DRAFT Pacific Lamprey

2019 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).

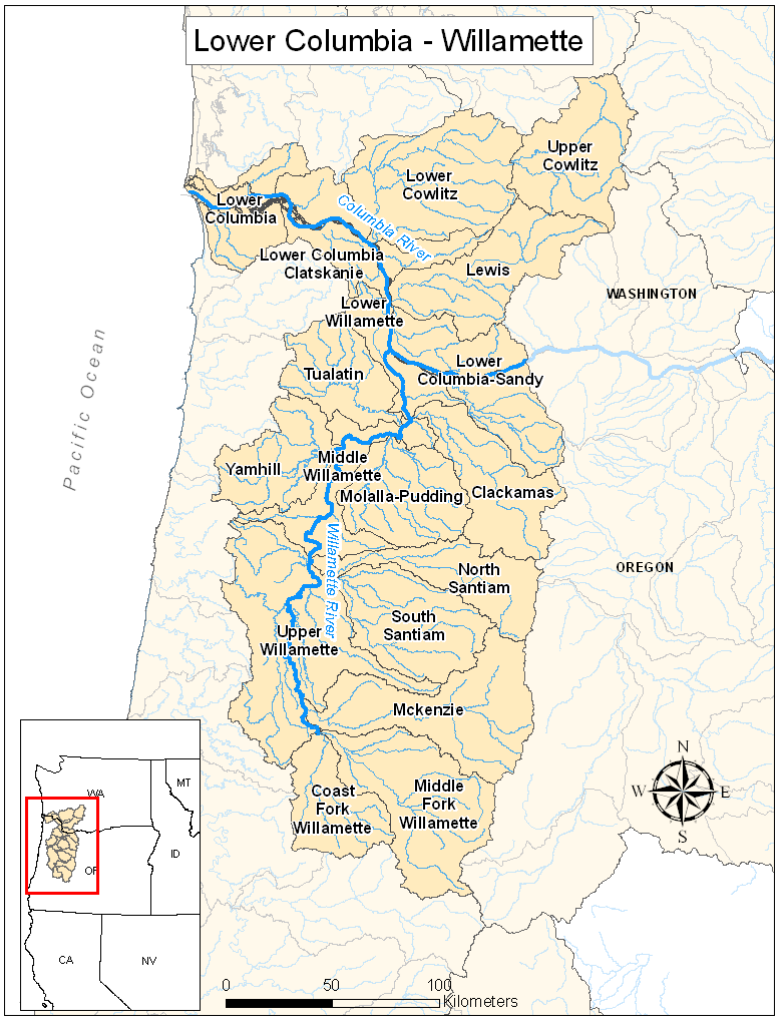


Figure 1. Map of watersheds within the Lower Columbia River/Willamette Regional Management Unit.

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%**

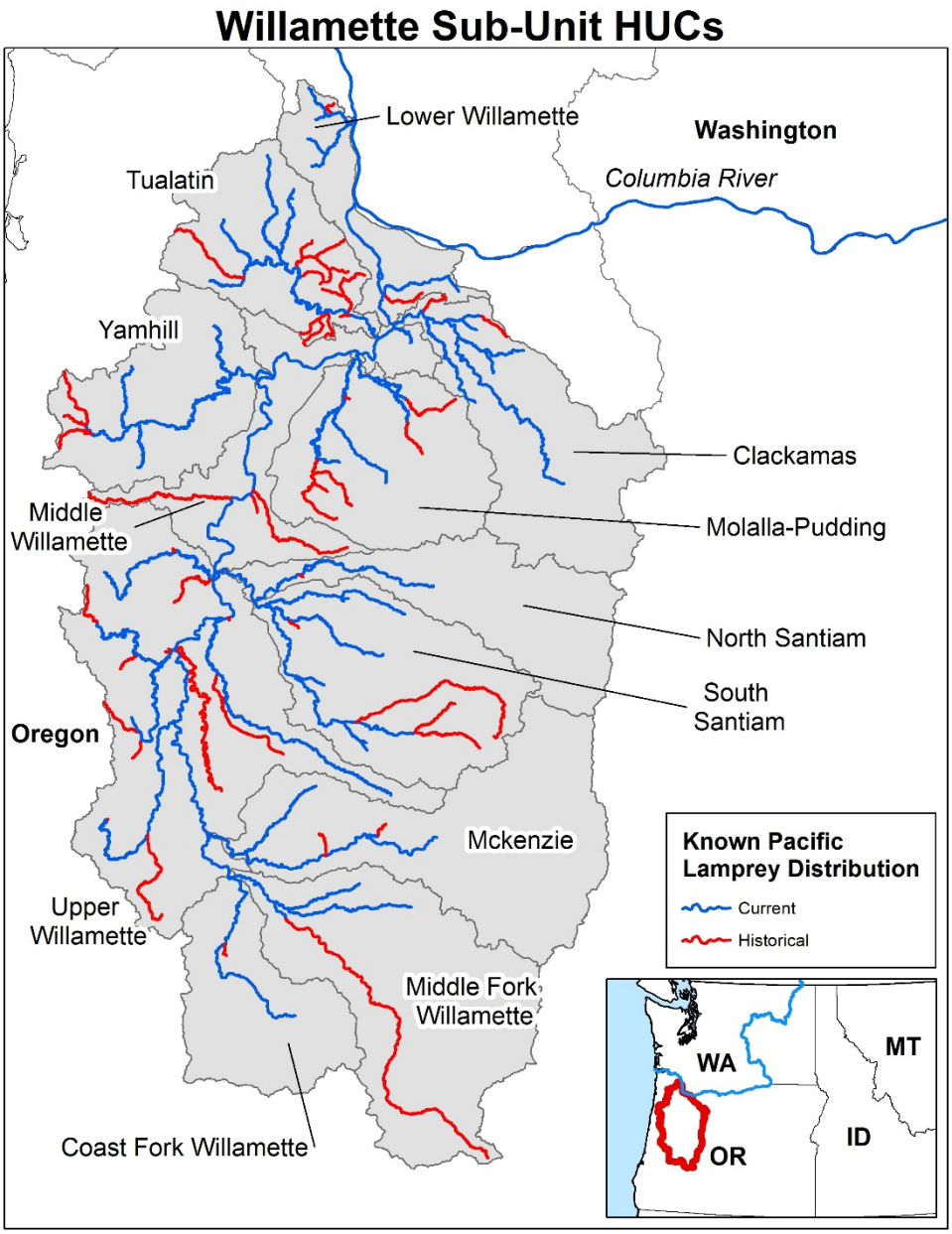


Figure 2. Current and historical distribution for Pacific Lamprey (based on known observation data): Lower Columbia and Willamette Regional Management Unit (USFWS Data Clearinghouse 2018).

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 alterations[1] 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 20ºC) 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										
Middle Fork Willamette	4	4	4	4	4	4	4	4	3	3
Coast Fork Willamette	4	4	4	4	4	4	4	4	2.5	2.5
Upper Willamette	2	4	4	4	3	4	3	4	2	4
McKenzie	3	3	3	3	3	3	3	3	2	2
North Santiam	4	4	4	4	4	4	3	3	1	1
South Santiam	4	4	4	4	4	4	4	4	2	4
Middle Willamette	2	4	4	4	4	4	3	3	1	U
Yamhill	2	2	2.5	2.5	2	2	2.5	2.5	1	1
Molalla-Pudding	2.5	2.5	2.5	2.5	2	2	2.5	2.5	3	3
Tualatin	2.5	2.5	2	2	2	2	2	2	3	3
Clackamas	3	3	1	2	1	1	1	1	3	U
Lower Willamette	1	2	3	3	4	4	4	4	4	4
Average Scope/Severity	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**
Mean	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								
Middle Fork Willamette	1	1	3.5	3	2	2	1	1
Coast Fork Willamette	3	2.5	2.5	2.5	3	3	2.5	2.5
Upper Willamette	3.5	3	4	3.5	4	3.5	1.5	U
McKenzie	2	2	3	3	2	1	1	1
North Santiam	3	3	2.5	3	2	3	1.5	3
South Santiam	3.5	3	3	3	3	3	1	U
Middle Willamette	3.5	3	4	4	3.5	4	4	U
Yamhill	3	3	4	4	4	4	3	3
Molalla-Pudding	4	4	4	4	4	4	3	3
Tualatin	2.5	2.5	4	4	4	4	3	3
Clackamas	1	2	3	3	3	3	3	U
Lower Willamette	2.5	2.5	4	4	4	4	4	4
Average Scope/Severity	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**
Mean	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 *USACE*	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 *USACE*	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 *USACE*	Row River- Tributary to Coast Fork	No fish passage facilities are present or planned at this dam.
Cottage Grove Dam *USACE*	Coast Fork Willamette River	No fish passage facilities are present or planned at this dam.
Fern Ridge Dam *USACE*	Long Tom River	No fish passage facilities are present or planned at this dam.
Leaburg Dam *EWEB*	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 *USACE*	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 *USACE*	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 *EWEB*	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 *USACE*	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 *USACE*	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 *BLM*	Tualatin River	No fish passage facilities are present or planned at this dam.
River Mill, Faraday, and North Fork Dams *PGE*	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 *PGE*	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 Pacific Lamprey Threats Assessment and RIP meeting (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

