

# Spring/Summer Update to the 2009 Water Management Plan

May 15, 2009

## **Introduction**

This spring/summer update (SSU) to the 2009 Water Management Plan (WMP) provides updated information regarding how the Action Agencies will operate Federal Columbia River Power System (FCRPS) reservoirs during the 2009 spring and summer seasons. The SSU does not repeat all of the information in the WMP, but instead provides additional updated information and specifies operations based on the current water supply forecasts, flow projections, and fish research. The SSU provides water supply forecasts for the spring and summer time period that are not yet available when the WMP itself is finalized. Operations contained in the SSU 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 determines how the FCRPS can be operated in 2009. The SSU also outlines 2009 research operations planned for FCRPS projects. Fish research studies are routinely conducted to test the performance of current or new fish passage structures and/or operations and their effects on fish passage and survival. The Studies Review Work Group (SRWG) finalizes research study plans in the early spring prior to the beginning of the juvenile salmonid spring migration. This SSU summarizes project operations that support these research activities as best possible where the operations have been coordinated and finalized with regional entities.

## **Water Supply Forecasts (WSF)**

There are four forecast points used to determine BiOp operation of the FCRPS reservoirs; Lower Granite, The Dalles, Libby, and Dworshak. The latest forecasts are presented in Table 1.

Table 1.— Latest water supply forecasts available as of March 1, 2009.

<b>Forecast Point</b>	<b>Forecast Period</b>	<b>Forecast Date</b>	<b>Value (MAF)</b>	<b>Percent Normal<sup>E</sup></b>
Lower Granite	April – July	April Final	20.4 <sup>A</sup>	95
Lower Granite	April – July	May Final	20.9 <sup>F</sup>	97
The Dalles	April – August	April Final	82.4 <sup>A</sup>	89
The Dalles	April – August	May Final	81.4 <sup>A</sup>	87
Hungry Horse	May – September	May Final	1.82 <sup>B</sup>	99
Hungry Horse	May – July	May Final	1.69 <sup>B</sup>	99
Libby	April – August	May Final	5.2 <sup>CD</sup>	82
Dworshak	April – July	May Final	2.6 <sup>C</sup>	98

All forecasts are from the National Weather Service Northwest River Forecast Center (RFC) unless otherwise indicated:

A – RFC forecast (value used to set operations for spring flow objectives).

B – U.S. Bureau of Reclamation Forecast. The May – September forecast determines flood control requirements and guides Var Q discharges.

C – Corps of Engineers Forecast.

D – Value used to set operations for Libby sturgeon pulse.

E – Percent of normal for RFC and BOR forecasts is based on 1971 – 2000 average. Percent of normal for Corps forecasts is based on 1929 – 1999 average.

F – Reservoir Forecast Center forecast (June value used to set operations for summer flow objectives).

## **Seasonal Flow Objectives**

### **Spring**

The spring seasonal flow objectives for Lower Granite are established using the Northwest River Forecast Center's April final water supply forecast for the period of April-July. The spring seasonal flow objective for McNary is established using the Northwest River Forecast Center's April final water supply forecast for the period of April-August at The Dalles. The Priest Rapids spring seasonal flow objective is fixed and is not dependent on any water supply forecast. Based on the April final forecast, spring flow objectives are shown Table 2.

Table 2.— Spring seasonal flow objectives at Lower Granite, Priest Rapids and McNary dams.

<b>Project</b>	<b>Spring Seasonal Flow Objective</b>
Lower Granite	100 kcfs
Priest Rapids	135 kcfs
McNary	228 kcfs

### **Summer**

The summer seasonal flow objective for Lower Granite Dam is based on the Northwest River Forecast Center's June final water supply forecast for the period of April-July. Based on the May final water supply forecast, preliminary summer seasonal flow objectives are shown in Table 3. The McNary summer seasonal flow objective is always 200 kcfs and is not dependent on the water supply forecast.

Table 3.— Summer seasonal flow objectives at Lower Granite and McNary dams.

<b>Project</b>	<b>Summer Seasonal Flow Objective</b>
Lower Granite	52 kcfs
McNary	200 kcfs

## **Storage Project Operations**

### **Libby Dam - Bull Trout Flows**

Bull trout minimum flows are specified in the 2006 Libby Sturgeon Biological Opinion (BiOp). Per the BiOp, the project will initiate bull trout flows of 6 kcfs on May 15 and maintain the minimum flow criteria until the sturgeon pulse begins. After the sturgeon pulse, and/or July through August, the bull trout minimum will be the tiered minimum (6-9 kcfs) based upon the COE May Final WSF. Given the May Final WSF shown in Table 1, the tiered bull trout flow after the sturgeon pulse through August is 7 kcfs. For the month of September, the bull trout minimum flow will return to 6 kcfs.

