



**NOAA
FISHERIES**

**Northwest
Fisheries
Science Center**

Smolt Survival and Travel Time & Transportation Analyses

Update with 2023 Data

Technical Management Team
2023 Year-End Review
December 6, 2023

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Smolt Survival

- Migration conditions, travel time and survival of PIT-tagged smolts through the hydropower system in 2023
 - Preliminary Results Memo: October 7, 2021
 - Reanalysis with estuary avian recoveries is in progress
(today: only some include “bird data” – still considered preliminary)
 - Only those fish left to migrate in-river
 - Only juvenile data, not survival to adult

PIT-tag Data Sources

H & W
Releases



Rocky Reach

Chief Joseph

Wells

Grand Coulee

Rock Island

Wanapum

Ice Harbor

Tagging for
Surv. & Transp.

Priest Rapids



PIT-trawl
Bird colonies
Pile dikes

Juvenile detectors

Snake R. trap

H & W
Releases

Bonneville

The Dalles

John Day

McNary

Lower Monumental

Little Goose

Lower Granite

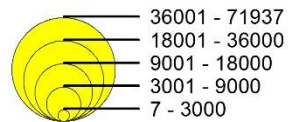
Hells Canyon

Oxbow

Brownlee

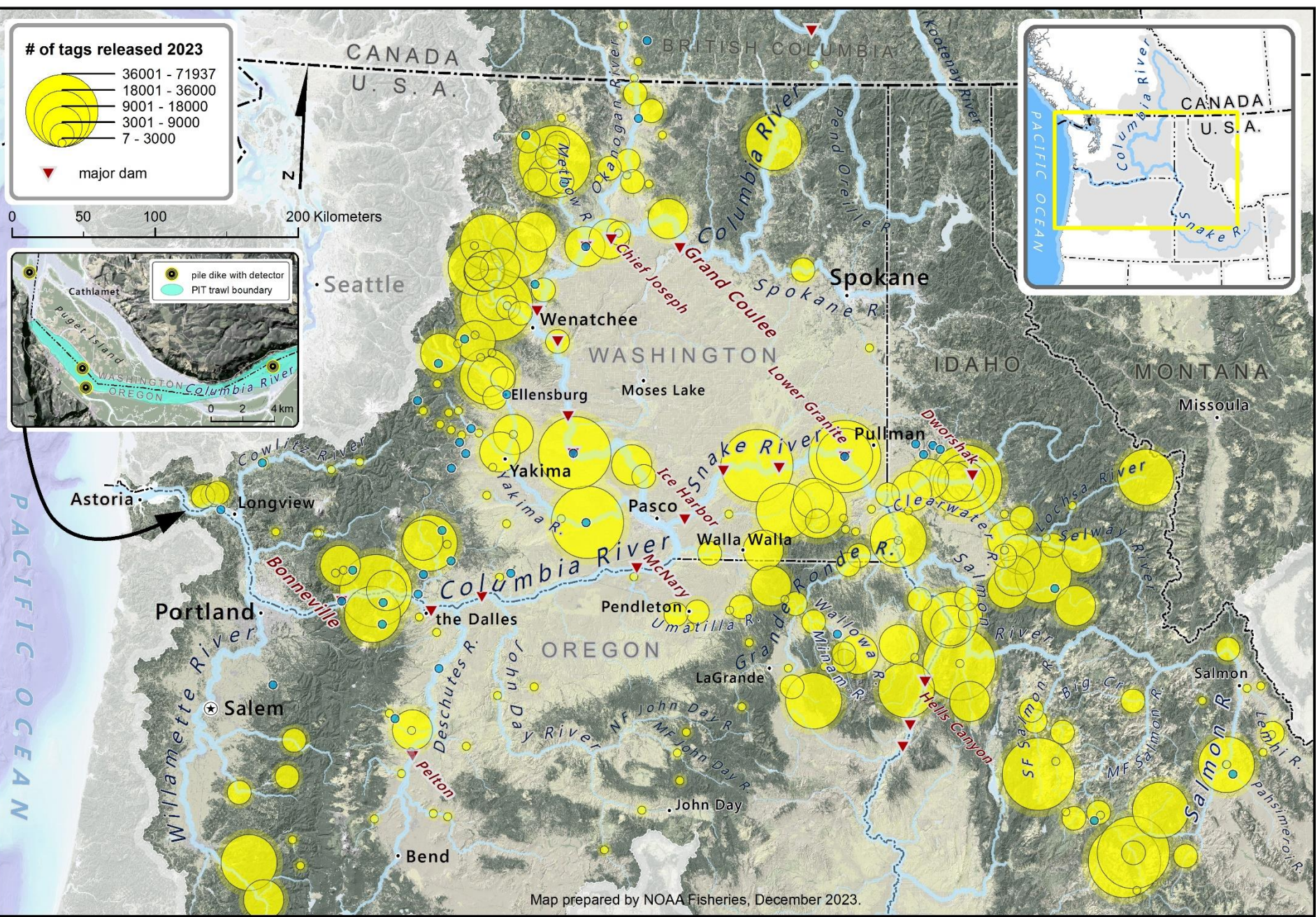
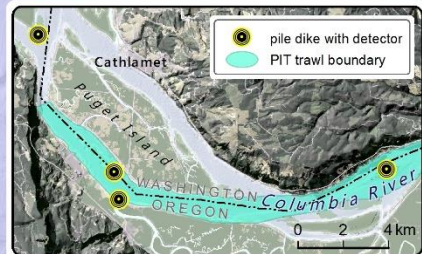


of tags released 2023



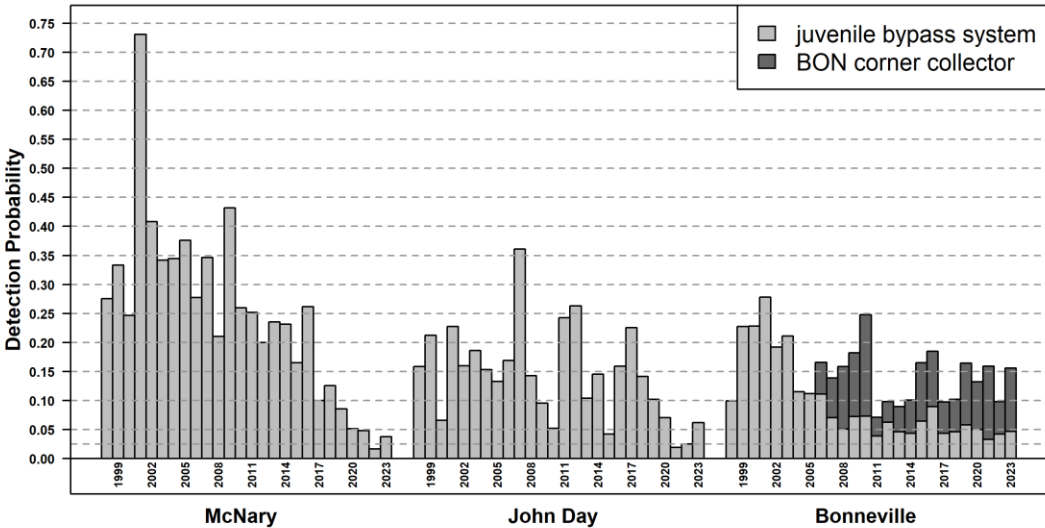
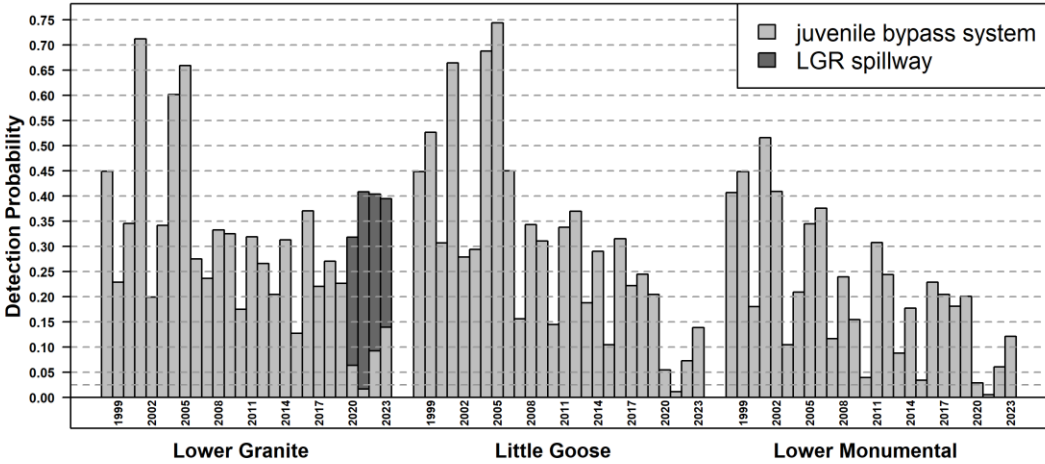
major dam

0 50 100 200 Kilometers

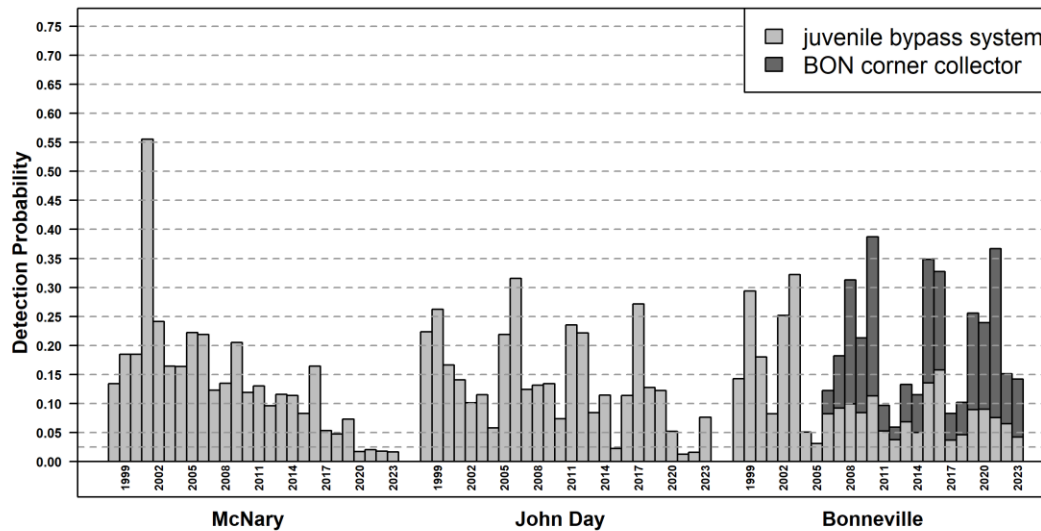
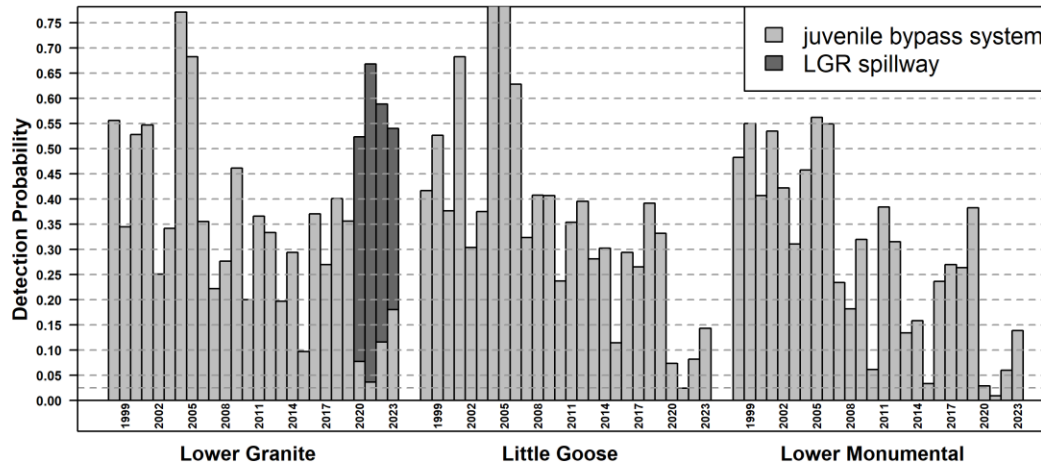


Map prepared by NOAA Fisheries, December 2023.

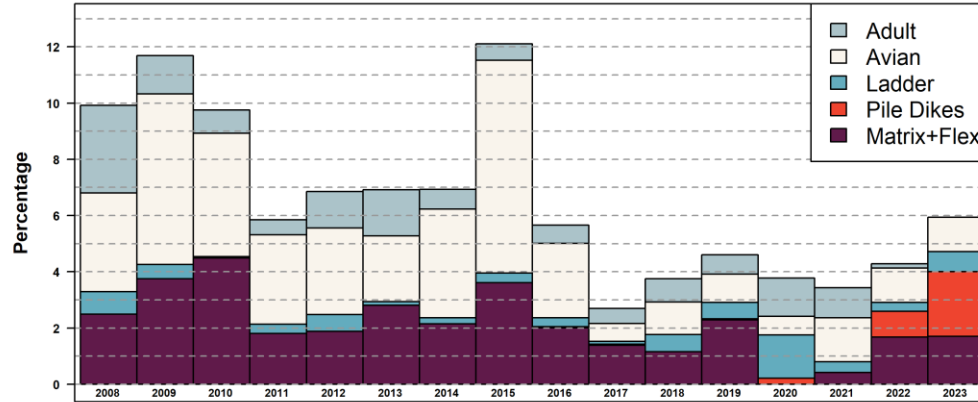
Detection Probabilities – Yearling Chinook



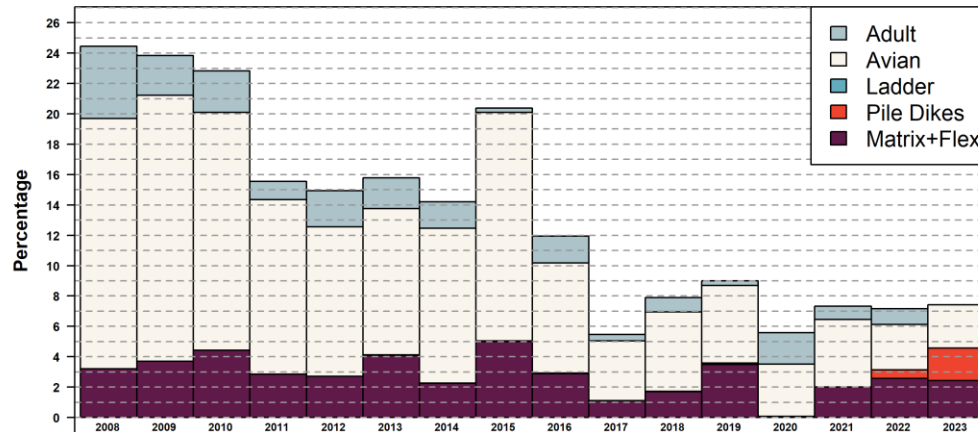
Detection Probabilities – Steelhead



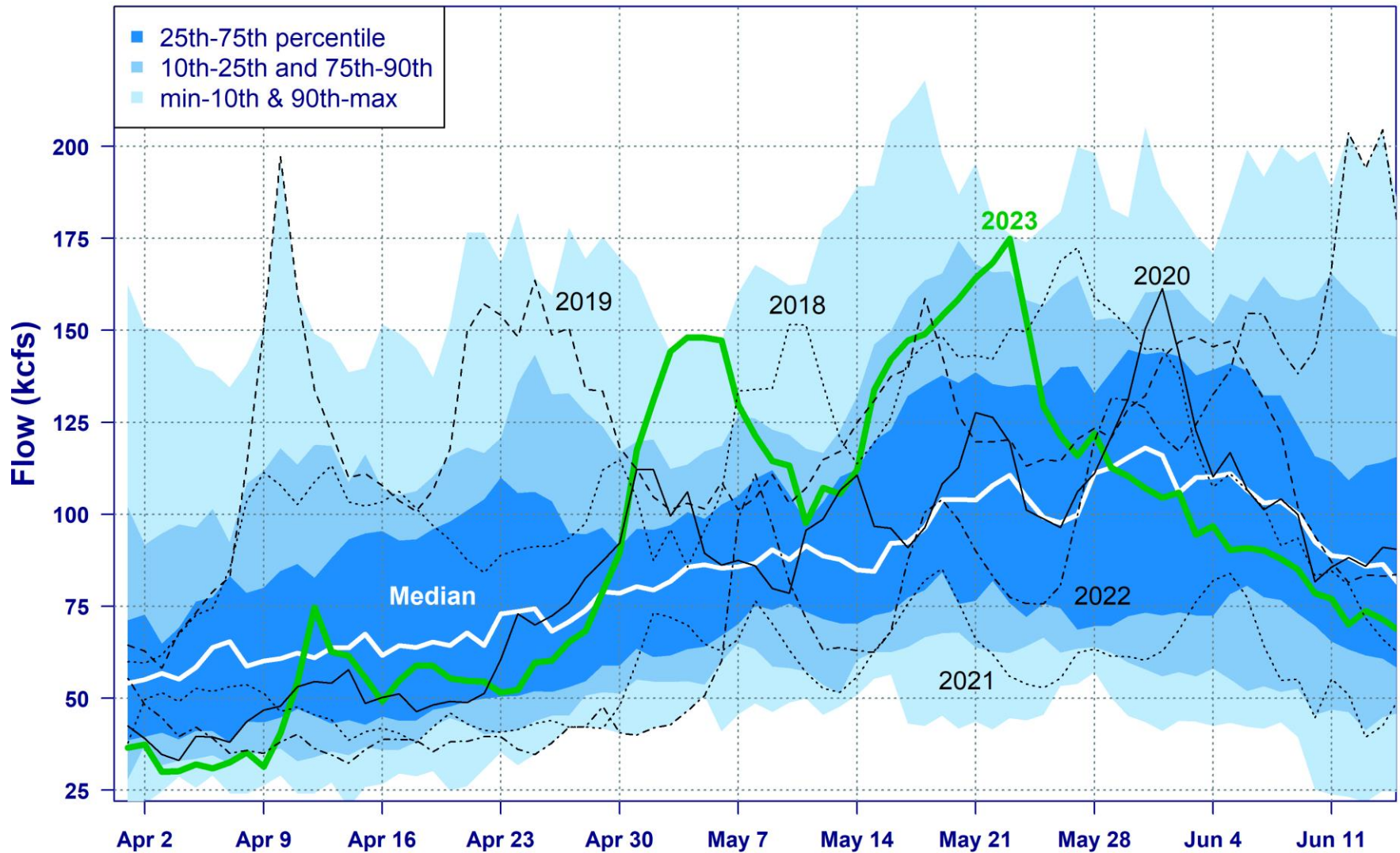
Percentage of Snake River Yearling Chinook Detected at Bonneville Detected Again Post-Bonneville
(Sample Size for Estimating Bonneville Detection Rate)



