Northwest **Power** and **Conservation** Council

August 7, 2017

DECISION MEMORANDUM

TO: **Council members**

FROM: **Mark Fritsch, project implementation manager**

SUBJECT: **Step review of the Master Plan - *Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research*.**

PROPOSED ACTION: The Fish and Wildlife Committee recommends to the Council the implementation of the work outlined in the Master Plan through Phase 3, Objective 5, for Projects #1994-026-00, *Pacific Lamprey Research and Restoration Project* (CTUIR), #2008-470-00, *Yakama Nation Ceded Lands Lamprey Evaluation and Restoration Project (YN)* and #2008-524-00, *Tribal Pacific Lamprey Restoration Plan* (CRITFC). With this recommendation the Council requests that Bonneville and the sponsors address the following.

- Assess whether these projects will be adequately funded through this phase of the Master Plan.
- Provide a status review for the ISRP and Council decision prior to the initiation of Objective 6 of Phase 3 in 2022.

SIGNIFICANCE: The intent of this Master Plan is to address the delivery and results of objectives, for the involved projects, from past Council reviews and recommendations. In addition, the Master Plan also supports efforts and recommendations of the Tribal Pacific Lamprey Restoration Plan and Conservation Agreement for

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

Pacific Lamprey as recognized in the 2014 Fish and Wildlife Program, as well as addressing a critical emerging priority.

BUDGETARY/ECONOMIC IMPACTS

There are three projects that have work elements associated with the goal and intent of the Master Plan. One project, CRITFC Project #2008-524-00*, Implement Tribal Pacific Lamprey Restoration Plan*, funded and coordinated the development of the Master Plan and will continue to assist in that role during the proposed phases of the Master Plan. The two other projects are to address the implementation of the Master Plan - CTUIR Project #1994-026-00, *Pacific Lamprey Research and Restoration Project* (FY 2018 contracted amount of $670,848) and YN Project #2008-470-00, *Yakama Nation Ceded Lands Lamprey Evaluation and Restoration* (FY 2018 contracted amount of $304,601).

It is important to note that the YN and the CTUIR approach to the implementation of Phase 1 and 2 of the Master Plan is to utilize existing equipment and upgrades and expansion at existing facilities to achieve design, construction and operational efficiencies.

It is expected that facility upgrades and equipment needs to initiate the implementation of the Master Plan approximates $205,000 and operations and recurring maintenance would vary among years and phases. Generally, costs associated with Phases 1 through 3 (Objective 5) would likely range from approximately $100,000 to $350,000 annually per each of the two projects (see Table 5-12 and 5-13 in the Master Plan).

BACKGROUND

In 1994, the Council approved the first lamprey project in the Fish and Wildlife Program. The project (Project #1994-026-00, *Pacific Lamprey Research and Restoration Project*) was proposed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and called for research and restoration of Pacific Lamprey throughout tribal ceded lands. This effort was followed by additional projects in 2002, 2007, 2008 and 2018. Currently, there are six active projects that focus on Pacific Lamprey funded through the F&W Program. These projects have a variety of goals and objectives, but aim at establishing population status and trends, documenting distribution, identifying limiting factors, and developing reintroduction and supplementation actions. Funding for these six projects totals $2,726,888[1] in FY 2018 (see table below).

Project #	Title	Sponsor
1994-026-00	Pacific Lamprey Research and Restoration Project	National Oceanic and Atmospheric Administration (NOAA), Umatilla Confederated Tribes (CTUIR), @ $670,848
2008-308-00	Willamette Falls Lamprey Escapement Estimate	Confederated Tribes of Warm Springs, @ $182,760

[1] Reflects FY2018 contracted amount.

2008-470-00	Yakama Nation Ceded Lands Lamprey Evaluation and Restoration	Yakama Confederated Tribes, @ $304,601
2008-524-00	Implement Tribal Pacific Lamprey Restoration Plan	Columbia River Inter-Tribal Fish Commission (CRITFC), @ $844,080
2011-014-00	Evaluate Status & Limiting Factors of Pacific Lamprey in the lower Deschutes River, Fifteenmile Creek and Hood River Subbasins	Confederated Tribes of Warm Springs, @ $476,395
2017-005-00	Pacific Lamprey Conservation Initiative	Pacific States Marine Fisheries Commission, @ $248,204

Of these six projects, three have aspects and work elements associated with Pacific Lamprey artificial propagation and translocation. Since 2000 and 2008, respectively, the Yakama Nation (YN) and CTUIR projects, with support from Columbia River Inter-Tribal Fish Commission (CRITFC), have done work on artificial propagation including research into spawning and rearing techniques and, translocation, restoration, and research activities.

In addition to the projects listed above, the USACE developed a Passage Improvement Plan as part of the MOA with Tribes and CRITFC. The goal of this 10-year plan was to improve adult and juvenile passage and survival through the Federal Columbia River Power System with emphasis on improvements at Bonneville, John Day, and McNary dams.

Prior to and concurrent with the work conducted by the projects above, the Columbia River Basin Lamprey Technical Workgroup, active since 1995, assisted the region in providing guidance and recommendations as a subcommittee to the Anadromous Fish Committee of the Columbia Basin Fish and Wildlife Authority. In 2011, the Tribal Restoration Plan for the Columbia River Basin (TPLRP) was completed which outlined objectives to halt the decline of Pacific Lamprey and restore them throughout their historical range for ecological heath and tribal cultural use. With the development of the Pacific Lamprey Assessment and Template for Conservation Measures by USFWS in 2011 which noted and built upon the needs and actions identified in the TPLRP, there was a need to solidify regional commitments for lamprey actions and in response a Conservation Agreement for Pacific Lamprey (Agreement) was signed in 2012 by tribal, state and federal partners in the region to collaborate on efforts that reduce or eliminate threats to Pacific Lamprey. The goal of the Agreement is to achieve long-term persistence of the species.

To demonstrate and reaffirm the importance of Pacific Lamprey to the ecological needs of the Basin and to respect the importance to the Tribal sovereigns, the Council recognized, and supported the TPLRP and Agreement in the 2014 Fish and Wildlife Program. This was also confirmed by the need to integrate and take the necessary

steps to implement additional lamprey measures into the Program (i.e., Emerging Priorities).

In addition, on November 16, 2017, and in response to the Council's Programmatic Issue #8 (i.e., Lamprey) placed[2] on the Program's lamprey projects as part of the Research, Monitoring and Evaluation and Artificial Production category project review recommendation of June 2011, the Council received a submittal titled Synthesis of Threats, Critical Uncertainties, and Limiting Factors in Relation to Past, Present and Future Priority Restoration Actions for Pacific Lamprey in the Columbia River Basin. On February 9, 2018, based on the ISRP review (ISRP document 2018-2), the Council found that the synthesis provided a "comprehensive" summary of the current understanding of Pacific lamprey in the basin and has addressed previous questions and concerns.

Master Plan

On March 28, 2018 the Council received the Master Plan - *Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research (Master Plan) – Conceptual phase to address Step 1 review elements*. The goal of this plan is to evaluate the feasibility of using artificial propagation and translocation techniques to better understand and ultimately restore Pacific Lamprey throughout its range, with emphasis on the Columbia River basin population segment. This submittal was anticipated as part of the project review decisions associated with Project #2008-470-00, Yakama Nation Ceded Lands Lamprey Evaluation and Restoration Project and Project #2008-524-00, Tribal Pacific Lamprey Restoration Plan in 2009 and 2010, respectively.

I. *Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research*

The master plan is intended to evaluate the feasibility of using artificial propagation and translocation techniques to better understand and ultimately restore Pacific Lamprey throughout its range, with emphasis on the Columbia River basin population segment.

This Master Plan summarizes and builds on over two decades of research and implementation, including adult translocation and artificial propagation efforts of all the lamprey work, as well as identifies facilities needed to meet artificial propagation actions associated with the three projects that are acting together to accomplish the overall goal of the Master Plan.

[2] The synthesis was a condition placed on the ongoing Pacific lamprey projects in the Program - *The synthesis should summarize results and develop conclusions on the data gathered so far about the status and trends of lamprey populations, limiting factors, and critical uncertainties and risks. The report should also prioritize actions based on these conclusions. Critical questions to analyze include the value of tributary habitat projects in helping to improve lamprey returns, whether mainstem dam passage is the key limiting factor, and the relative role of other factors such as ocean conditions and toxic contaminants*.

The Master Plan describes a phased (1 - 4) approach, emphasizing adaptive management, with the goal of making progress towards the artificial propagation research goals and biological objectives identified in the TPLRP, LCA, Framework, subbasin plans, the NPCC's Program, and the Columbia Basin Fish Accords within a feasible, cost effective, and biologically conservative manner. Phase 1 is ongoing through 2020 and Phase 2 is planned for 2018 through 2026. Results from this period will be synthesized during Phase 3 and will inform the future direction of the Master Plan (Phase 4). The phased approach also facilitates adaptive management and decisions. The geographic scope includes multiple subbasins within the middle to upper portions of the Columbia River Basin, including the Yakima, Methow, Umatilla, Grande Ronde, Walla Walla, and Tucannon River subbasins.

Phase 1 (2012-2020), initiated in 2011, and based on a previous decision associated with the YN and CRITFC projects, is characterized as the initial efforts towards successfully propagating and rearing larval lamprey through the first 6-12 months of their life history. This effort will continue, as well as the ongoing translocation of adult Pacific Lamprey into the Yakima, Methow, Umatilla, and Grande Ronde subbasins.

Phase 2 (2018-2026) is characterized as initiating a variety of lamprey re-introduction strategies as per experimental designs described in the Master Plan. These would include adult translocation, a continued activity, and outplanting of larval and early juvenile lamprey from a laboratory environment into the natural environment, a new activity, to determine post-release survival and habitat use, densities, growth, health, movements, and ultimately an understanding of extended larval survival for each strategy. In addition, some of the production beyond the needs of the study designs can be used as surrogates for natural fish in other research efforts such as entrainment into irrigation facilities/diversions or in survival evaluations at hydroelectric dams. This phase will also establish and study population segments utilizing translocated adults and artificially propagated larval/juvenile Pacific Lamprey in the Yakima, Methow, Umatilla, Grande Ronde, Walla Walla, and Tucannon subbasins, with the Entiat, Klickitat, John Day, and Imnaha subbasins serving as controls.

