

Spring / Summer Update to the 2003 Water Management Plan

1. Introduction

The 2003 Spring / Summer update to the Water Management Plan (WMP) updates information on how the Action Agencies plan on operating the Federal Columbia River Power System (FCRPS) reservoirs during the spring and summer seasons.

The *Spring / Summer WMP Update* (S/S Update) is needed because water supply forecasts for the spring and summer time period are not available at the time the water management plan is written in the fall of 2002. Planned operations in the Spring / Summer update are based on the most current water supply forecast which is considered to be the best available forecast of the expected runoff water volume, and thus how the FCRPS will be operated in 2003. The “April Final” forecast is the most current forecast available when the final version of the Spring Summer update was written.

The *S/S Update* also reports 2003 research operations planned for the FCRPS projects. Research studies are routinely conducted to test the performance of current or new fish passage operations and the effects on a wide range of conditions, including spill survival, tailrace egress, transport benefits and the performance of new passage devices like the Bonneville corner collector and the Lower Granite Removable Spillway Weir (RSW). The Studies Review Work Group establishes the research study plan in the spring just prior to the commencement of the spring migration. The *S/S Update* summarizes the project operations that support these research activities.

The *S/S Update* does not repeat all of the information in the Water Management plan, but provides additional detail and specifies operations based on the current water supply forecast or changes that need to be made in operations because of the availability of current water supply forecasts and other new information.

2.0 Role of Water Supply Forecasts

There are four forecast points that are used to determine BiOp operation of the FCRPS reservoirs. The latest forecasts are given below.

Forecast Point	Forecast Period	Forecast Date	Value (April Final Forecast)
Lower Granite	April – July	April Final	17.1 MAF ^A
Lower Granite	April – July	April Final	17.1 MAF
The Dalles	April – August	April Final	72.4 MAF ^A
The Dalles	April – August	April Final	72.4 MAF
Hungry Horse	April – August	March Final	1.53 MAF ^{AB}
Libby	April - August	April	5.0 MAF ^C

All forecasts from Weather Service unless otherwise indicated

A – Value that is used to set operations

B – USBR Forecast C – COE Forecast

Note: The April Final Forecast put out by the Weather Service assumes future precipitation to be normal.

3.0 Flow Objectives

Spring

The spring flow objectives for Lower Granite and McNary are established by the April final water supply forecast. The Priest Rapids spring flow objective is fixed (not dependent on the water supply forecast). Based on the April final forecast the spring flow objectives are shown below.

Project	Spring Flow Objective
Lower Granite	89 KCFS
McNary	220 KCFS
Priest Rapids	135 KCFS

Summer

Based on the latest water supply forecast (April Final) the summer flow objectives are shown below. The McNary summer flow objective is fixed (not dependent on the water supply forecast).

Project	Summer Flow Objective
Lower Granite	51 KCFS
McNary	200 KCFS

Prospects For Meeting Flow Objectives

An analysis of the likelihood of meeting the flow objectives was conducted by using the Corps' QADJ runs of the HYSSR model. This model uses the volume of the current water supply forecast and applies the 59-runoff shapes observed in the historical record to this forecast volume. The likelihood of meeting the flow objectives and refilling the reservoirs by the targeted dates is a function of both the runoff volume and the timeframe in which the snowmelt and stream flows occur. The likelihood of meeting the 2003 spring/summer flow objectives are listed below.

Summary of 17 APR 2003 QADJ Model Runs
CASE 1: 135 kcfs at PRIEST RAPIDS AP2-MAY and GCL Target 1288' June

17-Apr-03

Assumptions:

- *Streamflows were adjusted to the April Final Water Supply Forecast and shaped 59 different ways based on observed historical runoff.
- *Starting Elevations were the 15 April forecasted elevations from STP.
- *Grand Coulee operates to meet 135 kcfs at Priest Rapids 15 Apr - 31 May. Coulee targets El. 1288, 1285, 1280, and 1278 June 30, July 31, Aug 15, and Aug 30.
- *Hungry Horse operates to VARQ, meets minimum flows at Columbia Falls, targets full in June, El. 3550 in July, El. 3545 Aug 15, and 3540 ft by 31 Aug.
- *Brownlee operates to flood control elevations.
- *Dworshak releases 15 kcfs in April, targets full in June, releases 13 kcfs in Jul - Aug for LWG and targets 1520 ft by 31 Aug.
- *Libby operates on min flow (4 kcfs) or VARQ flood control Mar - Apr, conducts a sturgeon pulse operation in May and Jun, targets El. 2454 in July with minimum bull trout flow of 7 kcfs, targets El. 2449, and 2439 on Aug 15 and Aug 30.

Results:

Priest Rapids Meets Flow Objectives of 135 kcfs Apr2 - Jun:

Month	BiOp Target	No. Times Meeting Target out of 59 yrs	Average Flow for 59 Years (kcfs)
Apr2	135	59	136
May	135	58	142
Jun	135	33	136

Lower Granite Meets Flow Objectives of 89.1 kcfs in Apr - May, 76.2 kcfs in June and 50.5 kcfs in Jul - Aug:

Month	BiOp Target	No. Times Meeting Target out of 59 yrs	Average Flow for 59 Years (kcfs)
Apr2	89.1	11	74
May	89.1	32	90
Jun	76.2	36	82
Jul	50.5	6	41
Aug1	50.5	0	36
Aug2	50.5	0	28
APR1-JUN *	84.9	5	81

** For APR1 in all years: observed data for 1 - 13 April and short-term model results for 14 - 15 Apr were used. (This was done to compare results from last run for Apr 1 - Jun 30.)*

Lower Granite meets threshold target for APR1-JUN (81.2 kcfs) in 35 of the 59 years.

McNary Meets Flow Objectives of 220 kcfs in Apr2 - Jun and 200 kcfs in Jul - Aug:

Month	BiOp Target	No. Times Meeting Target out of 59 yrs	Average Flow for 59 Years (kcfs)
Apr2	220	5	204
May	220	14	213
Jun	220	10	200
Jul	200	2	163
Aug1	200	0	149
Aug2	200	0	134

Projects Refill by June 30:

Month	No. Times Meeting Target out of 59 yrs	Average Elevation on 30 Jun for 59 Years	Full
Libby	10	2451.3	2459.0
Hungry Horse	59	3560.0	3560.0
Grand Coulee	59	1288.0	1288.0
Dworshak	59	1600.0	1600.0

Note: Grand Coulee operates to meet Priest Rapids flow of 135 kcfs Apr2 - Jun.

4.0 Storage Project Operations

Libby Dam

Sturgeon Pulse

The current water supply forecast (April) of 4.96 MAF for Libby (April – August) puts Libby operations in the 2nd tier of operation for sturgeon called for in the USFWS 2000 Biological Opinion. Tier 2 calls for a Sturgeon flow volume of .8 MAF.

Below is the latest request from USFWS dated April 29, 2003

Latest USFWS Request

Earlier in the year we were not anticipating enough runoff above the Libby Project for even a minimum sturgeon augmentation flow. It now appears that there may be something near 0.8 MAF available for sturgeon while also fulfilling the needs of bull trout and anadromous fish. Because of the relatively small quantity of water, the length of the incubation period (approximately three weeks), variation in spawning timing, and the limited release capacity at Libby Dam, we are thinking that the best use of the water this year is for augmentation during the egg incubation / yolk-sac-fry stage. The dilemma is, which set of eggs / fry should be favored?

