Pacific Lamprey

2025 Regional Implementation Plan

for the

Mid-Columbia

Regional Management Unit

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I. Introduction

This is the annual Regional Implementation Plan (RIP) developed for the Mid-Columbia Regional Management Unit (RMU). RIPs for the Mid-Columbia RMU are revised each year as warranted, primarily based on new information provided by Mid-Columbia RMU partners. This RIP is not intended to be comprehensive in the information provided; rather, it provides an overview of the RMU and the status of Pacific Lamprey within the RMU, including the primary threats and significant conservation actions affecting this species. This plan and earlier versions are available on the Pacific Lamprey Conservation Initiative webpage (www.pacificlamprey.org/rmu/). The 2025 annual meeting notes are appended to this plan (Appendix 1).

II. Status and Distribution of Pacific Lamprey in the RMU

A. General Description of the RMU

The Mid-Columbia RMU includes watersheds that drain into the Columbia River mainstem from the Walla Walla River at Rkm 507 west to Bonneville Dam at Rkm 235. It is comprised of sixteen 4th field Hydrologic Unit Code (HUC) watersheds ranging in size from 1,793 to 8,158 km^2 (Table 1). Watersheds within the Mid-Columbia RMU include the Walla Walla, Umatilla, Willow, Middle Columbia-Hood, Klickitat, Upper John Day, North Fork John Day, Middle Fork John Day, Lower John Day, Lower Deschutes, Upper Deschutes, Little Deschutes, Beaver-South Fork, Upper Crooked, Lower Crooked and Trout watersheds (Figure 1).

Table 1. Drainage size and Level III Ecoregions of the 4th Field Hydrologic Unit Code (HUC) watersheds located within the Mid-Columbia RMU.

Watershed	HUC Number	Drainage Area (km^2)	Level III Ecoregion(s)
Walla Walla	17060102	4,612	Columbia Plateau, Blue Mountains
Umatilla	17060103	6,553	Columbia Plateau, Blue Mountains
Willow	17060104	2,248	Columbia Plateau, Blue Mountains
Mid-Columbia – Hood	17060105	5,587	Cascades, Eastern Cascade Slopes, Columbia Plateau
Klickitat	17060106	3,501	Cascades, Eastern Cascade Slopes, Columbia Plateau
Upper John Day	17070201	5,548	Blue Mountains
North Fork John Day	17070202	4,795	Blue Mountains
Middle Fork John Day	17070203	2,056	Blue Mountains
Lower John Day	17070204	8,158	Columbia Plateau, Blue Mountains
Upper Deschutes	17070301	5,578	Cascades, Eastern Cascade Slopes, Blue Mountains
Little Deschutes	17070302	2,726	Cascades, Eastern Cascade Slopes
Beaver-South Fork	17070303	3,968	Blue Mountains, Northern Basin
Upper Crooked	17070304	2,995	Blue Mountains, Northern Basin
Lower Crooked	17070305	4,787	Cascades, Eastern Cascade Slopes, Blue Mountains, Northern Basin
Lower Deschutes	17070306	5,944	Cascades, Eastern Cascade Slopes, Columbia Plateau, Blue Mountains
Trout	17070307	1,793	Columbia Plateau, Blue Mountains

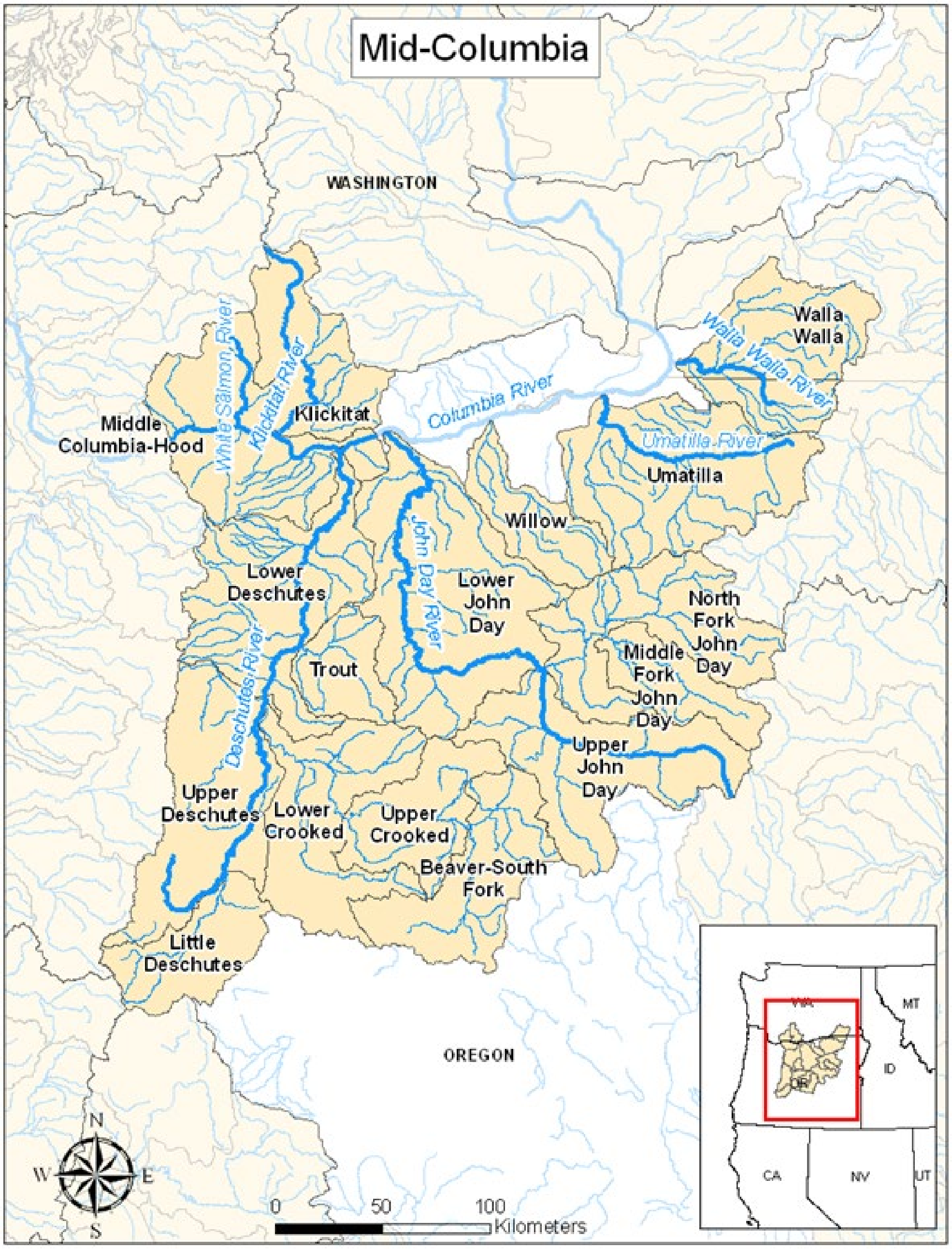

Figure 1. Map of watersheds in the Mid-Columbia Regional Management Unit.

