2016 ANNUAL FISHWAY STATUS REPORT

THE DALLES DAM

Date: Jan, 2017
From: Bob Cordie, Jeff Randall and Gabe Forrester

INTRODUCTION

The Dalles Dam has specific requirements for Columbia River fish passage that are specified in the annual Fish Passage Plan. The Dalles Dam has two fish ladders for upstream adult fish passage, as well as an ice trash sluiceway and spillway that are used for downstream steelhead kelt and juvenile fish passage. The following document is a summary of all fish related activities that occurred at The Dalles Dam in 2016. In addition Northern Wasco Co PUD has a turbine that supplies auxiliary water to the north fishway, which has a complete juvenile bypass system. Information on this systems operation can be acquired through Pacific States Marine Fish Commission monitoring report.

FISHWAY OPERATING SCHEDULE

The following information includes fish passage system operation for calendar year 2016. Total length of time for annual fishway outages can be determined by referring to previous years' annual reports. These fishways were closed or dewatered for maintenance when they were not in operation.

East Adult Fishway

Jan 5 – Feb 28	Dewatered for winter maintenance
Jan 1 – Jan 4	In full operation with attraction water
Mar 1 – Nov 31	In full operation with attraction water
Mar 22 – Mar 23	FU2 off for maintenance
Aug 4	Attraction water off half day for required ROV grating inspection
Dec 1 - Dec 31	Dewatered for winter maintenance

North Adult Fishway

Jan 1 – Dec 31	In full operation with attraction water
Dec 3	Dewatered 1 hour for annual maintence. Cancelled due to high fish numbers.
Aug 4	Attraction water off half day for required ROV grating inspection

Ice/Trash Sluiceway (Juvenile)

Jan 1- Mar 1	End gate closed
Mar 2 – Mar 31	In service with 4 sluice gates open
Apr 1 – Dec 2	In service with 6 sluice gates open
Dec 3 – Dec 14	In service with 4 sluice gates open
Dec 15	OOS with 0 sluice gates open
Dec 16 – Dec 31	End gate closed

Spillway

Jan 1 – April 9	Closed, all gates on seal
April 10 – Aug 31	Spill 40%, 24/7 for juvenile passage
Sept 1 – Dec 31	Closed, all gates on seal

2016 DEWATERING - FISH SALVAGE

FISHWAY DEWATERING PROCEDURES

Dewatering fishways provides the best opportunity for maintenance and inspection. To dewater the fishladders, exit bulkheads are installed and the ladder is allowed to drain. Entrance bulkheads are installed and dewatering pumps operated to dewater all areas of fishways below tailwater elevation. Fisheries personnel enter these areas to salvage trapped fish when water levels allow entry. Fish are pushed toward tailwater or captured. Captured fish are transported to forebay or tailwater, depending on location, fish species, age class and stress levels. A follow up inspection is made to capture any missed fish. Efforts are made to provide continual water supply during the entire operation to reduce fish stranding and stress. Fishway areas that cannot be dewatered are inspected by ROV underwater camera.

THE DALLES DAM FISH LADDER DEWATERING RESULTS

Key; adult=a, juvenile=j, carp=cp, catfish=ca, sculpin=sp, shad=sh, small mouth bass=smb, crappie=cr, pikeminnow=pm, whitefish=wf, redside=rs, large scale sucker=lss

Date	Event	Chinook	Steelhead	Sockeye	Coho	Lamprey	Shad	Sturgeon	Other	Comments	Morts
1/5/16	E. upper	2j	35j	0	0	1	0	0	0	none	1j steelhead
1/7/16	E. lower	0	5j, 2a	0	0	150	0	9	1smb, 4sp	none	4 lamprey
1/13/16	E. Lower	0	0	0	0	11	0	0	0	0	0
12/1/16	E. Upper	0	0	0	0	1	75	0	2wf, 1 lss	0	0
12/2/16	E. Lower	0	0	0	0	26	0	2	0	0	1 lamprey
12/3/16	E. Lower	0	1a, 1j	0	0	41	0	7a, 3j	1 rs	0	0
12/5/16	E. Lower	0	1j	0	0	13	0	0	0	0	2 a, 1j steelhead

Lamprey estimate due to large #'s and timely release to river. Two adult and 1 juvenile steelhead swam through a gap in the set barrier. Anchors were improved.

THE DALLES DAM NAVLOCK DEWATERING RESULTS

Date	Event	Chinook	Steelhead	Sockeye	Coho	Lamprey	Shad	Sturgeon	Other	Comments	Morts
3/9/16	T.V. 4-2	0	1a	3j	0	0	0	0	1 smb	none	0
12/19/16	T.V. 1-2	0	0	0	0	0	0	2	0	none	0

DEWATERING FISH SALVAGE DISCUSSION

Efforts are always made to prevent fish mortalities. However, when mortalities occur, procedures are analyzed to determine how to correct for future dewaterings. The barrier at the south entrance pool was reenforced for future dewaterings by adding anchor bolts to the edges of the pool to hold barriers in place. This will reduce the chance of mortalities due to stranding atop diffuser grating.

2014 - 2016 FISHWAY INSPECTION COMPARISON

Two complete visual fishway inspections were conducted per day during the adult fish passage season (March 1 to November 30). One fishway inspection was conducted per day during the non- passage season. A monitor is installed in the fisheries office showing real time and 24hour information of the operation of east entrances, east ladder and north ladder. This information is recorded as a third inspection. Equipment calibration, gatewell inspection and drawdown's are also part of the inspection program. Guidelines are provided by the COE Fish Passage Plan. Weekly fishway status reports are provided to fish managers throughout the year. Status information is also provided at monthly Fish Passage Operation and Maintenance meetings. Comparisons are made with prior 2 years to track how equipment has been performing. Fishway inspection data:

