

*Spring / Summer Update to the 2007 Water
Management Plan*

FINAL - May 14, 2007

TABLE OF CONTENTS

Introduction.....	2
2. Water Supply Forecasts (WSF)	3
3. Seasonal Flow Objectives.....	3
Spring.....	3
Summer.....	4
Prospects for Meeting Flow Objectives.....	4
4. Storage Project Inflow, Volume Comparison and Augmentation Volume forecasts	4
Libby Dam	4
Bull trout flows	4
Sturgeon Pulse	4
Hungry Horse Dam.....	5
Water Supply Forecast and Minimum Flows	5
Grand Coulee Dam	5
Dworshak Dam	6
6. Upper Snake River Flow Augmentation.....	6
7. Flood Control Operations	6
Dworshak/Grand Coulee flood control shift.....	7
8. Minimum Operating Pool	9
9. Hanford Reach	9
10. Spill for Juvenile Fish Passage	9
11. Operation Considerations.....	9
12. Water Quality - Spill Priority List	10
Other Spill Operations	10
13. 2007 Spill Operations	11
14. 2007 Fish Passage Research	12
Lower Granite.....	14
Little Goose.....	14
Lower Monumental.....	14
Ice Harbor Dam.....	14
McNary Dam	16
John Day Dam.....	17
The Dalles Dam	17
Bonneville Dam	17
16. Latest ESP HYSSR Model Runs (April)	18
16. Latest ESP Inflow and Volume Graphs	20
Libby.....	Error! Bookmark not defined.
Hungry Horse.....	23
Hungry Horse.....	Error! Bookmark not defined.
Dworshak	25
Dworshak	Error! Bookmark not defined.
17. ESP Flow Augmentation Volumes	29
Dworshak	Error! Bookmark not defined.

Spring / Summer Update to the 2007 Water Management Plan

Introduction

The 2007 Spring/Summer update to the Water Management Plan (WMP) updates information on how the Action Agencies plan to operate 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. Planned operations in the *S/S 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 2007. The “April Final” water supply forecast is the most current forecast available when the final version of the *S/S Update* is completed.

The *S/S Update* also reports 2007 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 second powerhouse corner collector. 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 WMP but does provide 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, flow projections, and other new information.

2. Water Supply Forecasts (WSF)

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

Forecast Point	Forecast Period	Forecast Date	Value (MAF)	Percent Normal ^E
Lower Granite	April – July	April Final	15.1 ^A	70
Lower Granite	April - July	May Final	14.2	66
Lower Granite	April - July	June Final	^B	
The Dalles	April – August	April Final	85.2 ^A	92
The Dalles	April - August	May Final	84.2	90
Hungry Horse	April - August	March Final	2.02 ^B	97
Hungry Horse	April - August	May Final	1.67	81
Libby	April - August	May Final	7.0 ^{CD}	110
Dworshak	April – July	May Final	1.9 ^C	70

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

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

B – USBR Forecast. March final forecast is basis of seasonal minimum Hungry Horse and Columbia Falls flows

C – COE Forecast

D – Value that is 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

3. Seasonal Flow Objectives

Spring

The spring seasonal flow objectives for Lower Granite is established by 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 by 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 (not dependent on the water supply forecast). Based on the April final forecast the spring flow objectives are shown below.

Project	Spring Seasonal Flow Objective
Lower Granite	85 kcfs
McNary	237 kcfs
Priest Rapids	135 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 latest water supply forecast (May Final) the summer seasonal flow objectives are shown below. The McNary summer seasonal flow objective is always 200 kcfs and is not dependent on the water supply forecast.

Project	Summer Seasonal Flow Objective
Lower Granite	50.0 kcfs
McNary	200 kcfs

Prospects for Meeting Flow Objectives

An analysis of the likelihood of meeting the flow objectives was conducted by using the Northwest River Forecast Center Ensemble Streamflow Prediction (ESP) inflows in the Corps Hydro System Seasonal Regulation Program (HYSSR) model. This model uses the current basin conditions combined with 44 historical weather patterns (temperature and precipitation) to produce 44 ESP hydrographs for 2007. 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 shape of the runoff. The likelihood of meeting the 2007 spring/summer flow objectives, based on Hydro System Seasonal Regulation Program (HYSRR) outflows based on the latest ESP inflows are shown in Section 13 of this document.

4. Storage Project Inflow, Volume Comparison and Augmentation Volume forecasts

See Sections 15 and 16 for latest inflow graphs and volume comparison charts for the storage projects. Section 17 shows augmentation volumes based on the latest ESP.

5. Storage Project Operations

Libby Dam

Bull trout flows

Bull trout minimum flows are specified in the 2006 Libby Sturgeon Biological Opinion. Per the BiOP, the project will initiate bull trout flows of at least 6 kcfs on May 15 and maintain these minimum flow criteria until the sturgeon pulse begins. After the sturgeon pulse, through August, the bull trout minimum (based on the May forecast for the April through August forecast) will be 9 kcfs in 2007. For the month of September the bull trout minimum flow will return to 6 kcfs.

Sturgeon Pulse

Per the 2006 Libby Sturgeon Biological Opinion, the sturgeon pulse volume is determined from a tiered flow structure based upon the COE May Final WSF for the period of April-August. This year the sturgeon pulse volume 1.17 MAF. Measurement of sturgeon volumes excludes the 4 kcfs minimum flow releases from the dam.

A request with specific flow and date recommendations will be submitted to TMT prior to initiating a flow operation for sturgeon.

Hungry Horse Dam

Water Supply Forecast and Minimum Flows

The March final Bureau of Reclamation WSF for April – August was 2016 kaf, 97 percent of normal. Minimum flow requirements from Hungry Horse and Columbia Falls from March through December are based on the March final forecast. This year the minimum flow requirements were set at 900 cfs and 3500 cfs, respectively.

Hungry Horse April 10 and June 30 Refill Objectives

The Bureau of Reclamation computes Hungry Horse's April 10 elevation objective by linear interpolation between the March 31 and April 15 forecasted flood control elevations based on the March final water supply forecast (WSF). Based on the March final (WSF), the April 10 objective was elevation 3533.4 feet. The project was at elevation 3534.7 on April 10. 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.

Grand Coulee Dam

Grand Coulee April 10 and June 30 refill Objective

The Bureau of Reclamation computes Grand Coulee's April 10 elevation objective by linear interpolation between the March 31 and April 15 forecasted flood control elevations based on the March final water supply forecast (WSF). Based on the March final (WSF) and the corresponding shifted flood control elevations the April 10 objective was elevation 1259.2 feet. The project was at elevation 1259.6 feet on April 10. Grand Coulee is expected to refill to 1290 feet 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 forecast at The Dalles, the summer draft limit for Grand Coulee is expected to be 1278 feet.

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 the making the decisions of when and how to draft Dworshak. The summer reservoir draft limit is 1,520 feet. This limit determines the maximum draft available for summer flow augmentation from Dworshak. The Action Agencies will draft Dworshak to 1520 feet 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.

6. Upper Snake River Flow Augmentation

The Bureau of Reclamation currently estimates that 427 kaf of Upper Snake River flow augmentation will be provided in 2007. Because of the low water supply forecast, this is 60 kaf less than the goal of the Snake River Basin Adjudication Agreement.

7. Flood Control Operations

The 31 March, 15 April and 30 April flood control elevations based on the April final forecasts are shown in the following table. The 31 January – 31 March flood control elevations were based on previous forecasts.

Here is a comparison of the forecast changes between the March final and April final forecasts:

March forecast

Project	Period	Volume (maf)	% Normal
The Dalles *	Apr – Aug	88.3	95
Lower Granite *	Apr – Jul	17.3	80
Libby**	Apr – Aug	6.5	103
Dworshak **	Apr – Jul	2.2	82
Grand Coulee *	Jan – Ju	63.0	100
Hungry Horse***	May - Sep	1.8	97

April forecast

Project	Period	Volume (maf)	% Normal
The Dalles *	Apr – Aug	85.2	92
Lower Granite *	Apr – Jul	15.1	70
Libby**	Apr – Aug	6.8	108
Dworshak **	Apr – Jul	2.0	74
Grand Coulee *	Jan – Ju	65.9	105

Hungry Horse***	May - Sep	1.5	82
-----------------	-----------	-----	----

* Prepared by National Weather Service

** Prepared by Corps of Engineers

*** Prepared by Bureau of Reclamation

Forecasts for all projects except Libby and Grand Coulee decreased from March to April. As a result, the end of April flood control elevation for Libby went down (forecast went up) from 2395.5 ft to 2378.8 ft.

