



# Fish Passage Center

## Weekly Report #16-14

June 17, 2016

### Summary of Events

#### Water Supply

Precipitation throughout the Columbia Basin has varied between 39% and 79% of average at individual sub-basins over June. Precipitation above The Dalles has been 58% of average over June. Over the 2016 water year, precipitation has ranged between 90% and 109% of average.

**Table 1.** Summary of June precipitation and cumulative October through June 15<sup>th</sup> precipitation with respect to average (1981–2010), at select locations within the Columbia and Snake River Basins.

Location	Water Year 2016		Water Year 2016	
	June 1–15, 2016		October 1, 2015 to June 15, 2016	
	Observed (inches)	% Average	Observed (inches)	% Average
Columbia above Coulee	1.23	75	30.7	101
Sneke River above Ice Harbor	0.33	39	18.5	96
Columbia above The Dalles	0.62	58	23.1	100
Kootenai	1.19	67	30.4	102
Clark Fork	0.57	40	19.9	90
Flathead	0.78	42	31.7	109
Pend Oreille River Basin above Waneta Dam	0.69	44	26.7	100
Salmon River Basin	0.49	40	23.3	96
Upper Snake Tributaries	0.42	44	19.7	90
Clearwater	0.83	52	35.1	101
Willamette River above Portland	1.08	79	65.2	107

Table 2 displays the June 16<sup>th</sup> ESP runoff volume forecasts for multiple reservoirs along with the June COE forecasts at Libby and Dworshak. The June 16<sup>th</sup> ESP forecast at The Dalles between April and August is 80,888 Kaf (91% of average).

**Table 2.** June ESP Runoff Volume Forecasts for various reservoirs within the Columbia and Snake River Basins.

Location	June 16, 2016 5-day QPF ESP	
	% Average (1981–2010)	Runoff Volume (Kaf)
The Dalles (Apr–Aug)	91	80,888
Grand Coulee (Apr–Aug)	93	5,3041
Libby Res. Inflow, MT (Apr–Aug)	89 110*	5,242 6,445*
Hungry Horse Res. Inflow, MT (Apr–Aug)	88	1,703
Lower Granite Res. Inflow (Apr–July)	84	1,6662
Brownlee Res. Inflow (Apr–July)	75	4,100
Dworshak Res. Inflow (Apr–July)	87 86*	2,105 2,083*

\* Denotes COE June Forecast

Grand Coulee Reservoir is at 1,285.1 feet (6-15-16) and has refilled 3.8 feet over the last week. Outflows at Grand Coulee have ranged between 99.0 and 128.6 Kcfs over the last week.

The Libby Reservoir is currently at an elevation of 2,432.6 feet (6-15-16) and has refilled 4.8 feet over the previous week. Daily average outflows at Libby Dam have been reduced from 10 Kcfs to 7 Kcfs over the last week.

Hungry Horse is currently at an elevation of 3,556.1 feet (6-15-16) and has refilled 2.2 feet over the last week. Outflows at Hungry Horse have been 2.5-3.2 Kcfs over the last week.

Dworshak is currently at an elevation of 1,599.9 feet (6-15-16) and has refilled 1.3 feet over the last week. Outflows have been increased from 1.6 Kcfs to 5.7 Kcfs

over the last week.

The Brownlee Reservoir was at an elevation of 2,076.5 feet on June 15<sup>th</sup>, 2016, and has refilled 2.6 ft. over the last week. Inflows at Brownlee have ranged between 14.9 and 19.1 Kcfs over the last week.

The Biological Opinion flow period began on April 3<sup>rd</sup> in the lower Snake River (Lower Granite). According to the April Final Water Supply Forecast (April 7, 2016), the flow objective this spring will be 96 Kcfs at Lower Granite. Flows at Lower Granite Dam have averaged 61.3 Kcfs last week and 86.9 Kcfs between April 3 and June 15, 2016.

Based on the April Final Water Supply Forecast, the Spring Biological Opinion Flow Objectives (which began on April 10<sup>th</sup>) will be 243 Kcfs at McNary Dam and 135 Kcfs at Priest Rapids Dam. Over the last week, flows at McNary have averaged 202.7 Kcfs and 131.3 Kcfs at Priest Rapids. Between April 10 and June 15, 2016 flows at McNary Dam averaged 259.7 Kcfs and Priest Rapids Dam flows were 159.8 Kcfs.

**Spill and River Temperature**

No spill occurred at Dworshak Dam over the past week.

Spring spill for fish passage began on April 3<sup>rd</sup> at the Snake River projects. Spill for fish passage at the Snake River projects is to occur at the following amounts described in the 2016 Fish Operations Plan (FOP).

Project	Spill Level Day/Night
Lower Granite	20 Kcfs/20 Kcfs
Little Goose	30%/30%
Lower Monumental	Gas Cap/Gas Cap
Ice Harbor	April 3–April 28: 45 Kcfs/Gas Cap April 28–June 20: 30%/30% vs. 45 Kcfs/Gas Cap

This past week all Lower Snake River projects (Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams) have spilled at the 2016 FOP levels.

Spill for fish passage began on April 10<sup>th</sup> at the middle Columbia River projects. Spill for fish passage at the middle Columbia River projects is to occur at the following amounts described in the 2016 FOP.

Project	Spill Level Day/Night
McNary	40%/40% June 16-Aug 31: 50%/50%
John Day	April 10-April 28: 30%/30% April 28-June 15: 30%/30% and 40%/40% June 16-July 20: 30%/30% and 40%/40%
The Dalles	40%/40%
Bonneville	100 Kcfs/100 Kcfs June 16 -Aug 31:85Kcfs /121Kcfs and 95 Kcfs

The spring spill period ends on June 15<sup>th</sup> according to the COE’s Fish Operation Plan. The original period for the spring spill to end in the Middle Columbia River was June 30<sup>th</sup>. Accommodations were made in past years to initiate summer spill earlier for testing purposes. This was done to assure adequate numbers of test fish were present to conduct the “performance tests”. Since 2014 the earlier June 15<sup>th</sup> date has been included in the FOP as part of the roll-over operations associated with the FOP. The earlier start date for summer spill is also included in the 2014 Supplemental Biological Opinion.

This past week all Middle Columbia River projects (McNary, John Day, The Dalles, and Bonneville dams) have spilled at the 2016 FOP levels.

Most sites were within TDG criteria over the past week. The only exception was one day (6/10) at the forebay at Ice Harbor Dam, where the TDG was 116%.

**Note:** The State of Oregon TDG waiver requires compliance only with 120% TDG in the tailrace, while the State of Washington requires compliance with both a 115% TDG forebay requirement and a 120% tailrace TDG requirement. The State of Oregon and the State of Washington also use different methodologies to estimate the 12-hour average TDG. For Oregon, the 12-hour average is based on the 12 highest hourly TDG measurements in a single calendar day (not necessarily consecutive). For Washington, the 12-hour average

is based on 12-hour rolling averages. The highest of the rolling averages is what is reported as the 12-hour average for a given day. The location of a TDG monitor will dictate which of these methodologies is used for compliance monitoring. The Washington methodology will apply to all the lower Snake River projects, as well as the middle Columbia River forebay monitors. On any given day the compliance of the tailrace monitors at the middle Columbia River projects will be determined using either the Washington or Oregon methodology, whichever is the most restrictive, and spill will be decreased if needed.

Monitoring for signs of gas bubble trauma (GBT) occurred at Lower Granite, Little Goose, Lower Monumental, McNary, Bonneville and Rock Island dams over the past week. No fish were observed with signs of GBT over the past week.

**Temperature:** At present water temperatures remain below the 68° F temperature standard at all the hydroelectric projects in the FCRPS. With the recent cool weather that prevailed over the region last week, there were decreases in water temperature at the project forebays at all sites. At Lower Granite, the forebay temperatures decreased to 62.2°F on June 16<sup>th</sup>. It is about a degree warmer downstream at Ice Harbor Dam, where the temperature was 63.5°F on June 16<sup>th</sup>. At McNary and Bonneville dams the forebay temperatures were 62.4°F and 63.5°F, respectively on June 16<sup>th</sup>. The forebay temperatures are measuring 2 to 4 degrees Fahrenheit less than the levels measures at this time last year.

### Smolt Monitoring

Smolt Monitoring Program (SMP) sampling is ongoing at all SMP bypass facilities and the Imnaha trap. Subyearling Chinook dominated this week's samples at all of the SMP bypass facilities while passage of spring migrants (i.e., yearling Chinook, steelhead, coho, and sockeye) continued to decrease at nearly all of the bypass facilities this week.