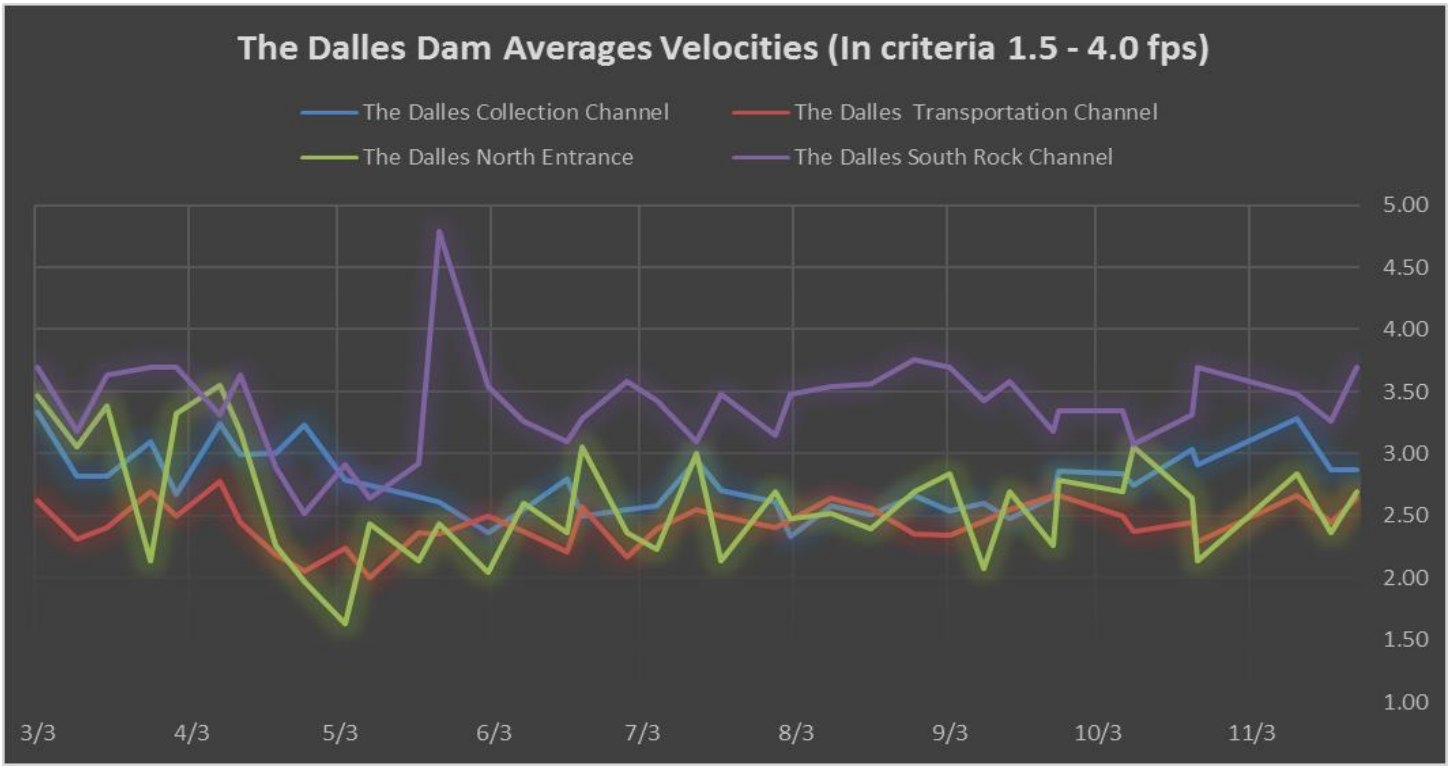
Inspection Criteria Comparison Chart						
	2016		2015		2014	
The Dalles Dam	Total # out of criteria	% out of criteria	Total #	%	Total #	%
Number of inspections	918		899		917	
NORTH FISHWAY	0	0				
Exit differential	0	0.00%	0	0.00%	0	0.00%
Count station differential	0	0.00%	0	0.00%	0	0.00%
Weir crest depth	24	2.61%	26	2.89%	4	0.44%
Entrance differential	3	0.33%	4	0.44%	1	0.11%
Entrance weir N1	2	0.22%	1	0.11%	1	0.11%
Entrance weir N2	0	0.00%	0	0.00%	0	0.00%
PUD Intake differential	15	1.63%	5	0.56%	0	0.00%
EAST FISHWAY						
Exit differential	1	0.11%	1	0.11%	0	0.00%
Removable weirs 154-157	31	3.38%	18	2.00%	10	1.09%
Weir 158-159 differential	28	3.05%	20	2.22%	7	0.76%
Count station differential	5	0.54%	6	0.67%	3	0.33%
Weir crest depth	1	0.11%	3	0.33%	3	0.33%
Junction pool weir JP6	4	0.44%	1	0.11%	2	0.22%
East entrance differential	8	0.87%	8	0.89%	11	1.20%
Entrance weir E1	1	0.11%	0	0.00%	0	0.00%
Entrance weir E2	17	1.85%	55	6.12%	3	0.33%
Entrance weir E3	7	0.76%	2	0.22%	17	1.85%
Collection channel velocity	1	0.11%	0	0.00%	0	0.00%
West entrance differential	3	0.33%	4	0.44%	14	1.53%
Entrance weir W1	4	0.44%	4	0.44%	21	2.29%
Entrance weir W2	15	1.63%	46	5.12%	21	2.29%
Entrance weir W3	1	0.11%	0	0.00%	0	0.00%
South entrance differential	7	0.76%	5	0.56%	35	3.82%
Entrance weir S1	18	1.96%	50	5.56%	30	3.27%
Entrance weir S2	3	0.33%	9	1.00%	37	4.03%
JUVENILE PASSAGE						
Sluicegate operation	15	1.63%	8	0.89%	25	2.73%
Turbine trashrack drawdown	0	0.00%	0	0.00%	0	0.00%
Spill volume	7	0.76%	1	0.11%	63	6.87%
Spill Pattern	1	0.11%	0	0.00%	1	0.11%
Turbine Unit Priority	180	19.61%	45	5.01%	93	10.14%
Turbine 1% Efficiency	1	0.11%	0	0.00%	0	0.00%

