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

July 6, 2022

MEMORANDUM

TO: **Council Members**

FROM: **Mark Fritsch**

SUBJECT: **Update on Pacific lamprey runs in the Columbia River Basin and translocation successes**

BACKGROUND:

Presenter: Laurie Porter and Jon Hess from the Columbia River Inter-Tribal Fish Commission (CRITFC)

Summary: Laurie will provide a summary on the current run of Pacific lamprey in the Columbia River Basin, and a brief overview of activities associated with the tribal projects being implemented through the Program. Jon will provide an overview of successful Pacific Lamprey translocation efforts in the Snake River that have increased overall abundance and productivity. Recent results have shown that adult offspring are returning in increasing numbers to Bonneville Dam as a direct result of the translocation programs of the Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes and Bands of the Yakama Nation, and Nez Perce Tribe.

The summary and overview are a complement to the presentation at the May Council meeting that provided a review of the status of Pacific Lamprey conservation and restoration efforts throughout the U.S. range with an emphasis on the Program's support for the Pacific Lamprey Conservation Initiative activities in the Columbia River Basin.

Relevance: The Fish and Wildlife Program (Program) recognizes Pacific Lamprey as not only an ecologically important species, but also a key cultural species in the Columbia Basin. This report addresses the 2014 Program's Emerging Priority #5[1]. In addition, the Program also addresses several specific measures in the Program's Lamprey strategy regarding lamprey passage and monitoring.

Workplan: Fish and Wildlife Division work plan 2022; Program Implementation and performance.

Background: Pacific Lamprey, *Entosphenus tridentatus (*formerly *Lampetra tridentata)*, have inhabited the Pacific for millions of years. Historic runs of Pacific Lamprey in the Columbia River Basin numbered in the hundreds of thousands, but their distribution and abundance have decreased and currently they return in drastically smaller numbers. They migrate from the mouth of the Columbia River to Chief Joseph and Hells Canyon dams, in the mainstem Columbia and Snake rivers, respectively. Threats to Pacific Lamprey occur throughout the entire range of the species and include but are not limited to: restricted mainstem and tributary passage, reduced flows and dewatering of streams, stream and floodplain degradation, degraded water quality, predation and changing marine and climate conditions.

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*) proposed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) called for research and restoration of Pacific Lamprey throughout tribal ceded lands. This was followed by additional projects in 2002, 2007, 2008 and 2018 (see Table 1). 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 generally aim at establishing population status and trends, documenting distribution, identifying limiting factors, and develop reintroduction and supplementation actions.

Table 1: Projects currently funded through the direct Fish and Wildlife Program.

Project #	Project Title	Sponsors
1994-026-00	Pacific Lamprey Research and Restoration Project	Confederated Tribes of the Umatilla Indian Reservation, NOAA
2008-308-00	Willamette Falls Lamprey Escapement Estimate	Confederated Tribes of the Warm Springs

[1] Emerging priority #5 – Implement additional sturgeon and lamprey measures (passage and research).

2008-470-00	Yakama Nation Ceded Lands Lamprey Evaluation and Restoration	Yakama Nation
2008-524-00	Implement Tribal Pacific Lamprey Restoration Plan	Columbia River Inter-Tribal Fish Commission
2011-014-00	Evaluate Status & Limiting Factors of Pacific in the lower Deschutes River, Fifteenmile Creek and Hood River Subbasins	Confederated Tribes Of the Warm Springs
2017-005-00	Pacific Lamprey Conservation Initiative	Pacific States Marine Fisheries Commission, US Fish and Wildlife Service

Prior to and concurrent with the work above, the Lamprey Technical Workgroup (LTWG), active since 1995, assisted the region in providing guidance and recommendations 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 (Assessment) and Template for Conservation Measures by USFWS in 2011 (and revised by PLCI partners in 2018) 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.

In addition, an aspect of Project #2008-524-00, *Implement Tribal Pacific Lamprey Restoration Plan*, which is managed by the Columbia River Inter-Tribal Fish Commission working with the USACE, targeted development of a Passage Improvement Plan as part of the Agreement. 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.

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 (see page 94). This was also confirmed by the need to integrate and take the necessary steps to implement additional lamprey measures into the Program[2].

[2] Emerging priority #5, page 116: Implement additional sturgeon and lamprey measures (passage and research).

On March 14,2018 the Council approved Project #2017-005-00, *Pacific Lamprey Conservation Initiative* as one of the most recent projects to be approved for the direct Program. The Oregon Department of Fish and Wildlife codified their Conservation Plan for Lampreys, which includes Pacific Lamprey in 2019.

Update on Pacific Lamprey runs and translocation successes in the Columbia River Basin

NWPCC

Laurie Porter **Columbia River Inter-Tribal Fish Commission**

Jon Hess **Columbia River Inter-Tribal Fish Commission**

"Here are my friends"

The late Elmer Crow, Nez Perce, who dedicated the final years of his life to helping restore his “eels.” Here, he is showing a net full of Pacific lamprey at the Nez Perce Tribal Hatchery awaiting out planting into the wild streams and rivers in Idaho.

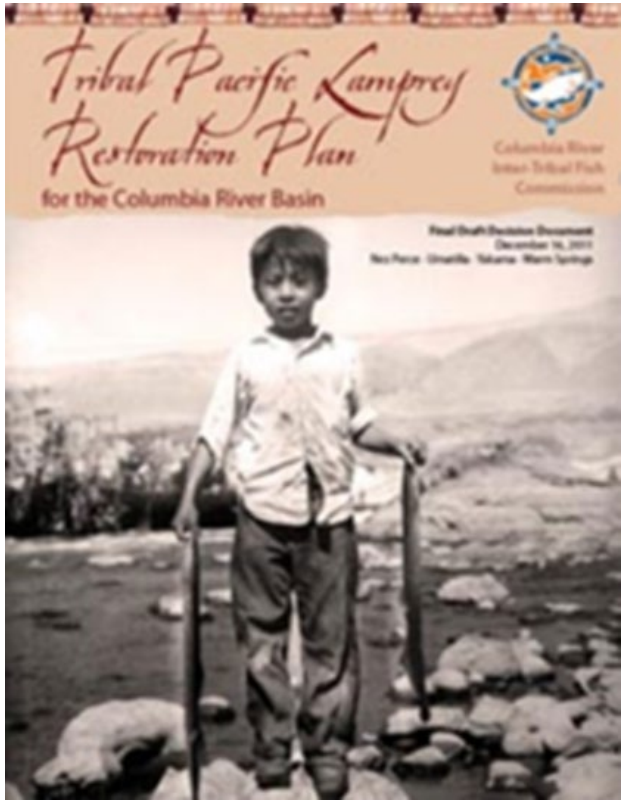
Tribal Pacific Lamprey Restoration Plan
Plan Vision and Goals

Plan Vision: Pacific lamprey are widely distributed within the Columbia River basin in numbers that fully provide for ecological, tribal cultural and harvest values.

Plan Goal: Immediately halt population declines and prevent additional extirpation in tributaries. Reestablish lamprey as a fundamental component of the ecosystem. Restore Pacific lamprey to sustainable, harvestable levels throughout the historical range and in all tribal usual and accustomed areas.

Numeric Goals: Columbia River Basin

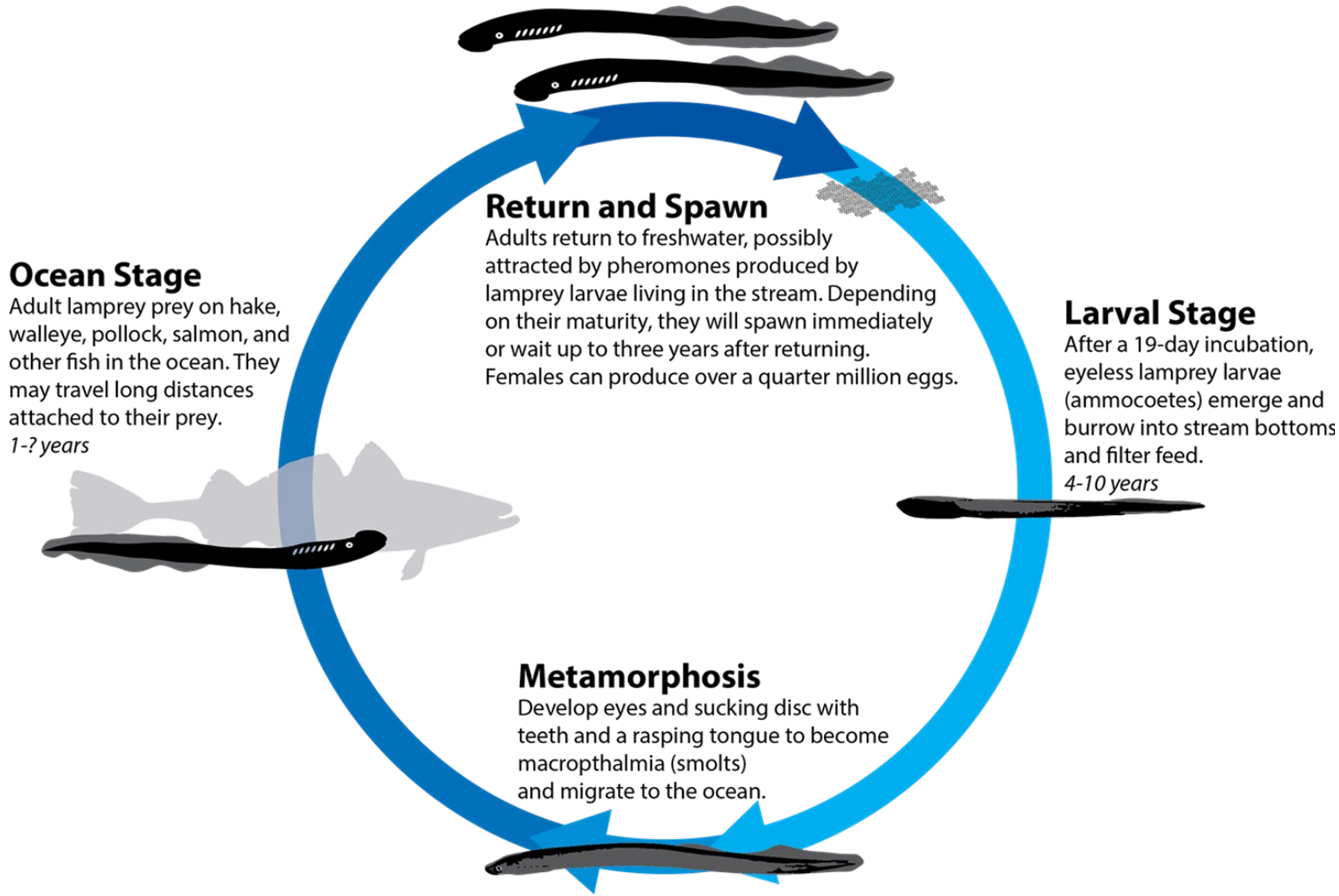
- 2012 - Halt decline
- 2020 - 200,000 adults (based on 2002–2003 Bonneville Dam counts)
- 2035 - 1,000,000 adults (from 1950s–1960s Bonneville Dam counts)
- 2050 - Restore lamprey to sustainable, harvestable levels throughout their historic range



