

2014 Water Management Plan

Seasonal Update

October 28, 2014

1. Introduction

The annual Water Management Plan (WMP) is developed prior to the implementation of Federal Columbia River Power System (FCRPS) operational measures identified in National Marine Fisheries Service (NMFS) 2008 FCRPS Biological Opinion (BiOp), NMFS 2010 Supplemental BiOp and NMFS 2014 Supplemental BiOp (collectively referred to as NMFS FCRPS BiOp), and the U.S. Fish and Wildlife Service (USFWS) 2000 and 2006 BiOps. The WMP is also developed prior to the receipt of any seasonal information that may determine how many of the operation measures are implemented. The Seasonal Update is intended to supplement the WMP with more detailed information on operations as the water year progresses. Each section of the Seasonal Update will be updated when information is available and finalized when no further information is available. The first update for the primary elements of Fall and Winter will be posted on November 1st of each year. The first update for the primary elements of Spring and Summer will be posted by March 1st of each year. The elements and operations included in the Seasonal Update are generally the same as have been previously presented in the Fall/Winter and Spring/Summer Updates to the WMP. The change to update in this manner is intended to present better continuity for tracking operations as they change throughout and across each season. The elements and operations described in the Seasonal Update and the approximate schedule for updates and finalization are as displayed in Table 1.

Table 1. Schedule for update and finalization of Seasonal Update elements and operations.

Section	Element	Begins	Finalized	Last Updated
	Current Conditions (e.g., WSF, Streamflows)	October	July	October 7, 2014
	Seasonal Flow Objectives	April	August	October 7, 2014
	Flood Control	January	June	October 7, 2014
	Storage Project Operations	September	September	October 7, 2014
	Water Quality (Spill Priority Lists)	January	December	October 7, 2014
	Specific Operations	Start Date	End Date	Last Updated
	Chum Flows (Bonneville Dam)	November 1	April 10	October 7, 2014
	Spring Creek Hatchery Releases (Bonneville Dam)	April	May	June 27, 2014
	Burbot spawning temperature management (Libby Dam)	November	December 30	November 10, 2010
	Upper Snake Flow Augmentation	April 1	August 31	October 7, 2014
	Lake Pend Oreille Kokanee (Albeni Falls Dam)	September 1	December 30	March 25, 2014
	Transportation	May 1	September 30	June 27, 2014
	Spill Operations	April 3	August 31	June 27, 2014
	Fish Passage Research	March	October	March 1, 2014
	Snake River Zero Generation	December	February	March 1, 2014
	Hanford Reach Fall Chinook Protection	November	June	February, 2014

2. Seasonal Update Elements and Specific Operations

2.1. Current Conditions

Water Supply Forecasts – NWRFC

The final water supply forecast (WSF) is defined as the forecast posted on NOAA’s Northwest River Forecast Center (NWRFC) website at 5:00 pm Pacific Standard Time on the 5th business day of the month (except April 8, as per the official WSF calendar). NWRFC water supply forecasts are available on the following website: <http://www.nwrfc.noaa.gov/ws/>

Table 2. The Dalles Dam Final Water Supply Forecasts.

Forecast Issue Date	January-July 2014		April-August 2014	
	Volume (maf)	% of 30-year Average (101.4 maf)	Volume (maf)	% of 30-year Average (87.5 maf)
January 8, 2014	96.1	95%	84.9	97%
February 7, 2014	80.0	79%	72.5	83%
March 7, 2014	102.1	101%	88.8	101%
April 8, 2014	104.9	103%	92.1	105%
May 7, 2014	109.6	108%	96.7	111%
June 6, 2014	107.7	106%	95.2	109%
July 8, 2014	108.3	107%	95.2	109%

Table 3. Grand Coulee Dam Final Water Supply Forecasts.

Forecast Issue Date	January-July 2014		April-August 2014	
	Volume (maf)	% of 30-year Average (59.6 maf)	Volume (maf)	% of 30-year Average (56.8 maf)
January 8, 2014	56.9	95%	54.6	96%
February 7, 2014	48.8	82%	48.2	85%
March 7, 2014	58.6	98%	57.8	102%
April 8, 2014	61.8	104%	60.4	106%
May 7, 2014	65.5	110%	64.7	114%
June 6, 2014	64.4	108%	63.0	111%
July 8, 2014	65.1	109%	63.5	112%

Table 4. Lower Granite Dam Final Water Supply Forecasts.

Forecast Issue Date	January-July 2014		April-August 2014	
	Volume (maf)	% of 30-year Average (27.4 maf)	Volume (maf)	% of 30-year Average (21.1 maf)
January 8, 2014	25.2	92%	20.6	98%
February 7, 2014	23.1	84%	18.7	88%
March 7, 2014	29.4	107%	22.7	108%
April 8, 2014	29.5	107%	23.5	111%
May 7, 2014	29.4	107%	22.9	108%
June 6, 2014	27.3	99%	20.7	98%
July 8, 2014	27.0	98%	20.6	98%

Water Supply Forecasts - Corps

Water supply forecasts for Libby and Dworshak dams are produced by the Corps' Seattle and Walla Walla Districts, respectively. Corps forecasts are available on the following website:

<http://www.nwd.usace.army.mil/Missions/WaterManagement/ColumbiaRiverBasin/ColumbiaRiverFloodControl.aspx>

Table 5. Libby Dam Water Final Supply Forecasts.

Forecast Issue Date	April-August 2014	
	Volume (kaf)	% of 78-year (1929-2008) Average (6,282 kaf)
November 7, 2014	5,125	82%
December 6, 2014	5,446	87%
January 8, 2014	5,432	86%
February 7, 2014	5,192	83%
March 7, 2014	5,505	88%
April 8, 2014	6,868	109%
May 7, 2014	6,996	111%
June 6, 2014	7,074	113%

Table 6. Dworshak Dam Final Water Supply Forecasts.

Forecast Issue Date	April-July 2014	
	Volume (kaf)	% of 81-year (1929-2010) Average (2,663 kaf)
December 6, 2014	2,470	92%
January 8, 2014	2,296	86%
February 7, 2014	2,274	85%
March 7, 2014	2,701	111%
April 8, 2014	3,111	117%
May 7, 2014	3,183	120%
June 6, 2014	2,933	110%

Water Supply Forecasts – Bureau of Reclamation

Water supply forecasts for Hungry Horse Dam are produced by the Bureau of Reclamation.

Table 7. Hungry Horse Dam Final Water Supply Forecasts.

Forecast Issue Date	April-August 2014		January-July 2014		May-September 2014	
	Volume (kaf)	% of 30-year Average (2,070 kaf)	Volume (kaf)	% of 30-year Average (2,224 kaf)	Volume (kaf)	% of 30-year Average (1,835 kaf)
January 8, 2014	2,045	106%	2,216	106%	1,787	106%
February 7, 2014	2,081	107%	2,223	106%	1,819	107%
March 7, 2014	2,110	109%	2,218	106%	1,845	109%
April 8, 2014	2,517	130%	2,617	125%	2,200	130%
May 7, 2014	2,614	135%	2,703	129%	2,404	142%
June 6, 2014	2,463	127%	2,567	122%	2,243	132%

Weekly Weather and Precipitation Retrospectives

Week	Weekly Weather / Precipitation Retrospective
October 7, 2013	Temperatures: Below average US basins; slightly above average in BC Precipitation: Well below average. Streamflows: Flat or receding.
October 14, 2013	Temperatures: Near average. Precipitation: Virtually none. Streamflows: Slowly receding. Baseflows are still higher than usual due to the record September rainfall.
October 21, 2013	Temperatures: Above average. Precipitation: Virtually none through Saturday, followed by light precip northwest half on Sunday. Streamflows: Slowly receding, although base flows remain a little higher than usual.
October 28, 2013	Temperatures: Below average initially, rose to above average Thu-Fri, then fell back below average by Sunday. Precipitation: Slightly above average. Streamflows: Very modest flow increases on the lower Columbia and Willamette, otherwise generally flat.
November 4, 2013	Temperatures: Near average. Precipitation: Above average BC; below average in US. Streamflows: Small rises on the lower Columbia, Willamette, and Snake basins. Flat elsewhere.
November 11, 2013	Temperatures: Above average.

Week	Weekly Weather / Precipitation Retrospective
	<p>Precipitation: Above average in BC and western MT; below average elsewhere. Streamflows: Mostly flat.</p>
November 18, 2013	<p>Temperatures: Below average. Precipitation: Near to slightly above average east of the Cascades; below average west. Streamflows: Generally flat, except for brief flow increases into the Willamette, lower Columbia, and Spokane/Clearwater basins early in the week.</p>
November 25, 2013	<p>Temperatures: Rose slowly to slightly above average. Precipitation: Dry through Friday; then well above average basinwide, especially western Washington. Streamflows: Brief but rather sharp flow increases into the Willamette, lower Columbia, and Spokane/Clearwater basins are beginning this morning</p>
December 2, 2013	<p>Temperatures: Very cold temperatures, basin-wide. Precipitation: Very wet at beginning of week with drying trend towards end of week. Streamflows: After brief rise due to precipitation, flat flows or recessions, coupled with some freezing gauges.</p>
December 9, 2013	<p>Temperatures: Seven-day cold snap (the longest since 2007) ended Thursday, with near average temperatures on the weekend. Coldest days were 12/7 and 12/8, with load center temps 18.5°F below average Precipitation: Well below average basinwide. Streamflows: Generally receding flows with some ice noted in headwater streams</p>
December 16, 2013	<p>Temperatures: Slight above average, except Wednesday-Thursday when temps were briefly below average Precipitation: Below average basinwide. A brief, low elevation snow event on 12/20 quickly melted. Streamflows: Generally flat.</p>
December 23, 2013	<p>Temperatures: Near average in valleys; well above average in mountains. Precipitation: Above average BC, western MT, and northwest WA; below average elsewhere. Streamflows: Flat or slowly receding</p>
December 30, 2013	<p>Temperatures: Slightly above average. Precipitation: Above average BC and western MT; little or no precip elsewhere. Streamflows: Flat or slowly receding.</p>
January 6, 2014	<p>Temperatures: Rose to above average. Precipitation: Well above average basinwide, especially in the northern 2/3rd. Streamflows: Temporary flow spikes began on the lower Columbia, Willamette, Clearwater/Spokane, and mid-Cs over the weekend</p>
January 13, 2014	<p>Temperatures: Load centers and valleys slightly above average. Higher elevations well above average. Precipitation: Heavy precipitation ended BC/MT/northern ID last Tuesday; mostly dry since then. Streamflows: Crests on the lower elevation streams early in the week receded back to baseflows</p>
January 20, 2014	<p>Temperatures: Near average in the valleys; well above average in the mountains. Precipitation: Virtually none. This is normally one of the wettest times of the year in the basin. Streamflows: Flat or receding</p>
January 27, 2014	<p>Temperatures: Below average, with low snow levels. Precipitation: Near average most US basins; well below average in BC. Streamflows: Flat or receding</p>
February 3, 2014	<p>Temperatures: Cold snap. Load center temps bottoming out at 22.5°F below average (16.8°F absolute temp) on Thursday, with 6 days of temps 10°F below average. Slow recovery began on Friday. Precipitation: Well above average with low elevation snow and ice south half. Little precip north half.</p>