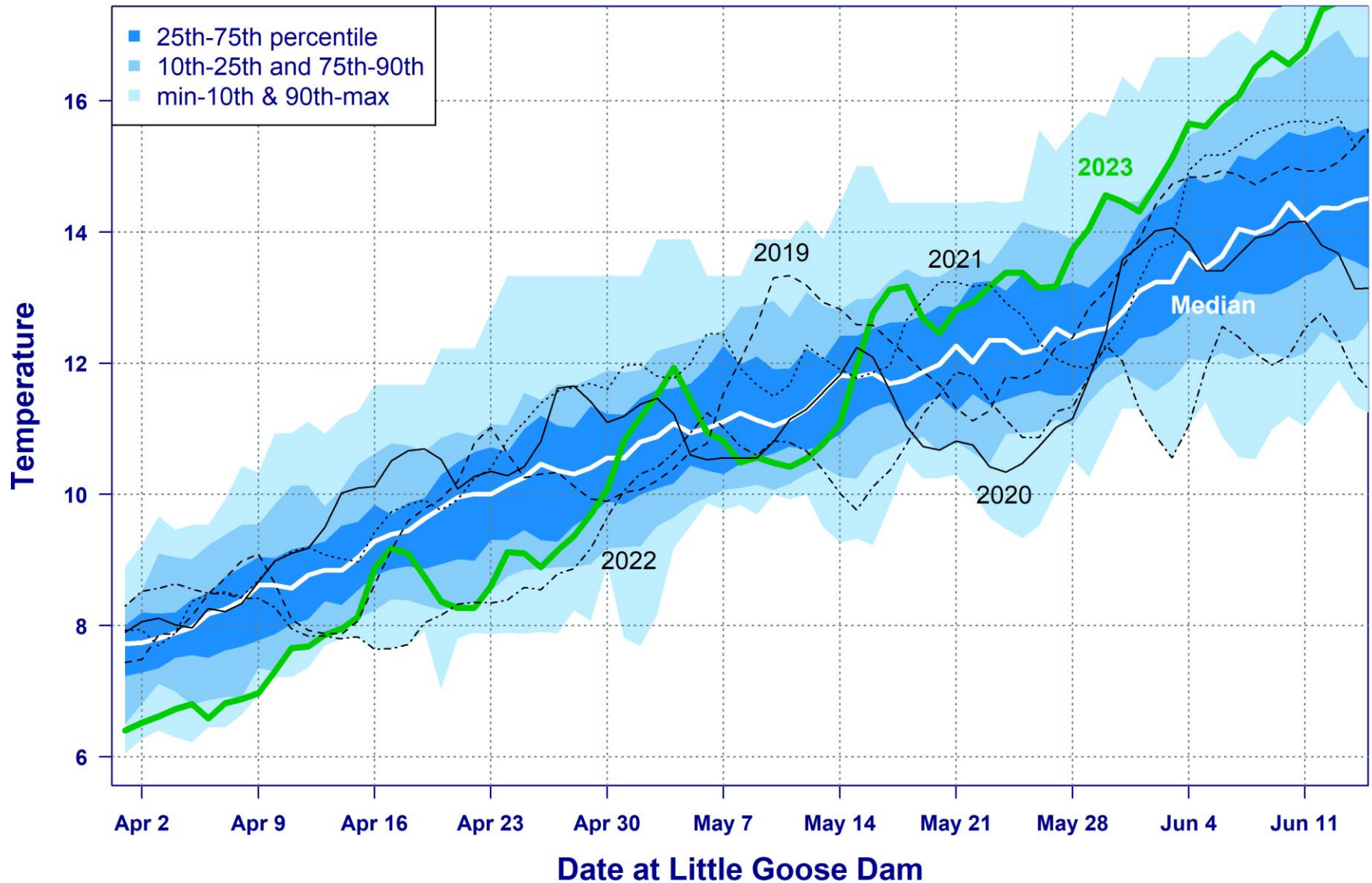
Percentage of Snake River Steelhead Detected at Bonneville Detected Again Post-Bonneville
(Sample Size for Estimating Bonneville Detection Rate)



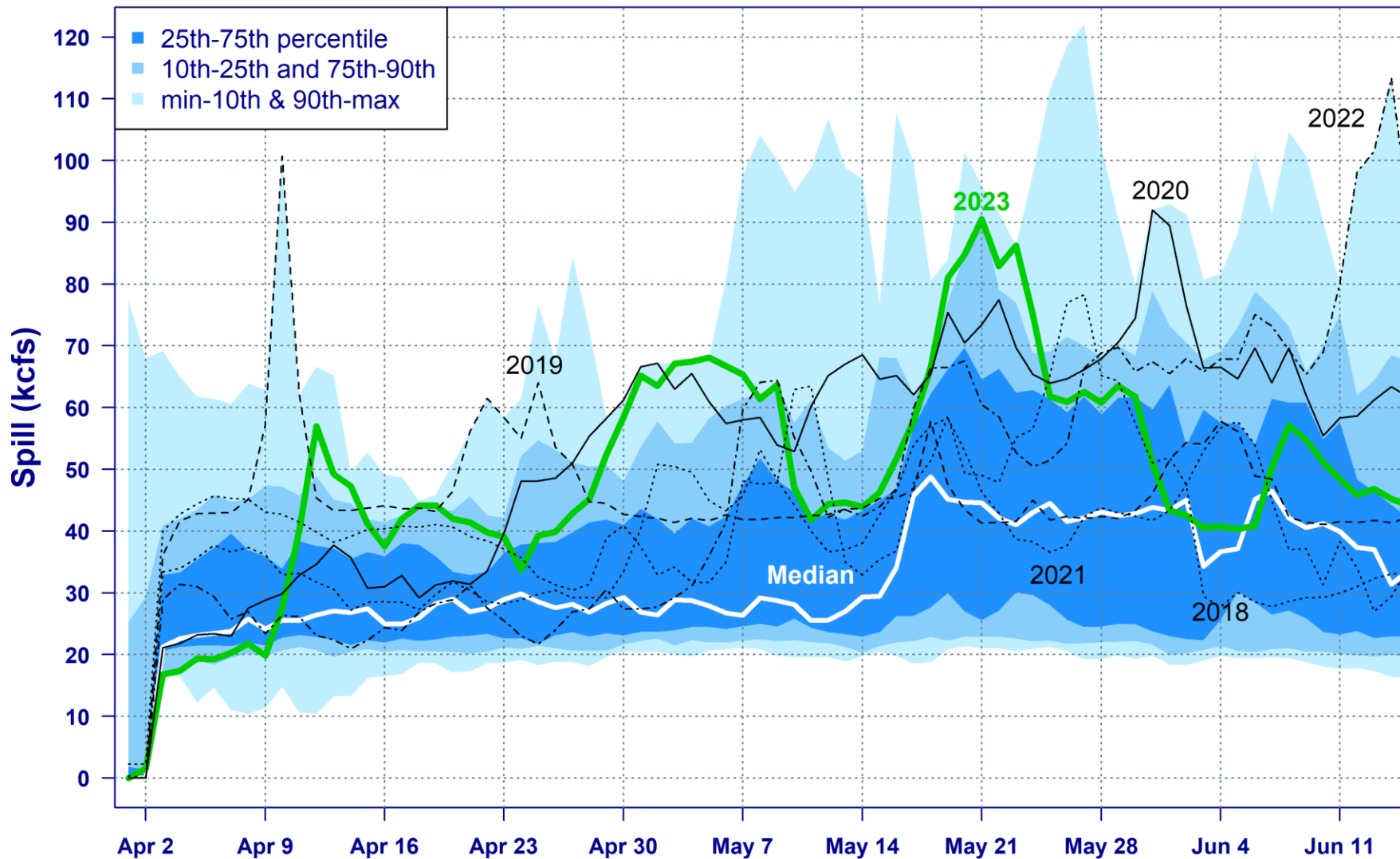
Daily Flow (kcfs) 1989-2023 Little Goose Dam



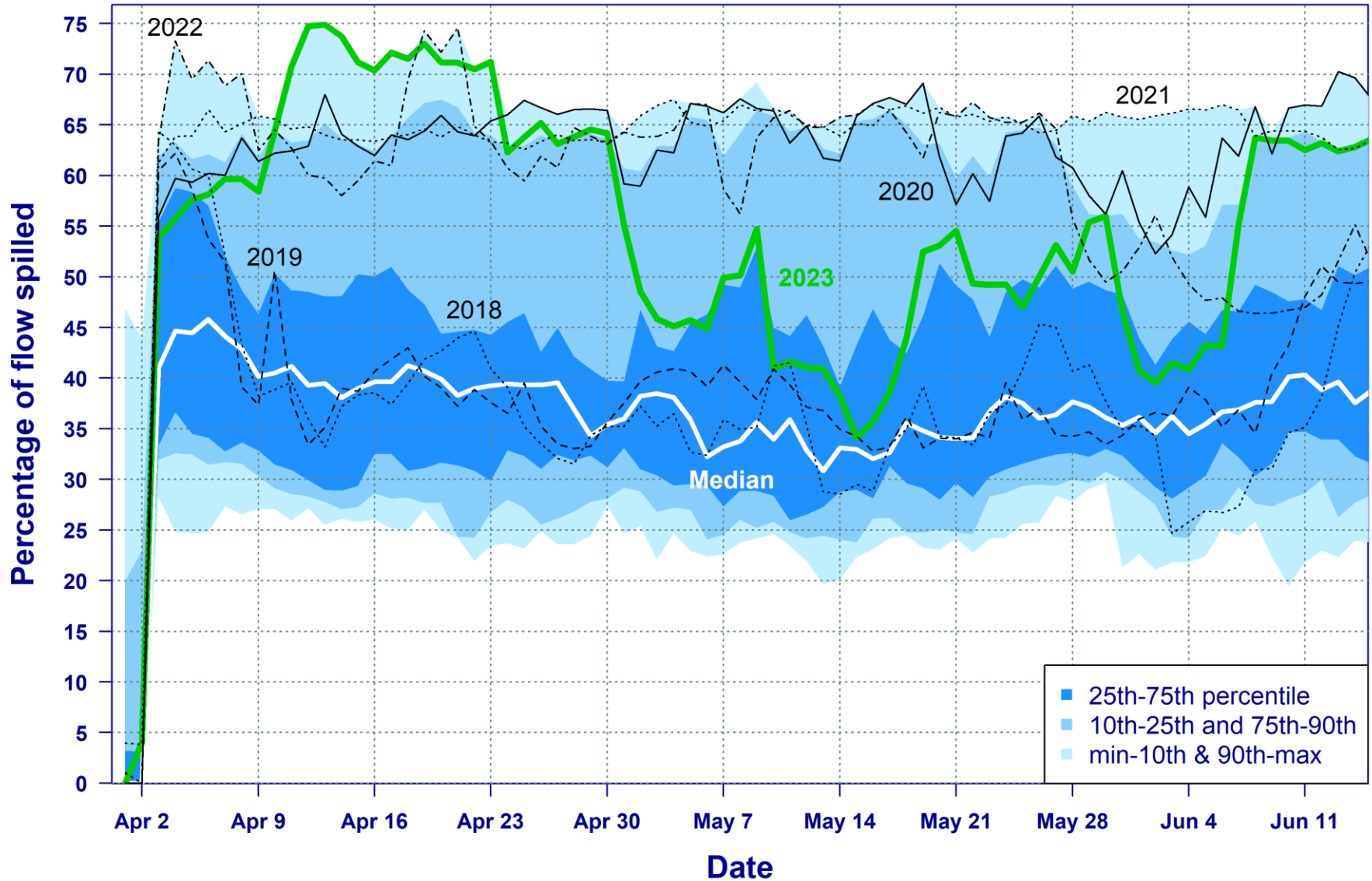
Daily Temperature 1989-2023 Little Goose Dam



Daily Spill (kcfs) 2006-2023 Mean LGR, LGS, LMN

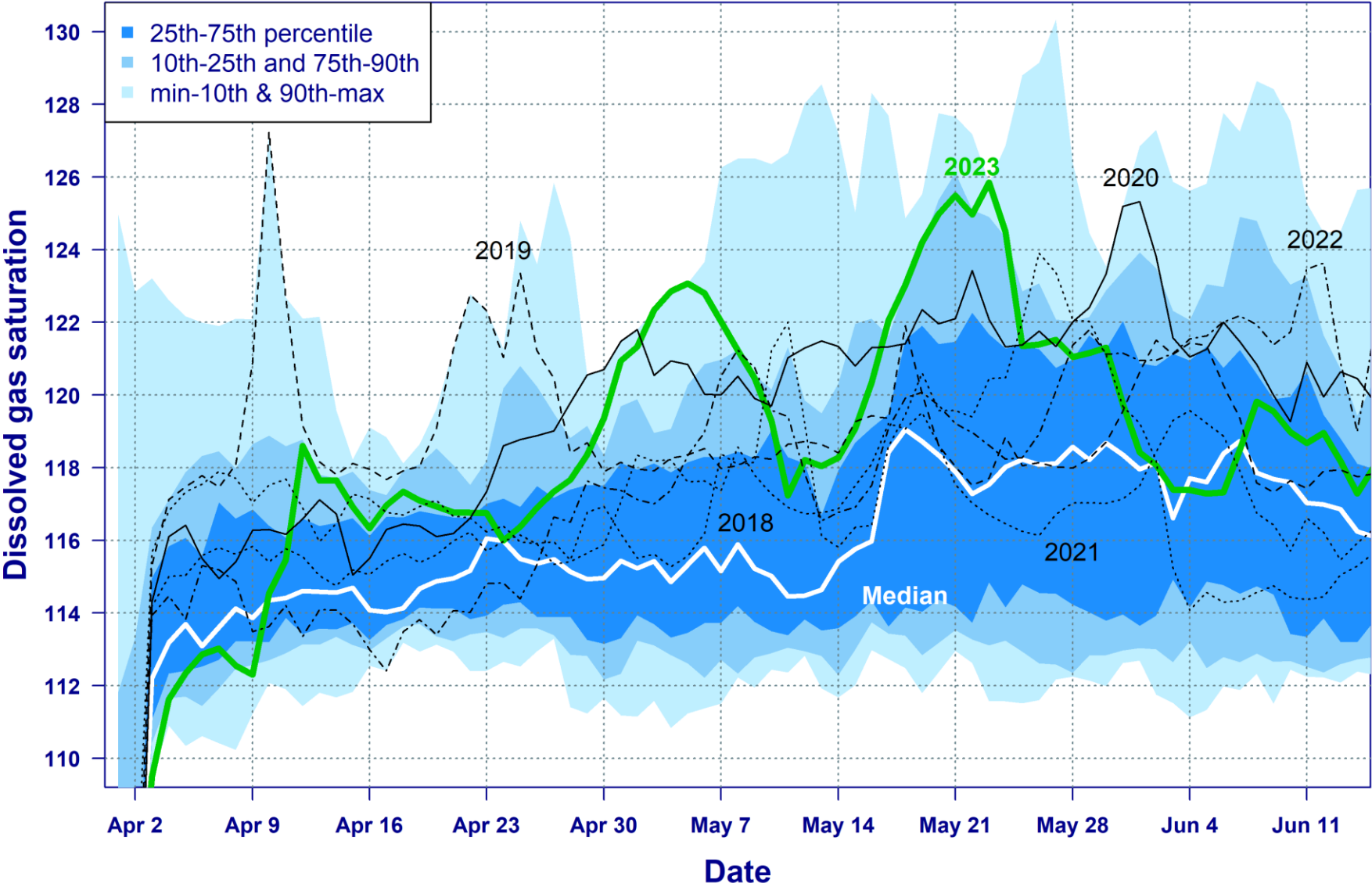


Daily %Spill 2006-2023 Mean LGR, LGS, LMN



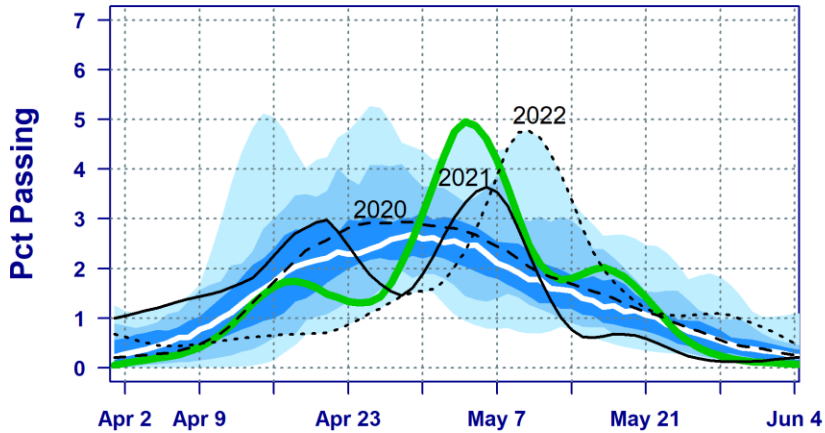
Daily Dissolved Gas Saturation 2006-2023