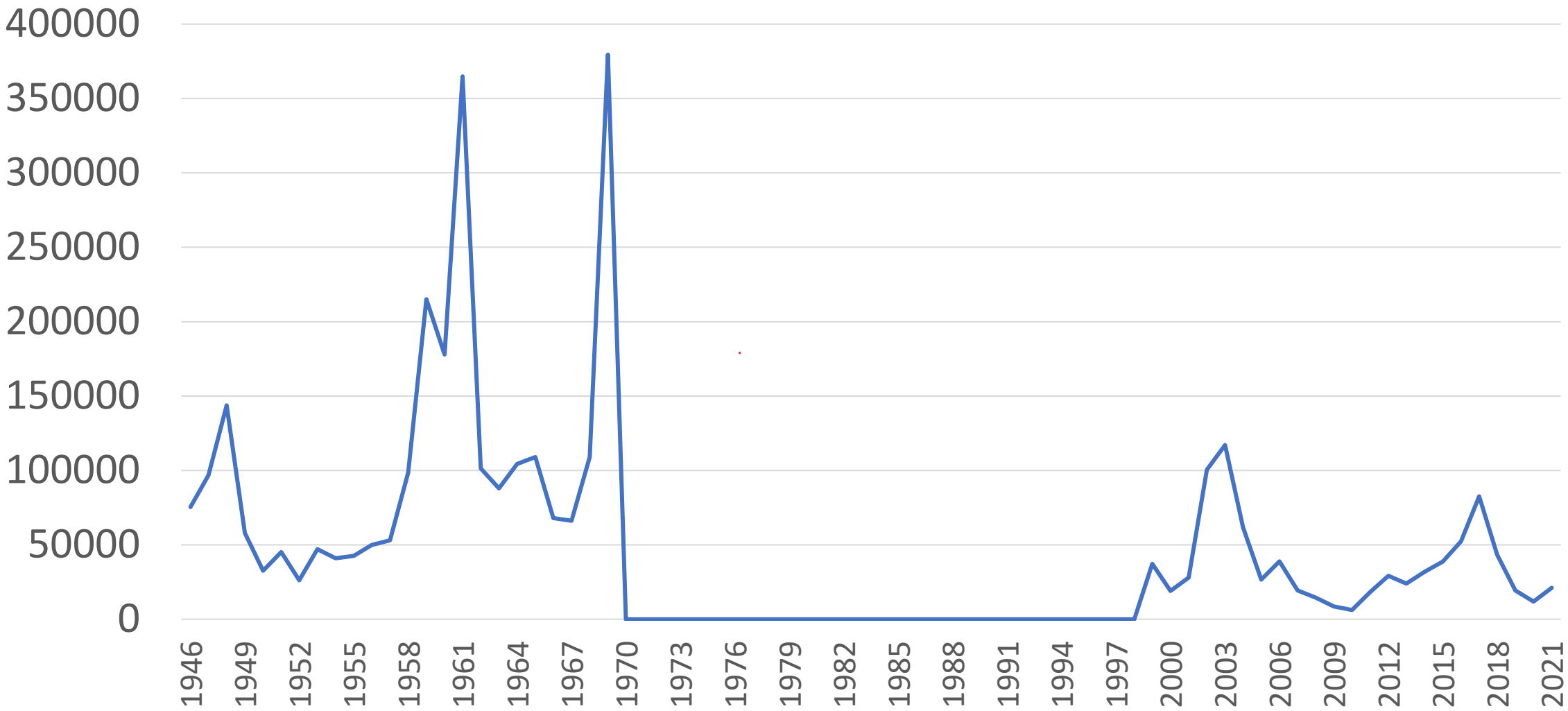
Columbia River Basin Fish and Wildlife Program, 2020 Addendum, Biological Objectives - Pacific Lamprey

In the absence of quantitative goals and objectives based in hydropower loss assessments, contribute to achieving the following adult abundance and other population targets for Pacific lamprey:

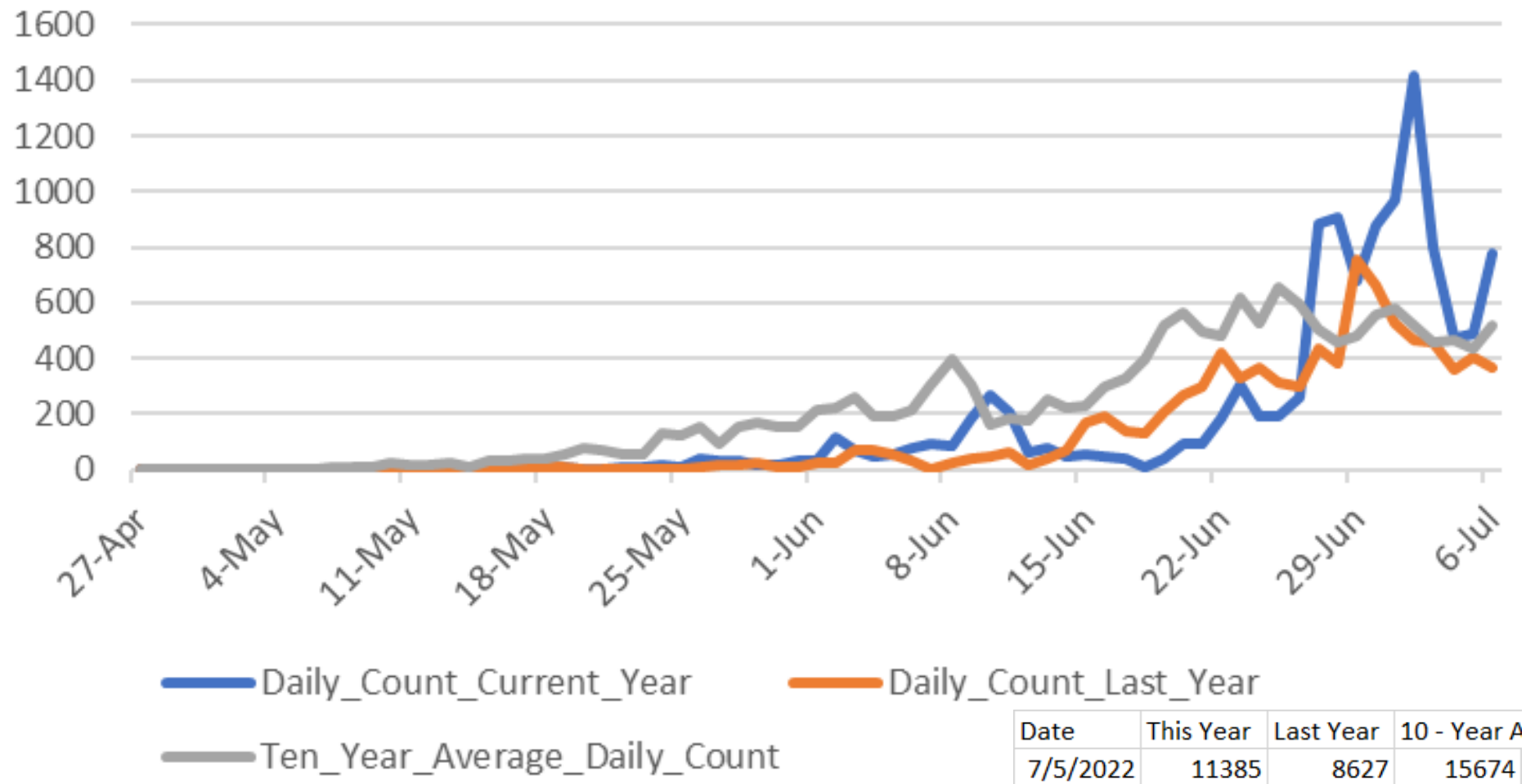
- L1 - Adult Pacific lamprey abundance target of a three-year rolling average of 200,000 at Bonneville Dam by 2025, progressing toward 1,000,000 by 2035.
- L2 - Reduce the risk of extirpation and improve adult abundance toward sustainable harvestable levels across the historic distribution and range of Pacific lamprey in the Columbia basin, including across all six Pacific Lamprey Regional Management Units (RMU), measured every five years.
- L3 - Improve passage efficiency for adult Pacific Lamprey to an interim standard of at least 80 percent at each dam on the mainstem Columbia and Snake rivers.
- L4 - For juvenile lamprey, improve passage efficiency and survival progressing toward standards used to measure juvenile salmonid survival.


Return and Spawn
Adults return to freshwater, possibly attracted by pheromones produced by lamprey larvae living in the stream. Depending on their maturity, they will spawn immediately or wait up to three years after returning. Females can produce over a quarter million eggs.
Larval Stage
After a 19-day incubation, eyeless lamprey larvae (ammocoetes) emerge and burrow into stream bottoms and filter feed.
4-10 years
Metamorphosis
Develop eyes and sucking disc with teeth and a rasping tongue to become macropthalmia (smolts) and migrate to the ocean.
Ocean Stage
Adult lamprey prey on hake, walleye, pollock, salmon, and other fish in the ocean. They may travel long distances attached to their prey.
1-? years

Bonneville Dam Adult Pacific Lamprey Counts

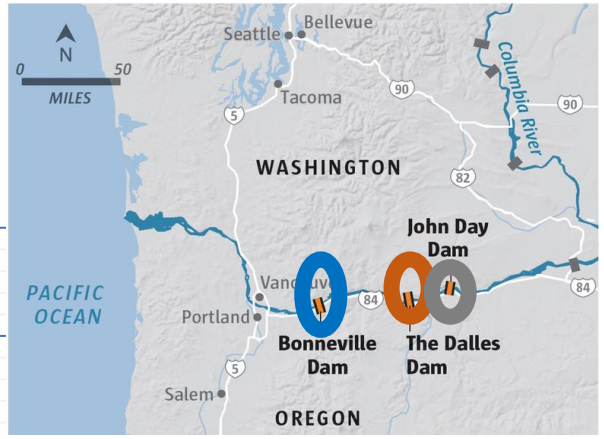


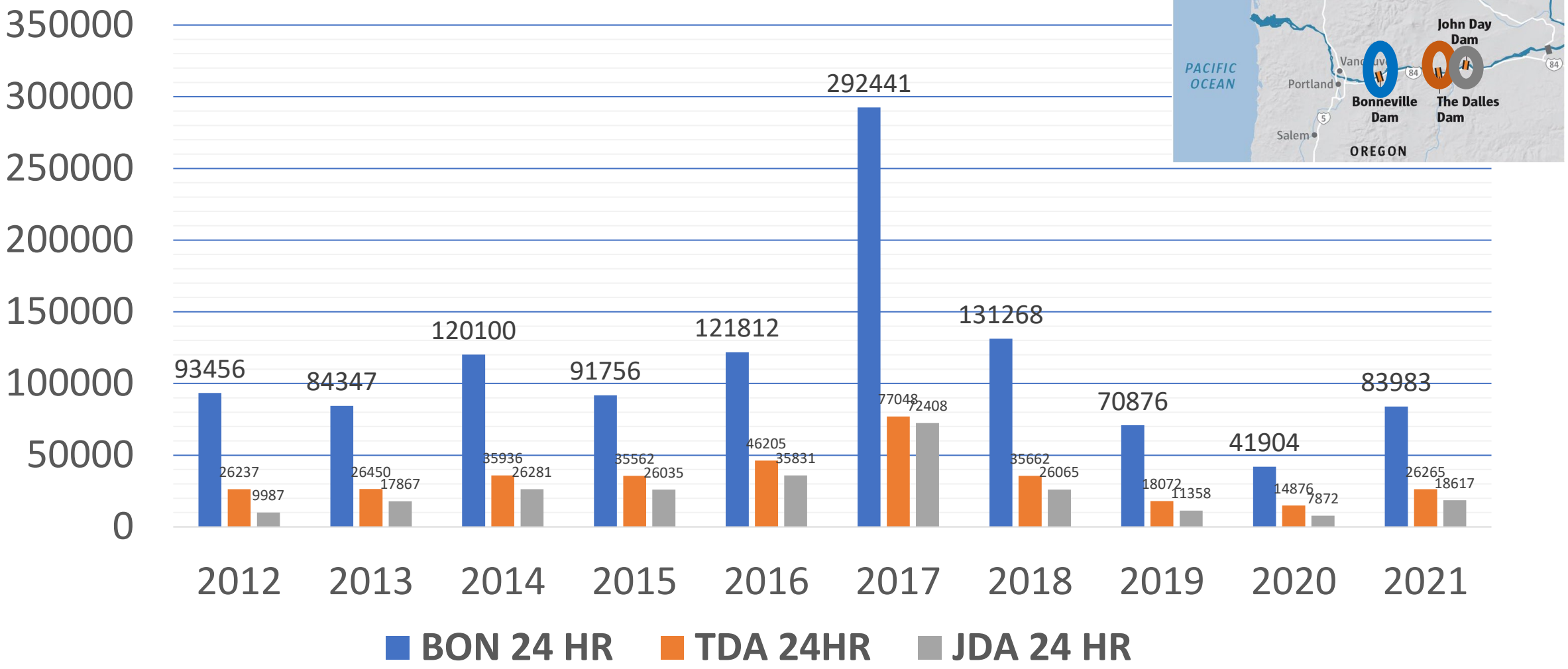
Adult Pacific Lamprey Day Counts Bonneville Dam