The end of April flood control elevation for Dworshak went up (forecast went down) from 1555.5 ft (based on system storage reservation diagram) to 1574.8 ft (flood control refill curve (FCRC) based on actual inflows to date and forecasted). The Dworshak end of April, May and June target elevations are recalculated weekly as runoff occurs and may change as the project transitions from the flood control to the refill mode. The flood control requirement for Dworshak is the greater of the flood control draft requirement from the local and system storage reservation diagrams. If the FCRC has a smaller draft requirement, then the FCRC controls the draft required; but after April 1, if the snow covered area (SCA) analyses requires a greater draft than the FCRC, then the SCA controls the draft requirement. The FCRC will be calculated weekly and the SCA will be monitored weekly.

Project	31-Jan	28-Feb	15-Mar	31-Mar	15-Apr	30-Apr
ARDB	1430.5	1422.9		1414.1	1414.1	1414.1
LIB	2393.7	2396.0	2395.5	2395.5	2378.7	2378.7
DCDB	1839.3	1812.5 A		1807.7	1807.7	1807.7
HGH	3543.9	3539.5		3535.1	3548.5	3548.4
GCL	1290.0	1290.0		1273.5	1266.7	1249.4
GCL-shifted	--	--		1272.5	1265.7	
BRN	2077.0	2057.9		2060.3B.	2069.1	2071.6
BRN-shifted	--	--		2077.0	2077	
DWR	1531.4	1550.4		1555.4	1572.6	1574.8
DWR-shifted	--	--		1560.3	1577.2	

Dworshak/Grand Coulee flood control shift

The Grand Coulee shift is based only on the Dworshak shift with no shift from Brownlee as Idaho Power Company (Brownlee owner) did not request shift. On 31 March, 73 kaf of flood control space was shifted from Dworshak to Grand Coulee.

Brownlee Flood Control Deviation

Idaho Power Company requested a deviation from their normal flood control rule curve the end of March, the middle of April and the end of April. The Corps approved a partial deviation of the requested amount for the end of March flood control elevation from 2057.4 feet to 2060.3 feet. The operation facilitated refill and meeting minimum flows.

8. Minimum Operating Pool

At the March 28 TMT meeting the Salmon Managers requested the AA stagger the Lower Snake projects draft to minimum operating pool (MOP) from top to bottom if possible and be completed by April, the start of fish spill date. All four projects reached their (MOP elevations prior to April 3. The table below describes the reservoir elevation ranges under MOP operations in 2007. Elevation ranges will be adjusted if needed to meet authorized project purposes including navigation. Below the table is a description of how the lower Snake River elevation levels were adjusted to reach MOP operational levels.

Project	Operation	Lower Range Elevation (ft)	Upper Range Elevation (ft)
Ice Harbor	MOP	437	438
Lower Monumental	MOP	537	538
Little Goose	MOP	633	634
Lower Granite	MOP	733	734

At John Day, the forebay is being operated within a 1.5-foot range of the minimum level that provides irrigation pumping from 10 April to 30 September. The initial range is 262.5 and 264.0 feet. The minimum level will be adjusted upward if needed to facilitate irrigation pumping. Actual John Day operations 262.5' – 264' range started 10 April 2007.

9. Hanford Reach

The Vernita Bar protection level flow was set at a level of 70 kcfs based on the 19 and 26 November 2006 redd count. This year's Vernita Bar protection operation ended on April 3 when the water over the eggs accumulated 1000 (C degrees) thermal units after the initiation of spawning. Starting at 0001 hours on April 4, Priest Rapids Dam began operating to maintain protective flow bands. See Appendix C for the Hanford Reach Agreement.

10. Spill for Juvenile Fish Passage

Implementation of the Spill for Juvenile Fish Passage is described in the 2007 Fish Operations Plan. This regionally coordinated plan was finalized on March 30, 2007. The Fish Operations Plan is an appendix to the 2007 Water Management Plan and the 2007 Fish Passage Plan.

11. Operation Considerations

Ice Harbor Dam: minimum generation may need to vary during spring and summer fish spill season due to a transformer failure at BPA's Sacajawea transmission facility near the project. Mobile capacitor banks have been installed at BPA's Franklin substation with the intent of alleviating the need for more than one unit of generation during periods of low flow..

12. 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 initial spill priority list for the fish spill season was issued 3 April as shown below. Involuntary spill will occur in the order shown. The priorities will be modified as needed based on status of fish migration, spill/transport strategies, and studies, and other factors.

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

Other Spill Operations

Until construction of the spill deflectors at Chief Joseph Dam has been completed and operating in spring of 2009, spill swapping between Chief Joseph Dam and Grand Coulee Dam will not be implemented if the spill deflector contractor is working downstream of Chief Joseph Dam.

13. 2007 Spill Operations

Season/Project	2007 Agreement Spill Levels	2007 Operational Spill Levels	Comments
Spring			
Lower Granite	20 kcfs day/night	20.4 kcfs	Will fluctuate due to project head changes
Little Goose	30% day/night	30% +/- 1% hourly	Target* 30% as a day average
Lower Monumental	27 kcfs day/night (Gas Cap)	spill cap day/night	Meet spill cap daily
Ice Harbor	30% day/night vs. 45 kcfs day / Gas Cap night	30% +/- 1% hourly; 45.6 kcfs day / spill cap night	Target 30% as a day average; 45.6 kcfs will fluctuate due to head changes; meet nightly spill cap
McNary	40% day/night	40% +/- 1% hourly	Target 40% as a day average
John Day	0 day / 60% night	60% +/- 1% hourly	Target 60% as a nightly average
The Dalles	40% day/night	40% +/- 1% hourly	Target 40% as a day average
Bonneville	100 kcfs day/night	100 kcfs	Will fluctuate due to head changes
Summer			
Lower Granite	18 kcfs day/night	18.6 kcfs	Will fluctuate due to head changes
Little Goose	30% day/night	30% +/- 1% hourly	Target 30% as a day average
Lower Monumental	17 kcfs day/night	17.1 kcfs	Will fluctuate due to head changes
Ice Harbor	30% day/night vs. 45 kcfs day / Gas Cap night	30% +/- 1% hourly; 45.6 kcfs day / spill cap night	Target 30% as a day average; 45.6 kcfs will fluctuate due to head changes; meet nightly spill cap
McNary	40% day/night vs. 60% day/night	40% +/- 1% hourly; 60% +/- 1% hourly	Target 40% or 60% as a day average
John Day	30% day/night	30% +/- 1% hourly	Target 30% as a day average
The Dalles	40% day/night	40% +/- 1% hourly	Target 40% as a day average
Bonneville	75 kcfs day / 120 kcfs night	74.6 kcfs day / spill cap night **	74.6 kcfs will fluctuate due to head changes; meet nightly spill cap

* Target: Make best effort to meet a specified spill level through frequent monitoring, projections, and spill adjustments within the defined range of variation. This will occur for each project through analysis and coordination between the Corps and BPA.

** The Bonneville Dam summer daytime spill discharge rate may increase from 75 kcfs to 81 – 83 kcfs, summer nighttime spill may be reduced from the spill cap to a specified level (not yet defined), and the start date of summer spill may be moved from July 1 to June 21. These changes are being regionally coordinated through FPOM, FFDRWG, and TMT.

14. 2007 Fish Passage Research

Summaries of 2007 fish passage research studies that have the potential to change project operations are described below.