In an effort to cause sturgeon to spawn over suitable rocky substrates some sturgeon expected to spawn this spring will continue to be captured, radio tagged, and transported to the Hemlock Bar area, about 10 miles upstream of Bonners Ferry. Two males have already been transported to this area, and they have remained in the vicinity. Additional males and females will be transported soon. This area is characterized by rocky substrates and high water velocities, and it is believed suitable for sturgeon spawning / incubation. If the “net and haul” fish remain in the Helmock Bar area, or at least over gravel substrate above Bonners Ferry and they spawn, augmentation flows would be timed to provide for incubation of their eggs / yolk-sac-fry. A specific system operation request would be timed based on the abrupt downstream movement of those transported females, an indicator that spawning has just occurred.

From past experience during a relatively low water years we can anticipate that most sturgeon in the river environment will spawn early, perhaps even during late May. While we may be able to bracket the start date based on the timing of eggs collected below Bonners Ferry, the actual request is likely to have little lead time. If we are to reliably gain advantage in terms of water velocity to exclude predation for released eggs from these radio tagged-transported females we will need to react quickly - after the first female spawns. We can expect an 18 to 20 hour lag time for enhancement flows from Libby Dam to reach the Hemlock Bar area. Further, the warmest available water form

Lake Koocanusa would be requested to avoid disruption of spawning behavior by other transported sturgeon. Adjustments in the selective withdrawal system for temperature control may also be guided by evidence of spawning in the river below Bonners Ferry. This will require close in-season coordination.

If none of these net and haul female sturgeon remain to spawn over a gravel substrate above Bonners Ferry, emphasis would shift to augmenting flows for releases of large numbers of four-day-old larvae from the Kootenai Tribe's Hatchery. We would expect a delay of two to three weeks after peak spawning in the wild before hatchery larvae would become available. Thus, the augmentation flow request would be delayed two or three weeks. We estimate that hatchery spawning may occur in the last half of June with 4-day-old larvae becoming available near the first of July. However, under this alternative the hatchery managers will be able to provide us with more precise advance notice of when larvae will be available.

When better information becomes available we will provide a specific system operation request based upon one of these scenarios.

Minimum Flows

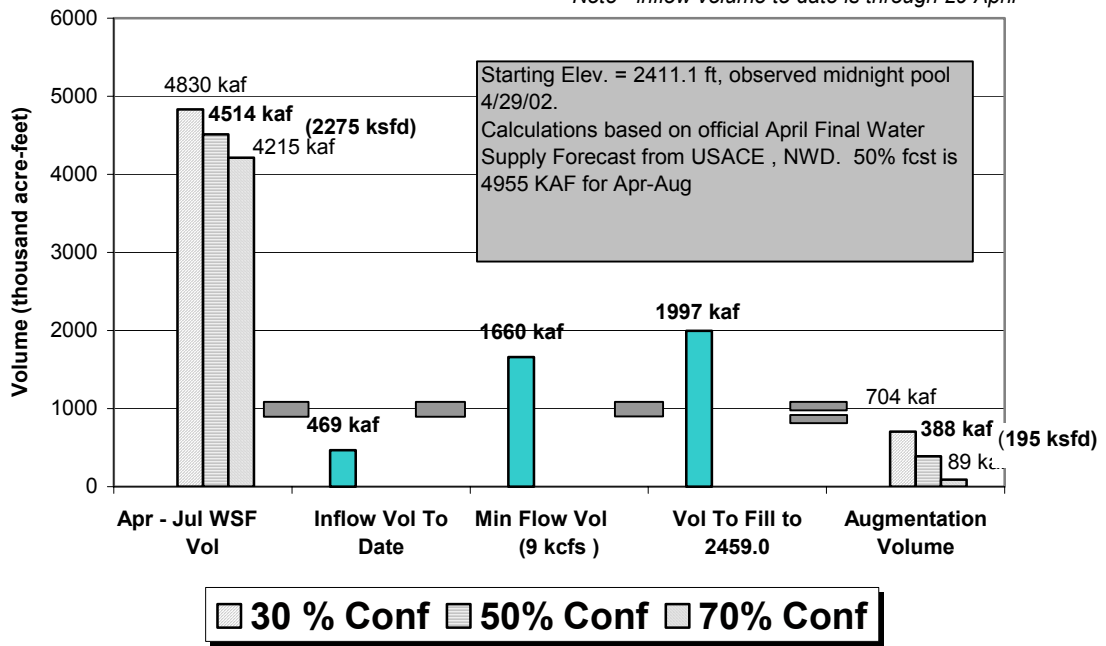
Tier 2 flows call for minimum bull trout releases of 7,000 cfs between the sturgeon flows in May/June and salmon flows in July. A year-round instantaneous minimum flow of 4,000 cfs is required outside of this period.

Based upon daily average flows of 7,000 cfs, one generator may be added per day (about 5,000 cfs/day), and the ramp-up rate will be 2,000 cfs/hour from October 1 – April 30 and 1,000 cfs/hour from May 1 – September 30. Ramp-down rates will be 500 cfs/hour with a daily ramp down rate of 1,000 cfs/day.

