2015 Water Management Plan
Seasonal Update
October 30, 2015

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 operation measures are implemented. The Seasonal Update is intended to supplement the WMP with more detailed information on operations as the water year progresses. Each section of the Seasonal Update will be updated when information is available and finalized when no further information is available.

The first update for the primary elements of Fall and Winter will be posted on November 1st of each year. The first update for the primary elements of Spring and Summer will be posted by March 1st of each year. The elements and operations included in the Seasonal Update are generally the same as have been previously presented in the Fall/Winter and Spring/Summer Updates to the WMP. The change to update in this manner is intended to present better continuity for tracking operations as they change throughout and across each season. The elements and operations described in the Seasonal Update and the approximate schedule for updates and finalization are as displayed in Table 1.

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

Section	Element	Begins	Finalized	Last Updated
2.1	Current Conditions (e.g., WSF, Streamflows)	October	July	October 30, 2015
2.2	Seasonal Flow Objectives	April	August	October 30, 2015
2.3	Flood Control	January	June	August 7, 2015
2.4	Storage Project Operations	September	September	October 15, 2015
2.5	Water Quality (Spill Priority Lists)	January	December	April 3, 2015
	Specific Operations	**Start Date**	**End Date**	**Last Updated**
2.6	Burbot Temperature Management (Libby Dam)	November	December 30	November 10, 2010
2.6	Chum Flows (Bonneville Dam)	November 1	April 10	April 3, 2015
2.7	Spring Creek Hatchery Releases (Bonneville Dam)	April	May	April 3, 2015
2.8	Lake Pend Oreille Kokanee (Albeni Falls Dam)	September 1	December 30	March 25, 2014
2.9	Upper Snake Flow Augmentation	April 1	August 31	April 3, 2015
2.10	Chum Operation	October 29, 2014	April 8, 2015	April 8, 2015
2.11	Hanford Reach Fall Chinook Protection	November	June	February, 2014
2.12	Snake River Zero Generation	December	February	April 3, 2015
2.13	Minimum Operating Pool	April 3	August 31	September 16, 2015
2.14	Spill and Transportation	April 3	August 31	September 16, 2015
2.15	Emergency Snake River Sockeye Trap Operations	July 15	August 5	September 16
2.16	Fish Passage Research	March	October	April 3, 2015

2. Seasonal Update Elements and Specific Operations

2.1. Current Conditions

Water Supply Forecasts – NWRFC

The final water supply forecast (WSF) is defined as the forecast posted on NOAA's Northwest River Forecast Center (NWRFC) website at 5:00 pm Pacific Standard Time on the 5th business day of the month (*April WSF is the 6th working day of the month to include most recent snow information and ESP forecast). 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 2015		April-August 2015	
	Volume (MAF)	% of 30-year Average (101.4 MAF)	Volume (MAF)	% of 30-year Average (87.5 MAF)
January 8, 2015	102.6	101	87.3	100
February 6, 2015	103.8	102	83.1	95
March 6, 2015	91.7	90	71.8	82
April 8, 2015	96.0	95	72.2	83
May 7, 2015	86.2	85	62.1	71
June 5, 2015	86.3	85	61.6	70
July 8, 2015	83.8	83	58.4	67

Table 3. Grand Coulee Dam Final Water Supply Forecasts.

Forecast Issue Date	January-July 2015		April-August 2015	
	Volume (MAF)	% of 30-year Average (59.6 MAF)	Volume (MAF)	% of 30-year Average (56.8 MAF)
January 8, 2015	60.1	101	56.5	100
February 6, 2015	61.5	103	55.8	98
March 6, 2015	56.5	95	49.4	87
April 8, 2015	61.6	103	51.1	90
May 7, 2015	55.8	94	45.3	80
June 5, 2015	55.9	94	44.5	78
July 8, 2015	54.1	91	42.0	74

Table 4. Lower Granite Dam Final Water Supply Forecasts.

Forecast Issue Date	January-July 2015		April-August 2015	
	Volume (MAF)	% of 30-year Average (27.4 MAF)	Volume (MAF)	% of 30-year Average (21.1 MAF)
January 8, 2015	27.6	101	22.1	105
February 6, 2015	28.7	105	20.7	98
March 6, 2015	23.1	84	16.5	78
April 8, 2015	21.9	80	14.7	70
May 7, 2015	18.8	69	11.5	54
June 5, 2015	19.0	69	11.6	55
July 8, 2015	18.5	68	10.8	51

Water Supply Forecasts - Corps

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

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

Table 5. Libby Dam Water Final Supply Forecasts.

Forecast Issue Date	April-August 2015	
	Volume (KAF)	% of 78-year (1929-2008) Average (6,282 KAF)
December	6,903	110
January	6,297	100
February	5,523	94
March	5,683	97
April	5,808	99
May	5,396	92
June	5,090	86

Table 6. Dworshak Dam Final Water Supply Forecasts.

Forecast Issue Date	April-July 2015	
	Volume (KAF)	% of 81-year (1929-2010) Average (2,663 KAF)
December	2,398	90
January	2,136	80
February	1,922	79
March	1,815	74
April	1,709	70
May	1,325	54
June	1,113	42

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 Date	April-August 2015		January-July 2015		May-September 2015	
	Volume (KAF)	% of 30-year Average (1,936 KAF)	Volume (KAF)	% of 30-year Average (2,098 KAF)	Volume (KAF)	% of 30-year Average (1,693 KAF)
January	2,265	117%	2,450	117%	1,980	117%
February	2,207	114%	2,427	116%	1,930	114%
March	1,916	99%	2,275	108%	1,676	99%
April	1,704	88%	2,337	111%	1,490	88%
May	1,789	92%	2,415	115%	1,490	88%
June	1,382	71%	2,026	97%	1,076	64%

Notable Water Supply Triggers for low WY operations

Project	WSF Trigger	Operation Triggered
Libby	The Dalles May Final Apr-Aug 72.2 MAF	Draft 20' from full by September 30th. (Caveat this year is that the draft will be 20' from full by August 31st to provide lower flows in September for sturgeon habitat work near Bonners Ferry)
Hungry Horse	The Dalles May Final Apr-Aug 72.2 MAF	Draft 20' from full by September 30th. (instead of 10')
Non Treaty Storage (NTS)	The Dalles May Final Apr-Aug 72.2 MAF	Firm release of up to 0.5 MAF of dry year NTS storage (May – June or other such period agreed to by both parties). The volume released will be shaped flat during the release period unless negotiated differently with BCH. If used this year, we will not have the right to it next year.
Grand Coulee	The Dalles July Final Apr-Aug 92.0 MAF	Summer Draft limit is lowered 2 feet to elevation 1278 feet by August 31. (minus the incremental storage adjustment of .3 feet for 2015 resulting an end of August objective of elevation 1277.7 feet)
Libby	May Final Libby Apr-Aug WSF less than 4.8 MAF	Tiered volumes of sturgeon pulse begin at WSF > 4.8 MAF. If below there is no sturgeon pulse.

Weekly Weather and Precipitation Retrospectives

Week	Weekly Weather / Precipitation Retrospective
October 6, 2014	**Temperatures:** Well above average. Several record highs Monday-Wednesday. **Precipitation:** Dry through Friday, then increasing rainfall in BC and west of the Cascades as a major weather pattern change commenced. **Streamflows:** Somewhat elevated baseflows in BC due to September rainfall; otherwise flat and typical early fall baseflows across the basin.
October 13, 2014	**Temperatures:** Well above average. **Precipitation:** Above average northwest half; below average southeast half. **Streamflows:** Very minor, localized rises Upper Columbia, lower Columbia and Willamette basins. Most rainfall went into moistening soils.
October 20, 2014	**Temperatures:** Above average, but not as warm as previous weeks. **Precipitation: Well above average (300-600% of normal),** except below average in the upper Snake. Several daily rainfall records Wed-Thu. Wind gusts 45-70mph west of Cascades Sat, which caused more damage than usual due to leaves still on the trees. First significant mountain snows this past weekend. **Streamflows:** Modest rises in BC, Western MT, Mid-Cs, lower Columbia and Willamette basins. Most rainfall went into moistening soils.
October 27, 2014	**Temperatures:** Above average, but cooled closer to average this weekend. **Warmest October on record in Portland and Seattle; 3rd warmest on record in Boise; tied for 4th warmest on record Spokane**. **Precipitation:** Well above average, especially northwest half. Snowpack gains in BC/western MT/central ID. **Streamflows:** Modest rises in much of the basin late last week, except in the Snake where weekend rain went into moistening soils.
November 3, 2014	**Temperatures:** Above average, then fell to near average this weekend. **Precipitation:** Well above average western WA, BC, much of ID and western MT (200-400% of average). Below average elsewhere. Much drier developed over the weekend. Some snowpack gains in BC. **Streamflows:** Significant, brief rises in BC and western MT, modest rises in ID. Flows generally diminished over the weekend.
November 10, 2014	**Temperatures:** For the first time since April, Well below average basinwide. Moderate early season cold snap Wed to Sun (load center temperatures 10-12 degrees below average). Record, below zero low temperatures east of the Cascades this weekend. **Precipitation:** Above average southern OR/southern ID; below average elsewhere. Damaging east winds Columbia Gorge, western OR/Western WA Tue-Wed, followed unusually early low-elevation snow and ice storm OR and southern ID Thu-Fri. **Streamflows:** Brief flow spike on the Willamette this weekend. Slowly receding flows elsewhere, although baseflows remained above normal.
November 17, 2014	**Temperatures:** Slowly recovered to near average after the previous week's cold snap. **Precipitation:** Increased to well above average US basins; below average in BC. **Streamflows:** Modest rises on the Willamettes and lower Columbia this weekend; flat elsewhere with some ice movement noted on high elevation streams.
November 24, 2014	**Temperatures:** Near record warmth through Friday, then plunged well below average this weekend. Load Center average temps dropped for 15° above average Thursday to 12° below average Sunday. **Precipitation:** Well above average basinwide (200-500% of normal), with significant snowpack gains. **Streamflows:** Modest rises on many US streams, especially the Snakes, mid-Cs, Lower Columbia, and Willamette, as snow levels rose well above pass levels. Rapid recessions this weekend, though, due to much colder temperatures.
December 1, 2014	**Temperatures:** Rose from well below average to well above average. **Precipitation:** Increased to above average US basins; below average in BC.

	Streamflows: Mostly flat.
December 8, 2014	**Temperatures:** Consistently above average. **Precipitation:** Most precipitation was west-side and into BC **Streamflows:** Small rises over the weekend.
December 15, 2014	**Temperatures:** Rose to well above average, with unusually high snow levels. **Precipitation:** Well above average US basins (200-300% of average). Below average in BC. **Streamflows:** Significant rises throughout the southern half of the basin, especially the Willamettes, lower Columbia, Clearwater and Snake basins.
December 22, 2014	**Temperatures:** Fell to near average with more seasonable snow levels. Arctic air spreading rapidly southward this morning. **Precipitation:** Well above average US basins with significant snowpack gains; near average in BC. **Streamflows:** Crests on many US streams Monday, followed by slow recessions. Flat flows in BC.
December 29, 2014	**Temperatures:** Moderate cold snap Tuesday-Thursday (temps ~10°F below average), then moderated closer to average by the weekend. **Precipitation:** Below average. **Streamflows:** Flat or receding.
January 5, 2015	**Temperatures:** Above average. **Precipitation:** Below average south half; near average north half. **Streamflows:** Minor flow increases Clearwater, Spokane, lower Columbia, which crested last Wed-Thu. Slowly receding flows since then. Flat flows in BC and western MT.
January 12, 2015	**Temperatures:** Above average. **Precipitation:** Dry initially, then above average, especially US basins. **Streamflows:** Modest flow increases on the Willamette, lower Columbia, Snakes, mid-Cs and Spokane, which crested on Monday. Mostly flat flows elsewhere.
January 19, 2015	**Temperatures:** Near average initially, then rose well above average (10-15 degrees above average). Near record highs this weekend, especially in the mountains. **Precipitation:** Well below average, except above average in western WA and BC this past weekend. **Streamflows:** Flat or receding through Friday, then minor rises on the Spokane, Clark Fork, Clearwater and Yakima Basins this weekend as very warm mountain temperatures melted some mid-elevation snow.
January 26, 2015	**Temperatures:** Above average. **Precipitation:** Well below average. **Streamflows:** Flat in BC and in higher elevations. Slowly receding in lower elevation streams but baseflows remained above average for late January.
February 2, 2015	**Temperatures:** Well above average with unusually high snow levels. Record warmth Thursday-Saturday. **Precipitation:** Well above average (200-400% of average) from prolonged Pineapple Express. Some snow stripped off below 6000ft, but 4-6ft of snow (4-5" water equivalent) fell on many BC snow pillows. Redfish Creek, BC, which is a high elevation snow pillow, received about 9ft (9" of water equivalent). **Streamflows:** Large rises on most low elevation streams this weekend from heavy rain and some snowmelt. Largest increases on the lower Snake, Spokane, Pend Oreille and Kootenai Basins.
February 9, 2015	**Temperatures:** Well above average, with a few record highs. **Precipitation:** Fell to well below average. **Streamflows:** Crests from previous heavy rains Tue-Wed (unregulated peak near 320 kcfs at The Dalles), followed by slow recessions.
February 16, 2015	**Temperatures:** Well above average, with a few record highs. **Precipitation:** Heavy precipitation ended last Tuesday; well below average since then.

	Streamflows: Crests from previous heavy rains Tue-Wed (unregulated peak near 320 kcfs at The Dalles), followed by slow recessions.
February 23, 2015	**Temperatures:** Fell to near average. **Precipitation:** Below average. **Streamflows:** Slowly receding, but still above normal for late February.
March 2, 2015	**Temperatures:** Rose to above average. Near record highs this weekend somewhat cancelled out by chilly nights. **Precipitation:** Well below average. **Streamflows:** Flat or slowly receding. Flows still above normal for early March.
March 9, 2015	**Temperatures:** Well above average with numerous records broken. Unusually high snow levels. **Precipitation:** Dry through Friday, followed by Pineapple Express event this weekend. Several daily rainfall records broken US basins. Strong winds and isolated wind damage western OR/WA on Sunday. **Streamflows:** Flat or slowly receding, followed by rapid rises on many US basin headwaters from weekend rain and snowmelt.
March 16, 2015	**Temperatures:** Above average, but not as warm as previous weeks. **Precipitation:** Above average, especially in BC with 3-5ft of mountain snow detected on most snow pillows. **Streamflows:** Crested last Wed, followed by slow recessions due to cooler temps. Unregulated flows at The Dalles peaked near 280 kcfs but remained near 250 kcfs this weekend.
March 23, 2015	**Temperatures:** Above average, ending much above average. **Precipitation:** Well above average through Wed, then well below average for the rest of the week **Streamflows:** Varied from mostly flat to showing slow recessions from rises over previous weekend. Unregulated flows at The Dalles remained consistently about 250 kcfs.
March 30, 2015	**Temperatures:** Starting much above average and cooling to just below average by mid-week**.** **Precipitation:** Below average for most of the week. **Streamflows:** Varied from mostly flat to slow recessions from rises over previous weekend. Unregulated flows at The Dalles remained consistently about 250 kcfs.
April 6, 2015	**Temperatures:** Rose to above average Tue-Fri, then fell below average with low snow levels this weekend. **Precipitation:** Below average through Thursday, then increased to near average with spotty heavy precipitation above Revelstoke, BC, western OR, central WA, and southern ID. **Streamflows:** Flat or receding due to colder temps. Unregulated flows at The Dalles fell to around 200 kcfs,
April 13, 2015	**Temperatures:** Slightly below average, then rose to well above average this weekend with cool nights. **Precipitation:** Near average Mon-Tue, then dried out. **Streamflows:** Flat or receding due to colder temps. Unregulated flows at The Dalles fell to around 170 kcfs,
April 20, 2015	**Temperatures:** Well above average through Tue, then fell sharply to below average **Precipitation:** Near average in BC; well below average elsewhere. **Streamflows:** Slow, modest and basinwide rises due to snowmelt cycling. Unregulated flows at The Dalles rose to around 200 kcfs this weekend.
April 27, 2015	**Temperatures:** Well above average through Tue, then fell closer to average **Precipitation:** Above average above Revelstoke, BC. Well below average elsewhere. **Streamflows:** Slow, modest, basinwide rises due to snowmelt cycling. **Unregulated flows at The Dalles rose slightly to 220 kcfs, but they should normally rise above 300 kcfs in early May. Spring runoff is also running about 2-3 weeks ahead of usual.**

