs."~~
- ~~—Additional stored water for flow augmentation from Brownlee and shaping of Upper Snake water (page 101): "NMFS and Idaho Power Company will cooperate on a study of Idaho Power Company operations, including shaping of Upper Snake water, and consider adjustments to [the Brownlee] operation."~~
- ~~—Shift flood control space requirement from Brownlee (page 101): "The TMT may recommend that the COE shift system flood control from Brownlee Reservoir to reservoirs in the Columbia River above the confluence with the Snake River."~~
- ~~—Exceed summer reservoir drafts (page 102): "The TMT may recommend lower summer reservoir elevations if necessary to meet flow objectives depending on the circumstances of the run-off and the salmon migration (e.g., 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)."~~
- ~~—Adjust actual start/end dates of flow augmentation season (page 103): "Actual timing of flow augmentation will be determined in season by the TMT."~~
- ~~—Schedule spill at collector projects (page 105): "The COE, during the juvenile spring/summer chinook migration season ..... shall spill at all projects, including collector projects..... except under [pre-specified] low flow conditions."~~

#### ~~[1998 Supplemental BiOp](#)~~

##### ~~[Spring Flow Objective for the Mid-Columbia River \(new provision\)](#)~~

~~Page III 2: "... Data ... support the designation of a mid-Columbia flow objective for steelhead of 135 kcfs at Priest Rapids. This flow objective and the supporting rationale are further described in Appendix A"~~

~~Page III 2: " The 1995 FCRPS Biological Opinion and this Supplemental FCRPS Biological Opinion give general direction to the in-season management process on the factors to take into account in making decisions about in-season operations that will result in levels of flow expected to provide the greatest survival benefits to listed fish. The biological opinions do not require seasonal average flow objectives to be met on a weekly basis, nor do they suggest that flow augmentation can be stopped or diminished once a seasonal average has been met."~~

~~Page III 3. "In the event that operations of the FCRPS are inconsistent with these measures, the Action Agencies will seek and consider offsetting measures to eliminate or minimize potential adverse effects. Where possible, additional measures will provide survival benefits in place, in kind, and in timely manner."~~

~~Page III 5. "The actual timing of flow augmentation and refill, and the degree to which the refill objective is met will be determined by the TMT. The TMT will give consideration to stock status, fish migration characteristics, and river conditions. The timing of operations to refill reservoirs may vary with the volume of reservoir inflow."~~

~~Page III 5: "The TMT, in recommending the shaping of flows in the mid Columbia, should consider the desire to improve flows at Priest Rapids during the period April 10 through June 30, the desire to refill storage projects, the timing and magnitude of the juvenile migration, water temperatures, spill and total dissolved gas levels, and adult fish passage and other requirements to improve the survival of listed fish. The TMT may consider and implement flows lower than the objective during the early part of the steelhead migration when relatively few fish are present, primarily in low flow years. The TMT may provide flows greater than the objective on a weekly basis during key points in the migration, while acknowledging that flows may be lower later in the steelhead migration as necessary to reserve water for flow augmentation for summer migrants."~~

#### ~~System Spill (modified from the 1985 BiOp)~~

~~Page III 11. "... the planning dates are April 3 (modified from the April 10 planning date specified in 1995 RPA Measure 2) to June 20 and June 21 to August 31 for spring and summer, respectively in the Snake River..."~~

~~Page C 1. "The spill program prescribed in 1995 RPA Measure 2 was developed to meet a fish passage efficiency (FPE) target of 80% at all dams where transport was not possible or when transport was not a priority.... In practice, however, spill necessary to reach the 80% FPE level (and therefore survival levels) could not be provided at some projects due to the requirement to control total dissolved gas (TDC) levels to within acceptable limits (Table A-1)." New spill levels are provided in Table III 2, page III 12. Minimum powerhouse flows for system reliability are also identified in Appendix C, pages C 9 through C 14.~~

#### ~~Flood Control Shifts and Snake River Flow Augmentation~~

~~Pages III 4 and 5. "Flood control operations will continue to include the ability to implement flood control shifts from Dworshak and Brownlee Reservoirs to Grand Coulee Reservoir in years when runoff conditions permit. This operation transfers system flood control from the Snake River to Grand Coulee, thereby increasing April flows in the lower Snake River when juvenile fish are migrating."~~

#### ~~Practical Implications~~

~~Based on the BiOp provisions listed above, a few practical implications emerge that affect implementation of the flow objectives, flood control shift, reservoir refill, and spill for fish passage.~~

~~The BiOp flow objectives are expressed as seasonal and the biological opinions do not require seasonal average flow objectives to be met on a weekly basis. However, the TMT will review hydrologic conditions and the status of the migrations on a weekly basis. Provided that flow augmentation water as identified in the BiOp is available, and absent safety concerns, physical constraints, or conflicting legal requirements, the TMT will therefore attempt to shape flow augmentation water to the fish migrations on a week by week basis.~~

~~The TMT needs to re-evaluate potential flood control shifts each year, based on the April July runoff volume forecast. Normally, a temporary shift of the Dworshak system flood control requirements to Grand Coulee is only worthwhile if the Dworshak April July inflow forecast is 3.2 maf or less, and if space is available at Grand Coulee. A potential flood control transfer from Brownlee to Grand Coulee is also based on similar runoff and storage space considerations. Any flood control shift, which varies from year to year and from month to month, will need to be requested and coordinated through the TMT.~~