Inspection Discussion

1. The north fish ladder weir crest depth was out of criteria from Jan4 through Feb3 due to a diffuser valve drive failure. Ladder flow could not be controlled adequately until replacement parts received and installed. Performance improved wit new parts.
2. The PUD intake differential was at a range >0.5' at various times throughout the year, but mainly during the milfoil die-off in August and early September. Raking PUD intake was requested as needed.
3. Removeable weirs 154-157 for the east fish ladder were out for various reasons throughout the 2016 season. The weirs were stuck in manual between 07/29 and 08/02 until repaired. Work on FCQ7 electrical panel between 09/16 and 10/20 was performed affecting power and automation. The remainder was from forebay level changes. Criteria exceedance was usually within 0.2'.
4. Weir 158 transducer regulating elevation was not working properly in May and the first half of June. Troubleshooting took longer than expected.
5. Entrance weirs E2, W2, and S1 depth were out of criteria during the first week of January while FU2 was out of service for scheduled maintenance. FU1 discharge was increased, but not sufficient.
6. Turbine unit priority served as a large percentage of the totals out of criterea for the 2016 season. MU's 3, 15, and 16 were out of service throughout the entire season. MU's 13 and 14 had annual maintenance during June. MU's 9 and 10 were out of service several times in early fall as well. All of the above affected the turbine block priority sequence.

MAINTENANCE ACCOMPLISHMENTS AND PLANS

1) All entrance weirs, used diffusers and count station equipment has been inspected and preventative maintenance as needed.
2) Entrance weir composite wheel replacement of existing stainless wheels to improve performance and guide wear 50% complete. Rehab entrance weir lifting beams 50% complete. West and north to be completed this winter.
3) West entrance weir W1 leafs found separated. Removed and repaired.
4) East count station window brush replaced with adjustments for better window cleaning.
5) East exit weirs 154 and 159 gearbox seals and couplers replaced to stop leakage. Weirs 155-158 to be completed in upcoming years as funding allows.
6) Dewatering pumps for south entrance and 4 of 6 collection channel rebuilt. Two remaining are stuck and cannot be removed. Future removal and rehab as funding allows.
7) East exit power source FCQ7 panel replacement 50% complete. Further work pending funding.
8) Diffuser valve preventative maintenance minimal due to long term plan. All diffusers are in positions necessary for ladder operation. Starting plans for removal of unneeded collection channel diffusers.
9) North fishway rock wall reinforcement repair alternatives developed through district Product Development Team. Construction expected winter 2018/19 pending funding.
10) Fishway entrance and exit weir automation upgrade planning underway.



Water Velocity Discussion

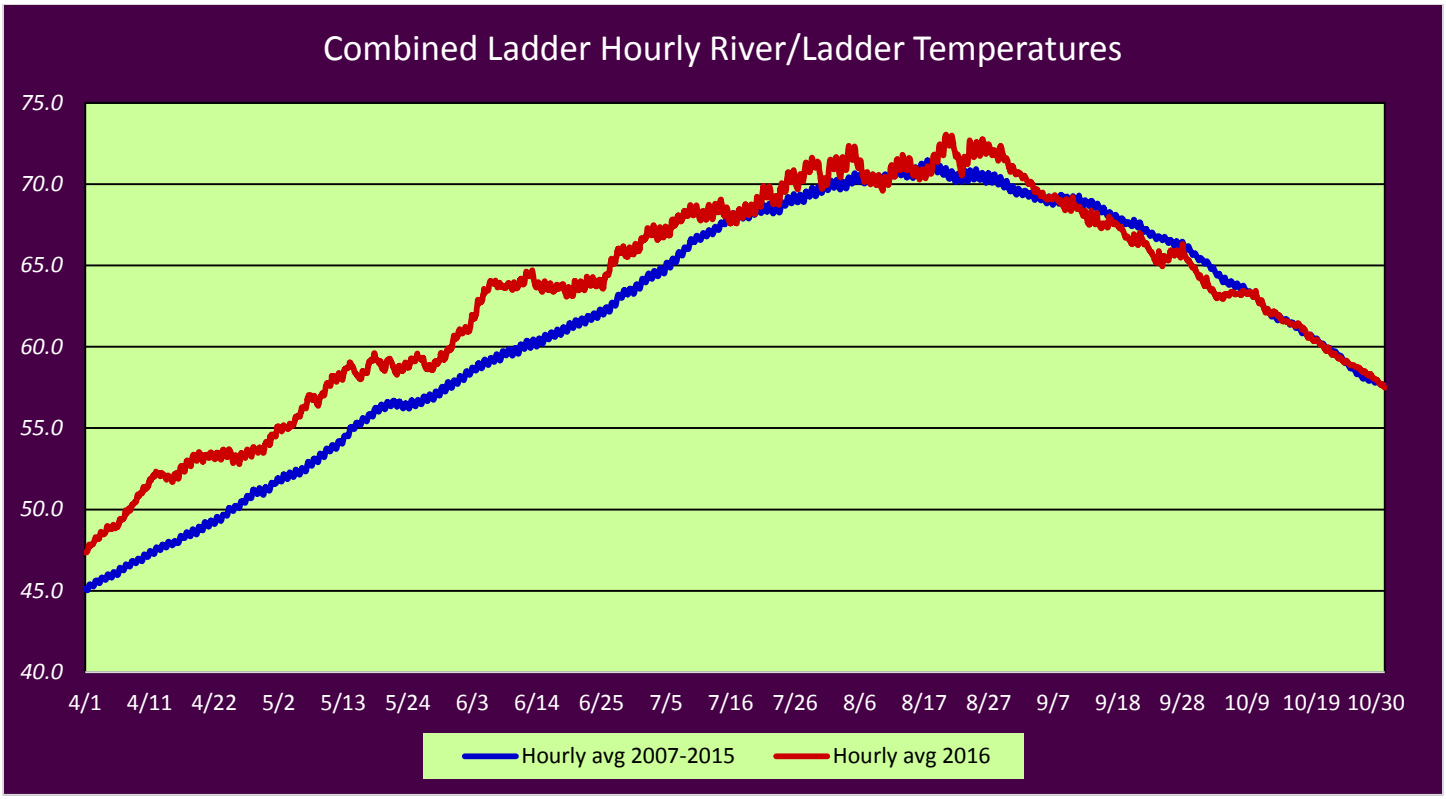
Fishway channel water velocities were measured weekly during Adult Fish Passage Season (Mar1 – Dec 1). Orange peels were timed through all fishway channels that are supplemented by auxiliary water and results were provided in the project weekly fishway status report. Criteria velocities of 1.5 to 4 fps were maintained throughout the fish passage season. Velocities were not always taken at unit 22 due to turbulence preventing float tracking. Velocity is generally slower from junction pool to unit 21, however past University of Idaho analysis did not reveal fish passage delays in this area.

