Pacific Lamprey 2023 Regional Implementation Plan *for the* Snake River Region: Lower Snake, Clearwater and Salmon Regional

Management Units



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Regional Implementation Plans are written annually to document activities benefiting lamprey that were done in the previous year, activities that will occur in the current year, and to present project proposals seeking funding. They also highlight any changes in status or threats and activities related to those documented in the Pacific Lamprey *Entosphenus tridentatus* Assessment, 2018 (USFWS 2018).

Projects that are proposed and discussed within this Regional Implementation Plan are in accordance with direction provided within the *Conservation Agreement for Pacific Lamprey in the States of Alaska, Washington, Idaho, Oregon and California, 2012.* Cooperative efforts through the Agreement intend to: a) develop regional implementation plans derived from existing information and plans; b) implement conservation actions; c) promote scientific research; and d) monitor and evaluate the effectiveness of those actions.

Projects identified in this Regional Implementation Plan do not imply or intend a funding obligation or any related activity from any of the government agencies, tribes or non-governmental entities discussed within this document.

I. Status and Distribution of Pacific Lamprey in the RMU

A. General Description of the RMU

The Snake River Region includes the Snake River and all waters draining into it downstream of Hells Canyon Dam (river km 397) to its confluence with the Columbia River (Figure 1). There are three Regional Management Units (RMUs): the Lower Snake Basin, the Clearwater River Basin, and the Salmon River Basin (Figure 1) with five major tributaries: Imnaha, Salmon, Grande Ronde, Clearwater, and Tucannon rivers. Within these RMUs there are 23 Hydrologic Unit Code (HUC) watersheds in 4 subbasins. The watersheds within this region that are still accessible to Pacific Lamprey range in size from 552-6,242 km².

The HUC 4 subbasins are: Lower Clearwater (17060306), Middle Fork Clearwater (17060304), South Fork Clearwater (17060305), Lochsa (17060303), Lower Selway (17060302), Upper Selway (17060301), Lower Salmon (17060209), Little Salmon (17060210), South Fork Salmon (17060208). Middle Salmon-Chamberlain (17060207), Lower Middle Fork Salmon (17060206), Upper Middle Fork Salmon (17060205), Middle Salmon-Panther (17060203), Lemhi (17060204), Pahsimeroi (17060202), Upper Salmon (17060201); Lower Snake-Asotin (17060103), Lower Grande Ronde (17060105), Upper Grande Ronde (17060104), Wallowa (17060105), Mainstem Snake Hells Canyon (17060101), and Lower Snake Tucannon (17060107).



Snake RMU HUCs: Sub-Basins

Figure 1. Map of watersheds within the Snake River Region.

B. Status of Species

Conservation Assessment and New Updates

Historic occupancy of Pacific Lamprey is believed to have been extensive in all watersheds depicted in Figure 2 as well as the Snake River up to Shoshone Falls, and all major tributaries between the Hells Canyon Dam Complex and Shoshone Falls (Weiser, Payette, Bruneau River, Owyhee, Malheur, Burnt, Powder rivers). Current population size is still unknown in most areas of historic occupancy, but the current distribution is reduced from historic ranges (Luzier et al. 2011; USFWS 2018). The knowledge of current lamprey distribution has come from an increase in recent sampling efforts, releases of artificially propagated larval lamprey, and an active adult supplementation program ongoing by the Nez Perce Tribe (NPT) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) whereby adult lamprey collected from locations downstream in the Columbia River are released into Snake basin tributaries. Current information describing known occurrences of Pacific Lamprey is displayed in Figure 2 (a product of the U.S. Fish and Wildlife Service (USFWS) data Clearinghouse https://www.sciencebase.gov/catalog/item/53ad8d9de4b0729c15418232).



Figure 2. Current and historic known distribution for Pacific Lamprey in the Snake Regional Management Units: Lower Snake, Clearwater and Salmon (USFWS Data Clearinghouse 2018). Not depicted is historic distribution in the Snake River and tributaries above the Hells Canyon Dam

Complex to Shoshone Falls.

Every five years the Pacific Lamprey Conservation Initiative (PLCI), through the RMUs, revise the Pacific Lamprey Assessment (USFWS 2019). 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 Snake River Management Unit through an online assessment questionnaire and virtual meeting held on March 21st, 2022. The following is a brief summary of key findings from the 2022 Pacific Lamprey Assessment.

