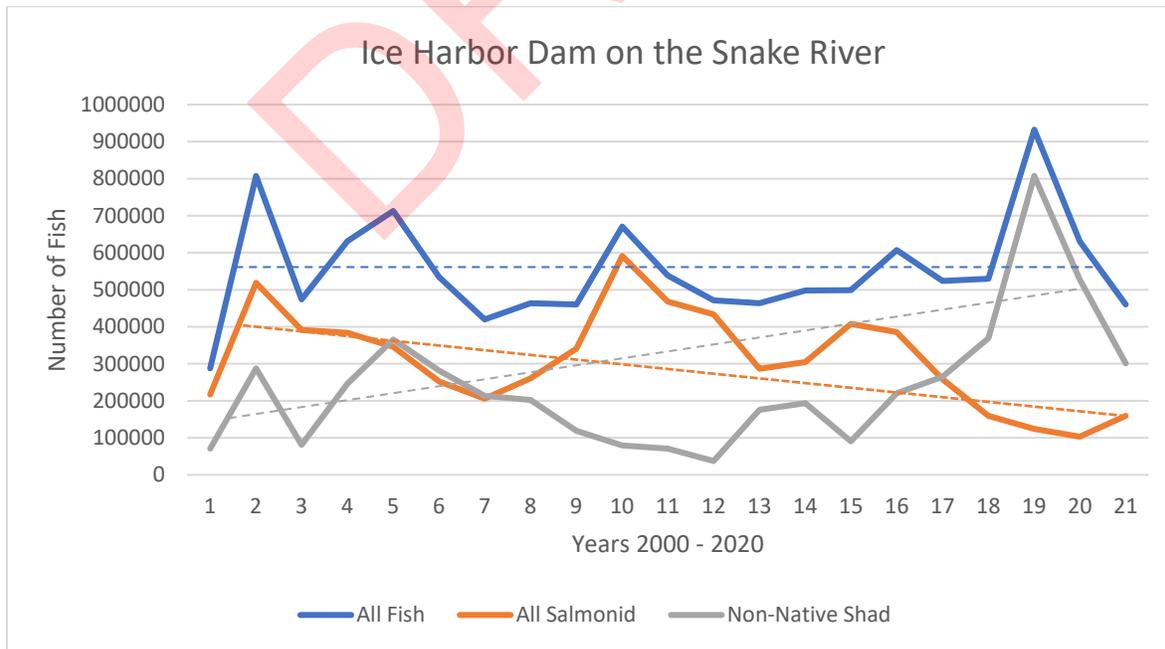


COST-EFFECTIVE SALMON RECOVERY AND INVASIVE SPECIES REMOVAL PLAN FOR THE SNAKE RIVER

Issue: With warming waters and changing ocean conditions, increased predation, and competition from invasive species, salmon runs in the Snake River are facing growing threats to their long-term sustainability and survival. While there is no one remedy that will address all of these pressures, improved fish passage can provide significant near-term benefit to the health of the salmon population in the Snake River. Dam removal is another option that has been proposed, though one that will take years to accomplish before any potential beneficial impact for the fish is realized. While the debate over the future of the lower Snake River dams continues, in the interim, fish passage and monitoring technologies now exist that are readily available and can be quickly installed. For a fraction of the cost of removal and without any negative impacts to the hydropower generation from these dams for the Pacific Northwest, action can be taken today to help the salmon reclaim upstream access and reduce pre-spawning mortalities.

Background: The Snake River is a tributary to the Columbia River. Prior to reaching the Snake River, salmon migrating from the ocean pass four dams on the lower Columbia River. Once they reach the lower Snake River, the fish then must pass an additional four dams - Ice Harbor, Lower Monumental, Little Goose, and Lower Granite. As they do so, they are also subject to increasing numbers of non-native and predatory fish species that have invaded these same waters and are using the existing fishways.

The graph below demonstrates the fish passage trends at Ice Harbor Dam, the first of the four lower Snake River dams (LSRD), over the last twenty years for both salmonids and non-native invasive shad. While the total number of all fish passing Ice Harbor dam has remained relatively stable (see blue trend lines) and averaged about 550,000 fish per year, the total number of salmon has decreased (see orange trend lines), with a contra-relationship to the number of shad (see gray trend lines) migrating through the Ice Harbor fish ladders over the last 10+ years.



Source: DAT Data Citation. Columbia River DART, Columbia Basin Research, University of Washington. (2021). Adult Passage Annual Counts. Available from http://www.cbr.washington.edu/dart/query/adult_annual_sum.