PROJECT: Finn Rock Reach Floodplain Restoration

Project Applicant/Organization: McKenzie River Trust

Contact Person: Christer LaBrecque

Email: christer@mckenzieriver.org

Phone: (541) 345-2799

Project Type: Habitat Restoration

Lamprey RMU population: Willamette Sub-Region

Watershed (5th HUC Field): *McKenzie*

NPCC Subbasin (4th HUC Field) name: *McKenzie*

Project Location: *50960 Highway 126, Vida OR 97488, Lane County Oregon*

Total Requested funds: $150,347

Short Project Summary (200 words or less):

The proposed project is a middle-McKenzie River floodplain habitat restoration project encompassing approximately 85 acres of historically seasonally functional floodplain. This reach of the McKenzie River has been identified as a high priority area for native fish habitat enhancement. The project is located approximately 3.75 river miles downstream of the Lower South Fork McKenzie Floodplain Enhancement Project. This project was funded in part by this grant program and was implemented by the US Forest Service and McKenzie Watershed Council. The project area is owned by the McKenzie River Trust, a non-profit land trust.

Goals:

1. Restore ecological processes that maintain a healthy, diverse, and resilient ecosystem to the project area by increasing the area of floodplain inundation at base flow conditions and surface roughness elements.
2. Increase low-gradient stream flow (maximize wetted surface) area to maximize off-channel rearing habitat for Upper Willamette River spring Chinook, Upper Willamette River rainbow trout, Pacific lamprey, and other species benefiting from these conditions.
3. Create a complex, dynamic habitat that includes topographic diversity that can be utilized by native turtles (Western Pond, Painted) and other species.
4. Remove stresses that could threaten goals stated above.

1. Detailed Project Description (500 words or less):

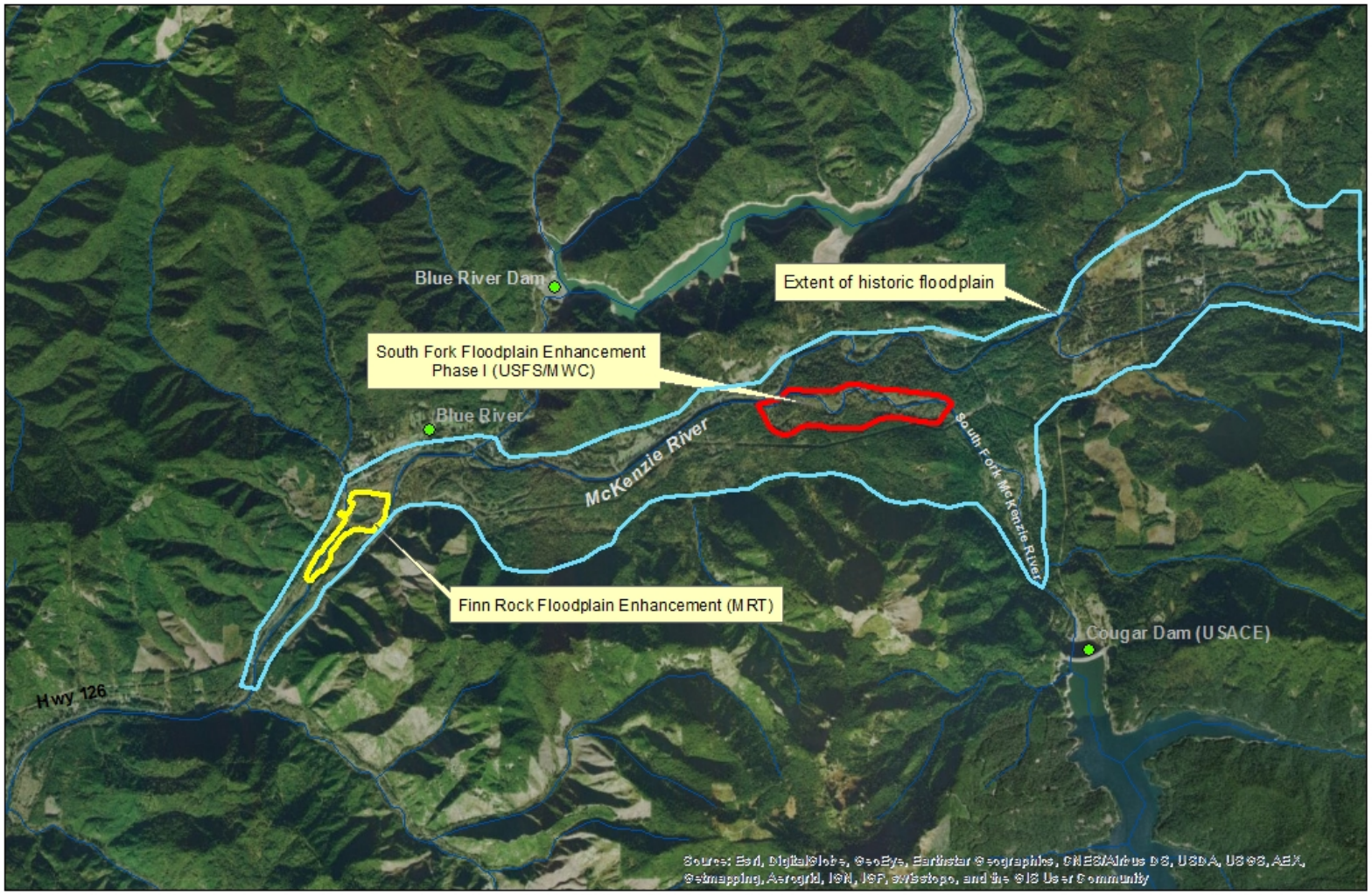
The proposed work would utilize the Stage 8 floodplain model. The basic hydrologic processes have been altered from many years of channelization, flow control, and loss of inputs of gravels and large wood have changed this side channel from a depositional environment to a transport reach. The project would seek to re-establish floodplain processes which have been reduced due to a number of factors. The most impactful of which was the installation of several dams upstream, for both flood control and power generation. The effects of this activity have seriously adversely altered (a) flow regime and stream flow routing, (b) supply, transport, and retention of sediment, large wood, and nutrients, (c) floodplain building and flood storage, (d) pool and bar formation, (e) channel migration, and (f) feeding/predation due to the loss of side channels.