NatureServe conservation status ranks changed in only three of 22 HUCs in 2022 (Table 1). Status ranks improved from Critically Imperiled (S1) to Imperiled (S1S2) in the Upper Grande Ronde and was attributed to increases in adult abundance from translocation efforts by the Nez Perce Tribe and the Confederated Tribes of the Umatilla Reservation. The Upper Middle Fork Salmon also increased from Possibly Extirpated (SH) to Critically Imperiled (S1) as recent data suggest spawning may occur in this watershed as evidenced by the presence of larval lamprey (IDFG electrofishing data). The Lower Salmon decreased from Critically Imperiled (S1) to Possibly Extirpated (SH) as it is believed that there is no spawning occurring within the HUC watershed and only rearing lamprey from upstream spawning are present. Short-term trends in many HUC watersheds have shifted to increasing because of the adult supplementation program while others were changed to unknown.

Watershed	HUC	Status	Historical	Current	Population Size (adults)	Short-Term Trend
		Rank	Occupancy	Occupancy		(% decline)
			(km ²)	(km ²)		
Lower Clearwater	17060306	S 1	1000-5000	100-500	50-250	Increasing
Middle Fork Clearwater	17060304	S1	250-1000	20-100	1-50	Severely declining
South Fork Clearwater	17060305	S1	1000-5000	100-500	50-250	Increasing
Lochsa	17060303	S1	1000-5000	20-100	50-250	Severely declining
Lower Selway	17060302	S1	1000-5000	20-100	50-250	Severely declining
Upper Selway	17060301	S 1	1000-5000	20-100	1-50	Severely declining
	17060209	<mark>SH</mark>	1000-5000	100-500	Zero, no individuals believed	Unknown
Lower Salmon					extant	
	17060210	SH	250-1000	0	Extinct, Zero, no individuals	Unknown
Little Salmon					believed extant	
South Fork Salmon	17060208	S1	1000-5000	20-100	50-250	Unknown
Middle Salmon-Chamberlain	17060207	S1	1000-5000	100-500	0, 1-50	Severely declining
Lower Middle Fork Salmon	17060206	S1	1000-5000	20-100	1-50	Severely declining
Upper Middle Fork Salmon	17060205	<mark>S1</mark>	1000-5000	4-20	1-50	Severely declining
Middle Salmon-Panther	17060203	S1	1000-5000	20-100	1-50	Unknown
	17060204	SH	250-1000	0	Extinct, Zero, no individuals	Unknown
Lemhi					believed extant	
	17060202	SH	250-1000	0	Extinct, Zero, no individuals	Unknown
Pahsimeroi					believed extant	
	17060201	SH	1000-5000	0	Extinct, Zero, no individuals	Unknown
Upper Salmon					believed extant	
Lower Snake-Asotin	17060103	S1	1000-5000	100-500	50-250	Increasing
Lower Grande Ronde	17060105	S1	1000-5000	100-500	50-250	Increasing
Upper Grande Ronde	17060104	S 1	1000-5000	100-500	1000-2500	Increasing
Imnaha	17060102	S 1	1000-5000	4-20	1-50	Severely declining
Wallowa	17060105	S1	1000-5000	4-20	50-250	Increasing
Mainstem Snake R Hells	17060101	S1	1000-5000	100-500	1-50	Unknown

Table 1. Population demographic and conservation status ranks (see Appendix 1) of the 4th Field HUC watersheds located within the Snake River RMU. Ranks highlighted in Yellow indicate a change from the 2018 Assessment (see appendix for ranking definitions).

Distribution and Connectivity

Upstream passage to the Snake River Region is restricted by four Federal Columbia River Power System (FCRPS) dams in the Columbia River (Bonneville, Dalles, John Day and McNary). Within the Snake River Region another four FCRPS dams on the Snake River (Ice Harbor, Lower Monumental, Little Goose and Lower Granite) impede upstream passage in the lower portion of the basin. The Hells Canyon Complex (Brownlee, Oxbow and Hells Canyon dams) on the Snake River as well as Dworshak Dam on the North Fork Clearwater River completely block upstream access for all native aquatic species. Culverts, irrigation diversions and smaller dams are widespread throughout the watersheds of the Snake River Region.

