Intensive Monitoring of Larval/Juvenile Lamprey Entrainment within Dryden Diversion, Wenatchee River, 2017

[Cover Photo: An overview of the canal upstream of the fish screens at Dryden Diversion, Wenatchee River, known to entrain several thousands of Pacific Lamprey each year]

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ABSTRACT

Dryden Diversion is an irrigation diversion on the Wenatchee River (river km 27.8) which entrains several to tens of thousands of larval/juvenile Pacific Lamprey (*Entospheus tridentatus*) each year. As in previous years, Chelan County PUD, US Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Yakama Nation Fisheries assisted with the Pacific Lamprey salvage operations on October 16, 17 and 18, 2017, soon after the canal was dewatered. In addition, one final salvage was conducted on October 20, 2017, by WDFW focusing on salmonids.

Through our collective efforts between October 16, 2017, and October 20, 2017, a total of 15,035 lamprey (13,797 larvae and 1,238 macrophthalmia) were captured and the majority were released in Jolanda Lake (river km 50.4) upstream of Tumwater Dam on Wenatchee River with Type I habitat. This was a large increase compared to previous years (totaling < 9,000 lamprey). Several factors likely contributed to this increase in salvage numbers in 2017, including 1) the larger number of people, including volunteers, that assisted in the salvage, 2) more electrofishers (up to four) used by separate teams covering more ground simultaneously, 3) three (instead of two) consecutive days of electrofishing immediately after the dewatering, 4) reduced dewatering rate at the beginning that minimized stranding and desiccation, and 5) maintenance of water levels in the evening hours between survey days.

Juvenile lamprey (macrophthalmia) comprised 8.2% of the overall number salvaged (which is roughly twice as high as previous years' rates). The total team salvage time (a combination of electrofishing and bank collection efforts by individual groups) was 60.9 hours, involving over 20 people from various agencies. At least 11.3% of the salvaged lamprey were captured from drying banks and fine sediment heaps, but there were likely more if we recorded them more consistently. Catch per unit effort (CPUE; # captured / hour of effort) was highest (408.9 #/hr) in Section 1 (the upstream most section) and lowest (32.8 #/hr) in Section 7 (the area just upstream of fish screens).

A combination of electrofishing densities and wetted area from each section was used to estimate the number of entrained lamprey in Dryden Diversion. The simple estimate was 15,111 lamprey and the cumulative estimate was 21,936 lamprey for the entire diversion. This estimate is likely an underestimate due to the fact that electrofishing efficiency is unlikely to be 100% (the presumed assumption), and is more likely to be ~50% when the density levels are high. Due to other supporting data, the most realistic lamprey estimate in Dryden Diversion may be close to 30,000 – 40,000 lamprey.

INTRODUCTION

Dryden Diversion (river km 27.8) on the lower reach of the Wenatchee River dewaters annually in mid-October. Among the various species salvaged during dewatering, lamprey (both larvae and juvenile life stages) are especially abundant. The vast majority are Pacific Lamprey, *Entosphenus tridentatus*, although a small number has been genetically identified as Western Brook Lamprey, *Lampetra richardsoni*, from past monitoring (visual identification confirmation, in addition to genetic confirmation, has been made in Entiat and Methow subbasins, but not in Wenatchee Subbasin to date). Efforts have been made by Chelan County PUD to salvage as many lamprey as possible each year, and more recently (since 2013) other federal, state, and tribal agencies have begun actively participating and contributing to this salvage effort (Beals and Lampman 2016; Beals and Lampman 2017). In September 2017, "Dryden Canal Annual Lamprey Fish Salvage Guidelines 2017" was drafted and shared by the partnering agencies with the Chelan County PUD. The area upstream of the fish screens (approximately 4,657 m^2 in surface area during irrigation season) is where the majority of the lamprey are found after dewatering. Coordination among the partnering agencies have strengthened in recent years to 1) increase the number of lamprey salvaged, 2) enhance our understanding of the lamprey entrainment issue and status at the diversion, and 3) promote various solutions to potentially resolve lamprey entrainment. The goal of this 2017 report is to 1) summarize the lamprey salvage efforts, 2) estimate the number of lamprey and habitat in the diversion by sections, and 3) describe some measures and recommendations for future salvage efforts.

METHODS

Partnering agencies involving Chelan County PUD, US Fish and Wildlife Service, Washington Department of Fish and Wildlife (WDFW), and Yakama Nation Fisheries (with a total of 10-20 people each day) salvaged lamprey and other incidental species (including Speckled Dace, Bridgelip Sucker, Chinook, rainbow trout, and sculpin) in Dryden Diversion on October 16, 17, and 18, 2017 (Monday through Wednesday). On October 20, 2017, a WDFW crew conducted a salvage focusing on salmonids (*Onchorynchus* spp.), but some lamprey were also captured incidentally. Dewatering began on October 14, 2017 (Saturday) at a slow rate and efforts were made by Chelan County PUD crew to maintain the water level above sediment deposition heaps within the diversion channel where lamprey are normally highly concentrated. Dates for salvage were established as close as possible to the initial dewatering date to limit additional loss of lamprey from desiccation and/or predation.

AbP-2 Backpack Electrofishers (ETS Electrofishing Systems Inc., Madison, WI), specially designed for the sampling of larval lampreys, were used during the primary salvage dates (October 16 through 18, 2017) to increase the efficiency of lamprey captured and salvaged. On October 16 and 17, 2017, four teams (each with one electrofisher and 2-3 people netting) conducted the

salvage and on October 18, 2017, three teams (each with one electrofisher and 1-2 people netting) conducted the salvage. We electrofished available wetted larval habitat (Type I and II), using standard lamprey settings [slow tickle pulse of 3 pulses/sec (to stimulate the lamprey to emerge) and fast stunning pulse of 30 pulses/sec (to immobilize the swimming larvae in water), 25% duty cycle, and a 3:1 burst pulse train]. Voltage was primarily 125 volts, but as the density levels decreased, a higher voltage (~175) was occasionally used, which helps improve the emergence of lamprey during cold water conditions (<10˚C). In many cases, survey visibility was less than ideal, and many lampreys were not visible in the turbid water.