Week	Weekly Weather / Precipitation Retrospective
	Streamflows: Flat
February 10, 2014	Temperatures: Rose to above average. Snow levels well above average US basins. Precipitation: Well above average, especially in US basins (200-400% of normal). Several daily rainfall records broken. Largest snowpack gains in a single week since early January. Streamflows: Significant rises on the Lower Columbia, Clearwater/Spokane, Snake and Willamette. Basins farther north rose only slightly with most precipitation falling as snow
February 17, 2014	Temperatures: Fell to below average. Precipitation: Above average with significant snowpack gains. This is the first time snowpack has been near average since the start of the season. Streamflows: Receded after crests on Tuesday/Wednesday in the Lower Columbia, Clearwater/Spokane, Snake and Willamette Basins. Flat elsewhere
February 24, 2014	Temperatures: Below average initially, then well below average with a brief, moderate cold snap this past weekend (load center temperatures near 10F below average). Precipitation: Below average BC; near to slightly above average US basins. Streamflows: Flat or receding.
March 3, 2014	Temperatures: Above average US, with higher than average snow levels. Below average in BC. Precipitation: Well above average (3-5 times normal), with several daily rainfall records broken. Heavy mountain snows with accumulations of 4-8feet in BC. Low elevation snowmelt noted in many US basins. Streamflows: Significant rises and crests on most US basins. Unregulated flows at Lower Granite peaked near 110 kcfs on Friday. Small rises also noted in BC.
March 10, 2014	Temperatures: Slightly above average. Precipitation: Above average, but not as wet as previous three weeks Streamflows: Crests on many US basins Mon-Tue, followed by rather rapid recessions. Unregulated flows at The Dalles peaked near 330 kcfs, and near 150 kcfs at Lower Granite.
March 17, 2014	Temperatures: Below average. Precipitation: Near average overall, except below average southern Oregon and Idaho. Streamflows: Slowly receding due to cold temperatures. Some snowmelt cycling noted in lower elevation headwaters across ID and western MT.
March 24, 2014	Temperatures: Near average Precipitation: Well above average, especially in US basins (200-30% of normal). Significant snowpack gains. Streamflows: Moderate rises on the Snake, Clearwater, and lower Columbia. Mostly flat elsewhere.
March 31, 2014	Temperatures: Slightly below average. Precipitation: Above average south half, western WA, and above Revelstoke, BC. Below average elsewhere. Streamflows: Slowly receded due to colder temperatures and somewhat drier weather.
April 7, 2014	Temperatures: Above average overall, but cold overnight lows slowed snowmelt in the mountains. Precipitation: Below average, except above average above Revelstoke, BC. Streamflows: Snowmelt cycling and gradually increasing flows on virtually all low elevation streams, especially in US basins. Upward trend in flows close to climatology for early April.
April 14, 2014	Temperatures: Above average initially, then fell to slightly below average. Precipitation: Above average WA, BC and northern ID, below average elsewhere. Streamflows: Snowmelt cycling on virtually all low and mid-elevation streams. Slow, upward trend in unregulated flows close to climatology for mid-April.
April 21, 2014	Temperatures: Below average, with unusually low snow levels for late April

Week	Weekly Weather / Precipitation Retrospective
	<p>Precipitation: Well above average basinwide (200-400% of normal). Significant snowpack gains.</p> <p>Streamflows: Snowmelt cycling on virtually all low/mid elevation streams. High elevation snowmelt halted due to colder temperatures. Upward flow trends close to climatology for late-April.</p>
April 28, 2014	<p>Temperatures: Numerous record high temps Wed-Fri, then fell to slightly below average.</p> <p>Precipitation: Dry Mon-Fri, then above average over the weekend northwest half.</p> <p>Streamflows: Snowmelt cycling on virtually all low/mid elevation streams, but flows began to lag compared to the usual spring runoff profile due to dry weather and subfreezing overnight temperatures in the mountains.</p>
May 5, 2014	<p>Temperatures: Numerous record high temps Wed-Fri, then fell to slightly below average.</p> <p>Precipitation: Well above average basinwide (150-300% of normal). Considerable and unusually spring snowpack gains, especially in BC.</p> <p>Streamflows: Gradual snowmelt rises basinwide, but rises are close to the usual spring runoff profile. Unregulated flows at The Dalles reached 420 kcfs on Tuesday, but diminished slightly late in the week.</p>
May 12, 2014	<p>Temperatures: Well above average through Fri with a few record highs, then cooled to near average.</p> <p>Precipitation: Virtually none through Fri, then increased to near average in BC/Western MT.</p> <p>Streamflows: Gradual basinwide snowmelt rises which were again tempered by cool nights in the mountains. Unregulated flows at The Dalles increased back above 400 kcfs.</p>
May 19, 2014	<p>Temperatures: Above average.</p> <p>Precipitation: Well below average, except closer to average in BC and western WA.</p> <p>Streamflows: Gradual basinwide snowmelt rises. Unregulated flows at The Dalles rose above 600 kcfs on Saturday. Flows peaked for the season on the Snakes this past weekend, which is near the long-term average.</p>
May 26, 2014	<p>Temperatures: Slightly below average initially, then rose to above average.</p> <p>Precipitation: Above average NW half, including BC where some fell as mountain snow; little rain SE half.</p> <p>Streamflows: Basinwide flows peaked and began slow recessions due to snowpack loss and cooler temps. Unregulated flows at The Dalles, after peaking at 722 kcfs, fell to 600 kcfs this weekend.</p>
June 2, 2014	<p>Temperatures: Above average.</p> <p>Precipitation: Well below average.</p> <p>Streamflows: Very gradual basinwide recessions as snowpack gradually diminished. Unregulated flows at The Dalles remained above 500 kcfs.</p>
June 9, 2014	<p>Temperatures: Near average through Thursday, then fell below average.</p> <p>Precipitation: Above average in BC, northern ID, and western MT. Below average elsewhere.</p> <p>Streamflows: Very gradual basinwide recessions as snowpack gradually diminished. Unregulated flows at The Dalles fell below 500 kcfs on Tuesday.</p>
June 16, 2014	<p>Temperatures: Below average initially, then rose to slightly above average.</p> <p>Precipitation: Above average, especially in Western MT (150-300% of average).</p> <p>Streamflows: Localized streamflow increases in MT due to heavy rains. Elsewhere, flows leveled off instead of falling due to the heavier rainfall. Unregulated flows hovered near 450 kcfs at The Dalles.</p>
June 23, 2014	<p>Temperatures: Above average initially, then fell slightly below average.</p> <p>Precipitation: Below average initially, then increased to above average late in the week.</p> <p>Streamflows: Localized streamflow spikes in MT and BC due to heavy rains. Snowmelt remained steady in BC, but decreased elsewhere. Unregulated flows slipped to 400 kcfs at The Dalles this weekend.</p>

Week	Weekly Weather / Precipitation Retrospective
June 30, 2014	<p>Temperatures: Brief heat wave Tue-Wed with several record highs, then fell closer to average.</p> <p>Precipitation: Below average, but with isolated strong thunderstorms in eastern OR/ID/Western MT.</p> <p>Streamflows: Very gradual basinwide recessions, although flows were propped up by high elevation snowmelt.</p>
July 7, 2014	<p>Temperatures: Well above average. Basinwide heat wave Fri-Sat which continued east of the Cascades on Sunday. Brief cooling west of Cascades Sunday due to an unexpectedly strong upper level disturbance.</p> <p>Precipitation: Below average, but scattered strong thunderstorms in OR/WA/southern ID on Sunday.</p> <p>Streamflows: Gradual basinwide recessions, except in BC where flows were propped up by high elevation snowmelt.</p>
July 14, 2014	<p>Temperatures: Well above average through Thursday; heat wave east of Cascades with numerous record highs. Temperatures moderated closer to average this weekend.</p> <p>Precipitation: Above average above Revelstoke, BC, and southeast ID; otherwise below average.</p> <p>Streamflows: Gradual basinwide recessions, except in BC where high elevation snowmelt continued.</p>
July 21, 2014	<p>Temperatures: Below average through Friday, then warmed above average.</p> <p>Precipitation: Well above average, especially the northwest half which extinguished several large wildfires. Over 3000 lightning strikes per hour during peak thunderstorm activity Tuesday and Wednesday.</p> <p>Streamflows: Gradual basinwide recessions, except in BC where brief flow spikes were noted late in the week.</p>
July 28, 2014	<p>Temperatures: Above average.</p> <p>Precipitation: Near average south, but the rainfall was spotty. Below average in BC,</p> <p>Streamflows: Slowly receding, except in BC where snowmelt has flattened flows with very small rises</p>
August 4, 2014	<p>Temperatures: Above average.</p> <p>Precipitation: Above average in Snake drainage with numerous, strong thunderstorms. Below average in BC,</p> <p>Streamflows: Slowly receding, except in BC where snowmelt has flattened flows.</p>
August 11, 2014	<p>Temperatures: Brief heat wave Mon-Tue with several record highs; then fell to near average.</p> <p>Precipitation: Well above average, especially in US Basins (200-500% of normal in what is normally the driest month of the year). Several rounds of strong thunderstorms Tue-Thu with thousands of lightning strikes each day along and east of the Cascades.</p> <p>Streamflows: Localized headwater flow increases or spikes due to thunderstorms in BC, Northern ID, western MT, and BC. Mainstem flows on the Snake and below Grand Coulee were generally flat.</p>
August 18, 2014	<p>Temperatures: Fell to near average.</p> <p>Precipitation: Well above average east of the Cascades, especially in western MT and central ID; below average west. Numerous strong thunderstorms in eastern WA, ID and MT Thu-Fri.</p> <p>Streamflows: Localized headwater spikes due to thunderstorms in northern WA, Northern ID and western MT. Mainstem flows flat or receding.</p>
August 25, 2014	<p>Temperatures: Well above average through Thursday, then fell below average this weekend.</p> <p>Precipitation: Above average in BC and western WA; below average elsewhere.</p> <p>Streamflows: Modest rises in BC peaked on Friday and have since diminished. Generally flat in US basins.</p>
September 1, 2014	<p>Temperatures: Rose to well above average.</p> <p>Precipitation: Above average in BC; below average elsewhere.</p>

Week	Weekly Weather / Precipitation Retrospective
	Streamflows: Flat or slowly receding.
September 8, 2014	Temperatures: Below average east of the Cascades, especially in BC and Western MT. Above average west of the Cascades, which coincided with hot temperatures in California this weekend. Precipitation: Near average in BC and Western MT, some of which fell as high elevation snow; little precipitation elsewhere. Streamflows: Flat or slowly receding.
September 15, 2014	Temperatures: Above average, with very warm temperature this past weekend. California and southwest also continued above average. Precipitation: Near average in BC, little precipitation elsewhere. Streamflows: Some rises in Canada due to precipitation. Otherwise flows were flat or receding
September 22, 2014	Temperatures: Well above average initially, with several record highs in ID/western MT; then cooled closer to average this weekend. Precipitation: Well above average west half and in BC through Thursday, then well above average in eastern Idaho this weekend. Below average elsewhere. Streamflows: Significant flow spikes in BC late last week which receded over the weekend. Elsewhere, flows remained flat as rains went into moistening soils.
September 29, 2014	Temperatures: Slightly below average initially, then rose well above average. Several record highs around Portland this weekend. Late season heat wave in California Wed-Sun. Precipitation: Above average in BC; below average elsewhere. First light snows of the season in the Cascades and ID mountains last Tuesday morning. Streamflows: Flat or receding.