Libby Outlook

**Volumes at Libby
1 April Through 31 July**

Note- inflow volume to date is through 29 April

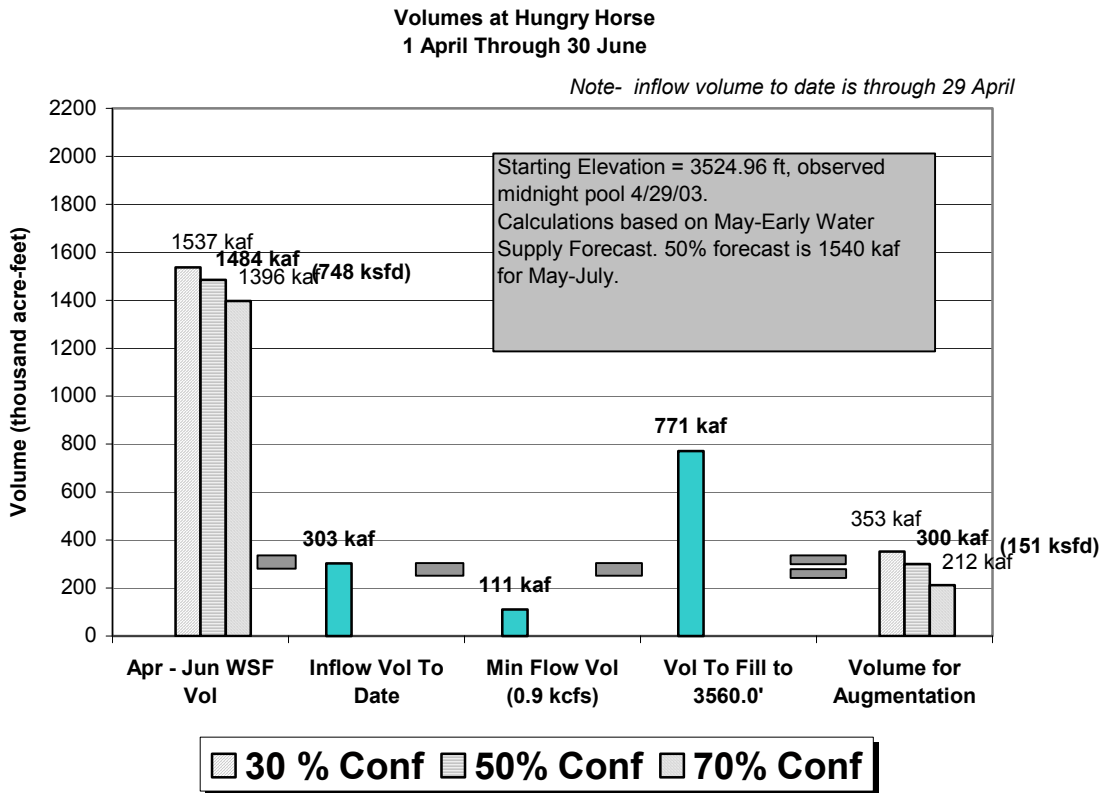


Hungry Horse Dam

Bull Trout Flows & Ramping Rates

Based on the Bureau of Reclamation March forecast for April – August of 1534 kaf, the minimum outflow from Hungry Horse will be 687 cfs and the minimum flow for Columbia Falls will be 3,372 cfs.

Hungry Horse Outlook



Grand Coulee Dam

Grand Coulee Summer Draft Limit

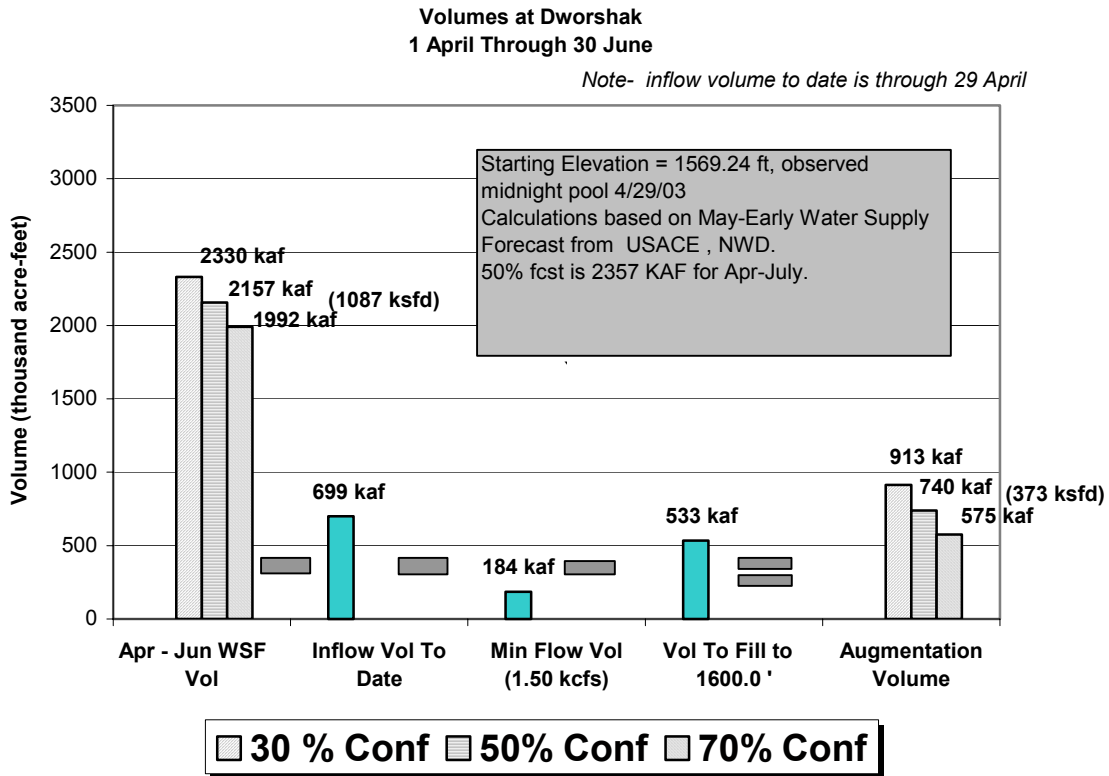
Based on the April final forecast of April – August runoff volume at the Dalles, the summer draft limit for Grand Coulee is expected to be 1278 feet.

Dworshak Dam

Summer Draft for Temperature Control

A key operation at Dworshak Dam is to draft cold water from the Dworshak reservoir in July and August to cool water temperatures in the Lower Snake River for the benefit of migrating salmon and steelhead. In-season modeling will be done to provide information to aid in the making the decisions of when and how to draft Dworshak for water temperature control.

Dworshak Outlook



5.0 Upper Snake River Flow Augmentation

The Bureau of Reclamation currently estimates that between 250 and 300 kaf will be available for flow augmentation in 2003.

6.0 Flood Control Operations

The flood control elevations based on the April final forecast are shown in the following table.

Note that April 10th flood control elevations are interpolated. As there is no official method of determining April 10th flood control elevations

Project	Date						
	31-Jan	28-Feb	15-Mar	31-Mar	10-Apr	15-Apr	30-Apr
ARDB	1435.5	1437.1		1438.5		1425.7	1425.7
LIB	2426.7	2436.4	2441.1	2448	2447.6	2447.4	2449.8
DCDB	1849.8	1828.6		1830.9		1822.5	1822.5
HGH	3548.1	3551.7		3553	3543.5	3538.8	3537.3
GCL	1290	1290		1283.3	1283.3	1283.3	1283.3
BRN	2077	2070		2076.3		2075.7	2077
DWR	1560.3	1565		1578.9	1554.2	1541.9	1541.9

Dworshak/Grand Coulee flood control shift

A flood control shift was not implemented, however, Dworshak operated to meet local and system flood control needs while meeting TDG standards, allowing actual operations to be above the non-shifted flood control elevation on April 15th. Grand Coulee was operated by adaptive management on a week-by-week basis to meet system flood control and fisheries needs, and met the non-shifted flood control elevation on April 15th.

7.0 Minimum Operating Pool

The minimum operating pool (MOP) operation for the Lower Snake projects is scheduled to start April 3rd. The table below shows currently planned MOP operations. The MOP + 1 to MOP +2 operations are due to research operations at Lower Granite and due to tow boat operators concerns at Ice Harbor and Little Goose.

Project	Lower Range		Upper Range	
	Operation	Elevation	Operation	Elevation
Ice Harbor	MOP +1	438	MOP + 2	439
Lower Monumental	MOP	537	MOP + 1	538
Little Goose	MOP +1	634	MOP + 2	635
Lower Granite	MOP +1	734	MOP + 2	735

At John Day the forebay will be operated within a 1.5-foot range between 262.5 and 264.0 feet from April 10th to September 30th.

8.0 Hanford Reach Agreement

HANFORD REACH FALL CHINOOK PROTECTION

Subject to the limitations and conditions set out below, Grant PUD, shall provide the following flow regimes through the rearing period for fall Chinook salmon spawning and rearing in the Hanford Reach.

