

FINAL Pacific Lamprey
2020 Regional Implementation Plan
for the
Lower Columbia/Willamette
Regional Management Unit
Willamette Sub-Unit



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I. Status and Distribution of Pacific Lamprey in the RMU

A. General Description of the RMU

Willamette River Sub-Unit

The Willamette Sub-Unit of the Lower Columbia River/Willamette Regional Management Unit is comprised of twelve 4th field HUCs that are situated within three Environmental Protection Agency (EPA) Level III Ecoregions: Coast Range, Willamette Valley and Cascades (Figure 1, Table 1).



Figure 1. Map of watersheds within the Lower Columbia River/Willamette Regional Management Unit.

Table 1. Drainage Size and Level III Ecoregions of the 4th Field Hydrologic Unit Code (HUC) Watersheds located within the Willamette Sub-Unit.

Watershed	HUC Number	Drainage Size (km2)	Level III Ecoregion(s)
Middle Fork	17090001	3,540	Willamette Valley
Coast Fork Willamette	17090002	1,726	Coast Range
Upper Willamette	17090003	4,850	Willamette Valley
McKenzie	17090004	3,468	Willamette Valley, Cascades
North Santiam	17090005	1,979	Willamette Valley, Cascades
South Santiam	17090006	2,696	Willamette Valley, Cascades
Middle Willamette	17090007	1,841	Willamette Valley
Yamhill	17090008	1,999	Coast Range
Molalla-Pudding	17090009	2,267	Willamette Valley, Cascades
Tualatin	17090010	1,836	Coast Range, Willamette Valley
Clackamas	17090011	2,442	Willamette Valley, Cascades
Lower Willamette	17090012	1,668	Willamette Valley

B. Status of Species

Conservation Assessment and New Updates

Increased attention on Pacific Lamprey has increased our understanding of this species in the Willamette Basin. Monitoring efforts, in which lamprey are either the target species or information is collected during other species' monitoring, have expanded the amount of information available and the quality of this information.

Previous studies have suggested a lack of genetic population structure (e.g., Goodman et al. 2008; Spice et al. 2012). However, these studies have focused on large geographical areas and have not controlled for time. Recently, two independent studies on adult Pacific Lamprey, conducted in different years and utilizing different genetic tools have reported evidence for some genetic differentiation among a relatively small body size, early migrating run, and a larger, later migrating run of adult Pacific Lamprey at Willamette Falls (Hess et al. 2015; Clemens et al. 2017a). Moderate genetic differentiation of adult Pacific Lamprey also occurred across years in the Willamette River Basin (Clemens et al. 2017a).

Abundance, Distribution and Connectivity

Since 2010, the Confederated Tribes of Warm Springs Reservation of Oregon have collected information to estimate the abundance of Pacific Lamprey adults at Willamette Falls (Falls) and the number passing the Falls through the fishways. Average estimates for this six year period are 182,224 adults (abundance at the Falls) and 65,446 adults (passing above the Falls; Table 2).

Historical occupancy of Pacific Lamprey was extensive throughout the Lower Columbia/Willamette RMU. From the previous threats assessment, Luzier et al. (2011) estimated that the current distribution was reduced 50-70% from historical ranges. Current distribution of lamprey in the Willamette Sub-Unit is strongly related to physical migration barriers. Twenty large dams are present within the Willamette Sub-Unit; 13 are owned and operated by the U.S. Army Corps of Engineers' (Corps or USACE) and collectively referred to as the Willamette Valley Project; at this time, none have successful upstream lamprey passage.

Other large dams are for either non-federal hydropower production or water supply. See “Passage” for more discussion on dam passage.

Of the estimated 371 dams present in the Willamette Basin, approximately 148 are privately owned and used primarily for the purposes of irrigation. The greatest concentration of dams can be found in the Tualatin (82) and Yamhill (65) watersheds (Hulse et al. 2002). Culverts are also widespread throughout the watersheds of the Willamette Sub-Region and impact Pacific Lamprey distribution to an unknown extent.

Recent information collected during the 2017 Threats Assessment and Regional Implementation Plan meetings will be used to determine the percentage of historical distribution still currently occupied. The intrinsic potential historical distribution for Winter Steelhead or Spring Chinook was used as a surrogate for Pacific Lamprey historical distribution.

Table 2. Estimated Pacific Lamprey adult abundance, and numbers passing Willamette Falls and Bonneville Dam, 2010-2017, percent of total that were harvested, percent of total numbers that passed Willamette Falls (Baker and McVay 2018).

Year	Total Abundance At Willamette Falls	Percent Harvested	Numbers Passing Willamette Falls Fishway	Percentage Passing
2010	64,388	2.5%	27,043	42%
2011	107,383	4.0%	46,819	44%
2012	243,048	2.7%	111,559	46%
2013	173,821	4.3%	49,365	28%
2014	336,305	1.1%	125,778	37%
2015	168,398	1.3%	32,112	19%
2016	115,682	2.3%	32,148	28%
2017	277,577	2.3%	80,848	29%
Average	185,825	2.6%	63,209	34%