Phase 3 (2022-2029) is characterized as analysis of results obtained in Phase 2 and development of management alternatives identifying how best to proceed with the application of artificial propagation and translocation as continued research and supplementation tools.

Phase 4 (2027 – 2029+) is characterized as a comprehensive implementation of a restoration strategy for Pacific Lamprey within the Upper Columbia and Snake River systems if warranted under Phase 3.

II. *Facilities*

Currently, both the YN and CTUIR have facilities to maintain propagated larval lamprey and hold adult lamprey at densities that these spaces allow for. The YN has

established the capacity to spawn, fertilize, incubate, and rear lamprey at the YN Prosser Fish Hatchery (PFH) in Prosser, WA, with assistance from other projects through surplus equipment and technical assistance. The CTUIR began holding brood stock in 2000. Currently, two existing facilities are used for adult lamprey brood stock holding, the South Fork Walla Walla (SFWW) facility located near Milton-Freewater, Oregon and the Minthorn Springs Acclimation facility located near Mission, Oregon. As part of Phases 1 and 2 the CTUIR are proposing to continue use of the facilities at the Water and Environmental Center (WEC) at Walla Walla Community College (Walla Walla, WA) and at the Mukilteo Research Station (MRS) in Mukilteo, WA operated by the NOAA Fisheries.

The YN intends to enhance the existing facilities at PFH to provide for additional research capacity, efficiency, staff safety and convenience as part of Phase 2 implementation. The primary developments will include the addition of a 65' x 35' pole building on the East Facility to house eight additional 14-ft-long trough tanks, eight additional 7-ft-deep shallow trough tanks, and four additional 6-foot circular tanks. Yakama Nation estimates costs associated with these enhancements to the PFH would total $135,000 over the first two years of project implementation.

The CTUIR has also proposed to renovate the currently unused Ozone building at the SFWW facility to permit Phase 2 expansion of the CTUIR lamprey propagation program. This will include a 32' × 36' building that can be supplied with either South Fork Walla Walla River water or well water to maintain three, 4' circular tanks for adult holding and 36, 8' troughs for larval rearing. Costs associated with retrofitting the former Ozone building at SFWW and the minor expansion of the facilities at MSR and WEC totals $70,000 over the first three years of project implementation.

III. *Major Project Review (The Three-Step Process)*

On March 28, 2018 the Council received a submittal from the Columbia River Inter-Tribal Fish Commission (CRITFC), a Master Plan titled *Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research*. This Master Plan was prepared by the CRITFC, the Confederated Tribes and Bands of the Yakama Nation (YN), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and the Nez Perce Tribe (NPT). This submittal is intended to initiate the review process associated with artificial production initiatives (i.e., Three-Step Review Process) in the F&W Program. Specifically, the Master Plan addresses the conditions placed on the CRITFC Project and the YN Project in 2009 and 2010, respectively.

On May 16, 2018 the Council received the ISRP review (ISRP document 2018-5). The ISRP found the Master Plan *meets scientific review criteria (qualified)*.

ANALYSIS

The ISRP found that the proposal provided requirements to meet the Step 1 review elements for this phase of the initiative. The review panel acknowledges the recognition

of the managers and their strong rationale for the progression associated with translocation and propagation of Pacific lamprey for the recovery of this species in the Columbia River Basin. The six qualifications raised by the ISRP are to be addressed as part of the Step 2 review (Qualifications #1, #2 and #3) or are intended to strengthen the implementation of the MP or ensure compliance to review elements (#4[3], #5 and #6). Specifically, needs associated with the anticipated Step 2 review include; quantitative objectives regarding the artificially propagated lamprey (#1), details regarding the analytical approaches to evaluate outplantings at different life stages (#2), and the evaluation of different supplementation strategies (#3).

Currently it is not known if supplementation (via artificial propagation) can promote the restoration of Pacific lamprey in the Columbia Basin. Translocation efforts to date appear to have been successful, but more rigorous analyses would be beneficial according to the proponents. The investigations and comparisons presented in the Master Plan will help determine if artificial propagation is a feasible and effective restoration tool for lamprey.

The foundational planning approach within the Master Plan for Phases 1 through 3 is to develop lamprey artificial propagation, translocation, restoration, and research activities within existing facilities, thereby reducing associated costs to the greatest extent possible.

Due to the experimental nature and Phased approach, and the prolonged time frame associated with the Master Plan a review should occur during Phase 3 prior to Objective #6[4] being implemented in 2022. This review would not only allow for a status update to the region, but also ensure that the qualifications are in process of being addressed and/or will be as part of the anticipated Step 2 review at the end of Phase 3.

Based on the ISRP review the Fish and Wildlife Committee recommends to the Council the implementation of the work outlined in the Master Plan through Phase 3, Objective 5[5], for Projects #1994-026-00, *Pacific Lamprey Research and Restoration Project* (CTUIR), #2008-470-00, *Yakama Nation Ceded Lands Lamprey Evaluation and Restoration Project (YN)* and #2008-524-00, *Tribal Pacific Lamprey Restoration Plan* (CRITFC). With this recommendation the Council requests that Bonneville and the sponsors assess whether these projects will be adequately funded[6] through this phase of the Master Plan and provide a status review for the ISRP and Council decision prior to the initiation of Objective 6 of Phase 3 in 2022.

---

[3] At a future phase, dependent on the outcome and findings of the proposed work, development of an HGMP could potentially be initiated after review and approval of other components of this Master Plan.

[4] *Phase 3, Objective 6. Utilize results from supplementation research strategies to inform development of restoration actions.*

[5] *Phase 3, Objective 5. Cross compare and evaluate supplementation monitoring results to determine most successful strategies.*

[6] When those details are available from Bonneville's ongoing Fiscal Year 2019 budget adjustment negotiations.

Master Plan: Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research

Prepared By:

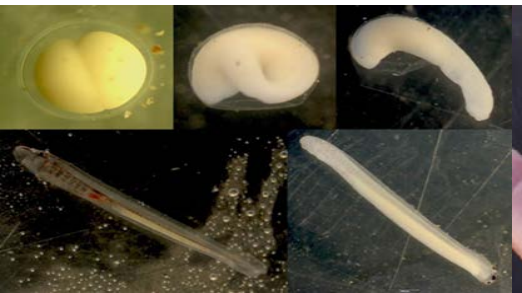
Columbia River Inter-Tribal Fish Commission

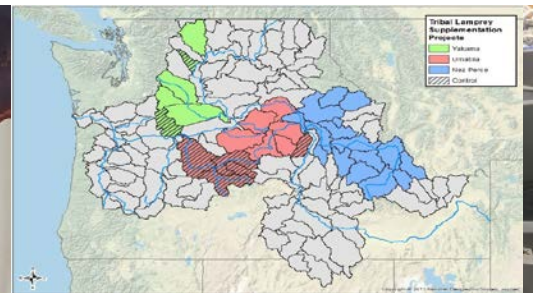
Yakama Nation

Confederated Tribes of the Umatilla Indian Reservation

Nez Perce Tribe

HDR Engineering, Inc.

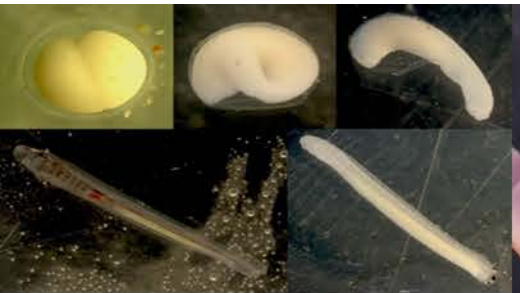


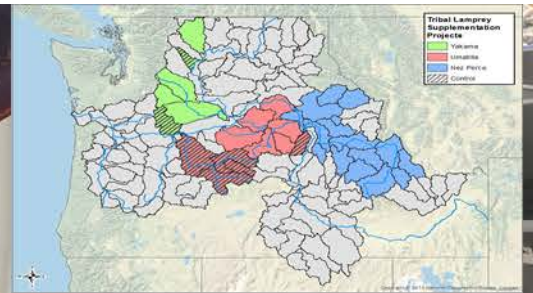


Master Plan: Pacific Lamprey Artificial Propagation, Translocation, Restoration, and Research

- The ISRP found the Master Plan *meets scientific review criteria (qualified) (*May 16, 2018*)*.

- The six qualifications raised by the ISRP are to be addressed as part of the Step 2 review (Qualifications #1, #2 and #3)
  - or are intended to strengthen the implementation of the MP or ensure compliance to review elements (#4 , #5 and #6).






Lamprey MP Background

- Long-term goals guiding the development of the lamprey MP are derived from the Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin (TPLRP) (CRITFC 2011).

    - Continue translocation in accordance with tribal guidelines,
    - Develop and implement lamprey translocation as a component of a regional supplementation plan,
    - Develop and implement lamprey artificial propagation as a component of a regional research and supplementation plan, and
    - Supplement/augment interior lamprey through reintroduction and translocation of adults and juveniles into areas with few or no lamprey.

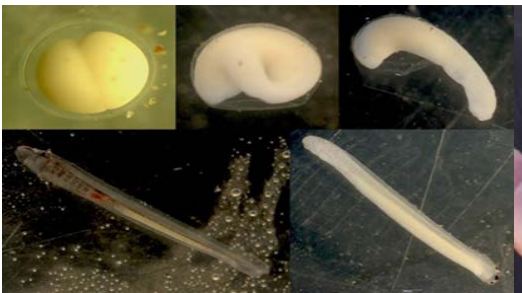
Lamprey MP Background

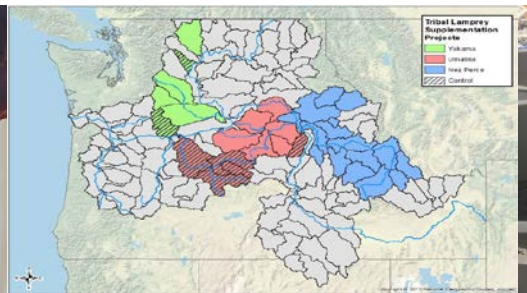
- Long-term goals guiding the development of the lamprey MP are derived from the Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin (TPLRP) (CRITFC 2011).