May 4, 2015	**Temperatures:** Slightly below average overall, but rose well above average this weekend west half. **Precipitation:** Above average in the upper Snake and above Revelstoke, BC. Well below average elsewhere. **Streamflows:** Slow rises, despite dry conditions, as snowmelt cycling continued. Unregulated flows at The Dalles rose to 250 kcfs, but they are normally above 350 kcfs by May 10.
May 11, 2015	**Temperatures:** Well above average in BC; near average west of Cascades; below average southeast half. **Precipitation:** Well above average southeast half; below average in BC and west of Cascades. **Streamflows:** Localized streamflow spikes in the Snake and mid-Cs due to localized heavy rain. Otherwise, gradual snowmelt rises in western MT, central ID and especially BC. Unregulated flows at The Dalles finally rose above 300 kcfs this weekend, but they should be over 450 kcfs by now.
May 18, 2015	**Temperatures:** Well above average in BC, and slightly above average elsewhere. **Precipitation:** Well above average along and east of the Cascades; below west. **Streamflows:** Snowmelt rises in western MT, central ID and especially BC. Isolated streamflow spikes elsewhere due to locally heavy rain. Unregulated flows at The Dalles rose above 350 kcfs, but they should be near 500 kcfs this time of year.
May 25, 2015	**Temperatures:** Well above average in BC, and slightly above average elsewhere. **Precipitation:** Above average along and east of the Cascades, especially in BC; below average west. **Streamflows:** Snowmelt rises in BC. Flat or receding flows elsewhere, but with isolated streamflow spikes due to locally heavy rain. Unregulated flows at The Dalles rose to 400 kcfs this weekend, but they should be near 520 kcfs this time of year.
June 1, 2015	**Temperatures**: Near average through Thursday,followed by moderate heat wave and record highs this weekend (load center temps 10-15°F above average for 3+ days). **Precipitation**: Above average, especially in BC. **Streamflows**: High snowmelt flows in BC, with slow recessions elsewhere punctuated by brief runoff spikes early last week. Unregulated flows at The Dalles peaked near 415 kcfs, which is likely the peak for the season (normal peak is around 520 kcfs).
June 8, 2015	**Temperatures:** Four day heat wave with several record highs (load center temps 12-16°F above average) through Tuesday. Temperatures then gradually cooled to near average. **Precipitation:** Scattered thunderstorms in BC, western MT and central ID; otherwise little or no rain. **Streamflows:** High snowmelt flows in BC, with slow recessions elsewhere. Unregulated flows at The Dalles fell below 400 kcfs as we passed peak runoff for the season.
June 15, 2015	**Temperatures:** Above average. **Precipitation:** Near average in BC; little or no rain elsewhere. **Streamflows:** Rather sharp basinwide recessions. Unregulated flows at The Dalles fell below 250 kcfs and were **near record lows for late June.**
June 22, 2015	**Temperatures:** Heat wave developed Friday and continued over the weekend. Load center temperatures peaked on Saturday 16°F above average. Numerous records broken, especially with warm overnight lows. **Precipitation:** Well below average. Isolated mountain thunderstorms west half this weekend. Several wildfires were ignited from lightning. **Streamflows:** Unregulated flows at The Dalles fell below 200 kcfs, which is a record low for late June. Basinwide recessions, except in BC where hot temperatures supported modest snowmelt increases.
June 29, 2015	**Temperatures:** Heat wave continued with load center temps 10-14°F above average. Several record highs across the basin. **It was the hottest June on record in the Columbia Basin (since 1948).**

	Precipitation: Well below average, except closer to average in BC due to scattered thunderstorms. **Streamflows:** High flows continued in BC due to rainfall and hot temperatures melting high elevation snow. Receding flows in all US basins.
July 6, 2015	**Temperatures:** Very warm temperatures continued through most of the week with cooling finally arriving for the west side on Friday. **Precipitation:** Well below average. Isolated thunderstorms in the southern portion of the basin had little to no impact on streamflow **Streamflows:** Flows remained higher in Canada due to warm temperatures but moderated as the week progressed. Receding flows in all US basins.
July 13, 2015	**Temperatures:** Slightly above average through Friday, then well above average this weekend. **Precipitation:** Well below average, with isolated thunderstorms southern OR/ID and in BC. **Streamflows:** Snowmelt flows moderated in BC as temperatures dropped. Receding flows in all US basins.
July 20, 2015	**Temperatures:** For the first time since mid-May, slightly below average. **Precipitation:** Above average northwest half. Below average elsewhere but with isolated thunderstorms during the week and widespread rains in progress eastern half this morning. **Streamflows:** Slowly receding, except for minor, brief spikes in BC, MT and ID. Unregulated flows at The Dalles fell to around 120 kcfs, which is more typical for mid-August.
July 27, 2015	**Temperatures: Heat wave Wed-Sun**. Load center temps peaked 11.5° F above average Fri, which is already the warmest week of the year climatologically. Heat wave also included much of California. **Precipitation:** Above average ID/MT, mostly early in the week. Below average elsewhere, but with isolated thunderstorms in BC and parts of OR and ID this weekend. **Streamflows:** Minor, brief flow spikes in ID/Western MT Tue-Thu due to thunderstorms, and BC this weekend due to high elevation snow and glacier melt. **July average flow at The Dalles was 123 kcfs. That is the lowest July flow on record.** Previous record was 127 kcfs in 1977; records go back to 1928.
August 3, 2015	**Temperatures:** Near average. **Precipitation:** Above average in BC and SE ID. Below average elsewhere. **Streamflows:** Minor, brief flow increases in BC and ID. Flat or receding elsewhere Unregulated flows above Grand Coulee and The Dalles recovered slightly, but remained near record lows for early August.
August 10, 2015	**Temperatures:** Brief heat wave Tue-Thu (peak 9.3°F above average on Wednesday), then fell to near average. This was the 5th heat wave this summer. **Precipitation:** Above average on BC; below average elsewhere. Numerous lightning strikes started several large wildfires Thu-Fri which were then fanned by gusty winds. **Streamflows:** Minor, brief flow increases in BC. Flat or receding elsewhere. Unregulated flows above Grand Coulee and The Dalles hovered just above record lows for mid-August.
August 17, 2015	**Temperatures:** Brief heat wave Tue-Wed (peak 8.6°F above average on Wednesday), then fell to near average before rising above average again this weekend. **Precipitation:** Below average, except closer to average in BC due to scattered thunderstorms. **Streamflows:** Flat or receding, except for very minor flow increases in BC due to warmer temperatures.
August 24, 2015	**Temperatures:** Well above average through Friday, then fell sharply below average. **Precipitation:** Dry through Thursday, then well above average northwest half, below average southeast half. Major fall-like storm Saturday with coastal wind gusts to 85 mph, and widespread gusts 40-60mph elsewhere northwest half. About 500,000 customers lost power in BC Hydro service territory according to news reports. **Streamflows:** Minor increases in BC due to heavy rains. Flat elsewhere.

August 31, 2015	**Temperatures:** Well below average. Longest and coolest period relative to average since last November. Snow levels as low as 5000ft this past weekend. **Precipitation:** Well above average north 2/3rd with isolated 6-8 inch water equivalent amounts in BC; below average southern ID and SW OR. Wettest week in the basin since March. **Streamflows:** Significant rises in BC peaked on Thu, which receded as temperatures cooled. Minor flow increases in the Okanogan, Clearwater and Clark Fork basins which quickly receded.
September 7, 2015	**Temperatures:** Rose to well above average**. Late season heat wave Thu-Sat (Temps pealed 11°F above average)** **Precipitation:** Below average. **Streamflows:** Small rises in BC due to warmer temps and leftover melting snow from previous week. Flat elsewhere.
September 14, 2015	**Temperatures:** Below average **Precipitation:** Above average basinwide, especially in BC and SE Idaho (200-300% of average). **Over 8 inches of precipitation has fallen in the mountains above Revelstoke, BC, so far this September, with a few spots up to 15 inches.** **Streamflows:** Significant rises underway in BC due to rain falling on early season snowpack. Very minor rises elsewhere as most of the rain went into moistening soils. For the first time since mid-April, unregulated flows have increased to above average above Grand Coulee.
September 21, 2015	**Temperatures:** Mostly below average, with two warmer days interspersed. **Precipitation:** Significant precipitation in Canada over past weekend. **Over 8 inches of precipitation has fallen in the mountains above Revelstoke, BC, so far this September, with a few spots up to 15 inches.** **Streamflows:** Significant rises in BC due to rain which were relatively short-lived. Very minor rises elsewhere as most of the rain went into moistening soils. For the first time since mid-April, unregulated flows have increased to above average above Grand Coulee.
September 28, 2015	**Temperatures:** Above average. **Precipitation:** Above average in BC. Below average elsewhere. **Streamflows:** Streamflows peaked last Monday in BC due to rain and some snowmelt, followed by recessions. Flat flows elsewhere.

2.2. Seasonal Flow Objectives

Project	Planning Dates	BiOp Season Average Flow Objective – (kcfs)	Season Average Flow Observed (kcfs)
Priest Rapids	Spring 4/10–6/30	135 kcfs	115.3
McNary	Spring 4/10–6/30	220 kcfs[i]	173.5
	Summer 7/1–8/31	200 kcfs	142.6
Lower Granite	Spring 4/3–6/20	85 kcfs[i]	53.5
	Summer 6/21–8/31	50 kcfs[ii]	25.9

i. Varies (220-260 kcfs at McNary or 85-100 kcfs at Lower Granite) according to NWRFC April forecast.

ii. Varies 50-55 kcfs according to NWRFC June forecast.

2.3. Flood Control

Flood Control Elevations and April 10th 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 10th elevations shown in the table below are calculated by linear interpolation between the March 31st and April 15th forecasted flood control elevations.

Project	Elevation Date Objective	Dec	Jan	Feb	Mar	Apr
Libby	**Jan 31st**	2410.6	2410.0			
	Feb 28th		2407.8	2435.7		
	March 31st		2406.7	2440.2	2433.8	
	April 10th		2406.7	2440.2	2433.8	
	April 15th		2406.7	2440.2	2433.8	
	April 30th		2406.7	2440.2	2433.8	2428.6
Hungry Horse	**Jan 31st**		3541.3			
	Feb 28th		3533.8	3535.5		
	March 31st		3525.2	3527.8	3540.4	
	April 10th		3522.4	3525.3	3539.5	
	April 15th		3521.0	3524.1	3539.0	3548.5
	April 30th		3516.6	3520.2	3537.4	3548.4
Grand Coulee	**Jan 31th**		1290.0			
	Feb 28th		1290.0	1290.0		
	March 31st		1276.7	1282.7	1283.3	
	April 10th		1265.4	1272.1	1253 (drumgate)	
	April 15th		1259.8	1266.8	1283.3	1283.3
	April 30th		1243.1	1249.5	1282.9	1281.8
Brownlee	**Jan 31st**		2077.0			
	Feb 28th		2049.9	2051.8		
	March 31th		2046.1	2051.1	2071.8	
	April 15th		2046.2	2053.1	2074.4	2076.8
	April 30th		2045.8	2054.5	2077.0	2077.0
Dworshak	**Jan 31st**		1550.6			
	Feb 28th		1549.9	1560.0		
	March 31st		1563.3	1574.1	1579.2	
	April 10th		1570.8	1581.3	1586.3	
	April 15th		1574.5	1584.9	1589.9	1592.8
	April 30th		-	-	-	-

2.4. Storage Project Operations

Libby Dam

Bull Trout Flows: Bull trout minimum flows are specified in the 2006 Libby Sturgeon Biological Opinion (2006 BiOp) and may be found in Table 9 on page 32 of the Final Water Management Plan on the following website:

http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/2015/

April 10 and Refill Objectives: According to the Corps' Libby March Runoff Forecast the most probable runoff volume for April - August was 5,683 KAF (97% of average from 1981-2010). This forecasted runoff volume resulted in an April 10 elevation objective of 2433.8 feet.

Sturgeon Pulse: Per the 2006 BiOp, the Sturgon pulse volume is determined from a tiered flow structure based upon the Corps' May Final WSF for the period of April - August. On May 5, 2015, the Action Agencies received System Operational Request (SOR) USFWS - 01. The SOR identified the following specifications.

- The 2015 sturgeon operations at Libby Dam will consist of one period of peak flow, followed by a hydrograph that gradually recedes towards the anticipated stable summer flow at Libby Dam.

- Begin sturgeon augmentation flow when the Regional Team of Biologists determines that high elevation tributary run - off downstream of Libby Dam is peaking.

- Increase discharge (according to ramping rates in 2006 BO) from Libby Dam up to full powerhouse capacity, depending on local conditions, e.g. river stage at Bonners Ferry.

- Maintain peak discharge (20,000 - 25,000 cubic feet per second (cfs)) for a period of 7 days.

- After 7 days of peak discharge, decrease discharge at Libby Dam 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 2326 mean sea level will remain uninstalled during this peak, allowing for conservation of warmer surface water that will be targeted for release during the descending limb of the hydrograph, described below.

- Selective withdrawal gates at Libby Dam above elevation 2326 mean sea level will be placed to within 30 feet of the surface of the reservoir prior to the end peak operation, described above, allowing for release of warmer surface water as the descending limb of the hydrograph commences. Release of warmer water from Libby Dam, in combination with lower volume of release, will allow the Kootenai River temperature to increase to appropriate spawning temperatures at Bonners Ferry (8 - 10° C.) during the 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 6th, TMT Meeting. The USFWS, presented SOR - USFWS - 01, Libby Release for Sturgeon and Bull Trout. The USFWS explained that due to the low flow year there is not enough water for two sturgeon pulses. This year's operation will instead aim for a single pulse targeting peak runoff from the high elevation tributaries. The single pulse operation maintains the same temperature management approach utilized in the double - pulse operations, which aims to target spawning temperatures towards the end of the operation. The pulse is intended to provide cues to sturgeon to begin upstream migration, then as temperatures warm, to provide cues to migrate further upstream from staging areas to spawn.

The SOR is for full powerhouse for 7 days, followed by gradually receding flow until the sturgeon volume is exhausted; however, flow will not drop below the bull trout minimum (7,000 cfs through August 31 in Tier 2 year). It was noted that flood risk reduction operations supersede flow augmentation and project managers will coordinate operations with regional sturgeon managers. The Corps explained how the Action Agencies would implement the SOR if approved by TMT. The Corps indicated the April - August inflow forecast for May is 5.4 MAF; however, the Corps expects that the inflow will likely be less, closer to 5 MAF. This means that the target sturgeon volume will be 800 KAF and the bull trout minimum will be 7 kcfs through August 31st. The TMT will poll on SOR - USFWS - 01 at the May 13th meeting.

Libby Dam VarQ Deviation Request. The Corps discussed the Libby Dam Var-Q Deviation Request which defines an alternative operation with outflow reduced from 18kcfs to 13kcfs in order to shift water later and increase summer refill elevation and allow for flexibility in summer flow operations. The Corps feedback from the Salmon Managers, noting that this type of deviation involves water management decisions that would need to be implemented today. The Corps continued that if outflow is dropped to 13 kcfs, the resulting maximum reservoir elevation would be approximately 3 feet higher than with the Var-Q operation. The Corps noted that the additional three feet allows for flexibility in how the Corps would be able to shape flow in June, July and August. BPA, asked if like other Columbia River basins, observed inflow in the Libby basin is coming in below the lowest ESP stream flow forecasts? The Corps stated that upper parts of the Kootenai Basin are closer to average, but still below the average for snowpack at this time of year. The Corps continued that with precipitation not landing as snow due to warmer temperatures, inflow was higher than average through March and April, but now May is returning back to average.

