

2016 Water Management Plan

Seasonal Update

November 8, 2016

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 the NOAA Fisheries 2008 FCRPS BiOp, as supplemented in 2010 and 2014 (collectively referred to as the 2014 NOAA Fisheries Supplemental BiOp), and the U.S. Fish and Wildlife Service (USFWS) 2000 FCRPS BiOp and 2006 Libby BiOp. The WMP is also developed prior to the receipt of any seasonal information that may determine how many of the operational 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 1 of each year. The first update for the primary elements of Spring and Summer will be posted by March 1 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
2.1	Current Conditions (WSF, Streamflows)	October	July	August 9, 2016
2.2	Seasonal Flow Objectives	April	August	August 9, 2016
2.3	Flood Control	January	June	August 9, 2016
2.4	Storage Project Operations	October	September	August 9, 2016
2.5	Water Quality (Spill Priority Lists)	January	December	August 9, 2016
	Specific Operations	Start Date	End Date	Last Updated
2.6	Burbot Spawning Flows (Libby)	November	December 30	November 10, 2010
2.77	Lake Pend Oreille Kokanee (Albeni Falls)	September 1	December 30	August 9, 2016
2.8	Upper Snake Flow Augmentation	April 1	August 31	August 24, 2016
2.9	Chum Flows (Bonneville Dam)	November 1	April 10	August 9, 2016
2.10	Hanford Reach Fall Chinook Protection	November	June	February 5, 2016
2.11	Snake River Zero Generation	December	February	November 18, 2015
2.12	Minimum Operating Pool	April 3	August 31	August 9, 2016
2.13	Spill and Transport Operations	April 3	August 31	March 14, 2016
2.14	Fish Passage Research	March	October	March 14, 2016

2. Seasonal Update Elements & Specific Operations

2.1. Current Conditions

2.1.1. 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. Water supply volume forecast are reported in million – acre – feet (MAF). 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 2016		April-August 2016	
	Volume (MAF)	% of 30-year Average (101.4 MAF)	Volume (MAF)	% of 30-year Average (87.5 MAF)
January 8, 2016	94.1	93	82.6	94
February 5, 2016	95.2	94	83.2	95
March 7, 2016	102.9	102	86.5	99
April 7, 2016	104.7	103	86.9	99
May 6, 2016	104.7	103	86.8	99
June 7, 2016	100.1	99	81.8	93
July 8, 2016	97.9	97	79.2	91

Table 3. Grand Coulee Dam Final Water Supply Forecasts

Forecast Issue Date	January-July 2016		April-August 2016	
	Volume (MAF)	% of 30-year Average (59.6 MAF)	Volume (MAF)	% of 30-year Average (56.8 MAF)
January 8, 2016	54.8	93	53.3	94
February 5, 2016	56.8	95	54.5	96
March 7, 2016	61.2	103	56.4	99
April 7, 2016	62.6	105	57.0	100
May 6, 2016	62.7	105	56.8	100
June 7, 2016	60.4	101	54.2	95
July 8, 2016	58.8	99	52.3	92

Table 4. Lower Granite Dam Final Water Supply Forecasts

Forecast Issue Date	January-July 2016		April-August 2016	
	Volume (MAF)	% of 30-year Average (27.4 MAF)	Volume (MAF)	% of 30-year Average (21.1 MAF)
January 8, 2016	24.3	89	19.8	94
February 5, 2016	25.6	93	20.7	98
March 7, 2016	25.7	93	19.3	91
April 7, 2016	26.4	96	20.2	96
May 6, 2016	25.4	93	19.1	90
June 7, 2016	24.5	89	18.1	86
July 8, 2016	24.1	88	17.6	84

2.1.2. Water Supply Forecasts - Corps

Water supply forecasts for Libby and Dworshak dams are produced by the Corps' Seattle and Walla Walla Districts, respectively. Water supply volume forecasts below are reported in thousand acrea feet (KAF). Corps forecasts are available on the following website: <http://www.nwd.usace.army.mil/Missions/WaterManagement/ColumbiaRiverBasin/ColumbiaRiverFloodControl.aspx>

Table 5. Libby Dam Final Water Supply Forecasts

Forecast Issue Date	April-August 2016	
	Volume (KAF)	% of 78-year (1929-2008) Average (6,282 KAF)
December	5,793	92
January	6,249	99
February	6,318	101
March	6,472	103
April	6,681	106
May	5,831	93
June	6,445	103

Table 6. Dworshak Dam Final Water Supply Forecasts

Forecast Issue Date	April-July 2016	
	Volume (KAF)	% of 79-year (1929-2008) Average (2,696 KAF)
December	1,676	62
January	1,913	71
February	1,986	74
March	2,025	75
April	2,308	86
May	2,090	78
June	2,083	77

2.1.3. Water Supply Forecasts – Bureau of Reclamation

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

Table 7. Hungry Horse Dam Final Water Supply Forecasts.

Forecast Issue Month	April-August 2016		January-July 2016		May-September 2016	
	Volume (KAF)	% of 30-yr Average (2,070 KAF)	Volume (KAF)	% of 30-yr Average (2,224 KAF)	Volume (KAF)	% of 30-yr Average (1,835 KAF)
January	1,858	96	2,019	96	1,625	96
February	1,742	90	1,885	90	1,524	90
March	1,801	93	1,969	94	1,574	93
April	1,781	92	2,000	95	1,557	92
May	1,706	88	1,937	92	1,251	74
June	1,695	88	1,937	92	1,235	73

2.1.4. Weekly Weather & Precipitation Retrospectives

Week	Weekly Weather / Precipitation Retrospective
October 5, 2015	<p>Temperatures: Above average.</p> <p>Precipitation: Increased to above average, except in far southern parts of the basin.</p> <p>Streamflows: Minor rises resumed over the weekend in British Columbia (BC) where soils are now quite moist. Flat flows elsewhere as rain went into moistening soils.</p>
October 12, 2015	<p>Temperatures: Well above average. Several record highs on Friday.</p> <p>Precipitation: Well below average.</p> <p>Streamflows: Receding in BC; flat elsewhere.</p>
October 19, 2015	<p>Temperatures: Above average, driven mostly by warm overnight lows.</p> <p>Precipitation: Above average southern Idaho, otherwise well below average despite significant rain west of the Cascades yesterday.</p> <p>Streamflows: Flat or receding. All rains this weekend went into moistening soils.</p>
October 26, 2015	<p>Temperatures: Above average for most of the week, then fell to near average yesterday.</p> <p>Precipitation: First major storms of the fall. Well above average northwest half (200-500% of average) with several daily rainfall records broken. Storm totals over 10 inches in parts of the Washington Cascades and Washington/Oregon coast. Below average SE third, but significant rains are spreading into that area this morning.</p> <p>Streamflows: Sharp but rather modest rises in the Willamette, lower Columbia and mid-Columbia; minor rises elsewhere except the Upper Snake where the heavy rain is just now starting to arrive.</p>
November 2, 2015	<p>Temperatures: Below average initially, then rose to slightly above average.</p> <p>Precipitation: Well above average SE third through Wednesday, then dried out. Below average through NW two thirds through Thursday, then turned wetter again over the weekend.</p> <p>Streamflows: Crests on Tuesday were followed by gradual basinwide recessions</p>
November 9, 2015	<p>Temperatures: Slightly above average, except well above average Friday – Saturday.</p> <p>Precipitation: Well above average northwest half, with significant snowpack gains. Below average southeast half.</p> <p>Streamflows: Minor rises on the Willamette, mid-Columbia and above Arrow Dam, which receded later in the week. Mostly flat elsewhere.</p>
November 16, 2015	<p>Major wind storm on Tuesday with gusts of 60-100 mph in the mountains, and 40-60 mph in the valleys.</p> <p>Temperatures: Above average through Tuesday, then fell below average. First widespread freeze west of the Cascades this weekend.</p> <p>Precipitation: Well above average, especially along and west of the Cascades. Dried out over the weekend.</p> <p>Streamflows: Moderate rises on the Willamette, mid-Columbia, Lower Columbia peaked on Thursday; minor rises elsewhere in the basin peaked on Wednesday. All flows have since diminished.</p>
November 23, 2015	<p>Temperatures: Below average.</p> <p>Precipitation: Well above average south half, with 6-12 inches of snow in lower elevations of southern Oregon and Idaho. Below average elsewhere.</p> <p>Streamflows: Flat or receding. Upper tributary river ice formation noted.</p>
November 30, 2015	<p>Temperatures: Rose to well above average.</p> <p>Precipitation: Increased to well above average (Heaviest amounts in BC and western Washington). Significant icing in the Columbia Gorge Wednesday - Thursday.</p> <p>Streamflows: Moderate flow increases into the Willamette, lower Columbia, mid-Columbia and Spokane. Mostly flat elsewhere.</p>
December 7, 2015	<p>Temperatures: Record warmth and unusually high snow levels Monday - Wednesday, then fell to near average.</p> <p>Precipitation: Very heavy basinwide. Numerous daily rainfall records Monday - Wednesday from Pineapple Express event. As temperatures cooled, significant snowpack gains above 4,000 feet.</p> <p>Streamflows: Significant flow spikes in most United States (US) basins, especially the Willamette, lower Columbia and Yakima where several tributaries flooded. Willamette mainstem flows nearing peak, while other streams recede due to colder temperatures.</p>

Week	Weekly Weather / Precipitation Retrospective
December 14, 2015	<p>Temperatures: Near average east of the Cascades; above average west.</p> <p>Precipitation: Above average US basins; below average in BC. Several locations in western Oregon and Washington approaching wettest December on record.</p> <p>Streamflows: Bankfull flows on the Willamette with several tributaries near or above flood stage. Flows slightly elevated in the Lower Columbia and mostly flat elsewhere as precipitation fell mostly as snow.</p>
December 21, 2015	<p>Temperatures: Slightly above average through Wednesday, then fell below average with low snow levels.</p> <p>Precipitation: Slightly below average.</p> <p>Streamflows: Bankfull flows on the Willamette finally began to recede a bit over the weekend. Flat or receding elsewhere.</p>
December 28, 2015	<p>Temperatures: Well below average. Load center temps bottomed out at 11° Fahrenheit (F.) below average on Saturday.</p> <p>Precipitation: Well below average. Low elevation snow and ice event western Washington, Oregon on Sunday.</p> <p>Streamflows: Flat or receding. Natural flows below normal for the first time since early December.</p>
January 4, 2016	<p>Temperatures: Started significantly below average and warmed to just about average by the end of the week.</p> <p>Precipitation: Significantly below average basin wide.</p> <p>Streamflows: Flat or receding. Natural flows continue below average.</p>
January 11, 2016	<p>Temperatures: Slightly above average.</p> <p>Precipitation: Above average US basins, especially along and west of Cascades. Below average in BC.</p> <p>Streamflows: Gradual but significant rises on the Willamette, with minor flow increases in the lower Columbia, and Clearwater. Mostly flat elsewhere.</p>
January 18, 2016	<p>Temperatures: Above average.</p> <p>Precipitation: Well above average basinwide. Significant snowpack gains, except upstream of Mica, BC.</p> <p>Streamflows: Near bankfull flows on the Willamette, but receded slightly over the weekend. Minor flow increases lower Columbia and Clearwater. Mostly flat elsewhere.</p>
January 25, 2016	<p>Temperatures: Above average initially, then fell to near average. Several record highs on Wednesday. Snow levels well above pass levels Monday - Thursday, then below pass levels this weekend.</p> <p>Precipitation: Well above average.</p> <p>Streamflows: Moderate flow increases crested on the Willamette, Lower Columbia, Clearwater, Spokane, lower Snake and mid-Columbia over the weekend. Mostly flat elsewhere.</p>
February 1, 2016	<p>Temperatures: Rose to above average west of Cascades with a few record highs Sunday. Remained slightly below average east of Cascades.</p> <p>Precipitation: Above average north, especially above Arrow, BC. Little precipitation south.</p> <p>Streamflows: Flat or receding.</p>
February 8, 2016	<p>Temperatures: Well above average, with several record highs this weekend.</p> <p>Precipitation: Dry initially, then well above average. Lower elevation snowmelt offset by significant high elevation snowpack gains.</p> <p>Streamflows: Significant rises on the Clearwater, Spokane, lower Snake and Mid-Columbia. More modest rises on the lower Columbia, Willamette and Pend Oreille. Mostly flat in BC where snowpack gains were most pronounced.</p>
February 15, 2016	<p>Temperatures: Near record highs Monday - Tuesday, then fell closer to average with snow levels lowering back to near pass levels.</p> <p>Precipitation: Well above average, with rain changing back to snow in mid and high elevation mountains.</p> <p>Streamflows: Flood crest on the Yakima, significant crests on the Clearwater, Spokane, lower Snake and mid-Columbia, and modest crests on the lower Columbia, Willamette and Pend Oreille. Flows crested Tuesday, and have since receded due to colder temps. Unregulated flows at The Dalles crested near 210 thousand cubic feet per second (kcfs) on Wednesday.</p>

Week	Weekly Weather / Precipitation Retrospective
February 22, 2016	<p>Temperatures: Above average.</p> <p>Precipitation: Mostly dry though Thursday, then turned much wetter and above average this weekend.</p> <p>Streamflows: Receded through Saturday, then minor rises resumed in the Clearwater, Spokane, mid-Columbia and lower Columbia due to warmer temps and rainfall.</p>
February 29, 2016	<p>Temperatures: Above average.</p> <p>Precipitation: Well above average (200 - 300% of normal).</p> <p>Streamflows: Mostly flat through Saturday, then rises began on many low elevation streams, especially the Clearwater, Spokane, mid-Columbia, lower Columbia and Willamette. Unregulated flows at The Dalles rose to 200 kcfs this weekend.</p>
March 7, 2016	<p>Temperatures: Generally above normal with one day below normal.</p> <p>Precipitation: Well above average (200 - 400% of normal).</p> <p>Streamflows: Moderate rises on many low elevation streams, especially the Clearwater, Spokane, mid-Columbia, lower Columbia and Willamette.</p>
March 14, 2016	<p>Temperatures: Slightly below average, then rose to above average this weekend.</p> <p>Precipitation: Above average southeast half. Below average northwest half.</p> <p>Streamflows: Slow basinwide recessions due to colder and drier weather. Unregulated flows at The Dalles fell back below 200 kcfs, but remained above average for mid-March.</p>
March 21, 2016	<p>Temperatures: Near average, with snow levels falling below pass levels this weekend.</p> <p>Precipitation: Near average. Low elevation snowpack losses offset by high elevation gains.</p> <p>Streamflows: Moderate rises on the lower Snake and eastern Oregon streams feeding the lower Columbia. Modest rises in the Spokane, Clearwater, Salmon and Willamette basins. All flows diminished over the weekend due to colder temperatures.</p>
March 28, 2016	<p>Temperatures: Started below average with a significant rise above average by the end of the week.</p> <p>Precipitation: Below average with significant dry days by end of the week.</p> <p>Streamflows: Mostly flat or receding with very small response to some precipitation. Week ended with rises in Canada and on the Mid-Columbia due to snow melt.</p>
April 4, 2016	<p>Temperatures: Fell to near average, then rose again to near record highs by Sunday.</p> <p>Precipitation: Increased to above average.</p> <p>Streamflows: Significant, basinwide snowmelt rises continued, especially on the Snake with unregulated flows at Lower Granite rising above 100 kcfs. Modest rises have also begun in the upper Columbia and Kootenay basins. Unregulated flows at The Dalles rose above the Initial Control Flow (ICF) of 321 kcfs on Monday, and to 400 kcfs this weekend.</p>
April 11, 2016	<p>Temperatures: Fell to near average, then rose to record highs by Sunday west of the Cascades.</p> <p>Precipitation: Increased to above average southeast third; remained below average elsewhere.</p> <p>Streamflows: Significant basinwide snowmelt rises peaked on Thursday, then receded slightly to briefly cooler temps. Unregulated flows at Lower Granite peaked near 110 kcfs Thursday but remained above 100 kcfs this morning. Unregulated flows at The Dalles rose above the Initial Control Flow (ICF) of 321 kcfs on Monday, peaked near 360 kcfs on Thursday, and remained above ICF as of this morning.</p>
April 18, 2016	<p>Temperatures: Record warmth through Thursday, the fell to near average this weekend. Significant basinwide snowmelt, even at higher elevations.</p> <p>Precipitation: Dry initially, then increased to above average as snow levels fell to pass levels.</p> <p>Streamflows: Significant, basinwide snowmelt rises, most of which crested on Sunday. Unregulated flows at The Dalles slipped to 310 kcfs Monday - Thursday, then rose over 500 kcfs this weekend. Lower Granite inflows rose to 120 – 130 kcfs this weekend. Flows this weekend were the highest in the Basin since the 2014 spring runoff.</p>
April 25, 2016	<p>Temperatures: Near average through Saturday, then rose well above average Sunday, mostly west of Cascades.</p> <p>Precipitation: Above average Snake basin; near average BC and western Montana; below average elsewhere.</p> <p>Streamflows: Basinwide recessions due to colder temps. Unregulated flows at The Dalles peaked near 540 kcfs Monday and receded to 420 kcfs this weekend. Although it slowed a little last week, the spring snowmelt is progressing about two weeks earlier than usual.</p>