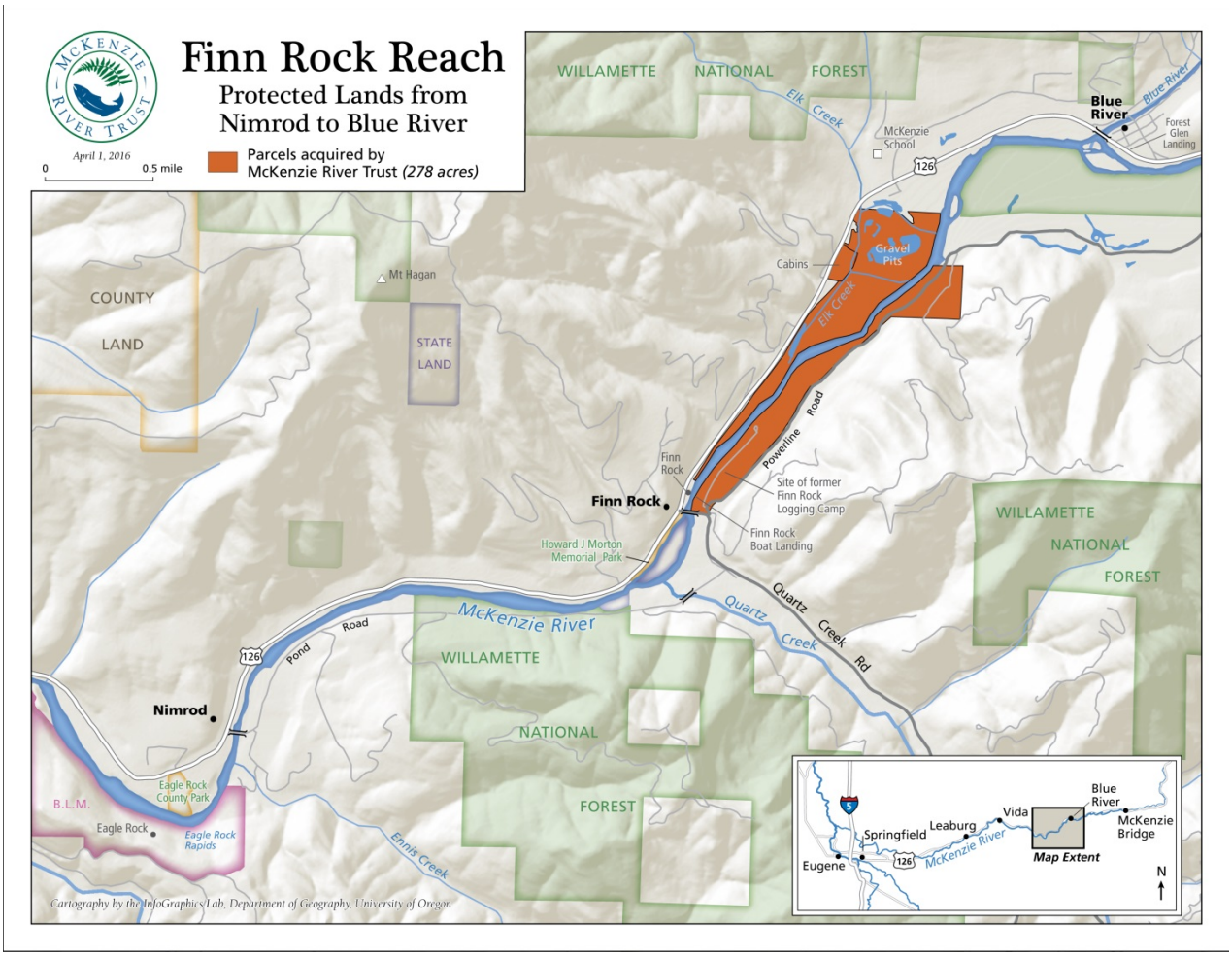
The objectives that will be met with what we are proposing are to (a) lower selected floodplain terrace areas to elevations conducive to more frequent inundation by removing floodplain fill material, (b) increase floodplain and side channel connectivity by utilizing removed floodplain fill material to aggrade incised side channel, (c) encourage the development of complex and dynamic habitat and by increasing large wood frequency throughout the project area, and finally (d) establish a diverse native plant assemblage in selected disturbed areas. Our goal for large wood installation is 20 large pieces per acre. Currently, we have obtained approximately 25% of the large wood. In addition, the project would remove man-made barriers (e.g., road, culverts, berms) and manage invasive plant species and establish plantings of native emergent, riparian, and upland species that enhance aquatic and terrestrial habitats.

Currently, the total project area is approximately 85 acres. Of this, it consists of ~48 acres of riparian forested habitat, ~24 acres of shallow wetland habitat, ~3,700 feet of side channel, and around 13 acres of gravel pits that are now effectively ponds with a significant bass population. Our design team believes the side channel has been head-cutting and has only been halted because of the gravel access road that led to the gravel extraction pits. This side channel is a productive spawning area for Upper Willamette Spring Chinook, but is not adequate for juvenile rearing or for Pacific lamprey due to the lack of deep pools, cover, large woody debris, and floodplain inundation and fine sediment deposition.

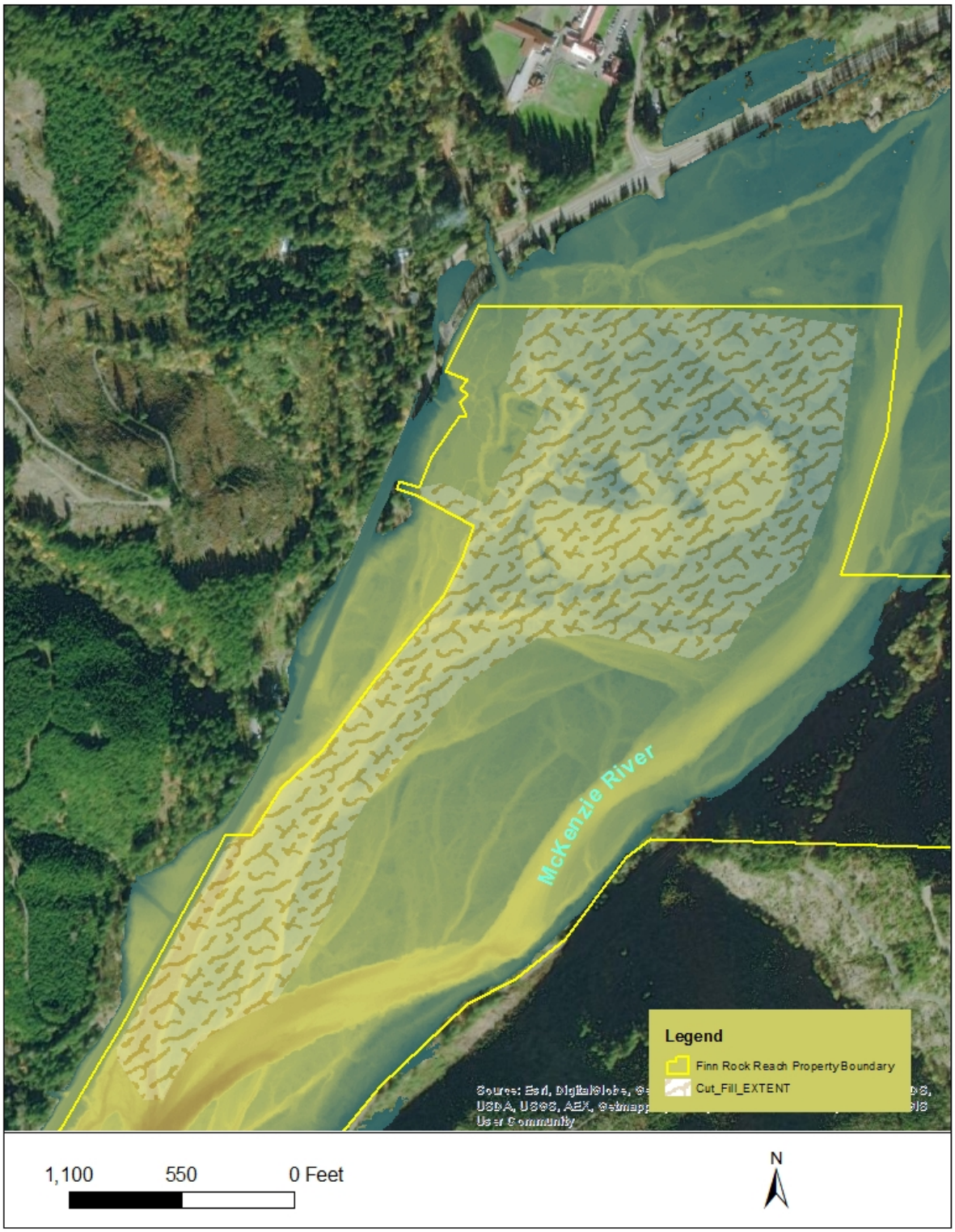
2. Descriptive Photographs-illustrations-Maps:

Middle McKenzie Floodplain Enhancement Projects




Finn Rock Reach
Protected Lands from Nimrod to Blue River
April 1, 2016
0
0.5 mile
Parcels acquired by McKenzie River Trust (278 acres)
WILLAMETTE NATIONAL FOREST
Elk Creek
McKenzie School
Blue River
Blue River
Forest Glen Landing
126
Cabins
Gravel Pits
Elk Creek
Mt Hagan
COUNTY LAND
STATE LAND
Powerline Road
Finn Rock
Site of former Finn Rock Logging Camp
Finn Rock
Finn Rock Boat Landing
Howard J Morton Memorial Park
WILLAMETTE NATIONAL FOREST
Quartz Creek Rd
McKenzie River
Pond Road
126
WILLAMETTE NATIONAL FOREST
Nimrod
Eagle Rock County Park
B.L.M.
Eagle Rock
Eagle Rock Rapids
Ennis Creek
Springfield
Leaburg
Vida
Blue River
McKenzie Bridge
Eugene
126
McKenzie River
Map Extent
N
Cartography by the InfoGraphics Lab, Department of Geography, University of Oregon

Finn Rock Floodplain Enhancement River Bathymetry



3. Linkage of actions to Identified Threats in RMU (300 words or less):

- What threat(s) does this project address? ***See your RIP for key threats: Stream and Floodplain Degradation***
- Project scope: Does this project address threat(s) specific to this RMU only, or does the project address the threat(s) prevalent in multiple RMUs?
  Single RMU ☒, Multiple RMUs ☐ list additional RMUs:
- How does this project address key threat(s) within the HUC where project is proposed?

The Project directly addresses key threats to Pacific lamprey within the Draft Pacific Lamprey 2018 Regional Implementation Plan for the Columbia/Willamette Regional Management Unit Willamette Sub-Unit. The project is located in the McKenzie Watershed, HUC 1709004, where Pacific Lamprey are ranked as S2-imperiled by NatureServe. The primary threats addressed are "Stream and Floodplain Degradation" and "Flow alterations (non-dam)" (RMU threat assessment score of 3 and 2 for the McKenzie, respectively). The degradation of streams through simplification and removal of large woody debris is a common threat within this HUC . At this site, the construction of gravel extraction pits in the floodplain between the mainstem and a side channel of the McKenzie, and its attendant access road, have created large berms of overburden within the floodplain and disrupted the flow regime within the side channel. Bathymetry conducted by the United States Forest Service, shows that the side channel is incising, increasing flow velocities and transporting sediment. The proposed project will regrade not only the gravel ponds, but much of the side channel itself, and add substantial amounts of large woody debris. As a result the project will become a depositional environment with increased permanently wetted surface area, greater sediment supply, and greater habitat complexity. The work will have a positive impact on Pacific lamprey spawning and rearing opportunities.

The retirement of the gravel pits and subsequent purchase by the McKenzie River Trust, along with a conservation easement held by the Bonneville Power Administration through the Willamette Wildlife Mitigation Plan has permanently protected this stretch of side channel, ensuring that no further stream alterations will threaten the habitat improvements.

4. Species/Habitat Benefits (200 words or less):

- How will the project provide meaningful measureable results to improve lamprey populations and/or their habitat conditions?
- What life stage or stages will benefit from action? How?
- What other species may benefit from action?

The Draft Snake, Columbia, and Coastal Conservation Plan for Lampreys lists protection and restoring habitat as a high priority, and addresses limiting factors related to habitat access and physical habitat. The project will restore the channel complexity and utilize large quantities of large woody debris, with a target of 20 large pieces per acre. The

project will also double the amount of stream channel surface area along 0.6 miles of side channel through the filling of deep pools and creation of a wider flow area.

The project will be creating more Pacific lamprey larval and juvenile stage habitat. Through massive earth movement, the side channel will be transformed from a transport reach into a depositional environment, with greater habitat complexity, and a greater variety of sediments, including fine sediments and gravel. The target habitat most closely conforms to "Type I" habitat described in the CPL. Lowering the stream velocity within the side channel will create easier passage for adult lamprey that are migrating upstream.

The project is designed to also benefit Chinook salmon, which are expected to see an increase in both juvenile rearing and spawning habitat.

5. Project Design / Feasibility (200 words or less):

- Have the designs for the project been completed already or will they be completed before planned project implementation? Yes ☒, No☐
- Are the appropriate permits (e.g., ESA consultation, Scientific Collection, fish health/transport, etc.) in place already or will they be in place before planned project implementation? Yes ☒, No☐
- Can the project be implemented within the defined timeframe? ***See BPA and NFHP requirements above***. Yes ☒, No☐

The project is in the early design stage. MRT has an agreement with the United States Forest Service to produce the project design, and a substantial amount of site analysis has taken place, including stream and pond bathymetry, and the exploration of several test pits for sediment analysis. The anticipated 60% design completion date is August 2019. At that time, a no-rise analysis will be completed and permitting will begin. The lack of infrastructure in the area limits the constraints on the project and increases its feasibility.

6. Partner Engagement and Support (200 words or less):

- What partners are supporting the project?
- What partners are active in implementing the project?
- What partners are providing matching funds or in-kind services that directly contribute to the project?

The partners who have been engaged at a Technical Advisory Group level include: US Forest Service, McKenzie Watershed Council, ODFW, BLM, The Nature Conservancy, and the University of Oregon Geology Department. The partners who are assisting with project design, permitting, and implementation are USFS and McKenzie Watershed Council. In addition,

McKenzie River Trust is in the process of modifying a contractual agreement with Tetra Tech to assist with project permitting.

McKenzie River Trust will be providing the cash match in the amount of at least $750,000, which had been provided by Eugene Water & Electric Board as cash match for MRT's Capital Campaign. The USFS and McKenzie Watershed Council would be providing in-kind match composed of design, technical review, and construction oversight / implementation. In addition, the members of the Technical Advisory Group have committed to at least 16 hours each of technical assistance.

7. Monitoring and Reporting (200 words or less):

- How is completion of the project going to be documented? ***See BPA and NFHP requirements above***.
- How will the projects' benefits to lamprey be monitored over time?

MRT will partner with USFS, ODFW, MRT and Watershed Council volunteers, and possibly USACE to carry out various aspects of project monitoring. Currently, USFS is in the process of finalizing monitoring protocols for Stage-0 and Stage-8 style floodplain projects.

Geomorphic types of monitoring could include (a) remote sensing (drone imagery), (b) transect monitoring, and (c) photopoint monitoring. *Biological* monitoring types could include (a) food web sampling led by USFS/ODFW crews, (b) pit tag array led by ODFW, and (c) spawning surveys. Synthesis monitoring types could include (a) data gathering/analysis, and (b) multi-part workshop to gather scientists and practitioners to examine existing data, and devise best practices/priorities for future monitoring and evaluation.

8. Project Budget (Including overhead):

Project Budget:

The project budget will be finalized when the design is complete in late 2019. The preliminary design budget for the entire project is $1.6 million. Contracted services comprise the bulk of these expenses. The largest contracted expenses are associated with the large amount earth moving (estimated 50,000 yards of material), and the acquisition and placement of large wood pieces (up to 1200).

The Trust has already secured half of the funding, $800,000, for the project ($500,000 as a grant from the Eugene Water and Electric Board, and $300,000 from private fundraising). A portion of the site is being considered for a Permittee Responsible Mitigation project, which would provide an additional $113,000. A decision on the mitigation funding is expected by August 2019. The Trust will also be requesting $350,000 restoration grant from the Oregon Watershed Enhancement Board. That grant will be submitted in October 2019. The remaining $180,000 has not been identified, but may include NOAA grants, or USFS Stewardship funds.

The project is scalable. If necessary the Trust can break the project into two phases, reduce the project's footprint, or reduce the amount of wood placement. The Trust desires to complete the project in one phase to reduce mobilization costs.