Mean LGR, LGS, LMN

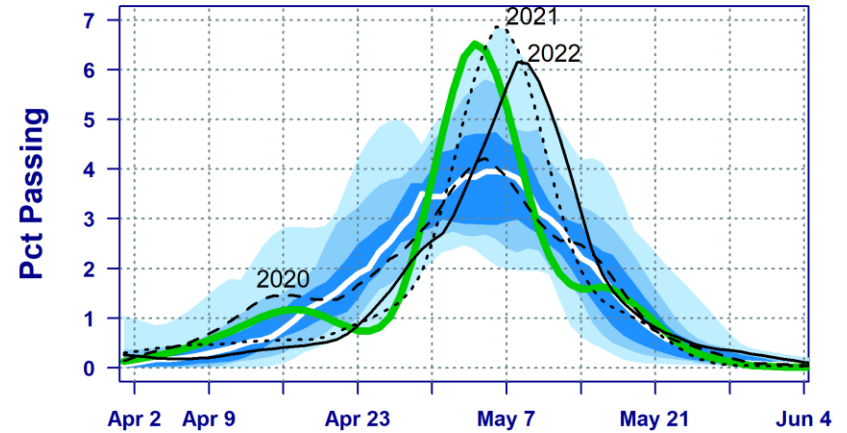


Passage Timing at Lower Granite Dam

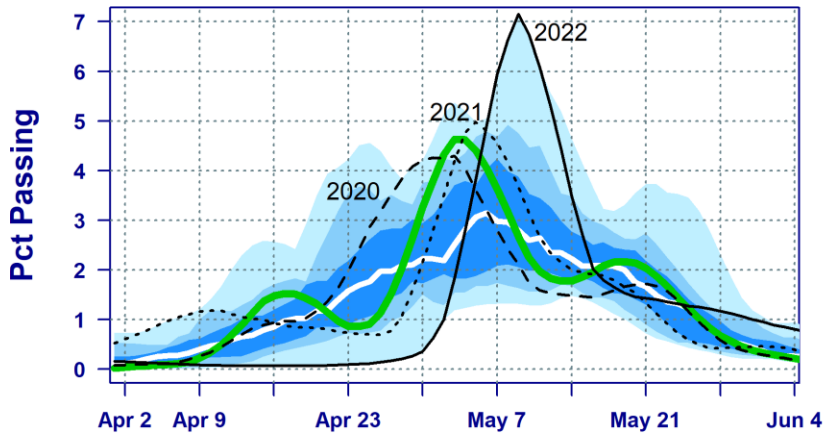
Wild Chinook



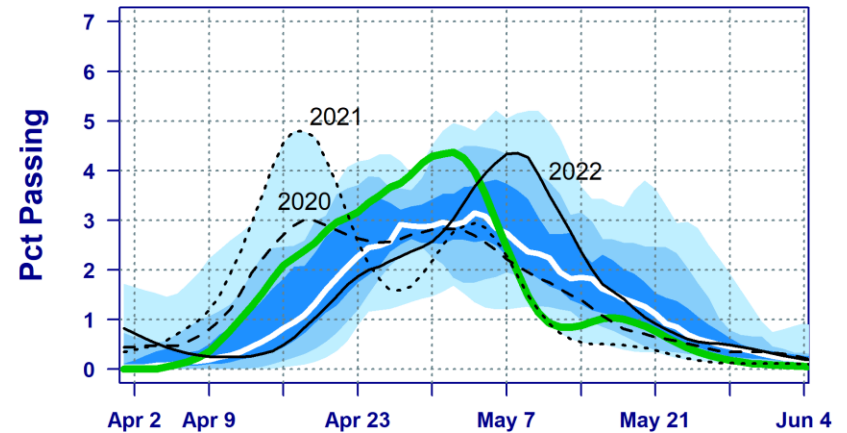
Hatchery Chinook



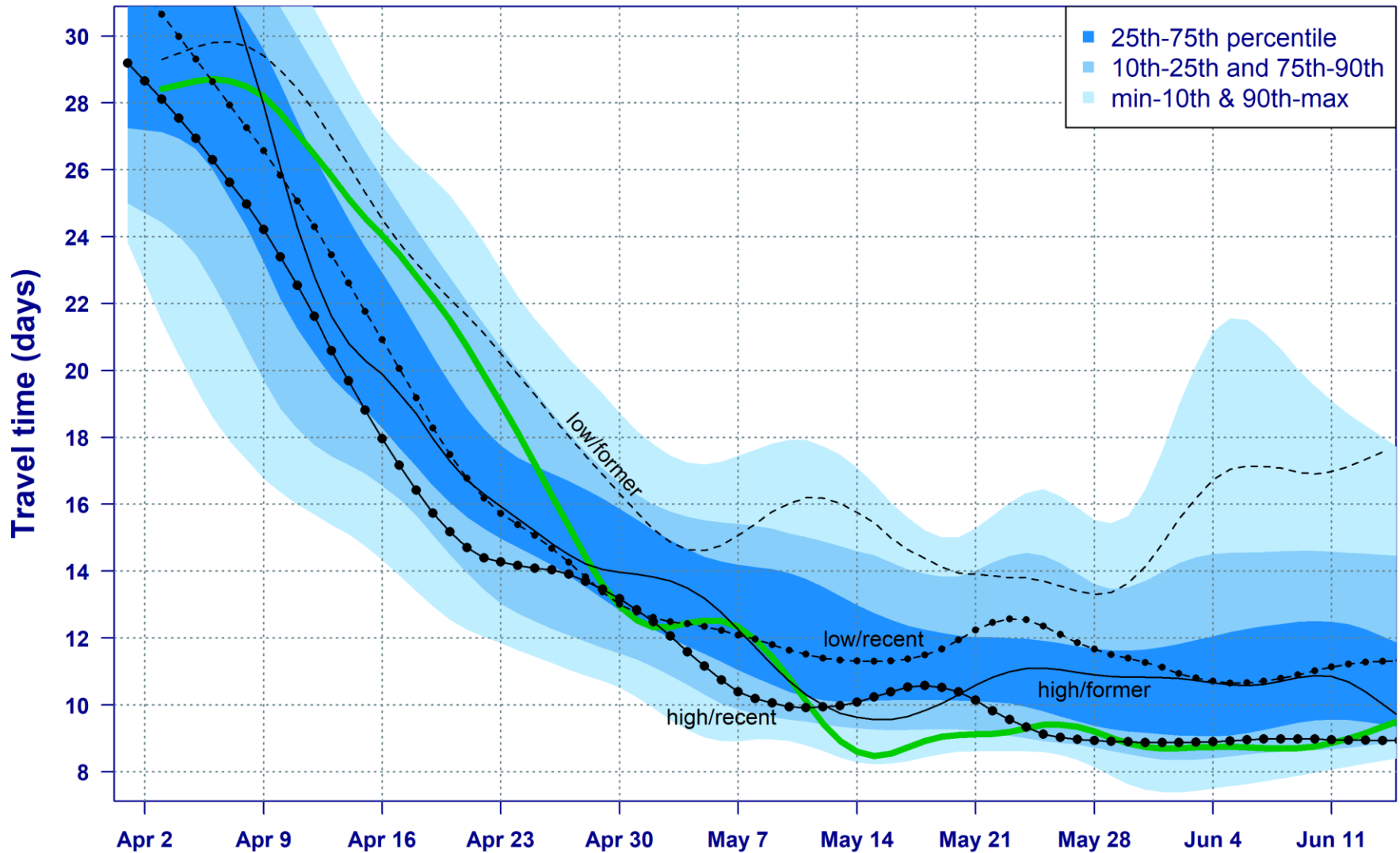
Wild Steelhead



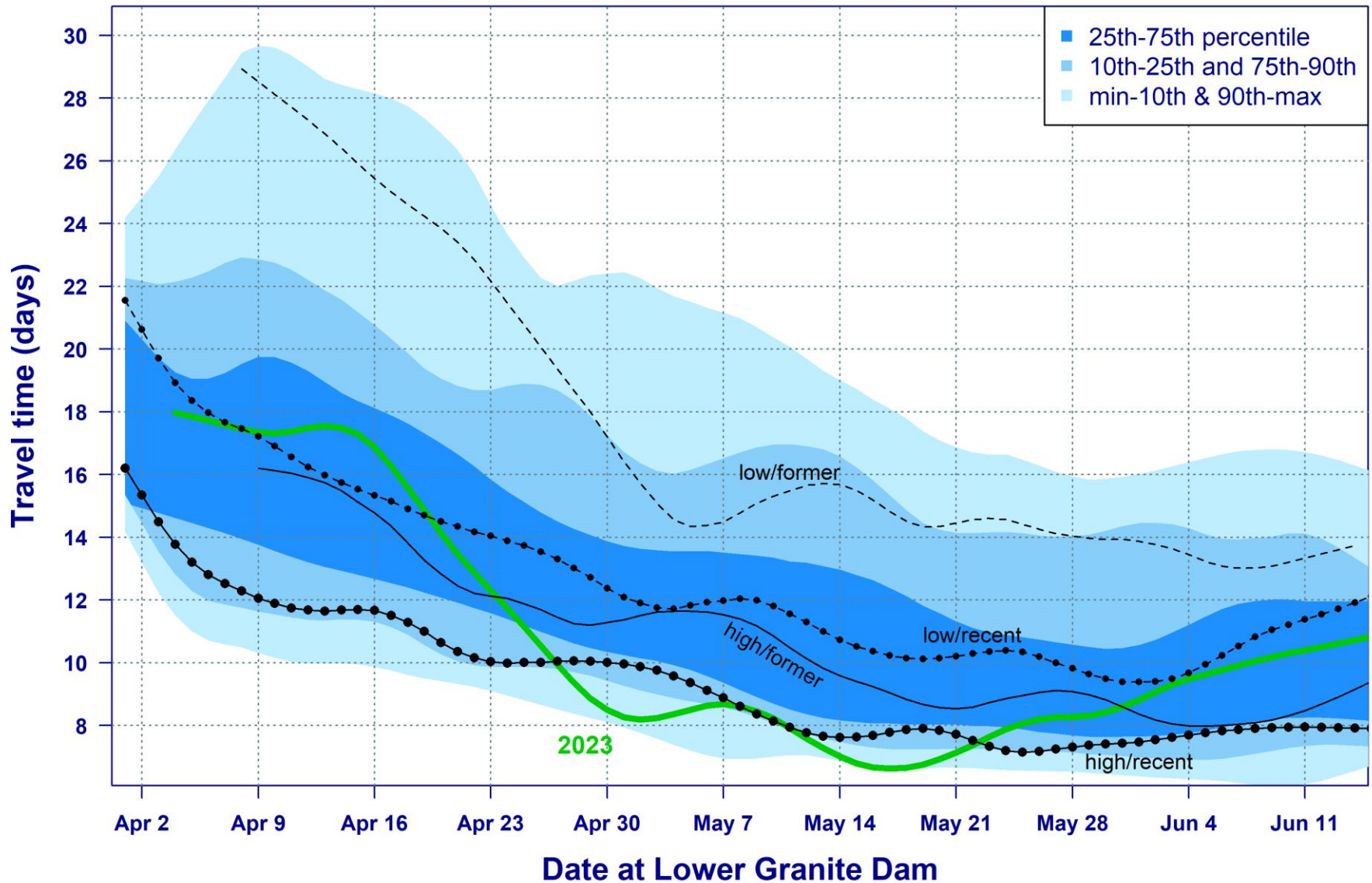
Hatchery Steelhead



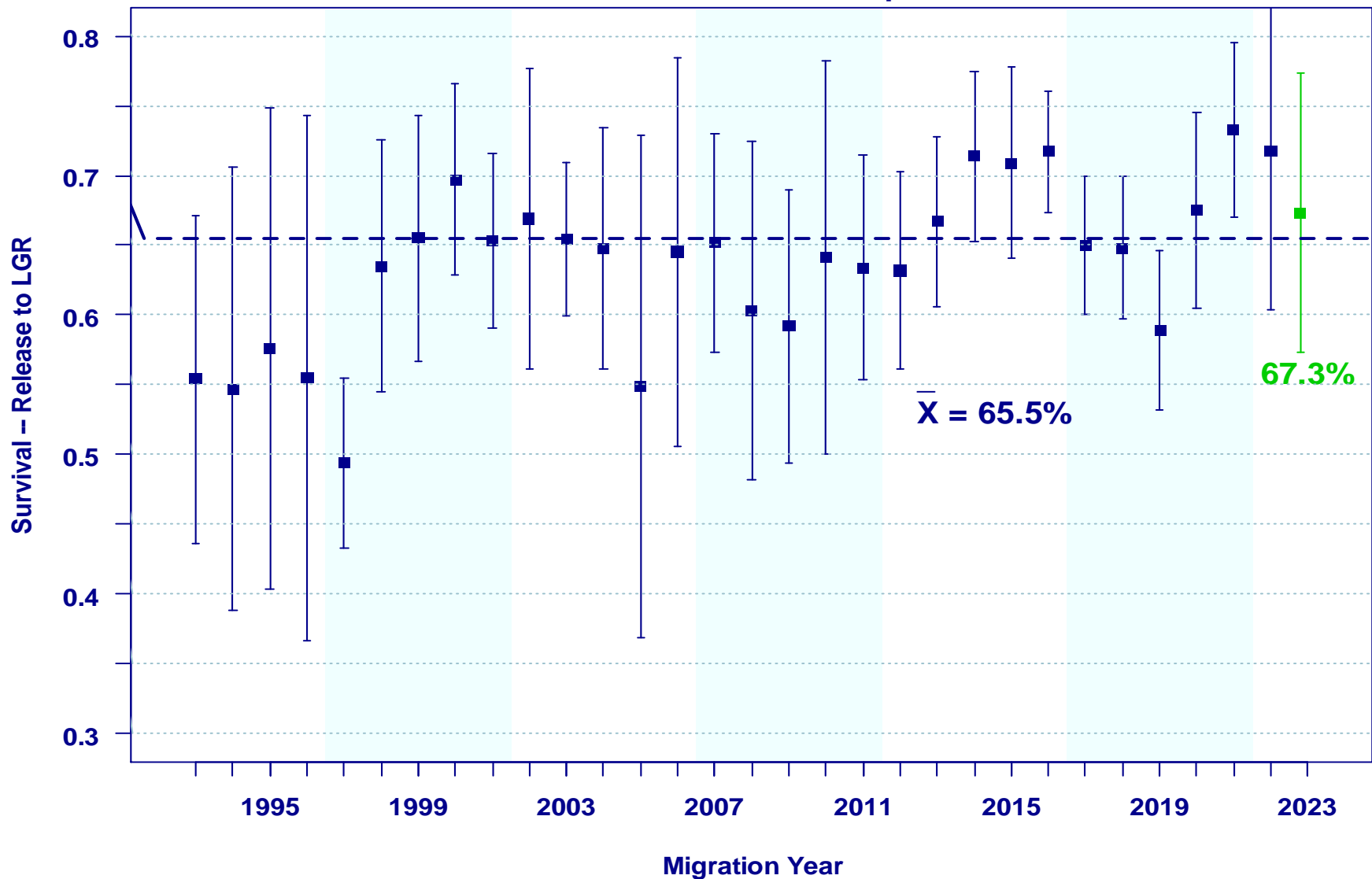
Travel Time - Lower Granite to Bonneville (461 km) Chinook 1997-2023 (exc. 2001)