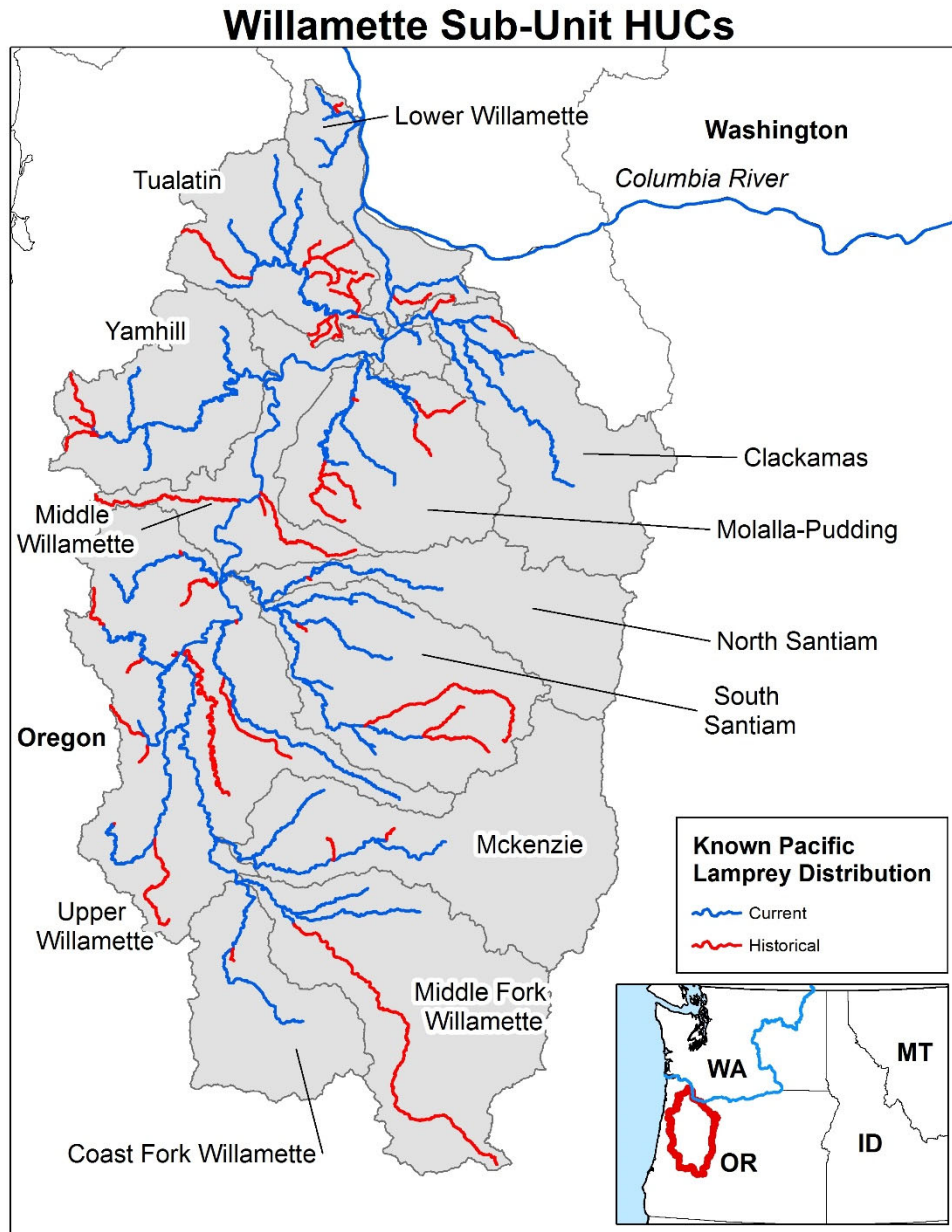


Figure 2. Current and historical distribution for Pacific Lamprey (based on known observation data): Lower Columbia and Willamette Regional Management Unit (USFWS Data Clearinghouse 2018).

C. Summary of Major Threats

The key threats within the Willamette Sub-Unit were identified by RMU participants during the 2017 Risk Assessment revision meeting in February 2017 (Table 3), to update the 2011 Risk Assessment. Key threats are defined as those threats in which the average scope and severity across all HUCs was greater than 2.5 on a scale from 1- 4 (>3.5 = High, 2.5- 3.49 =Moderate, 1.5- 2.49=Low and <1.5= Insignificant; U=Unknown). Risk Assessments are revised approximately every 5 years.

Stream and floodplain degradation (non-dam), water quality (non-dam) and dam-related flow alterations¹ are the highest priority threats in the Willamette Sub-Unit, followed by dam-related stream and floodplain degradation and dam-related passage (Table 3). The “dam-related” threats refer to those threats primarily caused by large dams, which affect multiple parameters (passage, water quality, seasonal baseflows and flood flows (timing, magnitude and duration), floodplain dynamics, habitat (e.g. inundation of habitat, loss of coarse sediment supply), and species composition (e.g. habitat suitability, predator/prey dynamics). Given the prevalence of large dams in the Sub-Unit, this distinction was made to better identify the cause of the threats, and ensure some threats were not masked by the presence of these dams.

Stream and Floodplain Degradation.—Nearly 70 percent of Oregon’s population resides in and around the Willamette Basin. Human settlement and development has greatly altered the physical habitat and hydrology of the Sub-Unit. In upland areas, forestry is the predominant land use. Fire suppression and timber harvest practices have altered the diversity and age/size composition of riparian vegetation. Many watersheds in the Willamette Sub-Unit are lacking mature conifers that play a pivotal role in bank stability, water quality protection, thermal cover, and the provision of large woody debris. In the valley, extensive agriculture and urban development have reduced the quality and complexity of aquatic and riparian habitats. Efforts to reduce flooding (dikes, levees, riprap, dams) and improve navigation (dredging, large wood clearing), have straightened and scoured streambeds, eliminated side channels and cut off flood plains. Cultivation, riparian clearing and conversion of land for crops, pastures, vineyards and development have filled and/or drained wetlands, increased soil erosion and sedimentation, and promoted the establishment and spread of invasive plant species. Simplification of the river channel and flow regulation and simplification of the mainstem Willamette have been hypothesized to be a cause of the decreased numbers of adult Pacific Lamprey harvested by Tribal members at Willamette Falls (Clemens et al. 2017b).