Date	This Year	Last Year	10 - Year A
7/5/2022	11385	8627	15674

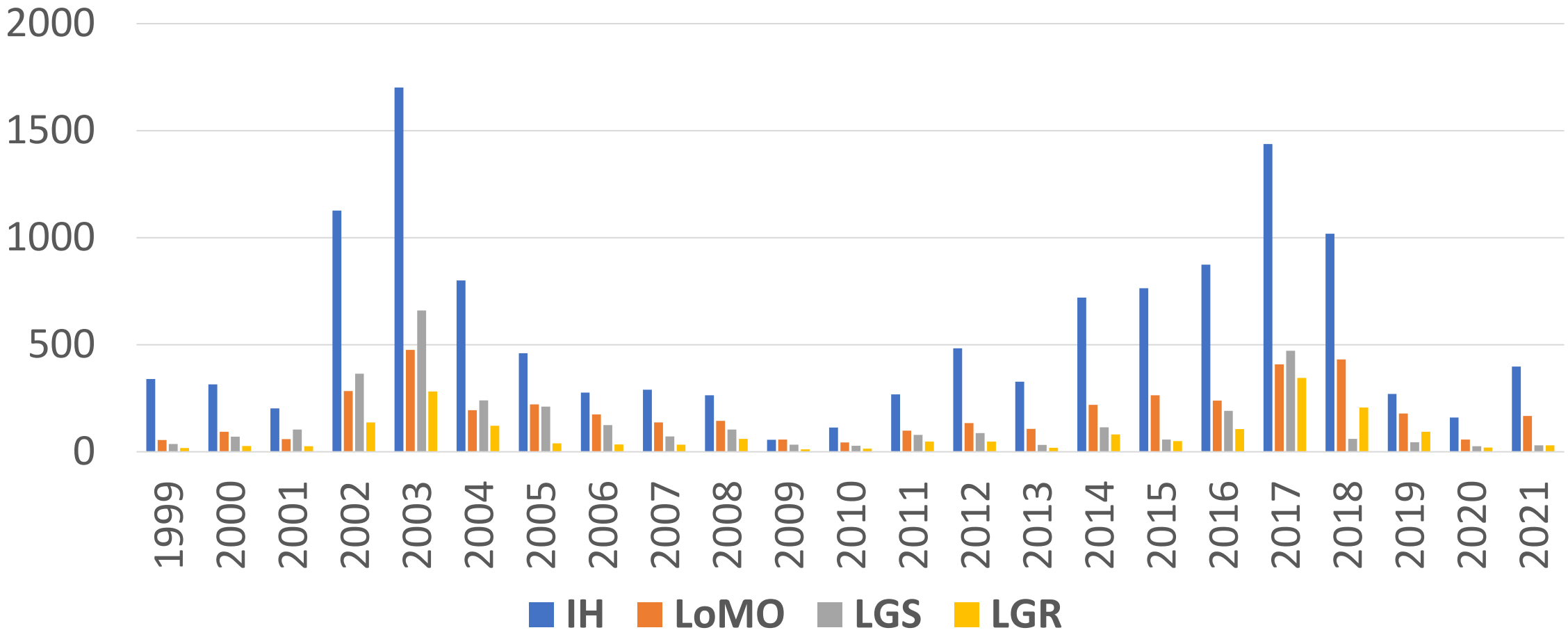
Adult Pacific Lamprey Dam Counts





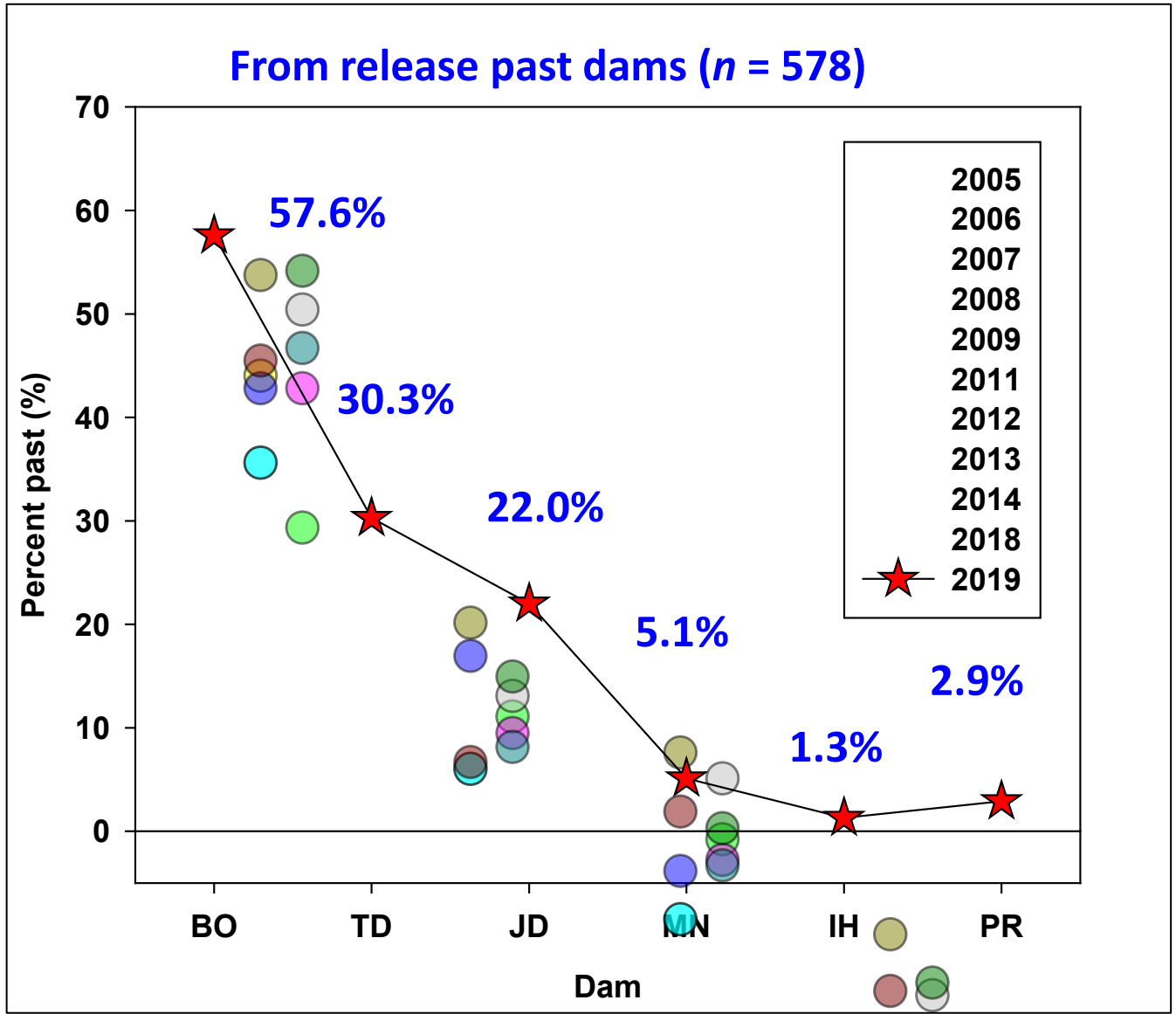

Buckaroo Dam
Bruneau River, Idaho
early 1900's

Adult Pacific Lamprey Dam Counts
IH, LoMo, LGS, LGR



Escapement past dams: HD PIT

- Slightly above average passage: BON, TDD, JDD
- Slightly below average passage: MCN, IHD, PRD

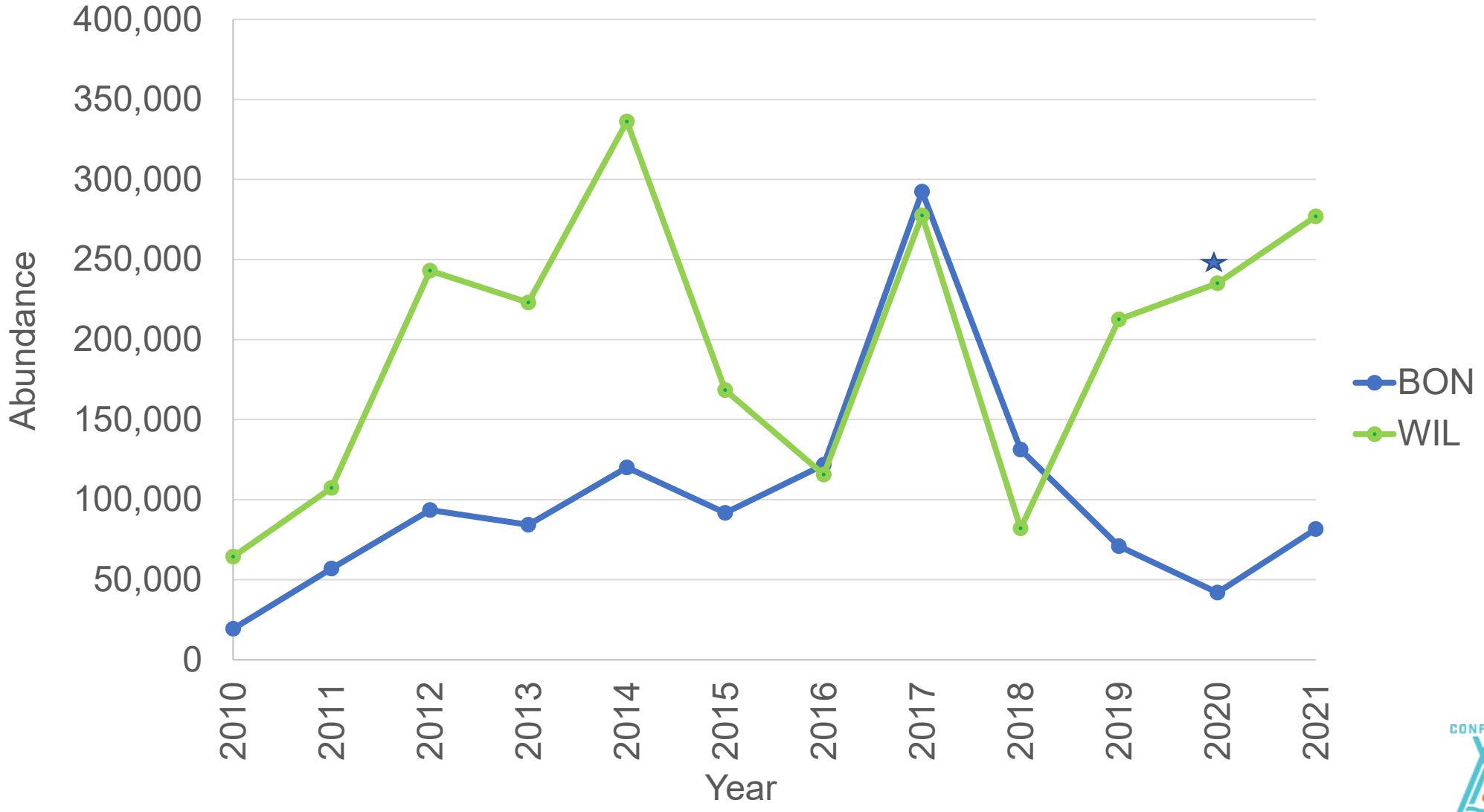


University of Idaho
College of Natural Resources

Keefer et al., 2019


Eels at Willamette Falls. 7-15-13

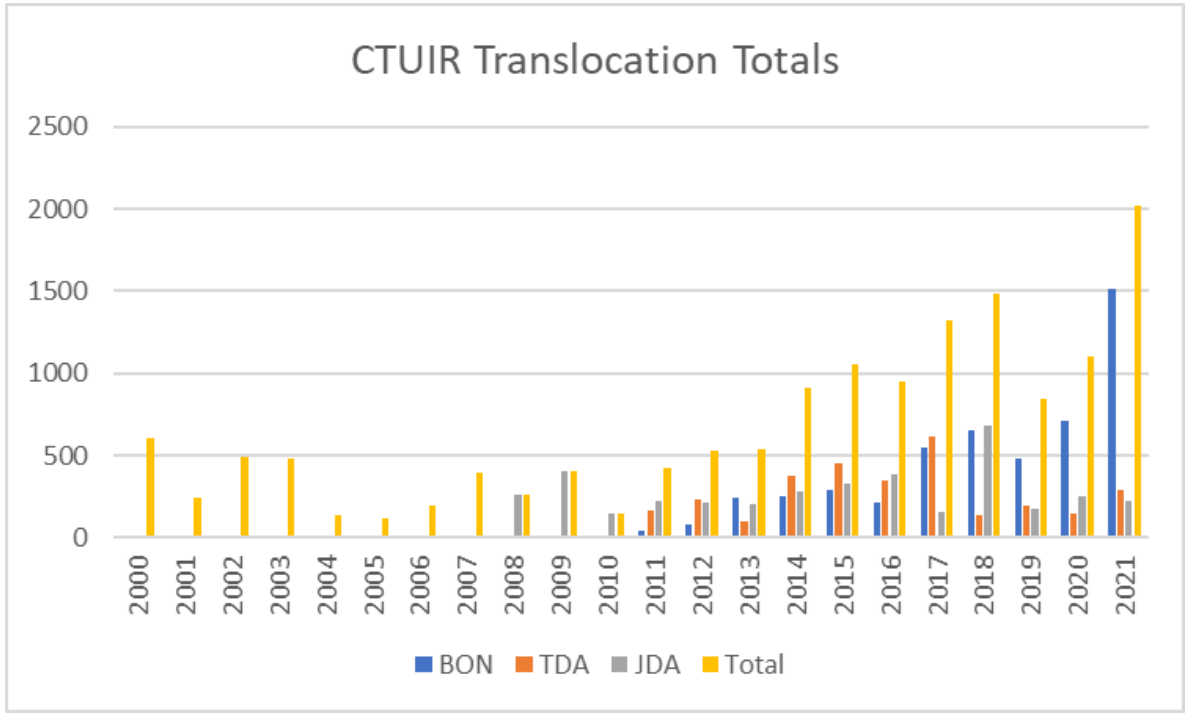
Bonneville Dam counts and Willamette Falls escapement estimates for Pacific Lamprey