Steelhead 1997-2023

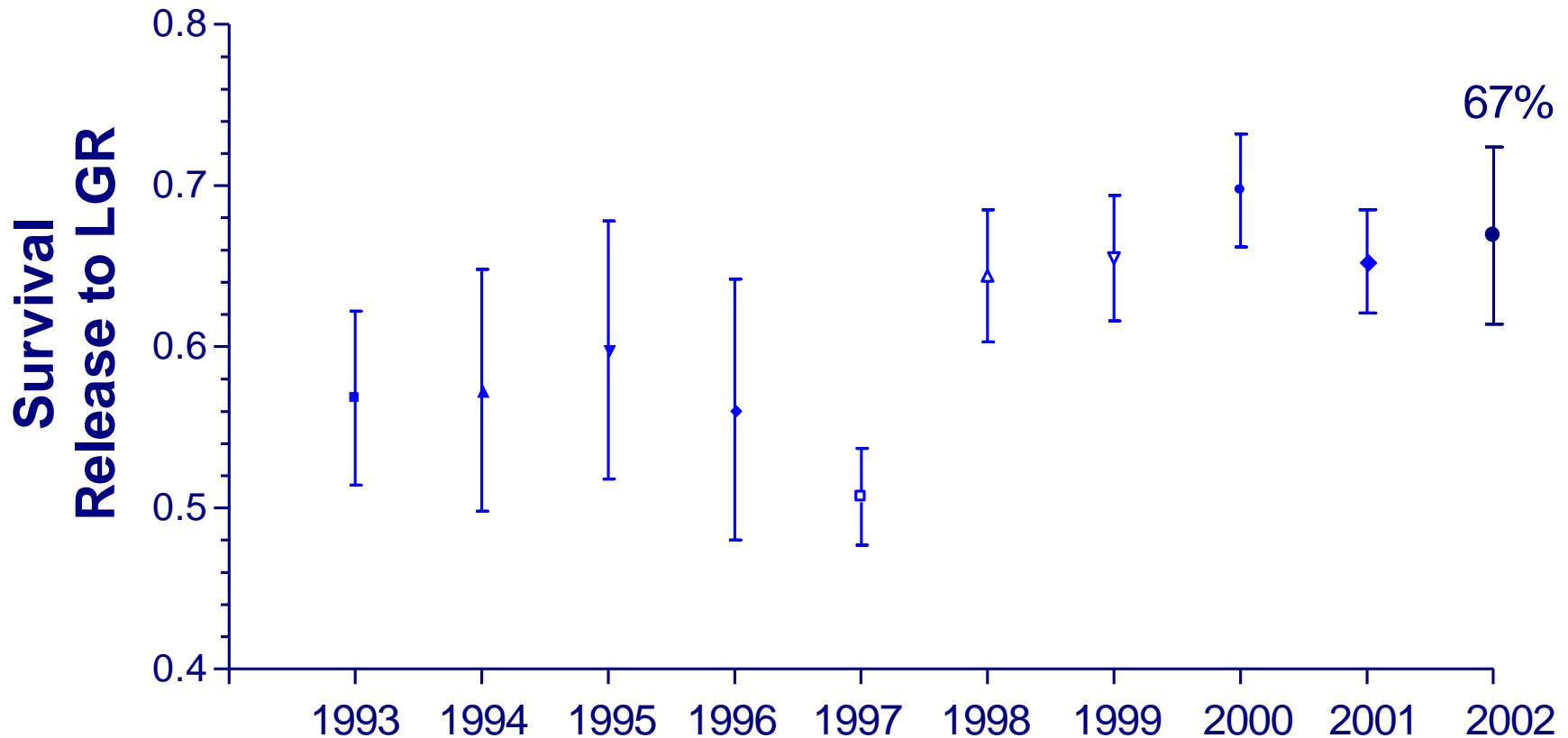


Yearling Chinook Snake River Basin Hatcheries Mean of Index Groups

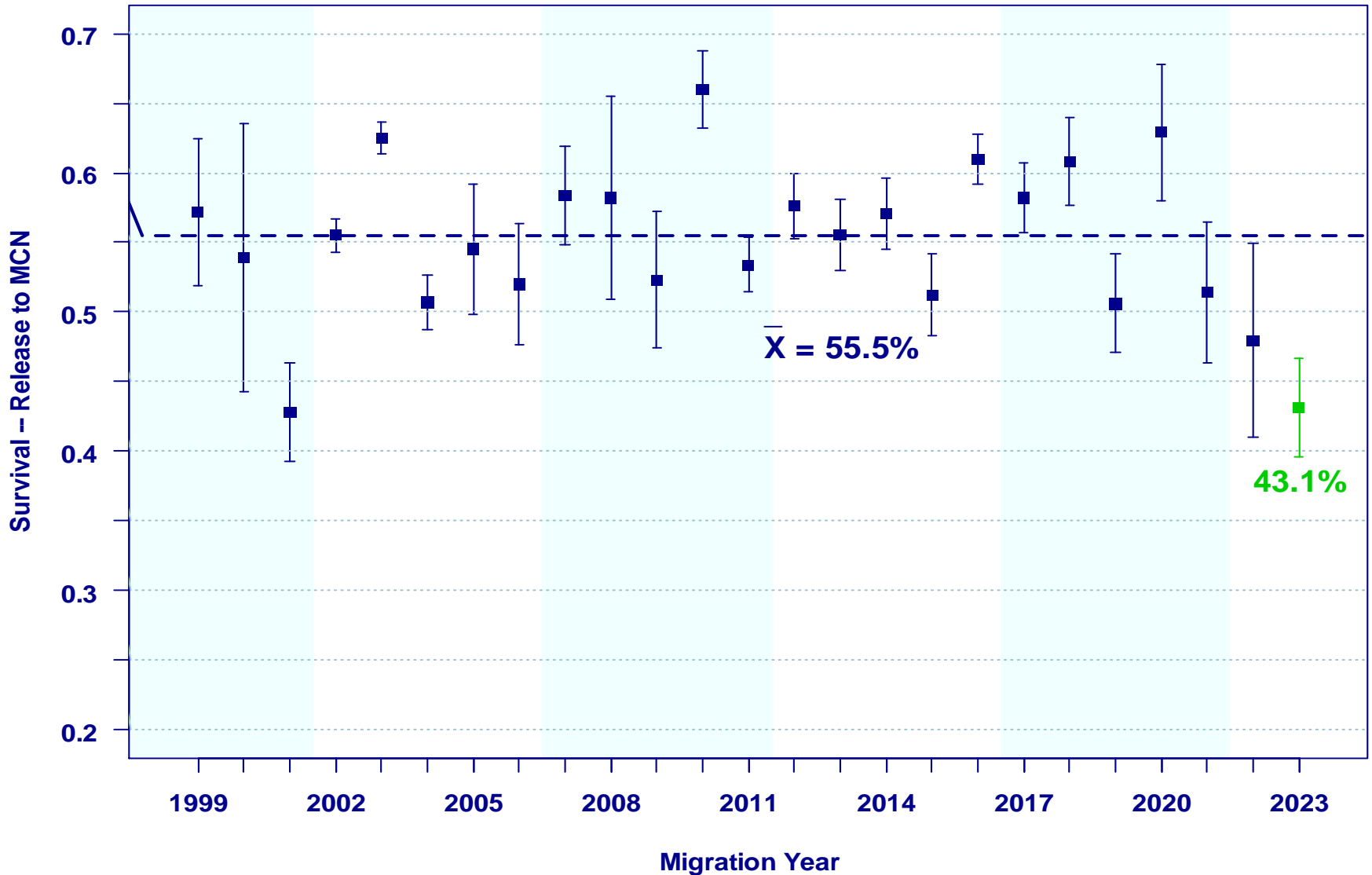


Jan 22, 2003

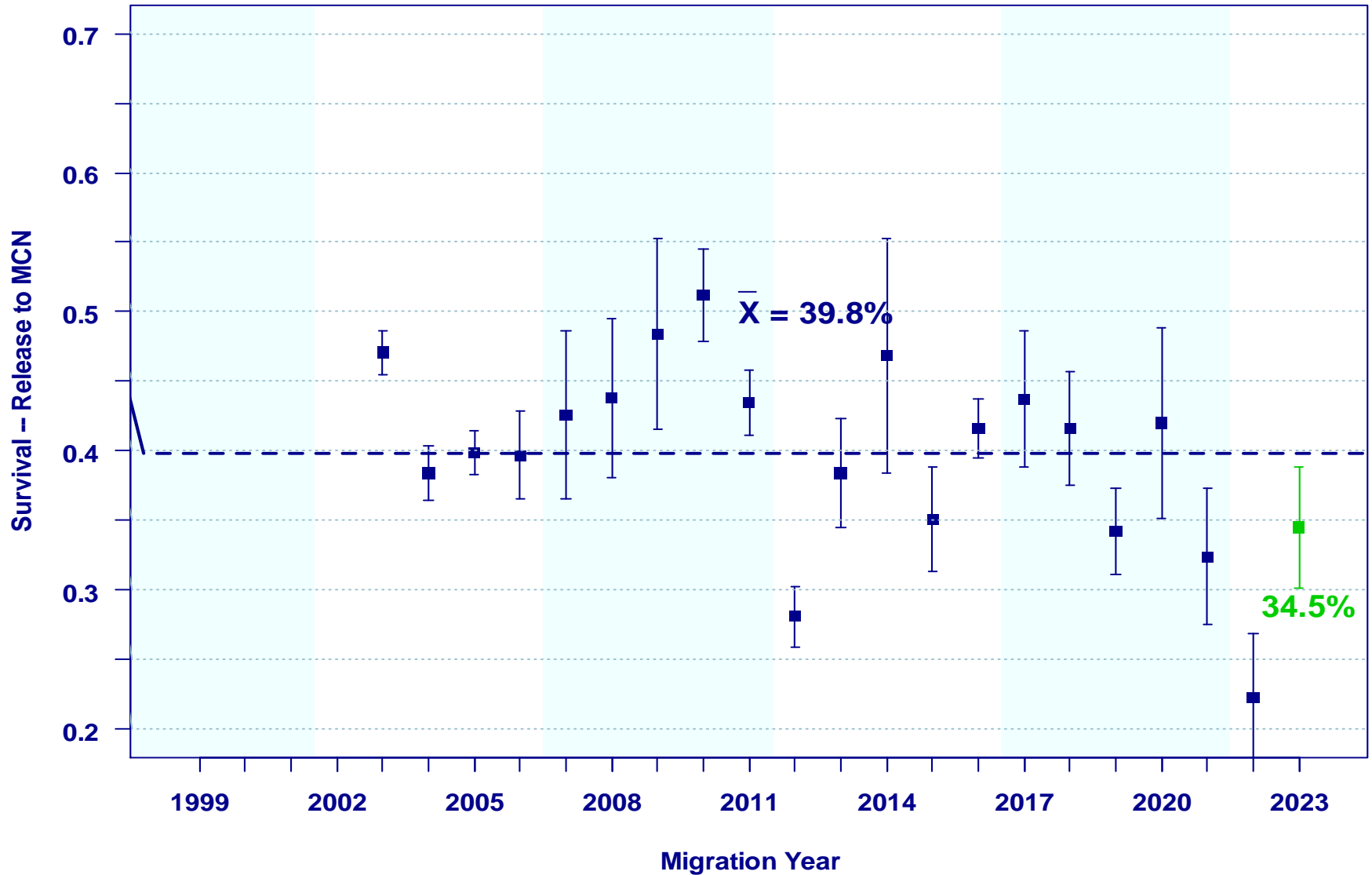
Yearling chinook salmon All Snake River Basin hatcheries combined



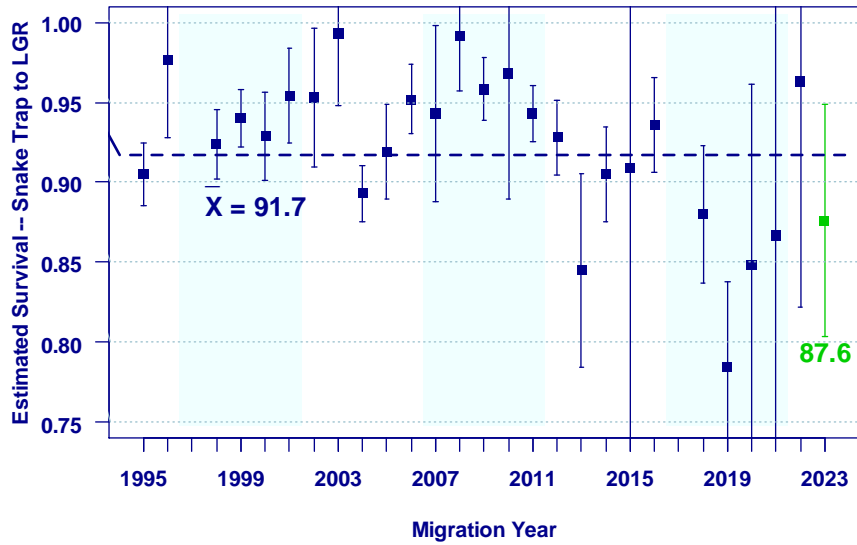
Yearling Chinook Upper Columbia River Hatcheries Mean of Index Groups