Water Quality.—Elevated water temperature, low dissolved oxygen, bacteria, and toxic pollutants such as herbicides, pesticides, heavy metals and flame retardants, are some of the water quality concerns in the Willamette Sub-Unit. These threats may be attributable to a number of human activities including riparian clearing, water withdrawals, failing septic systems, sewer overflow, and urban and agricultural run-off. Warm summertime temperatures (greater than or equal to 20°C) during July-August may prevent adult Pacific Lamprey from surviving, reproducing, or migrating far up into the Willamette Basin (Clemens 2017; Clemens et al. 2016; Clemens et al. 2012a; Clemens et al. 2009). These summertime temperatures have resulted in large die-offs, skewed sex ratios, documented testicular atresia (damaged testes) in

¹ “Flow Alterations” were formerly referred to as “Dewatering and Flow Management” in Luzier et al. (2011).

males, and faster maturation rates. Toxins may be particularly harmful to Pacific Lamprey because larvae burrow and feed in mud and fine substrates where toxins accumulate (Nilsen et al. 2015; Clemens et al. 2017b). Monitoring efforts to improve and protect water quality for fish, wildlife, and human health are ongoing in the Willamette Sub-Unit.

Flow Alterations – (formerly “Dewatering and Flow Management”). —Flow alterations were ranked as a Moderate key threat. Low flow conditions occur naturally in many watersheds of the Willamette Sub-Unit during summer months. These conditions may be aggravated by water withdrawals for municipal, industrial, commercial and agricultural use. In several tributaries, the large storage dams augment seasonal low flows, and some alter natural temperature and flow regimes. Water releases from thermally stratified reservoirs generally result in cooler water temperatures downstream of the dam in summer and warmer water temperatures in fall and winter. Abnormal seasonal temperature fluctuations may impact the behavior, development, and fitness of adult and juvenile lamprey. In 2005, the USACE completed a water temperature control tower at Cougar Dam on the South Fork McKenzie River, which has alleviated much of the dam-induced seasonal abnormalities in the McKenzie River. Such temperature control structures are still needed elsewhere in the Willamette Basin to return to more normative temperature regimes (e.g. North Santiam River, the Middle Fork Willamette).

Water diversions and impoundments alter the quantity and timing of flow events, which may impact adult and juvenile lamprey migration cues, decrease spawning habitat availability, prevent access to backwater or side channel habitats, create low water barriers, and contribute to mortality if incubating eggs or burrowing larvae are dewatered or exposed to a high temperature or low oxygen environment (Clemens et al. 2017b). Some improvements to flow regimes have occurred in the Willamette Basin. Since 2002, the USACE has largely operated their Willamette Valley Project dams according to minimum flows and ramping rates that were formalized under the Willamette Project Biological Opinion issued by the National Marine Fisheries Service (NMFS 2008) for the protection of anadromous salmonids. Further, through the Willamette Valley Sustainable River Project, The Nature Conservancy and the USACE and numerous other agencies and organizations are working to ensure that Willamette River flows are managed to benefit fish and wildlife habitats as well as local communities

(<https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/oregon/placesweprotect/wv-fact-sheet.pdf?redirect=https-301>).

Table 3. Summary of the assessment results for the main threats of the Willamette Sub-Unit. Key Threats are those that rank Moderate or High (2.5 or greater). Threats ranked less than 2.5 are not listed.

Watershed	Dam-Related Passage		Dam-Related Flow Alterations		Dam-Related Stream & Floodplain Degradation		Dam-Related Water Quality		Dam-Related Predation	
	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity
Willamette Sub-Unit										
<i>Middle Fork Willamette</i>	4	4	4	4	4	4	4	4	3	3
<i>Coast Fork Willamette</i>	4	4	4	4	4	4	4	4	2.5	2.5
<i>Upper Willamette</i>	2	4	4	4	3	4	3	4	2	4
<i>McKenzie</i>	3	3	3	3	3	3	3	3	2	2
<i>North Santiam</i>	4	4	4	4	4	4	3	3	1	1
<i>South Santiam</i>	4	4	4	4	4	4	4	4	2	4
<i>Middle Willamette</i>	2	4	4	4	4	4	3	3	1	U
<i>Yamhill</i>	2	2	2.5	2.5	2	2	2.5	2.5	1	1
<i>Molalla-Pudding</i>	2.5	2.5	2.5	2.5	2	2	2.5	2.5	3	3
<i>Tualatin</i>	2.5	2.5	2	2	2	2	2	2	3	3
<i>Clackamas</i>	3	3	1	2	1	1	1	1	3	U
<i>Lower Willamette</i>	1	2	3	3	4	4	4	4	4	4
<i>Average Scope/Severity</i>	2.8	3.3	3.2	3.3	3.1	3.2	3.0	3.1	2.3	2.8
Rank	M	M	M	M	M	M	M	M	L	M
<i>Mean</i>	3.0		3.2		3.1		3.0		2.5	
Overall Threat Rank	M		M		M		M		M	

Table 3 (continued). Summary of the assessment results for the main threats of the Willamette Sub-Unit. Key Threats are those that rank Moderate or High (2.5 or greater). Threats ranked less than 2.5 are not listed.

Watershed	Flow Alterations (non-dam)		Stream & Floodplain Degradation (non-dam)		Water Quality (non-dam)		Predation (non-dam)	
	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity
Willamette Sub-Unit								
<i>Middle Fork Willamette</i>	1	1	3.5	3	2	2	1	1
<i>Coast Fork Willamette</i>	3	2.5	2.5	2.5	3	3	2.5	2.5
<i>Upper Willamette</i>	3.5	3	4	3.5	4	3.5	1.5	U
<i>McKenzie</i>	2	2	3	3	2	1	1	1
<i>North Santiam</i>	3	3	2.5	3	2	3	1.5	3
<i>South Santiam</i>	3.5	3	3	3	3	3	1	U
<i>Middle Willamette</i>	3.5	3	4	4	3.5	4	4	U
<i>Yamhill</i>	3	3	4	4	4	4	3	3
<i>Molalla-Pudding</i>	4	4	4	4	4	4	3	3
<i>Tualatin</i>	2.5	2.5	4	4	4	4	3	3
<i>Clackamas</i>	1	2	3	3	3	3	3	U
<i>Lower Willamette</i>	2.5	2.5	4	4	4	4	4	4
<i>Average Scope/Severity</i>	2.7	2.6	3.5	3.4	3.2	3.2	2.4	2.6
Rank	M	M	H	M	M	M	L	M
<i>Mean</i>		2.7		3.4		3.2		2.5
Overall Threat Rank		M		M		M		M