B. Status of Species

2022 Pacific Lamprey Assessment

Approximately every five years the Pacific Lamprey Conservation Initiative (PLCI), through the RMUs, revise the Pacific Lamprey Assessment (e.g., USFWS 2019 and PLCI 2024). The Assessment utilizes local stakeholder knowledge and expertise to evaluate Pacific Lamprey distribution, population demographics, and threats at the 4th field HUC watershed level. This information is used to inform NatureServe, a diagnostic tool that characterizes the conservation risks of Pacific Lamprey across their historical range. Information about current Pacific lamprey distribution, population size, trends, and watershed threats were collected from stakeholders in the Mid-Columbia RMU through an online Assessment questionnaire and virtual meeting held on March 10th of 2022. The following is a brief summary of key findings from the 2022 Pacific Lamprey Assessment, available online at https://www.pacificlamprey.org/wp-content/uploads/2024/06/PacificLamprey_2022Assessment_FINAL_06_27_2024.pdf.

NatureServe Conservation status ranks changed in two of 16 HUCs in 2022. Status ranks improved from S1 (Critically Imperiled) to S2 (Imperiled) in the Mid-Columbia-Hood and Lower Deschutes. Changes in these areas are attributable to an expansion in current occupancy (Mid-Columbia-Hood) and high estimated population abundance (Lower Deschutes).

Distribution

Current Pacific Lamprey distribution in the Mid-Columbia RMU is still greatly reduced from historical range (Table 2). The ratio of current to historical distribution was estimated to be low in the majority of watersheds, ranging from 4% (Klickitat) to 16% (Mid-Columbia-Hood) in areas with known Pacific Lamprey occupancy. Although current distribution of lamprey has remained the same in most watersheds since the completion of the 2018 Assessment, distribution expanded slightly in both the Klickitat (+17 km^2) and Mid-Columbia-Hood (+81 km^2) due to an improved understanding of occupancy informed by increased sampling effort. A compilation of known larval and adult Pacific Lamprey occurrences in the Mid-Columbia RMU are displayed in Figure 2 and an ArcGIS Web Map available online at https://fws.maps.arcgis.com/apps/instant/basic/index.html?appid=3a85e0d266834a2aad815a9d2f18ddf5.

Abundance

Population abundance of Pacific Lamprey increased in six watersheds, with estimates ranging from zero to over 10,000 fish (Table 2). The increase in abundance in these watersheds is due to a better understanding of the proportion of adults potentially entering mid-Columbia tributaries, rather than a true increase in population abundance. Pacific Lamprey abundance was estimated in seven watersheds (i.e., Mid-Columbia-Hood, Klickitat, Upper John Day, North fork John Day, Middle fork John Day, Lower John Day, and Lower Deschutes) using annual counts at the three lowest mainstem Columbia River dams and the publication by Noyes et al. (2015) which estimated adult lamprey entrance in mid-Columbia tributaries from multiple years of acoustic telemetry and PIT tagging information (2011-2014). To estimate tributary abundance, average tributary entry rates (0.1% - 5.9%) were multiplied by the total number of adult Pacific Lamprey passing Bonneville, The Dalles, and John Day dams annually. Although estimates are based on a limited duration study, and not all potential spawning tributaries were monitoring for tagged lamprey, this information still provided a useful, initial foundation for estimating population size in mid-Columbia tributaries. Population abundance in the Umatilla was estimated from adult counts at Three Mile Falls Dam near Umatilla, OR. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) also has an active Pacific Lamprey translocation program, ongoing for the last 20 years (Ward et al. 2012), although no translocations occurred in 2018 and 2019 in the Umatilla River due to good volitional return numbers. However, there have been some occasional trap-and-haul efforts due to low flow and high water temperatures and lamprey passage system (LPS) rest box overcrowding.

Short-term Population Trend

Mainstem dam counts provide one of the few long-term records of adult Pacific Lamprey numbers in the Columbia River basin. Despite data gaps and monitoring inconsistencies, counts of adult Pacific Lamprey at Bonneville Dam indicate a significant downward trend in abundance over time. The 10-year median day time count of adult Pacific Lamprey prior to 1970 was over 106,000 fish (1960-1969), while the recent 10-year median is just over 30,000 fish (Columbia River DART 2022). Short-term population trend which is defined as the degree of change in population size over three lamprey generations (~36 years; Hess et al. 2022), was ranked as 'Unknown' in all but four mid-Columbia watersheds due to the lack of continuous long-term adult counts in these tributaries. The Umatilla, Mid-Columbia-Hood, Klickitat, and Lower Columbia have 10-22 years of consistent adult count information that was used to estimate short-term population trend for the 2022 Assessment. Based on the overall decline of counts at Bonneville Dam, mark-recapture information and TEK from CTUIR tribal members in the Umatilla (Close et al. 2004), Pacific Lamprey populations are estimated to have declined by 10-70% over the last 36 years (Table 2).

Pacific Lamprey are in very low abundance or possibly extirpated from Willow Creek. Electrofishing surveys conducted in 2010 and 2011 found only Western Brook Lamprey at a single location out of the 11 sites surveyed in Willow and Rhea Creek (Reid et al. 2011). In 2021, the CTUIR conducted environmental DNA (eDNA) sampling within the subbasin and had no detections for Pacific Lamprey but did detect *Occidentis* spp. (formerly *Lampetra* spp.; Carim et al. 2024). Habitat in mid-lower Willow Creek is poor and several small passage barriers (i.e., private diversions for irrigation) likely limit potential distribution. Pacific Lamprey are still believed to be extirpated from the Walla Walla River. Although present in the subbasin historically, Pacific Lamprey have not been observed during ongoing electrofishing, screw trap and spawning survey efforts (Moser and Close 2003). Pacific Lamprey are also believed to be extirpated in Trout Creek as well as the Deschutes River basin upstream from Pelton Dam. In fall 2020 and spring 2021, the Middle Deschutes Watershed Council in partnership with the Confederated Tribes of Warm Springs, Cramer Fish Sciences and Jefferson County SWCD conducted eDNA sampling on the lower Deschutes River and first three miles of Trout Creek to assess Pacific Lamprey presence and distribution. Environmental DNA sampling did not detect Pacific Lamprey in Trout Creek and surveyors noted the poor quality of habitat in the lower subbasin. There are no Pacific Lamprey upstream of the Pelton Round-Butte Dam. Pelton is currently impassable to lamprey and translocation is not occurring.

Table 2. Population demographic and NatureServe conservation status ranks (see Appendix 2) of the 4th Field Hydrologic Unit Code (HUC) watersheds located in the Mid-Columbia RMU. Steelhead intrinsic potential was used as a surrogate estimate of historical lamprey range extent in areas where historical occupancy information was not available. Ranks highlighted in yellow indicate a change from the 2018 Assessment.