Week	Weekly Weather / Precipitation Retrospective
May 2, 2016	<p>Temperatures: Well above average, especially Monday - Tuesday with near record highs, and again Friday - Saturday.</p> <p>Precipitation: Below average, except for several strong thunderstorms in southern Idaho/southern Oregon.</p> <p>Streamflows: Basinwide snowmelt rises resumed. Unregulated flows at The Dalles rose above 550 kcfs, and above 120 kcfs at Lower Granite. Spring snowmelt cycle remains about two weeks earlier than usual.</p>
May 9, 2016	<p>Temperatures: Well above average, except US basins where they fell sharply to near average this weekend.</p> <p>Precipitation: Dry initially, then increased to above average this weekend.</p> <p>Streamflows: Basinwide snowmelt flows peaked early in the week, then receded due to colder temps and depleting snowpacks. Unregulated flows peaked near 550 kcfs at The Dalles, then fell to 400 kcfs this weekend. Spring snowmelt is about 12 days earlier than usual.</p>
May 16, 2016	<p>Temperatures: Above average Monday - Wednesday, then below average.</p> <p>Precipitation: Well above average (150-400% of normal), with high elevation snows and scattered thunderstorms.</p> <p>Streamflows: Basinwide snowmelt flows continued. Despite heavy precip this weekend, flows diminished somewhat due to colder temperatures. Unregulated flows fell to around 360 kcfs on Friday, then rose back over 400 kcfs this weekend. Spring snowmelt is now running only about a week earlier than usual.</p>
May 23, 2016	<p>Temperatures: Slightly below average.</p> <p>Precipitation: Well above average in BC/Western Montana; below average elsewhere.</p> <p>Streamflows: Slow, basinwide recessions as snowpacks gradually deplete. Unregulated flows at The Dalles slipped below 400 kcfs (120 kcfs below normal for the end of May). Spring snowmelt continues to run about 10 days earlier than usual. Unregulated flows have peaked for the year.</p>
May 30, 2016	<p>Temperatures: Climbed to record levels this weekend. Heat wave criteria reached (average temps 75° F. or greater for 3 days).</p> <p>Precipitation: Well below average, except closer to average in BC from scattered thunderstorms.</p> <p>Streamflows: Snowmelt flow increases in BC, western Montana and central Idaho. Slow recessions elsewhere as snowpacks deplete. Unregulated flows at The Dalles fell to 320 kcfs, then rose above 400 kcfs this weekend.</p>
June 6, 2016	<p>Temperatures: First heat wave of the summer ended Wednesday, followed by below average temperatures.</p> <p>Precipitation: Near average north; below average south but with scattered strong thunderstorms. Some precipitation fell as snow above 7,000 feet this weekend.</p> <p>Streamflows: Snowmelt flows peaked in BC, central Idaho and western Montana on Wednesday, followed by sharp recessions due to cooler temps. Recessions accelerated elsewhere in the basin as snowpacks depleted. Unregulated flows at The Dalles peaked near 440 kcfs, then fell below 400 kcfs this weekend.</p>
June 13, 2016	<p>Temperatures: Well below average initially, the warmed closer to average this weekend. Record heat wave developed over southern California/Arizona this weekend.</p> <p>Precipitation: Above average northwest half. Below average southeast half.</p> <p>Streamflows: Rapid basinwide recessions due to depleting snowpack and cooler temperatures. Unregulated flows at The Dalles dropped from 430 kcfs last weekend to 220 kcfs this weekend, and were nearing record lows for mid-June.</p>
June 20, 2016	<p>Temperatures: Near average.</p> <p>Precipitation: Near average northwest half. Below average southeast half.</p> <p>Streamflows: Modest rises in BC due to rain and high elevation snowmelt, otherwise flows will continue to recede, with unregulated flow at The Dalles near record lows for mid June.</p>
June 27, 2016	<p>Temperatures: Above average east of Cascades; near average west.</p> <p>Precipitation: Below average, with scattered thunderstorms in Idaho/western Montana.</p> <p>Streamflows: Modest rises in BC due to rain and high elevation snowmelt, otherwise flat or receding except for small spikes in Idaho headwaters impacted by thunderstorms.</p>

Week	Weekly Weather / Precipitation Retrospective
July 4, 2016	<p>Temperatures: Well below average. Unusual light snowfall above 6,500 feet this past weekend. Basin average temperatures for July 1-10 were 12° F. colder than at the same time last year.</p> <p>Precipitation: Well above average, especially west of Cascades and in desert areas (200 - 500% of normal).</p> <p>Streamflows: Generally flat or receding, except for localized flow spikes due to thunderstorms.</p>
July 11, 2016	<p>Temperatures: Below average. Basin average temperatures for July 1-15 were 9° F. colder than at the same time last year. Coolest July since 2011.</p> <p>Precipitation: Above average east of Cascades; below average west.</p> <p>Streamflows: Minor rises in BC from rainfall and snowmelt, otherwise flat or receding.</p>
July 18, 2016	<p>Temperatures: Slightly below average, except for a brief temperature spike on Thursday. Heat wave in southern California/Arizona this weekend.</p> <p>Precipitation: Near average north, although rainfall was spotty. Mostly dry south.</p> <p>Streamflows: Typical, slow, late July recessions.</p>
July 25, 2016	<p>Temperatures: Rose to well above average, then fell sharply to near average this weekend.</p> <p>Precipitation: Below average. Scattered thunderstorms in BC, far northern Washington, and far northern Idaho.</p> <p>Streamflows: Slowly receding.</p>
August 1, 2016	<p>Temperatures: Below average Mon-Wed, above average Thu-Fri, below average this weekend.</p> <p>Precipitation: Increased to above average north. Below average south, with isolated thunderstorms.</p> <p>Streamflows: Slowly receding.</p>
August 8, 2016	<p>Temperatures: Below average initially, then rose to well above average with brief heat spell west of Cascades Fri-Sat.</p> <p>Precipitation: Below average.</p> <p>Streamflows: Flat or receding, except for localized flow spikes in western MT. Snowmelt cycling is still being detected in higher elevation streams in BC.</p>
August 15, 2016	<p>Temperatures: Heat wave west of Cascades Thu-Sat. Load center temps peaked 12°F above normal. Highs reached 100°F in Portland, and well into the 90s at the coast and in Seattle. Cooling began on Sunday.</p> <p>Precipitation: Mostly dry.</p> <p>Streamflows: Flat, although some snowmelt cycling and glacier melt was detected in BC.</p>
August 22, 2016	<p>Temperatures: Moderate heat wave west of Cascades Wed-Fri. Load center temps peaked 9°F above normal. Highs in the 90s in Portland and Seattle. Temperatures fell closer to average this weekend.</p> <p>Precipitation: Increased to near average in BC. Dry elsewhere.</p> <p>Streamflows: Flat or receding.</p>
August 29, 2016	<p>Temperatures: Fell to below average. Snow levels fell to 7000ft this past weekend.</p> <p>Precipitation: Well above average northwest half; below average southeast half. First light mountain snows of the season fell in MT/ID this weekend. Some light snow also noted in BC mountains.</p> <p>Streamflows: Flat or receding. Weekend rains soaked into very dry soils, or fell as snow on the highest peaks.</p>
September 5, 2016	<p>Temperatures: Below average, except for brief warming on Fri-Sat.</p> <p>Precipitation: Well above average north; below average south. Some precipitation fell as snow above 7000ft.</p> <p>Streamflows: Minor, brief flow increase in the Salmon/Clearwater after rains Labor Day weekend, and in BC late last week due to briefly warmer temps and rainfall in BC. Flat flows elsewhere.</p>
September 12, 2016	<p>Temperatures: Rose to above average, then fell to average northwest half on Sunday. Snow levels fell to 6500ft in BC.</p> <p>Precipitation: Increased to well above average west of Cascades and in BC. Above average in SE ID early in the week from scattered thunderstorms, but then dried out.</p> <p>Streamflows: Very minor, spotty flow spikes in BC, western MT and central ID due to weekend rainfall. Otherwise flat.</p>
September 19, 2016	<p>Temperatures: Below average until Fri, then jumped to well above average this weekend.</p> <p>Precipitation: Well above average eastern ID and Western MT. Below average elsewhere.</p> <p>Streamflows: Minor and brief flow increases in ID and western MT. Otherwise, mostly flat flows as rains went into moistening soils.</p>

Week	Weekly Weather / Precipitation Retrospective
September 26, 2016	<p>Temperatures: Started the week warm, with temperatures then falling to below normal by the weekend.</p> <p>Precipitation: Below average, but with increasing precipitation northwest half over the weekend.</p> <p>Streamflows: Minor and brief flow increases in ID, western MT and Canada. Otherwise, mostly flat flows as rains went into moistening soils.</p>

2.2. Seasonal Flow Objectives

Project	Planning Dates	BiOp Season Average Flow Objective (kcfs)	To-Date Season Average Flow (kcfs)
Priest Rapids	Spring 4/10–6/30	135 kcfs	157.5
McNary	Spring 4/10–6/30	220-260 kcfs ⁱ	249.7
	Summer 7/1–8/31	200 kcfs	161.3
Lower Granite	Spring 4/3–6/20	85-100 kcfs ⁱ	85.0
	Summer 6/21–8/31	50-55 kcfs ⁱⁱ	35.3

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	2415.3	2411.0	2411.0		
	Feb 29		2409.7	2407.0		
	March 31		2409.0	2405.7	2397.8	
	April 10		2409.0	2405.7	2397.8	
	April 15		2409.0	2405.7	2397.8	
	April 30		2409.0	2405.7	2397.8	2387.4
Hungry Horse	Jan 31		3547.0	3547.0		
	Feb 29		3545.1	3547.9		
	March 31		3542.8	3547.1	3545.4	
	April 10				3544.9	
	April 15		3541.8	3546.8	3544.7	3545.6
	April 30		3540.6	3546.4	3544.1	3545.0

Project	Elevation Date Objective	Dec.	Jan.	Feb.	Mar.	Apr.
Grand Coulee	Jan 31		1290.0	1290.0		
	Feb 29		1290.0	1290.0		
	March 31		1283.3	1283.3	1276.7	
	April 10				1253.0 (DG)	
	April 15		1271.2	1270.3	1260.3	1254.5
	April 30		1254.6	1253.6	1244.6	1243.8
Brownlee	Jan 31		2077.0	2077.0		
	Feb 29		2051.9	2051.6		
	March 31		2051.7	2050.7	2048.0	
	April 15		2053.8	2052.6	2049.3	2054.0
	April 30		2055.5	2053.9	2049	2046.9
Dworshak	Jan 31		1556.4	1556.4		
	Feb 29		1560.4	1557.0		
	March 31		1574.5	1570.9	1569.0	
	April 10		1581.8		1570.5	
	April 15		1585.4	1581.9	1571.2	1563.7
	April 30		-	-	1569.4	1543.5

2.4. Storage Project Operations

2.4.1. 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 31 of the Water Management Plan on the following website:

http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2016/Final/20151231_WMP_FIN_NWD.pdf

April 10 and Refill Objectives: According to the Corps' Libby March Runoff Forecast the most probable runoff volum for April – August was 6,472 KAF (103% of average from 1981 - 2010). This forecast runoff volume resulted in an April 10 elevation objective of 2397.8 feet.

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 6, 2016, the Action Agencies (AAs) received System Operational Request (SOR) USFWS #1 and the SOR identified the following specifications.

- The 2016 sturgeon operations at Libby Dam will consist of one period of peak flow, followed by a hydrograph that recedes towards the anticipated stable summer flow at Libby Dam (Figure 1).
- Begin sturgeon augmentation flow 7 - 10 days prior to when the high elevation tributary run-ff upstream of Libby Dam is forcast to peak; peak sturgeon augmentation flow timing will encompass peak inflow into Lake Koocanusa.

- Increase discharge (according to ramping rates in the 2006 BiOp) from VARQ flow to 20,000 cubic feet per second (cfs) upon forecast of peak inflow into Lake Koocanusa.
- Maintain a discharge of 20,000 cfs for 2 days (“pre-peak” flow).
- Increase discharge (according to ramping rates in the 2006 BiOp) 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 cfs) for a period of 7-10 days.
- After 7 - 10 days of peak discharge, decrease discharge (according to ramping rates in 2006 BiOp) towards stable summer flows until the sturgeon volume is exhausted to no less than bull trout minimum flows (7,000 cfs in Tier 2).
- Selective withdrawal gates at Libby Dam above elevation 2,326 mean sea level will be placed to within 30 feet of the surface of the forebay commencing upon the initiation of the flow augmentation operation. The intent of this strategy is to allow release of warmer surface water during the peak of the operation, and also allow for continued warming of the Kootenai River as discharge volume decreases. The temperature management strategy is to provide appropriate spawning temperatures at Bonner’s Ferry (8-10° C.) during the peak and descending limb of the hydrograph.
- Total number of days at peak discharge will depend on real time conditions and the shape of the inflow hydrographs.

May 11, Technical Management Team (TMT) Meeting. The US Fish and Wildlife Service (USFWS) presented TMT with SOR USFWS #1 on Libby Dam Releases for Sturgeon and Bull Trout Augmentation. The USFWS is looking to repeat the operation from last year with an emphasis on more water during the beginning of the operation. Due to the rapid snowmelt in April, the operation will consist of one period of peak flow, followed by a hydrograph that recedes towards the anticipated stable summer flow at Libby Dam. The sturgeon augmentation flow will begin 7 - 10 days prior to when the high elevation tributary run-off upstream of Libby is forecasted to peak. The USFWS noted there is a strong possibility the operation will commence this week.