  - **Continue translocation in accordance with tribal guidelines,**
  - Develop and implement lamprey translocation as a component of a regional supplementation plan,
  - **Develop and implement lamprey artificial propagation as a component of a regional research and supplementation plan, and**
  - Supplement/augment interior lamprey through reintroduction and translocation of adults and juveniles into areas with few or no lamprey.

Lamprey MP Background

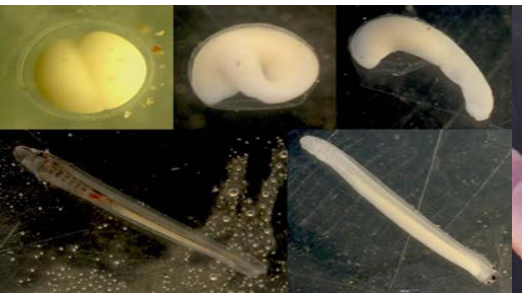
- The goals of the lamprey MP are consistent with other regional plans focusing on Pacific Lamprey that have been developed and implemented in recent years.
  - Pacific Lamprey Passage Improvements Implementation Plan (USACE 2008),
  - Pacific Lamprey Assessment and Template for Conservation Measures (Luzier et al. 2011),
  - Lamprey Conservation Agreement initiated by the USFWS (2012).
  - 2014 NPCC Fish & Wildlife Program (NPCC 2014)

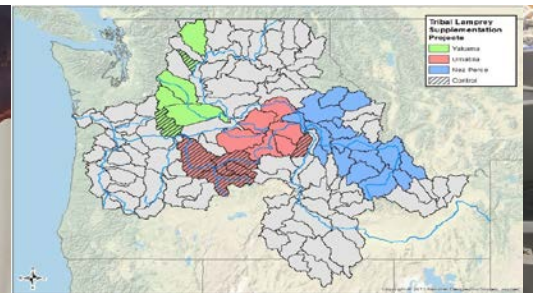





Lamprey MP Goal

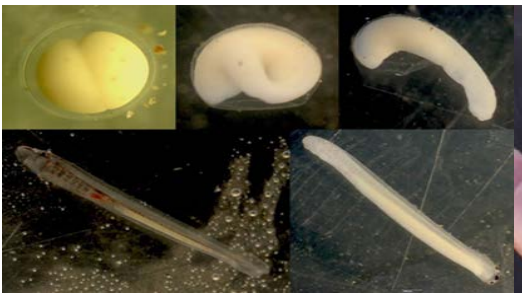
- Evaluate the feasibility of using artificial propagation and adult translocation techniques to better understand and ultimately restore Pacific Lamprey throughout its range.
    - with emphasis on the Columbia River basin population segment.

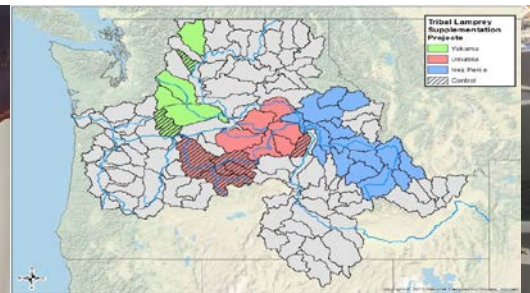




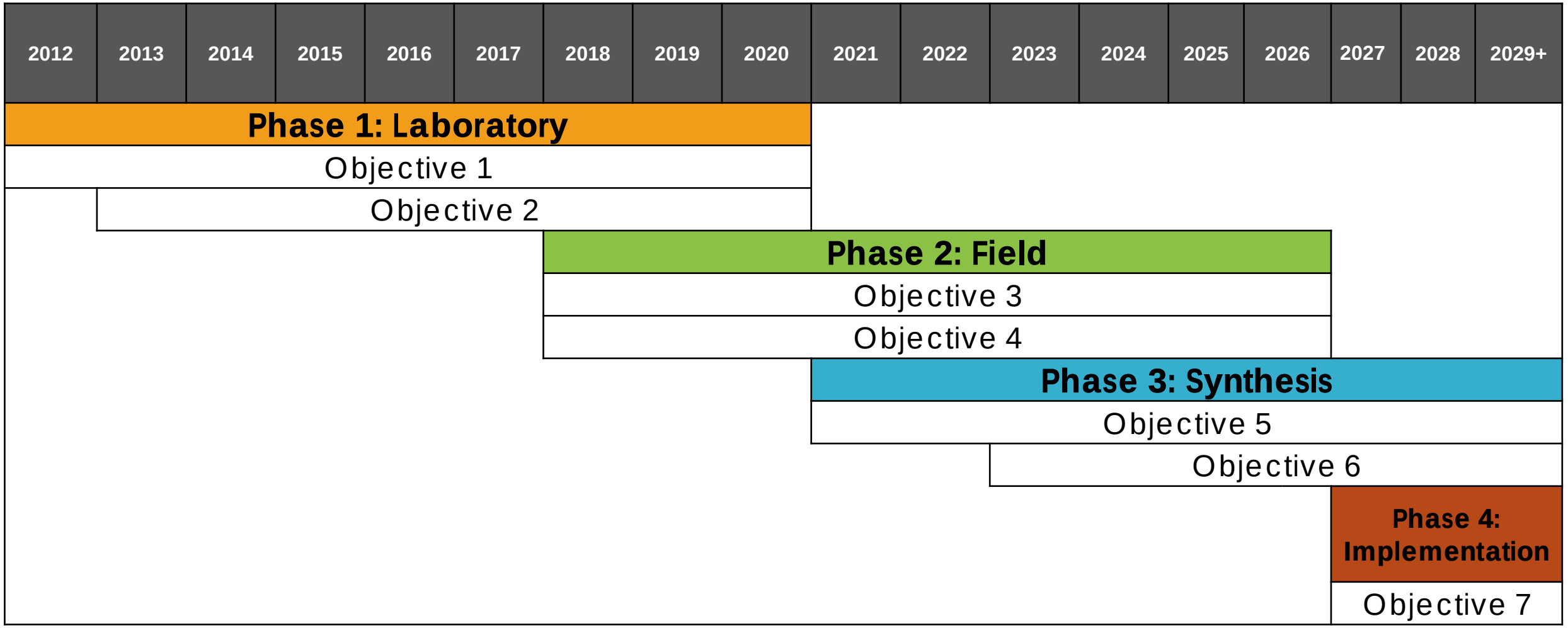

Lamprey MP Actions

- Actions proposed as part of this Master Plan will serve to:
  - Evaluate the success of adult translocation to support lamprey restoration.
  - Evaluate the feasibility of using artificial propagation techniques to support lamprey restoration.
  - Provide artificially propagated lamprey for research projects to evaluate critical uncertainties and limiting factors.
  - Obtain a better understanding of basic aspects of lamprey biology/ecology.
  - Develop techniques, protocols, and equipment needs for a future conservation aquaculture facility.



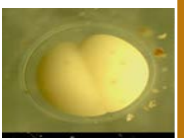
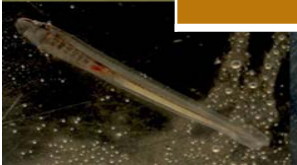



Lamprey MP Timeline and Phases



Lamprey MP Phases – Phase 1

Laboratory Phase: Research Basic Artificial Propagation Techniques and Equipment	1. Develop and implement best management practices for adult handling and artificial propagation in the laboratory. 2. Develop and implement best management practices for larvae and juvenile handling, feeding, and marking/tagging in the laboratory.	It is feasible to spawn and rear significant numbers of Pacific Lamprey in a hatchery.	2012-2020



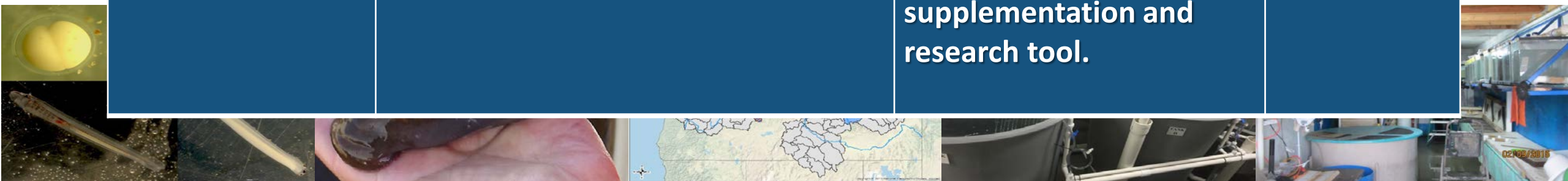


Lamprey MP Phases – Phase 2

Field Phase: **Supplementation and Biological Research**	**3. Out-plant successfully held and reared adult and juvenile products from Phase 1 as per supplementation experimental design.** **4. Provide successfully reared larvae and juveniles from Phase 1 for migration and passage research studies.**	**Hatchery-produced fish can adapt to natural conditions.** **Effective sampling methods can be tested and developed to sufficiently monitor lamprey in the short term, watershed scale and in the long term subbasin scale.** **It is feasible to produce larval/juvenile lamprey in sufficient numbers to evaluate critical limiting factors.**	**2018-2026**

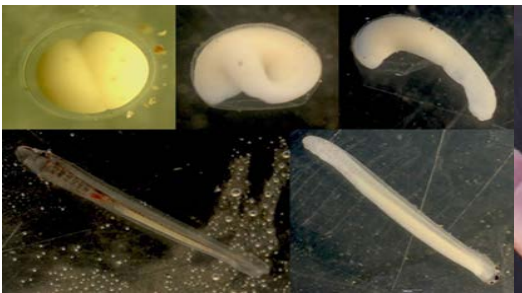

Lamprey MP Phases – Phase 3

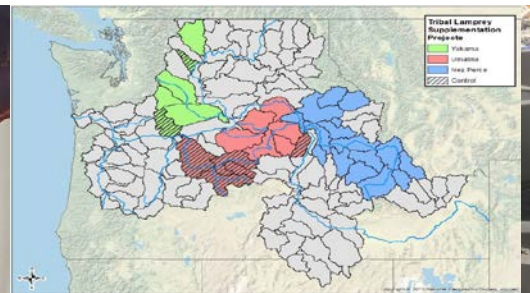
Synthesis Phase: Evaluation and Planning Next Steps towards Recovery	5. Cross compare and evaluate supplementation monitoring results to determine most successful strategies. 6. Utilize results from supplementation research strategies to inform development of restoration actions.	Hatchery fish survive, grow, and out-migrate, with needed passage improvements, in sufficient numbers to re-establish lamprey in targeted subbasins. Restoration benefits outweigh risks and costs involved in artificial propagation as a supplementation and research tool.	2022-2029