Watershed	HUC Number	Conservation Status Rank	Historical Occupancy (km^2)	Current Occupancy (km^2)	Population Size (adults)	Short-Term Trend (% decline)
Walla Walla	17060102	SH	1000-5000	Zero	Zero to 1-50	Unknown
Umatilla	17060103	S1	1000-5000	100-500	1000-2500	10-30%
Willow	17060104	SH	1000-5000	Not ranked	Zero	Unknown
Mid-Columbia – Hood	17060105	S2↑	1000-5000	500-2,000	1000-10,000	10-50%
Klickitat	17060106	S1	1000-5000	20-100	1000-10,000	50-70%
Upper John Day	17070201	S1	1000-5000	100-500	250-1000	Unknown
North Fork John Day	17070202	S1	1000-5000	100-500	250-2500	Unknown
Middle Fork John Day	17070203	S1	1000-5000	100-500	250-2500	Unknown
Lower John Day	17070204	S1	5000-20,000	100-500	250-1000	Unknown
Upper Deschutes	17070301	SX	1000-5000	Extinct	Extinct	Not ranked
Little Deschutes	17070302	SX	Not ranked	Extinct	Extinct	Not ranked
Beaver-South Fork	17070303	SX	1000-5000	Extinct	Extinct	Not ranked
Upper Crooked	17070304	SX	1000-5000	Extinct	Extinct	Not ranked
Lower Crooked	17070305	SX	1000-5000	Extinct	Extinct	Not ranked
Lower Deschutes	17070306	S2↑	1000-5000	100-500	2500-10,000	10-30%
Trout	17070307	SH	1000-5000	Zero	Zero	Unknown

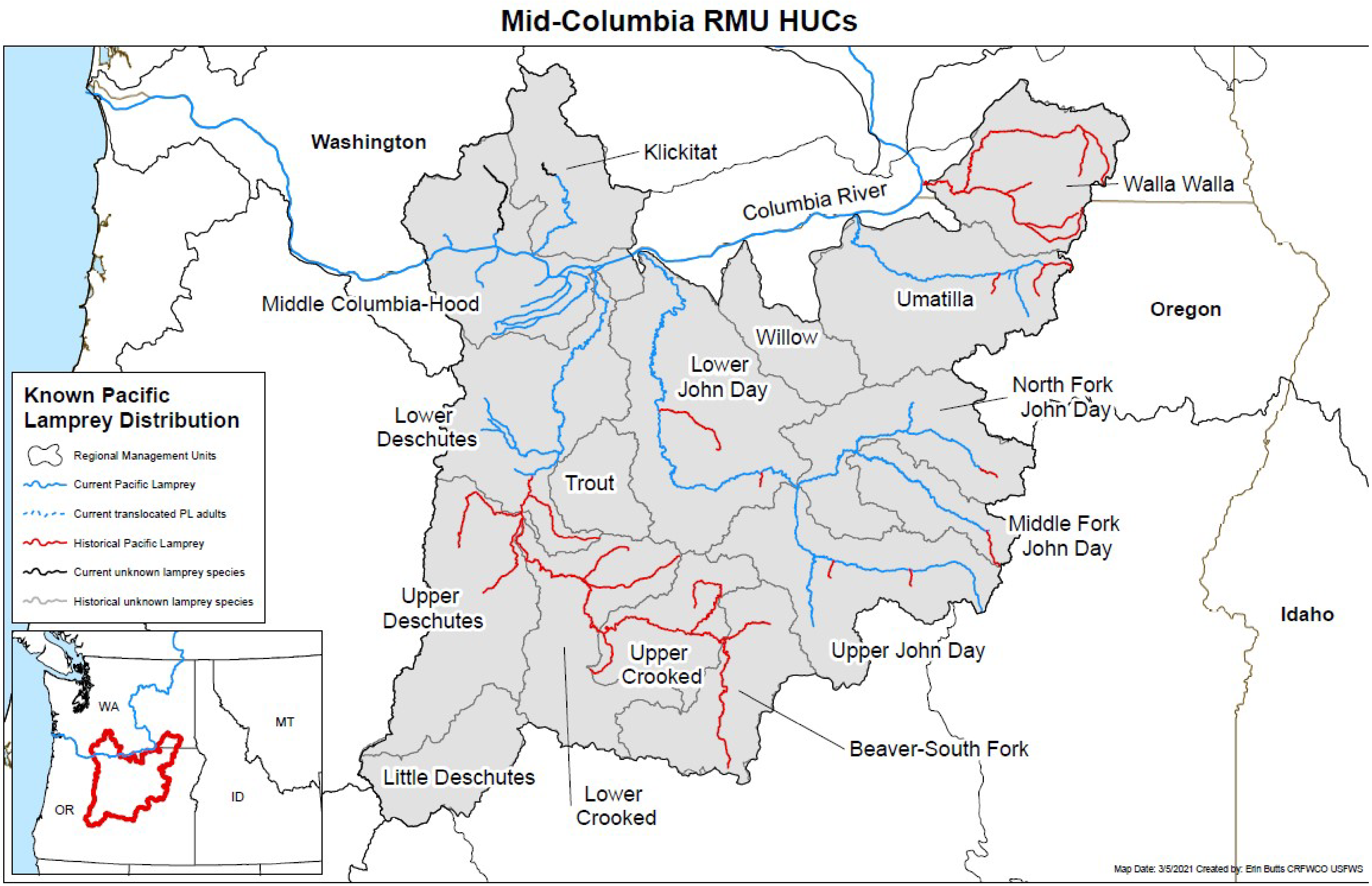

Figure 2. Current and historical known distribution for Pacific Lamprey: Mid-Columbia RMU (https://fws.maps.arcgis.com/apps/instant/basic/index.html?appid=3a85e0d266834a2aad815a9d2f18ddf5). Historical Pacific Lamprey distribution depicted in map was obtained from published literature, tribal accounts and state and federal agency records.

Distribution and Connectivity (Passage)

Mainstem passage for adult and juvenile Pacific Lamprey in the Mid-Columbia RMU is impeded by four Federal Columbia River Power System (FCRPS) dams (Bonneville, The Dalles, John Day, and McNary). A multi-agency effort to assess and reduce the impact of mainstem passage is ongoing (CRITFC 2011; USACE 2015; LTWG 2022). Passage within tributaries was ranked a moderate overall threat in the Mid-Columbia RMU (Table 3). Four dams that previously blocked fish passage have been removed from the region including Hemlock Dam on the Wind River (2009), Powerdale Dam and Odell Dam on the Hood River (2010 and 2016), and Condit Dam on the White Salmon River (2011). Within the Umatilla subbasin, tributary passage scores improved from a high (Mean Scope/Severity 3.5) to a moderate (Mead Scope/Severity 3.25) threat in 2022. Four diversions have been breached or removed from the subbasin in the last five years (i.e., Boyd's, Dillon, Brownell and Taylor diversion dams). Additionally, adult lamprey passage structures (i.e. LPS or flat plates with video monitoring and PIT detection) have been installed at Three Mile Falls diversion dam, Maxwell diversion dam, and Feed Diversion Dam to enhance passage. The Severity rank of tributary passage also improved (from moderate to low) in the Lower Deschutes. An LPS and video monitoring system were recently installed at the Warm Springs National Fish Hatchery fishway to improve passage conditions for adult Pacific Lamprey in the Warm Springs River.