The combined impacts from this series of passage impediments are the most significant threat on the natural distribution and connectivity for Pacific Lampreys in most of the HUCs and results in small population sizes through the current distribution (Storch et al. 2022). Total annual counts (daytime and nighttime) of adult Pacific Lamprey at Lower Granite Dam peaked at 2,894 adults in 2017 then declined to 93 in 2020 (Figure 3). The 2022 counts (1,443 Total) were an increase from 2021 (271 total).



Number of Adult Lamprey Counted at Lower Granite Dam 2009-2022

Figure 3. Number of adult Pacific Lamprey counted at Lower Granite Dam, 2009-2022. Daytime 2022 Snake River Region RIP for Lower Snake, Clearwater and Salmon RMUs

(16 hour counts) data obtained from http://fpc.org on Dec 07, 2023. Total (24 hour counts) data was obtained from the Army Corps of Engineers (ACOE).

Since 2000, surveys for larval Pacific Lamprey have been conducted in the Clearwater, Salmon, Selway and Lochsa subbasins of Idaho. Recent (2015-2019) surveys have confirmed the continued presence of larvae in the Mainstem, Middle and South Forks of the Clearwater River, the Lochsa and Selway rivers (Figure 2). In 2019, larval lamprey were detected in a few locations near the edge of their current distribution where they have not been recently documented. Idaho Power collected larval lamprey about 10 km's below Hells Canyon Dam and IDFG documented larval lamprey in the mainstem Salmon River near Salmon, ID.

Beginning in 2007, the NPT began releasing adult Pacific Lamprey, collected from downstream areas in the Columbia River, into tributaries of the Snake River as a means to supplement natural production (Table 1; see Ward et al. 2012). Subsequent stream surveys confirmed the presence of larvae in locations that received adult lamprey but had previously not contained larvae in recent years. The adult supplementation program has expanded throughout the years to include more tributaries throughout the basins (Table 1). CTUIR began supplementing adults in the Grande Ronde River Basin in 2015. The adult supplementation program has successfully reintroduced lamprey into extirpated tributaries and sustained these populations through annual releases. Translocation is now called Supplementation, to better represent the range of actions that occur when Pacific Lamprey are moved from one place to another. In 2021, CTUIR began releasing artificially propagated larval lamprey into the Toucannon River.

C. Threats

Summary of Major Treats

The highest priority threat in the Snake River Region is the Federal Columbia River Power System dams on the mainstem Snake and Columbia rivers (mainstem passage), which results in small effective population size in each of the watersheds still accessible to Pacific Lamprey (USFWS 2018, Storch et al. 2022). The Supplement to the Mainstem Lower Columbia River and Columbia River Estuary Subbasin Plan (NPCC 2004) recommends improving dam passage for Pacific Lamprey. Tables 3-5 summarize the known key threats within the Snake River Region tributaries that were updated during the 2021 Assessment.

In the Lower Snake RMU, climate change and lack of awareness remain as high priority threats, while both water quality and predation increased to moderate threats. 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) will likely exacerbate other threats within the sub-region. Climate change rankings increased in nearly every watershed in all three RMU's. In the Clearwater RMU, dewatering and flow management was increased to a low threat from an insignificant threat in the Lower Clearwater watershed.