Project	2007 Snake River Research Summary Table		
	Research Objectives	Spring Spill Plan 3 April – 20 June	Summer Spill Plan 21 June – 31 August
Lower Granite	Examine RSW performance	No test planned, operate Spill 20 kcfs w/ 6 kcfs through RSW and 14 kcfs from training spill	<u>20 June – 21 July</u> 18 kcfs spill 24/7 with RSW operating 24/7. Evaluate 2 spill patterns to test RSW performance on the survival of subyearling fall Chinook.
Little Goose	Examine route specific survival estimates, approach paths, passage distribution, forebay residence time, and tailrace egress under a tapered bulk spill pattern	<u>15 April – 30 May</u> 30% spill 24 hrs/day tapered bulk spill pattern in FPP LGS-10	<u>30 June -31 July</u> 30% spill 24 hrs/day Continue with tapered bulk spill evaluation .
Lower Monumental	Radio telemetry study examining spring bulk spill assuming a RSW For flows less than 120 kcfs using a single treatment test. Summer study will monitor fall Chinook movement w/ RT. Also, an acoustic telemetry study to characterize the relationship between fish movements, mortality and hydrodynamic conditions in the reservoir. Studies are to gather	<u>25 April – 30 May</u> Spill to the spill cap (approximately 27 kcfs) 24 hours/day Two spill patterns will be used. Bulk (high gate opening) for flows less than 120 kcfs simulating a RSW and a uniform pattern for flows over 120 kcfs. Both patterns are in the FPP, LMN-9 and LMN-10.	<u>21 June – 31 August</u> Spill to the spill cap (approximately 17 kcfs) 24 hours/day Continue RT and AT study to assist with a RSW post construction survival evaluation in 2008 using LMN-9..

	baseline data for post RSW study comparisons.		
Ice Harbor	Determine the passage rates and survival of fish during two operations of 30% spill 24 hr/day and 45 kcfs day/spill cap night using spill patterns IHR-9 and IHR-10 in the FPP.	<u>20 April – 10 June</u> Test 30% spill 24 hrs/day versus 45 kcfs day/spill cap night w/ RSW operating using random block design. Both treatments will have RSW operating 24/7.	<u>11 June – 10 July</u> Continue summer test comparing two operations using same spill patterns.
McNary	Estimate passage and survival of yearling Chinook and juvenile steelhead under two treatments of project operations. Characterize juvenile salmon behavior in the forebay of MCN under two treatments of project operations. Once research is completed return to pattern MCN-6 in FPP. Nighttime hours are 1800 to 0600 hrs.	<u>26 April – 30 June</u> 40% spill 24 hrs/day for Prototype Temporary Spillway Weir (TSW) testing using two spill configurations. Test spill pattern is under development.	<u>20 June – 22 July</u> 40% spill versus 60% spill 24 hrs/day in 2-day blocks to evaluate the performance of TSW's. Test spill pattern is under development.
John Day	Planning for a 2008 TSW test at JDA is underway which may lead to a 24-hour spring spill.	<u>10 April – 30 June</u> 0 spill day and 60% spill night (1800-0600 until May 15, then 1900-0600) No special operation for research during spring planned.	<u>20 June – 20 July</u> 30% spill 24 hrs/day No special operation for research during summer planned.
The Dalles	Use DIDSON acoustic camera and ACDP to evaluate smolt response to hydrodynamic	<u>10 April – 30 June</u> 40% spill 24 hrs/day	<u>7 June – 20 July</u> 40% spill 24 hrs/day

	conditions upstream of ITS.	No special operation for research during spring planned.	No special operation for research during summer planned.
Bonneville	Estimate total survival of yearling Chinook passing through the dam and spillway. Focus on new spill patterns to improve survival.	<u>26 April – 7 June</u> 100 kcfs spill 24 hrs/day using new spill pattern in FOP appendix A, for flows over 100 kcfs, use BON-15 in FPP. Fish passage spill patterns exceeding 92 kcfs will follow FPP, see FPIP for new patterns below 92 kcfs.	<u>20 June – 31 August</u> New spill volume and pattern under development by NWP.

Lower Granite

There will be no specific spill variations for testing in the spring. Normal spill pattern and rates as described in the 2007 FPP will be used. The RSW spill pattern may be modified to conduct a summer test of RSW performance and will be coordinated through the SRWG.

Little Goose

A spring study between 18 April and 25 May will examine route specific survival estimates, approach paths, passage distribution, forebay residence time, and tailrace egress. Spill during this time will be 30 percent of total outflow 24 hours/day using a new tapered bulk spill pattern. A similar study will be performed during the summer between 30 June and 31 July. The 2007 Agreement also provides for 14 days of night gas cap spill within the last week of April and second week of May (4/22 - 5/15). The dates of actual nighttime spill will be determined by the salmon managers.

Lower Monumental

A spill study will occur between 25 April and 30 May. Two spill patterns will be used depending on total river flow. A bulk spill pattern will be evaluated at river flows less than 120 kcfs simulating an RSW operation. For river flow in excess of 120 kcfs, a uniform spill pattern will be used.

Ice Harbor Dam

Spring and summer RSW tests are planned. The testing will involve alternating between 30 % spill for 24 hours/day and 45 kcfs day/ spill cap at night. The research schedule follows:

Date	Block #	Treatment
30-Apr	1	Gas Cap
1-May	1	Gas Cap
2-May	1	30%
3-May	1	30%
4-May	2	Gas Cap
5-May	2	Gas Cap
6-May	2	30%
7-May	2	30%
8-May	3	Gas Cap
9-May	3	Gas Cap
10-May	3	30%
11-May	3	30%
12-May	4	30%
13-May	4	30%
14-May	4	Gas Cap
15-May	4	Gas Cap
16-May	5	30%
17-May	5	30%
18-May	5	Gas Cap
19-May	5	Gas Cap
20-May	6	Gas Cap
21-May	6	Gas Cap
22-May	6	30%
23-May	6	30%
24-May	7	Gas Cap
25-May	7	Gas Cap
26-May	7	30%
27-May	7	30%
28-May	8	30%
29-May	8	30%
30-May	8	Gas Cap
31-May	8	Gas Cap
1-Jun	9	Gas Cap
2-Jun	9	Gas Cap
3-Jun	9	30%
4-Jun	9	30%
5-Jun	10	Gas Cap
6-Jun	10	Gas Cap
7-Jun	10	30%
8-Jun	10	30%
9-Jun	11	30%
10-Jun	11	30%

Date	Block #	Treatment
11-Jun	11	Gas Cap
12-Jun	11	Gas Cap
13-Jun	12	30%
14-Jun	12	30%
15-Jun	12	Gas Cap
16-Jun	12	Gas Cap
17-Jun	13	Gas Cap
18-Jun	13	Gas Cap
19-Jun	13	30%
20-Jun	13	30%
21-Jun	14	Gas Cap
22-Jun	14	Gas Cap
23-Jun	14	30%
24-Jun	14	30%
25-Jun	15	30%
26-Jun	15	30%
27-Jun	15	Gas Cap
28-Jun	15	Gas Cap
29-Jun	16	30%
30-Jun	16	30%
1-Jul	16	Gas Cap
2-Jul	16	Gas Cap
3-Jul	17	Gas Cap
4-Jul	17	Gas Cap
5-Jul	17	30%
6-Jul	17	30%
7-Jul	18	30%
8-Jul	18	30%
9-Jul	18	Gas Cap
10-Jul	18	Gas Cap
11-Jul	19	30%
12-Jul	19	30%
13-Jul	19	Gas Cap
14-Jul	19	Gas Cap
15-Jul	20	30%
16-Jul	20	30%
17-Jul	20	Gas Cap
18-Jul	20	Gas Cap
19-Jul	21	Gas Cap
20-Jul	21	Gas Cap
21-Jul	21	30%
22-Jul	21	30%

McNary Dam

A spring spill study will occur between 16 April and 10 June to examine passage, survival rates, and behavior under two treatments of project operations. Two different spill patterns will be used using a 2 day treatment within 4-day block design (see below). A summer spill study is tentatively scheduled to occur between 20 June and 22 July to examine passage, survival rates, and behavior under two treatments of project operations. Spill will alternate between 40 percent spill for 24 hours/day and 60 percent spill for 24 hours per day. A test schedule was not available at the time this document was finalized.