Gatewell/Intake trash rack debris monitoring

Gatewell drawdowns are a measurement of water level between forebay and gatewell used to determine turbine intake trashrack debris loads and are checked weekly. As in previous years, all maintained well within the criteria limit (+ or – 0.5'). Gatewell drawdown measurements have not been found out of criteria for past 20+ years, nor has gatewell debris been an issue.

WATER QUALITY

Water clarity was read by secchi dish at the count stations. Water clarity data is not included in this report due to its questionable accuracy. This data was collected per regional manager request to maintain historical data base. Temperature monitoring with data loggers in each fishway is provided biweekly in the fishway status reports. Additional monitoring will be done to determine differences from upper to lower ladder. The following graph is a compilation of weekly
readings collected by data loggers in the east and north fishladders, immediately upstream of the count stations.



River temperatures >70°F 6/28-8-30

Calibration

Calibration (comparing digital display and staff gauge readings vs tape measure) checks on all water level stillwells and weirs done weekly to assure accuracy. Maintenance is notified when they found off by more than 0.3'. Human error and weather conditions is factored into the results.

2016 Calibration results

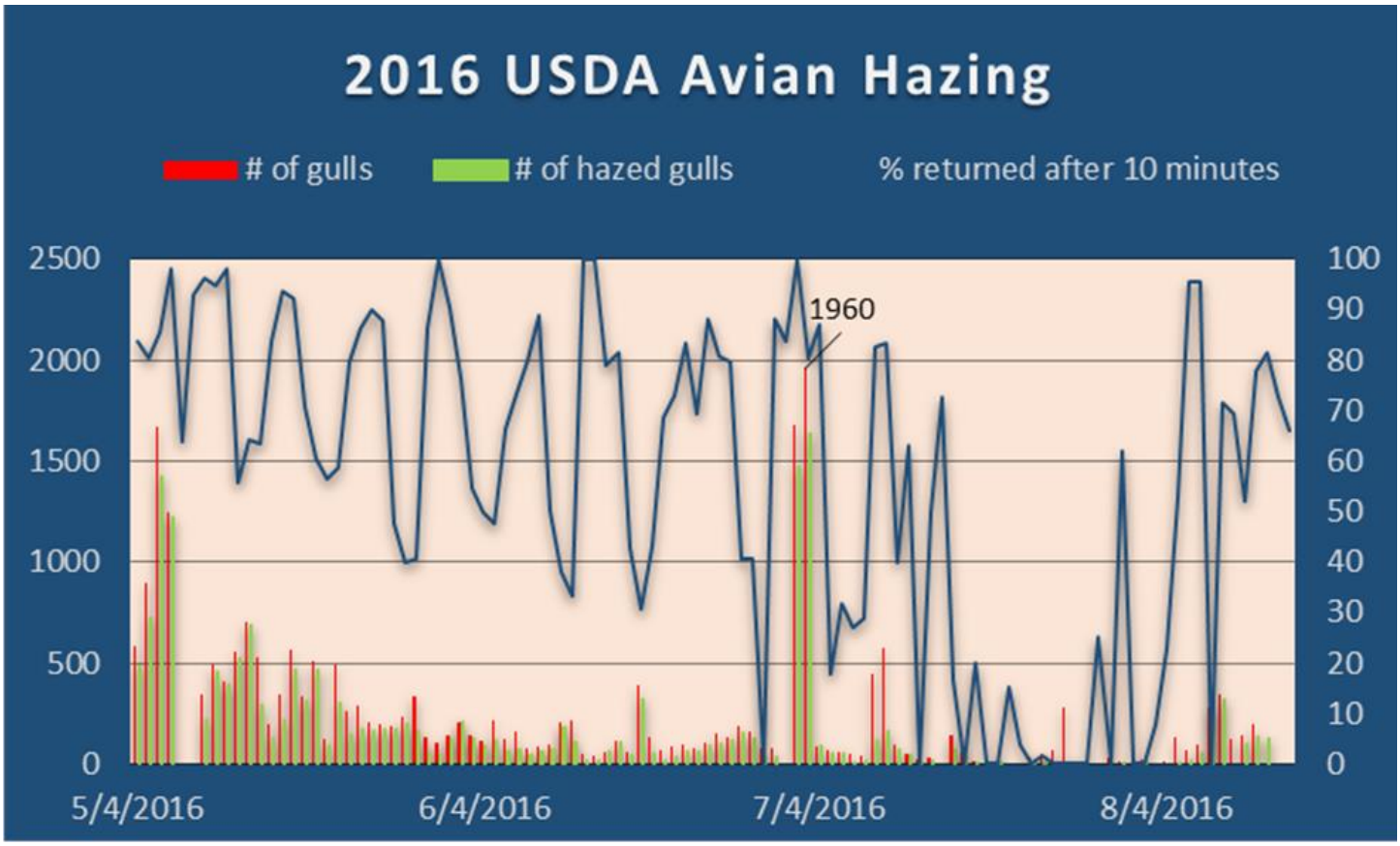
Location		3/3	3/10	3/17	3/23	4/3	5/1	5/10	5/17	5/31	6/15	6/25	7/14	7/24	8/11	8/23	9/16	10/1	10/18	10/29	11/3	11/11
East ladder entrance weirs	E1	-0.2		-0.2		0.0	-0.2						-0.5									
	E2	-0.3		-0.3		-0.3	-0.3						-0.4									
	E3	-0.1		0.1		0.0	-0.3						0.2									
	W1	0.0	0.0	0.0	-0.2	0.0	-0.1	-0.2	-0.3	-0.1	-0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0		0.1
	W2	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.2	-0.4	0.0	0.0	0.0	0.2	0.2	0.3	0.2	0.1	0.2	0.1	0.2		0.3
	W3																					
	S1	-0.5	0.6	0.0	-0.5	0.1	0.0	-0.1	-0.1	1.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	S2	0.0	-0.1	-0.5	-0.5	0.2	0.3	0.3	0.2	1.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.1
East ladder channel-tailwater	E Chan	0.3	-0.1	0.2	1.0	0.7	0.5	0.6	-0.1	-0.3	-0.3	-0.2	-0.7	-1.0	0.2	0.4	0.3	0.0	0.4	0.5	-0.1	-0.2
	E TW	0.5	-0.3	-0.8	-0.1	0.3	0.0	0.6	-0.1	-0.1	-0.3	-0.1	-0.6	-0.7	0.0	0.2	0.2	0.0	0.5	0.3	0.5	0.2
	W Chan	0.2	0.1	0.2	0.3	0.3	0.1	0.3	-0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.5	0.1	0.1	0.1		0.3
	W TW	0.0	-0.2	0.0	-0.2	-0.1	-0.2	-0.2	-0.2	0.0	0.1	0.0	0.1	0.2	0.2	0.2	0.3	0.0	0.2	0.1		0.2
	S Chan	-0.1	-0.2	-0.1	0.0	-0.1	-0.1	-0.3	-0.2	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	0.1	0.0	-0.1	-0.3	0.0	-0.2
	S TW	0.1	0.1	0.2	0.1	0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	0.0	-0.1	0.0	0.0	0.3	0.2	0.1	0.0	0.1	0.2
East ladder exit wiers	159	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1
	158	-0.8	0.1	-0.2	0.1	0.3	-0.2	0.1	0.7	0.6	-0.6	0.6	0.3	0.3	0.4	0.2	0.0	0.0	-0.1	-0.5	0.2	0.1
Forebay	E FB	-0.3				-0.2	-0.3				-0.2				-0.1							
	N FB	0.0				0.1	0.0				0.0				-0.1							
North ladder	N1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3		-0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2
	N Chan	-0.2	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.4	-0.3	-0.1	-0.2	-0.1
	N TW	-0.2	0.0	-0.1	-0.1	-0.1	0.1	0.0	-0.1	0.0	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1	-0.4	-0.4	-3.1	-0.4	-0.4	-0.4