Steelhead Upper Columbia River Hatcheries Mean of Index Groups

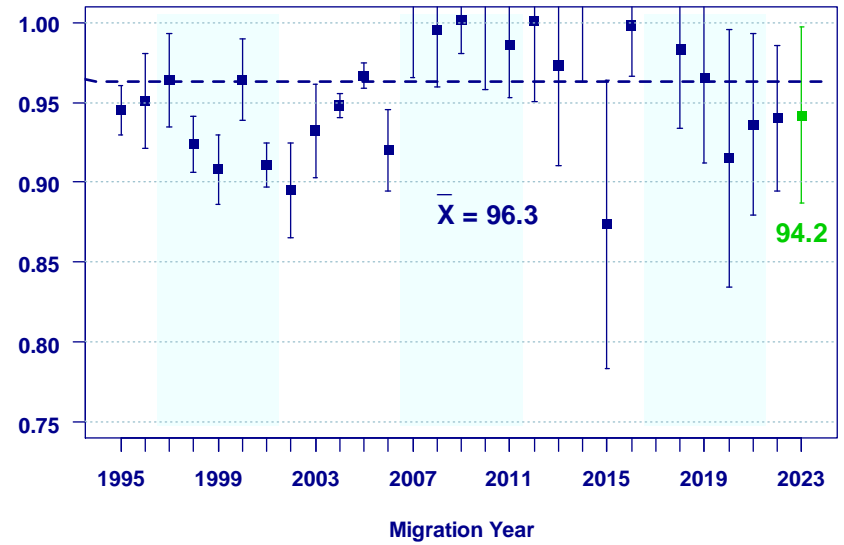


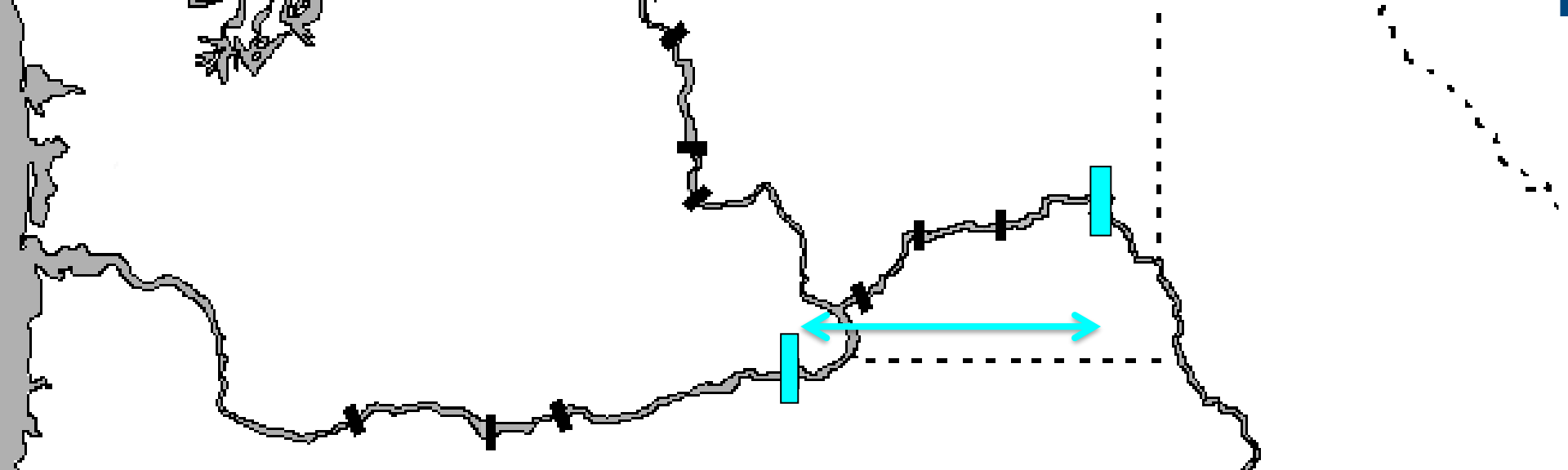
Yearling Chinook



Snake Trap to Lower Granite

Steelhead

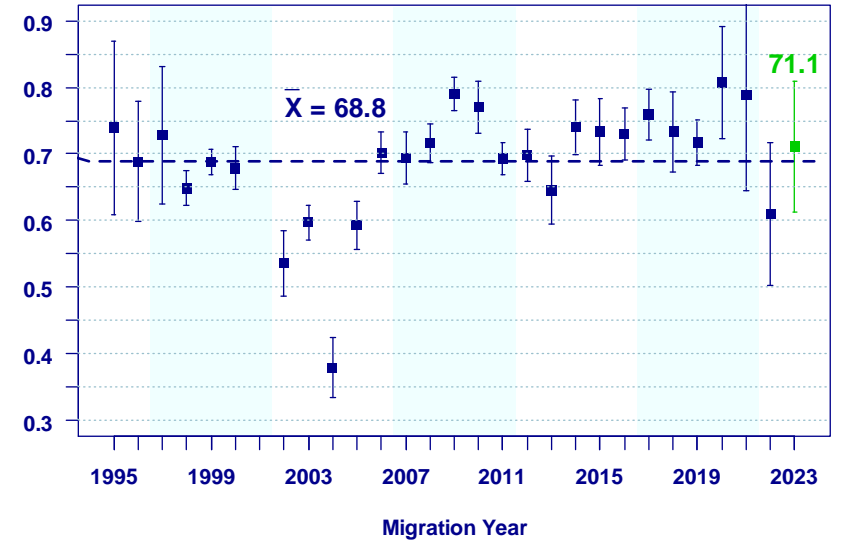
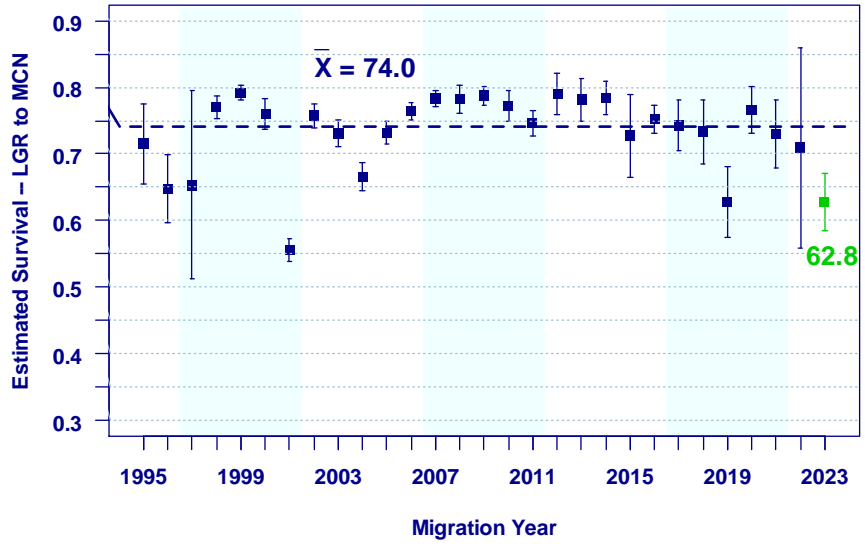


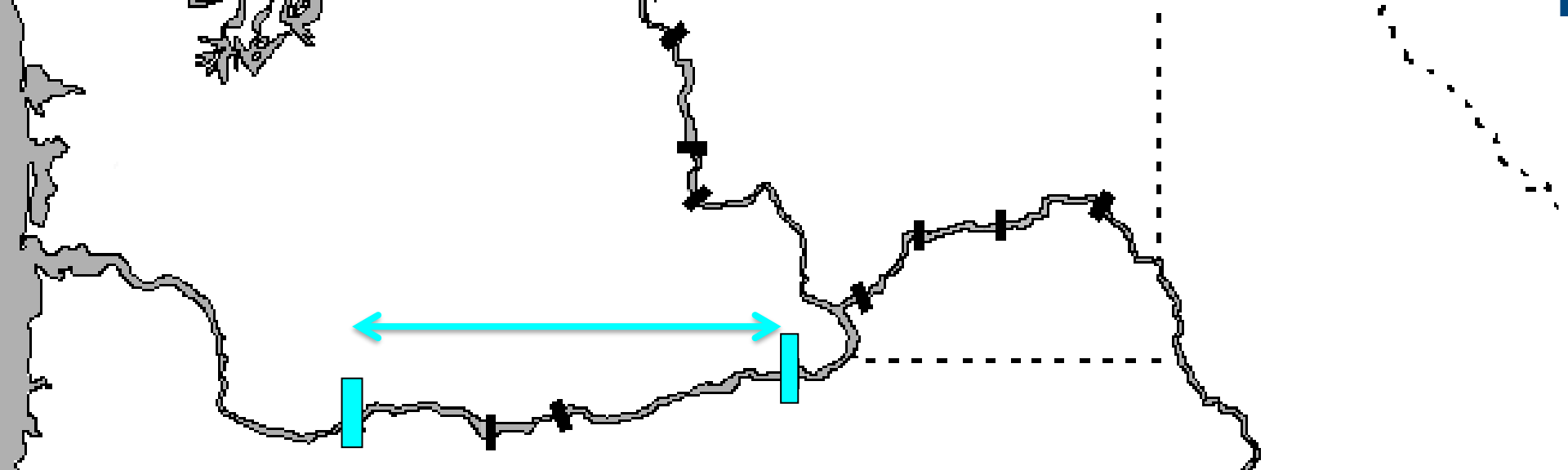


Yearling Chinook

Lower Granite to McNary

Steelhead

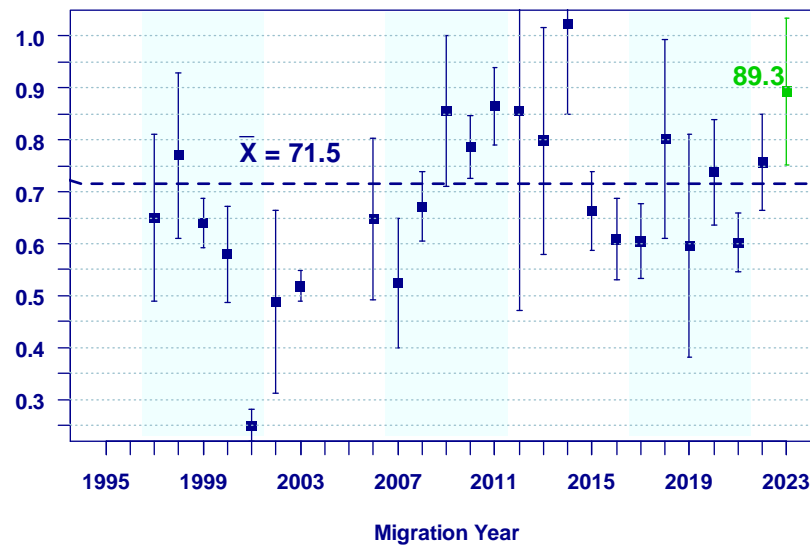
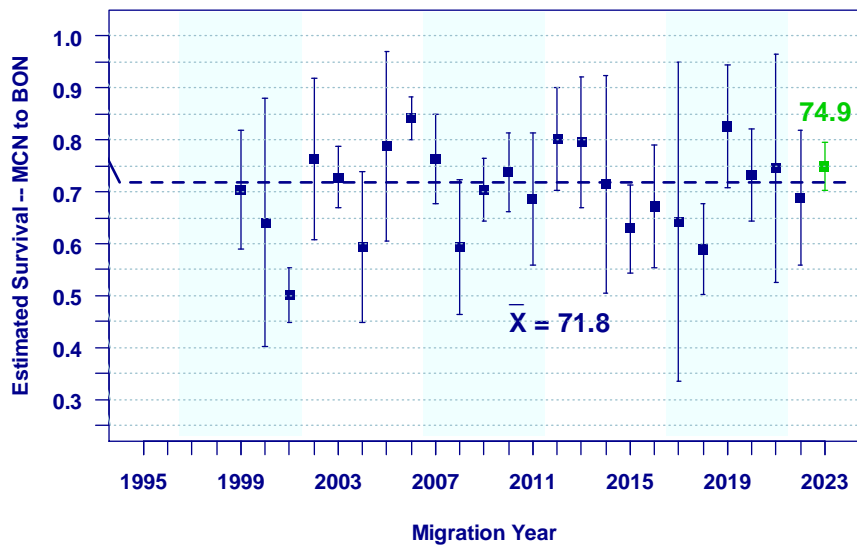


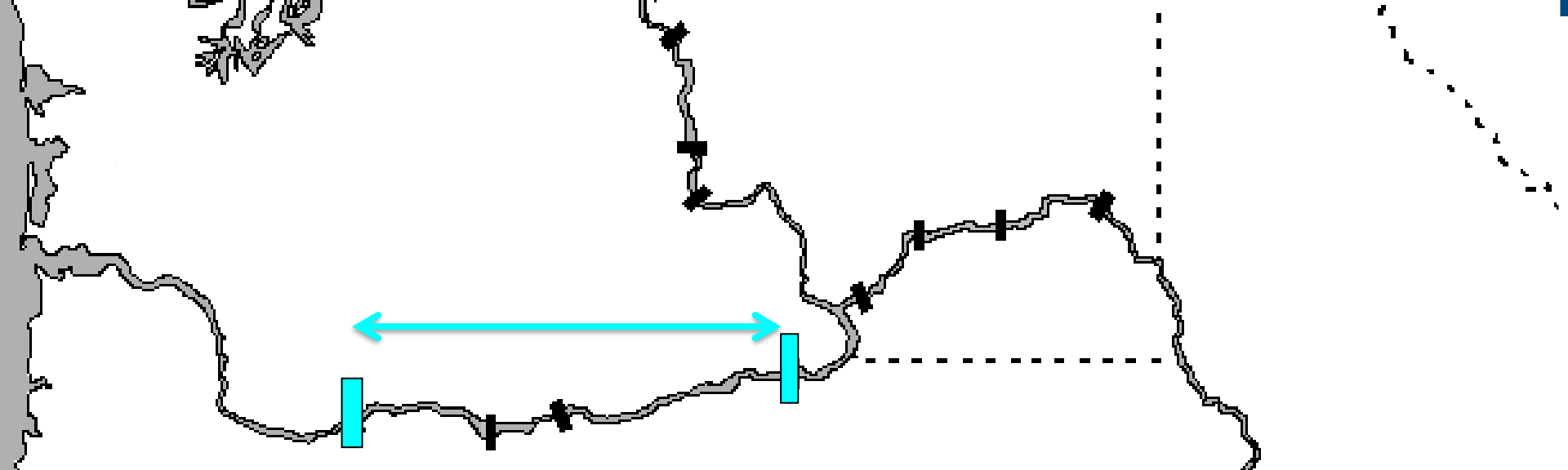


McNary to Bonneville Fish from Snake River

Yearling Chinook

Steelhead

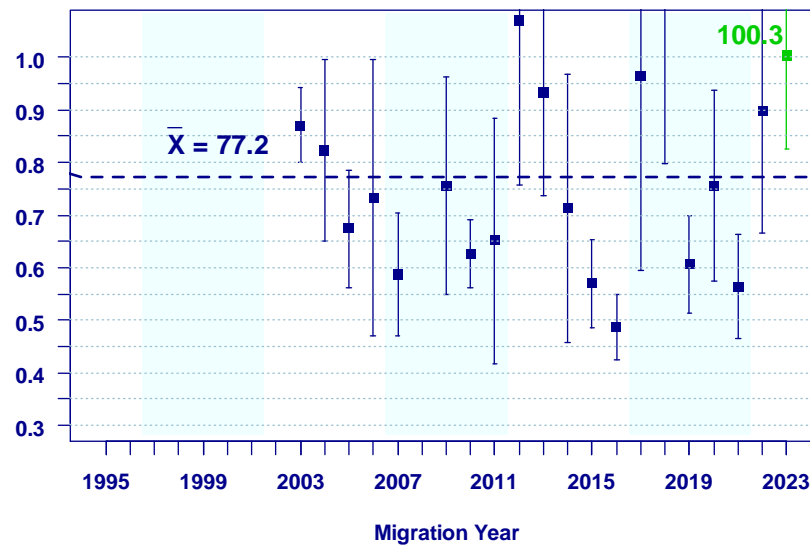
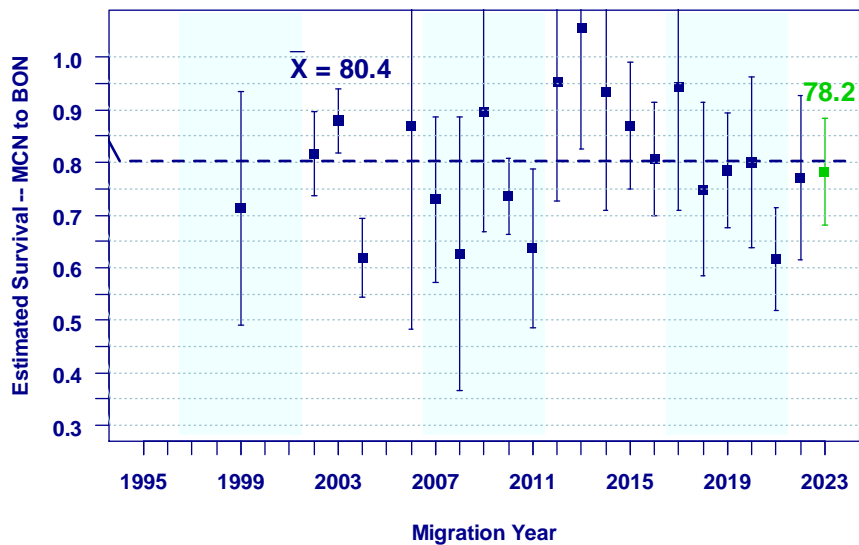