NOAA Fisheries, stated that this deviation request was presented at FPAC and the consensus was that during a low flow year like this one, the desire is to move as much water as possible into spring migration, understanding that this will likely have implications to summer flow. Salmon Managers expressed appreciation to the Corps for looking into this operation, noting that in wetter years it would likely be a valuable operation. The Corps recognized the Salmon Managers concerns and thanked them for considering the alternatives.

May 13th, TMT Meeting. The USFWS, provided an update on the proposed SOR - USFWS - 01. The USFWS noted that with the warmer weather and current system moving through, the proposed operation would likely start as early as next week, if approved through TMT. The date change proposed is due to river temperatures approaching spawning temperatures. The USFWS noted the daily maximum river temperatures are currently between 8 - 9° C. and typically sturgeon spawn between 8 - 10° C. The USFWS is working with ID to assess where the sturgeon are in the system, as this will feed into when the operation would be implemented. The Corps clarified that the SOR operation discussed last week remains the same, the only change is the potential change in start date. TMT representatives present were polled in regards to their support for implementing SOR - USFWS - 01: BOR, BPA, Colville, ID, Kootenai, MT, Nez Perce, NOAA Fisheries, Umatilla, Corps, USFWS, and WA were in support of the operation; OR did not have objection to the operation. Based in the coordination with the TMT during the May 6th and 13th meetings the Action Agencies decided to implement SOR - USFWS - 01.

May 20th, TMT Meeting. The Corps provided an update on the Libby Dam flow release for sturgeon and bull trout. The Corps noted that the sturgeon flow planning team met yesterday and decided to start the operation on Friday, May 22nd. Libby will operate at full powerhouse, 26.5 kcfs, beginning on Friday, May 22nd and continuing for 7 days. On Friday, May 29th, the operation will ramp down to 20kcfs and hold for 4 to 5 days and attempt to refill the pool. OR, asked what the temperature of the water is expected to be during the pulse? The Corps noted that the water temperature between Libby Dam and Bonners Ferry is at 50° F. The Action Agencies will implement SOR – USFWS - 01; an update will be provided at the next TMT meeting.

Summer Draft Limit: From August through November 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.

May 6th, TMT Meeting. The Corps received SOR 2015 - 02, "September/October 2015 Libby Dam Outflow for Kootenai River Habitat Restoration Project, Bonners Ferry Island Project," dated May 6, 2015. The Kootenai Tribe, provided an overview of the Kootenai River Habitat Restoration Program and described the multiple - phase project being implemented throughout a 55 - mile stretch of the Kootenai River. Data collection and modelling for the project began in 2002, and the first phase of on the ground restoration started in 2011. The project has been a collaborative effort aimed at addressing habitat concerns from an ecosystem perspective.

Efforts thus far have included bank and side channel restoration through the planting of riparian trees and shrubs, adding large wood structures to improve the cover and complexity of the pool habitat, enhancing instream habitat, and improving hydraulic complexity. Low and stable flow in September and October coordinated through TMT have been vital for the construction phases of the project and have allowed the Tribe to complete work within the in-water work window in a cost-effective and safe manner.

In 2015, the Tribe plans to implement the Bonners Ferry Islands Project, which aims to increase the number of large, deep pools in order to assist sturgeon migration upstream of Bonners Ferry to higher quality spawning habitat. If approved by TMT (SOR 2015 - 02), the lower, stable flow in September - October this year will facilitate excavation of two pools, construction of two islands, bank grading and placement of large wood structures. The presentation, including photos of the project, is available on the following TMT website: (http://www.nwd-wc.usace.army.mil/tmt/agendas/2015/0506_Agenda.html).

The Kootenai Tribe presented SOR 2015-02- September/October 2015 Libby Dam Outflow for Kootenai River Habitat Restoration Project. The Kootenai Tribe noted that the SOR requests 6,000cfs or less from Libby Dam during September and October, with a gradual decline to reach the targeted flow (following ramping rate guidelines in the 2006 USFWS BiOp for Bull Trout and White Sturgeon). The Kootenai Tribe continued that the low flow is needed to allow the Kootenai Tribe of Idaho's contractor to implement the in-water work associated with the Bonners Ferry Island Project described above. The Kootenai Tribe noted that this project will be require two seasons to be completed, however, another SOR will be presented to TMT in 2016 for the remaining work.

The Corps explained how the Action Agencies would implement the SOR if approved by TMT. This year Libby Dam will likely be drafted to 2339 feet (20 feet from full), as triggered by the BiOp during years when water supply is forecasted to be in the lowest 20th percentile (defined as a May final forecast of less than 72.2 MAF of April-August runoff volume at The Dalles Dam). The May final forecast will be finalized tomorrow but as of today the forecast is 69.7 MAF and is unlikely to increase above 72.2 MAF. In accordance with the BiOp, the Action Agencies would draft to 2339 feet by end of September based on the current forecast. This year, the Action Agencies will target 2339 feet by end of August in order to provide the low flow as requested in the SOR. Additional information regarding specific project outflow, dates, and forebay elevations, were provided in a presentation attached to today's TMT agenda: http://www.nwd-wc.usace.army.mil/tmt/agendas/2015/0506_LibbyOps_MayPublicMeetings.pdf

MT noted that if the forecast remains dry and inflow is low it might be appropriate to maintain a cushion above 2439ft by the end of August. TMT members generally agreed that the target elevation should be revisited in season. The Corps requested that TMT members review the SOR and come prepared to poll on the SOR at the May 13th meeting. The TMT will poll on SOR 2015-02 at the May 13th meeting.

May 13th, TMT Meeting. The Corps recapped SOR 2015 - 02, noting that the request is to hold a steady 6,000 cfs or less from Libby Dam during September and October, with a gradual decline to reach the targeted flow (following ramping rate guidelines in the 2006 USFWS BiOp for bull trout and white sturgeon). This SOR is intended to hold flows low and steady for construction on the next phase of the Kootenai River Habitat Restoration Project. TMT was briefed on this SOR by the Kootenai Tribe at the May 6th TMT meeting. NOAA Fisheries, noted there were no additional FPAC comments on the SOR. BPA noted that the operation will draft on minimums through the end of September and will be revisited by TMT in July to ensure the pool is not over drafted.

TMT representatives present were polled in regards to their support for implementing SOR-2015 - 02: BOR, BPA, Colville, ID, Kootenai, Nez Perce, NOAA Fisheries, Umatilla, Corps, USFWS, and WA were in support of the operation; MT approved the SOR with the caveat that TMT will revisit the operation in July/August for in season management of pool elevations; OR did not have objection to the operation. Based on the TMT coordination during the May 6th and 13th the Action Agencies will implement SOR - 2015 - 02; the TMT will check back in on the operation in July.

August 5th, TMT Meeting. The Corps provided an update on Libby operations. The Corps noted that inflows are dropping off quickly this summer, with inflows at 6 kcfs and outflows at 7 kcfs. The Corps continued that the operation will hold at minimum outflows of 7 kcfs, then ramp down to the bull trout minimum in September. The Corps noted that in May TMT coordinated to target an elevation of 2439 feet by the end of August, with flexibility to come in higher and inseason review/adjustment of the operation if needed. The current elevation is 2443 feet with end of August elevations projected to be near 2,440 feet with releases staying at 7 kcfs. The actual end of August and September elevation will depend on the actual inflows through the end of September. According to last week's modeling, there is a 75% chance of ending the month of September at 2439 feet if the Libby Dam elevation was 2441.5 feet at the end of August. The modeling shows that the median trace had an elevation of 2436 feet, 3 feet below the 2439 feet target, at the end of September if Libby Dam continues to release minimum flows through September. MT extended appreciation to the Corps for implementing an operation that stabilized outflows.

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 1st to August 31st. The final flow levels, for the remainder of the calendar year, are based on the March Final forecast. The BOR's March 2015 Final WSF for April - August was 1,916 KAF (99% of average) which set the minimum flow requirements below Hungry Horse and at Columbia Falls at 900 cfs and 3,500 cfs, respectively. The minimum flow requirements are set for the rest of the calendar year and will be updated following the January 2016 Final Forecast.

April 10th and June 30th Refill Objectives: The BOR computes Hungry Horse's final April 10th elevation objective by linear interpolation between the March 31st and April 15th forecasted flood control elevations based on the March Final WSF. Based on the March final forecast and forecasted flood control elevations, the April 10th elevation objective was 3539.5 feet for Hungry Horse, the actual elevation on April 10th was 3540.0 feet. Due to a decreasing water supply forecast, the April 30th flood control target continued to increase. From the March forecast the April 30th target was 3537.4 feet and from the April final forecast the target was 9 feet higher at 3548.4 feet. The actual elevation on April 30th was 3538.5 feet. Discharges from Hungry Horse during May averaged approximately 6,200 cfs to slow the refill based on the forecasted runoff. During June the runoff dropped off significantly and in spite of decreasing the discharges to an average flow of 2,800 cfs, Hungry Horse's maximum elevation was 3549.9 feet on June 24th.

Summer Draft Limit: The summer reservoir draft limit at Hungry Horse is 3550 feet (10 feet from full) by September 30th, except in the lowest 20th percentile of water years (The Dalles April - August < 72.2 MAF) when the draft limit is elevation 3540 feet (20 feet from full) by September 30th. 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 62.1 MAF which set the September 30th draft target to 3540 feet. Because of low flow in the Flathead basin Hungry Horse discharged water to help meet the Columbia Falls minimum flow requirements through the summer months. Inflows into the reservoir were much below average and as a result, the end of September elevation was 3536.0 feet.

Grand Coulee Dam

April 10th and June 30th refill Objective: For 2015 the official April 10th elevation objective was 1253.0 feet. This was a result of the required drum gate maintenance which requires the forebay to be no higher than elevation 1255.0 feet from mid-March through mid-May. Drum gate maintenance began around March 15th and was completed on May 11th. In order to maintain flows at McNary in mid-May, Grand Coulee did not begin filling until May 25th. Grand Coulee refilled across the month of June and filled to 1289.7 feet on July 13, 2015.

The Lake Roosevelt Incremental Storage Release Program: The total amount of water to be released from Grand Coulee in 2015 under the Lake Roosevelt Incremental Storage Release Program was 25,500 acre-feet and was be distributed as shown in Table 8.

Table 8. Lake Roosevelt releases requested for 2015.

"Bucket"	2015 Releases (acre-feet)	Total Lake Roosevelt Incremental Storage Releases Program (acre-feet)
Odessa	0	30,000
M&I	17,000	25,000
Instream Flow	8,500	27,500

The total amount of 25,500 acre-feet was released in the spring (April, May, June) since this was a below average water year. In order to demonstrate that the water was released in the spring, Lake Roosevelt was filled to elevation 1289.7 feet (0.3 feet from full) and will draft to 1277.7 feet on August 31st.

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 1278 feet. The draft limit will be modified an additional 0.3 feet, to elevation 1277.7 feet to implement the Lake Roosevelt Incremental Storage Release Program. Grand Coulee drafted to elevation 1277.5 feet on August 31, 2015.

Drum Gate Maintenance: A full 8-week period for drum gate maintenance was implemented in 2015. The maintenance required Lake Roosevelt to be below elevation 1255 feet for the whole period. The maintenance period began on March 15 and was completed on May 11, 2015.

Banks Lake: Banks Lake will draft to elevation 1565 feet by August 31st 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 be drafting the reservoir up to 5 feet from full (elevation 1565 feet by August 31st. Banks Lake drafted to elevation 1565 feet on August 31, 2015.

Dworshak Dam

The following summarize TMT discussions regarding flood control, refill, and flow augmentation operations.

February 4th, 2015, TMT Meeting. The water supply forecasts for Dworshak is coming in at less than 80% of normal, the flood control elevation for the end of February is around 1,560 feet.

March 4th, TMT Meeting. The Corps reported that Dworshak ended February at 1,565.7 feet; which was 5.7 feet above the end of February flood control elevation. As discussed at the February 18th TMT meeting, the Corps requested and received a deviation for the end of February flood control elevation. The Corps shared that although not finalized, the March forecast will be out soon and is likely to be 75% of normal; a slight decrease from the February forecast. The project is planning to operate at minimum flows for most of March, starting as soon as Thursday, March 5th. NOAA Fisheries, noted that FPAC had discussed Dworshak flows and was in favor of decreasing outflow to minimums.

March 18th, TMT Meeting. The Corps reported that Dworshak end of March elevation will likely be above the current targeted flood control elevation 1,577.7 feet due to recent inflow. The Corps is preparing a request for a flood control deviation to fill above 1577.7 feet by March 31st in order to support April/May flows for fish. The Corps reported that the first half of March was very dry with the exception of recent rainfall that melted 1 to 1.5 inches of snow pack in the basin. The Corps stated the STP will change next week and that the risk analysis and deviation will provide more information regarding target flows. The Corps is aiming for inflows of 8 kcfs or more through the end of April; additionally, 7.5 kcfs will be released on March 25th and 26th to aide a Dworshak hatchery release. The Nez Perce suggested the Corps aim for an earlier refill date as a result of the low water supply forecast.

March 25th, TMT Meeting. The Corps requested and received a flood control deviation for Dworshak. The Corps noted that the risk analysis was sent out last night and the deviation allows the project to operate 9 feet higher than the normal flood control. The project is planning to shift to full powerhouse for two days. There was uncertainty around when exactly the project will shift to full powerhouse, however the USFWS and the Corps will connect to solidify if the operation begins today at 6:00 pm or midnight tonight. This operation is planned to supply additional water for the Dworshak Hatchery release on Thursday and Friday, March 26 and March 27. Following the release, the project will return to 7.5 kcfs and hold through the end of the month, likely ending the month around 1,586 feet. The Corps continued, that depending on the water supply forecast, the Corps is expecting to operate at about 2/3 powerhouse capacity through the month of April, to help out the fish, and then refill near the end of May or middle of June. The Corps noted that this proposed operation will revert to normal flood control in April and it is expected that the water supply forecast will fall to mid-60% of the average, based on snow on the ground. The Corps noted that due to the water supply forecast, the end of April flood control target elevation is higher, with the target elevation likely within the top 10 feet of the pool, as such the Corps will operate accordingly. It was noted that the Corps is using 1992 as the analog year for modeling and have looked at 1977, 1992, and 2007, as analog years based on the 2015 forecast.

April 15th, TMT Meeting. The Corps provided an update on the Dworshak operations, noting that the project will be operated at full powerhouse beginning April 16th and likely continuing through the rest of the month. It is expected that inflows will increase over the weekend and with only 10% of the lower elevation snowpack remaining, the Corps is moving to an earlier refill date. IDFG extended appreciation to the Corps for acquiring the flood control deviations and delaying full powerhouse operations until later in April. IDFG expressed appreciation of the Corps efforts to help with juvenile fish migration conditions.

April 29th, TMT Meeting. The Corps provided an update on the Dworshak operations, noting that the project is currently lower than the end of the month target of 1,586.5 feet. NOAA Fisheries shared an FPAC recommendation to draft to 1,585.5 feet with a 7.5 kcfs outflow, recognizing that water released now will not be available for refill later. The Corps cautioned that this operation will exhaust the remaining available water and likely result in a fast dropdown to 5 kcfs and again to 2.5 kcfs mid-May to ensure a reliable chance of refill. The Corps also noted that the water supply forecast for the Dworshak basis is currently at 70% of normal and the Corps is expecting this week's run to show a 20% decrease. MT requested the Corps provide a graph illustrating the volume allocations for the season, including minimum flows, refill volumes and the remaining discretionary volume available for augmentation.