Calibration discussion

Calibration readings out of criteria are indicated by highlight. 2016 results are slightly higher than prior years. There were 32 readings out of criteria this year as compared to; 2015=24, 2014=22, 2013=28 and 2012=54. Maintenance was notified as needed for adjustments.

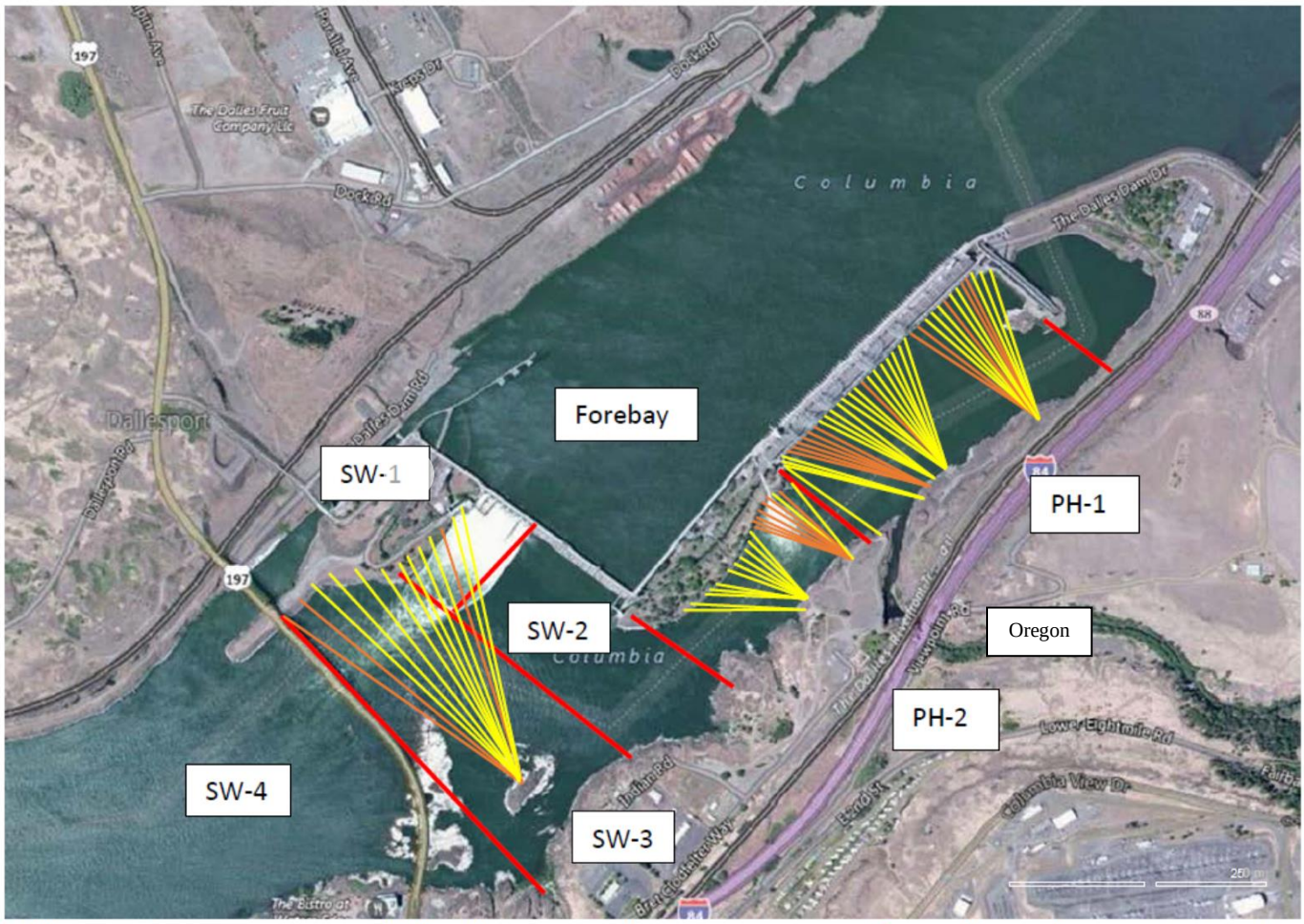
AVIAN PREDATOR ABATEMENT

The United States Department of Agriculture (USDA) was contracted to provide avian hazing abatement via pyrotechnics from May 4th – August 17th. The April 15 start was delayed due to delays in the approval process. Hazing commenced when there were a minumum of 12 birds present. Counts were tallied to see how many birds left after hazing, again for how many stayed in the zone, and a third time after a 10 minute time period to determine the effectiveness of the hazing. Graph shows that gulls were most prevelant in May and that the vast majority returned after 10 minutes. USDA concentrated specifically on zones upstream of the US-197 bridge (SWT3) and dowstream of the bridge (SWT4).