Dryden Diversion was separated into eight sections (each 35-55 m long; Fig. 1) to be able to assess the density and abundance levels in various parts of the diversion. Ribbon flagging were used to clearly identify the section boundaries. Each team recorded the salvage data separately by these sections. Type I / II larval lamprey habitat (preferred and acceptable habitat, respectively) was surveyed, with Type I habitat given priority. Specific sections (and areas within the sections) to primarily focus each day were determined based on a combination of water level conditions and larval lamprey densities (past and current). Total area of the sections were determined based on Google Earth polygons using Earth Point 2018 (http://www.earthpoint.us/Shapes.aspx).

Salvage start and end time, electrofishing (slow burst only) time, number of captured larval (i.e. ammocoete) and juvenile (macrophthalmia) lamprey, and specific areas covered were recorded for each section sampled and salvaged. A subsample of lamprey from each section were separated into three size classes (large >90 mm, medium 50-90 mm, small <50 mm) on October 17, 2017. Some of the captured lampreys were examined closely (focusing on tail pigmentation) periodically for species identification to see if any Western Brook Lamprey could be positively identified on site (if of identifiable length generally >50 mm). In addition to electrofishing, drying sediment banks and heaps were searched for desiccating larval lamprey. Where possible, lampreys collected from drying banks and heaps were tallied separately from those collected in wetted areas.

Areas surveyed / electrofished were estimated based on survey notes (i.e. notes describing which areas were covered within the section), percent water area (based on photos and notes on water level fluctuation), and electrofishing pace. Number of electrofishing passes (when covering the same area more than once) were also recorded, but due to the frequent changes in water levels throughout the survey period, the density levels fluctuated widely, preventing an accurate estimate based solely on multipass electrofishing. An estimated number of lampreys residing in each section was calculated by multiplying the density (#/m^2) and wetted area (m^2) at the time of the survey. Another estimate was calculated by adding the number of lamprey that were previously removed from the same area of the section prior to the survey (from previous electrofishing passes within the same day) to account for those that were already removed from the area that day. A final estimate also included the number of lamprey that were previously removed from the same section prior to the survey (from recent electrofishing efforts prior to the new survey date), representing the comprehensive estimate of lamprey.

RESULTS

During the salvage efforts between October 16 and 20, 2017, a total of 15,035 lampreys were captured and salvaged from Dryden Diversion (Table 1). This consisted of 13,797 larval lampreys (i.e. ammocoete) and 1,238 juvenile lamprey (i.e. macrophthalmia), which comprised 8.2% of the total number of lampreys. A total of 14,952 lampreys (13,724 larvae and 1,228 juvenile) were released in Jolanda Lake upstream of Tumwater Dam between October 16 and 18, 2017 at river km 50.4. Those captured on October 20, 2017, were released in Wenatchee River just downstream of Dryden Diversion (river km 27.8). Number of mortality recorded was limited this year (<10), but not all lamprey were examined thoroughly after being released at Jolanda Lake. The largest number of lamprey was captured from Section 1 (n=5,698) followed by Section 2 (n=4,780), and Section 3 (n=3,392) (Fig. 2). The smallest number of lamprey was captured from Section 8 (n=13); however, density levels in Section 8 were similar to Section 4 through 7, indicating some lamprey are getting entrained through the 1.75 mm mesh-size vertical-bar fish screens.

Mean density (mean density value from all surveys within the section) was highest in Section 2 (16.6 #/m^2), followed by Section 1 (8.0 #/m^2), and Section 3 (4.0 #/m^2) (Table 1, Fig. 3). Mean density was lowest in Section 7 (1.3 #/m^2) followed by Section 4 (1.9 #/m^2). Mean pace of electrofishing ranged from 1.2 m^2/min (Section 2 and 8) to 2.3 m^2/min (Section 1 and 3). Overall salvage density (total number of salvaged lamprey divided by total area of the section) was highest in Section 1, 2, and 3 for both larvae (11.5, 6.3, and 5.2 #/m^2, respectively) and juvenile (0.8, 0.6, and 0.6 #/m^2, respectively). Although the overall number of juvenile (macrophthalmia) collected from the lower sections were lower, the percent of juvenile within the overall catch were considerably higher for the lower sections compared to the upper sections (Fig. 4).

The size classes of lamprey from each section were recorded on October 17, 2017. In general, the number of small lamprey (<50 mm) proportion increased in the downstream direction (Fig. 5). The large lamprey (>90 mm) peaked in Section 3. Although efforts were made to capture all lamprey we observed at each section, a large number of the lamprey, especially smaller ones, escaped our nets due to high density and limited water clarity. As a result, the size distribution of captured lamprey may be slightly different from the truly representative section samples.

The overall wetted area was highest at Section 1 (343 m^2), followed by Section 3 (273 m^2) and Section 8 (249 m^2) (Table 2, Fig. 6). This was influenced heavily by the mean percent water cover (within the full channel water line) during salvage operations; Section 2 contained significantly less water compared to Section 1 as well as other sections (although the high density area of Section 1 at the lower end experienced pronounced dewatering due to deep fine sediment deposits that are in front of the ecology blocks).

The cumulative time spent in each section by survey teams was highest in Section 2 (18.8 hr; 30.9% of overall effort) followed by Section 3 (16.7 hr; 27.3%) and Section 1 (13.9 hr; 22.9%) (Table 2, Fig 7). This was primarily due to the high number of lamprey observed in these three

sections. Very little effort was spent in Section 8 downstream of the fish screens (0.2 hr; 0.3% of overall effort). Percent of electrofishing time in each section was similar to the trend observed for total time spent in each section. The section that had the highest capture per unit effort (CPUE) value was Section 1 (408.9 #/hr), followed by Section 2 (254.3 #/hr) and Section 3 (203.7 #/hr) (Table 1). The lowest CPUE value was observed at Section 7 (32.8 #/hr) (Fig. 8).