### **Libby Dam - Sturgeon Pulse**

Per the 2006 Libby Sturgeon Biological Opinion, the sturgeon pulse volume is determined from a tiered flow structure based upon the Corps' May Final WSF for the period of April-August. The sturgeon pulse volume for 2009 is 0.8 Maf. Measurement of sturgeon volumes excludes the 4 kcfs minimum flow releases from the dam. A request with specific flow levels and dates will be submitted to TMT prior to initiating an operation for sturgeon.

### **Libby Dam - April 10 and Refill Objectives**

Libby's April 10 objective was 2234.8 ft based upon the Corps' March Final WSF of 5,296 KAF. Libby Reservoir elevation on April 10 was 2402.8 ft. Libby did not reach the April 10 objective since the project was required to release minimum flows of 4,000 cfs. The project released minimum flows until the start of refill was declared on May 1. Once refill commenced, the project started passing inflow and will do so until inflows exceed the current VARQ flow of 13.4 kcfs. Since the project must provide sturgeon flows and is usually requested by SOR to maintain a flat flow (after the sturgeon flows) to reach 2,449 ft by the end of September, the project is often not able to refill to 2,459 ft. The volume to reach 2,449 ft is salmon flow augmentation water.

### ***Hungry Horse Dam***

#### **Water Supply Forecast and Minimum Flows**

The Bureau of Reclamation's March final WSF for April – August was 1,914 kaf (93% percent of normal). Minimum flow requirements from Hungry Horse and Columbia Falls are currently set at 900 cfs and 3,500 cfs, respectively. The March final forecast sets the minimum flow requirements from March through December.

#### **Hungry Horse April 10 and June 30 Refill Objectives**

The Bureau of Reclamation computes Hungry Horse's final April 10 elevation objective by linear interpolation between the March 31 and April 15 forecasted flood control elevations based on the March final WSF. Based on the March final WSF, the April 10 objective was elevation 3538.4 ft. The previous year's draft for summer flow augmentation, low winter stream flows, and required minimum discharges for the Columbia drafted Hungry Horse below the April 10 elevation objective. Hungry Horse Dam is expected to refill by approximately June 30. A late snowmelt runoff may delay refill to sometime after June 30 in order to avoid excessive spill at the project.

### ***Grand Coulee Dam***

#### **Grand Coulee April 10 and June 30 refill Objective**

The Bureau of Reclamation computes Grand Coulee's final April 10 elevation objective by linear interpolation between the March 31 and April 15 forecasted flood control elevations based on the March final WSF for The Dalles. Based on the March final WSF and the corresponding shifted flood control elevations, the April 10 objective was elevation 1281.9 ft. Grand Coulee hit the March 31 flood control elevation of 1281.6 ft. However in early April it became apparent that it would be difficult to maintain the Vernita Bar protection flows of 60 kcfs and also hit the April 10 elevation objective of 1281.9 ft. The issue was discussed at TMT and it was decided to maintain the Vernita Bar protection flows. It was estimated that maintaining the Vernita Bar flows may draft Grand Coulee about 1-2 ft below the 1281.9 ft April 10 objective. An additional complicating factor was the large increase in the RFC's Water Supply Forecast (WSF) from March to April at The Dalles. The April final forecast increased about 8 maf (9%) from the March final forecast resulting in Grand Coulee's April 30 flood control elevation dropping 24 ft to elevation 1257.7 ft (from March's forecast of 1281.7 ft). The April 15 flood control elevation decreased 9 ft from 1282 ft to 1273 ft. In order to achieve the new April 15 and April 30 flood

control elevations, Grand Coulee began drafting to the new flood control elevations starting on April 9. Grand Coulee's a maximum elevation on April 10 was 1280.4 ft. Calculation of an April 10 elevation based on the April forecast would have resulted in an elevation objective of 1275.9 ft. Grand Coulee is expected to refill to 1,290.0 ft by approximately June 30.

### **Grand Coulee Summer Draft Limit**

The Grand Coulee summer draft limit is set by the magnitude of the July final April – August WSF at The Dalles Dam. Based on the May final WSF at The Dalles, the summer draft limit for Grand Coulee is expected to be 1,278 ft. This draft limit will be modified if the Lake Roosevelt drawdown component of Washington's Columbia River Water Management Program (CRWMP) is implemented (WMP Section 4.6.6).