	Items	# Hours or Units	Cost per Unit ($)	RIP Funds Requested ($)	Cost Share ($)	Total Cost ($)
A	***Personnel:***	-	-	-	-	-
	a. MRT Project Manager	348	$38.75	$13,485		$13,485
B	***Equipment & Supplies:***	-	-	-	-	-
C	***Travel:***	-	-	-	-	-
	a. Travel to site (90 miles roundtrip)	2,700	$0.565	$1,526		$1,526
D	***Other: Contracted Services***	-	-	-	-	-
	a. Excavation & Removal (cut/fill)	200	$250	$50,000		$50,000
	b. Large wood placement	200	$250	$50,000		$50,000
E	***Administrative:***	-	-	-	-	-
	Overhead (%)					
	Indirect Costs (30.72 %)			$35,336		$35,336
	Total (Sum of A - E)	-	-	$150,347		$150,347

9. Timeline of major tasks and milestones:

Finn Rock Floodplain Restoration Timeline

Workflow	*Start Date/Month*	*End Date/Month*	*Responsible Party*
Pre-project preparation	***1/15/2018***	***4/27/2018***	***MRT***
Large Woody Debris sourcing	***9/15/2018***	***6/30/2020***	***MRT***

Environmental compliance/permits	***6/1/2019***	***6/1/2020***	***MRT/ Contractor***
Project design	***6/1/2018***	***9/15/2019***	***MRT / USFS***
Consultation with Technical Review Team	***1/15/2018***	***8/15/2019***	***MRT***
Final design completed	***9/15/2019***	***9/15/2019***	***MRT/USFS***
Submit OWEB grant application	***10/15/2019***	***10/15/2019***	***MRT***
Hire construction contractor	***11/1/2019***	***1/20/2020***	***MRT***
Construction of project	***7/15/2020***	***10/1/2020***	***Contractor***
Reporting	***10/1/2020***	***10/1/2026***	***MRT***

10. References for Finn Rock Proposal

Cluer, Brian & Thorne, Colin. (2014). *A Stream Evolution Model Integrating Habitat and Ecosystem Benefits*. **River Research and Applications**. 30. 10.1002/rra.2631.

Poirier, Jen; Gray, Ann; and Ben Clemens. (2018). *Draft Pacific Lamprey 2018 Regional Implementation Plan for the Lower Columbia/Willamette Regional Management Unit Willamette Sub-Unit.*

Powers PD, Helstab M, Niezgoda SL. *A process-based approach to restoring depositional river valleys to Stage 0, an anastomosing channel network*. **River Research and Applications.** 2018; 1–11. https://doi.org/10.1002/rra.3378

USDA Forest Service. (2017). *Lower South Fork McKenzie Floodplain Enhancement Project Design.*

II. References

Ackerman, N.K. 2017. Study Plan Proposed Modification: Evaluation of Adult Pacific Lamprey Upstream Passage Effectiveness Through the Clackamas River Hydroelectric Project. Clackamas River Project. FERC No. 2195. Prepared by Portland General Electric.

Ackerman, N.K., M.M. David, and B. Pyper. 2016a. Evaluation of Adult Pacific Lamprey Upstream Passage Effectiveness through the Clackmas River Hydroelectric Project, 2015/2016 Progress Report.

Ackerman, M.W., B.K. Hand, R.K. Waples, G. Luikart, R.S. Waples, C.A. Steele, B.A. Garner, J. McCane, and M.R. Campbell. 2016b. Effective number of breeders from sibship reconstruction: empirical evaluations using hatchery steelhead. Evolutionary Applications. doi: 10.1111/eva.12433.

Baker, C. and C. McVay. 2018. Willamette Falls Lamprey Escapement Estimate, Annual Report to BPA, project number 2008-308-00. Contract # 75473. Confederated Tribes of Warm Springs Reservation of Oregon, Warm Springs, Oregon. 27 pp.

Clemens, B. J., M. G. Mesa, R. J. Magie, D. A. Young, and C. B. Schreck. 2012b. Pre-spawning migration of adult Pacific lamprey, Entosphenus tridentatus, in the Willamette River, Oregon (USA). Environmental Biology of Fishes. 93: 245 – 254.

Clemens, B. J., L. Wyss, R. McCoun, L. Schwabe, I. Courter, S. Duery, J. Vaughn, and C. B. Schreck. 2012a. Migration characteristics and habitat use of the imperiled adult Pacific lamprey in the Willamette Basin: Prelude to estimating requirements for persistence. Final Draft Report to the Columbia River Inter-Tribal Fish Commission. April 2012. 51 pp.

Clemens, B., C. Schreck, S. van de Wetering, and S. Sower. 2016. The potential roles of river environments in selecting for stream- and ocean-maturing Pacific Lamprey, Entosphenus tridentatus (Gairdner, 1836). pp. 299 – 322. In: A. Orlov, & R. J. Beamish (eds.) Jawless Fishes of the World. Cambridge Scholars.

Clemens, B. J., S. van de Wetering, J. Kaufman, R. Holt, and C. B. Schreck. 2009. Do summertime temperatures trigger springtime maturation in adult Pacific lamprey, Entosphenus tridentatus? Ecology of Freshwater Fish. 18: 418 – 426.

Clemens, B. J., and 21 co-authors. 2017b. Conservation challenges and research needs for Pacific Lamprey in the Columbia River Basin. Fisheries. 42: 268-280.

Clemens, B. J., L. Wyss, R. McCoun, I. Courter, L. Schwabe, C. Peery, C. B. Schreck, E. K. Spice, and M. F. Docker. 2017a. Temporal genetic population structure and interannual variation in migration behavior of Pacific Lamprey Entosphenus tridentatus. Hydrobiologia. 794: 223-240.

Goodman, D. H., S. B. Reid, M. F. Docker, G. R. Haas, and A. P. Kinziger. 2008. Mitochondrial DNA evidence for high levels of gene flow among populations of a widely distributed anadromous lamprey *Entosphenus tridentatus* (Petromyzontidae). Journal of Fish Biology. 72: 400-417.

Hess, J. E., N. R. Campbell, M. F. Docker, C. Baker, A. Jackson, R. Lampman, and S. R. Narum. 2015. Use of genotyping by sequencing data to develop a high-throughput and multifunctional SNP panel for conservation applications in Pacific Lamprey. Molecular Ecology Resources. 15: 187-202.

Hulse, D., S. Gregory, and J. Patterson Baker. (EDS). (2002) Willamette River Basin Planning Atlas: Trajectories of Environmental and Ecological Change. (2nd edition), Oregon State University Press, Corvallis, Oregon 97333. 180p.

Luzier, C.W., H.A. Schaller, J.K. Brostrom, C. Cook-Tabor, D.H. Goodman, R.D. Nelle, K. Ostrand and B. Streif. 2011. Pacific Lamprey (Entosphenus tridentatus): Assessment and

Template for Conservation Measures. U.S. Fish and Wildlife Service, Portland, Oregon. 282 pp. http://www.fws.gov/columbiariver/publications.html

NMFS. 2008. 2008-2023 Willamette River Basin Project Biological Opinion. NOAA's National Marine Fisheries Service, Northwest Region, Seattle WA. F/NWR/2000/02117.

Schultz, L., M.P. Mayfield, G.T. Sheoships, L.A. Wyss, B.J. Clemens, B. Chasco, and C.B. Schreck. 2014. The Distribution and Relative Abundance of Spawning and Larval Pacific Lamprey in the Willamette River Basin. Final Report to the Columbia Inter-Tribal Fish Commission for project years 2011-2014. CRITFC Contract number C13-1. BPA Contract number 60877. BPA Project number 2008-524-00.

Spice, E. K., D. H. Goodman, S. B. Reid, and M. F. Docker. 2012. Neither philopatric nor panmictic: microsatellite and mtDNA evidence suggest lack of natal homing but limits to dispersal in Pacific Lamprey. Molecular Ecology. 21: 2916-2930.