While many passage barriers have been removed or structurally modified to improve passage, the region is still affected by a number of dams (e.g., Willow Creek Dam, McKay Dam, Pelton Round Butte Hydroelectric Project) and low elevation water diversions. Irrigation diversions for crops and livestock are numerous, particularly in the Mid-Columbia-Hood, Walla Walla, Umatilla and John Day basins. Contemporary structures are required to operate and maintain screening or bypass devices to protect fish from impingement or entrainment, though most screens are designed to protect/exclude salmonids and not lampreys. A recent study in the Umatilla River found a large proportion of PIT-tagged juvenile Pacific Lamprey released upstream of the Feed Diversion headgate were entrained into the diversion canal in 2020 (54%; Simpson 2022). Similarly, high levels of entrainment have also been observed at Westland and Three Mile Falls diversions (Aaron Jackson, CTUIR, personal comm.). A large number of irrigation diversions still do not meet NOAA criteria for screening or are completely unscreened and may entrap or impinge larval and juvenile lamprey to an unknown extent. The structural design of diversion dam fishways may also delay or inhibit the passage of adult lamprey that are unable to navigate past sharp edges (e.g. 90° angles), especially in areas of high velocity (LTWG 2022). Additionally, it has been observed in the Umatilla River that the angle at which the diversion canals are positioned relative to the river channel can influence the severity of larval and juvenile entrainment. Facilities with a less acute angle tend to entrain more lamprey (Aaron Jackson, CTUIR, personal comm.).

In the Klickitat subbasin, tributary passage worsened from a moderate (Mean Scope/Severity 3.0) to high threat (Mean Scope/Severity 3.50) in 2022. The Lyle Falls passage structure can delay adult lamprey passage during low water conditions and the low head weir at Klickitat Hatchery likely hinders adult passage based on the low number of Pacific Lamprey larvae observed during electrofishing surveys upstream from the hatchery. In addition, the surface water intake pump inadvertently diverts larval lamprey into hatchery ponds where they later become stranded when ponds are dewatered (Ralph Lampman, Yakima Nation Fisheries, personal comm.).

C. Summary of Major Threats

The following table summarizes the key threats (Mean Scope/Severity ≥ 2.5) within Mid-Columbia RMU tributaries as identified by RMU participants during the Assessment revision meeting in March 2022.

Table 3. Key threats to Pacific Lamprey and their habitats in the Mid-Columbia RMU, 2022.

Watershed	Mainstem Passage		Climate Change		Water Quality		Stream and Floodplain Degradation		Dewatering and Flow Management		Tributary Passage		Lack of Awareness		Small Population Size	
	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity
Walla Walla	4	4	4	4	3.5	3.5	4	4	4	4	4	4	3	2	4	4
Umatilla	4	4	4	4	3.5	3	4	4	3	3.5	3.5	3	3	3	2	2.5
Willow	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mid-Columbia/Hood	4	3.5	4	5	3.5	3.5	3	3	3	4	2	2	2	2	2	2
Klickitat	4	3.5	3.5	3.5	4	3.5	2	2	2.5	3.5	3.5	3	3	2.5	2	2.5
Upper John Day	4	4	4	4	4	4	3.5	4	3.5	3.5	3	3.5	3	3		
North Fork John Day	4	4	4	4	3	3	2.5	2.5	2.5	2.5	2	2	3	3		
Middle Fork John Day	4	4	4	4	3.5	3.5	3.5	3.5	2.5	2.5	2	2	3	3		
Lower John Day	4	4	4	4	4	4	3.5	3.5	4	4	3	3	3	3	2	2
Lower Deschutes	4	4	4	4	2.5	2.5	2.5	2.5	1.5	1.5	2	2	2	2	2	2
Mean	4.00	3.90	3.95	3.95	3.55	3.45	3.25	3.30	3.05	3.30	2.90	2.85	2.90	2.75	2.57	2.71
Rank	M	M	M	M	H	M	M	M	M	M	M	M	M	M	M	M
Mean Scope & Severity	3.95		3.95		3.50		3.28		3.18		2.88		2.83		2.64	
Drainage Rank	**H**		**H**		**H**		**M**		**M**		**M**		**M**		**M**	

The highest ranked threats in the Mid-Columbia RMU are described below. Mainstem passage, climate change and water quality were ranked a high threat in the Mid-Columbia, while stream and floodplain degradation, dewatering and flow management, tributary passage, lack of awareness and small population size were ranked a moderate threat in 2022.

Mainstem and Tributary Passage

A summary of passage issues in Mid-Columbia tributaries were described in the previous section (Distribution and Connectivity). Threats associated with adult and juvenile passage at mainstem FCRPS dams are described in the 2011 Pacific Lamprey Assessment (Luzier et al. 2011).

Climate change

Climate change was one of the highest ranking threats in the Mid-Columbia RMU with Assessment Scope/Severity scores worsening in eight watersheds (Table 3). Climate change is happening faster and more intensely than anticipated and the combined effects of climate change (e.g., changes to ambient temperature, precipitation, and streamflow patterns) and predicted rise in human population will likely exacerbate other threats in the RMU. Climate change is likely to alter the amount, timing, and type of precipitation with decreases in snowpack, earlier snow melt, and more winter precipitation as rain. This will contribute to earlier peak stream flows and lower summer baseflows. In a region heavily dominated by agricultural crop production, rising ambient temperatures will likely increase demand for water for irrigation that will further reduce stream flows and elevate water temperatures. These conditions may restrict lamprey habitat availability, hamper adult migration, reduce reproductive capability or contribute to increased mortality if incubating eggs, burrowing larvae or migrating juveniles are exposed to warm temperatures (>20°C) for an extended duration (Jackson and Moser 2012; Clemens et al. 2016). The impacts of climate change will vary across watersheds with some areas more resilient to impacts of climate change and some areas at greater risk from potential change based upon the underlying geology, impoundments, land use, or other factors (EPA 2021). Climate change is identified as a critical threat across the range of Pacific Lamprey, but the feasibility of making tangible changes will be challenging and require large scale institutional changes. Within the Lower Deschutes and Walla Walla subbasins, one of the strategies to combat climate change is the acquisition and subsequent protection of habitat. In the John Day subbasin, stream restoration (e.g., increasing channel complexity, channel deepening, riparian planting, riparian fencing) is being used as a tool to mitigate the effects of climate change.