Number of lamprey from drying banks and heaps were difficult to track separately and estimate, but were calculated to be at least 1,690 (11.2%), which is a very conservative estimate based on limited data (Table 3). Percent of lamprey salvaged from drying banks was highest in Section 1 (50.0%) followed by Section 2 (32.9%) and Section 3 (21.0%) (Fig. 9). Although lamprey from drying sediment in the lower sections were present especially as the water level dropped down further, we were not able to tally and record them consistently as they emerged.

Finally, number of lamprey present in each of the section was estimated by using the density and wetted area (Table 3). The simple estimate ("Section Estimate #" in Table 3) was 15,111 lamprey. When the removed lamprey numbers from salvage (from prior multipass sampling that were conducted within the same day within the same area of the same section) were combined to this estimate, the total number was 15,897 ("Section Estimate # + Daily Salvage #" in Table 3, "Cumulative Estimated # of Lamprey" in Fig. 10). When all removed lamprey numbers from prior salvage days were added to the new estimate, the total number was 21,936 ("Section Estimate # + All Salvage #" in Table 3). However, this estimate is likely a conservative estimate because it assumes that the electrofishing efficiency is 100%. In reality, the effectiveness of the electrofishing method can vary considerably, especially in high density conditions, and have been described as ~50% for larval density (Harvey and Cowx 2003; Steeves et al. 2003; Lasne et al. 2010; Beals and Lampman 2015). As a result, these estimates, though comprehensive, are still most likely a conservative estimate.

The daily summary data are also attached for reference (Table 4 and 5).

DISCUSSION

A total of 15,035 lamprey were salvaged from Dryden Diversion in 2017. In 2016, the total number salvaged was 6,735 (with an estimate of 13,139 lamprey being present), so this was a large improvement from the previous year's effort. Several factors likely contributed to this increase in salvage numbers in 2017, including 1) the larger number of people that assisted in the salvage, 2) more electrofishers (up to four) used by separate teams simultaneously covering more ground, 3) three (instead of two) consecutive days of electrofishing immediately after dewatering, 4) reduced dewatering rate at the beginning that minimized stranding and desiccation, and 5) maintenance of water levels in the evening hours between survey days. The use of mesh baskets for holding the captured lamprey in flow-through water conditions may have also contributed to reducing the mortality that were observed the previous year during release. These practical measures, so long

as they are helpful and compatible with canal operations, should continue in future years. Other potential measures to consider include 1) placement of a sprinkler system to allow drying banks to stay moist and allow desiccated lamprey to move back to wetted areas, 2) open the upper bypass gate prior to or during dewatering to allow more fine sediment deposits, and hence lamprey, to return to the river.

The 2017 estimate of lamprey number was 21,936. This estimate is likely an underestimate due to the fact that electrofishing efficiency is unlikely to be 100% (the presumed assumption), and is more likely to be ~50% when the density levels are high. In most of the sections (especially upper sections), almost as many lamprey were observed and missed as were captured, indicating very low efficiency levels. In addition, the mean daily capture density from all surveys increased gradually each day (5.0%, 7.0%, and 11.6% on October 16, 17, and 18, 2017, respectively). Although the water levels gradually dropped over the three days, decreasing the wetted area and potentially influencing the density levels, it nevertheless illustrates that density levels did not decrease substantially over the three days despite the large number of lamprey removed each day from salvage (4,646 and 5,324 lamprey removed from first and second day, respectively). On the third day, an equally large number of lamprey (4,982) were salvaged and removed. Based on all of this information, it is likely that the true estimate in Dryden Diversion may be close to 30,000 – 40,000 lamprey.

The upper sections contain a high density and number of lamprey (both larvae and juvenile), so it is logical and reasonable to focus the efforts in these areas. Especially, at the beginning of the dewatering, only some of the upper sections (primarily Section 2 and 3) have water levels conducive to backpack electrofishing, so all efforts should be focused in these sections as much as possible. However, as water levels drop, other sections should be monitored and sampled appropriately. Although the number of lamprey estimated from drying banks was less in the lower sections, many lamprey were actually observed trapped underneath the thick aquatic vegetation (i.e. elodea *Elodea anadensis*). Removing these aquatic vegetation mats prior to salvage operation, (though labor intensive) may help improve salvage efficiency in these sections.

Finally, an outreach video was created by Ruthie Aldrich, a USFWS intern who participated in the salvage operation process in 2017, and this video describes the salvage process at Dryden Diversion as well as lamprey biology and can be a great outreach tool. The video link can be found here: https://www.youtube.com/watch?v=lN2DFct0UEA&feature=youtu.be

Acknowledgement

Data were collected by all partners, including Chelan County PUD, USFWS, WDFW staff and volunteers that were present. Yakama Nation Fisheries would like to thank everyone that helped with their input and contribution for this report.

TABLES

Table 1. Summary of larval/juvenile lamprey capture data by sections at Dryden Diversion (Dryden, WA) between October 16 and 20, 2017.