MEETING NOTES
WILLAMETTE RMU- Pacific Lamprey Threats Assessment and RIP Annual Meeting
April 17, 2019

Conference call attendees:
ODFW: Monica Blanchard, Ben Clemens, Alex Farrand, Jeremy Romer, Steve Starcevich, Ben Walczak, Jeff Ziller
CTGR: Brandon Weems
PGE: Dan Cramer
McKenzie Watershed Council: Daniel Dietz
Clackamas Basin Council: Cheryl McGinnis, Doug Neely
HDR for CRITFC: Brian McIlraith
Tryon Creek Watershed Council: Alexis Barton
USACE: Greg Taylor, Chet Helms
USFS: Kimberly Conley, Doug Larson
USFWS: Erin Butts, Ann Gray, Jen Poirier, Joe Skalicky

Agenda-2019 Annual Pacific Lamprey Meeting for the Willamette RMU
Introductions
Overview of the Pacific Lamprey Conservation Initiative/ Updates
2018 Leaburg study results (Joe Skalicky)
Other potential Willamette Basin sites for study (Fall Creek, Faraday Lake, others?)
Funds available for lamprey projects (BPA, NFHP, end of year)
Priority projects funded in 2018
New proposed projects for 2019 and discussion/ new template
Partner Updates from the group
For those interested- the Lamprey Restoration Toolbox presentation

MEETING NOTES- see also the pdf of the Powerpoint presentation
Conservation Initiative- Framework
This meeting is for the Pacific lamprey Willamette Regional Management Unit Team, and one of many that occur under the Pacific Lamprey Conservation Initiative (PLCI). There are 4 "levels" of teams:

- Policy Team (meets 1 year- upper level managers/directors and Tribal elders)
- Conservation Team (meets 2x year- mid-level group; interface between the Policy Team and all other groups)
- Pacific Lamprey Technical Working Group (meets 2x year- subgroups meet as needed to accomplish goals).
    - Multiple subgroups for various issues (passage, dredging, engineering, habitat restoration, ocean phase, genetics, tagging etc): These groups are tasked with responding to information requests and developing products as directed by the Conservation Team)
- Multiple Regional Management Unit (RMU) Teams (see map in ppt pdf)
    - Regions all up and down the coast and Pacific Northwest, includes Alaska.
    - Goals:

- Access local knowledge on threats and ongoing restoration, monitoring and research, which is documented annually
- Identify and prioritize information needs and restoration projects for potential funding and
- provide a forum for coordination, collaboration at a local level

- New RMU this year : Species of Other Lamprey: Anadromous and Resident (aka SOLAR)

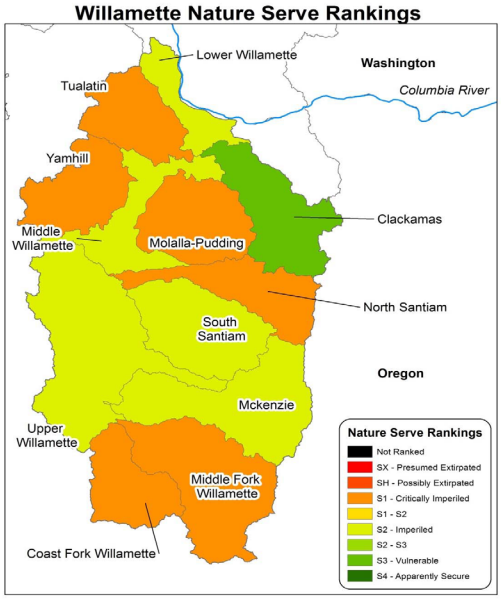
- ***-- YOU'RE INVITED TO PARTICIPATE IN ANY and ALL of these-***
  - just let Ann know what you want to participate in.

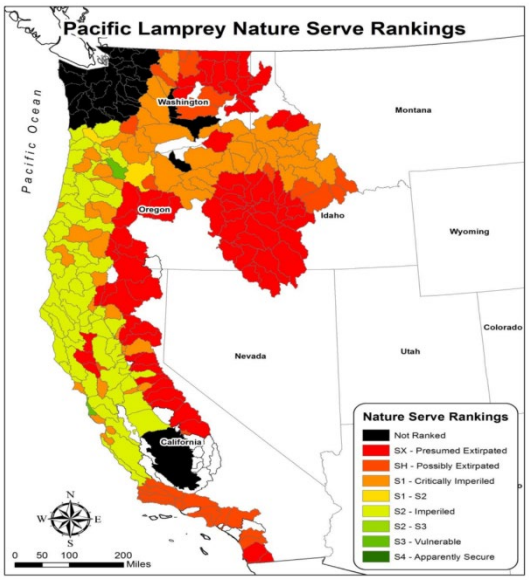
Conservation Initiative Updates:

Continue to **maintain and update website**: https://www.fws.gov/pacificlamprey/mainpage.cfm

- Technical documents (Passage, Best Management Practices)
- Updated Distribution Maps
- Regional Implementation Plans for each RMU
- **Databasin.org is an interactive GIS mapping tool**; has localized lamprey information
- Outreach/Education materials
  - Interactive Story Map (new in 2017- check it out: https://fws.maps.arcgis.com/apps/MapJournal/index.html?appid=34d16fcc9e5d444c87eeab169c829dde)
  - Curriculum

USFWS released the **Pacific Lamprey Assessment** in February 2019: https://www.fws.gov/pacificlamprey/assessmentmainpage.cfm#2018Assessment. This document is an update the 2011 and 2012 documents and provides an overview of status of lamprey in each RMU, using the information collected at the 2017 RMU meetings. Below is the Extinction Risk modeling results from NatureServe. Detailed information can be read in the Assessment.





Leaburg Drawdown Study/ Collaboration (March 2018)
This was discussed last year, but worth mentioning again. Paper is expected out this year. Collaboration between EWEB, ODFW, CTGR, USFWS and Smith-Root: Drawdown Study at Leaburg Reservoir on McKenzie in March 2018 to examine the effects of drawdown on larval lamprey (ramping rate ~1.8 inches per hour). Pre- and post-drawdown sampling/population estimates of larvae were completed using a deep water electrofishing boat. During drawdown, 3 different techniques were effectively used to enumerate lamprey from the sediments: observation, dry shocking, sediment removal. One technique (liquefaction) was planned but not used because the water pressure was to forceful; however, modification of the pump could potentially make it more useful. Results will be written up and distributed at a future date. While it's difficult to conclude much from initial results at this time, some are provided below:

- Pre-draw down larvae counts: ~11.4 fish/square meter (or ~13,000 fish)
- Post-drawdown larvae counts: ~2.5 fish/ square meter
    - Counts went down, but cannot say why (they left?, they died? unknown)
- Not all larvae are not coming out of the sediment even under slow drawdown conditions.
- ~50% of the total larvae emerge from the sediments on their own, and do so within the first 15 minutes. Few emerge after that time on their own. This is consistent with USGS laboratory studies.
- Short video (provided by Patrick Cooney of Smith Root): https://smith-root.wistia.com/medias/k3dr0z7f8n#

Drawdown/Salvage – Other opportunities
We reviewed Leaburg again, in large part because of the **benefits of this collaboration** to help better understand lamprey and dewatering and encourage other such efforts where opportunities present themselves, especially since we don't yet have a great source of funding for research-oriented projects. This is one relatively low-cost way to collect data.

Other opportunities include evaluating larval presence and drawdown at Faraday Lake on the Clackamas, and the annual drawdown of Fall Creek in the Middle Fork Willamette Basin. **Faraday Lake** full drawdown will occur this summer and does not happen often. Initial surveys found few lamprey but more surveys are anticipated prior to full drawdown. If you have questions, contact Joe Skalicky or Ann Gray.