~~The actual timing of flow augmentation and reservoir refill will be determined by the TMT, with due consideration given to fish migration status, river conditions and relevant implications (e.g. economics, other affected species, recreation, etc.).~~

~~The levels of the weekly flow requests may be higher or lower than the seasonal average objective, consistent with a June 30 refill objective. The TMT will weigh the biological benefits of flows above the seasonal flow objective against the biological benefits to listed salmon that would occur when this water could otherwise be used. During the juvenile migration season (April 20–August 31), McNary average daily outflow on weekends will be managed to be no less than 80% of the preceding week's average weekday outflow to minimize daily fluctuations.~~

~~Actual spill levels will be determined each year in the Water Management Plan developed through the Regional Forum. They need to be adjusted based on real-time total dissolved gas levels generated and on periodically updated minimum powerhouse flow requirements for system reliability. The actual dates of spill will be determined based on in-season monitoring information.~~

### **III. Water Supply Forecasts**

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. The (March Final) January - July forecast for the Columbia River at The Dalles is 130 million acre-feet (maf), 123% of normal. Runoff forecasts for Reclamation reservoirs above Brownlee are in the 123-124 percent of normal range.

Table 1. 1999 (and 1998) Runoff Volume Forecasts. Updated 3/15/99 with March Final Data

Location	March Final '99	% of Normal March Fin. '99	May Final 1998 (actual)	% of Normal 1998 (actual)
	Maf	%	Maf	%
Libby (Jan-Jul) *			5.20 (5.99)	81 (94)
Libby (Apr-Aug) *			5.06 (5.84)	79 (92)
Libby (Apr-Sep) *	<b>7.53</b>	<b>111</b>	5.38	79
Hungry Horse (Jan-Jul)			1.61 (1.79)	71 (79)
Hungry Horse (Apr-Sep)	<b>2.48</b>	<b>114</b>	1.50	69
Grand Coulee (Jan-Jul)	<b>71.4</b>	<b>117</b>	53.2 (59.0)	84 (93)
Dworshak (Apr-Jul) *	<b>3.60</b>	<b>133</b>	1.73 (2.86)	64 (81)
Lower Granite (Jan-Jul)	<b>37.9</b>	<b>127</b>	25.0 (31.3)	84 (105)
Lower Granite (Apr-Jul)	<b>28.3</b>	<b>131</b>	17.4	80
Lower Granite (Apr-Aug)			(25.0)	(109)
Lower Granite (Apr-Sep)				
The Dalles (Jan-Jul)	<b>130.0</b>	<b>123</b>	89.1 (104.0)	84 (98)
The Dalles (Apr-Sep)	<b>122.0</b>	<b>123</b>	79.9	81
The Dalles (Apr-Aug)			(90.1)	(97)
Brownlee (Jan-Jul)			8.90 (13.59)	91 (139)
Brownlee (Apr-Jul)	<b>8.38</b>	<b>145</b>		
Brownlee (Apr-Aug)			5.99 (.98)	82 (154)
Brownlee (Apr-Sep)			5.99	82

(\*) **Should use** COE Forecast

#### **III.V. Winter Operations (September 1998 - March 1999)**

##### Reservoir Refill

The BiOp states that the Corps of Engineers (COE), Bonneville Power Administration (BPA) and Bureau of Reclamation (Reclamation) shall operate the FCRPS during the fall and winter months, in a manner that provides the following levels of confidence of refill (see Table 2) to April 10 flood control at Grand Coulee, and to April 20 flood control at Libby, Hungry Horse and Albeni Falls while meeting the project and system minimum flow and flood control requirements prior to April 10 and 20. As a result, during the winter season leading up to the fish passage season of 1999, the Federal projects were operated with best efforts to meet the spring flow objectives recommended in the BiOp.

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 VII, 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 March final forecast)*

<b>Projects</b>	<b>Date of Max. FC Draft</b>	<b>Max. FC Draft Elev.</b>	<b>Min. Pool Elevation</b>	<b>Max. Pool Elevation</b>
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	3485.4	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

[NMFS recommended shortening this section somewhat by removing some of the detailed descriptions of the operations since the projects were generally operating to their end of month flood control elevations each period.]

**Libby.** Libby was operated to meet power needs in the September through December period. The project drafted from elevation 2444 feet on September 1 to near elevation 2405 feet on December 31. Libby was slightly below elevation 2411 on December 31 because of power generation at the end of December to meet a cold snap December 22 through 24. The end of January, February, and March flood control evacuation elevations were 2375.5, 2333.8, xx feet respectively based on each respective water supply forecast. The actual elevations at the end of January was 2373.9 feet. Libby operated on full powerhouse for most of January except for the period January 20 through 26 when outflow was reduced to 6 kcfs for a burbot study. During February Libby operated near full powerhouse capacity to meet the end of February flood control elevation of 2333.8 feet and actually ended the month at elevation 2334.1 feet. 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 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. Hungry Horse is evacuated somewhat in December in order to easily reach the April 15 flood control elevation. The April 15 to April 30 flood control evacuation continues to draft the reservoir. Since April inflows to Hungry Horse can be far in excess of the powerhouse capacity (approximately 8 kcfs, for the next six months or so due to ongoing automation work), the reservoir is evacuated to the end of April flood control elevation prior to April to avoid spilling at Hungry Horse in April. The BiOp recommends 75% confidence of achieving the April 15 flood control evacuation point. Based on each month's successive water supply forecast, the end of month flood control evacuation requirements were 3544.6, 3528.2, and xx feet at the end of January, February and March. The actual elevation at the end of January was near elevation 3613 feet as Reclamation drafted toward a deep April 30 flood

