

Pacific Lamprey  
2017 Regional Implementation Plan  
*for the*  
Mid-Columbia  
Regional Management Unit



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# I. Status and Distribution of Pacific Lamprey in the RMU

## A. General Description of the RMU

The Mid-Columbia River Regional Management Unit (RMU) includes 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. The region is comprised of five Level III Ecoregions described by the Environmental Protection Agency (EPA) (<https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>). The watersheds within this RMU ranged in size from 1,793–8,158 km<sup>2</sup>. The spatial arrangements of these HUCs are displayed in Figure 1 and sizes of HUCs are in Table 1.

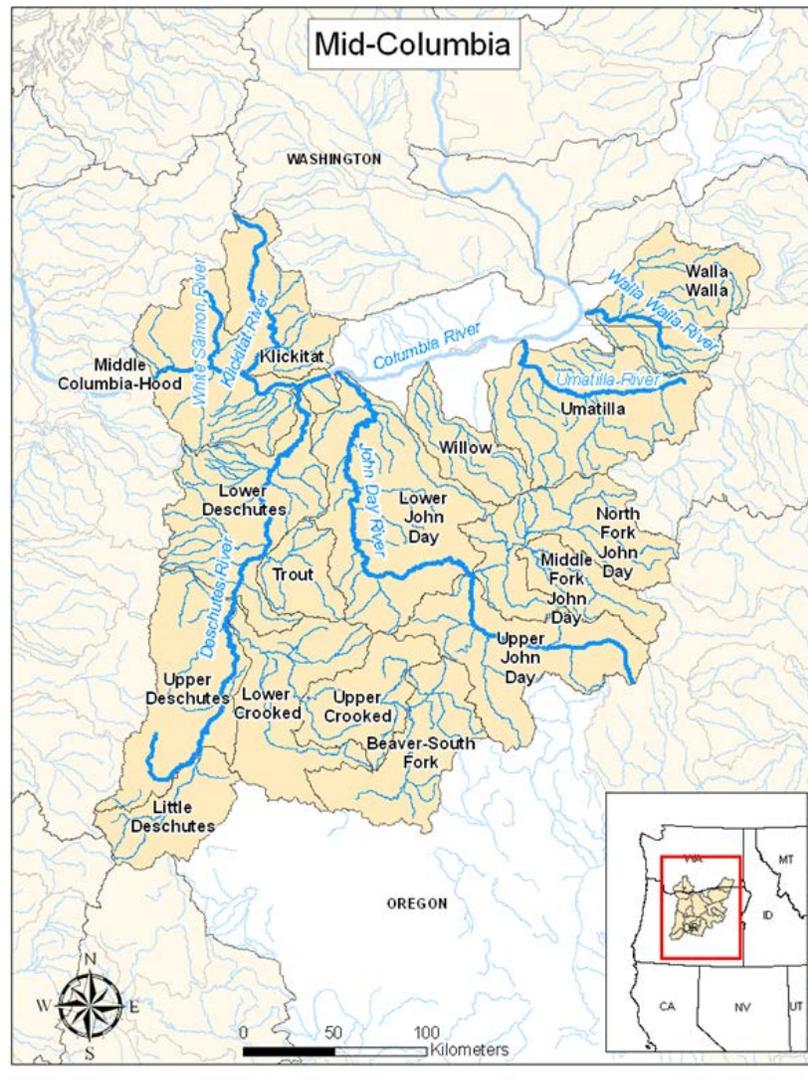


Figure 1. Map of watersheds within the Mid-Columbia Regional Management Unit.