Table 2. Releases of adult Pacific Lamprey into the Clearwater, Salmon, Grande Ronde and Asotin subbasins, 2007-2021, as part of the Nez Perce Tribe (NPT) and Confederated Tribes of the Umatilla Reservation (CTUIR) supplementation program. Asterisk denotes CTUIR releases. Data supplied by the Nez Perce Tribe and The Confederated Tribes of the Umatilla Reservation. Fish are released in the spring after being held over winter in a hatchery unless otherwise noted.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2019 summer	2020	2020 summer	2021	2001 summer	2022	2022 summer
Clearwater River																				
Lolo Cr.	50	28	30	24	0	40	31	10	50	57	65	90	89	50	50	0	50	0		
Newsom Cr.	50	26	45	23	0	40	30	10	50	56	61	95	80	0	20	0	50	0		
Orofino Cr.	49	25	30	22	0	40	24	0	51	56	0	90	80	0	30	0	21	0		
Little Canyon Cr.	0	0	0	0	0	17	12	0	32	41	0	0	13	0	0	0	0	0		
Red R.	0	0	0	0	0	0	0	0	0	0	0	91	81	0	30	0	50	0		
East Fork Potlatch R.	0	0	0	0	0	0	0	0	0	0	0	0	0	50	50	0	50	0		
Lochsa River	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0		
Clearwater mainstem	0	0	0	0	0	0	0	0	0	0	0	212	14	9	3	394	0	873		
Salmon River																				
South Fork Salmon R.	0	0	0	0	0	40	30	11	50	56	62	90	81	0	30	40	0	40		
Johnson Cr.	0	0	0	0	0	0	0	0	51	48	60	89	80	0	30	40	0	40		
Secesh R.	0	0	0	0	0	0	0	0	0	50	65	90	92	0	32	40	0	40		
Lower Snake																				
Asotin Cr.	28	27	35	22	29	40	30	10	43	56	61	90	80	50	50	0	50	0		
Grande Ronde River																				
Minam R.	0	0	0	0	0	0	0	0	25	55	35	90	77	0	30	0		100		
Wallowa R.	0	0	0	0	0	40	30	10	25	55	30	90	80	0	30	0	100	100		
Chesnimnus Cr.	0	0	0	0	0	0	0	0	0	56	64	90	78	0	30	0		100		
Catherine Cr.	0	0	0	0	0	0	0	0	0	167	250	212	233	0	253	0	400	0	400	
Upper Grande Ronde R.	0	0	0	0	0	0	0	0	0	400	201	527	539	0	178	0	400	0	1325 ^b	
Lookingglass Cr.	0	0	0	0	0	0	0	0	0	175	150	151	300	0	250	0	400	0	60	
Little Lookingglass Cr.	0	0	0	0	0	0	0	0	0	0	150	0	0	0	0	0	0	0	0	
Indian Cr.	0	0	0	0	0	0	0	0	0	0	0	92	123	0	0	0	41	0	0	
Meadow Cr.	0	0	0	0	0	0	0	0	0	0	0	82	135	0	0	0	0	0	0	
Sheep Cr.	0	0	0	0	0	0	0	0	0	0	0	82	209	0	0	0	0	0	0	
Five Points Creek	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	
Wenaha River	0	0	0	0	0	0	0	0	0	0	0	0	109	0	143	0	200	0	400	
																				ļ
Tucannon River															500k ^a		500k ^a		342kª	

^aDenotes artificially produced prolarvae stage release number

^bReleased at various locations in the Upper Grande Ronde

Table 3. Summary of the identified key threats of the Lower Snake RMU. Rankings in green are threats that decreased since last ranking, rankings in red are threats that increased. Threats are ranked: Insignificant (I) <1.5, Low (L) 1.5-2.4. Moderate (M) 2.5-3.4, High (H) \geq 3.5.

RMU/ Watershed	Tributa	ry Passage	Dewat Flow M	ering and anagement	Stream and Floodplain Degradation		Water	Quality	Predation		
	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	
Lower Snake- Asotin	2	1.5	1.5	1.5	3	3.5	2.5	2.5	3.5	3	
Lower Grande Ronde	2	2	1	1	2	2	2.5	2.5	3	2.5	
Upper Grande Ronde	2	3	3	3.5	3.5	3.5	3	3.5	3	3	
Imnaha	2	3.5	2	3	3.5	3.5	2	2	2	2	
Wallowa	2	3.5	2	3	3.5	3.5	2	2	2.5	2.5	
Lower Snake- Hells Canyon	2.5	2.5	4	4	3	3	2.5	2.5	4	3	
Lower Snake- Tucannon	3	3.5	1.5	2	3	3	3	2.5	3	3	
Average	2.21	2.79	2.29	2.64	3.00	3.14	2.50	2.50	3.00	2.71	
Rank	L	Μ	L	Μ	Μ	Μ	Μ	Μ	Μ	Μ	
Mean Scope/Severity	2	2.50	2	.46	3	.07	2	.50	2	86	
Watershed Rank		Μ		L]	М		Μ		Μ	

