



## Fish Passage Center

# Weekly Report #18-01

March 9, 2018

### This Week's Highlights

#### **Dworshak Operations**

Over the last month, numerous FPAC (Fish Passage Advisory Committee) and TMT (Technical Management Team) meetings have taken place concerning project operations at Dworshak Dam. This year at Dworshak, Unit #3 is out of service for rehabilitation through at least the early summer period. Unit #3 is the largest of the three units at Dworshak Dam, in terms of outflow capacity. Therefore, flows through the powerhouse are limited to 4.5-4.8 Kcfs during this rehabilitation work. Any outflow beyond the constrained powerhouse capacity at Dworshak must be spilled; creating concerns over Total Dissolved Gas supersaturation (TDG) in the river environment below Dworshak Dam and, subsequently, at Dworshak Hatchery as the water supply to the hatchery comes from downstream of Dworshak Dam. Although Dworshak Hatchery has been outfitted with TDG degassing columns (i.e., degassers) which significantly reduce TDG in hatchery supply water, there is still much concern over very high discharges and spill levels at Dworshak that will create elevated levels of TDG below the Dam and, subsequently, elevated TDG levels at the hatchery. At the recent 11.4-11.9 Kcfs spill levels, TDG directly below the dam has ranged between 121.2-123.8%, with the water supply to the hatcheries at approximately 104-105%.

Over the last month, the Official Water Supply (calculated by USACE) at Dworshak has increased from 2.85 Maf in February to 3.1 Maf in March. With the increasing water supply forecasts, USACE has continued expressing the need to increase outflows at Dworshak to reach deeper flood control elevations. At a TMT call last week (2-28-18), the planned operation was presented by the USACE to maintain outflows to a total discharge of 20 Kcfs (11.5 Kcfs spill) then holding that discharge through a variable period in early March, while drafting to a System Flood Control elevation of 1461.6 ft. by the end of March (based on the March Early Forecast of 3.1 Maf). The USACE presented three options for Dworshak outflows through mid-April. The Salmon Managers

approved a reduction in outflows from 20 Kcfs down to 16 Kcfs on March 2, 2018.

At this week's TMT call (3-7-18), USACE stated their March Final forecast of 3.1 Maf, would necessitate an April 15<sup>th</sup> draft to the bottom of the active storage at Dworshak (1,445 ft.) and require outflows to remain near 16 Kcfs with the potential to go higher in April. At the 3-7-18 TMT meeting, USACE presented a scenario of Dworshak operations that modeled outflows of 16 Kcfs through April 4<sup>th</sup>, followed by outflows of 18 Kcfs through April 15<sup>th</sup> to meet a Flood Control Elevation of 1,445 ft. After April 15<sup>th</sup>, outflows at Dworshak would ramp down to 6 Kcfs through the end of April. Outflows past April 30<sup>th</sup> were not presented in this scenario. Under this scenario, if future water supply decreases relative to the March estimates (3.1 Maf), Dworshak may have trouble refilling by the end of June as minimum outflows of 1.5-1.6 Kcfs would have to be released during the refill period. Because of the powerhouse constraints at Dworshak, a delay in refill into July or failing to refill could impact summer (July, August, and early September) release volumes which are needed for temperature control in the lower Snake River.

The FPC has provided multiple modeling scenarios to describe possible alternatives to the USACE operations, the last of which modified operations by targeting a hypothetical April 15<sup>th</sup> Local Flood Control Elevation of 1,487 ft. Under these scenarios, outflows would remain at or below 12 Kcfs through April 15<sup>th</sup> in order to meet the local flood control elevation of 1,487 ft. Flows would continue at 11-12 Kcfs through the end of April, and then drop to 2-10 Kcfs for all of May and June, depending on the shape of the runoff, to achieve refill by June 30<sup>th</sup>. These modeled scenarios had higher discharge through late April which is an important early period in the biological opinion flow period at Lower Granite Dam.

In summary, this alternative plan for operations at Dworshak would provide a more manageable outflow in terms of TDG production from now through April, possibly provide slightly higher outflows in May and June, and safeguard refill by June 30<sup>th</sup> if forecasts

decline. The latest alternative operates to the local flood control elevation at Dworshak, rather than the system flood control elevation (typically deeper draft). At present, USACE has not agreed to any operation other than operating to hard system flood control elevations. At this week's TMT call (3-7-18) the fisheries managers requested the USACE to explore flexibility and model scenarios for future discussion.

### Water Supply

Precipitation throughout the Columbia Basin has varied between 60% and 158% of average at individual sub-basins over early March. Precipitation above The Dalles has been 108% of average over early March. Over the 2018 water year, precipitation has ranged between 92% and 124% of average.

**Table 1. Summary of March precipitation and cumulative October through March precipitation with respect to average (1981-2010), at select locations within the Columbia and Snake River Basins.**

Location	Water Year 2018		Water Year 2018	
	March 1-8, 2018		October 1, 2017 to March 8, 2018	
	Observed (inches)	% Average	Observed (inches)	% Average
Columbia Above Coulee	0.87	98	22.2	108
Snake River Above Ice Harbor	0.75	126	11.2	92
Columbia Above The Dalles	0.75	108	15.2	100
Kootenai	0.93	109	22.0	110
Clark Fork	0.56	84	15.6	117
Flathead	0.54	64	22.4	124
Pend Oreille River Basin above Waneta Dam	0.65	82	19.7	116
Salmon River Basin	1.24	158	14.8	99
Upper Snake Tributaries	1.09	158	12.6	93
Clearwater	1.02	95	27.1	119
Willamette River above Portland	1.15	60	40.9	93

Snowpack within the Columbia Basin has been variable. Average snowpack in the Columbia River for basins above the Snake River confluence is 124% of average, for Snake River Basins the average snowpack is 88% of average, and for lower Columbia Basins between McNary and Bonneville Dam average snowpack is 70% of average.

Table 2 displays the March 8<sup>th</sup> ESP runoff volume forecasts for multiple reservoirs along with the March COE forecasts at Libby and Dworshak. The March 8<sup>th</sup> ESP forecast at The Dalles between April and August is 97,131 Kaf (111% of average).

**Table 2. March 8 ESP Runoff Volume Forecasts for various reservoirs within the Columbia and Snake River Basins.**

Location	March 8, 2018 5-day QPF ESP	
	% Average (1981-2010)	Runoff Volume (Kaf)
The Dalles (Apr-Aug)	111	97,131
Grand Coulee (Apr-Aug)	115	65,310
Libby Res. Inflow, MT (Apr-Aug)	112 122**	6,591 7,205**
Hungry Horse Res. Inflow, MT (Apr-Aug)	146	2,825
Lower Granite Res. Inflow (Apr- July)	105	20,908
Brownlee Res. Inflow (Apr-July)	95	5,184
Dworshak Res. Inflow (Apr-July)	118 127**	2,858 3,093**

\* Denotes COE April Forecast

Grand Coulee Reservoir is at 1255.8 feet (3-8-18) and has drafted 4.5 feet over the last week. Outflows at Grand Coulee have ranged between 98.1 Kcfs and 136.6 Kcfs over the last week. The end of March FC Elevation at Grand Coulee is 1256.9 ft. (based on March Final Forecast).

The Libby Reservoir is currently at elevation 2378.6 feet (3-8-18) and has drafted 5.9 feet over the past week. Daily average outflows at Libby Dam have been increased from 13.5 to 19.0 Kcfs over the last week. The end of March FC at Libby is 2358.3 ft. (based on March Final Forecast).

Hungry Horse is currently at an elevation of 3519.7 feet (3-8-18) and has drafted 4.3 feet last week. Outflows at Hungry Horse have been 8.5 Kcfs over the last week. The end of March FC at Hungry Horse is 3496.2 ft. (based on March Final Forecast).

