



Translocation of Adult Pacific Lamprey within the Yakima Subbasin, 2017-2018 Broodstock



[Cover Photo: Adult Pacific Lamprey being released above Prosser Dam on Yakima River (river km 76.1) by the general public during the World Fish Migration Day open house release event on April 21, 2018]

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Ralph Lampman

**Confederated Tribes and Bands of the Yakama Nation
Yakama Nation Fisheries Resource Management Program, Pacific Lamprey Project
P. O. Box 151, Toppenish, Washington 98948, USA**

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Highlights

- A total of 531 adult 2017-2018 broodstock Pacific Lamprey from Lower Columbia River were translocated to Yakima Subbasin between March 22 and May 30, 2018.
- From the PITAGIS regional data base (<http://www.ptagis.org/>), using Query Builder2 Reports, the interrogation data of PIT tagged lamprey were summarized.
- The number of adults migrating to Prosser Dam in spring 2018 was estimated to be ~2,613 based on a mark recapture study (>58.6% of which are estimated to pass the dam based on PIT tag detections).
- The number of adults passing Roza Dam is still unknown, but PIT tag detections display the behavior of lamprey repeatedly ascending and descending the three weir PIT arrays.

Abstract

This report is composed of two parts: 1) summary of all 2017-2018 broodstock adult Pacific Lamprey releases during the spring 2018 migration season within the Yakima Subbasin and 2) analysis of migration data from those adults that were PIT tagged. From the Lower Columbia 2017-2018 broodstock (adults collected in summer 2017 that primarily mature in 2018), a total of 531 adult Pacific Lamprey were released within the Yakima Subbasin between March 22 and May 30, 2018. This is the seventh year that adult Pacific Lamprey were translocated into the Yakima Subbasin. Larval Pacific Lamprey have not been documented upstream of Roza Diversion Dam (river km 210.5) until recently in 2016 (after adult translocation in Upper Yakima occurred in 2015).

From the PITAGIS regional data base (<http://www.ptagis.org/>), using Query Builder2 Reports, the interrogation data of PIT tagged lamprey were summarized. A total of 126 lamprey (38.8%) out of 324 total PIT tagged lamprey released were detected in at least one PIT array site. The highlights from the 2017-2018 broodstock adult Pacific Lamprey translocation monitoring in the Yakima Subbasin are the following:

- Sites that detected lamprey the most were ROZ (Roza Diversion Dam Combined; river km 210.5) at 14.6%, PRO (Prosser Diversion Dam Combined; river km 75.7) at 13.4%, Upper Toppenish (river km 55.5) at 4.5%, and Lower Ahtanum (river km 4.0) at 4.1%.
- Adult lamprey holding underneath Prosser Dam fish ladder PIT arrays was an issue in 2017, but this was resolved after vexar plastic mesh was attached to the nearby surface area.
- The number of adults migrating to Prosser Dam in spring 2018 was estimated to be ~2,613 based on a mark recapture study (>58.6% of which are estimated to pass the dam based on PIT tag detections).
- The number of adults passing Roza Dam is still unknown, but PIT tag detections display the behavior of lamprey repeatedly ascending and descending the three weir PIT arrays.

Part I: Release Summary

From the 2017-2018 broodstock (adults collected in summer 2017, most of which mature in spring/summer 2018), a total of 531 adult Pacific Lamprey were released in three lower Yakima tributaries (Satus, Toppenish, and Ahtanum) and mainstem Yakima River between March 22 and May 30, 2018 (Fig. 1 and Table 1). Overall female ratio was estimated to be 41.4%, PIT tag ratio was 61.0% (8 and 9 mm tags, 72.5% and 27.5%, respectively), and genetic tag ratio was 94.2%. All lamprey were originally captured from Bonneville Dam (1.5%), The Dalles Dam (32.4%), John Day Dam (26.6%) in Lower Columbia River during the summer of 2017, Prosser Dam in Lower Yakima River during the spring of 2018 (36.3%), or a mix of Lower Columbia sources (3.2%). Lamprey from Prosser Dam were captured from the vertical wetted wall lamprey passage structure. Total length averaged 609 mm (minimum 483 mm and maximum 728 mm), weight averaged 378.2 g (minimum 221.5 g and maximum 591.6 g), and interdorsal distance averaged 22 mm (minimum -2 mm and maximum 42 mm) during the PIT tagging operations in summer 2017 through spring 2018. Lamprey from Prosser Dam were slightly smaller than the Lower Columbia River lamprey in late spring (average of 574 mm and 612 mm for length and 353.4 g and 382.3 g for weight, respectively) and interdorsal distance was also smaller (average of 13 mm and 25 mm, respectively). The female ratio for the lamprey that were captured in the vertical wetted wall lamprey structures was also relatively high (60.3% on average and even higher during the early run); this higher ratio of female may be due to 1) male lamprey being more prone to pass through the fish ladder and/or 2) female lamprey being more adept at climbing the vertical wetted wall structure.

Table 2. Summary of 2016-2017 broodstock Pacific Lamprey translocation release data in the Yakima Subbasin. “# F” is “# of female lamprey”, and “# M” is “# of male lamprey.” “(?)” denotes lower certainty with the sex ID, and “# UN” is “# of unknown sex.” Female Ratio includes “# F (?)” and “# M (?)” in the estimation. The source of the lamprey is also shown (BON=Bonneville Dam, TDA=The Dalles Dam, JDA=John Day Dam, PRO=Prosser Dam, Mix=mixed source).

River	RKM	Date	#	# F	# M	# (?)	# (?)	# UN	# BON	# TDA	# JDA	# PRO	# Mix	# w/	# w/	# w/	Est.	PIT	Genetic
														8mm	9mm	Genetic	Female	Tag	Tag
Yakima	73.5	4/12/2018	35	12	20	0	1	2	0	35	0	0	0	35	0	34	36%	100%	97%
Yakima	73.5	5/3/2018	35	12	19	3	1	0	0	24	1	10	0	33	2	30	43%	100%	86%
Yakima	75.7	5/16/2018	2	1	1	0	0	0	0	1	0	1	0	2	0	2	50%	100%	100%
Yakima	76.1	3/22/2018	79	13	16	2	2	46	1	23	50	0	5	8	16	72	45%	100%	91%
Yakima	76.1	4/21/2018	35	16	16	1	0	2	0	32	3	0	0	35	0	35	52%	100%	100%
Yakima	76.1	5/7/2018	27	19	8	0	0	0	0	2	0	25	0	25	0	25	70%	93%	93%
Yakima	76.1	5/8/2018	50	9	35	2	4	0	0	1	0	49	0	0	0	47	22%	0%	94%
Yakima	76.1	5/11/2018	53	23	28	1	0	1	0	1	15	37	0	14	0	53	46%	26%	100%
Yakima	76.1	5/15/2018	29	8	21	0	0	0	0	0	0	29	0	0	0	29	28%	0%	100%
Yakima	76.1	5/21/2018	36	13	21	1	1	0	0	0	19	17	0	3	19	35	39%	61%	97%
Yakima	210.3	4/26/2018	35	11	16	3	3	2	0	35	0	0	0	35	0	35	42%	100%	100%
Yakima	210.3	5/15/2018	34	12	22	0	0	0	0	0	16	18	0	25	0	34	35%	74%	100%
Satus	6.0	5/30/2018	8	3	5	0	0	0	0	2	0	6	0	0	8	8	38%	100%	100%
Satus	31.3	3/23/2018	12	8	4	0	0	0	0	12	0	0	0	0	0	12	67%	0%	100%
Satus	31.3	3/30/2018	3	1	1	0	0	1	0	3	0	0	0	3	0	3	50%	100%	100%
Toppenish	54.4	4/30/2018	25	5	18	1	1	0	3	0	22	0	0	0	25	25	24%	100%	100%
Toppenish	61.6	5/10/2018	10	1	0	0	0	9	0	0	0	1	9	10	0	1	100%	100%	10%
Ahtanum	1.7	4/11/2018	20	6	5	4	1	4	3	0	14	0	3	0	17	17	63%	85%	85%
-	-	-	3	0	2	1	0	0	1	1	1	0	0	7	2	3	33%	300%	100%
-	-	-	531	173	258	19	14	67	8	172	141	193	17	235	89	500	41.4%	61.0%	94.2%

The number of translocated lamprey has steadily increased over the years since 2012, which started with only 15 lamprey (Table 3). The total accumulated number of translocated adult Pacific Lamprey in the Yakima Subbasin from 2012 (fall) - 2017 (spring) is 2576. The number of adult lamprey released in the last two years were slightly lower compared to 2014-2015 due to the increase in adult translocation numbers going outside the Yakima Subbasin in recent years (e.g. Methow and Wenatchee subbasins). The female ratio has fluctuated between 20-48% with an average of 38.4%, resulting in slightly higher numbers of males than females over the years, except for the 2011-2012 broodstock (with only 15 lamprey). Approximately 69.2% of all lamprey have been PIT tagged over the seven years to improve assessment of distribution and final destination of the released lamprey. Genetic tagging ratios have stayed close to 100% for all release years to track the success of translocation (via larval/juvenile sampling using parentage based genetics) with a current running average of 96.5%. In 2017 spring, a 38 fold increase in adult counts (compared to the previous 20-year average) was observed at Prosser Dam whereas broodstock counts from the Bonneville Dam more or less stayed level, indicating that adult returns can increase substantially in a relatively short period of time through adult translocation programs. Adult translocation began in 2012 with only 15 lamprey (Satus Creek only), and increased to 138 lamprey in 2013 (in three Yakima tributary streams), indicating that the increase in adult returns occurred only after effectively four years of translocation.

Table 3. Summary of all Yakama Nation Fisheries Pacific Lamprey translocation (broodstock 2011-2012 through 2017-2018). *Number of lamprey with genetic tags from 2012-2013 and 2013-2014 are approximate numbers.

Broodstock Year	# Total	# of Female	# of Male	# of Unknown	# with Pit Tags	# with Genetic Tags	Female Ratio	Pit Tag Ratio	Genetic Tag Ratio
2011-2012	15	9	6	-	14	15	60.0%	93.3%	100.0%
2012-2013	138	27	110	1	121	*135	19.7%	87.7%	95.7%
2013-2014	264	111	144	9	213	*250	43.5%	80.7%	94.7%
2014-2015	752	201	492	59	546	735	29.0%	72.6%	97.7%
2015-2016	447	191	249	7	151	427	43.4%	33.8%	95.5%
2016-2017	429	191	209	29	414	424	47.8%	96.5%	98.8%
2017-2018	531	192	272	67	324	500	41.4%	61.0%	94.2%
Total	2576	922	1482	172	1783	2486	38.4%	69.2%	96.5%

Lower Yakima River #1

In the Lower Yakima River, there were three release sites: 1) 70 lamprey were released at river km 73.5 downstream of Prosser Dam (left bank looking downstream) on April 12 and May 3, 2018 (35 lamprey each); 2) 2 lamprey were accidentally dropped within Prosser Dam Left Fish Ladder at river km 75.7 on May 16, 2018; and 3) 309 lamprey were released at river km 76.1 upstream of Prosser Dam on March 22, April 21, May 7, May 8, May 11, May 15, and May 21, 2018) (Fig. 5).

Water temperature was 10.2 and 15.4°C at the river km 73.5 site on April 12 and May 3, 2018, respectively, 16.0°C at the river km 75.7 site on May 16, 2018, and ranged from 8.7 to 16.3 at the river km 76.1 site between March 22 and May 21, 2018 (highest temperature during these releases was recorded on May 15, 2018, and then it attenuated). For early spring release, we target our releases to take place when the rivers/streams reach 7-12°C during late March to early April; however, these lamprey were released as an emergency measure (rather than scheduled releases) to prevent mortality at the hatchery and to increase the chances that lamprey survive to reach their spawning grounds successfully. Wild runs of Pacific Lamprey were migrating primarily later in the season during these warmer temperature conditions.

The primary goal for the releases downstream of Prosser Dam was to evaluate dam passage through the fish ladders and lamprey passage structures. The primary goal for the releases upstream of Prosser Dam was two-fold: 1) to evaluate the destination of lamprey upstream of Prosser Dam and the migration behavior into tributary streams, including translocation streams; and 2) to release the more sexually mature adults into the rivers/streams in a timely fashion so they can find spawning grounds on their own (prior to over ripening). Lamprey for the release upstream of the dam were predominantly sexually mature lamprey from Prosser Hatchery (many lamprey matured simultaneously around this time) that could not be held much longer in the tanks (due to their advanced sexual maturation stage). Due to the potential of lamprey holding underneath the PIT

arrays at Prosser Dam (or moving upstream to Roza Dam), all lamprey for these releases were tagged with 8 mm full duplex tags.

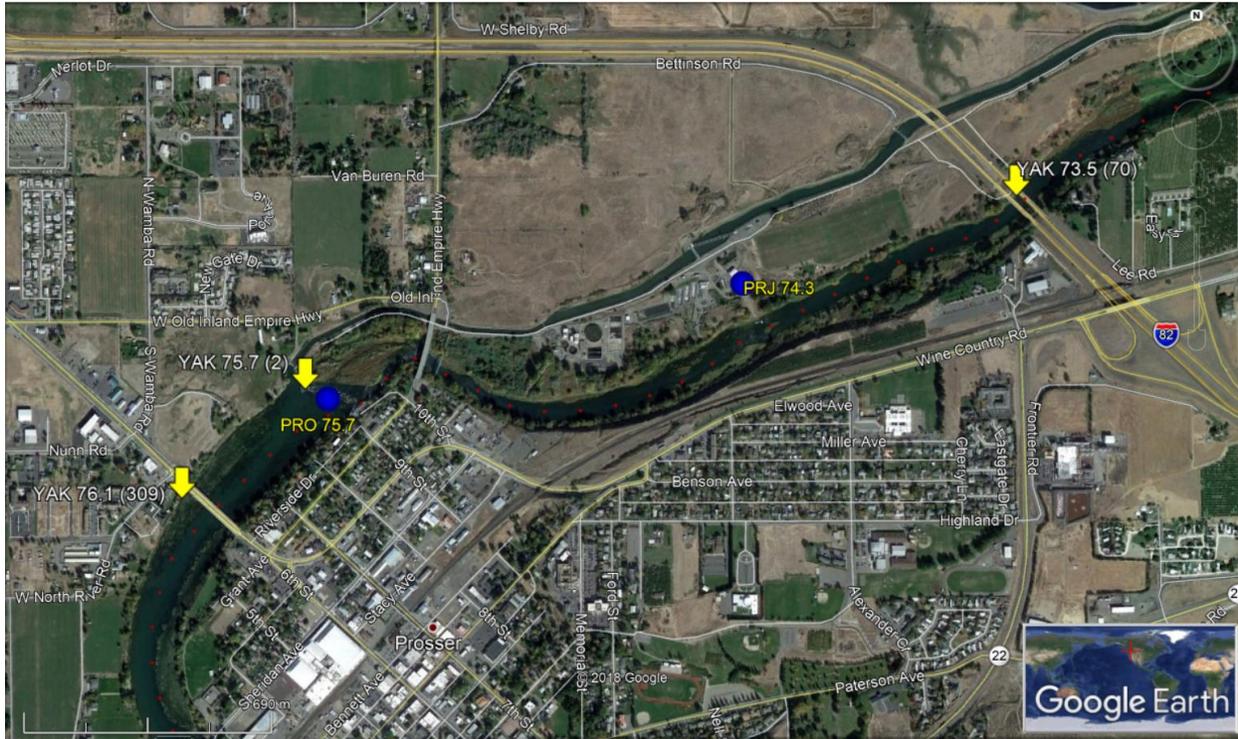


Figure 2. Aerial map of Pacific Lamprey translocation release sites (yellow arrows) in the Lower Yakima River. “YAK” stands for Yakima, the number next to the stream abbreviation is the river km, and the number in parenthesis is the total number of lamprey released. Also shown with the blue circles are the PIT tag array locations, including the location of Chandler Juvenile Monitoring Facility (PIT arrays are located on each of the three fish ladders at the dam). The red dots indicate 0.1 km segments of the Yakima River.

Lower Yakima River #2

There were three additional PIT tagged lamprey that were unaccounted for; they may have been released without being scanned or have escaped the Prosser Hatchery / Prosser Dam Fish Ladder Traps (river km 75.6) sometime between October 6, 2017, and May 29, 2018, and were later detected at Prosser Dam fish ladder (PRO). Because these were detected in the PTAGIS system, we report on these tagged lamprey to note their movement and destination.