BLOCK	DATE	START TIME	TREATMENT (PATTERN)
1	16-APR	0600 HRS	B (TABLE MCN-8)
1	17-APR	0600 HRS	B (TABLE MCN-8)
1	18-APR	0600 HRS	A (TABLE MCN-7)
1	19-APR	0600 HRS	A (TABLE MCN-7)
2	20-APR	0600 HRS	A (TABLE MCN-7)
2	21-APR	0600 HRS	A (TABLE MCN-7)
2	22-APR	0600 HRS	B (TABLE MCN-8)
2	23-APR	0600 HRS	B (TABLE MCN-8)
3	24-APR	0600 HRS	A (TABLE MCN-7)
3	25-APR	0600 HRS	A (TABLE MCN-7)
3	26-APR	0600 HRS	B (TABLE MCN-8)
3	27-APR	0600 HRS	B (TABLE MCN-8)
4	28-APR	0600 HRS	A (TABLE MCN-7)
4	29-APR	0600 HRS	A (TABLE MCN-7)
4	30-APR	0600 HRS	B (TABLE MCN-8)
4	1-MAY	0600 HRS	B (TABLE MCN-8)
5	2-MAY	0600 HRS	A (TABLE MCN-7)
5	3-MAY	0600 HRS	A (TABLE MCN-7)
5	4-MAY	0600 HRS	B (TABLE MCN-8)
5	5-MAY	0600 HRS	B (TABLE MCN-8)
6	6-MAY	0600 HRS	A (TABLE MCN-7)
6	7-MAY	0600 HRS	A (TABLE MCN-7)
6	8-MAY	0600 HRS	B (TABLE MCN-8)
6	9-MAY	0600 HRS	B (TABLE MCN-8)
7	10-MAY	0600 HRS	A (TABLE MCN-7)
7	11-MAY	0600 HRS	A (TABLE MCN-7)
7	12-MAY	0600 HRS	B (TABLE MCN-8)
7	13-MAY	0600 HRS	B (TABLE MCN-8)
8	14-MAY	0600 HRS	A (TABLE MCN-7)
8	15-MAY	0600 HRS	A (TABLE MCN-7)
8	17-MAY	0600 HRS	B (TABLE MCN-8)
9	18-MAY	0600 HRS	A (TABLE MCN-7)
9	19-MAY	0600 HRS	A (TABLE MCN-7)
9	20-MAY	0600 HRS	B (TABLE MCN-8)
9	21-MAY	0600 HRS	B (TABLE MCN-8)

10	22-MAY	0600 HRS	A (TABLE MCN-7)
10	23-MAY	0600 HRS	A (TABLE MCN-7)
10	24-MAY	0600 HRS	B (TABLE MCN-8)
10	25-MAY	0600 HRS	B (TABLE MCN-8)
11	26-MAY	0600 HRS	A (TABLE MCN-7)
11	27-MAY	0600 HRS	A (TABLE MCN-7)
11	28-MAY	0600 HRS	B (TABLE MCN-8)
11	29-MAY	0600 HRS	B (TABLE MCN-8)
12	30-MAY	0600 HRS	A (TABLE MCN-7)
12	31-MAY	0600 HRS	A (TABLE MCN-7)
12	1-JUN	0600 HRS	B (TABLE MCN-8)
12	2-JUN	0600 HRS	B (TABLE MCN-8)
13	3-JUN	0600 HRS	A (TABLE MCN-7)
13	4-JUN	0600 HRS	A (TABLE MCN-7)
13	5-JUN	0600 HRS	B (TABLE MCN-8)
13	6-JUN	0600 HRS	B (TABLE MCN-8)
14	7-JUN	0600 HRS	A (TABLE MCN-7)
14	8-JUN	0600 HRS	A (TABLE MCN-7)
14	9-JUN	0600 HRS	B (TABLE MCN-8)
14	10-JUN	0600 HRS	B (TABLE MCN-8)

John Day Dam

No research is planned for 2007.

The Dalles Dam

An evaluation of smolt response to hydrodynamic conditions upstream of the ice and trash sluiceway will occur in 2007. The DIDSON camera and Acoustic Doppler current profiler will be used to collect field data under normal operating conditions as stated in the FPP.

Bonneville Dam

Estimate total survival of yearling Chinook passing through the dam and spillway. Focus will be on the new patterns developed to improve project survival.

16. Latest ESP HYSSR Model Runs (May)

Summary of 30 Apr 2007 ESP HYSSR Model Runs

14-May-07

Assumptions:

- * Streamflows are from the 30 Apr ESP run, which uses current basin conditions combined with 44 historical weather patterns (temperatures and precipitation) to produce 44 ESP hydrographs for 2007.
- * Grand Coulee operates for a controlled refill while attempting to meet 135,000 cfs at Priest Rapids in May and targeting elevation 1289 ft by June 30. Summer lake targets are 1285.0 ft in July and 1280 ft in August.
- * Hungry Horse operates in May for a controlled refill by 30 June and meets minimum project outflow of 900 cfs and minimum flow of 3,500 cfs at Columbia Falls. The project drafts to 3540 ft by 31 Aug.
- * Brownlee refills in June (2077 ft) and drafts in July and August to provide 237 kaf Upper Snake flow augmentation water.
- * Dworshak targets 1595 in May, targeting full in June and drafting to 1535 ft and 1520 ft by 31 Aug and 30 Sep respectively.
- * Libby operates to VARQ flows in May. The project also meets minimum bull trout flows and the sturgeon pulse volume, both of which are appropriate for each ESP year. After the sturgeon pulse, Libby releases a flat flow and targets 2439 ft by 31 Aug.

Results:

Priest Rapids Meets the Following Flow Objectives:

Month	Occurrences out of 44 Years	Average Flow for 44 Years (kcfs)	Flow Objective (kcfs)
May	44	151	135
Jun	44	186	135

Lower Granite Meets the Following Flow Objectives:

Month	Occurrences out of 44 Years	Average Flow for 44 Years (kcfs)	Flow Objective (kcfs)
May	13	82	85
Jun	10	66	73
Jul	0	38	50
Aug 15	0	26	50
Aug 31	0	30	50

McNary Meets the Following Flow Objectives:

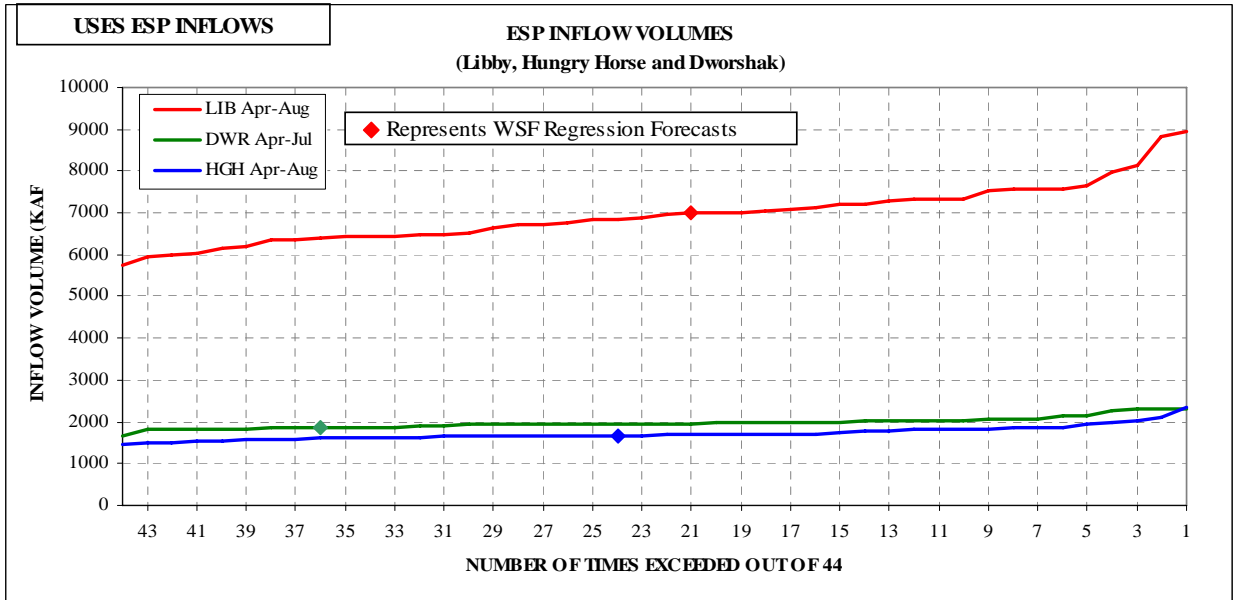
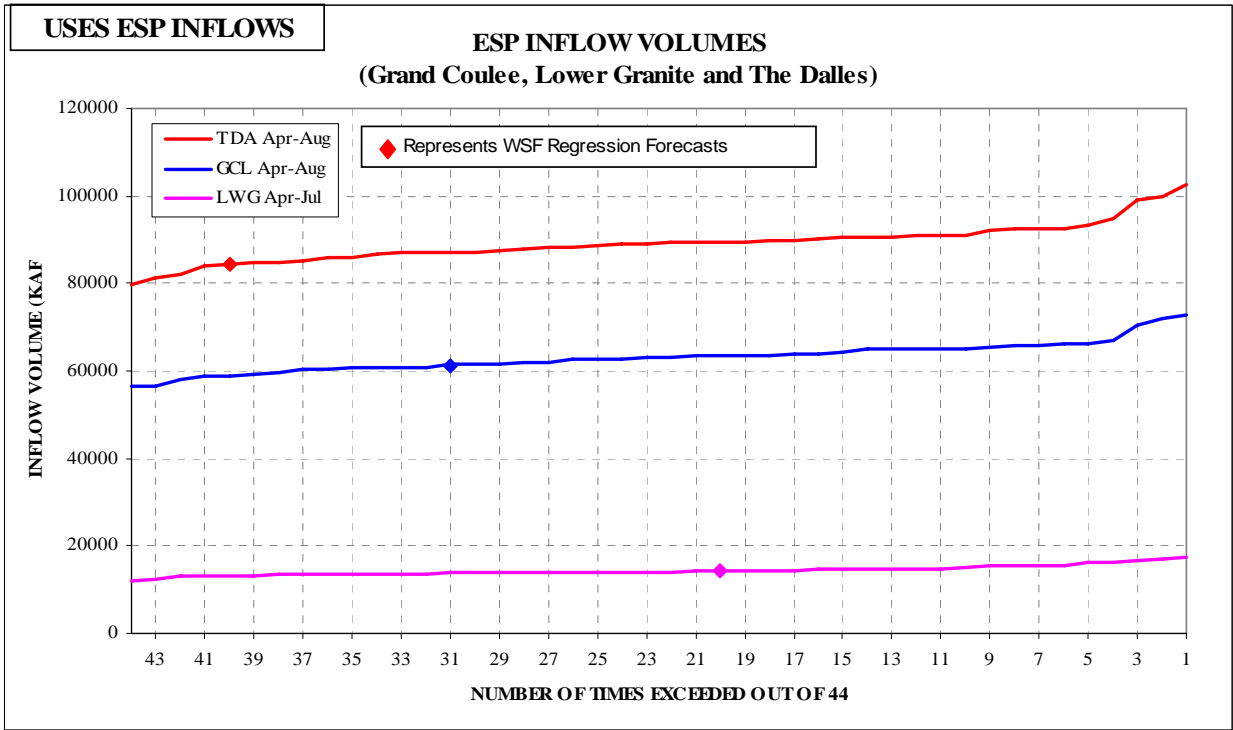
Month	Occurrences out of 44 Years	Average Flow for 44 Years (kcfs)	Flow Objective (kcfs)
May	17	235	237
Jun	33	259	237
Jul	42	240	200
Aug 15	7	176	200
Aug 31	1	158	200

Projects Refill to within 1 foot of full by 30 June:

Month	Occurrences out of 44 Years	Average Elevation on 30 Jun for 44 Years
Libby	0	2437
Hungry Horse	44	3560
Grand Coulee	44	1289
Dworshak	44	1600

Period Average Flows (kcfs):

	OBS FEB 1-28	OBS MAR 1-31	OBS APR 1-30	FCST MAY 1-31	FCST JUN 1-30	FCST JUL 1-31	FCST AUG 1-15	FCST AUG 16-31	FCST SEP 1-30
LIB	5.5	5.1	16.2	16.5	22.8	16.1	16.0	16.0	6.0
HGH	2.3	2.5	4.0	5.8	5.0	6.4	4.9	4.5	1.6
GCL	83	114	142	120	144	179	137	119	90
PRD	94	134	168	151	186	196	145	125	94
DWR	2.2	4.2	6.2	7.5	5.7	9.1	9.1	13.3	4.6
BRN	15	16	10	15	14	13	10	10	10
LWG	30	44	47	82	66	38	26	30	22
MCN	128	185	226	235	259	240	176	158	117
TDA	136	192	220	243	268	243	179	161	121
BON	149	210	237	248	272	246	181	163	123



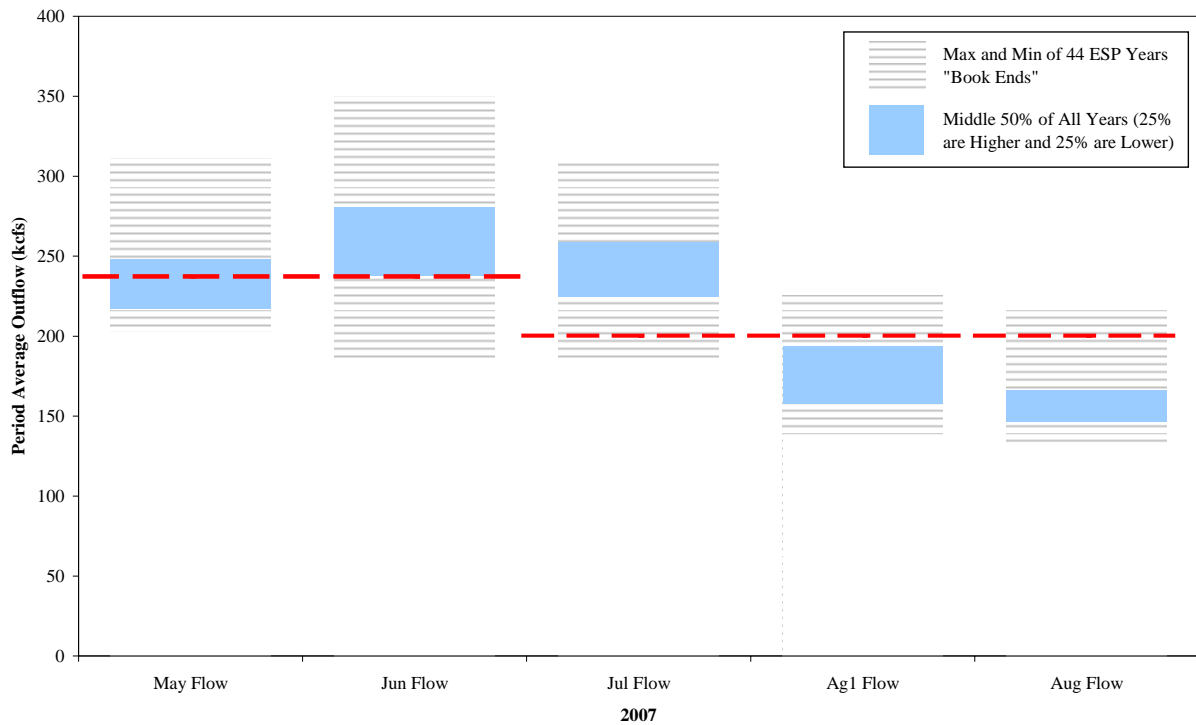
Volume Comparison Table (ESP versus Regression) - May Final:

Forecast Period	Official WSF (Regression)			ESP Volumes				
	Volume (kaf)	Percent of Average	30 year Average (kaf)	10% Exceedance Probability	30% Exceedance Probability	50% Exceedance Probability	70% Exceedance Probability	90% Exceedance Probability
Grand Coulee	61000	101%	60290	66300	64900	63100	61400	59000
Lower Granite	14200	66%	21550	16000	14600	14000	13800	13100
The Dalles	84200	90%	93090	93000	90600	89200	87000	84500
Hungry Horse *	1673	81%	2070	1910	1760	1680	1650	1560
Libby **	6990	112%	6248	7560	7200	6880	6480	6170
Dworshak **	1868	71%	2645	2120	2000	1950	1900	1830

* USBR Official Forecast (May Final)
 ** Corps Official Forecast (May Final)