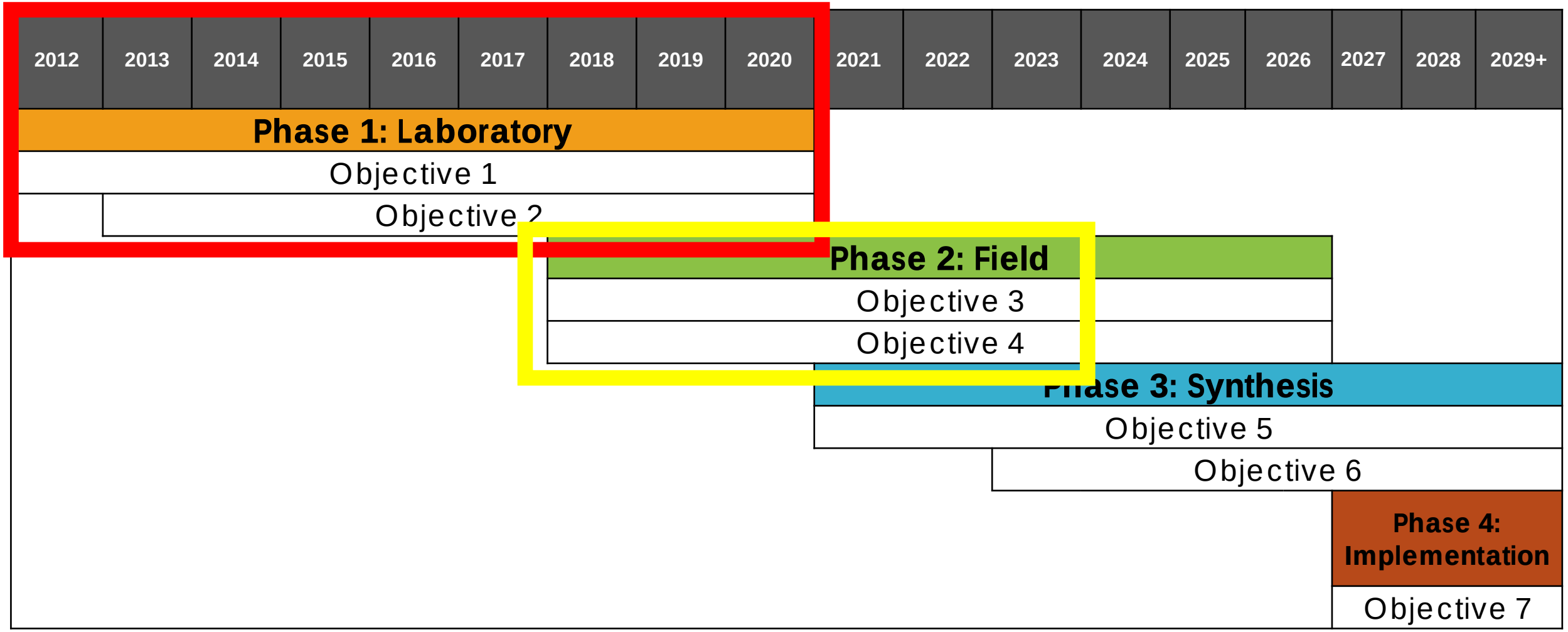
Lamprey MP Phases – Phase 4

Implementation Phase: Implement Restoration and Supplementation Actions	7. Implement restoration actions as per Phase 3 recommendations.	Naturally self-sustaining Pacific Lamprey can be restored through a combination of passage, habitat and hatchery actions.	2027-2029+



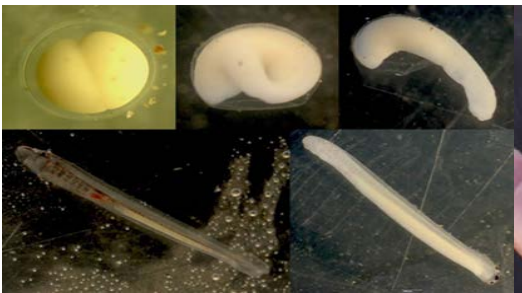


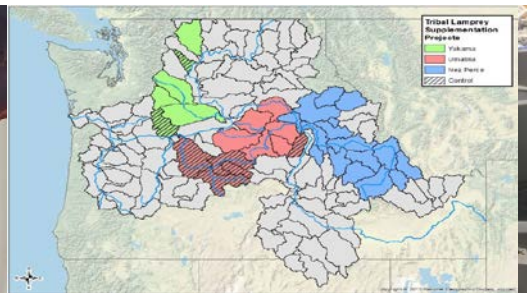

Lamprey MP Timeline and Phases



Yakama Nation Lamprey MP Objectives

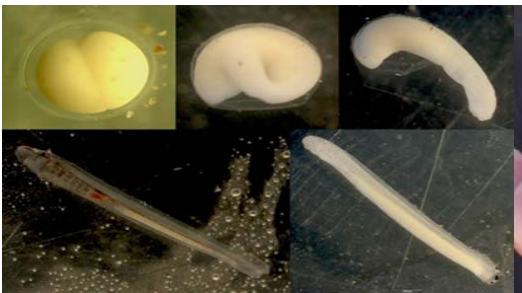
- Continue adult translocation in Lower Yakima and Methow subbasins.
- Focus artificial propagation research objectives in the upper Yakima and Naches watersheds.
- Release larvae/juveniles of various age-classes into different habitats at predetermined sites and observe performance over time.
- Each watershed, as a result, will have multiple age classes that will be released and evaluated.

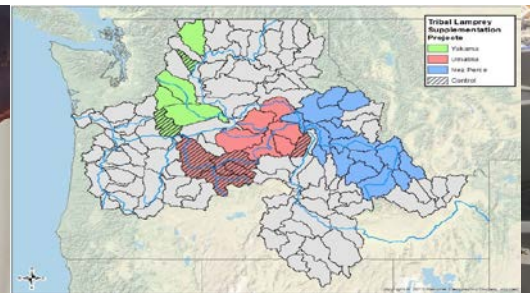





Umatilla Tribe Lamprey MP Objectives

- Continue adult translocation in Umatilla and Grande Ronde subbasins.
- CTUIR will release larvae/juvenile in various watersheds within the Walla Walla and Tucannon subbasins over the next 10 years.
- Goal 1) to release larvae of one specific age class over multiple years in predetermined sites.
- Goal 2) to assess the short-term and long-term productivity based on those multiple years of releases.





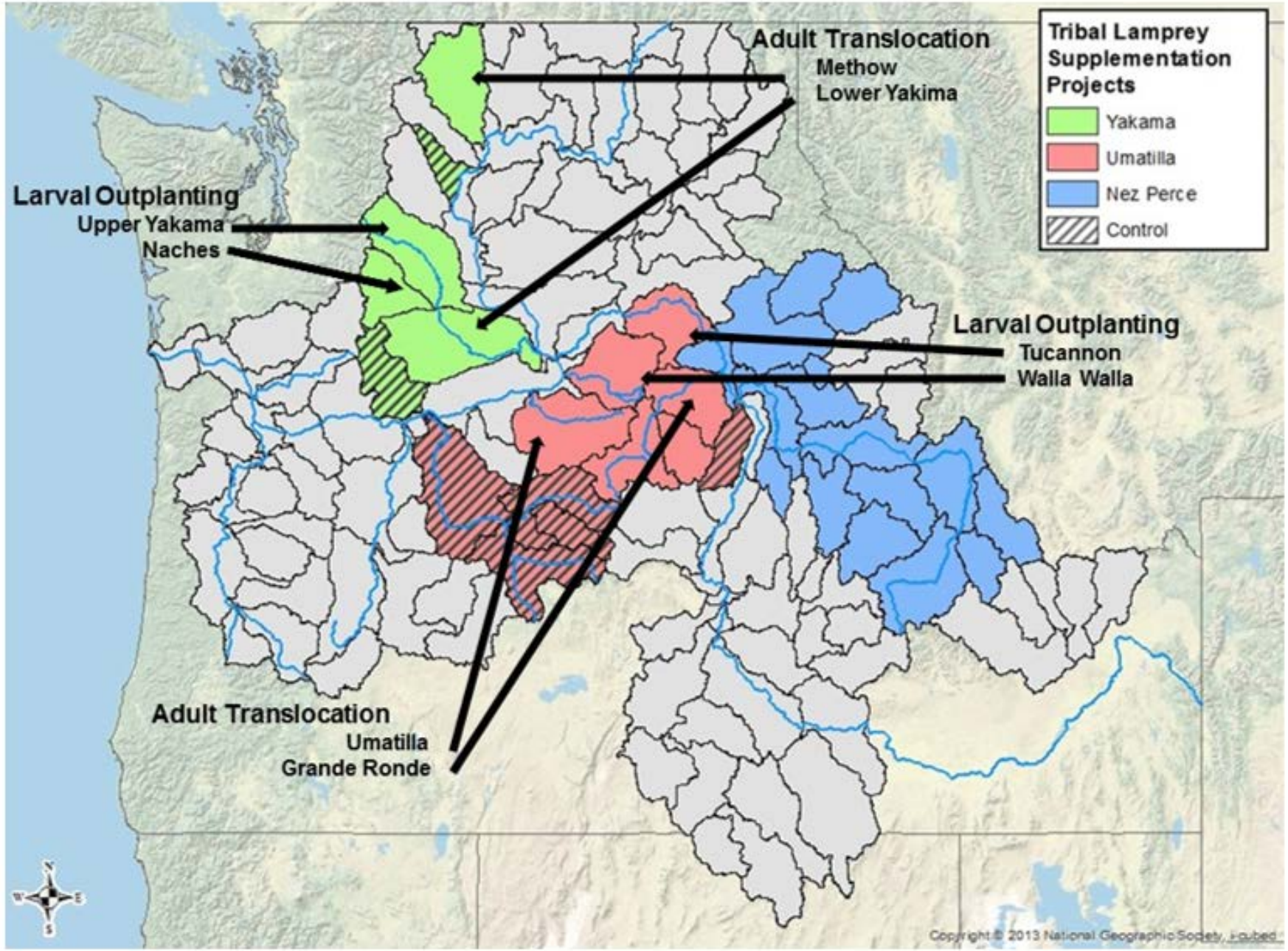
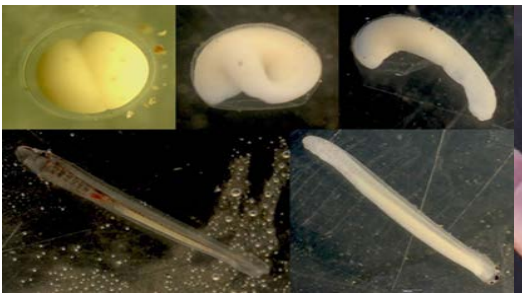
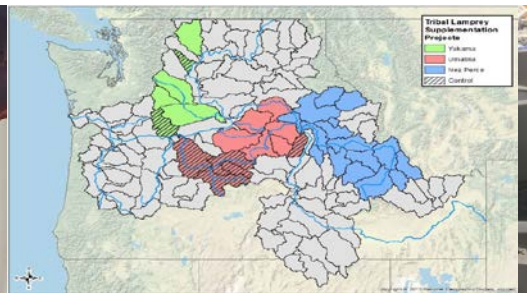