2.2. Seasonal Flow Objectives

Project	Planning Dates	BiOp Season Average Flow Objective – (kcfs)	Season Average Flow to date (kcfs)
Priest Rapids	Spring 4/10–6/30	135 kcfs	182.8
McNary	Spring 4/10–6/30	220-260 kcfs ⁱ	287.6
	Summer 7/1–8/31	200 kcfs	189.8
Lower Granite	Spring 4/3–6/20	85-100 kcfs ⁱ	92.5
	Summer 6/21–8/31	50-55 kcfs ⁱⁱ	45.6

- i. Varies according to NWRFC April forecast.
- ii. Varies according to NWRFC June forecast.

2.3. Flood Control

Flood Control Elevations and April 10 Objective Elevations per each forecast period are listed in the table below. Forecasted flood control elevations will be calculated beginning in December after the Libby and Dworshak water supply forecasts are available. Subsequent forecasted flood controls will be updated after the final water supply forecasts are available January-April.

Grand Coulee and all Canadian projects will be operated for standard flood control. Hungry Horse and Libby will be operated for Variable Q (VARQ) Flood Control. Beginning in January, the Corps calculates Upper Rule Curve elevations based on the monthly official final forecasts. Projects are operated using these elevations as an upper limit, with the objective of reaching their

spring refill elevations. Detailed flood control operations are available at the following website:
<http://www.nwd-wc.usace.army.mil/report/colsum>.

The April 10 elevations shown in the table below are calculated by linear interpolation between the March 31 and April 15 forecasted flood control elevations.

Project	Elevation Date Objective	Dec	Jan	Feb	Mar	Apr
Libby	Jan 31	2426.6	2426.7			
	Feb 28		2,436.4	2436.4		
	March 31		2441.6	2443.3	2440.9	
	April 10		2441.8	2444.2	2440.9	
	April 15		2441.9	2444.7	2440.9	2377.0
	April 30		2442.2	2446.1	2440.9	2377.0
Hungry Horse	Jan 31		3544.4			
	Feb 28		3540.0	3539.0		
	March 31		3535.0	3533.4	3532.4	
	April 10		3533.3	3531.6	3531.6	
	April 15		3532.5	3530.7	3529.4	3496.4
	April 30		3530.0	3527.9	3526.4	3495.4
Grand Coulee	Jan 31		1290.0			
	Feb 28		1290.0	1290.0		
	March 31		1276.8	1283.3	1266.8	
	April 10		1265.6	1283.3	1256.0	
	April 15		1260.0	1283.3	1250.6	1250.0
	April 30		1243.2	1282.7	1236.7	1235.2
Brownlee	Jan 31		2077.0			
	Feb 28		2057.3	2073.6		
	March 31		2058.6	2075.3	2067.3	
	April 15		2062.7	2076.2	2064.4	2056.1
	April 30		2063.8	2077.0	2059.3	2056.3
Dworshak	Jan 31		1546.5			
	Feb 28		1542.4	1543.5		
	March 31		1553.7	1555.2	1517.6	
	April 10		1561.0	1562.5	1505.7	
	April 15		1564.6	1566.2	1499.8	1492.5
	April 30		1544.7	1547.1	1515.9	1499.8

2.4. Storage Project Operations

Libby Dam

Bull Trout Flows: Bull trout minimum flows are specified in the 2006 Libby Sturgeon Biological Opinion (2006 BiOp) and may be found in Table 9 on page 34 of the Water Management Plan on the following website:

http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2014/Final/20131231_WMP_Revised_20131230.pdf

April 10 and Refill Objectives: According to the Corps' Libby February Runoff Forecast the most probable runoff volume for April – August was 5,192 kaf (88% of average from 1981-2010). This forecasted runoff volume resulted in an April 10 elevation objective of 2444.2 feet. This section will be updated throughout the season as new forecast information becomes available.

Sturgeon Pulse: Per the 2006 BiOp, the Sturgeon pulse volume is determined from a tiered flow structure based upon the Corps' May Final WSF for the period of April-August. On May 2, 2014 the Action Agencies (AAs) received System Operational Request (SOR) FWS#1. The SOR identified the following specifications.

- The 2014 sturgeon operations at Libby Dam will consist of two periods of peak flows.
- Begin sturgeon augmentation flow for the first peak when the Regional Team of Biologists determines that local tributary run-off downstream of Libby Dam is peaking.
 - Increase discharge (according to ramping rates in 2006 BO) from Libby Dam up to full powerhouse capacity, depending on local conditions, e.g. river stage at Bonners Ferry.
 - Maintain peak discharge (20,000-25,000 cubic feet per second (cfs)) for a period of 5-7 days.
 - Selective withdrawal gates at Libby Dam above elevation 2,326 feet mean sea level will remain uninstalled during this peak, allowing for conservation of warmer surface water that will be targeted for release during the descending limb of the second peak, described below.
 - After 5-7 days of peak discharge, decrease discharge at Libby Dam (according to ramping rates in 2006 BO) to a discharge that is sufficient to maintain a flow of at least 18,000 cfs at Bonners Ferry until commencement of the second peak.
 - Increase discharge (according to ramping rates in 2006 BO) from Libby Dam up to full powerhouse capacity when the Regional Team of Biologists determines that the high-elevation run-off in the Kootenai Basin has begun. Actual peak discharge during this second peak will depend on local conditions (i.e. river stage at Bonners Ferry).
 - Selective withdrawal gates at Libby Dam above elevation 2,326 feet mean sea level will be placed to within 30' of the surface of the reservoir prior to the end of the second peak, described above, allowing for release of warmer surface water as the receding limb of the hydrograph commences. Release of warmer water from Libby Dam, in combination with lower volume of release, will allow the Kootenai River temperature to increase to appropriate spawning temperatures at Bonners Ferry (8-10°C) during the receding limb of the hydrograph.
 - Maintain peak discharge for a period of 7-9 days.
 - After 7-9 days of peak discharge, and until the sturgeon volume is exhausted, decrease discharge at Libby Dam towards stable summer flows, to no less than bull trout minimum flows (9,000 cfs in Tier 4).
 - Total number of days at peak discharge will depend on real time conditions and the shape of the inflow hydrographs.

May 7 TMT Meeting: The USFWS introduced the SOR focused on augmentation water for sturgeon and bull trout. The SOR operation was similar to the two-peak sturgeon pulse operation that was implemented in 2013. The USFWS noted the minimum recommended release volume is 1.17 MAF; however, specifics of the operation cannot be determined this early in the season and thus will likely be adjusted based on real-time conditions. The USFWS explained that the operation is intended to coax sturgeon migration and staging upstream of Bonner's Ferry. The USFWS noted that although there is not conclusive evidence from last year's operation, behavior changes were observed and another year of the operation will provide more information. During the May 14 TMT meeting, the AAs informed the TMT that Libby Dam would be operated in order to meet the specifications identified in the SOR.

Summer Draft Limit: On April 16, 2014, the AAs received SOR #MT-2014-1 from Montana Fish, Wildlife and Parks (MT) regarding summer and fall operations of Libby Dam. In the event of an unforeseen significant precipitation event in the summer, MT requested the AAs not increase Libby discharges at the end of September ("double peak") in order to draft to 2449 feet at the end of September as specified in the NMFS FCRPS BiOp. Consistent with the NMFS FCRPS BiOp the AAs operational goal remains to target an elevation of 2449 feet at the end of September but an end of September operation with a gradually declining hydrograph will take priority over drafting to 2449 feet end of September. To accomplish the intended goal, the Corps will draft Libby Dam to 2452 to 2454 feet on August 31 and then release 10 kcfs in September until 2449 feet is reached or the end of the month. If 2449 feet is not reached, the Corps will release an equivalent volume of water above the one unit operation, normally seen in October, for the first half of the month or until elevation 2449 feet is reached. At anytime in late August, September or October if 2449 feet is reached the intended goal of the operation will be determined to be satisfied.

The intent of MT's request is to avoid the potential for any adverse impacts on fish, invertebrates and habitat, that can result from "double peaking." This has occurred in previous years when an unforeseen precipitation event occurs late in the summer and Libby Dam has to significantly increase discharges late in the summer in order to achieve 2449 feet end of September as specified in the NMFS FCRPS BiOp. TMT members either supported or did not object to operations associated with implementation of the SOR. This operation was coordinated during TMT meetings on April 16, April 30, May 7, May 14 and July 30. Additional information regarding operations associated with implementation of this SOR are attached to the referenced TMT agendas that are available on the following website: <http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>.

Hungry Horse Dam

Water Supply Forecast and Minimum Flows: The minimum flow requirements are measured at two locations the South Fork Flathead River below Hungry Horse Dam and the Flathead River at Columbia Falls. The minimum flows will be determined monthly, beginning in January, with the Bureau of Reclamation's WSF forecast for Hungry Horse Reservoir for the period of April 1 to August 31. The final flow levels, for the remainder of the calendar year, are based on the

March Final forecast. The Bureau of Reclamation's March 2014 Final WSF for April–August was 2,110 kaf (109% of average) which set the minimum flow requirements below Hungry Horse and at Columbia Falls at 900 cfs and 3,500 cfs, respectively. The minimum flow requirements are set for the rest of the calendar year and will be updated following the January 2015 Final forecast.

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 forecast and forecasted flood control elevations, the April 10 elevation objective was 3531.6 feet. Hungry Horse actual elevation on April 10 was 3510.0 feet. Due to an increasing water supply forecast through March and expected lower April 30 flood control elevations, Hungry Horse ramped up discharges in late March in order to target a lower April 30 flood control elevation. The average Hungry Horse discharge from April 10–April 30 was 12,688 cfs. A late snowmelt delayed the refill of Hungry Horse until July 15th to avoid excess spill.

Summer Draft Limit: The summer reservoir draft limit at Hungry Horse is 3550 feet (10 feet from full) by September 30, except in the lowest 20th percentile of water years (The Dalles April–August <72.2 maf) when the draft limit is elevation 3540 feet (20 feet from full) by September 30. The RFC's May Final April–August forecast is used to set the official draft limit. The May Final April–August forecast at The Dalles was 96.7 maf which set the September 30 draft limit at 3550 feet. Hungry Horse drafted to elevation 3549.9 feet on September 30, 2014.

Grand Coulee Dam

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 forecast and forecasted flood control elevations, the April 10 elevation objective was 1256.0 ft. Grand Coulee actual elevation on April 10 was 1249.0 ft. Due to an increasing water supply forecast through March and expected significantly lower April 30 flood control elevations, Grand Coulee ramped up discharges in late March in order to achieve a lower April 30 flood control elevation. Grand Coulee drafted from elevation 1257.9 feet on March 31 to elevation 1235.5 feet by May 10th. The ICF date was declared on May 9th and Grand Coulee decreased discharges and began a controlled refill for system flood control.

Grand Coulee will operate to refill around June 30 to provide summer flow augmentation. In order to demonstrate that water was released from Grand Coulee during the spring under the Lake Roosevelt Incremental Storage Release Program, Grand Coulee will target a refill elevation following a recommendation from the Fish Flow Releases Advisory Group (FFRAG). The refill target elevation in 2014 is 1289.8 ft which is 0.2 ft below the full pool elevation. Grand Coulee refilled to elevation 1289.7 feet on July 14th.

The Lake Roosevelt Incremental Storage Release Program: The total amount of water to be released from Grand Coulee in 2014 under the Lake Roosevelt Incremental Storage Release Program will be 25,500 acre-feet and will be distributed as shown in Table 8.

Table 8. Lake Roosevelt releases requested for 2014.