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

Watershed	HUC Number	Drainage Size (km <sup>2</sup> )	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

## B. Status of Species

### Conservation Assessment and New Updates

Current Pacific Lamprey distribution in the Mid-Columbia RMU is still greatly reduced from historic range. Distribution of lamprey has remained the same in most watersheds since the completion of the 2011 Assessment with the exception of the Umatilla and Mid-Columbia/Hood which saw an increase in the extent of distribution (Table 2). This increase may be attributable to successful adult translocation work in the Umatilla basin, passage improvements, or increased sampling effort (e.g., smolt trapping, redd surveys, occupancy sampling). A compilation of all known larval and adult Pacific Lamprey occurrences in the Mid-Columbia RMU are displayed in Figure 2, which is a product of the USFWS data Clearinghouse .

Population abundance of Pacific Lamprey in the Mid-Columbia RMU is largely unchanged since the 2011 Assessment, with estimates ranging from zero to over 2,500 fish (Table 2). The Umatilla is the only watershed that has seen an increase in adult populations over the last 5-10 years. The Confederated Tribes of the Umatilla Indian Reservation has an active Pacific Lamprey translocation program, ongoing for the last 20 years. This program has contributed to increases in rearing ammocoetes and number of returning adults (Jackson et al. 1997, Close et al. 2003, Howard et al. 2004).

Mainstem dam counts provide one of the only 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. Counts of adult Pacific Lamprey prior to 1970 averaged over 100,000 fish (1939-1969), while the recent 10 year average is just over 24,000 fish (USACE 2016). Although no long term count of Pacific Lamprey exists in Mid-Columbia tributaries, populations are believed to be declined by 10-70% (Table 2). The Klickitat was the only subbasin to observe a further decline of Pacific Lamprey populations (from 10-30% to 50-70%) in the last five years. Numbers of larval/juvenile lamprey captured in a rotary screw trap near Lyle Falls (RM 2.2) have declined from 2,000-4,000 fish annually (2003-2006), to around 50 fish annually (Ralph Lampman, Yakima Nation Fisheries (YNF), personal communication)

The status of Pacific Lamprey in Willow Creek is unknown. Willow Creek dam (RM 52.4) provides no fish passage and targeted sampling has not occurred in the basin. Pacific Lamprey are still believed to be extirpated from the Walla Walla River. Although Western Brook Lamprey are present in the basin, Pacific Lamprey have not been observed during ongoing electrofishing, screw trap and spawning survey efforts. Pacific Lamprey are also believed to be extirpated in Trout Creek as well as the Deschutes River basin upstream from Pelton Dam.

Table 2. Categorical rank inputs and resulting NatureServe ranks for Pacific Lamprey population groupings within the Mid-Columbia River Region 2017.

Watershed	Distribution		Population Size (# adults)	Short Term Trend (% decline)
	Historic (km <sup>2</sup> )	Current (km <sup>2</sup> )		
Walla Walla	D (1,000-5,000)	X (0)	ZA (0-50)	A (>70)
Umatilla	C (250-1,000)	G (2,000-20,000)	D (1,000-2,500)	D (10-30)
Willow				
Mid-Columbia- Hood	C (250-1,000)	F (500-2,000)	C (250-1,000)	Unknown
Klickitat	C (250-1,000)	E (100-500)	B (50-250)	B (50-70)
Upper John Day	CD (250-5,000)	CD (4-100)	BC (50-1,000)	B (50-70)
North Fork John Day	CD (250-5,000)	E (100-500)	BC (50-1,000)	B (50-70)
Middle Fork John Day	CD (250-5,000)	E (100-500)	C (250-1,000)	B (50-70)
Lower John Day	CD (250-5,000)	Unknown	BC (50-1,000)	B (50-70)
Lower Deschutes	D (1,000-5,000)	E (100-500)	E (2,500-10,000)	CD (10-50)
Trout	Unknown	Z (0)	Z (0)	Unknown