Samples at Bonneville Dam (BON) were again dominated by subyearling Chinook. This week's daily average passage index for subyearling Chinook at BON was about 5,400 per day, which is an increase over last week's daily average passage index of about 4,400

per day. Passage of spring migrants all continued to decrease this week, when compared to the previous week. This week's daily average passage indices for spring migrants were about 130 for yearling Chinook, 530 for steelhead, 400 for coho, and 80 for sockeye. Last week's daily average passage indices were about 250, 1,030, 740, and 330 per day, respectively. Pacific lamprey ammocoetes were encountered in three of this week's samples (June 10<sup>th</sup>, 12<sup>th</sup>, and 13<sup>th</sup>) while Pacific lamprey macrophthalmia were encountered every day this week. This week's daily average collection for Pacific macrophthalmia was 50 fish per day.

Sampling at John Day Dam (JDA) in 2016 is every-other-day for the entire SMP season. This is the first time every-other-day sampling has occurred at this site over the entire season. Subyearling Chinook continued to dominate the collections at JDA this week, with a daily average passage index of nearly 18,000 fish per day, which is an increase over last week's daily average of just over 5,000 fish per day. Passage of spring migrants all decreased this week when compared to last week. This week's daily average passage indices for spring migrants at JDA were all below 100 per day, except sockeye. The daily average passage index for sockeye this week was about 150 per day. Pacific lamprey ammocoetes were encountered in one of this week's samples (June 13<sup>th</sup>) while Pacific lamprey macrophthalmia were collected in all three of this week's samples. This week's daily average collection for Pacific macrophthalmia at JDA was about 350 per day, which is a slight increase from last week's daily average collection of about 300 per day.

As in recent years, sampling at McNary Dam (MCN) in 2016 will be every-other-day for the entire SMP season. Subyearling Chinook again were the dominate species at MCN this week, with a daily average passage index of about 48,350 per day. It is worth noting that the daily average passage index for subyearling Chinook this week is likely an underestimate, as the passage index estimates for the June 14 and June 16 samples were based on limited sample periods of 3.5 and 17 hours, respectively. Despite the limited sample periods on these two days, this week's daily average passage index for subyearling Chinook was higher than last week's average, which was about 29,000 fish per day. Passage of spring migrants all decreased this week, when compared to last week. This week's daily average

passage indices for spring migrants were all below 400 per day. Furthermore, no coho were encountered in this week's samples at MCN. Finally, Pacific lamprey macrophthalmia were collected in all four of this week's samples, with a daily average collection of about 550 per day. No Pacific ammocoetes have been collected at MCN so far this year.

This week's samples at Lower Granite Dam (LGR) were again dominated by subyearling Chinook, with a daily average passage index of about 36,400 per day. This is a slight decrease over last week's daily average passage index of nearly 39,000 subyearling Chinook per day. Passage of spring migrants all decreased this week when compared to last week. This week's daily average passage indices for spring migrants at LGR were 500 for yearling Chinook, 40 for coho, and 1,175 for steelhead. Last week's daily average passage indices for these three species were 560, 120, and 3,300 per day, respectively. For the second week in a row, no sockeye juveniles were encountered at LGR this week. Finally, Pacific lamprey ammocoetes were encountered in only one of this week's samples (June 11<sup>th</sup>) and Pacific lamprey macrophthalmia were encountered in two of this week's samples (June 10<sup>th</sup> and 13<sup>th</sup>).

Sampling at Little Goose Dam (LGS) was limited to a 24-hour sample every-other-day until transportation began, at which time sampling switched to daily. Subyearling Chinook dominated this week's collections at LGS. This week's daily average passage index for subyearling Chinook at LGS was about 33,500 fish per day, which is a slight increase over last week's daily average passage index of nearly 30,000 fish per day. Yearling Chinook, coho, and steelhead passage all decreased this week, when compared to last week. This week's daily average passage indices for these spring migrants were 200 for yearling Chinook, 100 for coho, and 1,050 for steelhead. Last week's daily average passage indices were 800, 200, and 2,250 per day, respectively. Furthermore, no sockeye juveniles were encountered in this week's samples at LGS. Finally, Pacific lamprey ammocoetes were encountered in one of this week's samples (June 12<sup>th</sup>) while Pacific lamprey macrophthalmia were encountered in six of this week's samples. This week's daily average collection for Pacific lamprey macrophthalmia was about 165 per day.

Sampling at Lower Monumental Dam (LMN) was

limited to a 24-hour sample every-third-day through the April 14<sup>th</sup> every-other-day from April 16<sup>th</sup> to April 30<sup>th</sup>, and every day with the initiation of transportation. This week's samples at LMN were dominated by subyearling Chinook, with a daily average passage index of about 18,800 per day, which is an increase over last week's daily average passage index of 11,650 per day. Passage of yearling Chinook did not change this week, when compared to last week. This week's daily average passage index for yearling Chinook at LMN was 330 per day. Coho and steelhead passage decreased this week, when compared to last week. This week's daily average passage indices were 15 for coho and 360 for steelhead. Last week's daily average passage indices were 115 and 940 per day, respectively. As with LGR and LGS, no sockeye juveniles were encountered in this week's samples at LMN. Finally, no Pacific lamprey macrophthalmia were encountered in only one of this week's samples (June 10<sup>th</sup>).

Subyearling Chinook continued to dominate the samples at Rock Island Dam (RIS) this week. This week's daily average passage index for subyearling Chinook at RIS was 350 per day, which is an increase over last week's daily average passage index of 200 fish per day. Passage of spring migrants was very low. This week's daily average passage indices for spring migrants were all below 20 fish per day. Finally, only two Pacific lamprey macrophthalmia were encountered in this week's samples, one each on June 10<sup>th</sup> and June 16<sup>th</sup>.

The Imnaha River Trap (IMN) is located at river kilometer seven and is operated by the Nez Perce Tribe. Sampling at the Imnaha River Trap is year-round and, for 2016, the Fish Passage Center has been receiving data since the January 1, 2016 sample. However, due to the remote nature of the trap, the Nez Perce Tribe is able to send collection data to the FPC only periodically. Currently, the FPC has data from IMN through the June 13 sample. For the period of June 8-June 13, steelhead dominated the collections at IMN. The daily average collection for steelhead over this time period was about 30 per day. The daily average collection for yearling Chinook over this same period was about 10 fish per day. Daily average collections for steelhead and yearling Chinook collections over the June 8-13 period were both lower than the daily average collections for the previous week (May 31-June 6). Due to high flows, there was no sample on June 7<sup>th</sup>.

The only other species of salmonid that was collected during the June 8-13 period was subyearling Chinook, but in very low numbers.

### Hatchery Release

**Snake River Zone:** The Snake River Zone encompasses the Snake River and its tributaries from its confluence with the Columbia River to Hells Canyon Dam. No new releases of juvenile salmonids were scheduled for this zone this week. Approximately 400,000 spring Chinook pre-smolts are scheduled to be released into the Selway River, a tributary of the Clearwater River, on or around July 1<sup>st</sup>. Although released in 2016, these pre-smolts are not in expected to out-migrate until spring of 2017. No other releases are scheduled for this zone over the next two weeks.

**Mid-Columbia Zone:** The Mid-Columbia Zone encompasses the area of the Columbia River and its tributaries from McNary Dam to Chief Joseph Dam. A release of approximately 7.0 million subyearling fall Chinook juveniles from Priest Rapids Hatchery, located just below Priest Rapids Dam, was scheduled to begin this week. This release is expected to run through the end of June. Although all of the fish from Priest Rapids Hatchery are marked with an otolith mark, approximately 3.3 million will be otherwise unmarked (i.e., no clips or CWT) and, therefore, difficult to distinguish from wild/natural fish. Approximately 3.5 million subyearling fall Chinook juveniles are scheduled to be released from Ringgold Hatchery. This release is expected to begin on June 23<sup>rd</sup> and run through July 7<sup>th</sup>. All of the fish released from Ringgold Hatchery are expected to be externally marked with an adipose clip. No other releases are scheduled for this zone over the next two weeks.

**Lower Columbia Zone:** The Lower Columbia Zone is defined as the Columbia River and its tributaries from Bonneville Dam to McNary Dam. No new releases were scheduled for this zone this week. Beginning on or around July 1<sup>st</sup>, Willard NFH will begin releases of subyearling fall Chinook brights into the Little White Salmon River. In all, approximately 2.0 million fall Chinook brights are expected to be released from Willard NFH.