Upper Yakima River

There was one release site in the Upper Yakima River: 1) 35 and 34 lamprey were released at river km 210.3 on April 26, 2018, and May 15, 2018 (Fig. 6).

Water temperature was 10.9 and 12.8°C at the release site on April 26, and May 15, 2018, respectively. For early spring release, we target our releases to take place when the rivers/streams reach 7-12°C.

The primary goal for the releases downstream of Roza Dam was to evaluate their passage at the dam and migration further upstream in the Upper Yakima Subbasin. Drainage holes within the Roza Fish Ladder weirs were widened (from 2” to 4”) in the lower section of the ladder during the winter of 2017, completing the widened drainage holes for the entire fish ladder (the upper section drainage holes were widened in winter of 2015). Whereas the holes are flush to the bottom of the floor in the upper section of the ladder, holes in the lower section were unfortunately offset from the floor bottom (~1 ft); Bureau of Reclamation staff were unable to drill the holes flush to the bottom due to the specific configuration of the weir structures in the lower section. Due to the potential of lamprey holding downstream of the ladder weir PIT arrays at Roza Dam, all lamprey for these releases were tagged with 8 mm full duplex tags.



Figure 3. Aerial map of Pacific Lamprey translocation release sites (yellow arrows) in the Upper Yakima River. “YAK” stands for Yakima, the number next to the stream abbreviation is the river km, and the number in parenthesis is the total number of lamprey released. Shown with the blue circles are the PIT tag array locations. The red dots indicate 0.1 km segments of the Yakima River.



Figure 7. Photos of the drainage holes at Roza Dam. Left photo is the original 2 inch hole, and the right photo is the new 4 inch holes.

Satus Creek

In Satus Creek, there were two release events: 1) 8 lamprey were released at river km 6.0 on May 30, 2018, 2) 12 and 3 lamprey were released at river km 31.3 on March 23, 2018, and March 30, 2018, respectively (Fig. 2). Water temperatures were 17.3, 7.1 and 10.7°C, respectively, during the three releases. For early spring release, we target our releases to take place when the rivers/streams reach 7-12°C.

The primary goal was two-fold: 1) to continue to increase the population abundance of Pacific Lamprey in Satus Creek and 2) to release the more sexually mature adults into the rivers/streams in a timely fashion so they can find spawning grounds on their own (prior to over ripening). Many of these lamprey were sexually mature lamprey from Prosser Hatchery (many lamprey matured simultaneously around this time) that could not be held much longer in the tanks (due to their advanced sexual maturation stage).

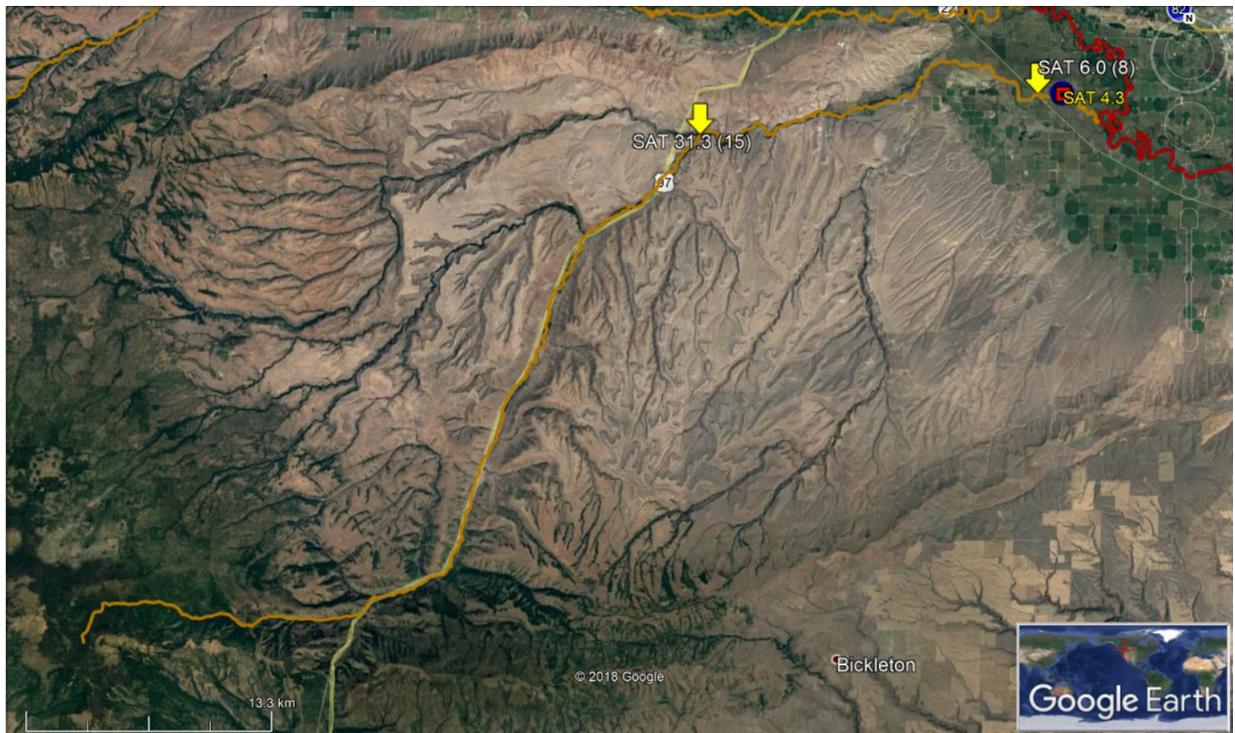


Figure 4. Aerial map of Pacific Lamprey translocation release site (yellow arrow) in Satus Creek (bottom orange line). “SAT” stands for Satus, the number next to the stream abbreviation is the river km, and the number in parenthesis is the total number of lamprey released. Also shown with the large blue circle is the PIT tag array location (river km 4.3), and the red square is the location of a screw trap for juvenile monitoring. Yakima River is the red line.

Toppenish Creek

In Toppenish Creek, there were two release events: 1) 25 lamprey were released at river km 54.4 on April 30, 2018; and 2) 10 lamprey were released at river km 61.6 on May 10, 2018 (Fig. 3). Water temperature were 11.8 and 15.0°C, respectively, during the two releases. For early spring release, we target our releases to take place when the rivers/streams reach 7-12°C.

The primary goal was two-fold: 1) to continue to increase the population abundance of Pacific Lamprey in Toppenish Creek and 2) to assess upstream movement through the Upper PIT arrays at Toppenish Creek river km 55.5 and Simcoe Creek river km 8.9.

The releases occurred in late spring, so they were released further upstream closer to the potential spawning ground reaches. Both upper arrays in upper Toppenish (river km 55.5) and Simcoe Creek (river km 8.9) were in operation during the spring release season (between March 22 and June 5, 2018, and between January 24 and June 4, 2018, respectively), but may not have detected post spawn downstream migration in mid-summer (typically May through July).

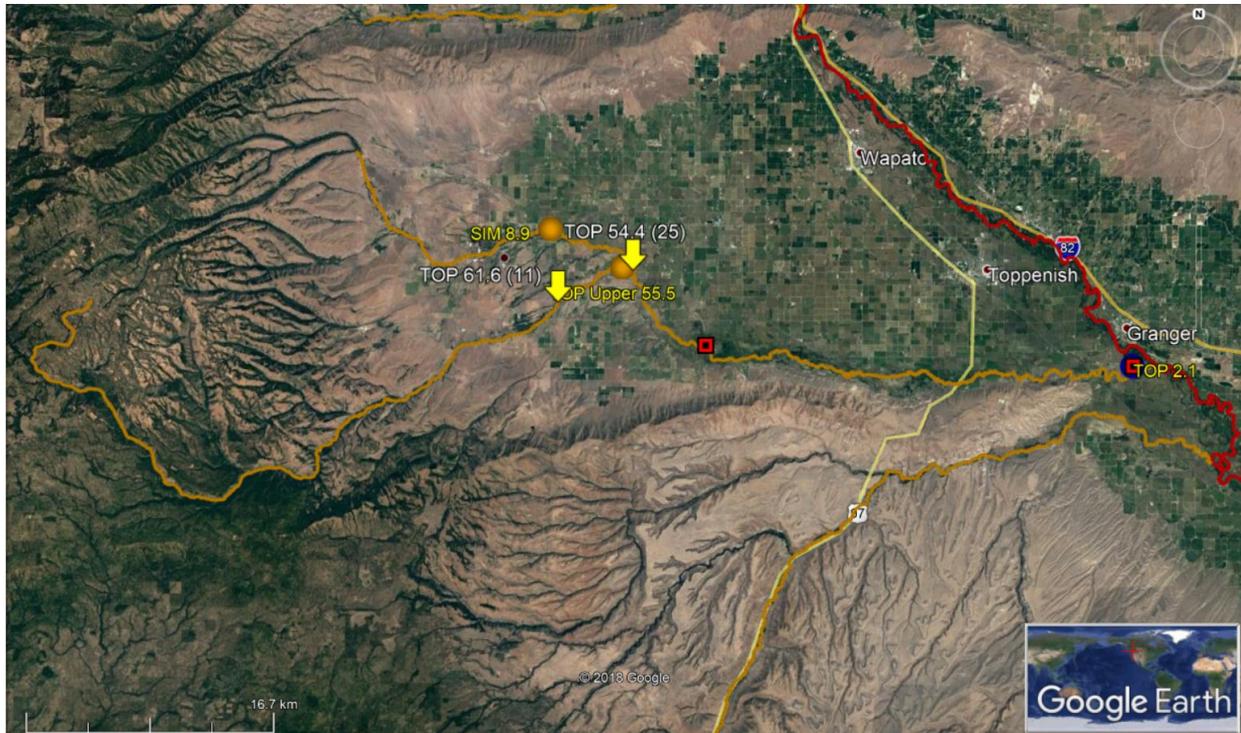


Figure 5. Aerial map of Pacific Lamprey translocation release sites (yellow arrows) in Toppenish Creek (upper orange line). “TOP” stands for Toppenish, the number next to the stream abbreviation is the river km, and the number in parenthesis is the total number of lamprey released. Also shown with the large blue and orange circles are the PIT tag array locations [one in lower Toppenish (river km 2.1), one in upper Toppenish (river km 55.5), and one in Simcoe Creek (river km 8.9)], and the red squares are the locations of screw traps for juvenile monitoring. Yakima River is the red line.

Ahtanum Creek

In Ahtanum Creek, there was one release event: 20 lamprey were released at river km 1.7 on April 11, 2018 (Fig. 4). Water temperature was 8.9 during the release. For early spring release, we target our releases to take place when the rivers/streams reach 7-12°C.

The primary goal was two-fold: 1) to continue to increase the population abundance of Pacific Lamprey in Ahtanum Creek and 2) to assess upstream movement through the lower PIT array at river km 4.0 (AHT).

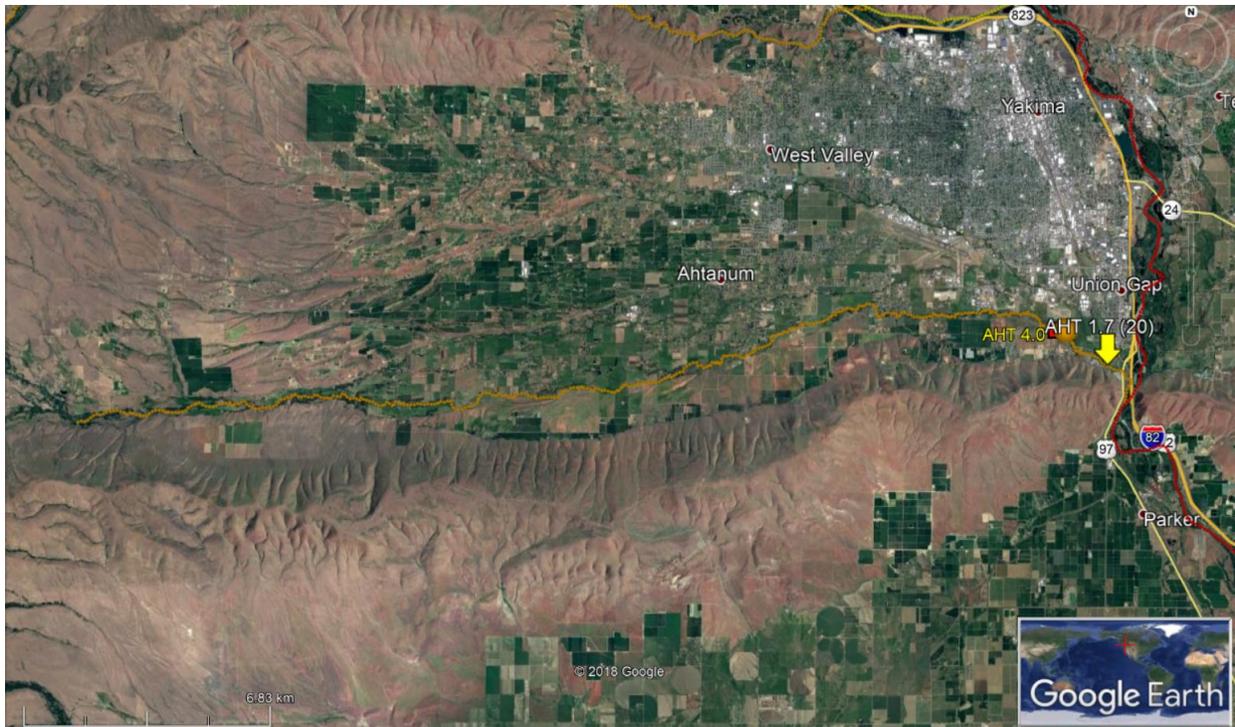


Figure 6. Aerial map of Pacific Lamprey translocation release site (yellow arrow) in Ahtanum Creek (orange dots / line). “AHT” stands for Ahtanum, the number next to the stream abbreviation is the river km, and the number in parenthesis is the total number of lamprey released. Also shown with the large orange circle is the PIT tag array location [one in lower Ahtanum (river km 4.0)], and the red square is the location of a screw trap for juvenile monitoring. Yakima River is the red line.

Part II: Pit Tag Detection and Analysis

From the PITAGIS regional data base (<http://www.ptagis.org/>), using Query Builder2 Reports, the interrogation data of individual PIT tagged lamprey are summarized. A total of 126 lamprey out of 324 total PIT tagged lamprey released (38.8%) were detected in at least one PIT array site. Only two lamprey (0.6%) were detected at two or more PIT array sites and none were detected at three or more PIT array sites. The total number of individual lamprey detections from all the PIT array sites were 138 (Table 4). First detection was on April 12, 2018 (21 days after first release) and last detection was on August 23, 2018 (154 days after first release).

There are a total of three instream PIT array sites on the mainstem Yakima River (river km 75.7, 171.2, and 210.5) and many more within the tributaries (Fig. 8). Within the Lower Yakima, there are two sites in Toppenish Creek (river km 2.1 and 55.5), and one site each in Simcoe (river km 8.9), Satus (river km 4.3), and Ahtanum (river km 4.0) creeks. Within the Upper Yakima, there are three sites within Teanaway River (river km 0.4, 19.8, and North Fork Teanaway river km 0.2), two sites within Menastash (river km 2.2 and 9.3) and Taneum (river km 0.1 and 3.6), and one site each within Swaulk (river km 0.3). Additional sites are being established in other tributaries (e.g. Naches, Cowiche, Tieton, Wenas, Reecer, and Cle Elum) and side channels / canals (Marion Drain, Holmes Acclimation channel) as well. Some of these arrays are temporary and are not running year around. Most sites have a pair of arrays, consisting of lower (downstream) and an upper (upstream) array.

Based on data provided by the flow monitoring station within Yakima River (river km 177.7), the release events occurred primarily during the beginning of the snow melt peak flow (Fig. 9). Discharge ranged approximately between 2,750-7,750 cfs within the Yakima River during the adult release period. The last detection was on August 23, 2018, which corresponds to the start of a decline in summer discharge in the subbasin (second decline after the large decline in May and June).