control draft. In February Reclamation operated to weekly load shapes with more outflow during weekdays than weekend. The end of February observed elevation was near elevation 3506 feet, which is needed to be at the end of April flood control draft without spill. March...

**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.** At Grand Coulee the project began September near elevation 1279 feet as agreed by upstream and downstream fish managers. Roosevelt Lake remained near elevation 1280 through September and filled to near elevation 1283 feet by the end of October. Lake Roosevelt remained above elevation 1280 until mid-December. The elevation at the end of December was approximately 1277 feet. 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 January, February, and March flood control evacuation levels were 1290 and the end of January, 1286.5 at the end of February, xx at the end of March, and xx at the end of April. The actual elevation at Grand Coulee was near 1265 feet at the end of January, and the project passed inflow across February ending the month near elevation 1265 feet. The flood control evacuation requirement on April 30 is elevation 1220.2 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. The 9.5 kcfs outflow from Hells Canyon continued 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 [NMFS] National Marine Fisheries Service's "Biological Opinion"**. By December 31 Brownlee was near elevation 2072 feet. The end of January flood control elevation is full, but the project began evacuation to elevation 2051 by the end of the month. Brownlee continued to evacuate in February and ended the month near elevation 2041?? feet, while the end of February flood control upper limit was 2044.5 feet. March... The April 30 flood control evacuation point is 20xx feet.

**Upper Snake River.** Reclamation's reservoirs in the Upper Snake River basin are operating near storage levels required for 1999 spring flood control objectives. Projects are either releasing their seasonal minimum flows or passing inflow to maintain flood control space until April. *Reclamation needs to provide input...*

**Dworshak.** The Dworshak project had been evacuated to elevation 1520 feet at the end of August. The outflow remained at minimum of 1300 cfs through December 19 and had filled slightly to elevation 1530. Dworshak increased outflow to full powerhouse capacity on December 20 and 21 for power generation during a cold snap. The project returned to minimum outflow afterwards. 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. Outflow in January increased to full powerhouse capacity of approximately 10 kcfs and the end of January pool elevation was near 1520 feet. Dworshak released full powerhouse capacity of 10.6 kcfs during February and ended the month at elevation 1489.2 feet, slightly below the end of February flood control upper limit of elevation 1491.5 feet.

**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 for safety purposes to complete flip lip 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 could be drafted as necessary to maintain the desired flows below Bonneville. Grand Coulee began drafting in early November to enhance flows, however heavy rainfall by mid-November significantly moderated the need to draft [BPA]. with BPA to use Grand Coulee to maintain the flow as needed. Grand Coulee could be drafted as low as elevation 1260 by the end of December to maintain this flow. However November was very wet, and Grand Coulee was not used to maintain the flow.

#### **IV. Spring Operations (April-June)**

##### Spring Flow Objectives at Lower Granite and McNary

[NMFS: A good deal of the following paragraph was already stated earlier in the document. ]

The spring flow objective at Lower Granite is based on the May final volume runoff forecast, using the sliding scale provided in the BiOp. Early determination based on the March final April-July runoff forecast of 28.3 maf at Lower Granite (which is greater than 20 maf) shows that the spring flow objective for the lower Snake River is at least 100 kcfs. The spring flow objective at McNary is to be based on the May final January-July volume runoff forecast for The Dalles, using another sliding scale provided in the BiOp. Early determination based on the January final January-July runoff forecast of 130 maf at The Dalles (which is greater than 105 maf), indicates that the McNary spring flow objective will be at least 260 kcfs.

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

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

The BiOp states NMFS' goal for operations of the Columbia River is to operate the FCRPS in such a way that flow objectives are met during the spring migration and reservoirs are full on June 30 (page 96). Having reservoirs full on June 30, when natural runoff declines, results in the greatest amount of water available for the summer migration period (page 96). Having reservoirs at flood control on April 10 (or 20 as the case may be) increases the likelihood that spring flow objectives will be met and the reservoirs will be full on June 30 (page 96).

As called for in the 1998 Supplemental BiOp, in years when the April 1<sup>st</sup>, April-to-August 50 Percent Confidence Volume Forecast at The Dalles is less than average, the volume of water available for spring flow augmentation on both the Columbia and Snake Rivers would be constrained, as necessary, to achieve refill of reservoirs by June 30. That is, the use of available reservoir storage would be prioritized for summer migrants.

The goal of the BiOp is for Dworshak, Libby, Hungry Horse, and Grand Coulee to be full on June 30, acknowledging that this may not be feasible under all water conditions (BiOp, page 96). Operations to refill Libby may result in refill at a date later than June 30 or deeper draft below the

interim draft limit [BOYCE] in years when flow augmentation is required for listed Kootenai River sturgeon.