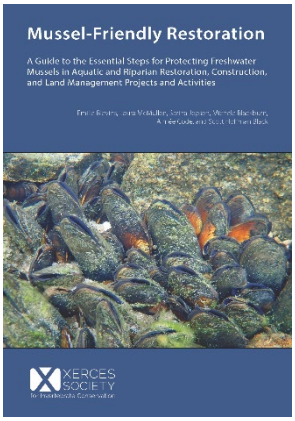
Fall Creek Reservoir drawdown occurs annually to assist with juvenile salmon outmigration. Drawdown typically occurs in the fall of each year and the reservoir becomes a run-of river for 7-10 days, before lake elevations come back up. There is the potential for lamprey to be stranded during this drawdown. CTGR have been annually translocating adult lamprey upstream of the dam since ~2012, and have documented spawning. This past year (November 2018) screw traps caught juvenile outmigrants (macrophthalmia) for the first time below Fall Creek Dam, and very rough, expanded estimates of macrophthalmia could be in the 1000s. Any study this year would primarily focus on collecting baseline information about where larval lamprey are in the reservoir. While there is limited flexibility in the drawdown operations, such information might be helpful in the future drawdowns to minimize impacts to lamprey.
If you have questions about this effort, contact Ben Clemens.

Dewatering Studies in the Lab
USGS has been funded to evaluate differing ramp rates and effect of day/night on larval lamprey. Laboratory tests will be conducted this summer. This is a follow-up to previous work done, which examined the effects of dewatering on larvae.
Liedtke, T.L., Weiland, L.K., and Mesa, M.G., 2015, Vulnerability of larval lamprey to Columbia River hydropower system operations—Effects of dewatering on larval lamprey movements and survival: U.S. Geological Survey Open-File Report 2015-1157, 28 p., available at: http://dx.doi.org/10.3133/ofr20151157.

From the proposal: "The 2015 work compared two dewatering rates and multiple dewatering levels as well as survival of larval lamprey following dewatering. The proposed 2018 work will focus on dewatering rates in an effort to provide guidance for field activities where dewatering occurs regularly, and information on optimal rates could protect larval lamprey and reduce or eliminate salvage operations."

Multi-species Salvage Protocol
As part of updating the BMP document for lamprey, Ann is attempting to develop a short multi-species salvage protocol, based on Joe Skalicky's ideas. If you have any feedback/input on the following, please contact Joe Skalicky or Ann Gray. A draft will be shared around to garner feedback later this year. ODFW expressed interest in a short 1 page protocol that could be sent out to salvage practitioners, along with take permits and other similar permits.

1) Conduct lamprey presence absence, and relative abundance.
   Also assess presence of native freshwater mussels- see handbook at https://xerces.org/western-freshwater-mussels/
2) Salvage pre-drawdown
   - FW mussels first
   - Larval Lamprey
   - Bony fish after lamprey
3) Salvage lamprey by hand during drawdown
   FW mussels if not salvaged earlier (not ideal if there are many).
4) "Dry shock" in areas with high larval densities as water recedes



<u>Lamprey Technical Workgroup Activities</u>
The Juvenile Engineering and Dredging Investigations subgroup (JEDI) is working on a white paper to summarize the information available on dredging and lamprey, and potential remedies/ impact minimizations. Contact is Dave Ward (HDR).

The Adult Engineering and Passage subgroup successfully funded Stillwater Sciences to develop a white paper on **Road Crossing Assessment and Remedies** for lamprey. If you have a relevant case study, please contact Ann Gray.

A Best Management Practices subgroup is revising the 2010 BMP document to better reflect our understanding at this point. If you'd like to help out or have useful experiences that could lend value to this (an anecdote or case study), please contact Ann Gray.

POTENTIAL PROJECTS and FUNDING SOURCES

There are 2 funding sources for the Conservation Initiative at this time:

- National Fish Habitat Partnership (NFHP)
- Bonneville Power Administration's (BPA) Cost Savings Fund.

Other end-of-year funding is sometimes available through USFWS and other federal agencies, but this is inconsistent at best, but sometime the only way to fund certain types of projects, such as directed research. A **new Project Proposal Template** was developed this year and includes a better description of the timeline and process for potential funding. If you have any question about this process or the template, please contact Ann Gray.

Funding awarded to Willamette Basin Projects in 2018 included the South Fork McKenzie Floodplain "Stage 0" Restoration project (partial funding of Phase 1), and ODFW's proposal to evaluation and improve Leaburg Ladder Counts for lamprey.

Persons who want to submit a project for consideration by the team should submit a Priority Project description and send it to Ann Gray by May 31, 2018. Please use the newly revised form-earlier version will not be accepted. Please feel free to contact Ann for any questions or additional advice prior to submitting your proposal. Thanks.

At the meeting, McKenzie River Trust and likely ODFW indicated they plan to submit proposals.

ROUND TABLE DISCUSSION: PARTNER UPDATES and COORDINATION

Ben Clemens: ODFW is releasing draft conservation plan for several species of lampreys for external review this week. This draft plan, ***the Snake, Columbia, and Coastal Conservation Plan for Lampreys in Oregon*** identifies new actions and acknowledges and supports ongoing actions to restore Pacific lamprey and also identifies needs for western river lamprey, western brook lamprey, and Pacific brook lamprey. The status and limiting factors rankings in this plan are intended to be consistent as possible with the Conservation Initiative.

Ben Clemens and Alex Farrand are exploring the idea of installing a lamprey ramp at the City of Albany's Lebanon Dam on the South Santiam. Currently there is a ladder on each side of this small dam, one of which (the one on the south bank) was designed and constructed in the past decade with some lamprey considerations but was never evaluated after construction. It is unknown if the North bank ladder passes lamprey. Several folks discussed the information available on lamprey distribution in the South Santiam, including Wiley Creek.

Joe Skalicky has been working in both Washington and Oregon in the lower Columbia RMU to assess the need for **lamprey passage improvements at hatcheries**. If you are aware of a need for evaluation somewhere, please contact him.

Fall Creek Passage. Chad Helms (USACE) reported that the upgraded adult fish collection facilities at **Fall Creek Adult Fish Collection Facility** collected 4-5 adult lamprey last year. Any collected will be moved upstream this year.

Brandon Weems (CTGR): The **Confederated Tribes of the Grand Ronde** hope to continue the **Fall Creek Translocation** of adults from Willamette Falls to above Fall Creek. ~240 adults have been transferred above Fall Creek Dam since 2012, and are planned to occur for through 2020. This year's translocation will occur only if the road access is restored in time.

Dan Cramer (PGE): **PGE** began a **trap and haul program** last year to will transfer ~250 adult lamprey above **North Fork Dam on the Clackamas**; efforts will continue until 2025; intent is to increase larval population /pheromone attraction for adults, and as a stop-gap measure as lamprey passage is improved at the North Fork fishway. This year, folks working on the Clackamas agreed that up to 400 adult lamprey could be moved above North Fork Dam. PGE will also be releasing PIT tagged lamprey below the North Fork fishway to evaluate lamprey passage and attempt to identify the problem areas for passage within the fishway.

Dan Cramer also reported that the **PGE surface collectors at North Fork and River Mill** dams are collecting juvenile lamprey in good numbers, both ammocoetes and macrophthalmia, which are likely a result of earlier trap and haul efforts around 2010. Often a pulse of lamprey juveniles come through during freshets (water is turbid). While the collection efficiency is unknown, it is somewhat surprising the numbers of lamprey collected at these surface collectors, especially at times outside freshets when the water is clear.

At **Willamette Falls,** PGE plans to install passage ramps along with flashboard installation, as well as open up the old fishway for lamprey passage, as they do every year. This year, ODFW made improvements to their mammal exclusion device at the fishway entrances. There has been increasing numbers of sea lions at the falls predating on migrating salmon and likely lamprey. The improvements are intended to improve fish survival, and there is hope that this (along with some sea lion removal efforts) will assist Pacific lamprey passage in the fishway. In 2018, the **Confederated Tribes of Warm Springs** were not able to complete the **lamprey population estimates at the Falls** because of the lack of fish migrating through the fishway. The last estimates were done in 2017: there were 277,577 adult lamprey at Willamette Falls; of those, 80,848 passed (29%). It is not clear why numbers at Willamette Falls have dropped; there has been an increase at Bonneville, and at for several years the counts at the Falls and Bonneville were following similar trends.