Once the forecast of peak inflow into Lake Koocanusa occurs, the project will ramp up according to the 2006 BiOp (discharge will increase from VARQ flow to 20 kcfs). Flows will be maintained at 20 kcfs for 2 days, then discharge will increase to full powerhouse for 7 - 10 days. After 7 - 10 days of peak discharge, they will ramp down to summer flows and to meet bull trout minimum flows (7 kcfs in a Tier 2 year). The USFWS stated that the operation is targeting spawning temperatures of 10° C. and drafting flows to encourage migration with spawning towards the end of the peak. BPA, stated that USFWS needs to coordinate with BPA today if they want to start the operation by Friday.

TMT members were polled on SOR USFWS #1, with the following results:

- NOAA Fisheries - support
- Bonneville Power Administration (BPA) - no objection
- Nez Perce (NP) - no objection
- Montana (MT) - support
- Idaho (ID) - support
- BOR - no objection
- Umatilla (no objection)
- Kootenai (support)
- Washington (WA) - no objection
- Oregon (OR) - no objection

ACTION: The Corps will implement the SOR USFWS #1 as states above and then drop down to bull trout minimums. The duration of the operation will depend on real time conditions and shape of the inflow hydrograph, however, is requested to be 7 - 10 days. The Corps, USFWS and BPA will coordinate to schedule the operation.

June 1, TMT Meeting. The Corps, reported on SOR USFWS#1 and noted that on May 26, the Corps finished 10 days at full powerhouse and have been ramping down since. The Corps is targeting an elevation 2,445 feet by the end of June. This elevation gives a slight chance of having to increase releases in July and August to be at 2,449 feet at the end of August. WA asked if there are any updates on sturgeon staging and movement in response to the flows. The Corps noted that he has heard that they have seen more adults above Bonners Ferry due to the habitat work. This is promising because they want the sturgeon to spawn in Montana.

Summer Draft Limit: From August through October in 2015 - 2017, the AAs will be operating Libby Dam in coordination with the Kootenai Tribe of Idaho in order to provide conditions for construction of a suite of Kootenai River Habitat Restoration Projects (KRHRP). In order to accommodate this operation, the AAs will coordinate with TMT on the actual operation to reach the NOAA Fisheries FCRPS BiOp September 30 elevation of either 2,439 or 2,449 feet.

May 11, TMT Meeting. The Kootenai Tribe of Idaho (KTOI) presented the Kootenai River Habitat Restoration SOR dated May 4, 2016. The KTOI explained that this habitat restoration project is ongoing since 2011. The SOR requests a release of 6 kcfs or less from Libby Dam during September through the first week of November to allow for the contractor to implement in-water work associated with the Bonners Ferry Island Project. Additionally, the operation will provide a gradual declining discharge to target flows following ramping rate guidelines in the 2006 BiOp for bull trout and white sturgeon. The purpose of the restoration is to improve habitat conditions in the Kootenai River to help adult sturgeon migrate upstream, improve spawning habitat, increase juvenile rearing habitat and improve the overall ecosystem function. Components of the restoration include: creating deeper pools, building bank structures to adjust water currents, developing instream island surfaces, grading eroding river banks and planting native vegetation.

TMT members were polled on the SOR for Kootenai River Habitat Restoration, with the following results:

- NOAA Fisheries (support)
- BPA (no objection)
- NP (no objection)
- MT (support)
- ID (support)
- BOR (no objection)
- Umatilla (no objection)
- Kootenai (support)
- WA (no objection)
- OR (no objection)

ACTION: The Corps will implement the SOR to maintain flows of 6 kcfs or lower from September through the first week of November. The Corps provided an update on Libby Operations. The April to August, May inflow forecast for Libby Dam is 5.8 MAF (99% of average). October through April saw above average precipitation; however April saw temperature departures in the basin and the Kootenai by 6 - 10° F. above average. The month of April was below 50% for precipitation which when coupled with higher than average temperatures resulted in rapid snowmelt. The BiOp requirements at Libby will be similar to last year. Sturgeon volume of 0.93 MAF, which triggers the bull trout minimum, 7 kcfs, after the pulse through August 31. For habitat operations, minimums in September will be 6 kcfs and the target elevation of 2,449 feet will be set for the end of August rather than the end of September. In summary, the timing of inflows shifted up by 4 - 6 weeks. Current flood risk is low due to the below average snowpack. Libby Dam will likely not refill to 2,452 - 2,454 feet this summer, anticipated refill will occur in late July to August (2,449 feet). The Seattle District is considering refilling earlier than late July and the District will continue to evaluate June targets throughout May.

For this year refill operations will be aggressive after the Sturgeon Volume is expended in early June. The operation for the end of June will be to target an elevation of 2,445 to 2,449 feet on June 30. This elevation band gives the project a 25% chance of double peaking in the summer to meet 2,449 feet at the end of August.

MT asked if the Corps is looking at remodeling the end of December draft which occurs before reliable inflow forecast data is available. MT continued that reconsidering the large releases early in the season may provide more flow later on to combat an early runoff as occurred in April. The Corps noted that there are additional variables which could be used in the equations to provide a more holistic view of the hydrology system. The NP agreed with MT and expressed concern about the Dworshak operation where early runoff is becoming the “new norm.” The NP inquired as to if there are forecasting tools available to provide accurate information considering the observed change in weather patterns.

The NP also suggested exploring operational modifications at all storage reservoirs. The Corps noted that 2011 - 2014 saw peak flows on time, the last two years are the only recent years with early runoff. NOAA Fisheries asked if the bull trout minimum is calculated on a sliding scale. The Corps noted that the minimum can be 6 - 9 kcfs after the sturgeon volume is down based on the May-August water forecast, this year it is 7 kcfs.

2.4.2. 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 BOR'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. Reclamation's March 2016 Final WSF for April-August was 1,801 (93% of average) KAF which set the minimum flow requirements below Hungry Horse and at Columbia Falls at 900 cfs and 3,500 cfs, respectively. The minimum flows are set for the rest of the calendar year and will be updated following the January 2017 Final Forecast.

April 10 and June 30 Refill Objectives: The BOR 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 3,544.9 feet for Hungry Horse, the actual elevation was 3,521.3 feet. The actual elevation was low due to the lingering effects of the dry conditions in water year 2015 when the reservoir did not fill and low inflows through the season required Hungry Horse to draft and release water to maintain target flows at Columbia Falls on the Flathead River. The April 30 target for flood risk management was consistent through the season and was 3,545 feet based on the April forecast. The reservoir remained well below this elevation throughout the spring and the actual April 30 elevation was 3,534.1 feet. Discharges from Hungry Horse Dam in the early spring were held low since the elevation was below the April 30 target elevation. The runoff in May and June dropped off significantly; 88% of average in May and 60% of average in June. During May the discharges were increased slightly during a wet period to help control the refill averaging 5,120 cfs, in June the discharges were decreased averaging 2,672 cfs. Hungry Horse's maximum elevation occurred on July 7 at 3558.9 feet which was 1.1 feet from the full elevation.

Summer Draft Limit: The summer reservoir draft limit at Hungry Horse is 3,550 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 3,540 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 82.4 MAF which set the September 30 draft target to 3,550 feet. Hungry Horse's actual elevation on September 30th was 3550 feet.

2.4.3. Grand Coulee Dam

April 10 and June 30 refill Objective: The BOR 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.

For 2016 the official April 10 elevation objective was 1,253.0 feet. This was a result of drum gate maintenance which requires the forebay to be no higher than elevation 1,255.0 feet from mid-March through mid-May. The actual elevation on April 10 was 1,253.5 feet. The April 30 flood risk management objective for Grand Coulee was 1,243.8 feet and the elevations were below 1,255 feet through the drum gate maintenance period. Grand Coulee began refill in late April. In mid-June the salmon managers raised the issue whether Grand Coulee should avoid refilling completely after the July 4 weekend to help maintain higher flows in the lower Columbia River. This proposal was agreed to at the June 22, 2016, TMT meeting. As a result, Grand Coulee filled to a maximum elevation of 1,288.5 feet in mid June and remained in the range of 1,287 to 1,288 feet after the July 4 weekend.

The Lake Roosevelt Incremental Storage Release Program: The total amount of water to be released from Grand Coulee in 2016 under the Lake Roosevelt Incremental Storage Release Program was 35,594 acre-feet and was be distributed as shown in Table 8.

Table 8. Lake Roosevelt releases requested for 2016.

“Bucket”	2016 Releases (acre-feet)	Total Lake Roosevelt Incremental Storage Releases Program (acre-feet)
Odessa	3,364	15,000
M&I	8,500	12,500
Instream Flow	23,730	55,000

The water was released in equal amounts during the spring (April, May, June) and in late summer. The spring water was released as Lake Roosevelt was refilling in late June and in order to demonstrate that the full amount was released in late summer by the end of August, Lake Roosevelt will draft to 1,277.6 feet on 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 1,278 feet. The draft limit will be modified an additional 0.4 feet, to elevation 1,277.6 feet to implement the Lake Roosevelt Incremental Storage Release Program. The actual elevation of Grand Coulee on August 31 was 1277.6 feet.

Drum Gate Maintenance: A full 8-week period for drum gate maintenance was implemented in 2016. The maintenance required Lake Roosevelt to be below elevation 1,255 feet for the whole period. The maintenance period began on March 14 and was completed on May 8, 2016.

Banks Lake: Banks Lake will draft to elevation 1,565 feet 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 feet from full. Banks Lake actual elevation on August 31 was 1564.9 feet.

Dworshak Dam

Unit 3 will be out of service due to an overhaul between the dates of September 1, 2016, and May 1, 2017. In order to minimize impacts on fish the Corps coordinated the timing of the Dworshak Dam Unit 3 outage with the FPOM during meetings on the following dates: November 12, 2016; December 17, 2015, and; January 14, 2016. Additional updates regarding the outage were also provided on the following FPOM meeting dates: March 10, 2016; April 14, 2016; and September 6, 2016. Additional information from these discussions may be found in FPOM notes for these meetings on the following website: <http://www.nwd-wc.usace.army.mil/tmt/documents/FPOM/2010/>

With unit 3 out of service total project generation outflow will be reduced from 10 kcfs (Unit 1 @ 2.5 kcfs + Unit 2 @ 2.5 kcfs + Unit 3 @ 5 kcfs = 10 kcfs total project outflow) down to 5 kcfs. The reduction in outflow may impact the projects ability to: provide spring and summer flow augmentation, refill, and/or achieve monthly elevation targets (e.g., April 10). The AAs will make best efforts to achieve monthly elevation targets and operations request by Salmon Managers operational requests but the AAs ability to achieve these targets and requests may be limited to to the reduction in outflow associated with the unit 3 outage. The Corps will coordinate DWR operations with the TMT during the outage period.

March 30, TMT Meeting. The Corps explained the proposal for a spill test at Dworshak Dam and requested TMT feedback. The Corps noted that the test is intended to mimic conditions that may arise during the unit 3 overhaul which is currently scheduled from September 1, 2016, to May 1, 2017. During the unit 3 outage, only the two smaller units will be in operation, and spilling could result in higher total dissolved gas (TDG) concentrations. The intention of the TDG test is to assess the effectiveness of downstream vacuum degassers located at the hatchery when TDG is 115%. The Corps noted that at this point, the project is aiming to conduct the test for a 6-hour period in the end of April/beginning of May, with a window of about a week between a hatchery release and the test. The Corps is looking for input from TMT, and then will need to work with Idaho DEQ and NP Water to acquire a short duration exemption to operate above the water quality requirement not to exceed 110% TDG.

The USFWS is interested in testing at 120% TDG. The Corps noted that this is possible; however, they would need to think more on what is the best way to do so as to not harm fish, as another 6-hour period of increased TDG level would be needed.

There was discussion regarding what information is already available from the hatcheries operating at 115% TDG. The Corps noted that there is 2014 data that is likely a combination of the vacuum degassers and packed column degassers. There are now vacuum degassers for the entire hatchery and so this test would be providing new information as to what could be expected during the unit 3 outage.

OR asked if they will use the same methodology for this test as was used in previous years when data was gathered; and also requested that the Corps provide more detail of the proposed test in writing. The Corps suspects that the TDG probes will be located in the same places at the hatchery and that they are using the same equipment. The Corps agreed to provide a description of the proposed test to TMT at the next meeting.

The Facilitator asked the TMT members present to provide input on both the 115% TDG test and the newly proposed 120% TDG test, recognizing that the details of the test are not yet fully fleshed out and more information will be provided to TMT. It was noted that this is not a final poll; instead, it is an opportunity for the Corps to hear from TMT members early in the planning of the potential operation. TMT members shared the following:

- USFWS: Interested in information from both a 115 and 120% test.
- WA: Supportive of both a 115 and 120% test, however, recommends that the two tests are performed separate from each other.
- Umatilla: Would like more information to inform the potential operations during the unit 3 outage. Data from the 115 and 120% tests would inform long term decision making. Suggested installing a probe in a location prior to the degasser, as well as in the raceway to measure potential TDG increase.
- OR: Supportive of understanding the potential impacts of 115% and higher TDG to inform operations next year.
- NP: The results of the test will be useful considering the challenges they may face in the future. NP is concerned about fish health at the downstream hatchery. NP noted that they plan to release sub-yearling Chinook into downstream acclimation ponds in the first week of May and that there is no degassing available at the ponds. NP also noted that there are millions of fish out-migrating and 4,000 redds in the river downstream. NP needs to talk to the hatchery and more coordination is needed to see if the test is viable (see action item below). [Later in the meeting NP reported back on a conversation with the hatchery: they can hold off of releasing the fish into the ponds until May 4-5, which allows for the TDG test on May 2-3. However, this is a short term solution and does not address issues caused by increased TDG next year.]
- ID: Supportive of the 115% and that he has not discussed the 120% test with his team yet, however, will encourage ID to support the 120% test as well. ID is concerned with the impact to fish, however, the duration of the test is short and so impacts should be less. ID asked if the Corps has talked with ID DEQ yet? The Corps responded that they were waiting to see if TMT supported the test before talking to ID DEQ and NP Water Quality.
- NOAA Fisheries: Supports the 115 and 120% tests and that the information gathered will inform decisions in the future.
- BOR: Concur with the Corps.
- BPA: Support collecting the data so that TMT knows what to expect with the unit 3 outage conditions.
- MT: Asked if the operation requires a TDG waiver from ID and NP? The Corps responded, yes.
- Colville: Support getting the data and would like to see the test be as protective of the hatchery and acclimation ponds as possible.

ACTION: NP will send the Corps redd emergence data.

ACTION: USFWS will coordinate with the hatchery to get PIT tag data on out-migrating fish to inform how long after the hatchery release the fish are out of the area.

ACTION: The Corps will provide additional details, including a written description, for the proposed test at the next TMT meeting on April 6.

April 6, 2016, TMT Meeting. The Corps noted that posted to the TMT agenda is a link to the revised spill test proposal, which includes an overview, background information and schedule. The Corps stated that the Corps is proposing the following schedule of test operations:

- Monday, May 2, 1200-1800 hours: operate Dworshak Dam with two small units plus spill to target 115% TDG at the Dworshak tailwater gauge.
- Tuesday, May 3, 1200-1800 hours: operate Dworshak Dam with two small units plus spill to target 120% TDG at the Dworshak tailwater gauge.