### Adult Passage

The summer Chinook count began June 1st at Bonneville Dam. Daily passage numbers at Bonneville Dam ranged between 2,339 and 4,066 adult summer Chinook in the last week. The 2016 summer Chinook count of 38,944 is about 79.4% of the 2015 count, while being 1.2 times greater than the 10-year average. The 2016 summer Chinook jack count of 3,269 is about 62.7% of the 2015 count and 46% of the 10-year average count. At Willamette Falls, 19,461 adult spring Chinook have been counted so far this year. In 2015, 49,244 adult spring Chinook were counted at Willamette Falls. This year's count is about 39.5% of the 2015 count and 73.2% of the 10-year average count of 26,576. As of June 16th, a total of 15,369 adult summer Chinook have been counted at have been counted at McNary Dam. The 2016 McNary Dam adult summer Chinook count has 438 fewer fish than the 2015 count, while being 1.3 times greater than the 10-year average count. Adult spring Chinook are counted at Lower Granite Dam through June 17th each year. As of June 16<sup>th</sup>, the total 2016 Lower Granite Dam adult spring Chinook count of 61,514 is about 58.9% of the 2015 count, while being about 1.1 times greater than the 10-year average count.

The 2016 Bonneville Dam adult steelhead count of 8,419 is about 1.2 times greater than the 2015 count of 6,811 and has 342 more fish than the 10-year average count of 8,077. The 2016 Bonneville Dam adult wild steelhead count of 3,100 has 28 fewer fish than the 2015 count of 3,128, while being 1.4 times greater than the 10-year average count of 2,185. Daily adult steelhead counts at Lower Granite Dam ranged from 1 to 8 adults per day last week. This year's Lower Granite steelhead count of 5,504 is 59.7% of the 2015 count of 9,217 and 59.2% of the 10-year average count of 9,291. The 2016 Lower Granite Dam adult wild steelhead count of 3,140 is 72.1% of the 2015 count of 4,356 and is about 89.2% of the 10-year average count of 3,520. At Willamette Falls, the 2016 count for steelhead was 16,797 as of June 13th. This year's steelhead count is about 2.5 times greater than the 2015 count of 6,550 and about 1.1 times greater than the 10-year average count of 15,919.

Daily adult sockeye passage numbers at Bonneville Dam ranged between 3,411 and 12,243 last week. The 2016 adult sockeye count at Bonneville Dam of

63,449 is 1.3 times greater than the 2015 count and 2.7 times greater than the 10-year average count. The 2016 adult sockeye count at McNary Dam of 16,657 is about 1.4 times greater than the 2015 count and about 4.3 times greater than the 10-year average count.

## Hatchery Releases Last Two Weeks

### Hatchery Release Summary

From: **6/4/2016** to **06/17/16**

Agency	Hatchery	Species	Race	MigYr	NumRel	RelStart	RelEnd	RelSite	RelRiver
Nez Perce Tribe	Lyons Ferry Hatchery	CH0	FA	2016	200,000	06-10-16	06-10-16	Cpt John Acclim Pond	Snake River
Nez Perce Tribe	Nez Perce Tribal Hatchery	CH0	FA	2016	280,070	06-06-16	06-06-16	Lukes Gulch Acclim.	S Fk Clearwater River
Nez Perce Tribe	Nez Perce Tribal Hatchery	CH0	FA	2016	280,070	06-07-16	06-07-16	Cedar Flats Acclim. Nez Perce Tribal Hatchery	Selway River Clearwater River M F
<b>Nez Perce Tribe Total</b>					<b>1,281,059</b>				
Washington Dept. of Fish and Wildlife	Priest Rapids Hatchery	CH0	FA	2016	7,039,543	06-16-16	06-24-16	Priest Rapids Hatchery	McNary Pool
Washington Dept. of Fish and Wildlife	Wells Hatchery	CH0	SU	2016	484,000	05-25-16	06-07-16	Wells Hatchery	Rocky Reach Pool
<b>Washington Dept. of Fish and Wildlife Total</b>					<b>7,523,543</b>				
<b>Grand Total</b>					<b>8,804,602</b>				

## Hatchery Releases Next Two Weeks

Hatchery Release Summary									
From:					6/18/2016		to		7/1/2016
Agency	Hatchery	Species	Race	MigYr	NumRel	RelStart	RelEnd	RelSite	RelRiver
Nez Perce Tribe	Dworshak NFH	CH1	SP	2017	400,000	07-01-16	07-01-16	Meadow Creek - SELW	Selway River
<b>Nez Perce Tribe Total</b>					<b>400,000</b>				
U.S. Fish and Wildlife Service	Willard Hatchery	CH0	FA	2016	2,000,000	07-01-16	07-07-16	Willard Hatchery	Little White Salmon River
<b>U.S. Fish and Wildlife Service Total</b>					<b>2,000,000</b>				
Washington Dept. of Fish and Wildlife	Priest Rapids Hatchery	CH0	FA	2016	7,039,543	06-16-16	06-24-16	Priest Rapids Hatchery	McNary Pool
Washington Dept. of Fish and Wildlife	Ringold Springs Hatchery	CH0	FA	2016	3,500,000	06-23-16	07-07-16	Ringold Springs Hatchery	McNary Pool
<b>Washington Dept. of Fish and Wildlife Total</b>					<b>10,539,543</b>				
<b>Grand Total</b>					<b>12,939,543</b>				

CH = Chinook, ST = Steelhead, CO = Coho, SO = Sockeye, CT = Cutthroat Trout, CM = Chum

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**Daily Average Flow and Spill (in Kcfs) at Mid-Columbia Projects**

Date	Grand Coulee		Chief Joseph		Wells		Rocky Reach		Rock Island		Wanapum		Priest Rapids	
	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill
06/03/2016	135.4	0.1	131.5	0.0	138.3	10.0	138.2	10.8	148.3	28.5	143.2	19.1	138.7	27.2
06/04/2016	127.7	0.1	127.6	0.0	144.0	10.0	144.9	11.4	157.2	28.4	157.6	20.0	153.5	27.4
06/05/2016	116.3	0.1	121.4	0.0	133.2	10.0	133.1	11.5	147.0	29.1	156.9	19.8	154.3	27.5
06/06/2016	123.6	0.1	125.1	0.0	137.6	10.0	138.9	11.8	151.9	29.1	154.3	20.0	150.8	27.6
06/07/2016	111.7	0.1	115.0	0.0	129.9	8.9	133.9	10.7	149.6	27.0	155.2	20.0	152.3	27.4
06/08/2016	92.9	0.1	85.8	0.0	105.5	9.0	109.2	10.9	123.5	28.0	142.2	19.5	140.6	27.3
06/09/2016	109.5	0.1	110.8	0.0	121.6	8.5	119.5	10.1	129.5	23.3	134.0	19.0	131.6	27.0
06/10/2016	104.2	0.1	100.6	0.0	114.0	8.4	112.9	11.1	127.0	26.4	135.0	19.3	131.4	27.4
06/11/2016	99.0	0.1	106.2	0.0	117.2	8.2	113.6	10.7	123.0	23.9	129.2	19.0	127.7	27.3
06/12/2016	121.3	0.1	118.4	0.0	127.6	9.4	125.3	9.5	135.8	22.3	136.3	19.2	132.1	27.7
06/13/2016	110.2	0.1	112.3	0.0	123.2	9.3	121.8	10.9	133.5	27.1	143.1	19.4	141.1	27.8
06/14/2016	119.3	0.1	117.1	0.0	120.1	8.6	114.4	11.9	122.9	27.5	119.9	19.1	115.9	27.5
06/15/2016	128.6	0.1	129.8	0.0	136.0	10.0	134.6	11.8	143.7	26.7	142.6	20.1	139.0	29.3
06/16/2016	116.8	0.2	122.0	0.0	128.7	9.4	124.4	10.6	132.7	22.7	142.2	20.0	138.9	28.9

**Daily Average Flow and Spill (in Kcfs) at Snake Basin Projects**

Date	Dworshak		Brownlee Inflow	Hells Canyon Outflow		Lower Granite		Little Goose		Lower Monumental		Ice Harbor	
	Flow	Spill		Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill
06/03/2016	1.4	0.0	---	15.4	65.4	20.6	61.4	18.3	60.2	41.1	62.8	18.9	
06/04/2016	1.4	0.0	---	18.4	66.3	20.5	62.4	18.7	61.9	26.5	64.9	19.5	
06/05/2016	1.4	0.0	---	16.7	70.6	20.5	66.6	19.9	65.6	26.4	69.2	20.7	
06/06/2016	1.5	0.0	---	16.4	72.4	20.4	66.3	19.7	66.7	24.6	69.3	20.7	
06/07/2016	1.8	0.0	---	15.6	76.3	20.4	75.9	22.7	70.7	23.9	74.4	47.1	
06/08/2016	1.6	0.0	---	18.4	75.1	20.4	71.0	21.4	69.2	23.0	75.2	54.0	
06/09/2016	1.6	0.0	---	17.0	76.2	20.3	72.6	21.9	71.0	23.9	76.5	54.8	
06/10/2016	1.6	0.0	---	14.5	71.7	20.2	68.3	20.5	67.5	23.0	71.7	50.4	
06/11/2016	1.6	0.0	---	9.8	61.2	20.4	57.4	17.2	56.6	24.0	61.5	48.7	
06/12/2016	1.6	0.0	---	10.5	54.0	20.5	49.3	14.9	47.8	23.9	52.8	40.9	
06/13/2016	3.5	0.0	---	16.4	54.8	20.4	52.5	15.7	50.9	24.5	53.0	20.3	
06/14/2016	5.2	0.0	---	13.7	55.1	20.3	52.2	15.4	50.0	24.2	51.6	15.5	
06/15/2016	5.7	0.0	---	12.9	56.0	20.5	53.5	16.0	53.4	25.0	57.8	36.4	
06/16/2016	5.7	0.0	---	14.6	53.6	20.5	50.2	15.0	47.5	24.8	49.9	37.2	