Figure 5-2. Supplementation actions proposed by the YN and CTUIR in various subbasins or watersheds.

Existing and Future Lamprey Facilities

- YN and CTUIR have facilities to maintain adult lamprey and propagated larval lamprey that are operational at various capacities.
- YN has established the capacity to spawn, fertilize, incubate, and rear lamprey at the Marion Drain Fish Hatchery and the Prosser Fish Hatchery.
- Additional capacity has been developed by the CTUIR at the Water and Environmental Center at Walla Walla Community College and at the Mukilteo Research Station (NOAA Fisheries) with planned expansion at South Fork Walla Walla facility





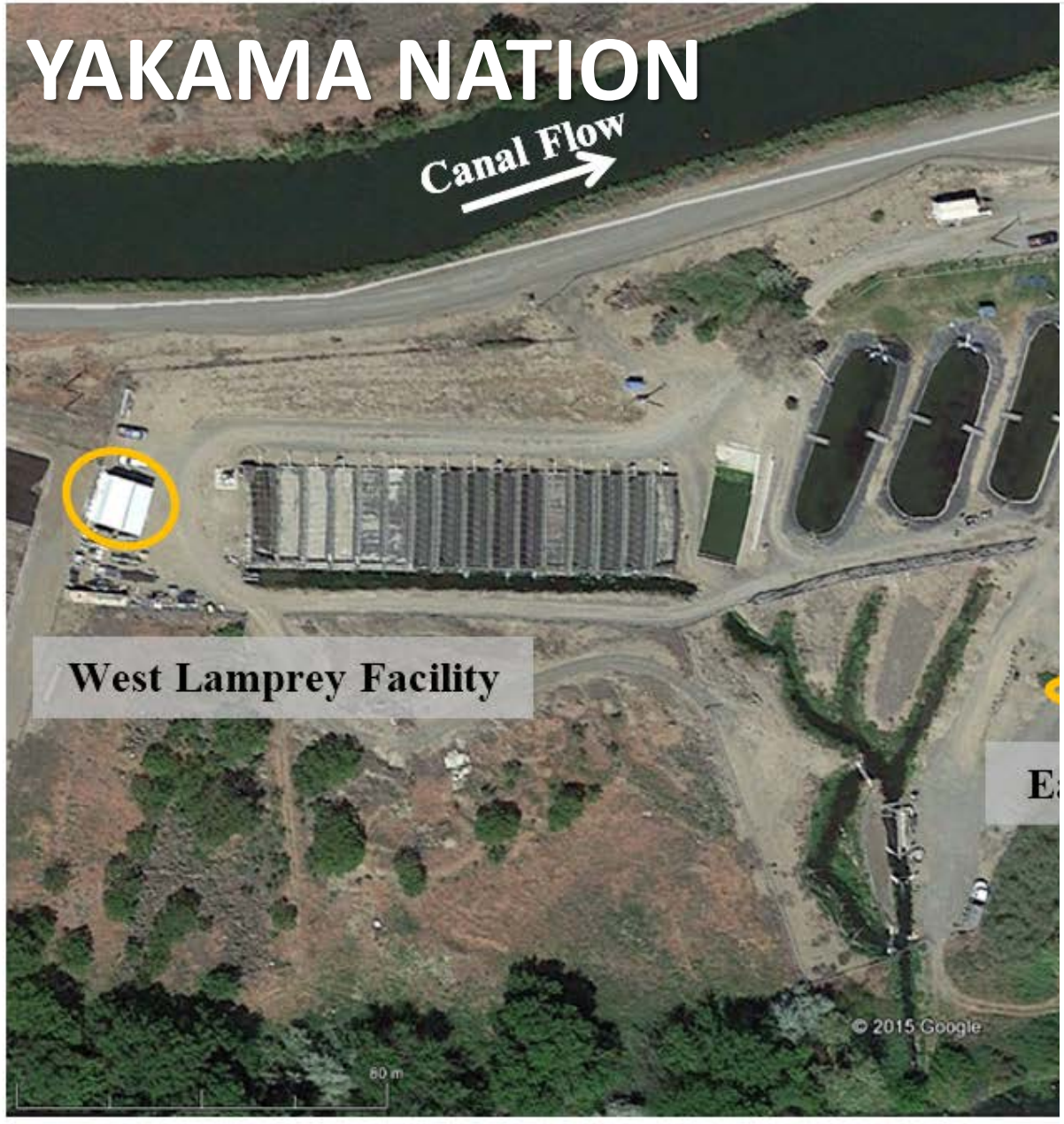



Figure 5-4. Existing Prosser Fish Hatchery aerial overview. Or
Lamprey Facilities.

Figure 5-5. East Lamprey Facility at Prosser Fish Hatchery.

Figure 5-6. West Lamprey Facility (incubation room) at Prosser Fish Facility.

YAKAMA NATION

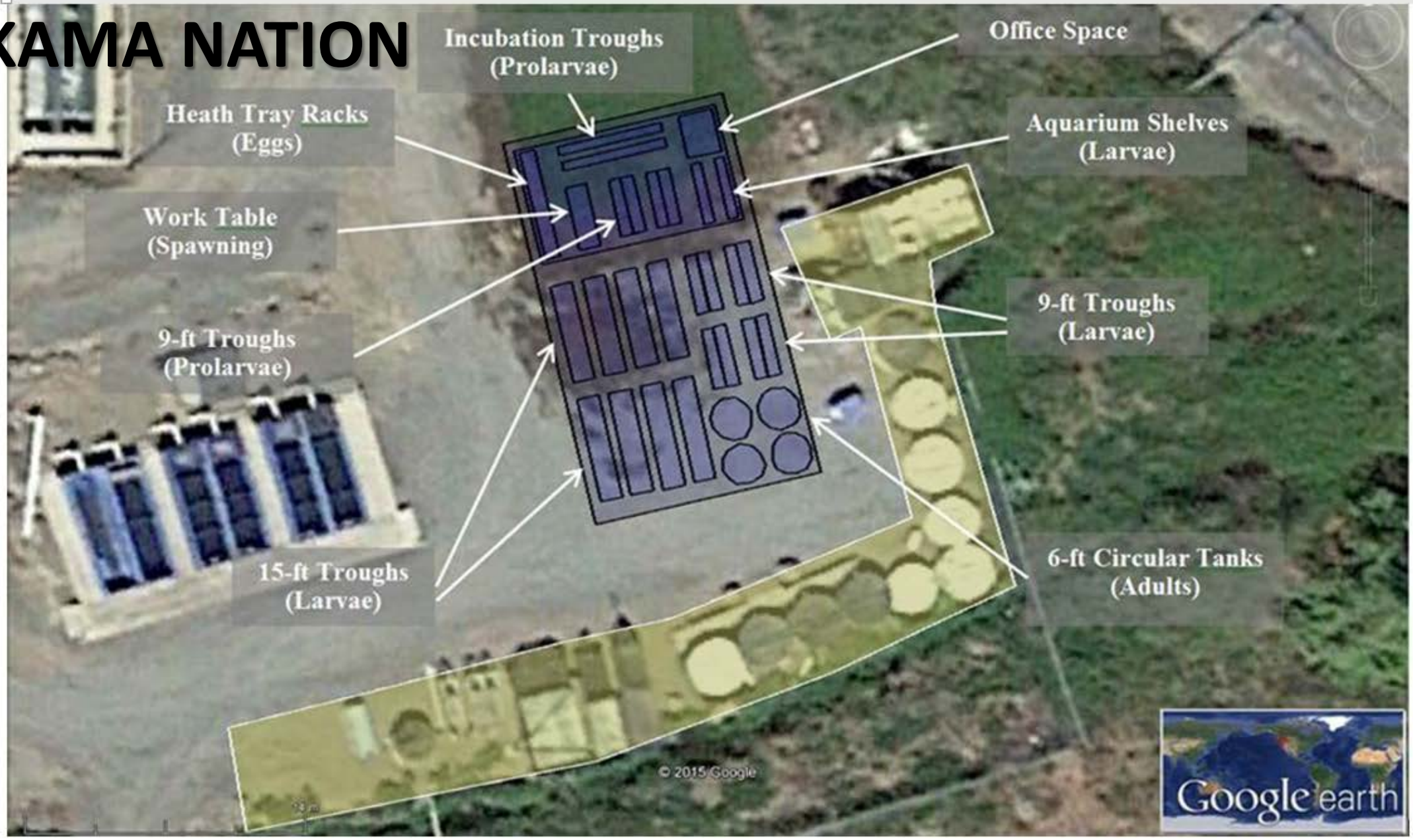
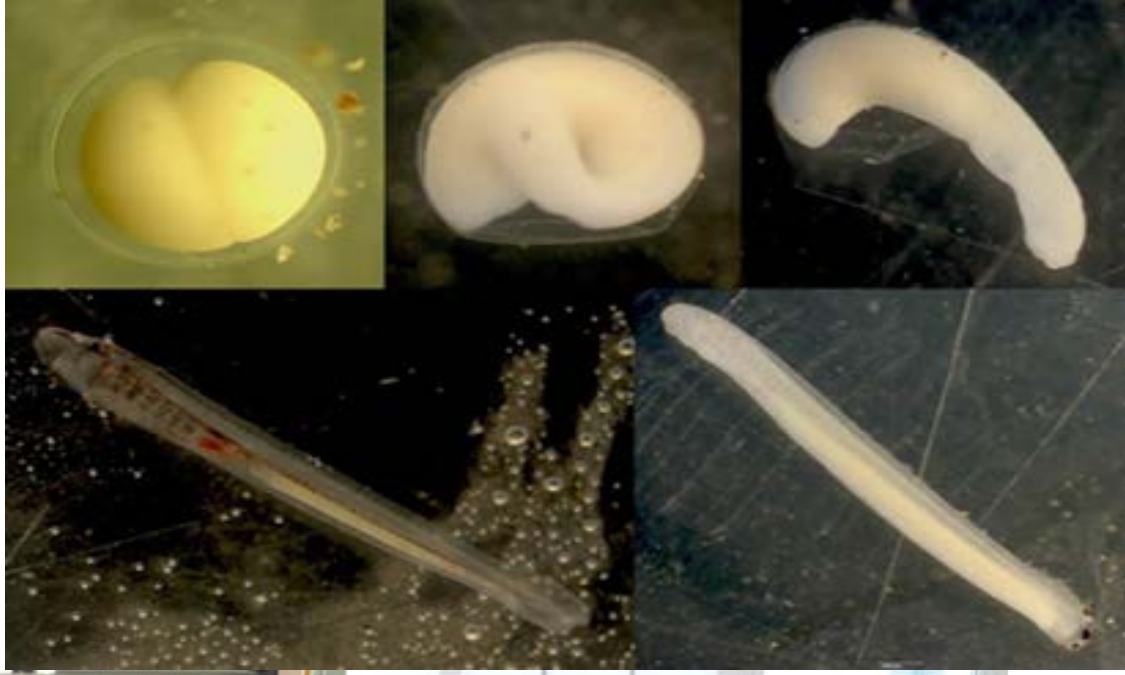


