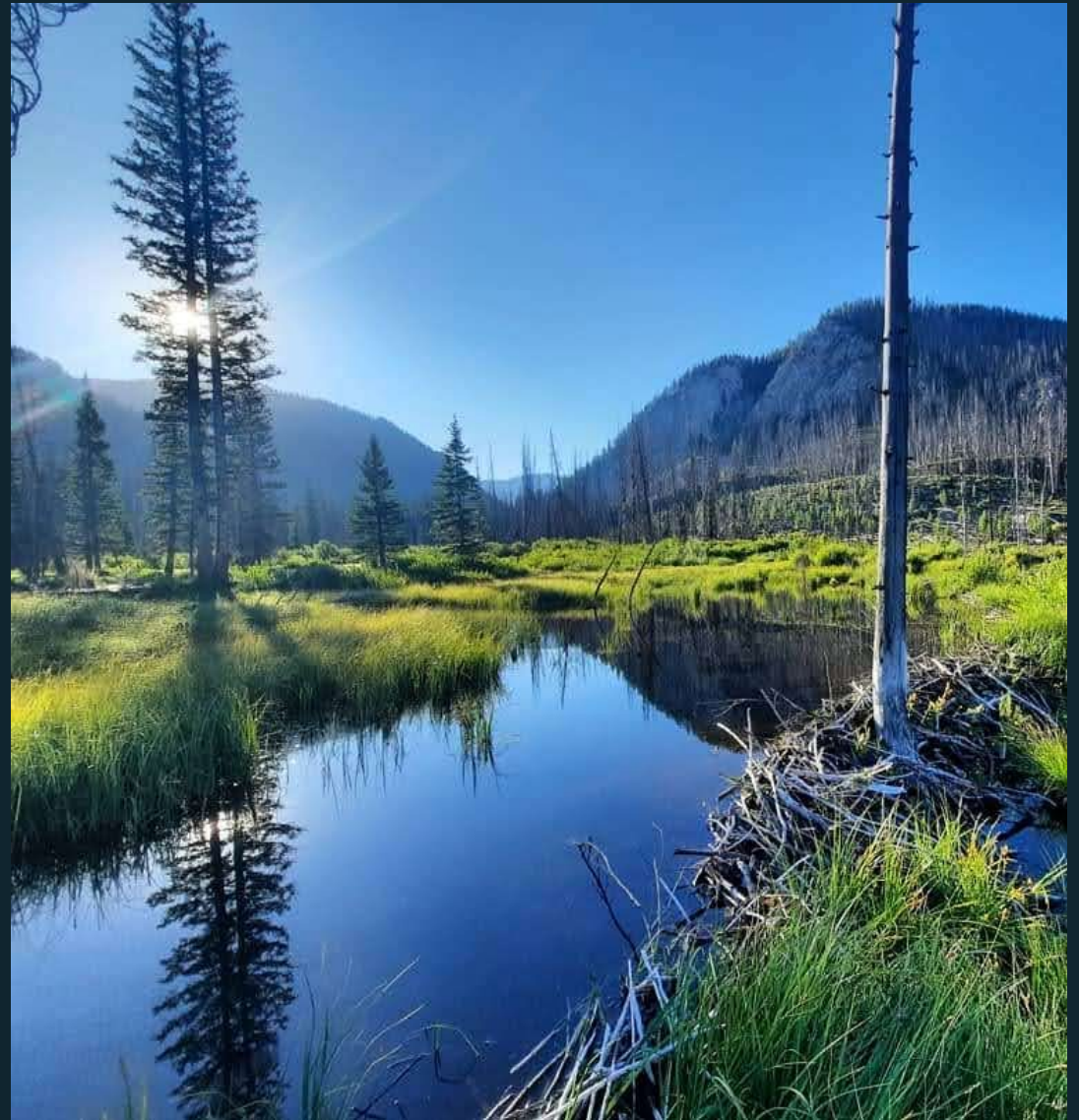

Implementation and evaluation of fish passage and habitat connectivity on the irrigated landscape

Kat Gillies-Rector

Anadromous fish screen program biologist



Outline

-
- Context
 - Screens
 - Tributaries
 - Watershed

Irrigating the arid west

- In Idaho, water is a public resource, owned by the public.
- The right to use water in the West is allocated based on who puts it to beneficial use.
- Homestead Act of 1862
- Desert Land Act of 1877



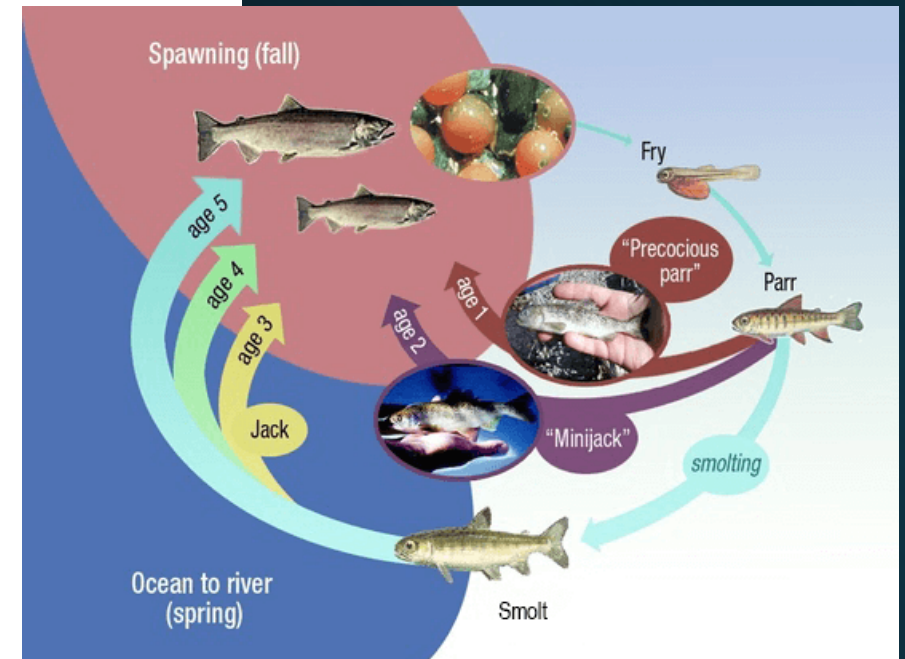
Irrigating the arid west

- Most fertile land converted to agriculture first, primarily in river floodplain and riparian areas
- Flood irrigation mimics natural flood pulse regime, withdrawing water in same locations as natural floodplain activation
- Primarily small, surface water, gravity diversions on private land



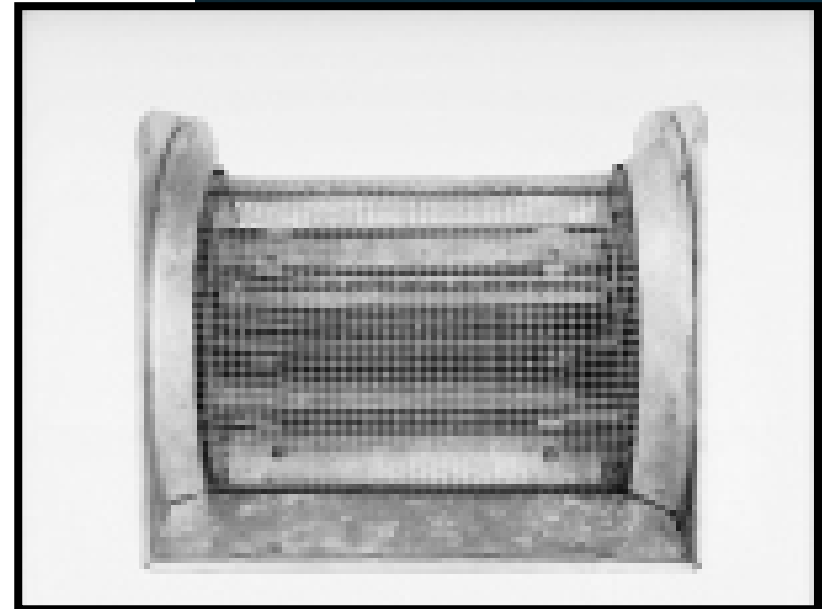
Anadromous fish overlap: temporal/LHS

- Complex life history strategy by life stage susceptibility to entrainment
- Timing within year of movements up and downstream
- Timing of movement to ocean, rearing timing within impacted habitats and lifetime susceptibility to entrainment



Idaho Fish Screens

- Grassroots, community-driven screening
- First major habitat undertaking in the basin
- Idaho screen program 1957-1966
 - 260 fish screens in Salmon River Basin



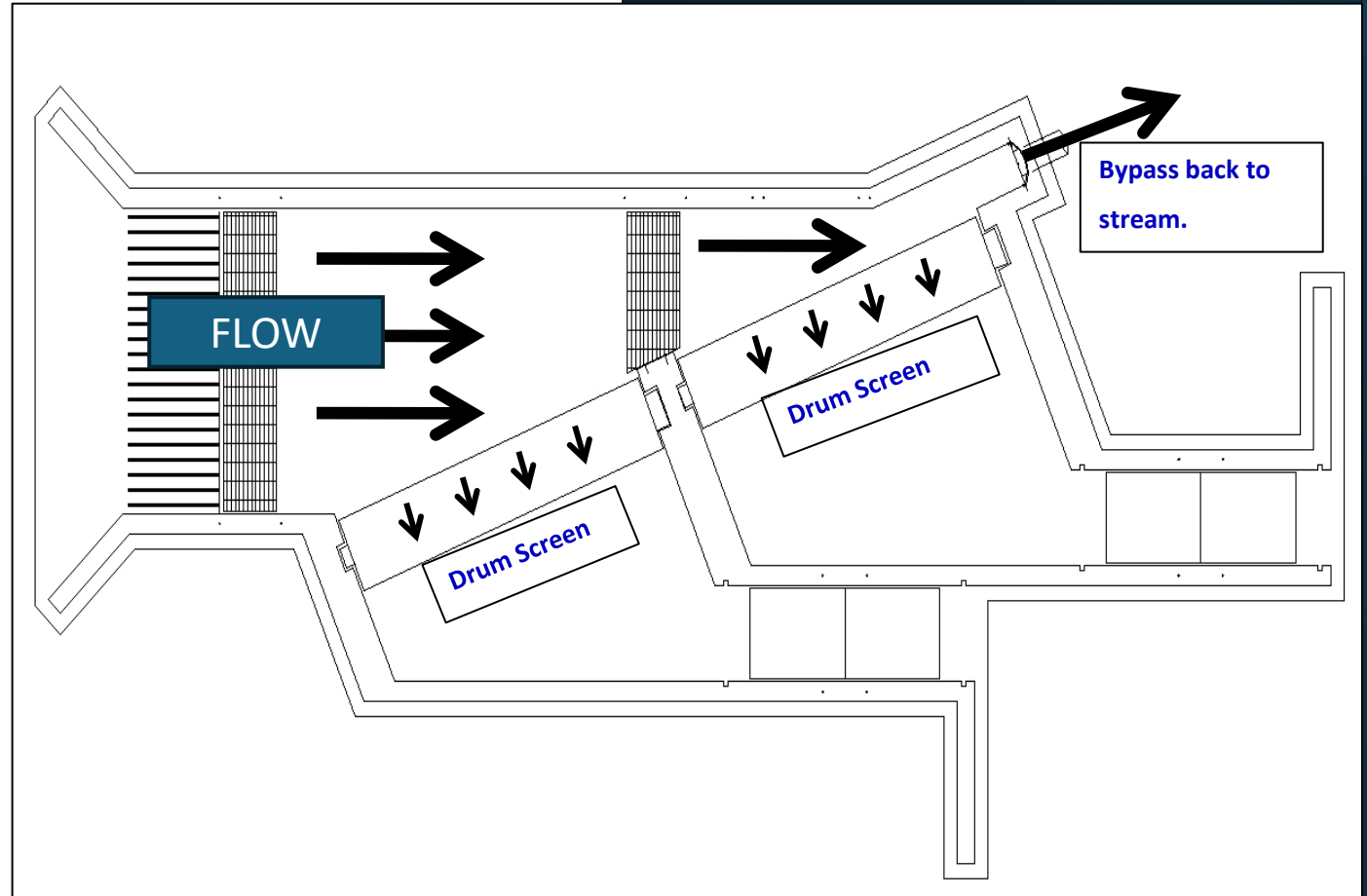
Idaho Fish Screens

- Listing of Chinook and steelhead in Snake River (1992, 1997)
- New funding mechanisms
- New screen criteria



