

Willamette Valley Downstream Fish Passage Monitoring Bulk Marking

Ryan Flaherty, Nicole Eller, Griffith Bell, John Lyssenko,
Brittney Norbury, and Hans Berge

Overview



- CFS was contracted by the USACE to bulk mark and release juvenile Chinook salmon with PIT tags during 2023.
- Goal: to determine how management actions enacted by the Interim Injunction Measures influence movement of juvenile Chinook salmon
- Part of a larger project involving rotary screw trapping and reservoir sampling.
- Project scheduled to continue through Spring of 2025.



Study Area – Timing and Releases

- Late May through December 2023
 - Late start impacted releases intended to target fry movement patterns
- Release locations (Head of Reservoir, Forebay, Tailrace)
 - South Fork McKenzie Basin
 - Cougar
 - Middle Fork Willamette Basin
 - Hills Creek
 - Lookout Point/Dexter
 - Fall Creek
 - South Santiam Basin
 - Green Peter
 - Foster
 - North Santiam Basin
 - Detroit/Big Cliff



Study Area – Redetection Locations

- Recovery/Observation locations in 2023
 - South Fork McKenzie Basin
 - Cougar Tailrace RST
 - Middle Fork Willamette Basin
 - Hills Creek Tailrace RST
 - MFW RST
 - Lookout Point/Dexter Tailrace RST
 - Fall Creek Tailrace RST
 - South Santiam Basin
 - Green Peter Tailrace RST
 - **Lebanon Dam PIT Array**
 - North Santiam Basin
 - Big Cliff Tailrace RST
 - **Stayton Bypass RST**
 - Columbia River Pile Dike Array 7



Methods



- PIT tagging
 - All hatchery origin
 - 8 mm PIT (45 mm FL – 65 mm FL)
 - 12 mm PIT (>65 mm FL)
- Tagging and rearing locations
 - S.F. McKenzie stock at McKenzie and Leaburg Hatchery
 - Middle Fork Willamette and South Santiam stock at Willamette Hatchery
 - North Santiam Stock at Marion Forks Hatchery
- Evaluate post tagging mortality and tag shed rate by observing for minimum of two weeks prior to release



Methods Continued



- Release PIT tagged fish targeting specific reservoir elevations/dam operations
- Query recaptures from PTAGIS, calculate redetection rates and travel times, and compare to dam operations
- Presenting results from releases that had enough tailrace detections to make meaningful inferences
 - Cougar
 - Fall Creek
 - Hills Creek