“Bucket”	2014 Releases (acre-feet)	Total Lake Roosevelt Incremental Storage Releases Program (acre-feet)
Odessa	0	30,000
M&I	17,000	25,000
Instream Flow	8,500	27,500

A total of 13,260 acre-feet will be released in the spring (April, May, June) and 12,240 acre-feet will be released in the summer (July, August). In order to demonstrate that the water was released in the specified time periods, Lake Roosevelt will attempt to fill to elevation 1289.8 feet or 0.2 feet from full around June 30 and will have a draft limit elevation of 1279.7 feet or an additional 0.3 feet by August 31.

Summer Draft Limit: The Grand Coulee summer draft limit is set by the magnitude of the RFC's July Final April–August WSF at The Dalles Dam. Based on the June Final WSF at The Dalles, the summer draft limit for Grand Coulee is expected to be 1280 ft. The draft limit will be modified an additional 0.3 ft or to elevation 1279.7 ft to implement the Lake Roosevelt Incremental Storage Release Program. Grand Coulee drafted to elevation 1279.6 ft on August 31, 2014.

Drum Gate Maintenance: A limited amount of drum gate maintenance was performed in 2014. Lake Roosevelt was below elevation 1255 feet for 6 weeks. Some general maintenance was performed but there was not enough time to check the hinge pins on the gages which requires a full 8-week period. A full 8-week period below elevation 1255 feet will be required in water year 2015 to perform all the required maintenance on the drum gates.

Banks Lake: Banks Lake will draft to elevation 1565 ft. by August 31 to provide more water for summer flow augmentation. Pumping to Banks Lake will be reduced and irrigation for the Columbia Basin Project will be met by drafting the reservoir up to 5 ft. from full (elevation 1565 ft.) by August 31. Banks Lake drafted to elevation 1554.9 ft. on August 31, 2014.

2.5. Dworshak Dam

In an effort to keep the Lower Granite Dam tailwater temperatures below 68°F the AA's coordinated Dworshak operations with the TMT during the following meetings.

7/2 TMT Meeting: The Corps provided an update on water temperature modelling for Dworshak Operations. Updated modelling will be provided on the TMT agendas as the season progresses (http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/0702_Agenda.html). The Corps noted the water temperatures for this time of year are relatively cool, within the 60°F range. However, models are anticipating temperature increases as the month progresses. Models run this morning showed temperatures increasing sooner than previously modeled, reaching above 66°F by next week. Based on the current modelling, the project expects to reduce from full powerhouse today at 1100 hours and to 7.4 kcfs in attempt to follow the inflows as they drop. The Corps plans to hold the pool at full through the weekend. Depending on temperature forecasts later this week, the project may increase to full powerhouse again by July 7th or 8th. NOAA Fisheries extended

appreciation to the Corps that the operation is mostly consistent with FPAC recommendations; he noted that the Corps has done a nice job refilling the pool and passing inflow at this time.

7/9 TMT Meeting: The Corps provided an update on water temperature modelling for Dworshak operations. Updated modelling will be provided on the TMT agenda as the season progresses (http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/0702_Agenda.html). The Corps noted that currently water in the Lower Granite tailrace is 66°F. Additionally, the Corps noted that Dworshak outflows are 12 kcfs; the project may increase to 13 kcfs if today's modelling suggests a significant temperature change. Current TDG levels in the Dworshak tailrace are between 105-106% and thus there is some room to increase to 13 kcfs if necessary.

7/16 TMT Meeting: The Corps provided an update on Lower Granite water temperatures and Dworshak operations. As of July 13, the tailwater temperatures at Lower Granite remain consistent, holding at around 66°F. The Corps indicated temperatures around 66°F ($\pm 1^\circ$ F) are consistent with 2012 temperatures for the same time period. The project is currently discharging 12 kcfs and plans to hold this level; however, current 10-day forecasts call for cooler weather which may lead to cooler water and allow for a decrease in discharge. Conversely, if temperatures are forecasted to rise above 68°F in the Lower Granite tailwater, the project will increase discharge. The Corps noted that the model seems to be tracking well. NOAA Fisheries extended appreciation to the Corps noting that the operation is going well.

7/30 TMT Meeting: The Corps provided an update on water temperatures for the Dworshak Operations. They noted that over the next few days the goal is to cut discharge in order to save water and meet temperature requirements at Lower Granite. The operation will drop to 10 kcfs tomorrow and hold there until adjustments are needed for temperature management, depending on the weather forecast. The trend appearing in the model is consistent with the operation to gradually reduce flows. Washington extended appreciation to the Corps that the operation is doing well as they continue to closely monitor rising temperatures. The Nez Perce Tribe, inquired over the lowest acceptable temperature for the hatchery at Dworshak. The Corps stated (and the USFWS confirmed) the hatcheries prefer not go below 43°F as this will affect steelhead growth. As of July 31, the Corps will implement the operation to reduce flows to 10 kcfs. The TMT will revisit this operation during a call next week, 8/6. The salmon managers requested that updated information (conditions, forecasts, models) be shared ahead of time.

NOAA Fisheries also reported that NOAA and other salmon managers are looking closely at adult fall back issues at Lower Granite, and are working through FPOM to do this investigation. Any relevant information from that query will be shared at a future TMT meeting. The Nez Perce Tribe inquired about temperature data at the adult fish ladder as well as the trap. There are no real time feeds from these locations, but data that are uploaded is shared when available at the weekly FPOM discussions that are happening around the fish ladder issue.

8/6 TMT Meeting: The Corps provided an update on water temperatures for Dworshak Operations. The Corps noted that last week thunder storms moved through the region with high winds, resulting in temperature mixing in the water column to a depth of 15 meters. As indicated in the Snake and Clearwater water temperature data provided on the TMT agenda (http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/0806_Agenda.html), water temperatures

in the Lower Granite forebay approached 68°F down to a depth of 15 meters. The Corps indicated it is unlikely water temperatures will exceed 69°F and the current planned operation is to continue discharge at full powerhouse through the entirety of the modelled period (8/11/14). Additionally the Corps noted, after correcting models that had previously been run using wetter projections than the season is currently presenting, the project is expecting approximately full powerhouse discharge from now until the end of August in order to get down to the target elevation of 1535 feet. The Corps indicated that if temperatures rise again in the following weeks the Corps will react accordingly, but it will mean they will end the month with less flow. Finally, the Corps mentioned that the rise in water temperature that occurred yesterday in the Lower Granite Dam tailwater is in part due to an outage at Lower Granite due to the bushing work. With this outage and water temperatures mixing due to high winds, the spill water is in excess of 68°F presenting challenges to the Corps to meet target temperatures in tailwater of 68°F at Dworshak.

8/20 TMT Meeting: The Corps provided an update on Dworshak operations. The Corps noted that due to a recent outage of Unit 3 (8/15/14) caused by a ground fault, the project has reduced outflow from 10 kcfs to 7 kcfs. The Corps noted that as a result of the outage, the Corps will be unable to draft to the 1535 feet elevation BiOp requirement at the end of August without increasing spill in excess of the State of Idaho's water quality standard of 110% TDG, as stated in the BiOp and Water Management Plan. It is unknown when the unit will be returned to service. The Corps shared that NOAA Fisheries drafted a SOR requesting that the Corps work to restore the 10 kcfs outflow of Dworshak in order to proactively head-off potential temperature increases in the Lower Granite forebay and tailrace which would impact operation of the adult fish ladder and trap. NOAA Fisheries does not operate the adult trap when temperatures exceed 69.0°F and subsequently the trap will not be operated today because water temperatures were 69.3°F at 0700 hours. The Corps provided an update on water temperatures in the Snake and Clearwater Rivers (links provided on the TMT agenda). The Corps reported that with current weather conditions, and if 7 kcfs is maintained out of Dworshak, water temperatures are projected to stabilize around 66°F. Today's model run forecasts LWG tailwater temperatures decreasing down to approximately 64.5°F on 8/27. The following question, comments and observations were noted by TMT members during this discussion:

NOAA Fisheries inquired as to what the forebay temperature impacts will be with the decrease in outflow. The Corps noted that the reservoir is continuing to stratify; and the Corps expects that temperatures at 10 meters will remain around 68-69°F, and there will be little change to temperatures at 15 meters. The Corps also noted that with less water from DWR, the warmer surface water will stratify deeper into the water column.

Idaho noted that the Lower Granite pumps pull water from multiple locations for the fish ladder, including surface water, which is warm mainly as a result of ambient temperatures.

The Salmon Managers expressed support for the Corps restoring cool water releases from Dworshak as had been coordinated at the last TMT meeting, noting that this water is important for both adult and juvenile migrating fish in the Snake River, as well as operation of the Lower Granite adult ladder and trap.

The Corps noted that increasing DWR outflow above the current 7 kcfs will increase TDG above the 110% State of Idaho water quality standard. Increasing to 8.5 kcfs outflows would result in approximately 115% TDG and increasing to 10 kcfs as specified in the draft SOR would result in approximately 120% TDG. TDG levels above 110% could impact the Dworshak National Fish Hatchery (NFH) and Nez Perce hatchery downstream. It was reported that the NFH noted that they can likely manage TDG levels up to 115%; it was unknown what TDG levels would be manageable for the Nez Perce hatchery. A waiver would likely be required from the State of Idaho and the Nez Perce Tribe to allow for exceedance of the 110% TDG water quality standard. The Corps requested that a SOR is submitted by the Salmon Managers in order to show support for the increased outflow over 7 kcfs, recognition of the TDG level impact and biological justification for fish. NOAA Fisheries shared their draft SOR and the Salmon Managers worked during the TMT meeting (with the participation of the AAs) to revise the SOR prior to sending it out to all of FPAC for revisions. The draft SOR will continue through the FPAC process and be submitted to the Corps by 3:00 pm today (8/20/14). The Corps will begin coordination with the State of Idaho and the Nez Perce Tribe to determine waiver needs for the exceedance of 110% TDG.

Lower Granite Dam Forebay, Tailrace and JFF Temperatures

Washington reported that temperatures in the Lower Granite forebay have been kept at or below 68°F for the most part. Washington noted that there are temperature variations at the surface elevation but at deeper levels there is more consistency. The Corps reiterated that temperatures barely rose over 68°F, noting that the average values may not accurately depict wider temperature excursions. Actual depth data and the geometric mean data are available on the TMT website as an attachment to today's agenda.

8/27 TMT Meeting: The Corps provided an update on Dworshak operations. The Corps noted that since the last TMT meeting on August 20, temperatures in the Lower Granite tailwater rose in excess of 68°F due to a storm event and subsequent wind mixing of warm surface water to depths of up to 20 meters. Average temperatures on August 24, 25 and 26 exceeded 68°F with temperatures falling below 68° F on Wednesday, August 27th. The Corps also noted that the outage of Unit 3 at DWR and limited ability to release cool water is contributing to the elevated LWG water temperatures. Currently, Dworshak is discharging 8.7-8.8 kcfs with TDG levels at 115%. The Corps shared that the model run on 8/25 shows a decrease in water temperature, which the Corps attributed to cooler air temperatures, fewer hours of daylight and more cloud cover. The Corps expected that next week the Lower Granite pool will return to more consistent water temperatures below 68° F.