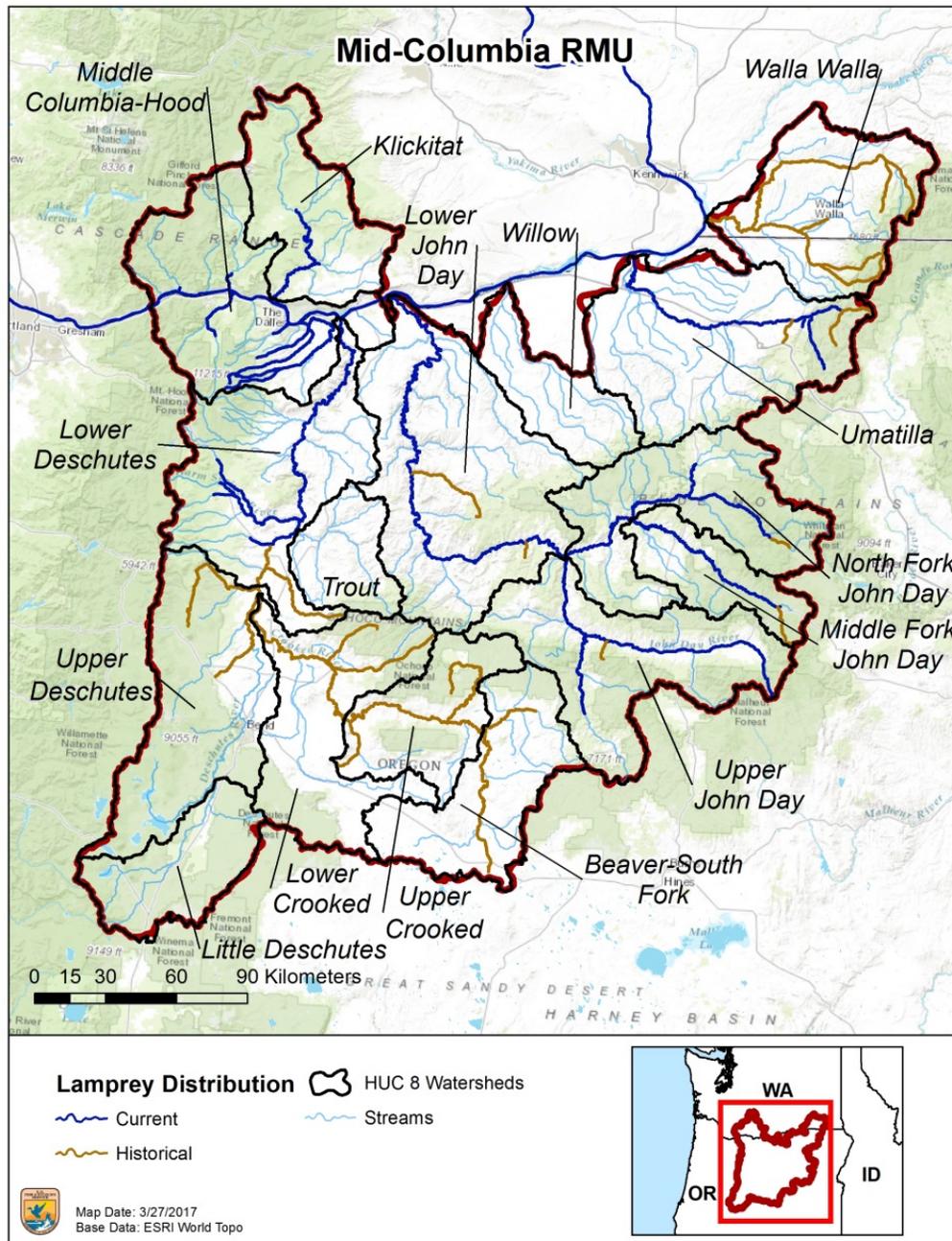


Figure 2. Current and historic known distribution for Pacific Lamprey: Mid-Columbia RMU (USFWS Data Clearinghouse 2017).