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.

#### Spring Flow Objective for the Mid-Columbia River

As stated in the 1998 Supplemental BiOp (Pages III-2 to III-7), the NMFS' goal for operations in the mid-Columbia is to operate the FCRPS to match available water to fish movement during the spring and see that reservoirs are refilled by June 30 of each year. The actual timing of flow and the degree to which the June 30 refill objective is met would be determined by the TMT. The TMT, in recommending the shaping of flows in the mid-Columbia, would consider the desire to meet an average flow objective of 135 kcfs at Priest Rapids during the period April 10 through June 30, the desire to refill by June 30, timing, magnitude of the juvenile migration, water temperature, spill and total dissolved gas levels, adult fish and other requirements for improved survival of listed fish. The TMT may consider and implement flows lower than the objective during the early part of the steelhead migration when fewer fish are present, particularly in low flow years. Flows greater than the objective may be provided on a weekly basis during key points in the migration, while acknowledging that lower flows would then need to occur later in the spring migration as a result of the desire to refill reservoirs by June 30 to provide flow augmentation for summer migrants.

#### 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). However, problems caused by rock outcrops in the navigation channel below Lower Monumental Dam force the Ice Harbor reservoir to operate at MOP+1. The operating ranges are shown in Table 5.

Table 5. Lower Snake River Reservoirs Operating Ranges

<b>Reservoirs</b>	<b>MOP Range(ft)</b>	<b>Normal Operating Range (ft)</b>
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... flow augmentation is required for listed Kootenai River sturgeon. According to USFWS,...~~ will be operated for Kootenai River sturgeon. [YOSHINAKA: The USFWS will prepare operational guidelines for Kootenai River white sturgeon that will address flow augmentation to be provided by the Libby Project. These operational guidelines will be prepared in coordination with the National Marine Fisheries Service. 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. [This was coordinated with Bob Hallock, USFW]

[YOSHINAKA: The Federal operating agencies (Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration) 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. Reasonable and prudent alternatives for protection of bull trout may alter the initial operational guidelines that are developed by the Action Agencies.]

At Hungry Horse during the period April through June, the project will attempt to refill and meet Columbia Falls minimum flow requirements of 3,500 cfs or greater or local and system power needs. As noted earlier, the project's powerhouse capacity may still be limited to 8 kcfs.

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, where full is elevation 2062.5 feet..

Canadian Treaty projects will operate consistent with the 1998-99 DOP (Detailed Operating Plan) and related operating agreements such as the Non-Power Uses Agreement and the Non Treaty Storage Agreement. [BPA]. 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. [YOSHINAKA: Many Technical Management Team members do not have the DOP. It would be helpful to have the DOP for reference so that we can use this information to plan for future operations of the other projects that may be affected or may affect the Treaty projects. The DOP should be made available to all Technical Management Team members].

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 near xxxx. 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 (Pages III-11 through III-17) is listed in Table 6.

Table 6. Summary of Spill Requirements and Other Considerations

Project	Flow trigger	Spill Duration	Recommended Min/Max Powerhouse Capacity <sup>(1)</sup>	Spill Cap for 120% TDG <sup>(2)</sup> at the start of the spring season	Other Considerations (per 1998 Suppl. BiOp Appendix C) to prevent eddy formation, improve fish passage, etc.
	Kcfs	hours	kcfs	kcfs	% of flow or kcfs
LWG	85	12 <sup>(4)</sup>	11.5/123	45	
LGS	85	12 <sup>(4)</sup>	11.5/123	60	35% max <sup>(3)</sup> , page C-11
LMN	85	12 <sup>(4)</sup>	11.5/123	40	50% max <sup>(3)</sup> page C-11
IHR		24	7.5/94	75	
MCN		12 <sup>(4)</sup>	50/175	120-160	
JDA		12 <sup>(5)</sup>	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 <sup>(6)</sup>		24	50/	230 <sup>(5)</sup>	<sup>(6)</sup> 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 1800-0600 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)

The 1998 Supplemental BiOp recommends spilling to a level that is only controlled by the 120% TDG limit. Spill caps to be implemented at all projects during the juvenile spring/summer chinook migration season (April 3 - June 20 in the Snake River and April 10 - June 30 in the Columbia River are provided in Table 6. The 1998 BiOp (page III-8) also recommends that spill 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.

Spill at Lower Granite, Lower Granite, Little Goose, Lower Monumental and Ice Harbor will be provided as required by the BiOp, up to the relevant spill caps.

NMFS has initiated request for the states waivers to allow spill for-fish-passage to occur up to the 120% TDG level.....

The BiOp also states that the best condition for an evaluation of the effects and efficacy of spill to improve in river survival would be for a single spill regime to prevail throughout the spring migration season. Therefore, the TMT may recommend that spill occur under certain conditions, including when the number of fish arriving at the projects are significant and when the flows are expected to reach trigger levels during most of the spring season.

As of ~~mid~~ 25, 1999 discussions are still going on regarding the level of spill at Bonneville,

- 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?

**VI. 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. Early flow determinations, based on the (March final) April-July runoff forecast of 28.3 maf at Lower Granite, are provided shown in Table 7.