Additionally, as a result of reduced DWR outflows, the project will be unable to draft to elevation 1535 feet by the BiOp target date of August 31. Currently the elevation at Dworshak is 1546 feet and is drafting around 1 foot per day. Thus, it will be approximately 11 days (on approximately September 5) until 1535 feet elevation is achieved. The USFWS has been in contact with the DWR National Fish Hatchery and operators are not comfortable with TDG increasing above the current levels of 115% and are concerned that sustained high TDG will stress the fish, increasing likelihood of disease. The Nez Perce Tribe noted the need to continue monitoring for impacts on fish and that there needs to be a balance so as to not compromise the hatchery fish. The Nez Perce Tribe also noted that increasing DWR's degassing abilities needs

to be prioritized in order to avoid these situations in the future. The Corps informed the group that the hatchery is in the process of a systematic upgrade of the degassing system. The 2nd half of the main water supply degassing vacuum system is expected to be completed sometime next summer.

The Corps also noted that as of Monday, hatchery TDG levels were at 103% in the raceway and dissolved nitrogen was at 104.5% as a result of the upgrade earlier this year. Washington noted the Salmon Managers appreciate the Corps efforts to address degassing and he hopes they continue to treat it as a priority. Idaho inquired about the summer-to-fall transition operation at DWR. The Corps noted that the operation will continue to be coordinated with the Dworshak Board; however, they expect that once the target elevation 1535 feet is reached, the project will resume complying with the 110% TDG standard and reduce outflows to approximately 6.7 kcfs and hold until the operation intercepts with the previously-coordinated ramp down schedule. NOAA Fisheries asked when Unit 3 is expected to return to service. The Corps noted that there is no definite return to service date for Unit 3; however, the Corps expects that it will be after the temperature flow augmentation season.

The Corps noted the reason for the uncertain timeframe is largely in part because Unit 3 has not been unstacked since 1979, a process which will require great technical finesse and effort. Washington indicated the Corps is managing the operation well by maintaining a TDG cap of 115%. The Corps also noted that Unit 3 will need to be completely overhauled eventually and because this is a complicated endeavor, the Corps will utilize this unstacking opportunity for inspections that will provide information for the eventual overhaul.

SOR 2014-2

NOAA Fisheries shared the final special operation request for the Dworshak Operations, as submitted to the AAs last Wednesday, August 20. The request sought to increase discharge over 7 kcfs, with the recognition of the potential impacts of increased TDG levels on the downstream hatcheries. NOAA Fisheries noted that as of this morning the water temperature in the Lower Granite adult trap was around 71° F, preventing the trap from operating, however, the cool pool depth is increasing. The Corps stated the plan is to maintain Dworshak TDG levels no higher than 115% until target elevation 1535 feet is reached, likely by September 5, then resume managing DWR outflows not to exceed 110 TDG%. The Corps received a Short Term Activity Exemption of the Total Dissolved Gas Standard from State of Idaho and Nez Perce Tribe for the temporary exceedance of the 110% TDG standard. The Corps expressed gratitude to the group for their efforts to develop the SOR and Washington expressed gratitude to the Corps for their implementation of the operation.

9/17 TMT Meeting: The Corps provided an update on Dworshak operations. The Corps noted that the Lower Granite tailwater is at 61° F and the temperature augmentation is complete. On Monday, September 15, Dworshak reduced discharge from 8.7 kcfs (115% TDG cap) down to 6.7 kcfs (110% TDG cap). The project will hold this operation until Friday and will then ramp down to 4.8 kcfs (no spill) for approximately 2-3 days, then to 2.4 kcfs (one small unit) until the forebay reaches 1520 feet on September 25, per the Dworshak Board Nez Perce Agreement. After that time, the project will go to minimum discharge. BPA noted that the lower three

Snake River projects returned to the August 31 MOP range on the September 25 concurrent with the draft to elevation 1520 feet at Dworshak, as has been implemented in previous years.

2.6. Water Quality

The AAs have coordinated the following spill priority lists with the TMT to date, and they may be found on the following website:

<http://www.nwd-wc.usace.army.mil/tmt/documents/ops/spill/priority/>

- **September 1, 2013 – December 31, 2013:** Winter spill priority list coordinated during the August 21, 2013 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2013/>
- **January 1, 2014 – March 31, 2014:** Winter spill priority list coordinated during the August 21, 2013 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2013/>
- **March 24, 2014 – March 31, 2014:** Spring spill priority list coordinated during the March 19, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>
- **April 1, 2014 – April 25, 2014:** Spring spill priority list coordinated during the March 19 and April 16, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>
- **April 26, 2014 – May 6, 2014:** Spring spill priority list coordinated during the April 16, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>
- **May 7, 2014 – May 20, 2014:** Spring spill priority list coordinated during the May 7, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>
- **May 21, 2014 – June 10, 2014:** Spring spill priority list coordinated during the May 21, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>
- **June 11, 2014 – August 31, 2014:** Summer spill priority list coordinated during the June 11, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>
- **September 1, 2014 – December 31, 2014:** Winter spill priority list coordinated during the August 20, 2014 TMT meeting; minutes may be found on the following website:
<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>

2.7. Burbot Spawning Temperature Management (Libby Dam)

Under the terms of a Memorandum of Understanding (MOU) prepared in 2005 by the Kootenai Valley Resource Initiative (KVRI) and signed by the Corps, the selective withdrawal gate system at Libby Dam has been set to release cool water in November and December, before temperature stratification limits the temperature control capability. The purpose of this operation is to provide cooler river temperatures downstream of Libby Dam (closer to normative thermal conditions). This operation will likely result in November and December temperatures being slightly cooler than the existing selective withdrawal temperature rule curve. Corps staff at Libby Dam removed selective withdrawal gates incrementally during late October to assure that daily temperature change remains within 2°F per day; gates were removed systematically to slowly lower river temperature by early November (a span of about 8°F). Temperature will not be minimized this fall until isothermal conditions develop due to constraints and precautions that will be observed related to selective withdrawal crane rehabilitation that will occur over the winter, necessitating a more conservative gate removal pattern. Rather than removing all gates (resulting in withdrawal elevation of 2,222 feet), the Corps removed all but 3 rows of gates (resulting in withdrawal elevation of 2,253 feet).

2.8. Spring Creek Hatchery Release (Bonneville Dam)

The USFWS coordinated the Bonneville Dam Powerhouse Two (PH2) special operation for the first Spring Creek Hatchery release during the April 2, 9 and 16 TMT meetings. The USFWS released approximately 6.4 million juvenile tule fall Chinook on April 11 from the Spring Creek National Fish Hatchery. The special operation included special operation of targeting PH2 units at the mid-range which was expected to improve passage conditions for bypassed fish through the gatewells of PH2 from April 12 to 22. Specifically, in coordination with the TMT, the AAs implemented the following operation:

- 1) PH2 units within 1% mid-range (13-15 kcfs);
- 2) Then, PH1 units up to the 1% upper limit;
- 3) Then, PH1 units up to Best Operating Point (BOP);
- 4) Then, PH2 units up to 18.5 kcfs per unit.

Additional information regarding these discussion may be found in the April 3 and 10 TMT meeting note on the following website:

<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014/>

The USFWS coordinated the Bonneville Dam PH2 special operations for the second Spring Creek Hatchery release during the April 30 TMT meeting. The USFWS released approximately 4.6 million juvenile tule fall Chinook from the Spring Creek National Fish Hatchery on May 6. The special operation included targeting PH2 units at the mid-range which was expected to improve passage conditions for bypassed fish through the gatewells of PH2 from May 7 to 16. Specifically, in coordination with the TMT, the AAs implemented the following operation:

- 1) PH2 units within 1% mid-range (13-15 kcfs);
- 2) Then, PH1 units up to 1% upper limit;
- 3) Then, PH1 units up to BOP;
- 4) Then, increase flow through PH2 units in a manner that maintains a flow-neutral operation with PH1 at BOP.

Additional information regarding this operation may be found in the April 30, TMT meeting notes on the following website:

<http://www.nwd-wc.usace.army.mil/tmt/agendas/2014>

2.9. Lake Pend Oreille Kokanee Spawning Flows (Albeni Falls Dam)

The Corps received a letter from the USFWS dated October 21, 2013, regarding the 2013-2014 Minimum Control Elevation (MCE) for Lake Pend Oreille, Idaho (FWS Ref: 01EIFW00-2014-TA-0005 (COMM-110)). The letter indicated the USFWS would not be providing a SOR for the 2013-2014 MCE due to IDFG's re-evaluation of kokanee egg-to-fry survival data. Subsequent to this letter, IDFG concluded survival data at this time do not justify a USFWS request for a specific MCE. Accordingly, the USFWS deferred to the AAs for determining the MCE for the 2013-2014 operation. Therefore, during the October 2, 2013, TMT meeting the AAs coordinated a MCE of 2051 feet for the 2013-2014 operation. Regarding the 2014-2015 operation, the the AAs are planning on implementing a MCE of 2051 feet (operating range of 2051-2052 feet with no flexible winter power operation) to facilitate IDFG habitat restoration work on the Clark Fork River Delta, near Clark Fork, Idaho.

2.10. Upper Snake Flow Augmentation

487 kaf of flow augmentation was provided from the Upper Snake in 2014.

2.11. Chum Operation

Date	TMT Discussion/Chum Operation
October 30, 2013	TMT Meeting - WDFW reported that five Chum have passed Bonneville and Chum are expected to arrive in the Ives area this weekend with the forecasted rain. The Action Agencies will plan to implement Chum operations on November 7th, pending the TMT check-in scheduled for November 6th. The operation will target a tailwater elevation of 11.5feet with a band of 11.3 to 11.7 feet. The Corps reported that due to construction efficiencies, the lamprey flume work is ahead of schedule and is not expected to conflict with the Chum operation. CRITFC assured the TMT that CRITFC enforcement will monitor Hamilton Springs for gill net use in the area.
November 6, 2013	TMT Meeting - WDFW reported that Chum have passed Bonneville and were noted in the Ives, Horseshoe, Multnomah, Hamilton Creek, and Hamilton Springs areas. The TMT coordinated the start of the Bonneville Dam Chum operation for 0600 hours on November 7 th .