### Distribution and Connectivity

Passage for both adults and juveniles 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 2009). Threats to passage within tributaries were considered moderate in the

Mid-Columbia RMU. 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). In the Umatilla River basin, adult lamprey passage structures (i.e. Lamprey Passage System or flat plates) have been installed at Three Mile Falls diversion, Maxwell diversion dam, and Feed Diversion Dam to enhance passage. Boyd's diversion dam was recently removed, and two large diversion dams on the lower Umatilla River are scheduled for removal in 2017 (Dillon Diversion dam) and 2018 (Brownell diversion dam). In the John Day basin, over 100 push-up diversion dams have been removed to restore fish passage (Brent Smith, Oregon Department of Fish and Wildlife, personal communication).

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 (Umatilla River), Pelton Round Butte Hydroelectric Project), and low elevation water diversions. Irrigation diversions for crops and/or 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 by-pass devices to protect fish from impingement or entrainment. Unfortunately there are still a large number of diversions with no screens or inadequate screening that may entrap or impinge migrating juveniles. The structural design of diversion dams 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 (e.g., dam crest; Pacific Lamprey Technical Workgroup 2017).

Fish hatcheries in the lower Columbia River basin often utilize barrier dams/weirs and fish ladders to divert returning adult salmon into the hatchery during brood collection. Many of these structures are major barriers to adult Pacific Lamprey. In the Klickitat River, Pacific Lamprey are distributed upstream to the Klickitat Hatchery where a low head weir currently impedes adult passage (see priority project *Adult Passage Improvement in Klickitat Subbasin*). 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, YNF, personal communication).

The cumulative impacts from this series of passage impediments likely impose a significant impact on distribution and connectivity for Pacific lamprey in most of the watersheds (Clemens et al. 2017).

## C. Threats

### Summary of Major Threats

The following table summarizes the key threats within the Mid-Columbia RMU tributaries as identified by RMU participants during the Risk Assessment revision meeting in April 2017 (High = 4; Moderate/High = 3.5; Moderate = 3; Low/Moderate = 2.5; Low = 2; Unknown = no value). The highest priority threat in the Mid-Columbia watersheds is mainstem passage followed by climate change.

Watershed	Tributary Passage		Dewatering and Flow Management		Stream and Floodplain Degradation		Water Quality		Small Population Size		Lack of Awareness		Climate Change		Mainstem Passage	
	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity
<i>Walla Walla</i>	4	4	4	4	4	4	3.5	3.5	4	4	3	3	3.5	3.5	4	4
<i>Umatilla</i>	4	3	3	3.5	4	4	3.5	3	3.5	3.5	3	3	3.5	3.5	4	4
<i>Willow</i>	4	4	4	4	4	4	3.5	3.5			4	4	4	4	4	4
<i>Mid-Columbia/Hood</i>	2	2	3	4	3	3	3.5	3.5	2.5	2.5	2.5	2.5	4	4	4	4
<i>Klickitat</i>	3	3	2	2	2	2	4	3.5	3.5	3.5	3.5	3.5	3	3	4	4
<i>Upper John Day</i>	3.5	3.5	3.5	3.5	3.5	4	4	4	3	3	3	3	3.5	3.5	4	4
<i>North Fork John Day</i>	2	2	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3.5	3.5	4	4
<i>Middle Fork John Day</i>	2	2	2.5	2.5	3.5	3.5	3	3	3	3	3	3	3.5	3.5	4	4
<i>Lower John Day</i>	3	3	4	4	3.5	3.5	4	4	2	2	3	3	3.5	3.5	4	4
<i>Lower Deschutes</i>	2	2.5	1.5	1.5	2.5	2.5	2	2	2	2	2	2	3.5	3.5	4	4
<b>Drainage Rank</b>	<b>M</b>		<b>M</b>		<b>M</b>		<b>M</b>		<b>M</b>		<b>M</b>		<b>H</b>		<b>H</b>	

## **Current Threats**

Among the many threats identified in the Mid-Columbia RMU, some showed a pervasive impact in the entire region, such as *Mainstem Passage*, *Climate Change*, and *Lack of Awareness*. Other threats were more location specific, but nevertheless showed significant impacts at the local scale, such as *Tributary Passage*, *Dewatering and Flow Management*, *Stream and Floodplain Degradation*, and *Water Quality* (Clemens et al. 2017).