**Daily Average Flow and Spill (in Kcfs) at Lower Columbia Projects**

Date	McNary		John Day		The Dalles		Bonneville		PH1	PH2
	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill		
06/03/2016	204.4	81.8	215.1	64.4	202.7	81.0	220.3	99.8	10.5	97.6
06/04/2016	216.2	86.6	210.4	62.9	194.2	77.4	210.8	99.9	13.4	85.1
06/05/2016	242.0	96.8	236.6	70.7	216.9	86.7	223.3	100.3	16.2	94.5
06/06/2016	233.5	93.5	219.3	65.7	202.6	81.0	236.4	100.2	22.0	101.8
06/07/2016	233.9	93.5	234.1	70.3	220.5	88.2	236.4	99.8	27.9	96.3
06/08/2016	225.7	90.4	215.4	68.2	201.6	80.7	220.7	100.1	4.5	103.7
06/09/2016	217.6	87.1	219.6	87.9	204.3	81.6	217.5	100.7	0.9	103.5
06/10/2016	213.4	85.7	199.7	80.0	181.8	73.0	204.0	99.2	1.0	91.4
06/11/2016	209.2	84.2	207.2	82.8	193.9	77.5	212.3	99.3	1.0	99.7
06/12/2016	193.2	77.8	192.0	76.7	178.1	71.3	200.3	99.6	1.0	87.3
06/13/2016	192.6	77.3	177.3	70.9	160.2	64.1	180.0	99.6	7.2	60.8
06/14/2016	200.4	80.3	195.0	75.9	182.7	73.3	194.6	100.3	10.1	71.7
06/15/2016	192.8	77.4	188.7	56.7	172.5	69.0	187.4	100.8	10.1	64.1
06/16/2016	196.2	98.3	190.6	60.5	173.3	69.3	192.6	96.5	12.7	70.9

## Gas Bubble Trauma Monitoring Results from Representative Sites on the Snake River and Columbia River

Site	Date and Species	Number of Fish	Number w GBT signs	Number w Fin Signs	% Fin GBT	% Severe Fin GBT	Number of Fish with Fin GBT Listed by Highest Rank			
							Rank 1	Rank 2	Rank 3	Rank 4
<b>Lower Granite Dam</b>										
	06/09/16 Chinook + Steelhead	101	0	0	0.00%	0.00%	0	0	0	0
<b>Little Goose Dam</b>										
	06/06/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/13/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
<b>Lower Monumental Dam</b>										
	06/08/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/15/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
<b>McNary Dam</b>										
	06/05/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/09/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/13/16 Chinook + Steelhead	103	0	0	0.00%	0.00%	0	0	0	0
<b>Bonneville Dam</b>										
	06/07/16 Chinook + Steelhead	96*	0	0			0	0	0	0
	06/08/16 Chinook + Steelhead	4*	0	0			0	0	0	0
	06/11/16 Chinook + Steelhead	86*	0	0			0	0	0	0
	06/12/16 Chinook + Steelhead	14*	0	0			0	0	0	0
	06/14/16 Chinook + Steelhead	45*	0	0			0	0	0	0
<b>Rock Island Dam</b>										
	06/07/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/09/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/14/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0
	06/16/16 Chinook + Steelhead	100	0	0	0.00%	0.00%	0	0	0	0

## Total Dissolved Gas Saturation (%) - Average of 12 Highest Hours, 24 h Average and 24 h High

### Total Dissolved Gas Saturation Data at Upper Columbia River Sites

Date	Hungry H. Dnst				Boundary				Grand Coulee				Grand C. Tlwr				Chief Joseph			
	24 h		12 h		#	24 h		12 h		#	24 h		12 h		#	24 h		12 h		#
	Avg	Avg	High	hr		Avg	Avg	High	hr		Avg	Avg	High	hr		Avg	Avg	High	hr	
6/3	103.3	103.5	103.8	24	---	---	---	0	108.2	108.4	108.5	24	107.1	107.2	107.6	24	107.1	107.5	108.0	24
6/4	103.4	104.0	104.2	24	---	---	---	0	108.3	108.8	109.1	24	107.2	107.6	107.8	24	107.4	107.9	108.9	19
6/5	104.3	104.6	105.0	24	---	---	---	0	109.0	109.3	109.6	24	107.9	108.3	108.5	24	109.0	109.0	109.0	2
6/6	104.9	105.4	105.6	24	---	---	---	0	109.6	109.9	110.2	24	108.4	108.8	109.2	24	109.2	109.7	110.0	24
6/7	105.7	106.0	106.4	24	---	---	---	0	109.8	110.0	110.2	24	108.5	108.9	109.1	24	109.4	109.9	110.2	24
6/8	105.6	106.0	106.5	24	---	---	---	0	109.7	109.9	110.0	24	108.2	108.6	109.2	24	109.3	109.5	109.7	24
6/9	104.8	105.2	105.6	24	---	---	---	0	109.3	109.5	109.6	24	107.7	108.0	108.6	24	108.4	108.5	108.7	24
6/10	104.5	104.9	105.3	24	---	---	---	0	108.7	109.0	109.1	24	107.2	107.5	107.7	24	107.6	107.7	108.1	24
6/11	103.7	103.9	104.1	24	---	---	---	0	107.7	107.9	108.3	24	106.0	106.2	106.4	24	106.7	107.0	107.1	24
6/12	103.6	104.0	104.2	24	---	---	---	0	107.4	107.6	107.8	24	105.8	106.1	106.2	24	106.6	107.0	107.3	24
6/13	104.4	104.9	105.0	24	---	---	---	0	108.4	108.8	108.9	24	106.9	107.2	107.3	24	107.4	107.8	108.1	24
6/14	104.0	104.3	104.4	24	---	---	---	0	108.7	108.8	108.9	24	107.0	107.1	107.3	24	107.1	107.3	107.5	24
6/15	103.8	104.2	104.3	24	---	---	---	0	108.4	108.6	108.7	24	106.8	107.0	107.1	24	106.3	106.7	107.1	24
6/16	103.5	103.7	104.1	23	---	---	---	0	108.3	108.5	108.7	23	106.3	106.8	107.0	23	106.0	106.2	106.4	23

### Total Dissolved Gas Saturation Data at Mid Columbia River Sites

Date	Chief J. Dnst				Wells				Wells Dwnstrm				Rocky Reach				Rocky R. Tlwr			
	24 h		12 h		#	24 h		12 h		#	24 h		12 h		#	24 h		12 h		#
	Avg	Avg	High	hr		Avg	Avg	High	hr		Avg	Avg	High	hr		Avg	Avg	High	hr	
6/3	106.5	106.7	106.9	24	106.6	107.1	107.7	24	108.5	109.0	109.5	24	107.8	108.0	108.6	24	113.2	114.2	115.0	24
6/4	107.1	107.6	107.9	24	107.8	108.3	108.8	24	109.5	110.4	110.9	24	108.4	109.2	109.6	24	113.5	114.8	115.7	24
6/5	108.4	108.6	109.1	24	108.9	109.5	110.2	23	110.5	111.3	112.1	23	109.9	110.7	111.1	24	114.6	115.8	116.8	24
6/6	108.7	109.2	110.2	24	109.7	110.2	110.6	24	111.2	111.9	112.2	24	110.8	111.3	111.7	24	115.3	116.4	117.2	24
6/7	109.0	109.3	109.6	24	109.5	110.0	110.6	24	111.0	111.7	112.2	24	111.1	111.4	111.6	24	114.8	115.5	115.9	24
6/8	109.2	109.6	110.7	24	109.1	109.6	109.9	24	110.4	110.9	111.4	24	110.9	111.3	111.6	24	114.6	115.0	115.4	24
6/9	108.3	108.7	109.2	24	107.3	107.5	107.8	23	108.8	109.1	109.5	23	109.5	109.8	110.0	24	113.8	114.1	114.5	24
6/10	107.7	108.2	108.4	24	107.1	107.5	107.7	24	108.6	109.1	109.5	24	108.1	108.3	108.7	24	113.0	113.9	114.4	24
6/11	106.8	107.2	107.7	24	105.8	106.1	106.5	24	107.2	107.9	108.4	24	107.0	107.2	107.6	24	111.8	112.8	114.0	24
6/12	106.4	106.8	107.2	24	106.0	106.6	107.0	24	107.7	108.5	108.8	24	107.0	107.1	107.3	24	111.8	112.5	113.6	24
6/13	107.2	107.8	108.3	24	107.0	107.6	108.0	24	108.6	109.4	110.0	24	107.9	108.2	108.5	24	112.8	113.6	114.0	24
6/14	107.0	107.4	107.8	24	105.8	106.1	106.3	24	107.3	107.6	107.9	24	108.1	108.4	108.7	24	113.2	113.6	114.1	24
6/15	106.0	106.5	106.8	24	105.7	106.2	106.8	23	107.2	107.8	108.3	23	107.1	107.2	107.4	24	113.0	113.5	113.7	24
6/16	106.2	106.6	107.1	23	105.3	105.6	106.2	23	106.9	107.3	107.6	23	106.2	106.4	106.8	23	112.1	112.6	113.4	23