Water quality

Water quality worsened from a moderate to high threat in the Mid-Columbia RMU. Assessment Scope/Severity scores increased/worsened in Willow, the Middle Fork John Day, and lower Deschutes (Table 3). Elevated water temperature is still the primary concern in most Mid-Columbia watersheds. Lower and mainstem reaches regularly experience prolonged warming often starting in late spring, extending into fall. Factors contributing to excessive water temperatures generally include increased air temperature, lack of riparian cover, widening of stream channels, or reduced instream flows associated with water withdrawals. The impacts of warm water temperatures (e.g., ≥20°C) on Pacific Lamprey embryonic development, physiology, adult migrations, reproductive capability and evolutionary pressures can be multitudinous and substantial (Clemens et al. 2016). Other water quality concerns in Mid-Columbia watersheds include low dissolved oxygen levels, pH extremes, sedimentation, and presence of bacteria (e.g., fecal coliform), heavy metals, or toxic pollutants (e.g., insecticides, PCBs). A study conducted in 2023 by the Pacific Northwest National Laboratory (PNNL), U.S. Geological Survey (USGS) and Yakama Nation Fisheries found high levels of mercury in larval Pacific Lamprey in Mid-Columbia tributaries. Additionally, organohalogenated compounds were detected in larval Pacific Lamprey samples collected from four locations on the Confederated Tribes of the Warm Springs Reservation (Warm Springs River, Shitike Creek, Beaver Creek, Dry Creek) as well as from returning adult Pacific Lamprey collected at Sherars Falls on the Deschutes River (Smith et al. 2023). Direct exposure to heavy metals and toxins in water, sediment, or through dietary intake may result in high concentrations of contaminants accumulating in the fatty tissues of lamprey that may compromise development, reproduction and survival (Nilsen et al. 2015; Clemens et al. 2017; Madenjian et al. 2021; Smith et al. 2023). In 2023, the Oregon Health Authority and Washington State Department of Health issued a consumption advisory recommending limits on the amount of adult lamprey consumed from the Columbia River and its tributaries due to high levels of mercury and PCBs in lamprey tissue (https://critfc.org/wp-content/uploads/2022/09/lamprey-consumption-advisory.pdf).

Stream & floodplain degradation

Stream and floodplain degradation was ranked a moderate threat in the Mid-Columbia RMU. Aquatic habitat conditions within the Klickitat and Lower Deschutes HUCs are relatively intact with only moderate impacts to riparian vegetation. In the majority of the Mid-Columbia RMU however, historical and current land use practices have contributed to large scale losses in stream habitat complexity. Unmanaged livestock grazing, road building, and timber harvest have altered Mid-Columbia watersheds by widening or entrenching stream channels, intensifying bank erosion, compacting soils, reducing water infiltration and storage potential, increasing runoff, and reducing riparian vegetation cover. Many watersheds in the RMU lack mature trees that play a pivotal role in bank stability, water quality protection, thermal cover, and input of wood into channels. Large wood can benefit streams by influencing the structural complexity of the channel (i.e., creating pools or undercut banks), reducing flow velocities and facilitating the deposition of fine substrate and organic matter important for larval lamprey rearing and feeding (Gonzalez et al. 2017). Within lowlands, efforts to prevent flooding and provide irrigation for crops and livestock have straightened and scoured streambeds, eliminated side channels and cut off floodplains. Cultivation, riparian clearing and conversion of land for infrastructure (e.g., railroad and roads), crops, pastures and residential development have filled and/or drained wetlands, increased soil erosion and sedimentation, and promoted the establishment and spread of invasive plant species. The cumulative loss of aquatic and riparian habitat has contributed to increased stream temperatures and reduced or eliminated important spawning and rearing habitat for Pacific Lamprey within many watersheds. RMU partners continue to work hard to implement restoration projects aimed at addressing habitat degradation, water quality issues and impaired floodplain function throughout the Mid-Columbia region.

Dewatering & flow management

Dewatering and flow management was also ranked a moderate threat in the Mid-Columbia RMU. Extensive water withdrawals for irrigation leave many watersheds in the Mid-Columbia RMU dewatered or with inadequate flow during summer and fall months. These conditions are most severe in the Walla Walla, Umatilla, Willow and John Day basins where demand often exceeds available water supply. Streamflow is an important determinant of water quality and aquatic habitat conditions (Clemens et al. 2017). Reduced flows may increase water temperatures to critical levels, lower dissolved oxygen levels, reduce spawning and rearing habitat availability, prevent access to backwater or side channel habitats, and create low water barriers. Actions to restore and protect diminished instream flows will require large scale institutional changes involving water rights and salmonid management and will likely require a long-term effort. Current measures to improve flows include buying or leasing water rights, cooperative exchange of Columbia River water for instream flows (Umatilla Basin Project Act), diversion improvements (e.g., flow measuring devices, fish screens, conversion from flood to sprinkler systems), and irrigation efficiency projects (e.g., replacing open ditches/canals with pipe). These water efficiency improvements may help conserve water for instream flows, but with predicted trends in population growth, increased demand, and the anticipated effects of climate change, water supply issues will likely be an ongoing problem in the Mid-Columbia RMU.

Lack of Awareness

Lack of Awareness was ranked a moderate threat, though the severity of this threat improved in three Mid-Columbia watersheds in 2022 (Umatilla, Mid-Columbia-Hood, and Klickitat). Pacific Lamprey awareness is slowly becoming more widespread among stakeholders and the public. Tribes, state and federal agencies, watershed councils and others have played a significant role in improving awareness through targeted outreach, youth education events, webinars, publications (e.g., Clemens and Wang 2021) and fact sheets (https://wdfw.wa.gov/sites/default/files/2025-04/20250313-lampreys-friends-or-foes-final.pdf). Nevertheless, it’s unclear how improved awareness translates to on-the-ground actions that incorporate or benefit lamprey such as lamprey specific fish salvage, design of fish screens, passage improvements, habitat restoration and permitting (e.g., Section 404 permits). For example, instream water work, whether for restoration activities or maintenance of diversions, can dewater areas or remove sediments in which larval lamprey are burrowed. Such actions without first salvaging lamprey may result in the death of hundreds to thousands of larvae and juveniles. Increasing public and agency awareness about the presence of larval lamprey in the sediments, adult lamprey spawning habitats and timing during in-water work, and education on actions to minimize these impacts, could greatly decrease localized mortality and injury to lamprey populations. For more information about how to minimize impact to native lampreys during in-water work, please consult LTWG (2020).

Small Population Size

Small population size was ranked a moderate threat, but is primarily a concern in the Walla Walla, Willow, and watersheds upstream of the Pelton Round-Butte Dam. There is the potential that adult lamprey could recolonize the Walla Walla and Willow from larger, adjacent populations, but this has not yet occurred in these subbasins. Although larval lamprey pheromones may increase the attraction of adults to a watershed (e.g., Umatilla translocation/reintroduction efforts), lamprey have recolonized areas without larval lamprey pheromone attraction (e.g., Condit dam removal). It is difficult to parse out the factors that may affect recolonization (i.e., pheromones, habitat quality, flow, water temperature, etc.) and how to interpret small population size as an impact.

