Distribution and Occupancy of Pacific Lamprey in Six Major Columbia River Subbasins within the Yakama Nation Ceded Lands: Summary from 2009-2017 Surveys



[Cover Photo: Overview of a larval lamprey survey site on the Wenatchee (river km 84.0, 3.3 river km downstream of Lake Wenatchee), where Pacific Lamprey were identified in August, 2017]

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ABSTRACT

This report covers the most up-to-date information related to Pacific Lamprey (*Entosphenus tridentatus*) and Western Brook Lamprey (*Lampetra richardsoni*) distribution and site occupancy within the White Salmon, Klickitat, Yakima, Wenatchee, Entiat, and Methow subbasins. Information was compiled from Yakama Nation Fisheries larval lamprey electrofishing surveys between 2009 and 2017, as well as available data from partnering agencies. In the following report, we refer to all Lampetra spp. as Western Brook Lamprey for simplification purposes.

White Salmon Subbasin – In 2016 (the most recent survey year), no Pacific Lamprey (0%) were found in the White Salmon River between river km 0.0 and 41.5. Genetic samples were collected (and are currently awaiting analysis) from lampreys too small to identify (less than 50 mm in total length).

Klickitat Subbasin – In 2017, Pacific Lamprey were captured at 4 of 4 (100%) sites in the Klickitat River within the known distribution (river km 1.9-69.4). Larval Pacific Lamprey were confirmed immediately upstream of the weir dam at the Klickitat Fish Hatchery (river km 69.4). This finding confirms that some adult Pacific Lamprey are able to pass the weir dam (albeit unknown passage efficiency).

Yakima Subbasin – In 2017, Pacific Lamprey were found at river km 13.0 (in Richland, WA); 60.5 river km downstream of the previous known lower distribution (river km 73.5) in the Lower Yakima River. In 2016 and 2017, Pacific Lamprey occupancy in the Lower Yakima River was 75% (present at 6 of 8 sites). Adult translocation began in all three lower Yakima River tributaries (Satus Creek, Toppenish Creek and Ahtanum Creek) in 2013. As a result, between 2013 and 2017, Pacific Lamprey occupancy in these streams increased extensively, with 13 of 18 (72.2%) sites in Satus Creek (river km 12.9-43.8), 4 of 4 (100%) sites in Toppenish Creek (river km 43.5-73.0), and 14 of 19 (73.4%) sites in Ahtanum Creek (river km 0.9-34.9) occupied by Pacific Lamprey were translocated upstream of Roza Dam by YN in the spring of 2015. In the Upper Yakima River, between 2016 and 2017, 8 of 18 (44.4%) sites within the updated Pacific Lamprey distribution (river km 191.8-318.3) had Pacific Lamprey. In the Teanaway River, Pacific Lamprey were found at 4 of 7 (57.1%) sites surveyed between 2016 and 2017 within the updated Pacific Lamprey distribution (river km 0.3-7.1).

Wenatchee Subbasin – Between 2015 and 2017, Pacific Lamprey were present at 10 of 10 (100%) sites downstream of Tumwater Dam (river km 49.6). No larval lampreys have been found in Icicle Creek. Pacific Lamprey adult translocation in Wenatchee Subbasin, including upstream of Tumwater Dam, began in spring of 2016. In the summer of 2016, larval Pacific Lamprey were found at only 1 of 6 (17%) sites upstream of Tumwater Dam (at river km 56.2 near the Highway 2 Bridge; surveyed sites ranged from river km 50.4-84.0). Then, in 2017, Pacific Lamprey were

found at 5 of 5 (100%) sites upstream of the dam, stretching from Jolanda Lake (river km 50.4) upstream to river km 84.0 (a site 3.3 river km downstream of Lake Wenatchee). In 2017, young of year (< 30 mm in length) larval lampreys were found at river km 6.5 in Nason Creek. The captured lampreys were too small to identify to species (less than 50 mm in total length), but they are likely progeny from adult Pacific Lamprey released into the upper Wenatchee River (currently awaiting genetic confirmation).

Entitat Subbasin – In 2016, Pacific Lamprey were confirmed at 4 of 4 (100%) sites within the known Pacific Lamprey distribution (river km 1.2-46.4). In 2016, Yakama Nation morphologically and genetically confirmed the presence of Western Brook Lamprey in the Entiat River at river km 46.5 (3.9 river km downstream of Box Canyon).

Methow Subbasin – Adult translocation began in the fall of 2015 in the lower Methow Subbasin In 2016 (first year for YOY offspring from translocation to show up), Pacific Lamprey occupancy did not increase, with Pacific Lamprey found at only 2 of 6 (33.3%) sites. However, in 2017, Pacific Lamprey were found at 3 of 3 (100%) sites. In 2017, Western Brook Lamprey was morphologically identified at river km 59.3 (shortly upstream of the confluence of Beaver Creek). These samples are awaiting genetic confirmation. In 2016, YN confirmed (through genetic analysis) the presence of Western Brook Lamprey in the Chewuch River at river km 16.1. In the Chewuch River in 2016 and 2017, Pacific Lamprey were found at 7 of 10 (70.0%) sites. No Pacific Lamprey have been found in the Twisp River or the upper Methow River to date.

INTRODUCTION

Since 2009, the Yakama Nation Pacific Lamprey Project (YNPLP) has conducted larval lamprey electrofishing surveys to document the distribution and relative abundance of Pacific Lamprey (*Entosphenus tridentatus*) within six major Mid and Upper Columbia subbasins: the White Salmon, Klickitat, Yakima, Wenatchee, Entiat, and Methow subbasins.

In the White Salmon Subbasin, Western Brook Lamprey (*Lampetra richardsoni*), a (predominantly) resident lamprey species, is also present in the subbasin in relatively high abundance. Pacific Lamprey were absent upstream of Condit Dam (river km 5.9) prior to the dam's removal in 2011. Recently, in 2015, USFWS detected Pacific Lamprey upstream of the Condit Dam removal site.

In the Klickitat Subbasin, Western Brook Lamprey (*Lampetra richardsoni*), a (predominantly) resident lamprey species, is also present in the subbasin in relatively high abundance. Now with up to nine years of past survey data in the Klickitat Subbasin, the YNPLP has enough information to share related to the occupancy and distribution ranges of lamprey species. The primary monitoring objective in the Klickitat Subbasin is to monitor the distribution and status/ trend of wild Pacific Lamprey (and if present, Western Brook Lamprey). In this report, we have

summarized key information related to the distribution and occupancy of Pacific Lamprey within the Klickitat Subbasin using survey data collected between 2009 and 2017.

In the Yakima Subbasin, Western Brook Lamprey (*Lampetra richardsoni*), a (predominantly) resident lamprey species, is also present in the subbasin in relatively high abundance. Since 2012, adult Pacific Lamprey have been translocated (collected from Lower Columbia River dams and held at Prosser Fish Hatchery) into three major lower Yakima River tributaries (Satus Creek, Toppenish Creek, and Ahtanum Creek) to supplement the declining wild population. Additionally, in March of 2015 adult Pacific Lamprey were translocated upstream of Roza Dam to restore their historical distribution upstream of the dam. Future supplementation efforts will include the release of artificially propagated larvae at strategic locations within the Yakima Subbasin.

In the Wenatchee Subbasin, Pacific Lamprey is the only lamprey species known to be present. Tumwater Dam (located at river km 49.6) is a known passage barrier for Pacific Lamprey, though historically lamprey were present in the area upstream of the dam. In 2016, the YNPLP translocated adult Pacific Lamprey (initially collected from Lower Columbia River dams and held at Prosser Fish Hatchery) into the mainstem Wenatchee River (both upstream and downstream of Tumwater Dam). Translocation efforts were put in place to understand adult usage of spawning habitat throughout the subbasin, adult passage over Tumwater Dam, and to restore lamprey populations upstream of the dam.

In the Entiat Subbasin, Pacific Lamprey is the only lamprey species known to present. Box Canyon (located at river km 50.4) is a known natural passage barrier for Pacific Lamprey. Now with up to four years of past survey data in the Entiat Subbasin, the YNPLP has enough information to share related to the occupancy and distribution ranges of Pacific Lamprey. The primary monitoring objective is to monitor the distribution and status/ trend of wild Pacific Lamprey. In this report, we have summarized key information related to the distribution and occupancy of Pacific Lamprey within the Entiat Subbasin using survey data collected between 2012 and 2016.