Figure 5-7. Aerial overview of the new pole building and tanks proposed at the East Lamprey Facility at Prosser Fish Facility.

Figure 5-8. Existing South Fork Walla Walla Adult Holding Facility. The center-most pond is used for adult lamprey holding. Planned repurposed ozone building is in the black circle.

Figure 5-9. Existing Minthorn Springs Adult Lamprey Holding facility. Adults are held in tanks located in the black circle.

Figure 5-12. Recirculating water trough (left) and tank rack (right) with interchangeable Cambro



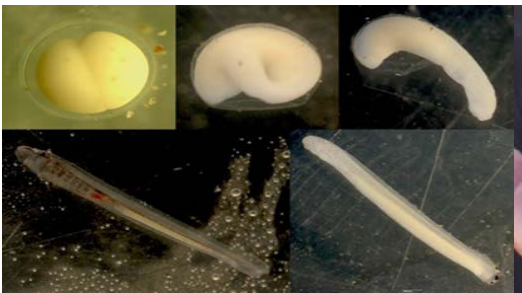
CTUIR/WWCC WEC Lamprey Laboratory

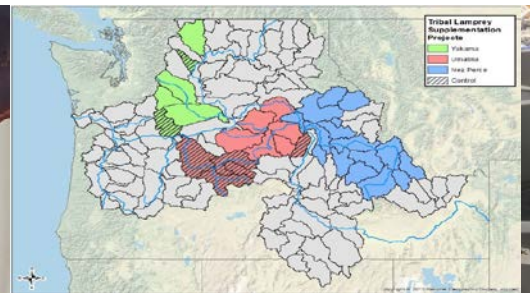
Figure 5-10. Adult lamprey holding tanks at the Water Environmental Center

Figure 5-11. Heath rack (left) and Eager upwelling jars (right) modified for lamprey egg incubation.

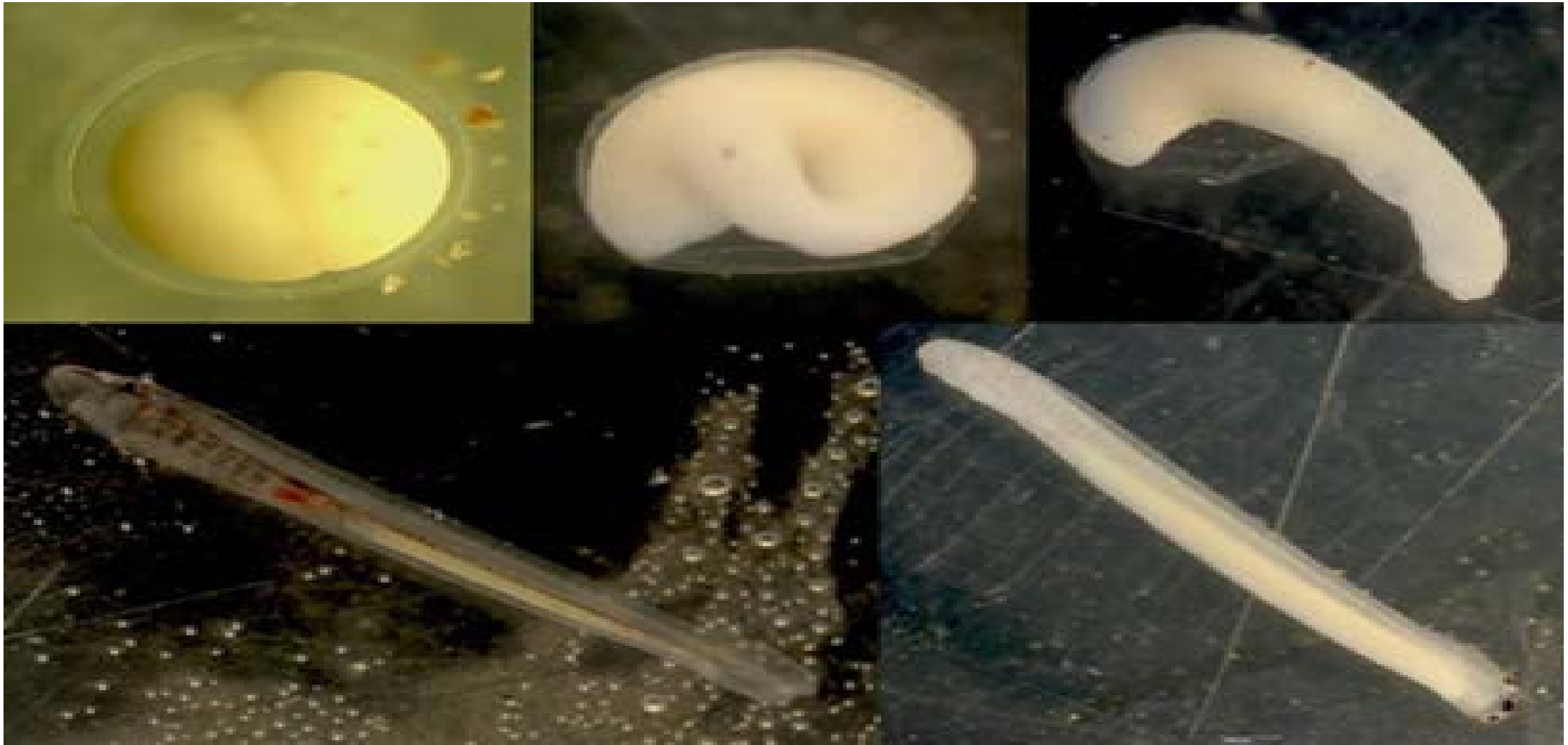
Short-term next steps

- Strengthen qualitative and analytical approaches for Phases 1 and 2.
- Work with Bonneville Power Administration to determine environmental compliance needs to implement Phase 2 objectives.
- Implement Phase 2 objectives (2018-2026).
- Gear up existing facilities in support of Phase 2 (2018-2019).
- Provide status review to the ISRP 2022 (-2026).
- Implement Phase 3 analysis and future plan development (2022-2029).






Questions



DRAFT budgets

Yakama Nation

Table 5-12. Estimated conceptual costs for a 10-year YN lamprey artificial propagation project from FY 2018 through FY 2027.

Expense Type	Phase 1 / Phase 2 / Phase 3 / Phase 4[a]										10-Year Cost
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
Payroll/fringe	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$600,000
Building	$60,000	--	--	--	--	--	--	--	--	--	$60,000
Equipment	$40,000	$35,000	--	--	--	$10,000	--	--	--	$10,000	$95,000
Supplies	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$90,000
Utilities	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$30,000
Vehicles	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$80,000
Travel	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$50,000
Indirect	$23,213	$22,284	$15,785	$15,785	$15,785	$17,642	$15,785	$15,785	$15,785	$17,642	$175,487
Total	$208,213	$142,284	$100,785	$100,785	$100,785	$112,642	$100,785	$100,785	$100,785	$112,642	$1,180,487

[a] Cost estimates do not include Phase 4 implementation.

Umatilla Tribe

Expense Type	Phase 1			Phase 2							10-Year Cost
				Phase 3							
										Phase 4[a]	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
Payroll/fringe	$100,000	$100,000	$100,000	$200,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$2,000,000
Travel, training, vehicles	$10,000	$10,000	$10,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$135,000
Materials, supplies, services	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$250,000
Facilities upgrades	$50,000	$10,000	$10,000	--	--	--	--	--	--	--	$70,000
Indirect	$79,550	$62,350	$62,350	$103,200	$124,700	$124,700	$124,700	$124,700	$124,700	$124,700	$1,055,650
Total	$264,550	$207,350	$207,350	$343,200	$414,700	$414,700	$414,700	$414,700	$414,700	$414,700	$3,510,650

Table 5-13. Estimated conceptual costs for a 10-year CTUIR lamprey artificial propagation project from FY 2018 through FY 2027.