Passage- The current distribution of Pacific Lamprey is largely determined by the many large dams throughout the Willamette Basin that do not provide passage (Clemens et al. 2012b; Schultz et al. 2014; Table 4). The USACE Willamette Valley Project dams were primarily built to reduce flood risks, but also generate electricity and provide water storage for irrigation, recreation and drinking water. The structures range in size from 49 feet (Fern Ridge) to 519 feet (Cougar) tall and provide little or no fish passage for Pacific Lamprey. Largely constructed in the early 1960s, the USACE dams block hundreds of miles of historical, anadromous spawning and rearing habitat and have adversely affected native fish populations in the basin. Consequently, the Willamette Valley Project Biological Opinion, issued by the National Marine Fisheries Service (NMFS 2008), requires the Corps to improve adult and juvenile salmonid passage at several high priority dams.

USACE's adult fish trap and haul facilities located at the base of these dams are primarily designed for anadromous salmonids, which are trapped and transported by truck and released upstream of the dams. Some of the recent upgrades include features (e.g. rounded walls at fishway entrances and orifices) that may increase the ability to capture and haul adult lamprey if additional infrastructure (such as ramps and collection boxes) was added. Work to date has included the construction or upgrade of adult fish collection facilities at Cougar, Detroit (Minto), Foster, Dexter and Fall Creek Dams to improve trap and haul conditions for salmonids (i.e., improved attractant flows, larger holding areas, less direct handling of fish). At this time, Fall Creek Dam has the only experimental ramps for upstream lamprey passage at these USACE dams.

Downstream fish passage solutions for salmonids at the USACE dams are still under evaluation. No permanent downstream fish passage collection facilities for any of the USACE dams have been completed. Juvenile fish (all species) must pass through turbines, spillway gates, or other routes of water passage as they migrate downstream. USACE has tested a small, experimental, floating surface collector at Cougar Dam for downstream passage of salmonids. Other studies to determine downstream passage solutions at Detroit and Lookout Point Dams continue. It is unclear if passage improvement measures will ultimately restore access to the habitat above these dams for Pacific Lamprey.

Although most passage projects in the Willamette Sub-Unit are focused on improving conditions for ESA-threatened spring Chinook salmon and winter steelhead, a growing number of projects are providing passage for Pacific Lamprey. In conjunction with Federal Energy Regulatory Commission relicensing, Portland General Electric (PGE) has installed three lamprey passage structures at Willamette Falls Hydroelectric Project (Lower Willamette River), rebuilt the existing fish ladder at River Mill Dam (Clackamas River) and made modifications to the fishway that traverses the Faraday and North Fork Dams (Clackamas River) to improve upstream passage of adult Pacific Lamprey. PGE is also monitoring the downstream migration of juvenile lamprey with two, new surface collectors at River Mill and North Fork Dams. These facilities are collecting and enumerating lamprey outmigrants. The collection efficiency of the downstream passage structures are unknown, but thousands of ammocoetes and macrophthalmia have been collected each year since construction. PGE is also trapping and hauling adult Pacific Lamprey into the Clackamas above North Fork Dam to increase larval production (and the pheromones they produce) in the upper basin in an effort to increase adult attraction to this area. In the future, PGE will perform a multi-year radio telemetry study that will assess migration and passage success of adult Pacific Lamprey through the fish ladder at North Fork Dam.

Table 4. Passage conditions at most large dams located in the Willamette Sub-Unit.

Dam / Ownership	River	Passage Conditions for Pacific Lamprey
Dexter, Lookout Point, and Hills Creek <i>USACE</i>	Middle Fork Willamette	A trap and haul facility for anadromous salmonids occurs below Dexter Dam, the lower-most dam on the Middle Fork Willamette. Future upgrades may increase the ability to capture and haul adult lamprey upstream of these dams. Permanent downstream passage facilities are not present.
Fall Creek Dam <i>USACE</i>	Tributary to Middle Fork Willamette below Dexter Dam	A trap and haul facility for anadromous salmonids occurs below Fall Creek Dam, and USACE has installed a ramp/collection box specific for lamprey. Future upgrades may increase the ability to capture and haul adult lamprey upstream of these dams. CTGR are conducting a reintroduction/translocation of adults captured at Willamette Falls above this dam. Downstream passage facilities are not present; “passage” for downstream migrant salmonids is provided by annual 1-2 week drawdown of the reservoir- typically in December or January each year.
Dorena Dam <i>USACE</i>	Row River- Tributary to Coast Fork	No fish passage facilities are present or planned at this dam.
Cottage Grove Dam <i>USACE</i>	Coast Fork Willamette River	No fish passage facilities are present or planned at this dam.
Fern Ridge Dam <i>USACE</i>	Long Tom River	No fish passage facilities are present or planned at this dam.
Leaburg Dam <i>EWEB</i>	McKenzie River	Two upstream fishways are located at Leaburg Dam (~10 feet tall). Lamprey passage efficiency is unknown, but Pacific Lamprey are found above this dam. EWEB’s diversions are screened to NMFS criteria, which are adequate for larger outmigrants, but may allow the smallest larvae to pass through the screen, and intermediate sized larvae may become impinged or wedged in the gaps of the screen material.
Cougar Dam <i>USACE</i>	South Fork McKenzie River	A trap and haul facility for anadromous salmonids occurs below Cougar Dam; recent upgrades may increase the ability to capture and haul adult lamprey upstream if additional infrastructure was added. Permanent downstream passage facilities are only in the design phase, but may be installed in 2020.
Blue River Dam <i>USACE</i>	Blue River (tributary to McKenzie River)	No fish passage facilities are present or planned at this dam.