May 4th, TMT Meeting. NOAA Fisheries shared that there is interest in building on a small peak in flow that is forecasted for Lower Granite. The Salmon Managers would like to increase flows to full powerhouse at Dworshak for a short duration, in hopes that it would build on the natural hydrograph and ideally encourage juvenile fish passage. Initially, the Salmon Managers recommended operating Dworshak at full powerhouse for 4 days, then cutting back to 7.5 kcfs for a day, then 5 kcfs for another day, and then holding 2.5 kcfs until refill. The Corps cautioned that the current draft water supply forecast is assuming normal precipitation, and the basin is not seeing normal precipitation at this point. The Corps expressed concern that an operation such as

the one proposed by the Salmon Managers would require a steep decrease in outflow, from full powerhouse to 1.6 kcfs, in order to begin refilling and would likely exhaust the flexibility of options for the summer season. The Corps also noted that as of the night of May 3rd, the Dworshak pool elevation 8.5 feet below the FCRC, the suggested operation would draft the pool by another foot or so.

May 6th, TMT Meeting. The Corps provided an update on Dworshak operations. The Corps noted that the BiOp states that the project is to maintain a 95% probability of refill, unless otherwise coordinated at TMT. The Corps presented two water volume analysis charts illustrating the probabilities of 20, 50, and 80% confidence of refilling if the project moves forward with a 2 or 4 day operation at full powerhouse. These scenarios did not incorporate water used for ramp down operations. The scenarios ranged from 449 KAF to -18 KAF of potential augmentation volume available after the operations. The Corps is concerned that the project will likely not be able to refill if the 4 day full powerhouse operation is implemented and that the Salmon Managers need to recognize the risk and likely implications to summer augmentation operations. The Corps reiterated that this operation would most likely exhaust any flexibility for summer operations. The Corps strongly recommended that if the Salmon Managers want to continue at full powerhouse, they recognize the need for an immediate ramp down to minimum flow in order to attempt refill by the end of June.

NOAA Fisheries noted that the April to July water supply forecast is for 1,325 feet and April to June is 455 KAF which seems adequate. The Corps noted that 455 kaf was observed for runoff, which is about 69% of the average for the month of April. The Corps continued that there is a decreasing trend in basin; the forecast will likely drop to 45% of normal and possibly continue to decrease. The Corps also pointed out that snowpack is very limited and most of the precipitation will be lost to groundwater and not enter the streams. Any rainfall experienced from now through the spring and summer seasons will not be productive as far as aiding streamflow and base flow in the summer.

Following a brief caucus, Salmon Managers (Umatilla, NOAA Fisheries, WA, ID, OR, Nez Perce, and USFWS) unanimously recommended that Dworshak continue to operate at full powerhouse until midnight on Friday, May 8th (for a total of 4 days), then ramp down to 5 kcfs on Saturday, May 9th, followed by a third ramp down to minimum outflow of 1.6 kcfs on Sunday, May 10th. NOAA Fisheries noted that while this is not an ideal operation, as it risks refill and will likely impact summer flow augmentation flexibility, the hope is that the benefits to the spring migrants will outweigh costs to temperature control operations in the summer season. Representatives from NOAA, WA, ID, and Nez Perce all expressed recognition of the risks to refill and appreciation for the Corps professional opinion.

Dworshak will operate at full powerhouse through midnight on Friday, May 8th. At 0100 hours on Saturday, May 9th, the project will ramp down to 5 kcfs, and at 0100 hours on Sunday May 10th, the project will ramp down to minimum flow (1.6 kcfs) and hold. ID will update regional fishermen (via email) of the operation change.

May 13th, TMT Meeting. The Corps discussed the Dworshak Operations, noting that the current elevation is at 1,587.5 feet, releasing minimum discharge (1.5 kcfs) and slowly filling the reservoir. NOAA Fisheries noted that after looking at forecasts, FPAC discussed potential options for additional flow augmentation out of Dworshak. As discussed in FPAC, the intent of the operation would be to give another pulse to help move fish through the system by increasing flows to 5 kcfs for one day, then 10 kcfs for a day, ramping back down to 5 kcfs for a day and then returning to minimum flows. The Corps cautioned that although RFC forecasts show a bump in inflows from 8.8 kcfs to 11 kcfs though the weekend, and does not expect inflows to reach 11 kcfs.

NOAA Fisheries noted that the Salmon Managers discussed the risk to refill that further augmentation poses; NOAA Fisheries also noted a significant increase in yearling Chinook passage at Lower Granite, Lower Monumental and Little Goose, which correlated with the previous operation coordinated at TMT (4 days of full powerhouse then ramp down, see 5/6/15 summary). There was discussion regarding how this year compares to other years, both in regards to streamflows and fish passage.

The Corps noted that last week's operation resulted in the reservoir being 10 feet below the assured refill curve of 95% confidence. If the project was to implement a 5 kcfs to 10 kcfs to 5 kcfs followed by minimum discharge, the reservoir will likely be 2 to 3 feet below full based on analog years 1992 and 1977.

Following a brief caucus, Salmon Managers requested that the Action Agencies implement another flow augmentation operation at Dworshak, beginning on May 16th: 5 kcfs for one day, 7.5 kcfs on May 17th, 5 kcfs on May 18th and then return to minimum discharge on Tuesday, May 19th. Paul noted that Salmon Managers fully acknowledge the risk this operation poses to refill and thus to the availability of summer augmentation water.

The Action Agencies will implement the request. On Saturday, May 16th, Dworshak will release 5 kcfs, at 0100 hours on Sunday, May 17th the project will increase to 7.5 kcfs, at 0100 hours on Monday, May 18th the project will ramp back down to 5 kcfs, and on Tuesday, May 19th the project will ramp down to minimum flow and hold. May 19th the project will ramp down to minimum flow and hold.

May 20th, TMT Meeting. The Corps provided an update on Dworshak operations. The Corps noted noted the current elevation is at 1,591 feet and the reservoir is slowly filling. The Corps reported that as coordinated at TMT, the project released 5 kcfs on May 16th, 7.5 kcfs on May 17th, 5 kcfs on May 18th, and then reduced to minimum flows on May 19th. The Corps noted that modeling indicates the reservoir will fill between June 5th and June 20th based on similar historic water years. NOAA Fisheries was pleased to hear that refill is likely to occur before the end of June. WA asked the Corps whether the precipitation signaled for in NOAA Fisheries forecasts will help the reservoir over the next few days. The Corps anticipates that observed precipitation will be less than forecasted, noting that previous forecasts suggested an increase in inflows up to 11-12kcfs, yet only 7-8kcfs was observed.

June 10th, TMT Meeting. The Corps provided an update on Dworshak and Lower Granite water temperatures. The Corps noted that air and water temperatures are climbing as a result of recent warm weather. Currently, Lower Granite tailwater temperature is approaching 64 ° F and climbing. Sunday, June 7, the project refilled and has since drafted slightly. The Corps continued that current temperature modeling shows the heat wave will subside in the next week; however, Lower Granite water temperatures are forecasted to approach 68 ° F by early next week. The Corps reported that the project may need to initiate water temperature augmentation towards the end of this week or the weekend. Currently, the Corps expects to continue passing inflow, about 3 kcfs, until the models suggest that it is time to start augmentation.

The USFWS asked when temperature augmentation typically begins, The Corps noted that the models suggest temperature augmentation is running 2 to 3 weeks earlier than the average. He also noted that if temperature augmentation starts mid-June, depending on how the water is utilized, it is possible elevations will reach 1,535ft by mid-August, thus exhausting the augmentation water. Charles Morrill continued that this time of year target water temperatures for the hatchery are between 43 and 44 ° F, currently the temperature release is around 42 ° F. The USFWS noted that temperatures are a few degrees cooler than normal at the hatchery; however, the hatchery is not too concerned about temperature impacts at this point. The Corps and the USFWS will continue to coordinate with the hatchery.

The Corps noted that in prior weeks, deeper depths of water were warmer due to wind mixing; Russ Kiefer, ID, noted that temperatures are in the 14 to 15 degree Celsius range which requires more effort to keep lower elevations cooler. The Corps added that not a lot of cold water has been released, as the season continues Lower Granite temperatures will increase. Doug asked what outflows should be expected if temperature augmentation starts on Saturday. The Corps indicated that the objective is to stay below 68 ° F with a discharge between 7-7.5kcfs. He shared that this is a judicious decision to stretch the water as far as possible into the summer, while not exceeding temperature criteria. Charles asked if there was any information from last year's discussion regarding wind equipment in the pools. The Corps noted that the weather equipment will be procured, however the Corps is still in the contracting phase at this point. The Corps will update TMT members via e-mail if the temperature augmentation begins before the next TMT meeting.

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

June 17th, TMT Meeting. The Corps provided an update on Dworshak and Lower Granite water temperatures and noted that current conditions are approaching 68° F. and thus the project began temperature augmentation operations on Tuesday night, releasing cooler water from Dworshak into the Lower Granite pool. Modeling indicates that if Dworshak discharge was not increased by today, temperature exceedances would occur later this week. The Corps increased discharge from 3 kcfs out of Dworshak to full load on unit 3 at 5.3 kcfs. While modeling indicates cooler temperatures over the next few days, the Corps is planning to hold the current release in anticipation of warmer weather over the weekend. The Corps noted that maintaining the operation at 5.3 kcfs should be sufficient to stay below 68° F. in the Lower Granite tailwater through early next week. The Corps continued that going into the operation, the pool is half a

foot down and it is expected to draft to approximately 5 feet below full by the end of June. WA noted that the temperature string data show temperatures 7° C. warmer than this time last year. The Corps concluded that the Corps is currently modeling running 5.3 kcfs outflows through June 25th, with an increase to 7.5 kcfs through the July 4th weekend, followed by an increase to 12 kcfs for the rest of July. This would result in drafting Dworshak to approximately 1555 feet by the end of July. Then operating at full powerhouse (9.7 kcfs) for the month of August would result in drafting Dworshak to 1535 feet on approximately August 18th.

June 24th, TMT Meeting. The Corps provided an update on Dworshak and Lower Granite operations. The Corps noted that temperature models indicate a need to increase Dworshak outflow in order to maintain water temperatures below 68° F. in the Lower Granite tailrace. The Corps plans to increase Dworshak outflows to 8.5 kcfs at midnight June 24th and will likely increase to full powerhouse by June 26th or 28th, depending on the forecast; the Corps will continue to run models daily to determine when to go to full powerhouse or higher if necessary to maintain Lower Granite tailrace below 68° F. The Corps also noted this season is experiencing unusually warm air temperatures, which are expected to continue. The Corps continued that per TMT coordination, the project is operating to maintain a 1-1.5° F. water temperature buffer below 68° F. in the Lower Granite tailrace, noting that the Dworshak gas cap is typically around 13-14 kcfs, compared to full powerhouse which is around 10 kcfs. The Corps will continue to provide TMT with updated water temperature modelling results; they will also provide TMT with modelled forecasts of potential impacts of current operations on late summer water volumes.

July 1st, TMT Meeting. The Corps noted that as of July 1 water temperatures in the Lower Granite tailwater were around 65.5° F. This temperature decrease is a result of multiple factors, including a temporary increase in Dworshak's discharge over the weekend to 13.5 kcfs, switching from 1 to 2 units at Lower Granite (passing cooler water), increased release of cold (17° C.) from Idaho Power, a region-wide rain storm and recent cloud cover which has reduced solar radiation. The Corps noted that the project team has conducted numerous model runs and that models are suggesting that discharge can be reduced from full powerhouse down to ½ powerhouse through the weekend and still maintain the 1-1.5° F. temperature buffer coordinated through TMT. The project plans to reduce discharge to 5.4 kcfs tonight and hold this through the weekend; the project will continue to monitor and model temperatures and increase discharge if needed to maintain the buffer, while limiting discharge to only what is needed to maintain the buffer. The Corps does not expect to be able to operate below full powerhouse capacity and maintain the 1-1.5° F. buffer throughout July. The Corps postulated that with the amount of water available, the project may be able to reduce temperatures at Lower Granite within a couple of degrees. The Corps also noted that the 1-1.5° F. buffer is necessary in order to allow the project to be responsive without exceeding 68° F. It was noted that TMT will continue to track and manage this operation throughout the season.

July 8th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that on July 6th, water temperatures at Lower Granite exceeded the 68° F. threshold, and as of July 8th water temperatures were at 69.5° F. and climbing. The Corps reported that modelling suggests that warmer temperatures will only last a couple of days and then will drop back down below 68° F. The Corps noted that on July 6th Dworshak

discharge was increased from 5.4 to 7.5 kcfs, which should help lower water temperatures soon (water particle travel time from Dworshak to Lower Granite is 72 hours), and moderate ambient temperatures are forecasted for the next few days. The Corps reiterated that the per TMT recommendation, the project will continue to operate to conserve water at Dworshak, while striving to maintain water temperatures below 68° F. The Corps reported that, although last week's models were a bit off, the current modeling is tracking well. The Nez Perce, noted that moderation in ambient temperatures in the Clearwater area may provide the temperature relief needed and hopefully that coupled with the increase in discharge at Dworshak will bring cooler temperatures to Lower Granite. The Fish Passage Operations & Maintenance group will meet at 10:00am on July 8th to discuss Lower Granite operations in greater details.

July 15th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite tailwater temperatures. The Corps noted that current tailwater temperature is 65° F., cooling off from last week's high temperatures which exceeded 68° F. Following a brief caucus, the Salmon Managers recommended that Dworshak operate at full powerhouse for 1 week and then the operation will be revisited at TMT. If conditions change and allow for the temperature buffer (1.5° F) to be maintained with less discharge, the project should decrease releases from Dworshak. It was noted that if more than full powerhouse is needed in order to maintain the 1.5° F. buffer, the project should shift and operate to the 68° F. threshold, instead of the buffer. The Action Agencies will operate Dworshak at full powerhouse from July 15th to July 22nd in order to maintain a 1.5° F. buffer around the 68° F threshold for the Lower Granite tailwater. If feasible, while still maintain the temperature buffer, the project will decrease discharge. If more than full powerhouse is needed to keep Lower Granite tailwater temperatures within the threshold, the project will shift and operate to 68° F. instead of the 1.5° F. buffer.

July 22nd, TMT Meeting. The Corps, updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that the current Dworshak tailwater temperature is 65° F. The Nez Perce, requested NOAA Fisheries contact Idaho Power and explore options to shape the augmentation water in an attempt to manage temperature impacts. NOAA Fisheries will coordinate connecting with Idaho Power to explore options to shape augmentation water to manage temperature impacts. Following a brief caucus, the majority of Salmon Managers suggested decreasing discharge to 7.5 kcfs for two days, then review the operation to determine if there is a need to increase discharge. It was noted that due to the current adult sockeye emergency, ID does not support decreasing discharge to 7.5 kcfs and would prefer the project is operated to the 68° F. criteria (1.5° F buffer). ID noted that decreasing outflows at Dworshak over the next two days will further impact adult Snake River sockeye migration and will likely increase water temperatures on the Snake. At midnight on July 23rd, based on NOAA Fisheries recommendation and other Regional Salmon Managers, the Action Agencies will decrease discharge at Dworshak to 7.5 kcfs and maintain the operation for two days. Salmon managers will follow up with the Action Agencies on Friday, July 24th to determine if any operational changes should be made.

July 27th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that current Dworshak tailwater temperature is 65° F. Surface temperatures at Lower Granite are cooler than prior weeks due to the cooler air and even some precipitation in the region. The Corps noted that at this point and until further TMT

coordination, the project will continue running full power house in order to keep temperatures below 68° F. The region is expecting warmer weather towards the end of the week.

July 29th, TMT Meeting. The Corps noted that current Lower Granite tailwater temperature is 66.6° F. The Corps continued that last week's model results showed a decrease in temperatures by a degree, allowing a reduction in discharge to 7.5 kcfs, as previously coordinated at TMT. The Corps noted that air temperatures are forecasted to increase, thus following a two-day hold at 7.5 kcfs, the Corps anticipates returning to full powerhouse to avoid any exceedances at the end of the forecast period. The Salmon Managers present (Nez Perce, ID, NOAA Fisheries, WDFW, Umatilla, OR, Colville and USFWS) suggested keeping the 68° F. criteria until August 3rd, then following the planned outage, decrease discharge to 7.5 kcfs for one week, and after one week reconvene reassess operations moving forward. Per the Salmon Manager's suggestions, The Corps will implement the operation as follows: maintain discharge at 7.5 kcfs until July 31st, and then resume full powerhouse operations at midnight on July 31st. On August 3rd the operation will reduce discharge to 3 kcfs during breaker repair from 0700 hours to 1500 hours. Following the planned outage, the operation will return to a discharge of 7.5 kcfs for one week.