RMU/ Watershed	Small I	Population Size	La Aw	Lack of Awareness		Climat	e Change		Mainste	m Passage
	Scope	Severity	Scope	Severity	_	Scope	Severity	_	Scope	Severity
Lower Snake- Asotin	4	4	3	3		3.5	3.5		4	4
Lower Grande Ronde	4	4	3.5	3.5		4	4		4	4
Upper Grande Ronde	4	4	4	4		4	3.5		4	4
Imnaha	4	4	4	4		4	4		4	4
Wallowa	4	4	4	4		4	4		4	4
Lower Snake- Hells Canyon	4	4	3.5	4		4	4		4	4
Lower Snake- Tucannon	4	4	2.5	3		3	3		4	4
Average	4.00	4.00	3.50	3.64		3.79	3.71		4.00	4.00
Rank	Η	Η	Н	Н		Н	Η		Н	Н
Mean Scope/Severity	4	.00	3	3.57		3	3.75		4.00	
Watershed Rank		Н		Η			Н			Н

Table 4. Summary of the identified key threats of the Clearwater RMU. Rankings in green mean the threat decreased since last ranking, rankings in red mean the threat increased. Threats are ranked: Insignificant (I) <1.5, Low (L) 1.5-2.4. Moderate (M) 2.5-3.4, High (H) \geq 3.5.

RMU/ Watershed	Tributa	ry Passage	Dewate Flow M	atering and Management Stream and Floodplain Degradation		Water	Quality	Predation		
	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity	Scope	Severity
Lower Clearwater	2	2	3	3.5	3	3.5	3	3.5	2	3
Middle Fork Clearwater	2	2	1.5	1.5	2	2	2	2	3	2
South Fork Clearwater	2	2	1.5	1.5	2.5	2.5	2	2	2	2
Lochsa	1.5	1.5	1	1	1.5	1.5	1	1	1	1
Lower Selway	1	1	1	1	1.5	1.5	1.5	1.5	1	1
Upper Selway	1	1	1	1	1	1	1	1	1	1
Average	1.58	1.58	1.50	1.58	1.92	2.00	1.75	1.83	1.67	1.67
Rank	L	L	L	L	L	L	L	L	L	L
Mean Scope/Severity	1	.58	1	.54	1	.96	1	.79	1	.67
Watershed Rank		L		L	L		L		L	

RMU/ Watershed	Small I	Population Size	La Awa	ick of areness		Climate Change			Mainste	m Passage	
	Scope	Severity	Scope	Scope Severity		Scope	Severity		Scope	Severity	
Lower Clearwater	4	4	2.5	2.5		4	4		4	4	
Middle Fork Clearwater	4	4	2	2		3	3		4	4	
South Fork Clearwater	4	4	2	2		3	3		4	4	
Lochsa	4	4	2	2		2	2		4	4	
Lower Selway	4	4	2	2		2	2		4	4	
Upper Selway	4	4	2	2		2	2		4	4	
Average	4	4	2.08	2.08		2.67	2.67		4	4	
Rank	Η	Η	L	L		Μ	Μ		Н	Н	
Mean Scope/Severity		4	2	2.08		2	.67			4	
Watershed Rank		Н		L		Μ			Н		

Table 5. Summary of the identified key threats of the Salmon RMU. Rankings in green mean the threat decreased since last ranking, rankings in red mean the threat increased. Threats are ranked: Insignificant (I) <1.5, Low (L) 1.5-2.4. Moderate (M) 2.5-3.4, High (H) \geq 3.5.

RMU/ Watershed	Tributa	ry Passage	Dewat Flow M	ering and anagement	ng and Stream and agement Degradation			Water	Quality		Predation		
	Scope	Severity	Scope	Severity	-	Scope	Severity	_	Scope	Severity	_	Scope	Severity
Lower Salmon	2	2	2	2		2	2		2	2		4	3
Little Salmon	2	2	2	2		2	2		2.5	2.5		2	2
South Fork Salmon	1.5	1.5	1	1		2	2		1	1		2	1.5
Middle Salmon- Chamberlain	1	1	1	1		1.5	1.5		2	2		2	2
Lower Middle Fork Salmon	1	1	1	1		1	1		1	1		1	1
Upper Middle Fork Salmon	1	1	1	1		1	1		1	1		1	1
Middle Salmon-Panther	2.5	2.5	2.5	3		2.5	2.5		2.5	2		2	1
Lemhi	3	3	3	3		2.5	2.5		2.5	2		2	1
Pahsimeroi	3	3	3	3		3	2.5		2.5	2		2	1
Upper Salmon	2.5	2	2.5	2		2.5	2.5		2	2		2	1
Average	1.95	1.90	1.90	1.9		2.00	1.95		1.90	1.75	-	2.00	1.45
Rank	L	L	L	L		L	L		L	L		L	L
Mean Scope/Severity	1	.93	1	.90		1	.98		1.83		1.73		.73
Watershed Rank		L		L			L		L			L	