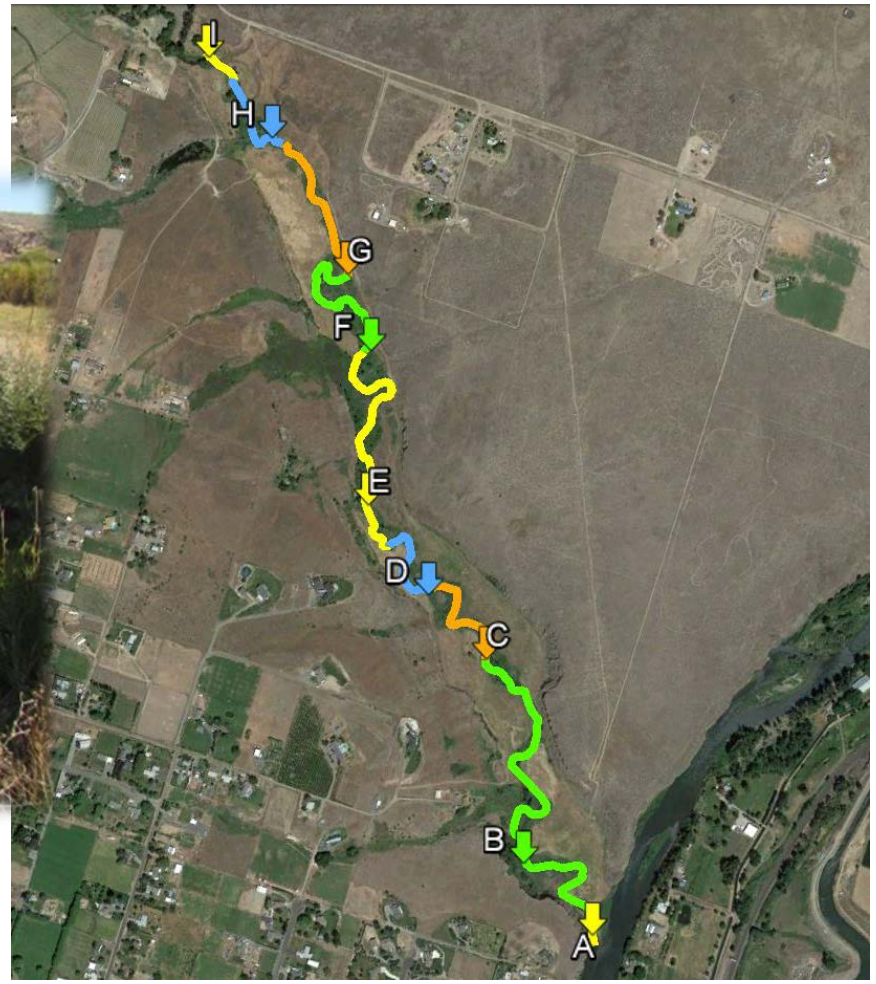
[a] Cost estimates do not include Phase 4 implementation.

END

Lower Wenas Site (Yakima, WA)

Year 1 Only

Habitat Area =
8101 m^2



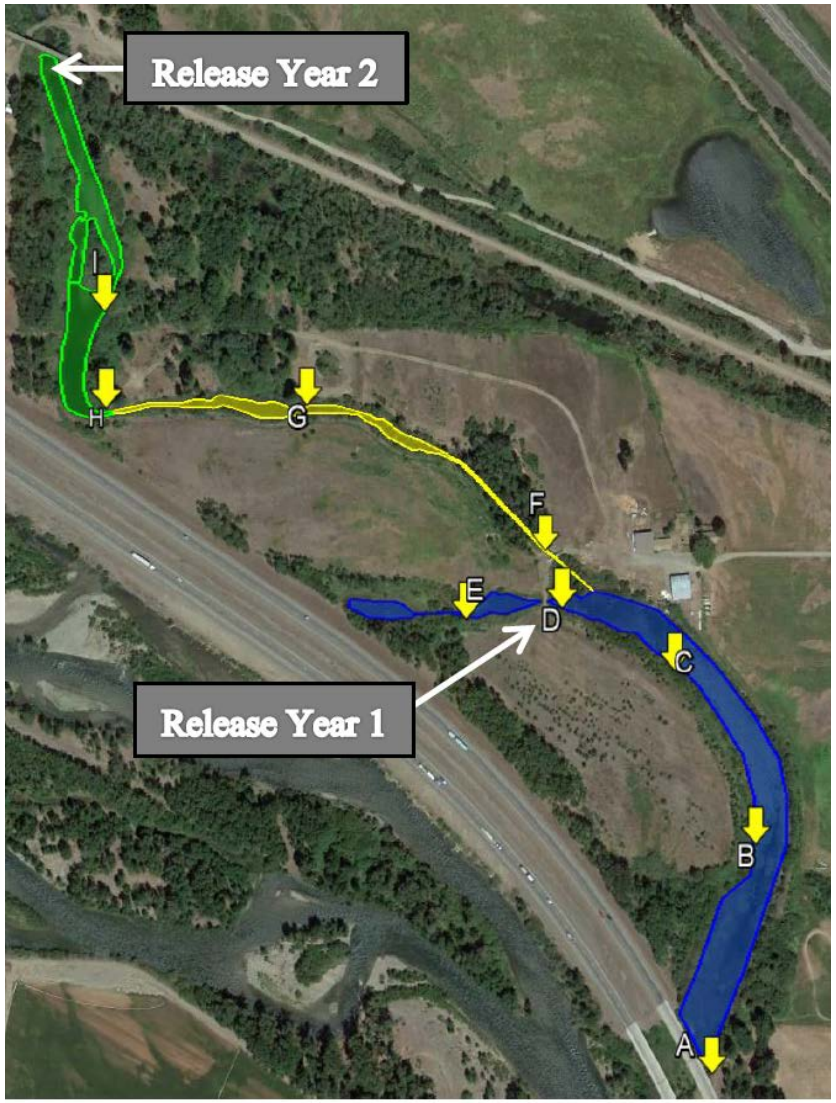
Carry Capacity =
49,000 larvae

Holmes Acclimation Site (Ellensburg, WA)

Year 2-3

Habitat Area =
17,414 m^2

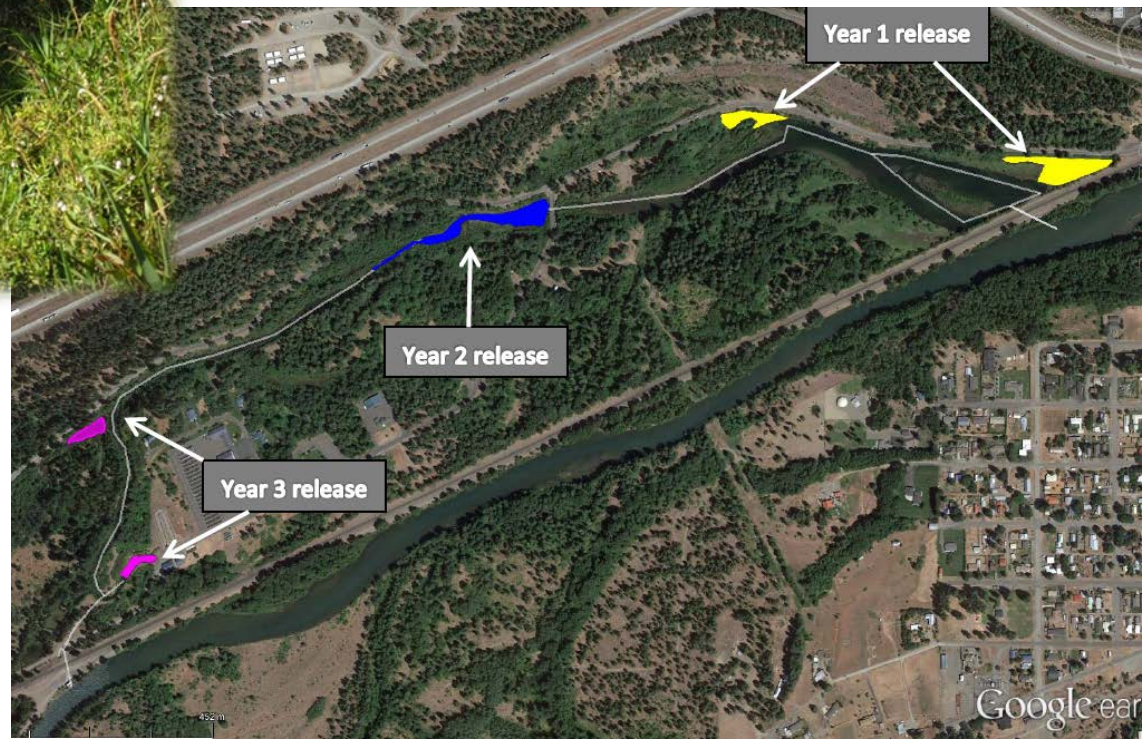
Carry Capacity =
149,000 larvae



Cle Elum Hatchery Site (Cle Elum, WA)

Year 1-3

Habitat Area =
45,896 m^2



Carry Capacity =
291,000 larvae

Eschbach Park Site (Naches, WA)

Year 1-3

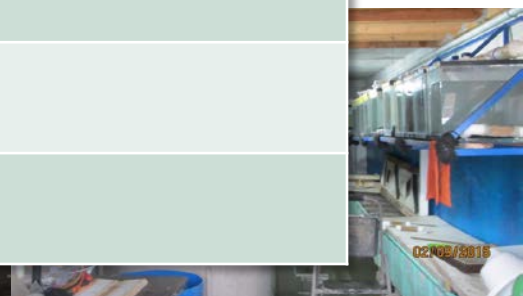
Habitat Area = 23,425 m^2

Carry Capacity = 197,000 larvae

Year	Activity
2000	• CTUIR begins an adult translocation program.
2007	• NPT begins an adult translocation program.
2011	• 1st International Forum on the Recovery and Propagation of Lamprey is held in Portland, Oregon.
2012	• USFWS and USGS begin experiments to evaluate different rearing regimes for larval lamprey. • YN and CTUIR begin developing Best Management Practices for lamprey artificial propagation. • YN begins an adult translocation program.
2014	• Supplementation Research Framework developed.
2015	• Draft lamprey MP developed.
2018	• Lamprey MP completed and submitted to ISRP.