1. Spawning Period

(a) Flows maintained during the spawning period and escapement levels are factors influencing the placement of redds. The flow manipulation is directed to minimize formation of redds above the 70 kcfs elevation. Minimizing formation of redds above the 70 kcfs elevation in turn is a key factor influencing the success of the flow regime during the emergence period.

(b) During the spawning period, Grant PUD will operate the Priest Rapids Project to the extent feasible through use of the mid-Columbia hourly coordination and reverse load factoring to produce a Priest Rapids outflow during daylight hours equal to 68% of the daily average Wanapum inflow. This obligation shall be in effect only if the daily average Wanapum inflow is between 80 kcfs and 125 kcfs. The goal during the spawning period is to limit spawning to the area below the 70 kcfs elevation on Vernita Bar. In the event physical changes are made at Priest Rapids which affect Grant PUD's ability to provide reverse load factoring, Grant PUD agrees to meet with the Fishery Agencies and Tribes to determine what adjustments to Grant PUD's obligation shall be made.

2. Pre-Hatch Period

During the pre-hatch Period the Priest Rapids outflow may be reduced to 36 kcfs for up to 8 hours on weekdays and 12 hours on weekends (with no two consecutive minimum periods). All participants recognize that utilization of the 36 kcfs minimum may have to be limited to achieve the Priest Rapids outflow goal during the spawning period.

3. Post-Hatch Period

(a) After hatching has occurred at redds located in the 36 to 50 kcfs zone, the protection level flow shall be maintained over Vernita Bar so that the intergravel water level is no less than 15 cm below the 50 kcfs elevation.

(b) After hatching has occurred at redds located in the zone above the 50 kcfs elevation, the protection level flow shall be maintained over Vernita Bar through the post hatch

period so that the intergravel water level is no less than 15 cm below the critical elevation.

4. Emergence Period

(a) During the emergence period, after emergence has occurred in the 36 to 50 kcfs zone, the protection level flow shall not be less than necessary to maintain water over Vernita Bar at the 50 kcfs elevation.

(b) During the emergence period, after emergence has occurred above the 50 kcfs elevation, the protection level flow shall be maintained at or above the critical elevation.

5. Rearing Period

(a) Flow fluctuations during the rearing period may impact juvenile fall chinook. Elimination of all flow fluctuations is not physically possible without severely impacting the ability of mid-Columbia operators to produce a reliable supply of electricity. The goal during the rearing period is to provide a high level of protection for juvenile fall chinook rearing in the Hanford Reach by limiting flow fluctuations while retaining a reasonable level of load-following capability at each of the 7 dams on the mid-Columbia River.

(b) During the rearing period, Grant PUD will operate the Priest Rapids Project to the extent feasible through use of the mid-Columbia Hourly Coordination Agreement to produce a Priest Rapids outflow that limits flow fluctuations according to the following criteria:

(1) When previous day average weekday Priest Rapids outflow is between 36 and 80 kcfs limit Priest Rapids outflow weekday delta to no more than 20 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 36 and 80 kcfs limit the Priest Rapids outflow weekend delta to no more than 20 kcfs.

(2) When previous day average weekday Priest Rapids outflow is between 80 and 110 kcfs limit Priest Rapids outflow weekday delta to no more than 30 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 80 and 110 kcfs limit the Priest Rapids outflow weekend delta to no more than 30 kcfs.

(3) When previous day average weekday Priest Rapids outflow is between 110 and 140 kcfs limit Priest Rapids outflow weekday delta to no more than 40 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 110 and 140 kcfs limit the Priest Rapids outflow weekend delta to no more than 40 kcfs.

(4) When previous day weekday average Priest Rapids outflow is between 140 and 170 kcfs limit Priest Rapids outflow weekday delta to no more than 60 kcfs. When the average of BPA’s Friday Priest Rapids outflow estimates for Saturday and Sunday is between 140 and 170 kcfs limit the Priest Rapids outflow weekend delta to no more than 60 kcfs.

(5) When previous day average Priest Rapids outflow is greater than 170 kcfs Priest Rapids outflow for the following day will be at least 150 kcfs.

6. Monitoring Team

For purposes of determining the protection level flow during the post hatch and emergence periods, a critical elevation shall be determined each year as follows:

(a) The monitoring team will survey redds on Vernita Bar in a specified area for the purpose of determining the initiation of spawning, the location of redds and the extent of spawning. The surveys will be conducted on weekends beginning on the weekend closest to October 15 of each year.

(b) The monitoring team will make a final redd survey the weekend prior to Thanksgiving to determine the critical elevation, which will be set as follows: (Elevations must be in 5 kcfs increments beginning at the 40 kcfs elevation.)

(1) If 31 or more redds are located above the 65 kcfs elevation, the critical elevation will be the 70 kcfs elevation.

(2) If there are 15 to 30 redds above the 65 kcfs elevation, the critical elevation will be the 65 kcfs elevation.

(3) If there are fewer than 15 redds above the 65 kcfs elevation, then the critical elevation will be the first 5 kcfs elevation above the elevation containing the 16th highest redd within the survey area on Vernita Bar (see Table 1 below for examples of the application of these counts).

Table 1. Examples illustrating theoretical final Vernita Bar redd counts and the resulting critical elevations, elevations are provided in kcfs ranges.

	36-50 kcfs	50-55 kcfs	55-60 kcfs	60-65 kcfs	65-70 kcfs	70+ kcfs	Resulting Critical Elevation
Example 1	836	418	148	71	48	34	70
Example 2	283	94	65	28	16	4	65
Example 3	105	35	10	3	1	0	55

(c) Additional activities of the monitoring team will include calculation of temperature units, determination of the dates of initiation of spawning, hatching, emergence, the end of the emergence period and the end of the rearing period. The monitoring team may also make nonbinding recommendations including non-binding recommendations to

protect redds above the critical elevation or to address special circumstances. By August 1 of the following year, Grant PUD will submit an annual report to the monitoring team and BPA. The annual report will include, but not be limited to: 1) Vernita Bar redd counts, 2) dates on which the hatching, emergence, end of emergence and end of rearing occurred, 3) a record of Columbia River flows through the Hanford Reach based on Priest Rapids discharges, and 4) a description of the actual flow regimes from the initiation of spawning through the rearing period based on available data. After review by the monitoring team, the final report will be sent to all participants.

7. Redds Above Critical Elevation

This Agreement is not intended either to preclude or require protection of redds above the critical elevation.

9.0 Spill for Juvenile Fish Passage

Spring Spill Operations – Snake River Dams

Since the forecasted average flow at Lower Granite is 84.9 kcfs (close to the 85 kcfs trigger for spring spill on the Snake River) the Regional Forum Implementation Team (IT) decided that there would be spill for juvenile fish passage at Lower Granite, Little Goose, and Lower Monumental in 2003. If average flows drop significantly below this level during the spill season (4/3-6/20) IT agreed to revisit the decision as to whether spill should be provided or whether to maximize transportation at some point in the spring season if river conditions are judged unfavorable for spring migrants.

Lower Granite Dam

A special spill operation to test the Removable Spillway Weir is planned for 2003. See the 2003 Snake River Research Operations Summary Table (see section 11).