In the Methow Subbasin, both Pacific Lamprey and Western Brook lamprey are known to be present. In recent years, Pacific Lamprey numbers have been declining rapidly in the Methow Subbasin, likely due to the large number of hydroelectric dams lamprey have to pass through to reach the Subbasin (only 0-35 lamprey counted at Wells Dam from 2006-2015). John Crandall (Methow Salmon Recovery Foundation, previously Wild Salmon Conservancy) has been leading electrofishing surveys for Pacific Lamprey (*Entosphenus tridentatus*) in the Methow Subbasin since 2011, with the Yakama Nation's participation beginning in 2013. Starting in 2015, adult Pacific Lamprey were translocated into the mainstem Methow River (initially collected from Lower Columbia River dams and held at Prosser Fish Hatchery) to supplement the declining wild population.

METHODS

Rivers and streams with the potential to hold Pacific Lamprey were surveyed extensively within six major Mid and Upper Columbia subbasins between 2009 and 2017: the White Salmon,

Klickitat, Yakima, Wenatchee, Entiat, and Methow subbasins. Larval lamprey were surveyed during the summer/fall low flow season between mid-June and mid-October. Surveys were focused on Type I (preferred) and/or Type II (acceptable) habitat to provide optimal opportunity to capture the largest number of larval lamprey. Type I habitat primarily consists of fine sand, silt and/or clay and is absent of coarse substrate (gravel/cobble/boulder). Type II habitat is coarse shifting sand or other fine substrate mixed with coarse substrate. Type III (unsuitable) habitat consists of no fine sediments and was not surveyed. Type I and II habitat is generally found in backwater areas, side channels, or along the margins of larger pools.

Survey sites were chosen based on aerial images from Google Earth and GIS software and site visits. Sites that had higher chances of being a Type I habitat [such as slow water, shallow channel margin with dark tints (usually indicating fine sediment), backwater eddies, confluence of side channels, behind island bars, and tail end of deposition bars, etc.] were given priority. We determined that targeting the preferred habitat more effectually will provide us with a better framework for evaluating presence/absence, distribution, and relative abundance. Further, due to restricted survey time, the ease of access to a survey site (bridges, road access, landowners who lived right on the river or a short hike) was a critical issue and strongly considered when choosing sites. By prioritizing accessibility, more ground could be covered throughout the expansive six subbasins. Chosen habitat sites were ultimately spatially distributed throughout individual subbasins and watersheds.

After larval habitat sites were identified, the sites were visited on the ground and the site was initially scouted for larval habitat availability. If larval habitat was present, larval lamprey surveys were performed with an AbP-2 backpack electrofisher designed for the sampling of larval lampreys (ETS Electrofishing Inc., Madison, Wisconsin) at a rate of >60 seconds per meter. The electrofishing setting was at 3 pulses per second (125 V direct current) at 25% duty cycle with a 3:1 burst pulse train (three pulses on, one pulse off) to entice larval lamprey to leave the fine sediment. Once larval lamprey were observed, we used a pulse of 30 pulses/sec at 25% duty cycle to stun and effectively capture the fish. If no lamprey was found, a second pass at up to 200 V (other settings the same) was conducted to substantiate presence/absence. At all survey sites, a minimum of 5 m² of larval habitat was sampled at each site. Captured lampreys were identified to species, if fish length was >50 mm (Western Brook Lamprey or Pacific Lamprey).

Pacific Lamprey distribution is the upper and lower extent where Pacific Lamprey was found between 2009 and 2015. An updated range was identified for 2016 and 2017 surveys (if different than the observed range in 2015). Pacific Lamprey occupancy is the percent of surveyed sites with Pacific Lamprey present within the known Pacific Lamprey distribution range. Additionally, a more general lamprey distribution, and occupancy, is shown, which includes both Pacific Lamprey and Western Brook Lamprey. In the following report, we refer to all Lampetra sp. lampreys as Western Brook Lamprey. However, Western River Lamprey (*Lampetra ayresii*) are morphologically identical to Western Brook Lamprey, and could be included (unknowingly) in some identifications. Additionally, due to the wide distribution, and morphological variation of Lampetra sp., additional (not yet described) Lampetra species could be (unknowingly) included in the Western Brook classification.

RESULTS

White Salmon Subbasin

White Salmon River

The lowermost distribution of Pacific Lamprey is at river km 0.8 (surveyed in 2014), located 0.1 km upstream of the Lewis and Clark Hwy Bridge (Table 1). The uppermost distribution is at river km 7.2 (surveyed in 2015 by USFWS), located approximately 1.3 river km upstream of the old Condit Dam site (river km 5.9). In 2016 (the most recent survey year), no Pacific Lamprey (0%) were found within the known distribution. Genetic samples were collected (and are currently awaiting analysis) from lampreys too small to identify (less than 50 mm in total length). No adult Pacific Lamprey translocation has taken place in the White Salmon River.

Western Brook Lamprey have been documented between river km 0.8 (same location as Pacific Lamprey), and river km 41.5 (0.8 river km downstream of the confluence of Trout Lake Creek near Trout Lake, WA; Table 2). In 2016, Western Brook Lamprey was found at 5 of 5 (100%) sites within the lamprey distribution.

Trout Lake Creek

No Pacific Lamprey have been found in Trout Lake Creek (confluence with the White Salmon River at river km 42.3; Table 1). In 2017, Western Brook Lamprey was found between river km 0.5 and 13.3. In 2017, Western Brook Lamprey was found at 4 of 4 (100%) sites within the lamprey distribution (Table 2).

Table 1. Pacific Lamprey distribution and site occupancy in the White Salmon Subbasin from larval lamprey electrofishing surveys between 2012 and 2016. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Watershed	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
		2012	2				0	2	0	0	-
		2013	5				0	4	1	0	0%
	White Salmon	2014	3	0.8	7.2	6.4	0	2	1	1	100%
	write Gainon	2015	4	0.0	7.2	0.4	0	2	2	0	0%
		2016	5				0	4	1	0	0%
White Salmon		2017	0				-	-	-	-	-
white Sainon		2012	1								
		2013	1								
	Trout Laka	2014	0								
	HOUL Lake	2015	1	-	-	-	-	-	-	-	-
		2016	4								
		2017	0								

Table 2. Lamprey distribution and site occupancy (Pacific Lamprey and Western Brook Lamprey) in the White Salmon Subbasin from larval lamprey electrofishing surveys between 2012 and 2016. "Lamprey" (when stated alone) stands for both Pacific Lamprey and Western Brook Lamprey, and "PA Lamprey" stands for "Pacific Lamprey." Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with lamprey. "%Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied (by All Lamprey) within the Pacific Lamprey Distribution" divided by the "Number (#) of Sites within Pacific Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Upper Occupancy within Lamprey Distribution" divided by the "Number (#) of Sites Within Pacific Upper Occupancy Within Lamprey Distribution" divided by the "Number (#) of Sites Within Pacific Upper Occupancy Within Lamprey Distribution" divided by the "Number (#) of Sites Within Pacific Upper Occupancy Within Upper Occupancy Within Lamprey Distribution" divided by the "Number (#) of Sites Within Pacific Upper Occupancy Within Upper Occupancy Within Upper Occupancy Within Upper Distribution" divided by the "Number (#) of Sites Within Pacific Upper Occupancy Within Upper Occupancy Within Upper Occupancy Upper Occupancy Within Upper Occupancy Upper Occupancy

Watershed	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with Lamprey	River km of Upper-most Site with Lamprey	Total River km with Lamprey	# of Sites within PA Lamprey Distribution	# of Sites Occupied (All Lamprey) within PA Lamprey Distribution	% Lamprey Occupancy within PA Lamprey Distribution	# of Sites within Lamprey Distribution	# of Sites Occupied (All Lamprey) within Lamprey Distribution	% Lamprey Occupancy within Lamprey Distribution
		2012	2				0	0	-	1	0	0%
		2013	5				1	0	0%	5	3	60%
W	White Salmon	2014	3	0.8	11 5	40.7	1	1	100%	3	3	100%
	write Samon	2015	4	0.0	41.5	40.7	2	1	50%	4	2	50%
		2016	5				1	1	100%	5	5	100%
White		2017	0				-	-	-	-	-	-
Salmon		2012	1							-	-	-
		2013	1	12	15	0.3				1	1	100%
	Trout Lako	2014	0	4.2	4.5	0.5				-	-	-
	HOUL LAKE	2015	1				-		-	1	1	100%
		2016	4	0.5	13.3	12.8				4	4	100%
		2017	0	0.5	13.3	12.0				-	-	-

Klickitat Subbasin

Klickitat River

The lower most distribution of Pacific Lamprey is river km 0.0, at the mouth located in Lyle, WA (observed in 2014; Table 3). The upper most distribution of Pacific Lamprey is at river km 69.4, located immediately upstream of the Klickitat Fish Hatchery weir dam (river km 69.4). In 2017 (the most recent survey year), Pacific Lamprey were found at 6 of 6 (100%) sites.