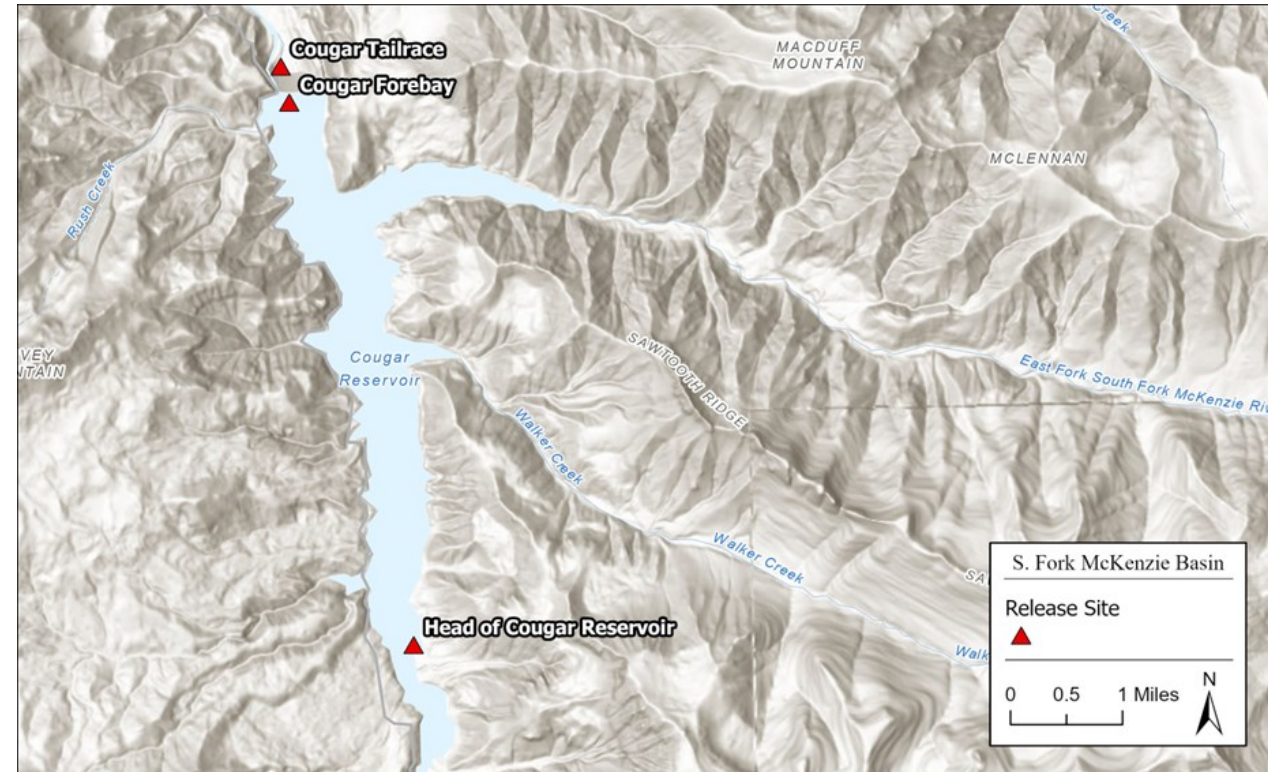
Results – South Fork McKenzie Basin



Results – Cougar Project Area Summary

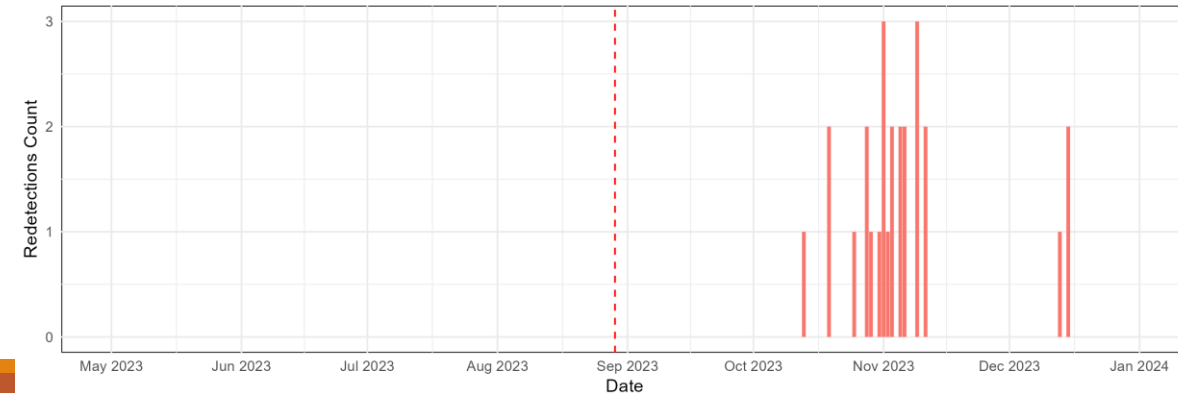
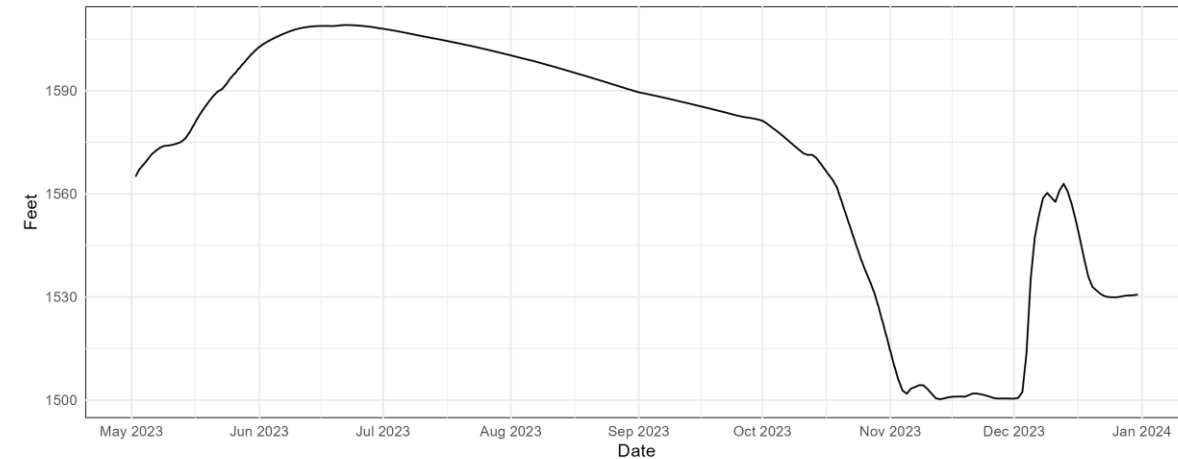
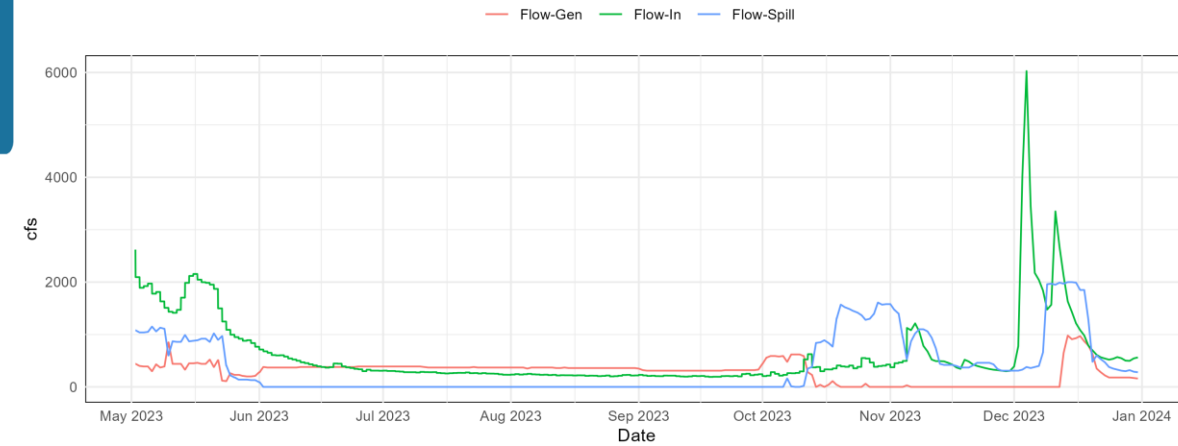


- Tagged and released 37,604 subyearlings
- Pathogen outbreaks led to higher mortality rates than expected
 - 3.5% mean tagging mortality rate
 - 0.25 % mean tag shed rate
- Four releases targeting various operations
 - Late August – Slow draft, powerhouse operations
 - Early October – Prior to fall drawdown/RO operations
 - Mid October – Mid fall drawdown
 - Mid November – Full drawdown



Results – Cougar Late August Release

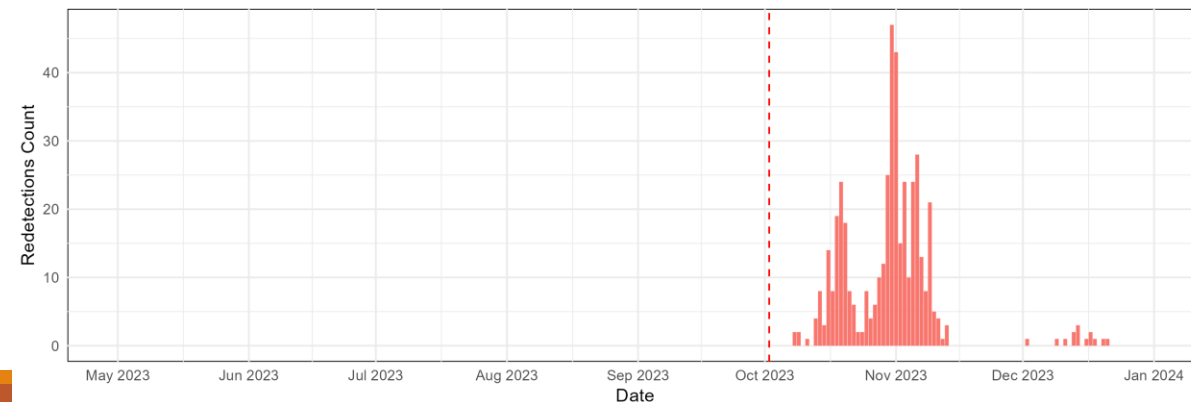
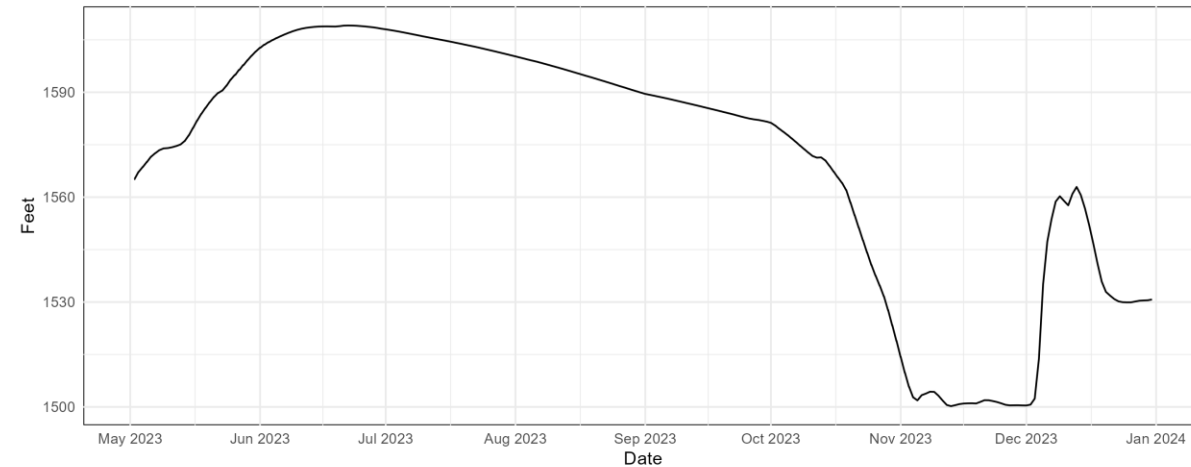
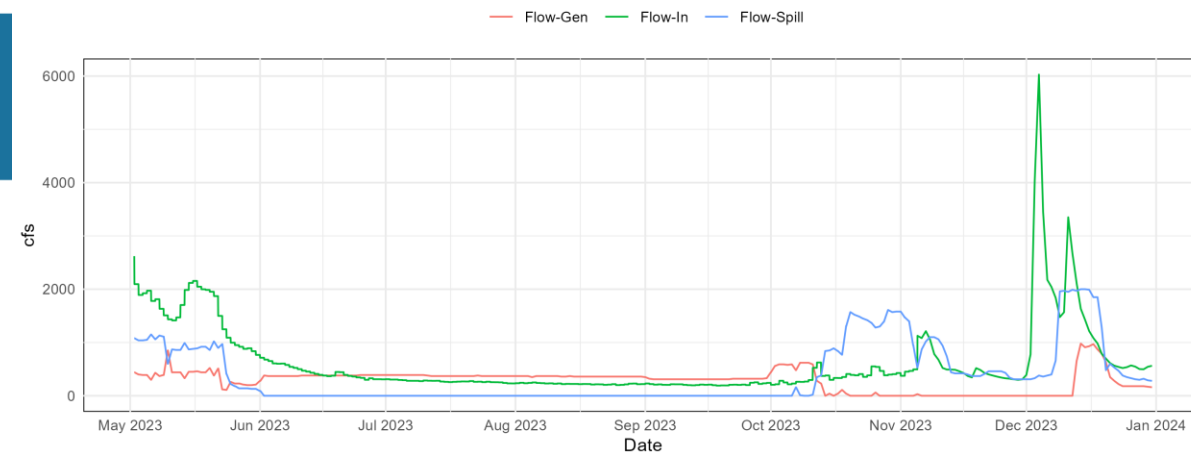
- 5,200 released at head of reservoir on August 29th
- 26 recaptured in Tailrace (0.5%)
- Mean travel time: 69 days
- All redetections coincided with drawdown and regulating outlet operations