Table 4 continued.

Dam / Ownership	River	Passage Conditions for Pacific Lamprey
Trail Bridge Dam <i>EWEB</i>	McKenzie River	No fish passage facilities are present at this dam. Future upgrades in the next ~5 years will include a trap and haul facility that includes design considerations for trap and haul of adult Pacific Lamprey. Downstream passage will be provided by spill and powerhouse shut-down, which will occur year-round.
Minto, Big Cliff and Detroit Dams <i>USACE</i>	North Santiam	A trap and haul facility for anadromous salmonids occurs below Big Cliff Dam, the lower-most dam, at Minto. Recent upgrades may increase the ability to capture and haul adult lamprey upstream if additional infrastructure was added. Permanent downstream passage facilities are not present.
Foster and Green Peter Dams <i>USACE</i>	South Santiam	A trap and haul facility for anadromous salmonids occurs below Foster Dam, the lower-most dam. Recent upgrades may increase the ability to capture and haul adult lamprey upstream if additional infrastructure was added. Permanent downstream passage facilities are not present.
Scoggins Dam <i>BLM</i>	Tualatin River	No fish passage facilities are present or planned at this dam.
River Mill, Faraday, and North Fork Dams <i>PGE</i>	Clackamas River	A new fishway at the lower-most River Mill Dam was constructed in 2006 and provides 90% passage efficiency for Pacific Lamprey. PGE has recently modified the North Fork Fishway, which traverses both Faraday and North Fork dams, and is currently evaluating passage here. Permanent downstream passage facilities, which are collecting and enumerating lamprey outmigrants, are at North Fork and River Mill dams. The collection efficiency is unknown, but thousands of ammocoetes and macrophthalmia have been collected each year since construction.
Willamette Falls Dam <i>PGE</i>	Willamette River	Modifications to the existing fishway to improve lamprey passage have been completed. Additionally, seasonal lamprey ramps are installed annually to provide upstream egress for lamprey upstream passage. Modifications to improve downstream salmonid passage have been completed, including improved spill conditions, which are likely to improve passage conditions for lamprey.

Predation. Predation (both dam-related and not dam-related) was ranked as a moderate threat to lamprey. Predation on lamprey likely occurs throughout the Willamette Basin: sea lion and white sturgeon activity is commonly seen immediately below Willamette Falls, and many warm-water predatory fish species are common throughout the basin in the large reservoirs and lower tributaries of the Willamette. These non-native fish are able to overwinter and survive in the basin largely because of large reservoirs or other modified habitats. At this time, there is very little direct study of predation in the Willamette Basin; thus, while there may be many potential predators of lamprey present, in many areas it is uncertain what the severity of such predation is

to the lamprey population.

Other.—Predicted trends in human population growth, increased development, and anticipated effects of climate change (i.e., elevated water temperatures, increased demand for consumptive surface water use, altered flow regimes) will likely compound existing threats to Pacific Lamprey throughout the Willamette Sub-Unit.

2017 Nature Serve Values:

Based on the scores provided above, the following rankings were determined using a modified NatureServe ranking model to assess the current threats and extinction risk to Pacific Lamprey. The use of the NatureServe model is described in Luzier et al. 2011, and the following updated ranks will be further detailed in the 2018 update to that document (*Pacific Lamprey Assessment and Template for Conservation Measures*), expected to be completed in summer 2018.

Table 5. NatureServe Rankings by HUC. S1 = Critically imperiled in the jurisdiction because of extreme rarity or because of some factors such as very steep declines making it especially vulnerable to extirpation; S2 = imperiled in the jurisdiction because of rarity due to very restricted range, very few occurrences, steep declines, or other factors making it vulnerable steep declines making it especially very vulnerable to extirpation; S3 = vulnerable in the jurisdiction due to restricted range, relatively few occurrences, recent and widespread declines, or other factors making it vulnerable to extirpation.

NatureServe Ranking	HUC
S1- Critically Imperiled	Middle Fork Willamette
S1- Critically Imperiled	Coast Fork Willamette
S1- Critically Imperiled	Upper Willamette
S2 – Imperiled	McKenzie
S1- Critically Imperiled	North Santiam
S1- Critically Imperiled	South Santiam
S1- Critically Imperiled	Middle Willamette
S1- Critically Imperiled	Yamhill
S1- Critically Imperiled	Molalla-Pudding
S1- Critically Imperiled	Tualatin
S3- Vulnerable	Clackamas
S1- Critically Imperiled	Lower Willamette

Restoration Actions

The following work was recently completed or is actively occurring in the Willamette Sub-Unit. Additional detail is provided in the Willamette Sub-Unit Meeting Notes for the 2020 Annual Meeting of the Willamette Pacific Lamprey RMU (see Appendix A to this document).

- Clackamas Watershed
 - Two new surface collectors for downstream fish passage have been completed by PGE at the River Mill and North Fork Dams over the past few years. Both are collecting many juvenile lamprey outmigrants; however, the collection efficiency of these facilities for lamprey is unknown.
 - PGE began Trap and Haul efforts to transfer adult lamprey above North Fork Dam in 2017, and plan to continue through 2025.
 - Multiple habitat restoration efforts have occurred in the Clackamas Basin (PGE, Metro and others), including the ongoing “Shade Our Streams” efforts by the Clackamas River Basin Council and PGE.
- Fall Creek (Middle Fork Willamette)
 - The Confederated Tribes of the Grand Ronde is leading a multi-year lamprey translocation study on Fall Creek (2012- present).
 - The USACE has completed the newly constructed Fall Creek Adult Fish Collection Facility; it is on line and in process of commissioning. No signs of lamprey at the new adult collection facility yet. The facility was designed with lamprey passage in the ladder in mind, may ultimately assist with a trap and haul program for Pacific Lamprey. USACE hopes to place fyke traps in and around the waterways of the facility this year.
- The Confederated Tribes of Warm Springs Reservation of Oregon continues to assess passage and abundance of adult Pacific Lamprey at Willamette Falls.
- McKenzie
 - In 2018, a current large-scale project is underway to restore floodplain connectivity and function on over 500 acres of historical alluvial delta at the confluence of the South Fork McKenzie River. Project will remove approx. 40 acres of levees and augment sediment (over 200,000 cubic yards) and large wood (3,000-4,000 pieces) on 4.5 miles of the South Fork below Cougar Dam, resulting in 5-10 miles of secondary channel reconnection (up to 400% increase), and improving spawning and rearing habitats for Pacific Lamprey. Implementation of Phase I was partially funded through the RIP process with BPA cost savings funds. Phase I includes restoration of the lower 2.0 miles of the project area (400 acres of floodplain). Project leads: USFS (Kate Meyer), McKenzie Watershed Council (Jared Weybright).