Dworshak is currently at an elevation of 1488.0 feet (3-8-18) and has drafted 13.2 feet over last week.

Dworshak outflows have been 16-16.5 Kcfs last week. The end of March System FC at Dworshak at the end of March is 1461.6 ft. (based on March Final Forecast).

The Brownlee Reservoir was at an elevation of 2036.0 feet on March 8, 2018. Outflows at Hells Canyon have ranged between 14.8 and 23.7 Kcfs over the last four days. The end of March FC is 2037.2 ft. (based on March Final Forecast).

### Spill

Due to relatively high flows for this time of year and multiple unit outages, involuntary spill has occurred at John Day Dam since early February. Over the last week, daily average spill volumes at John Day Dam have ranged from 67.7 Kcfs on March 2<sup>nd</sup> to 29.6 Kcfs on March 7<sup>th</sup>. In addition, The Dalles Dam spilled approximately 7.5 Kcfs every-other-day from March 1<sup>st</sup> to March 7<sup>th</sup>. This spill operation was in place to attract adults to the North ladder while the East ladder was out of service. Once the East ladder was returned to service on March 8<sup>th</sup> the spill operation was terminated. Finally, due to the rehab of unit #3 at Dworshak Dam, hydraulic capacity at this project has been limited to approximately 5 Kcfs. Therefore, Dworshak Dam has been spilling since late January for flood control operations. Over the last week, daily average spill volumes at Dworshak Dam have been approximately 11.5 Kcfs. Waivers in total dissolved gas levels for the implementation of the voluntary fish spill programs don't begin until April. Therefore, the 110% standard for total dissolved gas is currently in place. However, since the spill is considered involuntary, any exceedences of the 110% standards are not interpreted as violations by the US Army Corps of Engineers.

### Smolt Monitoring

Smolt Monitoring Program (SMP) activities began at Bonneville Dam on March 2<sup>nd</sup>, with the first sample tallied and reported on March 3<sup>rd</sup>. In April 2017, the U.S. District Court for the District of Oregon ordered an earlier start to SMP sampling at additional Snake and Mid-Columbia sites, beginning in 2018. Therefore, 2018 SMP sampling activities at Little Goose and John Day dams began approximately one month earlier than usual. Sampling at John Day Dam began on February 28<sup>th</sup>, with the first sample tallied and reported on March 1<sup>st</sup>. Sampling at Little Goose Dam started on March

1<sup>st</sup>, with the first sample tallied and reported on March 2<sup>nd</sup>. Sampling at SMP traps on the Salmon and Snake rivers began on March 4<sup>th</sup>, with the first samples tallied and reported on March 5<sup>th</sup>. Data for the SMP trap on the Imnaha River are available back to February 15<sup>th</sup>. Sampling at the SMP trap on the Grande Ronde River began on March 7<sup>th</sup>, with the first sample tallied and reported on March 8<sup>th</sup>. SMP sampling at the other bypass facilities is expected to begin in late March (at Lower Granite Dam) or early April (at Lower Monumental, McNary, and Rock Island dams).

Subyearling Chinook have made up the majority of the salmonids sampled at Bonneville Dam (BON) so far this year. All of the subyearling Chinook sampled at BON so far this year have been fry. Over the past week the daily average passage index for subyearling Chinook fry was about 755 per day. A relatively small number of yearling Chinook and coho fry have also been collected this week. Pacific lamprey macrophthalmia were encountered every day this week. This week's daily average collection for Pacific lamprey macrophthalmia was 85 per day. Pacific lamprey ammocoetes were encountered in one sample this week (March 8<sup>th</sup>).

Similar to the last two years, sampling at John Day Dam (JDA) is every-other-day. Although passage has been relatively low, yearling Chinook have made up the majority of the salmonids sampled at JDA so far this year. This week's daily average passage index for yearling Chinook was approximately 60 per day. Steelhead and subyearling Chinook have also been encountered in this week's samples. All of the subyearling Chinook collected at JDA so far this year have been fry. Pacific lamprey macrophthalmia have been encountered in every sample conducted so far this season and in relatively high numbers. This week's daily average collection for Pacific lamprey macrophthalmia was about 1,320 per day. Pacific lamprey ammocoetes were encountered in one sample this week (March 7<sup>th</sup>).

Similar to recent years, sampling at Little Goose Dam (LGS) will be every-other-day until the start of transportation, at which time sampling will change to every day. To date, the only salmonids that have been encountered at LGS this season were yearling Chinook, sockeye, and steelhead. However, passage for these three species has been very low, with daily average passage indices of less than 10 fish per day, per species.

It is worth noting that the sockeye collected so far at LGS are likely kokanee from Dworshak reservoir, as Dworshak has been spilling since January. Pacific lamprey macrophthalmia and ammocoetes have also been collected in this week's samples. Pacific macrophthalmia were encountered in three of this week's samples while ammocoetes were encountered in only one (March 4<sup>th</sup>).

The Snake River Trap at Lewiston, ID (LEW) is located at river kilometer 225 of the Snake River and is operated by Idaho Department of Fish and Game. To date, no salmonids or lamprey juveniles have been collected at the Snake River Trap.

The Grande Ronde Trap (GRN) is located at river kilometer 002 of the Grande Ronde River and is operated by the Oregon Department of Fish and Wildlife. To date, no salmonids or lamprey juveniles have been collected at GRN.

The Salmon River Trap at Whitebird (WTB) is located at river kilometer 103 of the Salmon River and is operated by Idaho Department of Fish and Game. Similar to recent years, sampling at WTB in 2018 will only occur during the weekdays. To date, only one yearling Chinook has been collected at this trap (March 6<sup>th</sup>). No other salmonids or lamprey juveniles have been collected to date.

The Imnaha River Trap (IMN) is located at river kilometer 007 of the Imnaha River and is operated by the Nez Perce Tribe. Sampling at the Imnaha River Trap is year round. For 2018, the FPC currently has data from IMN for the period of February 15<sup>th</sup> through March 8<sup>th</sup>. In that period, a total of 15 yearling Chinook and one steelhead have been sampled at the trap.

### **Hatchery Releases**

FPC has not received preliminary data from some hatcheries as of 3/9/18, therefore, this hatchery release schedule represents the most up to date accounting that are available, but should not be considered a complete record of scheduled hatchery releases.

### **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 releases were scheduled for this zone this week. However, approximately 5.4 million yearling spring Chinook

juveniles are scheduled to be released in this zone over the next two weeks. Of these, 57% are expected to be released into the Little Salmon River, 28% are scheduled to be released into the Clearwater River, 10% are scheduled to be released into the Snake River at Hells Canyon Dam, and about 5% are expected to be released into the Imnaha River. The releases from Rapid River Hatchery into the Little Salmon River are volitional, and they are expected to run through the end of April. Additionally, approximately 675,000 yearling summer Chinook are scheduled to be released into the Lochsa River, a tributary of the Clearwater River, on March 12<sup>th</sup>. Finally, 558,000 summer steelhead are expected to be released into the Snake River at Hells Canyon Dam beginning on March 19<sup>th</sup> and running through the end of the month.

### **Upper Columbia Zone:**

The Upper Columbia Zone encompasses the area of the Columbia River and its tributaries from Priest Rapids Dam to Chief Joseph Dam. Approximately 165,000 steelhead juveniles were released from Winthrop Hatchery into the Methow River this week. No releases are scheduled to begin over the next two weeks for this zone.