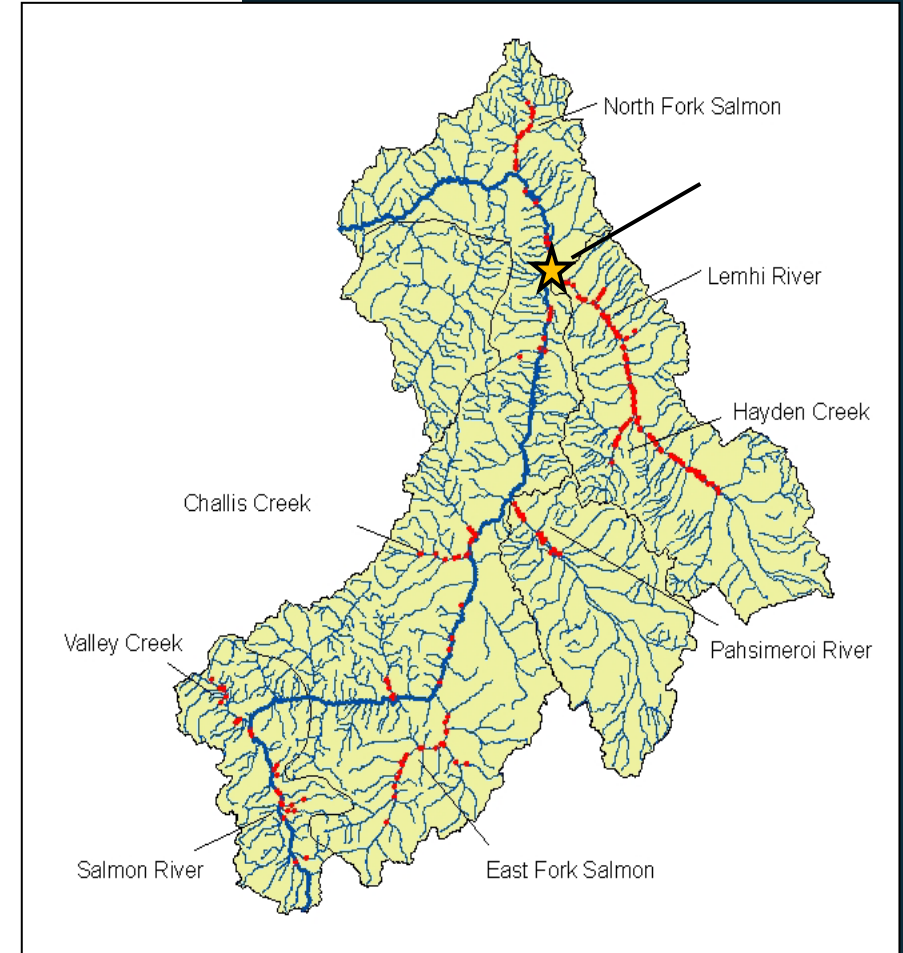
Screen Criteria

- NOAA established small screen guidelines
- Quantitative and qualitative criteria to minimize injury, entrainment, mortality
- “No contact, no delay”



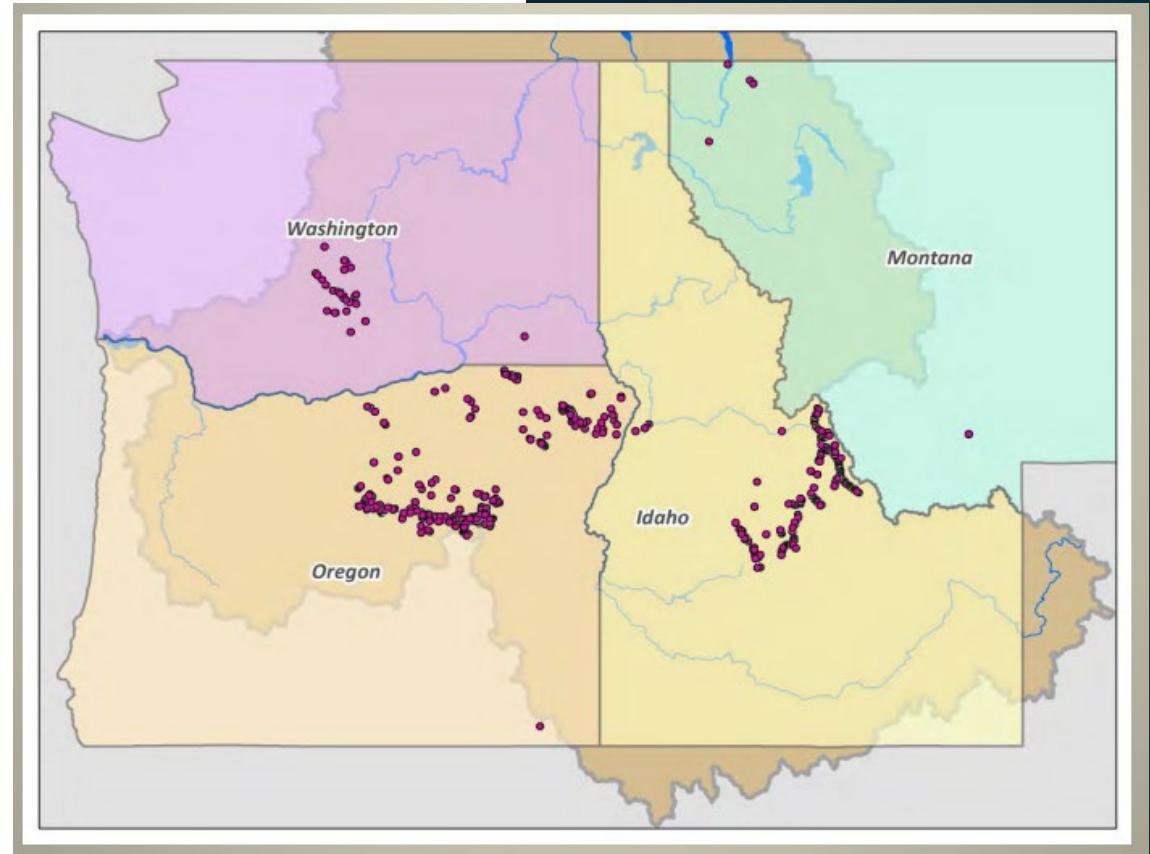
Idaho Fish screens: historic perspective

- All the locations of screens
- Project development & prioritizing locations?
- All within the context of OSC/watershed program
- Instrumental in creation of SHIPPUS- initial prioritization tool still used today



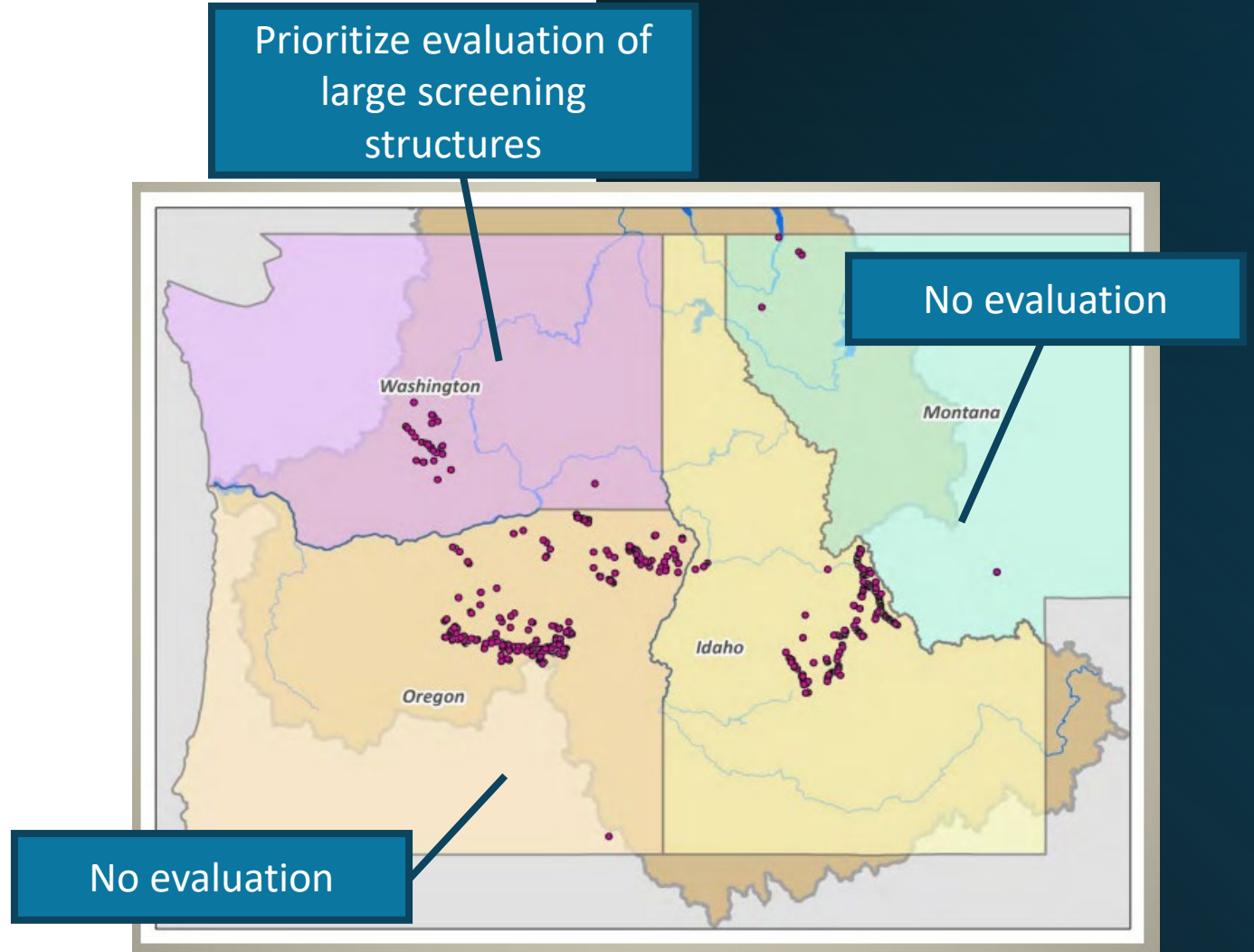
Screen Programs

- Fish screens ubiquitous throughout Snake/Columbia Basin
- IDFG Anadromous Fish Screen Program leads the region in implementing and evaluating fish screens