Table 7. Biological Opinion's Summer Flow Objectives

<b>Lower Granite</b>	<b>Lower Granite</b>	<b>McNary</b>	<b>McNary</b>
<b>Period</b>	<b>Flows (kcfs)</b>	<b>Period</b>	<b>Flows (kcfs)</b>
6/21-8/31	55	7/1-8/31	200

Summer Reservoir Interim Draft Limits

The interim draft limits specified in the BiOp (page 95) 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. As stated in the BiOp (page 97), “operations for anadromous fish [should] not place at risk other portions of the Columbia Basin ecosystem and the resident fish and wildlife that rely on the reservoirs.”

However, the BiOP (RPA 1(f), page 102), also stated that “the TMT may recommend lower summer reservoir elevations if necessary to meet flow objectives depending on the circumstances of the runoff and the salmon migration (e.g., 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). In general, lower summer reservoir elevations will only be recommended when the upper rule curve goals were not met on April 20 at Grand Coulee and Albeni Falls, or when 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

<b>Grand Coulee</b>	<b>Libby</b>	<b>Hungry Horse</b>	<b>Dworshak</b>
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 Koonanusa 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."*

Since NMFS does not agree with this interpretation by the Corps, 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.

Based on the March final water supply forecasts, 1999 does not have an unregulated runoff less than 65 maf at The Dalles for the April through August period, nor is it one in a series of low water years. These are conditions listed in the BiOp under which interim draft limits could be exceeded. [NMFS]

#### Upper Snake River Reservoir Operation

Per the BiOp (page 101), *"the TMT shall coordinate with Idaho Power Company (IPC) for the provision of additional stored water for flow augmentation from Brownlee Reservoir if necessary to meet the flow objectives at Lower Granite."* 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 (See Section VIII for more up-to-date information). The TMT will provide recommendations on the actual delivery of the Reclamation 427 kaf water to optimize downstream migration conditions for migrating listed salmon [BOYCE: and minimize fishery and recreational impacts in Brownlee Reservoir.]

In 1998, the Bureau of Reclamation relied on four sources of water for Snake River flow augmentation, as shown in Table 9.

Table 9. Sources of **1998** Water for Snake River Flow Augmentation

Source	Acre-Feet	Prospects as of 6/23/98
Oregon	17,847	Reclamation natural flow right (part of Skyline Farms).
Boise	40,932	40,932 af of USBR storage. Additional rentals may be made.
Payette	145,000	95,000 af of USBR storage plus rental pool rentals
Upper Snake	223,221	23,000 af of USBR storage plus rental pool rentals limited to amount needed to complete 427,000 af.

amounts of water consigned for rentals from the three Idaho Rental Pools. Reclamation plans to make releases in patterns similar to those of 1996, 1997 and 1998. Implementing this strategy will likely be split with a summer and winter release, assuming that Idaho Power shapes flows. Previous release past generally start when storage releases for irrigation commence. Reclamation will work closely with the appropriate Reclamation will also work with the Idaho Power Company to manage flow augmentation flows through Brownlee.

watermasters are agents of the Department of Water Resources, Reclamation assumes that coordination with the June 6, 1995 order.

Reclamation, BPA, and Idaho Power Company will coordinate with TMT to manage delivery of

#### Other Summer Reservoir Operations

During the July - August period Dworshak will draft to as low as elevation 1520 feet. Note that 110% and 120% TDG is about 14 and 22 kcfs respectively. In 1998, the state of Idaho and 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. In 1999,

| **[BOYCE suggested** 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

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, exchange, if it occurs, will be fully documented. Provisions are in place in the DOP to provide for 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 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 operations with TMT.

As stated earlier, during the storage period May 1 through July 5, 1999, water may be stored into 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.

Grand Coulee 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 [BOYCE: and if the April 10 rule curve is not met]. .

#### 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.

During the fall chinook migration season (June 21 to August 31 in the Snake River, and July 1 to August 31 in the Columbia River), the Corps is prepared to implement the 1998 BiOp by spilling up to the 120% TDG at all non-collector projects (Ice Harbor, John Day, The Dalles and Bonneville). Spill periods are 24 hours at Ice Harbor, The Dalles and Bonneville, and 1800-0600 (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. Current spill caps for the 120% TDG level were listed in Table 6.

As stated above, depending on the outcome of on-going regional discussions, some spill changes may occur in 1999 at Bonneville, The Dalles and John Day.