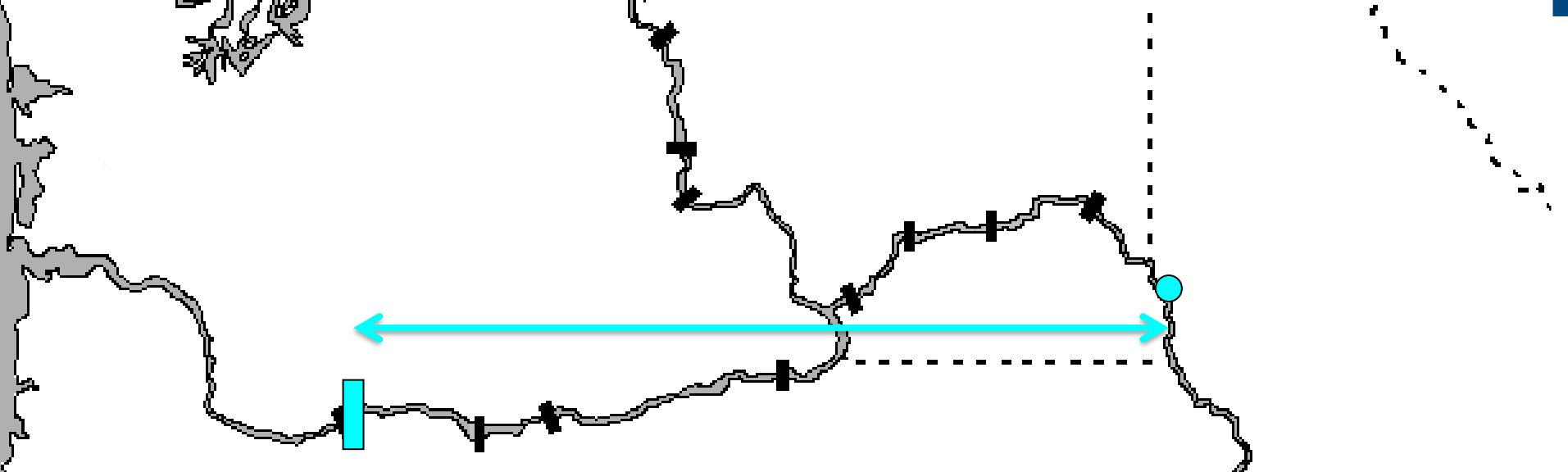


McNary to Bonneville Fish from Upper Columbia

Yearling Chinook

Steelhead

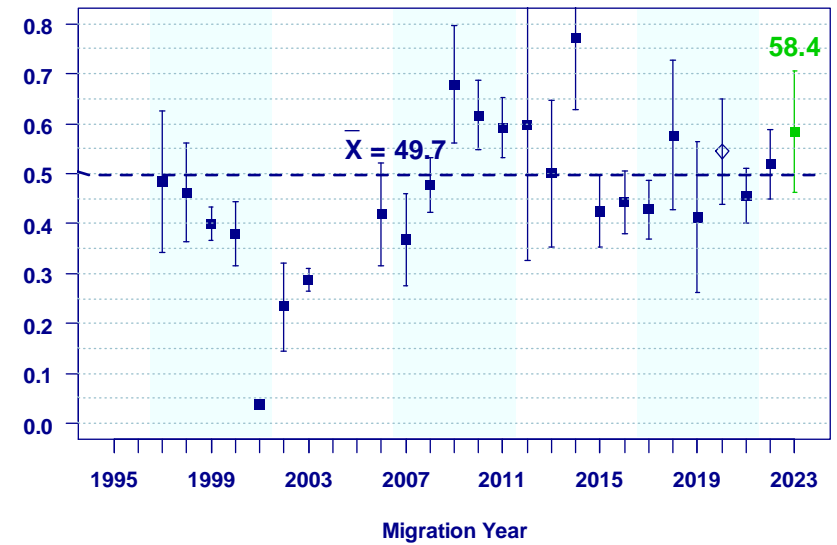
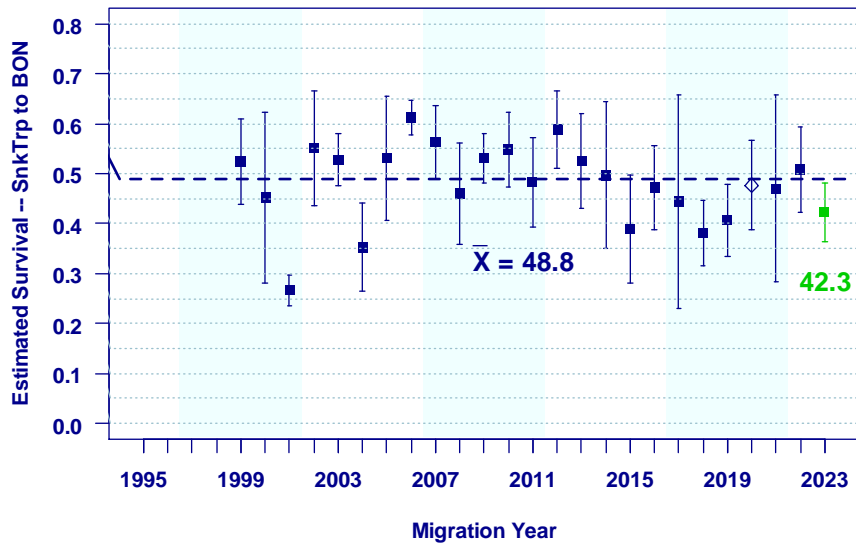




Yearling Chinook

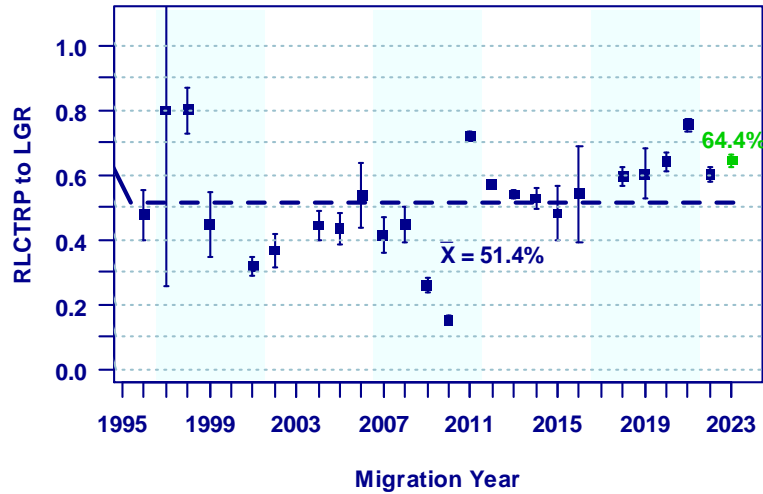
Snake River Trap to Bonneville

Steelhead

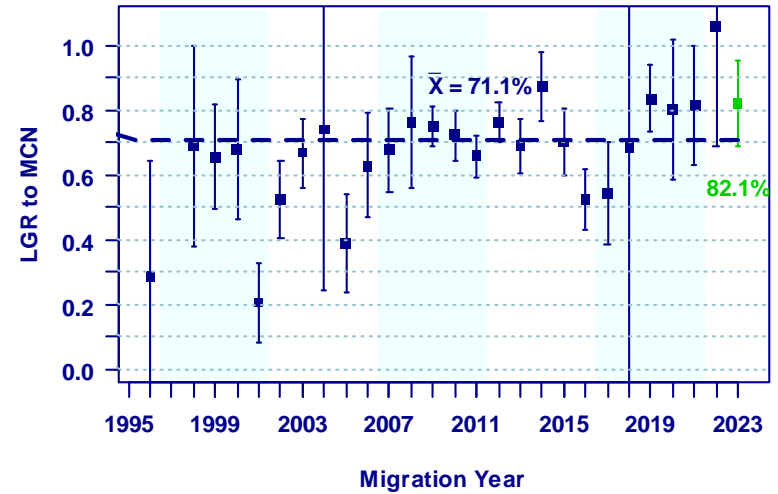


Snake River Sockeye: Estimated Survival

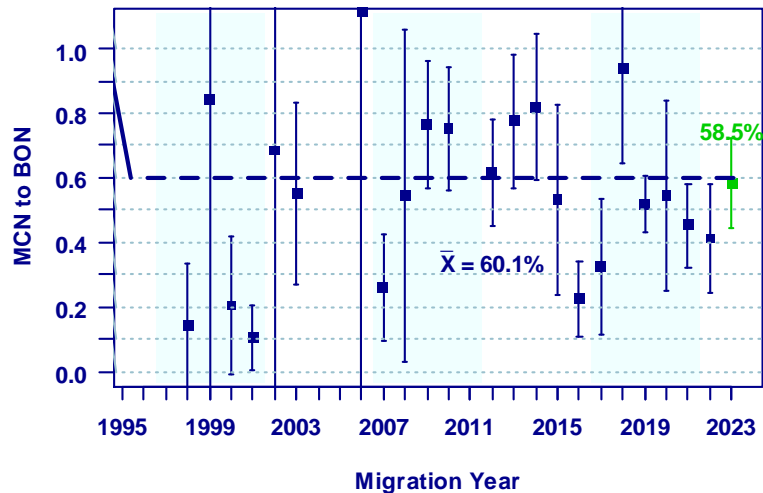
Redfish Lake Trap to Lower Granite



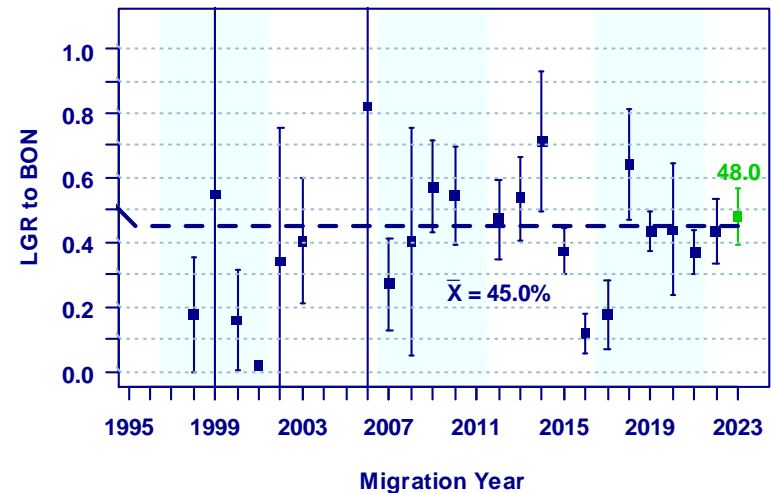
Lower Granite to McNary



McNary to Bonneville

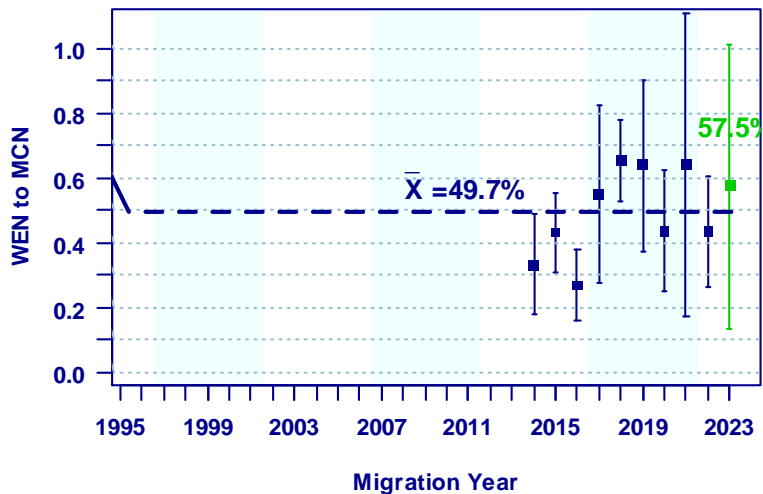


Lower Granite to Bonneville

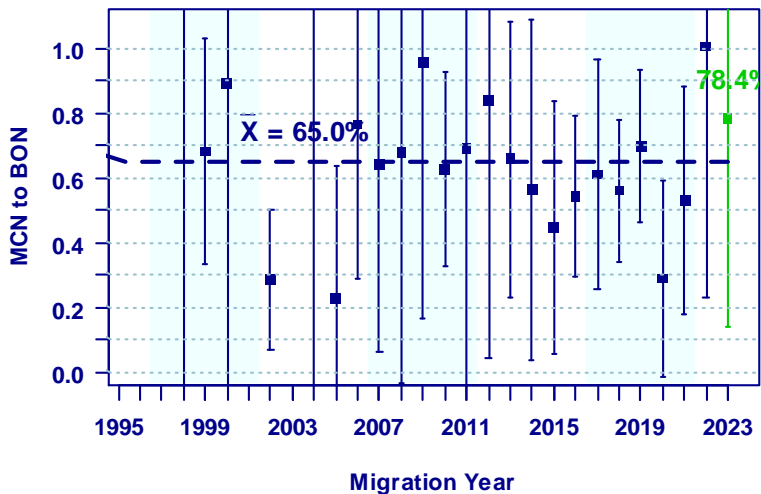


Columbia River Sockeye: Estimated Survival

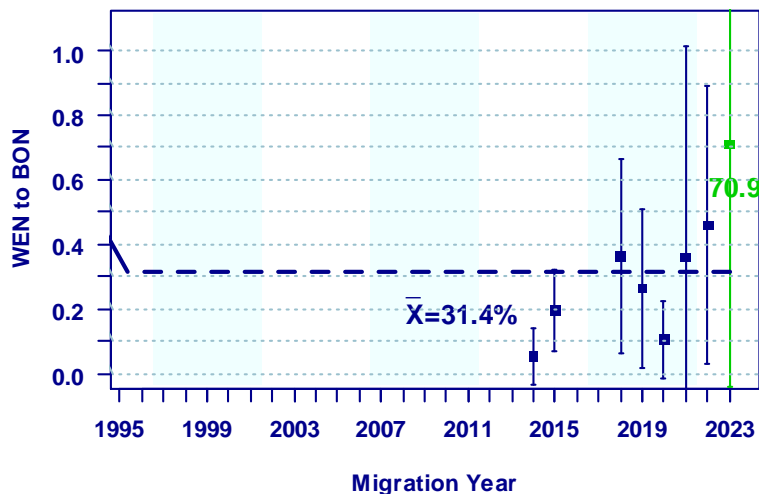
Lower Wenatchee to McNary

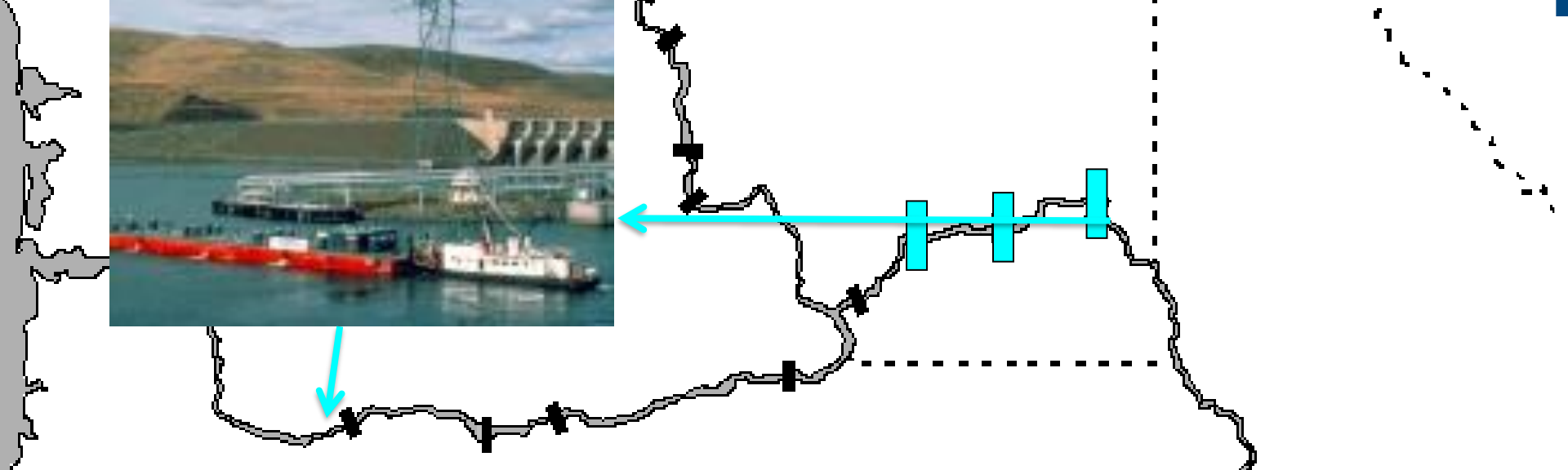


McNary to Bonneville



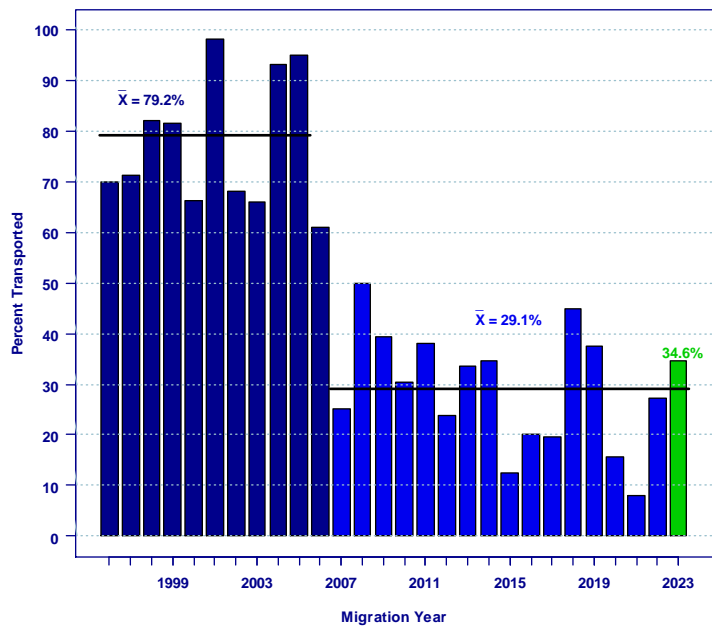
Lower Wenatchee to Bonneville



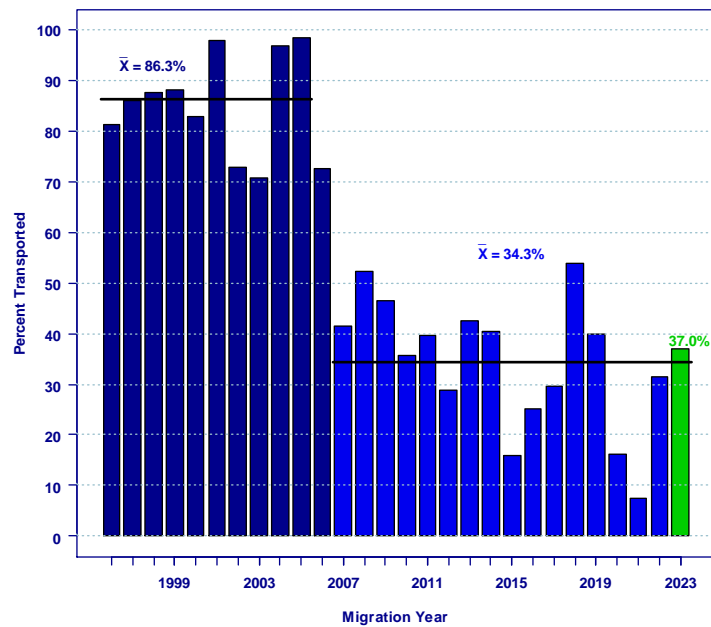


Estimated Percent Transported

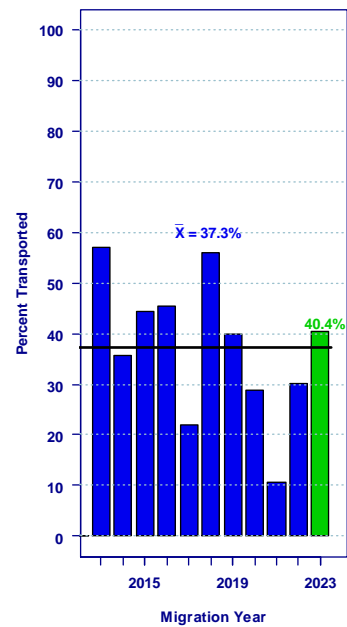
Yearling Chinook



Steelhead



Sockeye



Acknowledgments

- Bonneville Power Administration
- PTAGIS – Pacific States Marine Fisheries Commission
- Avian Predation Detection Project
 - Real Time Research -- Astoria-Megler Bridge etc.
 - Corps of Engineers Fish Field Units – East Sand Island
- DART – University of Washington Columbia Basin Research
- NOAA Colleagues: Jim Faulkner, Dan Widener, Tiffani Marsh
- Legions of Taggers, Coordinators, Agencies, etc.