Section	# of Larvae Salvaged	# of Juvenile Salvaged	% of Macro	# of Lamprey Salvaged	% from Sections	# of Morts	Mean Density (m2)	Overall Larval Density (#/m2)	Overall Juvenile Density (#/m2)	Larval Lamprey CPUE (#/hr)	Juvenile Lamprey CPUE (#/hr)	Lamprey CPUE (#/hr)
1	5310	388	6.0%	5698	37.9%	1	8.0	11.5	0.8	381.1	27.8	408.9
2	4367	413	7.6%	4780	31.8%	2	16.6	6.3	0.6	232.3	22.0	254.3
3	3064	328	10.6%	3392	22.6%	5	4.0	5.2	0.6	184.0	19.7	203.7
4	545	46	12.2%	591	3.9%	0	1.9	0.9	0.1	106.2	9.0	115.1
5	318	23	7.6%	341	2.3%	0	3.1	0.5	0.0	137.3	9.9	147.2
6	106	15	16.1%	121	0.8%	0	3.8	0.1	0.0	127.2	18.0	145.2
7	75	25	26.4%	100	0.7%	0	1.3	0.4	0.1	24.6	8.2	32.8
8	13	0	0.0%	13	0.1%	0	2.6	0.02	0.0	78.0	0.0	78.0
Total	**13798**	**1238**	**-**	**15036**	**100.0%**	**8**	**-**	**-**	**-**	**-**	**-**	**-**
Average	**1725**	**155**	**8.2%**	**1880**	**-**	**1**	**5.1**	**2.9**	**0.3**	**158.0**	**14.2**	**172.3**

Table 2. Summary of salvage area and lamprey capture effort by sections at Dryden Diversion (Dryden, WA) between October 16 and 20, 2017.

Section	Area (m2)	% Area	# of Sampling	Cumulative Time (hr)	% Cumulative Time	Shock Time (min)	% Shock Time	% Section E-Fished	% Water Cover	Watered Area (m2)	Area Salvaged (m2)	E-Fishing Pace (m^2/min)
1	462	9.9%	14	13.9	22.9%	343	24.9%	181%	69%	343	755	2.3
2	698	15.0%	14	18.8	30.9%	352	25.5%	284%	15%	107	366	1.2
3	593	12.7%	18	16.7	27.3%	418	30.3%	310%	46%	273	897	2.3
4	582	12.5%	7	5.1	8.4%	108	7.8%	83%	37%	216	222	2.2
5	579	12.4%	3	2.3	3.8%	57	4.2%	21%	37%	174	100	1.5
6	721	15.5%	3	0.8	1.4%	21	1.5%	12%	37%	216	36	1.7
7	192	4.1%	6	3.1	5.0%	75	5.5%	72%	33%	58	123	1.4
8	830	17.8%	2	0.2	0.3%	4	0.3%	2%	40%	249	5	1.2
Total	**4657**	**100%**	**67**	**60.9**	**100%**	**1379**	**100%**	**965%**	**314%**	**1636**	**2505**	**-**
Average	**582**	**12.5%**	**8**	**7.6**	**12.5%**	**172**	**13%**	**121%**	**39%**	**205**	**313**	**1.7**

Table 3. Summary of larval/juvenile lamprey abundance estimate data by sections for Dryden Diversion (Dryden, WA) in 2017.

Section	% from Drying Bank	# from Drying Bank	Section Estimate #	Section Estimate # + Daily Salvage #	Section Estimate # + All Salvage #	% from Sections	Estimated Density
1	50.0%	386	5840	5840	8006	36.5%	17.3
2	32.9%	864	3284	4070	5591	25.5%	8.0
3	21.0%	435	2232	2232	4374	19.9%	7.4
4	3.3%	5	974	974	1123	5.1%	1.9
5	0.0%	0	602	602	625	2.8%	1.1
6	0.0%	0	1330	1330	1360	6.2%	1.9
7	0.0%	0	200	200	207	0.9%	1.1
8	0.0%	0	650	650	650	3.0%	0.8
Total	**-**	**1690**	**15111**	**15897**	**21936**	**100.0%**	**-**
Average	**11.3%**	**211**	**1889**	**1987**	**2742**	**12.5%**	**4.9**

Table 4. Summary of daily larval/juvenile lamprey capture data at Dryden Diversion (Dryden, WA) between October 16 and 20, 2017. Columns that are in blue font represent mean values, whereas others are total values.

Date	Sections Covered	# of Larvae	# of Macro	# of Lamprey	% of Macro	Density (m^2)	% from Drying Bank	# from Drying Bank	Section Estimate #	Section Estimate # + Daily Salvage #	Section Estimate # + All Salvage #
10/16/2017	1,2,3,4	4121	525	4646	12.7%	5.0	27%	1257	8817	9640	9640
10/17/2017	1,2,3,4,5,6,7,8	4903	421	5324	9.0%	7.0	8%	432	9258	9679	14325
10/18/2017	1,2,3,4,5,6,7	4700	282	4982	6.0%	6.1	-	-	**11097**	**11594**	**21551**
10/20/2017	2,3,4	73	10	83	13.6%	0.9	-	-	458	458	7400
Overall	**-**	**13797**	**1238**	**15035**	**8.2%**	**5.8**	**-**	**-**	**-**	**-**	**-**

Table 5. Summary of daily salvage area and lamprey capture effort at Dryden Diversion (Dryden, WA) between October 16 and 20, 2017. Columns that are in blue font represent mean values, whereas others are total values.

Date	Sections Covered	Voltage	Start Time	End Time	Cumulative Time (hr)	Shock Time (min)	Area Salvaged (m2)	% Section E-Fished	% Water Cover	Wetted Area (m^2)	E-Fishing Pace (m^2 per min)
10/16/2017	1,2,3,4	125-175	9:00	17:00	23.0	457	930	19%	46%	266	2.4
10/17/2017	1,2,3,4,5,6,7,8	125	9:20	17:15	18.3	429	759	14%	40%	220	1.5
10/18/2017	1,2,3,4,5,6,7	125	9:20	17:15	18.4	441	816	11%	39%	192	-
*10/20/2017	2,3,4	280	-	-	1.3	30	88	25%	27%	161	2.9
Overall	-	-	-	-	**60.9**	**1357**	**2593**	**17%**	**38%**	**209**	**2.3**