August 5th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that current Lower Granite tailwater temperature is 65.4° F. The Corps noted the updated model results include water temperatures for the Snake River at Anatone and for Clearwater at Orofino as requested by TMT members last week. The Corps continued that if the operation holds outflows to 7.5 kcfs out of Dworshak, temperatures should stay two degrees below the 68° F. threshold. If the operation were to ramp down to 5.4 kcfs water temperatures slowly climb but do not approach the 68° F. mark until the end of the 10 day period. The Corps noted that dropping to 5.4 kcfs is a viable option at this time.

The Corps clarified that the model shows an operation holding at 7.5 kcfs through August 11th and then shifting to a flat flow of 5.4 kcfs mid-August. If the operation immediately reduces to 5.4 kcfs, the effect would be an average discharge of 6 kcfs for the remainder of the month. The Corps noted that ramping down to 5.4 kcfs would retain more water that may be needed to counteract warmer temperatures later on in the month. The Salmon Managers present noted that they had discussed dropping down to 5.4 kcfs at FPAC and would like to suggest that the Corps implement that operation as soon as possible.

The Corps will implement the operation as follows: decrease discharge to 5.4 kcfs on Thursday, August 6th, at midnight. They will notify TMT when the model results indicate the operation is 3 days away from exceeding the 68° F. buffer.

August 12th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that current water temperatures are near 67° F, cooling off from yesterday's temperature which approached, but did not exceed, 68° F. The Corps shared that according to the model, the current discharge will keep temperatures below 68° F. for the next five days, however, Idaho Power plans to increase discharge in the next three days which will introduce more warm water into the system and thus require an increase in discharge out of Dworshak to maintain 68° F. The Corps requested regional recommendations. The Corps anticipated that with an average discharge of 5.6 kcfs out of Dworshak, it is possible to ramp up

the operation and still meet the target elevation of 1535 feet for the end of August. The Corps noted that it is necessary to stay aligned with the Dworshak Board's planned elevation of 1535 feet end at the end of August. NOAA Fisheries will follow-up with the Nez Perce.

The Corps noted that the STP average outflows requires 5.5 kcfs to achieve 1535 feet by the end of August, thus if you increase to 7.5 kcfs in the coming days you may have to reduce down to a 1 small unit operation (approximately 2.5 kcfs or less) in the final week of August. The Corps agreed this is a possibility and it is dependent on fluctuating inflows for the remainder of the month. The Corps reiterated that the number of days holding at 7.5 kcfs is dependent on inflows, currently inflows are at 0.5 kcfs and on August 4th inflows were at 1.1 kcfs; this variability presents uncertainty in determining how long discharge is able to stay at 7.5 kcfs without exhausting available water. The Corps noted that a decision is required by Thursday night, otherwise temperatures will increase over 68° F. on August 15th.

Following a brief caucus, the Salmon Managers recommended an increase in discharge out of Dworshak, beginning at midnight on Thursday, August, 13th. Salmon Managers acknowledged that discharge flows are dependent on inflows and subject to change.

The Action Agencies will increase discharge out of Dworshak to 7.5 kcfs beginning at midnight on Thursday, August 13th and until midnight Saturday, August, 15th. The operation will then ramp down to an outflow that will achieve 1535 feet end of August, and at this time current anticipated outflow that would achieve 1535 feet end of August is 5.5 kcfs. The Corps will adjust as necessary to achieve 1535 feet end of August.

August 19th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that due to technical difficulties the most recent model is not yet available on the TMT website, however, it will be posted following the meeting. Temperatures in the Lower Granite tailwater are currently around 68° F. and are expected to cool over the next 3-4 days; however, there may be a subsequent rise in the 10 - day forecast. Temperatures are expected to reach 68° F. on August 23rd, an outcome that is likely unavoidable. The Corps noted that the plan is to drop Dworshak outflow from 5.7 kcfs to 5.2 kcfs discharge on Saturday, August 22nd, then hold in order to hit 1535 feet by the end of August, at which point they will transition to the Nez Perce operation. It is expected that the augmentation water will be exhausted by September 20th, plus or minus a few days depending on the inflows. Temperatures should be close to 68° F. throughout the operation, but no exceedances according to the model. It was noted that the smoke from wildfires is likely limiting solar radiation impacts on water temperatures.

August 26th, TMT Meeting. The Corps updated TMT on Dworshak and Lower Granite water temperatures. The Corps noted that water temperatures are currently around 66° F. and temperatures are expected to cool off in the coming weeks due to shorter days and a decrease in solar radiation due to wildfire smoke in the air. Current modeling does not show any exceedances through the end of the month. The Nez Perce, noted it was his understanding that the end of August target elevation for Dworshak was modified per Dworshak Board's Operational Plan, to 1534 feet rather than 1535 feet. The Corps agreed with the Nez Perce and reiterated per the Dworshak Board Operational Plan the Action Agencies will draft Dworshak to

1534 feet by the end of August. The Corps noted that in order to reach 1534 feet by the end of August, the project would increase discharge to around 5.7 kcfs through the remainder of August and into September.

The Action Agencies will implement the Board's Operational Plan included below.

1) On or about August 31st, Dworshak will be drafted to approximately elevation 1534 feet and discharge is expected to be approximately 5.7 kcfs.

2) On September 1st, maintain discharge of approximately 5.7 kcfs.

3) On September 15th, reduce discharge to approximately 4.6 kcfs.

4) On about September 19th, reduce discharge to approximately 2.4 kcfs.

5) Reduce to minimum outflow about 1.5 kcfs when reservoir pool draft to elevation 1520 feet forecasted to be approximately September 22nd, however, this depends on inflows.

NOAA Fisheries, stated that the modification request will help conditions at the Lower Granite reservoir by maintaining a steady discharge, cooling off forebay temperatures, and improving conditions for the adult trap. The Corps also noted that BPA transmission submitted a consideration to operate Unit 1 which may make it difficult to drop flows to 5.7 kcfs; the current modeling at 5.7 kcfs is based on operating Unit 3 only. The Corps will do additional analysis and request clarification from BPA on the unit preference, regardless, the project expects to be able to discharge approximately 5.5 kcfs.

Dworshak will hold discharge between 5.5 - 5.7 kcfs until the end of August to reach the modified target elevation of 1534 feet. For the month of September the Action Agencies will implement the Board's Operational Plan as specified above.

2.5. Water Quality

Spill priority lists coordinated with the TMT may be found on the following website:

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

2.6. Burbot Temperature Management (Libby Dam)

Under the terms of a Memorandum of Understanding (MOU) prepared in 2005 by the Kootenai Valley Resource Initiative (KVRI) and signed by the Corps, the selective withdrawal gate system at Libby Dam has been set to release cool water in November and December, before temperature stratification limits the temperature control capability. The purpose of this operation is to provide cooler river temperatures downstream of Libby Dam (closer to normative thermal conditions). This operation will likely result in November and December temperatures being slightly cooler than the existing selective withdrawal temperature rule curve. Corps staff at Libby Dam removed selective withdrawal gates incrementally during late October to assure that

daily temperature change remains within 2°F per day; gates were removed systematically to slowly lower river temperature by early November (a span of about 8°F). Temperature will not be minimized this fall until isothermal conditions develop due to constraints and precautions that will be observed related to selective withdrawal crane rehabilitation that will occur over the winter, necessitating a more conservative gate removal pattern. Rather than removing all gates (resulting in withdrawal elevation of 2222 feet), the Corps removed all but 3 rows of gates (resulting in withdrawal elevation of 2253 feet).

2.7. Spring Creek Hatchery Release (Bonneville Dam)

April 29th, TMT Meeting. The USFWS provided an update on the Spring Creek Hatchery release and noted that the second and final release of Spring Tule Chinook occurred Monday, April 27th, with a release of 4 million. The release was implemented a week early due to a parasite in the fish; the early release is intended to get the fish to the estuary sooner and allow the salt water to clear any remaining parasites. The Service also noted that the mortality rate increased from 0.15% per day to 0.21% per day as a result of the parasite; however the increase in mortality rate was not enough to warrant an even earlier release.

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

Regard ing the 2014-2015 operation the the AAs are planning on implementing a MCE of 2051 feet (operating range of 2051-2052 feet with no flexible winter power operation) to facilitate IDFG habitat restoration work on the Clark Fork River Delta, near Clark Fork, Idaho.

2.9. Upper Snake Flow Augmentation

BOR is anticipating the release of 487 KAF of flow augmentation from the Upper Snake in 2015.

2.10. Chum Operation

Date	TMT Discussion/Chum Operation
October 29, 2014	TMT Meeting - The TMT coordinated the following chum operation that would start on November 1st. 1. Operate Bonneville tailwater within a 1 foot range of 11.5 - 12.5 feet elevation during all hours. 2. If necessary to pass additional flows, operate Bonneville tailwater up to 13.0 feet elevation during all hours, returning to 11.5 - 12.5 feet whenever possible. 3. If necessary to pass additional flows, operate Bonneville tailwater up to 16.5 feet elevation during nighttime hours (5 pm-6 am) with the highest tailwater elevations around midnight. 4. If necessary, operate Bonneville tailwater up to 18.5 feet elevation during nighttime hours (5 pm - 6 am) with the highest tailwater elevations around midnight. 5. If necessary, operate Bonneville tailwater at a range of 13.0 - 16.5 feet elevation during daytime hours (6 am - 5 pm) with no upper limit during nighttime hours and the highest tailwater elevations around midnight. At this point, the Action Agencies would notify TMT and coordinate further operations if necessary. WDFW reported that chum were present in the Grays River and chum have been observed passing Bonneville Dam.
November 5, 2014	TMT Meeting - The chum operation began at 0600 hours on November 1st, at which point the tailwater elevation at Bonneville was 11.6 feet, with an outflow of 114 kcfs. On November 5th, at 0800 hours tailwater elevation was 11.9 feet with total outflow of 112.9 kcfs. NOAA Fisheries indicated chum are in the area, with 4 fish, as well as a red observed within the Multnomah Falls/ Horsetail Falls area and 12 chum have gone above Bonneville. WA added there were 7 live chum and 1 redd observed in the Ives/Pierce Complex area and additionally, 71 live, 5 dead fall chinook were observed and 7 redds.
November 19, 2014	TMT Meeting - Bonneville Dam has been operating lower than 13 feet tailwater. Yesterday's (11/18) minimum was 11.8 feet and maximum was 12.8 feet. WA noted that due to weather conditions they were not able to survey for chum last week, however, so far 40 chum have been counted in the I-205 area and 60 in the Ives area.

Date	TMT Discussion/Chum Operation
December 17, 2014	TMT Meeting - The operation has been implemented as planned and as of this morning (0800 hours) the tailwater was at 12.7 feet with a total outflow of 125.1 kcfs. NOAA Fisheries noted this was a challenging year due to a lack of continuous data from field crews. It appears that Chum spawning is nearing the end, however, there are still fish spawning. This year, redds were observed further up the channel than previous years, as a result a higher protection level to be set for incubation and emergence. NOAA Fisheries continued to report that water levels at Bonneville are rising and the project may not be able to hold 13 feet for much longer, however, expects to be able to hold it until next week. As of yesterday, FPAC members were okay with maintaining a 13 foot daytime threshold until more information is available from surveys on 12/23. FPAC has made a request for specific details from the survey and is hoping that it will inform as to what a reasonable protection level will look like going forward. USFWS noted that hopefully the surveys will provide depth information and a map of the elevation and location of the redds. The trap at Duncan Creek will be removed on December 23rd which will require a 11.5-12.5 feet elevation from 0800 to 1400 hours. The Corps will continue the current operation, holding the daytime elevation between 11.5 - 13.0 feet, until 0800 on December 23rd. As of 0800 hours on the 23rd, the elevation will be kept between 11.5-12.5 feet for the Duncan Creek trap removal. At 1500 hours, the operation will shift to the chum incubation operation, which calls for a minimum tailwater elevation of 13.0 feet during all hours. Additional information will be gathered during surveys on the 23rd and TMT will check in on and adjust the operation if needed at the January 7th TMT meeting.
January 7, 2015	TMT Meeting - The Corps noted the operation has not changed since December 19th at 1500 hours when the project began operating to a minimum tailwater of 13 feet. Operation parameters are available on the TMT website. NOAA Fisheries, noted that hopefully there will be additional information from spawning surveys by the next TMT meeting on January 21st, at which point TMT can discuss options moving forward with the operation.
January 21, 2015	TMT Meeting - NOAA Fisheries, discussed the chum spawning operation, noting the operation will continue to maintain a minimum tailwater elevation of 13 feet, pending additional information. WA, added that the operation will be reexamined once data is reviewed and discussed internally and with FPAC; WA suggested revisiting this topic at the next TMT meeting. The Corps provided additional information on the Bonneville Dam forecast, stating that tailwater is operating within the 17-19 feet range, well above the 13 feet minimum and according to the NWRFC Bonneville Dam inflows will be between 185-195 kcfs over the next 10 day period.

Date	TMT Discussion/Chum Operation
February 4, 2015	TMT Meeting - NOAA Fisheries, discussed the chum spawning operation, noting that WDFW has been the lead on the ground on this project and they requested maintaining a 13 feet tailwater elevation when possible. WA, agreed with NOAA Fisheries, noting that WA requests the operation continue to meet a 13 feet tailwater elevation while there is water to support it. BPA, asked WA to elaborate on what information was used to determine the 13 feet threshold, as this differs from the final survey recommendations regarding the protection of Ives Island. WA noted that based on the information provided to the staff, there was adequate coverage on the given day of the survey but there was concern over the preciseness of the data long-term. WA stated that if water is available WA will request a minimum 13 feet tailwater elevation. BPA asked what the minimum elevation recommendation would be if water is not available. WA speculated (but was not sure) that elevation recommendations would be a gradual ramp down to 12.5 feet and 12 feet. The Corps provided additional information on the Bonneville Dam forecast, stating that the tailwater is operating at 18.2 feet and noted that the 10 day forecast indicates inflow will gradually increase from 197 kcfs to 292 kcfs by February 9th and then back down to 268 kcfs by February 13th. Based on this information the Corps plans to continue implementing the current chum spawning operation (13 feet minimum tailwater). Per the recommendation to continue the project with a minimum tailwater elevation of 13 feet, while water is available, the Corps will implement the operation as requested. TMT will revisit this issue at their next scheduled meeting, on February 18th.
February 18, 2015	TMT Meeting - WA, noted there is nothing to report on the current chum spawning operation. NOAA Fisheries, added that an update on forecasted chum emergence will be provided at the next TMT meeting; however, it is likely that emergence will be earlier than normal this year. NOAA Fisheries noted that forecasted emergence for the Hanford reach is February 28th, which is earlier than usual and it is reasonable to expect this to hold true for other reaches as well. NOAA Fisheries will provide an update on the chum emergence forecast at the March 4th TMT meeting.
March 4, 2015	TMT Meeting - NOAA Fisheries, reported that the chum incubation period and temperature units are continuing to be tracked. The incubation and pending emergence will continue to be tracked. There is no new information to report regarding redd locations. An update will be provided at the next TMT meeting.
March 18, 2015	TMT Meeting - NOAA Fisheries, reported on the chum operation, noting that they have continued to track temperature units and emergence is expected to be within the normal range. BPA, asked if the operation was on track for a complete emergence by the end of March. NOAA Fisheries noted that the temperature monitoring is tracked with the floating gauge and is not representative of all of the redds, thus is it difficult to say when emergence will be complete. NOAA Fisheries noted that stream flows over the next 10 days look sufficient to continue the operation, however, emergence can continue past March. The need to balance flows for the chum operation and summer flow augmentation was noted, and it was recognized that there are step down options that could be implemented if necessary.