Smolt Transportation

Yearling Chinook & Steelhead Data from Migration Years 2017-2020

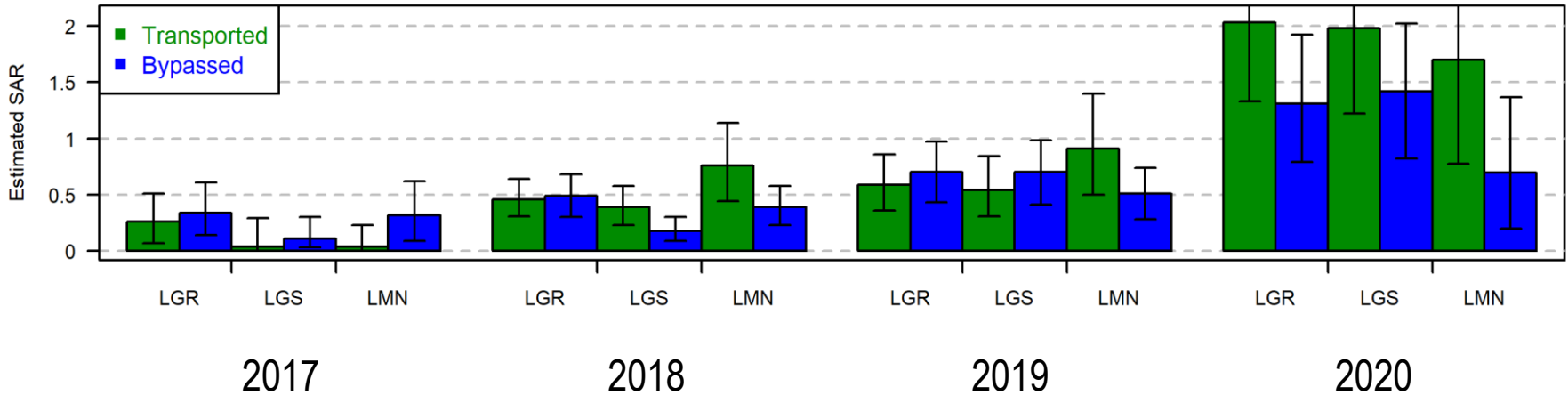
- Updated with adult returns through Dec 31, 2022
- Added smolt migration year 2020
- Spillway-passed fish at LGR

Terminology – Groups of Fish

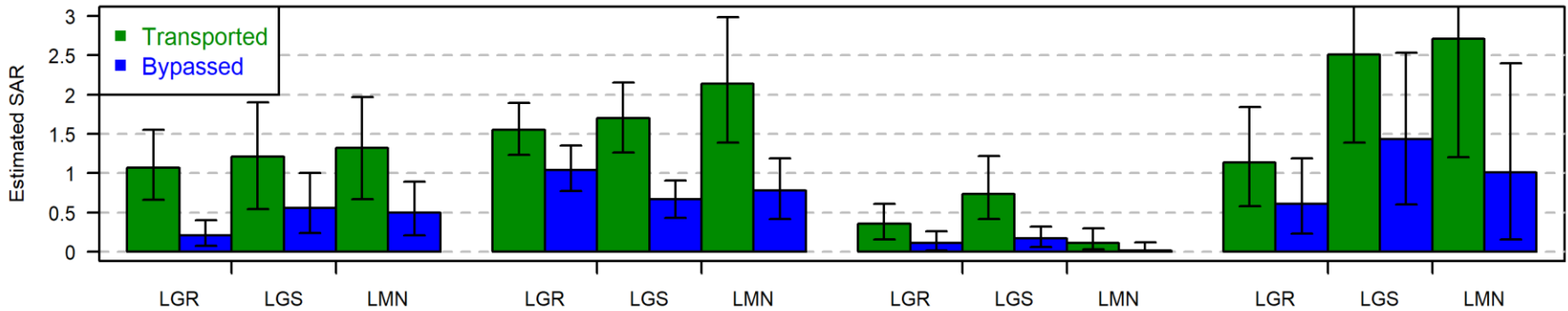
- “**Transported**” – Entered gatewell (at LGR), guided into Juvenile Fish Facility, collected in raceway, loaded into barge, transported in barge to below Bonneville Dam
- “**Bypassed**” – Entered gatewell (at LGR), guided into Juvenile Fish Facility, directed to tailrace
- “**Spilled**” – Passed LGR via spillway

Annual Estimated SARs – Transport Period

Wild Yearling Chinook

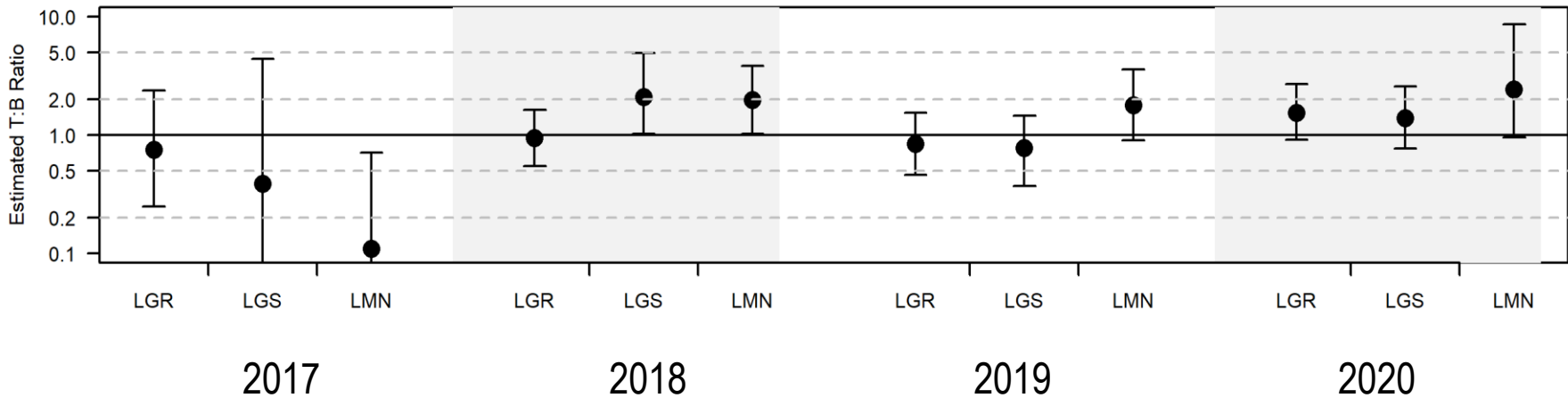


Wild Steelhead

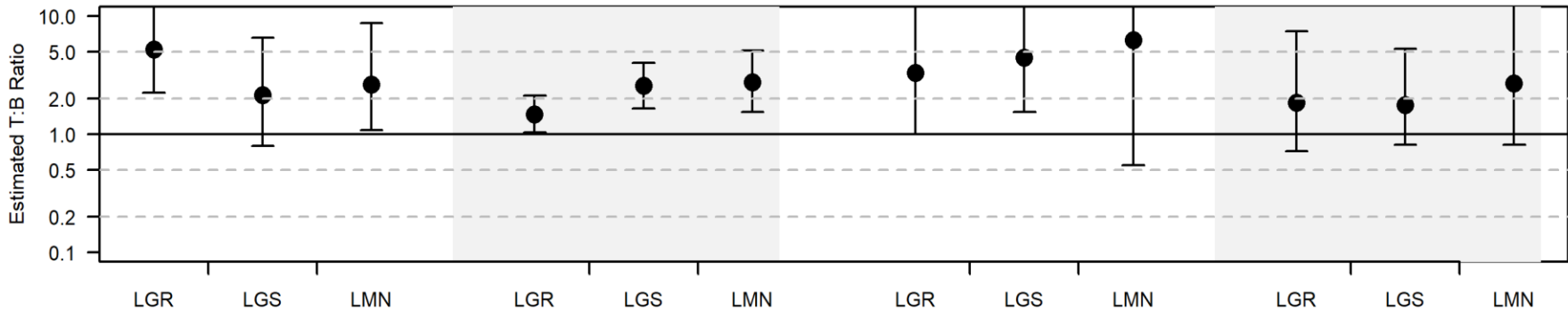


Annual Estimated T:B – Transport Period

Wild Yearling Chinook - T:B

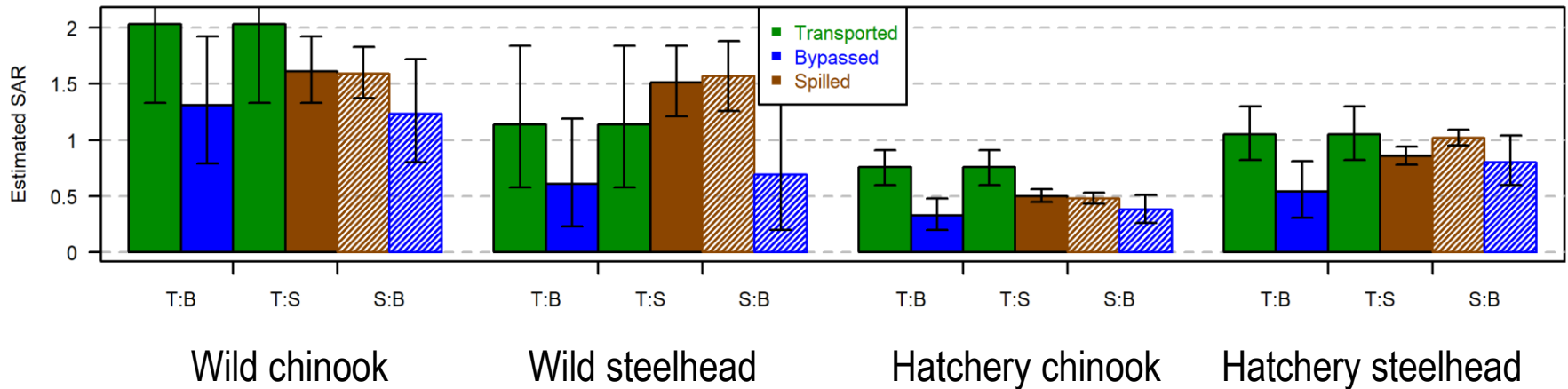


Wild Steelhead - T:B

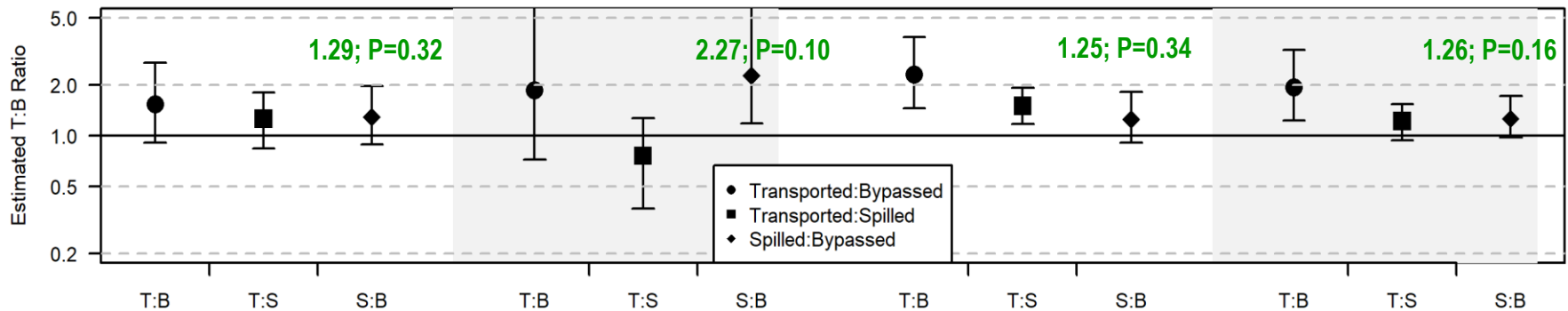


Spillway Detector – Migration Year 2020

Smolt-to-Adult Return%



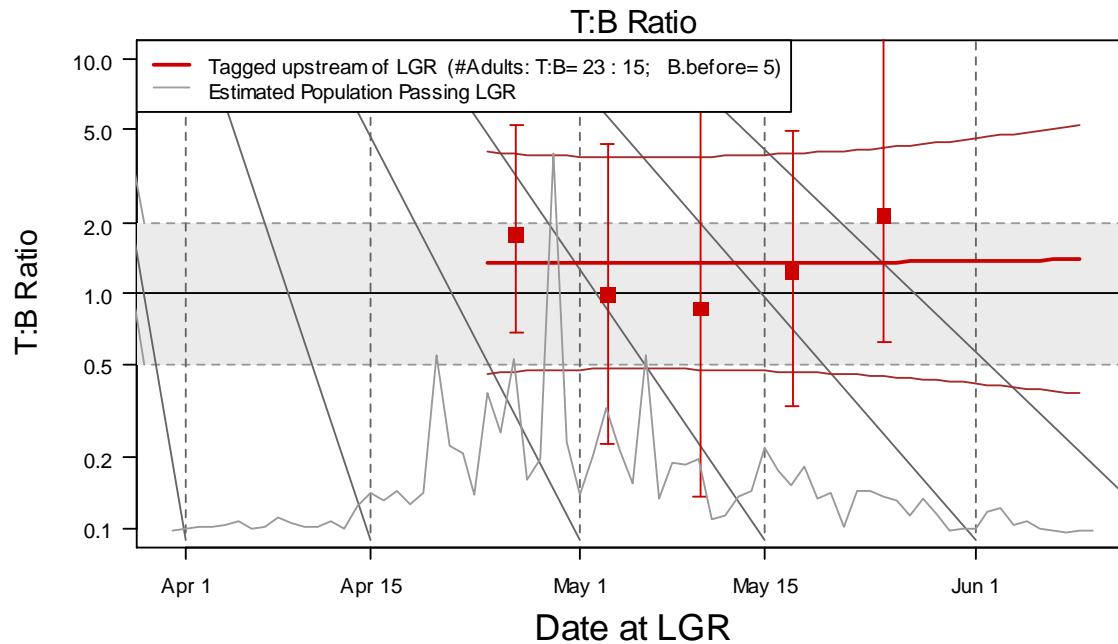
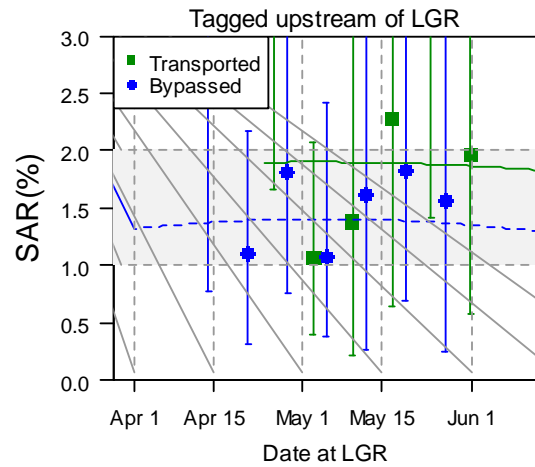
Ratios