Location ■ Head of Reservoir

Results – Cougar Early Oct. Release

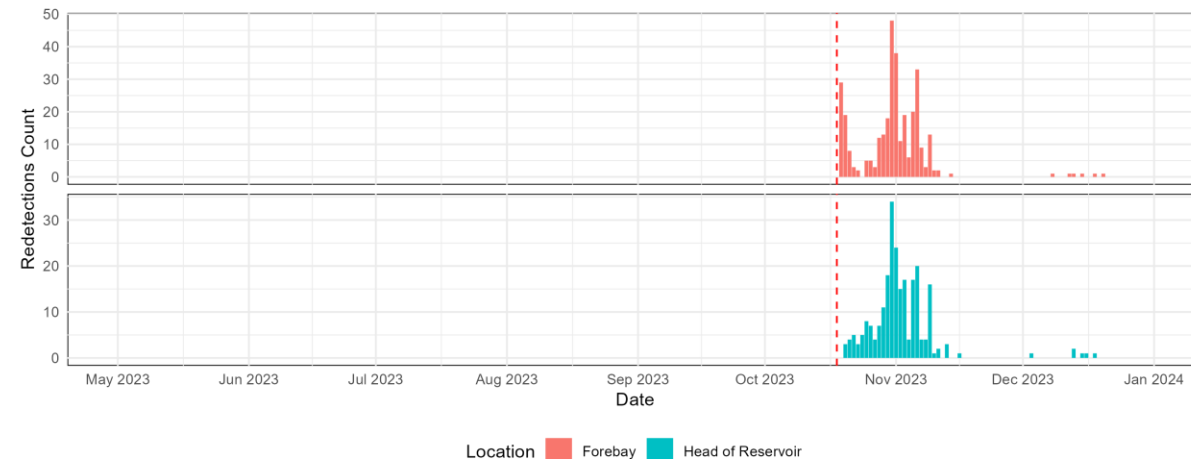
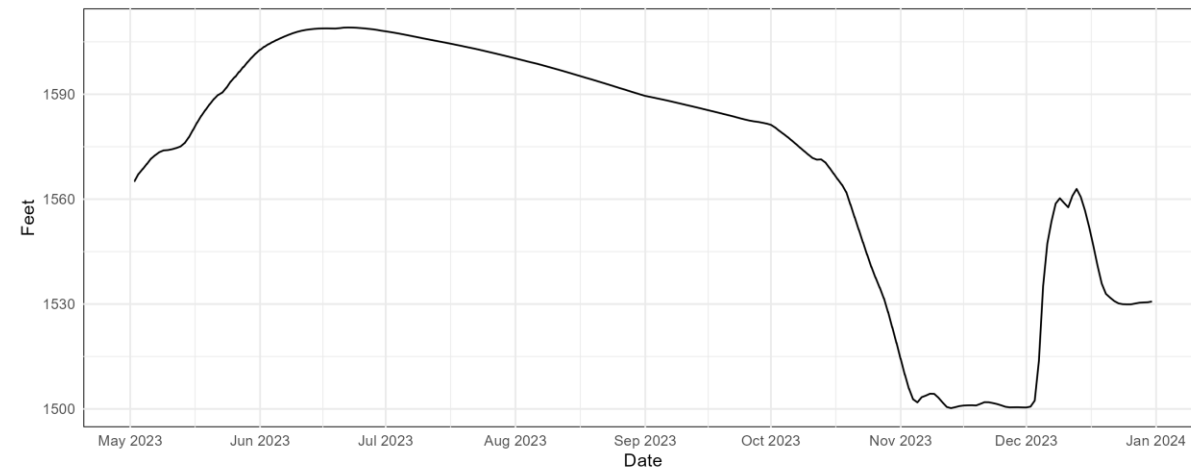
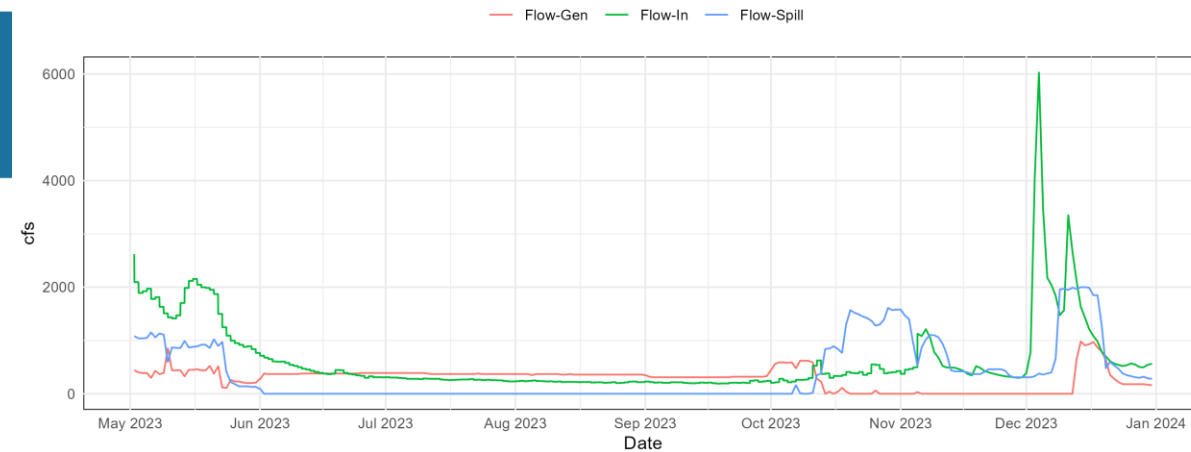
- 8,012 released on Oct. 2 at head of reservoir
- Prior to start of drawdown and regulating outlet operations
- 446 recaptured in tailrace (5%)
 - First recapture on Oct 8.
 - Mean travel time: 28 days
 - 432 (92%) detected by Nov 13
 - Peak recapture coincided with reaching full drawdown elevation and high regulating outlet discharge