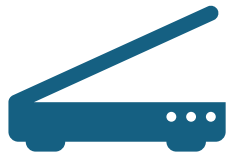


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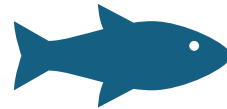


Methods



PIT tagging studies

Instream arrays
Screen-mounted arrays



Electrofishing and snorkel abundance and distribution surveys



Genetics studies

Parentage based tagging
Genetic stock identification

Program objectives

- Increase survival of juvenile salmon and steelhead that interact with diversions during outmigration
- Reconnect tributary rearing habitat for anadromous and resident populations
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Screen and Bypass monitoring



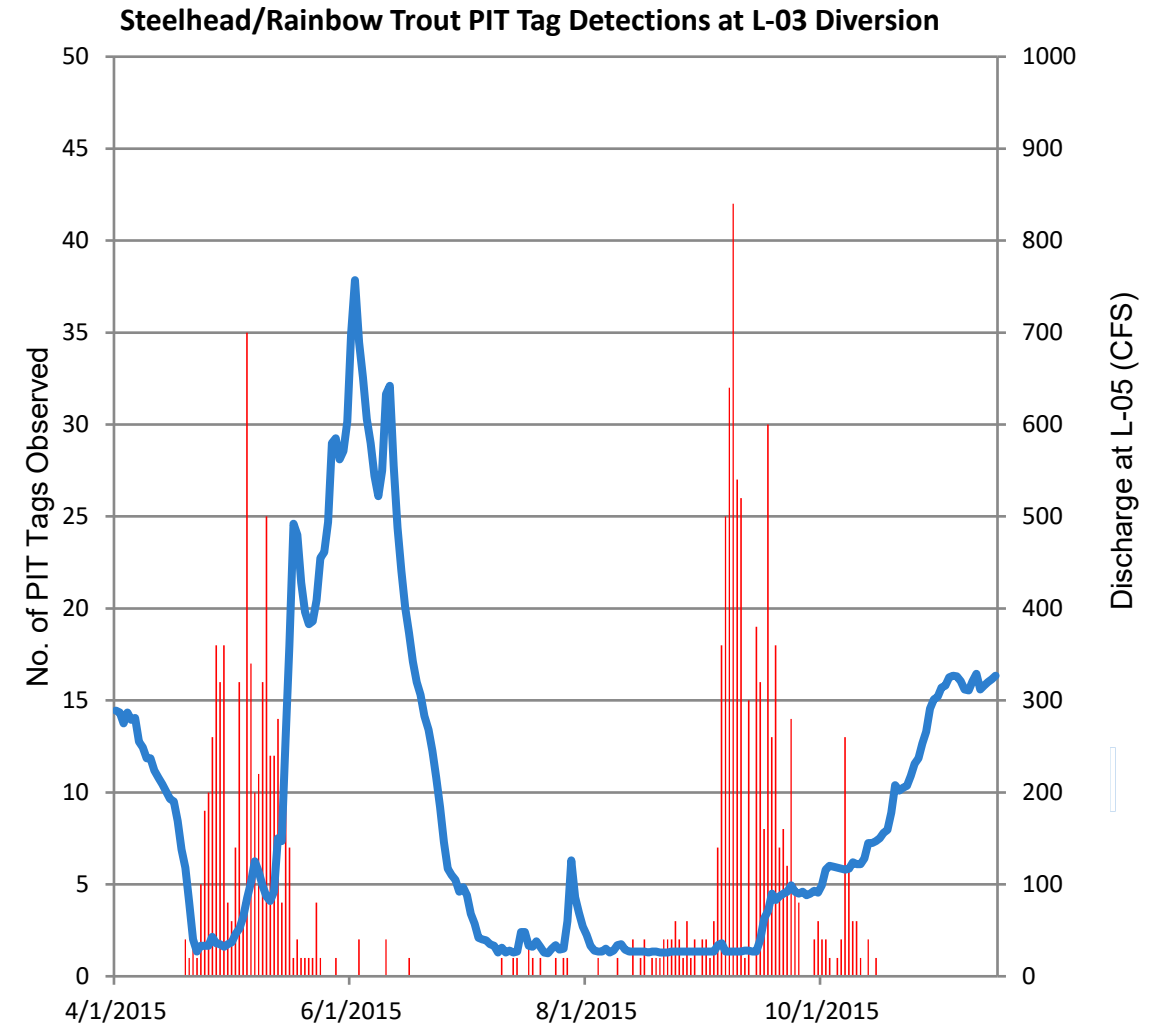
Measuring Entrainment

- Project in cooperation with NOAA Fisheries Science Center
- Identified location and size of each diversion
- Calculated entrainment rate from 3 representative PIT tag array locations
- Routed “fish” through GIS-based simulation of Lemhi basin and different flow conditions
- Removed individuals at each diversion based on modeled probability of entrainment



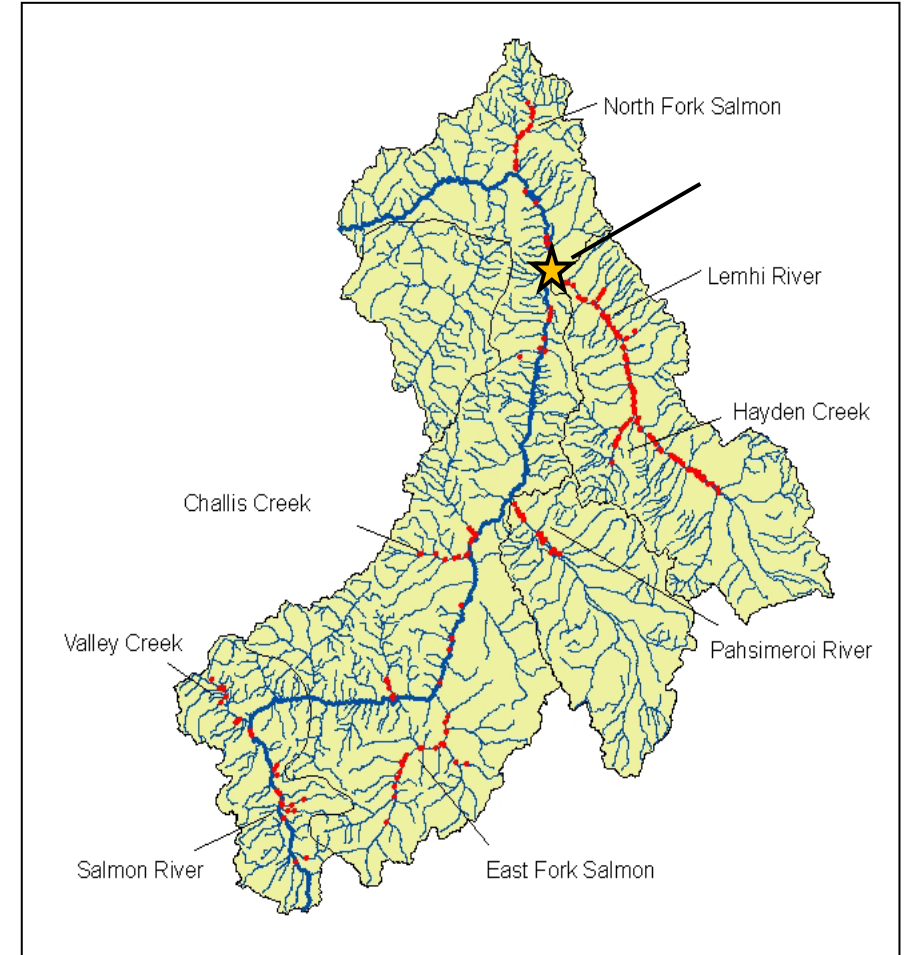
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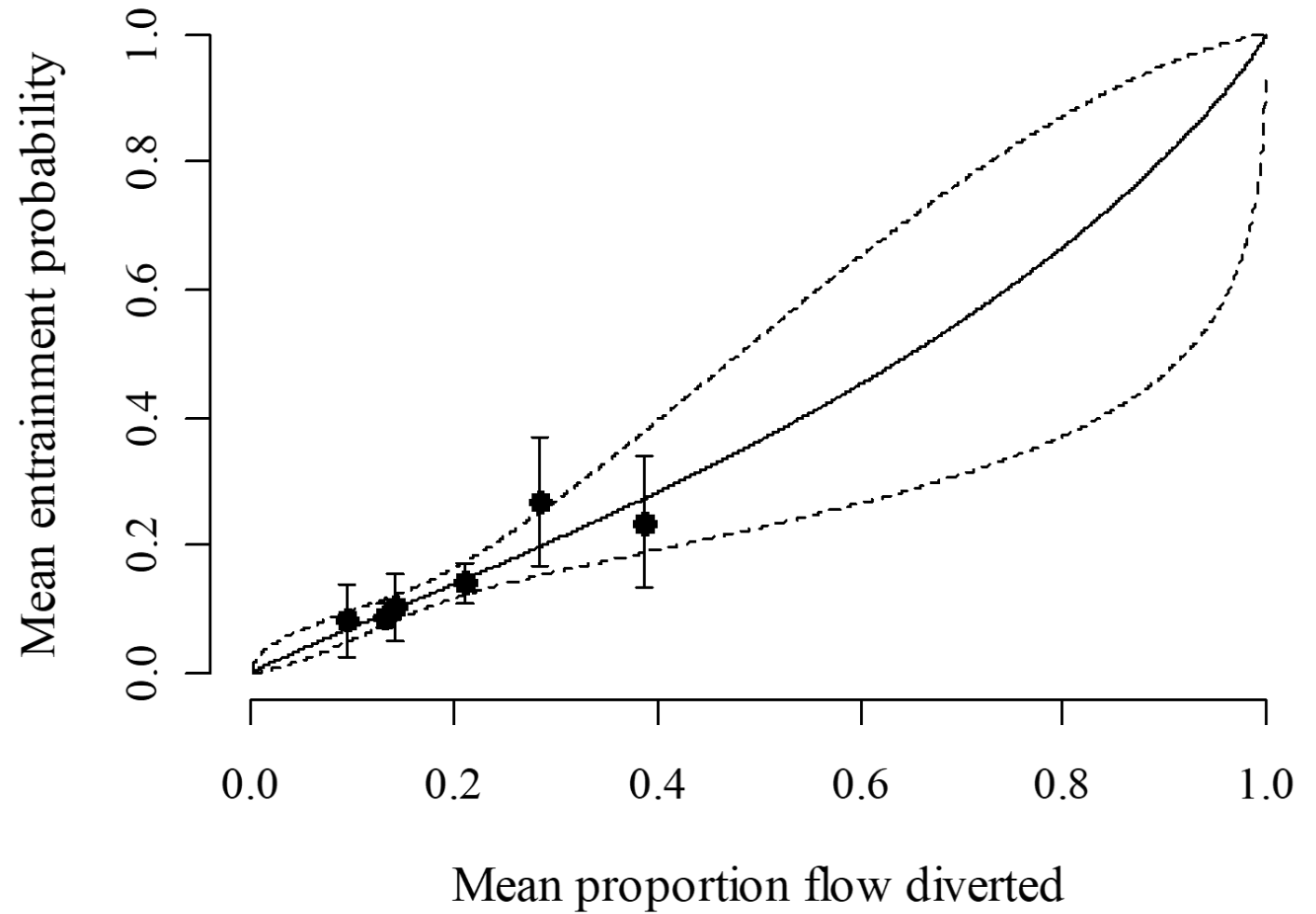