The Corps emphasized that the amount of flow released depends on the temperature, and noted that the proposal is based on current conditions and may have to be adjusted in real time. Discharges during the test are expected to be approximately 8.5 kcfs and 9.5 kcfs respectively, if water temperatures remain cool. The Corps asked if that is total project discharge. The Corps noted it is total project discharge and roughly 4.8 kcfs will go through two turbines and the remainder will be spill through the ROs. Ambient air temperature and pressure greatly influence TDG generation. TDG will be measured in several locations: downstream of the degassing equipment, in the nursery head tank, and in the raceway supply head boxes. The Corps is meeting with the Dworshak National Fish Hatchery on Friday, April 8, to discuss the locations of the water quality monitoring probes.

BPA asked if the hours of operation for the spill test could be changed to 1000-1600 hours. The Corps noted that the time change is no problem. The Corps also noted that the Corps will coordinate with Idaho Department of Environmental Quality (IDEQ) and NP Water Quality to request a short duration exemption to operate above the water quality standard of 110% TDG.

The Facilitator, asked TMT members to provide input on the current proposal, with the revised testing times between 1000 and 1600 hours. TMT members shared the following:

- BPA: Supports the operation, however, would like to request a 1000 hour start time.
- NOAA Fisheries: Support.
- Umatilla: Support.
- MT: No objection.
- Colville: No objection.
- WA: Support.
- BOR: Supports the operation along with BPA's modification in start time.
- ID: Supports the operation including the 120% test. IDFG noted that IDEQ has ultimate approval on the short term exemption and needs to be coordinated with ASAP.

- NP: No objection, however, the NP TMT member cannot speak on behalf of NP Water Quality. NP TMT member will respond to any information requests or questions they may have.
- OR: Supports the operation and is interested in seeing the results. OR will follow up with the Corps on more specifics of the test.

The Facilitator thanked TMT members for their input, noting that USFWS was not present to weigh in on the operation. The Corps will coordinate with IDEQ and NP Water Quality to request a temporary TDG exemption, if there are any changes as a result of those conversations, the Corps will update TMT. Pending approval of the short term exemptions, the Corps will implement the following operation.

- On Monday, May 2, 1000-1600 hours: operate Dworshak Dam with two small units plus spill to target 115% TDG at the Dworshak tailwater gauge.
- On Tuesday, May 3, 1000-1600 hours: operate Dworshak Dam with two small units plus spill to target 120% TDG at the Dworshak tailwater gauge.

ACTION: The Corps will coordinate with IDEQ and NP Water Quality to request short term TDG exemptions; if approved, they will implement the DWR spill test on May 2, and again on May 3. They will bring any revisions to the operation outlined above to the TMT.

ACTION: The Corps and IDFG will connect with IDEQ and invite them to participate in the meeting with Dworshak National Fish Hatchery on Friday, April 8.

April 13, TMT Meeting. The Corps reported back to TMT on recommendations provided during a meeting with the Dworshak Hatchery on April 8. It was suggested that the spill test operations are moved from early May to April 28 and 29; the Corps agreed to the recommendation and will implement the Dworshak Dam spill test in accordance with the revised dates (specified below). The Corps noted that the Corps is in the process of coordinating with the NP Water Quality and IDEQ and that if additional changes are made to the operation, the Corps will circle back to TMT to report the changes. Additionally, the Corps added that the spill test is subject to change based on real time conditions, and coordination with the NP and State of Idaho. OR, asked if the Corps would follow up with TMT once the status of the waivers is determined. The Corps will provide an update either through TMT or FPOM.

ACTION: The Corps will update TMT members with feedback received from the NP and IDEQ. Additionally, the Corps will update TMT members as to which forum will provide the data from the spill test, either FPOM or TMT.

ACTION: Pending coordination with NP and IDEQ, the Corps will implement the Dworshak Dam Spill Test as follows:

- Thursday, April 28, 1000-1600 hours: operate Dworshak Dam with two small units plus spill to target 115% TDG at the Dworshak tailwater gauge (DWQI).

- Friday, April 29, 1000-1600 hours: operate Dworshak Dam with two small units plus spill to target 120% TDG at the Dworshak tailwater gauge.

April 27, 2016, TMT Meeting. Nothing has changed since the last TMT meeting, when the AA planned a spill test at Dworshak from 1000-1600 hours on April 28 and 29 to gather information that will inform operations next year when unit 3 is down for repairs. Currently, the AA are still waiting for written approval from IDEQ and the NP to exceed 110% TDG levels in the Dworshak tailrace per state water quality standards. While verbal support has been given, written approval is needed for the spill test to occur. WA asked at what time tomorrow approval would be too late to initiate the test. The Corps said that's difficult to pin down due to communications between Corps Division, Corps Walla Walla District and Dworshak Dam staff in order to implement the test spill levels. BPA noted that project operators are standing by, ready to implement the test if given permission. The AA will provide an update at the next meeting.

May 11, 2016, TMT Meeting. The Umatilla, noted that FPAC would like to recommend operating Dworshak at full powerhouse to increase flows for juvenile migration. Umatilla asked for the AAs to consider increasing flows as soon as possible and holding until the end of the day on Monday, May 16, or longer if the scheduled maintenance can be moved to a different date. This increase in flow would improve passage of juveniles and would be more beneficial now than towards the end of June when fewer juveniles are passing.

The Corps noted that work on a hatchery intake pipeline is scheduled for May 17 and 18, during which they cannot run water through unit 3 for safety reasons. The Umatilla requested that the hatchery work be conducted after the migration period has ended. IDFG agreed to follow up with the hatchery to see if pipeline work could be postponed in order for the Corps to increase flows out of Dworshak. In addition to the hatchery maintenance, there is a generation restriction for transmission testing scheduled for May 19. BPA, suggested that they may be able to consolidate the ramp down for the two maintenance operations.

The Corps will continue to monitor the flows, and adjust accordingly to meet the end of month elevation. There are multiple criteria they need to meet and the Corps will do a snow flight towards the end of May. TMT will revisit this operation at the May 18 meeting.

- **ACTION:** The Corps will bring DWR up to full powerhouse and will hold until the end of the day on Monday, May 16, or longer if the maintenance can be moved from the 17, 18, and 19. Otherwise, the project will ramp down for hatchery work on Tuesday, May 17.
- **ACTION:** The Corps, ID, and BPA will coordinate to see if the scheduled maintenance can be rescheduled to allow for the full powerhouse operation to be prolonged.

The Corps presented the results from the Dworshak Dam Spill Tests conducted on April 28 and 29. A graph with the test results is on the TMT website. The Corps noted that the TDG percentages in the river are highly variable and dependent on flows and heavily influenced by ambient conditions. In April, the system experienced higher than normal flows, therefore the

TDG results may not be representative of actual percentages that would occur in season. Below are the TDG results from operating Dworshak with spill targets of 115% and 120% at the various gauge locations:

- PECK - 115% Test: 105%; 120% Test: 107%;
- Tribal Hatchery - 115%: 104%; 120%: 105.5%;
- Big Canyon - 115%: 102%; 120%: 102%;
- North & South D-Gas - 115%: 101%; 120%: 103%; and
- Burrow Pond - 115%: 101.5%; 120%: 103-104%

The Corps noted that overall the test was successful in testing the ability of the equipment to strip gas from the surrounding area. Overall, the degassing equipment is working as designed. TMT noted that the difference between the two tests appears to be an increase in TDG of roughly 1% and inquired if it is appropriate to speculate that a spill target of 125% would increase TDG levels at the hatchery by another 1%. The Corps said it is uncertain if TDG levels would only rise 1% with an increase to 125%. NOAA Fisheries asked what spill was needed to get to 115% TDG. The Corps cautioned attributing TDG directly to flow, as there are other factors that influence TDG, however, during the test, 115% was reached between 8-10.5 kcfs. For the 120% test, discharge was near 11.5 kcfs.

Ambient air temperature and pressure also impact TDG levels, with TDG generally being higher in the afternoon compared to morning and nighttime conditions.

WA acknowledged that this test illustrates that the degassing equipment is working well. WA noted that the hatchery is concerned with TDG levels above 100%; WA asked if there were any thoughts on increasing degassing capabilities at the hatchery to get closer to 100%. USFWS, explained that there are a few improvements that can be made to the equipment; however, it is unlikely that TDG would be decreased much, and costs would be high. WA noted the importance in examining the capabilities of the equipment to provide the best possible protection to the hatchery while minimizing impacts in the river.

May 18, TMT Meeting. The Corps provided an update on Dworshak operations. The Corps noted that following the last TMT meeting, the Corps ramped up Dworshak to full powerhouse and held through Monday, May 16. Unit 3 was turned off on May 18 to allow divers to clean up the hatchery intake. Over the weekend, higher flows were forecasted to increase up to 15,000-16,000 cfs, yet flows remained at 9,000 cfs. As a result of flows remaining at 9,000 cfs, the big unit was ramped down to 5.5 kcfs and the two smaller units will ramp down to 4.5 kcfs on Thursday, May 19. By Saturday, May 21 one unit will be running at full-load, between 2.3 - 2.4 kcfs until the end of the month.

There is a snow flight planned for June 1, which will provide more information for operations. At this point, The Corps noted, the project is operating with the objective of positioning the reservoir for refill, aiming to have no more than 5 feet to fill in June. The Corps also noted that the transmission maintenance scheduled for May 19 was rescheduled to next week and will not affect Dworshak operations. The NP asked if the projected runoff is not occurring in real time, does that reflect a reduction in overall water supply within the basin? The Corps noted that the

forecast changed due to cooler temperatures and less precipitation over the weekend, so total runoff volume likely remains unchanged.

June 15, TMT Meeting. The Corps reported on water temperatures in the Snake River and Clearwater River. Yesterday, Lower Granite tailwater temperature was 62.5° F. Water temperatures are on the low end due to cooler air over the last week. The Corps provided a water temperature comparison model run for May 24 - June 23, 2016. The Corps noted the following:

- Healthy flows are maintained out of the Snake River at Anatone, at 50-60 kcfs. Flows are expected to decrease over the course of the week.
- The model is predicting lower temperatures (by 1° F.) than what has been observed. This may be due to wind mixing in the pool in addition to other variables.
- Monday, June 13, Dworshak was filled, and as a result discharge increased. Looking ahead ten days, inflows to Dworshak will come down and less water will be released. The model suggests that at the end of the ten-day window, water temperatures in the Lower Granite tailrace will approach 65° F. Whether additional water should be released out of Dworshak to combat rising water temperatures depends on the weather forecast.
- There is a 2-3 day water travel time from Dworshak to Lower Granite pool; if the Corps needs to adjust the operation, it must occur three days prior to when the change is expected to be realized at Lower Granite.
- A high quality weather gauge will be established at Lower Granite, it will provide accurate data once installed. It will also provide quality control to make sure the model runs are accurate and to prevent corrupted data as was seen last year.
- At this time, the Corps recommends targeting 65° F. in the Lower Granite tailrace until the bulk of sockeye move through the system. In 2015 the target temperature, was 67° F. The not-to-exceed temperature remains 68° F.

NOAA Fisheries, asked what volume of the Dworshak reservoir would be required to achieve LWG tailrace temperature no higher than 65° F. The Corps noted that full powerhouse will likely not be discharged. Currently, discharge is at 2.5 kcfs, and it may increase to 6-7 kcfs, the Corps estimated that it would require a fairly insignificant volume, approximately 10 to 15 kaf. WA, asked where the weather station would be located at Lower Granite. The Corps noted one gauge will be near the end of the lock approach wall and eventually they hope to install a second gauge on the temperature string buoy in the forebay. The NP asked if current Dworshak discharge temperatures are at the coolest point for the summer season, and if the temperatures are acceptable to the hatchery. The Corps stated that temperatures are at what is expected to be the coolest point. The Corps in coordination with the hatchery has been leaving gates up in “undershot” mode so water is pulled from deep in the reservoir (approximately 1,400 feet) in an effort to keep disease levels low; temperatures average around 43° F. in the hatchery.

TMT members were asked for input on the suggestion of targeting LWG tailrace temperatures of 65° F. versus 67° F. The Corps noted that the Corps will need a response from Salmon Managers within a week, before it is critical to make a decision and implement the action.

- NP requested more information on implementation dates and discharge amounts.
 - The Corps noted that the temperature model provided is for the next 5-7 days, forecasting beyond that would not be reliable. As temperatures get warmer the model will be run on a daily basis.
- WA, asked if 65° F. is targeted, will available volumes be expended more quickly if temperatures continue to rise?
 - The Corps noted that it is possible, however the Corps is not recommending targeting 65° F. all summer, only during critical passage times for sockeye.
- USFWS, asked why last year's buffer of 67° F. was not achieved.
 - The Corps noted that due to incorrect solar radiation data, the operation did not release sufficient water to lower water temperatures enough. The model incorrectly suggested temperatures would cool off if discharge was held at 7 kcfs, when in actuality 10 kcfs was needed. Once temperatures exceeded 67° F. it took roughly a week to regain critical mass in order to drop temperatures.
- The NP asked for additional temperature model results comparing target temperatures of 65° F. and 67° F. The NP also noted that if operations are able to provide better conditions beyond the criteria, it is beneficial to other migrants as well.
- WA suggested Salmon Managers wait a week and review additional information on the impacts to the lower river in an effort to be judicious with cool water available at Dworshak.
- NOAA Fisheries stated that waiting until next week may present challenges with potential air temperature increases looming. NOAA Fisheries recommended providing the Corps with guidelines to increase flows, but not to exceed 4 kcfs, if temperatures increase over the weekend.
- IDFG suggested discussing this more at the June 21 FPAC meeting and then bringing a recommendation to TMT. IDFG noted that the temperatures will likely rise starting on Monday and targeting 67° F. until Salmon Managers meet at FPAC should be fine.
- USFWS agreed with NOAA Fisheries that temperatures are forecasted to reach 90° F. and it may be prudent to meet before the June 21. USFWS also recommended allowing the Corps to have flexibility in raising flows if temperatures rise above model predictions.
 - The Corps noted that another model run will be provided via e-mail on Friday. Additionally, there is a lag time between air and water temperatures. If warm temperatures occur starting on Sunday, there will be a 1-2 day lag until water temperatures increase as well. If temperatures increase dramatically an unscheduled TMT call may occur on Monday to make any operational changes.

ACTION: The AA will operate Dworshak Dam through Wednesday, June 22 targeting 67° F. in the Lower Granite Dam tailrace. If water temperatures increase and suggest the Corps would not be able to operate Dworshak Dam outflows not to exceed 65 degree F. in the Lower Granite Dam tailrace prior to the Wednesday, June 22 TMT meeting then a TMT call will be scheduled for Monday, June 20 to address potential operational changes.

ACTION: The Corps will provide updated model runs on Friday, June 17 to be posted to the TMT website on the agenda for the June 22 meeting.

ACTION: FPAC will convene on Tuesday, June 21 to discuss a 65° F. target and will provide TMT with a recommendation on Wednesday, June 22.