### Total Dissolved Gas Saturation at Mid Columbia River Sites

Date	Rock Island				Rock I. Tlwr				Wanapum				Wanapum Tlwr				Priest Rapids			
	24 h		12 h		#	24 h		12 h		#	24 h		12 h		#	24 h		12 h		#
	Avg	Avg	High	hr		Avg	Avg	High	hr		Avg	Avg	High	hr		Avg	Avg	High	hr	
6/3	108.7	109.1	109.5	24	113.9	114.6	115.2	24	111.1	112.3	113.5	24	111.5	111.8	112.0	24	110.0	110.4	110.9	24
6/4	108.4	109.4	110.3	24	113.3	114.7	115.3	24	112.7	114.1	114.9	24	112.5	113.2	113.5	24	111.2	111.6	112.3	24
6/5	109.7	110.6	111.3	24	114.7	115.3	115.8	24	114.9	116.2	117.3	24	113.6	113.9	114.1	24	112.6	112.9	113.3	24
6/6	110.6	111.3	111.8	24	115.4	116.6	117.2	24	115.2	116.5	117.8	24	113.9	114.2	114.6	24	113.3	113.6	113.8	24
6/7	110.6	111.2	111.7	24	115.3	116.2	116.8	24	113.9	115.0	116.0	24	113.7	114.1	114.3	24	112.4	112.9	113.3	24
6/8	110.2	110.4	110.8	24	115.8	116.6	117.4	24	112.7	113.1	113.5	24	113.5	113.9	114.6	24	111.8	112.5	112.9	24
6/9	109.4	109.8	110.2	24	113.8	114.4	116.0	24	110.7	111.0	111.5	24	111.9	112.2	112.3	24	110.0	110.4	110.8	24
6/10	108.3	108.6	108.9	24	114.0	114.9	115.5	24	110.4	110.7	110.9	24	112.0	112.1	112.2	24	110.2	110.5	110.8	24
6/11	107.2	107.6	108.2	24	112.6	113.8	115.5	24	108.4	109.0	109.9	24	110.7	111.2	111.7	24	108.8	109.1	109.3	24
6/12	107.6	108.4	109.1	24	112.1	113.3	114.1	24	107.9	108.7	109.3	24	110.0	110.4	110.8	24	108.7	109.0	109.5	24
6/13	108.1	108.7	109.2	24	113.5	114.3	115.0	24	109.3	109.5	109.6	24	111.3	111.4	111.6	24	109.3	109.4	109.6	24
6/14	108.5	108.8	109.0	24	114.0	114.5	114.8	23	108.8	108.9	109.2	24	111.3	111.6	111.9	24	109.1	109.4	109.7	24
6/15	107.9	108.3	108.8	24	113.5	114.5	115.5	24	---	---	---	0	---	---	---	0	---	---	---	0
6/16	106.9	107.1	107.8	23	112.0	112.9	114.7	23	---	---	---	0	---	---	---	0	---	---	---	0

## Total Dissolved Gas Saturation (%) - Average of 12 Highest Hours, 24 h Average and 24 h High

### Total Dissolved Gas Saturation Data at Lower Columbia and Snake River Sites

Date	<u>Priest R. Dnst</u>			<u>Pasco</u>			<u>Dworshak</u>			<u>Clwrtr-Peck</u>			<u>Anatone</u>							
	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>					
	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High					
6/3	111.7	112.2	112.5	24	---	---	---	0	106.0	107.5	108.7	24	101.5	102.6	103.0	24	104.2	105.3	106.0	24
6/4	112.6	113.1	113.2	24	---	---	---	0	105.8	107.4	109.0	24	102.5	103.4	104.1	24	104.9	105.9	106.6	24
6/5	113.4	113.7	113.8	24	---	---	---	0	106.8	108.5	109.5	24	102.4	103.2	104.1	24	104.8	105.5	106.3	24
6/6	113.9	114.1	114.4	24	---	---	---	0	106.4	107.9	109.2	24	102.4	103.5	104.2	24	104.9	105.8	106.5	24
6/7	113.1	113.5	114.0	24	---	---	---	0	106.6	109.1	113.3	24	102.3	103.1	104.0	24	105.0	105.7	106.2	23
6/8	112.7	113.1	113.3	24	---	---	---	0	105.4	106.7	108.5	24	101.9	102.4	103.1	24	104.7	105.2	106.0	24
6/9	111.6	111.8	112.0	24	---	---	---	0	106.5	108.1	109.3	24	101.7	102.6	103.3	24	104.4	105.2	105.8	24
6/10	111.7	112.1	112.4	24	---	---	---	0	105.8	106.5	107.4	24	100.6	100.9	101.9	24	103.4	103.6	104.0	24
6/11	111.0	111.1	111.3	24	---	---	---	0	105.9	107.3	108.3	23	100.9	101.8	102.2	22	103.8	104.5	105.1	23
6/12	111.1	111.3	111.5	24	---	---	---	0	106.0	107.8	109.0	24	101.2	102.4	103.7	24	103.9	104.9	105.6	24
6/13	111.5	111.7	111.8	24	---	---	---	0	102.2	103.7	105.7	24	101.1	102.1	102.6	24	103.8	104.5	105.1	24
6/14	111.4	111.9	113.1	24	---	---	---	0	103.1	105.0	105.6	24	101.1	102.3	102.8	24	103.0	103.5	103.9	24
6/15	---	---	---	0	---	---	---	0	105.5	106.1	106.6	24	102.5	103.4	104.4	24	103.0	103.7	104.5	24
6/16	---	---	---	0	---	---	---	0	104.9	105.3	105.9	23	101.8	102.2	102.9	23	102.6	103.0	103.6	23

### Total Dissolved Gas Saturation Data at Snake River Sites

Date	<u>Clwrtr-Lewiston</u>			<u>Lower Granite</u>			<u>L. Granite Tlwr</u>			<u>Little Goose</u>			<u>L. Goose Tlwr</u>							
	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>					
	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High					
6/3	101.9	103.7	105.0	24	103.1	103.3	103.6	24	110.1	110.4	110.7	24	109.0	109.2	109.3	24	111.0	111.2	111.4	24
6/4	102.6	104.4	105.7	24	103.0	103.1	103.6	24	110.2	110.5	111.1	24	110.0	110.4	111.0	24	111.7	112.0	112.2	24
6/5	102.4	103.9	105.1	24	103.7	104.4	105.0	24	110.1	110.5	111.7	24	111.1	111.4	112.7	24	111.7	112.2	112.5	24
6/6	102.5	104.1	105.4	24	105.6	106.1	106.4	24	110.5	110.7	111.8	24	112.6	112.8	113.8	15	112.4	112.5	113.2	15
6/7	102.1	103.6	104.7	24	105.1	105.4	105.7	24	110.8	111.1	111.5	24	114.3	114.5	115.3	14	113.0	113.2	113.6	14
6/8	101.8	103.0	104.6	24	104.6	104.8	105.3	24	110.6	110.9	111.3	24	113.9	114.5	115.9	24	112.1	112.6	113.2	24
6/9	101.7	103.4	104.4	24	103.2	103.3	103.6	24	110.3	110.5	110.7	24	112.3	112.7	113.4	24	111.9	112.2	112.5	24
6/10	99.8	100.2	100.6	24	102.0	102.3	103.0	24	110.1	110.3	111.3	24	110.9	111.2	111.5	24	111.5	111.9	112.4	24
6/11	101.1	102.8	103.9	24	100.5	100.8	101.5	24	110.1	110.3	110.6	24	108.5	108.9	110.1	24	111.0	111.3	111.9	24
6/12	102.0	104.1	105.5	24	100.3	100.5	100.7	24	110.5	110.8	111.2	24	107.9	108.2	108.7	24	111.3	111.7	112.0	24
6/13	102.0	103.5	104.6	24	100.8	101.0	101.2	24	110.5	110.9	111.4	24	108.6	109.0	109.4	24	111.1	111.4	111.7	24
6/14	101.0	102.0	102.9	24	101.6	101.9	102.2	24	110.4	110.7	111.3	24	106.9	107.2	107.6	24	110.6	110.8	111.0	24
6/15	101.8	103.2	104.6	24	102.1	102.3	102.5	24	110.6	110.9	111.5	24	106.8	107.4	107.6	24	110.7	110.8	111.3	24
6/16	101.8	103.0	103.7	23	101.3	101.8	102.3	23	110.4	110.7	111.1	23	106.1	106.3	106.7	23	110.5	110.7	110.9	23