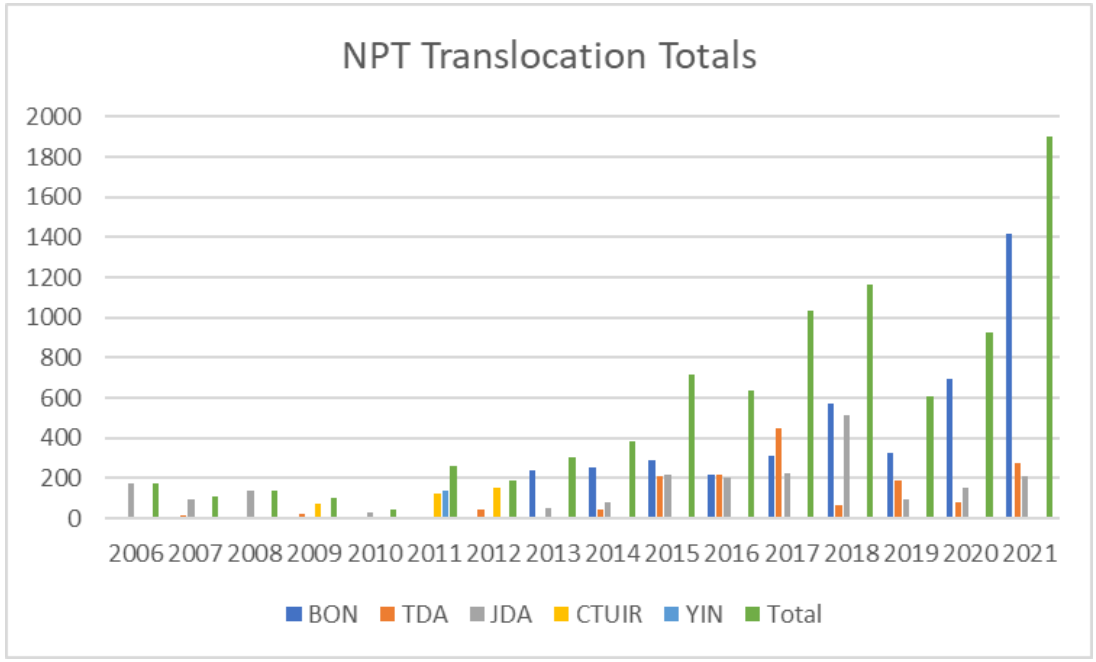
CONFEDERATED TRIBES OF WARM SPRINGS 1855

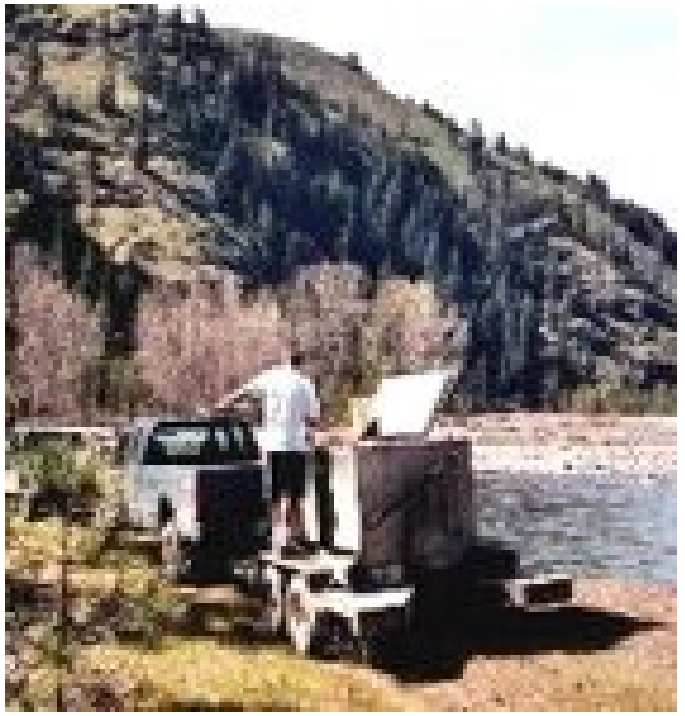

Legend
Lamprey Sites
Adult Collection, CRITFC/3T
Adult Holding, NPT
Adult Release, CTUIR
Adult Release, NPT
Adult Release, YN
Adult Voalitional Return, CTUIR
Adult Voalitional Return, CTWSRO
Larvae Dam Collection, CRITFC
Larvae Dam Collection, NPT
Larvae Screwtrap, CTUIR
Larvae Screwtrap, CTWSRO
Larvae Screwtrap, NPT
Larvae Screwtrap, YN
Larvae efish, CTUIR
Larvae efish, CTWSRO
Larvae efish, NPT
Larvae efish, YN
Ocean Survey, All
Columbia/Snake Rivers
Columbia Basin
Click to add text
Vancouver
Nanaimo
Victoria
Seattle
Olympia
Spokane
Kennewick
Portland
Salem
Oregon
Idaho
Boise
Lethbridge
Cabinet Mountains
Lewis Range
Rocky
Blue Mountains
Cascade Range
Coastal Ranges
Absaroka Range
Harney Basin
NEZ PERCE TRIBE
TREATY OF 1855
CONFEDERATED TRIBES OF WARM SPRINGS 1855
CAYUSE - WALLA WALLA - UMATILLA
CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
Treaty of 1855

Confederated Tribes of the Umatilla Indian Reservation Translocation

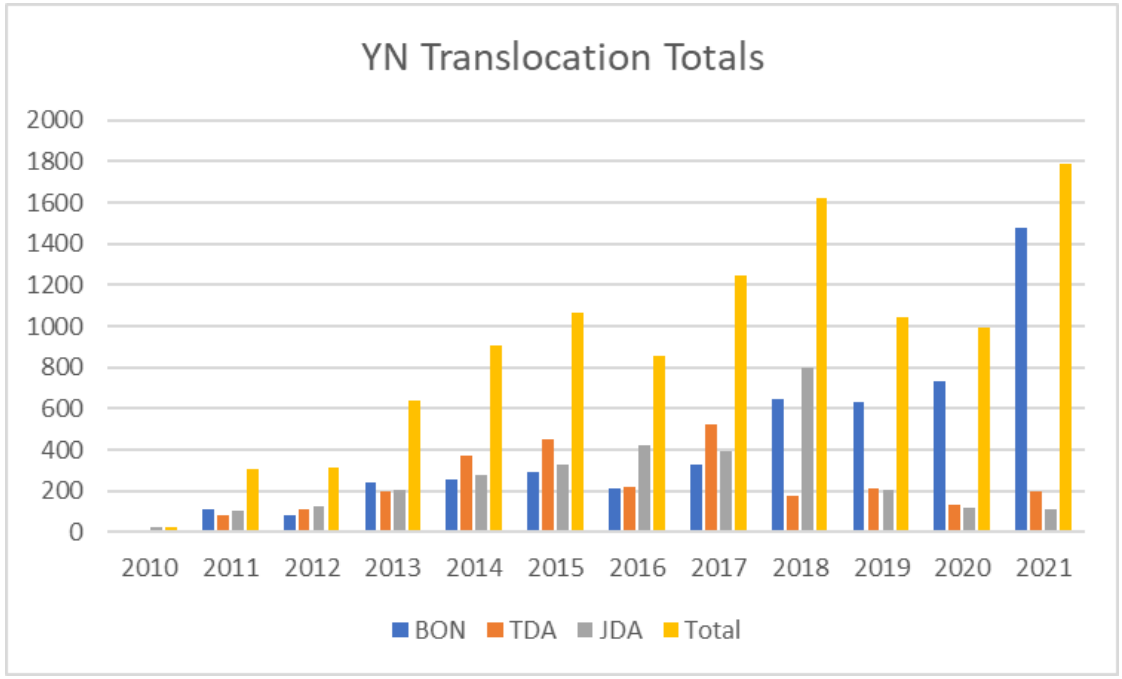


Nez Perce Tribe Translocation





Yakama Nation Translocation



Outline

- the dataset of the published study
- larval and juvenile boost
- Snake River juvenile abundance
- Snake River natal-origin adults at BON?
- ocean residence time?
- Juvenile-to-Adult-Return (JAR) model
- Snake River translocation adults at BON?
- yeah, your model says so, but really?!
- preference of migration route? Willamette vs BON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FEATURE ARTICLE

Pacific Lamprey Translocations to the Snake River Boost Abundance of All Life Stages

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Hess et al. 2022. Pacific Lamprey translocations to the Snake River boost abundance of all life stages. Transactions of the American Fisheries Society151:263–296. DOI: 10.1002/tafs.10359263