Little Goose Dam

Spring spill passage at Little Goose Dam will be as specified in the BiOp. Spill nights to gas cap (1800 – 0600)

Lower Monumental Dam

Spring spill at Lower Monumental Dam has been modified from that called for in the BiOp. Tailrace egress conditions will be monitored in 2003 to verify that balanced flows from the spillway and the powerhouse present more favorable juvenile passage conditions. This operation is discussed in 2003 Fish Passage Plan and in the 2003 Snake River Research Operations Summary Table (see section 11).

Ice Harbor Dam

In 2003 spill tests will be conducted to evaluate juvenile survival under lower spill levels and to provide information for designing an RSW at Ice Harbor. See the 2003 Snake

River Research Operations Summary Table (section 11) for more information on these tests.

Summer Spill Operations – Snake River Dams

The summer spill planning period is June 21-August 31 for the Lower Snake projects.

Lower Granite Dam, Little Goose, Lower Monumental Dam

As recommended in the BiOp, no spill and full transport will be conducted at the Snake River transport dams.

Ice Harbor Dam

Summer spill tests (like the spring tests) will evaluate improved juvenile survival and to provide information for designing an RSW at Ice Harbor. See the 2003 Snake River Research Operations Summary Table (section 11) for more information on these tests.

Spring and Summer Spill Operations – Lower Columbia River Dams

The spring spill planning period for the Lower Columbia River dams is 4/10-6/30 (Spill started 4/14). The summer spill planning period is July 1 - August 31 for Lower Columbia River projects. Spring and summer spill operations on the Lower Columbia River Dams are nearly identical. The exception is McNary Dam at which no summer spill occurs.

McNary Dam

Spring spill will be conducted as specified in the BiOp which calls for night spill (1800 – 0600) to the gas cap. A new gas cap of 160-180 kcfs will be used in 2003 following the installation of spillway deflectors. Spring spill will be suspended when river conditions are no longer spring-like (flows <200 kcfs and water temperature >62-degrees F) and transport initiated. No summer spill occurs at McNary Dam.

John Day Dam

Juvenile survival through the project will be tested in 2003. See the 2003 Columbia River Research Operations Summary Table (see section 11) for more information.

The Dalles Dam

Juvenile survival under different tailrace spill patterns will be tested in 2003. In non-test periods spill will correspond to that recommended in the BiOp (40% of the outflow up to the gas cap 24 hours a day). See also research below. See the 2003 Columbia River Research Operations Summary Table (see section 11) for more information.

Bonneville Dam

Juvenile passage and adult fallback research at Bonneville Dam will continue in 2003. See the 2003 Columbia River Research Operations Summary Table (see section 11) for more information.

10. Water Quality – Spill Priority List

River operations are conducted to meet State Clean Water Act total maximum daily load (TMDL) dissolved gas standards. Also, research operations at a particular dam can be impacted by involuntary spill. Thus spill at research projects is given lower priority in the hope that involuntary spill can be eliminated during research. In 2003 involuntary spill will occur in the following order:

1. Little Goose
2. Lower Monumental
3. McNary
4. The Dalles
5. Bonneville
6. Priest Rapids
7. Rocky Reach
8. Wells
9. Rock Island
10. Lower Granite
11. Ice Harbor
12. John Day
13. Wanapum
14. Chief Joseph
15. Grand Coulee

2002 GAS Cap levels

The range of gas caps during 2002 at the projects were:

	Min	Max
BON	90	170
TDA	75	135
JDA	75	170
MCN	90	185
IHR	85	102
LGS	25	50
LWG	33	55

11. 2003 Fish Passage Research

A summary of 2003 fish passage research studies are described below and in the 2003 Snake River and Lower Columbia River Spring-Summer Research Summary Tables (following pages).

Lower Granite Dam

An evaluation of the RSW operation without the presence of the Behavioral Guidance System or the Surface Bypass Collector will be performed this spring. The spill schedule for this test period is presented in the 2003 Snake River Research Summary Table (Following Pages). See section 12.

Lower Monumental Dam

A modified spill schedule has been adopted at this project this year. This spill schedule was based on observations of the physical models at the WES facility. The objective of this new spill schedule is to reduce eddies in the tailrace and improve egress conditions for juveniles passing this project.

Ice Harbor Dam

An evaluation of a modified spill schedule will be performed at this project this spring and summer. The objective of the modified schedule is to improve tailrace egress and improve survival for juveniles passing this project. The evaluation will follow a block design schedule presented in section 12.

John Day Dam

An evaluation of a modified spill schedule will be performed at this project during the spring months. The objective of this modified schedule is to evaluate project FPE and survival under two treatment conditions. In addition, juvenile survival through the passage routes of spill, bypass, and turbines will be evaluated with a focus on improving egress conditions for juvenile fish exiting the bypass system. Summer testing will include an evaluation of 12-hour nighttime versus 24-hour spill under a block design schedule. (See section 12)

The Dalles Dam

An evaluation of the spillway will be conducted in 2003. The focus of the study will be to determine the need and potential location of a training wall and its potential to reduce injury and mortality in The Dalles stilling basin. The results of the study will determine whether a training wall will be constructed for the 2004 fish passage season. (See Section 12).

Bonneville Dam

An evaluation of 75 kcfs daytime spill versus gas cap daytime spill will be conducted to determine the effects on adult and juvenile passage. The evaluation will follow a block design schedule presented in the Appendix. The adult evaluation will focus on the influence of spill on delay and fallback at the project. (See section 12).

Projects	2003 Snake River Research Summary Table		
	Research Objective(s)	Spring Spill Plan (4/3-6/20)	Summer Spill Plan (6/21-8/31)
Lower Granite	<p>Test fish passage efficiency of the RSW without the behavioral guidance wall and the Surface Bypass Collector.</p> <p>Test fish survival with RSW spill versus gas cap spill.</p> <p>Transportation versus in-river survival through the Snake River dams.</p>	<p><u>4/3 – 4/13</u>: Nighttime spill to the gas cap (~52-kcfs) if runoff forecast exceeds 85 kcfs season average.</p> <p><u>4/14 – 5/29</u>: (46-day test) RSW flow of 6.5 kcfs with 12kcfs training flow (18.5 kcfs total) for 24-hours. (versus)</p> <p><u>5/30 – 6/20</u>: <u>Nighttime</u>: Spill to the Gas Cap (~52-kcfs)</p>	No Spill – Transport fish from the bypass system.
Little Goose	<p>No spill research is planned at Little Goose.</p> <p>Transportation versus in-river survival through the Snake River dams.</p>	<u>Nighttime</u> : Spill to the gas cap (~45 kcfs) if season average flows are projected to be >85kcfs	No Spill – Transport fish from the bypass system.
Lower Monumental	<p>Preliminary evaluation of tailrace egress and fish survival in 2003 under a 50% spill / 50% powerhouse flow condition. Verify the conclusions reached via WES model studies.</p> <p>Transportation versus in-river survival through the Snake River dams.</p>	<p>For flows less than 75 kcfs spill 50%.</p> <p>Spill 45% of the river for flows between 75 and 100 kcfs.</p> <p>For flows above 100 kcfs spill 50% of the river up to the gas cap.</p> <p>If flows drop below 24 kcfs, provide 12 kcfs for minimum turbine capacity and spill the remainder.</p>	No Spill – Transport fish from the bypass system.