Some information resources:

- **USFWS Lamprey Conservation Initiative:** *www.fws.gov/pacific/Fisheries/sphabcon/**Lamprey**/*
- **Distribution Maps and interactive GIS maps:** *Databasin.org*
- **2018 Regional Implementation Plans:** *https://www.fws.gov/pacificlamprey/PLCI_RIPs.cfm*
- Ann_E_Gray@fws.gov; 503-231-6909

Meeting Adjourned

DRAFT Pacific Lamprey Conservation Initiative: identification of program types and funding. Compiled April 24, 2018.

Agency Program	Funding Source Title	Types of projects and applicants	Current / Recent Application to Pacific Lamprey	Average / Range of Available Funds	Application process and deadlines
US Fish and Wildlife Service	Pacific Northwest Funds	Region 1 funds available for Passage, Habitat restoration, and Monitoring and evaluation	Example Projects: Yakima River adult lamprey passage study and structure development. Warm Springs hatchery adult lamprey passage structure. Umatilla River adult lamprey passage structure at 3-mile dam and Westland diversion dam	$50-60K per project. Approximately $100-150k per year	Work with the four Fish and Wildlife Conservation offices in Region1 to develop project proposals. Sponsors are asked to develop proposals from Regional Implementation Plan high priority project lists.
US Fish and Wildlife Service	National Fish Passage	Region 1 funds available for fish habitat restoration	Necanicum River dam passage modification and habitat restoration 2012	$50-100K per project. Approximately $900K per year for projects 130K per year for engineering	Work with the four Fish and Wildlife Conservation offices in Region1 to develop project proposals. Sponsors are asked to develop proposals from Regional Implementation Plan high priority project lists. NFP projects for other species are instructed to consider lamprey friendly passage criteria.
US Fish and Wildlife Service	Tribal Grant Program	Regions 1,7,and 8 Development of restoration plans, fish habitat restoration	Example projects: • Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians received $96,635 in 2016 for the Tenmile Lakes Basin Lamprey Conservation Project. • Lower Elwha Klallam Tribe awarded $187,125 in 2016 to study and document Lamprey re-colonization of the Elwha River post dam removal. • Cow Creek Band of Indians 2012 $200,000 Lamprey Conservation in the Umpqua Basin Project • Wiyot Tribe in 2011 $200,000 Eel River lamprey evaluation and restoration plan • Confederated Tribes of the Grand Ronde Reservation 2010 Lamprey Upstream Migration in the Willamette Valley •	As a reminder, Tribal Wildlife grants are competitive within each region and the project is limited to $200,000. In 2016 $964,163 was awarded to tribes in Oregon, Washington and Idaho.	We will provide a webinar about the application process on June 7th. Nathan Dexter will have more details available on the Region 1 tribal website and via outreach as we get nearer to that date. Questions may be directed to Nathan at (503) 736-4774 or nathan_dexter@fws.gov. https://www.fws.gov/nativeamerican/grants.html

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US Fish and Wildlife Service	National Fish Habitat Partnership	Region 1,7, 8 potential future funds for Habitat restoration, and Monitoring and evaluation, operational support		No funds available for Pacific Lamprey Fish Habitat Partnership available at this time.	
OWEB	Small Grant Program	Improve instream habitat (e.g. place large wood or boulders, manage erosion, control invasive species), fish passage (remove or replace irrigation or push-up dams, culverts or stream crossings)	Potential future funding source for lamprey conservation work in Oregon.	• Up to $15,000 • Must secure 25% match funding Applicant: Watershed council, Soil & Water Conservation District or Tribe Project Host: local, state, or federal agency, etc.	Apply online - local small grant team sets its own application deadline and review period. See http://www.oregon.gov/oweb/pages/index.aspx
OWEB	Monitoring Grant	• Monitoring/surveys to determine long-term patterns (status and trend) targeting habitat, juvenile fish, adult fish, water quantity, water quality, etc. • Monitoring/surveys to determine effectiveness of restoration project in meeting biological objective.	Potential future funding source for lamprey conservation work in Oregon.		Apply online in the fall. See http://www.oregon.gov/oweb/pages/index.aspx
OWEB	Restoration Grant	• Instream habitat restoration including: bank stabilization, fish passage improvement, fish screening, flow, habitat restoration	Potential future funding source for lamprey conservation work in Oregon.		Apply online in the spring or fall. See http://www.oregon.gov/oweb/pages/index.aspx
OWEB	Technical Assistance Grants	• TA-1: Technical Design – development of a technical design for a restoration project • TA-2: Technical Planning – development of an implementation plan for restoration activities	Potential future funding source for lamprey conservation work in Oregon.		Apply online in the spring or fall See http://www.oregon.gov/oweb/pages/index.aspx
USGS	Science Support Partnership Program	Research & technical assistance USGS partners with the USFWS	Potential future funding source for lamprey conservation work in Region 1	≈$178,000 available in FY2019 for new projects in Region 1	FY2019 application due Friday June 15th, 2018

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Bonneville Power Administration	Northwest Power & Conservation Council's Cost Savings Program	High priority lamprey monitoring and restoration actions identified in Columbia basin RMU Regional Implementation Plans. Highest priority will be given to on-the-ground restoration projects (e.g., habitat restoration, passage improvements, supplementation), then to monitoring and evaluation projects, and then to inventory projects.	Example Projects: • McKenzie Watershed Alliance received $150,000 for floodplain restoration project on lower South Fork McKenzie River (Willamette RMU). • US Bureau of Reclamation and Yakama Nation Fisheries received $40,000 for the installation of 2 VWW passage structures at Prosser Dam in the Yakima subbasin. • The Nez Perce Tribe received $30,000 to upgrade infrastructure used to trap, haul and overwinter adult lamprey captured in lower Columbia River for translocation past mainstem dams in Snake Basin.	$100,000 maximum per year	Proposals due to Regional Implementation Plan in late August
US Army Corps of Engineers					
US Bureau of Reclamation	Science and Technology Project	Research proposals, typically for developing innovative ideas or methods that could be applicable to Reclamation.	Any lamprey issue related to Reclamation project. Must be led by a Reclamation staff.	$100,000	Annual call for proposals in April with Deadline in July. Amount that is funded with each proposal varies $80,000 – $100,000
US Forest Service					
NOAA Fisheries	Pacific Coastal Salmon Restoration Fund	NOAA Competitive grant program funding salmon and steelhead habitat restoration, etc.	No projects are specifically targeted to Pacific lamprey, however, many of the PCSRF salmonid habitat restoration projects and fish passage projects (e.g., culverts) would also benefit lamprey	Approximately $65 million annually based on FY14-FY16	Eligible entities include the states of CA, OR, WA, ID, AK, as well as Pacific tribes.
Oregon Wildlife Foundation		• Habitat restoration • Natural resource/outdoor education • Invasive species removal/control • Studies that support improved fish/wildlife management	Potential future funding source for lamprey conservation work.	$5,000 or less	2018 application deadlines: 4/17, 8/6, 10/29 http://www.myowf.org/grants
National Fish and Wildlife Foundation	Bring Back the Natives Program	Restoration activities that address key limiting factors for focal species (e.g. salmon, steelhead, Pacific Lamprey)	Potential future funding source for lamprey conservation work	Grants range in size from $25,000 to $100,000 Must provide non-federal match of at least $1 for every $1 of grant funds requested.	Annual call for proposals in spring http://www.nfwf.org/bnb/Pages/home.aspx

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Oregon Department of Fish and Wildlife	Restoration and Enhancement Program	• Projects that increase recreational angling opportunities, access to the fish resource, or improve fish management capabilities (e.g. new fishways and screens, improvements to fish habitat that benefit fish (e.g. fish passage or habitat modifications). • Aquatic inventories that characterize populations, habitat or the effectiveness of other projects. • Public outreach/education	Potential future funding source for lamprey conservation work	Grants range in size	2018 Application deadlines: July 9th, 2018 October 26th, 2018 https://www.dfw.state.or.us/fish/re/2016_revamp/how.asp
Wildlife Conservation Society	Climate Adaption Fund	1-2 year projects that implement on-the-ground actions that assist wildlife and ecosystems to adapt to climate change at a landscape scale	Potential future funding source for lamprey conservation work	$50,000 to $250,000 per project	https://www.wcsclimateadaptationfund.org/program-information/