the dataset of the published study

Translocation program

Primary goal- Interim abundance of larvae

Secondary goal- direct & indirect boost abundance of all life stages

Ultimate goal- restore ecosystem services & sustainable harvest

Genetic monitoring

Measure direct success

Direct success = larval, juvenile, and adult offspring

the dataset of the published study

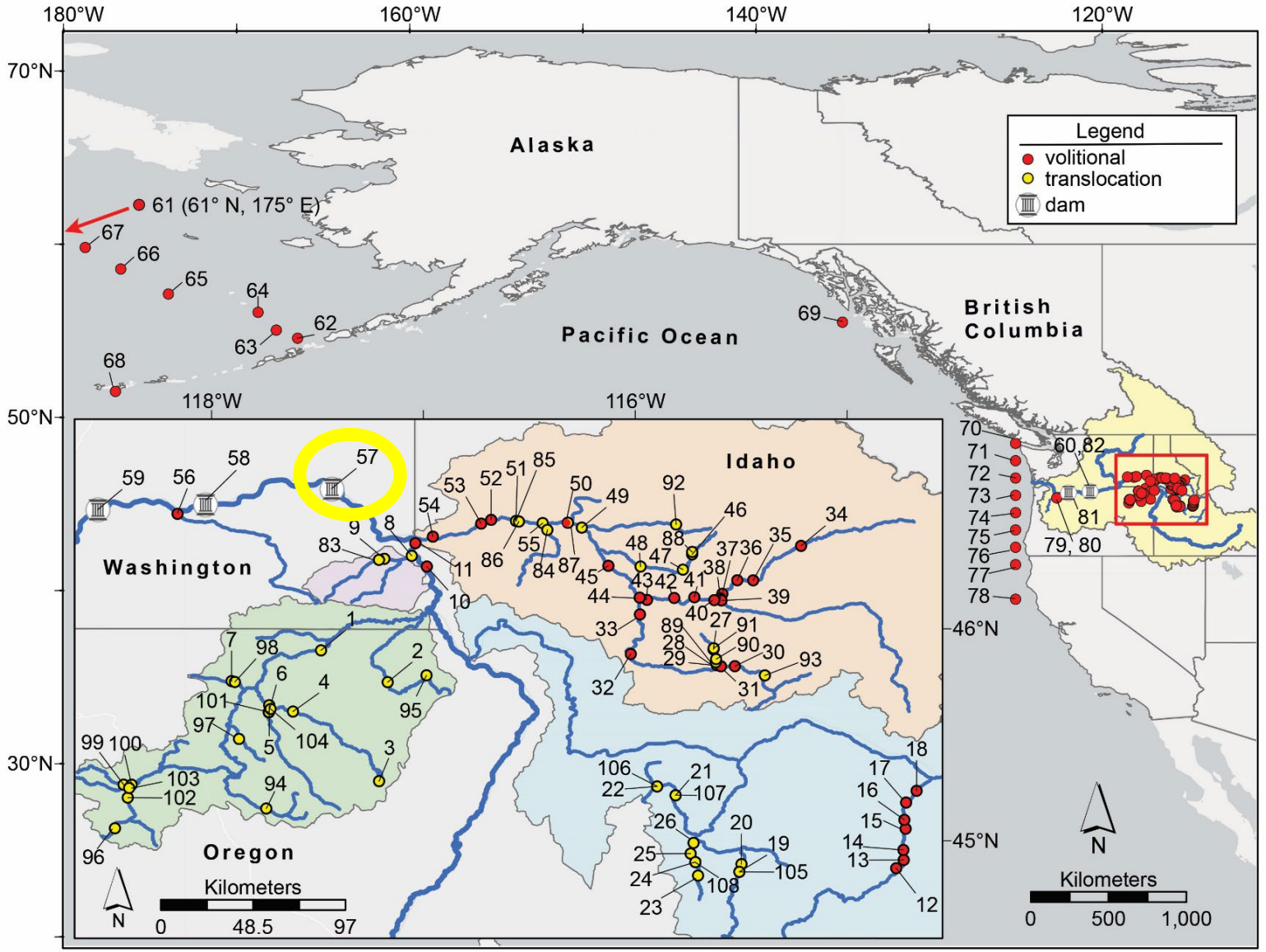
N = 25,856

Parent = 6,899

Larvae from Tran. Sites = 3,481

SNPs = 260

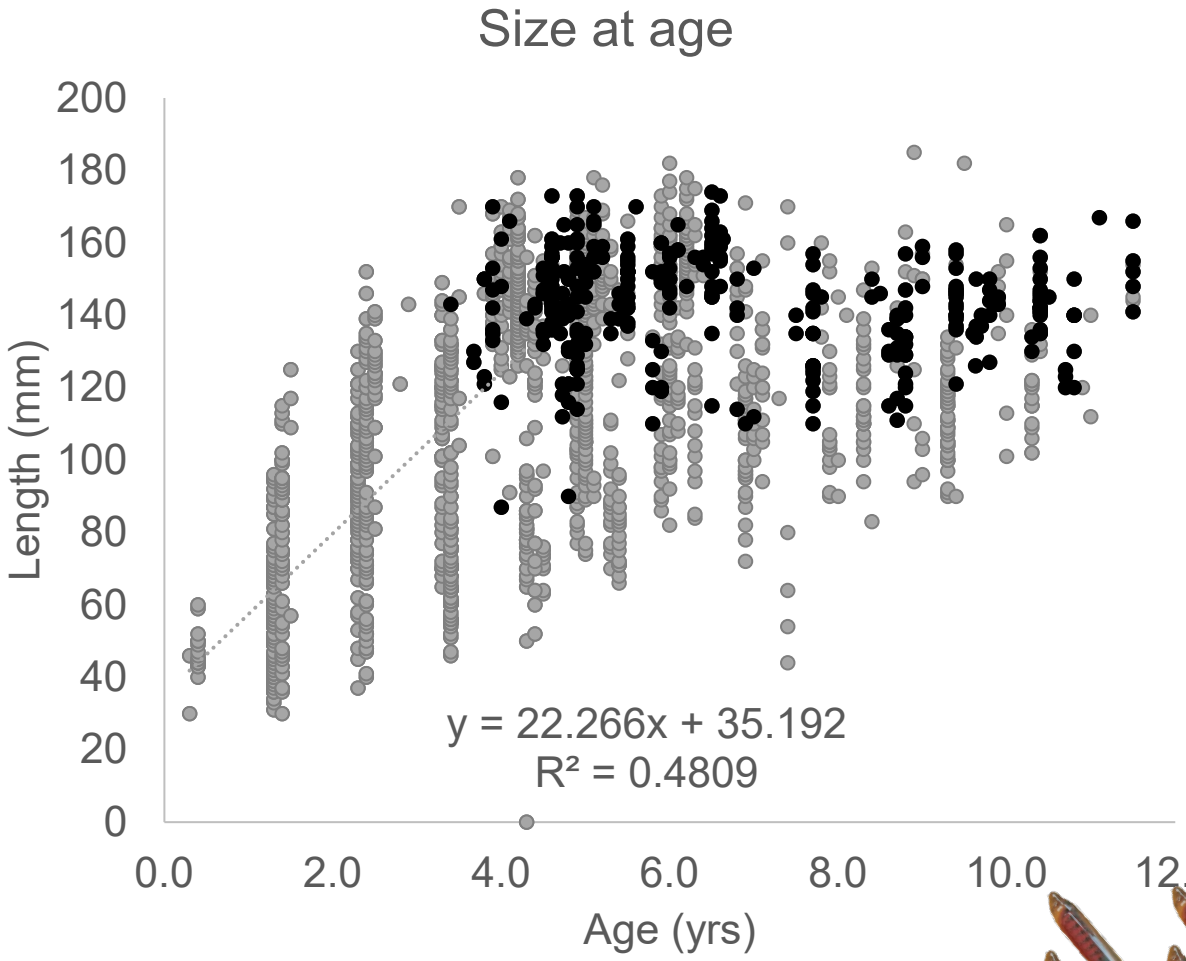
Natal origins from Parentage & Sibship



Putative volitional

Translocation

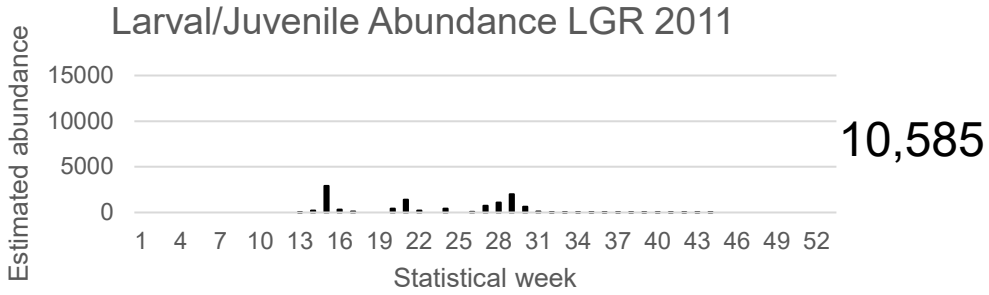
larval and juvenile boost



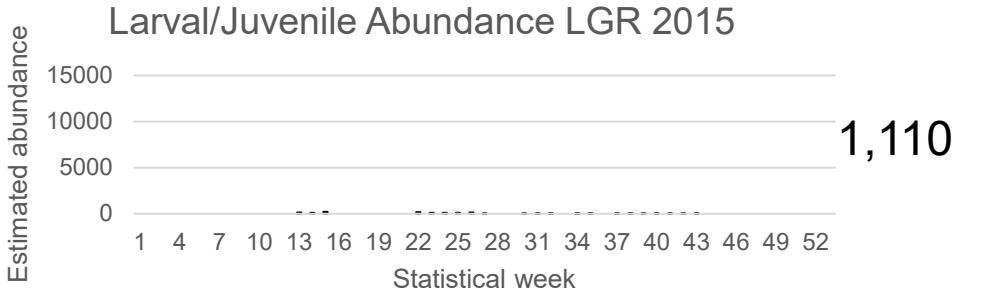
Direct boost for larval and juvenile abundance?

Presence of translocation larval offspring confirmed!
1,982 parent assignments, 89% in translocation areas