### **Middle Columbia Zone:**

The Middle Columbia Zone is defined as the Columbia River and its tributaries from Bonneville Dam to Priest Rapids Dam (excluding the Snake River). 885,000 yearling spring Chinook were scheduled to be released into the Cowlitz River this week. 709,000 are volitional releases and are scheduled to run through the end of March.

Further, approximately 125,000 fall Chinook juveniles are scheduled to be released from the Pendelton Acclimation Pond into the Umatilla River in late March. No other releases are schedule for this zone over the next two weeks.

### **Lower Columbia Zone:**

The Lower Columbia Zone is defined as the Columbia River and its tributaries below Bonneville Dam. Approximately 750,000 yearling spring Chinook were scheduled to be released this week. These releases were scheduled to occur in various Columbia River tributaries located below Bonneville Dam, including: 1.) the Willamette and its tributaries (58%), 2.) the Sandy River (9%), and 3.) Youngs Bay (33%). Additionall,

200,000 fall Chinook were scheduled for release at Tanner Creek, just below Bonneville Dam this week.

Nearly 2.6 million spring Chinook are scheduled to be released into this zone in the next two weeks. Of these, approximately 57% are scheduled to be released into the Santiam, McKenzie, Clackamas, and Mollala rivers, all tributaries of the Willamette River. The remaining were released into tributaries of the Columbia River below Bonneville Dam; 400,000 are scheduled for release in Gnat Creek, 150,000 into Blind Slough, 240,000 into Eagle Creek, and 300,000 into Youngs Bay. Additionally, nearly 1.2 million fall Chinook fry are scheduled to be released into this zone on the Klaskanine River. And finally, 25,000 winter Steelhead juveniles are scheduled to be released into the Clackamas River on March 15<sup>th</sup>.

### **Adult Passage**

Bonneville Dam uses video counts from January 1<sup>st</sup> through March 31<sup>st</sup> and direct counting after this period. Bonneville Dam counts adult salmon and steelhead year round. Lower Granite Dam uses video counts from March 1<sup>st</sup> through March 31<sup>st</sup> and direct counting after this period. Lower Granite Dam counts adult salmon and steelhead through December 30<sup>th</sup> each year. Willamette Falls Dam also uses video counts and reports adult counts year round. Video counts can cause a delay in posting the count data to the web, because the counting staff at the projects have to review the tapes. The FPC collects the adult count data from projects several times a day and updates Adult Dam Count report linked on our homepage (<http://www.fpc.org/>). During the winter season at Bonneville Dam (from 1/1/2018 through 3/7/2018), 2 adult Chinook and 747 adult steelhead were counted. In 2017 for the same time frame, 1 adult Chinook and 520 adult steelhead were counted. The 2018 Bonneville Dam winter season count of adult steelhead had 227 more fish than the 2017 count.

The Willamette Falls cumulative steelhead count from January 1<sup>st</sup> through March 8<sup>th</sup> is 660. The 2018 Willamette Falls winter steelhead count is about 1.9 times greater than the 2017 count of 351, while being and 31% of the 10-year average count of 2,127. This year's Lower Granite steelhead count of 50 is 7.8% of the 2017 count of 641 and 7.8% of the 10-year average count of 642.

This winter, based on estimates made by the Technical Advisory Committee (TAC) for U.S. v.

Oregon, the spring Chinook run for 2018 is expected to be 248,520. The TAC reported that 208,805 spring Chinook had returned to the river in 2017 (see U.S. v. Oregon, Technical Advisory Committee's February 15, 2018, document *Columbia River Mouth Fish Returns* which displays 2017 actual and 2018 forecasts of spring Chinook, summer Chinook, sockeye, and steelhead counts from the Oregon and Washington Departments of Fish and Wildlife). This is available at: [http://www.dfw.state.or.us/fish/OSCRP/CRM/returns\\_and\\_expectations/docs/2017\\_returns\\_18forecasts.pdf](http://www.dfw.state.or.us/fish/OSCRP/CRM/returns_and_expectations/docs/2017_returns_18forecasts.pdf)

The Bonneville Dam corner collector was opened on March 1<sup>st</sup> for kelt passage. Between March 1<sup>st</sup> and March 8<sup>th</sup>, a no salmon were observed over the separator at the Bonneville Juvenile Monitoring Facility (JMF). Kelt passage at the Bonneville JMF can be found at: <http://www.fpc.org/adultsalmon/bonkeltcounts.htm>.

## Hatchery Releases Last Two Weeks

Hatchery Release Summary										
From:	2/24/2018		to		03/09/18					
Agency	Hatchery	Species	Race	MigYr	NumRel	RelStart	RelEnd	RelSite	RelRiver	Zone
Oregon Dept. of Fish and Wildlife	Bonneville Hatchery	CH1	FA	2018	200,000	03-03-18	03-03-18	Tanner Creek	Tanner Creek	LCOL
Oregon Dept. of Fish and Wildlife	Clackamas Hatchery	CH1	SP	2018	66,000	03-07-18	03-07-18	Bull Run Acclimation	Sandy River	LCOL
Oregon Dept. of Fish and Wildlife	Clatsop County Fisheries	CH1	SP	2018	250,000	03-01-18	03-01-18	Youngs Bay	Youngs River	LCOL
Oregon Dept. of Fish and Wildlife	McKenzie Hatchery	CH1	SP	2018	202,000	03-01-18	03-01-18	McKenzie Hatchery	Willamette River	LCOL
Oregon Dept. of Fish and Wildlife	Willamette Hatchery	CH1	SP	2018	234,000	03-03-18	03-03-18	Dexter Pond	Willamette River	LCOL
<b>Oregon Dept. of Fish and Wildlife Total</b>					<b>952,000</b>					
U.S. Fish and Wildlife Service	Eagle Creek NFH	CO	SO	2018	350,000	03-02-18	03-02-18	Eagle Creek Hatchery	Eagle Creek	LCOL
U.S. Fish and Wildlife Service	Winthrop NFH	ST	SU	2018	165,000	03-02-18	03-02-18	Winthrop Hatchery	Methow River	UCOL
<b>U.S. Fish and Wildlife Service Total</b>					<b>515,000</b>					
Umatilla Tribe	Bonneville Hatchery	CH1	FA	2018	120,000	02-26-18	02-26-18	Pendelton Acclim Pond	Umatilla River	MCOL
Umatilla Tribe	Bonneville Hatchery	CH1	FA	2018	765,000	02-26-18	02-26-18	Pendelton Acclim Pond	Umatilla River	MCOL
Umatilla Tribe	Leaburg Hatchery	CO	UN	2018	500,000	02-28-18	02-28-18	Pendelton Acclim Pond	Umatilla River	MCOL
<b>Umatilla Tribe Total</b>					<b>1,385,000</b>					
Washington Dept. of Fish and Wildlife	COOP	CH1	SP	2018	55,000	03-01-18	03-01-18	Cowlitz River	Cowlitz River	LCOL
Washington Dept. of Fish and Wildlife	Cowlitz Salmon	CH1	SP	2018	709,000	03-01-18	04-01-18	Cowlitz River	Cowlitz River	LCOL
Washington Dept. of Fish and Wildlife	Fallert Creek Hatchery	CH1	SP	2018	380,000	03-01-18	03-01-18	Kalama River	Kalama River	LCOL
<b>Washington Dept. of Fish and Wildlife Total</b>					<b>1,144,000</b>					
<b>Grand Total</b>					<b>3,996,000</b>					