### Total Dissolved Gas Saturation Data at Snake and Lower Columbia River Sites

Date	<u>Lower Mon.</u>			<u>L. Mon. Tlwr</u>			<u>Ice Harbor</u>			<u>Ice Harbor Tlwr</u>			<u>McNary-Oregon</u>							
	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>	<u>24 h</u>	<u>12 h</u>	<u>#</u>					
	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High					
6/3	110.4	110.5	110.7	24	116.0	116.8	117.8	24	115.5	115.8	116.2	24	115.5	115.7	116.0	24	---	---	---	0
6/4	110.5	110.8	111.5	24	117.9	118.2	118.8	24	115.7	116.0	116.3	24	114.7	116.0	116.4	24	---	---	---	0
6/5	112.4	112.8	113.2	24	118.5	119.0	119.2	24	118.1	119.0	119.4	24	116.5	117.0	117.6	24	---	---	---	0
6/6	113.7	114.0	114.2	24	119.0	119.4	119.9	24	119.4	119.7	119.8	24	115.6	117.2	117.6	24	---	---	---	0
6/7	113.7	113.9	114.1	24	115.8	116.4	116.7	24	118.7	119.0	119.9	24	116.0	116.4	116.6	24	---	---	---	0
6/8	114.1	114.4	114.5	24	116.9	117.5	117.7	24	118.4	119.1	120.0	24	115.6	115.9	116.6	24	---	---	---	0
6/9	113.4	113.5	113.7	24	117.0	117.5	117.9	24	116.0	116.4	117.0	24	115.8	116.0	116.2	24	---	---	---	0
6/10	111.7	112.0	112.9	24	116.6	117.2	117.3	24	114.7	115.1	115.7	24	115.5	116.0	116.3	24	---	---	---	0
6/11	110.1	110.3	110.6	24	115.7	115.9	116.2	24	113.0	113.2	113.7	24	115.0	115.4	115.7	24	---	---	---	0
6/12	110.1	110.5	110.7	24	116.6	117.1	117.3	24	112.9	113.1	113.3	24	113.8	114.8	115.3	24	---	---	---	0
6/13	111.2	111.5	111.8	24	117.7	118.0	118.1	24	113.6	113.9	114.3	24	112.9	113.5	114.6	24	---	---	---	0
6/14	110.3	110.6	111.1	24	117.4	117.9	117.9	24	113.7	113.9	114.1	24	112.4	113.0	114.9	24	---	---	---	0
6/15	109.3	109.4	109.6	24	117.1	117.7	117.8	24	112.7	113.0	113.4	24	113.8	115.6	116.3	24	---	---	---	0
6/16	107.7	108.1	108.9	23	116.6	116.9	117.5	23	111.2	111.8	113.0	23	113.9	114.5	115.8	23	---	---	---	0

## Total Dissolved Gas Saturation (%) - Average of 12 Highest Hours, 24 h Average and 24 h High

### Total Dissolved Gas Saturation Data at Lower Columbia River Sites

Date	<u>McNary-Wash</u>			#	<u>McNary Tlwr</u>			#	<u>John Day</u>			#	<u>John Day Tlwr</u>			#	<u>The Dalles</u>			#
	<u>24 h</u>	<u>12 h</u>			<u>24 h</u>	<u>12 h</u>			<u>24h</u>	<u>12h</u>			<u>24h</u>	<u>12h</u>			<u>24h</u>	<u>12h</u>		
	Avg	Avg	High		Avg	Avg	High		Avg	Avg	High		Avg	Avg	High		Avg	Avg	High	
6/3	109.4	109.6	110.7	24	115.2	115.8	117.0	24	107.1	107.8	108.3	24	113.9	114.4	114.8	24	110.0	110.6	110.9	24
6/4	110.0	110.7	111.2	24	115.2	115.6	116.1	24	109.9	111.2	113.3	24	114.4	114.7	115.9	24	111.0	111.5	111.8	24
6/5	112.4	112.9	114.1	24	114.7	114.9	115.3	24	111.4	111.8	112.4	24	116.4	117.1	122.8	24	112.2	112.6	113.2	24
6/6	114.0	114.4	114.7	24	115.2	115.8	115.9	24	112.1	112.7	113.4	24	115.0	115.6	116.0	24	112.3	112.7	113.0	24
6/7	114.2	114.6	115.3	24	115.6	116.4	120.9	24	112.8	113.5	114.2	24	114.7	115.3	116.0	24	111.9	112.2	112.4	24
6/8	113.7	114.6	115.2	24	117.1	118.3	118.6	24	113.9	114.2	114.4	24	115.0	116.0	116.3	24	111.0	111.5	112.1	24
6/9	111.1	111.4	111.8	24	116.5	117.1	117.6	24	112.4	112.7	113.2	24	115.2	116.4	116.6	24	110.6	111.8	112.3	24
6/10	108.7	109.3	110.0	24	115.7	116.4	116.9	24	110.0	110.5	111.3	24	114.0	115.5	116.5	24	110.6	111.3	112.2	24
6/11	106.7	106.9	107.3	24	115.2	115.5	115.6	24	107.6	107.8	108.4	24	114.3	115.1	115.2	24	109.1	109.2	109.3	24
6/12	107.0	107.5	107.9	24	114.7	114.9	115.1	24	106.6	106.9	107.1	24	113.6	113.8	114.2	24	109.4	110.4	110.8	24
6/13	108.2	108.6	108.8	24	114.4	114.7	115.0	24	106.2	106.4	106.6	24	113.4	114.4	114.8	24	109.4	110.4	110.8	24
6/14	107.1	107.5	108.1	24	114.8	115.5	115.8	24	105.2	105.4	105.7	24	114.3	115.2	115.7	24	107.8	108.5	108.7	24
6/15	105.7	105.9	106.1	24	114.7	115.5	116.5	24	104.5	104.7	104.9	24	113.8	114.2	114.7	24	108.3	108.6	109.0	24
6/16	104.7	104.9	105.3	23	116.0	116.6	117.4	23	103.7	103.8	104.1	23	114.0	114.4	115.0	23	106.4	107.0	107.8	23

### Total Dissolved Gas Saturation Data at Lower Columbia River Sites

Date	<u>The Dalles Dnst</u>			#	<u>Bonneville</u>			#	<u>Warrendale</u>			#	<u>Camas\Washougal</u>			#	<u>Cascade Island</u>			#
	<u>24 h</u>	<u>12 h</u>			<u>24 h</u>	<u>12 h</u>			<u>24h</u>	<u>12h</u>			<u>24h</u>	<u>12h</u>			<u>24h</u>	<u>12h</u>		
	Avg	Avg	High		Avg	Avg	High		Avg	Avg	High		Avg	Avg	High		Avg	Avg	High	
6/3	114.8	115.5	116.0	24	111.4	112.5	113.0	24	115.7	116.3	116.8	24	113.3	114.6	115.6	24	117.0	117.3	117.5	24
6/4	115.6	116.5	117.0	24	114.1	114.7	116.1	24	116.6	117.1	117.5	24	113.3	113.5	114.0	24	117.1	117.5	117.8	24
6/5	116.5	117.1	117.3	24	116.1	116.4	116.6	24	117.5	117.9	118.2	24	115.2	116.8	118.0	24	117.5	117.9	118.0	24
6/6	116.3	116.8	117.3	24	115.4	116.1	116.5	24	117.4	117.7	117.9	24	115.9	117.0	118.0	24	117.8	118.0	118.4	24
6/7	116.1	116.4	116.7	24	113.3	113.5	113.6	24	116.0	116.3	116.7	24	114.6	115.4	116.0	24	117.7	117.9	118.2	24
6/8	115.3	115.7	116.1	24	111.2	112.0	112.9	24	115.3	115.6	115.8	24	112.5	113.1	113.9	24	117.4	117.6	117.9	24
6/9	115.0	115.6	115.9	24	109.8	110.2	110.3	24	115.0	115.1	115.3	24	110.8	111.4	111.7	24	117.2	117.4	117.7	24
6/10	114.7	115.0	115.4	24	110.3	110.5	110.9	24	115.1	115.4	115.7	24	110.2	110.8	111.3	24	116.8	117.0	117.3	24
6/11	113.8	114.0	114.7	24	109.8	110.1	110.4	24	114.9	115.2	115.5	24	110.3	111.5	112.1	24	116.8	116.9	117.1	24
6/12	113.9	114.4	114.6	24	110.9	111.1	111.3	24	115.5	116.1	116.4	24	112.3	113.7	114.5	24	116.7	116.8	116.9	24
6/13	114.1	114.4	114.5	24	110.6	110.8	111.0	24	115.4	115.6	116.0	24	111.4	111.7	112.5	24	116.5	116.6	116.8	24
6/14	113.2	113.6	113.9	24	109.7	109.9	110.1	24	114.8	115.1	116.4	24	110.4	110.8	111.2	24	116.8	117.0	117.5	24
6/15	113.5	114.4	115.1	24	110.9	111.3	111.7	24	116.2	116.6	116.8	24	111.8	114.0	115.2	24	116.9	117.2	117.6	24
6/16	112.4	112.9	113.6	23	110.0	110.2	110.7	23	115.6	116.0	116.4	23	112.7	113.9	115.0	23	116.7	116.8	117.0	23