### **Dworshak Dam**

#### **Summer Draft for Temperature Control and Flow Augmentation**

A key operation at Dworshak Dam is to draft cold water from the Dworshak reservoir in July, August, and September to cool water temperatures and provide flow augmentation 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 making the decisions of when and how to draft Dworshak. The summer reservoir draft limit is 1,535 ft by the end of August. This limit determines the maximum draft available for summer flow augmentation from Dworshak. The Action Agencies will draft Dworshak to 1,520 ft in September. The extension of the draft limit from August 31 into September reflects requirements for about 200 kaf to be held for release as defined per the Snake River Basin Adjudication Agreement.

#### **Upper Snake River Flow Augmentation**

Based on current estimates (as of May 5, 2009), the Bureau of Reclamation is hopeful that a minimum of 449 kaf and up to 487 kaf of Upper Snake River flow augmentation will be provided in 2009.

### **Flood Control Operations**

Table 4.— Flood control elevations (ft) as of May 1, 2009.

Project	Date						
	Jan 31	Feb 28	Mar 15	Mar 31	Apr 10	Apr 15	Apr 30
MCDB	-	-	-	-	-	-	-
ARDB	1430.5	1423.2	-	1421.9	-	1414.6	1414.1
LIB (Var Q)	2426.2	2436.4	2441.1	2441.6	-	2434.2	2434.2
DCDB	1839.3	1812.5	1812.5	1818.9	-	1819.5	1819.5
HGH (Var Q)	3544.1	3537.5	-	3539.5	-	3530.8	3528.0
GCL	1290.0	1290.0	-	1283.3	-	1274.3	1257.7
BRN	2077.0	2058.1	-	2074.6	-	2050.9	2053.2
DWR	1528.5	1525.6	-	1532.9	-	1502.8	1525.4

## Dworshak/Grand Coulee flood control shift

Based on the March final forecast, Dworshak and Grand Coulee's end of March unshifted flood control elevations were 1532.9 ft and 1283.3 ft, respectively. Dworshak's actual end of March elevation was 1540.48 ft. This was 104.5 kaf above the project's end of March unshifted elevation. Grand Coulee's actual end of March elevation was 1281.35 ft. This was 150 kaf below the project's end of March unshifted elevation.

## Minimum Operating Pool (MOP)

All four Lower Snake River projects are scheduled to reach MOP elevations by April 3 (Table 5). The MOP elevation ranges will be adjusted as needed to meet authorized project purposes including navigation. At lower river flows (<40.0 kcfs) under current fish spill operations, the Little Goose reservoir MOP elevation may be adjusted as necessary to provide adequate depth over the entrance sill to the Lower Granite Dam navlock.

Table 5.— Snake River MOP elevations.

Project	Operation	Lower Range Elevation (ft)	Upper Range Elevation (ft)
Ice Harbor	MOP	437.0	438.0
Lower Monumental	MOP	537.0	538.0
Little Goose <sup>A</sup>	MOP	633.0	634.0
Lower Granite	MOP	733.0	734.0

A – To be adjusted as necessary to provide adequate depth over entrance sill at Lower Granite navlock.

At John Day, the forebay is being operated within a 1.5 ft range of the minimum level that provides irrigation pumping from April 10 to September 30. The initial range is 262.5 and 264.0 ft. The minimum level will be adjusted upward as necessary to facilitate irrigation pumping.

## Hanford Reach

The Vernita Bar protection level flow was set at a level of 60.0 kcfs based on the 2008 redd count. This year's Vernita Bar protection operation end date will be determined in coming months.

## 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. The latest spill priority list was issued November 5, 2008 as shown below. Involuntary spill will occur in the order shown. The priorities will be modified throughout 2009 during the spill season as needed based on spill operations, status of fish migration, spill/transport strategies, and research studies.

1. Lower Granite
2. Little Goose
3. Lower Monumental
4. Ice Harbor

5. Wells
6. Rocky Reach
7. Rock Island
8. Wanapum
9. Priest Rapids
10. McNary
11. John Day
12. Bonneville
13. Chief Joseph
14. Grand Coulee
15. Dworshak
16. The Dalles

## ***2009 Spill Operations***

Spring spill operations were finalized and included in Appendix E of the Fish Passage Plan available at: <http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/2009/>. Summer spill operations are still under development and will be posted at the same link once finalized.