#### ~~—Summer Transportation [BOYCE: suggests moving this paragraph to Section IX]~~

~~The Action Agencies do not propose any change from the operation for transporting juvenile summer migrants that was described in 1995 RPA Measure 3. The action agencies propose to continue evaluating fall chinook transport. 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.~~

### **VII. Outlook for Meeting Flow Objectives in 1999**

#### Summary Hydrographs at Lower Granite and McNary

The weekly flow ordinates of the 1999 summary hydrographs for Lower Granite and McNary are provided in Table 10. ~~They~~ Weekly flow values are derived from average hydrographs of the 1929-1987 period, adjusted to match reflect the March/January final April-September runoff volume forecasts. As such, they represent average natural (unregulated) runoff conditions before the dams are in place but may not necessarily reflect the runoff distribution of any particular year. ~~prepared in January 1999.~~ See Figure 1.

|

Table 10. 1999 Summary Hydrographs at Lower Granite and McNary (in kcfs)  
 Apr-Sep. Runoff = 31.7 maf at TDA

Week ending	LWG99	MCN99	LWGQOBJ	MCNQOBJ
05-Apr	9995	223316	29	0
12-Apr	112400	277334	100	0
19-Apr	122408	317344	100	37
26-Apr	134122	378368	100	260
03-May	163136	530404	100	260
10-May	163142	530420	100	260
17-May	163148	530429	100	260
24-May	163170	530474	100	260
31-May	147178	577494	100	260
07-Jun	144183	585494	100	260
14-Jun	144172	585484	100	260
21-Jun	144152	585474	81	260
28-Jun	92129	434438	55	260
05-Jul	54108	320404	55	243
12-Jul	5483	320354	55	200
19-Jul	5460	320316	55	200
26-Jul	5046	302287	55	200
02-Aug	3241	194263	55	200
09-Aug	3238	194255	55	200
16-Aug	2932	152224	55	200
23-Aug	2932	152217	55	200
30-Aug	3220	130214	5514	29200
<del>06-Sep</del>	39	210	14	29
<del>13-Sep</del>	43	207	0	0
<del>20-Sep</del>	46	192	0	0
<del>27-Sep</del>	44	191	0	0
<del>04-Oct</del>	41	189	0	0

(\*) average daily flows during the week indicated

**1999**  
**SUMMARY HYDROGRAPHS**  
**LOWER GRANITE AND MCNARY**

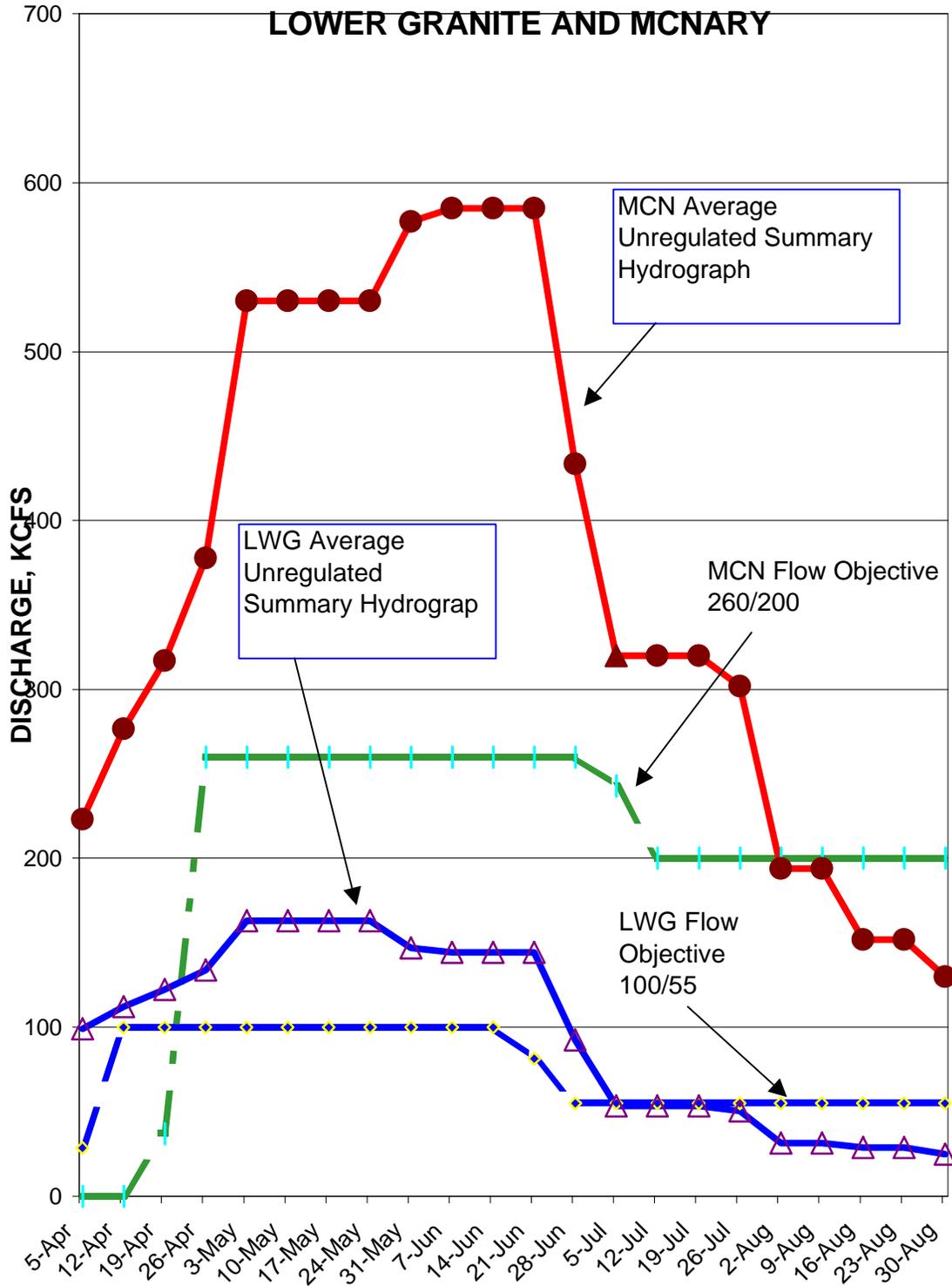


FIGURE 1

3/17/99

The COE Power Branch made a 59-year (1929-1987) monthly flow computer simulation based on the January 1999 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 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 superseded by weekly flow projections made more specifically for 1999 (see below).