- State-wide
 - Ben Clemens (ODFW) reported that he is working on a **Lamprey Conservation Plan** for the state of Oregon, which will cover 4 species (Western River, Western Brook, Pacific and Pacific Brook lamprey). The status and limiting factors rankings in this plan are being cross-walked with those from the USFWS, is to be consistent with the PLCI. The plan is expected to be completed in 2019.

Selection of Priority Actions

A. Prioritization Process

The highest priority threat in the Willamette Sub-Unit is stream and floodplain degradation (score = 3.4). Several other factors ranked above 3.0: dam-related passage, dam-related flow alteration and water quality. Priority projects identified by participating members of the Willamette Sub-Unit RMU addressed threats to passage, stream and floodplain degradation and uncertainties in Pacific Lamprey distribution and enumeration.

B. High Priority Proposed Project Information

No proposals were submitted in 2021 for 2022 funding from the Willamette .

I. References for RIP

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II. MEETING NOTES

WILLAMETTE RMU- Pacific Lamprey Threats Assessment and RIP Annual Meeting April 20, 2021

April 20, 2021

Web conference attendees

ODFW: Ben Clemens, Alex Farrand, Emma Garner, Jeremy Romer

Confederated Tribes of the Grand Ronde: Lawrence Schwabe

Coast Fork Watershed Council: Reilly Newman

Greater Yamhill Watershed Council: Luke Westphal

Long Tom Watershed Council: Dana Dedrick

McKenzie Watershed Council: Jared Weybright

Pudding River Watershed Council: Anna Rankins

Tryon Creek Watershed Council: Alexis Barton

Portland General Electric: Dan Cramer, Maggie David, Nick Ackerman

CRITFC: Laurie Porter

USACE: Terri Berling, Doug Garletts, Chad Helms

USFWS: Erin Butts, Ann Gray, Amy Horstman, Jen Poirier, Joe Skalicky

PLCI: Alicia Marrs

Co-chairs: Ann Gray and Jen Poirier (USFWS)

MEETING NOTES (see also pdf of powerpoint, emailed on April 16, 2021)

2021 Activities & Events

- **4th Annual Lamprey Information Exchange Continues (2nd Tuesdays 11am to 1:30 pm)**
 - **May 11th** - Learning from North American Sea Lamprey Research and Experiences
 - **June 8th** - Diversity in Lampreys: Within-species and Across Species
 - Registration and list of speakers at: fws.gov/pacificlamprey/LTWGMainpage.cfm
 - Recordings of previous webinars: www.gotostage.com/channel/plci
- **5th Annual Lamprey Information Exchange -planning**
 - **December 7-9, 2021 – Mark your calendars!**
 - Held at Water Resources Education Center in Vancouver, WA with virtual options
 - Session development currently underway- **If you have a poster or presentation you would like to present, contact Ann Gray.**
- **FYI: Recent Publications by Lamprey Technical Workgroup**
 - Overview of eDNA and Applications for Research and Monitoring of Lampreys (LTWG, Genetics subgroup)
 - Monitoring and Minimizing Effects of Dredging on Lampreys (LTWG, JEDDI subgroup)
 - Barriers to Adult Pacific Lamprey at Road Crossings: Guidelines for Evaluating and Providing Passage (LTWG, Adult Passage & Engineering subgroup)
 - Best Management Guidelines for Native Lampreys During In-water Work (LTWG)

- **FYI: Recent Publications on Lamprey**

- Microhabitat use by pre-spawning Pacific lamprey *Entosphenus tridentatus* in a large, regulated river differs by year, river segment, and availability (Clemens and Schreck 2021)
- Native Lampreys of Oregon (Brochure published by ODFW)
- Dispelling misperceptions of native lampreys (*Entosphenus* and *Lampetra* spp.) in the Pacific northwest (USA) (Clemens and Wang 2021)
- Management of anadromous lampreys: Common threats, different approaches (Clemens et al. 2020)
- River Network and Reach-Scale Controls on Habitat for Lamprey Larvae in the Umpqua River Basin, Oregon (Jones et al. 2020)
- For more lamprey publications, check out the **Data Clearinghouse literature site** on USGS Science Base
<https://www.sciencebase.gov/catalog/item/53ad8d9de4b0729c15418232>

Background: Pacific Lamprey Conservation Initiative

- The Willamette River Regional Management Unit group is part of Pacific Lamprey Conservation Initiative (PLCI).
- The PLCI is a collaborative effort developed to promote the coordination and implementation of conservation efforts across the range of lamprey.
- The PLCI is organized into four groups: Policy Committee (i.e., high-level managers, tribal council members), Conservation Team (signatories of Conservation Agreement), Lamprey Technical Workgroup and Regional Management Unit groups.

Background: Regional Management Unit (RMU) groups

- RMU partners include project leads, field biologists, restoration practitioners, natural resource managers and stakeholders familiar with watersheds in region.
- Partners provide information for Risk Assessment (see below).
- Assist with development of Regional Implementation Plan (see below).
- Support the development and implementation of priority lamprey projects.
- There are 18 RMU groups across range of Pacific Lamprey.