Western Brook Lamprey have been found from the mouth, upstream to river km 82.7. In 2017, Western Brook Lamprey was found at 5 of 5 (100%) sites within the lamprey distribution (Table 4). One site was surveyed upstream of the lamprey distribution at river km 99.7.

Little Klickitat River

In the Little Klickitat River, Pacific Lamprey have been found from river km 0.6 (at the Highway 142 Bridge) upstream to river km 2.3. In 2017, Pacific Lamprey were found at 1 of 1 (100%) sites surveyed within the known Pacific Lamprey distribution (Table 3). Western Brook Lamprey have been documented upstream to river km 29.2, located in Goldendale, WA (Table 4).

Table 3. Pacific Lamprey distribution and site occupancy in the Klickitat Subbasin from larval lamprey electrofishing surveys between 2009 and 2017. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
		2009	30				0	3	27	25	93%
		2010	0				-	-	-	-	-
		2011	1				0	0	1	1	100%
		2012	0	0.0	69.3	69.3	-	-	-	-	-
	Klickitat	2013	12				0	4	8	8	100%
		2014	5				0	0	5	4	80%
		2015	9				0	3	6	5	83%
		2016	0	0.0	69.4	69.4	-	-	-	-	-
Klickitat		2017	6	0.0	00.4	00.4	0	2	4	4	100%
Nickia		2009	16				0	14	2	2	100%
		2010	0				-	-	-	-	-
		2011	0				-	-	-	-	-
		2012	0				-	-	-	-	-
	Little Klickitat	2013	2	0.5	2.8	2.3	0	2	0	-	-
		2014	0				-	-	-	-	-
		2015	0				0	0	0	-	-
		2016	0				-	-	-	-	-
		2017	1				0	0	1	1	100%

Table 4. Lamprey distribution and site occupancy (Pacific Lamprey and Western Brook Lamprey) in the Klickitat Subbasin from larval lamprey electrofishing surveys between 2009 and 2017. "Lamprey" (when stated alone) stands for both Pacific Lamprey and Western Brook Lamprey, and "PA Lamprey" stands for "Pacific Lamprey." Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with lamprey. "%Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied (by All Lamprey) within the Pacific Lamprey Distribution" divided by the "Number (#) of Sites within Pacific Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites Within Pacific Lamprey Distribution." "%Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with Lamprey	River km of Upper-most Site with Lamprey	Total River km with Lamprey	# of Sites within PA Lamprey Distribution	# of Sites Occupied (All Lamprey) within PA Lamprey Distribution	% Lamprey Occupancy within PA Lamprey Distribution	# of Sites within Lamprey Distribution	# of Sites Occupied (All Lamprey) within Lamprey Distribution	% Lamprey Occupancy within Lamprey Distribution
		2009	30				27	26	96%	29	27	93%
		2010	0				-	-	-	-	-	-
		2011	1				1	1	100%	1	1	-
		2012	0				-	-	-	-	-	-
	Klickitat	2013	12	0.0	82.7	82.7	8	8	100%	9	9	100%
		2014	5				5	5	100%	5	5	100%
		2015	9				6	5	83%	8	7	88%
		2016	0				-	-	-	-	-	-
Klickitat		2017	6				4	4	100%	5	5	100%
Nickiat		2009	16				2	2	100%	13	5	38%
		2010	0				-	-	-	-	-	-
		2011	0				-	-	-	-	-	-
		2012	0				-	-	-	-	-	-
	Little Klickitat	2013	2	0.6	29.8	29.2	0	0	-	2	2	100%
		2014	0				-	-	-	-	-	-
		2015	0				0	-	-	-	-	-
		2016	0				-	-	-	-	-	-
		2017	1				1	1	100%	1	1	100%

Yakima Subbasin

Lower Yakima River (mouth to the confluence of the Naches River, river km 191.9)

The distribution of Pacific Lamprey in the lower Yakima River is from river km 13.0 (downstream of the Van Giesen Road Bridge in Richland, WA) to river km 191.8, located immediately downstream of the Naches River confluence (Table 5). In 2017, Pacific Lamprey were found at in the lower-most reach of the Yakima River (river km 13.0). Prior to 2017, no larval lampreys (Pacific Lamprey or Western Brook Lamprey) were found downstream of river km 74.1 (near the Yakama Nation Fish Hatchery in Prosser, WA). The distribution of Pacific Lamprey stretches 178.8 river km in the lower Yakima River (118.3 river km, prior to surveys in 2017).

Since adult translocation began in 2012, the abundance and distribution of Pacific Lamprey in the Yakima Subbasin began increasing (Figure 1). In the lower Yakima River between 2010 and 2012, Pacific Lamprey occupied only 6 of 60 (10%) surveyed sites within the known Pacific Lamprey distribution (river km 73.5-191.8; Table 5 and Figure 1). However, between 2013 and 2017, Pacific Lamprey occupied 13 of 26 (50%) sites, displaying substantially increased distribution (river km 13.0-191.8) and occupancy. In 2016 and 2017, Pacific Lamprey occupancy was 75% (present at 6 of 8 surveyed sites). However, larval Western Brook Lamprey was found at all (100%) of these sites (present at 8 of 8 sites surveyed; Table 7).

Upper Yakima River (from the confluence of the Naches River, upstream)

The distribution of Pacific Lamprey in the upper Yakima River is from the Naches River confluence, upstream to river km 318.3, near a WDFW access area on Golf Course Road, Cle Elum, WA. In 2016, Pacific Lamprey were first found in the upper reach of the Yakima River. The distribution of Pacific Lamprey stretches 126.5 river km in the upper Yakima River. Table 6).

Adult Pacific Lamprey were translocated upstream of Roza Dam by YN in the spring of 2015 (with hopes that spawning activity would occur later in the spring of 2015). In the upper Yakima River, between 2016 and 2017, 8 of 18 (44.4%) sites surveyed within the updated Pacific Lamprey distribution (river km 191.8-318.3) had Pacific Lamprey (Table 6 and Figure 4).

Satus, Toppenish, Ahtanum Creeks (Lower Yakima Tributaries)

The lower most site with Pacific Lamprey in Satus Creek is river km 12.9, immediately upstream of the Plank Road Bridge near Toppenish, WA. The upper most river km is 43.8, located 2.5 river km upstream from the Highway 97 Bridge. The distribution expanded upstream by 2.5 river km in 2017 (Table 5).

In Toppenish Creek, the lower most site where Pacific Lamprey have been found is river km 43.5, located at the crossing of Harrah Road, near Harrah, WA. The upper most site where Pacific Lamprey have been found is river km 73.0, located at the Olney Irrigation Diversion. In 2017, the known distribution of Pacific Lamprey expanded 28.3 river km, and the lower most distribution dropped by 1.1 river km (Table 5).

In Ahtanum Creek, the lower most distribution of Pacific Lamprey is river km 1.1, near the Highway 97 Bridge near Union Gap, WA. The upper most distribution of Pacific Lamprey is river km 34.9, near the Herke Property Irrigation Diversion (near Wiley City, WA; Table 5).

Between 2010 and 2012, only 2 of 27 (7.4%) sites surveyed in the lower Yakima River tributaries were occupied by Pacific Lamprey within the known Pacific Lamprey distribution (1 of 13 [7.7%] and 1 of 13 [7.7%] in Satus and Ahtanum streams, respectively); no Pacific Lamprey were found in Toppenish Creek (Table 5 and Figure 2). Adult translocation began in these tributaries in 2013. As a result, between 2013 and 2017, Pacific Lamprey occupancy in these streams increased extensively, with 13 of 18 (72.2%) sites in Satus Creek (river km 12.9-43.8), 4 of 4 (100%) sites in Toppenish Creek (river km 43.5-73.0), and 14 of 19 (73.4%) sites in Ahtanum Creek (river km 0.9-34.9) occupied by Pacific Lamprey within the updated and extended Pacific Lamprey distribution. Western Brook Lamprey have been documented in each of these streams (Table 7), and have been documented to reside at each of the sites where Pacific Lamprey have been found.

Naches River (Upper Yakima River Tributary)

In the Naches River (confluence with the Yakima River at river km 191.9), no Pacific Lamprey were found prior to 2014 (Table 5 and Figure 3). However, after a small release of radio tagged adult Pacific Lamprey by USFWS/YN in 2013 and 2014, Pacific Lamprey were found at 10 of 23 (43.5%) sites surveyed between 2014 and 2017 within the updated distribution of Pacific Lamprey (river km 1.7-41.9).