Study assumptions for the computer simulation run are as follows:

- Stream-flows were adjusted based on the ~~March~~ ~~January~~ 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 31-Dec-98~~ 2400 hours from CROHMS data. ~~For Corra Linn, use Queen Bay's values;~~
- ~~Flow Objectives (kcfs): April 15—August 15 run on target flow (kcfs):~~

Projects	April	Apr2	May	Jun	July	Aug1	Aug2
Lower Granite	100	100	100	<del>85</del> 84.4	<del>53</del> 2	<del>53</del> 2	<del>53</del> 2
McNary		260	260	260	200	200	200
Vernita Bar	60	60	60				
Priest Rapids	<del>88</del>	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) ~~project fixed operation using actual TSR values;~~
- ~~HGH will operate Operating on new 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. curves from Jan-Jul 30 at Libby, Hungry Horse, Dworshak, Brownlee and Grand Coulee;~~
- Grand Coulee will operate on ~~Jan-Aug run on new~~ 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.

Month Ends	Jan	Feb	Mar	Apr1	Apr2	May	Jun	Jul
Elevation Ft	1265	1255.6	1248.2	1232.6	1220.6	1280	1290	1290

- 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 15,000 22,742 35,000 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

~~Brownlee new operation:~~

~~—Jan Apr run on new flood control~~

~~—May Aug run on new target elevations:~~

May	Jun	Jul	Aug1	Aug2
2069	2077	2077	2067	2057

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 (788 days)	6/21-8/31 (72 days)
Seasonal Flow Objective, kcfs	100.0	55.03.2
Projected Seasonal Average, kcfs	123.518.6	63.559.947.4
No. Years Seasonal Objective is Met	*598 (10098%)	*485218 (81831%)
No. Years Ave. Flows > Seas. Objective:		
Apr1/Apr2/May/June	2717/3326/578 9/5245	
June/July/Aug1/Aug2		59/37010/020 /010
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	<del>347.92</del> 203.0	<del>216.91</del> 171.2135. 3
No. Years Seasonal Objective is Met	*59 (100%)	*370 (630%)
No. Years Ave. Flows > Seas. Objective:		
Apr2/May/June	<del>292</del> /5435/596	
July/Aug1/Aug2		<del>4603</del> /3600/150 0
<b>Priest Rapids</b>		
Periods:	4/1003-6/30	
Seasonal Flow Objective, kcfs	135	
Projected Seasonal Average, kcfs	<del>195.67</del> 989.8	
No. Years Seasonal Objective is Met	*59 (100%)	
No. Years Ave. Flows > Seas. Objective:		
Apr1/Apr2/May/June	<del>5527</del> /325136/5 <del>54852</del> /5958	

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

### 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.

#### 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 U.S. Fish and Wildlife Service and Idaho Department of Fish and Game to ensure that the water temperature requirements of the Clearwater River fish hatcheries are taken into account. **[YOSHINAKA: 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 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 below-average runoff forecast, widespread spill is expected to prevail be mostly voluntary during a good portion of the 1998 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, the TMT will also have to specify temporary spill conditions at those projects.

~~Per the 1998 BiOp, The Dalles will spill up to 120% TDG cap or up to 64% of the flow (30% of the flow on alternate days), whichever is lower.~~

This limitation is met by limiting spill to an appropriate 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 2 and 3.

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.