Background: Pacific Lamprey Risk Assessment

- NatureServe modeling exercise that uses our current knowledge of Pacific Lamprey distribution, abundance, population trends and local threats to assess the relative risk of extirpation at the 4th field HUC level.
- Risk rankings used to guide the identification and prioritization of conservation measures in the RMU.
- Risk Assessment will be updated every 5 years or so to monitor progress and change (next revision in 2022 or 2023).

- Current Assessment is on Pacific Lamprey Conservation Initiative web page under Assessment on blue bar www.fws.gov/pacificlamprey/mainpage.cfm or <https://www.fws.gov/pacificlamprey/assessmentmainpage.cfm#2018Assessment>

Background: Regional Implementation Plans (RIPs)

- The RIPs summarize the status, distribution and local threats to lamprey, and include on the ground projects (submitted by RMU partners) that address the identified threats to lamprey and their habitats in the region.
- The purpose of the RIP process is to facilitate the funding of high priority lamprey research and conservation actions.
- Completed RIPs for all RMUs are on Pacific Lamprey Conservation Initiative web page under *Plans* on blue bar or https://www.fws.gov/pacificlamprey/PLCI_RIPs.cfm.

2020 New Information on Lamprey Distribution?

One goal of meeting is to revise the available distribution maps as needed based on new information.

- **All:** Please look at our updated distribution maps on the interactive Databasin.org *Pacific Lamprey Known Observations and Distribution*:
 - <https://databasin.org/datasets/a243fb1346ca4258b6388c5f7a90aee4/>
 - Please report any new distribution data or potential errors to Erin Butts (USFWS) Erin_Butts@fws.gov
 - [There are some data points for other species of lampreys \(e.g. Western brook\) in the database.](#)
 - Luke [indicated he had some eDNA data for Pacific lamprey in the Yamhill, and asked if that is appropriate for the distribution data.](#) Erin indicated she is developing a separate database for eDNA information; it's not yet up. [Luke will send Erin his data.](#)
- **All:** [If you're planning to submit a proposal for funding](#), please review project requirements, and get your proposal to Ann Gray by July 16, 2021. If you have any questions, please reach out to Ann, Alicia, or Jen.
 - <https://www.fws.gov/pacificlamprey/PlansMainpage.cfm#RIPprojectproposalprocess>

2020 Regional Implementation Plan Revisions?

One goal of meeting is to revise the RIP as needed based on new information. The top 4 threats as we identified in the Risk Assessment are

- Stream and Floodplain Degradation
- Flow Alterations
- Water Quality
- Passage

No one suggested there were any changes in threats at the meeting. The RMU Team can note changes each year and those notes will be used to re-evaluate in ~2022/2023, when the Risk Assessment will be updated. [If you have any concerns or changes in the 2020 RIP for the 2021](#)

version, please email Ann. Document available here:
<https://www.fws.gov/pacificlamprey/Documents/RIPs/2020/2020%20Willamette%20RIP.pdf>

Status of 2020 RIP Lamprey Project Proposals

- *A Community Science Project to Assess Lamprey Distribution and Raise Awareness of the Cultural and Ecological Importance of Lampreys*
 - Ben Clemens (ODFW), partnering with Patrick Edwards (PSU) and Gabe Sheoships
 - Project funded in 2020 (BPA-Cost Savings funding)
 - Small project focused on Beaverton/Salem area- could expand to a broader base in the future.
- *Responses of Larval Lamprey to Stage 0 Restoration across Space and Time*
 - Paul Burns (USFS); Ben Clemens (ODFW); Ann Gray (USFWS)
 - Project funded in 2020 (BPA-Cost Savings funding)
- *Evaluating Larval Lamprey Movement Capabilities to Improve Dewatering Guidance*
 - Marty Liedtke (USGS)
 - Project funded in 2020 (USFWS end of year)
- *Finn Rock Reach Floodplain Habitat Restorations*
 - Daniel Dietz (McKenzie River Trust)
 - Project unfunded to date– still in consideration for NFHP

Lamprey project funding

- There are 2 primary sources of lamprey-specific funds:
 - NWPCC - BPA Cost Savings Funding
 - National Fish Habitat Partnership Funding
- **UPDATED!!:** PLCI recently updated the project proposal template and guidance documents: docs: <https://www.fws.gov/pacificlamprey/PlansMainpage.cfm#RIPprojectproposalprocess>
 - Our PLCI Coordinator, **Alicia Marrs**, is available to help match RIP projects to available funding sources: Alicia@pacificlamprey.org
- **NWPCC - BPA Cost Savings Funding**
 - Total funding around \$300,000 annually
 - Currently, BPA Funding only applies to RMUs in Columbia River basin.
 - Eligible projects include: Passage or infrastructure improvements, habitat restoration, assessments that lead to the development of BMPs or Guidance documents, assessments that lead to on the ground projects, or research questions that inform management (e.g. acoustic tagging & migration, translocation, population structure, etc.).
 - Project proponent will be responsible for administration and costs related to sub-contracts and associated overhead/indirect.
 - See Power Point presentation for projects funded by Cost Savings Program in 2020.
 - Project implementation period variable depending on project goals (12-24 months).

- **National Fish Habitat Partnership Funding**
 - We will have \$20,000 to fund projects in 2021;
 - Future funding is expected to increase in the next year or two – from \$75,000-\$250,000 annually.
 - NFHP funding is available to RIP projects in any RMU (though non-Columbia basin RMUs will be given first priority)
 - Eligible projects include: stakeholder outreach (including workshops), habitat restoration (including passage or infrastructure improvements and design) or habitat assessment projects.
 - 18-month project period
- **Miscellaneous end of year funding from federal agencies:**
 - Funding varies, but typically less than \$25,000 annually.
 - All project types and RMUs eligible for funding.
 - Typically we can pull from proposals submitted to funding sources above to best fit the available funds.