Wenas Creek (Upper Yakima River Tributary)

No Pacific Lamprey have been found in Wenas Creek, despite efforts to find them (Table 6). A total of 21 sites were surveyed between 2011 and 2016. Western Brook Lamprey was found upstream to river km 19.2 (Table 8). Wenas Creek is a planned out-planting site for hatchery-reared larval Pacific Lamprey. In 2016 (the most recent survey year), Western Brook Lamprey was found at 3 of 4 (75%) sites (focused on the lower reach, from the mouth to river km 3.0).

Taneum, Swauk, and Teanaway Creek/River (Upper Yakima River Tributaries)

Pacific Lamprey were collected in 2016 (and again in 2017) from survey sites in the Teanaway River, one year after adult Pacific Lamprey were released above Roza Dam. In the Teanaway River (confluence with the Yakima River at river km 288.9), Pacific Lamprey were found at 4 of 7 (57.1%) sites surveyed between 2016 and 2017 within the updated Pacific Lamprey distribution (river km 0.3-7.1; Table 6 and Figure 5). Western Brook Lamprey have been found in each Swauk, Teanaway and Taneum tributary streams (Table 8). In 2017, Western Brook Lamprey was found at 2 of 2 (100%) sites in Swauk Creek (river km 1.2 and 3.4), and 2 of 2 (100%) of sites in the Teanaway River (river km 1.7 and 7.1). There has been limited survey effort in Taneum Creek, although an irrigation diversions in the lower reach of the system is monitored yearly. Many Western Brook Lamprey have been observed in this diversion.

Table 5. Pacific Lamprey distribution and site occupancy in the Lower Yakima Subbasin from larval lamprey electrofishing surveys between 2009 and 2017. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated directly into the respective stream. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Lower Yakima 2000 00 -1 -1 -1 -1 -1 Lower Yakima 2011 20 73.5 191.8 118.3 0 0 90 0 00 Statis 2017 4 13.0 191.8 118.3 0 0 10 2 2006 Statis 2007 4 13.0 191.8 178.8 0 4 3 3066 Statis 2017 4 12.9 41.3 28.4 1 2 6 7 -1	Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
Lower Yakima 2010 50 2012 221 2013 100 2012 221 2013 101 2014 118.3 118.3 0 0 222 2016 3 10% 2016 2016 2016 4 13.0 191.8 118.3 0 0 222 3 14% 2016 2016 4 13.0 191.8 178.8 0 0 4 3 795/ 4 2016 4 13.0 191.8 178.8 0 0 4 3 795/ 4 2016 4 12.9 41.3 28.4 0 6 1 175/ 4 12.9 3 100% 2016 4 12.9 43.8 30.9 0 1 3 100% 2017 4 12.9 43.8 30.9 0 4 4 100% 2017 4 12.9 43.8 30.9 1 3 100% 2017 4 12.9 43.8 30.9 <td></td> <td></td> <td>2009</td> <td>0</td> <td></td> <td></td> <td></td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td>			2009	0				-	-	-	-	-
Vakima 2011 2013 9 2013 73.5 191.8 118.3 0 0 9 2010 0 9 2013 0 0 22 23 14% 2019 2013 101 2 20% 1 10 3 1 33% 2017 4 130 191.8 178.8 1 0 3 1 33% 2017 4 130 191.8 178.8 1 2 0 0% 2017 4 12.9 41.3 28.4 1 2 0 0% 2018 6 12.9 43.8 30.9 0 4 1 25% 2016 4 12.9 43.8 30.9 0 1 3 3 100% 2010 10 2017 4 12.9 43.8 30.9 0 1 3 3 100% 2010 10 2017 4 12.9 43.8			2010	50				21	0	29	3	10%
Vakina 2012 22 73.5 191.8 118.3 0 0 222 3 14% 2014 4 1 0 3 1 33% 2014 4 10.0 10 2 20% 2016 6 1 0 3 1 33% 2017 4 13.0 191.8 178.8 0 0 4 3 79% 2010 0 - <td></td> <td></td> <td>2011</td> <td>9</td> <td></td> <td></td> <td></td> <td>0</td> <td>0</td> <td>9</td> <td>0</td> <td>0%</td>			2011	9				0	0	9	0	0%
Vakima 2013 10 2014 4 2015 6 10 3 1 33% 2015 4 2015 4 10.0 191.8 178.8 0 0 4 3 77% 2017 4 13.0 191.8 178.8 0 0 4 3 77% 2017 4 13.0 191.8 178.8 0 0 4 3 77% 2017 4 12.9 41.3 28.4 0 0 4 1 200 0 0 1 200 0 0 1 200 0 0 1 200 0 0 1 200 0 0 1 100% 100% 100% 10 10 10 0 0 0 1 100% 10 10 10 0 100% 10 10 10 10 0 10 10 10			2012	22	73.5	191.8	118.3	0	0	22	3	14%
Lower Yakima Toppenish 2014* 4		Yakima	2013	10				0	0	10	2	20%
Lower Yakima 2015* 6 - - 1 0 5 4 88% 2017 4 13.0 191.8 178.8 0 0 4 3 75% 2010 4 -			2014*	4				1	0	3	1	33%
Naches Page 101 * 4 13.0 191.8 178.8 0 0 4 3 79% 2009 0 -			2015*	6				1	0	5	4	80%
Lower Yakima Toppenish 2017 4 13.0 191.8 178.8 0 0 4 3 75% Lower Yakima 2010 4 12.9 41.3 28.4 1 1 2 0 0% 1 1 2 0 0% 0 4 1 25% 0 0% 1 1 2 0 0 4 1 1 1 2 0 4 25% 0 0% 1 <td1< td=""><td></td><td></td><td>2016*</td><td>4</td><td></td><td></td><td></td><td>0</td><td>0</td><td>4</td><td>3</td><td>75%</td></td1<>			2016*	4				0	0	4	3	75%
Lower Yakima 2009 0 -			2017*	4	13.0	191.8	178.8	0	0	4	3	75%
Lower Yakima 2010 2017 2018 2018 2018 2018 2018 2018 2018 2018			2009	0				-	-	-	-	-
Lower Yakima 2017 0 12.9 41.3 28.4 0 0 4 1 25% Lower Yakima 2015 4 20 4 20 4 20% 20% 4 25% Lower Yakima Toppenish 2017 4 12.9 43.8 30.9 0 4 25% Lower Yakima Toppenish 2017 4 12.9 43.8 30.9 0 1 3 3 100% 2016 4 12.9 43.8 30.9 0 1 3 3 100% 2017 4 12.9 43.8 30.9 0 1 3 3 100% 2016 10 10 10 1 10 0 0 1 1 100% 2016 7 2017 4 43.5 73.0 29.5 1 1 100% 10 0 0% 0 0 0% <td></td> <td></td> <td>2010</td> <td>4</td> <td></td> <td></td> <td></td> <td>1</td> <td>1</td> <td>2</td> <td>0</td> <td>0%</td>			2010	4				1	1	2	0	0%
Satus 2012 10 12.9 41.3 28.4 4 0 6 1 17% 2014 4 2014' 6 2 0 4 1 25% 2016 4 2 50% 4 2 50% 4 100% 2016 4 12.9 43.8 30.9 0 1 3 100% 2010 10 -			2011	8				1	2	5	0	0%
Johns 2013 4 1 25% 2014 6 0 4 1 00% 2017 4 12.9 43.8 30.9 0 1 3 3 100% 2017 4 12.9 43.8 30.9 0 1 3 3 100% 2010 0 -		Satus	2012	10	12.9	41.3	28.4	4	0	6	1	17%
Lover Yakima 2019 4 129 43.8 30.9 0 1 3 3 100%, 4 Lover Yakima Toppenish 2016 1 1 0 0 4 4 100%, 4 100%, 4 <td< td=""><td></td><td>Salus</td><td>2013</td><td>4</td><td></td><td></td><td></td><td>0</td><td>0</td><td>4</td><td>1</td><td>23%</td></td<>		Salus	2013	4				0	0	4	1	23%
Lower Yakima Toppenish 2017 4 12.9 43.8 30.9 0 1 3 3 100% Lower Yakima Toppenish 2010 10 -			2014	4				2	0	4	2	100%
Lower Yakima Z017 4 12.9 43.8 30.9 0 1 3 3 100% Lower Yakima Toppenish 2013 3 44.6 44.7 0.1 2 3 0 -			2015	4				0	0	3	3	100%
Lower Yakima Toppenish 2019 0 -			2010	4	12.0	13.8	30.9	0	1	4	3	100%
Lower Yakima Toppenish 2010 44.6 44.7 0.1 2 3 0 - <t< td=""><td>-</td><td></td><td>2000</td><td></td><td>12.5</td><td>40.0</td><td>50.5</td><td>-</td><td>-</td><td>-</td><td>-</td><td>100 /0</td></t<>	-		2000		12.5	40.0	50.5	-	-	-	-	100 /0
Lower Yakima Toppenish 2011 0 44.6 44.7 0.1 1 2 3 0 - - Lower Yakima Toppenish 2013 44.6 44.7 0.1 1 2 3 0 -			2003	10				6	3	1	0	0%
Lower Yakima Toppenish 2012 5 44.6 44.7 0.1 2 3 0 - - 2014 5 2015 4 - 1 2 0 - 0 1 0 0 0% 0% 0% 0% 0 0 0% 0			2010	0				-	-	-	-	-
Lower Yakima Toppenish 2017 3 44.6 44.7 0.1 1 2 0 - - 2015' 4 2015' 4 3 2 0 -			2012	5				2	3	0	-	
Naches Naches 2014" 5 3 2 0 - - 2015" 4 2016" 7 1 2 1 1 100% 2017" 4 43.5 73.0 29.5 1 0 3 3 100% 2010 5 0 1 0 0 0% 0% 2011 0 5 0 0 0% 0% 0% 2011 0 -	Lower Yakima	Toppenish	2013*	š	44.6	44.7	0.1	1	2	Ő		
2015* 4 1 2 1 <td>Lower Fakina</td> <td>ropponion</td> <td>2014*</td> <td>5</td> <td></td> <td></td> <td></td> <td>3</td> <td>2</td> <td>õ</td> <td>-</td> <td></td>	Lower Fakina	ropponion	2014*	5				3	2	õ	-	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			2015*	4				1	2	1	1	100%
2017 4 43.5 73.0 29.5 1 0 3 3 100% 2009 1 0 5 0 1 0 0 0% 2010 5 0 1 0 0 0% 0% 2011 0 - 0 1 0			2016*	7				4	3	0	-	100%
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			2017*	4	43.5	73.0	29.5	1	0	3	3	100%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-		2009	1				0	1	0	0	0%
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			2010	5				0	5	0	0	0%
Simce (Toppenish Creek Trib) 2012 2 - - - 0 2 0 0 0% 2013* 1 2013* 1 0 0 0% 0 0% 2015* 1 2015* 1 0 1 0 0 0% 2016* 1 9.0 9.0 0.0 0 0 1 1 100% 2017* 1 9.0 9.0 0.0 0 1 1 100% 2010 10 2009 0 -<			2011	0				-	-	-	-	-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Simcoe	2012	2	-	-	-	0	2	0	0	0%
Creek Trib) 2014* 2 0 2 0 0 0% 2015* 1 9.0 9.0 0.0 0 1 1 100% 2017* 1 9.0 9.0 0.0 0 0 1 1 100% 2019 0 - 0 </td <td></td> <td>(Toppenish</td> <td>2013*</td> <td>1</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0%</td>		(Toppenish	2013*	1				0	1	0	0	0%
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		Creek Trib)	2014*	2				0	2	0	0	0%
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			2015*	1				0	1	0	0	0%
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			2016*	1	0.0	0.0	0.0	0	0	1	1	100%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2017*	1	9.0	5.0	0.0	0	0	1	1	100%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2009	0				-	-	-	-	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2010	10				0	3	7	1	14%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2011	1				0	0	1	0	0%
Ahtanum 2013* 3 0 1 2 1 50% 2014* 4 0 0 4 1 25% 2015* 4 0 0 4 3 75% 2016* 5 0.9 34.9 34.0 0 0 4 3 75% 2017* 4 0.9 34.9 34.0 0 0 4 4 100% 2017* 4 0.9 34.9 34.0 0 0 4 4 100% 2010 10 -			2012	5	0.9	31.9	31.0	0	0	5	0	0%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Ahtanum	2013*	3				0	1	2	1	50%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2014*	4				0	0	4	1	25%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2015*	4				0	0	4	3	75%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2016*	5	0.9	34.9	34.0	0	0	5	5	100%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2017*	4				0	0	4	4	100%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			2009	0				-	-	-	-	-
2011 1 0 0 1 0 0% Naches Naches 2012 7 1.7 29.0 27.3 0 6 1 0 0% Naches Naches 2013* 5 0 2 3 0 0% 2014* 7 2015 8 0 2 6 3 50% 2016 9 1.7 41.9 40.2 1 1 7 4 57%			2010	10				0	3	7	0	0%
Naches 2012 7 1.7 29.0 27.3 0 6 1 0 0% Naches Naches 2013* 5 0 2 3 0 0% 2014* 7 0 3 4 1 25% 2015 8 0 2 6 3 50% 2016 9 17 41.9 40.2 1 1 7 4 57%			2011	1				0	0	1	0	0%
Naches 2013* 5 0 2 3 0 0% 2014* 7 0 3 4 1 25% 2015 8 0 2 6 3 50% 2016 9 17 419 40.2 1 1 7 4 57%			2012	7	1.7	29.0	27.3	0	6	1	0	0%
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Naches	Naches	2013*	5				0	2	3	0	0%
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			2014*	7				0	3	4	1	25%
$2016 9 \qquad 17 \qquad 419 \qquad 402 \qquad 1 \qquad 1 \qquad 7 \qquad 4 \qquad 57\%$			2015	, 0				0	3	÷ e	2	50%
			2013	0					~	7	3	50 /0
2017 4 1.7 41.8 40.2 1 0 3 2 67%			2016 2017	9 4	1.7	41.9	40.2	1	1	/ 3	4	57% 67%