Conservation and Restoration Actions

Within the mainstem Columbia River, improvements to Bonneville, The Dalles, John Day and McNary hydroelectric dam fishways have occurred to increase adult passage success. Instream and floodplain habitat restoration activities have been implemented in the Mid-Columbia subbasins, although these actions have been designed / funded primarily for salmonid recovery. The following conservation actions were initiated or recently completed by RMU partners in the Mid-Columbia Regional Management Unit from 2012-2025.

HUC	Threat	Action Description	Status
RMU	Dewatering/ flow	Water savings through Columbia Basin Water Transactions Program	Ongoing
RMU	Dewatering/ flow	Study to evaluate fate of salvaged larval lamprey during dewatering events https://doi.org/10.3133/ofr20201026	Complete
RMU	Dewatering/ flow	Larval lamprey movement study to understand how far lamprey can move over dewatered surfaces	Complete/ Ongoing
RMU	Dewatering/ flow	Study to test efficacy of portable backpack suction dredge to sample for larval lamprey during salvage	Complete
RMU	Dewatering/ flow	Lamprey salvage at irrigation diversion canals and hatchery ponds	Ongoing
RMU	Dewatering/ flow/ Passage	Study testing use of venturi pump to prevent/reduce entrainment into irrigation diversion canals	Ongoing
RMU	Disease	New lamprey pathogen publication (Jackson et al. 2019)	Complete
RMU	Passage	Evaluation of juvenile entrainment mechanisms and preventative measures.	Ongoing

RMU	Passage	PLCI funded project to identify potential barriers to lamprey passage in Mid-Columbia RMU.	Ongoing
RMU	Population	Environmental DNA, spawning ground surveys, smolt trapping and occupancy sampling to better understand lamprey distribution.	Ongoing
RMU	Population	Conservation Plan for Lampreys in Oregon (ODFW) *https://www.dfw.state.or.us/fish/CRP/coastal_columbia_snake_lamprey_plan.asp*	Complete
RMU	Population	Artificial propagation and larval rearing of Pacific Lamprey (YNF, CTUIR, USFWS)	Ongoing
RMU	Population	Mesocosm experiment to investigate performance of artificially propagated larvae and juveniles vs wild fish	Complete
RMU	Population	eDNA sampling in lower Umatilla River, John Day River, Walla Walla River and Willow Creek	Ongoing
RMU	Population	Large-scale PIT tagging of larval and juvenile Pacific Lamprey in mid-upper Columbia tributaries	Ongoing
RMU	Predation	Lab study looking at limit of detection/identification of larval and juvenile lamprey in predator stomachs	Complete
RMU	Stream Degradation	Implementation of instream and floodplain habitat restoration activities.	Ongoing
Columbia River	Passage	PNNL study of juvenile lamprey migration through mainstem dams	Ongoing
Columbia River	Passage	Testing Smart Panels at Bonneville Dam. Panels detect passage of lamprey by sensing the attachment and suction pressure of adult lamprey.	Ongoing
Columbia River	Passage	Developed floating adult Lamprey collector (FALCon) for deployment in Bonneville tailrace July 2025.	Ongoing
Columbia River	Population	Seasonal abundance of larval lamprey at confluence of 3 tributaries in Bonneville Dam reservoir and 3 tributaries below Bonneville Dam (5 year study)	Ongoing

Columbia River	Population	eDNA sampling at Bonneville, McNary, Wells and Rocky Reach to determine number of PCL DNA copies/second.	Complete
Columbia River	Predation	Using eDNA to look at diet/scat of 6 fish species, bird species (e.g., gulls, cormorants, white pelican) and Sea Lion spp.	Ongoing
Columbia River	Stream Degradation	Lab study looking at effects of sediment overburden on burrowed larval lamprey	Complete/ Ongoing
Columbia River	Stream Degradation/ Water Quality	Riparian plantings at mouths/deltas of mid-Columbia tributaries to reduce water temperature in shallow water habitat	Proposed
Walla Walla–Umatilla–John Day	Population	Master Plan for Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research (CRITFC, YN, CTUIR, NPT)	Complete
Walla Walla	Population	Larval lamprey surveys and eDNA sampling conducted every 5 years	Ongoing
Walla Walla	Population	Release of artificially propagated lamprey as part of Master Supplementation Plan	Ongoing
Walla Walla	Stream Degradation	Large floodplain reconnection project on lower 6 miles of river	Ongoing
Umatilla	Population	Translocation/reintroduction of adult Pacific Lamprey.	Ongoing
Umatilla	Population	Monitoring larval density trends and adult passage success to spawning areas.	Ongoing
Umatilla	Population	Collection of genetic samples to contribute to ongoing work by John Hess (CRITFC)	Ongoing
Umatilla	Population/ Passage	Ongoing larval and juvenile lamprey PIT tagging study	Ongoing
Umatilla	Passage	Installation of Lamprey Passage Systems to enhance passage for Pacific Lamprey at three water diversion dams.	Complete
Umatilla	Passage	Completed design for wetted wall lamprey passage structure for Westland Diversion. Installation 2026.	Ongoing
Umatilla	Passage	Telemetry to assess use of Lamprey	Complete

		Passage Systems at diversion dams.	
Umatilla	Passage	Sampling of Bureau of Reclamation canals to estimate extent of juvenile entrainment into diversions.	Ongoing
Umatilla	Passage	Removal of Boyd, Dillon and Brownell diversion dams.	Complete
Umatilla	Stream Degradation/ Water Quality	Study looking impact of warm water temperatures on larval lamprey growth, movement, behavior and physiology.	Ongoing
Mid-Col. Hood	Passage	Monitoring natural recolonization above former site of Powerdale Dam on Hood River and Condit Dam on White Salmon River.	Ongoing
Mid-Col Hood	Population	Larval occupancy/density surveys in principal tributaries.	Ongoing
Mid-Col Hood	Population	Electrofishing in White Salmon and Wind Rivers to assess distribution and abundance of larval lamprey	Ongoing
Mid-Col Hood	Population	Course scale eDNA sampling on White Salmon River and tributaries	Complete
Mid-Col Hood	Population	Survey to assess Pacific Lamprey recolonization of White Salmon River following Condit Dam removal	Complete
Mid-Col Hood	Population	Translocation of adult Pacific Lamprey above former Condit Dam location on White Salmon River	Proposed
Mid-Col Hood	Population/ Passage	eDNA collection & monitoring in Hood River tributaries with passage barriers.	Ongoing
Mid-Col Hood	Stream Degradation	Restoration and screen upgrade on lower East Fork Hood River.	Ongoing
Klickitat	Passage	Modification/improvements to Lamprey Passage Structure at Lyle Falls fish ladder.	Complete
Klickitat	Passage	Passage improvement for adult Pacific Lamprey at Klickitat Hatchery weir	Proposed
Klickitat	Population	Distribution surveys of mainstems and principal tributaries.	Ongoing
Klickitat	Population	Electrofishing in tributaries to assess distribution and abundance of larval lamprey	Ongoing
Klickitat	Population	Course scale eDNA sampling on	Complete