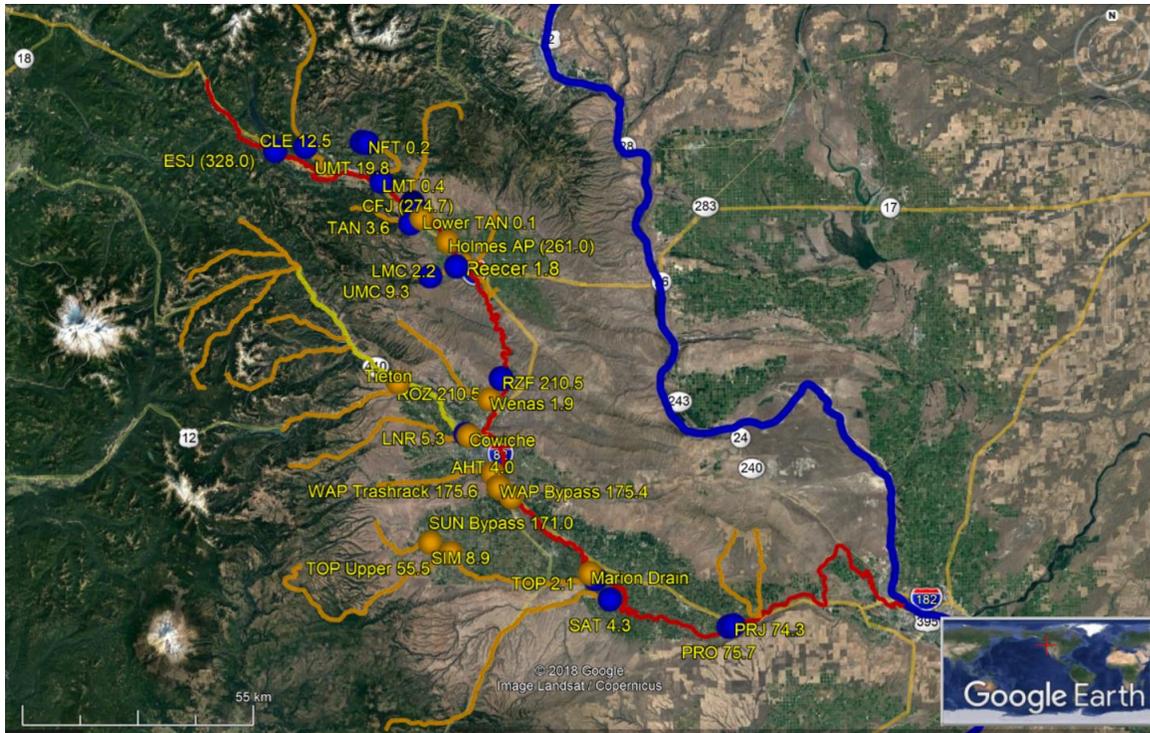


Figure 8. Overall aerial map of PIT tag arrays within the Yakima Subbasin. The two- to three-letter abbreviation or name and its associated river km is labeled in yellow font. The red line represents mainstem Yakima River, the orange lines represent its tributaries, and the blue line represents the Columbia River.

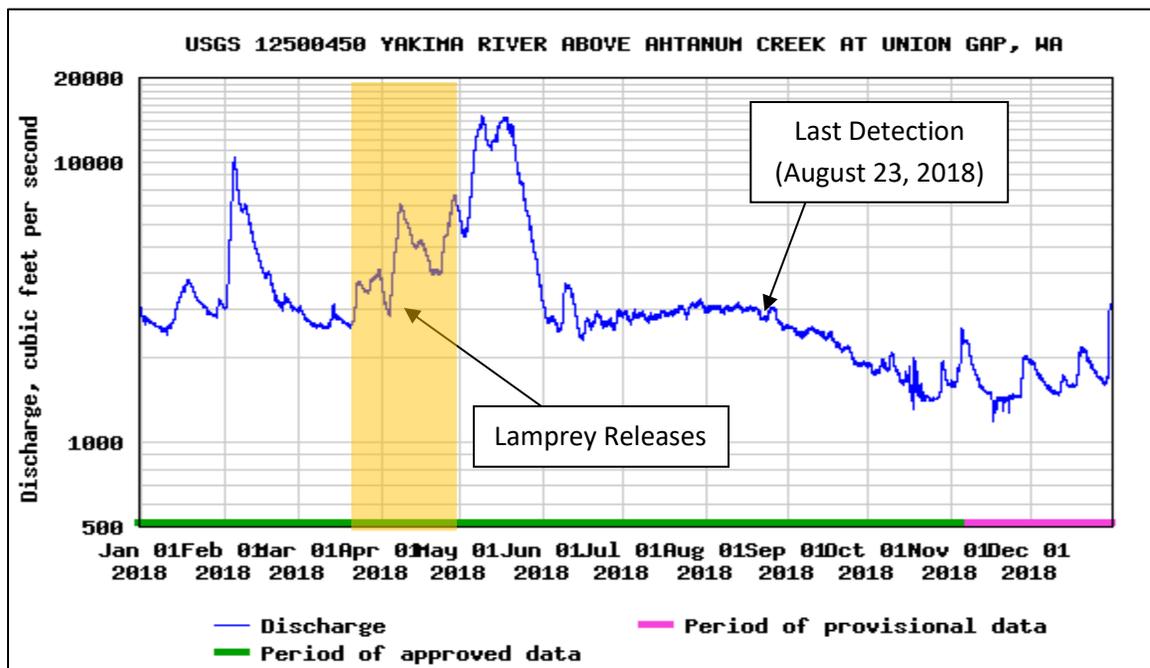


Figure 97. Discharge (cubic feet per second) data of the Yakima River at Union Gap, WA (river km 177.7) between January 1, 2018, and December 31, 2018 (US Geological Survey National Water Information System: Web Interface), and associated lamprey release and detection information.

The detection summary from each release groups are described below. The first bullet point summarizes the overall detection percentages, the second bullet point summarizes the location of first detections, and if there were any lamprey with multiple detections, the following bullet point summarizes those additional detection locations, and finally the last bullet point summarizes the overall detection from all detections, including multiple detections.

A table is also attached to provide summary data on first detection of all detected lamprey (ordered by detection site longitude primarily and by detection date secondarily), including the site name, first and last detection date/time, days since release (or days since last detection for second or third detections), distance traveled, migration speed, duration of detection, movement direction, first and last antenna, and total number of detections. Some of the columns are color coded to emphasize the high and low values (high values are blue and low values are red hued colors). If there were multiple detections by any individual lamprey, additional tables were provided. The primary purpose of these tables is to provide more information and data for readers that are interested in more than the simple overview of the detections, including specific antenna detections, movement speed, and temporal timing of the detections.

Lower Yakima River #1 (River KM 73.5; 4/12/2018; n=35)

- Twenty-one of 35 lamprey (60%) were detected, and one (3%) was detected at two sites.
- Of the 21 first detections, 20 detections (95%) were from lamprey moving upstream to PRO (Prosser Diversion Dam Combined; river km 75.7; Fig. 10), and one detection (5%) was from lamprey moving downstream to B2J (Bonneville Dam PH2 Juvenile Facility; river km 229.5; Fig. 11).
- One of the 35 lamprey that was not detected at any of the PIT array sites was recaptured at one of the Prosser Dam lamprey passage structures.

Table 4. Summary of first detections from Lower Yakima River (river km 73.5) release on April 12, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site		River		First Time Value	Days Since Release	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction?	First	Last	#
	Code	Site #	River	KM									Ant. ID	Ant. ID	
1	BZJ	1	Columbia	229.5	6/4/18 2:11	52.6	-377.3	-7.2	6/4/18 2:12	0.0	1.58	Down	1	82	10
2	PRO	1	Yakima	75.7	4/15/18 11:29	3.0	2.2	0.7	4/15/18 11:30	0.0	0.77	Up	6	5	6
3	PRO	2	Yakima	75.7	4/20/18 7:37	7.8	2.2	0.3	4/20/18 7:39	0.0	1.92	Up	2	1	1507
4	PRO	3	Yakima	75.7	4/21/18 2:16	8.6	2.2	0.3	4/21/18 2:18	0.0	1.87	Up	6	5	21
5	PRO	4	Yakima	75.7	4/21/18 2:57	8.6	2.2	0.3	4/21/18 2:57	0.0	0.10	Up	6	5	4
6	PRO	5	Yakima	75.7	4/21/18 6:50	8.8	2.2	0.3	4/21/18 6:50	0.0	0.18	Up	6	5	10
7	PRO	6	Yakima	75.7	4/23/18 0:29	10.5	2.2	0.2	4/23/18 0:29	0.0	0.37	Up	4	3	2
8	PRO	7	Yakima	75.7	4/23/18 21:22	11.4	2.2	0.2	4/23/18 21:22	0.0	0.23	Up	6	5	13
9	PRO	8	Yakima	75.7	4/23/18 23:44	11.5	2.2	0.2	4/23/18 23:47	0.0	2.33	Up	6	5	36
10	PRO	9	Yakima	75.7	4/24/18 5:30	11.7	2.2	0.2	4/24/18 5:34	0.0	3.22	Up	6	5	123
11	PRO	10	Yakima	75.7	4/24/18 22:13	12.4	2.2	0.2	4/24/18 22:15	0.0	1.85	Up	6	5	33
12	PRO	11	Yakima	75.7	4/25/18 0:41	12.5	2.2	0.2	4/25/18 0:44	0.0	3.53	Up	6	5	41
13	PRO	12	Yakima	75.7	5/2/18 23:36	20.5	2.2	0.1	5/2/18 23:39	0.0	2.60	Up	6	5	25
14	PRO	13	Yakima	75.7	5/4/18 0:36	21.5	2.2	0.1	5/4/18 0:36	0.0	0.13	Up	6	6	6
15	PRO	14	Yakima	75.7	5/4/18 17:55	22.2	2.2	0.1	5/4/18 17:57	0.0	2.22	Up	2	1	13
16	PRO	15	Yakima	75.7	5/5/18 4:31	22.7	2.2	0.1	5/5/18 4:34	0.0	3.40	Up	2	1	29
17	PRO	16	Yakima	75.7	5/27/18 1:27	44.5	2.2	0.0	5/27/18 1:36	0.0	9.35	Up	2	1	1885
18	PRO	17	Yakima	75.7	5/30/18 23:26	48.4	2.2	0.0	5/30/18 23:30	0.0	4.10	Up	2	1	231
19	PRO	18	Yakima	75.7	6/1/18 22:51	50.4	2.2	0.0	6/1/18 22:53	0.0	1.75	Up	6	5	74
20	PRO	19	Yakima	75.7	6/2/18 23:05	51.4	2.2	0.0	6/2/18 23:09	0.0	3.57	Up	2	1	8
21	PRO	20	Yakima	75.7	6/4/18 0:11	52.5	2.2	0.0	6/4/18 0:16	0.0	5.02	Up	6	5	13

- Thirteen (65%), six (30%), and one (5%) of 20 detections occurred on the right, left, and center fish ladders, respectively. Nineteen (95%) of these 20 detections within the fish ladder were last detected at the upper array, indicating those likely passed Prosser Dam. The median number of days to pass the dam since release were 10.5, 11.7, and 33.6 days for the center, right, and left ladders, respectively, indicating the left ladder takes considerably more time to pass compared to the other ladders.
- The number of detections at PRO site ranged from 2 to 1885 hits (ranging between 0.37 seconds to 9.35 seconds). Lamprey do not appear to be holding in front of the arrays anymore as was documented to be a problem in summer of 2017.
- One of the 21 lamprey (50%) first detected at PRO, was also detected later at ROZ (Roza Diversion Dam Combined; river km 210.5; Fig. 12). This adult was detected at Roza Dam for 40.9 days and was last detected at the upper weir array (however, it is uncertain if it passed the upper most section of the fish ladder). The total number of detection hits were 35,675, indicating that it spent a lot of time in front of the PIT tag arrays within the lower fish ladder weirs at Roza Dam.

Table 5. Summary of second detections from Lower Yakima River (river km 73.5) release on April 12, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site Code	Site #	River	River KM	First Time Value	Days Since Detection	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction ?	First Ant. ID	Last Ant. ID	# Reads
	1	ROZ	1	Yakima	210.5	5/9/18 1:13	23.6	134.8	5.7	6/18/18 23:53	40.9	58960.1	Up	3	1

- In the end, of the 35 lamprey, 20 (57%) were detected at PRO, one (8%) was detected at ROZ, and one (8%) was detected at B2J.

Lower Yakima River #2 (River KM 73.5; 5/3/2018; n=35)

- Sixteen of 35 lamprey (46%) were detected, and two (6%) was detected at two sites.
- All first detections (n=16) were from lamprey moving upstream to PRO (Prosser Diversion Dam Combined; river km 75.7; Fig. 10).
- Five lamprey that was not detected at any of the PIT array sites was recaptured at one of the Prosser Dam lamprey passage structures.

Table 6. Summary of first detections from Lower Yakima River (river km 73.5) release on May 3, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site Code	Site #	River	River KM	First Time Value	Days Since Release	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction ?	First Ant. ID	Last Ant. ID	# Reads
	1	PRO	1	Yakima	75.7	5/3/18 22:29	0.4	2.2	6.2	5/3/18 22:29	0.0	0.23	Up	6	5
2	PRO	2	Yakima	75.7	5/3/18 22:51	0.4	2.2	6.0	5/3/18 22:51	0.0	0.20	Up	6	5	9
3	PRO	3	Yakima	75.7	5/4/18 0:54	0.5	2.2	4.8	5/4/18 0:57	0.0	3.40	Up	6	5	29
4	PRO	4	Yakima	75.7	5/4/18 1:32	0.5	2.2	4.6	5/4/18 1:33	0.0	1.00	Up	6	5	14
5	PRO	5	Yakima	75.7	5/4/18 1:34	0.5	2.2	4.6	5/4/18 1:42	0.0	8.68	Up	6	5	196
6	PRO	6	Yakima	75.7	5/4/18 2:38	0.5	2.2	4.2	5/4/18 2:42	0.0	4.25	Up	6	5	50
7	PRO	7	Yakima	75.7	5/4/18 21:11	1.3	2.2	1.7	5/4/18 21:12	0.0	1.20	Up	6	5	44
8	PRO	8	Yakima	75.7	5/14/18 22:39	11.4	2.2	0.2	5/14/18 22:44	0.0	4.83	Up	6	5	10
9	PRO	9	Yakima	75.7	5/15/18 2:54	11.5	2.2	0.2	5/15/18 3:06	0.0	11.52	Up	6	5	1625
10	PRO	10	Yakima	75.7	5/22/18 16:00	19.1	2.2	0.1	5/22/18 16:05	0.0	5.43	Up	4	3	3
11	PRO	11	Yakima	75.7	5/22/18 23:13	19.4	2.2	0.1	5/22/18 23:22	0.0	8.28	Up	4	3	2
12	PRO	12	Yakima	75.7	5/23/18 14:50	20.0	2.2	0.1	5/23/18 14:53	0.0	3.00	Up	2	1	5
13	PRO	13	Yakima	75.7	5/23/18 17:25	20.1	2.2	0.1	5/23/18 17:28	0.0	3.12	Up	2	1	13
14	PRO	14	Yakima	75.7	5/28/18 1:34	24.5	2.2	0.1	5/28/18 1:38	0.0	4.28	Up	2	1	10
15	PRO	15	Yakima	75.7	5/30/18 19:41	27.2	2.2	0.1	5/30/18 19:44	0.0	2.63	Up	2	1	17
16	PRO	16	Yakima	75.7	6/3/18 0:31	30.4	2.2	0.1	6/3/18 0:35	0.0	4.13	Up	2	1	14

- All first detections at PRO occurred between May 3 and June 3, 2018 (0.4 and 30.4 days post release). Eleven of 21 (52%) detections occurred within 13 days after release; the remainder of detections were from 21-53 days after release. Duration of detection ranged

from 0.10 to 9.35 seconds. Time of day was between 17:57 and 11:30 (but primarily between 11 PM – 3 AM).

- Nine (56%), five (31%), and two (13%) of 16 detections occurred on the right, left, and center fish ladders. All of these within fish ladder detections were last detected at the upper array, indicating those lamprey likely passed Prosser Dam. The median number of days to pass the dam were 0.5, 19.2, and 24.5 days for the right, center, and left ladders, respectively, indicating the left and center ladders take considerably more time to pass compared to the right ladder.
- One of the 16 lamprey (6%) first detected at PRO was also detected later at ROZ (Roza Diversion Dam Combined; river km 210.5; Fig. 12). This adult was detected at Roza Dam for 40.9 days and was last detected at the upper weir array (however, it is uncertain if it passed the upper most section of the fish ladder). The total number of detections were 35,675, indicating that it spent a lot of time in front of the fish ladder weir PIT tag arrays.
- One of the 16 lamprey (6%) first detected at PRO was also detected later in the bypass outlet of Sunnyside Diversion Array (river km 171.0).