Table 6. Pacific Lamprey distribution and site occupancy in the Upper Yakima Subbasin from larval lamprey electrofishing surveys between 2010 and 2017. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated directly into the respective stream. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
		2009	0				-	-	-	-	-
		2010	5				0	5	0	0	0%
		2011	41				0	41	0	0	0%
		2012	9	-	-	-	0	9	0	0	0%
	Yakima	2013	13				0	13	0	0	0%
		2014	14				0	14	0	0	0%
		2015*	12				0	12	0	0	0%
		2016	10	404.0	040.0	100 5	0	0	10	4	40%
		2017	8	191.8	318.3	126.5	0	0	8	4	50%
-		2009	0								
		2010	0				-	-	-	-	-
		2011	3				0	3	0	0	0%
		2012	5				0	5	0	0	0%
	Wenas	2013	0	-	-	-	-	-	-	-	-
		2014	3				0	3	0	0	0%
		2015	6				0	6	0	0	0%
		2016	4				0	4	0	0	0%
		2017	0				-	-	-	-	-
-		2009	0								
		2010	0				-	-	-	-	-
		2011	8				0	8	0	0	0%
		2012	1				0	1	0	0	0%
Upper Yakima	Swauk	2013	0	-	-	-					
		2014	0								
		2015	0				-	-	-	-	-
		2016	0								
		2017	2				0	2	0	0	0%
-		2009	0								
		2010	0				-	-	-	-	-
		2011	4				0	4	0	0	0%
		2012	1				0	1	0	0	0%
	Taneum	2013	0	-	-	-					
		2014	0								
		2015	0				-	-	-	-	-
		2016	0								
		2017	0								
-		2009	0								
		2010	0				-	-	-	-	-
		2011	3				0	3	0	0	0%
		2012	0	-	-	-					
	Teanaway	2013	0								
		2014	0				-	-	-	-	-
		2015	0								
		2016	6		74	0.0	- 1	0	5	2	40%
		2017	2	0.3	7.1	۵.۵	0	0	2	2	100%