## Hatchery Releases Next Two Weeks

Hatchery Release Summary										
From:	3/10/2018		to		3/23/2018					
Agency	Hatchery	Species	Race	MigYr	NumRel	RelStart	RelEnd	RelSite	RelRiver	Zone
Idaho Dept. of Fish and Game	Clearwater Hatchery	CH1	SP	2018	818,207	03-19-18	04-04-18	Clear Creek	Clearwater River M F	SNAK
Idaho Dept. of Fish and Game	Clearwater Hatchery	CH1	SU	2018	674,919	03-12-18	03-14-18	Powell Acclim Pond	Lochsa River	SNAK
Idaho Dept. of Fish and Game	Niagara Springs	ST	SU	2018	558,000	03-19-18	03-30-18	Hells Canyon Dam	Snake River	SNAK
Idaho Dept. of Fish and Game	Rapid River Hatchery	CH1	SP	2018	200,000	03-16-18	03-16-18	Little Salmon River	Salmon River (ID)	SNAK
Idaho Dept. of Fish and Game	Rapid River Hatchery	CH1	SP	2018	458,442	03-12-18	03-12-18	Hells Canyon Dam	Snake River	SNAK
Idaho Dept. of Fish and Game	Rapid River Hatchery	CH1	SP	2018	2,500,000	03-12-18	04-27-18	Rapid River	Little Salmon River	SNAK
<b>Idaho Dept. of Fish and Game Total</b>					<b>5,209,568</b>					
Nez Perce Tribe	Kooskia NFH	CH1	SP	2018	513,409	03-19-18	03-19-18	Kooskia Hatchery	Clearwater River M F	SNAK
<b>Nez Perce Tribe Total</b>					<b>513,409</b>					
Oregon Dept. of Fish and Wildlife	Bonneville Hatchery	ST	WI	2018	25,000	03-15-18	03-15-18	Clackamas River	Clackamas River	LCOL
Oregon Dept. of Fish and Wildlife	Clackamas Hatchery	CH1	SP	2018	240,000	03-15-18	03-15-18	Eagle Creek Hatchery	Eagle Creek	LCOL
Oregon Dept. of Fish and Wildlife	Clatsop County Fisheries	CH1	SP	2018	150,000	03-15-18	03-15-18	Blind Slough	Col R Bel. Bon Dam	LCOL
Oregon Dept. of Fish and Wildlife	Clatsop County Fisheries	CH1	SP	2018	300,000	03-22-18	03-22-18	Youngs Bay	Youngs River	LCOL
Oregon Dept. of Fish and Wildlife	Enhancement Program	CH1	SP	2018	55,000	03-15-18	03-15-18	Clackamas River	Clackamas River	LCOL
Oregon Dept. of Fish and Wildlife	Gnat Creek Hatchery	CH1	SP	2018	400,000	03-15-18	03-15-18	Gnat Creek	Col R Bel. Bon Dam	LCOL
Oregon Dept. of Fish and Wildlife	Klaskanine Hatchery	CH0	FA	2018	1,200,000	03-15-18	03-15-18	Klaskanine River	Klaskanine River	LCOL
Oregon Dept. of Fish and Wildlife	Lookingglass Hatchery	CH1	SP	2018	210,000	03-15-18	03-15-18	Imnaha River	Imnaha River	SNAK
Oregon Dept. of Fish and Wildlife	Marion Forks Hatchery	CH1	SP	2018	50,000	03-15-18	03-15-18	Santiam River & N Fk	Santiam River	LCOL
Oregon Dept. of Fish and Wildlife	Marion Forks Hatchery	CH1	SP	2018	100,000	03-15-18	03-15-18	Mollala River	Willamette River	LCOL
Oregon Dept. of Fish and Wildlife	Marion Forks Hatchery	CH1	SP	2018	635,000	03-15-18	03-15-18	Santiam River & N Fk	Santiam River	LCOL
Oregon Dept. of Fish and Wildlife	McKenzie Hatchery	CH1	SP	2018	202,000	03-21-18	03-21-18	McKenzie Hatchery	Willamette River	LCOL
Oregon Dept. of Fish and Wildlife	South Santiam Hatchery	CH1	SP	2018	421,000	03-10-18	03-10-18	South Santiam Hatchery	Santiam River	LCOL
<b>Oregon Dept. of Fish and Wildlife Total</b>					<b>3,988,000</b>					
Umatilla Tribe	Bonneville Hatchery	CH1	FA	2018	125,000	03-22-18	03-22-18	Pendelton Acclim Pond	Umatilla River	MCOL
<b>Umatilla Tribe Total</b>					<b>125,000</b>					
<b>Grand Total</b>					<b>9,835,977</b>					

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

**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
02/23/2018	157.9	0.0	164.6	3.3	169.5	22.2	169.4	9.1	170.1	32.7	180.0	19.0	178.0	46.9
02/24/2018	134.2	0.0	138.4	0.0	141.8	0.2	143.9	0.9	150.7	9.9	165.3	11.4	166.6	42.7
02/25/2018	149.5	0.0	143.5	0.0	143.5	4.2	141.3	1.1	145.3	3.2	149.9	0.4	143.0	2.0
02/26/2018	144.6	0.0	145.3	0.0	147.1	14.0	153.6	0.6	157.5	16.2	174.6	20.0	175.0	40.4
02/27/2018	146.1	0.0	150.9	6.6	152.7	26.1	144.8	0.0	148.4	9.0	156.3	4.6	152.5	26.7
02/28/2018	134.9	0.0	139.0	0.0	142.8	17.2	145.1	0.8	149.7	8.9	159.9	5.4	158.6	25.7
03/01/2018	141.5	0.0	138.6	0.0	143.6	24.5	143.4	0.0	147.7	7.9	160.4	0.0	156.6	7.2
03/02/2018	136.6	0.0	137.3	0.0	136.5	12.0	141.9	0.0	142.0	4.7	147.7	0.0	144.3	0.0
03/03/2018	112.6	0.0	121.5	0.0	124.3	1.9	131.1	0.0	137.7	3.1	155.2	0.0	150.8	2.1
03/04/2018	98.1	0.0	91.4	0.0	112.2	0.0	113.7	0.0	120.3	0.0	143.0	0.0	145.5	1.6
03/05/2018	118.2	0.0	117.9	0.0	104.1	0.0	106.6	0.0	109.4	3.1	140.4	0.0	136.9	0.0
03/06/2018	115.2	0.0	115.7	0.0	125.5	1.7	119.5	0.0	120.6	1.2	140.3	0.0	137.7	0.0
03/07/2018	123.1	0.0	125.7	0.0	125.0	0.0	128.7	0.0	132.4	0.8	133.0	0.0	127.7	0.0
03/08/2018	131.2	0.0	127.5	0.0	126.7	9.4	123.7	0.0	125.8	3.2	111.2	0.0	104.1	0.0

**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
02/23/2018	20.0	15.1	---	---	52.7	0.0	51.0	0.0	53.4	2.1	53.6	0.0
02/24/2018	20.0	15.1	---	---	49.5	0.0	49.3	0.0	51.1	0.0	53.9	0.0
02/25/2018	20.0	15.0	---	---	52.0	0.0	48.7	0.0	51.2	0.1	48.8	0.0
02/26/2018	20.0	14.9	---	---	49.6	0.0	48.0	0.0	50.9	0.0	50.7	0.0
02/27/2018	20.0	15.0	---	---	45.5	0.0	46.6	0.0	51.2	3.1	49.8	0.0
02/28/2018	20.1	15.1	---	---	53.5	0.0	46.7	0.0	45.3	1.0	47.1	0.0
03/01/2018	20.0	15.3	---	---	52.8	0.0	52.7	0.5	56.7	5.0	54.0	0.0
03/02/2018	16.0	11.5	---	---	51.5	0.0	51.0	0.0	53.1	1.0	51.4	0.0
03/03/2018	16.0	11.4	---	---	43.4	0.0	44.6	0.0	49.0	0.0	51.0	0.0
03/04/2018	16.0	11.4	---	---	46.5	0.0	43.8	0.0	49.8	0.0	53.9	0.0
03/05/2018	16.1	11.5	---	---	45.3	0.0	46.7	0.0	47.2	0.1	47.1	0.0
03/06/2018	16.0	11.3	---	---	48.7	0.0	46.6	0.0	48.0	0.0	48.9	0.0
03/07/2018	16.0	11.3	---	---	49.0	0.0	47.1	0.0	48.5	0.0	44.9	0.0
03/08/2018	16.6	11.9	---	---	47.9	0.0	49.1	0.0	50.9	0.0	52.5	0.0