### ***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 Pacific Lamprey 2017 Regional Implementation Plan for the Mainstem Columbia River Regional Management Unit (*will cite when complete*).

### ***Climate change***

Climate changes is expected to produce changes in ambient temperature, precipitation, and streamflow patterns. In a region heavily dominated by agricultural crop production, rising ambient temperatures will likely increase demand for water for irrigation that will in turn reduce streamflows 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 ammocoetes are exposed to relatively warm temperatures (>20°C) for an extended duration (Clemens et al. 2016). The impacts of climate change will vary across watersheds with some areas more resilient to impacts of climate change (e.g., Klickitat), and some areas at greater risk from potential change based upon the underlying geology, impoundments, land use, or other factors. Climate change is identified as a critical subject for the Mid-Columbia RMU, but the feasibility of making tangible changes will be challenging and require large scale institutional changes. Within the Walla Walla basin, one of the strategies to combat climate change is the acquisition and subsequent protection of habitat. In the John Day basin, 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.

### ***Lack of Awareness***

Scientific understanding of Pacific Lamprey life history characteristics, habitat needs, physiological limitations, and awareness in terms of Best Management Practices when conducting instream work has improved over the last 5-10 years. Nevertheless, there is still a large portion of the human population that is not aware of lamprey, its importance to freshwater ecosystems, and how to avoid impacts to them (Clemens et al. 2017).

### ***Dewatering & flow management***

Natural conditions (e.g., climate, geology, vegetation, topography) and 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, 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.

### ***Stream & floodplain degradation***

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, land use activities and human settlement have greatly altered the physical habitat and hydrology of the region. In upland areas, historic and ongoing timber practices have completely deforested or altered the function and diversity of riparian vegetation. Many watersheds in the RMU are lacking 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), increasing the deposition of fine substrate and organic matter, thereby providing important rearing habitat for juvenile salmonids and larval lamprey (Gonzalez et al. 2017). Within lowlands, agriculture and grazing practices have contributed to the loss of aquatic and riparian habitat. 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.

### ***Water quality***

Elevated water temperature is the primary water quality concern in the Mid-Columbia RMU. Increased temperatures may be associated with excessive solar radiation, removal of riparian vegetation, reduction of instream flow, and flood irrigation water returns. Other water quality concerns include low dissolved oxygen, pH extremes, sedimentation, and the presence of bacteria, heavy metals, and toxic pollutants (e.g., insecticides, PCBs; Clemens et al. 2017). These issues are likely attributable to land use practices or other natural causes. Toxins and heavy metals may be a particular concern for Pacific Lamprey. Direct exposure to toxins in water or sediment during larval and adult life stages can result in high concentrations of contaminants accumulating in fatty tissues that may compromise fish health and development (Nilsen et al. 2015; Clemens et al. 2017). Monitoring and restoration efforts to improve and protect water quality for fish, wildlife, and human health are ongoing in the Mid-Columbia RMU.

## **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. To date, the primary lamprey restoration activities that have occurred within the Mid-Columbia RMU include:

- Successful translocation of spawning adults in the Umatilla Basin
- Ongoing efforts towards improving adult passage (see *Distribution and Connectivity* above). Recent sampling has found natural recolonization of Pacific Lamprey above the former sites of Powerdale Dam on the Hood River (Hess et al. 2015) and Condit Dam on the White Salmon River (Jolley et al. 2016).
- Development of protocols and techniques for the artificial propagation and larval rearing of Pacific Lamprey (Yakama Nation and Umatilla Tribes)
- Ongoing work to better understand and quantify entrainment at diversions
- Implementation of programs (ODFW, WDFW) to educate public and provide financial and technical assistance with installation and maintenance of fish screens at water diversions.
- Continued effort throughout the RMU to better understand Pacific Lamprey distribution through eDNA, smolt trapping, redd surveys and occupancy sampling.
- The Columbia Basin Water Transactions Program (CBWTP) has been instrumental in water savings in several tributaries in the Mid-Columbia Region and the Umatilla Tribes have purchased irrigation rights in both the Walla Walla and Umatilla basins.