Date	TMT Discussion/Chum Operation
November 20, 2013	<p>TMT Meeting - WDFW reported that flow conditions have not been favorable for surveying Chum, however, the run is underway and at this point, it appears that numbers are average to below average. Survey data for this week (11/19) was not yet available. There are 112 Chum reported to have passed Bonneville as of 11/19 and recent BPA observations indicate approximately 25 pairs were spawning in the Hamilton Springs and Hamilton Creek area. The Corps reported that the Bonneville tailwater operation is underway, targeting 11.5 feet, with a range of 11.3-11.7 feet. Currently, the Bonneville tailwater elevation is at 11.6 feet.</p>
December 4, 2013	<p>TMT Meeting - As of November 26, 42 live chum have been observed spawning in the Ives Island area, with 5 dead and 6 redds noted at 6 feet of visibility, the Corps reported. On November 7 the Action Agencies initiated the chum operation as a range of 11.3-11.7 feet elevation in the Bonneville tailwater, targeting an elevation of 11.5 feet elevation. On November 29, the Action Agencies increased the operating range to 11.6-12 feet elevation, targeting 11.8 feet. The higher operating range has remained in effect since.</p>
December 5, 2013	<p>TMT Meeting - In response to cold weather, Bonneville has been moving as much water as possible within the current chum operating instructions to generate power during the daytime when people need it. This has resulted in high nighttime tailwater elevations as high as 18.5 feet, BPA, explained. The operational change will alleviate some of the effects of current operation: the high nighttime tailwater elevations are known to be less than ideal conditions for spawning chum; debris accumulation at the Bonneville 2nd powerhouse has limited the capacity of the 2nd powerhouse limiting the ability to manage the discharge in the river without spill; and the high nighttime tailwater elevations have also affected the repair work on the Bradford Island fish ladder.</p> <p>The Action Agencies have proposed adjusting the daytime tailwater operating range upward (to 12.7 to 13.1 feet targeting 12.9 feet) to facilitate more power generation during the day with the benefit of alleviating the likelihood of high nighttime tailwater elevations and the associated impacts. It is the intention of the Action Agencies that the operating range will return to the current operation range (11.6 to 12.0 feet targeting 11.8 feet) as the proposed higher range will inundate a band of habitat that chum typically do not choose for spawning thus minimizing the likelihood of setting a higher protection level moving forward. It is expected that TMT would discuss the return to the current operating range after field observations have been made.</p> <p>WDFW will be on the lookout for signs of spawning at higher elevations and report its findings to TMT. The details of the Action Agencies' proposal is for a temporary change to the daytime operating range in the Bonneville tailwater elevation of 12.7-13.1 feet, targeting elevation 12.9 feet, to be implemented effective immediately today through 3 pm on Friday, December 13. Once this temporary operation was complete the Action Agencies would revert back to the previous tailwater range of 11.6 to 12.0 feet targeting 11.8 feet.</p>

Date	TMT Discussion/Chum Operation
December 11, 2013	<p>TMT Meeting - NOAA reported on December 10, WDFW surveyors observed that spawning was still occurring but nearing its end. They found no indications of redds established at higher elevations. Returning to the 11.6 feet to 12.0 feet range targeting 11.8 feet in the Bonneville tailwater should therefore be protective of spawning this year.</p> <p>Given that information, BPA would like to revert to the previous chum operation effective tomorrow morning, December 12. The Corps indicated the project will revert from its current daytime operation of 12.7 to 13.1 feet targeting 12.9 feet in the Bonneville tailwater, as coordinated in a TMT call December 5, to the previous operation of 11.6-12.0 feet elevation, targeting 11.8 feet during daytime. At night, there is still the option of allowing the Bonneville tailwater elevation to rise to 18.5 feet. However, such an elevation is unlikely given current projections, BPA said. NOAA noted that 18 feet elevation apparently cleared the area of chum. NOAA and BPA will confer further regarding the chum operation. TMT will revisit chum in its next regular meeting December 18.</p>
December 18, 2013	<p>TMT Meeting - Spawning activity is well past its peak, with maybe a few hundred redds at the I-205 site, WDFW, said. There currently only a handful of fish in the Ives Island area. The current chum operation calls for an elevation band of 11.6-12 feet, targeting 11.8 feet in the Bonneville tailwater. The plan moving forward is to maintain this daytime tailwater requirement until December 24 at 1800 hours. The Corps indicated at that time the new requirement will be to maintain an 11.5 minimum tailwater on all hours. There is also a need to remove the fish trap on Duncan creek. WDFW is planning on removing it December 24. The Action Agencies and the state of Washington are coordinating this effort. If the trap cannot be removed on that date or at the tailwater occurring on the 24th it will occur at a later date. If necessary the tailwater may temporarily drop below the hard constraint of 11.5 feet for trap removal.</p>
January 15, 2014	<p>TMT Meeting - WDFW reported that flows are being managed to maintain 11.5 feet elevation in the Bonneville tailwater for chum protection. In terms of maintaining that elevation through emergence, BPA, said Grand Coulee is expected to meet its April 10 flood control elevation, which is currently projected to be 1264-1265 feet.</p>
February 5, 2014	<p>TMT Meeting - Yesterday's FPAC call elicited a consensus recommendation to continue the current chum operation, NOAA, reported. The salmon managers will keep an eye on precipitation and inflow forecasts and adjust future recommendations accordingly.</p> <p>Hearing that recommendation, the Action Agencies will continue the current chum operation: maintain during all hours an 11.5-foot minimum tailwater elevation at Bonneville Dam. The Corps noted that at 0800 hours today, the tailwater elevation was 11.8 feet, due to challenges in predicting lower Columbia flows and wind conditions to not go below the 11.5 foot minimum. The Corps is currently implementing the chum operation as agreed upon in December and plan to continue that operation until TMT meets next on February 19. Any changes in this plan will be communicated to TMT members via email.</p>
February 19, 2014	<p>TMT Meeting - There has been adequate water supply to maintain an 11.5 foot tailwater elevation at Bonneville for chum, WDFW reported. There are no expectations of a shortage through the end of emergence. The Salmon Managers will continue to track emergence-related data and keep the Action Agencies informed.</p>

Date	TMT Discussion/Chum Operation
March 5, 2014	TMT Meeting - WDFW and the Corps indicated the chum operation is going well and continuing to meet targets. Chum are still in the gravel, Bonneville is currently operating at 171 kcfs outflows with a tailwater elevation of 16.8 feet, and the operation is being implemented as planned. TMT will continue to receive updates at future TMT meetings.
March 19, 2014	TMT Meeting - WDFW and the Corps indicated the chum operation is going well and continuing to meet targets. There has been some emergence of fry (40% by March 14 th , the remaining 60% expected to emerge by the end of the week). Current Bonneville tailwater is 19.6 feet and the water conditions are great. TMT will receive an update at the next TMT meeting.
April 2, 2014	TMT Meeting - WDFW reported that the Chum operation has been successful due to good water supply and coordination; all of the fry are expected to have emerged. Temperature Units at the monitoring stations have reached 1,000 and flow forecasts continue to look healthy. The official Chum emergence operation is complete and the agencies will continue to operate for protection.

Chum survey data gathered at the Ives/Pierce Island Complex are summarized in the table below. Data from all Chum survey areas, including the Ives/Pierce Island Complex, are provided by the Fish Passage Center and available on the following website:

http://www.fpc.org/spawning/spawning_surveys/ODFW_reports/2013spawning.htm

Table 9. Chum Data from Surveys of the Ives/Pierce Island Complex

Date	Lives	Dead ⁱ	Redds ⁱⁱ	Visibility (feet)
24-Sep	0	0	0	12.5
3-Oct	0	0	0	5
8-Oct	0	0	0	5
10-Oct	0	0	0	10
15-Oct	0	0	0	10
17-Oct	0	0	0	10
22-Oct	0	0	0	6
24-Oct	0	0	0	6
29-Oct	0	0	0	12
31-Oct	2	0	0	11
5-Nov	7	0	0	8
12-Nov	13	0	2	10
19-Nov	27	0	4	7
26-Nov	42	5	6	6
3-Dec	49	4	1	1.5
10-Dec	59	3	0	6
17-Dec	31	9	0	4
24-Dec	10	1	0	5
31-Dec	1	1	0	8.5
7-Jan	0	0	0	10
14-Jan	0	0	0	12

i. Dead are newly samplly fish only.

ii. Redds are an instantaneous count for the day, not cumulative.

2.12. Vernita Bar/Hanford Reach Fall Chinook Protection Program Operations (Non-BiOp Action)

Date	Summary
November 24, 2013	<ul style="list-style-type: none"> • On November 24, 2013, the third Vernita Bar ground redd count was conducted to determine the 2013-2014 Hanford Reach Critical Flow Elevation. • Based on the survey count and the Hanford Reach Fall Chinook Protection Program Agreement, the 2013-2014 Critical Flow Elevation was set at the 65 kcfs elevation. • The Monitoring Team agreed that the fish spawning season had ended and that November 24, 2013 be identified as the end of spawning date.
February 19, 2014	<ul style="list-style-type: none"> • Grant PUD, reported that 800 temperature units have accumulated since initiation of spawning. Emergence is expected to occur in the third week of March. At present there are operational constraints based on protection flows needed to meet USGS gage requirements. Due to a discrepancy between the USGS gage and actual discharges at Priest Rapids, the dam is now releasing 68 kcfs to meet the USGS gage requirement of 65 kcfs. The equipment has been recalibrated to bring the two readings closer together.
February, 2014	<ul style="list-style-type: none"> • Flow downstream of Priest Rapids exceeded 68 kcfs on a few days as a result of draft Wannapum for dam safety considerations.

2.13. Snake River Zero Generation (Non-BiOp Action)

According to the Lower Snake River projects’ operating manuals, from December 1 through February 28, "zero" minimum project discharge is permitted on a limited basis. Under an agreement between the Corps of Engineers and the fishery agencies, zero river flow is allowed for water storage during low power demand periods (at night and on weekends) when there are few, if any, actively migrating anadromous fish present in the Snake River. Water stored under zero river flow conditions may maximize power production from the Columbia River Basin system, but zero river flow operations are not recommended at Lower Snake projects when fish are actively migrating in the Snake River.”

Salmon Managers submitted System Operations Request (SOR) 2005-22 Snake River Zero Nighttime and Weekend Flow, to the Action Agencies (AA) on December 6, 2005. The SOR may be found on the following website:

<http://www.nwd-wc.usace.army.mil/tmt/sor/2005/2005-22.pdf>

In the SOR the Salmon Managers provided the AAs with the following table to clarify the criteria of “... few, if any ...” prior to the implementation of the Zero Generation Operation.

The few migrating adult criterion trigger will be defined on a sliding scale outlined in the following table. The table applies to both “wild” and “total” categories of returning adult steelhead.

Run to date>#	Run to date< #	Few criteria< #
0	30,000	10
30,000	60,000	20
60,000	100,000	35
100,000	150,000	50
150,000	200,000	65
200,000	250,000	80
250,000		100

The TMT coordinated the Snake River Zero Nighttime Generation Operation during the December 4, 2013, meeting. The operation was implemented between the dates of December 6, 2013, and February 28, 2014. As identified in SOR 2005-22 the criteria for implementing the 2013/2014 operation was a three day moving average of less than 35 total and 10 wild steelhead at Lower Granite Dam. On December 6, 2013, these criteria were achieved as the 3 day average steelhead passage was 26 total and 7 wild.

2.14. Minimum Operating Pool (MOP)

Surveys conducted in 2011 demonstrated impairment of the federal navigation channel in the Lower Granite pool. In accordance with the RPA, until maintenance activities are conducted to provide adequate channel depths for safe navigation, the Corps supports adopting the variable minimum operation pool (MOP) operation used during the 2014 season (Table 9) and coordinated this operation with TMT in 2011/2012/2013/2014. Snake River MOP ranges (Table 10) as well as the Lower Granite variable MOP operation inflow-dependent ranges are included below.