FIGURES

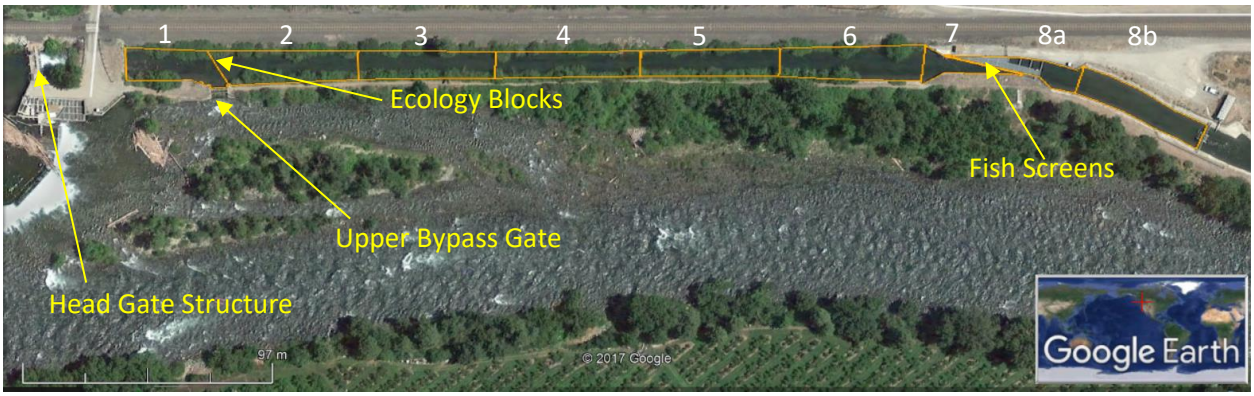

Figure 1. Aerial map of Dryden Diversion (Dryden, WA) from headgate structure to just downstream of the fish screens. Sections are delineated by orange lines and section ID numbers are shown in white font at the top of the map.

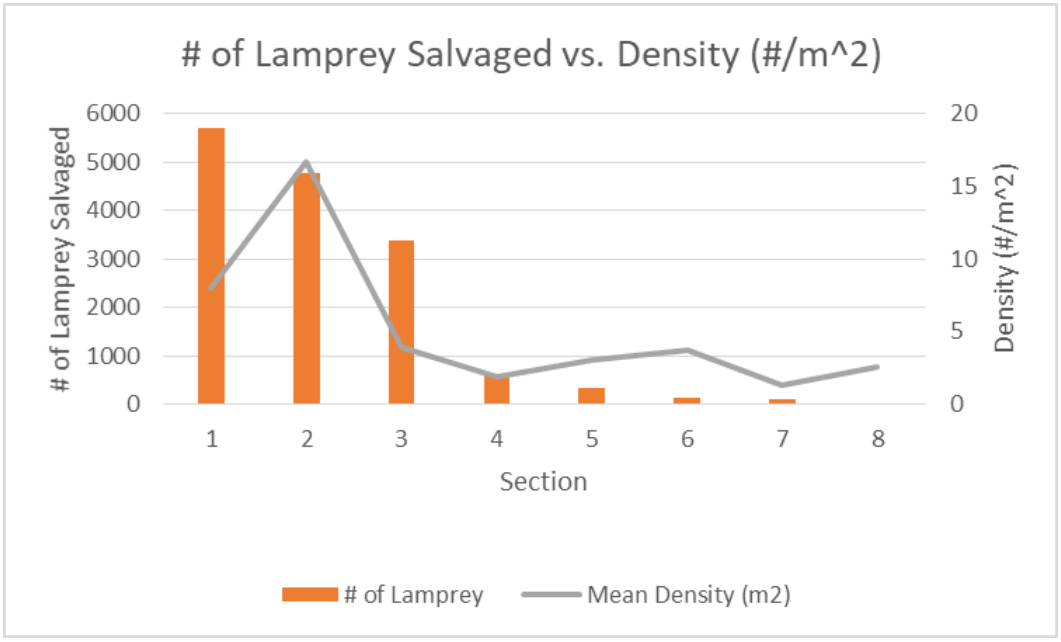

Figure 2. Total number of lamprey salvaged and mean survey density by sections at Dryden Diversion (Dryden, WA).

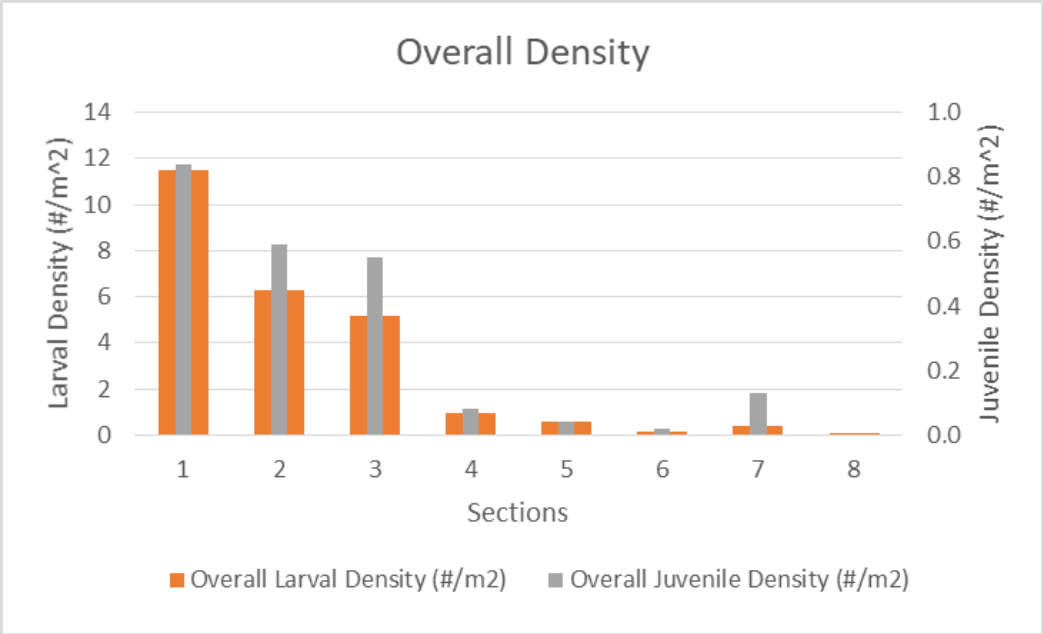

Figure 3. Density of larval and juvenile lamprey from Dryden Diversion (overall number of lamprey salvaged divided by overall section area at full water level) by sections at Dryden Diversion (Dryden, WA).