## **II. Selection of Priority Actions**

### **A. Prioritization Process**

Participating members of the Mid-Columbia RMU met in Walla Walla, Washington in April 2017 to revise the 2011 Risk Assessment, discuss current threats to Pacific Lamprey, and identify specific actions and research needed to address threats and uncertainties within the region. The following five projects were selected by the Mid-Columbia RMU as priority projects for the 2017 Regional Implementation Plan: “ Passage Improvement in the Mainstem Klickitat River”, “Characterization of Juvenile Outmigration”, “Development of New Sampling Techniques for Juveniles”, “Development of Screening Criteria”, and “Reduction of Dewatering Mortality.” Proposed projects directly address two critical threats in the region (Passage and Dewatering and Flow Management) as well as an identified data need (juvenile sampling techniques). Several of the projects have widespread application and knowledge gained will benefit all RMUs.

## B. High Priority Proposed Project Information

### Adult Passage Improvement in Klickitat Subbasin

#### Project Description

Passage improvement for adult Pacific Lamprey at two facilities in mainstem Klickitat River.

- **HUC:** 1707010604 (Lower Klickitat), 1707010602 (Middle Klickitat)
- **Facilities Ownership:** WDFW, YKFP operates the facility through lease agreement.
- **Regulatory Responsibility:** YKFP, BPA and NMFS have fish passage responsibilities at these two facilities (Klickitat Hatchery, river km 69.4 and Lyle Falls, river km 4.2).
- **Rationale and linkage to the watershed:** Larval lamprey surveys since 2009 by Yakama Nation Fisheries have shown that Pacific Lamprey distribution stops largely at the Klickitat Hatchery weir (Fig. 1). A few Pacific Lamprey have been documented immediately upstream of the weir (potentially indicating partial passage during part of the year, such as spring high flow events), but passage appears to be very sporadic and limited. The weir has a 90 degree edge/lip, preventing all low flow passage for Pacific Lamprey. In addition, a combination of passage monitoring and modification is critical at Lyle Falls (Fig. 2 & 3) to improve the passage and distribution for the entire subbasin, which is experiencing a decline in numbers.
- **Expected outcome (threats addressed):** To provide all-season passage for adult Pacific Lamprey (both summer/fall and spring migration runs) at Klickitat Hatchery weir (Fig. 1) and Lyle Falls.
- **Identification and coordination with relevant stake holders:** The primary stakeholders at these two facilities are YKFP, which includes the Yakama Nation, WDFW, BPA and NMFS.
- **Feasibility and expected timeframes:** There is strong support among stakeholders to modify the weir to enhance Pacific Lamprey passage (was also mentioned in Klickitat Hatchery Complex Program Draft EIS). 2017-2018 (pending concurrence by stakeholders on the best alternative). Lyle Falls project can begin right away (2017).
- **Proponent Role and Responsibilities:** YKFP primarily responsible for expenditure of funds and activities. Yakama Nation Fisheries Resource Management Program will provide technical support/advice and help with coordination.
- **Consensus within the RMU Groups:** The need for passage improvement in Klickitat Subbasin was expressed strongly at the Mid-Columbia RMU meeting on April 19, 2017.
- **Expected outcome:** Increased adult and larval Pacific Lamprey abundance and distribution within the Klickitat Subbasin to help restore the current subpopulation that has experienced a severe decline in the past 10 years (~50 fold decrease in out-migrating juveniles/larvae).
- **Budget and identification of potential funding sources:** \$20,000 for the Klickitat Hatchery weir passage improvement project. \$10,000 for the Lyle Falls passage monitoring and improvement project. It is thought that this project could be cost shared with existing BPA and YKFP funding.