Table 7. Lamprey distribution and site occupancy (Pacific Lamprey and Western Brook Lamprey) in the Lower Yakima and Naches subbasins from larval lamprey electrofishing surveys between 2009 and 2017. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated directly into the respective stream. "Lamprey" (when stated alone) stands for both Pacific Lamprey and Western Brook Lamprey, and "PA Lamprey" stands for "Pacific Lamprey." Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with lamprey. "%Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied (by All Lamprey Distribution." "% Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Lamprey Distribution." by the "Number (#) of Sites Within Pacific Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with Lamprey	River km of Upper-most Site with Lamprey	Total River km with Lamprey	# of Sites within PA Lamprey Distribution	# of Sites Occupied (All Lamprey) within PA Lamprey Distribution	% Lamprey Occupancy within PA Lamprey Distribution	# of Sites within Lamprey Distribution	# of Sites Occupied (All Lamprey) within Lamprey Distribution	% Lamprey Occupancy within Lamprey Distribution
		2009	0				-	-	-	-		-
		2010	50				29	8	28%	29	8	28%
		2011	9				9	4	44%	9	4	44%
		2012	22	73.5	191.8	118.3	22	11	50%	22	11	50%
	Yakima	2013	10				10	7	70%	10	7	70%
		2014*	4				3	3	100%	3	3	100%
		2015*	6				5	4	80%	5	4	80%
		2016*	4				4	4	100%	4	4	100%
		2017*	4	13.0	191.8	178.8	4	4	100%	4	4	100%
		2009	0				-	-	-	-	-	-
		2010	4				2	0	0%	2	0	0%
		2011	0				5	1	179/	0	2	229/
	Satus	2012	10	2.9	41.3	38.4	4	3	75%	3	3	33 /6 75%
	Odido	2013	e e				4	3	75%	-	1	67%
		2014	4				3	3	100%	4	4	100%
		2016*	4				4	4	100%	4	4	100%
		2017*	4	12.9	43.8	30.9	3	3	100%	3	3	100%
		2009	0	12.0	10.10	00.0	-	-	-	-	-	-
		2010	10				0	0	-	4	1	25%
		2011	0				-	-	-	-	-	
		2012	5				0	0	-	3	3	100%
Lower	Toppenish	2013*	3	43.3	73.2	29.9	0	0	-	2	2	100%
Yakima		2014*	5				0	0	-	3	3	100%
		2015*	4				1	1	100%	3	3	100%
		2016*	7				0	-	-	4	4	100%
		2017*	4				3	3	100%	3	3	100%
		2009	1							1	1	100%
		2010	5							5	3	60%
		2011	0							-	-	-
		2012	2				-	-	-	2	2	100%
	Simcoe	2013*	1	0.1	30.6	30.5				1	1	100%
		2014*	2							2	2	100%
		2015*	1							1	1	100%
		2016*	1				1	1	100%	1	1	100%
		2017*	1				1	1	100%	1	1	100%
		2009	0				- 7	- 7	-	-	-	-
		2010	10				1	1	100%	10	5	90%
		2011	5	0.0	29.5	27.6	5	4	909/	5	4	909/
	Abtanum	2012	3	0.9	30.0	37.0	2	+ 2	100%	3		100%
	Antanum	2013	4				4	3	75%	4	3	75%
		2015*	4				4	4	100%	4	4	100%
		2016*	5				5	5	100%	5	5	100%
		2010	4	0.9	34.9	34.0	4	4	100%	4	4	100%
		2000					-	-	-	-	-	-
		2009	10				- 7	-	-	-	-	-
		2010	10				1	1	0%	10	1	10%
		2011	1				1	-	-	1	0	0%
		2012	7	1.6	72.3	70.7	1	1	100%	7	4	57%
Naches	Naches	2013*	5				3	2	67%	5	4	80%
		2014*	7				4	3	75%	6	5	83%
		2015	8				6	3	50%	8	5	63%
		2016	9				7	5	71%	7	5	71%
		2017	4	0.0	72.3	72.3	3	3	100%	4	4	100%

Table 8. Lamprey distribution and site occupancy (Pacific Lamprey and Western Brook Lamprey) in the Upper Yakima Subbasin from larval lamprey electrofishing surveys between 2010 and 2017. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated directly into the respective stream. "Lamprey" (when stated alone) stands for both Pacific Lamprey and Western Brook Lamprey, and "PA Lamprey" stands for "Pacific Lamprey." Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with lamprey. "%Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied (by All Lamprey) within the Pacific Lamprey Distribution." "% Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Lamprey Distribution." "% Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Lamprey Distribution." "% Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Lamprey Distribution." "% Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Lamprey Distribution." "% Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites within Pacific Camprey Distribution." "%

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with Lamprey	River km of Upper-most Site with Lamprey	Total River km with Lamprey	# of Sites within PA Lamprey Distribution	# of Sites Occupied (All Lamprey) within PA Lamprey Distribution	% Lamprey Occupancy within PA Lamprey Distribution	# of Sites within Lamprey Distribution	# of Sites Occupied (All Lamprey) within Lamprey Distribution	% Lamprey Occupancy within Lamprey Distribution
		2009	0				-	-	-	-	-	-
		2010	5				1	1	100%	4	1	25%
		2011	41				0	-	-	39	22	56%
		2012	9				1	0	0%	8	7	88%
	Yakima	2013	13	191.8	328.1	136.3	0	-	-	13	11	85%
		2014	14				0	0	-	14	6	43%
		2015*	12				0	-	-	12	5	42%
		2016	10				10	10	100%	10	10	100%
		2017	8				8	6	75%	8	6	75%
		2009	0							-	-	-
		2010	0							-	-	-
		2011	3							2	2	100%
		2012	5							5	3	60%
	Wenas	2013	0	0.0	19.2	19.2	-	-	-	-	-	-
		2014	3							3	3	100%
		2015	6							6	4	67%
		2016	4							4	3	75%
		2017	0							-	-	-
		2009	0							-	-	-
		2010	0							-	-	-
		2011	8							8	5	63%
Upper		2012	1							1	1	100%
Yakima	Swauk	2013	0	0.2	11.7	11.5	-	-	-	-	-	-
		2014	0							-	-	-
		2015	0							-	-	-
		2016	0							-	-	-
		2017	2							2	2	100%
		2009	0									
		2010	0									
		2011	4									
	_	2012	1									
	Taneum	2013	0	-	-	-	-	-	-	-	-	-
		2014	0									
		2015	0									
		2016	0									
		2017	0									
		2009	0							-	-	-
		2010	0							-	-	-
		2011	3	0.2	12	1.0	_	_	_	2	2	100%
	Teanaway	2012	0	0.2	1.4	1.0	-	-	-	-	-	-
	reanawdy	2013	0							-	-	-
		2014	0							-	-	-
		2015	U				5	4	80%	-	- 5	-
		2010	2	0.1	7.1	7.0	2	2	100%	2	2	100%
		<u> /</u>	~				-	-		-	-	



Figure 1. Pacific Lamprey site occupancy in the Lower Yakima River (downstream of the Naches River confluence, river km 191.9). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 5 for more details.



Figure 2. Pacific Lamprey site occupancy in Lower Yakima River tributaries (Satus, Toppenish and Ahtanum streams). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the respective streams. Adult Pacific Lamprey were translocated into Satus Creek in 2012 and into Toppenish and Ahtanum creeks starting in 2013. See Table 5 for more details.



Figure 3. Pacific Lamprey site occupancy in the Naches River. "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 5 for more details.



Figure 4. Pacific Lamprey site occupancy in upper Yakima River. "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 6 for more details.



Figure 5. Pacific Lamprey site occupancy in the Teanaway River (a tributary in the upper Yakima River, confluence at river km 288.9). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. See Table 6 for more details.

Wenatchee Subbasin

Lower Wenatchee River (from mouth to Tumwater Dam, river km 49.6)

In the lower Wenatchee River, the lower most distribution of Pacific Lamprey is at river km 1.0 (surveyed in 2012), located 0.30 km downstream of the Highway 285 Bridge (Table 9 and Figure 6). The upper most distribution is at river km 48.8 (surveyed in 2015 by USFWS), located 0.8 river km downstream of Tumwater Dam. Pacific Lamprey are distributed within 47.8 river km of the lower Wenatchee River. Between 2015 and 2017, Pacific Lamprey were present at 10 of 10 (100%) sites. Adult translocation began in lower Wenatchee River to assess the detection efficiency of instream pit tag arrays and passage efficiency of Pacific Lamprey over Tumwater Dam.

Upper Wenatchee River (from Tumwater Dam, river km 49.6, upstream)

Pacific Lamprey adult translocation was first initiated in the spring of 2016 upstream of Tumwater Dam, in an effort to recolonize the area upstream of the dam (Table 9 and Figure 7). In the summer of 2016, larval Pacific Lamprey were found at 1 of 6 (17%) sites at river km 56.2 (near the Highway 2 Bridge). Then, in 2017, Pacific Lamprey were found at 5 of 5 (100%) sites, stretching from Jolanda Lake (river km 50.4) upstream to river km 84.0, at a site 3.3 river km downstream of Lake Wenatchee.

Icicle Creek (Lower Wenatchee River Tributary)

No larval lampreys have been found in Icicle Creek (Table 9). Adult Pacific Lamprey were released into Icicle Creek in late summer of 2017 to monitor migration behavior and spawning activity within Icicle Creek.