Location ■ Head of Reservoir

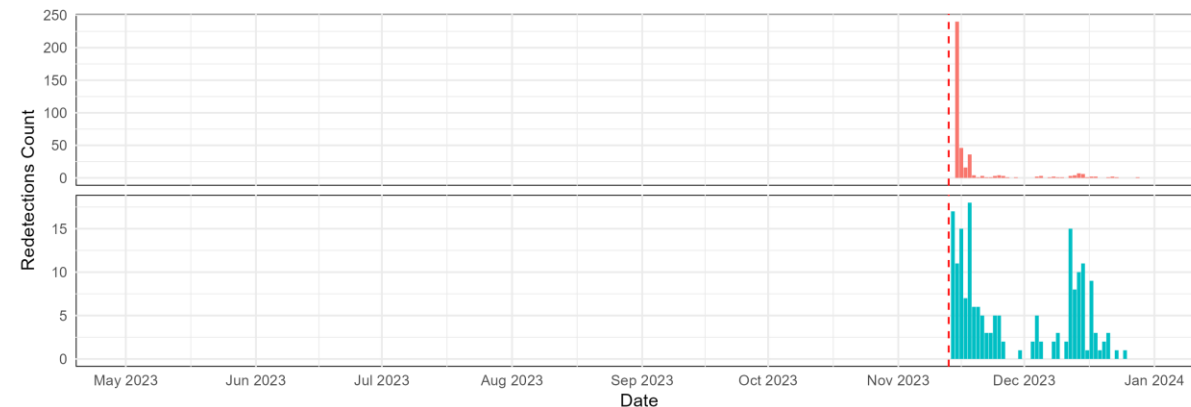
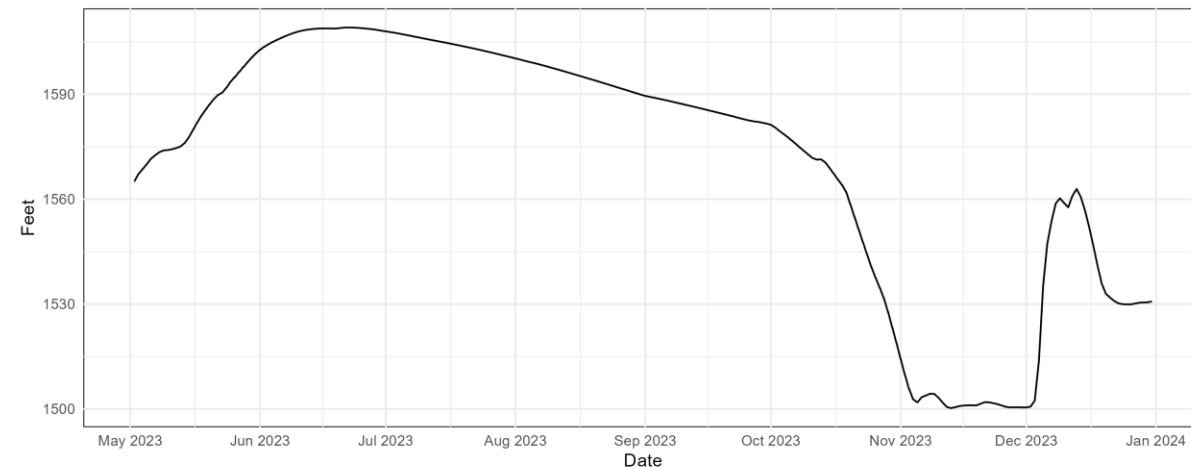
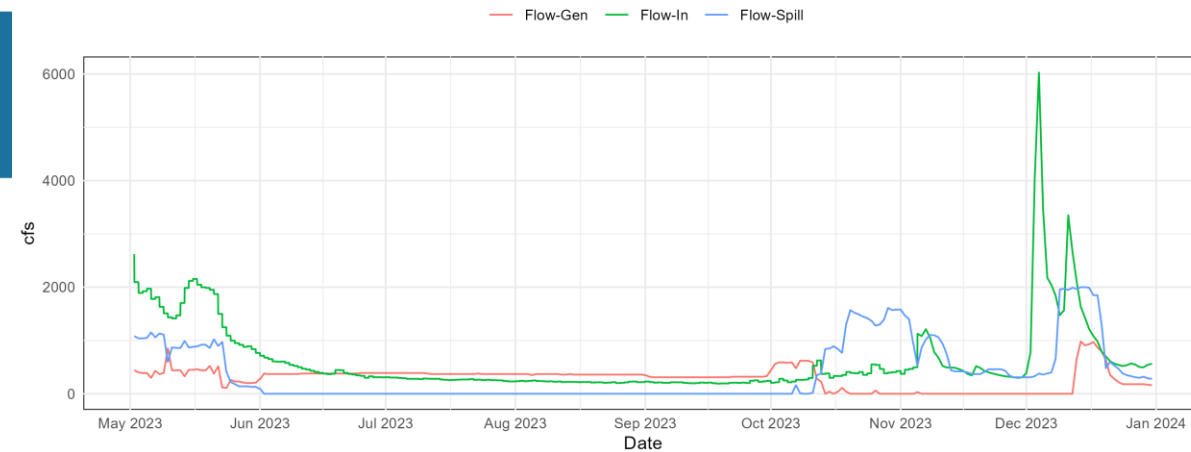
Results – Cougar Mid Oct. Release

- Total of 9,006 released on October 18 to target mid-draft to drawdown elevation
 - 3996 at head of reservoir
 - 5010 at forebay
- Head of Reservoir
 - 243 redetected in tailrace (6.1%)
 - First passage Oct 20
 - Mean travel time: 15 days
 - Peak coincided with end of draft to full drawdown elevation and discharge through RO
- Forebay
 - 328 redetected in tailrace (6.5%)
 - First passage on Oct 19
 - Mean travel time: 13 days
 - Similar pattern to head of reservoir



Results – Cougar Mid Nov. Release

- Total of 8,994 released across November 13 - 14 targeting full drawdown elevation, regulating outlet operations
- 3,999 released at head of reservoir
 - 185 redetected in tailrace (4.6 %) lower than mid draft release (6.1%)
 - Mean travel time: 16.4 days
 - Second pulse coincided with increased RO flow, increased in-flow
- 4,995 released in the forebay
 - 400 redetected in tailrace (8%)
 - 240 (62%) passed in one day, 338 (85%) within 4 days
 - Mean travel time of 4.6 days
- Forebay group exhibited higher detection rate, faster travel times compared to head of reservoir