RMU/ Watershed	Small F	Population	L	Lack of Awareness			e Change		Mainste	m Passage
w ater sneu	Scope	Severity	Scope	Severity	-	Scope	Severity	-	Scope	Severity
Lower Salmon	4	4	3	3	-	4	3	•	4	4
Little Salmon	4	4	3	3		3	3		4	4
South Fork Salmon	4	4	3	3		3	3		4	4
Middle Salmon- Chamberlain	4	4	3	3		3	3		4	4
Lower Middle Fork Salmon	4	4	2	2		3	3		4	4
Upper Middle Fork Salmon	4	4	2	2		2	2		4	4
Middle Salmon-Panther	4	4	4	4		3	3.5		4	4
Lemhi	4	4	4	4		3.5	3.5		4	4
Pahsimeroi	4	4	4	4		3	3		4	4
Upper Salmon	4	4	4	4		3	3		4	4
Average	4.00	4.00	3.20	3.20		3.05	3.00		4.00	4.00
Rank	Н	Н	Μ	Μ		Μ	Μ		Н	Н
Mean Scope/Severity	4	.00		3.20		3	.03		4	.00
Watershed Rank		Н		Μ			Μ			Н

D. Restoration Actions

Idaho Department of Fish and Game (IDFG)

Idaho Department of Fish and Game does not have a dedicated Pacific Lamprey monitoring program but does target juvenile lamprey via electrofishing on wilderness float trips, and encounters Pacific Lamprey incidentally in screw traps and occasionally in stream electrofishing surveys. The majority of IDFG sampling occurs somewhat regularly on wilderness float trips in the Selway River and Middle Fork Salmon River.

Pacific Lamprey are also encountered by IDFG in rotary screw traps operated primarily to monitor Chinook Salmon and steelhead emigrant abundance. Trap operators collected genetic samples from a subset of encountered lamprey and sent them to the genetics lab at the Columbia River Inter-Tribal Fish Commission (CRITFIC). In 2021, IDFG and IFWCO collected eDNA samples in the Selway River.

U.S. Fish and Wildlife Service Idaho Fish and Wildlife Conservation Office (IFWCO)

IFWCO conduced annual larval lamprey sampling in the Clearwater Drainage for PBT data and assisted IDFG with eDNA sampling in the Selway River.

Nez Perce Tribe (NPT)

During 2021, NPT Lamprey Translocation Initiative Program continued its adult releases in all the usual targeted tributaries including Orofino Creek, Newsome Creek, Red River, Lolo Creek, East Fork Potlatch River, Big Meadow Creek, Wallowa River, Minam River, Joseph Creek, and Asotin Creek. See Table 2 for a summary of releases through 2021. Larval lamprey sampling was conducted in Hells Canyon as part of the PLCI funded project as well as translocation tributaries for annual monitoring.

United States Forest Service (USFS)

The USFS works with tribal and agency partners as needed to facilitate supplementation efforts as well as eDNA sampling.

The Rocky Mountain Research Station, through the eDNA Basinwide Lamprey Inventory and Monitoring Project (eBLIMP) (<u>https://www.researchgate.net/project/eBLIMP-The-eDNA-Basinwide-Lamprey-Inventory-Monitoring-Project</u>) has developed an eDNA marker for Pacific Lamprey and a preliminary set of rangewide occurrence probability maps to assist with future surveys. They have been actively collecting eDNA samples throughout Idaho and the Pacific Northwest to detect presence of lamprey species and map their distribution. An article was recently published on the findings (Young et al. 2022)

Oregon Department of Fish and Wildlife (ODFW)

ODFW personnel published a peer-reviewed article outlining fish passage issues at Lower Snake River Dams (Storch et al. 2022).