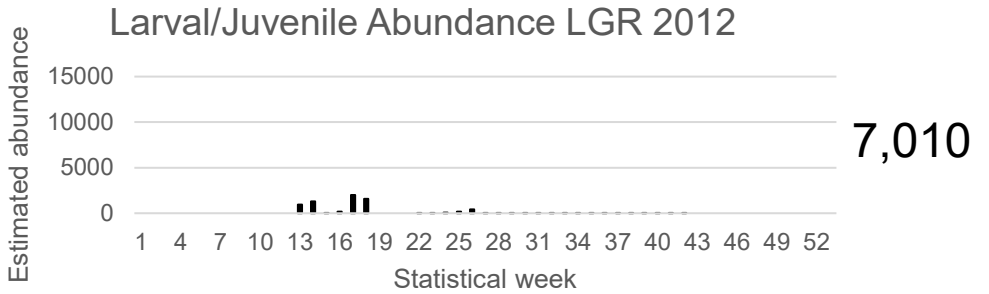
Snake River juvenile abundance



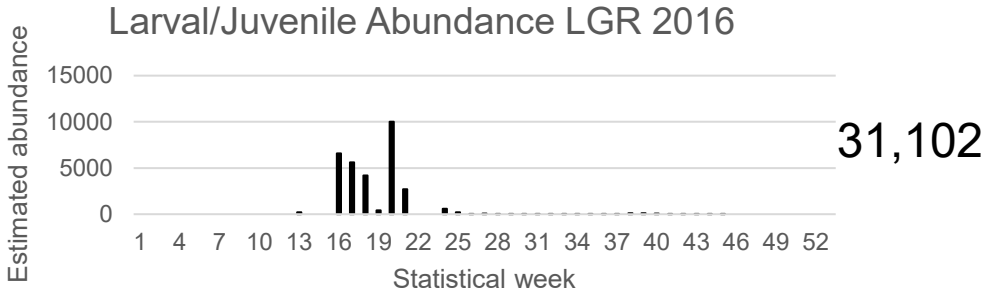
10,585



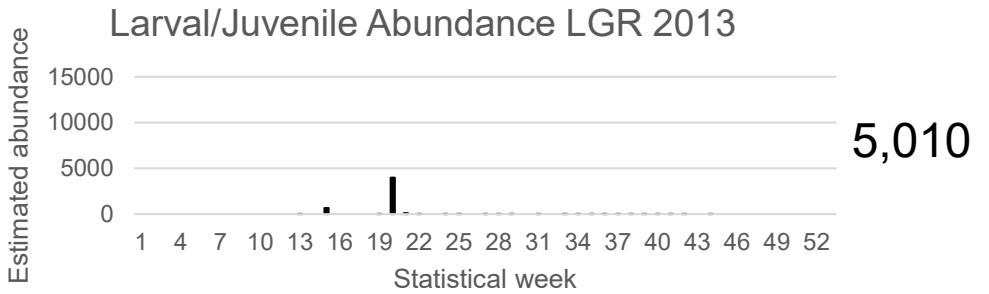
1,110



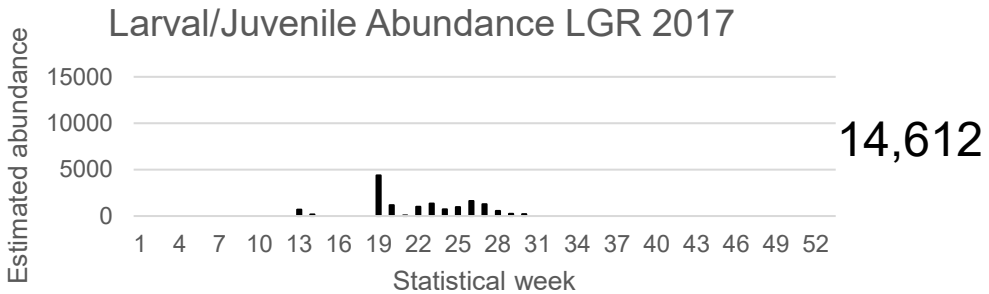
7,010



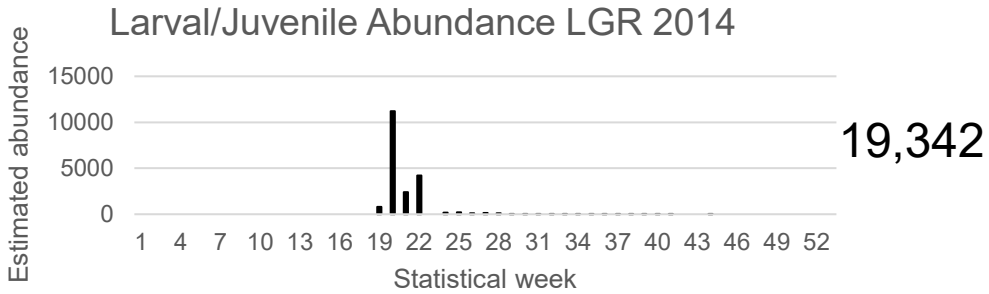
31,102



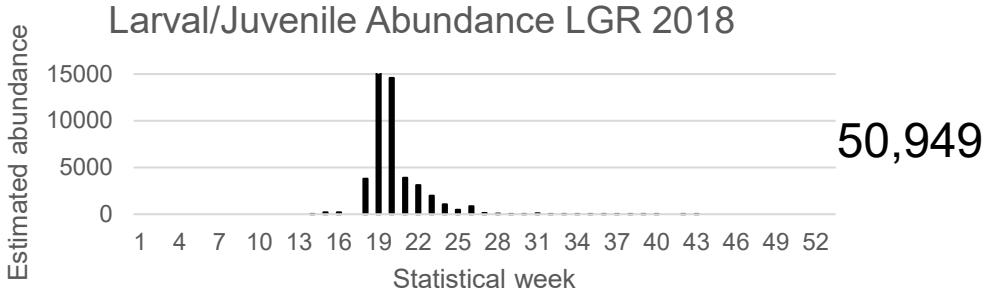
5,010



14,612

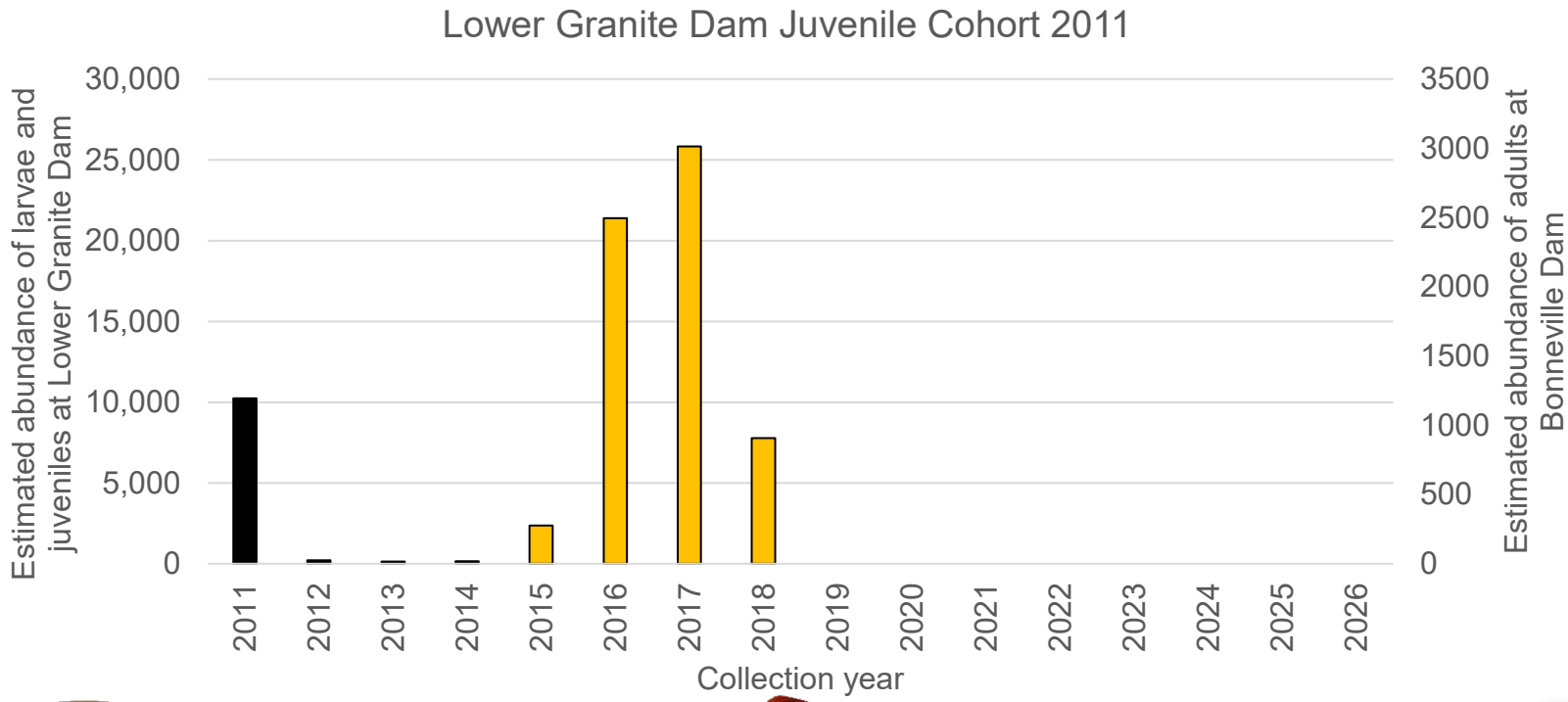


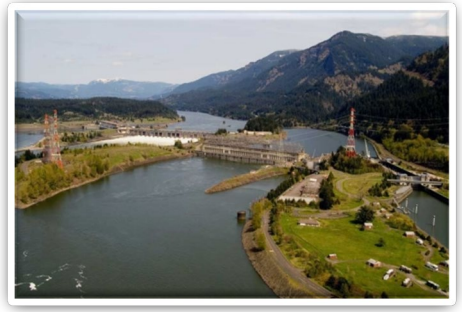
19,342



50,949

Snake River natal-origin adults at BON?



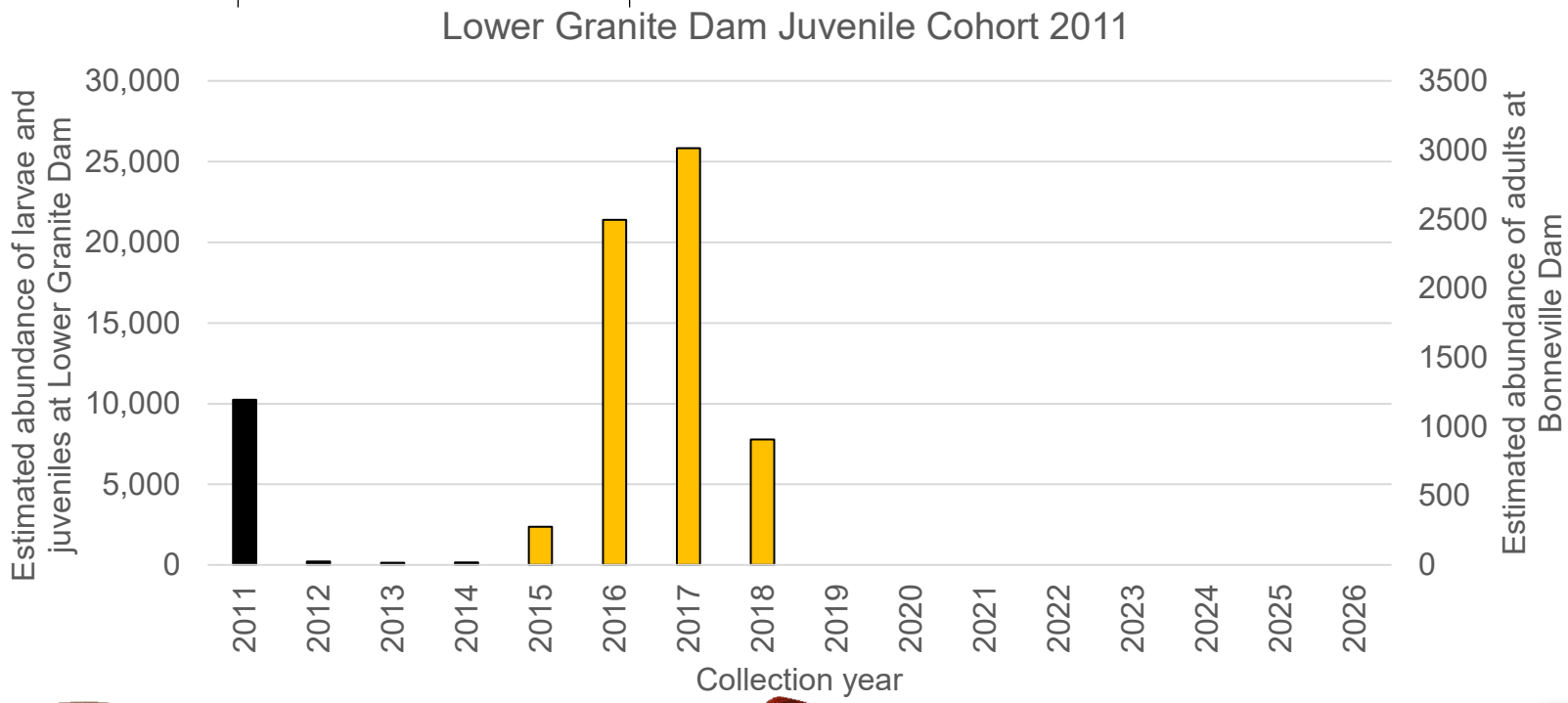


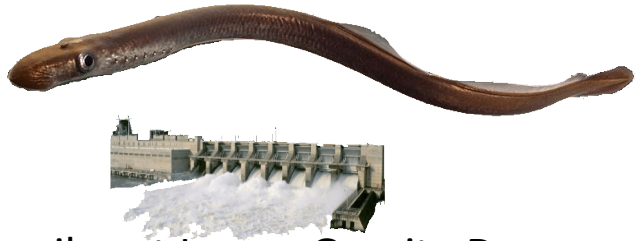
Juveniles at Lower Granite Dam

Adults at Bonneville Dam

ocean residence time?