June 22, TMT Meeting. The Corps reported on water temperatures in the Snake River and Clearwater River. Currently, LWG tailwater is at 59.5° F. Temperatures are on the rise and flows are declining in the Snake River at Anatone and Clearwater River at Orofino, as shown in the model temperature results from Monday, June 20. Precipitation is expected in the region to moderate temperatures; however the 10-day weather forecast indicates air temperatures will warm up considerably by the end of next week. Based on current model results, DWR water releases for temperature augmentation are likely not needed this week. However, given the trend, it is likely releases will start occurring next week. At Dworshak, current outflow is at 4.3 kcfs and expected to drop down to 3 kcfs in the next day. By June 25, outflow is again expected to drop down to 2.4 kcfs; flows will be held until releases for temperature augmentation begin. The model is run every Monday, Wednesday, and Friday. Once the tailrace temperature hits 65° F., the model will then be run daily. The Corps asked for feedback from TMT whether the Corps should target tailrace temperatures of 65° F. or 67° F. During the conversation, the Corps received the morning's model results. The Corps noted that based off of the June 22 model run the Lower Granite tailrace will hit 65° F. on June 26, 66° F. on June 29, and 67° F. on July 1. In this scenario, water would need to be released on June 28 to target 67° F., June 27 to target 66° F., and June 23 to target 65° F.

WA, asked for an update on the weather station installation at Lower Granite. The Corps stated that the station is being tested and will be operational in another two weeks. Presently, historical data are used to inform model runs, the weather station, once operational, will provide an additional data point.

IDFG stated that during the FPAC meeting on Tuesday, no consensus was reached among Salmon Managers regarding the Corps' request to target 65° F. in the Lower Granite tailrace. The general preference was to target 67° F. at Lower Granite.

TMT members had the following questions and comments:

- NOAA Fisheries asked the Corps to provide volume differences for each target, 65 degrees and 67 degrees. The Corps stated that the Corps could provide model runs that look at that difference. NOAA Fisheries noted that weather is a big driver in water temperatures, but that does not necessarily mean once the tailrace rises above 65° F. that it cannot drop back down. However, once control over the temperatures is lost, it takes more water to regain that control. Last year there was a clear indication that sockeye were adversely affected by thermal blockages in the river. The Corps is recommending targeting lower temperatures this year to avoid any adverse effects.
- NOAA Fisheries noted that the additional auxiliary water supply to the fish ladder at Lower Granite and the pump scheduled for operation at Little Goose on July 1 will provide substantial aid in keeping ladder temperatures cool for sockeye.
- WA stated that the experimental operations performed last year have not lead to clear conclusions of the benefits achieved. Moreover, the incremental benefits of holding the tailrace at 65° F. are uncertain. Salmon Managers want to ensure the DWR pool is

maintained to provide enough cool water through August, while balancing impact to sockeye and others in the system currently. WA asked if the Corps could lower the pool earlier and still maintain the agreed upon target for the July-August timeframe. With the upcoming unit 3 out at Dworshak, could additional water be provided this summer to maintain the 65° F. target operation?

- The Corps noted that if Dworshak is drafted below 1,520 feet, then refill will be potentially jeopardized the following year. The Corps noted per the RPA, the AAs draft to 1,535 feet by the end of August and 1,520 feet by the end of September in accordance with the NP Agreement. Salmon Managers would need to complete significant coordination to request modification to these operations specified above.
- WA clarified that he was not suggesting the additional augmentation water come out of the 200 kaf of the NP agreement.

BPA asked if Salmon Managers discussed maintaining tailrace temperatures of 66° F. rather than 67° F.

- IDFG noted that setting a target of 66° F. in the tailrace was not discussed at FPAC. IDFG is in favor of targeting tailrace temperatures of 66° F. in an effort to improve conditions for sockeye while being mindful of the total volume of cool water available through August. WA asked what volumes would look like if targeting 66° F. The Corps stated that flows would likely increase from 2.4 kcfs to 4.8 kcfs, which equates to 2.5 kcfs for one additional day and then a marginal amount going forward. The total volume being discussed is roughly 5 kaf, a fraction of an inch. The group was interested in seeing modeling for 65° F., 66 and 67° F. targets in the tailrace.
- MT, reflected that last year TMT struggled to reach consensus and the sockeye suffered as a result. It appears that this same indecisiveness is occurring again. TMT needs provide the best recommendation possible; if TMT would like to be risk averse, it is best not to wait until the last second to make the operation change.
- BPA asked how the adult sockeye conversion rate from Bonneville to McNary is shaping up this year.
 - NOAA Fisheries noted that 151,000 sockeye have passed Bonneville, 103,000 at The Dalles and 88,000 at John Day. Sockeye are moving and temperatures remain stable at 64° F. NOAA Fisheries noted that it will not take long for temperatures to increase to 68° F. if the July forecast is accurate. Temperatures are expected to approach 100° F. in the basin by June 30.
- IDFG reminded TMT members that the 66° F. target tailrace temperature is not a proposal for the entire season, but just for the peak of the sockeye run. As temperatures rise, it is easier to keep temperatures cooler than to try and bring temperatures back down later.

Some Salmon Managers suggested targeting 66° F. in the LWG tailrace, while other suggested continuing to manage to the 67° F. target. Those in favor of targeting 66° F. (NOAA Fisheries, ID, USFWS, Colville, MT) noted that it is important to stay ahead of the temperature curve while drafting minimal volume from Dworshak. There was concern in not acting soon enough with temperatures expected to rise soon and quickly.

Those in favor of targeting 67° F. (OR, NP, WA), noted that 67 is a buffer to satisfy the actual target of 68° F. Newer weather monitoring and solar radiation tools would be good additions to improve the accuracy of predictions. Also, operational improvements (i.e. the pumps at Lower Granite and Little Goose) may improve conditions. Additionally, it was pointed out that the TMT is focusing on the LWG tailrace temperatures to make these decisions, instead of taking a broader look at the system. Much of the issues in 2015 were the result of high temperatures in the Lower Columbia. It was pointed out that 80% of the sockeye mortality occurred below Ice Harbor Dam.

The Umatilla was not present for the conversation. BOR and BPA noted that they would support the Corps' decision.

ACTION: The AAs will continue to operate Dworshak Dam targeting 67° F. in the Lower Granite Dam tailrace. If Salmon Managers wish to change the operation to target 66° F. in the Lower Granite tailrace, an unscheduled call will occur on Friday, June 24 to amend the operation.

ACTION: The Corps will provide updated model runs on Friday, June 24. These will be posted to the TMT website on the agenda for the June 29 meeting.

ACTION: FPAC will convene on Tuesday, June 28 and discuss the 66° F. target compared to the 67° F. target and will provide TMT with any requests for changes in operation on Wednesday, June 29.

ACTION: DS Consulting will contact the Umatilla to see if there is an alternate Umatilla representative for TMT.

June 29, TMT Meeting. The Corps reported on water temperatures in the Snake River and Clearwater River. Currently, Lower Granite (LWG) tailwater is 66° F. Water temperatures at Anatone and Orofino rose above 70° F. as air temperatures steadily climbed throughout the week.

Over the weekend, discharges out of Dworshak were held at 2.4 kcfs to conserve water as much as possible and maintain the target of 67° F. as coordinated at TMT. The reservoir touched full and on the morning of June 27 discharge was increased to 7 kcfs because model results indicated that water temperatures were approaching 67° F. within three days.

Between June 27-28, Idaho Power discharged an additional 5 kcfs of warm water beyond what the model was anticipating. The following model run showed temperature exceedances above 68° F. by July 1, triggering an increase to full powerhouse, 9.4 kcfs, on June 28 to keep temperatures below 68° F. The Corps will continue to run models daily to inform the current operation target of 67° F. in the LWG tailwater.

The NP asked if discharge requests are based on the target tailwater of 67° F. The Corps responded yes, as coordinated at TMT last week, the Corps is operating Dworshak not to exceed

67° F. in the LWG tailwater. WA noted that he was surprised to see the change in outflow. The Corps noted that per TMT direction, the Corps is operating to the 67 degree target, and if temperatures and space in the reservoir allow, discharge will be decreased in an effort to conserve water for later in the season. WA wondered if outflows were maintained at 3.6 kcfs over the weekend, would it mean that full powerhouse would not be necessary now? The Corps noted that with increasing air temperatures and warm water coming from Hells Canyon, full powerhouse was necessary to stabilize water temperatures. In addition to solar radiation, the LWG spillway weir is in operation and passing water as warm as 25° C. OR asked if there have been any temperature exceedances at LWG tailwater. The Corps noted that the current temperature is 66.3° F. and there have not been any exceedances due to the operational change made on Monday.

MT, recommended closing the spillway weir to limit warm surface water from moving downstream to help cool the river. The Corps stated there are new FPP criteria this year that would require the RSW to close when flows are below 30 kcfs. NOAA Fisheries proposed to close the RSW at LWG now for the remainder of the season and the Salmon Managers caucused to discuss.

Following their caucus, Salmon Managers reported back with unanimous consensus, of those present (NOAA Fisheries, USFWS, OR, ID, WA, MT, NP, and Tom Iverson), to close the RSW at LWG as soon as possible through the remainder of the spill season. They expressed that there are concerns over the effects of the RSW closure on subyearling passage and the inability to monitor the impact on them; however, given the temperature conditions, they felt that closing the RSW was a preemptive measure necessary to manage increasing water temperatures. The Corps noted that an updated model showing the RSW closure would be provided tomorrow. OR asked that the AA continue to monitor the delta difference between the forebay and tailwater locations.

ACTION: The Corps will take the RSW out of service at LWG and implement the spill pattern for uniform spill with no RSW, as defined in the Fish Passage Plan. The Corps will implement the operation as soon as operationally possible. If the change occurs after June 30, the Corps will notify TMT members via e-mail.

July 6, TMT Meeting. The Corps gave TMT an update on flow and temperature augmentation operations at Dworshak Dam.

On July 1, modeling of temperatures from the Orofino and Anatone gauges showed that with 9.5 kcfs releases from Dworshak, temperatures at the Lower Granite tailwater should stay below 68° F. without further augmentation from Dworshak. However, on July 3, modeling results indicated that tailwater temperatures could approach or exceed 68° F. in the next 14 days, so DWR releases were increased to 10.5 kcfs, with 9.5 kcfs of that through the powerhouse and 1 kcfs as spill.

Subsequent modeling showed that, with temperatures declining, DWR releases could be reduced to 7.5 kcfs. This water-conserving action was delayed a few days by the Fourth of July holiday. Current modeling shows LWG tailwater temperatures hovering around 66 - 67° F. for the next few days, so the Corps does not anticipate any changes in DWR operations.

The NP asked whether this means 7.5 kcfs releases will continue through July 15 unless something unexpected happens; the Corps said that's correct. The Corps will continue modeling daily for temperature management. On July 3, adult sockeye began passing LWG in large numbers, which indicates that DWR operations are sufficient to support sockeye migration.

July 13, TMT Meeting. The Corps reported on current water temperatures in the Snake River and Clearwater River. Due to heavy precipitation in the region, water temperatures in the Clearwater River at Orofino dropped to 60° F. on July 10. Water temperatures are considerably cooler compared to last week, where temperatures in the Clearwater were in excess of 70° F.

On July 6, discharges out of Dworshak were reduced from 10.5 kcfs to 7.5 kcfs because model results indicated declining water temperatures. Since July 6, discharges out of Dworshak have been held at an even flow of 7.5 kcfs. The latest model run (July 12) shows Lower Granite tailwater temperatures continuing to decline; water temperatures are expected to return to more normal levels outside of the 10-day forecast.

Currently, the Corps plans to maintain an outflow of 7.5 kcfs for the next week for two reasons: to meet the end of August elevation target of 1,535 feet as stated in the BiOp; and because model results indicate water temperatures will not exceed 67° F. within the modeled timeframe. The Corps will continue to conserve water in to August; an increase in outflow will likely occur before the end of July.

NOAA Fisheries, stated that Dworshak operations were discussed at FPAC and FPAC members are supportive of the operations. IDFG, shared with TMT that water temperatures on the lower Salmon River at Whitebird are following a similar trend and are in the 60° F. range. IDFG is optimistic that cooling water temperatures will provide good migration and conversion conditions for Sockeye in the Snake River.

ACTION: The Corps will maintain a flat discharge of 7.5 kcfs out of Dworshak Dam until conditions warrant a change in outflow. An update will be provided at the next TMT meeting.

July 20, TMT Meeting. The Corps, reported on current water temperatures in the Snake River and Clearwater River. The Corps noted that the cooler weather has helped keep temperatures below the 68° F. threshold. The Corps shared that discharge at Dworshak was increased to 9.6 kcfs, full powerhouse, on Sunday, July 17th at midnight; the project plans to hold 9.6 kcfs discharge unless conditions warrant a change. The increase in discharge was in preparation of the end of August Dworshak forebay elevation target of 1,535 feet. The project will continue to run models and if needed will increase discharge to offset temperature.

ACTION: The Corps will maintain a constant discharge of 9.6 kcfs out of Dworshak Dam until conditions warrant a change in outflow. An update will be provided at the next TMT meeting.

July 27, TMT Meeting. The Corps reported that current water temperatures in the Snake River and Clearwater River are around 66° F. the Corps presented three water temperature comparisons from July 5 - August 4. The first model showed a decrease in discharge from 12.0 kcfs to 9.8 kcfs starting at midnight on Friday, July 29. The second model showed the same decrease in discharge, however, at midnight on Sunday, July 31. The third model showed an increase in discharge to 12.5 kcfs, followed by a decrease to 9.8 kcfs.

The Corps explained that the region needs to balance short term releases to make sure that there is sufficient water through August. If discharge is decreased to 9.8 kcfs on July 31, it will likely be able to be held until the end of August. If discharge is decreased at a later date, for example, Monday, August 1, discharge will have to be decreased to 7.5 kcfs for a few days towards the end of August. The Corps asked Salmon Managers for input on whether they should drop discharge on Friday or hold off until Monday. Salmon Managers caucused and reached consensus to maintain 12.0 kcfs discharge out of Dworshak until midnight on Sunday, July 31 and drop down to full powerhouse.

ACTION: The Corps will maintain 12.0 kcfs out of Dworshak Dam until midnight on Sunday, July 31 then decrease discharge to 9.8 kcfs beginning on Monday, August 1.

August 10, TMT Meeting. The Corps reported on current water temperatures in the Snake River and Clearwater River. Presently, water temperatures are cool in both systems and modeling indicates water temperatures will remain cool in to next week. The Corps asked for Salmon Managers' input on dropping Dworshak outflow by turning off one small unit this Friday, August 12, in order to conserve water, in case of a temperature spike at the end of the month. If the region prefers to stay with the current operation of full powerhouse, the small unit will be dropped on August 18 to prevent drafting too much by the end of August. If the unit is dropped sooner, additional water will be conserved to be available later in August and the unit will be turned back on around August 25 in order to reach the end of August elevation target of 1,535 feet, depending on flow. Salmon Managers caucused to discuss both proposals. NOAA, reported that Salmon Managers reached consensus and recommended the Corps reduce Dworshak outflow to 7.8 kcfs on August 12. If conditions change, they would like the Corps to modify the operation as needed. NOAA and the NPT was interested in more information on any other turbine operating scenarios that could keep flows more balanced through the end of the month; for instance, an outflow between 7.8 kcfs and 9.8 kcfs, or even below 7.8 kcfs. The AAs will look into this and bring information on options to the next TMT meeting.

ACTION: The Corps will reduce outflow to 7.8 kcfs out of Dworshak Dam at 0000 hours on Friday, August 12. The AAs will bring additional information on other Dworshak Dam outflow scenarios to the next TMT meeting on August 17.