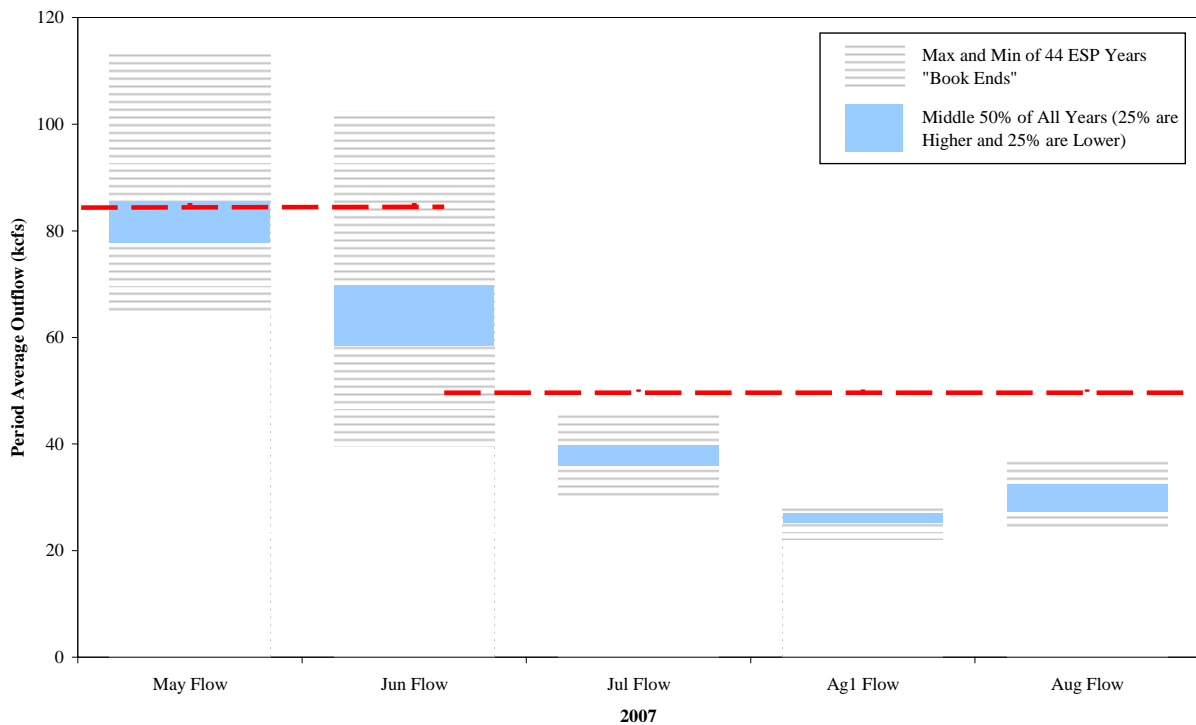
USES ESP INFLOWS

**MCNARY ESP HYSSR RESULTS
MONTHLY OUTFLOW PROJECTIONS**



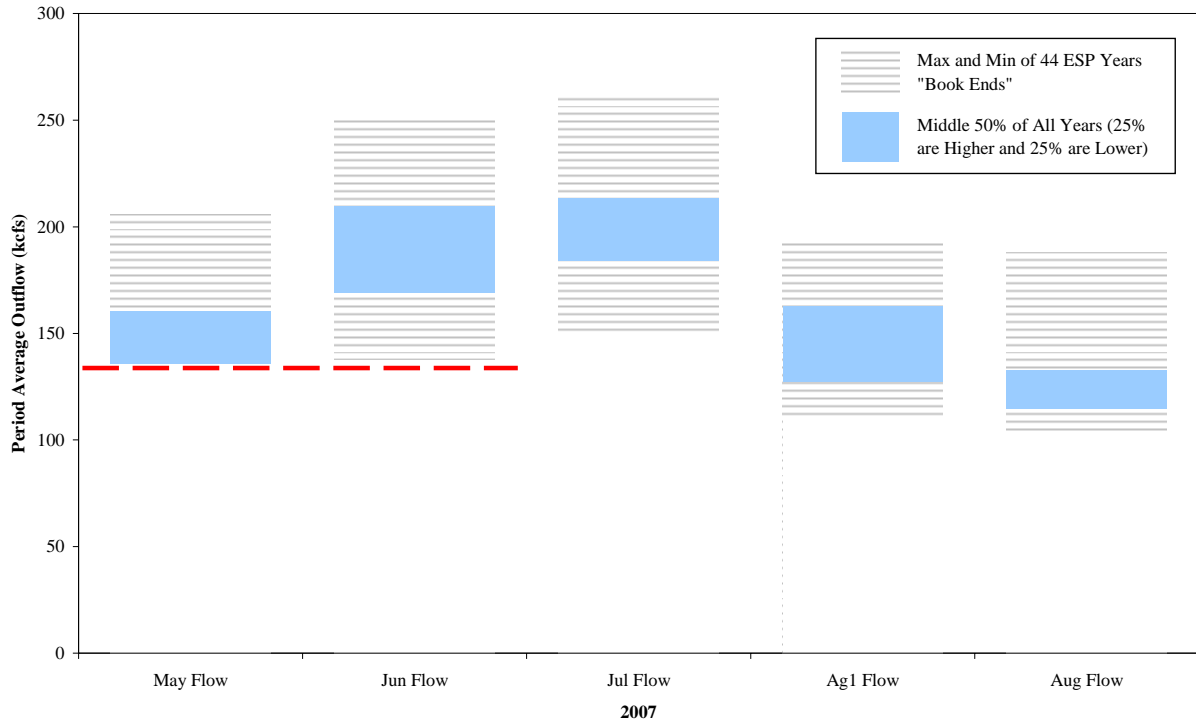
USES ESP INFLOWS

**LOWER GRANITE ESP HYSSR RESULTS
MONTHLY OUTFLOW PROJECTIONS**

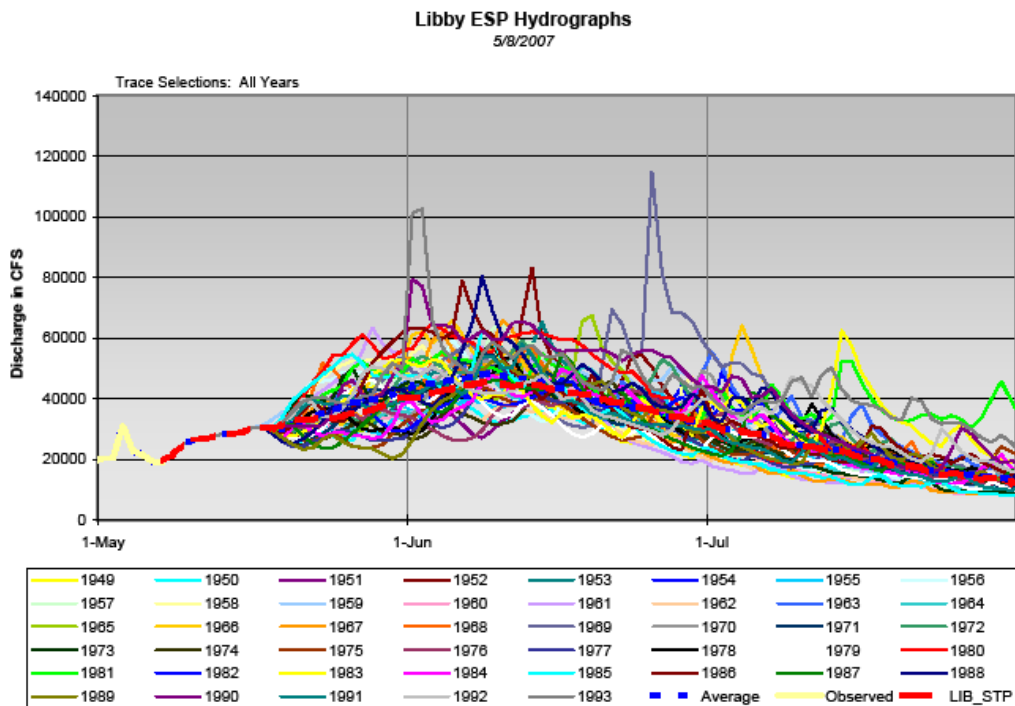
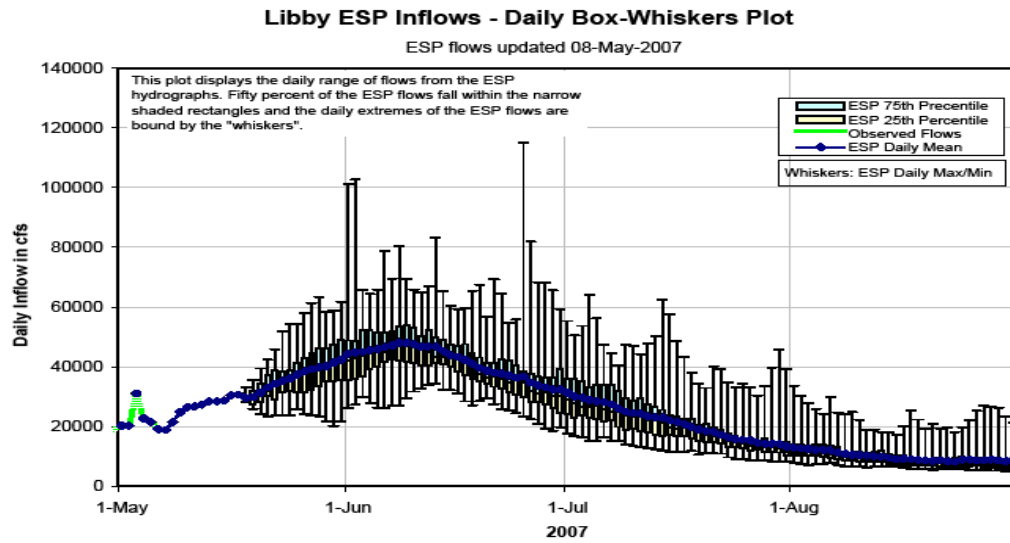