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

Date	McNary		John Day		The Dalles		Bonneville			
	Flow	Spill	Flow	Spill	Flow	Spill	Flow	Spill	PH1	PH2
02/23/2018	223.9	8.2	225.5	96.5	216.1	0.0	231.6	0.5	112.4	114.8
02/24/2018	230.6	3.3	226.0	96.3	218.1	0.0	228.8	0.6	109.4	115.0
02/25/2018	202.8	0.0	209.9	80.7	203.2	0.0	223.8	0.6	108.5	110.7
02/26/2018	204.2	0.0	209.0	81.6	203.5	0.0	215.8	0.6	109.7	101.7
02/27/2018	207.9	0.0	209.0	85.7	202.7	0.0	218.1	1.1	103.3	106.4
02/28/2018	209.4	0.0	210.9	80.0	200.7	0.0	210.6	1.2	104.9	97.0
03/01/2018	212.2	0.0	212.3	77.2	203.4	7.5	225.3	1.2	117.6	99.2
03/02/2018	209.0	0.0	213.3	67.7	206.8	0.0	225.4	1.2	123.4	93.3
03/03/2018	201.3	0.0	208.3	59.9	199.4	7.3	221.7	1.2	125.5	87.6
03/04/2018	193.7	0.0	192.1	44.6	182.0	0.0	197.2	1.2	105.9	82.6
03/05/2018	204.3	0.0	212.7	63.7	205.1	7.7	221.5	1.2	116.4	96.5
03/06/2018	185.5	0.0	199.7	49.3	195.3	0.0	214.6	1.2	102.7	103.2
03/07/2018	181.2	0.0	179.8	29.6	173.3	7.5	188.5	1.2	90.1	89.9
03/08/2018	180.7	0.0	180.0	29.8	174.4	0.0	191.4	1.2	91.3	91.8

## 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	<u>Hungry H. Dnst</u>			#	<u>Boundary</u>			#	<u>Grand Coulee</u>			#	<u>Grand C. Tlwr</u>			#	<u>Chief Joseph</u>			#
	<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>	
	<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>		
2/23	---	---	---	0	---	---	---	0	99.5	99.7	100.1	24	98.4	98.7	99.2	24	---	---	---	0
2/24	---	---	---	0	---	---	---	0	100.5	100.7	100.8	24	99.6	99.9	100.0	24	99.5	99.5	99.8	9
2/25	---	---	---	0	---	---	---	0	101.4	101.7	102.0	24	100.5	100.9	101.1	24	100.9	101.0	101.3	13
2/26	---	---	---	0	---	---	---	0	100.5	100.7	101.1	24	99.7	100.0	101.4	24	99.7	99.7	99.9	14
2/27	---	---	---	0	---	---	---	0	100.7	101.0	101.1	24	99.8	100.1	100.3	24	100.2	100.2	100.5	14
2/28	---	---	---	0	---	---	---	0	101.2	101.5	101.8	24	100.5	100.8	101.2	23	100.6	100.7	101.0	15
3/1	---	---	---	0	---	---	---	0	102.0	102.2	102.2	24	101.4	101.6	102.1	24	101.2	101.3	101.4	24
3/2	---	---	---	0	---	---	---	0	101.8	102.2	102.4	24	101.2	101.8	102.8	24	101.1	101.4	101.5	24
3/3	---	---	---	0	---	---	---	0	100.9	101.1	101.2	24	100.6	101.0	101.4	24	100.3	100.5	100.9	23
3/4	---	---	---	0	---	---	---	0	100.1	100.2	100.4	24	99.9	100.1	100.4	24	99.6	99.8	100.0	18
3/5	---	---	---	0	---	---	---	0	99.6	99.7	99.9	24	99.3	99.6	99.9	24	99.3	99.4	99.6	15
3/6	---	---	---	0	---	---	---	0	99.5	99.8	99.9	24	99.0	99.3	100.0	24	99.7	99.7	100.0	11
3/7	---	---	---	0	---	---	---	0	100.3	100.8	100.8	24	99.5	99.9	100.4	24	100.4	100.5	100.7	15
3/8	---	---	---	0	---	---	---	0	101.3	101.7	101.8	23	100.4	100.7	101.2	23	101.0	101.3	101.4	23

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

Date	<u>Chief J. Dnst</u>			#	<u>Wells</u>			#	<u>Wells Dwnstrm</u>			#	<u>Rocky Reach</u>			#	<u>Rocky R. Tlwr</u>			#
	<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>	
	<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>		
2/23	99.4	101.1	104.9	24	97.6	97.8	98.3	24	102.4	103.8	105.3	24	100.6	101.0	101.5	24	104.7	106.9	111.2	22
2/24	99.0	99.2	99.3	24	98.9	99.1	99.2	24	99.2	99.6	101.5	24	102.8	103.5	103.9	24	104.8	105.8	110.0	23
2/25	100.0	100.4	100.7	24	99.7	100.0	100.3	24	100.9	102.1	106.1	24	102.9	104.1	104.9	24	104.3	105.1	106.0	21
2/26	99.1	99.3	99.4	24	98.6	98.8	99.1	24	102.0	103.8	106.2	24	99.3	99.6	100.3	24	101.2	102.1	106.6	23
2/27	101.9	104.6	108.8	24	99.2	99.4	99.6	24	105.4	106.8	109.2	24	102.4	103.4	104.1	24	103.0	103.8	104.5	23
2/28	99.8	100.0	100.3	24	100.0	100.3	100.7	24	104.2	106.6	108.8	24	104.3	105.8	106.8	24	105.2	106.3	107.0	24
3/1	100.6	100.7	100.8	24	100.4	100.4	100.5	24	106.2	109.6	111.2	24	106.2	106.5	106.9	24	106.4	106.7	106.8	22
3/2	100.5	100.8	100.9	24	99.9	100.2	100.4	24	103.0	105.7	107.2	24	104.7	105.3	106.2	24	105.2	105.7	106.1	24
3/3	99.6	99.9	100.3	24	99.2	99.4	99.7	24	100.3	101.3	106.1	24	104.5	106.3	106.9	24	105.1	106.0	106.6	20
3/4	99.2	99.5	100.2	24	98.7	98.9	99.2	24	98.9	99.3	100.3	24	103.2	103.9	104.3	24	103.8	104.1	104.3	21
3/5	98.7	99.0	99.7	24	98.3	98.6	98.8	24	98.4	98.7	99.1	24	100.0	100.4	101.1	24	101.2	101.6	103.1	21
3/6	99.0	99.3	100.0	24	98.4	98.7	98.9	24	99.0	99.8	102.4	24	99.1	99.2	99.3	22	99.8	100.2	100.7	22
3/7	99.6	99.9	100.4	24	99.4	99.8	99.9	24	99.6	100.1	100.3	24	99.8	100.3	101.1	23	100.6	100.9	102.0	21
3/8	100.2	100.6	100.8	23	100.5	100.8	101.0	23	102.7	104.8	106.3	23	101.3	101.5	101.8	23	102.0	102.3	102.6	20