Location ■ Forebay ■ Head of Reservoir

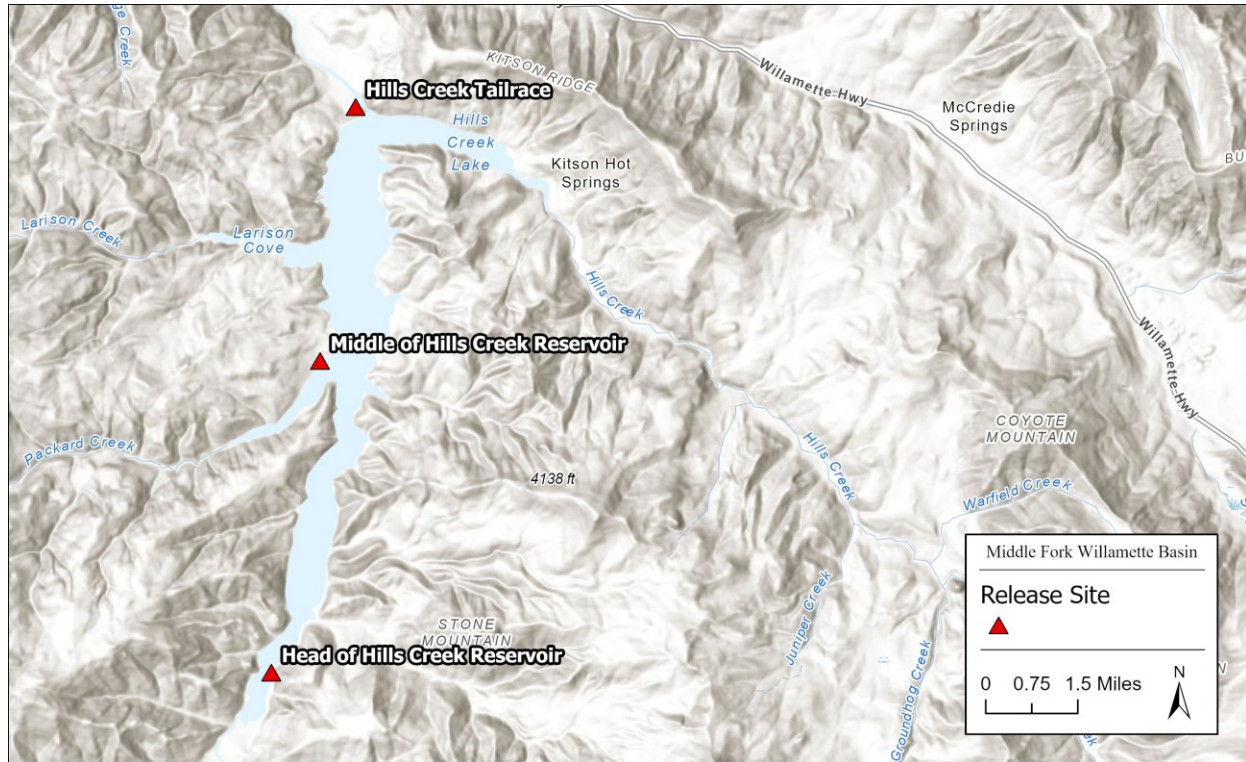
Results – Middle Fork Willamette



Results – Hills Creek Summary

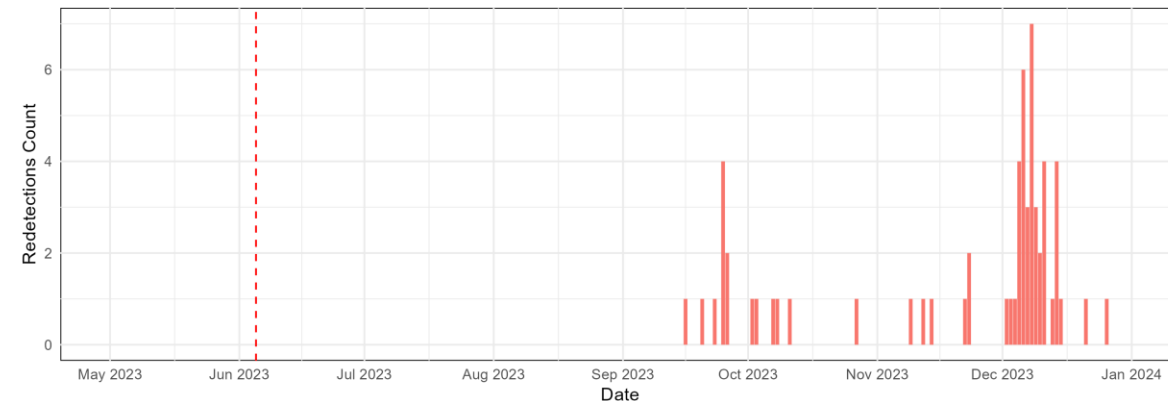
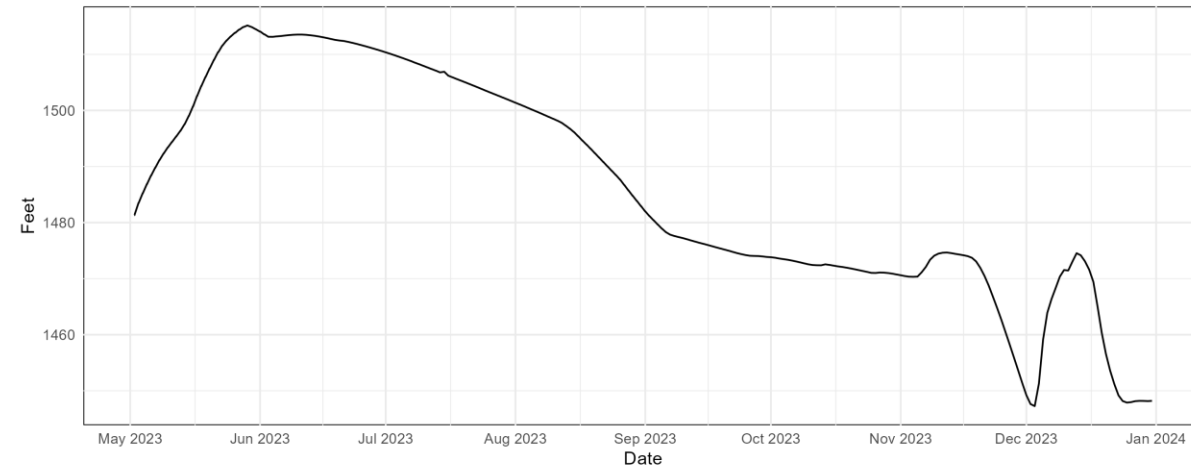
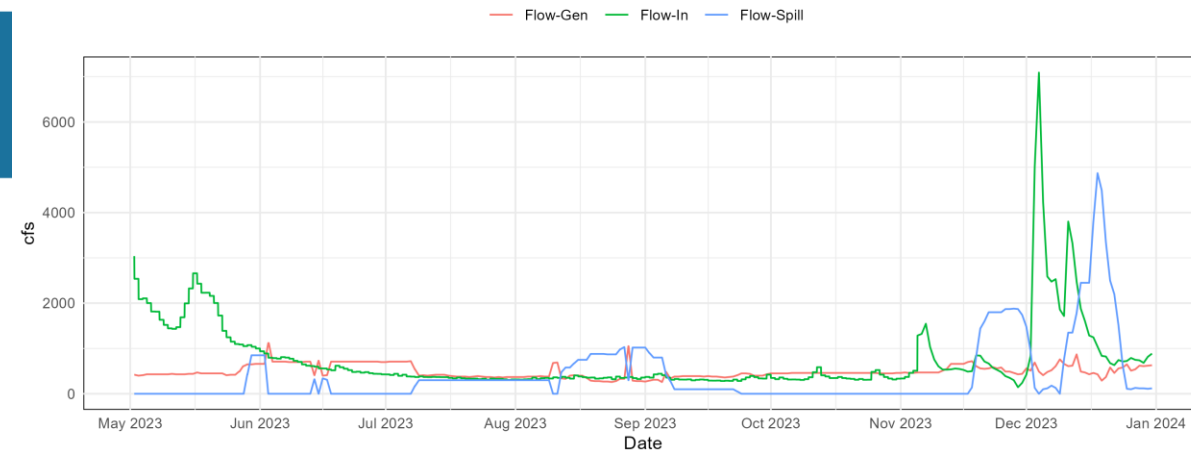


- Tagged and released a total of 22,782 juvenile Chinook salmon
- Tagging mortality 0.22 – 0.45 %
- Tag shed rate: 0.09 – 0.4 %
- Two release group
 - 9,784 Early June
 - Intended to target fry movement
 - 12,998 Early November
 - Target fall/winter regulating outlet operations