Table 7. Summary of second detections from Lower Yakima River (river km 73.5) release on May 3, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site Code Value	Site #	River	River KM	First Time Value	Days Since Detection	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction?	First	Last	#
													Ant. ID	Ant. ID	
1	ROZ	1	Yakima	210.5	6/11/18 22:16	38.8	134.8	3.5	6/18/18 0:05	6.1	8748.6	Up	3	2	7768
2	SDA	1	Yakima	171	6/5/18 4:36	12.5	95.3	7.6	6/5/18 4:36	0.0	0.0	Up/Down	6	6	1

- In the end, of the 35 lamprey, 16 (46%) were detected at PRO, one (3%) at ROZ, and one (3%) at Sunnyside Diversion Array.

Lower Yakima River #3 (River KM 75.7; 5/16/2018; n=2)

- One of two lamprey (50%) that were accidentally dropped in the auxillary water of the upper fish ladder was detected, and none were detected at two sites.
- The first detection was from lamprey moving into the Chandler smolt bypass separator at PRO (Prosser Diversion Dam Combined; river km 75.7; Fig. 10). This means that the lamprey likely found a way to pass the dam undetected and were later found moving downstream into the Chandler Diversion bypass.

Table 8. Summary of first detections from Lower Yakima River (river km 75.7) release on May 16, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	PRO	1	Yakima	75.7	6/2/18 21:54	17.5	0.0	0.0	6/2/18 21:54	0.0	0.02	Up/Down	A1	A3	#
1	PRO	1	Yakima	75.7	6/2/18 21:54	17.5	0.0	0.0	6/2/18 21:54	0.0	0.02	Up/Down	A1	A3	3

- In the end, of the two lamprey, one (50%) was detected at PRO.

Lower Yakima River #4 (River KM 76.1; 3/22/2018 through 5/21/2018; n=120)

- Eight of 120 lamprey (7%) were detected, and none were detected at two sites.
- Of the eight first detections, six detections (75%) were from lamprey moving upstream initially, including two detections (25%) at SUN (Sunnyside Instream Array; river km 171.1), two detections (25%) at SAT (Lower Satus Creek; river km 4.3), one detection (13%) at Lower Ahtanum (river km 4.0) and one detection (13%) at ROZ (Roza Diversion Dam Combined; river km 210.5; Fig. 12). Two detections (29%) were from lamprey moving downstream initially, including one detection (14%) at PRO (Prosser Diversion Dam Combined; river km 75.7; Fig. 10) and one detection (14%) at MCJ (McNary Dam Juvenile; river km 464.9).

Table 9. Summary of first detections from Lower Yakima River (river km 76.1) release between March 22 and May 21, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

Release Date	Site Code	Site #	River	River KM	First Time Value	Days Since Release	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction ?	First Ant. ID	Last Ant. ID	#	
3/22/2018	1	MCJ	1	Columbia	464.9	4/13/18 22:39	22.4	-144.5	-6.5	4/13/18 22:40	0.0	0.17	Down	1	4	4
3/22/2018	2	SAT	1	Satus	4.3	4/12/18 22:54	21.4	40.4	1.9	4/12/18 22:54	0.0	0.00	Up	12	12	1
3/22/2018	3	SUN	1	Yakima	171.1	4/27/18 19:31	36.3	95.0	2.6	4/27/18 19:31	0.0	0.00	Up	0B	0B	1
4/21/2018	1	SAT	1	Satus	4.3	4/28/18 1:03	6.5	40.4	6.2	4/28/18 1:03	0.0	0.00	Up	14	14	1
4/21/2018	18	AHT	1	Ahtanum	4.0	5/15/18 1:02	23.5	104.7	4.5	5/15/18 1:02	0.0	0.00	Up	-	-	1
5/21/2018	1	PRO	1	Yakima	75.7	5/22/18 3:09	0.4	-0.4	-0.9	5/22/18 3:09	0.0	0.02	Down	A1	A3	3
5/21/2018	2	SUN	1	Yakima	171.1	6/29/18 0:02	38.3	95.0	2.5	6/29/18 0:02	0.0	0.00	Up	0E	0E	1
5/21/2018	3	ROZ	1	Yakima	210.5	6/20/18 1:16	29.4	134.4	4.6	8/18/18 1:37	59.0	84981.38	Up	3	1	19801

- In the end, of the 120 lamprey, two (2%) were detected at SUN, two (2%) at SAT, one (1%) at Lower Ahtanum, one (1%) at ROZ, one (1%) at PRO, and one (1%) at MCJ.

Lower Yakima River #5 (Unknown River KM; 10/24/2017 through 5/24/2018; n=3)

- Three lamprey that were not recorded to be released were detected at PRO (Prosser Diversion Dam Combined; river km 75.7; Fig. 10); these were adults that likely escaped the vertical wetted wall structures while they were being held inside the traps to attract wild adults. The release dates are unknown, but are estimated based on last detection from our scanners.
- Their PIT tag codes are the following: 3DA.1A19B397E8, 3DA.1A19B38FE6, 3D6.1D593D9509.
- One of these three lamprey were last detected at the upper array, indicating it likely passed the dam.

Table 10. Summary of first detections from Lower Yakima River (unknown river km) release between October 24, 2017, and May 24, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site		River	River KM	Days		River KM Travel	Migration		Duration (Days)	Duration (Sec)	Direction ?	First	Last	#
	Code	Site			Since	Release		Speed (km/day)	Last Time				Ant. ID	Ant. ID	
1	PRO	1	Yakima	75.7	5/29/18 22:49	0.2	-	#VALUE!	5/29/18 22:49	0.0	0.00	Up	1	1	3
2	PRO	2	Yakima	75.7	4/15/18 21:17	68.2	-	#VALUE!	4/15/18 21:18	0.0	1.50	Up	6	5	23
3	PRO	3	Yakima	75.7	10/24/17 4:16	17.6	-	#VALUE!	10/24/17 5:07	0.0	50.80	Up	2	2	49

- In the end, of the three lamprey, three (100%) were detected at PRO.

Upper Yakima River #1 (River KM 210.3; 4/26/2018; n=35)

- Twenty-seven of 35 lamprey (77%) were detected, and none were detected at two sites.
- Of the 27 first detections, all detections were from lamprey moving upstream initially to ROZ (Roza Diversion Dam Combined; river km 210.5; Fig. 12).
- Median number of days lamprey were detected at ROZ was 12.9 (minimum of 14 seconds to maximum of 56.2 days).
- Highest number of detections from an individual lamprey was 62,015 (30.4 days spent at the dam). This lamprey, as well as most of the other lampreys detected at Roza Dam, have ascended and descended the three fish ladder PIT array weirs repeatedly back and forth during this period.
- Nine of the 27 detected lamprey (33%) were last detected at the upstream weir PIT array. However, it is uncertain if those passed the upper most section of the fish ladder. The remaining (66%) likely moved downstream in the end.

Table 11. Summary of first detections from Upper Yakima River (river km 210.3) release on April 26, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site Code	Site #	River		First Time Value	Days Since Release	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction ?	First Ant. ID	Last Ant. ID	# Reads
			River	KM											
1	ROZ	1	Yakima	210.5	4/26/18 20:59	0.4	0.2	0.5	5/26/18 2:14	29.2	42075.62	Up	3	3	69989
2	ROZ	2	Yakima	210.5	4/27/18 1:36	0.6	0.2	0.3	4/27/18 2:03	0.0	26.97	Up	3	3	4
3	ROZ	3	Yakima	210.5	5/4/18 20:30	8.4	0.2	0.0	6/20/18 0:58	46.2	66508.65	Up	3	3	7242
4	ROZ	4	Yakima	210.5	5/6/18 23:34	10.5	0.2	0.0	5/19/18 21:21	12.9	18587.25	Up	3	2	6383
5	ROZ	5	Yakima	210.5	5/7/18 20:11	11.4	0.2	0.0	5/17/18 4:38	9.4	13466.33	Up	3	1	1118
6	ROZ	6	Yakima	210.5	5/7/18 21:16	11.4	0.2	0.0	5/16/18 9:48	8.5	12272.05	Up	3	3	2057
7	ROZ	7	Yakima	210.5	5/7/18 21:17	11.4	0.2	0.0	5/14/18 22:39	7.1	10161.70	Up	3	3	5079
8	ROZ	8	Yakima	210.5	5/7/18 21:20	11.4	0.2	0.0	5/7/18 1:27	1.2	1686.90	Up	3	3	12461
9	ROZ	9	Yakima	210.5	5/7/18 21:20	11.4	0.2	0.0	7/3/18 1:57	56.2	80916.37	Up	3	1	2377
10	ROZ	10	Yakima	210.5	5/7/18 22:39	11.5	0.2	0.0	5/8/18 12:24	0.6	824.63	Up	3	2	314
11	ROZ	11	Yakima	210.5	5/7/18 22:59	11.5	0.2	0.0	6/7/18 21:18	30.9	44538.95	Up	3	1	15604
12	ROZ	12	Yakima	210.5	5/7/18 23:10	11.5	0.2	0.0	6/21/18 21:19	44.9	64689.40	Up	3	1	3316
13	ROZ	13	Yakima	210.5	5/8/18 0:05	11.5	0.2	0.0	6/10/18 22:06	33.9	48841.05	Up	3	2	9467
14	ROZ	14	Yakima	210.5	5/8/18 0:36	11.6	0.2	0.0	6/2/18 23:42	26.0	37385.65	Up	3	1	22889
15	ROZ	15	Yakima	210.5	5/8/18 1:08	11.6	0.2	0.0	5/14/18 21:27	6.8	9859.77	Up	3	3	19577
16	ROZ	16	Yakima	210.5	5/8/18 22:14	12.5	0.2	0.0	5/21/18 21:55	13.0	18701.08	Up	3	3	16429
17	ROZ	17	Yakima	210.5	5/8/18 23:27	12.5	0.2	0.0	5/23/18 2:28	14.1	20341.52	Up	3	1	5445
18	ROZ	18	Yakima	210.5	5/9/18 22:55	13.5	0.2	0.0	6/9/18 7:26	30.4	43711.32	Up	3	3	62015
19	ROZ	19	Yakima	210.5	5/9/18 23:31	13.5	0.2	0.0	5/27/18 2:50	17.1	24678.93	Up	3	2	9299
20	ROZ	20	Yakima	210.5	5/13/18 0:44	16.6	0.2	0.0	6/8/18 3:47	26.1	37622.75	Up	3	3	3776
21	ROZ	21	Yakima	210.5	5/15/18 21:04	19.4	0.2	0.0	5/15/18 22:05	0.0	61.60	Up	3	3	258
22	ROZ	22	Yakima	210.5	5/16/18 20:19	20.4	0.2	0.0	6/18/18 22:34	33.1	47655.02	Up	3	3	41855
23	ROZ	23	Yakima	210.5	5/29/18 2:41	32.6	0.2	0.0	5/31/18 0:28	1.9	2746.67	Up	3	1	13729
24	ROZ	24	Yakima	210.5	6/4/18 21:44	39.4	0.2	0.0	6/17/18 0:20	12.1	17436.12	Up	3	1	12119
25	ROZ	25	Yakima	210.5	6/6/18 6:46	40.8	0.2	0.0	6/7/18 22:25	1.7	2378.67	Up	3	2	7991
26	ROZ	26	Yakima	210.5	6/6/18 22:06	41.5	0.2	0.0	6/6/18 22:21	0.0	14.45	Up	3	1	1187
27	ROZ	27	Yakima	210.5	6/18/18 21:46	53.4	0.2	0.0	6/20/18 1:16	1.1	1649.72	Up	3	3	2924

- In the end, of the 35 lamprey, 27 (77%) were detected at ROZ.

Upper Yakima River #2 (River KM 210.3; 5/15/2018; n=25)

- Sixteen of 25 lamprey (64%) were detected, and none were detected at two sites.
- Of the 25 first detections, all detections were from lamprey moving upstream initially to ROZ (Roza Diversion Dam Combined; river km 210.5; Fig. 12).
- Median number of days lamprey were detected at ROZ was 7.9 (minimum of 15 seconds to maximum of 92.1 days).
- Highest number of detections from an individual lamprey was 132,640 (92.1 days spent at the dam). This lamprey, as well as most of the other lampreys detected at Roza Dam, have ascended and descended the three fish ladder PIT array weirs repeatedly back and forth during this period.
- Four of the 16 detected lamprey (25%) were last detected at the upstream weir PIT array. However, it is uncertain if those passed the upper most section of the fish ladder. The remaining (75%) likely moved downstream in the end.

Table 12. Summary of first detections from Upper Yakima River (river km 210.3) release on May 15, 2018. See page 15 for the definition of the column headings. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	Site Code	Site #	River	River KM	First Time Value	Days Since Release	River KM Travel	Migration Speed (km/day)	Last Time Value	Duration (Days)	Duration (Sec)	Direction ?	First Ant. ID	Last Ant. ID	# Reads
	1	ROZ	1	Yakima	210.5	5/15/18 20:46	0.2	0.2	1.2	6/17/18 23:58	33.1	47712.33	Up	3	1
2	ROZ	2	Yakima	210.5	5/15/18 20:59	0.2	0.2	1.1	5/17/18 23:46	2.1	3047.62	Up	3	2	4722
3	ROZ	3	Yakima	210.5	5/15/18 21:46	0.2	0.2	0.9	6/6/18 0:24	21.1	30397.67	Up	3	2	4105
4	ROZ	4	Yakima	210.5	5/15/18 23:02	0.3	0.2	0.8	5/16/18 5:20	0.3	378.27	Up	3	3	1931
5	ROZ	5	Yakima	210.5	5/15/18 23:21	0.3	0.2	0.7	6/23/18 23:34	39.0	56173.38	Up	3	3	65057
6	ROZ	6	Yakima	210.5	5/15/18 23:34	0.3	0.2	0.7	6/5/18 3:14	20.2	29019.47	Up	3	3	1854
7	ROZ	7	Yakima	210.5	5/15/18 23:37	0.3	0.2	0.7	6/18/18 1:19	33.1	47622.02	Up	3	3	9612
8	ROZ	8	Yakima	210.5	5/16/18 1:22	0.4	0.2	0.6	5/26/18 13:06	10.5	15103.53	Up	3	3	5947
9	ROZ	9	Yakima	210.5	5/16/18 1:32	0.4	0.2	0.5	5/17/18 6:56	1.2	1764.03	Up	3	2	5276
10	ROZ	10	Yakima	210.5	5/16/18 17:12	1.0	0.2	0.2	5/21/18 20:06	5.1	7374.27	Up	3	3	12147
11	ROZ	11	Yakima	210.5	5/16/18 20:34	1.2	0.2	0.2	5/16/18 20:49	0.0	15.58	Up	3	3	601
12	ROZ	12	Yakima	210.5	5/16/18 22:14	1.2	0.2	0.2	5/22/18 8:03	5.4	7789.75	Up	3	1	25321
13	ROZ	13	Yakima	210.5	5/22/18 21:25	7.2	0.2	0.0	8/23/18 0:06	92.1	132640.72	Up	3	2	31866
14	ROZ	14	Yakima	210.5	5/22/18 22:00	7.2	0.2	0.0	6/4/18 23:07	13.0	18787.08	Up	3	3	6732
15	ROZ	15	Yakima	210.5	6/9/18 0:39	24.3	0.2	0.0	6/9/18 0:55	0.0	15.08	Up	3	1	1944
16	ROZ	16	Yakima	210.5	6/19/18 3:49	34.5	0.2	0.0	6/19/18 5:10	0.1	81.38	Up	3	1	8819

- In the end, of the 25 lamprey, 16 (64%) were detected at ROZ.

Satus Creek #1 (River KM 6.0; 5/30/2018; n=8)

- None of eight lamprey (0%) were detected.

None were released downstream of the one and only Satus PIT tag array site (SAT; river km 4.3), so detection is not expected here (unless they move downstream or display post spawning downstream drifting).

Satus Creek #2 (River KM 31.3; 3/23/2018; n=0)

None of the lamprey were PIT tagged for this release.

Satus Creek #3 (River KM 31.3; 3/30/2018; n=3)

- None of three lamprey (0%) were detected.