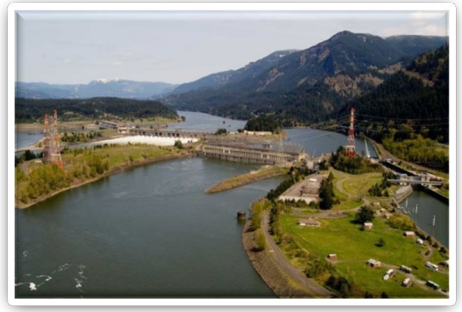
5.5 ocean years



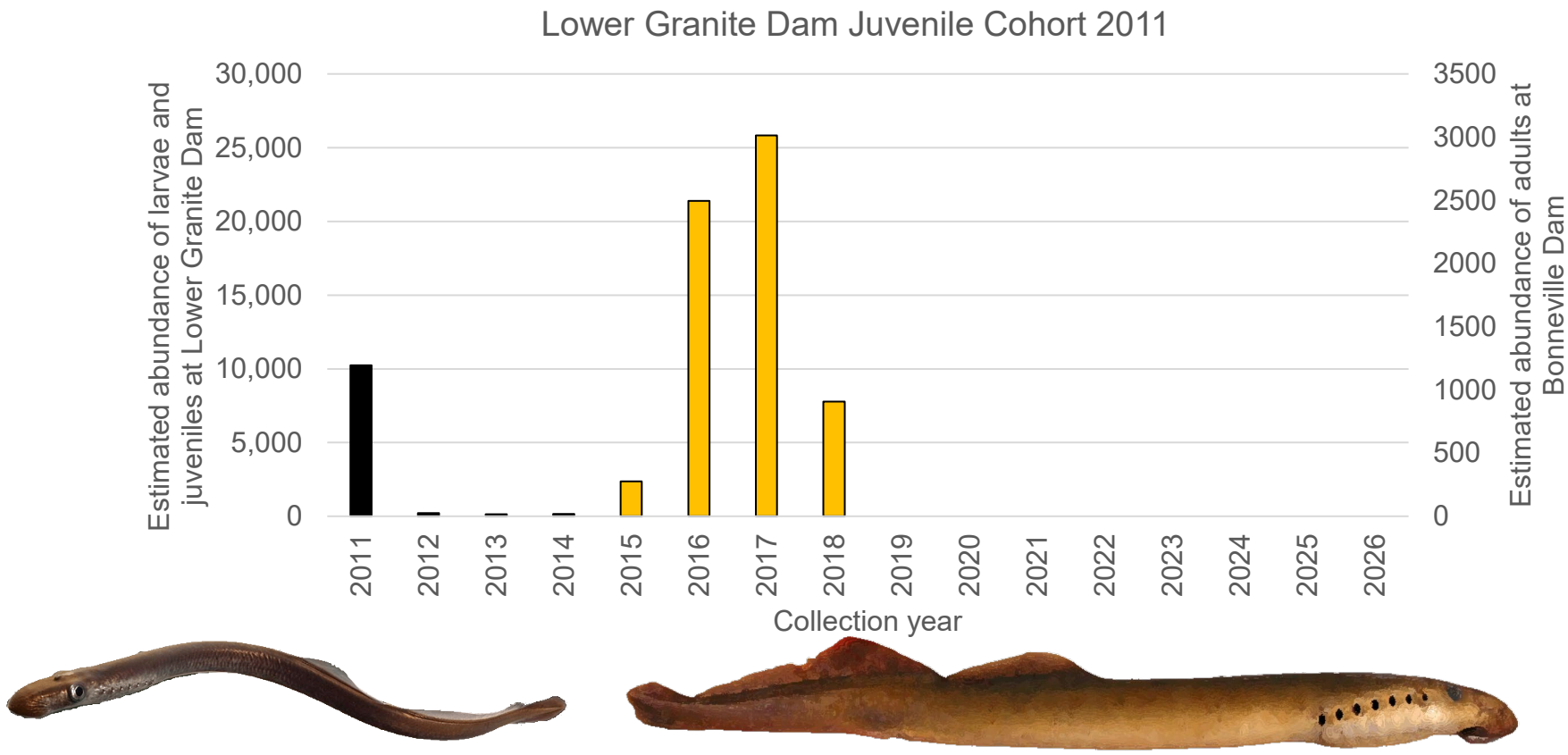


Juveniles at Lower Granite Dam

Adults at Bonneville Dam

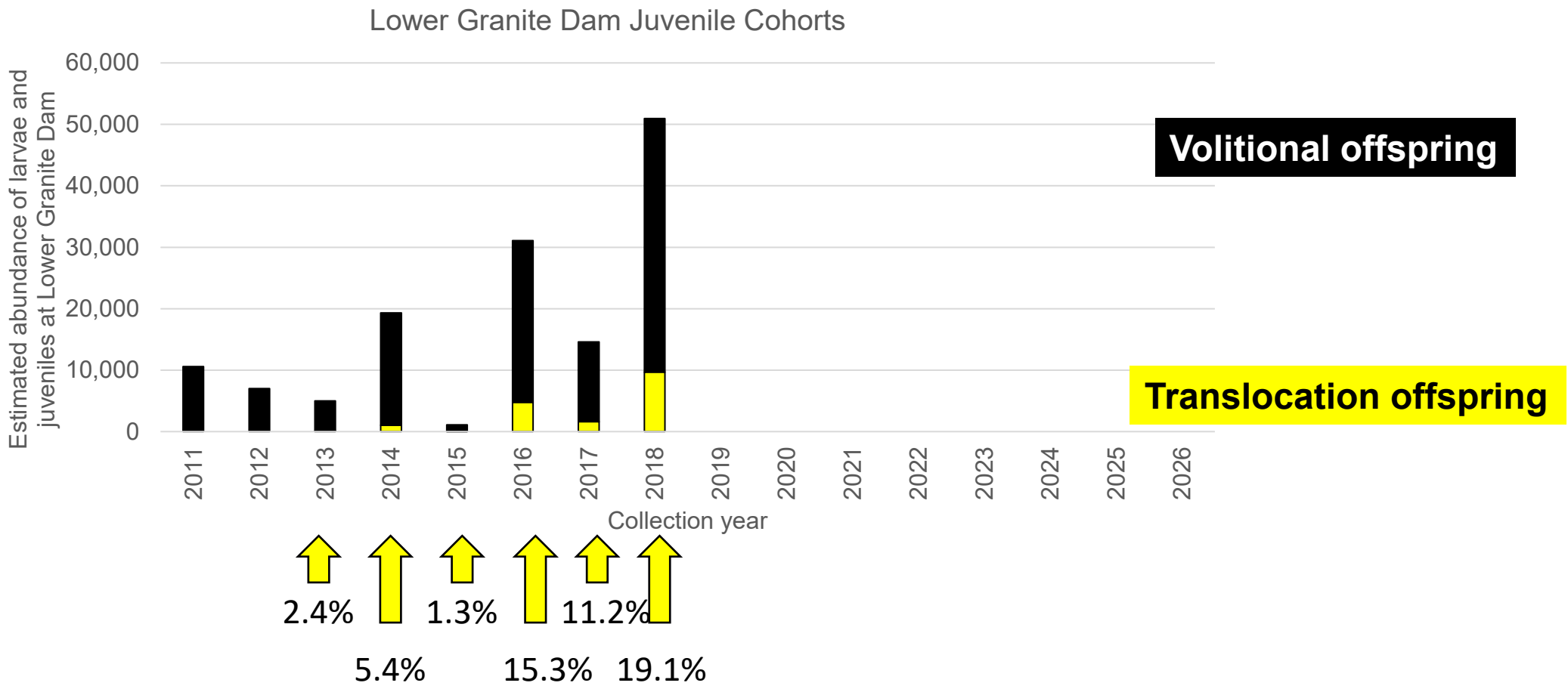


Juvenile-to-Adult-Return (JAR) model

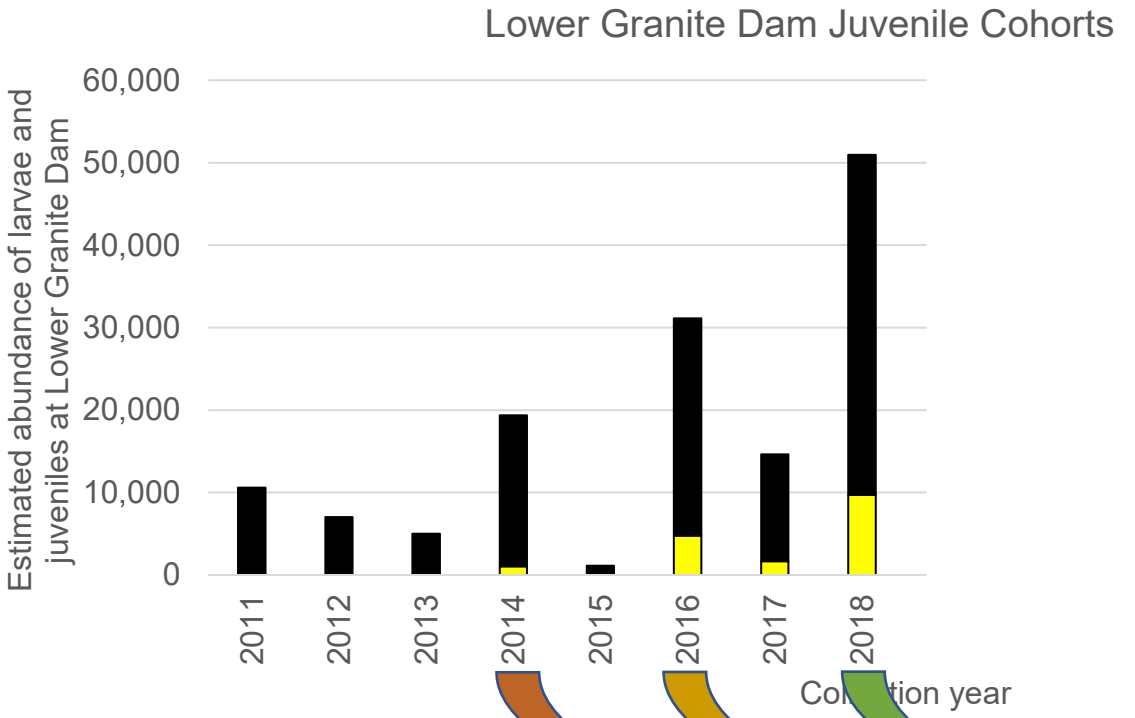


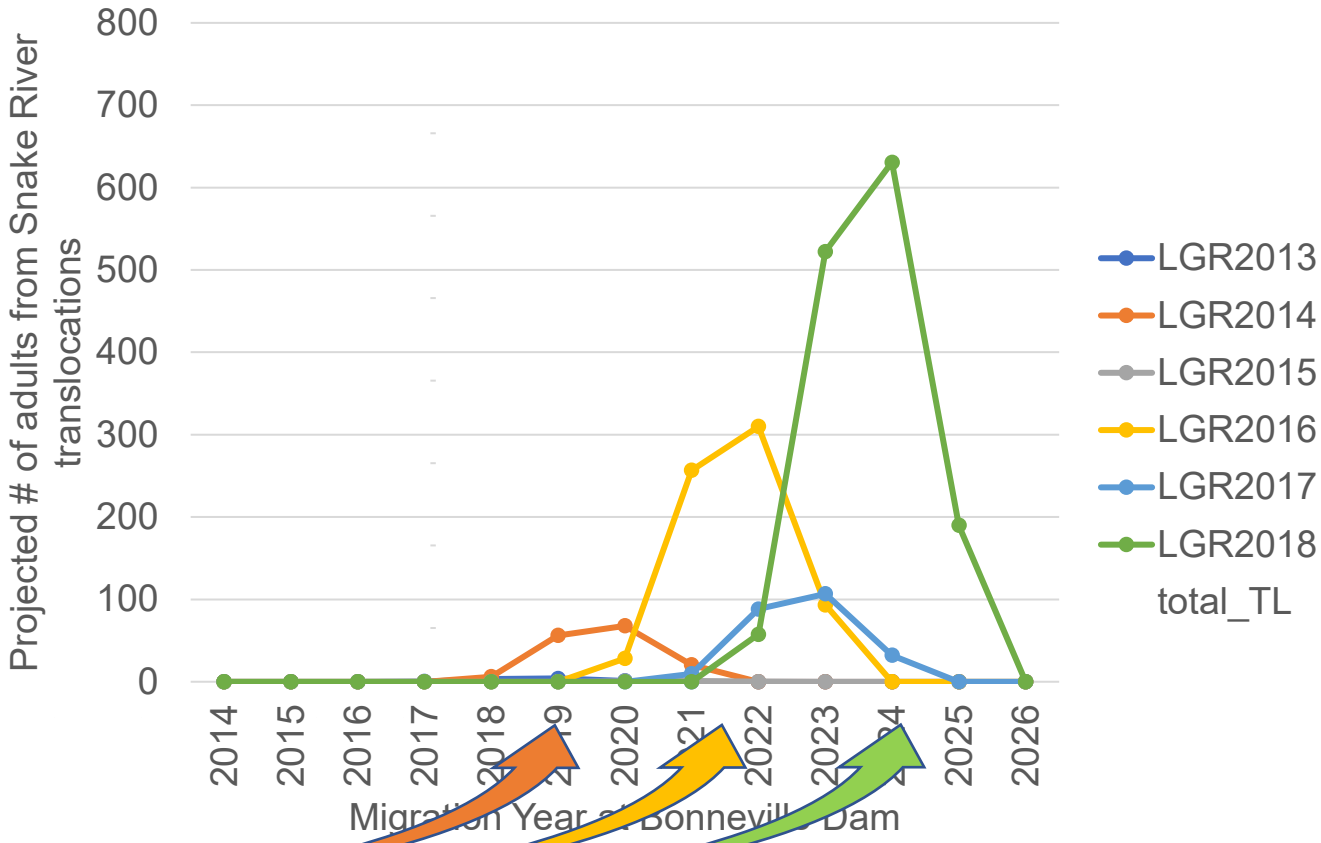
Juvenile-to-Adult-Return (JAR) = 10,585 / 6,693 = 1.58

Snake River translocation adults at BON?

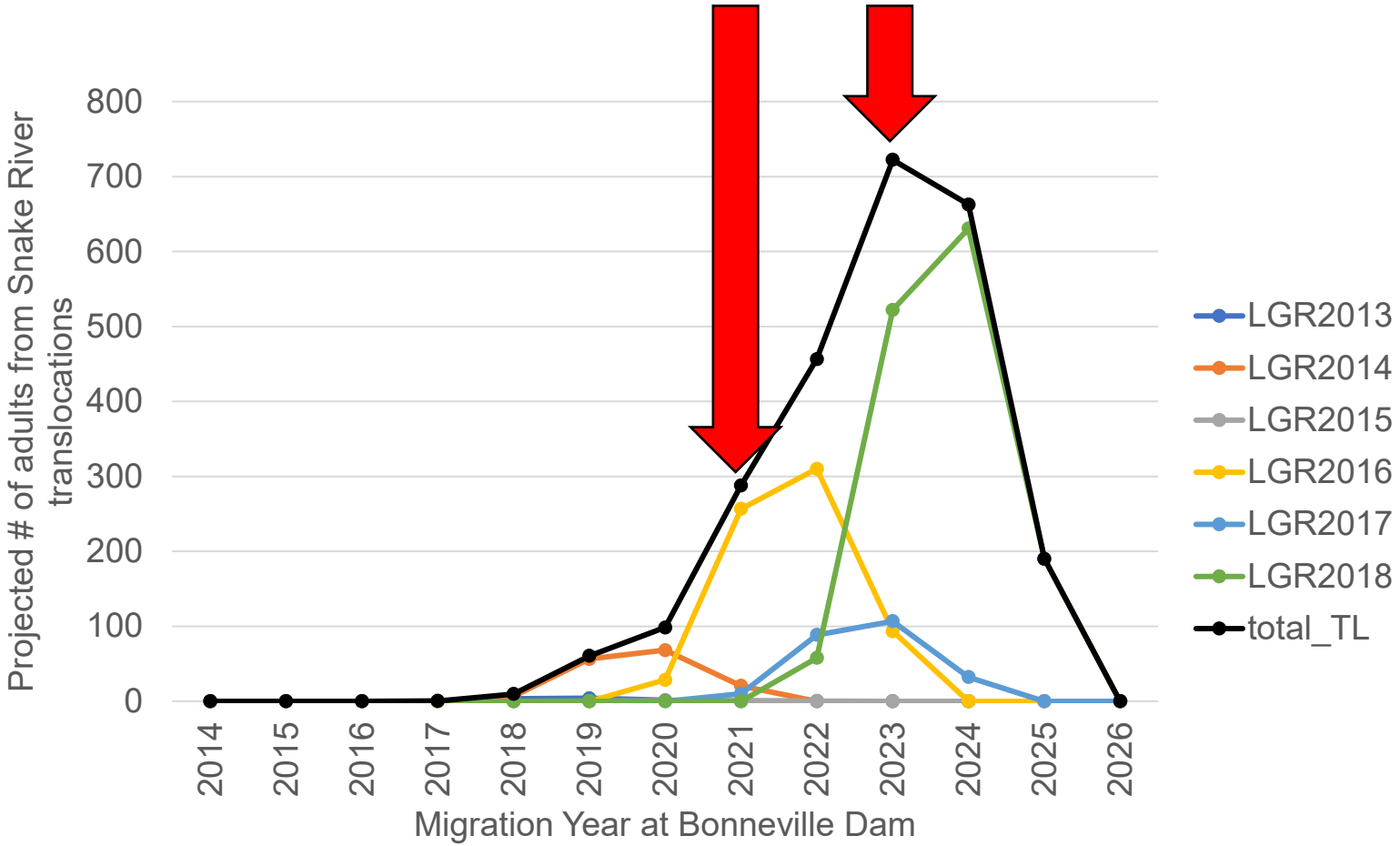


Snake River translocation adults at BON?