		mainstem and confluence of all tributaries	
Klickitat	Water Quality	Mercury study in Klickitat and other Mid/Lower Columbia tributaries	Ongoing
John Day Basins	Population	Larval lamprey surveys and eDNA sampling conducted every 5 years	Ongoing
John Day Basins	Population	Collected genetic samples and PIT tagged ≈400 PCL (>100 mm) in NF John Day	Complete
John Day Basins	Passage	Removal of over 100 push-up diversion dams	Ongoing
John Day Basins	Passage	Fish screening improvements	Ongoing
John Day Basins	Stream Degradation	Large channel restoration project in core area for lamprey (Middle Fork John Day)	Complete
Lower Deschutes	Passage	Installation of LPS and video monitoring system at Warm Springs National Fish Hatchery fishway	Complete
Lower Deschutes	Passage	Juvenile telemetry study to look at passage and downstream migration from tributaries above Lake Billy Chinook.	Proposed
Lower Deschutes	Water Quality	Collection of larval lamprey and sediment samples to characterize contaminants in tributaries on the Warm Springs Reservation	Complete
Lower Deschutes	Water Quality	Study to look at contaminants in adult Pacific Lamprey tissue near suspected point sources on Warm Springs Reservation	Complete
Lower Deschutes-Trout	Population	Environmental DNA sampling on lower Deschutes, Shitike Creek and Trout Creek to assess distribution of Pacific Lamprey	Complete

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IV. Appendix 1. 2025 RMU Meeting Notes

Annual Pacific Lamprey Meeting for the Mid-Columbia RMU

April 10th 2025, 9:00 – 10:30 AM

Co-chairs: Jen Poirier (USFWS) & Aaron Jackson (CTUIR)

Virtual meeting attendees:

Confederated Tribes of Warm Springs: Erin Pfuntner
Confederated Tribes of the Umatilla Indian Reservation: Aaron Jackson (out sick)
Hood River Watershed Group: Alix Danielsen
NOAA: Kinsey Frick
ODFW: Ben Clemens
USFWS: Ann Gray, Jen Poirier, Will Simpson, Joe Skalicky
WDFW: Monica Blanchard
Yakama Nation Fisheries: Ralph Lampman

Agenda

- Introductions
- RMU Questionnaire
- RIPs
- Lamprey Distribution information
- Partner updates
- Partner presentation
- PLCI updates (Info Exchange, PLCI newsletter, funding)
- RMU action items

RMU Questionnaire

- Developed by the Pacific Lamprey Conservation Initiative (PLCI) Policy Committee.
- Purpose of Questionnaire is to better understand the different impediments to progress on lamprey conservation within agencies/organizations at the RMU level
- The Questionnaire is anonymous unless you want to provide your contact information
- Responses are due by June 30th
- PLCI Steering Committee will review all responses during summer and provide a summary to the Policy Committee in fall 2025.

Regional Implementation Plans (RIPs)

- RIPs are a supplementary document to the Pacific Lamprey Assessment https://www.pacificlamprey.org/wp-content/uploads/2024/06/PacificLamprey_2022Assessment_FINAL_06_27_2024.pdf
- RIPs summarize Assessment results (e.g., population demographics, distribution, threats) and highlight conservation and restoration actions for lamprey.
- Used by the Policy Committee and others to inform action items and priorities for Pacific Lamprey.
- Also used in the PLCI RFP process, where proposal must demonstrate how the project will address specific threats or data gaps within the RMU (highlighted in RIP).
- RIPs are revised annually, but undergo a major revision every five years immediately following the Pacific Lamprey Assessment that will occur in 2027.
- Have there been any major changes to threats in RMUs? Any events that might impact abundance or distribution?
- Please review RIP (specifically pages 7-11) and send any potential edits or revisions to Jen Poirier by June 13th.
- We will submit our revised RIP to the PLCI Coordinator by August 1st and it will be posted on the webpage. RIPs for each of the 18 RMUs are available online https://www.pacificlamprey.org/rmu/

Changes in threats discussion

Ralph Lampman (YNF): Results are back from a 2023 mercury study. The Pacific Northwest National Laboratory (PNNL) found high levels of mercury in mid-Columbia tributaries (e.g., Klickitat River). In general, mercury levels were high in Washington tributaries and lower in Oregon tributaries. In the Klickitat River, mercury levels were worse moving upstream to the hatchery. We will hopefully identify the source in a few months and whether increased mercury levels extend further upstream from the hatchery.

Ben Clemens (ODFW): responded in chat that he wondered if increased mercury levels had to do with methylization of mercury via natural processes (on top of anthropocentric mercury pollution).

Distribution Information

- Just a reminder that Pacific Lamprey distribution information is now available in Arc GIS online.
- https://fws.maps.arcgis.com/apps/instant/basic/index.html?appid=3a85e0d266834a2aad815a9d2f18ddf5
- Please email Jen Poirier if you have any new distribution or eDNA information to share (all species) or have any questions regarding the web map.

Partner Updates

Ben Clemens (ODFW)

- ODFW is partnering with Ralph Lampman (YNF), Monica Blanchard (WDFW), Kinsey Frick (NOAA) and engineers from Michigan State University to test 'Smart Panels'. The panels are currently used in the Great Lakes to detect the passage of lamprey by sensing the attachment and suction pressure of adult lamprey. The smart panels will be tested at Bonneville Dam in June 2025.
- A new Lampreys: Friends or Foes fact sheet was developed through a collaborative effort with PLCI, the Great Lakes Fishery Commission, New York Sea Grant, and others. https://www.dfw.state.or.us/fish/species/docs/lamprey/Lampreys%20-%20Friends%20or%20Foes.pdf

Joe Skalicky (USFWS)

- PLCI recently funded Phase 1 of a project to identify potential barriers to lamprey passage within three RMUs: Mid-Columbia, Willamette and lower Columbia. Phase 2 will involve on-site evaluation of potential barriers. Please get in touch with Joe if you know of a site/structure that may be a lamprey barrier!

Alix Danielsen (Hood River Watershed Group)

- Increasing eDNA collection and monitoring in tributaries with passage barriers that had historical lamprey populations. eDNA to be conducted over the next 2-3 years.
- Working with partners on restoration of lower East Fork Hood River following removal of Powerdale Dam in 2010. Currently in design phase of a screen upgrade project on the East Fork. The current screen in not NMFS compliant and there is concern about lamprey entrainment. The Hood River Watershed Group is looking for input from those with more knowledge about screens. Joe Skalicky and Ralph Lampman offered to work with Alix.

Ralph Lampman (YNF)

- Pelton Round Butte funding – several partners submitted a proposal for a juvenile telemetry study to look at passage and downstream migration from tributaries upstream of Lake Billy Chinook. Unfortunately the proposal was rejected. Funders are more interested in an adult study.
- Working on a floating adult Pacific Lamprey collector in conjunction with the Smart Panel (see Ben Clemens update above). The floating collector will be installed at the tailrace of B2 at the south entrance of Bonneville Dam for 3½ weeks in July 2025. Partners include Cramer Fish Sciences, the Umatilla Tribe, Columbia River Inter-Tribal Fish Commission (CRITFC), and Whooshh Innovations.