## Two-Week Summary of Passage Indices

<b>Average:</b>	0	0	0	0	80	162	65	25	363	152	543
<b>YTD</b>	0	0	0	316	197,992	147,513	60,053	45,333	154,245	58,624	799,681

COMBINED STEELHEAD												
Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR (INDEX)	LGS (INDEX)	LMN (INDEX)	RIS (INDEX)	MCN (INDEX)	JDA (INDEX)	BO2 (INDEX)	
06/03/2016	*	---	139	---	---	2,741	2,286	731	50	---	436	900
06/04/2016	*	---	118	---	---	2,804	2,130	521	29	1,864	---	445
06/05/2016	*	---	95	---	---	2,567	2,788	2,043	30	---	729	450
06/06/2016	*	---	110	---	---	4,512	2,998	1,048	17	5,240	---	1,514
06/07/2016	*	---	---	---	---	3,464	1,681	703	19	---	549	1,383
06/08/2016	*	---	118	---	---	2,328	1,934	854	18	1,184	---	1,217
06/09/2016	*	---	33	---	---	4,771	1,867	664	27	---	410	1,286
06/10/2016	*	---	11	---	---	2,779	2,439	546	18	339	---	908
06/11/2016	*	---	16	---	---	2,532	1,648	803	20	---	116	1,041
06/12/2016	*	---	9	---	---	1,536	1,506	601	11	0	---	820
06/13/2016	*	---	5	---	---	655	718	201	12	---	116	469
06/14/2016	*	---	---	---	---	161	287	281	9	0	---	175
06/15/2016	*	---	---	---	---	0	428	125	10	---	0	156
06/16/2016	*	---	---	---	---	555	358	0	18	357	---	119
06/17/2016	*	---	---	---	---	---	---	---	---	---	---	143
<b>Total:</b>		0	654	0	0	31,405	23,068	9,121	288	8,984	2,356	11,026
<b># Days:</b>		0	10	0	0	14	14	14	14	7	7	15
<b>Average:</b>		0	65	0	0	2,243	1,648	652	21	1,283	337	735
<b>YTD</b>		755	26,481	3,377	9,186	3,953,919	2,293,606	1,837,388	17,506	733,928	502,551	620,939

COMBINED SOCKEYE												
Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR (INDEX)	LGS (INDEX)	LMN (INDEX)	RIS (INDEX)	MCN (INDEX)	JDA (INDEX)	BO2 (INDEX)	
06/03/2016	*	---	0	---	---	0	43	122	6	---	591	405
06/04/2016	*	---	0	---	---	0	29	0	0	678	---	356
06/05/2016	*	---	0	---	---	0	73	66	12	---	415	225
06/06/2016	*	---	0	---	---	0	0	0	6	676	---	351
06/07/2016	*	---	---	---	---	0	0	0	0	---	366	585
06/08/2016	*	---	0	---	---	0	0	0	0	338	---	277
06/09/2016	*	---	0	---	---	0	1	0	0	---	212	84
06/10/2016	*	---	0	---	---	0	0	0	1	0	---	227
06/11/2016	*	---	0	---	---	0	0	0	0	---	250	68
06/12/2016	*	---	0	---	---	0	0	0	1	0	---	49
06/13/2016	*	---	0	---	---	0	0	0	0	---	166	94
06/14/2016	*	---	---	---	---	0	0	0	1	339	---	44
06/15/2016	*	---	---	---	---	0	0	0	0	---	31	0
06/16/2016	*	---	---	---	---	0	0	0	0	357	---	65
06/17/2016	*	---	---	---	---	---	---	---	---	---	---	48
<b>Total:</b>		0	0	0	0	0	146	188	27	2,388	2,031	2,878
<b># Days:</b>		0	10	0	0	14	14	14	14	7	7	15
<b>Average:</b>		0	0	0	0	0	10	13	2	341	290	192
<b>YTD</b>		1	0	0	133	43,851	32,770	24,148	56,600	860,537	302,674	799,931

COMBINED LAMPREY JUVENILES												
Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR <sup>†</sup> (Samp)	LGS (Coll)	LMN (Coll)	RIS (Coll)	MCN (Coll)	JDA (Coll)	BO2 (Coll)	
06/03/2016	*	---	0	---	---	0	40	0	0	---	570	80
06/04/2016	*	---	0	---	---	0	30	0	1	550	---	32
06/05/2016	*	---	0	---	---	0	50	0	0	---	200	16
06/06/2016	*	---	0	---	---	0	0	0	1	1,000	---	60
06/07/2016	*	---	---	---	---	0	150	0	0	---	216	24
06/08/2016	*	---	0	---	---	1	100	50	0	300	---	24
06/09/2016	*	---	0	---	---	2	50	50	0	---	250	56
06/10/2016	*	---	0	---	---	1	0	50	1	1,200	---	56
06/11/2016	*	---	0	---	---	1	200	0	0	---	490	72
06/12/2016	*	---	0	---	---	0	200	0	0	400	---	116
06/13/2016	*	---	0	---	---	1	50	0	0	---	130	88
06/14/2016	*	---	---	---	---	0	400	0	0	200	---	16
06/15/2016	*	---	---	---	---	0	250	0	0	---	440	24
06/16/2016	*	---	---	---	---	0	110	0	1	400	---	8
06/17/2016	*	---	---	---	---	---	---	---	---	---	---	10
<b>Total:</b>		0	0	0	0	6	1,630	150	4	4,050	2,296	682
<b># Days:</b>		0	10	0	0	14	14	14	14	7	7	15

## Two-Week Summary of Passage Indices

\* See sampling comments <http://www.fpc.org/currentDaily/smpcomments.htm>

Smolt indices, clipped & unclipped or combined, are presented in the following order: yearling chinook (chinook 1's,) subyearling chinook (chinook 0's), steelhead, coho, sockeye, and lamprey juveniles.

Two classes of fish counts are shown in these tables:

Sample counts (Samp) are provided for juvenile lamprey at LGR. See note below for details †.

Collection counts (Coll), which account for sample rates but are not adjusted for flow;

Passage indices (INDEX), which are collection counts divided by the proportion of water passing through the sampled powerhouse.

Passage indices are not population estimates, but are used to adjust collection counts for daily fluctuations in the site's or project's operations.

The classes of counts presented in the report are defined below for each site. Most samples occur over a 24-hr period that spans two calendar days. In this report, the date shown corresponds with the sample end date.

Combined lamprey juvenile collection counts are provided for all sites. Combined lamprey juveniles is a combination of pacific lamprey ammocoetes, brook lamprey ammocoetes, unknown lamprey ammocoetes, pacific lamprey macrophthalmia, and unidentified lamprey species.

† In 2013 it was confirmed that juvenile lamprey can escape the sample tank at LGR which would lead to unreliable estimates of collection. Therefore, only sample counts are provided in this report.