Measuring Entrainment

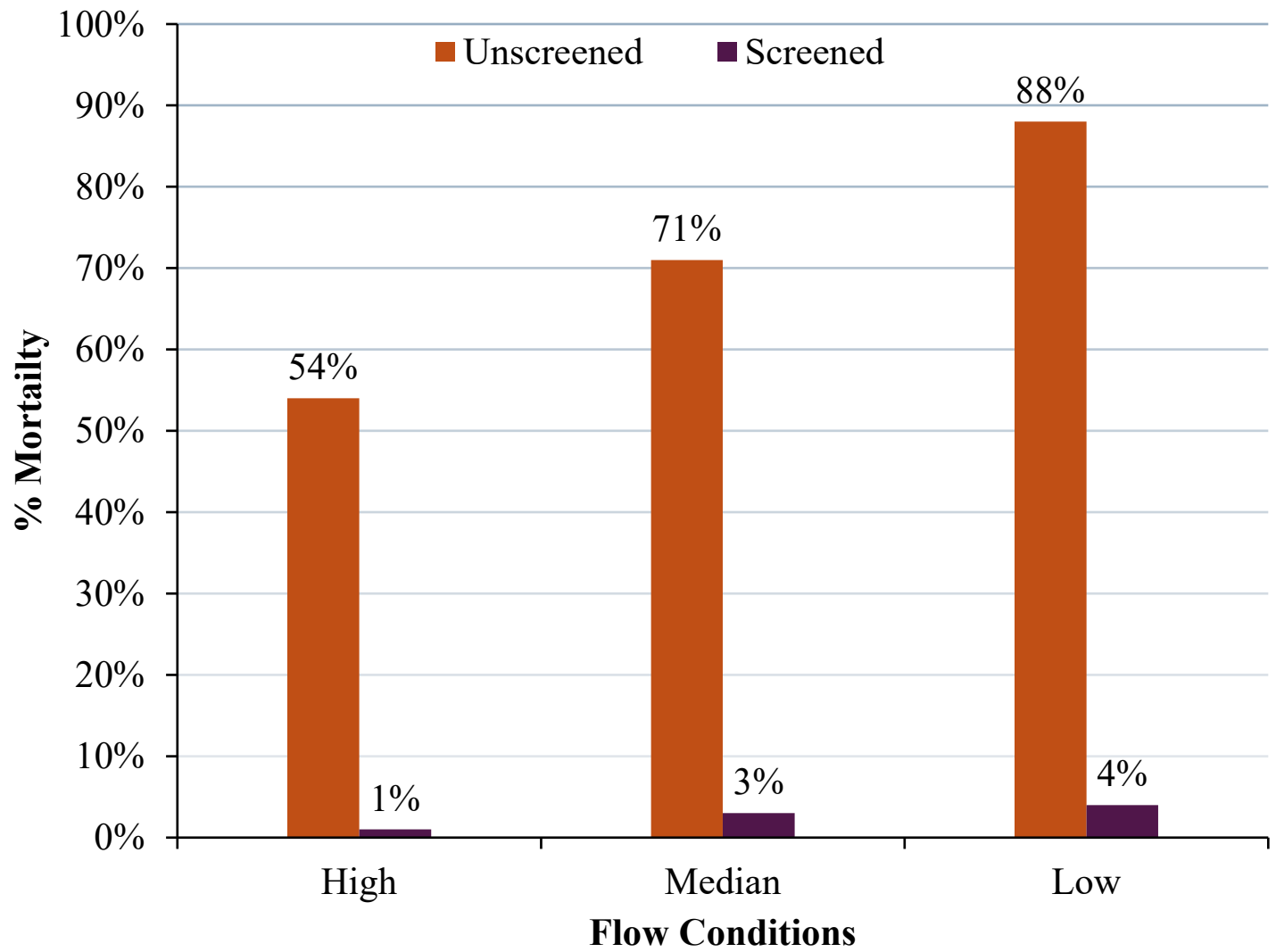
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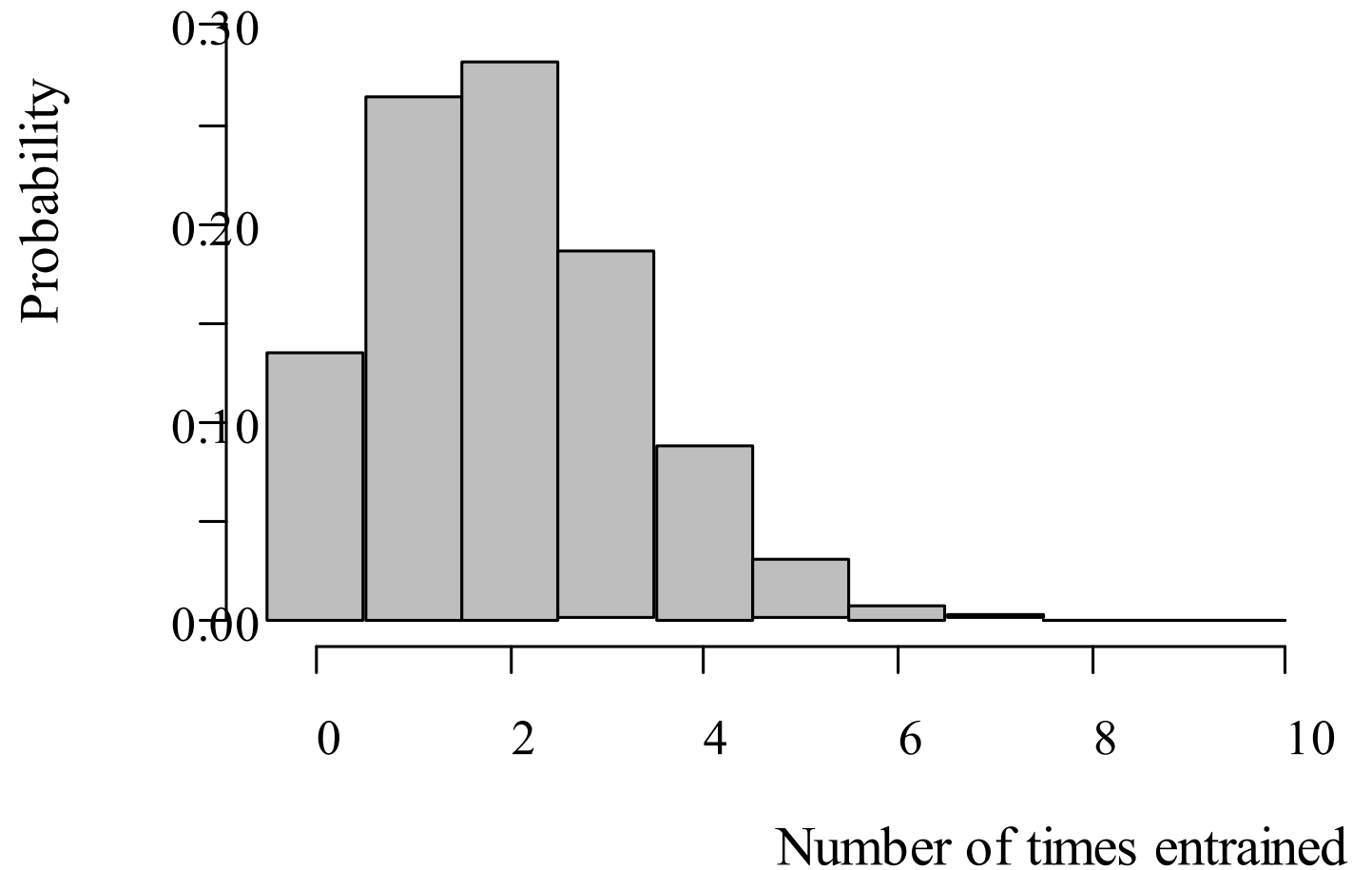
Entrainment
Probability higher
when proportion
of flow diverted is
higher