August 17, TMT Meeting. The Corps reported on current water temperatures in the Snake and Clearwater Rivers. Presently, water temperatures are fairly cool in both systems, with Lower Granite tailwater temperatures at 65.3 degrees Fahrenheit. Due to a warm spell in the region, discharge has been increased to avoid temperature exceedances in the coming week. The Corps will continue to operate Dworshak Dam at full powerhouse through the end of the week, then drop down to one small and one large unit in order to achieve the target elevation of 1,535 feet

by the end of August. WA, asked for an update on the temperature station in the Lower Granite pool. The Corps noted that the weather station is operating as of last week, however, they are still working on transmitting the data. Additionally, another weather station, midway up the reservoir pool, is set for installation next year. The hope is that information from these stations will help inform next years modelling.

ACTION: The Corps will continue to operate Dworshak Dam at full powerhouse through the end of this week and will drop down to one large and one small unit the following week to achieve the target elevation of 1,535 feet by August 31.

August 31, TMT Meeting. The Corps, updated TMT on Dworshak and noted that the project touched the end of August target elevation (1,535 feet) at 2300 hours on August 30. Current water temperatures in the Snake and Clearwater Rivers systems are fairly cool, with Lower Granite tailwater temperatures around 65 degrees Fahrenheit. The Corps noted that model results show temperature hovering around 65-66 degrees for the foreseeable future, as night and day temperatures are dropping for the season. Given this situation, there is no expectation that temperature will be an issue. The Corps also reported on the 2016 Dworshak Board Operation. Per the operation, the project will:

- Discharge 6.7 kcfs through August 31.
- On September 1 at 0400 hours, Unit 3 will be taken off-line for an overhaul, at which point, discharge will be reduced to 6.0kcfs (2 small units, plus spill up to ~110% TDG). All units will be operated in undershot mode to maintain temperatures around 45 degrees.
- On about September 13/14, discharge will be reduced to 4.6kcfs (2 small units, without spill).
- On about September 17/18, discharge will be reduced to 2.5 kcfs (1 small unit).
- When the pool elevation reaches 1520 feet the discharge will be reduced to 1.5 kcfs.

The above stated operation is dependent on inflows into Dworshak. Lately, inflows have been lower than forecasted. The current STP forecasts approximately 900 cfs. OR, asked for clarification as to who makes up the Dworshak Board. The Corps noted that the Board is made up of the Nez Perce, State of Idaho, NMFS, USACE and BPA. The USFWS asked for clarification on what 'undershot mode' is. The Corps explained that the powerhouse intakes have temperature selectors that allow the project to modify temperatures by lowering or raising the gates. He explained that at the request of Dworshak National Hatchery, for the last several years the project has operated in undershot mode in order to supply the coldest water possible downstream.

ACTION: The Corps will continue to operate Dworshak Dam as outlined in the Dworshak Board agreement stated above and available in more detail on the TMT website

http://www.nwd-wc.usace.army.mil/tmt/agendas/2016/0831_Dworshak_Board_2016_Operational_Plan_NWD.pdf. IDFG reported to TMT that ID has finalized their recommendations for the Dworshak operation priorities during the Unit 3 overhaul. IDFG is prepared to present them for TMT conversation at the next TMT meeting on September 7.

ACTION: IDFG will present the ID recommendations at the September 7 TMT meeting.

August 31, TMT Meeting. The Corps updated TMT on Dworshak operations and noted that the project touched the end of August target elevation (1535 feet) at 2300 hours on August 30. Current water temperatures in the Snake and Clearwater Rivers systems are fairly cool, with Lower Granite tailwater temperatures around 65 degrees Fahrenheit. The Corps noted that model results show temperature hovering around 65-66 degrees for the foreseeable future, as night and day temperatures are dropping for the season. Given this situation, there is no expectation that temperature will be an issue. The Corps also reported on the 2016 Dworshak Board Operation. Per the operation, the project will:

- Discharge 6.7 kcfs through August 31.
- On September 1 at 0400 hours, Unit 3 will be taken off-line for an overhaul, at which point, discharge will be reduced to 6.0kcfs (2 small units, plus spill up to ~110% TDG). All units will be operated in undershot mode to maintain temperatures around 45 degrees.
- On about September 13/14, discharge will be reduced to 4.6 kcfs (2 small units, without spill).
- On about September 17/18, discharge will be reduced to 2.5 kcfs (1 small unit).
- When the pool elevation reaches 1,520 feet the discharge will be reduced to 1.5 kcfs.

The above stated operation is dependent on inflows into Dworshak. Lately, inflows have been lower than forecasted. The current STP forecasts approximately 900 cfs. OR asked for clarification as to who makes up the Dworshak Board. The Corps noted that the Board is made up of the Nez Perce, State of Idaho, NMFS, USACE and BPA. The USFWS, asked for clarification on what 'undershot mode' is. The Corps explained that the powerhouse intakes have temperature selectors that allow the project to modify temperatures by lowering or raising the gates. The Corps explained that at the request of Dworshak National Hatchery, for the last several years the project has operated in undershot mode in order to supply the coldest water possible downstream.

ACTION: The Corps will continue to operate Dworshak Dam as outlined in the Dworshak Board agreement stated above and available in more detail on the TMT website (http://www.nwd-wc.usace.army.mil/tmt/agendas/2016/0831_Dworshak_Board_2016_Operational_Plan_NWD.pdf).

ID, reported to TMT that ID has finalized their recommendations for the Dworshak operation priorities during the Unit 3 overhaul. ID is prepared to present them for TMT conversation at the next TMT meeting on September 7.

ACTION: IDFG will present the ID recommendations at the September 7 TMT meeting.

2.5. Water Quality

Spill priority lists are coordinated with the TMT and available on the following website at: <http://www.nwd-wc.usace.army.mil/tmt/documents/spill-priority/>

2.6. Burbot Spawning Flows (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).

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

Regarding the 2015-2016 operation the the AAs implemented an 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.

2.8. Upper Snake Flow Augmentation

BOR released 427 KAF of flow augmentation from the Upper Snake Basin in 2016.

2.9. Chum Operation

Date	TMT Coordination Summary
October 21, 2015	<p>At this time the tentative plan for chum operation will be the same operation coordinated last year. The operation would begin with a tailwater elevation of 11.5 to 13.0 feet beginning on November 7. TMT will revisit the chum operation at the Nov 4 TMT meeting, unless there is significant rainfall and then an interim meeting will be scheduled.</p>
November 4, 2015	<p>NOAA Fisheries, reported that as of midnight on November 3, Bonneville tailwater elevation was 11.2 feet and flows were between 108 - 110 kcfs. NOAA Fisheries continued that on Monday, BPA and NOAA Fisheries visited Hamilton Springs and Hamilton Creek to see if the streams were watered; both were flowing well and pictures are available on the TMT agenda. WDFW, shared that chum were sighted in the springs on Tuesday.</p> <p>The group discussed when to initiate the chum operation. It was noted that at this point, there is not enough inflow at Bonneville to support a constant tailwater elevation of 11 feet without moving water from Grand Coulee, which takes 3 days to travel downstream to Bonneville. BPA noted that one option would be to hold off on implementing the chum operation and use flows to continue filling Grand Coulee for future use. USFWS explained that Salmon Managers would like to start the operation as soon as possible to ensure that chum have access to habitat, which WA noted is stated in the BiOp to be available at 11.3 feet.</p> <p>After discussion, TMT members coalesced around an interim operation that set a range of 10.5 - 12.5 feet tailwater elevation all hours, unless there is not enough water, in which case the project will prioritize daytime hours. Then on Saturday, November 7, the AAs will initiate the previously coordinated chum operation. BPA noted that they need to check and make sure there will be sufficient water for this operation.</p> <p>Starting today, November 4 at 0600, operate Bonneville tailwater elevations between 10.5 - 12.5 feet at all times if possible; if there is not enough water, prioritize daytime hours. On Saturday, November 7 at 0600 hours shift to the previously planned chum operation.</p> <p>On Saturday, November 7 at 0600 hours implement the following operation:</p> <ol style="list-style-type: none"> 1. Operate Bonneville tailwater within a 1-foot range of 11.5 - 12.5 feet during all hours. 2. If necessary to pass additional flow, operate as necessary up to 13.0 feet during all hours, returning to the range of 11.5 - 12.5 feet whenever possible. 3. If necessary to pass additional flow, operate Bonneville tailwater up to 16.5 feet during nighttime hours (1700 – 0600 hours). The highest tailwater elevations will be concentrated around midnight. 4. If necessary to pass additional flow, the Bonneville Dam tailwater will be operated up to 18.5 feet during nighttime (1700 - 0600 hours). The highest tailwater elevations will be concentrated around midnight. 5. If necessary to pass additional flow, operate tailwater between 13.0 - 16.5 feet during daytime hours (0600 – 1700 hours) with no upper limit during nighttime hours. The highest tailwater elevations will be concentrated around midnight. The AAs will notify TMT of this occurrence and coordinate further operations if necessary.
November 18, 2015	<p>NOAA Fisheries reported that the chum operation commenced on November 7 at 0600 hours. Chum were observed in the area. Tailwater elevations have ranged from 11.5 - 12 feet, however, rose to 16 feet on November 17 due to large amounts of rainfall. Chum counts observed at Woods Landing were around 160 and at Bonneville numbers were near 140. WA confirmed that Chum counts were abundant in most areas and also noted that the last time Chum counts were over 100 at Bonneville Dam was in 2010 and the current count of 146 is the highest number observed in the last 10 years.</p>

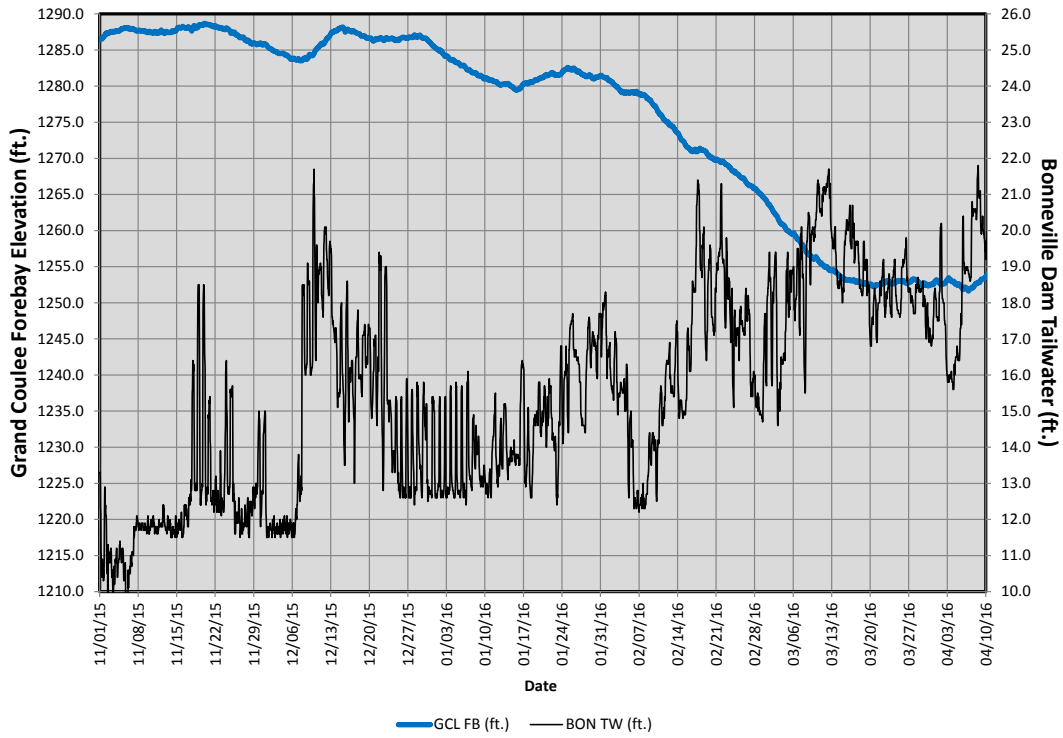
Date	TMT Coordination Summary
December 11, 2015	<p>Bonneville tailwater was 19 feet due to increased streamflows. Forecasts suggest that by late next week flows should drop enough for the project to manage the flow. Per the coordinated chum operation, once possible, the project would drop back down to a minimum of 13 feet, and operate between 13.0 - 16.5 feet (step 6). NOAA Fisheries reported that Salmon Managers met and discussed the operation, noting that they do not want to hold a minimum of 14 feet, considering the uncertainty of January - March flows, until they have more information regarding where the fish are spawning. They would prefer to dial back to 13 feet during the day, and increase as necessary to rewet the redds at night (between 13 – 20 feet). WDFW crew plans to survey for redds on Tuesday December 15, at which point they should have a better idea of where fish are spawning.</p>
December 16, 2015	<p>Salmon Manager provided a recommendation for the chum protection operation as minimum 13 feet tailwater elevation, and to re-wet redds, with a tailwater elevation up to 16 feet for a four hour period at night. WA, noted that surveys were conducted on Monday and Tuesday, and that the survey crew reported that there were Chum in the area, however, no signs of redds in the exposed dry areas or edges of the water; the tailwater elevation was between 13.5 - 15.0 feet during the surveys. Both NOAA Fisheries and WA noted that if there are no redds above 13 feet, the tailwater could be stepped down when possible. BPA noted that there is still too much water in the system to significantly shape the flow; and did not expect flows to come down until January.</p> <p>The plan is to continue with the current chum operation through midnight December 31. At 0000 hours on January 1 the AAs will switch to the incubation operation, tentatively set a minimum of 12.5 feet. If more information becomes available TMT will revisit this operation. TMT will check in on the Chum operation at the December 22 conference call.</p> <p>BPA and WDFW will coordinate the removal of the WDFW trap at Duncan Creek.</p>
December 22, 2015	<p>BPA reported that the survey crew saw one live chum and one live Chinook, both of which looked to be nearing their end. There were no fish caught in the WDFW sein and no new information regarding redd sightings. WDFW, noted that he did not have any additional information from the survey, or any changes to the suggested minimum tailwater elevation of 12.5 feet from last week's meeting. NOAA Fisheries, shared that FPAC arrived at a recommended operation today on their call. FPAC suggests holding a minimum of 12.5 feet, with a four hour rewetting period of the tailwater elevation up to 15 feet in case there are redds at higher elevations. It was noted that if possible, the preference is to not have the rewetting hours be a consecutive 4-hour period. WDFW noted that the survey crew intends to go back out to survey next week, so if conditions allow, there may be more information.</p> <p>BPA noted that the project should be able to hold the 12.5 feet elevation with four hours up to 15 feet, however, if something changes, a TMT meeting will be scheduled.</p>
January 6, 2016	<p>NOAA Fisheries provided an update on the Chum and noted that despite regular surveys, the river conditions have made it a challenge to obtain precise data on the location and depth of redds. NOAA Fisheries continued that it is expected that the spawning peak was in late November when hundreds of Chum were sighted at various locations.</p> <p>NOAA Fisheries noted that, following the November surveys, flows increased and Chum observations decreased. Currently, the survey crew is reporting no visible redds at higher elevations, therefore FPAC recommends discontinuing the minimum of 12.5 feet, with a four hour rewetting period of tailwater elevation up to 15 feet. Instead, FPAC would like to suggest a revised operation with a minimum tailwater of 12.2 feet and cease rewetting.</p> <p>The Corps noted that the Corps will implement the tailwater minimum of 12.2 feet, however, it may be challenging to maintain beyond next week if water supply forecasts continue to decrease. The Corps suggested holding a TMT meeting next week to check in on the operation. TMT members agreed that the operation should be revisited next week.</p>