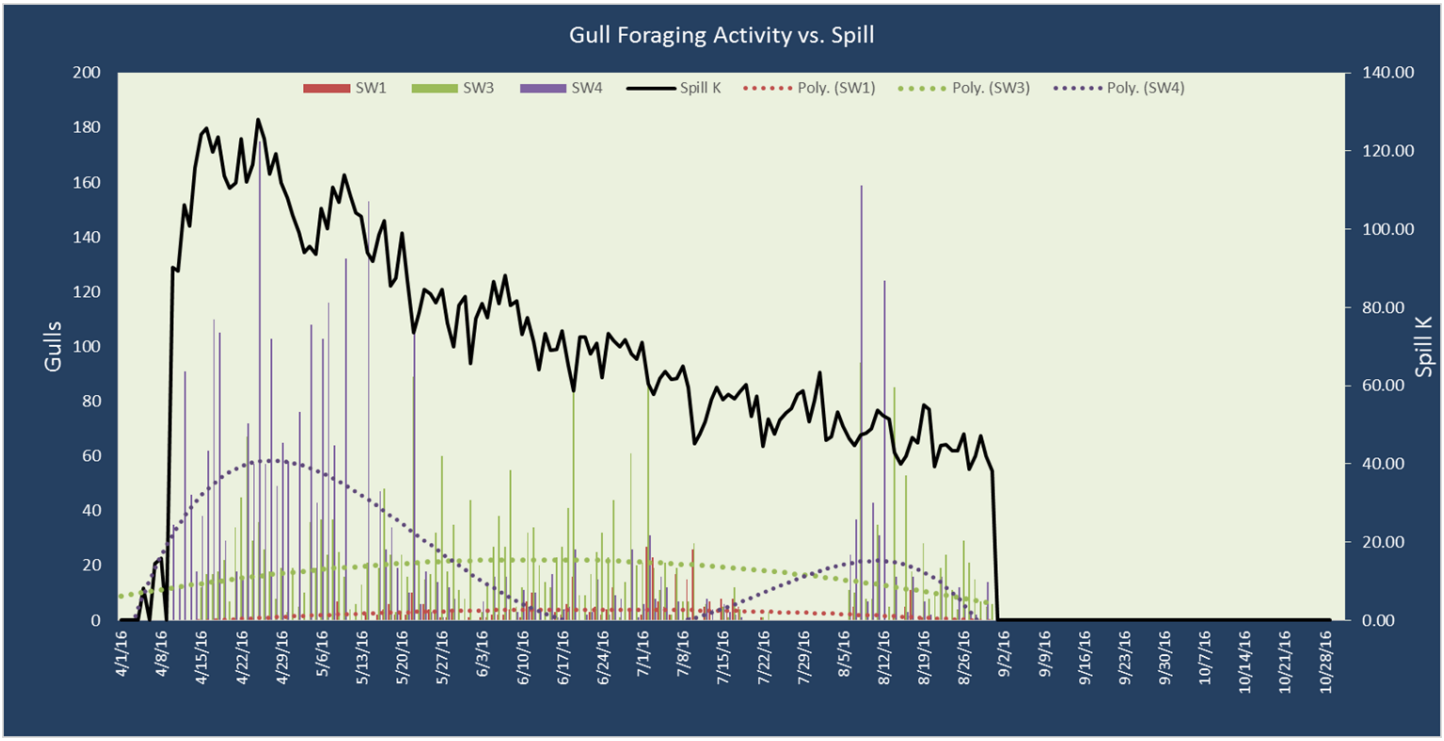


USDA hazing effort: Hazers were present during all daylight hours (~06:00-20:00) located on the peninsula downstream of the Dalles bridge (SW4). There were large periods of time in which hazers could not use pyrotechniques due to barges and/or heavy wind days. Number of gulls were logged prior to hazing, how many initially left and the number returning after 10 minutes. The data was compiled in a daily total. The overall numbers of gulls present throughout the year near the dam were lower than previous year. This year large numbers of pelicans were present. USDA hazers witnessed harrassment of gulls by pelicans which may be correlated with the decreased numbers of gulls congregating around the dam.