Projects	2003 Snake River Research Summary Table		
	Research Objective(s)	Spring Spill Plan (4/3-6/20)	Summer Spill Plan (6/21-8/31)
Ice Harbor	<p>Evaluations of project survival under two spill operations. 2003 testing will also help determine the location and design of an RSW for Ice Harbor.</p> <p>Tests also will evaluate alternative spill levels to improve survival.</p>	<p><u>Test BiOp spill:</u> Daytime: Spill 45-kcfs Nighttime: Spill 100 kcfs</p> <p>(versus)</p> <p><u>Spill 50% of flow: 24 Hours</u></p>	<p><u>Test BiOp spill:</u> Daytime: Spill 45-kcfs Nighttime: Spill 100 kcfs</p> <p>(versus)</p> <p><u>Spill 50% of flow: 24 Hours</u></p>

Project	2003 Lower Columbia River Research Summary Table		
	Research Objective(s)	Spring Spill Plan (4/10-6/30)	Summer Spill Plan (7/1-8/31)
Bonneville Dam	<p>Jointly Evaluate Juvenile Passage and Adult Fallback alternating daytime spill between 75-kcfs and the gas cap.</p>	<p>Alternate spill in two day blocks from 4/14 - 7/6 as follows:</p> <p><u>Days 1 & 2:</u> Spill to gas cap (~140-kcfs) for 24-hours</p> <p><u>Days 3 & 4 :</u> Spill 75-kcfs daytime Spill to gas cap (~140-kcfs) nighttime</p> <p>Outside of the test period implement BiOp spill. Daytime: 75-kcfs Nighttime: Spill to gas cap (~90-150kcfs)</p>	<p>(BiOp Spill) Spill 75-kcfs daytime Spill to gas cap (~140-kcfs) nighttime</p>
The Dalles	<p>Tests of juvenile survival at varied tailrace spill patterns will occur in 2003. Tests will be made of 8, 12, and 18 kcfs spill levels in bays 2 & 4. Also 21 kcfs will be tested at Bay 2. The test will begin around May 12.</p> <p>An 80' tailwater elevation is desired for the test.</p> <p>Turbine operation will be prioritized similar to that of 2000: every other unit (odd numbered units) from West to East, then fill in even units from West to East.</p>	<p>Spill 40% of instantaneous flow for 24-hours.</p> <p>During test periods, special spill patterns will be used.</p>	<p>Spill 40% of instantaneous flow for 24-hours. (Minimum spill 36 kcfs?)</p>

Project	2003 Lower Columbia River Research Summary Table		
	Research Objective(s)	Spring Spill Plan (4/10-6/30)	Summer Spill Plan (7/1-8/31)
John Day	<p>Juvenile survival and fish passage efficiency will be tested in 2003.</p> <p>The spring study will run from 28 of April through 11 June.</p> <p>For both spring and summer, it will be important to ensure the powerhouse is operated with south units as first priority</p>	<p><u>4/10-4/27:</u> (BiOp) Daytime: No spill Nighttime: 60% of flow.</p> <p><u>4/28 – 6/11:</u> (Test) Daytime: No spill Nighttime: 60% of flow (versus) Daytime: No spill Nighttime: 45% of flow</p> <p><u>6/11-6/13:</u> (BiOp) Daytime: No spill Nighttime: 60% of flow.</p>	<p><u>6/13 – 7/30 (Test)*</u> (Depending on river temp).</p> <p>Daytime: No spill Nighttime: 60% of flow (versus) 24-Hours: 30% of flow</p> <p>* The summer study will follow a 4-day randomized block design. The schedule for the summer study is in Appendix A of the Fish Passage Plan (FPP).</p> <p><u>7/31-8/31</u> (BiOp spill) Daytime: No spill Nighttime: 60% of flow</p>
McNary	<p>Spring Transport Evaluation Survival of transported versus in-river migration.</p> <p>Collect baseline project survival information through the spring and summer</p>	<p><u>Nighttime:</u> Spill to the new gas cap 160-180 kcfs.</p> <p><u>Daytime:</u> Alternate daily full flow by-pass (no separation)</p> <p>Versus</p> <p>Separation/detection and transport of only PIT tagged fish.</p>	<p>Stop spill and initiate transport when conditions are no longer spring-like (flows <200kcfs and water temp. >62-degrees F)</p>

12 Appendix – Research Plans

Lower Granite RSW /Research Plan

The overall goal of the 2003 RSW evaluation is to determine the fish passage performance of the RSW without forebay occlusion devices present, as well as determine relative survival of fish passing through spill during RSW operation and the BiOp spill condition. RSW performance and fish survival will be compared with spill to the gas cap.

Proposed Operation of Lower Granite Dam and the RSW

The two operational conditions for the spring 2003 evaluation of the RSW at Lower Granite are:

1. Spill to the dissolved gas cap (~45 kcfs) for 12 hours per day (1800 to 0600). This is the BiOp spill condition. The RSW will not be operated during this condition. (Note: prior to 2002, the gas cap was around 60 kcfs spill. During the 2002 RSW evaluation, the gas cap was generally reached at spill levels of around 40 to 45 kcfs.) “Gas Cap” conditions will likely be adjusted during the season.
2. RSW operation (around 6.7 kcfs at the expected forebay elevation) plus around 12 kcfs training spill through bays 2 – 8. This is a 24-hour operation.

If river flows exceed powerhouse capacity plus the planned spill condition, additional spill will be added to pass river flow. Test spill operations are detailed in table 1.

Table 1. LGR spill scenarios - spring 2003

	RSW		BiOp	
	Stops	Flow	Stops	Flow
Bay 1/RSW	Open	6.7	Close	0
Bay 2	1	1.8	4	7.2
Bay 3	1	1.8	4	7.2
Bay 4	0	0	3	5.4
Bay 5	1	1.8	3	5.4
Bay 6	1	1.8	3	5.4
Bay 7	1	1.8	4	7.2
Bay 8	2	3.6	4	7.2
Total volume (kcfs)		19.3		45.0

Turbine Unit Priority

Unit number 1 will be out of service for the duration of the spring 2003 RSW test. Priority of the other units will be 2, 6, 3, 4, 5.

Study Design

The treatment calendar for the 2003 RSW test is summarized in Figure 1. The test period consists of 4-day blocks with 2 consecutive days for each treatment within each block. The beginning treatment of each block was randomly chosen.

The 46-day study period was chosen to allow time for surgical implants of radio transmitters. Surgical implants have been used for the past several years at Lower Granite, so the researchers wanted to maintain consistency between years by using this methodology again.