Mortality varied by flow conditions, minimum 54%



More likely to be entrained two or more times than not at all



Tributary populations



Rearing habitat and migration corridors





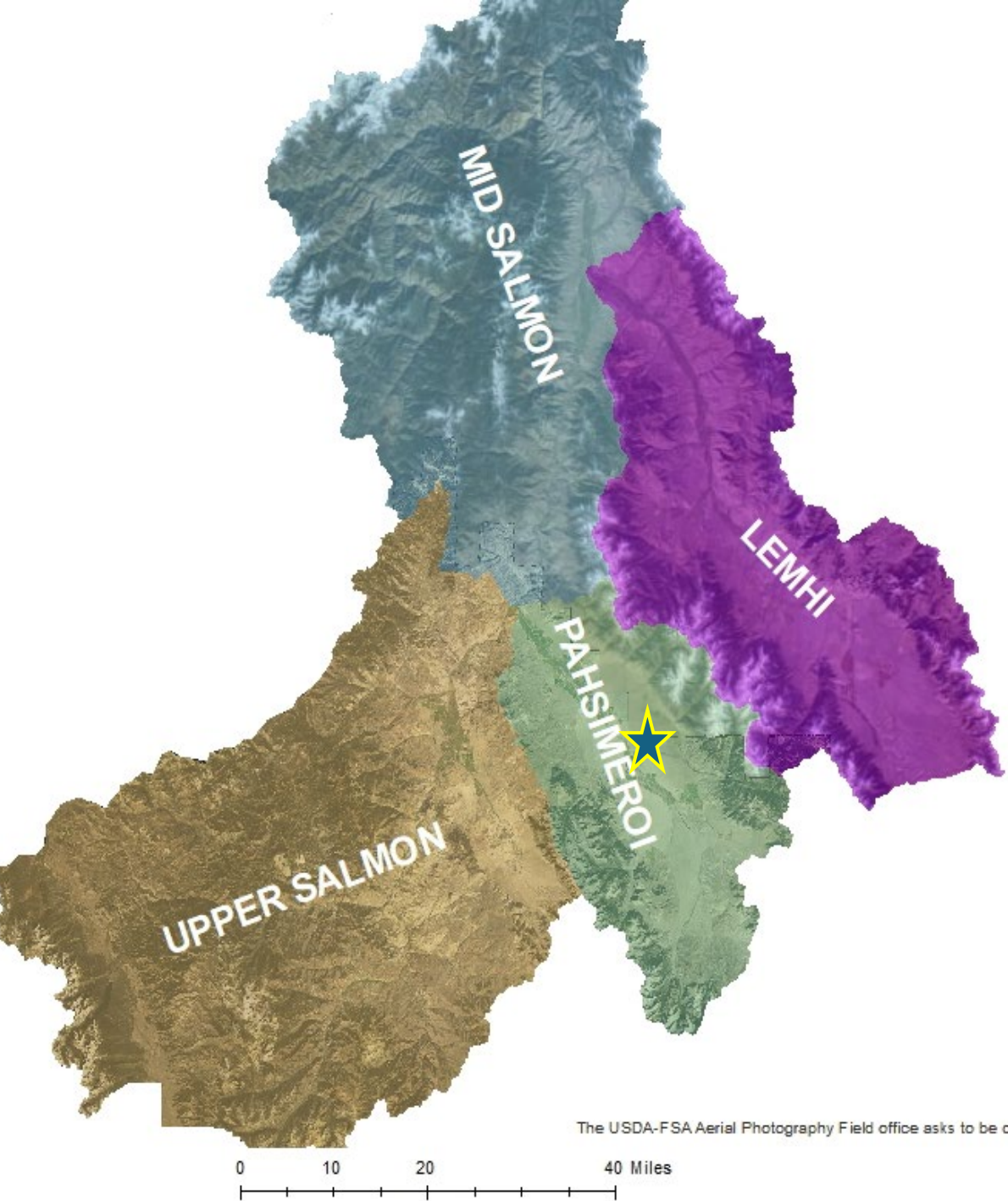
Tributary Project Work

- Reconnection through **screening** and **flow projects**
- Instream habitat improvements
- Fencing & grazing management
- All happening with landowner engagement, on private land



Tributary Inventory

- Inventory of fish community, irrigation diversions, and habitat condition, barrier evaluation
- Abundance and distribution with electrofishing or snorkel
- Detailed report used by funders and collaborators

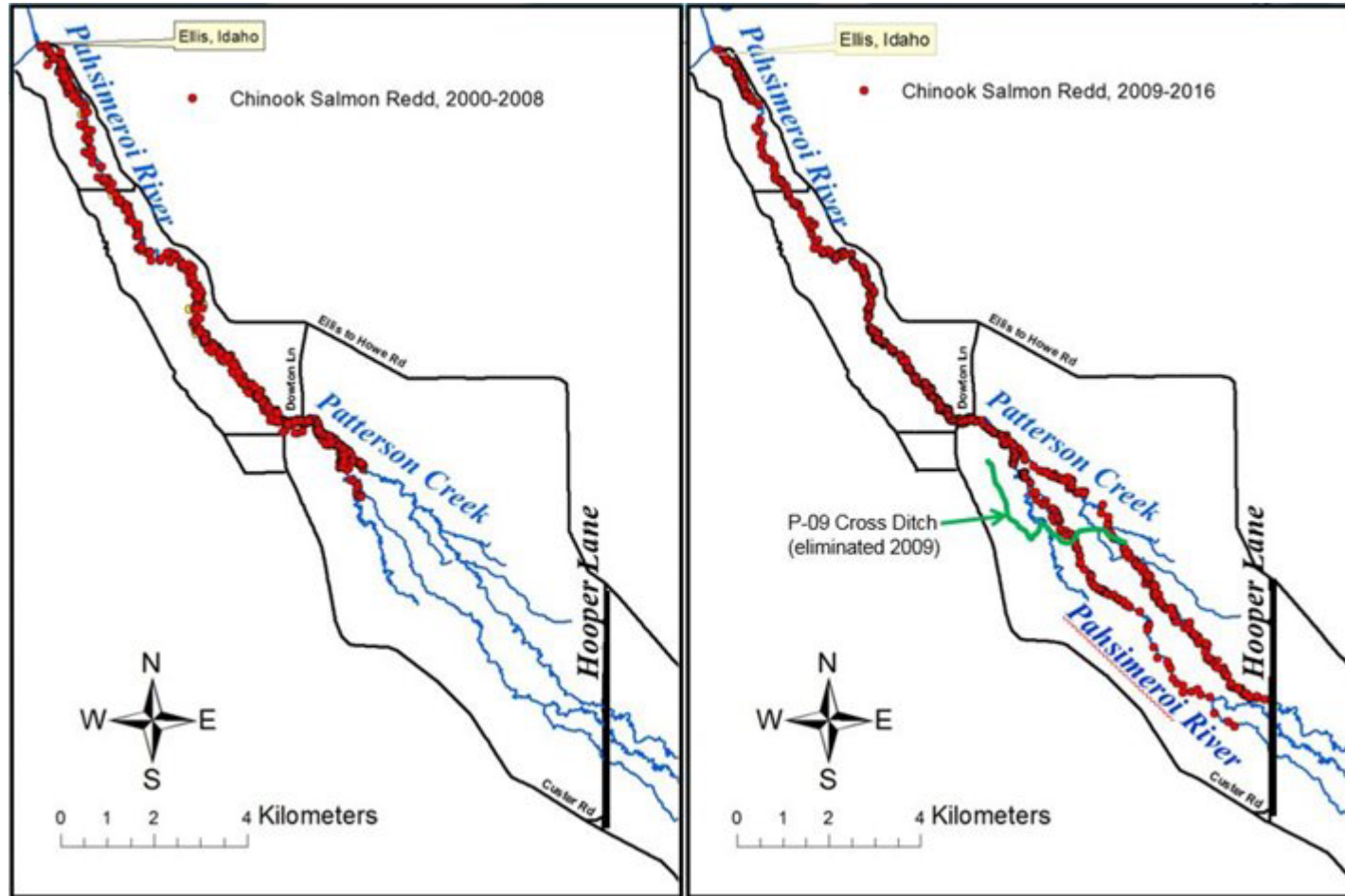


The USDA-FSA Aerial Photography Field office asks to be cr

Tributary Inventory

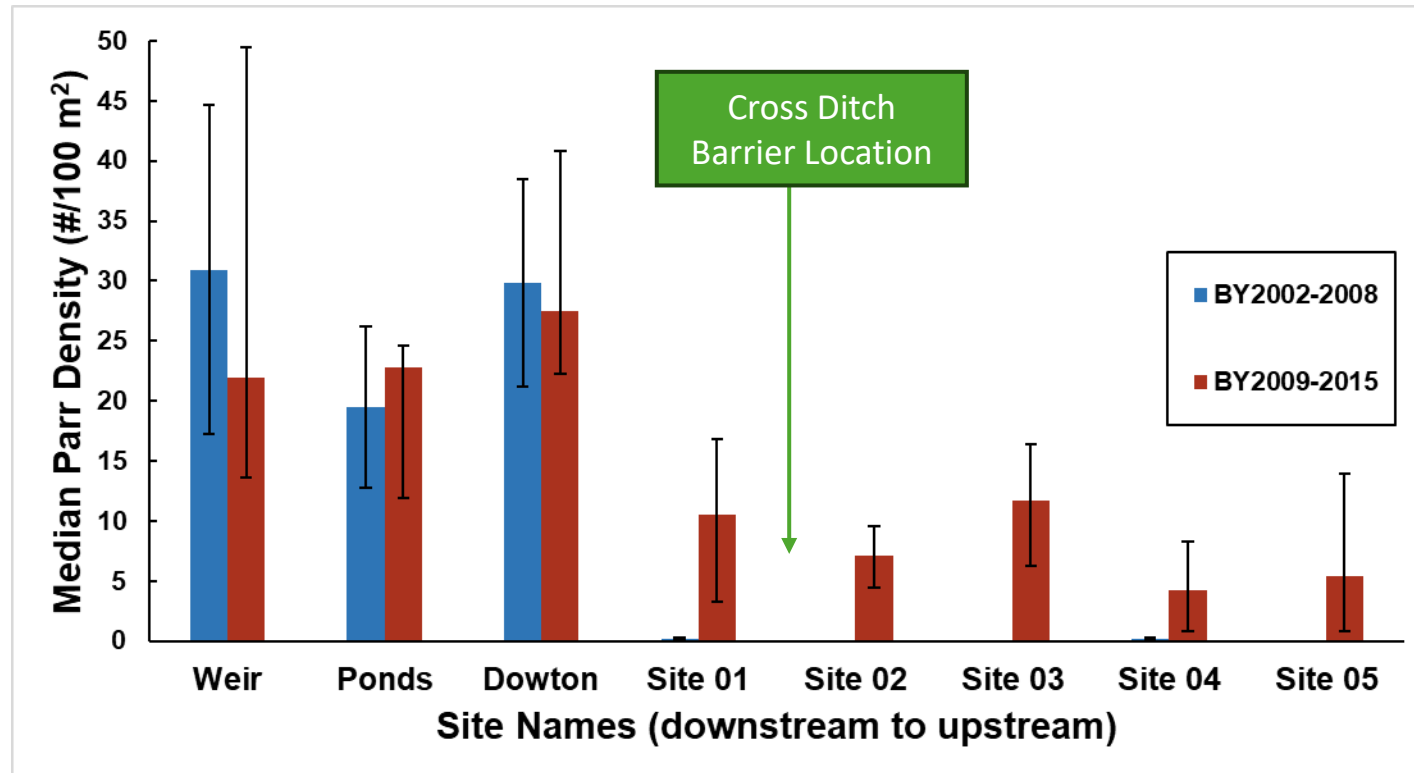
- Historically focused on collecting data for tributaries slated for screening and habitat work
- Currently evaluating locations where screens, habitat projects, and water transactions have been implemented
- Example: Pahsimeroi River Reconnect