## ***2009 Fish Passage Research***

### **Bonneville Dam**

1. BII Shallow Draft Behavioral Guidance Structure Evaluation (Year 2)
  - A ~700' long, 10' deep guidance boom has been installed in the forebay of BII to guide more fish to the BII corner collector.
  - Acoustic telemetry will be used to assess yearling Chinook, steelhead, and subyearling Chinook passage behavior and distribution at BII and compare results to past data.
2. BII FGE Improvements Evaluation
  - JBS fish condition, mortality, and OPE of PIT-tagged yearling and subyearling Chinook salmon under various turbine loading operations within the 1% range of peak efficiency.
3. Sea Lion Predation Observations
  - Continue observation and documentation of sea lion predation on spring Chinook, steelhead, lamprey and sturgeon in the tailrace of Bonneville Dam.
4. Adult Lamprey Passage Evaluation
  - Evaluation of Cascade Island Entrance modifications (includes tagging adult spring/summer chinook salmon)
  - Examine the effect of reducing nighttime ladder entrance flow on adult lamprey entrance and passage through BII fishways
  - Passage efficiency and time for tagged lamprey and spring/summer chinook through TDA and JDA

### **The Dalles Dam**

1. Hydroacoustic monitoring of kelt passage at the Ice and Trash Sluiceway through March.

## **John Day Dam**

1. Spillway Weirs (SWs) Evaluation (2<sup>nd</sup> year)
  - Two SWs are installed, one in bay 15 and one in bay 16. Each TSW passes approximately 10 kcfs.
  - Study to evaluate passage behavior and survival at 30% vs. 40% spill with the SWs operating. Yearling Chinook, steelhead, and subyearling Chinook passage will be evaluated using acoustic telemetry:
    - Forebay residence time (from ~2km upstream to passage)
    - 2-D and 3-D near-dam behavior
    - Dam passage survival (all available routes individually and combined)
    - Tailrace egress times

## **McNary Dam**

1. Spillway Weirs (SWs) Evaluation
  - SW in bays 4 and 20.
  - Spring acoustic telemetry passage and survival evaluation consists of a single 40% spill treatment to begin about April 20.
  - Summer acoustic telemetry passage and survival evaluation will examine two spill level treatments (40% vs. 60% spill) with a single spill pattern to begin ~mid-June.
2. Juvenile Lamprey separator study
  - Test of screen material to separate juvenile lampreys in JFF raceways.
3. Adult Pacific Lamprey passage study
  - Study subjects will be trapped in McNary fish ladder.
  - Passage evaluated with HD PIT tags and radio tags.

## **Ice Harbor Dam**

1. Project Passage and Survival Evaluation
  - 30% vs. 45kcfs/TDG cap spill.
  - Single-release project survival estimates using LMN study fish.
2. Avian Predation of Steelhead
  - Steelhead collected and tagged at JBS for release.
3. Adult Pacific Lamprey passage study
  - Study subjects will be trapped in McNary fish ladder.
  - Passage evaluated with HD PIT tags and radio tags.

## **Lower Monumental Dam**

1. Spillway Weir (SW) Evaluation
  - SW installed in Bay 8.
  - Spring two-treatment test to evaluate two spill patterns (Bulk vs. Uniform) at TDG cap spill.
  - Summer single treatment test to evaluate SW performance at 17 kcfs spill.
  - Vertical distribution of fish passing SW to be monitored with hydroacoustics.
2. Avian Predation of Steelhead
  - Steelhead collected and tagged at JBS for release.
3. Juvenile Lamprey separator study

- Test of screen material to separate juvenile lampreys in JFF raceways.
- Test subjects from McNary JFF, may be moved to Lower Monumental JFF.
- 4. Bull Trout PIT tag study.
  - Incidental Bull Trout in JFF will be PIT-tagged and released to the tailrace.

### **Little Goose Dam**

1. Post-construction evaluation of Spillway Weir (SW)
  - SW installed in spillbay 1.
  - Passage and survival of radio-tagged juvenile Chinook and steelhead
  - 30% spill spring and summer
  - TSW crest adjusted for summer operations.
2. Direct injury and survival of fish passing the SW.
  - Bays 1 (SW) and 8.
  - High and Low SW crest evaluated.
3. Bull Trout PIT tag study.
  - Incidental Bull Trout in JFF will be PIT-tagged and released to the tailrace.

### **Lower Granite Dam**

1. Transportation Seasonal Effects Evaluation
  - Weekly barging begins April 9 to determine an optimal transportation strategy.
2. Fall Chinook Transport study
  - Fish PIT-tagged and released upstream (hatcheries, naturally produced fish).
  - Compare SARs of transport and inriver groups of fish.
  - Includes “holdover” fall Chinook juveniles.
  - Take scale samples from returning adults to determine age at ocean entry.
3. Bull Trout PIT tag study.
  - Incidental Bull Trout in JFF will be PIT-tagged and released to the tailrace.