None were released downstream of the one and only Satus PIT tag array site (SAT; river km 4.3), so detection is not expected here (unless they move downstream or display post spawning downstream drifting).

Toppenish Creek #1 (River KM 54.4; 4/30/2018; n=25)

- Twenty-two of 25 lamprey (88%) were detected, and two (8%) were detected at two sites.
- Of the 22 first detections, all detections were from lamprey moving upstream initially, including 12 detections (55%) at Upper Toppenish (Toppenish Creek; river km 55.5), and 10 detections (45%) at SIM (Simcoe Creek; river km 8.9).
- Of the ten first detected at SIM, two (20%) were later detected at Upper Toppenish site.

Table 13. Summary of first detections from Toppenish Creek (river km 54.4) release on April 30, 2018. See page 15 for the definition of the column headings. TOP stands for Upper Toppenish Creek array and SIM stands for Simcoe array. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	TOP				SIM			
	First Detection	Days Since Release	Last Detection	Duration (sec)	First Detection	Days Since Release	Last Detection	Duration (sec)
1	4/30/18 15:38	0.3	4/30/18 15:38	0.68	#N/A	#N/A	#N/A	#N/A
2	4/30/18 20:09	0.5	4/30/18 20:13	3.57	#N/A	#N/A	#N/A	#N/A
3	4/30/18 20:21	0.5	4/30/18 20:25	3.68	#N/A	#N/A	#N/A	#N/A
4	4/30/18 20:50	0.5	4/30/18 20:52	2.46	#N/A	#N/A	#N/A	#N/A
5	4/30/18 20:59	0.5	4/30/18 20:59	0.20	#N/A	#N/A	#N/A	#N/A
6	4/30/18 21:07	0.5	4/30/18 21:11	3.32	#N/A	#N/A	#N/A	#N/A
7	4/30/18 21:12	0.5	4/30/18 21:12	0.28	#N/A	#N/A	#N/A	#N/A
8	4/30/18 21:30	0.5	4/30/18 21:31	0.14	#N/A	#N/A	#N/A	#N/A
9	4/30/18 21:57	0.5	4/30/18 22:02	4.57	#N/A	#N/A	#N/A	#N/A
10	4/30/18 22:04	0.5	4/30/18 22:05	0.29	#N/A	#N/A	#N/A	#N/A
11	4/30/18 23:05	0.6	4/30/18 23:07	1.83	#N/A	#N/A	#N/A	#N/A
12	5/8/18 22:13	8.5	5/8/18 22:13	0.23	#N/A	#N/A	#N/A	#N/A
13	#N/A	#N/A	#N/A	#N/A	5/1/18 3:25	0.8	5/1/18 3:25	0.25
14	#N/A	#N/A	#N/A	#N/A	5/1/18 4:02	0.8	5/1/18 4:02	0.00
15	5/1/18 21:18	1.5	5/1/18 21:22	4.00	5/1/18 4:27	0.8	5/1/18 4:27	0.33
16	#N/A	#N/A	#N/A	#N/A	5/1/18 22:12	1.5	5/1/18 22:12	0.16
17	5/2/18 0:11	1.6	5/2/18 0:11	0.00	5/1/18 22:19	1.5	5/1/18 22:21	1.67
18	#N/A	#N/A	#N/A	#N/A	5/1/18 23:41	1.6	5/1/18 23:43	1.85
19	#N/A	#N/A	#N/A	#N/A	5/3/18 5:10	2.8	5/3/18 5:10	0.37
20	#N/A	#N/A	#N/A	#N/A	5/3/18 5:18	2.8	5/3/18 5:21	2.54
21	#N/A	#N/A	#N/A	#N/A	5/5/18 2:11	4.7	5/5/18 2:11	0.19
22	#N/A	#N/A	#N/A	#N/A	5/18/18 22:06	18.5	5/18/18 22:07	0.19

- In the end, of the 25 lamprey, 14 (56%) were detected at Upper Toppenish and 10 (40%) were detected at SIM.

Toppenish Creek #2 (River KM 61.6; 5/10/2018; n=10)

- 0 of 8 (0%) were detected.

None were released downstream of the Upper Toppenish PIT tag array site (river km 55.5), so detection is not expected here (unless they move downstream or display post spawning downstream drifting).

Ahtanum Creek (River KM 1.7; 4/11/2018; n=17)

- Twelve of 17 lamprey (71%) were detected, and none were detected at more than one site.
- All detections were from lamprey moving upstream to the Lower Ahtanum array (river km 4.0).

Table 14. Summary of first detections from Ahtanum Creek (river km 1.7) release on April 11, 2018. See page 15 for the definition of the column headings. AHT stands for Lower Ahtanum Creek array. The number displayed in the first “#” column is the unique identifier for all individual lamprey detected at least once and remains the same for all the tables listed for this particular release.

#	AHT First Detection	Days		Duration (sec)
		Since Release	AHT Last Detection	
1	4/11/18 17:35	0.3	4/11/18 17:35	0.57
2	4/11/18 17:54	0.3	4/11/18 17:54	1.75
3	4/11/18 18:38	0.3	4/11/18 18:38	0.35
4	4/11/18 22:28	0.5	4/11/18 22:28	1.08
5	4/11/18 22:48	0.5	4/11/18 22:48	1.96
6	4/11/18 22:51	0.5	4/11/18 22:51	2.05
7	12:13:11 AM	0.5	12:13:15 AM	3.92
8	4/12/18 0:36	0.5	4/12/18 0:36	1.82
9	4/12/18 0:38	0.5	4/12/18 0:38	2.14
10	4/12/18 2:08	0.6	4/12/18 2:08	0.59
11	4/12/18 2:21	0.6	4/12/18 2:21	0.14
12	4/12/18 2:37	0.6	4/12/18 2:37	0.31

- In the end, of the 17 lamprey, 12 (71%) were detected at Lower Ahtanum.

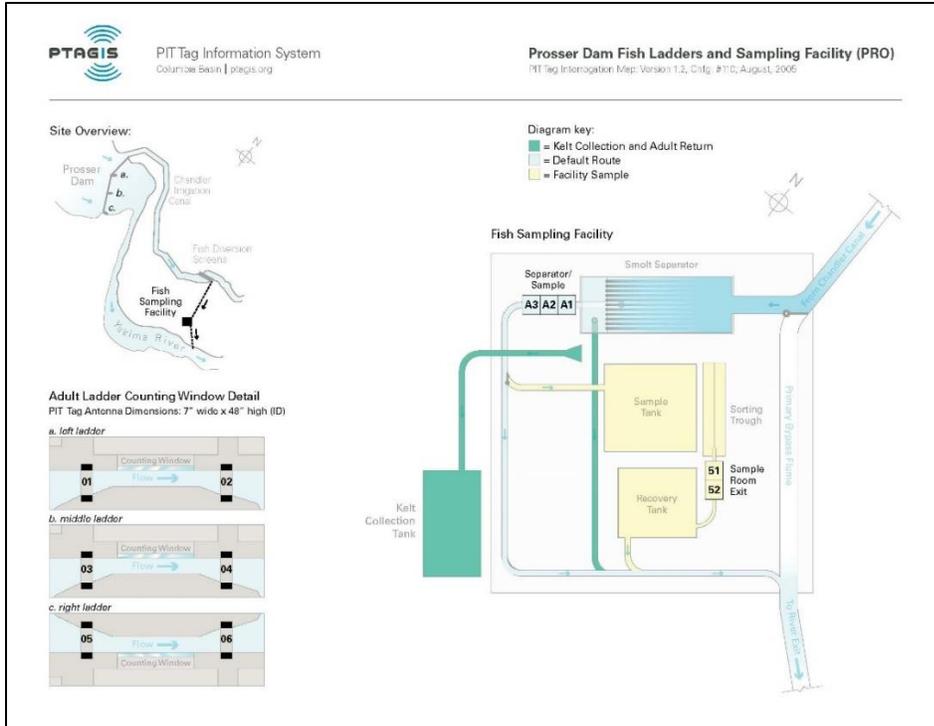


Figure 10. PIT array configuration at Prosser Diversion Dam.

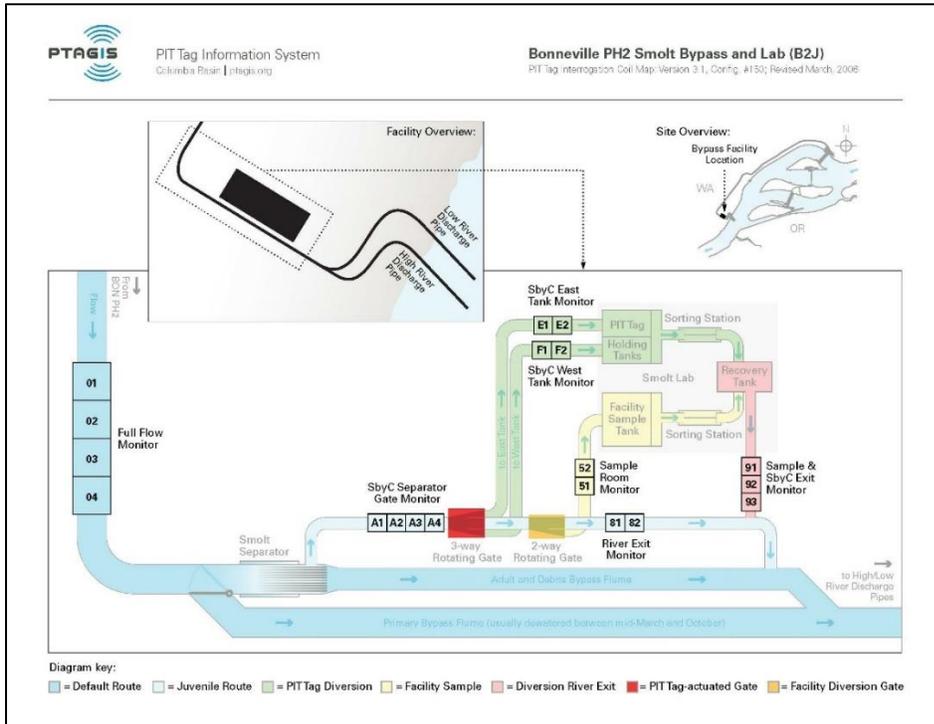
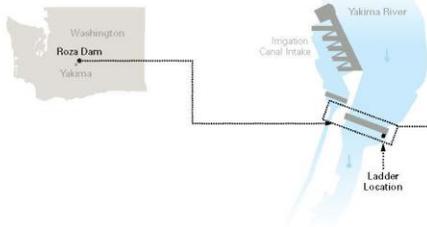


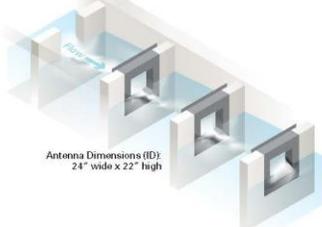
Figure 11. PIT array configuration at Bonneville Dam PH2 Smolt Bypass and Lab (B2J).



Site Overview:



Notched Weir Detail:



Site Detail:



Figure 12. PIT array configuration at Roza Diversion Dam.

Summary

The highlights from the 2017-2018 broodstock adult Pacific Lamprey translocation monitoring are the following (Table 15 and 16 and Fig. 13):

Overall

- The overall detection percentage of PIT tagged lamprey was 38.8%, which is typically what we observe with the Yakima Subbasin release.
- Sites that detected lamprey the most were ROZ (Roza Diversion Dam Combined; river km 210.5) at 14.6%, PRO (Prosser Diversion Dam Combined; river km 75.7) at 13.4%, Upper Toppenish (river km 55.5), and Lower Ahtanum (river km 4.0).
- The majority of lamprey detected were moving upstream initially (>75% for each release events).
- The highest proportion of detections were observed from the Upper Toppenish (88%), below Roza Dam (77%), and Lower Ahtanum (71%) releases.
- Based on the Upper Toppenish Creek release, 56% of the lamprey appeared to have chosen the upper Toppenish Creek, and 32% have chosen Simcoe Creek for spawning, and 12% were not detected (may have moved downstream or simply did not get detected by either of the PIT array sites). Spawning habitat is lacking between the release site and the two respective upper PIT array sites, so it is unlikely that lamprey remained in this area downstream of the PIT array sites for spawning. Based on these results, currently the overall attraction to upper Toppenish Creek appears slightly stronger than Simcoe Creek.
- Although fall migration is the primary migration timing observed at major hydro dams, many lamprey migrate considerable distances (>100 km) during the spring final migration within this type of tributary environments.
- The fastest upstream traveling lamprey detected was 7.6 km/day. This lamprey swam 95.3 km in 12.5 days (from Yakima river km 73.5 release).
- Three lamprey were detected outside of the Yakima Subbasin; two in MCJ (McNary Dam Juvenile; river km 464.9) and one in B2J (Bonneville PH2 Juvenile; river km 229.5).
- The proportion of lamprey released in the lower mainstem Yakima reaching translocation streams (Satus, Toppenish, Ahtanum) were low; many do not appear to migrate to these streams from the mainstem Yakima on their own from past mainstem releases.
- In 2019, we will continue to release a portion in the tributaries as well as a portion in the mainstem Yakima River (as part of paired releases downstream and upstream of Prosser and Roza dams) to help fully seed the entire Yakima Subbasin. The number of larval populations and outmigrating macrophthalmia from the three Lower Yakima translocation tributaries (Satus, Toppenish, and Ahtanum creeks) have increased steadily in recent years, indicating success in offspring production.

Table 15. Summary of 2017-2018 broodstock Pacific Lamprey translocation detection sites from the Yakima Subbasin releases. The three letter abbreviation assigned by PTAGIS is used for each of the detection site and site name provides more description. “Site Name” that start with * indicate that the site is not an official PTAGIS site and hence detection data are not currently available from the PTAGIS website.

Site Subbasin Name	Site Code Value	Site Name	River	River KM	# of Lamprey Detected	% of Lamprey Detected
Lower Columbia-Sandy	B2J	B2J - Bonneville PH2 Juvenile	Columbia	229.5	1	0.3%
Middle Columbia-Lake Wallula	MCJ	MCJ - McNary Dam Juvenile	Columbia	464.9	2	0.6%
Lower Yakima	PRO	PRO - Prosser Diversion Dam Combined	Yakima	75.7	42	13.4%
Lower Yakima	-	*Sunnyside Diversion Canal	Yakima	171.0	1	0.3%
Lower Yakima	SUN	SUN - Sunnyside Instream Array	Yakima	171.1	3	1.0%
Upper Yakima	ROZ	ROZ - Roza Diversion Dam (Combined)	Yakima	210.5	46	14.6%
Lower Yakima	SAT	SAT - Lower Satus Creek	Satus	4.3	2	0.6%
Lower Yakima	TOP	TOP - Lower Toppenish Creek	Toppenish	2.1	4	1.3%
Lower Yakima	-	*Upper Toppenish	Toppenish	55.5	14	4.5%
Lower Yakima	SIM	*Simcoe	Simcoe	8.9	10	3.2%
Lower Yakima	AHT	*Lower Ahtanum	Ahtanum	4.0	13	4.1%
Total Detections	-	-	-	-	138	-
Total # of Lamprey	-	-	-	-	126	38.9%

Table 16. Summary of PIT array detections from each release event (with at least one detection event) in the Yakima Subbasin for the 2017-2018 broodstock Pacific Lamprey translocation. For the release location, “YAK” stands for Yakima, “TOP” stands for Toppenish, “AHT” stands for Ahtanum, and the number next to the stream name is the river km (see Part I for more information). The three letter abbreviation assigned by PTAGIS is used for each of the detection site (see Table 15 for more description of the site). “% Initially Upstream” displays the percent of lamprey that had a first detection upstream (rather than downstream) after release.