Proposed Solution: Technology exists allowing for selective fish passage at each of the LSRD via a volitional portal and sorting system (details on the technology can be found at - www.whooshh.com) that automatically identifies and rapidly removes non-native shad while safely passing native salmonid – all in under a minute. "The system will simultaneously and more accurately count every fish. AI enabled classification of target species is also possible with high definition images captured of every fish migrating upstream. Tied to automated sorting removing non-native species like shad will reduce salmonid stresses, migration delays, and even downstream mortality when

juveniles migrate by reducing predation between dams. Avoiding any use of warm surface waters from the forebay for upstream passage of adult salmonid, as occurs with ladders, will also reduce salmonid attraction delays and pre-spawning mortalities during their migration and mitigate the impact of climate change on the fish. A noteworthy side benefit by not using the forebay waters for fish ladders 24 x 7, more water can be reserved and then made available to optimize water management practices to increase power production while enhancing habitat conditions downstream. These actions may well enable the salmon to begin their recovery before any other action is taken and is a critical first step for any LSRD proposal. Finally, we can estimate that the upfront costs for the new fish passage systems will be returned in less than 10 years. Based on DART fish count data at Ice Harbor and Lower Granite and practical experience in deploying systems in the Pacific Northwest over the past decade, it is expected that selective fish passage infrastructure will reduce the number of migrating shad by more than 90% at Ice Harbor dam and correspondingly increase the number of salmon successfully passing the last LSRD, Lower Granite, from 8%-50% depending on the species.

Proposed Schedule:

Q1 FY22: Direction and funding to the U.S. Army Corps of Engineers (USACE) to begin permitting applications and complete permitting process for new selective fish passage systems at the LSRD.

Q1 FY22: Engage contractors to provide a detailed report on ladder maintenance savings/extra power generation at each of four dams to validate economic estimates below.

Q1 FY22: Procure contracts for advanced selective fish passage portals for the LSRD. Deliverables to include:

Q2 FY22: Build & Install fish recognition system designed to fit both Ice Harbor fish ladders for the scanning of all fish species and removal of shad to prevent their passage. Begin data collection and image retention of each fish scanned to establish base line data starting Q1 FY22.

Q3 FY22: Design layout of fish passage portals at each dam.

Q4 FY22: Direct USACE to complete infrastructure deliverables for installation of two fish passage portals at each dam per design requirements. (See Assumptions)

Q1 FY23: Begin deployment of fish passage portals at the LSRD

Q2 FY23: Complete deployment of fish passage portals at the LSRD

Q4 FY23-32: Passage as a Service – includes adaptive management with use of fish passage equipment, maintenance, support & data - contractor to inspect, train, deploy, maintain and support fish passage portal equipment, and provide data/reports for each installation.

Assumptions & Infrastructure: Permitting, access, attraction water, power, and other infrastructure requirements described below are to be provided by USACE. Layout/routing will require passage over access roads both in the tailrace area and at dam crest. System exits may require anchoring for floating structures (designed by contractor) to accommodate forebay fluctuations. Similarly, tailrace integration may have to handle a range of stage heights. Some or all of the existing entrance ladder structures will be re-used, and tailrace water is provided for attraction flows. A minimum of four migrator tube sizes are required to accommodate the range of species sizes on each selective fish passage fishway.

Deployment Timeline: Operational Q3 2023 – Q4 2032

Preliminary Cost Estimates: FY22 Appropriations. \$67MM

Breakdown of Costs:

Estimated Capital Costs:

Permitting by USACE at each dam Est. \$500K x 4 ----- \$ 2MM

Infrastructure modification by USACE for each installation Est. \$1.5MM x 8 ----- \$12MM

Mobilization & installation costs for all systems Est. \$500k x 8 ----- \$ 4MM

Estimated Operating Costs:¹

Equipment, Maintenance, Support, Data for 8 Passage Portals FY22-32 ----- \$48MM

Total: \$67MM

USACE Cost Savings/Potential Revenue - Based on previous studies related to USACE fish ladder sediment maintenance costs, it is estimated that USACE will save \$20MM (\$2M/yr x 10yr) at the LSRD on fish ladder maintenance. In addition, by not using forebay waters to feed the existing fish ladders, the potential increased hydropower generation capacity can produce up to \$60MM (\$6M/yr x 10yr) in additional revenue, based on historical data.² We believe the sum of avoided costs of annual fish ladder maintenance and increased generation capacity with selective fish passage portal upgrades will provide significant near term benefits and improvements to help save our salmon and remove invasive species. .

Summary: Improved selective fish passage systems will have an economic impact that offers massive ROI for PNW stakeholders. It is estimated that for every extra salmon transported above the LSRD per year, it will increase the number of salmon returning to spawn and help support the \$1+ billion commercial and recreational salmon fisheries in the PNW. Additionally, it is expected that the invasive shad removal and potential biomass processing at the LSRD will provide new economic opportunities for local economies and tribal organizations.

Requested FY2022 Report Language: Army Corps of Engineers. *“The Committee recommends not less than \$67,000,000 to demonstrate advanced fish passage technologies at dams for endangered salmonids and removal of invasive species.”*

Budget Outline prepared by Whooshh Innovations

WHOOSH INNOVATIONS is a founding member of the Fish Innovations Network (FIN)



¹ Does not include costs associate with running any USACE pumps to provide attraction water

² See 2018 OVG report for historical data and LSRD fish ladder water calculations and pricing assumptions.

Note: References and reference materials/data are available upon request.