Pahsimeroi Reconnect Study

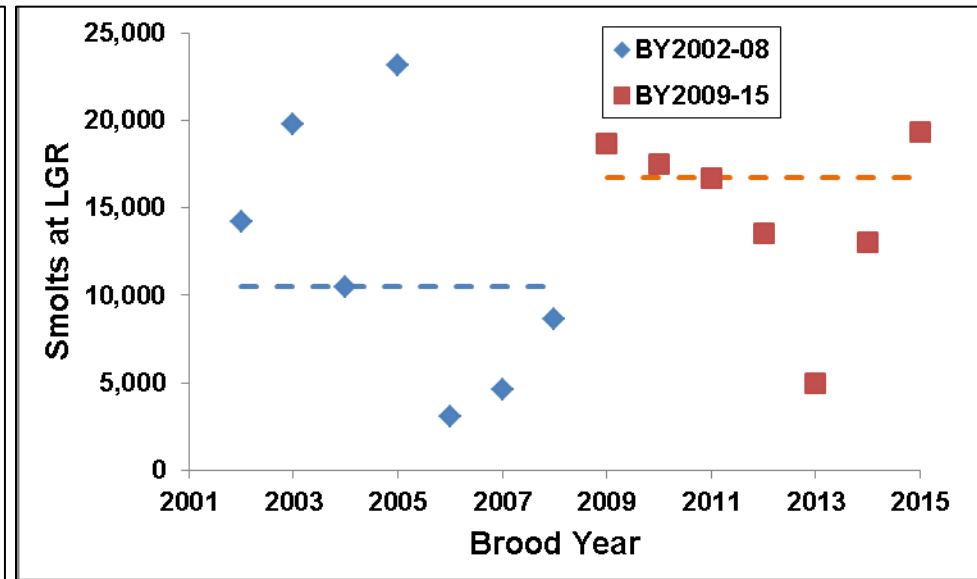
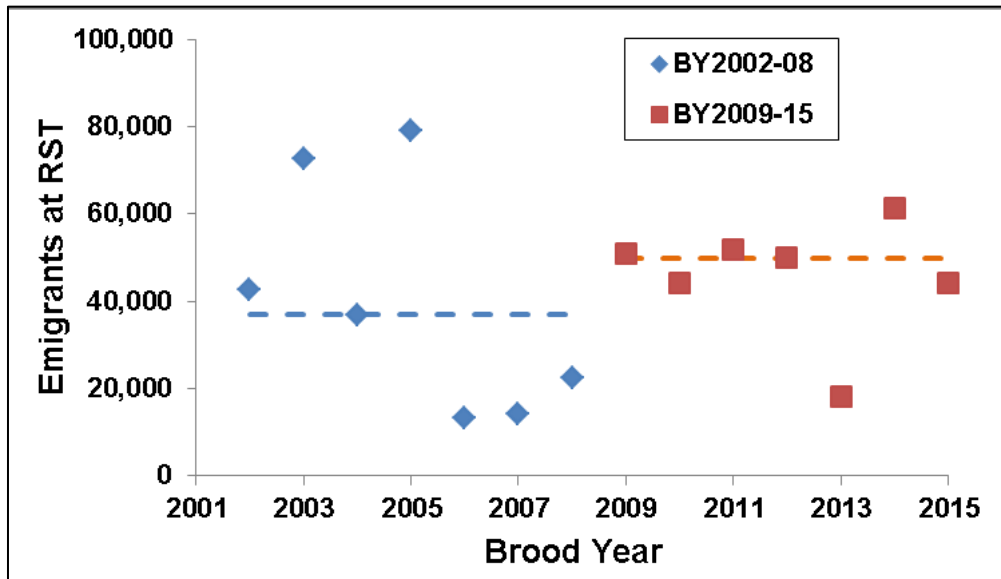


- Water project removed dewatering barrier, added miles of spawning and rearing habitat
- Annual snorkel and spawning ground surveys throughout basin
- Understand distribution, density, and survival to LGR (first dam encountered in hydro system)

Pahsimeroi Reconnect Study



Pahsimeroi Reconnect Study



Landscape connectivity



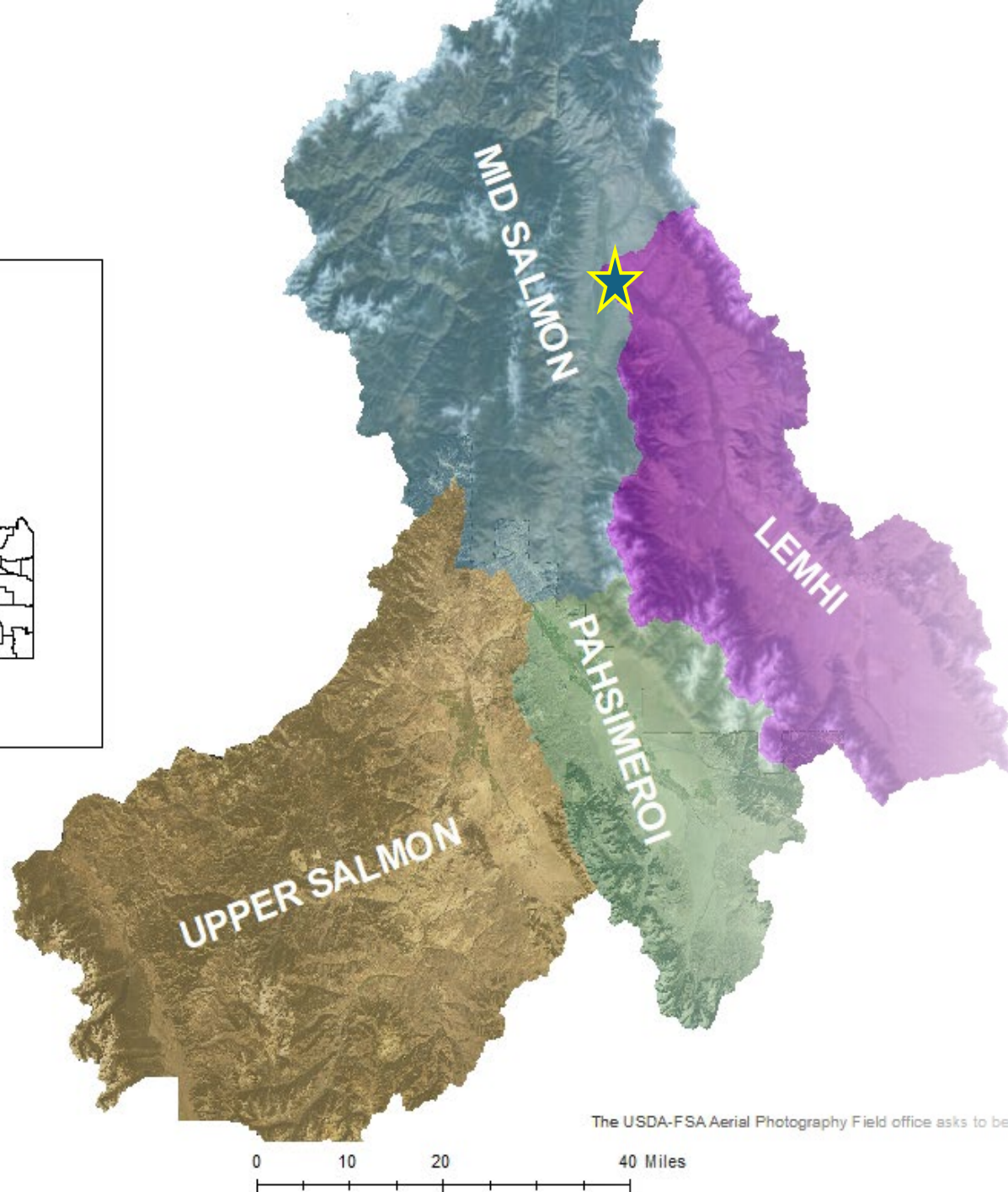
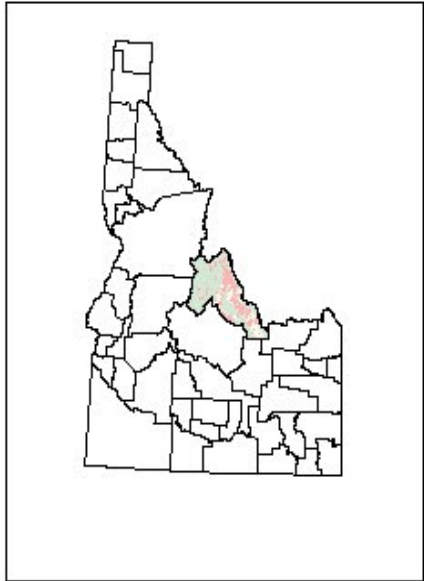


Using Bull Trout as a surrogate for Anadromous Fish

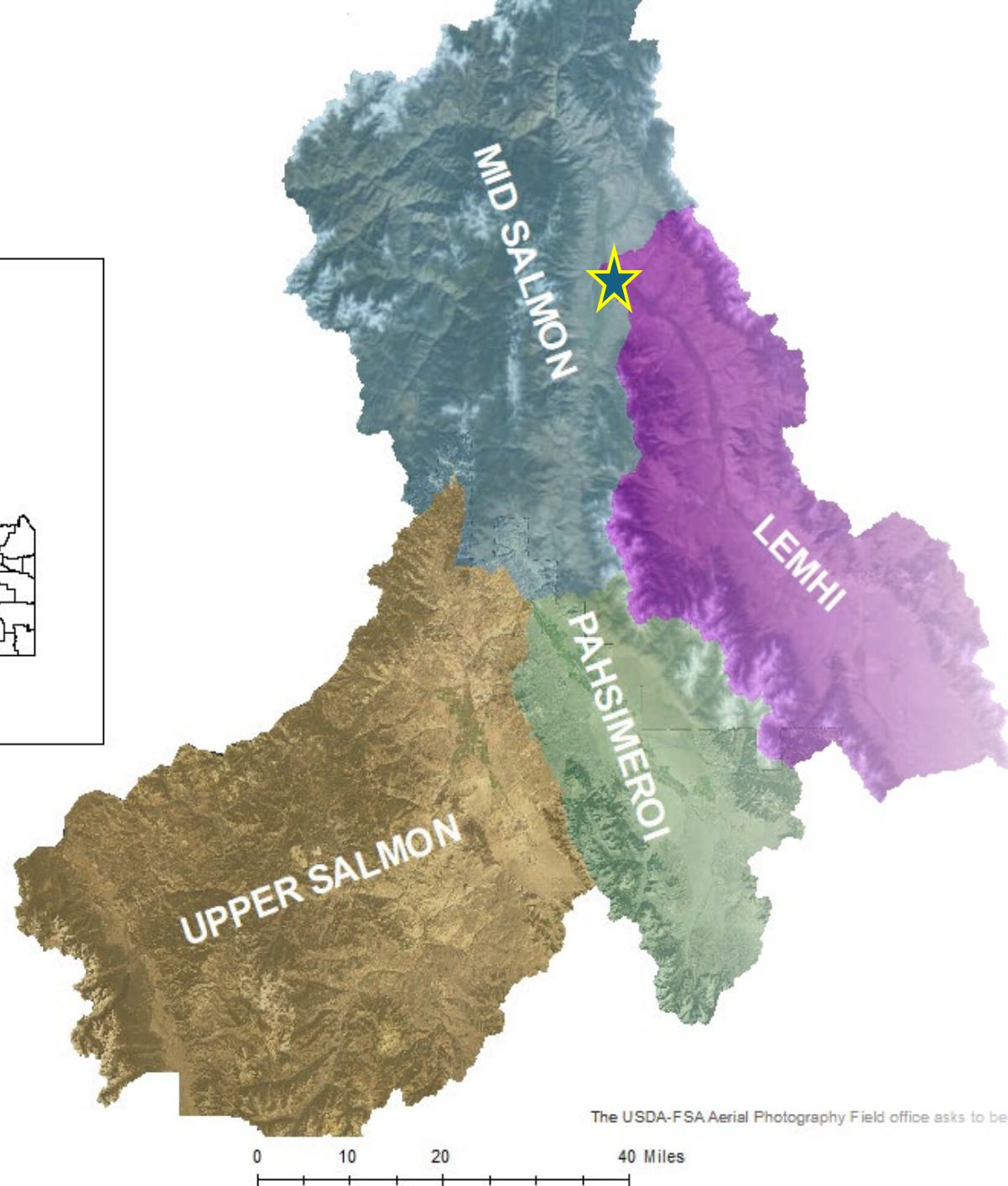
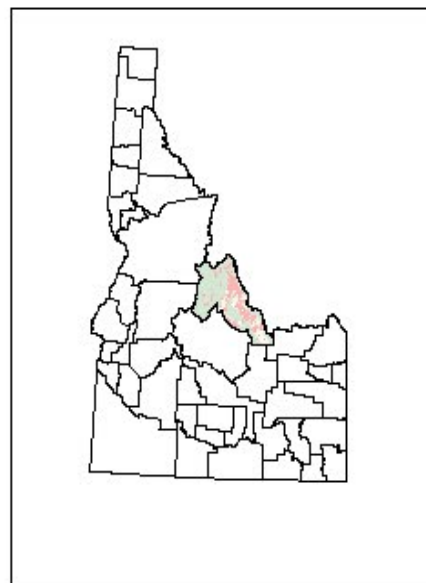
- Threatened species considered in program evaluation by BPA
- Complex life history
 - Long-distance migrations
 - Iteroparous
 - Long-lived
- Require high quality, connected stream and river habitat