Some Seasonal Stuff for MY 2020

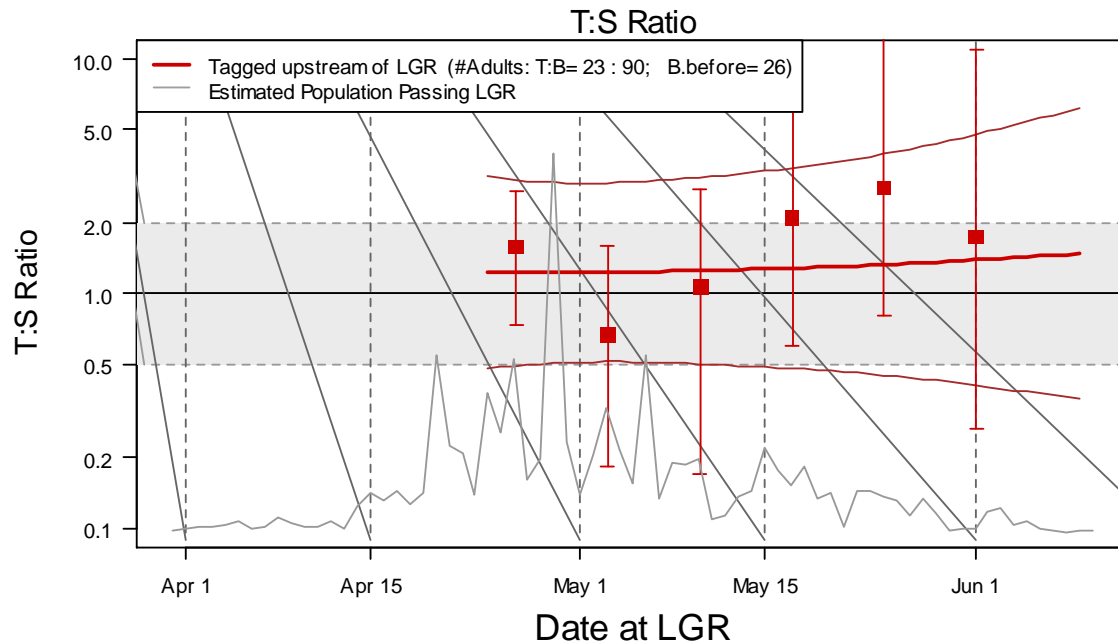
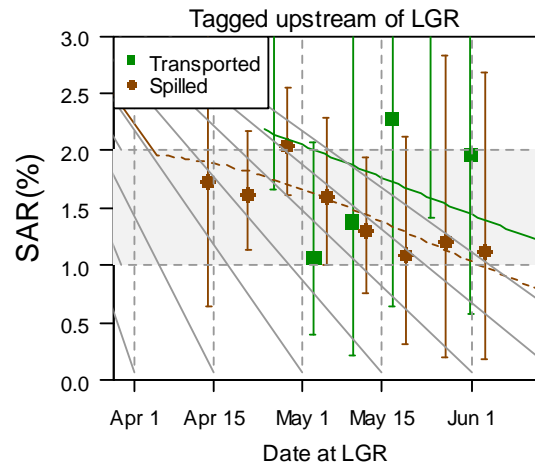
Wild Chinook 2020

Transported or Bypassed at Lower Granite Dam



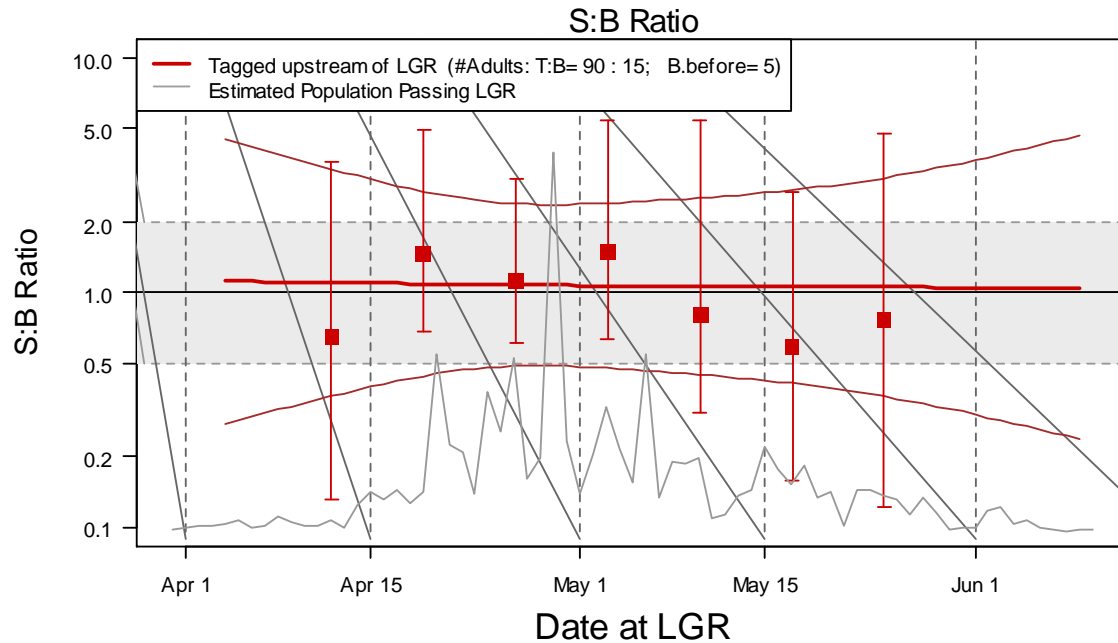
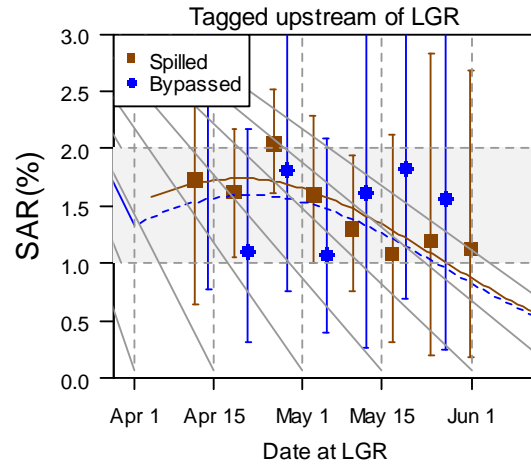
Wild Chinook 2020

Transported or Spilled at Lower Granite Dam



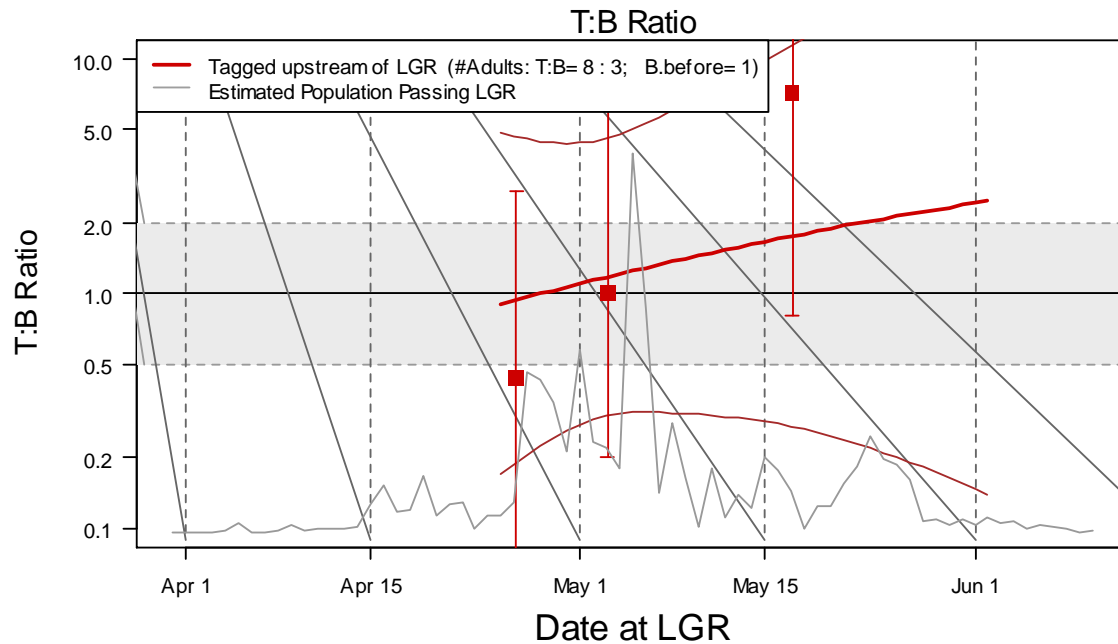
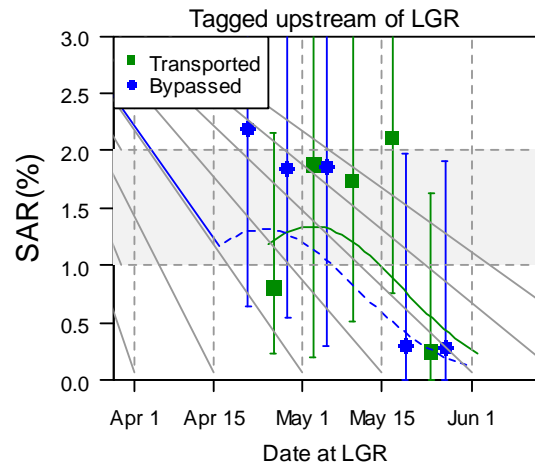
Wild Chinook 2020

Spilled or Bypassed at Lower Granite Dam



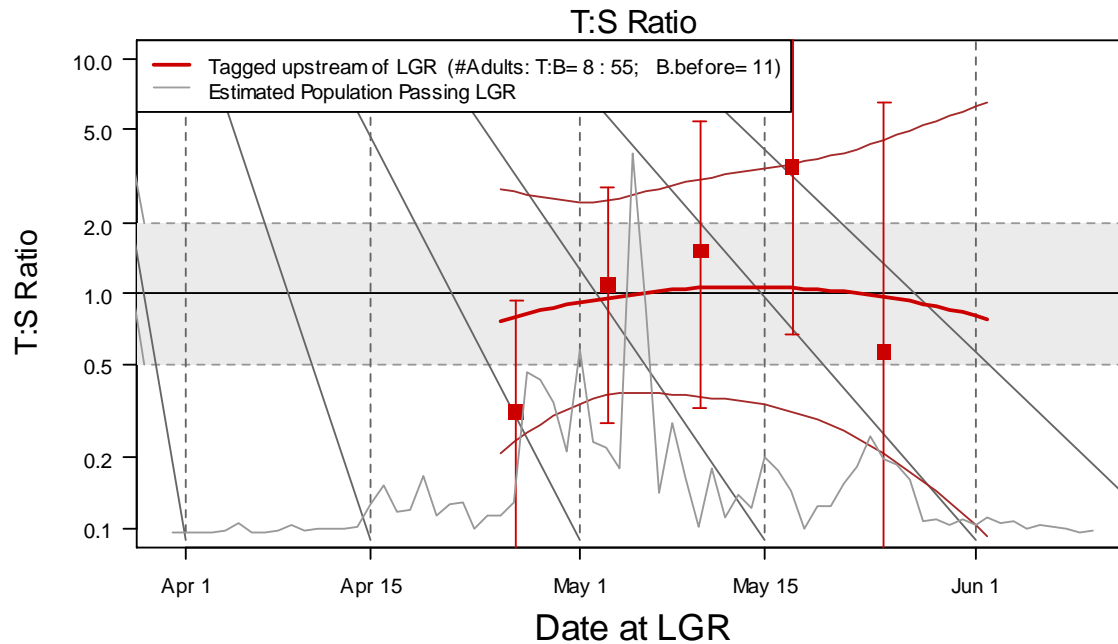
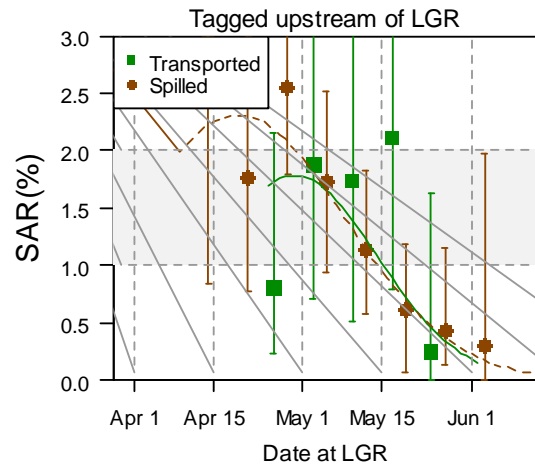
Wild Steelhead 2020

Transported or Bypassed at Lower Granite Dam



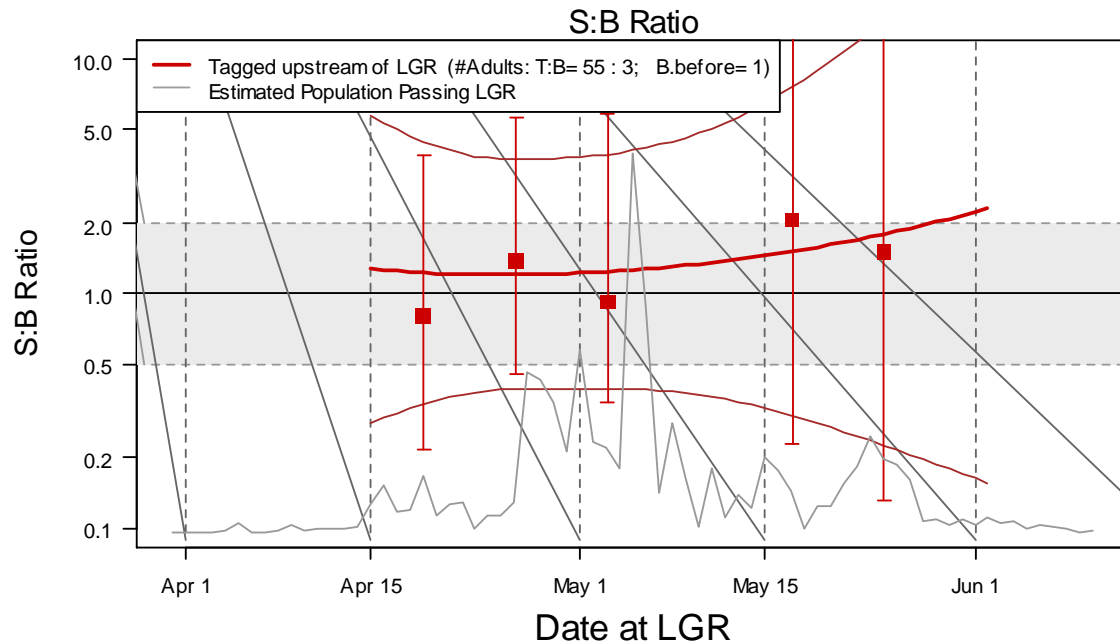
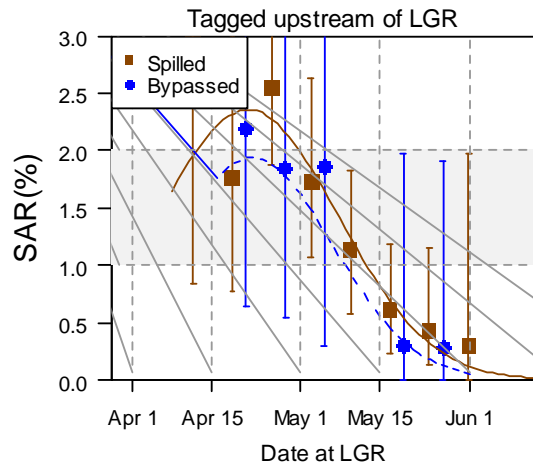
Wild Steelhead 2020

Transported or Spilled at Lower Granite Dam



Wild Steelhead 2020

Spilled or Bypassed at Lower Granite Dam



Summary: Transportation/Bypass/Spillway

- SARs generally remain higher for transported than for bypassed
 - MY 2020: Transported also higher than spillway-passed for 3 of 4 stocks
 - Transport usually benefits steelhead more than chinook, but not 2020
- SARs greater for MY 20 than other recent years
- SARs greater for spillway-passed than bypassed in MY 20
 - One year of data
 - ~25% greater for WCH, HCH, and HST; 100% greater for WST
 - Patterns consistent with slight increase in spillway advantage through season
 - Spillway more benign, or spillway-passed and bypassed fish inherently different?

Acknowledgments

- U.S. Army Corps of Engineers
- PTAGIS – Pacific States Marine Fisheries Commission
- Legions of Taggers, Coordinators, Agencies, etc.
- **Tiffani Marsh, NOAA NWFSC, ret.**

Questions



NOAA FISHERIES

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | NOAA Fisheries | Northwest Fisheries Science Center