Figure 1. 2003 Lower Granite RSW test treatment calendar – 46-day test period.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
April	13	14 RSW	15 RSW	16 Gas Cap	17 Gas Cap	18 Gas Cap	19 Gas Cap
	20 RSW	21 RSW	22 Gas Cap	23 Gas Cap	24 RSW	25 RSW	26 Gas Cap
	27 Gas Cap	28 RSW	29 RSW	30 RSW	1 RSW	2 Gas Cap	3 Gas Cap
May	4 RSW	5 RSW	6 Gas Cap	7 Gas Cap	8 Gas Cap	9 Gas Cap	10 RSW
	11 RSW	12 Gas Cap	13 Gas Cap	14 RSW	15 RSW	16 Gas Cap	17 Gas Cap
	18 RSW	19 RSW	20 Gas Cap	21 Gas Cap	22 RSW	23 RSW	24 RSW
	25 RSW	26 Gas Cap	27 Gas Cap	28 RSW	29 RSW	30	31

RSW days are RSW plus 12 kcfs for 24 hours per day. (0600 - 0600)

(Test starts at 0600 on April 14)

Gas Cap days are spill to the cap (40 - 45 kcfs in 2002) for 12 hours per day (1800 - 0600)

Ice Harbor Project Survival Evaluation

Two operations will be evaluated using 2 day blocks of BIOP operations (Fish Passage Plan) and 2 days of "test" conditions throughout the spill season. The pattern is described in the Ice Harbor Spill Table. The tests condition is a 50% spill operations for 24 hours, beginning at 0500. There may be a short time in early June where test operations may not be needed due to lack of test fish. Under that circumstance, BIOP flows will be allowed for those periods. This will be coordinated through RCC.

Ice Harbor Spill Evaluation – Treatment Blocks

Month	Day	Test	Month	Day	Test	Month	Day	Test
April	23	BIOP	May	28	BIOP	July	1	TEST
April	24	BIOP	May	29	TEST	July	2	BIOP
April	25	BIOP	May	30	TEST	July	3	BIOP
April	26	TEST	May	31	BIOP	July	4	TEST
April	27	TEST	June	1	BIOP	July	5	TEST
April	28	BIOP	June	2	TEST	July	6	BIOP
April	29	BIOP	June	3	TEST	July	7	BIOP
May	1	TEST	June	4	BIOP	July	8	TEST
May	2	TEST	June	5	BIOP	July	9	TEST
May	3	BIOP	June	6	TEST	July	10	BIOP
May	4	BIOP	June	7	TEST	July	11	BIOP
May	5	TEST	June	8	BIOP	July	12	TEST
May	6	TEST	June	9	BIOP	July	13	TEST
May	7	BIOP	June	10	TEST	July	14	BIOP
May	8	BIOP	June	11	TEST	July	15	BIOP
May	9	TEST	June	12	BIOP	July	16	TEST
May	10	TEST	June	13	BIOP	July	17	TEST
May	11	BIOP	June	14	TEST	July	18	BIOP
May	12	BIOP	June	15	TEST	July	19	BIOP
May	13	TEST	June	16	BIOP	July	20	TEST
May	14	TEST	June	17	BIOP	July	21	TEST
May	15	BIOP	June	18	TEST	July	22	BIOP
May	16	BIOP	June	19	TEST	July	23	BIOP
May	17	TEST	June	20	BIOP	July	24	TEST
May	18	TEST	June	21	BIOP	July	25	TEST
May	19	BIOP	June	22	TEST			
May	20	BIOP	June	23	TEST			
May	21	TEST	June	24	BIOP			
May	22	TEST	June	25	BIOP			
May	23	BIOP	June	26	TEST			
May	24	BIOP	June	27	TEST			
May	25	TEST	June	28	BIOP			
May	26	TEST	June	29	BIOP			
May	27	BIOP	June	30	TEST			

John Day Project Survival Test

Spill treatments for JDA 2003 spring test

Date	Spill Treatment	Date	Spill Treatment	Date	Spill Treatment
28-Apr-03	0 day/60 night	12-May-03	0 day/60 night	27-May-03	0 day/45 night
29-Apr-03	0 day/60 night	13-May-03	0 day/60 night	28-May-03	0 day/60 night
30-Apr-03	0 day/45 night	14-May-03	0 day/60 night	29-May-03	0 day/60 night
1-May-03	0 day/45 night	15-May-03	0 day/60 night	30-May-03	0 day/45 night
2-May-03	0 day/60 night	16-May-03	0 day/45 night	31-May-03	0 day/45 night
3-May-03	0 day/60 night	17-May-03	0 day/45 night	1-Jun-03	0 day/60 night
4-May-03	0 day/45 night	18-May-03	0 day/60 night	2-Jun-03	0 day/60 night
5-May-03	0 day/45 night	19-May-03	0 day/60 night	3-Jun-03	0 day/45 night
6-May-03	0 day/45 night	20-May-03	0 day/45 night	4-Jun-03	0 day/45 night
7-May-03	0 day/45 night	21-May-03	0 day/45 night	5-Jun-03	0 day/60 night
8-May-03	0 day/60 night	22-May-03	0 day/60 night	6-Jun-03	0 day/60 night
9-May-03	0 day/60 night	23-May-03	0 day/60 night	7-Jun-03	0 day/60 night
10-May-03	0 day/45 night	24-May-03	0 day/45 night	8-Jun-03	0 day/60 night
11-May-03	0 day/45 night	25-May-03	0 day/45 night	9-Jun-03	0 day/45 night
		26-May-03	0 day/45 night	10-Jun-03	0 day/45 night

Spill treatments for JDA summer test
2003

Date	Spill Treatment	Date	Spill Treatment	Date	Spill Treatment
		26-Jun-03	0 day/60 night	13-Jul-03	30 day/30 night
		27-Jun-03	30 day/30 night	14-Jul-03	30 day/30 night
		28-Jun-03	30 day/30 night	15-Jul-03	0 day/60 night
		29-Jun-03	30 day/30 night	16-Jul-03	0 day/60 night
13-Jun-03	30 day/30 night	30-Jun-03	30 day/30 night	17-Jul-03	30 day/30 night
14-Jun-03	30 day/30 night	1-Jul-03	0 day/60 night	18-Jul-03	30 day/30 night
15-Jun-03	0 day/60 night	2-Jul-03	0 day/60 night	19-Jul-03	30 day/30 night
16-Jun-03	0 day/60 night	3-Jul-03	30 day/30 night	20-Jul-03	30 day/30 night
17-Jun-03	30 day/30 night	4-Jul-03	30 day/30 night	21-Jul-03	0 day/60 night
18-Jun-03	30 day/30 night	5-Jul-03	0 day/60 night	22-Jul-03	0 day/60 night
19-Jun-03	0 day/60 night	6-Jul-03	0 day/60 night	23-Jul-03	0 day/60 night
20-Jun-03	0 day/60 night	7-Jul-03	0 day/60 night	24-Jul-03	0 day/60 night
21-Jun-03	30 day/30 night	8-Jul-03	0 day/60 night	25-Jul-03	30 day/30 night
22-Jun-03	30 day/30 night	9-Jul-03	30 day/30 night	26-Jul-03	30 day/30 night
23-Jun-03	0 day/60 night	10-Jul-03	30 day/30 night	27-Jul-03	30 day/30 night
24-Jun-03	0 day/60 night	11-Jul-03	0 day/60 night	28-Jul-03	30 day/30 night
25-Jun-03	0 day/60 night	12-Jul-03	0 day/60 night	29-Jul-03	0 day/60 night
				30-Jul-03	0 day/60 night

The Dalles

Spill schedule for 2003 May-June balloon-tag test at TDA. Assumes river flows that will achieve an 80' tailwater. If actual river flows are different from assumed values, spill percentage will change.