Date	TMT Discussion/Chum Operation
March 25, 2015	TMT Meeting - NOAA Fisheries, reported on the chum spawning operation. NOAA Fisheries summarized last week's discussion centering on balancing chum tailwater elevation below Bonneville and upstream elevation and spring/summer flow augmentation needs. At this point, the balance greatly depends on stream flows, which due to the recent series of rain events are adequate to continue the 13 feet tailwater elevation. NOAA Fisheries noted that stream flows are up and NOAA Fisheries' 10 day forecast shows adequate water in the lower river. NOAA Fisheries also noted that Chum are well into the estimated emergence period. The data provided from the December 5th red survey is not inclusive of all fish and the recommendation is to continue with protection efforts by maintaining 13 feet.
April 1, 2015	TMT Meeting - NOAA Fisheries reported on the chum spawning operation. The most recent temperature data set was received and shows that the water temperatures have reached or are near emergence temperatures. The emergence date was noted as April 2nd. NOAA Fisheries reiterated that, as discussed at the last TMT session, these temperatures do not reflect emergence for all chum in the area. NOAA Fisheries also noted that BPA solicited feedback from FPAC regarding an operation to retrieve the temperature gauge data on April 6th. The operation would require BPA to lower the tailwater to 12 feet for a 4 hour window to allow for the equipment to be accessed. BPA noted that the push to get the equipment out is not only to retrieve the data, but also to avoid putting the equipment at risk during the fishing season. BPA shared that the intent was to implement the operation after emergence and before the start of the spill season, noting that there may be a need to drop spill if the operation is postponed into the spill season. Salmon Managers shared that they are concerned with dropping the tailwater from the current 19 feet to 12feet, as it may expose or strand fish emerging from higher elevations. Salmon Managers suggested holding off on this operation until the flows have dropped for the summer, likely June. Another option suggested, however, not vetted at FPAC, is to try to get to the equipment during the low point before the spring runoff, likely in mid-April. Umatilla suggested that TMT continue to track conditions for a more opportune time, when both flows and the risk to fish are lower. Yet another option discussed was to implement the operation on April 9th. BPA and FPAC agreed that more discussion is needed and a special TMT session may be necessary either this week or early next week. If a special session is not scheduled, TMT will revisit the chum operation at the April 8th TMT meeting. BPA and Salmon Managers will continue respective discussions with the intent of finding a way to retrieve the temperature equipment while limiting potential impacts to emerging chum. The Corps will schedule a special TMT session either this week or early next week to discuss further if necessary.

Date	TMT Discussion/Chum Operation
April 8, 2015	TMT Meeting - NOAA Fisheries reported on the chum spawning operation. NOAA Fisheries noted that it is coming up on the time to transition from the chum operation to spring operations. The Corps provided an update on the current operation as well as the upcoming forecast. NOAA Fisheries highlighted that as of 0600 hours on April 8th, Bonneville Dam outflows were at 204 kcfs and tailwater elevation was holding at 17.5 feet, 4.5 feet above the current chum protection level. NOAA Fisheries noted that thus far April tailwater elevations have been consistently between 18.1-19 feet and outflows have been between 217-234 kcfs. NWRFC forecasts Bonneville will continue to experience high inflows: the 5 day forecast calls for 175 kcfs and 10 day forecast is 180 kcfs. The Corps noted that because an earlier end was not coordinated through TMT, the chum operation will end on April 10th, when the spring spill season officially begins. This operation is consistent with previous years. The chum operation will end on April 10th in conjunction with the beginning of the spring spill season.

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

http://www.fpc.org/spawning/spawning_surveys.html

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

Date	Lives	Dead[i]	Redds[ii]	Visibility (feet)
25- Sept-14	0	0	0	10
2-Oct-14	0	0	0	10
10-Oct-14	0	0	0	12.5
17-Oct-14	0	0	0	10
24-Oct-14	0	0	0	8
31-Oct-14	0	0	0	12
4-Nov-14	3	0	1	6
6-Nov-14	NC	0	NC	Carcass count only
10-Nov-14	29	2	8	10 feet vis.
12-Nov-14	-	-	-	No survey wind gusts 60-80 mph
14-Nov-14	13	5	NC	10
18-Nov-14	39	5	9	3
25-Nov-14	170	17	33	6
2-Dec-14	-	-	-	No survey wind gusts 60 mph
5-Dec-14	122	35	31	2
9-Dec-14	75	5	35	2
12-Dec-14	0	6	0	12
16-Dec-14	35	2	20	12
23-Dec-14	0	0	0	0.5
29-Dec-14	0	0	0	0.5
6-Jan-15	0	1	0	4

i. Dead are newly samply fish only.
ii. Redds are an instantaneous count for the day, not cumulative.

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

Date	Summary
April 7, 2015	Beginning this Saturday, April 11, 2015, Section C.5(b)(6) of the Hanford Reach Fall Chiook Protection Program Agreement (HRFCPPA) will be in effect. This section requires that: "On four consecutive Saturdays and Sundays that occur after 800 TUs have accumulated after the end of the Spawning Period, Priest Rapids Outflow will be maintained to at least a minimum flow calculated as the average of the daily hourly minimum flow from Monday through Thursday of the current week."
April 20th,	Two weekends of Section C.5(b)(6) of the HRFCPPA remain. This constraint requires that on Saturday and Sunday Priest Rapids outflow to be at least a minimum flow calculated as the average of the daily hourly minimum flow from Monday through Thursday of the current week. On May 3rd this flow constraint will end. Grant County Public Utility District (GCPUD) will also continue to be in the Emergence Period which requires minimum flows below Priest Rapids to be at or above the Critical Elevation (70 kcfs) as well as the the Rearing Period which constrains Priest Rapids daily fluctuations. Based on accumulated temperatures we are projecting that the Emergence Period will end on May 4th and the Rearing Period will end on June 9th.
May 7th	Rearing period protection flows remain in effect (daily fluctuations). Grant County Public Utility District (GCPUD) are projecting that the Rearing Period will end on June 6. The Emergence Period (minimum flow protections) ended on May 2.
May 27th	GCPUD is projecting that all flow constraints under the Hanford Reach Fall Chiook Protection Program Agreement (HRFCPPA) will end on 6/3/2015 @ 24:00. Until then, GCPUD remains in the the Rearing Period, which constrains daily fluctuation below Priest Rapids Dam.
June 2nd	GCPUD is projecting that tomorrow will be the final day of protection flows under the HRFCPPA. On 6/3/2015 at 24:00 the Rearing Period will end, concluding the 2014-2015 protection flow season.

2.12. 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 of Engineers and the fishery agencies, zero river flow is allowed for water storage during low power demand periods (at night and on weekends) when there are few, if any, actively migrating anadromous fish present in the Snake River. Water stored under zero river flow conditions may maximize power production from the Columbia River Basin system, but zero river flow operations are not recommended at Lower Snake projects when fish are actively migrating in the Snake River."

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

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

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

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

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

November 19, 2014, TMT Meeting. BPA, requested the 2014 criteria for zero generation on the Snake River Dams. NOAA Fisheries, noted that the 2014 criteria will be a rolling 3 day average count of 65 total steelhead and/or 20 wild steelhead at Lower Granite Dam based on a rolling 3 day average. The criteria are based on a sliding scale outlined in the attachment posted on the TMT agenda. NOAA Fisheries indicated that there are currently 100's of steelhead passing Lower Granite daily; however, numbers may be dropping. The recent cold weather may be influencing the recent decrease in passage. NOAA Fisheries will continue to track steelhead passage and will contact the Action Agencies when the trigger is hit. An update will be provided at the December 17th TMT
meeting.

December 17, 2014, TMT Meeting. BPA noted the trigger has yet to be hit and water temperatures have crept up from 5 to 6.5 °C. However, there is still potential the trigger will be hit by the end of the month and the operation will be implemented as coordinated. NOAA Fisheries is fine with the AAs tracking and implementing the operation if the triggers are hit, and it is not necessary for them to wait for word from NOAA Fisheries. The Corps noted the criteria include a rolling 3-day average count of less than or equal to 65 total steelhead and 20 wild steelhead at Lower Granite. If these criteria are not met by the end of December then the AAs will implement the operation on January 1st, 2015 when the Lower Granite Dam fish ladder goes out of service.

January 7, 2015, TMT Meeting. BPA, reported that the zero nighttime generation operation has been implemented; however, the trigger was not hit. Regardless of the trigger, the ladder was scheduled to be taken out of service on January 1st with the initiation of the zero nighttime generation operation. TMT members present were uncertain as to if and when the ladder was taken out of service, however, it was believed to have been done on 5th or 6th of January.

2.13. Minimum Operating Pool (MOP)

In accordance with Reasonal Prudent Alternative 5 in the NOAA Fisheries 2014 Supplemental BiOp the Action Agencies operate the Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose and Lower Granite) at MOP (unless adjusted to meet authorized project purposes, primary navigation) from April 3 through August 31 as specified in the 2015 Fish Operations Plan (FOP). MOP ranges at Lower Snake River Projects are found in Table 9 below.

Table 9. MOP Elevation Ranges for Lower Snake River Projects

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

Additional information regarding MOP operations are described in the FOP on the following website.

http://www.nwd-wc.usace.army.mil/tmt/agendas/2015/2015_Fish_Operations_Plan_(030315).pdf

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.

2.14. Spill and Transportation in 2015

Spring spill will begin on April 3 at Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams. Spring spill operations will continue through June 20. Spring spill will begin April 10 at McNary, John Day, The Dalles, and Bonneville dams. Spring spill operations will continue through June 15. Spring spill operations are shown below in Table 10.

Table 10. Summary of 2015 spring spill levels at lower Snake and Columbia River projects

Project	Planned 2015 Spring Spill Operations (Day/Night)
Lower Granite	20 kcfs/20 kcfs
Little Goose	30%/30%
Lower Monumental	Gas Cap/Gas Cap (approximate Gas Cap range: 20-29 kcfs)
Ice Harbor	**April 3-April 28:** 45 kcfs/Gas Cap **April 28-June 20:** 30%/30% vs. 45 kcfs/Gas Cap (approximate Gas Cap range: 75-95 kcfs)
McNary	40%/40%
John Day	**April 10-April 28:** 30%/30% **April 28-June 15:** 30%/30% and 40%/40%
The Dalles	40%/40%
Bonneville	100 kcfs/100 kcfs

Summer spill will begin on June 21 at Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams and continue through August 31 at all four Snake River projects. Summer spill will begin June 16 at McNary, John Day, The Dalles, and Bonneville dams and continue through August 31 at all four Columbia River projects. Summer spill levels are shown below in Table 11.

Table 11. Summary of 2015 summer spill levels at lower Snake and Columbia River projects

Project	Planned 2015 Spring Spill Operations (Day/Night)
Lower Granite	18 kcfs/18 kcfs
Little Goose	30%/30%
Lower Monumental	17 kcfs/17 kcfs
Ice Harbor	**June 21-July 13:** 30%/30% vs. 45 kcfs/Gas Cap **July 13-August 31:** 45 kcfs/Gas Cap (approximate Gas Cap range: 75-95 kcfs)
McNary	50%/50%
John Day	**June 16-July 20:** 30%/30% and 40%/40% **July 20-August 31:** 30%/30%
The Dalles	40%/40%
Bonneville	85 kcfs/121 kcfs and 95 kcfs/95 kcfs

Additional information regarding spill may be found in the FOP on the following website.

http://www.nwd-wc.usace.army.mil/tmt/agendas/2015/2015_Fish_Operations_Plan_(030315).pdf

To achieve the 2014 Supplemental BiOp goal of transporting about 50% of juvenile steelhead, transportation will be initiated at Lower Granite, Little Goose, and Lower Monumental dams on May 1, as coordinated with the TMT in 2014.

The collection of fish at lower Snake River projects for transportation will commence at 0700 hours on May 1. Barging of fish will begin the following day and collected juvenile fish will be transported from each facility on a daily or every-other-day basis (depending on the number of fish) throughout the migration season. Transportation operations will be carried out at each project in accordance with all relevant FPP operating criteria.

2.15. Emergency Snake River Sockeye Trap Operations

July 15, TMT Meeting. The Corps, provided and update on Lower Granite operations. Following TMT and FPOM coordination, Lower Granite closed the RSW on July 8, and on July 13, switched to Unit 1 priority.

July 22, TMT Meeting. The Corps, provided an update on the Emergency Snake River Sockeye Trap and Haul Operation. The Corps recapped a previously discussed operation at Little Goose Dam, as recommended by NOAA Fisheries, which the Corps was intending to implement, however, the Corps requested feedback from regional managers regarding the biological implications of the operation. The proposed, 2-day operation at Little Goose would be to cut spill during daytime hours from 0400 hours to 2000 hours and shift to nighttime minimum generation on a single unit in accordance with unit priority, and spilling the remainder of outflow from 2000 hours to 0400 hours. The Corps noted they plan to continue operating Lower Granite with Unit 1 as the priority unit and deep spill (no RSW), and there is no change to that project, as recommended by NOAA Fisheries. The Corps requested additional feedback from the Salmon Managers on operations at Little Goose Dam, the following points were made:

- NOAA Fisheries noted that this year adult Sockeye passage numbers are dismal, with only 10% of the Sockeye over Bonneville passing Lower Snake projects and the majority highly stressed en route, leading to mortalities. ID noted that 4,000 fish are estimated to have passed Bonneville and only 300 have converted at Lower Granite. According to NOAA Fisheries, the proposal to cease spill during the day is intended as an opportunity to pass cooler water downstream. If the operation runs all outflow through the powerhouse, cooler water will be routed downstream to the Lower Granite ladder entrance, which will hopefully result in increased passage.

- NOAA Fisheries noted that the adult Sockeye trap and haul at Lower Granite is likely the best option for increasing Sockeye survival. Additionally, this proposed operation at Little Goose may bypass more sub-yearling fall Chinook to be transported, which would provide a benefit considering in-river conditions are not ideal for juvenile downstream migration.

- ID noted that they support the operation change at Little Goose, however, proposed a ‘package deal test’ that includes shifting operations at Lower Granite to better support out-migrating juvenile Chinook, hopefully stimulate adult passage by making a change, and having a better chance of being agreed to by all parties. For this package test, ID suggested switching Lower Granite to Turbine 2 and spilling the remainder. ID expressed great concern over how many adult Sockeye have already been lost, with the

potential of higher mortality if actions are not taken as soon as possible. Because the two project operation did not gain traction at the July 21, FPOM meeting, ID asked fellow managers, specifically, USFWS and OR, for suggested operations. No alternate operations were suggested.

- USFWS indicated they are not in support of a change in operations at Little Goose Dam based on data that suggest ladder temperatures between 74-77 °F are the reason behind poor passage numbers of Sockeye. USFWS would like additional analyses on how the Little Goose RSW operations affect forebay temperatures which then affect ladder temperatures. USFWS also noted that the adult Sockeye passage season is coming to an end and that conditions for sub-yearling fall Chinook migration needs to be considered as well.

- OR agreed with USFWS regarding concerns over water temperatures, noting that the data set is not complete. OR suggested that it would be best to look over the data, track changes and make decisions regarding actions from a system-wide perspective, instead of what they see as impromptu, reactive, changes at individual projects.

- Umatilla stated they would prefer the paired Lower Granite / Little Goose operations proposed by ID, and objected to only implementing the Little Goose operation, however, would not elevate. Umatilla would like more data on Little Goose hydraulics and temperatures before supporting the Little Goose operation. Umatilla also noted that low conversion rates at Lower Granite appear to be due to high water temperatures. They expressed concern over modifying Dworshak operations which will greatly impact Fall Chinook runs.

- Nez Perce agreed with OR, USFWS and CRITFC/Umatilla stating that temperature data and passage rates need further study, noting that changing the operation at Little Goose may impact sub-yearling Fall Chinook and have questionable benefits to adult Sockeye.

- Nez Perce followed up on their previous request for Sockeye passage data that ID provides to NOAA Fisheries, and which helps inform daily transport decisions. ID noted that the data they are using are available on the TMT website and it indicates that temperatures of 75 °F and higher affect passage rates.