Release \ Site	# Tagged	% Initially Upstream	Upper								SUN		Undetected	
			B2J	MCJ	PRO	SAT	TOP	TOP	SIM	AHT	SUN	(Canal)		
YAK 73.5 A	35	95%	3%	0%	57%	0%	0%	0%	0%	0%	0%	0%	3%	40%
YAK 73.5 B	35	100%	0%	0%	46%	0%	0%	0%	0%	0%	0%	3%	3%	54%
YAK 75.7	2	100%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	50%
YAK 76.1	120	75%	0%	1%	1%	2%	0%	0%	0%	1%	2%	0%	1%	93%
YAK 210.3 A	35	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	77%	23%
YAK 210.3 B	25	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	64%	36%
TOP 54.4	25	100%	0%	0%	0%	0%	0%	48%	40%	0%	0%	0%	0%	12%
AHT 1.7	17	100%	0%	0%	0%	0%	0%	0%	0%	71%	0%	0%	0%	29%

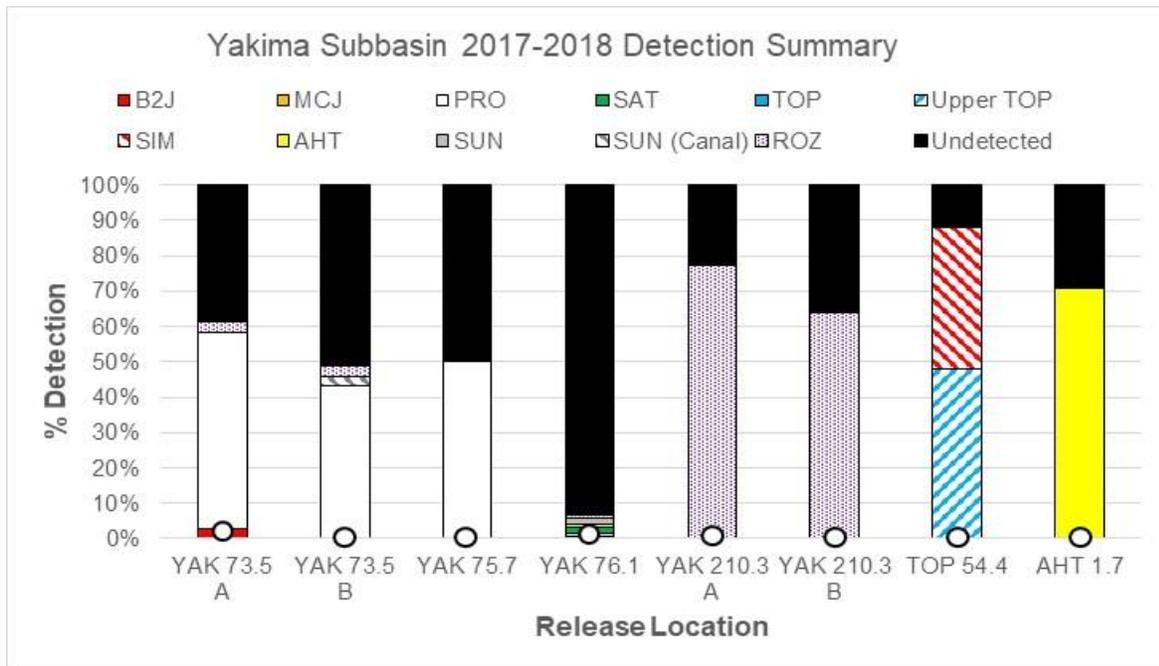


Figure 13. Summary of PIT array detections from each release event (with at least one detection event) in the Yakima Subbasin for the 2017-2018 broodstock Pacific Lamprey translocation. For the release location, “YAK” stands for Yakima, “TOP” stands for Toppenish, “AHT” stands for Ahtanum, and the number next to the stream name is the river km (see Part I for more information). The three letter abbreviation assigned by PTAGIS is used for each of the detection site (see Table 4 for more description of the site). The white circle on the graph indicates the relative location of the release in relation to the respective detection sites (sites above are upstream of the release sites, whereas those below are downstream).

Prosser Dam

- Adult lamprey holding underneath Prosser Dam fish ladder PIT arrays was an issue last year, but after we attached vexar plastic mesh to nearby surface areas, this does not appear to be an issue anymore (longest PIT tag detection duration was 11.5 seconds during spring 2018).
- The right fish ladder appears to attract the largest number of lamprey each year (in the early season in spring). Unlike the results from 2017, we did not detect lamprey moving between the fish ladders (based on first and last detections).
- Based on the release below Prosser Dam between April 12 and May 3, 2018, it was estimated that at least 46-54% were able to pass the dam using the fish ladders (based on PIT tag detection of passage). Surprisingly, none of the 37 lamprey that were detected passing the counting station PIT arrays were counted through the window count monitoring. In 2017, over 500 lamprey (a record number for one year) were counted through this window count monitoring.
- Although it is certainly possible that a lamprey could swim through the window count station undetected (i.e. motion sensor not getting triggered despite the lamprey presence),

the video surveillance system (Toshiba Surveillix) appears to be very efficient in picking up any lamprey moving through the station, even if they swim exclusively on the bottom floor or near surface of water (personal communication with fishing counting crew and Mark Johnson, YKFP). As a result, our best hypothesis is that the majority of these lamprey have likely passed through the picketed lead area instead of the counting window station.

- Underneath each of the two PIT array enclosures within the counting stations (shielded using fiberglass), there is a small area where PIT tags can be detected (small 1-2" range). Given the high flow environment at the counting station and the picketed lead area, lamprey may be keying into the flow break created by the fish counting window concrete structure. Hence, this may help explain why a large group of lamprey were detected moving through this seemingly narrow path of PIT detection behind the picketed leads.
- On the other hand, it is also possible that some tagged lamprey could pass the dam completely undetected (if they pass through the picketed lead areas); from radio telemetry work, the count efficiency at Prosser Dam was estimated to be ~43% (roughly 1 out of 2 lamprey passed the dam undetected).
- Based on mark recapture, a total of six lamprey were recaptured at the vertical wetted wall lamprey passage structures after the two release events below Prosser Dam. The total recapture rate is estimated to be 8.6% (first release recapture rate was only 2.9%, but the second release recapture rate was 14.3%). Some of the adults used for this Prosser Dam study were wild lamprey originally captured from the Prosser Dam lamprey passage structures; for the Prosser origin lamprey, the recapture rate was even higher (30%, three out of 10 lamprey). This may be the display of natural preference from individual lampreys for a particular migration route, or may be a display of differences between migrating wild runs of lamprey vs. translocated lamprey that have been held in holding tanks for several months.
- Total number of fish ladder counts during 2018 spring/summer (April – July) were only seven lamprey (Fig. 14 and 15). On the other hand, the total number of lamprey collected from the three vertical wetted wall lamprey passage structures was 224 (177 from the lower left ladder, 37 from the upper left ladder, and 10 from the right ladder). Although on the surface it initially appeared that a very high portion of lamprey (~97%) are passing through these vertical wetted wall passage structures, based on the PIT tag release study, we speculate that this estimate may be considerably biased due to the lamprey undercounting that occurs at the fish counting station.
- From the 2011-2012 USFWS radio telemetry, it was estimated that only ~43% of the adult lamprey passing Prosser Dam were being counted (i.e. ~57% are passing without being detected). The detection efficiency was especially low for the right fish ladder (~23%) in comparison to the center (~50%) and left (~83%) fish ladders from this year. The number of lamprey passing the dam unaccounted may vary widely from ladder to ladder as well as from year to year.

- In spring 2018 (starting on April 17, 2018), we made an effort to clean out all the sediment built up in front of the picketed lead to allow more lamprey to pass under the picketed lead (for easier passage). The amount of sediment built-up in this area was minimal in center and left fish ladders, but the right ladder had quite a bit of sediment built up (1 ft). Removing all of this sediment built-up at the beginning of the spring migration season may have increased the ratio of lamprey that were able to pass through the picketed lead area even more (hence, more lamprey evading the counting station).
- Furthermore, in 2018, Prosser Dam fish ladders were closed for an extended period (39%) between April 1, 2018 and May 31, 2018, totaling 24 days due to snow melt high water flooding (Table 17). Even though some of the ladder entrances are left open during these high flow shut downs, the upstream gates facing the forebay were closed tight (we confirmed on the right ladder that no space >0.25 inches were present by the upper gate for lamprey to pass during these closures). In addition, no lamprey PIT tags were detected during these closure periods despite the fact that the PIT monitoring are left “on” during this time, which suggest further that they may not be able to pass the dam during these closure periods. This potentially contributed to the large number of days it took for the lamprey to pass the dam in 2018 (see below).
- The median number of days it took for lamprey to pass the dam was much longer in 2018 compared to 2017 and it was consistently longer for the left fish ladder compared to the right and center fish ladders. There was also a seasonal tendency where more lamprey approached the right ladder during the early spring high flow season, whereas during the late spring lower flow conditions, more lamprey approached the left ladder. Passage through the left fish ladder may be more challenging compared to the other two ladders.
- In summary, the total number of adult Pacific Lamprey migrating to Prosser Dam is estimated to be 2,613 based on the mark-recapture rate of 8.6% from the vertical wetted wall lamprey passage structures, which captured a total of 224 lamprey. Based on PIT tag releases, we concluded that at least 1306 (~50%) are likely passing the dam through fish ladders. Based on this assessment, our estimate of the window count detection efficiency is ~0.5% (a much lower value than what was assessed in the past). It is uncertain what the fate of the remaining 1083 lamprey are; it is plausible that a portion of these lamprey may be passing the dam without being detected at all (neither by the window counts nor PIT tag detections). The lamprey passage structure overall passage efficiency is estimated to range between 8.6 and 17.2% of the total number of lamprey passing the dam (depending on the size of the run that may be passing the dam unnoticed).
- In 2019, we will conduct a paired release of lamprey downstream and upstream of the dam to help understand the portion of the run that passes the dam undetected and so that an estimate of total passage can be calculated.

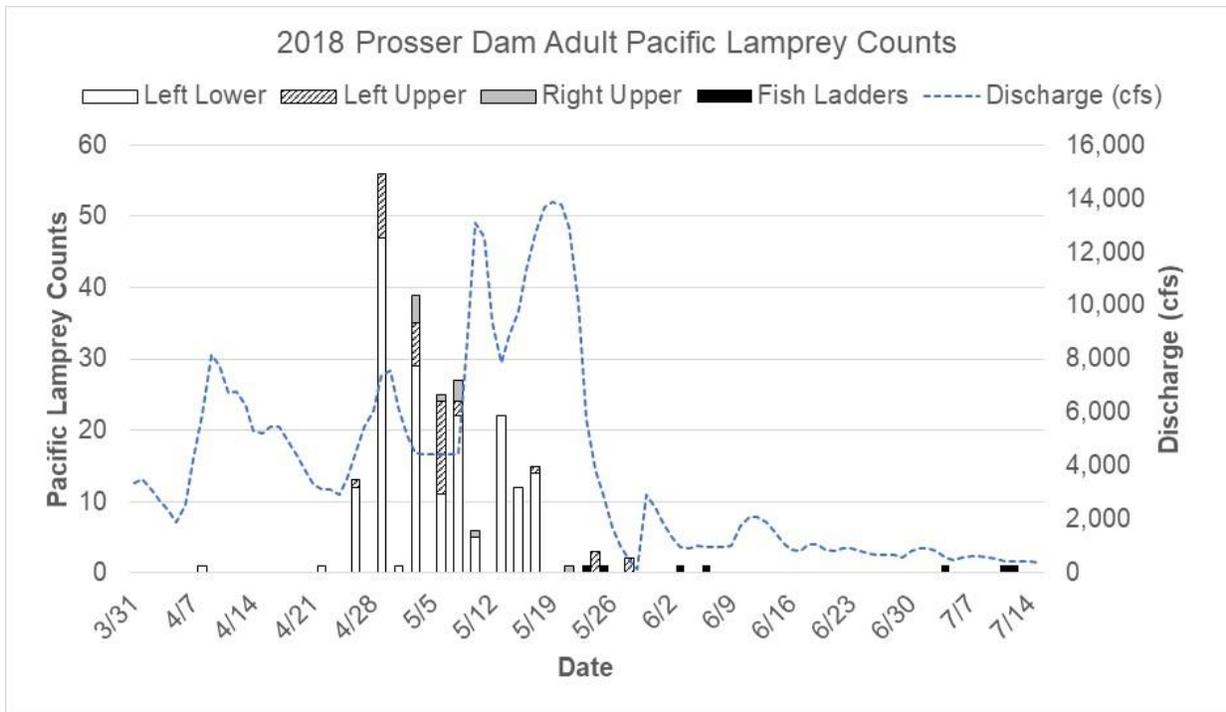


Figure 14. Adult Pacific Lamprey counts during spring/summer 2018 at Prosser Dam by specific migration routes (in relation to discharge conditions).

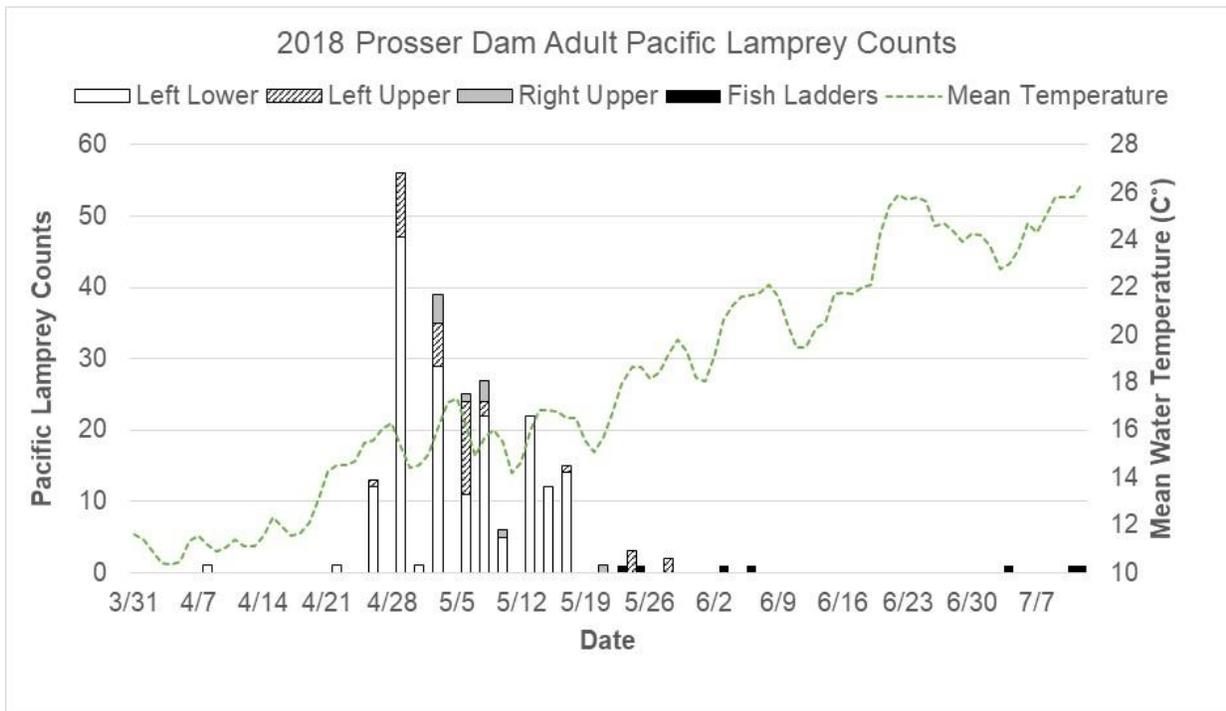


Figure 15. Adult Pacific Lamprey counts during spring/summer 2018 at Prosser Dam by specific migration routes (in relation to mean water temperature conditions).

Table 17. The range of dates that the fish ladders at Prosser Dam were closed during the spring snow melt season in 2018.

Ladder Closure Dates	# Days Closed
April 5-April 10, 2018	6
April 27-May 1, 2018	5
May 4, 2018	1
May 6-13, 2018	8
May 17-22, 2018	4
Total	24

Roza Dam

- Despite the lower abundance of Pacific Lamprey upstream of the Roza Dam in Upper Yakima, lamprey released below the dam continues to show a high percent of detection within the fish ladder (77 and 64% detections from the two releases). It is possible that more lamprey have approached the dam’s tailrace and made attempts to enter the ladder entrance without being detected.
- The median number of days that those detected lamprey have spent at the dam was 7.9 and 12.9 days from the two releases, with a maximum of 62,015 and 132,640 detections, displaying repeated ascending and descending of the downstream, middle, and upstream weir PIT arrays. Continuous holding by PIT arrays is still occurring at Roza Diversion Dam and will be closely examined in 2019 (focusing on issues and potential solutions). Half duplex tags will be used for 2019.
- Even though new drainage holes were drilled in the lower portion of the ladder (partially to help with lamprey passage), those holes were not flush with the floor unlike the upper ladder due to the physical configuration of the ladder design. This may have prevented lamprey from fully utilizing these alternate passage routes in the lower ladder (although it is still uncertain if lamprey are utilizing these drainage holes for passage in the upper ladder).
- A portion of the detected lamprey (33 and 25%) were last detected at the upstream weir PIT array, indicating they may have potentially passed the dam through the hole drilled in the upper trapping pool; however, the PIT tag array installed at the trapping pool (through the lamprey hole) was not operating normally in 2018 (due to noise issues) and there are no PIT data to confirm whether these have indeed passed the dam.
- In 2019, we will conduct a paired release of lamprey downstream and upstream of the dam and with a functioning PIT array at the upper trapping pool in place, we should be able to confirm whether lamprey are able to pass the upper part of the dam.