- **Project Lead: Ralph Lampman – YN Fisheries**



**Figure 1. Klickitat Hatchery weir during low flow period. The channel spanning edge/lip is 90 degree angle making it difficult for Pacific Lamprey to climb.**



**Figure 2. Lamprey Passage Structure at Lyle Falls Fish Ladder. The entrance of the LPS is in a great location, but the volitional release point is currently at the bottom of the fish ladder (inhibiting passage of adult lamprey if they struggle within the fish ladder).**



**Figure 3. The resting box (left photo) for the Lamprey Passage Structure at Lyle Falls Dam. With some modification, adult lamprey could potentially be trapped here daily and PIT tagged to evaluate passage at Lyle Falls and within the fish ladder (to determine the best way to increase passage here).**

## Characterization of Juvenile Outmigration

### Project Description

Utilize full duplex PIT tags (and receivers) to determine passage routes and timing within the Umatilla River and FCRPS dams.

- **HUC:** 17070104 (Umatilla River) and Mid-Columbia mainstem
- **Facilities Ownership:** CTUIR and USACE
- **Regulatory Responsibility:** USACE has fish passage responsibilities for the mainstem Columbia River. USBR has fish passage responsibilities for the mainstem Umatilla irrigation diversion dams.
- **Rationale and linkage to the watershed:** This action has a clear region/basin-wide application and the products will have region-wide applications to other lamprey related projects throughout the Columbia River Basin. There is concern from Tribal commissioners over lack of juvenile focused studies.
- **Expected outcome (threats addressed):** The goal of this project is to determine timing and routes of juvenile outmigration/passage in both tributaries and the mainstem Columbia River.
- **Identification and coordination with relevant stake holders:** The primary stakeholders are CTUIR and NOAA. Many other partners would facilitate and utilize information gained from this project.
- **Feasibility and expected timeframes:** CTUIR and NOAA would implement project. This project is ready to start.
- **Proponent Role and Responsibilities:** CTUIR and NOAA primarily responsible for coordination and expenditure of funds and activities for tagging. CTUIR, NOAA, USFWS, USACE and other partners would assist with detection.
- **Consensus within the RMU Groups:** The Mid-Columbia RMU Group deferred to CTUIR for selection of priority projects for this round.
- **Expected outcome:** Determination of timing and routes of passage for juveniles migrating out of Umatilla basin and through FCRPS.
- **Budget and identification of potential funding sources:** Existing USBR funding and potentially BPA funding. \$200,000/ annually with step increases.
- **Project Lead:** Aaron Jackson – CTUIR.

## Develop New Sampling Techniques for Juveniles

### Project Description

Through workshops develop/refine outmigration sampling techniques for juvenile lamprey. This project would aid in determining timing and passage of outmigrating juveniles, with initial primary focus on improving trapping methods, techniques and efficiencies.

- **HUC:** Multiple
- **Facilities Ownership:**
- **Regulatory Responsibility:** USACE has fish passage responsibilities for the mainstem Columbia River. BOR has fish passage responsibilities for the mainstem Umatilla irrigation diversion dams.
- **Rationale and linkage to the watershed:** This action has a clear region/basin-wide application and the products will have region-wide applications to other lamprey related projects throughout the Columbia River Basin. There is concern from Tribal commissioners over lack of juvenile focused studies.
- **Expected outcome (threats addressed):** The goal of this project is to develop/refine outmigration sampling techniques for juveniles. It would help determine timing and routes of juvenile outmigration/passage across the entire range of Pacific Lamprey.
- **Identification and coordination with relevant stake holders:** The primary stakeholders are CTUIR and NOAA. Many other partners would facilitate and utilize information gained from this project.
- **Feasibility and expected timeframes:**
- **Proponent Role and Responsibilities:** CTUIR primarily responsible for coordination and expenditure of funds and activities.
- **Consensus within the RMU Groups:** The Mid-Columbia RMU Group deferred to CTUIR for selection of priority projects for this round.
- **Expected outcome:** Safe and effective collection/tagging methods for juvenile would help determine timing and routes of passage for juveniles migrating out of Umatilla basin and through FCRPS.
- **Budget and identification of potential funding sources:** BPA funding. \$15,000 to start—significant increases in out years.
- **Project Lead:** Aaron Jackson – CTUIR.