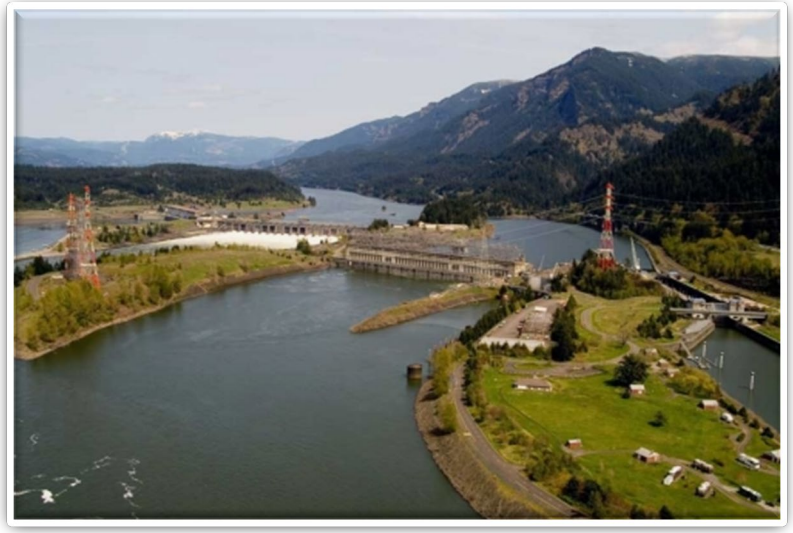




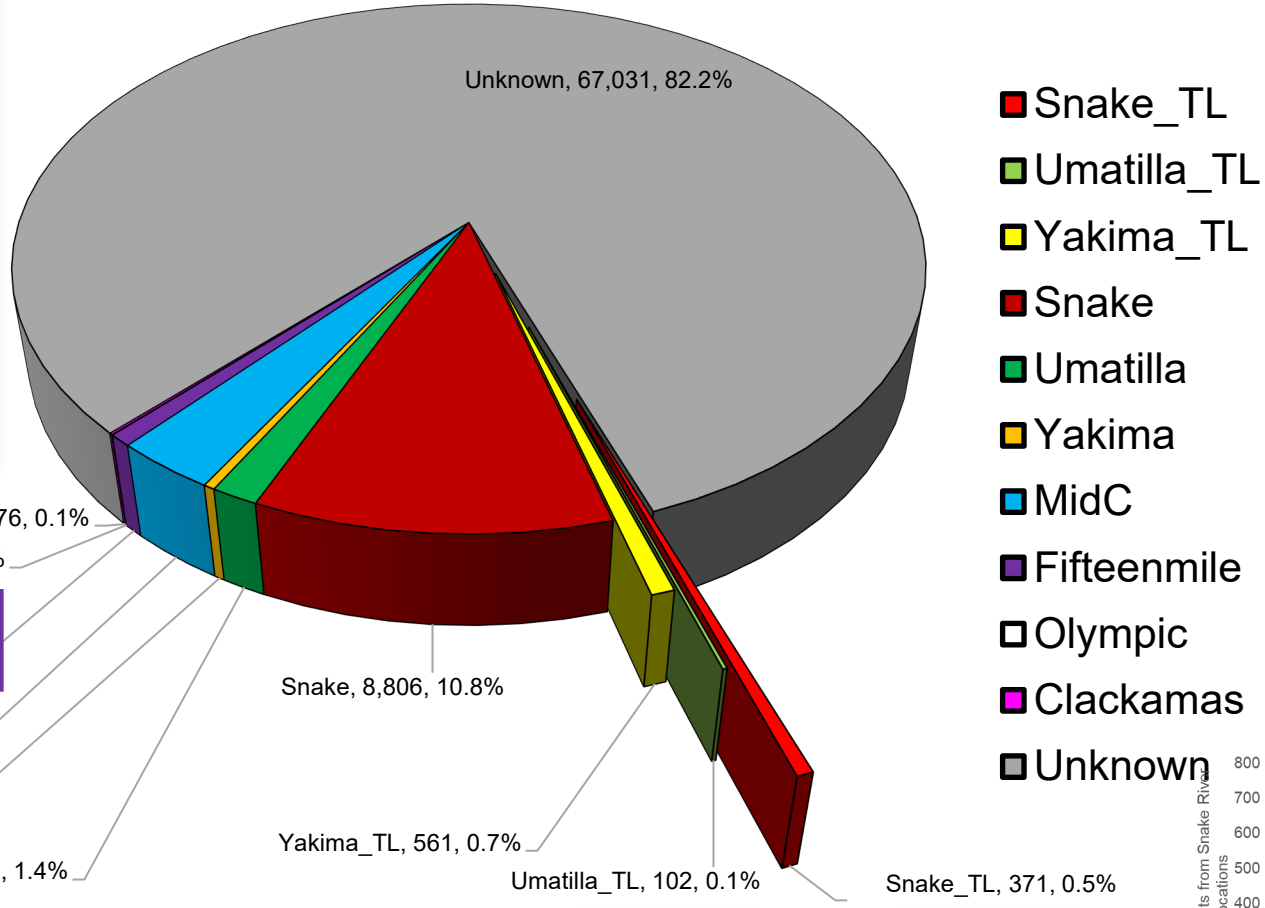
Snake River translocation adults at BON?



yeah, but really?!

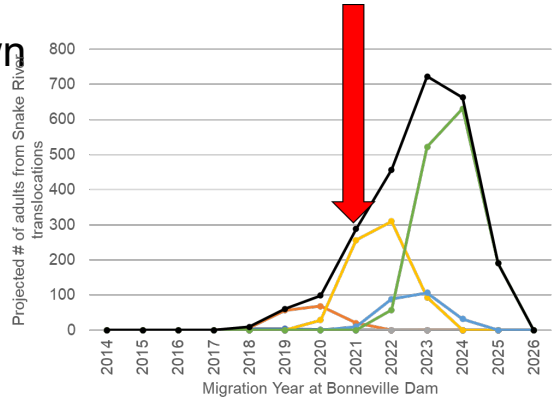


Bonneville Dam Pacific Lamprey Adult Migration Year 2021



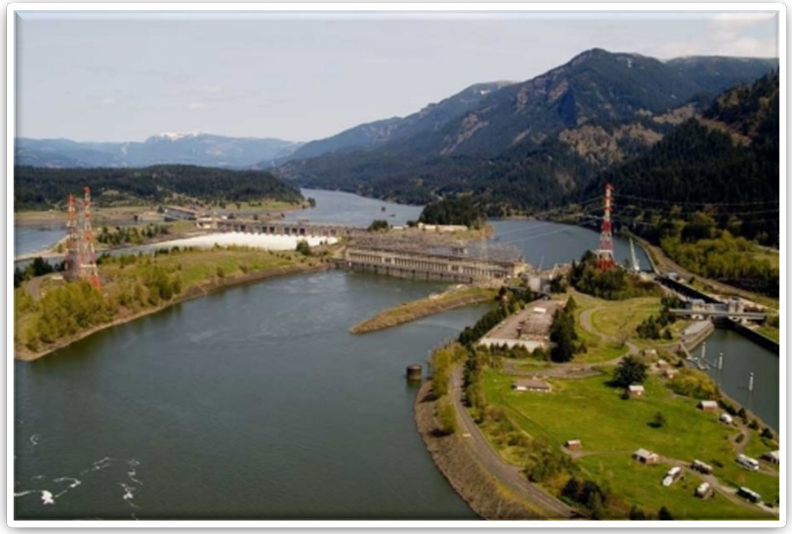
MY21
Run siz
81,566

Translocation = 1,034 adults



preference of migration route?

Willamette Falls
Willamette River



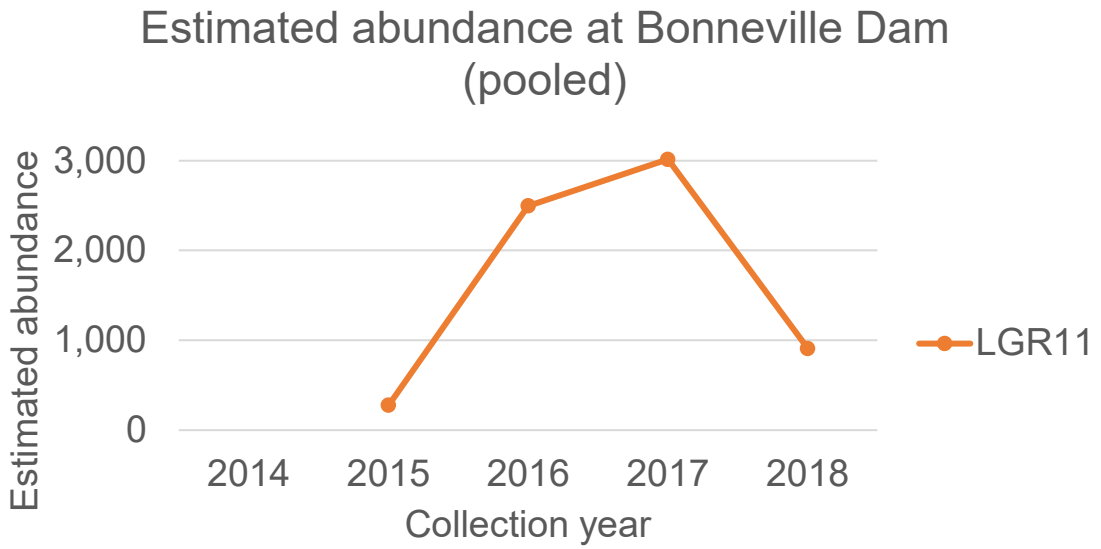
Bonneville Dam
Columbia River

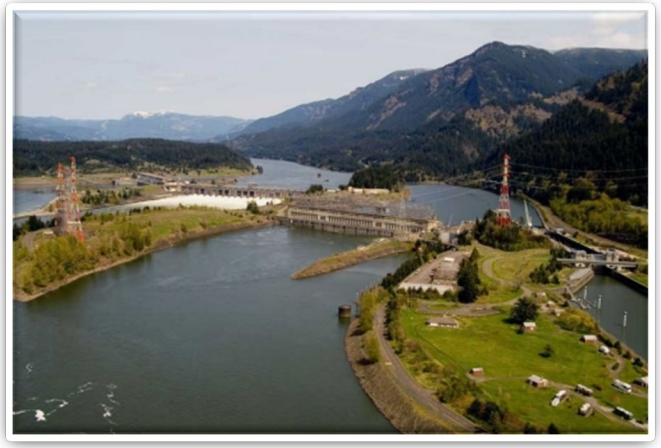
water?...check.
passage?...check
friends?...

preference of migration route?

Cohort 2011

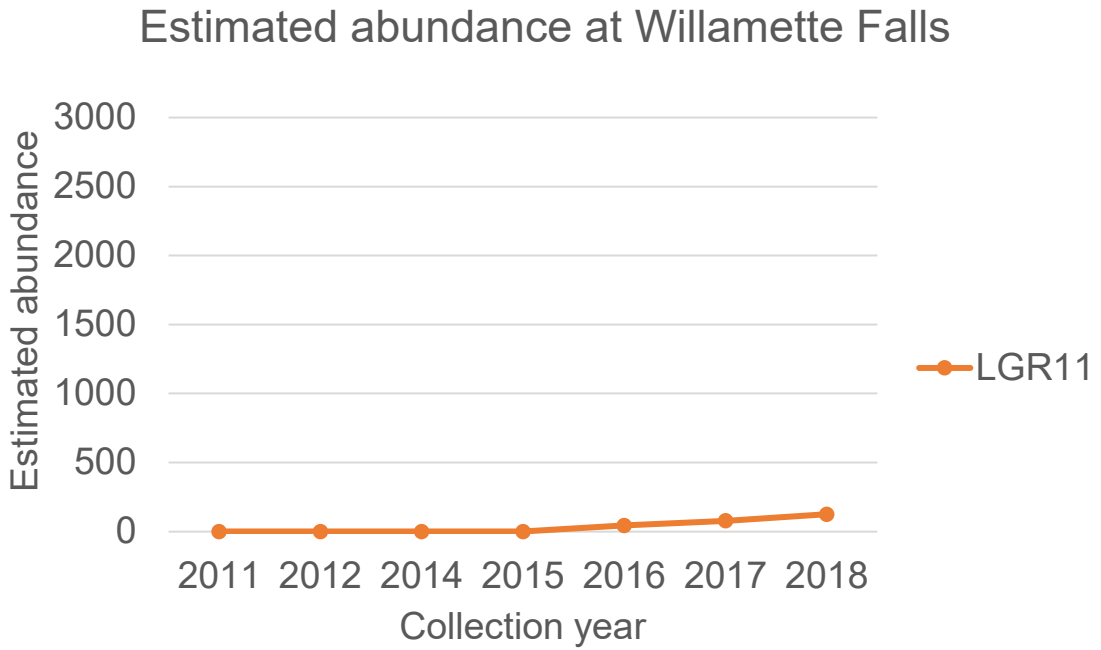
Bonneville = 3,014 (97%)





Bonneville Dam

Willamette = 78 (3%)



Total = 3,092

Pictured: Henry Begay at Willamette Falls
Photo credit: Michael Durham


Photo credit: Jeremy FiveCrows

Conclusions

- **Snake River natal-origins adults at BON?**
  Yes they return!
- **ocean residence time?**
  5+ years!
- **Juvenile-to-Adult-Return (JAR) model**
  1.6 larvae/juveniles to 1 adult return
- **Snake River translocation adults at BON?**
  700+ could return by 2023
- **yeah, your model says so, but really?!**
  300+ Snake River adults in 2021!
- **preference of migration route?**
  97% return to BON compared to WIL

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Acknowledgements

CONFEDERATED TRIBES OF WARM SPRINGS 1855

NEZ PERCE TRIBE TREATY OF 1855

CONFEDERATED TRIBES AND BANDS YAKAMA NATION TREATY OF

CAYUSE · WALLA WALLA · UMATILLA CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION Treaty of 1855

BONNEVILLE POWER ADMINISTRATION