Results – Hills Creek June Release

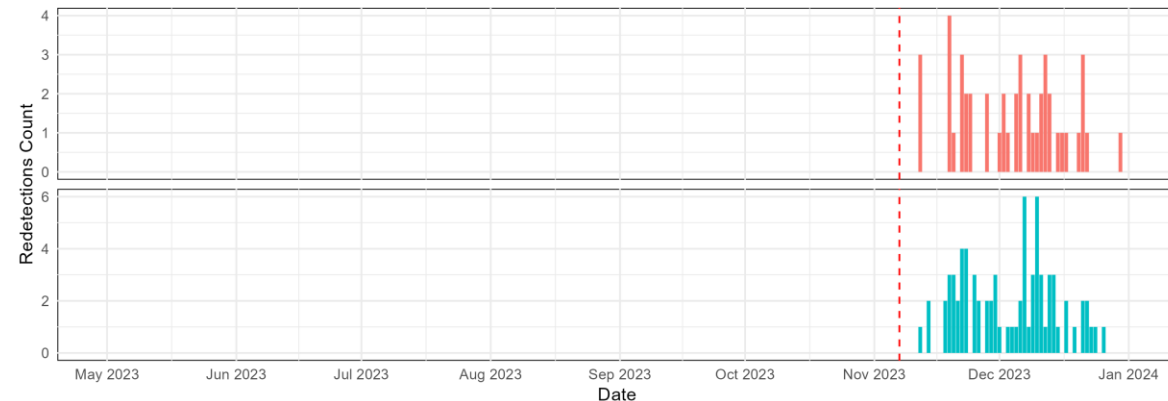
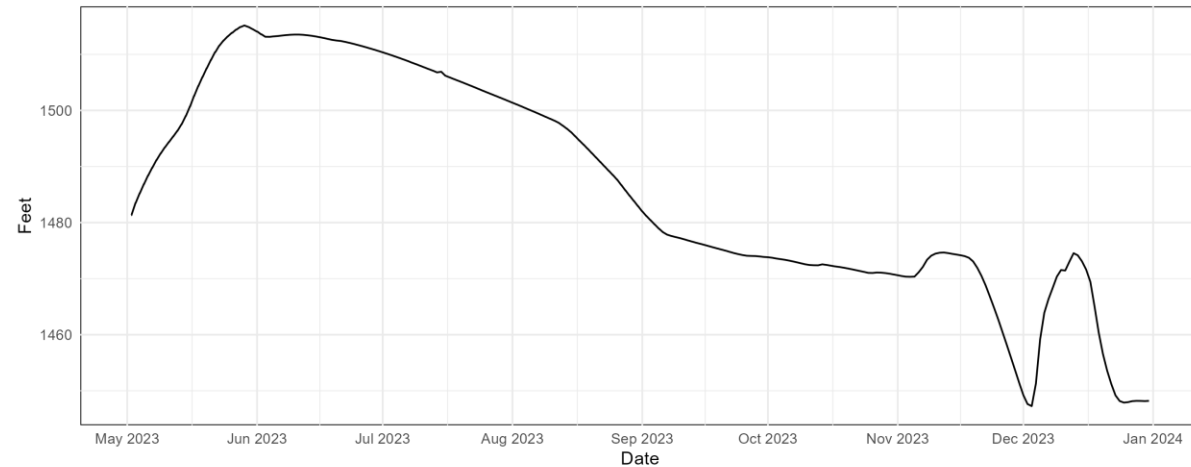
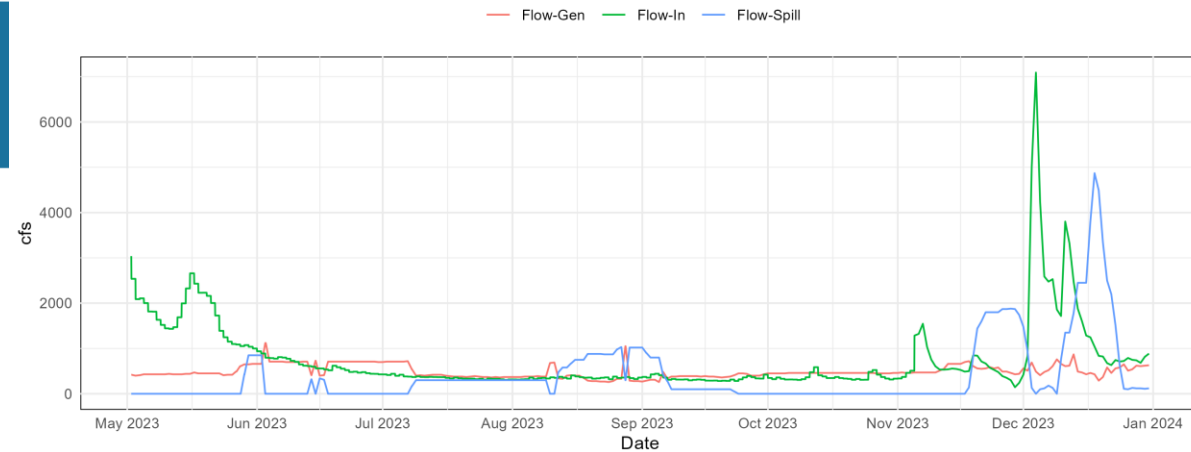
- 9,784 released at Head of Reservoir on June 5, 2023
- 61 recaptured in Tailrace screw trap
 - Recapture rate 0.6%
 - First redetection 103 days after release
 - Mean travel time: 167 days
 - Recaptures peaked in early December coinciding with spike in reservoir in-flow and regulating outlet operations



Location ■ Head of Reservoir

Results – Hills Creek Nov. Release

- Total of 9,999 released on November 7 to target fall/winter regulating outlet operations
 - Split between head of reservoir (5,000) and mid-reservoir (4,999)
- 46 from Head of Reservoir release group recaptured in tailrace screw traps
 - 0.9% recapture rate
 - Mean travel time: 27 days
- 76 from Mid-Reservoir release group recaptured in tailrace
 - 1.5% recapture rate
 - Mean travel time: 25 days