- Colville objected to the proposed 'package deal test' operation for Little Goose and Lower Granite, noting that continuing Unit 1 priority at Lower Granite is preferred due to cooler water and flow pattern from U1 that seems to encourage passage. [The Colville later clarified via email with the Facilitator that Colville, however, did not object to the proposed 2-day test operation at Little Goose. The Colville noted that the benefits to Sockeye are questionable and there may be negative impacts to Fall Chinook, however, due to the short duration of the operation, Colville does not object.]

- WA noted that they do not object to the proposed Little Goose operation. However, will not oppose the operation as it is a two day experiment under emergency conditions and as

ID has noted, sometimes a change in pattern may prompt fish to move. WA also stated they understood the concerns expressed by the other managers.

- MT was in support of the Little Goose operation, noting that action will have to be taken soon in order to improve Sockeye passage and survival.

- MT also pointed out the relative status of the two species being impacted, with Snake River sockeye in critical condition, whereas Snake River fall Chinook are doing very well.

TMT members were polled as to if their agency supported the proposed Little Goose operation (no spill during the daytime hours, and nighttime minimum generation, spill the remainder):

- ID – Support.
- MT – Support.
- NOAA Fisheries – Support.
- WA – Does not support; no objection.
- Colville – Does not support; no objection.
- Nez Perce – Object.
- USFWS – Object.
- OR – Object.
- Umatilla – Object.
- BPA [not polled at TMT, however, supports the Corps decision].
- Corps [not polled at TMT, support].
- Reclamation [not polled at TMT]

ACTION:

The Corps will consult internally with policy and legal staff and report back to TMT members via e-mail, by this afternoon with a decision regarding Little Goose operations moving forward.

July 27, TMT Meeting. The Corps, provided an update on the emergency trapping and transport of adult Snake River Sockeye operation. The Corps noted the Corps implemented NOAA Fisheries' and other regional managers recommended experimental emergency operation at Little Goose, which entailed a two-day period (7/23-25) of no spill during the daylight hours of 0400 hours to 2000 hours and a period of single unit operation at minimum generation while spilling the remainder of outflow during the nighttime hours of 2000 hours to 0400 hours. Following the completion of the emergency operation, Little Goose operations returned to the previously coordinated TMT operation (targeting spill of 11 kcfs, 9 kcfs, or 7 kcfs dependent on previous day's average outflow).

Regarding Lower Granite operations, the Corps is maintaining Unit 1 priority and deep spill with no RSW. NOAA Fisheries, noted that there was a slight increase in passage during Little Goose no spill operations and a decline once the operation reverted back; NOAA Fisheries also noted the increasing passage trend that began prior to implementing the emergency operation.

NOAA Fisheries, provided the following Sockeye counts: July 20th – 6 fish; July 21st – 7 fish; July 23rd (test day 1) – 10 fish; July 24th (test day 2) – 12 fish; and on July 26th - 8 fish.

NOAA Fisheries noted that fish counts increased around July 21st, when the air temperatures cooled, thus making it difficult to say if the increase in Sockeye passage was due to the emergency operation at Little Goose or a response to temperature. NOAA Fisheries noted that Steelhead and Chinook passage numbers also responded to the cooler temperatures and/or the operation, with numbers spiking around July 24th. Additionally, Sockeye have been observed in cool water corridors at the Lyons Ferry Fish Hatchery; ID and NOAA Fisheries are exploring options to assist these fish upstream. Salmon managers requested the following data from the Action Agencies:

- OR requested hourly summary data, similar to that which was provided in 2013, showing fish going up and down the ladder. NOAA will provide this data at the next TMT meeting.

- OR requested PIT tag data to see if individual Sockeye are being double counted.

- OR requested that NOAA Fisheries check to see if any of the adult Sockeye have been observed coming over the juvenile ladder separator.

- WDFW requested that air temperature, entrance & exit ladder temperatures and relative run time be included in an updated Little Goose Hourly Passage Data graph and provided to TMT. Umatilla requested flow data also be included in the Little Goose graph.

- Additionally, Umatilla requested temperature scroll-case data for Little Goose.

There was discussion regarding the goal, objectives, and indicators of 'success' for the emergency operation and operations moving forward. OR noted that they do not have a clear understanding of the intention and units of measurement of the emergency operation. NOAA Fisheries noted that from their perspective, the goal is to get adult Snake River Sockeye to their hatchery destination for spawning. WDFW shared that although the region utilizes the available data in season, often during emergency actions the bulk of the analyses and assessment of 'success' happens following the emergency action. WDFW recapped the Lower Granite and Little Goose operations thus far during Sockeye passage. It was noted that during emergency situations, all of the 'tools in the toolbox' need to be considered.

ACTIONS:

- NOAA Fisheries and the Corps will work to get TMT members the information requested (listed above).

- NOAA Fisheries will review data and following the FPOM meeting today at 1:00PM, NOAA Fisheries will provide a recommendation for adult Snake River Sockeye operations moving forward.

- NOAA Fisheries and ID will continue exploring options to trap and haul fish from the Lyons Ferry Hatchery.

Until further discussion and recommendation from NOAA Fisheries, the Corps will continue to operate Little Goose with the previously coordinated TMT operation (coordinated at the June 25th TMT meeting); the Corps will operate Lower Granite with Unit 1 priority.

July 29, TMT Meeting. NOAA Fisheries, provided an update on the emergency trapping and transport of adult Snake River Sockeye operation. NOAA Fisheries noted that emergency trapping of adult Sockeye at the Lower Granite dam began on July 13th, in an effort to transport endangered Sockeye to the Eagle Creek Hatchery in ID. Trapping occurred for 4 hours during morning periods, this criteria was lifted yesterday after it was determined that zero Sockeye have died during the operation; the trapping duration has been extended to 8 hours a day, 4 hours in the morning and 4 hours in the afternoon. NOAA Fisheries continued that a total of 41 fish have been trapped and hauled, which is considered a success seeing as 0 fish migrated to the hatchery prior to the emergency operation.

ID, noted that Sockeye trapped under the emergency operation are brought to the Eagle Creek Fish Hatchery for tagging and genetic analysis before being released into Red Fish Lake or Alturas Lake. NOAA Fisheries noted that PIT-tagged fish were detected at the Redfish Lake trap and in the Salmon River, which could indicate more fish are migrating as temperatures cool. NOAA Fisheries continued that Nez Perce is holding Sockeye collected at the juvenile bypass separator in the kelt tanks at Lower Granite dam. ID acknowledged the work of the Nez Perce tribe, noting that they sent tribe members to Lower Granite to move fish to the kelt tanks until the transport vehicle arrived the next day. ID also noted that following a snorkel survey, they decided not to trap and haul from the Lyons Ferry Hatchery due to very low Sockeye sightings.

The Corps, noted that the second emergency experimental operation is underway at Little Goose Dam. The Corps implemented NOAA Fisheries' and ID's recommended experimental emergency operation at Little Goose, which entailed a two-day period (7/27-29) of no spill during the daylight hours of 4:00AM to 8:00PM and a period of single unit operation at minimum generation while spilling the remainder of outflow during the nighttime hours of 8:00PM to 4:00AM. The Corps feedback on 3 suggested operation changes, which were provided by USFWS and FPC: (1) the assessment provided by Steve Haeseker, (2) cycling of the navigation locks and (3) pump installation in the Little Goose forebay.

1. It was noted that based on Steve Haeseker's assessment, there was no compelling evidence to warrant a change in the experimental operation at Little Goose at this time.

2. Due to the current status of the navigation lock at Little Goose the Corps does not recommend cycling it. The Corps noted that there are issues with the navigation locks, only 1 valve is operational at this point, and the return to service date is unknown. The navigation lock can still operate with 1 valve; however the refill time is greatly increased and the reliability of the navigation system is questionable.

    a. Umatilla, requested the Corps send out an updated MOC describing the implications of having 1 operational valve.

    b. Umatilla noted navigation locks as a tool for passage is an appropriate discussion piece for SRWG.

3. The Corps noted that due to funding, contracting and implementation needs, acquisition of a pump in the Little Goose forebay to cool the fish ladder is not a short-term viable option.

    a. Umatilla noted that this issue is likely to arise again and a forebay pump would be a good option to cool temperatures in an emergency situation, which the Corps should pursue for later this season.

    b. OR, recommended the Corps devise a long term 'emergency situation' contract that will anticipate these types of issues and enable the region to make swift decisions in times of need.

4. ACTIONS:

    a. The Corps implemented NOAA Fisheries' recommended emergency operation at Little Goose as follows: July 27-29 of no spill during daylight hours of 4:00AM to 8:00PM and a period of single unit operation at minimum generation while spilling the remainder of outflow during nighttime hours of 8:00PM to 4:00AM.

    b. The Corps will look into pump feasibility at the Little Goose forebay for the upcoming Fall Chinook season and provide an update when available.

    c. The Corps will explore OR's suggestion of devising a long term contract that allows for swift decision making in emergency situations, e.g. contracting for a forebay pump in a low water year.

The discussion of navigation locks as a fish passage tool will be discussed at SRWG on August 7th.

July 30, TMT Meeting. The Corps, noted that the 2nd emergency test operation at Little Goose has concluded and at this point NOAA Fisheries is not recommending continuing the operation. ID, requested input from the region regarding when to terminate the Emergency Snake River Sockeye Trap and Haul operation at Lower Granite. ID noted there were two options discussed internally at ID:

1. End the trap and haul operation at 12:00PM on 7/31; or,

2. On Monday, August 3rd, at 0400 hours return to FPP unit priority (Unit 2 as the priority unit) at Lower Granite Dam, with deep spill, no RSW and a uniform spill pattern. And continue the trap and haul program through next Wednesday, August 5.

ID explained that the hope is that the change in operation will stimulate the remaining Sockeye to move through the project. NOAA Fisheries is not opposed to the proposal to switch to Unit 2, however, noted that switching U1 on and off is not recommended due to the current condition of U1 and concerns that turning it on and off may break it.

Nez Perce, asked if the proposed operation utilizes the Nez Perce's assistance with storing Sockeye collected from the juvenile bypass separator in the kelt tanks to be transported the next day. ID expressed gratitude for Nez Perce's effort to store Sockeye captured after the hauling truck departs and requested they continue to assist through this operation.

TMT members weighed in and were polled on the recommendation to alter the Emergency Snake River Sockeye Trap and Haul Operation at Lower Granite to include an operation with Unit 2 priority at Lower Granite Dam with deep spill, no RSW and a uniform spill pattern beginning on August 3rd at 0400 hours and continuing with this operation until further notice. The Emergency Snake River Trap and Haul operation would conclude on August 5th at 1200hours:

- BOR – Support.
- BPA – Support.
- Colville – No objection.
- Montana – No objection.
- Nez Perce – Support.
- NOAA Fisheries – No objection.
- OR – No objection.
- Umatilla – Support.
- Corps – Support.
- USFWS – Support.

ACTIONS:

- Monday, August 3rd, the Action Agencies will resume FPP unit priority at Lower Granite Dam, Unit 2 as the priority unit; the Corps will continue to implement deep spill, no RSW, and a uniform spill pattern beginning at 0459 hours and will operate until further notice.

The Emergency Snake River Sockeye Trap and Haul Operation will conclude on Wednesday, August 5th, at 1200 hours and the Corps will revisit the operation at the next TMT meeting scheduled for August 5th.

August 5, TMT Meeting. The Corps, provided an update on the regional requests regarding the cycling of navigation locks and the auxiliary pump installation at the Little Goose fish ladder. It was noted that due to a valve issue and structural issues at a downstream gate, it is not feasible for the Corps to operate the navigation locks at a higher frequency at this time. The Corps stated that the valve is scheduled for repair this fall and the downstream gate is scheduled for repair in 2017; it is important that the navigation locks remain functional until the repairs are completed. The Corps also noted that water temperature modeling indicated that navigation lock cycling results in 1.3 kcfs which provides no temperature benefit downstream. Umatilla, noted that the request for cycling the locks was to increase fish passage not to improve water temperatures. NOAA Fisheries, stated that 1-11% of Sockeye use navigation locks, thus it is beneficial to continue this conversation at FFDRWG and FPOM.

The Corps also investigated the feasibility of the adult ladder at Little Goose Dam. A formal memo was distributed to FPOM yesterday that indicated that a pump could reduce peak days above 72 °F if installed. The Corps noted that the pump would pull water from 20 meter depth and provide 25cfs of water into the forebay at the ladder exist. The Corps continued that there could be a benefit during a low water year, however, the Corps will need to conduct a cost-benefit analysis to determine if an auxiliary pump is feasible in the long run, as this tool would only be needed in the lowest water years. Further investigation of feasibility and cost for implementation of rental pump operation at Little Goose for September 2015 could be investigated pending availability of funding.

Members of FFDRWG and FPOM will continue the navigation lock discussion and look at available data to determine strategies at various projects and the benefits of cycling locks more often. TMT members will provide comments to the auxiliary pump memo and continue the discussion at FPOM.

August 12, TMT Meeting. ID, provided an update on the Emergency Snake River Sockeye Trap and Haul Operation which officially ended on Wednesday, August, 5th, however, an extension was granted for Sockeye encountered during biological sampling at Lower Granite Dam. If any Sockeye are captured during biological sampling, they are transported to the kelt tank and then moved to the Eagle Fish Hatchery. Yesterday, 3 Sockeye were trapped and transported; a total of 59 Sockeye are at the Eagle Fish Hatchery. ID, noted that the extension will occur as long as the trap and haul operation is viewed as productive.

August 19, TMT Meeting. ID, provided an update on the Sockeye Trap and Haul operation. ID noted that a total of 51 Sockeye have been trapped and hauled from Lower Granite to the Eagle Fish Hatchery, and 23 Sockeye were caught and hauled from traps in the basin. Of the 74 fish trapped and hauled, 24 are naturally produced and there have been no mortalities.

2.16. Fish Passage Research in 2015

The following information is included in the 2015 Fish Passage Plan Appendix A that may be found on the following website.

http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/2015/final/FPP15_AppA.pdf

- **Bonneville Dam Studies.**

March 2015–June 2015: PH2 Fish Guidance Efficiency (FGE) Program – Biological Evaluation and Velocity Measurements in Turbine Units 14, 15. Biological testing, April 1-May 31 (except during Spring Creek NFH peak passage periods): A daily schedule will be provided for test operations at Units 14 and 15. Flows representative of the middle 1% peak efficiency range will be 14.3-14.8 kcfs for Unit 14 and flows representative of the upper 1% range will be 18.0-18.5 kcfs for Unit 15. Adjacent units 13 and 16 operations in the 1% range are requested during the test periods to provide stable operations to minimize hydraulic changes in the gatewell.

Hydraulic testing, June 1-4: A daily schedule will be provided for test operations at Unit 15. Hydraulic measurements in gatewell slots 15A, 15B, and 15C are scheduled to occur in the upper 1% range (18.0-18.5 kcfs) during the test period. Adjacent units 14 and 16 operations in the 1% range are requested during the test periods to provide stable operations to minimize hydraulic changes in the gatewell.

Unit outages needed to install trashrack release mechanism:

1. Late March: one day to install equipment in 14A, 15A.
2. May 4-11: one day to relocate equipment from 15A to 15C.
3. June or July: 1 day following conclusion of testing to remove modified trashracks and re-install unmodified trashracks at 14A and 15C. This would occur after the 95% sockeye smolt passage index is estimated to have passed Bonneville Dam.

VBS screens in test gatewells will be raised, seals inspected, and cleaned at least once per week, or as coordinated with the project to account for environmental conditions.

FPP criteria affected: Unit 15 test operations in upper 1% range may be out of FPP criteria (see FPP BON section 5.2.1). Unit outages and test operations may result in PH2 units being operated out of FPP priority order (see FPP BON Table BON-14).

Reason/BiOp RPA/Other relevant info: B2 FGE Program Post-Construction. FCRPS BiOp Measure-Hydropower Strategy 2: RPA 18. AFEP study code: BPS-P-15-1.

Regional coordination (FFDRWG, FPOM, etc.) and related memos: Study methods, schedule, and test unit operations coordinated in AFEP and FFDRWG. Hydraulic test period June 1-4 coordinated at FFDRWG Oct. 27, 2014, to avoid impacts to the Little White Salmon hatchery releases in mid-June.