Nason Creek (Upper Wenatchee River Tributary)

In 2017, young of year (< 30 mm in length) larval lampreys were found at river km 6.5 in Nason Creek (access site off of Highway 2 heading towards Lake Wenatchee; Table 10). The captured lampreys were too small to identify to species (less than 50 mm in total length), but they are likely progeny from adult Pacific Lamprey released into the upper Wenatchee River in spring of 2017 (or potentially from adults released in spring of 2016).

White River (Upper Wenatchee River Tributary)

In 2016, one pit tagged adult Pacific Lamprey was detected moving into the White River (tributary of the Wenatchee River that connects upstream of Lake Wenatchee). As of yet, no larval lampreys have been found in the White River (Table 9). No surveys were conducted in 2017, although future surveys will occur in this area.

Table 9. Pacific Lamprey distribution and site occupancy in the Wenatchee Subbasin from larval lamprey electrofishing surveys between 2009 and 2017. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated directly into the respective stream. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
		2012	5				0	0	5	4	80%
		2013	0				-	-	-	-	-
	Wenatchee	2014	0	1.0	48.8	47.8	0	0	2	2	1009/
		2015	4				0	0	3	4	100%
Lower		2017*	3				Ő	ŏ	3	3	100%
Wenatchee		2012	3				0	3	0	0	0%
		2013	0								
	loiolo	2014	0				-	-	-	•	-
	ICICIE	2015	5	-	-	-	0	5	0	0	0%
		2016	0				-	-	-	-	-
		2017*	2				0	2	0	0	0%
		2012	7				0	7	0	0	0%
		2013	0	-	-	-	_	_	_	_	_
	Wenatchee	2014	0				-	-	-	-	-
		2015	3				0	3	0	0	0%
		2016*	6	50.4	84.0	33.6	0	0	6	1	17%
Upper		2017*	5				0	0	5	5	100%
Wenatchee		2012	3				0	3	0	0	0%
		2013	0				-	-	-		-
	Nason	2014	0	-	-	-					
		2015	4				0	4	0	0	0%
		2016	1				0	1	0	0	0%
		2017	5				0	5	0	0	0%
		2012	0								
		2013	0				-	-	-	-	-
	14/1-14-	2014	0								
	white	2015	1	-	-	-	0	1	0	0	0%
		2016	1				0	1	0	0	0%
		2017	0				-	-	-		-

Table 10. Lamprey distribution and site occupancy (Pacific Lamprey and Western Brook Lamprey) in the Wenatchee Subbasin from larval lamprey electrofishing surveys between 2012 and 2017. "Lamprey" (when stated alone) stands for both Pacific Lamprey and Western Brook Lamprey, and "PA Lamprey" stands for "Pacific Lamprey." Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with lamprey. "%Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied (by All Lamprey) within the Pacific Lamprey Distribution" divided by the "Number (#) of Sites within Pacific Lamprey Distribution." "%Lamprey Distribution." "%

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with Lamprey	River km of Upper-most Site with Lamprey	Total River km with Lamprey	# of Sites within PA Lamprey Distribution	# of Sites Occupied (All Lamprey) within PA Lamprey Distribution	% Lamprey Occupancy within PA Lamprey Distribution	# of Sites within Lamprey Distribution	# of Sites Occupied (All Lamprey) within Lamprey Distribution	% Lamprey Occupancy within Lamprey Distribution
		2012	5				5	4	80%	5	4	80%
		2013	0				-	-	-	-	-	-
	Wenatchee	2014	0	1.0	48.8	47.8	-	-	-	-	-	-
		2015	3				3	3	100%	3	3	100%
		2016*	4				4	4	100%	4	4	100%
Lower _		2017*	3				3	3	100%	3	3	100%
vvenatchee		2012	3									
		2013	0									
	Icicle	2014	5	-	-	-	-	-	-	-	-	-
		2015	0									
		2017	2									
		2012	7									
		2013	0	_	_	_					_	
	Wenatchee	2014	0									
		2015	3									
		2016*	6	50.4	84.0	33.6	6.0	1.0	17%	6.0	1	17%
-		2017*	5				5.0	5.0	100%	5.0	5	100%
		2012	3									
		2013	0									
Upper	Nason	2014	4	-	-	-	-	-	-	-	-	-
Wenatchee		2015	4									
		2010	5	6.5	6.5	0.0				1.0	1	100%
		2017	0	0.0	0.0	0.0						10070
		2012	0									
		2010	0									
	White	2014	1	-	-		-	-	-	-	-	-
		2016	1									
		2010	0									
		2017	J									



Figure 6. Pacific Lamprey site occupancy in the Lower Wenatchee River, downstream of Tumwater Dam, river km 49.6). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 9 for more details. No electrofishing surveys were conducted in 2013 and 2014 (indicated by the "x").



Figure 7. Pacific Lamprey site occupancy in the Upper Wenatchee River (upstream of Tumwater Dam, river km 49.6). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 9 for more details. No electrofishing surveys were conducted in 2013 and 2014 (indicated by the "x").

Entiat Subbasin

Entiat River

In the Entiat River, surveys have shown that Pacific Lamprey range in distribution from river km 1.2 (0.8 river km upstream of the Highway 97 Bridge in Pateros, WA) to river km 46.4, approximately 4 river km downstream of Box Canyon/Silver Falls (the upper distribution was confirmed by USFWS in 2013). In 2016, a total of six sites were surveyed in the Entiat River (four within the Pacific Lamprey distribution, and two outside of the distribution; Table 11). Of sites surveyed within the distribution, all four sites (100%) were confirmed to have Pacific Lamprey. The two sites surveyed upstream of the known distribution were river km 46.5 and 47.2. No adult Pacific Lamprey have been translocated into the Entiat Subbasin.

Further in 2016, Yakama Nation morphologically and genetically confirmed the presence of Western Brook Lamprey in the Entiat River at river km 46.5 (3.9 river km downstream of Box Canyon; Table 12). river km 46.5 is the upper most distribution of lamprey in the Entitat River.

Table 11. Pacific Lamprey distribution and site occupancy in the Entiat Subbasin from larval lamprey electrofishing surveys between 2012 to 2016. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
		2012	5				2	0	3	3	100%
		2013	0				-	-	-	-	-
Entist	Entiat	2014	9	12	46.4	15.2	0	3	6	5	83%
Lindat	Linda	2015	0	1.2	40.4	40.2	-	-	-	-	-
		2016	6				0	2	4	4	100%
		2017	0				-	-	-	-	-

Table 12. Lamprey distribution and site occupancy (Pacific Lamprey and Western Brook Lamprey) in the Entiat Subbasin from larval lamprey electrofishing surveys between 2012 and 2016. "Lamprey" (when stated alone) stands for both Pacific Lamprey and Western Brook Lamprey, and "PA Lamprey" stands for "Pacific Lamprey." Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with lamprey. "%Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied (by All Lamprey) within the Pacific Lamprey Distribution" divided by the "Number (#) of Sites within Pacific Lamprey Occupancy within Lamprey Distribution" is the "Number (#) of Sites Within Pacific Lamprey Distribution." "%Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with Lamprey	River km of Upper-most Site with Lamprey	Total River km with Lamprey	# of Sites within PA Lamprey Distribution	# of Sites Occupied (All Lamprey) within PA Lamprey Distribution	% Lamprey Occupancy within PA Lamprey Distribution	# of Sites within Lamprey Distribution	# of Sites Occupied (All Lamprey) within Lamprey Distribution	% Lamprey Occupancy within Lamprey Distribution
		2012	5				3	3	100%	3	3	100%
		2013	0	12	46.4	15.2	-	-	-	0	-	-
Entiot	Entiot	2014	9	1.2	40.4	40.2	6	5	83%	6	5	83%
Entiat	Linual	2015	0				-	-	-	-	-	-
		2016	6	12	46.5	45.3	5	5	100%	5	5	100%
		2017	0	1.2	-0.5	-5.5	-	-	-	-	-	-

Methow Subbasin

Methow River

In the Methow River, the lower most distribution of Pacific Lamprey is river km 2.9 (surveyed by John Crandall between 2009 and 2012), located approximately 2.3 river km upstream of the Hwy 97 Bridge (Table 13). The upper most distribution of Pacific Lamprey (surveyed by John Crandall between 2009 and 2012) is at river km 81.4, located approximately 3.6 river km downstream of the Chewuch River confluence. No lampreys have been found in the Upper Methow River (upstream of the Chewuch confluence), despite efforts to find them (by YN and partners). In 2017, Western Brook Lamprey was morphologically identified at river km 59.3 (shortly upstream of the confluence of Beaver Creek). These samples are awaiting genetic confirmation.