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

Date	<u>Rock Island</u>			#	<u>Rock I. Tlwr</u>			#	<u>Wanapum</u>			#	<u>Wanapum Tlwr</u>			#	<u>Priest Rapids</u>			#
	<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>		<u>24 h</u>	<u>12 h</u>	<u>High</u>	
	<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>			<u>Avg</u>	<u>Avg</u>		
2/23	100.6	102.3	104.8	24	106.3	107.9	110.4	22	101.9	102.1	102.6	24	103.3	104.4	106.7	24	104.3	105.5	106.6	24
2/24	102.1	102.7	103.4	23	104.5	106.2	109.6	22	102.8	102.9	103.2	24	103.4	103.7	104.3	24	104.6	105.0	105.8	24
2/25	103.3	104.0	104.3	22	104.1	104.3	104.7	20	104.0	104.5	104.6	24	104.7	105.5	105.8	24	104.3	104.6	104.8	24
2/26	99.5	100.1	100.8	24	102.8	103.9	105.0	23	103.5	103.9	104.5	24	104.3	105.0	105.3	24	103.2	103.4	103.8	24
2/27	100.7	102.2	102.6	23	102.8	104.8	106.8	22	102.9	103.1	103.2	24	103.0	103.5	104.7	24	103.9	104.2	104.4	23
2/28	103.0	103.5	104.7	24	104.9	105.8	106.6	22	103.0	103.2	103.5	24	103.0	103.4	104.6	24	103.5	104.0	104.5	24
3/1	105.6	105.9	106.2	23	107.0	107.7	108.6	21	103.8	104.1	104.5	24	103.8	104.6	105.0	24	103.8	104.3	104.5	24
3/2	104.3	105.1	105.9	24	105.5	106.7	108.2	23	104.3	104.5	104.6	24	104.5	104.7	104.9	24	103.1	103.3	103.4	24
3/3	104.9	106.0	106.6	22	105.7	106.2	106.6	20	104.0	104.1	104.2	24	104.5	104.8	104.9	24	102.9	103.1	103.2	23
3/4	101.8	102.8	103.7	22	101.9	102.8	103.9	19	103.5	103.8	104.1	24	103.6	103.9	104.5	24	103.2	103.3	103.4	24
3/5	100.6	101.5	103.6	23	101.6	102.4	103.9	21	103.2	103.3	103.4	24	103.4	103.5	103.6	24	102.6	102.7	102.8	24
3/6	98.8	99.0	99.1	22	99.5	99.8	101.9	21	102.7	102.9	103.3	24	102.4	102.9	103.4	24	102.6	102.9	103.1	24
3/7	99.1	99.5	100.0	20	99.5	99.9	100.1	20	102.8	102.9	103.0	24	102.6	102.7	102.9	24	102.9	103.1	103.3	24
3/8	100.5	101.2	101.5	23	101.5	102.3	104.2	19	103.0	103.5	106.4	24	102.4	102.8	103.1	24	103.7	103.9	104.3	24



## 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>					
	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>				
2/23	108.3	109.8	111.1	24	---	---	---	0	121.9	122.0	122.2	24	113.9	114.3	114.7	24	---	---	---	0
2/24	109.9	112.0	114.0	24	---	---	---	0	122.3	122.4	122.6	24	114.4	114.6	114.8	24	---	---	---	0
2/25	103.5	103.9	104.4	24	---	---	---	0	122.5	122.7	122.8	24	114.7	115.0	115.2	24	---	---	---	0
2/26	108.2	109.5	109.7	24	---	---	---	0	122.2	122.4	122.6	24	114.5	114.7	115.0	24	---	---	---	0
2/27	106.4	107.7	108.3	24	---	---	---	0	122.2	122.3	122.5	24	114.8	115.2	115.5	24	---	---	---	0
2/28	107.4	109.3	110.2	24	---	---	---	0	122.6	122.8	123.2	24	115.5	115.9	116.2	24	---	---	---	0
3/1	104.0	104.7	105.3	24	---	---	---	0	123.5	123.8	123.9	24	116.2	116.5	116.8	24	---	---	---	0
3/2	103.2	103.4	103.6	24	---	---	---	0	121.9	122.1	122.4	24	113.5	114.0	116.0	24	---	---	---	0
3/3	103.3	103.6	103.9	24	---	---	---	0	121.6	121.7	121.9	24	113.4	113.9	114.4	24	---	---	---	0
3/4	103.6	103.9	104.9	24	---	---	---	0	121.3	121.4	121.6	24	113.5	113.7	114.1	24	---	---	---	0
3/5	102.6	102.7	102.8	24	---	---	---	0	121.1	121.2	121.3	24	113.3	113.5	113.8	24	---	---	---	0
3/6	102.9	103.2	103.4	22	---	---	---	0	121.1	121.3	121.5	24	113.7	114.2	114.7	24	---	---	---	0
3/7	---	---	---	0	---	---	---	0	121.5	121.7	121.9	24	114.2	114.8	115.3	24	---	---	---	0
3/8	---	---	---	0	---	---	---	0	122.1	122.2	122.5	23	114.7	115.0	115.6	23	---	---	---	0