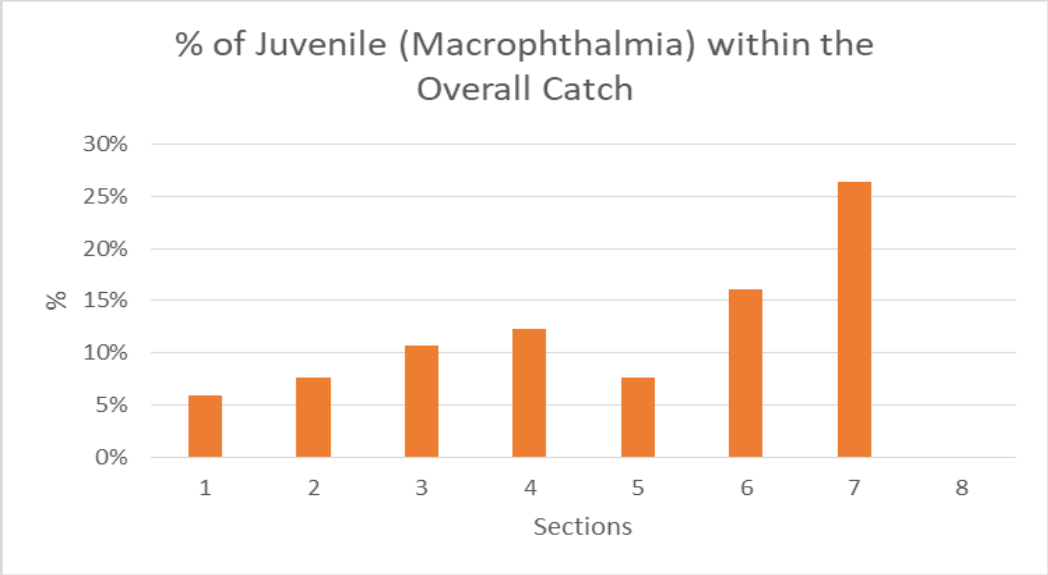

Figure 4. Percent of juvenile lamprey within the overall capture numbers by sections at Dryden Diversion (Dryden, WA).

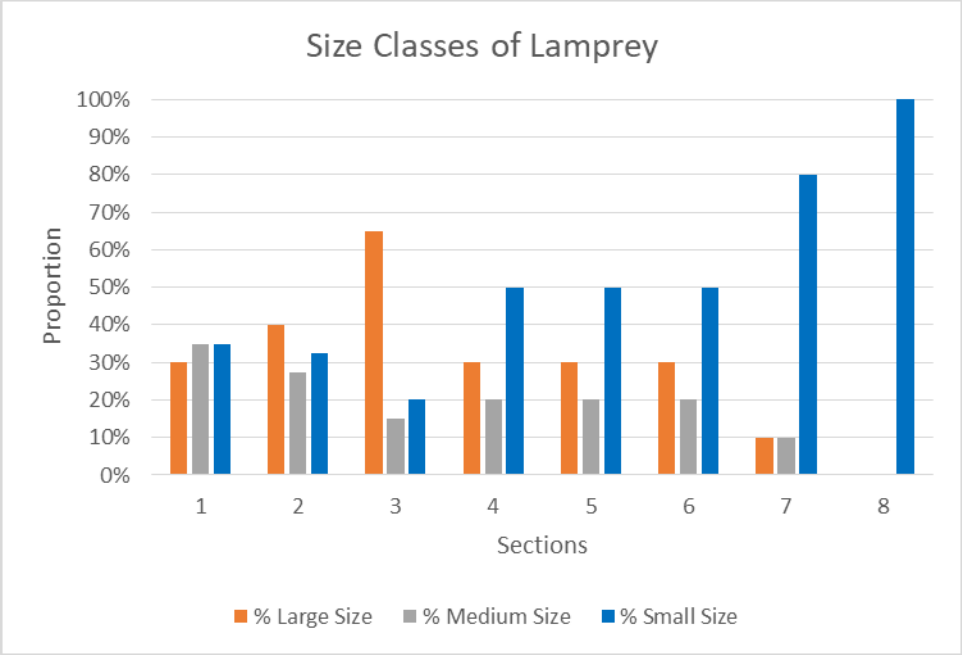

Figure 5. Size classes of lamprey on October 18, 2017, by sections at Dryden Diversion (Dryden, WA).

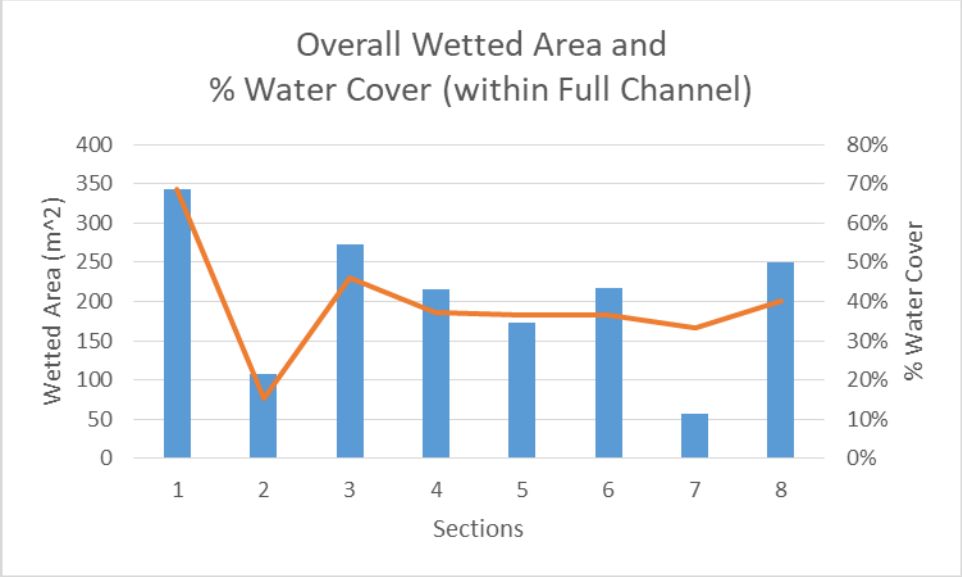

Figure 6. Overall wetted area in comparison with percent water cover within the full channel by sections at Dryden Diversion (Dryden, WA).