Table 9. Variable MOP Ranges for Lower Granite Dam

Lower Granite Inflows	Operation	Minimum Operating Pool Elevation (feet)	Upper Limit of 1-foot Operating Range (feet)
≥ 120 kcfs	MOP	733.0	734.0
80 kcfs - 119 kcfs	MOP +1	734.0	735.0
50 kcfs - 79 kcfs	MOP +1.5	734.5	735.5
≤ 49 kcfs	MOP +2	735.0	736.0

Table 10. MOP Elevation Ranges for Lower Snake River Projects

Project	Minimum Operating Pool Elevation (feet)	Upper Limit of 1-foot Operating Range (feet)
Ice Harbor	437.0	438.0
Lower Monumental	537.0	538.0
Little Goose	633.0	634.0
Lower Granite*	733.0	734.0

*See table above for LWG variable MOP operation

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

2.15. Spill and Transportation in 2014

Spring and summer spill operations are summarized in the tables below. Additional information regarding spill operations may be found in the 2014 Fish Operations Plan which is Appendix E of the Fish Passage Plan that may be found on the following website:

<http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/2014/index.html>

Table 2.— Summary of 2014 spring spill levels at lower Snake and Columbia River projects

Project	Planned 2014 Spring Spill Operations (Day/Night)
Lower Granite	20 kcfs/20 kcfs
Little Goose	30%/30%
Lower Monumental	Gas Cap/Gas Cap (approximate Gas Cap range: 75-95 kcfs)
Ice Harbor	April 3-April 28: 45 kcfs/Gas Cap April 28-June 1: 30%/30% vs. 45 kcfs/Gas Cap (approximate Gas Cap range: 75-95 kcfs)
McNary	40%/40%
John Day	April 10-April 28: 30%/30% April 28-June 11: 30%/30% and 40%/40%
The Dalles	40%/40%
Bonneville	100 kcfs/100 kcfs

Table 3.— Summary of 2014 summer spill levels at lower Snake and Columbia River projects

Project	Planned 2014 Summer Spill Operations (Day/Night)
Lower Granite	18 kcfs/18 kcfs
Little Goose	30%/30%
Lower Monumental	17 kcfs/17 kcfs
Ice Harbor	June 16-July 13: 30%/30% vs. 45 kcfs/Gas Cap July 13: 45 kcfs/Gas Cap (approximate Gas Cap range: 75-95 kcfs)
McNary	50%/50%
John Day	June 11-July 21: 30%/30% and 40%/40% July 21-August 31: 30%/30%
The Dalles	40%/40%
Bonneville	85 kcfs/121 kcfs and 95 kcfs/95 kcfs

Juvenile transportation operations were coordinated during the TMT meetings on April 23. NOAA recommended to start juvenile transport on May 1st at Lower Granite, Little Goose and Lower Monumental Dams, with no staggered start date. According to NOAA modelling, a May 1st start date at all projects should allow for close to 50% transport of steelhead. Idaho preferred to shut off the surface weir and collect fish later in May. Washington, USFWS, Oregon and the Nez Perce Tribe all agreed that of the options explored to date, their preference would be to start transport at Lower Granite on May 1 and then stagger start dates at Little Goose and Lower Monumental. NOAA's interpretation of the ISAB Review and CSS data does not support a staggered start date given the BiOp spread the risk requirement to transport about 50% of the steelhead; OR, pointed out that there is disagreement regarding the interpretation of the data. Based on TMT coordination the Corps decided to initiate transport at Lower Granite, Little Goose, and Lower Monumental Dams on May 1st, with no staggered start dates and the first barge departures occurring on May 2nd.

2.16. McNary Dam Operations

For a total of 5 days from May 28, 0600 hours to May 29, 0700 hours; May 29, 1600 hours to June 1, 0700 hours; June 2, 0700 to 1600 hours; and June 5, 0700 hours to June 6, 0700 hours spill at McNary Dam increased by approximately 12-17 kcfs during special operations to limit turbine units to the mid-point of the $\pm 1\%$ peak efficiency range. These special turbine operations were implemented in an effort to help reduce descaling of bypassed juvenile salmon, particularly sockeye that increased to a high of 36.8 percent on May 27. Juvenile sockeye sampled during the mid-point operations had descaling rates of 16.7 percent on May 29, 14.9 percent on May 31 and 25.0 percent on June 6, compared to descaling rates during normal turbine operations of 19.8 percent on June 2, 16.0 percent on June 4, and 0.0 percent on June 8. Concurrent debris removal efforts included spill operations to pass debris on May 29-30 that required intermittent closure of both spillway weirs for boat safety. Due to decreasing juvenile sockeye passage and inconclusive information regarding effects of turbine operations on descaling, the Corps resumed operating all available turbine units within the full $\pm 1\%$ peak efficiency operating range on June 6 at 0700 hours. The Corps implemented the operations in conjunction with debris removal efforts as coordinated with TMT members on May 27, May 28, May 29, June 4 and June 6.

2.17. Fish Passage Research in 2014

The following information is included in the 2014 Fish Passage Plan in Appendix A that may be found on the following website:

<http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/2014/index.html>

- **Bonneville Dam Studies.**

March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At BON, the primary focus of this study will be on

adult passage behavior at the modified Washington Shore Fish Ladder north downstream entrance and Cascades Island entrance.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, access will be needed to the BON Adult Fish Facility (AFF) and USACE tagging trailers to collect spring-summer Chinook salmon (up to 600 adult/400 jack), sockeye salmon (400 adult), and steelhead (up to 800 adults), tag with radio and PIT-tags, and release ~8 km below BON. Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

May–June 2014: FGE Program PH2 Gatewell Velocity Testing. The USACE Portland District is planning to collect water velocity data at PH2 in late May and early June 2014. A test frame will be in the A-slot of Unit 14 for each test. Unit 14 would be held to a specific range of the 1% for each test day. All testing is scheduled to occur during daylight hours only, 0600-1700. A test frame will be in the A-slot for Unit 15 testing. Unit 15 would be held to a specific range of the 1% for each test day. All testing will occur daylight hours only, 0600-1700. A schedule will be provided to Bonneville Dam Operations. See Memorandum of Coordination (MOC) 14BON02 for further information.

- **The Dalles Dam Studies.**

March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At TDA, the primary focus will be on impacts of the 8/9 extended spill wall and associated spill pattern on passage behavior of adult salmonids. Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, adult salmon and steelhead will be collected and tagged at the Bonneville Dam Adult Fish Facility and released below BON (see BON section 2.2.1. above). Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

- **John Day Dam Studies.**

March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The

study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At JDA, the primary focus will be on the efficacy of improvements to the North Fish Ladder entrance and transition pool area.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, adult salmon and steelhead will be collected and tagged at the Bonneville Dam Adult Fish Facility and released below BON (see BON section 2.2.1. above). Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

June–July 2014: BiOp Performance Standard Compliance Test at John Day Dam during Summer Spill Operations. In 2014, Pacific Northwest National Laboratory (PNNL) will conduct the second year of a two year study to assess compliance with the BiOp Juvenile Salmon Performance Standard. This test will utilize acoustic telemetry to estimate dam passage survival for subyearling Chinook salmon. Hydrophones will be deployed on the upstream face of the dam to monitor all major routes of passage available to juvenile salmon. In addition, hydrophones will be deployed in the forebay of the spillway and powerhouse and autonomous receivers will be deployed in both the forebay and tailrace each approximately two kilometers from the dam.

- **McNary Dam Studies.**

March 2014: Direct Injury and Survival of Adult Steelhead Passing Turbines and Temporary Spillway Weirs (TSW). Turbine unit 12 intake A will be used for the study and turbine operations have been identified as peak turbine efficiency and best geometry (approximately 14 kcfs if sample size allows). Turbines operate within $\pm 1\%$ of peak turbine efficiency (1% range) as a soft constraint from November 1 through March 31; however, operation at the best geometry point (approximately 14 kcfs) will be coordinated through FPOM. Turbine testing is expected to require approximately 7 days for completion. A scintillation frame with fish release pipe will be lowered into the unit 12A head gate slot and will require McNary Project assistance. Turbine outages may be required to install direct release pipes in unit 12A. Appropriate coordination with McNary Project personnel will occur for the installation and removal of the unit 12A head gate, and mobilization and install of the fish release pipe structure. This will require the use of the gantry crane.

A TSW will be installed in spillbay 19 or 20 (at the discretion of McNary Project) to conduct the study. The TSW will operate at 10 kcfs assuming a forebay elevation of approximately 339-340 feet mean sea level. The 10 kcfs spill requirement for this study is expected for approximately 4-7 days, 10 hours per day. This operation has previously been accepted by BPA and the Region for the FY14 study. The installation of the TSW will be coordinated through FPOM and will include a request to leave the TSW installed (not spilling) through the fish passage season. The Contractor will be self-sufficient for installation of the fish release pipes at the TSW.

Previous attempts to conduct this study have been unsuccessful due to low adult steelhead returns in 2013. If the full sample size cannot be obtained in 2014, we will only test the turbine operated at peak efficiency and the TSW. Final study dates, turbine outages and operations, and TSW spill will be coordinated appropriately through FPOM. Spill requirements for the study will require further coordination and cooperation with BPA. Equipment removal will occur prior to the beginning of the fish passage season and is expected to occur prior to the last week of March.

Depending upon sample size for the March 2014 study it may be necessary to repeat the study as described above between October 2014 and February 2015. Regional discussion of the 2014 study results will determine the need for a second year of study. Coordination for a follow-on study will occur immediately upon a Regional decision to conduct such a study.

March 2014–March 2015: Adult Salmon and Steelhead Migration and Passage Behavior in the Lower Columbia River. This is the second year of a study to address two primary objectives: 1) assess passage behavior of adult salmonids in relation to modifications at BON, TDA, and JDA; and 2) estimate passage success (i.e., conversion rates) from BON to MCN. The study will include evaluation of late-run (October) summer steelhead passage and overwintering behavior at BON, TDA, JDA and MCN. At MCN, the primary focus will be on the effects of a prototype lamprey entrance installed in the winter of 2013/14 at the south fishway entrance on passage behavior and success of adult salmonids.

Installation of new antennas and repairs to existing antennas will be made during the 2013/14 winter maintenance period and completed prior to commencement of tagging in spring of 2014. From late March through October, adult salmon and steelhead will be collected and tagged at the Bonneville Dam Adult Fish Facility and released below BON (see BON section 2.2.1. above). Lower Columbia River projects will monitor for adult salmonids from March through October, then for late-run (overwintering) steelhead from October through March. Access to antennas and receivers for downloading and maintenance will be needed from March 2014 through the 2014/15 winter maintenance period.

April–July 2014: BiOp Performance Standard Compliance Test at McNary Dam during Spring and Summer Spill Operations. In 2014, Pacific Northwest National Laboratory (PNNL) will conduct the second year of a two year study to assess compliance with the BiOp Juvenile Salmon Performance Standard. This test will utilize acoustic telemetry to estimate dam passage survival for juvenile steelhead, and yearling and subyearling Chinook salmon. Hydrophones will be deployed on the upstream face of the dam to monitor all major routes of passage available to juvenile salmon. In addition, hydrophones will be deployed in the forebays of the spillway and powerhouse and autonomous receivers will be deployed in both the forebay and tailrace each approximately two kilometers from the dam.

June–October 2014: Adult Pacific Lamprey Passage Success. This study will use half-duplex (HD) PIT-tag systems to evaluate passage success of adult Pacific lamprey at McNary Dam, the four Lower Snake River projects and associated river segments. This study will require Project support to provide power for electronics and access to download data from the PIT-tag detection

equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

June–October 2014: Underwater Video Monitoring of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage. The purpose of this study is to use underwater video, acoustic imaging, and/or other non-invasive technologies to count and observe adult salmonids and Pacific lamprey in the fish ladders at McNary Dam. The primary goal of this work is to estimate the number of adult lamprey passing behind the picketed lead gates at count stations and to develop escapement estimates of the total number of lamprey passing McNary Dam. This study will require Project support to provide power for electronics equipment in the fishways, access for the installation, repair, and testing of electronic equipment and access to download data from video camera equipment.