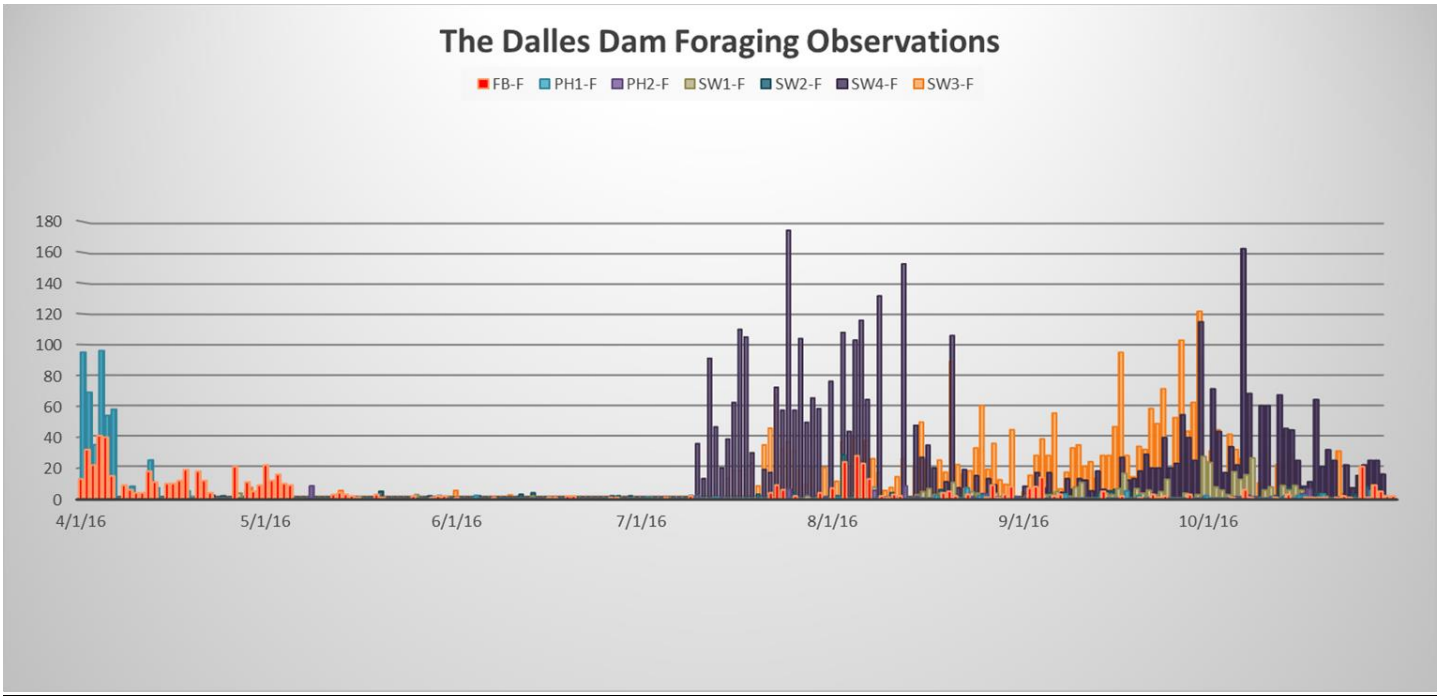
The Dalles Dam Zones for Bird Counts



Red lines = avian zones Yellow lines = current wires Orange lines = down or missing wires



Project fisheries staff provided daily avian counts for the entire year. The highest bird counts were on the spillway side of the dam downstream of The Dalles US-197 bridge (SWT4). Gulls foraged heavily in this zone. The majority of resting birds were double crested cormorants in the forebay (FB1) often perched on the electrical transmission towers near the Washington shore and pelicans perched on the rock islands below the bridge (SWT4). Other birds included grebes, mergansers, and eagles. Grebes were observed in the summer along with pelicans but the vast majority of grebes and mergansers were in the fall and winter months during the juvenile shad outmigration. Eagles were observed in the winter. There continues to be high numbers of Bald Eagles overwintering in Westrick Park, feeding primarily on post-spawn adult shad. Previous studies have shown no impact from avian lines. Refer to Fisheries Field Unit "Evaluation of Interaction Between Overwintering Bald Eagles and the Avian Line Array at The Dalles Dam 2013" report for further details.



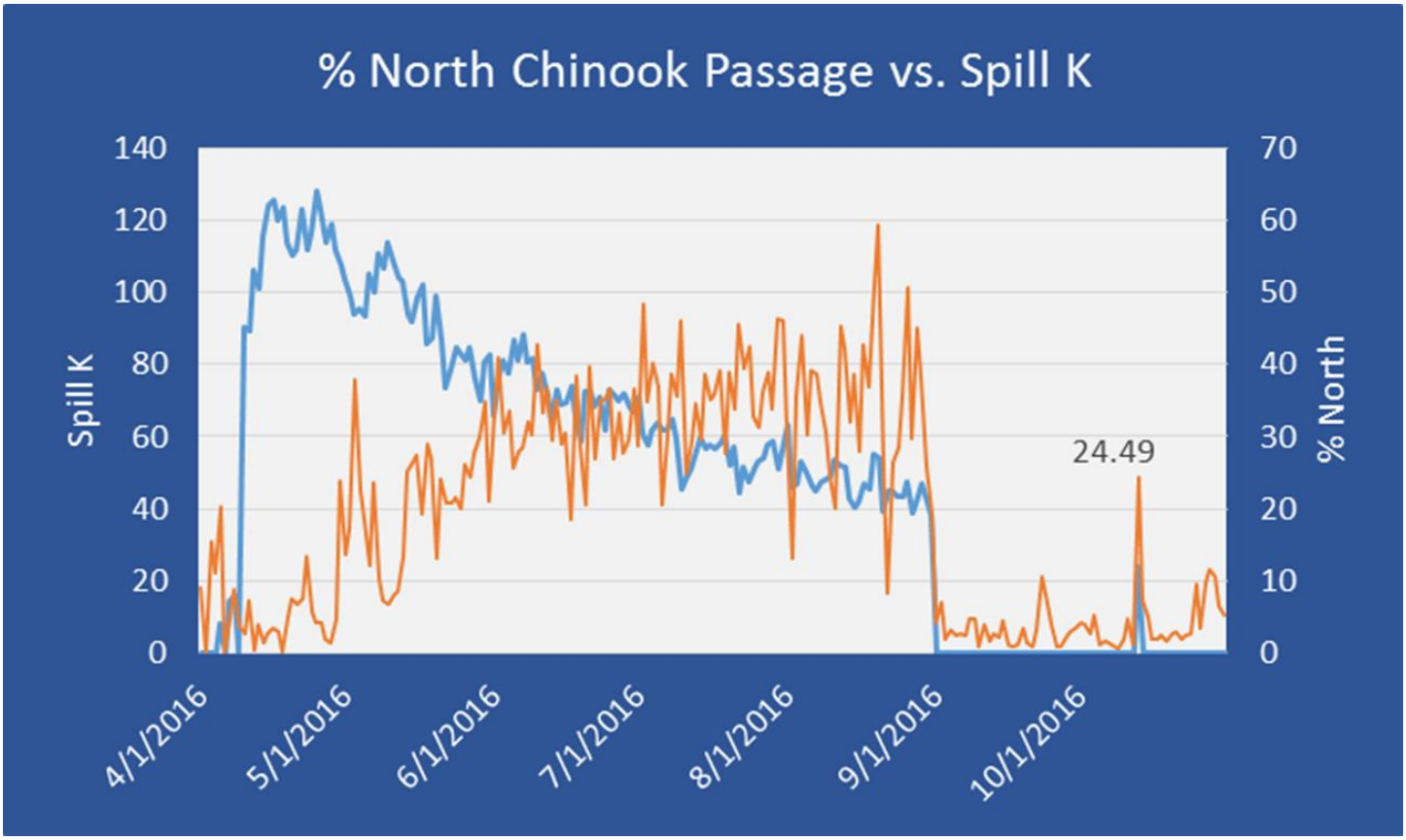
Avian Discussion

The bird count data was collected from fishway inspections once per day, alternating between morning and afternoon observations. Most of the gull feeding activity occurred just up stream and down stream of The Dalles Bridge (SWT3 and SWT4). Gull hazing from boat and shore by USDA was used in 2016. The presence of pelicans during summer was substantially higher and more consistant in 2016 than in previous years. Further analysis of their impacts on gull foraging will be continued in 2017.