USES ESP INFLOWS

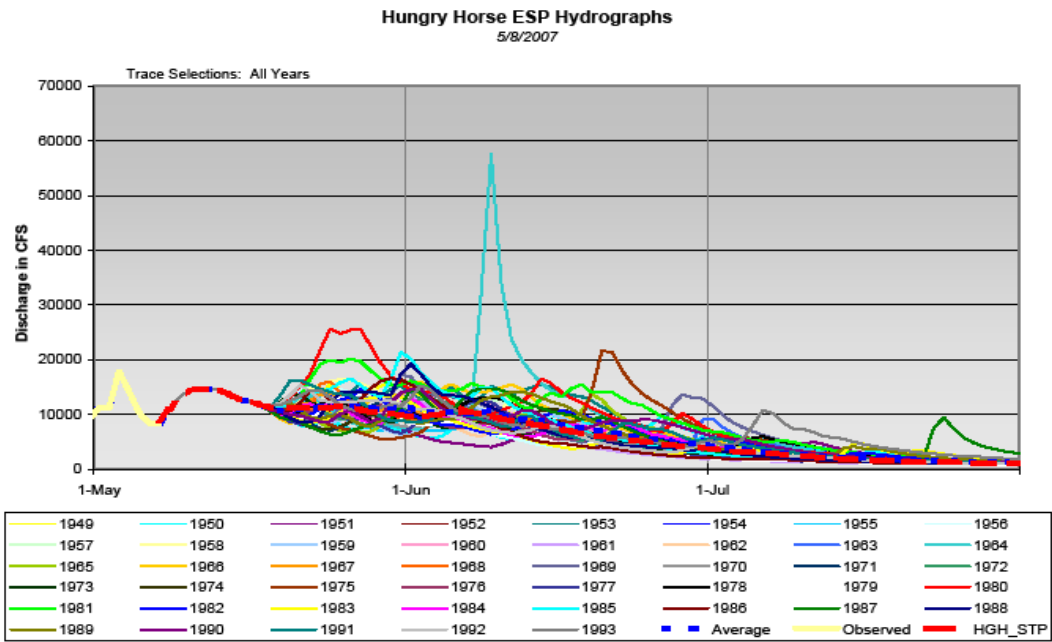
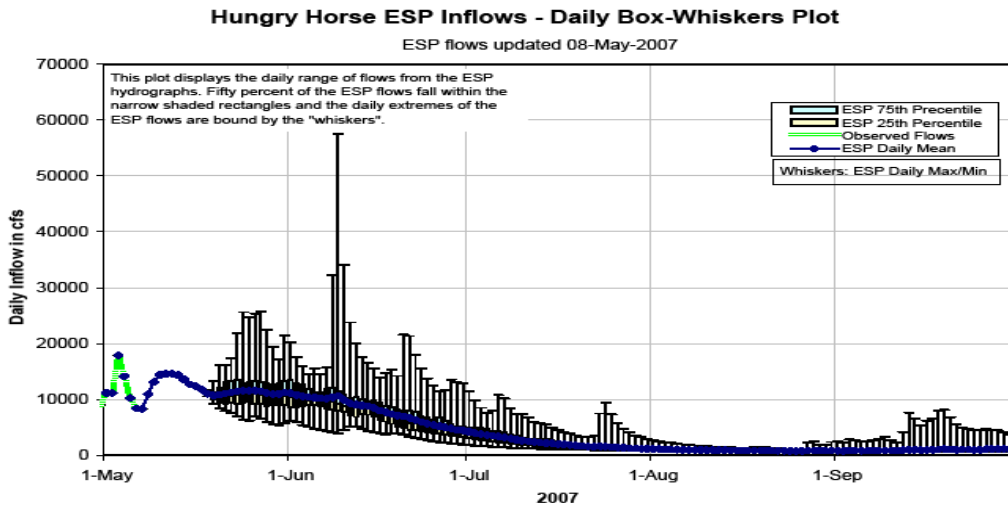
**PRIEST RAPIDS ESP HYSSR RESULTS
MONTHLY OUTFLOW PROJECTIONS**



