



# LAMPREY PASSAGE SYSTEM AT WARM SPRINGS NATIONAL FISH HATCHERY



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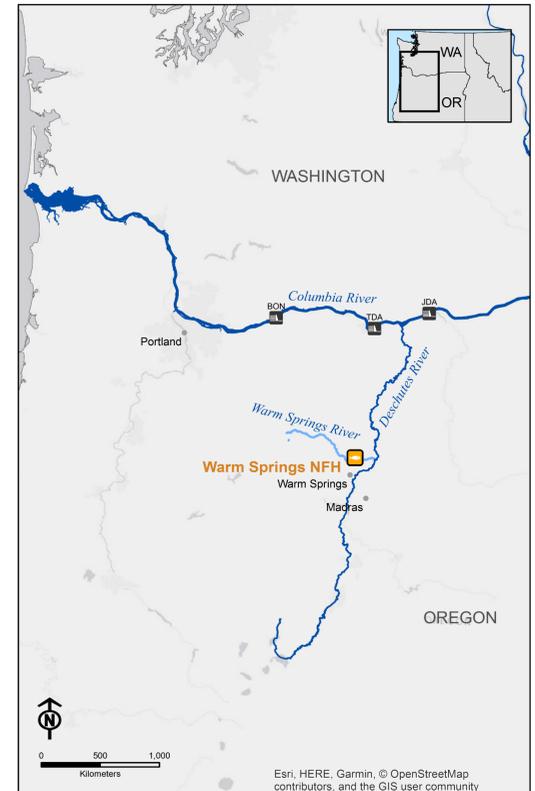
## BACKGROUND

Population declines of Pacific Lamprey are partially attributed to spawning migration impediments (Luzier et al. 2011). Fishway modifications have been made at dams across the Columbia River Basin.

In 2014, the USFWS assessed the low-head dam and fish ladder at Warm Springs National Fish Hatchery (NFH) (Gallion & Skalicky 2014). The assessment identified passage deficiencies for adult Pacific Lamprey and recommended installation of a Lamprey Passage System (LPS) in the fish ladder. The LPS was installed in fall 2017 and will become fully operational in spring 2018. Prior to the installation LPS, we conducted a telemetry study to evaluate lamprey passage.



LPS at Warm Springs NFH



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## OBJECTIVES

### Evaluate Lamprey Passage

Estimate upstream passage efficiency, routes, and migration timing of Pacific Lamprey at Warm Springs NFH prior to the LPS operation.

### Develop Lamprey Passage System

Design and install a Lamprey Passage System at Warm Springs NFH.

## METHODS

### Trapping

In 2017, we checked pot traps weekly for > 5 months (162 d) during the expected spawning up-migration period. We captured 9 lamprey over 5 days between July and August.



Trapping below the fish ladder entrance

### Radio-telemetry

We radio-tagged, and released 6 adult Pacific Lamprey downstream of the hatchery dam. We monitored fish passage using radio telemetry antennas located upstream, downstream, and within the fish ladder.



Pacific Lamprey captured at Warm Springs NFH

## LPS DEVELOPMENT

### Design + Fabrication

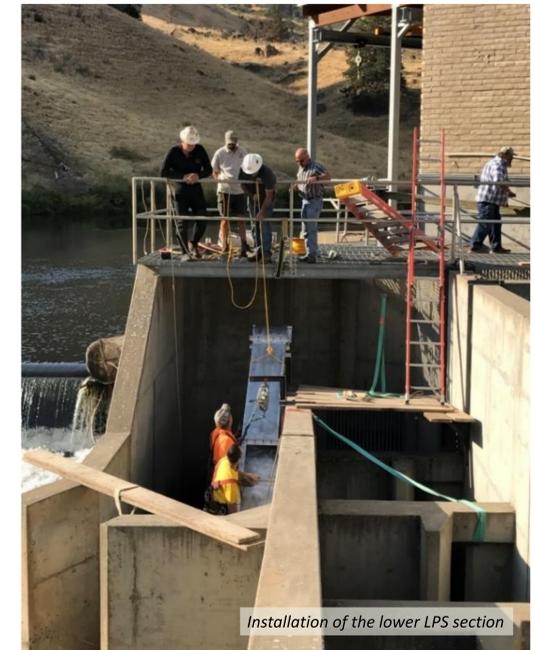
Collaborating with lamprey experts, a chute and flume LPS design was selected. Similar designs are in use at Bonneville Dam and on several low-head dams on the Umatilla River.

### Installation

The LPS was bolted to the fish ladder and 75 gal/min of water will be pumped to the LPS. A short exit pipe will drop lamprey into the forebay.

### Operation Begins

The LPS will become fully operational in spring 2018. As with other LPSs, we expect the first year to be a conditioning year. Lamprey use is expected to increase in 2019.



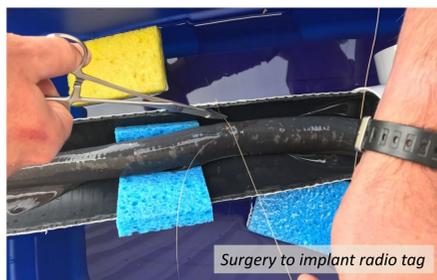
Installation of the lower LPS section

## RESULTS

### Lamprey Final Outcomes:

Downstream

- Lamprey detected at ladder but remain downstream (n=2).



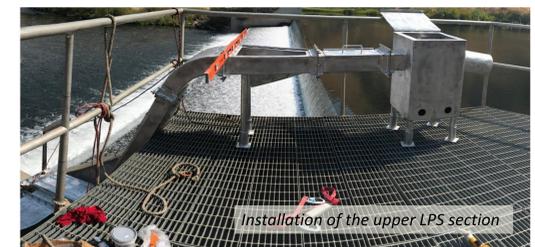
Surgery to implant radio tag

Upstream

- Lamprey delayed (2.5d & 11.5d) before moving upstream (n=2).
  - Navigated the ladder in <1 hr
  - Exited at a turning pool
- Lamprey moved upstream the night of its release (n=1).
- Lamprey's upstream route is unknown (n=1).

## SUMMARY

- Current fish passage at Warm Springs NFH is designed for salmonids.
- We tracked Pacific Lamprey as they attempted to move upstream of the hatchery weir and fish ladder. Some, but not all, lamprey moved upstream through the ladder.
- A LPS was installed at Warm Springs NFH in 2017 and will be fully operational in spring 2018.
- Future monitoring and evaluation will assess passage success via the LPS including:
  - Estimating the % of lamprey approaching, attempting to, and successfully using the LPS.
  - Considering design improvements, if needed.
  - Assessing effects on salmonids.



Installation of the upper LPS section

## References

- Gallion, D. and J. Skalicky. 2014. Pacific Lamprey and Bull Trout Passage Assessment at Warm Springs National Fish Hatchery 2014 Report. U.S. Fish and Wildlife Service, Vancouver, Washington. 42 pp.
- Luzier, C.W., H.A. Schaller, J.K. Brostrom, C. Cook-Tabor, D.H. Goodman, R.D. Nelle, K. Ostrand and B. Streif. 2011. Pacific Lamprey (*Entosphenus tridentatus*) Assessment and Template for Conservation Measures. U.S. Fish and Wildlife Service, Portland, Oregon. 282 pp.