### 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>					
	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>				
2/23	107.1	108.0	108.6	24	---	---	---	0	100.3	100.9	101.6	24	---	---	---	0	99.8	100.2	100.6	24
2/24	107.3	107.6	107.9	24	---	---	---	0	102.3	102.4	102.6	24	---	---	---	0	100.9	101.2	101.9	24
2/25	107.4	107.8	108.1	24	---	---	---	0	103.2	103.6	103.8	24	---	---	---	0	101.0	101.3	101.5	24
2/26	107.3	108.0	108.7	24	---	---	---	0	102.6	102.8	103.0	24	---	---	---	0	100.0	100.3	100.6	24
2/27	107.5	108.5	109.4	24	---	---	---	0	102.9	103.2	103.5	24	---	---	---	0	100.1	100.4	100.6	24
2/28	108.4	109.3	109.9	24	---	---	---	0	103.3	103.6	103.9	24	---	---	---	0	101.2	101.7	101.9	24
3/1	108.8	109.5	110.4	24	---	---	---	0	104.1	104.4	104.9	24	---	---	---	0	103.1	103.8	105.1	24
3/2	106.8	107.4	108.0	24	---	---	---	0	104.2	104.4	104.6	24	---	---	---	0	102.8	103.0	103.3	24
3/3	106.4	107.5	108.5	24	---	---	---	0	103.6	103.8	103.9	24	---	---	---	0	102.5	102.8	103.0	24
3/4	106.3	107.3	108.0	24	---	---	---	0	103.2	103.4	103.7	24	---	---	---	0	102.1	102.3	102.5	24
3/5	106.2	106.8	107.5	24	---	---	---	0	102.4	102.6	102.8	24	---	---	---	0	101.6	101.7	101.8	24
3/6	107.0	108.2	109.5	24	---	---	---	0	101.9	102.0	102.4	24	---	---	---	0	101.7	102.0	102.2	24
3/7	107.3	108.6	109.6	24	---	---	---	0	102.6	103.3	103.6	24	---	---	---	0	102.9	103.6	103.8	24
3/8	107.6	108.6	109.8	23	---	---	---	0	104.2	104.6	105.6	23	---	---	---	0	104.3	104.7	105.1	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>					
	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>	<u>Avg</u>	<u>Avg</u>	<u>High</u>	<u>hr</u>				
2/23	---	---	---	0	100.5	102.8	107.5	24	---	---	---	0	99.4	99.6	99.8	24	---	---	---	0
2/24	---	---	---	0	99.7	100.0	100.4	24	---	---	---	0	99.8	100.0	100.3	24	---	---	---	0
2/25	---	---	---	0	100.5	100.8	101.0	24	---	---	---	0	99.5	99.5	99.6	3	---	---	---	0
2/26	---	---	---	0	100.0	100.1	100.4	24	---	---	---	0	99.8	99.8	101.7	10	---	---	---	0
2/27	---	---	---	0	102.0	104.1	109.1	24	---	---	---	0	99.8	100.0	100.3	16	---	---	---	0
2/28	---	---	---	0	101.5	102.8	106.1	24	---	---	---	0	100.8	101.4	101.7	24	---	---	---	0
3/1	---	---	---	0	106.1	106.2	106.4	24	---	---	---	0	102.4	102.8	102.9	24	---	---	---	0
3/2	---	---	---	0	102.4	103.6	106.0	24	---	---	---	0	102.6	102.8	102.9	24	---	---	---	0
3/3	---	---	---	0	101.1	101.4	104.0	24	---	---	---	0	101.5	101.7	102.1	24	---	---	---	0
3/4	---	---	---	0	100.6	100.8	100.9	24	---	---	---	0	100.6	100.9	101.1	24	---	---	---	0
3/5	---	---	---	0	100.6	100.9	101.9	24	---	---	---	0	100.0	100.2	100.3	24	---	---	---	0
3/6	---	---	---	0	101.3	101.8	102.2	24	---	---	---	0	100.2	100.6	100.9	24	---	---	---	0
3/7	---	---	---	0	102.3	102.9	103.0	24	---	---	---	0	101.5	102.1	102.2	24	---	---	---	0
3/8	---	---	---	0	103.5	103.8	104.1	23	---	---	---	0	103.1	103.5	103.7	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	McNary-Wash			McNary Tlwr			John Day			John Day Tlwr			The Dalles			#				
	24 h	12 h	#	24 h	12 h	#	24h	12h	#	24h	12h	#	24h	12h	#					
	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	AVG	High					
2/23	---	---	---	0	108.0	108.2	108.6	24	---	---	---	0	118.9	119.0	119.1	24	---	---	---	0
2/24	---	---	---	0	105.1	106.1	107.2	24	---	---	---	0	119.1	119.2	119.4	24	---	---	---	0
2/25	---	---	---	0	104.2	104.8	105.2	24	---	---	---	0	118.8	118.9	119.2	24	---	---	---	0
2/26	---	---	---	0	104.6	104.9	105.2	24	---	---	---	0	118.4	118.5	118.6	24	---	---	---	0
2/27	---	---	---	0	104.4	104.6	104.9	24	---	---	---	0	118.5	118.6	118.8	24	---	---	---	0
2/28	---	---	---	0	103.7	104.1	104.8	24	---	---	---	0	118.7	119.0	119.1	24	---	---	---	0
3/1	---	---	---	0	104.7	105.6	105.9	24	---	---	---	0	118.6	119.1	119.2	24	---	---	---	0
3/2	---	---	---	0	105.6	106.0	106.1	24	---	---	---	0	117.1	117.6	118.4	24	---	---	---	0
3/3	---	---	---	0	105.1	105.3	105.5	24	---	---	---	0	115.6	116.8	117.0	24	---	---	---	0
3/4	---	---	---	0	102.5	103.2	104.0	24	---	---	---	0	112.6	114.1	118.1	24	---	---	---	0
3/5	---	---	---	0	101.2	101.5	102.1	24	---	---	---	0	115.9	117.1	117.3	24	---	---	---	0
3/6	---	---	---	0	101.4	101.6	102.4	24	103.1	103.1	103.3	12	113.4	114.8	115.1	24	106.1	106.4	107.3	15
3/7	---	---	---	0	102.5	102.8	103.8	24	103.8	104.3	104.6	24	112.0	112.4	112.8	24	106.4	106.8	107.1	24
3/8	---	---	---	0	104.1	104.3	105.0	23	105.2	105.5	105.7	23	112.6	112.8	112.9	23	106.0	106.3	106.7	23

Total Dissolved Gas Saturation Data at Lower Columbia River Sites

Date	The Dalles Dnst			Bonneville			Warrendale			Camas\Washougal			Cascade Island			#				
	24 h	12 h	#	24 h	12 h	#	24h	12h	#	24h	12h	#	24h	12h	#					
	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High	Avg	Avg	High					
2/23	110.2	110.8	111.3	24	---	---	---	0	109.7	110.2	110.4	24	---	---	---	0	---	---	---	0
2/24	111.5	112.0	112.3	24	---	---	---	0	109.4	109.6	110.1	24	---	---	---	0	---	---	---	0
2/25	110.1	110.3	110.6	24	---	---	---	0	109.4	109.6	109.7	24	---	---	---	0	---	---	---	0
2/26	108.0	108.3	109.3	24	---	---	---	0	108.8	109.1	109.4	24	---	---	---	0	---	---	---	0
2/27	108.8	109.3	109.4	24	---	---	---	0	108.3	108.6	108.9	24	---	---	---	0	---	---	---	0
2/28	111.0	111.8	112.6	24	---	---	---	0	109.1	109.9	110.6	24	---	---	---	0	---	---	---	0
3/1	111.2	111.4	111.6	24	---	---	---	0	111.8	112.5	113.2	24	---	---	---	0	---	---	---	0
3/2	108.9	109.8	110.4	24	---	---	---	0	111.6	112.0	113.2	24	---	---	---	0	---	---	---	0
3/3	107.4	107.7	107.9	24	---	---	---	0	110.1	110.4	110.8	24	---	---	---	0	---	---	---	0
3/4	105.7	106.2	106.4	24	---	---	---	0	107.8	108.3	109.0	24	---	---	---	0	---	---	---	0
3/5	105.1	106.2	108.0	24	107.2	107.2	107.3	12	106.7	106.9	107.3	24	---	---	---	0	108.7	108.8	110.5	14
3/6	106.1	106.8	107.2	24	108.0	109.3	111.9	24	106.3	106.6	106.9	24	106.6	106.6	107.9	8	108.7	108.9	109.1	24
3/7	106.6	107.7	108.0	24	116.3	118.2	119.2	24	107.0	107.3	107.4	24	104.3	104.6	105.5	24	109.5	110.1	110.6	24
3/8	105.8	106.0	106.4	23	120.5	121.0	121.6	23	107.6	108.0	108.2	23	104.2	104.9	105.6	23	110.4	110.9	111.2	23

FISH PASSAGE CENTER

## Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 1 of 7

### COMBINED YEARLING CHINOOK

Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR (Index)	LGS (Index)	LMN (Index)	RIS (Index)	MCN (Index)	JDA (Index)	BO2 (Index)
02/23/2018		0									
02/24/2018		0									
02/25/2018		0									
02/26/2018		0									
02/27/2018		3									
02/28/2018		0									
03/01/2018		0								129	
03/02/2018		0				6					
03/03/2018		2								37	12
03/04/2018		1				0					12
03/05/2018	0	0		0						27	35
03/06/2018	1	0		0		9					0
03/07/2018	0	1		0						60	0
03/08/2018	0	2	0	0		8					0
03/09/2018											
<b>Total:</b>	1	9	0	0	0	23	0	0	0	253	59
<b># Days:</b>	4	14	1	4	0	4	0	0	0	4	6
<b>Average:</b>	0	1	0	0	0	6	0	0	0	63	10
<b>YTD:</b>	2	15	0	0	0	23	0	0	0	253	59

Number of hours sampled:

- No data available or no sample conducted

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

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## Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 2 of 7