17. Latest ESP Inflow and Volume Graphs Libby

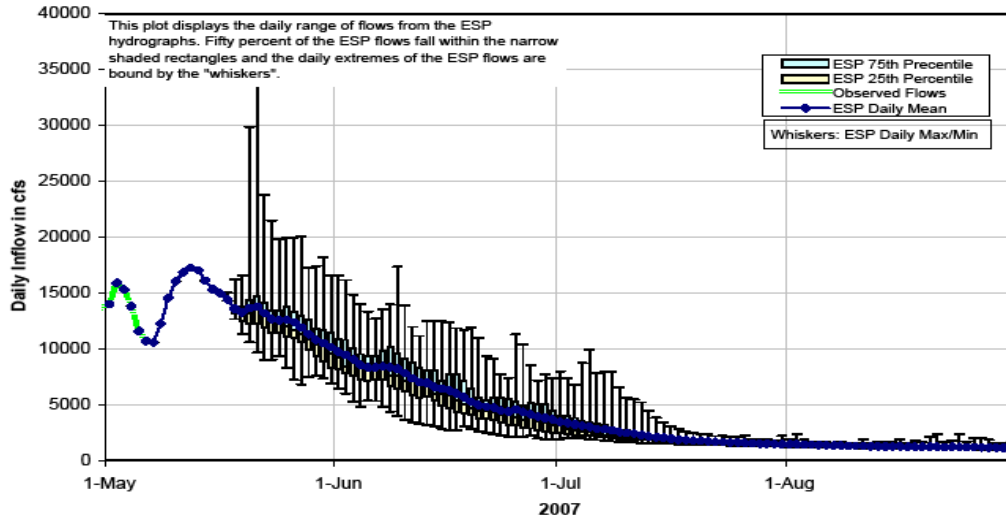


Hungry Horse



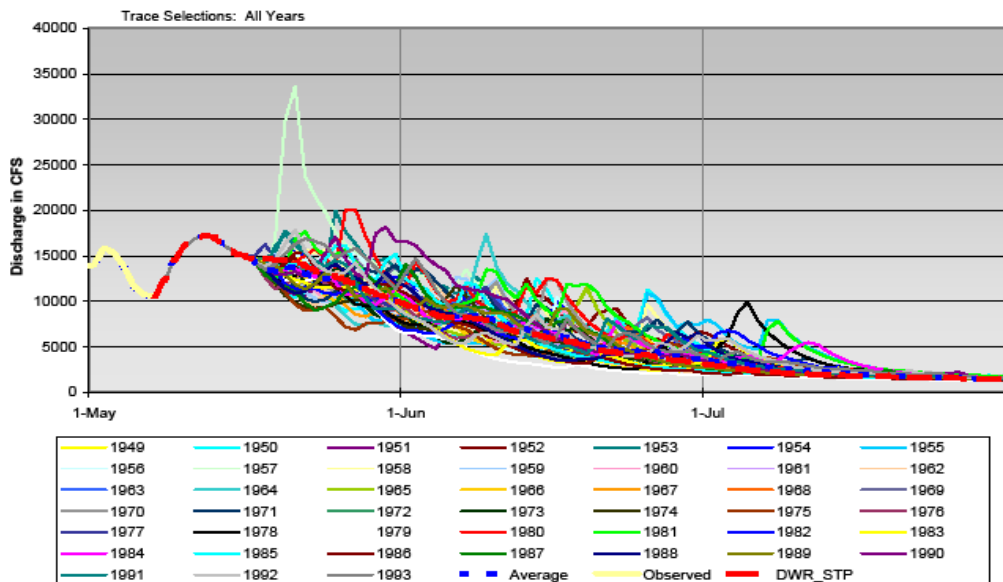
Dworshak ESP Inflows - Daily Box-Whiskers Plot

ESP flows updated 08-May-2007

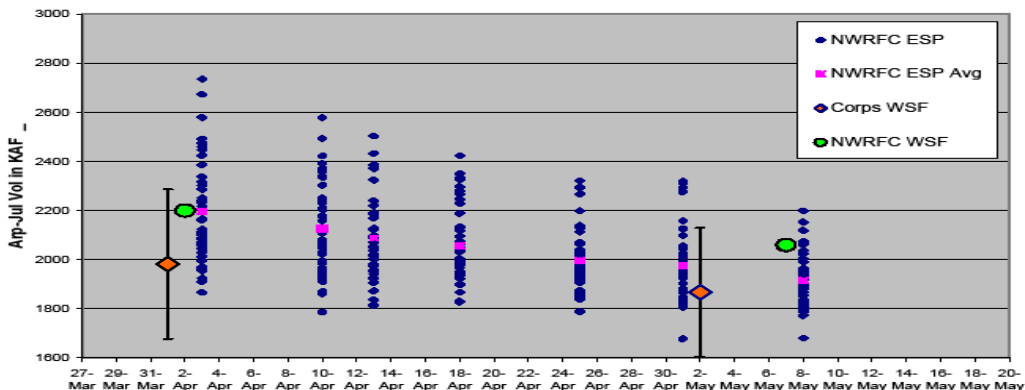


Dworshak ESP Hydrographs

5/8/2007



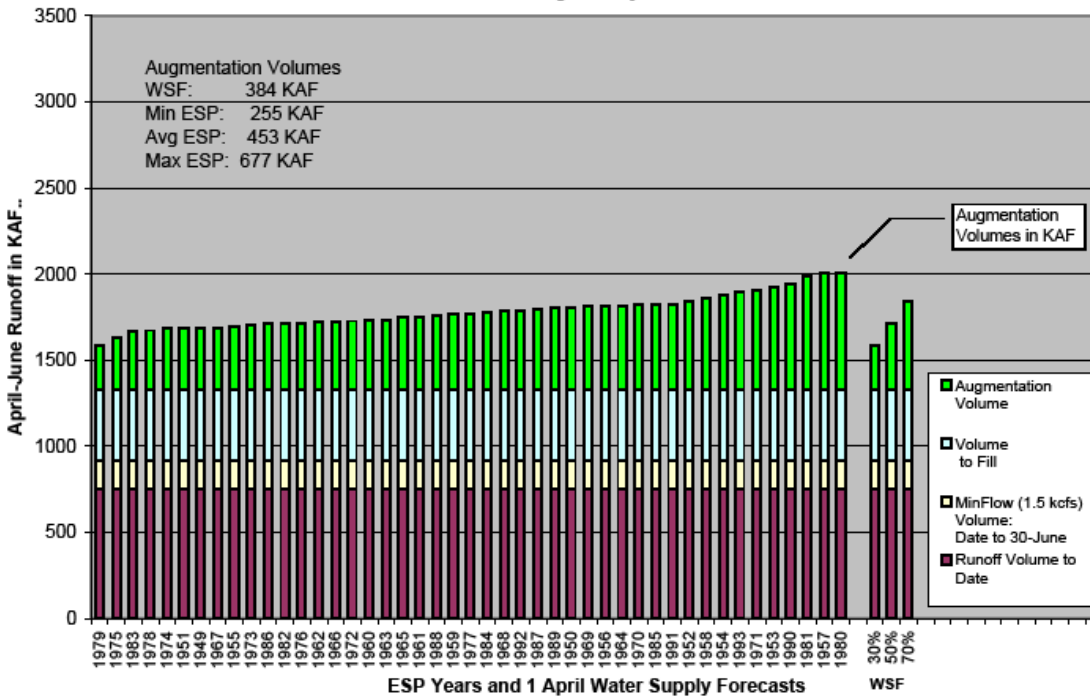
DWR AprJul Volume Forecast Comparison



ESP Flow Augmentation Volumes *Dworshak*

Dworshak Augmentation Volumes ESP inflows and 01-May Water Supply Forecast

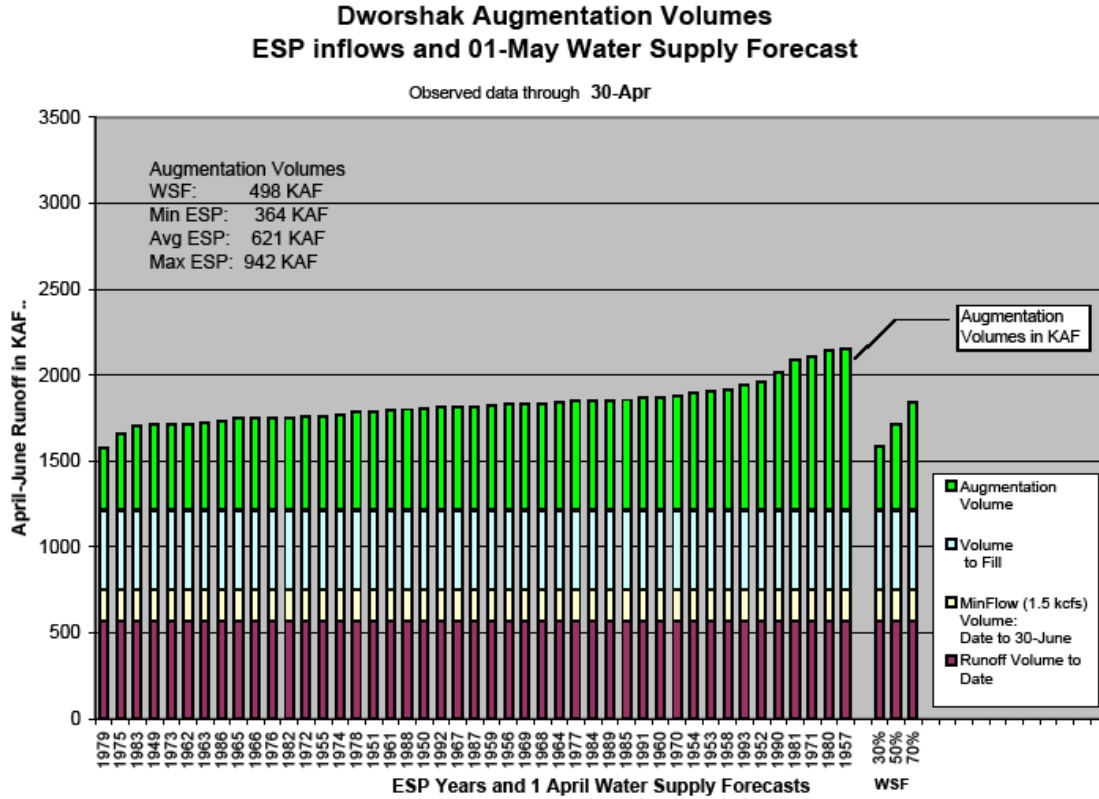
Observed data through 7-May



5/8/2007

. ESP Flow Augmentation Volumes

Dworshak



17.