Supplemental Material: PIT Tag Information

“#” column below corresponds to the “#” displayed in the detection summary tables in Part II.

Total		Release		Release			
#	PIT Tag (Full ID)	#	Date	River	KM	Latitude	Longitude
1	3D6.1D593D94B1	1	4/12/2018	Yakima	73.5	46.217485	-119.747678
2	3D6.1D593D94B3	2	4/12/2018	Yakima	73.5	46.217485	-119.747678
3	3D6.1D593D9538	3	4/12/2018	Yakima	73.5	46.217485	-119.747678
4	3D6.1D593D94EA	4	4/12/2018	Yakima	73.5	46.217485	-119.747678
5	3D6.1D593D94BC	5	4/12/2018	Yakima	73.5	46.217485	-119.747678
6	3D6.1D593D9518	6	4/12/2018	Yakima	73.5	46.217485	-119.747678
7	3D6.1D593D94E7	7	4/12/2018	Yakima	73.5	46.217485	-119.747678
8	3D6.1D593D956B	8	4/12/2018	Yakima	73.5	46.217485	-119.747678
9	3D6.1D593D94B9	9	4/12/2018	Yakima	73.5	46.217485	-119.747678
10	3D6.1D593D94AD	10	4/12/2018	Yakima	73.5	46.217485	-119.747678
11	3D6.1D593D94C3	11	4/12/2018	Yakima	73.5	46.217485	-119.747678
12	3D6.1D593D94D7	12	4/12/2018	Yakima	73.5	46.217485	-119.747678
13	3D6.1D593D951D	13	4/12/2018	Yakima	73.5	46.217485	-119.747678
14	3D6.1D593D94DF	14	4/12/2018	Yakima	73.5	46.217485	-119.747678
15	3D6.1D593D9501	15	4/12/2018	Yakima	73.5	46.217485	-119.747678
16	3D6.1D593D955D	16	4/12/2018	Yakima	73.5	46.217485	-119.747678
17	3D6.1D593D94C2	17	4/12/2018	Yakima	73.5	46.217485	-119.747678
18	3D6.1D593D955A	18	4/12/2018	Yakima	73.5	46.217485	-119.747678
19	3D6.1D593D9539	19	4/12/2018	Yakima	73.5	46.217485	-119.747678
20	3D6.1D593D9523	20	4/12/2018	Yakima	73.5	46.217485	-119.747678
21	3D6.1D593D94AC	21	4/12/2018	Yakima	73.5	46.217485	-119.747678
22	3D6.1D593D94DC	22	4/12/2018	Yakima	73.5	46.217485	-119.747678
23	3D6.1D593D9537	23	4/12/2018	Yakima	73.5	46.217485	-119.747678
24	3D6.1D593D9567	24	4/12/2018	Yakima	73.5	46.217485	-119.747678
25	3D6.1D593D951A	25	4/12/2018	Yakima	73.5	46.217485	-119.747678
26	3D6.1D593D94F9	26	4/12/2018	Yakima	73.5	46.217485	-119.747678
27	3D6.1D593D951C	27	4/12/2018	Yakima	73.5	46.217485	-119.747678
28	3D6.1D593D94AA	28	4/12/2018	Yakima	73.5	46.217485	-119.747678
29	3D6.1D593D94C1	29	4/12/2018	Yakima	73.5	46.217485	-119.747678
30	3D6.1D593D9552	30	4/12/2018	Yakima	73.5	46.217485	-119.747678
31	3D6.1D593D9521	31	4/12/2018	Yakima	73.5	46.217485	-119.747678
32	3D6.1D593D94E0	32	4/12/2018	Yakima	73.5	46.217485	-119.747678
33	3D6.1D593D94EF	33	4/12/2018	Yakima	73.5	46.217485	-119.747678
34	3D6.1D593D94E9	34	4/12/2018	Yakima	73.5	46.217485	-119.747678
35	3D6.1D593D94DB	35	4/12/2018	Yakima	73.5	46.217485	-119.747678
36	3D6.1D593D94E3	1	5/3/2018	Yakima	73.5	46.217485	-119.747678
37	3D6.1D593D94BD	2	5/3/2018	Yakima	73.5	46.217485	-119.747678
38	3D6.1D593D9502	3	5/3/2018	Yakima	73.5	46.217485	-119.747678

39	3D6.1D593D93ED	4	5/3/2018	Yakima	73.5	46.217485	-119.747678
40	3D6.1D593D954E	5	5/3/2018	Yakima	73.5	46.217485	-119.747678
41	3D6.1D593D9546	6	5/3/2018	Yakima	73.5	46.217485	-119.747678
42	3D6.1D593D9534	7	5/3/2018	Yakima	73.5	46.217485	-119.747678
43	3D6.1D593D94F1	8	5/3/2018	Yakima	73.5	46.217485	-119.747678
44	3D6.1D593D94E4	9	5/3/2018	Yakima	73.5	46.217485	-119.747678
45	3D6.1D593D94F0	10	5/3/2018	Yakima	73.5	46.217485	-119.747678
46	3D6.1D593D94DE	11	5/3/2018	Yakima	73.5	46.217485	-119.747678
47	3D6.1D593D9511	12	5/3/2018	Yakima	73.5	46.217485	-119.747678
48	3D6.1D593D9568	13	5/3/2018	Yakima	73.5	46.217485	-119.747678
49	3D6.1D593D94C8	14	5/3/2018	Yakima	73.5	46.217485	-119.747678
50	3D6.1D593D94E6	15	5/3/2018	Yakima	73.5	46.217485	-119.747678
51	3D6.1D593D9549	16	5/3/2018	Yakima	73.5	46.217485	-119.747678
52	3D6.1D593D953E	17	5/3/2018	Yakima	73.5	46.217485	-119.747678
53	3D6.1D593D94F4	18	5/3/2018	Yakima	73.5	46.217485	-119.747678
54	3D6.1D593D9569	19	5/3/2018	Yakima	73.5	46.217485	-119.747678
55	3D6.1D593D9532	20	5/3/2018	Yakima	73.5	46.217485	-119.747678
56	3D6.1D593D9559	21	5/3/2018	Yakima	73.5	46.217485	-119.747678
57	3D6.1D593D962F	22	5/3/2018	Yakima	73.5	46.217485	-119.747678
58	3D6.1D593D9533	23	5/3/2018	Yakima	73.5	46.217485	-119.747678
59	3D6.1D593D94FB	24	5/3/2018	Yakima	73.5	46.217485	-119.747678
60	3D6.1D593D9551	25	5/3/2018	Yakima	73.5	46.217485	-119.747678
61	3D6.1D593D954D	26	5/3/2018	Yakima	73.5	46.217485	-119.747678
62	3D6.1D593D9525	27	5/3/2018	Yakima	73.5	46.217485	-119.747678
63	3D6.1D593D9514	28	5/3/2018	Yakima	73.5	46.217485	-119.747678
64	3D6.1D593D9522	29	5/3/2018	Yakima	73.5	46.217485	-119.747678
65	3D6.1D593D9554	30	5/3/2018	Yakima	73.5	46.217485	-119.747678
66	3D6.1D593D94D0	31	5/3/2018	Yakima	73.5	46.217485	-119.747678
67	3D6.1D593D955E	32	5/3/2018	Yakima	73.5	46.217485	-119.747678
68	3D6.1D593D962E	33	5/3/2018	Yakima	73.5	46.217485	-119.747678
69	3D6.1D593D94F6	34	5/3/2018	Yakima	73.5	46.217485	-119.747678
70	3D6.1D593D9531	35	5/3/2018	Yakima	73.5	46.217485	-119.747678
71	3D6.1D593D9544	1	5/16/2018	Yakima	75.7	46.212743	-119.773506
72	3D6.1D593D94DA	2	5/16/2018	Yakima	75.7	46.212743	-119.773506
73	3D6.1D593D94D9	1	3/22/2018	Yakima	76.1	46.210034	-119.777972
74	3D6.1D593D94A7	3	3/22/2018	Yakima	76.1	46.210034	-119.777972
75	3D6.1D593D9506	2	3/22/2018	Yakima	76.1	46.210034	-119.777972
76	3D6.1D593D94CC	4	3/22/2018	Yakima	76.1	46.210034	-119.777972
77	3D6.1D593D94EC	5	3/22/2018	Yakima	76.1	46.210034	-119.777972
78	3D6.1D593D94F8	6	3/22/2018	Yakima	76.1	46.210034	-119.777972
79	3D6.1D593D94F7	7	3/22/2018	Yakima	76.1	46.210034	-119.777972
80	3D6.1D593D94E5	8	3/22/2018	Yakima	76.1	46.210034	-119.777972
81	3DA.1A19B32B0D	9	3/22/2018	Yakima	76.1	46.210034	-119.777972
82	3DA.1A19B33996	10	3/22/2018	Yakima	76.1	46.210034	-119.777972

83	3DA.1A19B2F9B0	11	3/22/2018	Yakima	76.1	46.210034	-119.777972
84	3DA.1A19B39650	12	3/22/2018	Yakima	76.1	46.210034	-119.777972
85	3DA.1A19B394ED	13	3/22/2018	Yakima	76.1	46.210034	-119.777972
86	3DA.1A19B33C6B	14	3/22/2018	Yakima	76.1	46.210034	-119.777972
87	3DA.1A19B39616	15	3/22/2018	Yakima	76.1	46.210034	-119.777972
88	3DA.1A19B394AE	16	3/22/2018	Yakima	76.1	46.210034	-119.777972
89	3DA.1A19B2FA2D	17	3/22/2018	Yakima	76.1	46.210034	-119.777972
90	3DA.1A19B393F6	18	3/22/2018	Yakima	76.1	46.210034	-119.777972
91	3DA.1A19B38E06	19	3/22/2018	Yakima	76.1	46.210034	-119.777972
92	3DA.1A19B39533	20	3/22/2018	Yakima	76.1	46.210034	-119.777972
93	3DA.1A19B395A0	21	3/22/2018	Yakima	76.1	46.210034	-119.777972
94	3DA.1A19B394EB	22	3/22/2018	Yakima	76.1	46.210034	-119.777972
95	3DA.1A19B393AD	23	3/22/2018	Yakima	76.1	46.210034	-119.777972
96	3DA.1A19B396F6	24	3/22/2018	Yakima	76.1	46.210034	-119.777972
97	3D6.1D593D9561	1	4/21/2018	Yakima	76.1	46.210034	-119.777972
98	3D6.1D593D9513	2	4/21/2018	Yakima	76.1	46.210034	-119.777972
99	3D6.1D593D9542	3	4/21/2018	Yakima	76.1	46.210034	-119.777972
100	3D6.1D593D9503	4	4/21/2018	Yakima	76.1	46.210034	-119.777972
101	3D6.1D593D94FC	5	4/21/2018	Yakima	76.1	46.210034	-119.777972
102	3D6.1D593D94A6	6	4/21/2018	Yakima	76.1	46.210034	-119.777972
103	3D6.1D593D9530	7	4/21/2018	Yakima	76.1	46.210034	-119.777972
104	3D6.1D593D951B	8	4/21/2018	Yakima	76.1	46.210034	-119.777972
105	3D6.1D593D94E2	9	4/21/2018	Yakima	76.1	46.210034	-119.777972
106	3D6.1D593D956A	10	4/21/2018	Yakima	76.1	46.210034	-119.777972
107	3D6.1D593D9510	11	4/21/2018	Yakima	76.1	46.210034	-119.777972
108	3D6.1D593D94A8	12	4/21/2018	Yakima	76.1	46.210034	-119.777972
109	3D6.1D593D94C4	13	4/21/2018	Yakima	76.1	46.210034	-119.777972
110	3D6.1D593D96EF	14	4/21/2018	Yakima	76.1	46.210034	-119.777972
111	3D6.1D593D9508	15	4/21/2018	Yakima	76.1	46.210034	-119.777972
112	3D6.1D593D94BA	16	4/21/2018	Yakima	76.1	46.210034	-119.777972
113	3D6.1D593D94CD	17	4/21/2018	Yakima	76.1	46.210034	-119.777972
114	3D6.1D593D94FE	18	4/21/2018	Yakima	76.1	46.210034	-119.777972
115	3D6.1D593D94F3	19	4/21/2018	Yakima	76.1	46.210034	-119.777972
116	3D6.1D593D94D6	20	4/21/2018	Yakima	76.1	46.210034	-119.777972
117	3D6.1D593D94D4	21	4/21/2018	Yakima	76.1	46.210034	-119.777972
118	3D6.1D593D94AE	22	4/21/2018	Yakima	76.1	46.210034	-119.777972
119	3D6.1D593D94D1	23	4/21/2018	Yakima	76.1	46.210034	-119.777972
120	3D6.1D593D9560	24	4/21/2018	Yakima	76.1	46.210034	-119.777972
121	3D6.1D593D94C7	25	4/21/2018	Yakima	76.1	46.210034	-119.777972
122	3D6.1D593D9543	26	4/21/2018	Yakima	76.1	46.210034	-119.777972
123	3D6.1D593D9504	27	4/21/2018	Yakima	76.1	46.210034	-119.777972
124	3D6.1D593D9507	28	4/21/2018	Yakima	76.1	46.210034	-119.777972
125	3D6.1D593D9423	29	4/21/2018	Yakima	76.1	46.210034	-119.777972
126	3D6.1D593D94EE	30	4/21/2018	Yakima	76.1	46.210034	-119.777972

127	3D6.1D593D9520	31	4/21/2018	Yakima	76.1	46.210034	-119.777972
128	3D6.1D593D950D	32	4/21/2018	Yakima	76.1	46.210034	-119.777972
129	3D6.1D593D93F0	33	4/21/2018	Yakima	76.1	46.210034	-119.777972
130	3D6.1D593D94D5	34	4/21/2018	Yakima	76.1	46.210034	-119.777972
131	3D6.1D593D952E	35	4/21/2018	Yakima	76.1	46.210034	-119.777972
132	3D6.1D593D94AA	1	5/7/2018	Yakima	76.1	46.210034	-119.777972
133	3D6.1D593D955E	2	5/7/2018	Yakima	76.1	46.210034	-119.777972
134	3D6.1D593D9624	1	5/7/2018	Yakima	76.1	46.210034	-119.777972
135	3D6.1D593D95D4	2	5/7/2018	Yakima	76.1	46.210034	-119.777972
136	3D6.1D593D9619	3	5/7/2018	Yakima	76.1	46.210034	-119.777972
137	3D6.1D593D95E6	4	5/7/2018	Yakima	76.1	46.210034	-119.777972
138	3D6.1D593D95EE	5	5/7/2018	Yakima	76.1	46.210034	-119.777972
139	3D6.1D593D95D6	6	5/7/2018	Yakima	76.1	46.210034	-119.777972
140	3D6.1D593D95DB	7	5/7/2018	Yakima	76.1	46.210034	-119.777972
141	3D6.1D593D9606	8	5/7/2018	Yakima	76.1	46.210034	-119.777972
142	3D6.1D593D9550	9	5/7/2018	Yakima	76.1	46.210034	-119.777972
143	3D6.1D593D9613	10	5/7/2018	Yakima	76.1	46.210034	-119.777972
144	3D6.1D593D962D	11	5/7/2018	Yakima	76.1	46.210034	-119.777972
145	3D6.1D593D9600	12	5/7/2018	Yakima	76.1	46.210034	-119.777972
146	3D6.1D593D95DA	13	5/7/2018	Yakima	76.1	46.210034	-119.777972
147	3D6.1D593D95EC	14	5/7/2018	Yakima	76.1	46.210034	-119.777972
148	3D6.1D593D9529	15	5/7/2018	Yakima	76.1	46.210034	-119.777972
149	3D6.1D593D95F1	16	5/7/2018	Yakima	76.1	46.210034	-119.777972
150	3D6.1D593D960C	17	5/7/2018	Yakima	76.1	46.210034	-119.777972
151	3D6.1D593D95E7	18	5/7/2018	Yakima	76.1	46.210034	-119.777972
152	3D6.1D593D95FD	19	5/7/2018	Yakima	76.1	46.210034	-119.777972
153	3D6.1D593D95E3	20	5/7/2018	Yakima	76.1	46.210034	-119.777972
154	3D6.1D593D9541	21	5/7/2018	Yakima	76.1	46.210034	-119.777972
155	3D6.1D593D95E5	22	5/7/2018	Yakima	76.1	46.210034	-119.777972
156	3D6.1D593D95EB	23	5/7/2018	Yakima	76.1	46.210034	-119.777972
157	3D6.1D593D95FE	24	5/7/2018	Yakima	76.1	46.210034	-119.777972
158	3D6.1D593D95D7	25	5/7/2018	Yakima	76.1	46.210034	-119.777972
159	3D6.1D593D962E	1	5/8/2018	Yakima	76.1	46.210034	-119.777972
160	3D6.1D593D9522	2	5/8/2018	Yakima	76.1	46.210034	-119.777972
161	3D6.1D593D94F6	3	5/8/2018	Yakima	76.1	46.210034	-119.777972
162	3D6.1D593D95DF	1	5/11/2018	Yakima	76.1	46.210034	-119.777972
163	3D6.1D593D9604	2	5/11/2018	Yakima	76.1	46.210034	-119.777972
164	3D6.1D593D960B	3	5/11/2018	Yakima	76.1	46.210034	-119.777972
165	3D6.1D593D95E2	4	5/11/2018	Yakima	76.1	46.210034	-119.777972
166	3D6.1D593D9548	5	5/11/2018	Yakima	76.1	46.210034	-119.777972
167	3D6.1D593D9607	6	5/11/2018	Yakima	76.1	46.210034	-119.777972
168	3D6.1D593D95D8	7	5/11/2018	Yakima	76.1	46.210034	-119.777972
169	3D6.1D593D955F	8	5/11/2018	Yakima	76.1	46.210034	-119.777972
170	3D6.1D593D954B	9	5/11/2018	Yakima	76.1	46.210034	-119.777972