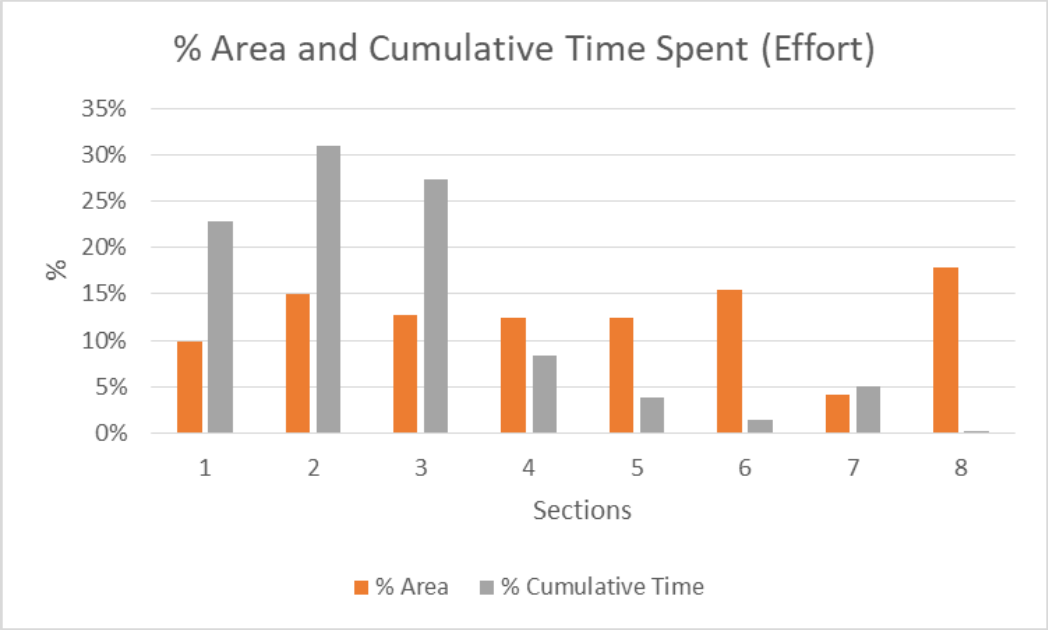

Figure 7. Percent area and cumulative time spent within each section compared to the overall total area and time, respectively, at Dryden Diversion (Dryden, WA).

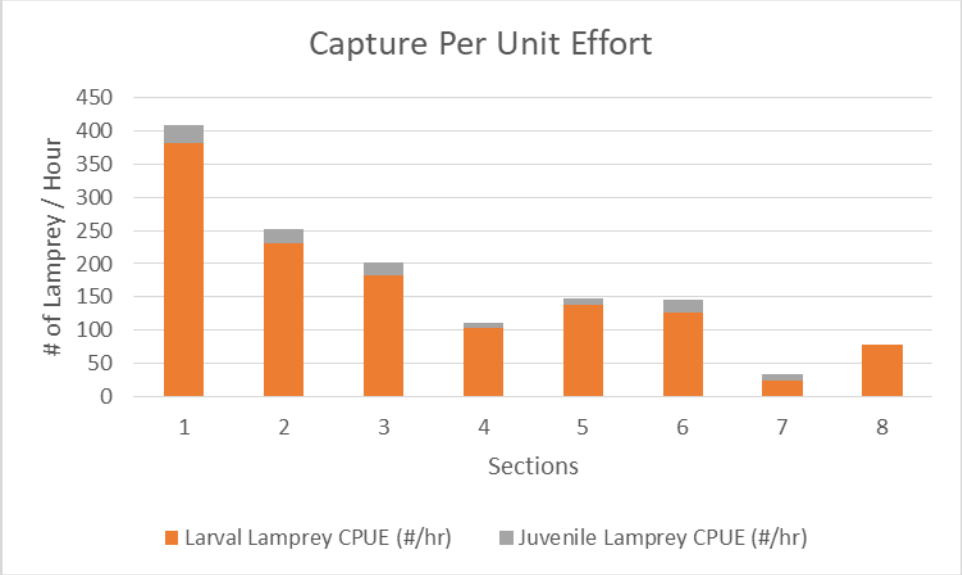

Figure 8. Capture per unit effort for lamprey salvage by sections at Dryden Diversion (Dryden, WA).