Location ■ Head of Reservoir ■ Mid Reservoir

Results – Fall Creek Summary

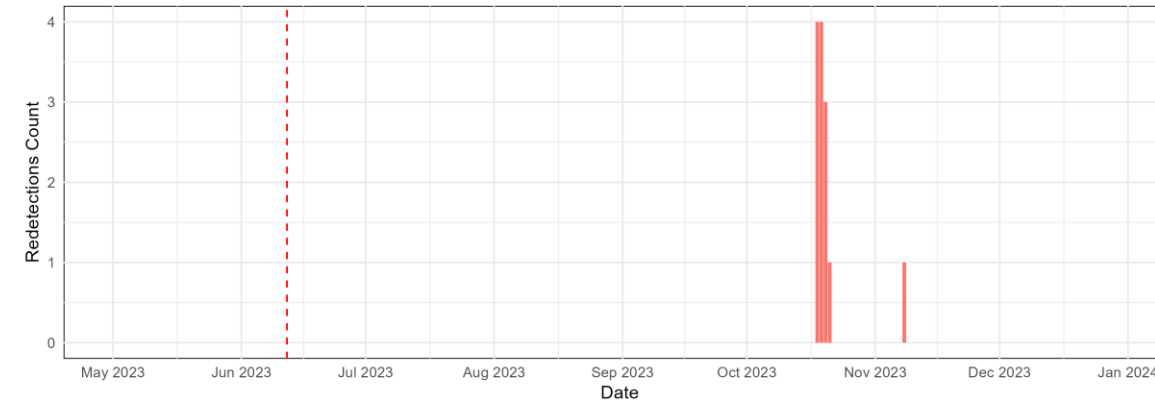
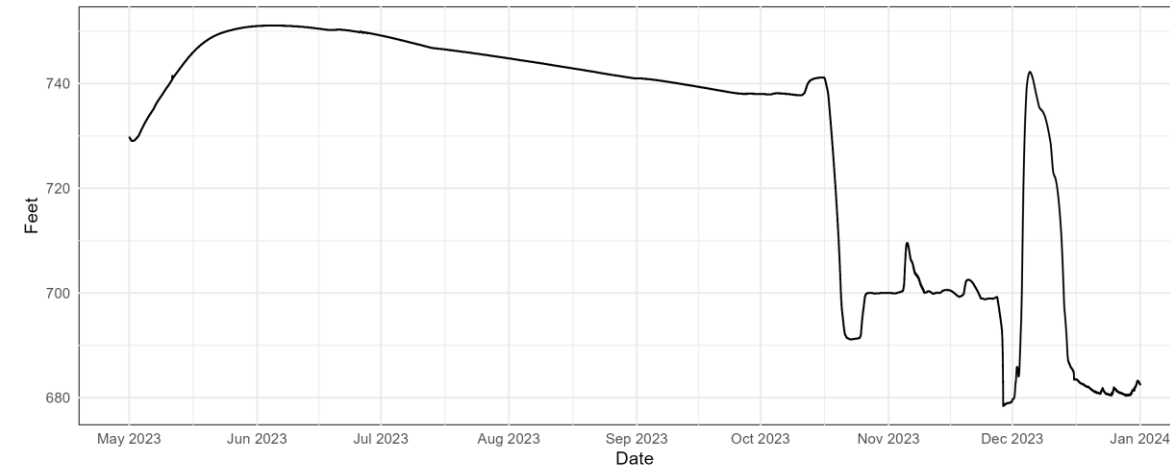
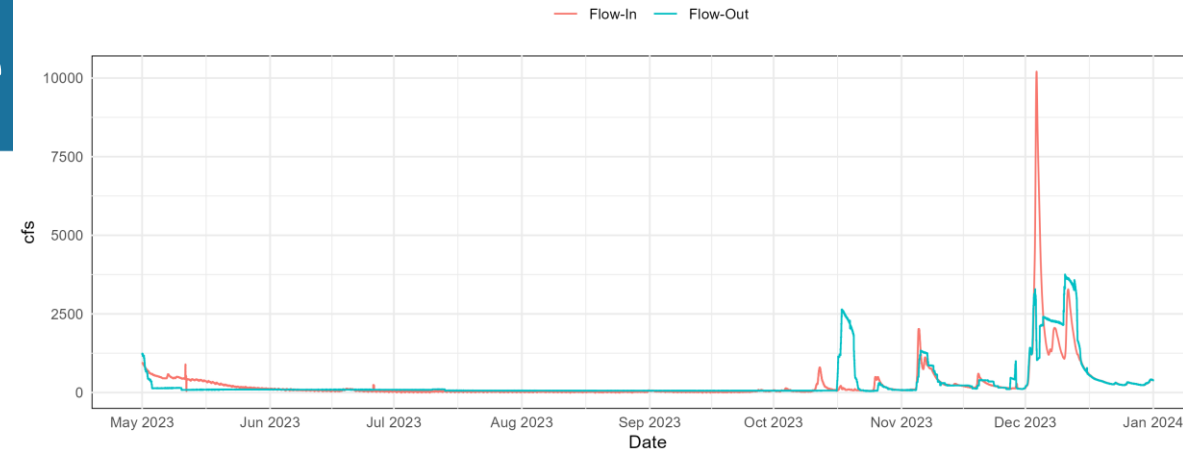


- Tagged and released a total of 21,656 juvenile Chinook salmon
- Tagging mortality 0.45 – 0.68 %
- Tag shed rate: 0.3 – 0.4 %
- Three release groups
 - Mid June release originally intended to target fry movement.
 - Late September prior to drawdown
 - Early November full drawdown



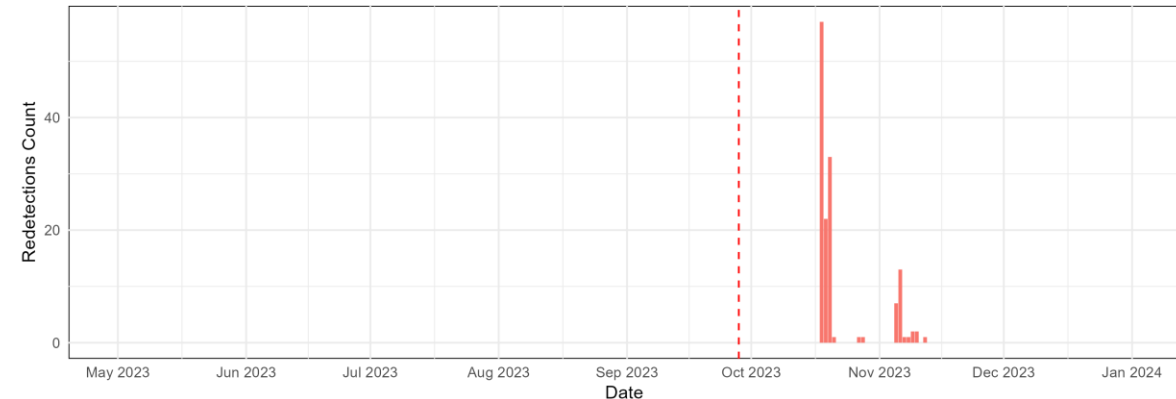
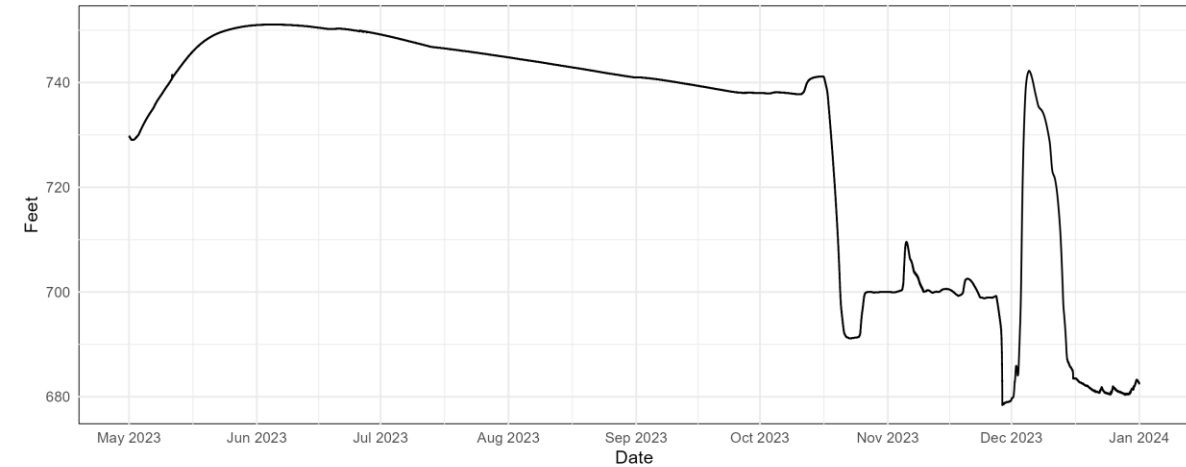
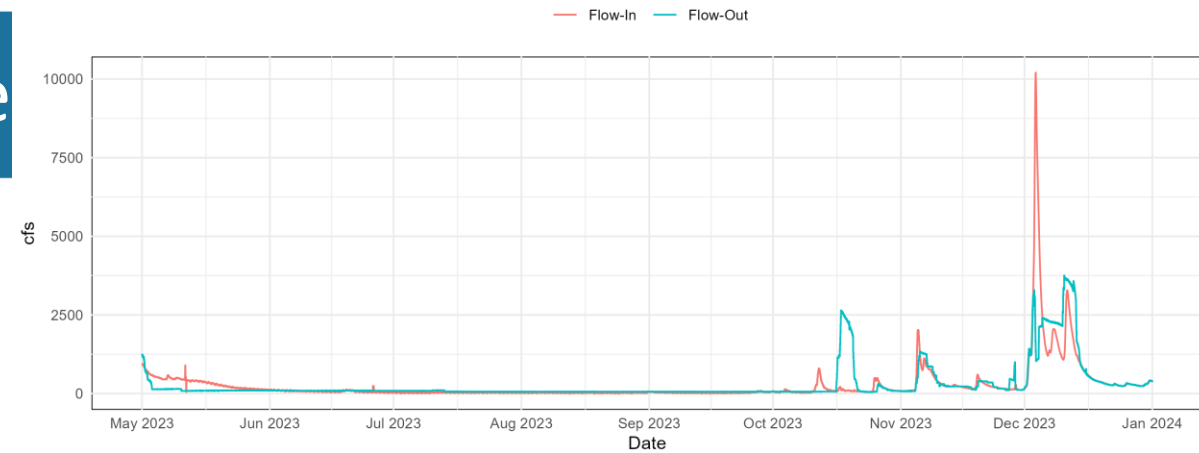
Results – Fall Creek Mid June Release