The high numbers of cormorant numbers is primarily roosting behavior. Cormorant near dam feeding behavior starts to occur in November and December when the shad juvenile outmigration peaks. The high numbers observed in the forebay are roosting in the power line towers and north side debris boom. There was a substantial gull number increase in May and Cormorant increase in August.

NORTH LADDER PASSAGE VS SPILL

Spill operation has been documented to affect north fishladder passage in the past several years. In previous years spill >110KCFS tended to block salmonids from entering the north ladder. During late April and early May, this trend is apparent. It was again clearly demonstrated that with no spill, salmonids are not attracted to the north entrance area either; hence the drop in north passage immediately after spill stops.



FISHLADDER OVERCROWDING CONCERN

With record numbers of fall chinook passage in 2015 and very limited use of the north fish ladder during non spill season, there remains a concern of overcrowding in the east fishway, causing potential passage delay. Spill has been determined to attract fish to the north. Language was developed for the 2016 Fish Passage Plan to impliment spill attraction for the north fishladder. However passage numbers did not meet threshold numbers for implimenting spill attraction.

SEA LIONS

There continues to be frequent sea lions sightings in the Bonneville Pool. No sightings have been made inside the fishways to date, but several have been in close proximity to entrances. The following is a log of all the sea lion sightings in 2016. Due to hazing efforts by USDA, there was a significant decrease in sightings at The Dalles Dam. Note: California sea lion (SL); for locations see Figure 5.

Date	Time	Species	Activity	Location and notes
4/29/16	1400	SL	swimming	east ent - 3 brand on back
5/3/16	1000	SL	Swimming	east ent- 311 brand on back
5/4/16	1300	SL	swimming	east ent- 311 brand on back
5/4/16	1245	SL	swimming	west ent- c014
5/4/16	13:20	SL	eating salmon	SW3 near bridge island
12/5/16	1115	SL	swimming	in front of powerhouse- c014

FISH COUNTING

Visual fish counting was conducted 4/1/15 to 10/31/15 by Normandeau Environmental Consultants contract. Counts were loaded to the COE website. Video counting was performed during the off season. Refer to Corps of Engineers 'Annual Fish Passage Report' 2016 for fish count and comparison to previous years. A video counting test continues to be investigated by Fish Field Unit for the north count station. This will include use of latest video/computer technology for improved visability and more efficient/accurate fish counting. Testing is scheduled to continue next passage season.

PIKEMINNOW ABATEMENT

Washington Dept Fish and Wildlife conducted hook and line dam-angling in support of the on-going BPA funded Columbia River Predator Control Program Dam angling from May through Sept, in conjunction with ODFW and PSMFC. A total of 3,064 northern pikeminnow >230mm were caught at The Dalles Dam. Most angling occurred from powerhouse tailrace.

ZEBRA/QUAGGA MUSSEL MONITORING

Zebra mussel veliger sampling was conducted once in August via plankton tow. Sample sent to Portland State University's Center for Lakes and Reservoirs for analysis. No mussels found to date. Program will continue in 2017.

15 MILE CREEK STEELHEAD RETURNS

ODFW analyzed PIT data and determined extremely low steelhead survival from Bonneville to 15 mile creek. The recently installed PIT antenna in The Dalles fishladder revealed high numbers of 15 mile creek steelhead overshooting The Dalles. These fish need to pass back downstream sometime before March. However the ice trash sluiceway, a known preferred route for adult downstream migrants is closed Dec 16 – Feb 28. Investigation is underway to determine if extended sluiceway operation is merited. ODFW to share results and recommendations with FPOM committee.

RESEARCH

The following are a list of fish related research and contract personnel that were on site during the 2017 passage season.

Confederated Tribes of the Umatilla Indian Reservation – Captured adult Pacific lamprey as part of the on-going project to restore lamprey to various tributaries. CTUIR worked with the Nez Perce and Yakama Nation to help with lamprey collection efforts. CTUIR captured 208 lamprey by Aug 22.

Normandeau Environmental Consultants – Continued to perform fish counting at the north and east fishways via count stations.

Oregon Dept of Fish and Wildlife –Captured, tagged, and collected biological data from northern pikeminnow as part of an evaluation of the Northern Pikeminnow Management Program.

Oregon Department of Fish and Wildlife and Fish Passage Center – Continued to provide once monthly fishway inspections of adult and juvenile systems.

Pacific States Marine Fish Commission – FERC required sampling at the Northern Wasco County PUD intake structure as per the Coorperative Agreement between Pacific States Marine Fisheries Commission and Wasco County PUD.

Pacific States Marine Fisheries Commission PTAGIS Information System – monitored Thin Wall PIT Tag detection system in The Dalles east and north count stations.

U.S. Dept of Agriculture – Provided avian hazing of piscivorous birds to reduce avian predation on juvenile salmonids May 4th to August 17th via pyrotechnics during juvenile passage season.

U. S. Geological Survey – Total Dissolved Gas (TDG) and water temperature monitoring.

Yakama Nation - Captured adult Pacific lamprey as part of the on-going project to restore lamprey to various tributaries. Yakama Nation worked with the Nez Perce and CTUIR to help with lamprey collection efforts. Yakama Nation captured 219 lamprey by Sept 16.

Removal of derelict equipment attached at the powerhouse main unit intakes not completed this year and is not scheduled until 2018.

END
Approved by; Ron Twiner, Operations Project Manager, The Dalles Dam