### Definitions for Smolt Index Counts

WTB (Collection) = Salmon River Trap at Whitebird : Collection Counts

IMN (Collection) = Imnaha River Trap : Collection Counts

GRN (Collection) = Grande Ronde River Trap : Collection Counts

LEW (Collection) = Snake River Trap at Lewiston : Collection Counts

LGR (Index) = Lower Granite Dam Bypass Collection System : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse Flow} / (\text{Powerhouse Flow} + \text{Spill}) \}$

LGS (Index) = Little Goose Bypass Collection System : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse Flow} / (\text{Powerhouse Flow} + \text{Spill}) \}$

LMN (Index) = Lower Monumental Dam Bypass Collection System : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse Flow} / (\text{Powerhouse Flow} + \text{Spill}) \}$

RIS (Index) = Rock Island Dam Second Powerhouse Bypass Trap : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse 2 Flow} / (\text{Powerhouse 1 \& 2 Flow} + \text{Spill}) \}$

MCN (Index) = McNary Dam Bypass Collection System : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse Flow} / (\text{Powerhouse Flow} + \text{Spill}) \}$

JDA (Index) = John Day Dam Bypass Collection System : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse Flow} / (\text{Powerhouse Flow} + \text{Spill}) \}$

BO2 (Index) = Bonneville Dam Second Powerhouse Bypass Collection System : Passage Index Counts

Passage Index =  $\text{Collection Counts} / \{ \text{Powerhouse 2 Flow} / (\text{Powerhouse 1 \& 2 Flow} + \text{Spill}) \}$

JDA and BO2 data collected for the FPC by Pacific States Marine Fisheries Commission.

RIS data collected for the FPC by Chelan Co. PUD.

LGR, LMN, and MCN data collected for the FPC by Washington Dept. of Fish and Wildlife.

LGS and GRN data collected for the FPC by Oregon Dept. of Fish and Wildlife.

IMN data collected for the FPC by the Nez Perce Tribe.

Fall (post SMP season) trapping at the Imnaha River Fish Trap (IMN) is funded by the Lower Snake River Compensation Program (LSRCP)

WTB and LEW data collected for the FPC by Idaho Dept. of Fish and Game.



### Two Week Transportation Summary

Source: Fish Passage Center

Updated:

6/17/16 9:35 AM

		06/03/16	TO	06/17/16			
		Species					
Site	Data	CH0	CH1	CO	ST	SO	Grand Total
<b>LGR</b>	Sum of NumberCollected	362,175	5,156	800	22,156		390,287
	Sum of NumberBarged	360,365	5,073	799	20,847		387,084
	Sum of NumberBypassed	324	70	0	1,289		1,683
	Sum of Numbertrucked	0	0	0	0		0
	Sum of SampleMorts	28	0	0	1		29
	Sum of FacilityMorts	1,376	3	1	19		1,399
	Sum of ResearchMorts	82	10	0	0		92
	Sum of TotalProjectMorts	1,486	13	1	20		1,520
<b>LGS</b>	Sum of NumberCollected	310,151	4,870	1,581	16,115	102	332,819
	Sum of NumberBarged	309,789	4,864	1,539	16,103	93	332,388
	Sum of NumberBypassed	16	0	0	0	0	16
	Sum of Numbertrucked	0	0	0	0	0	0
	Sum of SampleMorts	13	1	0	0	1	15
	Sum of FacilityMorts	333	5	42	12	8	400
	Sum of ResearchMorts	0	0	0	0	0	0
	Sum of TotalProjectMorts	346	6	42	12	9	415
<b>LMN</b>	Sum of NumberCollected	124,090	2,811	530	5,239	70	132,740
	Sum of NumberBarged	123,171	2,794	530	5,197	68	131,760
	Sum of NumberBypassed	284	11	0	29	0	324
	Sum of Numbertrucked	0	0	0	0	0	0
	Sum of SampleMorts	12	2	0	6	1	21
	Sum of FacilityMorts	73	4	0	7	1	85
	Sum of ResearchMorts	0	0	0	0	0	0
	Sum of TotalProjectMorts	85	6	0	13	2	106
Total Sum of NumberCollected		796,416	12,837	2,911	43,510	172	855,846
Total Sum of NumberBarged		793,325	12,731	2,868	42,147	161	851,232
Total Sum of NumberBypassed		624	81	0	1,318	0	2,023
Total Sum of Numbertrucked		0	0	0	0	0	0
Total Sum of SampleMorts		53	3	0	7	2	65
Total Sum of FacilityMorts		1,782	12	43	38	9	1,884
Total Sum of ResearchMorts		82	10	0	0	0	92
Total Sum of TotalProjectMorts		1,917	25	43	45	11	2,041

**Cumulative Adult Passage at Mainstem Dams Through: 06/16**

DAM	ENDDATE	Spring Chinook						Summer Chinook						Fall Chinook					
		2016		2015		10-Yr Avg.		2016		2015		10-Yr Avg.		2016		2015		10-Yr Avg.	
		Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack
BON	06/16	137215	11145	220480	13314	146704	24884	38944	3269	49015	5211	33532	7110	0	0	0	0	0	0
TDA	06/16	105504	9999	194116	12307	114381	21222	26360	1858	31356	3442	22721	4590	0	0	0	0	0	0
JDA	06/16	93659	8262	166015	11514	99110	19896	21866	1391	24214	2307	16956	3459	0	0	0	0	0	0
MCN	06/16	82626	7237	156151	8767	89797	16347	15369	1098	15807	1385	11392	2231	0	0	0	0	0	0
IHR	06/16	67484	5029	116462	5745	63912	10829	3899	319	4737	568	3984	840	0	0	0	0	0	0
LMN	06/16	66115	6268	111511	8697	63840	10328	1876	224	2303	434	2893	530	0	0	0	0	0	0
LGS	06/16	62597	6365	105124	8553	59587	11445	622	72	434	85	874	163	0	0	0	0	0	0
LGR	06/16	61514	5403	104415	8251	57250	12307	0	0	0	0	0	0	0	0	0	0	0	0
PRD	06/15	16843	1003	27716	1570	17080	1731	1952	196	1578	100	959	72	0	0	0	0	0	0
WAN	06/15	17066	919	25982	1077	16645	2069	1506	53	1890	45	820	93	0	0	0	0	0	0
RIS	06/15	16980	689	29779	1045	16146	2604	0	0	0	0	0	0	0	0	0	0	0	0
RRH	06/15	7414	332	12560	584	6608	1130	0	0	0	0	0	0	0	0	0	0	0	0
WEL	06/15	4767	729	9997	1128	4636	1263	0	0	0	0	0	0	0	0	0	0	0	0
WFA	06/13	19461	1167	49244	1930	26576	877	0	0	0	0	0	0	0	0	0	0	0	0

DAM	ENDDATE	Coho						Sockeye			Steelhead						Lamprey		
		2016		2015		10-Yr Avg.		10-Yr			10-Yr			Wild	Wild	10-Yr	10-Yr		
		Adult	Jack	Adult	Jack	Adult	Jack	2016	2015	Avg.	2016	2015	Avg.	2016	2015	Avg.	2016	2015	Avg.
BON	06/16	0	0	0	0	0	0	63449	49131	23683	8419	6811	8077	3100	3128	2185	7050	5493	3246
TDA	06/16	0	0	0	0	0	0	38595	30880	13074	986	913	3233	547	285	1096	901	2645	338
JDA	06/16	0	0	0	0	0	1	33889	25699	9286	759	995	5551	521	465	1994	655	1275	172
MCN	06/16	-1	0	8	5	1	0	16657	12290	3888	693	1051	5967	442	447	1913	66	67	7
IHR	06/16	0	0	0	0	0	0	30	9	1	1491	1393	5353	784	742	1562	8	29	1
LMN	06/16	-2	0	0	0	0	0	3	14	0	1537	3559	8550	1051	1872	2839	5	8	0
LGS	06/16	0	0	0	0	0	0	1	19	0	3446	1537	3188	2003	1009	1501	0	4	0
LGR	06/16	0	0	0	0	0	0	0	14	0	5504	9217	9291	3140	4356	3520	1	0	0
PRD	06/15	0	0	0	0	0	0	4225	3151	522	55	63	70	0	0	0	244	126	12
WAN	06/15	0	0	0	0	0	0	2669	2012	322	46	71	130	0	0	0	161	79	5
RIS	06/15	0	0	0	0	0	0	1403	761	105	57	131	134	29	86	68	17	2	0
RRH	06/15	0	0	0	0	0	0	582	344	43	99	120	347	34	81	230	3	0	0
WEL	06/15	0	0	0	0	0	0	127	185	18	82	56	81	37	38	54	1	0	0
WFA	06/13	0	0	1	0	0	0	0	0	0	16797	6550	15919	0	0	0	0	0	0

PRD does not post wild steelhead numbers.  
 These numbers were collected from USACE, Grant PUD, Douglas PUD, Chelan PUD, ODFW and DART.  
 Wild steelhead numbers are included in the total. Wild Steelhead are defined as unclipped fish.  
 Historic counts (pre-1996) were obtained from CRITFC and compiled by the FPC.  
 Historic counts 1997 to present were obtained from the Corps of Engineers.

### Columbia/Snake Project Forebay Temperatures