Bull Trout Passage at Screens

- Suitable surrogate for adult steelhead when evaluating downstream passage and screens

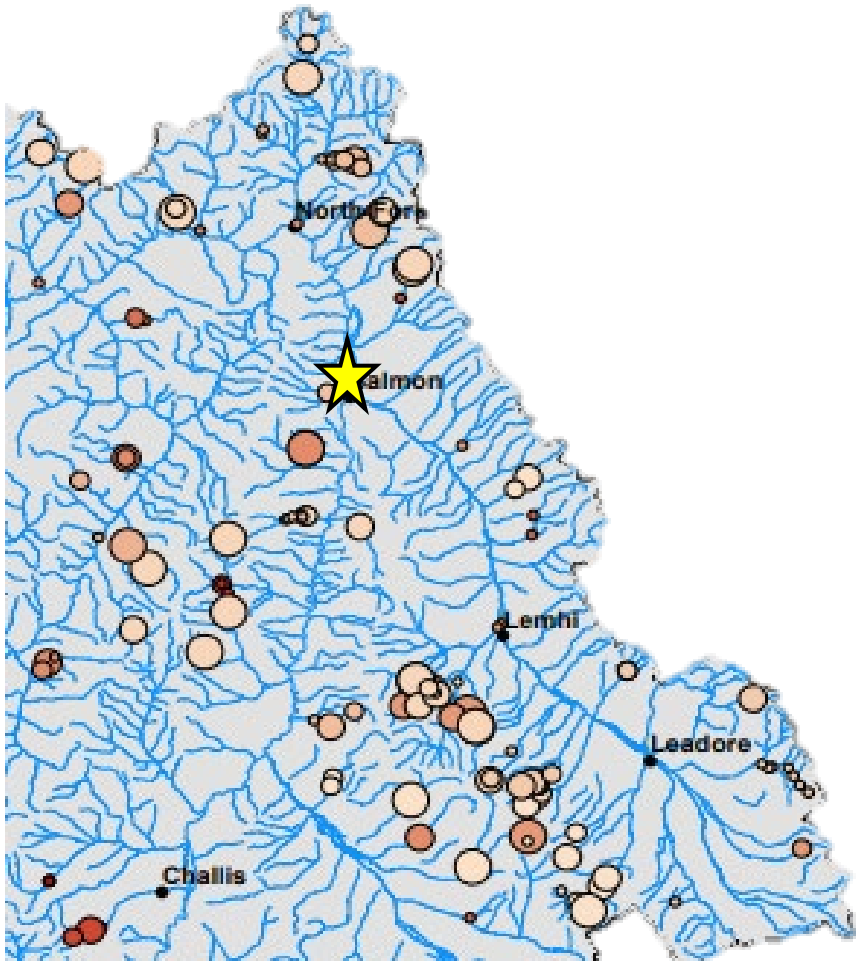


Genetic methods at the landscape scale



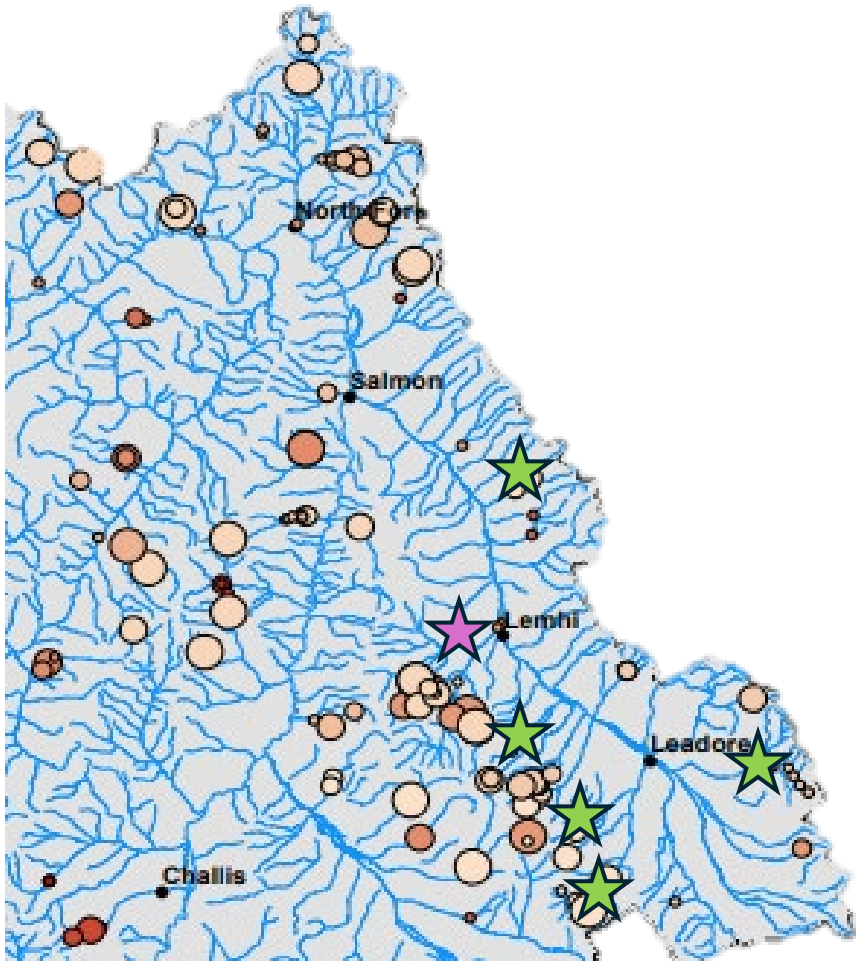
- When tagging projects are too expensive or labor-intensive
- Rely on robust genetics workgroup at IDFG Eagle Fish Genetics Lab
- Understand genetic mixing of tributaries

Lemhi Population Genetics



- Population connectivity evaluated in Lemhi Basin in early 2000s using microsatellites
- Significant *screening, flow projects,* and *barrier removal* work in intervening 20 years
- Sampling previously visited sites
- Re-running historic samples with new methods

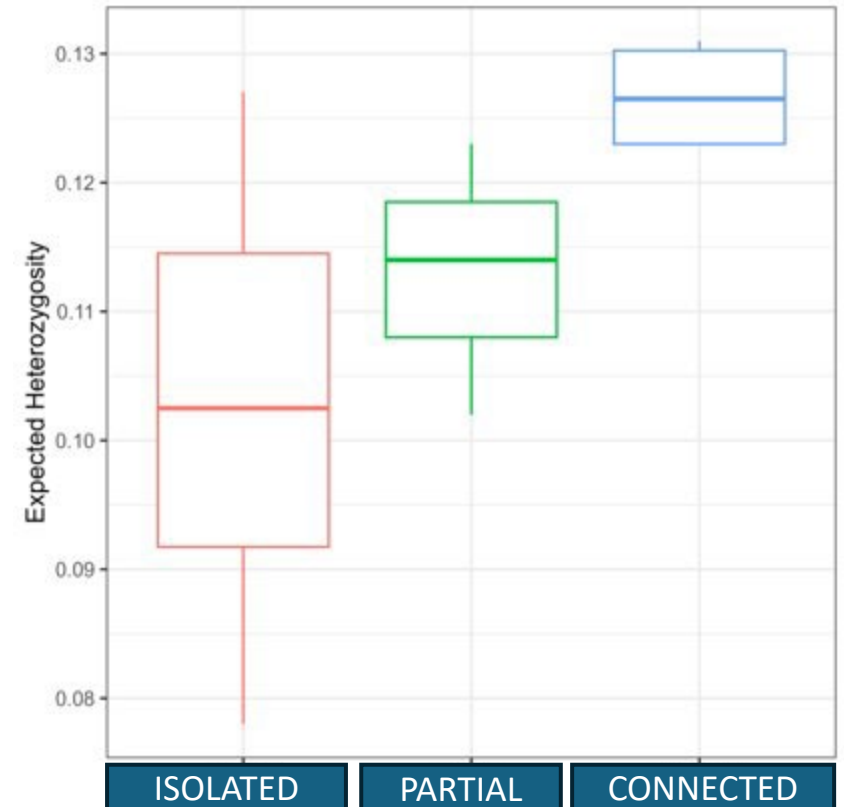
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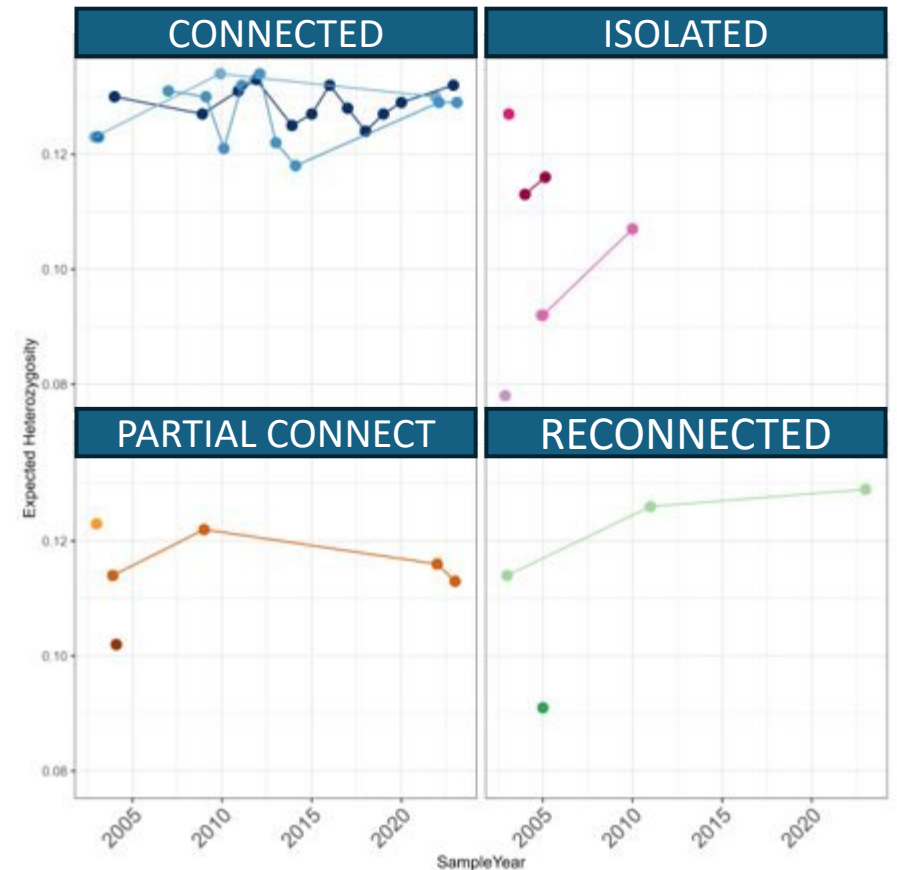
Landscape Population Genetics