Test days will run from approximately 0700 - 1900 hours. For each gate opening and closure, Normandeau will notify the project when testing is complete each day. The juvenile pattern will be run outside of test periods.

Test Day	Day of Week	Discharge (kcfs)										Bay 11	Bay 12	Total Spill	Assumed River	Spill %
		Bay 1	Bay 2	Bay 3	Bay 4	Bay 5	Bay 6	Bay 7	Bay 8	Bay 9	Bay 10					
20-May-03	Tues	9	12	12	12	12	15	12	12	12	0	0	0	108.0	270	40.0
21-May-03	Wed	4.5	21	6	6	6	6	6	6	6	12	10	9	98.5	246	40.0
22-May-03	Thurs	9	18	18	18	18	21	0	0	0	0	0	0	102.0	255	40.0
23-May-03	Fri	4.5	21	6	6	6	6	6	6	6	12	10	9	98.5	246	40.0
24-May-03	Sat	9	18	18	18	18	21	0	0	0	0	0	0	102.0	255	40.0
25-May-03	Sun	9	9	9	9	9	9	9	12	15	15	8	0	113.0	283	39.9
26-May-03	Mon	9	9	9	9	9	9	9	12	15	15	8	0	113.0	283	39.9
27-May-03	Tues	Make up day (weather/flow)														
28-May-03	Wed	9	12	12	12	12	15	12	12	12	0	0	0	108.0	270	40.0
29-May-03	Thurs	9	18	18	18	18	21	0	0	0	0	0	0	102.0	255	40.0

30-May-03	Fri	4.5	21	6	6	6	6	6	6	6	12	10	9	98.5	246	40.0
31-May-03	Sat	9	12	12	12	12	15	12	12	12	0	0	0	108.0	270	40.0
1-Jun-03	Sun	9	9	9	9	9	9	9	12	15	15	8	0	113.0	283	39.9
2-Jun-03	Mon	9	9	9	9	9	9	9	12	15	15	8	0	113.0	283	39.9
3-Jun-03	Tues	Make up day (weather/flow)														
4-Jun-03	Wed	9	12	12	12	12	15	12	12	12	0	0	0	108.0	270	40.0
5-Jun-03	Thurs	9	18	18	18	18	21	0	0	0	0	0	0	102.0	255	40.0
6-Jun-03	Fri	4.5	21	6	6	6	6	6	6	6	12	10	9	98.5	246	40.0
7-Jun-03	Sat	9	12	12	12	12	15	12	12	12	0	0	0	108.0	270	40.0
8-Jun-03	Sun	9	9	9	9	9	9	9	12	15	15	8	0	113.0	283	39.9
9-Jun-03	Mon	9	18	18	18	18	21	0	0	0	0	0	0	102.0	255	40.0
10-Jun-03	Tues	9	18	18	18	18	21	0	0	0	0	0	0	102.0	255	40.0
11-Jun-03	Wed	4.5	21	6	6	6	6	6	6	6	12	10	9	98.5	246	40.0
12-Jun-03	Thurs	Make up day (weather/flow)														

Bonneville Adult Passage study

Daytime spill levels will alternate between 75 KCFS (Fallback limit) (low) and spilling to the TDG Gas Cap (high) as shown below.

Date	Spill Treatment	Date	Spill Treatment	Date	Spill Treatment	Date	Spill Treatment
10-Apr-03	Low	16-May-03	High	21-Jun-03	Low	27-Jul-03	Low
11-Apr-03	Low	17-May-03	High	22-Jun-03	Low	28-Jul-03	Low
12-Apr-03	High	18-May-03	Low	23-Jun-03	High	29-Jul-03	High
13-Apr-03	High	19-May-03	Low	24-Jun-03	High	30-Jul-03	High
14-Apr-03	Low	20-May-03	High	25-Jun-03	High	31-Jul-03	High
15-Apr-03	Low	21-May-03	High	26-Jun-03	High	1-Aug-03	High
16-Apr-03	High	22-May-03	Low	27-Jun-03	Low	2-Aug-03	Low
17-Apr-03	High	23-May-03	Low	28-Jun-03	Low	3-Aug-03	Low
18-Apr-03	High	24-May-03	High	29-Jun-03	Low	4-Aug-03	High
19-Apr-03	High	25-May-03	High	30-Jun-03	Low	5-Aug-03	High
20-Apr-03	Low	26-May-03	Low	1-Jul-03	High	6-Aug-03	Low
21-Apr-03	Low	27-May-03	Low	2-Jul-03	High	7-Aug-03	Low
22-Apr-03	High	28-May-03	Low	3-Jul-03	Low	8-Aug-03	Low
23-Apr-03	High	29-May-03	Low	4-Jul-03	Low	9-Aug-03	Low
24-Apr-03	Low	30-May-03	High	5-Jul-03	High	10-Aug-03	High
25-Apr-03	Low	31-May-03	High	6-Jul-03	High	11-Aug-03	High
26-Apr-03	Low	1-Jun-03	Low	7-Jul-03	High	12-Aug-03	Low
27-Apr-03	Low	2-Jun-03	Low	8-Jul-03	High	13-Aug-03	Low
28-Apr-03	High	3-Jun-03	High	9-Jul-03	Low	14-Aug-03	High
29-Apr-03	High	4-Jun-03	High	10-Jul-03	Low	15-Aug-03	High
30-Apr-03	High	5-Jun-03	Low	11-Jul-03	High	16-Aug-03	High
1-May-03	High	6-Jun-03	Low	12-Jul-03	High	17-Aug-03	High
2-May-03	Low	7-Jun-03	High	13-Jul-03	Low	18-Aug-03	Low
3-May-03	Low	8-Jun-03	High	14-Jul-03	Low	19-Aug-03	Low
4-May-03	High	9-Jun-03	Low	15-Jul-03	High	20-Aug-03	High
5-May-03	High	10-Jun-03	Low	16-Jul-03	High	21-Aug-03	High
6-May-03	Low	11-Jun-03	High	17-Jul-03	Low	22-Aug-03	Low
7-May-03	Low	12-Jun-03	High	18-Jul-03	Low	23-Aug-03	Low
8-May-03	Low	13-Jun-03	Low	19-Jul-03	Low	24-Aug-03	Low
9-May-03	Low	14-Jun-03	Low	20-Jul-03	Low	25-Aug-03	Low
10-May-03	High	15-Jun-03	High	21-Jul-03	High	26-Aug-03	High
11-May-03	High	16-Jun-03	High	22-Jul-03	High	27-Aug-03	High
12-May-03	Low	17-Jun-03	Low	23-Jul-03	High	28-Aug-03	Low
13-May-03	Low	18-Jun-03	Low	24-Jul-03	High	29-Aug-03	Low
14-May-03	High	19-Jun-03	High	25-Jul-03	Low	30-Aug-03	High
15-May-03	High	20-Jun-03	High	26-Jul-03	Low	31-Aug-03	High