- Continuing an eDNA predation study working with Cramer Fish Sciences, USACE, ODFW, WDFW, and CRITFC. This year (depending on funding) they hope to look at bird stomach samples and white pelican and sea lion scats for potential predation of salmon and lamprey.

Erin Pfuntner (CTWS)

- Working with ODFW to monitor screw traps, that while focused on steelhead and salmon, also collect lamprey. Also assisting ODFW with fish salvage efforts.
- Delta project at the confluence of the Hood and Columbia Rivers. Christine Longjohn (CTWS Bio 3) would be a good contact for more information about lamprey as well as Lyman Jim.

Will Simpson (USFWS)

- Ongoing project monitoring entrainment at Umatilla River canals.
- Conducting study looking at the impact of warm water temperatures on larval lamprey in the Umatilla River. The study looked at growth, behavior and physiology of larval lamprey. Would like to expand the project in 2025. If you have any locations that might be suitable, let Will know. Ralph mentioned in the chat that the Yakima River and tributaries have lots of sites with very warm water temperatures where larval lamprey are present and survive (approaching 30°C). Will added that they are interested to know if larval lamprey are hunkering down or if they are moving at these elevated temperatures.

Ann Gray (USFWS)

- Ann Gray (USFWS) and Moserworks, LLC (Mary Moser) received PLCI funding to develop Trap and Haul Guidelines for adult lamprey. This document will follow the format of other lamprey passage documents developed by the Lamprey Technical Workgroup, such as Practical Guidelines for Incorporating Adult Pacific Lamprey Passage at Fishways (available https://www.pacificlamprey.org/ltwg/). Mary is going to set up discussions/interviews with folks currently conducting T&H /translocation to summarize their current practices and lessons learned. Please contact Ann (ann_e_gray@fws.gov) if you have a project appropriate for a short (~2 pages) case study that can be included in this document.
- Two recent emails from USACE regarding emergency procedures under Executive Order (EO 14156) on the energy crisis. The USACE has approved the use of special emergency processing procedures by Portland District to 'facilitate the Nation's energy supply'. This will likely fast track a lot of actions (e.g., spills may change, effecting downstream passage).

Aaron Jackson (CTUIR)

- Develop design for wetted wall lamprey passage structure for Westland Diversion in the Umatilla River, expected 2026.
- Released ~1000 adult lamprey into the Umatilla and tributaries as part of translocation efforts.
- Working with partners (YN, Cramer Fish Sciences, Whoosh, USACE and CRITFC) on floating adult lamprey collector (FALCon) for deployment in Bonneville tailrace July 2025.

- New publication on performance comparisons for art prop and wild Pacific Lamprey juveniles and larvae (NOAA, USGS, CTUIR).
- Collection of eDNA samples in Umatilla Basin and Willow Creek planned for summer 2025.

Partner Presentation

Theresa 'Marty' Liedtke (USGS) presented highlights from a controlled lab study looking at how sediments added on top of larval lamprey (e.g., during dredging activities, restoration efforts, or in-water work) may potentially impact burrowed larval lamprey.

You can access Marty's paper here: https://www.cbfish.org/Document.mvc/Viewer/P215582

- Joe Skalicky added that prior to this work, there was not a lot of information on the effects of dredging on lamprey.
- Ralph also added that when looking at substrate overburden depth in diversion canals, they noticed that larger larvae tended to get stuck under the substrate and after one day many died (the above study saw no mortality). This work was conducted in winter, which may have impacted the results. Ralph suggested that the 15-cm diameter tubes used in the above study may have made it easier for lampreys to climb up through the sediment. Future work might consider using a larger diameter tube.

PLCI Updates

Lamprey Information Exchange

- The 9th annual Lamprey Information Exchange will be held December 9-11th in the Portland Oregon area.
- This is a 2-3 day event where we share the latest in Pacific Lamprey research.
- The deadline to submit an abstract is Monday, June 30th 2025. Submit your abstract here https://www.jotform.com/form/250843961910156
- Stay tuned for other details!

PLCI Newsletter

- Sign up for the PLCI newsletter to stay up to date on all PLCI events. You can sign up on the bottom of the homepage on the webpage https://www.pacificlamprey.org/.

Lamprey Technical Workgroup

- The Lamprey Technical Workgroup (LTWG) is a technical advisory committee of PLCI
- Multiple subgroups studying a range of topics
- Produced multiple white papers available here - https://www.pacificlamprey.org/ltwg/
    - Adult Passage & engineering
    - Abundance based goals
    - Barriers to tidal connectivity

- Contaminants
- Genetics & eDNA
- Juvenile Entrainment, Dredging and Dewatering Investigations (JEDDI)
- Lamprey Aquaculture Network
- Ocean
- Outreach
- Restoration
- Tagging
- Subgroup on Other Lamprey Species Anadromous and Resident (SOLAR)

- The LTWG and subgroups are always looking for new members. You don't need to be a technical expert!
- Please contact the new LTWG Chair – Julie Harris (julianne_harris@fws.gov) for more information about how to join or co-lead a subgroup.

Lamprey Project Funding Opportunities

- PLCI has two dedicated funding sources
- Bonneville Power Administration's (BPA) PLCI Columbia River Basin Projects
- National Fish Habitat Partnership (NFHP) project funding
- The guidelines and proposal templates pertaining to each funding opportunity can be found on the PLCI webpage. https://www.pacificlamprey.org/funding-nfhp/

- **BPA RFP will be out in late summer 2025**. Funding is available to projects within the Columbia River Basin only. Total funding ~300K
    - 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.
    - 12-24 month project period. Earliest project start date is May 2026.

- **NFHP RFP will be out in January 2026**. Funding is available to projects in any RMU. Total funding ranges from $150-350K.
    - Eligible projects include: stakeholder outreach (e.g., ID workshops), habitat restoration (including passage or infrastructure improvements and design), habitat assessments and monitoring.
    - Projects must have 1:1 non-federal match or in-kind support. 18-24 month project period. Earliest project start date is spring/summer 2027.

Appendix 2. NatureServe Conservation Status Rank Definitions

SX Presumed Extirpated.—Species or ecosystem is believed to be extirpated from the jurisdiction (i.e., nation, or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. (= “Regionally Extinct” in IUCN Red List terminology).

SH Possibly Extirpated.—Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include: (1) that a species has not been documented in approximately 20–40 years despite some searching or some evidence of significant habitat loss or degradation; or (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.

SU Unrankable. .—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

S1 Critically Imperiled.—Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.

S2 Imperiled.—Imperiled in the jurisdiction because of rarity due to very restricted range, very few occurrences, steep declines, or other factors making it very vulnerable to extirpation from the jurisdiction.

S3 Vulnerable.—Vulnerable in the jurisdiction due to a restricted range, relatively few occurrences, recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 Apparently Secure.—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5 Secure.—Common, widespread, and abundant in the jurisdiction.