### COMBINED SUBYEARLING CHINOOK

Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR (Index)	LGS (Index)	LMN (Index)	RIS (Index)	MCN (Index)	JDA (Index)	BO2 (Index)
02/23/2018		0									
02/24/2018		0									
02/25/2018		0									
02/26/2018		0									
02/27/2018		0									
02/28/2018		0									
03/01/2018		0								16	
03/02/2018		0				0					
03/03/2018		0								0	561
03/04/2018		0				0					718
03/05/2018	0	0		0						7	530
03/06/2018	0	0		0		0					620
03/07/2018	0	0		0						0	885
03/08/2018	0	0	0	0		0					1,216
03/09/2018											
<b>Total:</b>	0	0	0	0	0	0	0	0	0	23	4,530
<b># Days:</b>	4	14	1	4	0	4	0	0	0	4	6
<b>Average:</b>	0	0	0	0	0	0	0	0	0	6	755
<b>YTD:</b>	0	0	0	0	0	0	0	0	0	30	4,530

Number of hours sampled:

- No data available or no sample conducted

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

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## Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 3 of 7

### COMBINED COHO

Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR (Index)	LGS (Index)	LMN (Index)	RIS (Index)	MCN (Index)	JDA (Index)	BO2 (Index)
02/23/2018		0									
02/24/2018		0									
02/25/2018		0									
02/26/2018		0									
02/27/2018		0									
02/28/2018		0									
03/01/2018		0								0	
03/02/2018		0				0					
03/03/2018		0								0	0
03/04/2018		0				0					12
03/05/2018	0	0		0						0	23
03/06/2018	0	0		0		0					21
03/07/2018	0	0		0						0	81
03/08/2018	0	0	0	0		0					98
03/09/2018											
Total:	0	0	0	0	0	0	0	0	0	0	235
# Days:	4	14	1	4	0	4	0	0	0	4	6
Average:	0	0	0	0	0	0	0	0	0	0	39
YTD:	0	0	0	0	0	0	0	0	0	0	333

Number of hours sampled:

- No data available or no sample conducted



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## Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 4 of 7

### 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)
02/23/2018		0									
02/24/2018		0									
02/25/2018		0									
02/26/2018		0									
02/27/2018		0									
02/28/2018		0									
03/01/2018		0								8	
03/02/2018		1				6					
03/03/2018		0								7	0
03/04/2018		0				3					0
03/05/2018	0	0		0						13	0
03/06/2018	0	0		0		18					0
03/07/2018	0	0		0						0	0
03/08/2018	0	0	0	0		7					0
03/09/2018											
<b>Total:</b>	0	1	0	0	0	34	0	0	0	28	0
<b># Days:</b>	4	14	1	4	0	4	0	0	0	4	6
<b>Average:</b>	0	0	0	0	0	9	0	0	0	7	0
<b>YTD:</b>	0	1	0	0	0	41	0	0	0	28	0

Number of hours sampled:

- No data available or no sample conducted

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

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## Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 5 of 7

### 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)
02/23/2018		0									
02/24/2018		0									
02/25/2018		0									
02/26/2018		0									
02/27/2018		0									
02/28/2018		0									
03/01/2018		0								0	
03/02/2018		0				14					
03/03/2018		0								0	0
03/04/2018		0				1					0
03/05/2018	0	0		0						0	0
03/06/2018	0	0		0		10					0
03/07/2018	0	0		0						0	0
03/08/2018	0	0	0	0		6					0
03/09/2018											
Total:	0	0	0	0	0	31	0	0	0	0	0
# Days:	0	0	0	0	0	8	0	0	0	0	0
Average:	0	0	0	0	0	8	0	0	0	0	0
YTD:	0	0	0	0	0	37	0	0	0	0	0

Number of hours sampled:

- No data available or no sample conducted

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

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## Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 6 of 7

### COMBINED LAMPREY JUVENILES

Date	WTB (Coll)	IMN (Coll)	GRN (Coll)	LEW (Coll)	LGR* (Sample)	LGS (Coll)	LMN (Coll)	RIS (Coll)	MCN (Coll)	JDA (Coll)	BO2 (Coll)
02/23/2018		0									
02/24/2018		0									
02/25/2018		0									
02/26/2018		0									
02/27/2018		0									
02/28/2018		0									
03/01/2018		0								2,045	
03/02/2018		0				2					
03/03/2018		0								1,360	135
03/04/2018		0				3					130
03/05/2018	0	0		0						1,265	90
03/06/2018	0	0		0		0					50
03/07/2018	0	0		0						620	30
03/08/2018	0	0	0	0		2					80
03/09/2018											
<b>Total:</b>	0	0	0	0	0	7	0	0	0	5,290	515
<b># Days:</b>	4	14	1	4	0	5	0	0	0	5	7
<b>Average:</b>	0	0	0	0	0	1	0	0	0	1,058	74
<b>YTD:</b>						7				5,290	515

- No data available or no sample conducted

- 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.

Number of hours sampled:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----



# Smolt Monitoring Program Two Week Passage Index Report

Date 3/9/2018 8:17:17 AM

Page 7 of 7

Smolt Monitoring Program Sites and Agency Collaborations:

- 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
- LGS (Index) - Little Goose Bypass Collection System : Passage Index Counts
- LMN (Index) - Lower Monumental Dam Bypass Collection System : Passage Index Counts
- RIS (Index) - Rock Island Dam Second Powerhouse Bypass Trap : Passage Index Counts
- MCN (Index) - McNary Dam Bypass Collection System : Passage Index Counts
- JDA (Index) - John Day Dam Bypass Collection System : Passage Index Counts
- BO2 (Index) - Bonneville Dam Second Powerhouse Bypass Collection System : Passage Index Counts

- No data available or no sample conducted

Number of hours sampled:



Important Information About this Report:

- For clip information see: <http://www.fpc.org/currentdaily/smpcomments.htm>
- Three 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. Equations for passage index are provided below for each site.
  - LGR, LGS, LMN, MCN, JDA (Index) = Lower Granite Dam Bypass Collection System : Passage Index Counts Passage Index = Collection Counts / (Powerhouse Flow / (Powerhouse Flow + Spill))
  - RIS, BO2 (Index) = Rock Island Dam Second Powerhouse Bypass Trap : Passage Index Counts Passage Index = Collection Counts / (Powerhouse 2 Flow / (Powerhouse 1 & 2 Flow + Spill))
- 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.
- 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.

Cumulative Adult Passage at Mainstem Dams Through: 03/08

dam	enddate	Spring Chinook						Summer Chinook						Fall Chinook					
		2018		2017		10-Yr Avg.		2018		2017		10-Yr Avg.		2018		2017		10-Yr Avg.	
		Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack	Adult	Jack
BON	03/07	2	0	1	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0
TDA	02/28	9	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
JDA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MCN	02/28	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
IHR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LMN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGR	03/07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PRD		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WAN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RRH		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WEL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WFA	03/08	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

DAM	ENDDATE	Coho						Sockeye			Steelhead						Lamprey		
		2018		2017		10-Yr Avg.		2018	2017	10-Yr Avg.	10-Yr Unclipped		Unclipped		10-Yr Avg.	2018	2017	10-Yr Avg.	
		Adult	Jack	Adult	Jack	Adult	Jack	2018	2017	Avg.	2018	2017	Avg.	2018	2017	Avg.	2018	2017	Avg.
BON	03/07	1	-1	0	0	0	0	0	0	0	747	520	1006	314	220	380	0	0	0
TDA	02/28	4	0	0	0	0	0	0	0	0	43	0	79	15	0	38	0	0	0
JDA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MCN	02/28	0	0	0	0	1	0	0	0	0	184	0	214	79	0	82	0	0	0
IHR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LMN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGR	03/07	0	0	0	0	0	0	0	0	0	50	641	642	8	239	192	0	0	0
PRD		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WAN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RRH		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WEL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WFA	03/08	0	2	85	85	0	0	0	0	0	660	351	2127	643	351	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.