- Theory predicts
 - Higher diversity in populations with gene flow
 - Lower diversity in populations that are isolated
- Levels of genetic diversity in isolated and connected tributaries mirror expectation
- Reconnected tributary has increasing heterozygosity over time



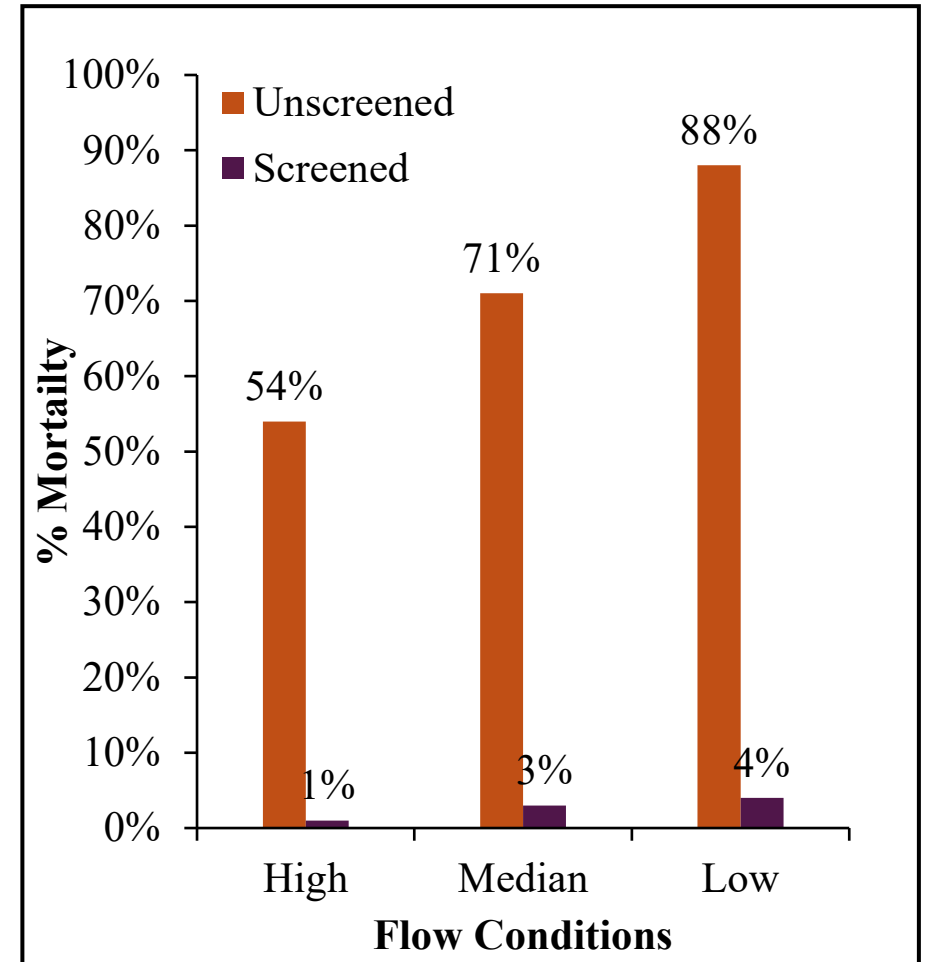
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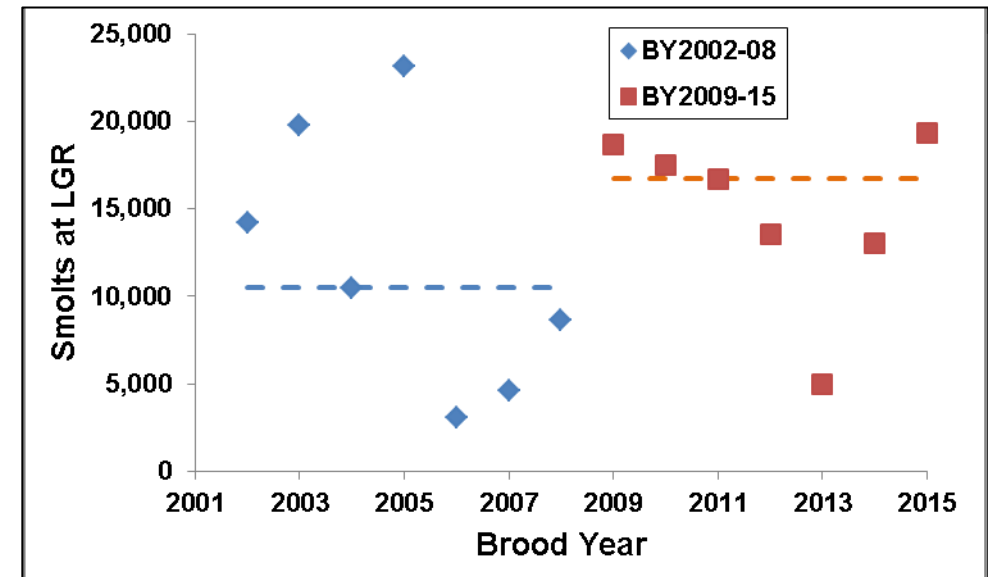
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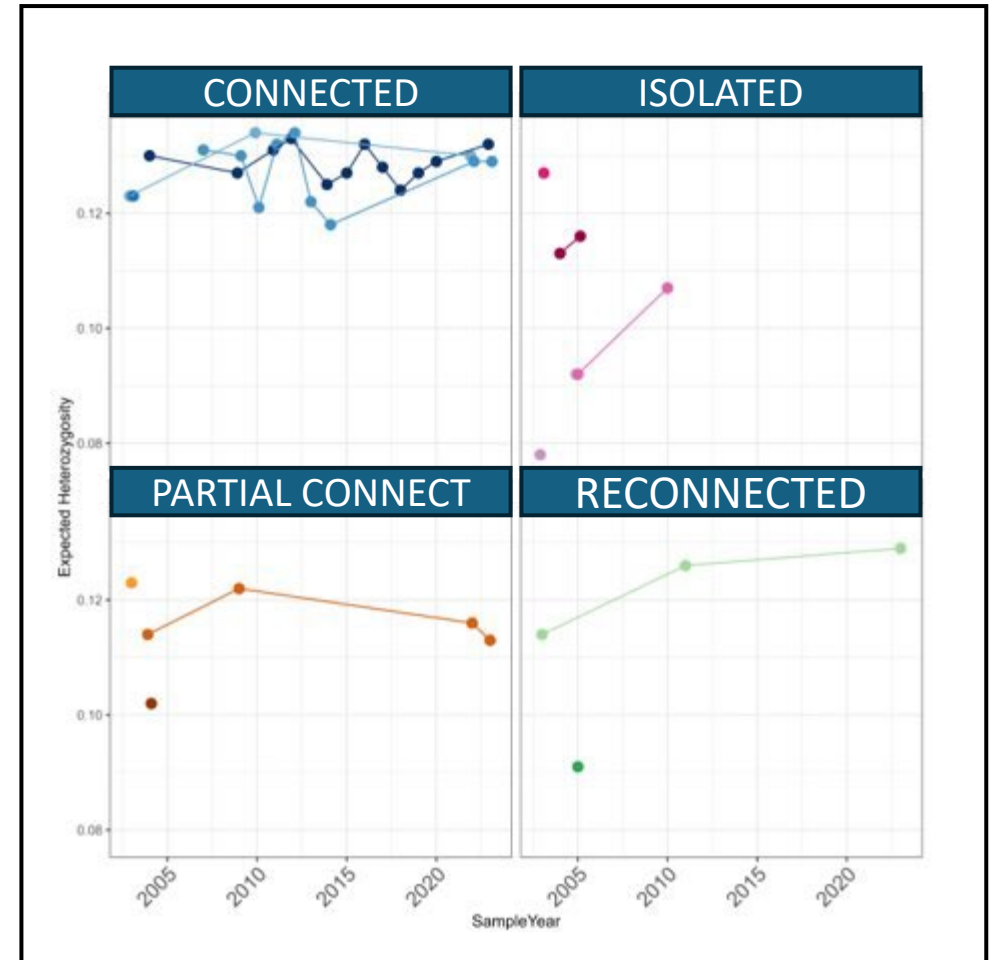
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- Demonstrate that screening doesn't just increase survival of individual out-migrants, but is required for population viability and ecological function



Photo Credit: Carson Jeffres

Thank You



Bonneville
POWER ADMINISTRATION

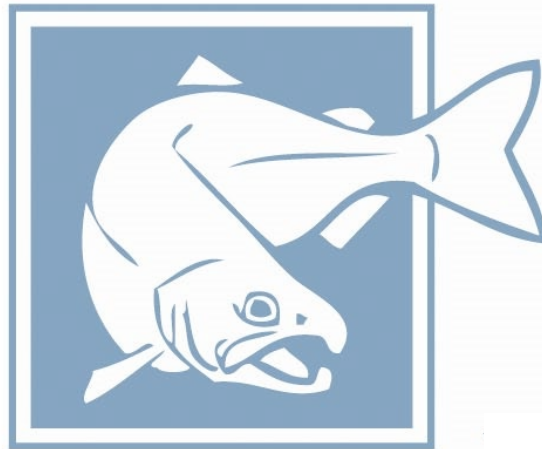


Northwest **Power** and
Conservation Council



I University of Idaho

Upper Salmon Basin WATERSHED PROGRAM



*Homegrown,
Common-Sense
Conservation*



— BUREAU OF —
RECLAMATION