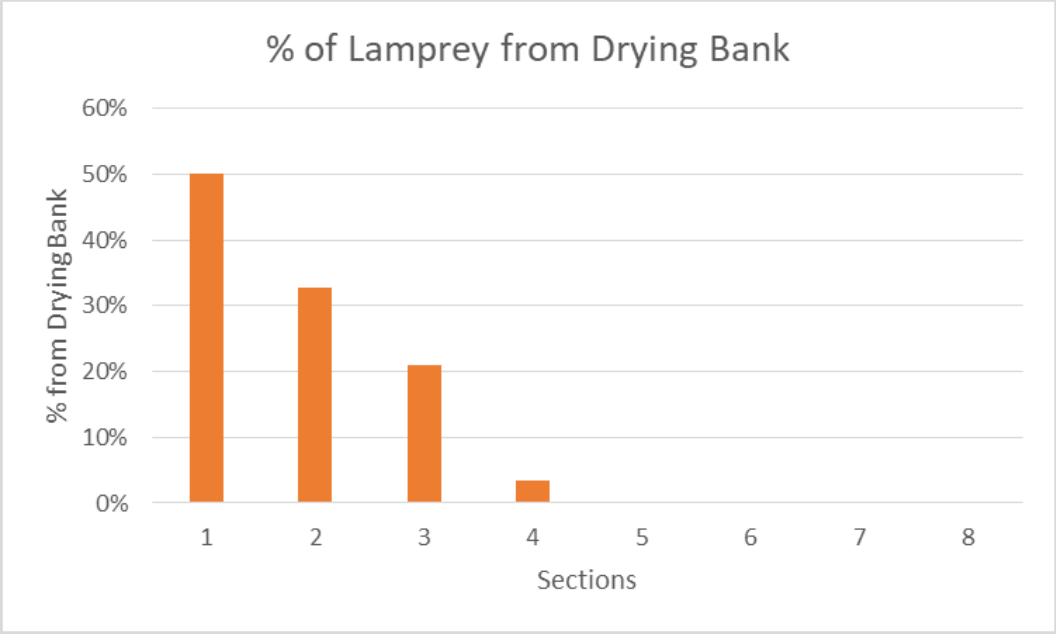

Figure 9. Percent of lamprey that were captured from the drying banks or fine sediment heaps by sections at Dryden Diversion (Dryden, WA).

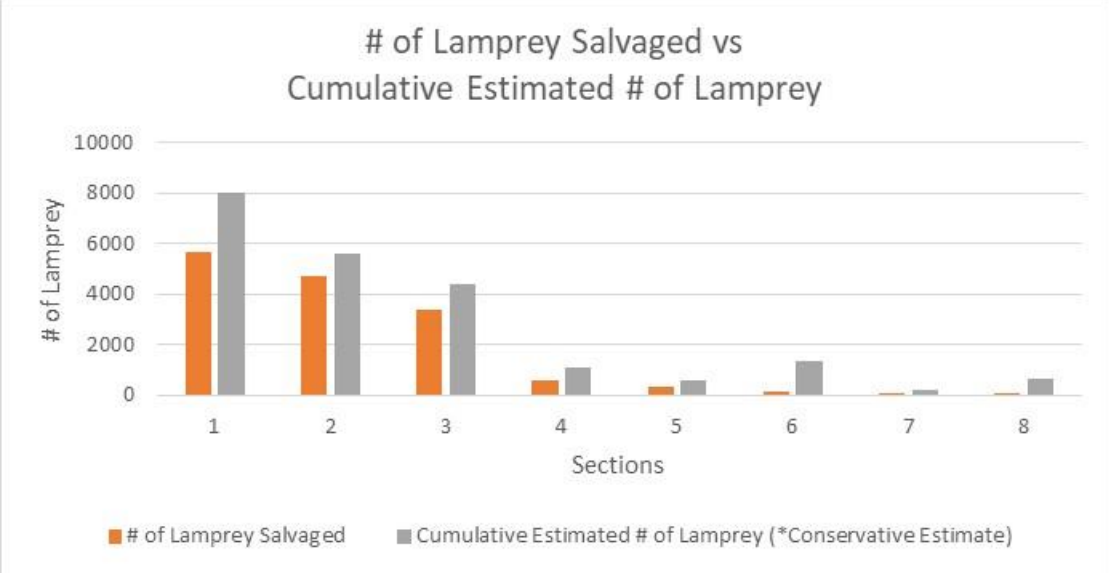

Figure 10. Number of lamprey salvaged compared to cumulative estimated number of lamprey by sections at Dryden Diversion (Dryden, WA).

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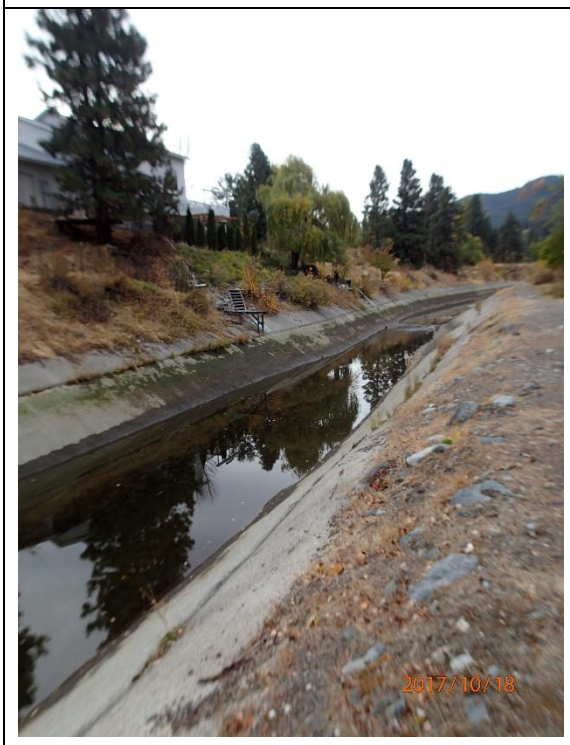
APPENDIX: Photos (provided primarily by USFWS) 	**Section 1, looking downstream (October 18, 2017)**
	**Section 2, looking downstream (October 18, 2017)**
	**Section 3, looking downstream (October 18, 2017)**

	**Section 4, looking downstream (October 18, 2017)**
	**Section 6, looking downstream (October 18, 2017)** **Aquatic vegetation forming a thick mat, making the spotting of lamprey difficult both in water and on bank.**
	**Section 7, looking downstream (October 18, 2017)**

	**Section 8, looking downstream (October 17, 2017)**
	**Section further downstream from Section 8 (October 18, 2017)**

	**Section 1, near the downstream end where the bypass gate is located (large amount of fine sediment building in front of the gate). (March 2, 2017)**
	**Section 1, upper bypass gate outlet on the Wenatchee River. (March 2, 2017)**

	**Section 7, lower bypass channel outlet into Wenatchee River (some questions remain as to whether adult lamprey may be attracted to this outlet flow)** **(March 2, 2017)**