June–October 2014: Adult Lamprey Study. Installation of a prototype adult lamprey passage structure at the McNary Dam South (Oregon) Fish Ladder (SFE2) is expected to be completed in February 2014. This passage structure will provide a lower velocity passage route into the adult fish ladder. Optical video and DIDSON acoustic cameras will be used to evaluate fine-scale passage behavior of Pacific lamprey at the entrance and exit of the passage structure. As with other lamprey study objectives, operation of the DIDSON and conventional video cameras will occur throughout the adult lamprey passage season (early June–October). Additionally, two half-duplex PIT-tag detectors (4 loops) will be installed into the passage structure to determine the preferred passage route through the varied-velocity baffle box section. The passage structure includes a knife gate which will be opened in early June and closed at the end of October as the adult lamprey migration winds down.

September 2014–March 2015: Adult Steelhead Temporary Spillway Weir (TSW) Passage Efficiency. Hydroacoustic transducers will be installed from outside of the trashrack in a single turbine unit intake on up to 10 turbine units. Turbine unit intakes will be randomly selected and rolling unit outages of 3 units at a time is expected for installation of the transducers. A dive will be required to install and remove transducers and the installation dive is expected to require 5-7 days. Scheduled turbine unit outages will dictate which and how many turbine units will be used for the study and will be coordinated with the McNary Project. No specific turbine unit operation will be tested. Hydroacoustic transducers will also be installed on a TSW in either spillbay 19 or 20 and will be coordinated with the McNary Project. This study is to be conducted in conjunction with the adult steelhead direct injury and survival study (section 5.2.1. above) and will require 10 kcfs spill over the TSW 24 hours per day in a block design (to be determined) of X number of days “on” and X number of days “off” for the duration of the study to equate to spilling during 50% of the study period. Final study dates, turbine unit outages, installation and removal of equipment and TSW, and spill through the TSW will be appropriately coordinated through FPOM, RCC, BPA and the McNary Project.

- **Ice Harbor Dam Studies.**

February–August 2014: Ice Harbor Turbine Characterization Study. In support of the Ice Harbor turbine replacement program, baseline Sensor Fish data will be collected in one or two of turbine units 1-3. Specific study units may vary depending on scheduled outages and will be

coordinated with the Ice Harbor Project. It is expected that 3 or 4 specific turbine operations will be required for testing with 2 release elevations. This study will implement the new generation of Sensor Fish as well as a new release mechanism; therefore, data collection may occur in multiple timeframes as equipment optimization may be intermittently required. Ice Harbor Project support beyond adjusting turbine operations is not expected for this study. Study dates and specific turbine units and operations will be appropriately coordinated with the Ice Harbor Project and/or FPOM once finalized.

March 2014–March 2015: Adult Salmon Study. A study of adult salmon passage in the Lower Columbia River is planned for the 2014 adult passage season using salmon tagged at the Bonneville Dam Adult Fish Facility (AFF) and includes passage and fate through the Lower Snake River. Salmon and steelhead will be collected, tagged with radio-telemetry transmitters and/or PIT-tags, and released below Bonneville Dam (see BON section 2.2.1. above). Installation and maintenance of any new radio-telemetry antennas or receivers will be completed in March–April 2014 for detecting adult fish tagged at the Bonneville AFF and adult lamprey tagged for the Lower Snake River radio-tracking study. There is no Lower Snake River adult spring Chinook salmon study from Ice Harbor Dam planned for 2014.

May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some additional arrays will be installed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

June–October 2014: Underwater Video Monitoring of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage. The purpose of this study is to use underwater video, acoustic imaging, and/or other non-invasive technologies to count and observe adult salmonids and Pacific lampreys, *Entosphenus tridentatus*, in the fish ladders at Ice Harbor Dam. The goal of this work is to estimate the number of adult lamprey passing behind the picketed lead gates at count stations and to develop escapement estimates of the total number of lamprey passing Ice Harbor Dam. This study will require Ice Harbor to provide power for electronics equipment in the fishways, access for the installation, repair, and testing of electronic equipment and access for the downloading of data from video camera equipment. Maintenance and installation of camera equipment and will occur during the winter maintenance period when adult fishways are dewatered.

June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success for adult Pacific lamprey, *Entosphenus tridentatus*, at McNary Dam, Ice Harbor Dam and the remaining Lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support provide power for

electronics and access for the downloading of data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

- **Lower Monumental Dam Studies.**

May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some additional arrays will be installed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success of adult Pacific lamprey *Entosphenus tridentatus* at McNary Dam, the four lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support to provide power for electronics, and access for downloading data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

- **Little Goose Dam Studies.**

March 2014–March 2015: Adult Salmon Study. A study of adult salmon passage in the Lower Columbia River is planned for the 2014 adult passage season using salmon tagged at the Bonneville Dam Adult Fish Facility (AFF) and includes passage and fate through the Lower Snake River. Salmon and steelhead will be collected, tagged with radio-telemetry transmitters and/or PIT-tags, and released below Bonneville Dam (see BON section 2.2.1. above). Installation and maintenance of any new radio-telemetry antennas or receivers will be completed in March–April 2014 for detecting adult fish tagged at the Bonneville AFF and adult lamprey tagged for the Lower Snake River radio-tracking study. There is no Lower Snake River adult spring Chinook salmon study from Ice Harbor Dam planned for 2014. During the 2013/14 winter maintenance period, the LGS adult ladder count window slot will be modified to a minimum slot opening of 18' in preparation of temporary PIT-tag antennae in January 2014.

May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some

additional arrays will be needed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success for adult Pacific lamprey, *Entosphenus tridentatus*, at McNary Dam, the four Lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support to provide power for electronics and access for downloading data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

- **Lower Granite Dam Studies.**

March 2014–March 2015: Adult Salmon Study. A study of adult salmon passage in the Lower Columbia River is planned for the 2014 adult passage season using salmon tagged at the Bonneville Dam Adult Fish Facility (AFF) and includes passage and fate through the Lower Snake River. Salmon and steelhead will be collected, tagged with radio-telemetry transmitters and/or PIT-tags, and released below Bonneville Dam (see BON section 2.2.1. above). Installation and maintenance of any new radio-telemetry antennas or receivers will be completed in March–April 2014 for detecting adult fish tagged at the Bonneville AFF and adult lamprey tagged for the Lower Snake River radio-tracking study. There is no Lower Snake River adult spring Chinook salmon study from Ice Harbor Dam planned for 2014. From July through September, adult steelhead will be collected from the Lower Granite adult trap by a contractor for radio-tagging.

April–June 2014: Evaluation of Prototype Overflow Weir and 14-inch Orifice for the Lower Granite Juvenile Bypass System Upgrade. The prototype overflow weir and enlarged 14” orifice that were installed into intake gatewell 5A in the winter 2012/13 will be evaluated for a variety of metrics including survival and travel time during April–June 2014. The following modifications will be made in winter 2013/14, prior to initiation of the 2014 study:

- (a) the broad-crested overflow weir that was installed in winter 2012/13 will be modified into a sharp-crested overflow weir;
- (b) the 14” orifice that was installed in winter 2012/13 will have a gatewell-side light ring installed;
- (c) a temporary in-channel PIT-tag detection system will be installed within the juvenile collection channel.

The 2014 biological testing period, approximately April 15 to June 20, is intended to coincide with peak fish out-migration periods, debris passage and water passage for juvenile spring and fall Chinook salmon, juvenile and adult steelhead and juvenile Pacific lamprey. Preliminary plans for a new Juvenile Fish Facility (JFF) at Lower Granite Dam include the use of the larger 14” orifices with the gatewell-side light ring for fish to pass from gatewells to the collection channel. Results of this study will be used to inform management decisions on final structural

modifications and operational changes at Lower Granite Dam to optimize salmonid survival and passage, including determining whether installation of additional overflow weirs is warranted.

Final study plans during the test period will principally mimic the 2013 study plan, as coordinated with RCC and Lower Granite project staff for implementation. In order to conduct the necessary biological testing, deviations from the standard turbine operating priority order defined in the Fish Passage Plan, Lower Granite Dam Table LWG-5, will be necessary in order to operate unit 5 during testing periods (see Table LWG-5 below with testing priority order). Unit 2 will remain the first priority unit during the test period to provide fish ladder attraction flow. If low inflow occurs, Unit 1 will be prioritized to provide fish ladder attraction flow. There will be no changes to spill or spill patterns for this study. From April 15–June 30, 2014, unit 5 will be operated at the upper end of the 1% range, or at an alternative fixed discharge if possible, during each test block to provide consistent testing conditions. Based on historical river flow, it is likely that sufficient inflow will permit operation of unit 5 for this test through June 30. Final unit operations will be dictated by final study plans (i.e., days per week) and will be coordinated with RCC and Lower Granite Dam project staff.

Table LWG-1. Lower Granite Dam Turbine Unit Operating Priority Order.

Season	Duration	Unit Priority
March 1 – December 15 Fish Passage Season	Start Units	2, 3, then 4-6 any order, then 1 ^a
	Stop Units ^b	4-6 any order, then 3, 2, 1 ^b
April 15 – June 30 Study of Unit 5 Prototype Bypass Structures ^c	Start Units	2, 5, 3, then 4 or 6 any order, then 1 ^a
	Stop Units ^b	4 or 6 any order, then 3, 5, 2, 1 ^b
December 16 – February 28 Winter Maintenance Season	Stop/Start Units	Any Order

a. Unit 1 has fixed Kaplan blades (non-adjustable) and can only operate in the upper 1% range. The priority order minimizes Unit 1 starts/stops and allows for the longest runtime once Unit 1 is started.

b. Stop units in reverse Start order, except run Unit 1 as long as BPA load request and required spill rate can be met.

c. From April 15–June 30, 2014, unit 5 will be operated at the upper end of the 1% range, or at an alternative fixed discharge if possible, during each test block to provide consistent testing conditions.

1.1.2. Kelt Reconditioning, Transport and In-River Survival. Provide assistance to Nez Perce Tribe for collection of post-spawn steelhead (kelt) off the Lower Granite separator for their reconditioning program. Depending on flow conditions, separator technicians will collect a similar number of A-run and B-run kelt for transfer to CRITFC/NPT researchers at Dworshak Dam reconditioning facilities (about 400 kelt) with remaining kelt PIT-tagged for direct release

into the tailwaters (about 1,200-1,400 kelt) and limited release into gatewell 5A as part of the evaluation of prototype overflow weirs and enlarged 14” orifice (see section 9.2.2. above).

May–October 2014: Adult Lamprey Study. A study of Snake River adult lamprey passage is planned for the 2014 adult passage season. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some additional arrays will be needed in the adult fish ladders in the vicinity of transition or turn pools. Installation and maintenance of radio-telemetry equipment will be completed in May–June prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from May through October.

June–October 2014: Adult Pacific Lamprey Passage Success. This study will evaluate passage success for adult Pacific lamprey, *Entosphenus tridentatus*, at McNary Dam, the four Lower Snake River dams, and associated river segments using half-duplex (HD) PIT-tag systems. This study will require Project support to provide power for electronics and access for downloading data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

July 2014 – January 2015: Juvenile Fish Bypass System Upgrade Construction. Starting in July 2014, construction activities associated with the Lower Granite Dam fish bypass system upgrade will include the plugging of the fish screen slots and Wagner Horns. The construction project will occur during scheduled turbine unit outages for annual maintenance. Following placement of the plugs, the slots will be dipped to remove all fish prior to the placement of Tremie concrete. Fish removed from the slots will be transported below the dam and released. Fish salvage operations will be coordinated with Project Fisheries and SMP staff. This operation has been coordinated with the region via FPOM as described in Memorandum of Coordination (MOC) 13 LWG 22. The fish screen slot and Wagner Horn plugs are anticipated to be completed by January 2015.