Adult translocation began in the fall of 2015 in the lower Methow Subbasin in response to a declining abundance and lack of recruitment (i.e. virtually no younger age class larvae) for Pacific Lamprey throughout the subbasin. In 2016 (first year for translocation YOY offspring to show up), Pacific Lamprey occupancy continued to decline, with Pacific Lamprey found at 2 of 6 (33.3%) sites (Table 13 and Figure 8). However, in 2017, Pacific Lamprey were found at 3 of 3 (100%) surveyed sites.

Chewuch River (confluence defines the upper and lower Methow River)

In the Chewuch (confluence with the Methow River at river km 84.1), the lower most distribution of Pacific Lamprey is at river km 0.8 (surveyed in 2014), located 0.2 km upstream of the Highway 20 Bridge in Winthrop, WA (Table 13). The upper most distribution (surveyed by John Crandall between 2009 and 2012) is at river km 51.7, and is located 3.0 km downstream of the footbridge by the end of the road. In 2012, the uppermost distribution was at river km 28.6, and in 2015, this shifted downstream to river km 23.9., showing the rapid recession of the upper distribution over this short span of time.

Pacific Lamprey were found at 11 of 14 (78.8%) of surveyed sites between 2013 and 2015 within the known Pacific Lamprey distribution (river km 0.8-51.7 Table 13 and Figure 9). In 2016 and 2017 (after translocation began in the fall of 2015), Pacific Lamprey were found at 7 of 10 (70.0%) sites surveyed. No Pacific Lamprey have been found in the Twisp River or the upper Methow River to date, but adult translocation began in the Twisp River and upper Methow River in 2017. In 2016, YN confirmed (through genetic analysis) the presence of Western Brook Lamprey in the Chewuch River at river km 16.1.

Table 13. Pacific Lamprey distribution and site occupancy in the Methow Subbasin from larval lamprey electrofishing surveys between 2013 and 2017. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated directly into the respective stream. "PA Lamprey" stands for "Pacific Lamprey." Pacific Lamprey distribution is defined as the stream reach between (and including) the listed lower-most and upper-most river km locations with Pacific Lamprey. "% PA Lamprey Occupancy within PA Lamprey Distribution" is the "Number (#) of Sites Occupied by Pacific Lamprey" divided by the "Number (#) of Sites within Pacific Lamprey Distribution."

Subbasin	Stream Name	Year	# of Survey Sites	River km of Lower-most Site with PA Lamprey	River km of Upper-most Site with PA Lamprey	Total River km with PA Lamprey	# of Sites Downstream of PA Lamprey Distribution	# of Sites Upstream of PA Lamprey Distribution	# of Sites within PA Lamprey Distribution	# of Sites Occupied (PA Lamprey)	% PA Lamprey Occupancy within PA Lamprey Distribution
Lower Methow —	Methow	2013	5				1	0	4	3	75%
		2014	3				0	0	3	2	67%
		2015*	3	2.9	81.4	78.5	0	0	3	2	67%
		2016*	6				0	0	6	2	33%
		2017*	3				0	0	3	3	100%
	Twisp	2013	1				0	1	0	0	0%
		2014	0				_	_	_	_	
		2015	0	-	-	-	-	-	-	-	-
		2016	2				0	2	0	0	0%
		2017*	0				-	-	-	-	-
Upper Methow	Methow	2013	4				0	4	0	0	0%
		2014	0								
		2015	0	-	-	-	-	-	-	-	-
		2016	2				0	2	0	0	0%
		2010	2					-	Ū		070
	Chewuch	2017*	0				-	-	-	-	-
		2013	6				0	1	5	4	80%
		2014	4				0	0	4	4	100%
		2015	5	0.8	51.7	50.9	0	0	5	3	60%
		2016	5				0	0	5	4	80%
		2017*	5				0	0	5	3	60%



Figure 8. Pacific Lamprey site occupancy in the Lower Methow River (downstream of the Chewuch River confluence, river km 84.1). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 13 for more details.



Figure 9. Pacific Lamprey site occupancy in the Chewuch River (confluence with the Methow River at river km 84.1). "Percent [%] Pacific Lamprey Occupancy" was calculated by dividing the number of sites occupied by Pacific Lamprey by the number of sites surveyed within the Pacific Lamprey distribution. An asterisk (*) next to a survey year indicates a year where adult Pacific Lamprey were actively translocated into the river. See Table 13 for more details.

DISCUSSION

White Salmon Subbasin – Pacific Lamprey were confirmed by USFWS upstream of the old Condit Dam removal site in 2014. Established index sites will continued to be monitored to assess recolonization of Pacific Lamprey into the subbasin after the removal of Condit Dam.

Klickitat Subbasin – In 2017, Pacific Lamprey were captured at 4 of 4 (100%) sites in the Klickitat River within the known distribution (river km 1.9-69.4). Larval Pacific Lamprey were confirmed immediately upstream of the weir dam at the Klickitat Fish Hatchery (river km 69.4). This finding confirms that adult Pacific Lamprey are able to successfully (with unknown efficiency) pass the weir dam. The passage efficiency of adult Pacific Lamprey over the dam will be studied in 2018.

Yakima Subbasin – In 2017 in the lower Yakima River (downstream the Naches River confluence, river km 191.9), Pacific Lamprey were found at river km 13.0 (in Richland, WA); 60.5 river km downstream of the previous known lower distribution (river km 73.5). This finding shows that Pacific Lamprey do utilize the lower reach of the Yakima River, although likely limited in the summer months when the water temperatures are very warm. This survey was conducted in October, when the water temperature was cooler (~ 14 C).

Adult translocation began in lower Yakima River tributaries (Satus Creek, Toppenish Creek and Ahtanum Creek) in 2013. The distribution and abundance of Pacific Lamprey in the tributary streams is increasing every year. Adult translocation will continue in future years to continually supply recruitment each year to these systems.

Adult Pacific Lamprey were translocated upstream of Roza Dam by YN in the spring of 2015. Larval Pacific Lamprey have now been found throughout the upper Yakima River (both upstream and downstream of Roza Dam). Adult Pacific Lamprey will continue to be released into the upper Yakima River to both assess passage efficiency of adult Pacific Lamprey over Roza Dam, as well as understand migration patterns throughout the upper Yakima Subbasin.

Wenatchee Subbasin – Larval Pacific Lamprey appear to be in good abundance throughout the lower Wenatchee River. However, no larval lampreys have been found in Icicle Creek to date. Adult Pacific Lamprey were released into Icicle Creek in the summer of 2017 in order to understand their migration patterns within (or out of) Icicle Creek. We will continue to monitor Icicle Creek for presence of larval lampreys.

Pacific Lamprey adult translocation began upstream of Tumwater Dam in spring of 2016 upstream of Tumwater Dam. In the summer of 2016, larval Pacific Lamprey were found at 1 of 6 (17%) sites at river km 56.2 (near the Highway 2 Bridge). Then, in 2017, Pacific Lamprey were found at 5 of 5 (100%) sites, stretching from Jolanda Lake (river km 50.4) upstream to river km 84.0, at a site 3.3 river km downstream of Lake Wenatchee. Adult Pacific Lamprey will continue to be released upstream of the dam to continually build the growing population upstream of the dam. In

2017, young of year (< 30 mm in length) larval lampreys were found at river km 6.5 in Nason Creek (access site off of Highway 2 heading towards Lake Wenatchee). The captured lampreys were too small to identify to species (less than 50 mm in total length), but they are likely progeny from adult Pacific Lamprey released into the upper Wenatchee River in the spring of 2017 (or even from twice overwintered adults from the 2016 adult release upstream of the dam).

Entitat Subbasin – Pacific Lamprey appear to be relatively abundant throughout the Entiat River. No adult Pacific Lamprey have been translocated into the subbasin, in order to monitor the natural production of Pacific Lamprey in this system. In 2016, Yakama Nation morphologically and genetically confirmed the presence of Western Brook Lamprey in the Entiat River at river km 46.5 (3.9 river km downstream of Box Canyon; Table 12).

Methow Subbasin – Adult translocation began in the fall of 2015 in the lower Methow Subbasin in response to a declining abundance and lack of recruitment (i.e. virtually no younger age class larvae) for Pacific Lamprey throughout the subbasin. Results show promising recruitment in the Methow River from the translocated adults. Translocation will continue in the subbasin in future years, in order to supplement the low numbers of adult lamprey passing over Wells Dam. In 2017, Western Brook Lamprey was morphologically identified at river km 59.3 (shortly upstream of the confluence of Beaver Creek). These samples are awaiting genetic confirmation. In 2016, YN confirmed (through genetic analysis) the presence of Western Brook Lamprey in the Chewuch River at river km 16.1.