171	3D6.1D593D951F	10	5/11/2018	Yakima	76.1	46.210034	-119.777972
172	3D6.1D593D9634	11	5/11/2018	Yakima	76.1	46.210034	-119.777972
173	3D6.1D593D960A	12	5/11/2018	Yakima	76.1	46.210034	-119.777972
174	3D6.1D593D9610	13	5/11/2018	Yakima	76.1	46.210034	-119.777972
175	3D6.1D593D94FF	14	5/11/2018	Yakima	76.1	46.210034	-119.777972
176	3DA.1A19B3C7ED	1	5/21/2018	Yakima	76.1	46.210034	-119.777972
177	3DA.1A19B395E8	2	5/21/2018	Yakima	76.1	46.210034	-119.777972
178	3DA.1A19B39663	3	5/21/2018	Yakima	76.1	46.210034	-119.777972
179	3D6.1D593D954D	1	5/21/2018	Yakima	76.1	46.210034	-119.777972
180	3DA.1A19B39701	4	5/21/2018	Yakima	76.1	46.210034	-119.777972
181	3DA.1A19B393A5	5	5/21/2018	Yakima	76.1	46.210034	-119.777972
182	3DA.1A19B392D6	6	5/21/2018	Yakima	76.1	46.210034	-119.777972
183	3DA.1A19B393E1	7	5/21/2018	Yakima	76.1	46.210034	-119.777972
184	3DA.1A19B3930B	8	5/21/2018	Yakima	76.1	46.210034	-119.777972
185	3DA.1A19B396F8	9	5/21/2018	Yakima	76.1	46.210034	-119.777972
186	3D6.1D593D960E	10	5/21/2018	Yakima	76.1	46.210034	-119.777972
187	3DA.1A19B3952F	11	5/21/2018	Yakima	76.1	46.210034	-119.777972
188	3DA.1A19B3961A	12	5/21/2018	Yakima	76.1	46.210034	-119.777972
189	3DA.1A19B3950F	13	5/21/2018	Yakima	76.1	46.210034	-119.777972
190	3DA.1A19B393E4	14	5/21/2018	Yakima	76.1	46.210034	-119.777972
191	3DA.1A19B39530	15	5/21/2018	Yakima	76.1	46.210034	-119.777972
192	3DA.1A19B395A1	16	5/21/2018	Yakima	76.1	46.210034	-119.777972
193	3DA.1A19B3958D	17	5/21/2018	Yakima	76.1	46.210034	-119.777972
194	3DA.1A19B39378	18	5/21/2018	Yakima	76.1	46.210034	-119.777972
195	3DA.1A19B39466	19	5/21/2018	Yakima	76.1	46.210034	-119.777972
196	3DA.1A19B39729	20	5/21/2018	Yakima	76.1	46.210034	-119.777972
197	3DA.1A19B3949F	21	5/21/2018	Yakima	76.1	46.210034	-119.777972
198	3DA.1A19B3969E	22	5/21/2018	Yakima	76.1	46.210034	-119.777972
199	3D6.1D593D94D8	1	4/26/2018	Yakima	210.3	46.747407	-120.467084
200	3D6.1D593D9516	2	4/26/2018	Yakima	210.3	46.747407	-120.467084
201	3D6.1D593D94AB	3	4/26/2018	Yakima	210.3	46.747407	-120.467084
202	3D6.1D593D94E1	4	4/26/2018	Yakima	210.3	46.747407	-120.467084
203	3D6.1D593D94B7	5	4/26/2018	Yakima	210.3	46.747407	-120.467084
204	3D6.1D593D9556	6	4/26/2018	Yakima	210.3	46.747407	-120.467084
205	3D6.1D593D94B0	7	4/26/2018	Yakima	210.3	46.747407	-120.467084
206	3D6.1D593D94C6	8	4/26/2018	Yakima	210.3	46.747407	-120.467084
207	3D6.1D593D94E8	9	4/26/2018	Yakima	210.3	46.747407	-120.467084
208	3D6.1D593D94C9	10	4/26/2018	Yakima	210.3	46.747407	-120.467084
209	3D6.1D593D9540	11	4/26/2018	Yakima	210.3	46.747407	-120.467084
210	3D6.1D593D94DD	12	4/26/2018	Yakima	210.3	46.747407	-120.467084
211	3D6.1D593D94CB	13	4/26/2018	Yakima	210.3	46.747407	-120.467084
212	3D6.1D593D9564	14	4/26/2018	Yakima	210.3	46.747407	-120.467084
213	3D6.1D593D9524	15	4/26/2018	Yakima	210.3	46.747407	-120.467084
214	3D6.1D593D94CA	16	4/26/2018	Yakima	210.3	46.747407	-120.467084

215	3D6.1D593D94B4	17	4/26/2018	Yakima	210.3	46.747407	-120.467084
216	3D6.1D593D9526	18	4/26/2018	Yakima	210.3	46.747407	-120.467084
217	3D6.1D593D94C5	19	4/26/2018	Yakima	210.3	46.747407	-120.467084
218	3D6.1D593D94B2	20	4/26/2018	Yakima	210.3	46.747407	-120.467084
219	3D6.1D593D94BF	21	4/26/2018	Yakima	210.3	46.747407	-120.467084
220	3D6.1D593D953D	22	4/26/2018	Yakima	210.3	46.747407	-120.467084
221	3D6.1D593D94A9	23	4/26/2018	Yakima	210.3	46.747407	-120.467084
222	3D6.1D593D94BB	24	4/26/2018	Yakima	210.3	46.747407	-120.467084
223	3D6.1D593D94AF	25	4/26/2018	Yakima	210.3	46.747407	-120.467084
224	3D6.1D593D952C	26	4/26/2018	Yakima	210.3	46.747407	-120.467084
225	3D6.1D593D94EB	27	4/26/2018	Yakima	210.3	46.747407	-120.467084
226	3D6.1D593D94ED	28	4/26/2018	Yakima	210.3	46.747407	-120.467084
227	3D6.1D593D94C0	29	4/26/2018	Yakima	210.3	46.747407	-120.467084
228	3D6.1D593D94D2	30	4/26/2018	Yakima	210.3	46.747407	-120.467084
229	3D6.1D593D94CE	31	4/26/2018	Yakima	210.3	46.747407	-120.467084
230	3D6.1D593D9500	32	4/26/2018	Yakima	210.3	46.747407	-120.467084
231	3D6.1D593D955C	33	4/26/2018	Yakima	210.3	46.747407	-120.467084
232	3D6.1D593D94B6	34	4/26/2018	Yakima	210.3	46.747407	-120.467084
233	3D6.1D593D94BE	35	4/26/2018	Yakima	210.3	46.747407	-120.467084
234	3D6.1D593D95E4	1	5/15/2018	Yakima	210.3	46.747407	-120.467084
235	3D6.1D593D9628	2	5/15/2018	Yakima	210.3	46.747407	-120.467084
236	3D6.1D593D961F	3	5/15/2018	Yakima	210.3	46.747407	-120.467084
237	3D6.1D593D961E	4	5/15/2018	Yakima	210.3	46.747407	-120.467084
238	3D6.1D593D9566	5	5/15/2018	Yakima	210.3	46.747407	-120.467084
239	3D6.1D593D9515	6	5/15/2018	Yakima	210.3	46.747407	-120.467084
240	3D6.1D593D961C	7	5/15/2018	Yakima	210.3	46.747407	-120.467084
241	3D6.1D593D9616	8	5/15/2018	Yakima	210.3	46.747407	-120.467084
242	3D6.1D593D961B	9	5/15/2018	Yakima	210.3	46.747407	-120.467084
243	3D6.1D593D9555	10	5/15/2018	Yakima	210.3	46.747407	-120.467084
244	3D6.1D593D95F5	11	5/15/2018	Yakima	210.3	46.747407	-120.467084
245	3D6.1D593D95DD	12	5/15/2018	Yakima	210.3	46.747407	-120.467084
246	3D6.1D593D95E8	13	5/15/2018	Yakima	210.3	46.747407	-120.467084
247	3D6.1D593D95FB	14	5/15/2018	Yakima	210.3	46.747407	-120.467084
248	3D6.1D593D9558	15	5/15/2018	Yakima	210.3	46.747407	-120.467084
249	3D6.1D593D950A	16	5/15/2018	Yakima	210.3	46.747407	-120.467084
250	3D6.1D593D95EA	17	5/15/2018	Yakima	210.3	46.747407	-120.467084
251	3D6.1D593D956D	18	5/15/2018	Yakima	210.3	46.747407	-120.467084
252	3D6.1D593D95F8	19	5/15/2018	Yakima	210.3	46.747407	-120.467084
253	3D6.1D593D9605	20	5/15/2018	Yakima	210.3	46.747407	-120.467084
254	3D6.1D593D9627	21	5/15/2018	Yakima	210.3	46.747407	-120.467084
255	3D6.1D593D9528	22	5/15/2018	Yakima	210.3	46.747407	-120.467084
256	3D6.1D593D9563	23	5/15/2018	Yakima	210.3	46.747407	-120.467084
257	3D6.1D593D9547	24	5/15/2018	Yakima	210.3	46.747407	-120.467084
258	3D6.1D593D95D2	25	5/15/2018	Yakima	210.3	46.747407	-120.467084

259	3DA.1A19B39589	1	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
260	3DA.1A19B39621	2	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
261	3DA.1A19B39558	3	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
262	3DA.1A19B391AA	4	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
263	3DA.1A19B3937A	5	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
264	3DA.1A19B396FF	6	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
265	3DA.1A19B393EB	7	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
266	3DA.1A19B393D8	8	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
267	3DA.1A19B394E8	9	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
268	3DA.1A19B39382	10	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
269	3DA.1A19B394B4	11	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
270	3DA.1A19B396DD	12	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
271	3DA.1A19B396D2	13	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
272	3DA.1A19B33AB5	14	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
273	3DA.1A19B3965D	15	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
274	3DA.1A19B3939A	16	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
275	3DA.1A19B3941A	17	4/11/2018	Ahtanum	1.7	46.538344	-120.480006
276	3DA.1A19B394D8	1	5/30/2018	Satus	6.0	46.274145	-120.155678
277	3DA.1A19B395EB	2	5/30/2018	Satus	6.0	46.274145	-120.155678
278	3DA.1A19B31ABF	3	5/30/2018	Satus	6.0	46.274145	-120.155678
279	3DA.1A19B31D47	4	5/30/2018	Satus	6.0	46.274145	-120.155678
280	3DA.1A19B39354	5	5/30/2018	Satus	6.0	46.274145	-120.155678
281	3DA.1A19B390CF	6	5/30/2018	Satus	6.0	46.274145	-120.155678
282	3DA.1A19B38FCD	7	5/30/2018	Satus	6.0	46.274145	-120.155678
283	3DA.1A19B3911B	8	5/30/2018	Satus	6.0	46.274145	-120.155678
284	3D6.1D593D94F2	1	3/30/2018	Satus	31.3	46.253534	-120.396827
285	3D6.1D593D9536	2	3/30/2018	Satus	31.3	46.253534	-120.396827
286	3D6.1D593D950B	3	3/30/2018	Satus	31.3	46.253534	-120.396827
287	3DA.1A19B394A4	1	4/30/2018	Toppenish	54.4	46.375502	-120.619021
288	3DA.1A19B39519	2	4/30/2018	Toppenish	54.4	46.375502	-120.619021
289	3DA.1A19B39642	3	4/30/2018	Toppenish	54.4	46.375502	-120.619021
290	3DA.1A19B3C7B7	4	4/30/2018	Toppenish	54.4	46.375502	-120.619021
291	3DA.1A19B39292	5	4/30/2018	Toppenish	54.4	46.375502	-120.619021
292	3DA.1A19B3961E	6	4/30/2018	Toppenish	54.4	46.375502	-120.619021
293	3DA.1A19B393BD	7	4/30/2018	Toppenish	54.4	46.375502	-120.619021
294	3DA.1A19B3902B	8	4/30/2018	Toppenish	54.4	46.375502	-120.619021
295	3DA.1A19B396B6	9	4/30/2018	Toppenish	54.4	46.375502	-120.619021
296	3DA.1A19B39535	10	4/30/2018	Toppenish	54.4	46.375502	-120.619021
297	3DA.1A19B394A7	11	4/30/2018	Toppenish	54.4	46.375502	-120.619021
298	3DA.1A19B39434	12	4/30/2018	Toppenish	54.4	46.375502	-120.619021
299	3DA.1A19B3937D	13	4/30/2018	Toppenish	54.4	46.375502	-120.619021
300	3DA.1A19B39494	14	4/30/2018	Toppenish	54.4	46.375502	-120.619021
301	3DA.1A19B390F9	15	4/30/2018	Toppenish	54.4	46.375502	-120.619021
302	3DA.1A19B3A586	16	4/30/2018	Toppenish	54.4	46.375502	-120.619021

303	3DA.1A19B38FEA	17	4/30/2018	Toppenish	54.4	46.375502	-120.619021
304	3DA.1A19B3969B	18	4/30/2018	Toppenish	54.4	46.375502	-120.619021
305	3DA.1A19B39628	19	4/30/2018	Toppenish	54.4	46.375502	-120.619021
306	3DA.1A19B3947B	20	4/30/2018	Toppenish	54.4	46.375502	-120.619021
307	3DA.1A19B39291	21	4/30/2018	Toppenish	54.4	46.375502	-120.619021
308	3DA.1A19B393AE	22	4/30/2018	Toppenish	54.4	46.375502	-120.619021
309	3DA.1A19B38FBC	23	4/30/2018	Toppenish	54.4	46.375502	-120.619021
310	3DA.1A19B393FF	24	4/30/2018	Toppenish	54.4	46.375502	-120.619021
311	3DA.1A19B39546	25	4/30/2018	Toppenish	54.4	46.375502	-120.619021
312	3DA.1A19B39581	1	5/10/2018	Toppenish	61.6	46.356144	-120.684541
313	3D6.00180731B7	2	5/10/2018	Toppenish	61.6	46.356144	-120.684541
314	3D6.00180731C4	3	5/10/2018	Toppenish	61.6	46.356144	-120.684541
315	3D6.1D593D9509	1	5/29/2018	-	-	-	-
316	3DA.1A19B38FE6	2	2/6/2018	-	-	-	-
317	3DA.1A19B397E8	3	10/6/2017	-	-	-	-