- **The Dalles Dam Studies.**

There are no studies scheduled for The Dalles Dam in 2015.

- **John Day Dam Studies.**

There are no studies scheduled for John Day Dam in 2015.

- **McNary Dam Studies.**

Ongoing through March 2015: McNary Dam Adult Steelhead Temporary Spillway Weir (TSW) and Turbine Unit Passage Efficiency. This study is being conducted as follow-on to the adult steelhead direct injury and survival study. Approximately 10 kcfs spill over the TSW will be required 24 hours/day in a 6-day block design of: 3 days "TSW-on" and 3 days "TSW-off", which equates to TSW spill 50% of the study period. No specific turbine operations are required as the powerhouse will operate as scheduled. Two 30-day study periods were identified and coordinated regionally to coincide with historically high steelhead fallback behavior: the first study period was November 15–December 15, 2014, and the second will start as early as January 2015 and no later than February 15, 2015, depending on when the second fallback period begins. Adult fish guidance efficiency (FGE) will be estimated from the first 30-day sample period. Adult behavior will be monitored in the forebay vicinity of the TSW to determine the start of the second 30-day study.

Hydroacoustic transducers were installed from outside of the trashrack in a single turbine unit intake slot on ten turbine units. Turbine unit intakes were randomly selected from those units currently in operation and rolling unit outages of three units at-a-time are required for installation and removal of the transducers. Three transducers were also installed on the TSW in spillbay 20. A dive is required to install and remove transducers and is expected to require 5-7 days at the beginning and end of the study. Transducer removal is expected to occur in July and final dates must be coordinated with the McNary Project. While study dates, turbine unit outages, installation and removal of equipment and TSW, and spill through the TSW have been appropriately coordinated through FPOM, RCC, BPA and the McNary Project, further coordination for the second 30-day study period will be necessary, particularly if beginning spill prior to February 15, 2015.

Ongoing through Spring 2016: Radio-Telemetry Monitoring of Adult Salmon and Lamprey. Radio-telemetry equipment previously installed for FY14 studies (adult salmon and lamprey) will be used to continue monitoring for tagged adult salmon and lamprey through

spring 2015. Additional lamprey will be tagged in summer 2015 and monitored for passage evaluations through spring 2016. Access to antennas and receivers for downloading and maintenance will be needed through the winter maintenance period.

June 2015–October 2015: Evaluation of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage at McNary Dam. A prototype adult lamprey passage structure was installed at the McNary Dam South (Oregon) Fish Ladder SFE2 in February 2014 to provide a lower velocity entrance into the adult fish ladder. Optical video and DIDSON acoustic cameras will be used to evaluate fine-scale passage behavior of Pacific lamprey at the entrance and exit of the passage structure. As with other lamprey study objectives, deployment and operation of the DIDSON and conventional video cameras will be supported by the research technician and will occur throughout the adult lamprey passage season (early June–October). Additionally, two half-duplex PIT-tag detectors (four loops) have been installed into the passage structure to determine the preferred passage route through the varied-velocity baffle box section. The passage structure includes a knife gate which will be opened on the first Monday of June by 0900 hours and closed on the first Monday of October by 0900 hours, as the adult lamprey migration begins and winds down, respectively. This study will require electrical power for equipment in the fishways; access for installation, repair and testing of electronic equipment; and access to download data from DIDSON and video camera equipment. Project support will be required to load test cranes for equipment deployment and maintenance, but will not require project crane services. This is the second year evaluation of the passage structure.

- **Ice Harbor Dam Studies.**

Ongoing through Spring 2016: Radio-Telemetry Monitoring of Adult Salmon and Lamprey. Radio-telemetry equipment previously installed for FY14 studies (adult salmon and lamprey) will be used to continue monitoring for tagged adult salmon and lamprey through spring 2015. Additional lamprey will be tagged in summer 2015 and monitored for passage evaluations through spring 2016. Access to antennas and receivers for downloading and maintenance will be needed through the winter maintenance period.

February 2015–April 2015: Spillbay 2 Ogee/Deflector Post-Construction Evaluation. Following the reshaping of the spillbay 2 ogee and deflector, a direct injury and survival study including sensor fish releases will occur to evaluate the new fish passage and hydraulic conditions. This study will replicate and compare one or two release elevations tested in 2005 after the removable spillway weir (RSW) was installed.

Yearling Chinook salmon will be supplied by Dworshak National Fish Hatchery. This study will require holding and handling facilities off the dam where fish may be held and reevaluated pre- and post-release. Fish will be transported to the forebay deck, tagged with balloon tags and released through an induction system that will run off of water supplied by submersible pumps (110v). Two 4-inch release pipes will be placed at the RSW where yearling Chinook and sensor fish will be released simultaneously at 1.5 feet and 6.5 feet above the spillbay ogee crest. Pipes will be installed by the contractor with mobile cranes. Boaters will recapture fish in the tailrace and will require BRZ access. Upon recapture, fish will be transferred to another tank and transported back to the holding facility for a 48-hour survival evaluation.

It is anticipated that approximately 7.5 kcfs spill will be required through the RSW from 0700-1700 hours for approximately 14 days. Anticipated Project support needs will be to assist with 110v power supplies, operating the RSW, equipment install placement and scheduling suggestions and safety clearances during equipment installation and removal.

Spill requirements and dates will be coordinated with BPA, RCC and FPOM. Final study dates will be coordinated with Ice Harbor Project personnel through NWW Operations Division. Study dates will be dependent on completion of the spillbay 2 ogee and deflector reshaping, and may require a reduction in study scope to only one release pipe to facilitate releases 1.5 feet above the spillbay ogee crest. The Post-Construction Evaluation is planned to be completed before the initiation of spring spill operations for fish passage on April 3, 2015; however, if construction is not completed in time for the evaluation to occur before April 3, the evaluation would be conducted during the early part of spring spill and coordinated through FPOM for a modified spill pattern that would reduce entrainment and retention of balloon-tagged fish in the stilling basin. An 8-hour RSW outage for removal of the release pipe at the end of the biological evaluation will be needed.

March 2015–August 2015: Characterization of Juvenile Salmon Turbine Unit Intake Distribution. See FPOM Coordination (MOC) 15-IHR-001 (12-Feb-2015). A hydroacoustic study to evaluate the distribution of juvenile Chinook and steelhead within the turbine unit before and after encountering the intake screen will occur at Ice Harbor Dam in 2015 (spring study April 1-May 31, 2015; summer study June 1-July 31, 2015). Results will be used to validate the elevation of release points used in future direct injury, survival and sensor fish studies. Data will be collected during the fish passage season April–July.

Hydroacoustic transducers will be installed on the trashrack and STS frame in Unit 1 slot B. Dive work to install and remove transducers on the trashrack will require mobile crane support (provided by the contractor) and outages of Unit 1 and adjacent Unit 2. The dive will occur on the upstream side of the trashrack and is expected to require no more than 1 day on both ends of the study for installation (early March 2015) and removal (August 2015). The dive is not expected to require Project support beyond holding safety clearances.

Installation of the STS transducers is tentatively planned to occur concurrent with the scheduled screen deployments the week of March 23, 2015, when unit 1 will be out-of-service and screens pulled. No specific turbine operations are required. Project support will be required for the gantry crane to raise the STS and dog it high for install on the bottom frame support, then lower it into place on schedule with the other screens for fish passage season.

An equipment shed with 110v power supply will be needed on the powerhouse deck to house hydroacoustic operating and data collection equipment. Trashrack transducer data and power cables are proposed to run up the turbine unit pier nose, into the collection channel under the deck, then up through gatewell or under a speed bump across the powerhouse deck to where they will meet the STS transducer data cables. STS data cables are proposed to run up the STS frame through D-rings or chain links welded to the frame. Collectively, the cables will run across the powerhouse deck to the shed. Final equipment installation and study dates will be coordinated with Ice Harbor Project personnel through NWW Operations Division.

March 2015–December 2015: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. A study of Snake River adult lamprey passage is planned for the 2015 adult passage season, June to October. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex (HD) PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is used for both adult lamprey and salmonid studies with equipment installed in previous years. Although equipment installation has occurred, periodic maintenance and downloading of radio-telemetry equipment is required throughout the year. Maintenance of HD-PIT antennas will occur during the winter maintenance period when adult fishways are dewatered.

January 2016: Turbine Characterization Study. In support of the Ice Harbor turbine replacement program, baseline Sensor Fish data will be collected in turbine unit 1. Sensor Fish data were collected in November 2014; however, with Unit 3 OOS for blade repairs and the difficulty in recapturing Sensor Fish released through Unit 1, a second effort is needed to collect the remainder Sensor Fish data.

It is expected that approximately 10 days of operations are needed to complete data collection in January 2016. Four specific turbine operations will be required for testing with three Sensor Fish release elevations within the turbine unit intake:

1. lower 1% @ 62 MW;
2. peak @ 72 MW;
3. best operating point for fish @ 87 MW;
4. and upper 1% @ 102 MW.

This study will implement the new generation of Sensor Fish as well as a new release mechanism; therefore, data collection may occur in multiple timeframes as equipment optimization may be intermittently required. The Ice Harbor Project staff support beyond adjusting turbine operations is not expected for this evaluation. Study dates, specific turbine units, unit operations and the potential for having screens deployed in unit 1 during the winter with either primary bypass or gatewell dipping will be coordinated with the Ice Harbor Project and with FPOM through the NWW Operations Division.

- **Lower Monumental Dam Studies.**

Ongoing through Spring 2016: Radio-Telemetry Monitoring of Adult Salmon and Lamprey. Radio-telemetry equipment previously installed for FY14 studies (adult salmon and lamprey) will be used to continue monitoring for tagged adult salmon and lamprey through spring 2015. Additional lamprey will be tagged in summer 2015 and monitored for passage evaluations through spring 2016. Access to antennas and receivers for downloading and maintenance will be needed through the winter maintenance period.

March 2015–December 2015: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. A study of Snake River adult lamprey passage is planned for the 2015 adult passage season, June to October. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex (HD) PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is used for both adult lamprey and salmonid studies and equipment was installed in previous years. Although equipment installation has occurred, periodic maintenance and downloading of radio-telemetry equipment is required throughout the year. Maintenance of HD-PIT antennas will occur during the winter maintenance period when adult fishways are dewatered.

- **Little Goose Dam Studies.**

Ongoing through Spring 2016: Radio-Telemetry Monitoring of Adult Salmon and Lamprey. Radio-telemetry equipment previously installed for FY14 studies (adult salmon and lamprey) will be used to continue monitoring for tagged adult salmon and lamprey through spring 2015. Additional lamprey will be tagged in summer 2015 and monitored for passage evaluations through spring 2016. Access to antennas and receivers for downloading and maintenance will be needed through the winter maintenance period.

March 2015–December 2015: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. A study of Snake River adult lamprey passage is planned for the 2015 adult passage season, June to October. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex (HD) PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is used for both adult lamprey and salmonid studies and equipment was installed in previous years. Although equipment installation has occurred, periodic maintenance and downloading of radio-telemetry equipment is required throughout the year. Maintenance of HD-PIT antennas will occur during the winter maintenance period when adult fishways are dewatered.

- **Lower Granite Dam Studies.**

Ongoing through Spring 2016: Radio-Telemetry Monitoring of Adult Salmon and Lamprey. Radio-telemetry equipment previously installed for FY14 studies (adult salmon and lamprey) will be used to continue monitoring for tagged adult salmon and lamprey through spring 2015. Additional lamprey will be tagged in summer 2015 and monitored for passage evaluations through spring 2016. Access to antennas and receivers for downloading and maintenance will be needed through the winter maintenance period.

March 2015–June 2015: Kelt Collection, Transport to Reconditioning, and In-River Survival. From March 25 through June 15, 2015, provide assistance to Nez Perce Tribe for

collection of post-spawn steelhead (kelt) off the Lower Granite separator for their reconditioning program. Depending on flow conditions, separator technicians will collect a similar number of A-run and B-run kelt for transfer to CRITFC/NPT researchers at Dworshak Dam reconditioning facilities (about 400 kelt) with remaining kelt PIT-tagged for direct release into the tailwater (about 1,200-1,400 kelt) and limited release into gatewell 5A as part of the evaluation of prototype overflow weirs and enlarged 14" orifice.

April 2015–June 2015: Study to compare seasonal SARs of early in-river migrating Snake River yearling anadromous salmonids versus transported. A study will be conducted to determine seasonal effects of transporting fish from the Snake River to optimize a transportation strategy. At Lower Granite, fish will be collected for this study starting on approximately April 6, with marking beginning on April 7, 2015. Depending on the number of fish available, fish will be collected 1-2 days with tagging occurring on the day following collection. A barge will leave each Thursday morning with all fish collected during the previous 1-3 days. By barging all fish (minus the in-river group) during 1 to 3 days of collection, barge densities will be maintained at a level similar to what would occur under normal transport operations that time of year. This pattern will occur in the weeks preceding general transportation and will be incorporated into general transportation once that operation begins. The desired transported sample size is 6,000 wild Chinook and 4,000-6,000 wild steelhead weekly for approximately 8 weeks.

April 2015–October 2015: Evaluation of Adult Pacific Lamprey Migration Behavior and Passage Success in the Lower Snake River. A study of Snake River adult lamprey passage is planned for the 2015 adult passage season, June to October. The primary goals of the research are to determine fish ladder entrance preferences, migration timing through the ladders, turn-around points in the ladders, fallback rates, and conversion rates between the Lower Snake River dams. Lamprey will be captured and tagged with radio tags and half-duplex PIT-tags at John Day Dam, transported for release below Ice Harbor Dam, and monitored at the four Lower Snake River projects. Radio-telemetry equipment is in place from the adult salmon passage studies and some additional arrays will be installed in the adult fish ladders in the vicinity of transition or turn pools. Installation of equipment occurred in 2014, but will require and maintenance and balancing of radio-telemetry equipment in the spring (April-June) prior to the adult lamprey migration season. Access to antennas and receivers for downloading and maintenance will be needed from April through October.

August 2015–December 2015: Study to compare SARs of Snake River fall Chinook salmon under alternative transportation and dam operational strategies. A sample of subyearling Chinook salmon will be collected at Lower Granite juvenile fish facility using the PIT-tag sort-by-code system. Fish will be measured and compared to fish captured at Bonneville Dam to determine growth for in-river migrants. Sort-by-code will also be used to collect holdover fall Chinook juveniles in the spring. Scales will be collected from a subsample of returning adults in the fall for age at ocean entry and overall age analysis.

Long-Term (through March 2017): Juvenile Fish Bypass System Upgrade Construction. See FPOM MOC **15-LWG-01** (12-Feb-2015). Construction activities associated with the Lower Granite Dam fish bypass system upgrade began in 2014 and are expected to continue throughout 2015, with completion expected in March 2017. Construction activities in 2015 are anticipated to include the plugging of the fish screen slots (FSS) including the Wagner Horns; 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; and associated components, potentially including work within the forebay associated with construction activities. The construction of FSS plugs are expected to occur during scheduled turbine unit outages for annual maintenance and/or in association with non-priority units while they are offline. Following placement of the FSS plugs, the slots will be dipped to remove all fish prior to the placement of Tremie concrete. Fish removed from the slots will be transported below the dam and released. Fish salvage operations will be coordinated with Project Fisheries.

During the 2015/16 winter work period, the juvenile collection channel may be widened to the final 9.5' channel width in the vicinity of turbine units 5 and 6 (upstream end of collection channel). Crossover activities involving permanent modifications to the existing juvenile bypass system (JBS) are not anticipated to begin prior to August 2016.

Activities for the FSS 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.

Update 5-Feb-2015: The construction of the FSS and Wagner Horn plugs was completed at Unit 1 in early February 2015. Construction at Unit 3 began in January 2015 with an anticipated completion by mid- February 2015. Currently, Unit 2 is on the schedule for completion March 25, 2015. The completion of Units 1 and 3 would allow either unit to be run as priority units during the Unit 2 outage. Units 5, 6 and 4 are scheduled to be completed during their next annual maintenance period starting July 7, 2015 through October 5, 2015.