Partner Project Updates & Announcements

- **Anna Rankins (PRWC)**- Pudding River has considerable restoration opportunities. Anna is looking for opportunities to engage community members in science, with a potential focus on lamprey, pesticides and agriculture. Previously did some work with the community collecting eDNA samples last summer. Currently efforts this year are focused on schools near Woodburn and Mill Creek. Ben Clemens (ODFW) indicated larval lamprey were very abundant several years ago, when OSU did some sampling and offered to reach out to Elena Nilson (USGS) to see if there were specific results relevant to the Pudding. Ben and Anna to coordinate.
- **Joe Skalicky (USFWS) and Jeremy Romer (ODFW)**- discussed effect of Holiday Farm Fires on Leaburg Reservoir. Given the many larval lamprey that reside in the fine sediment deposits throughout Leaburg Reservoir, reservoir drawdown can strand thousands of larval lamprey, and likely did due to operations during the fire. Jeremy indicated that the reservoir was drawn down completely for a while, then raised for some time (which would have allowed larval lamprey coming downstream to re-establish in the dewatered areas), and then had to be drawn down again. The drawdown occurred when the gates were opened. Due to fire, dam operators were evacuated, and the gates had to be opened fully to pass any debris and avoid damage to the dam.
- **Jeremy Romer's AFS talk on Leaburg Dam Project and Outreach:** For Oregon AFS Jeremy did a presentation on the 2020 Leaburg Dam /lamprey passage/ community education and outreach. Presentation highlights how collaboration and outreach with local community was essential to completing this radio-tagging study - if you missed it and (you may have to be registered for the conference- not sure), you can view it on this link until June:

- <https://web.cvent.com/hub/events/4d63e12e-4c43-4f7a-84a3-5e6e74729bf0/sessions/1382820f-406c-42d1-b9d9-5d520f67f188>
 - Emma also provided the link to allow access to all 2021 AFS recordings through the beginning of June. If you "join the virtual meeting" and go through the process to getting a code again, you can see the whole agenda and access all recordings you want: <https://web.cvent.com/event/4d63e12e-4c43-4f7a-84a3-5e6e74729bf0/summary>
 - Jeremy also indicated the adult lamprey have no trouble passing the vertical slot fishway (North side of dam/river). The half-ice harbor fishway on the south side of the dam had much less attraction flow and few lamprey were detected using that fishway.
- **Doug Garletts (USACE):** Anecdote FYI- Many bass lures look exactly like larval lamprey, so lamprey are likely a favorite food item for bass. USACE is operating the Fall Creek Adult Passage Trap and Haul Facilities. They occasionally get lamprey in the trap, and they haul those upstream of the dam. It is difficult to collect them.
 - **Terri Berling (USACE) -** USACE is no longer running the outmigrant trap below Fall Creek. That task has been contracted out to Cramer Sciences, but currently trap is not fishing. In Fall of 2020 and January 2021, some juvenile lamprey were collected.
 - **Lawrence Schwabe (CTGR):** indicated their Fall Creek Reintroduction of Pacific lamprey was completed. No adults have been moved above Fall Creek Dam for 2 years. Eyed juvenile lampreys were collected in the USACE outmigrant trap below Fall Creek 2-3 years ago, documenting successful reproduction and growth above the dam.
 - **Alex Farrand/ Ben Clemens (ODFW):** ODFW has been working on a project at Mercer Dam on Rickreall Creek to provide fish passage at the dam, partnering with BLM (Tony Spitzack), USFWS, CTGR, and Luckiamute Watershed Council. Laurie Porter (CRITFC) expressed interest to be included in future planning. Project currently only hold as Ben is working with Greg Apke (ODFW) to get the City of Dallas (who owns the dam for water supply) to determine the best way to approach passage for lamprey and coho.
 - **Dana Dedrick (LTWC):** Dana is looking learn more about lamprey in Long Tom River. There is a new 1135 Ecosystem Restoration Project (USACE) to start to look at Monroe Dam fish passage. There are 2 more run of river check dams above that as well. Confederated Tribes of Siletz Indians (Stan van de Wetering) and City of Monroe are partners. A lamprey passage study/info would be enormously helpful. If lamprey passage (and chinook) were provided at Monroe Dam, that passage would then allow anadromous access to habitat that has been restored in tributaries in the upper Long Tom basin. Doug and Chad (USACE) and Joe and Ann (USFWS) offered to coordinate and assist with the project.
 - **Jared Weybright (MRWC)-** In the McKenzie River Basin, the Holiday Farm Fire has created many restoration opportunities among a network of partners, including MRWC, McKenzie River Trust, EWEB, USFS, ODFW and others. Partners are looking to continue work on the South Fork McKenzie Stage 0 restoration, and other floodplain connection opportunities, including Quartz and Ennis Creeks. Expecting 5 to 10 projects to be selected for build-out throughout the area and tributaries and off-channel areas. Stay tuned!

- **Maggie David (PGE)** –PGE is currently in its 5th year of a trap and haul program for adult Pacific lamprey, concurrent with lamprey passage studies at the Clackamas hydroelectric project (Clackamas River). Lamprey are collected at the lower River Mill Dam and passed above the North Fork Dam/Reservoir (250 to 400 fish). While passage at River Mill Dam is good for lamprey (>90% passage efficiency), lamprey passage at the next ladder upstream (North Fork Fishway) is poor. Trap and haul will continue while PGE studies attempt to identify problem areas and appropriate fixes to the North Fork Fishway.

Willamette RMU Review Timelines

- 2021 project proposals **due July 16th** to Ann Gray.
- Willamette RMU draft RIP & project proposal review July 26th – August 5th
- RIP project proposals will be presented to Conservation Team August 18th
- Conservation team will review and rank projects and begin making project selections October 8th (BPA funding)
- Timeline of NFHP funding procurement is variable

Contacts for Willamette River RMU sub-region:

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