Date	TMT Coordination Summary
January 13, 2016	<p>BPA, provided an update on the chum operation and noted that Bonneville is operating with a minimum tailwater elevation of 12.2 feet, however due to recent non-treaty storage releases out of Canada and an increase in incremental flows, the tailwater elevation has been between 13 - 14 feet for the last few days. Considering the pending forecast and official water supply forecasts, BPA noted that the AAs recommend exercising caution and trying to conserve water through future operation. NOAA Fisheries noted that members of FPAC were displeased to see elevations in the 13 - 14 feet range, after being cautioned by AAs to reduce tailwater elevations, and then seeing elevations come back up. NOAA Fisheries noted that the release of the Canadian water was unexpected and Salmon Managers were caught off guard by the higher than expected flows over the weekend.</p>
January 20, 2016	<p>The COE noted that the Bonneville tailwater elevation as of 0800 hours was 14.6 feet and continued that Bonneville is continuing to operate with a minimum tailwater elevation of 12.2 feet all hours. The RFC forecast for Bonneville shows inflows of 143 kcfs today and the 10 day inflow forecast is approximately 130 kcfs. NOAA Fisheries and the Salmon Managers agreed with maintaining the current protection level with a minimum tailwater elevation of 12.2 feet. Rainfall is forecasted over the next week and may cause an increase Bonneville tailwater elevations. It was suggested that TMT meet next Wednesday for an update and check in on the Chum operation. The Corps also pointed TMT members to agenda attachment 4c, which provides a summary of hourly average tailwater elevations, coordinated tailwater operating ranges, and Chum surveys for each week from November 1 through January 19.</p> <p>ACTION: The AAs will continue operating Bonneville with a tailwater minimum of 12.2 feet. A conference call will be held on February 27 at 9:00 am to check in on the operation.</p>
January 27, 2016	<p>The Corps provided an update on the current chum operation. The Corps noted that Bonneville is operating at a minimum tailwater elevation of 12.2 feet. BPA, noted that January 17 to January 24 outflows from Priest Rapids ran between 74 and 90 kcfs, which is just above the 74 kcfs required to meet the minimum flow at Vernita Bar. During the same period the flow at Lower Granite was running at 25 - 30 kcfs and the 12 day average incremental flows are approximately 30 kcfs. BPA continued that even if the flow at Priest Rapids was at the minimum discharge for Vernita Bar of 74 kcfs, natural flows would result in tailwater elevations above the protection level. Additionally, the Willamette River is running high and Lower Granite flows have increased with both rivers forecasted to peak again in the next 10 days. The expectation is that these conditions will continue to produce higher tailwater elevations at Bonneville. NOAA Fisheries, summarized that with higher flows in the Willamette, the Snake River and at Vernita Bar, higher tailwater at Bonneville is expected to continue next week.</p> <p>ACTION: The AA's will continue operating Bonneville with a tailwater minimum of 12.2 feet. A conference call will be held on February 3 at 9:00 am to check in on the Chum operation.</p>
February 3, 2016	<p>The Corps noted that as of 0700 hours, Bonneville is operating at a tailwater elevation of 15.4 feet, which is above the tailwater minimum of 12.2 feet. The Corps will continue operating Bonneville with a tailwater minimum of 12.2 feet. Current Bonneville inflows are at 150 kcfs; the 10 day forecast shows a gradual decrease of inflows down to 115 kcfs. The current water supply forecast at The Dalles is in the mid to upper 90% and the official 5 day-QPF forecast for April - August is 86 MAF (98% of average). The USFWS, asked if the AAs know when chum emergence will occur. BPA, said they do not know precisely when emergence will happen. WA, asked if with the recent drafts, was Grand Coulee expected to meet the April 10 refill target, with an 85 % probability, and maintain current chum operations. BPA, confirmed that Grand Coulee was drafting to meet this expectation.</p> <p>ACTION: The AA's will continue operating Bonneville with a tailwater minimum of 12.2 feet. A TMT meeting will be held on February 17 at 9:00am to check in on the Chum operation.</p>

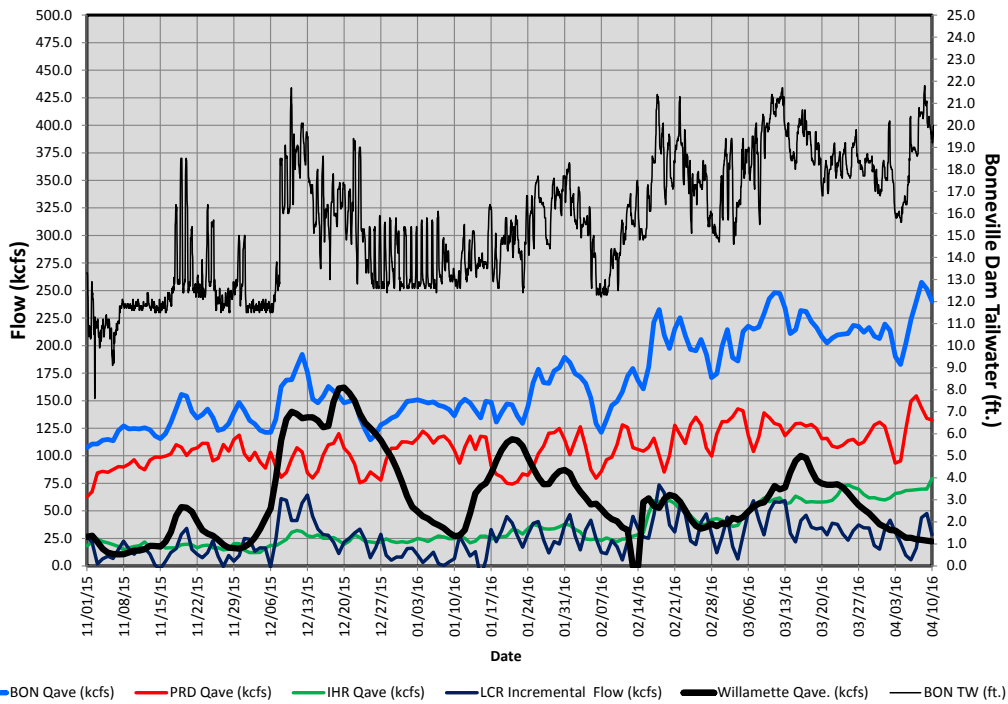
Date	TMT Coordination Summary
February 17, 2016	<p>NOAA Fisheries reported on the chum operation noting that BON tailwater remains above the minimum protection level. There is uncertainty if protection level will be adequate in March after drafting occurs for drumgate maintenance. The chum incubation period will continue through to April 15. WA, stated that chum fry emergence is occurring at Hamilton Springs, Gray's River, Crazy Johnson and Duncan Creek. The Corps will continue to operate above the minimum tailwater elevation of 12.2 feet until coordinated differently. As of February 17th at 0700 hours, the Bonneville tailwater elevation is at 18.7 feet.</p> <p>ACTION: The AAs will continue operating Bonneville with a tailwater minimum of 12.2 feet.</p>
March 2, 2016	<p>The Corps noted that as of 0700 hours, Bonneville is operating at a tailwater elevation of 18 feet, which is above the tailwater minimum of 12.2 feet. The Corps will continue operating Bonneville with a tailwater minimum of 12.2 feet unless coordinated otherwise. BPA, discussed the graphs found in the seasonal update and available as a link on the TMT agenda (http://www.nwdwc.usace.army.mil/tmt/agendas/2016/0302_Agenda.html). BPA noted that there is a lot of water in the system due to drafting for drumgate maintenance. The first graph provided shows the Grand Coulee forebay steadily dropping to the drumgate maintenance elevation of 1,255 feet. Bonneville tailwater has also risen as a result of drafting at Grand Coulee (black line). The second graph shows average outflows at Bonneville (bright blue line), Priest Rapids (red line), Willamette (black line) and Ice Harbor (green line). The blue line near the x - axis illustrates Priest Rapids outflow combined with Ice Harbor outflows subtracted from Bonneville outflows. The result depicts what incremental inflows are between Ice Harbor, Priest Rapids and Bonneville. WA, extended appreciation to BPA for providing the update.</p> <p>ACTION: The AA's will continue operating Bonneville with a tailwater minimum of 12.2 feet.</p>
March 16, 2016	<p>NOAA Fisheries noted that chum redds are well under water and those emerging will hopefully arrive to better ocean conditions than years prior. USFWS, asked what emergence monitoring and data are available. NOAA Fisheries stated that there is monitoring at Gray's River and Hamilton Springs, however, there is no mainstem emergence monitoring. Emergence timing data used are from the intensive monitoring program conducted from 1999 to 2006. OR, asked BPA if the Temperature Unit trajectory is still on track to meet target objectives Facilitator's Note: in edits, OR clarified that the TU trajectory is to reach 825 TU somewhere between the 3rd week of March and the 3rd week in April; with 932 TU reach being met after week 3 in April]. BPA, stated that the operation is meeting objectives and will continue to be implemented as coordinated at TMT until April 9, when the emergence protection operation is over.</p> <p>ACTION: The AA's will continue operating Bonneville with a tailwater minimum of 12.2 feet through midnight on April 9, 2016.</p>
March 30, 2016	<p>NOAA Fisheries noted that the Columbia spill operation will start on April 10 and should not be a concern for chum as there is plenty of water covering the redds. The Corps noted that the AA's will continue to implement as coordinated at TMT until April 9, and then the emergence protection operation is over. BPA, noted that the Snake River spill operation starts on April 3.</p> <p>ACTION: The AA's will continue operating Bonneville with a tailwater minimum of 12.2 feet through midnight on April 9, 2016.</p> <p>ACTION: On April 10, the AA's will begin the Columbia River spill operation, as coordinated in the Fish Operations Plan.</p>

Dates	Chum Water Management Summary
November, 7 - 17, 2015	The chum operation began on November 7. Between November 7 and 17 The TW was held steady on all hours between TW elevation 11.5 to 12.5 feet. Grand Coulee was generally passing inflow with the forebay within the top 2 feet.
November 17 - 25, 2015	Beginning on the November 17 well above average precipitation in the basin increased local streamflows with the Willamette River flow peaking at over 50 kcfs. Daytime TW elevations remained at or below 13.0 feet with nighttime TW elevation reaching up to 18 feet during this period. During this period Grand Coulee was generally passing inflow with the forebay within the top 2 feet.
November 25 - Dec 7, 2015	Precipitation continued to be well above average during this period with moderate rises in streamflows. The Tailwater elevations at Bonneville generally remained below 13.0 feet except for a few nights where nighttime TW elevations reached 15-16 feet. Grand Coulee was drafted during this period ~4 feet for power flexibility.
December 7 - 25, 2015	Very heavy precipitation basinwide with numerous rainfall records contributed to producing one of the wettest December on record. Local streamflows and incremental flows across the basin increased significantly. The Willamette River flow increased to over 150 kcfs during this period. The result produced TW elevations downstream of Bonneville dam of 15 - 20 feet on all hours during this period. It wasn't until the end of this period that the daytime tailwater returned to under 13.0 on December 25. During this period Grand Coulee refilled to ~1287 feet.
December 25 - Jan 15, 2016	Precipitation during this period was below average to start then picked up near the end with streamflows responding. The Willamette River flow increased to over 100 kcfs during this period. The TW elevations below Bonneville Dam during this period were generally under 13 feet during the day with the 4 hours of rewetting protection operation to 15 feet on other hours. During this period Grand Coulee was drafted to elevation ~1280 feet primarily due to the support of the chum protection operation with a small portion due to power flexibility. Water supply forecasts during this period had been steadily dropping prompting concerns about the additional water required for the rewetting operation.
January 15 - 31, 2016	Any further concerns regarding a precipitous continued drop in the water supply forecast faded across Jan as precipitation was generally above average during this period. Local streamflows once again increased with near bank full flows on the Willamette River. Bonneville Dam TW elevations during this period were well above the required minimum of 12.2 feet. Higher TW elevations during this period were a combination of high local streamflows and passage of non-treaty storage releases. During this period Grand Coulee had a net fill of ~1 foot finishing up Jan at just over elevation 1,281 feet which is 4 feet above the Jan VDL at elevation 1277.0 feet.
January 31 - Feb 12, 2016	Precipitation in portions of the basin increased water supply conditions closer to normal. Reclamation announced that they will schedule drumgate maintenance this year with water supply forecasts close to average. This requires Grand Coulee to be drafted to elevation 1255 feet by Mar 14. The result is that the TW elevations below Bonneville Dam will be well above the protection minimum through mid Mar.
February 12 - Mar 14, 2016	Grand Coulee was drafted to the drum gate maintenance elevation. This draft combined with robust Snake and Willamette River flows contributed to BON TW elevations of 15 - 21 feet.
March 14 - April 30, 2016	Grand Coulee will be operated within a 5-foot operating range between 1250 - 1255 feet and will be filled to the coordinated April 10 Elevation Objective of 1253.0 on March 10. From April 10 Grand Coulee will be drafted to the April 30 FRM elevation currently forecasted to be 1244.6 feet.

2015-16 Chum Operations



2015-16 Chum Operations



Chum survey data gathered at the Ives/Pierce Island Complex are in **Table 9**. Data from all Chum survey areas are provided by the Fish Passage Center on the following website:
http://www.fpc.org/spawning/spawning_surveys.html

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

Date	Lives	Dead ⁱ	Redds ⁱⁱ	Visibility (feet)
October 8, 2015	0	0	0	5
October 15	0	0	0	5
October 22	0	0	0	10
October 29	0	0	0	6
November 3	0	0	0	4
November 10	70	1	33	9
November 18	52	6	3	1
November 24	341	36	47	6
December 3	188	NC	NC	5
December 8	0	2	24	0.5
December 15	4	6	NC	3
December 22	1	1	NC	3
December 29	0	0	0	3
January 7, 2016	0	0	0	6

i. Dead are newly sampled fish only.

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

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

The Hanford Reach Fall Chinook Protection Agreement (Agreement) establishes the obligations of the Parties with respect to the protection of fall Chinook in the Hanford Reach of the Columbia River. The Parties agree that during the term of the Agreement these flow regimes address all issues in the Hanford Reach with respect to fall Chinook protection and the impact of operation of the seven dams operating under Mid Columbia Hourly Coordination, including the obligations of Grant, Chelan, and Douglas under any new licenses issued by the Federal Energy Regulatory Commission (FERC).

Beginning in mid-October, under the terms of the Hanford Reach Fall Chinook Protection Program Agreement, river flows are reduced every Sunday morning (day of lowest power demand) to the Priest Rapids Dam minimum operating discharge of 36,000 cubic feet per second (ft³/s) [1,000 cubic meters per second (m³/s)]. This allows the Agency and Utility Party Monitoring Team to manually survey for redd distribution at Vernita Bar just downstream of Priest Rapids Dam. These drawdowns occur every Sunday morning until the initiation of fall Chinook spawning has been set both above and below the 50,000 ft³/s flow elevations. A final drawdown is conducted on the Sunday prior to Thanksgiving to establish the minimum critical flow needed to protect pre-emergent fall Chinook. Given the previously described limitations, this weekly reduction in river flow affords the best viewing conditions for aerial flights. Aerial

flights are therefore scheduled to be conducted concurrent with the Sunday morning drawdowns, when possible.