## Development of Screening Criteria

### Project Description

Through workshops develop new screening criteria for larval/juvenile lamprey and implement defining new lamprey screening criteria from laboratory (and field trials).

- **HUC:** Multiple
- **Facilities Ownership:** Bureau of Reclamation
- **Regulatory Responsibility:** USBR has fish passage responsibilities for the mainstem Umatilla irrigation diversion dams.
- **Rationale and linkage to the watershed:** Irrigation diversions withdraw a substantial proportion of flow from the Walla Walla and Umatilla Rivers and have the potential to entrain large numbers of larval/juvenile lamprey. Development of screening criteria for lamprey would have a clear region/basin-wide application and the products will have region-wide applications to other lamprey related projects throughout the Columbia River Basin.
- **Expected outcome (threats addressed):** The goal of this project is to develop screening criteria for larval and juvenile lamprey to reduce mortality of lamprey in irrigation diversions.
- **Identification and coordination with relevant stake holders:** The primary stakeholders in the Umatilla subbasin are the USBR, USFWS, ODFW, CTUIR and associated irrigation Districts.
- **Feasibility and expected timeframes:**
- **Proponent Role and Responsibilities:** CTUIR, NOAA, USBR, BPA and USFWS primarily responsible for coordination and expenditure of funds and activities.
- **Consensus within the RMU Groups:** The Mid-Columbia RMU Group deferred to CTUIR for selection of priority projects for this round.
- **Expected outcome:** Mortality associated with entrainment and dewatering in irrigation diversions will be reduced.
- **Budget and identification of potential funding sources:** It is thought that this project could be cost shared with existing USBR, BPA and private irrigation company funding. \$15,000 to start—significant increases in out years.
- **Project Lead:** Aaron Jackson – CTUIR.

## Reduction of Dewatering Mortality

### Project Description

Through workshops identify ways to reduce mortality of lamprey during dewatering periods, increase salvage efforts and implement solutions (field trials)

- **HUC:** Multiple
- **Facilities Ownership:** Bureau of Reclamation
- **Regulatory Responsibility:** USBR has fish passage responsibilities for the mainstem Umatilla irrigation diversion dams.
- **Rationale and linkage to the watershed:** Irrigation diversions withdraw a substantial proportion of flow from the Walla Walla and Umatilla Rivers and have the potential to entrain large numbers of larval/juvenile lamprey. This action has a clear region/basin-wide application and the products will have region-wide applications to other lamprey related projects throughout the Columbia River Basin.
- **Expected outcome (threats addressed):** The goal of this project is to provide safe, timely and effective juvenile passage past all irrigation facilities that are operated within the Umatilla and Walla Walla basins to provide access to all rearing habitats and migration corridor below each of these Projects.
- **Identification and coordination with relevant stake holders:** The primary stakeholders in the Umatilla subbasin are the USBR, ODFW, USFWS, CTUIR and associated irrigation Districts.
- **Feasibility and expected timeframes:**
- **Proponent Role and Responsibilities:** CTUIR, NOAA, USBR, BPA and USFWS primarily responsible for coordination and expenditure of funds and activities.
- **Consensus within the RMU Groups:** The Mid-Columbia RMU Group deferred to CTUIR for selection of priority projects for this round.
- **Expected outcome:** Mortality associated with entrainment and dewatering in irrigation diversions will be reduced
- **Budget and identification of potential funding sources:** It is thought that this project could be cost shared with existing USBR funding, BPA funding and private irrigation companies. \$15,000 to start—significant increases in out years.
- **Project Lead:** Aaron Jackson – CTUIR.

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