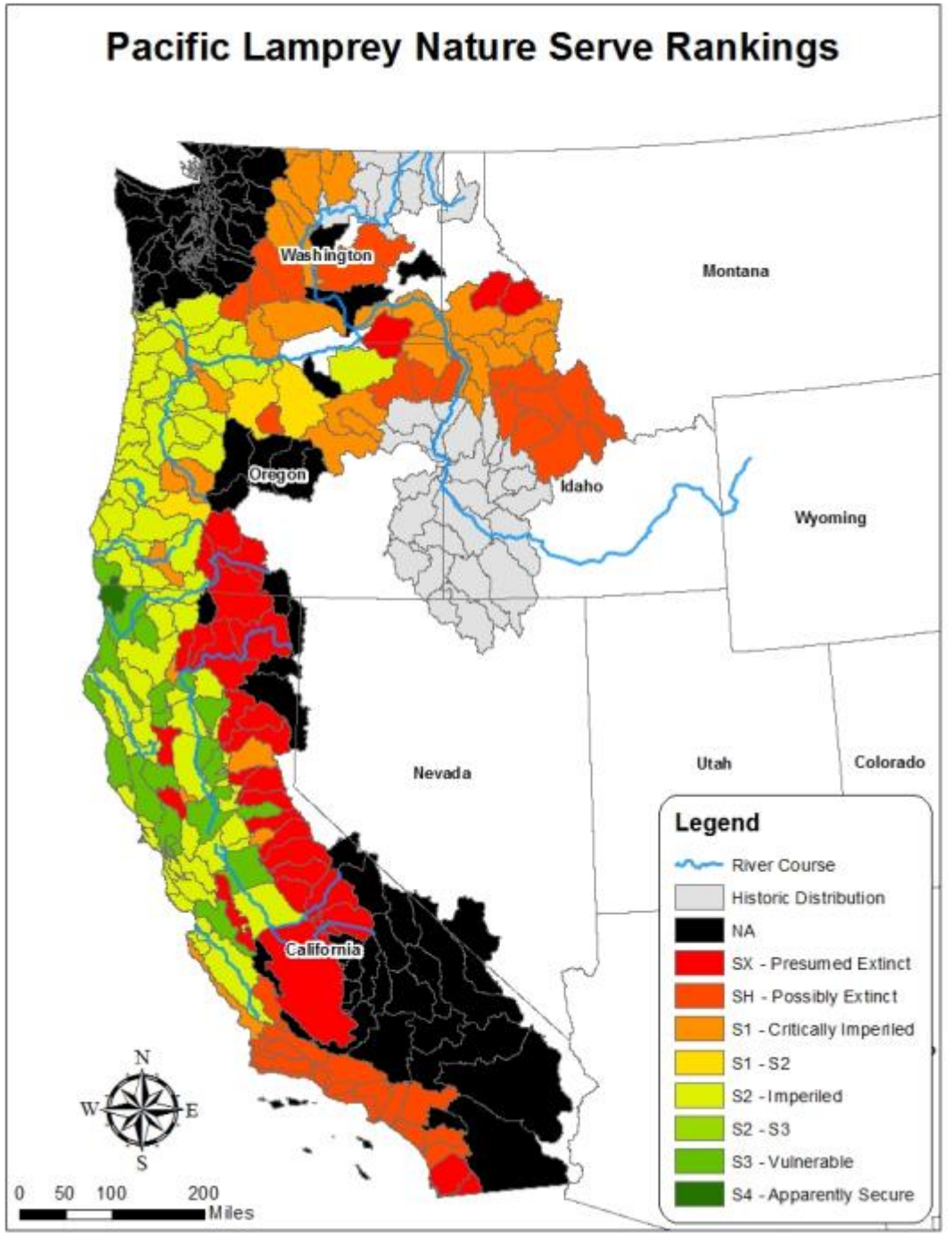


Lamprey Conservation Timeline

- **1994 - NWPCC Fish and Wildlife program directs lamprey work**
- **1995 - Formation of Technical Workgroup**
- **2003 - Petition to list Pacific Lamprey**
- **2004 - Finding that listing not warranted**
- **2004 - Lamprey Summit I**
- **2007 - Corps Adult Passage Plan**
- **2007 - USFWS Conservation Initiative**
- **2008 - Fish Accords**
- **2008 – Lamprey Summit II/Tribal plan**
- **2011/2012 - Assessment**
- **2012 – Lamprey Summit III - Conservation Agreement signing**
- **2013 – Implementation Planning**
- **2017 – Lamprey Summit IV - Assessment revision, Agreement re-signing**

Pacific Lamprey Assessment

Risk levels for lamprey in the Columbia Basin?



Summary of CRITFC tribe lamprey projects

Confederated Tribes of the Umatilla Indian Reservation

- Supplementing adult populations with translocation followed with monitoring and evaluation of all life stages
- Conducting larval surveys in NE Oregon / SE Washington
- Researching the impacts of low-elevation diversions
- Identifying effective lamprey screening criteria
- Installing / refining lamprey passage structures
- Improving artificial propagation techniques
- Developing tagging techniques for juveniles
- Developing a baseline for disease and pathogen levels in lamprey

Nez Perce Tribe

- Supplementing adult populations with translocation
- Describing behavior of spawning adults
- Characterizing interior spawning habitat
- Determining post-supplementation larval abundance, parentage, age structure, and migration timing
- Determining occupancy in non-translocation streams
- Pursuing mainstem passage improvement options

Confederated Tribes and Bands of the Yakama Nation

- Conducting larval lamprey surveys (distribution, status & trend, relative abundance)
- Identifying passage barriers and implementing actions
- Investigating entrainment of larval and juvenile lamprey and implementation of solutions
- Supplementing adult populations with translocation
- Improving artificial propagation and larval rearing techniques
- Developing species ID and tagging techniques for larval lamprey

Confederated Tribes of Warm Springs

- Evaluating status, distribution, adult passage and abundance estimates
- Describing migration patterns of adults
- Characterizing spawning and larval rearing habitat
- Researching factors limiting population dynamics
- CTWSRO Lamprey Synthesis to NPCC (Nov. 2015)

Columbia River Inter-Tribal Fish Commission

- Developing next generation genetic markers for lamprey
- Supporting evaluations of status, distribution, and abundance throughout the basin
- Facilitating adult collection for translocation programs
- Implementing outreach and education efforts
- Evaluating contaminants in lamprey habitats and tissues
- Developing planning documents for supplementation research and regional lamprey RME
- Provided coordinated CRB synthesis to NPCC/ISRP

Collaborative tribal efforts

- Improving tributary and mainstem passage
- Monitoring and evaluation of adult translocation
- Research and development of artificial propagation
- Genetic monitoring of lamprey restoration projects
- Larval sampling techniques and occupancy modeling
- Evaluating contaminants in lamprey habitats and tissues
- Assessing limiting factors and critical threats

Priorities for future action

- **Improve mainstem adult lamprey passage.**
- **Improve passage within the tributary environment.**
- **Develop and improve alternative passage routes and strategies.**
- **Develop, improve, and implement supplementation and restoration research activities.**
- **Continue to understand limiting factors and lamprey life history at all levels.**
- **Strengthen lamprey outreach and education.**
- **Continue to identify, evaluate, and monitor status, trends, and distribution of lamprey within the Columbia River Basin.**

Sample of tribal publications

Jackson, A.D., M.L. Moser, S.T. Onjukka, S. Lapatra, K. Lujan, C. Samson, M.G. White, M. Blair, L. Rhodes, R. Lampman, J.C. Jolley. *In Revision.* Prevalence of Pathogens in Pacific Lamprey (*Entosphenus tridentatus*) of the Pacific Northwest. Journal of Aquatic Animal Health.

Moser, M.L., A.D. Jackson, R.P. Mueller, A.N. Maine, M. Davisson. 2017. Effects of passive intergrated transponder (PIT) implantation on Pacific Lamprey ammocoetes. Animal Biotelemetry (2017) 5:1.

Lampman, R., M. Moser, A. Jackson, R. Rose, A. Gannam, and J. Barron. 2016. Developing Techniques for Artificial Propagation and Early Rearing of Pacific Lamprey (*Entosphenus tridentatus)* for Species Recovery and Restoration, Chapter 22 *in* A. Orlov editor. Jawless Fishes of the World.

Moser, M. L., A. D. Jackson and M.C. Lucas and R. P. Muller. 2015. Behavior and potential threats to survival of migrating lamprey ammocoetes and macrophthalmia. Reviews in Fish Biology and Fisheries 25: 103-116.

Jackson, A. D. and M.L. Moser. 2012. Low-elevation dams are impediments to Adult Pacific lamprey spawning migration in the Umatilla River, Oregon. North American Journal of Fisheries Management, Vol. 32 (3): 548-556.

Moser, M.L., A. D. Jackson, T. Tsuzaki and P. S. Kemp. 2012. Do surgically implanted radio transmitters alter the climbing ability of adult Pacific lamprey, Lampetra tridentata? Fisheries Management and Ecology, Ecology and Management Note: 3 pgs

Ward, D. L., B. J. Clemens, D. Clugston, A. D. Jackson, M. L. Moser, C. Peery, and D. P. Statler. 2012. Translocating Adult Pacific Lamprey within the Columbia River Basin: State of the Science. Fisheries, Vol. 37 (8): 351-361.

Close D. A., K. P. Currens, A. Jackson, A. J. Wildbill, J. Hansen, P. Bronson, and K. Aronsuu. 2009. Lessons from the reintroduction of a non-charismatic migratory fish: Pacific lamprey in the upper Umatilla River, Oregon. Pages 233–253 *in* L. R. Brown, S. D. Chase, M. G. Mesa, R. J. Beamish, and P. B. Moyle, editors. Biology, management and conservation of lampreys in North America. American Fisheries Society, Symposium 72, Bethesda, Maryland.

Close, D. A., A. D. Jackson, B. P. Conner, and H. W. Li. 2004. Traditional ecological knowledge of Pacific lamprey (*Entosphenus tridentatus*) in northeastern Oregon and southeastern Washington from indigenous peoples of the Confederated Tribes of the Umatilla Indian Reservation. Journal of Northwest Anthropology 38:141–162.