Date	Summary
October 8, 2015	<p>Operations to support the Hanford Reach Fall Chinook Protection Program will begin on Oct. 15, 2015. Reverse Load Factoring will begin at 0000 hours on Thursday October 15, and continue through the end of the Spawning Period. The Spawning Period is scheduled to end on November 22, (last Sunday prior to Thanksgiving), but may be extended if spawning activity is observed during the redd survey on that day. During Reverse Load Factor, Priest Rapids Outflows (as measured at the USGS gauge) must remain between 55 and 70 kcfs during daylight hours.</p> <p>Reduced daytime flows (38 kcfs) below Priest Rapids Dam on Sundays during the Spawning Period will be required to support redd counts on Vernita Bar. The first redd count will be conducted on Sunday, October 18. Specific details for operational support during Vernita Bar redd counts will be updated throughout the season and be provided in individual flow requests.</p>
October 18, 2015	<p>On Sunday, October 18, representatives from Grant PUD and Washington Department of Fish & Wildlife conducted the first 2015 Vernita Bar spawning ground survey. One redd was observed in the 36 – 50 kcfs elevation zone (Table 1). Five redds are required for the Initiation of Spawning, therefore the date for the Initiation of Spawning has not been set. A second spawning ground survey will be conducted next Sunday, October 25.</p>
October 25, 2015	<p>On Sunday, October 25, representatives from Grant PUD and Washington Department of Fish & Wildlife conducted the second 2015 Vernita Bar spawning ground survey. Fifty-one redds were observed in the 36 – 50 kcfs elevation zone and 16 redds were observed in the above 50 kcfs elevation zone (Table 1). Five redds are required for the Initiation of Spawning, therefore spawning has initiated in both the below and above the 50 kcfs zone. The date for the Initiation of Spawning has been set as October 21. The next spawning ground survey will be used to determine the Critical Elevation and will be conducted on Sunday November 22.</p>
November 22, 2015	<p>On Sunday, November 22, the third Vernita Bar redd survey was conducted to determine the 2015 - 2016 Hanford Reach Critical Elevation and Protection Level Flow. Flows from Priest Rapids Dam at Vernita Bar were approximately 45 kcfs.</p> <p>Based on the survey count and the Hanford Reach Fall Chinook Protection Program Agreement, the <u>2015 - 2016 Critical Elevation is set at the 70 kcfs elevation</u>. The Monitoring Team agreed that the fish spawning season had ended and that November 22, be identified as the End of Spawning date. Reverse load factoring ended at 2400 on November 22. A supplemental ground survey will not be required.</p> <p><u>GCPUD is projecting the Post-Hatch Period, which requires a minimum flow no less than 15 cm below the Critical Elevation, will begin on November 28.</u></p>
November 28, 2015	<p>Tonight at 2400 hours GCPUD will transition from the Pre-Hatch Period to the Post-Hatch Period. The Post-Hatch Period requires that flow below Priest Rapids Dam be no less than 15 cm below the Critical Elevation/Protection Level Flow (70 kcfs). The transition to the Post-Hatch Period occurs when 500 temperature units have accumulated from the start of spawning.</p> <p>The next protection period is Emergence/Rearing. These periods have both minimum flow constraints and daily flow fluctuation constraints. We are projecting that these periods will begin in mid-March, 2016.</p>
February 1, 2016	<p>The next flow constraint periods are Emergence and Rearing. During this period there are limits to daily flow fluctuations below Priest Rapids Dam. These constraints are projected to begin on February 28, 2016. This date could change depending on water temperatures.</p>
February 18, 2016	<p>Continued warm temperatures have pushed the start date for the Emergence Period and Rearing Period to February 25.</p> <p>As a reminder, during the Emergence Period the minimum flow continues to be at the Critical Elevation (70 kcfs) and during Rearing Period daily flow fluctuations are limited based on inflow from Rock Island Dam.</p>

Date	Summary
February 22, 2016	<p>GCPUD is projecting that the Rearing and Emergence Periods will begin on February 24.</p> <p>As a reminder, during the Emergence Period the minimum flow continues to be at the Critical Elevation (70 kcfs) and during Rearing Period daily flow fluctuations are limited based on inflow from Rock Island Dam.</p>
March 23, 2016	<p>GCPUD is currently in the Emergence Period and Rearing Period. The primary flow constraints during these periods are a minimum flow of 70 kcfs and daily flow fluctuation constraints based on Rock Island outflow.</p> <p>We are projecting that the Emergence Period (minimum flow constraint) will end on May 4. We are projecting that the Rearing Period (flow fluctuation constraints) will end on June 8.</p> <p>We are projecting that the first weekend of the weekend minimum flow constraints will begin on April 9. The weekend flow constraints require that on four consecutive Saturdays and Sundays Priest Rapids Outflow to maintain a minimum flow calculated as the average of the daily hourly minimum flow from Monday through Thursday of the current week.</p>
April 4, 2016	<p>The weekend flow constraints begin on April 9.</p> <p>As a reminder, the weekend flow constraints require that on four consecutive Saturdays and Sundays Priest Rapids Outflow will maintain a minimum flow calculated as the average of the daily hourly minimum flow from Monday through Thursday of the current week.</p>
April 27, 2016	<ol style="list-style-type: none"> 1. Special weekend constraints will end May 1 2. The Emergence Period, which includes a minimum flow of 70 kcfs, is projected to end on April 29 3. The Rearing Period, which includes flow fluctuation constraints, is projected to end on June 4
May 10, 2016	<p>GCPUD is currently projecting that Hanford Reach flow protections will end on June 1. This date may change depending on water temperatures.</p> <p>GCPUD is currently in the Rearing Period. The flow constraint during this period is a limit to daily flow fluctuations determined by Rock Island outflow.</p>
May 25, 2016	<p>GCPUD is projecting that flow protections under the Hanford Reach Agreement will end on May 30.</p>
May 28, 2016	<p>GCPUD is not projecting that the flow protections will end on May 31.</p>
May 31, 2016	<p>Grant PUD is projecting that flow protections under the Hanford Reach Agreement will end today, May 31, at 2400 hours.</p>

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

According to the Lower Snake 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 and the fishery agencies, zero discharge 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 flow conditions may maximize power production from the Columbia River Basin system, but zero flow operations are not recommended at Lower Snake projects when fish are actively migrating in the Snake River.

On December 6, 2005, Salmon Managers submitted System Operations Request (SOR) 2005-22 "Snake River Zero Nighttime and Weekend Flow" to the AAs (available online at: <http://www.nwd-wc.usace.army.mil/tmt/sor/2005/2005-22.pdf>). The SOR 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 trigger will be defined on a sliding scale outlined in the following table, based on counts of both “wild” and “total (wild + hatchery)” 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

November 18, 2015, TMT Meeting. NOAA Fisheries shared the 2015 run-to-date count data for adult steelhead at Lower Granite, which will determine the “few, if any” criteria this year. For 2015, the run-to-date (June 1 through November 17) of adult steelhead counted at Lower Granite Dam is 33,000 wild and 127,000 combined (wild and hatchery). Using these run-to-date numbers, the criteria this year for “few” fish is defined as: less than 20 wild steelhead and less than 50 combined wild and hatchery steelhead, measured as a rolling 3-day average. The Corps noted that only one count (wild or combined) needs to be higher than the criterion to show more than a “few” adults migrating. In other words, both wild and combined counts need to be less than the “few” criterion in order to trigger the zero generation operation.

The Corps stated once the criteria (wild < 20 and combined < 50) have been achieved, then the AAs will be able to implement the operation at nighttime on an as needed basis. If the “few” criteria of wild and combined are not achieved by December 30, when Lower Granite Dam adult ladder counts end, the operation will begin December 31, and continue through February. The Corps and NOAA Fisheries will continue to track steelhead counts. When/if the criteria are met, NOAA Fisheries will email the AAs to begin implementation of the zero generation operation at the Snake River projects. On December 4, 2015, steelhead passage at Lower Granite Dam met the "few, if any" criteria.

2.12. Minimum Operating Pool (MOP)

In accordance with RPA 5 in the NOAA Fisheries 2014 Supplemental BiOp, and as specified in the annual Fish Operations Plan (FOP), the AAs operate the Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose, Lower Granite) within the 1-foot MOP operating range (**Table 10**) from April 3 through August 31, unless adjusted to meet authorized project purposes (primarily navigation). Additional information may be found in the FOP, included in the Fish Passage Plan (FPP) as Appendix E on the following website:

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

Table 10. MOP Elevation Ranges for Lower Snake River Projects.

Project	MOP 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

At John Day Dam from April 10 to September 30, the forebay is operated within a 1.5-foot range (262.5 to 264.0 feet) 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.

2.13. Spill and Transportation in 2016

Annual spring and summer spill operations for juvenile fish passage are defined in the Fish Operations Plan (FOP), included in the FPP as Appendix E. In 2016, spring spill (**Table 11**) will occur April 3 through June 20 at the Lower Snake River projects (Lower Granite, Little Goose, Lower Monumental, Ice Harbor), and April 10 through June 15 at the Lower Columbia River projects (McNary, John Day, The Dalles, Bonneville). Summer spill (**Table 12**) will begin on June 21 at the Lower Snake projects and on June 16 at the Lower Columbia projects, and will continue through August 31 at all projects.

Table 11. FOP Spring Spill Operations for Fish Passage in 2016.

Project	Spring Dates	2016 FOP Spring Spill Operations
Lower Granite	April 3 – June 20	20 kcfs
Little Goose	April 3 – June 20	30%
Lower Monumental	April 3 – June 20	Gas Cap w/ bulk pattern (approx 20-29 kcfs)
Ice Harbor	April 3 – April 28	Day 45 kcfs/Night Gas Cap (approx 75-95 kcfs)
Day=0500-1800 / Night=1800-0500	April 28 – June 20	2-day blocks of: 30% vs. Day 45 kcfs/Night Gas Cap (approx 75-95 kcfs)
McNary	April 10 – June 15	40%
John Day	April 10 – April 28	30%
	April 28 – June 15	2-day blocks of: 30% vs 40%
The Dalles	April 10 – June 15	40%
Bonneville	April 10 – June 15	100 kcfs

Table 12. FOP Summer Spill Operations for Fish Passage in 2016.

Project	Dates	2016 FOP Summer Spill Operations
Lower Granite	June 21 – Aug 31	18 kcfs
Little Goose	June 21 – Aug 31	30%
Lower Monumental	June 21 – Aug 31	17 kcfs
Ice Harbor Day=0500-1800 / Night=1800-0500	June 21 – July 13	2-day blocks of: 30% vs. Day 45 kcfs/Night Gas Cap (approx 75-95 kcfs)
	July 13 – Aug 31	Day 45 kcfs/Night Gas Cap (approx 75-95 kcfs)
McNary	June 16 – Aug 31	50%
John Day	June 16 – July 20	2-day blocks of: 30% vs 40%
	July 20 – Aug 31	30%
The Dalles	June 16 – Aug 31	40%
Bonneville Day/Night hours per FPP Table BON-5	June 16 – Aug 31	2- day blocks of: Day 85 kcfs/Night 121 kcfs vs. 95 kcfs

Transport will begin on May 1 at Lower Granite, Little Goose, and Lower Monumental dams, unless otherwise coordinated with TMT. The goal is to transport approximately 50% of juvenile steelhead in accordance with the 2014 Supplemental BiOp. Fish collection for transport will begin on May 1 and barging will begin the following day and continue daily or every-other-day (depending on the number of fish) throughout the migration season. Transport operations will be carried out at each project in accordance with all applicable FPP criteria.

2.14. Fish Passage Research in 2016

Fish research activities described below are excerpted from the 2016 FPP Appendix A.

- January 2016 – May 2016. McNary, Ice Harbor, Lower Monumental, Little Goose, Lower Granite - Evaluation of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage.** 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. Adult Lamprey were captured and tagged at John Day Dam in 2014 and 2015, and tags remain active for 2016. This study will continue to require electrical power for electronics and access to maintain and download data from the PIT-tag detection equipment. Maintenance of equipment will occur during the winter maintenance period when adult fishways are dewatered.

- February 2016 – July 2016. Little Goose - FGE Emergency Gate Closure Study.** This study is to estimate and compare fish guidance efficiency (FGE) at two adjacent units with head gates in the raised (control) and stored (treatment) operating positions, and to estimate impacts (if any) to FGE and Project juvenile fish passage performance when units are operated with head gates stored. Results will aid in determining the appropriate path forward for restoring the 10-minute emergency head gate closure criterion.

Hydroacoustic transducers will be installed on the trashrack and ESBS frames in turbine units 2 and 3. Installation is expected to occur during the in-water work window in February, 2016. A dive to install transducers on the trashracks will require a three-unit outage. Project personnel will assist with alternating unit 2 and unit 3 head gate orientation between raised and stored

operating positions once per week on a random block design for the duration of the study beginning approximately 4 April, 2016 through approximately July 15, 2016. Should low flow limit the Project's ability to operate three turbine units in June and July, an alternating turbine unit operating priority between units 2 and 3 will be necessary to meet the study design, assuming river conditions will permit the operation of two units. Head gates will remain in either the raised or lowered position in units 2 and 3 and unit operation will alternate on the random block design rather than changing head gate position during the low flow period. Adult fish passage will not be affected as all in-water work will be conducted during the work window. No specific turbine unit operating points (MW) are requested for this study. The dive to remove transducers will occur during the in-water work window in FY17.

• **Ongoing through March 2017. Lower Granite - Juvenile Fish Bypass System Upgrade.** Construction activities associated with the Lower Granite Dam juvenile bypass system (JBS) upgrade began in 2014 and are expected to continue throughout 2016, with project completion expected in March 2017 (FPOM MOC: 15 LWG 004 and 13 LWG 17).

Construction activities in 2016 are anticipated to include the mining the existing juvenile collection channel during 2015/16 winter maintenance period (MOC: 15 LWG 023) and during the extended Juvenile Bypass System (JBS) outage (1 Aug 2016 to 24 March 2017) to widen the collection channel (MOC: 13 LWG 17), mining of the transportation channel through the south non-overflow section of the powerhouse; erection of the new primary and secondary dewatering structures and transportation flume; installation of new primary and emergency bypass outfall structures in the tailrace, and associated components. Work during 2016 will include work within the forebay associated with collection and transportation channel improvements and within the tailrace for outfall construction activities.

During the 2015/16 winter work period, the juvenile collection channel is being widened to the final 9.5' channel width in the vicinity of turbine units 5 and 6 (upstream end of collection channel). The collection channel will be widened within the vicinity of Turbine Units 1-4 during the extended winter maintenance period August 1, 2016 to March 24, 2017. Crossover activities involving permanent modifications to the existing juvenile bypass system (JBS) are anticipated to occur during the extended JBS outage starting August 2016. Lower Granite Dam RSW operations will be extended through December 15, 2016, as part of the extended JBS shutdown as described in MOCs 13 LWG 17 and 15 LWG 025. As discussed within NWW FFDRWG and FPOM, it may be necessary to adaptively manage RSW operations during the September 1, 2016, to December 15, 2016, period to improve fish passage conditions and facilitate in-water outfall construction activities.

Activities that require special project operations other than as described above will be coordinated through FPOM and/or FFDRWG, as appropriate. All fish salvage operations will follow standard dewatering procedures and will be coordinated through Lower Granite's fisheries staff in accordance with standard operation procedures. Any deviations from FPP operations will be coordinated through FPOM and/or FFDRWG as appropriate.