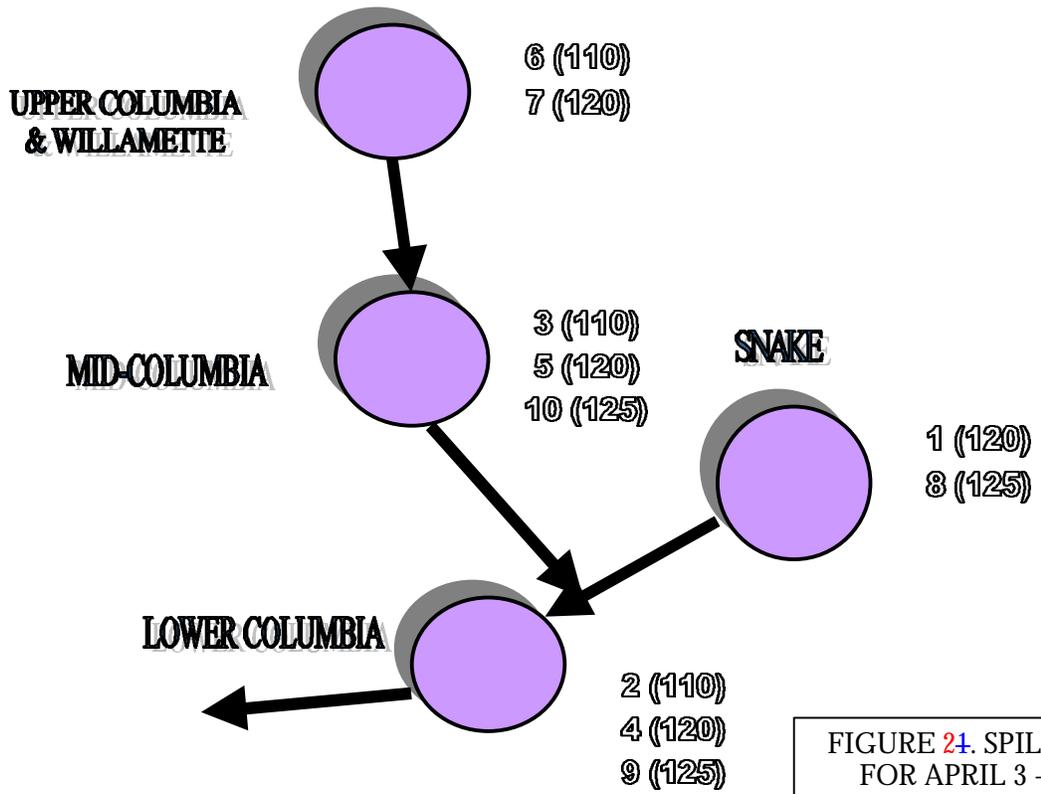


FIGURE 21. SPILL PRIORITY FOR APRIL 3 - APRIL 20  
Priority (% TDG)

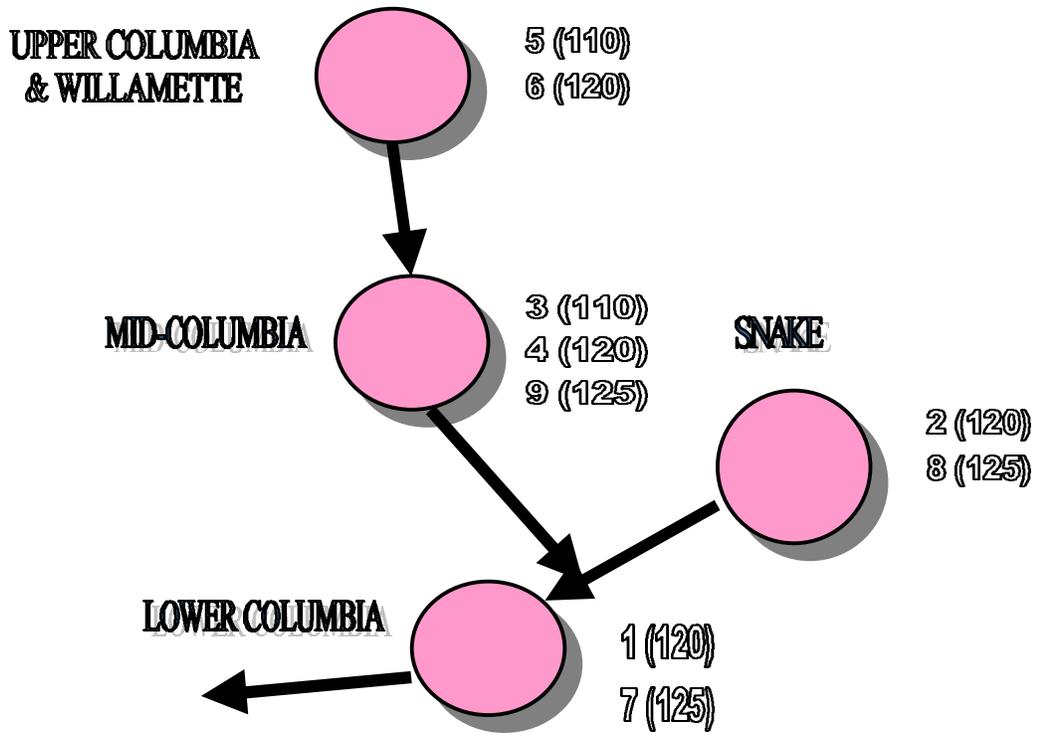


FIGURE 32. SPILL PRIORITY FOR APRIL 20-AUGUST 31  
Priority (% TDG)

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] dams 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.

[YOSHINAKA: 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.

[YOSHINAKA: This section should be updated to describe proposed 1999 operations]

### **Summer Transportation [moved from VI per BOYCE's suggestion]**

The Action Agencies do not propose any change from the operation for transporting juvenile summer migrants that was described in 1995 RPA Measure 3. The action agencies propose to continue evaluating fall chinook transport. 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.

#### **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 and real-time river conditions. [YOSHINAKA: The spill volume and schedule for test spilling at The Dalles Dam has not been determined yet. This section should be updated after a final decision regarding spill at The Dalles Dam has been made]

Table 12. Anticipated special operations for fish research and other activities.

<b>Project</b>	<b>Activity</b>	<b>Operational Requirements</b>	<b>Start/End Date</b>
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 No Spill Fishway Auxiliary Water may be Curtailed (1 - 2 days ?)	9/1 - 9/31
	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.

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- **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)**

**[YOSHINAKA:** 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**