Columbia River Inter-Tribal Fish Commission (CRITFC)

The CRITFC Hagerman Genetics Laboratory is the primary processor of lamprey genetic samples

collected in the Columbia Basin. They conduct genotyping of all life stages of lamprey collected for monitoring supplementation within the Snake River basin, which includes larvae and juveniles sampled within and outside of supplementation areas and samples collected at mainstem dam juvenile collection facilities.

Confederated Tribes of the Umatilla Indian Reservation (CTUIR)

The Confederated Tribes of the Umatilla Indian Reservation continued adult supplementation in the Snake River Basin during 2020. Adult lamprey, captured at Columbia River Dams, were released into 4 locations in the Grand Ronde River Drainage. See Table 1 for a summary of releases through 2022. CTUIR began releasing propagated larval lamprey in the Toucannon River for the first time in the spring of 2021. About 200,000 prolarvae were released on May 21st and about 300,000 on June 8th.

U.S. Army Corp of Engineers (COE)

Lamprey passage research and improvements have been ongoing by the COE on mainstem Columbia and Snake River dams, and activities are captured in the Columbia and Snake River Regional Management Unit Regional Implementation Plan. Lamprey specific improvements, including attachment plates at orifices, flow diffusers, lamprey orifices on weir walls and removal of right angles and hanging structures are being made at several facilities. Changes at the juvenile salmonid bypass facilities are being implemented to facilitate juvenile lamprey return to the river, rather than into barges. Research on a juvenile lamprey passage and survival study using acoustic telemetry at Lower Granite Dam has begun.

University of Idaho

The University of Idaho's Department of Fish and Wildlife Sciences has been involved with several facets of research and evaluation of adult Pacific Lamprey migration and behavior at mainstem Columbia River and Snake River dams and published a recent article.

Syms, J.C.*, M.A. Kirk*, C.C. Caudill, and D. Tonina. 2021. A biologically based measure of turbulence intensity for predicting Pacific lamprey passage behaviors. <u>Journal of Ecohydraulics</u>. DOI: 10.1080/24705357.2020.1856007

Table 4. Restoration actions in the Snake River RMU.

HUC	Threat	Action Description	Status	Agency
Lower Snake,	Population,	Adult translocation	Ongoing	NPT, CTUIR
Clearwater, and	Distribution			
Salmon RMU's				
Lower Snake-	Population,	Larval	Ongoing	CTUIR
Tucannon	Distribution	supplementation		
Lower Snake,	Population,	Larval distribution	Ongoing	NPT, FWS,
Clearwater, and	Distribution	and density		CTUIR,
Salmon RMU's		efishing surveys,		IDFG
		PBT collection		
Lower Snake,	Population,	Basinwide	Ongoing	USFS, FWS,
Clearwater, and	Distribution	Lamprey		IDFG
Salmon RMU's		Inventory and		
		Monitoring Project		
		(eBLIMP)		
Lower Snake,	Population	PBT collection and	Ongoing	CRITFC
Clearwater, and		processing		
Salmon RMU's				
Lower Snake,	Population	PIT tagging larval	Ongoing	NPT
Clearwater, and		lamprey		
Salmon RMU's				
Lower Snake,	Population	PBT collection at	Ongoing	IDFG,
Clearwater, and		screw traps		WDFW, NPT
Salmon RMU's		_		
Lower Snake,	Mainstem	Passage	Ongoing	ACOE
Clearwater, and	passage, small	improvement		
Salmon RMU's	population size	projects on		
		mainstem dams		NDT
Hells Canyon,	Lack of	Snake Basin larval	Ongoing	NPT
Lower Snake-	awareness,	Pacific Lamprey		
Asotin	dewatering and	collaboratory		
	flow management,			
	mainstem			
	passage, small			
L Cu .l	population size	T	Onesine	A COE NIDT
Lower Snake,	Lack of	Juvenile lamprey	Ongoing	ACOE, NPI
Clearwater, and	awareness,	passage study at		
Salmon RIVIU S	dewatering and	Lower Granite		
	now management,	Dam using		
		acoustic tags		
	passage, small			
Cloarwater DMU	Population	Padio tolomotry	Complete	EWC NDT
	Population,	noiset to identify	Complete	1' W 5, INF I
		snawning locations		
		and timing		
		and mining		

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Appendix 1

The following are the definitions for interpreting the NatureServe conservation status ranks in Table 2.

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.