- Total of 9,649 on June 12 at head of reservoir
- 13 redetected in the tailrace screw trap
- 0.1 % redetection rate
- Mean travel time: 130 days
- Drawdown drafting process took place from October 18 – October 22
 - 12 of 13 redetected during this period



Results – Fall Creek Late Sept. Release

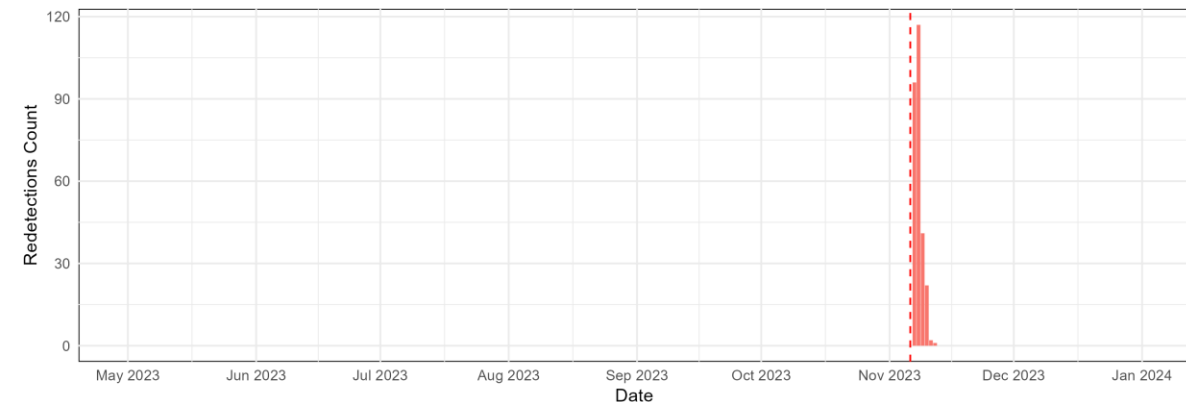
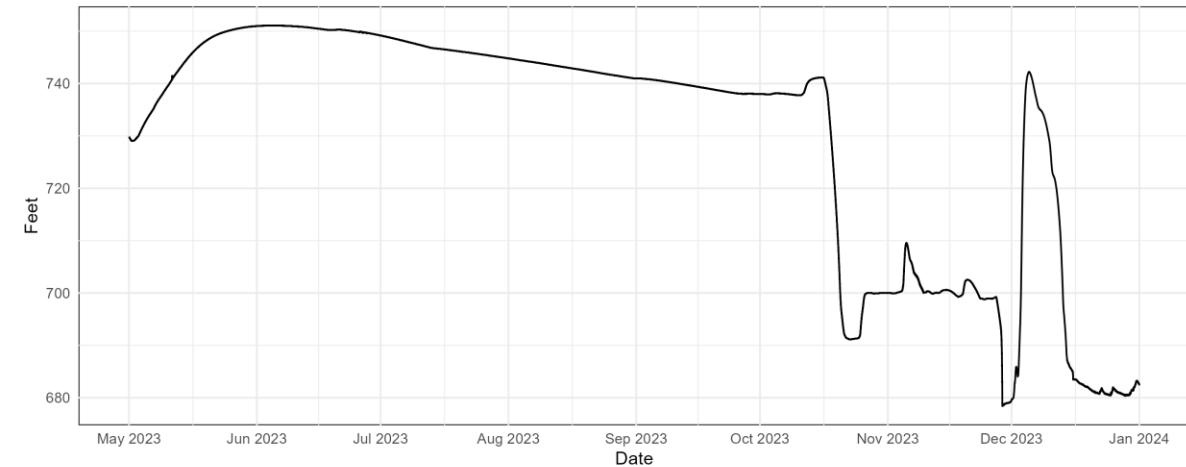
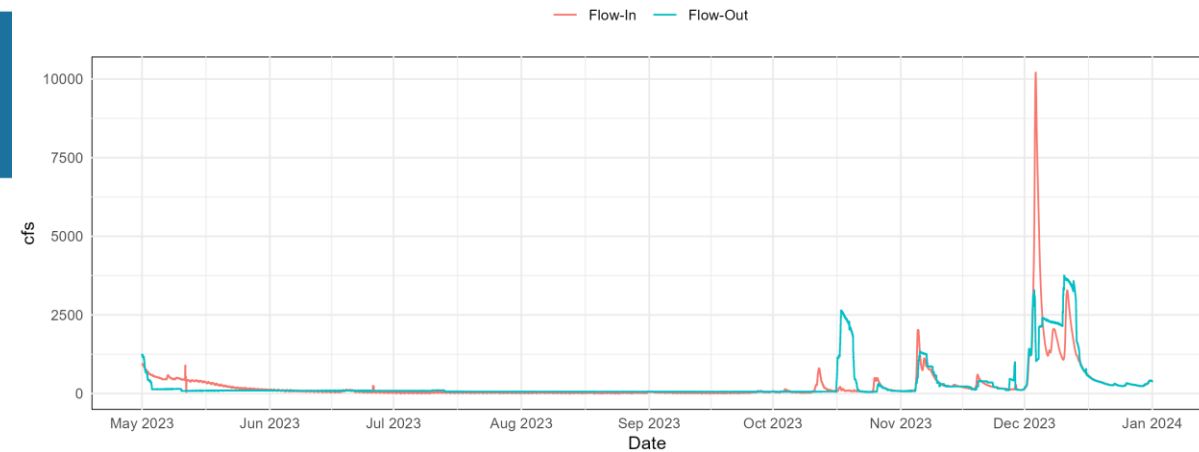
- Total of 5,006 released on September 28 at head of reservoir prior to start of drawdown
- 142 redetected in the tailrace screw traps
- 2.8 % redetection rate
- Mean travel time: 24 days
- 113 (80%) redetected during drawdown process



Location ■ Head of Reservoir

Results – Early November Release

- Total of 5,000 released on November 6th at head of reservoir prior to start of drawdown
- 279 redetected in the tailrace screw traps
- 5.6 % redetection rate
- Mean travel time: 1.84 days
- All redetections occurred within 6 days of release
- Rapid movement through “reservoir” at full drawdown



Location ■ Head of Reservoir

Results – Lookout Point Summary



- Tagged and released 21,658 subyearlings
- Tagging mortality 0.39 – 0.45 %
- Tag shed rate: 0.4 – 0.53%
- Two release groups
 - 9,784 fry late May
 - 12,011 subyearlings Mid September targeting fall deep drawdown
- 15 fish recovered throughout the study area
 - 0.06% recovery rate
- Insufficient redetections to evaluate how dam operations influence movement patterns



A large group of brown trout swimming in clear water. The fish are densely packed, with many showing prominent dark spots on their sides. The water is clear, and the background is a dark, slightly mottled blue-grey. The text "Results – South Santiam" is overlaid in white, sans-serif font in the upper-middle portion of the image.

Results – South Santiam

Results – Green Peter Summary

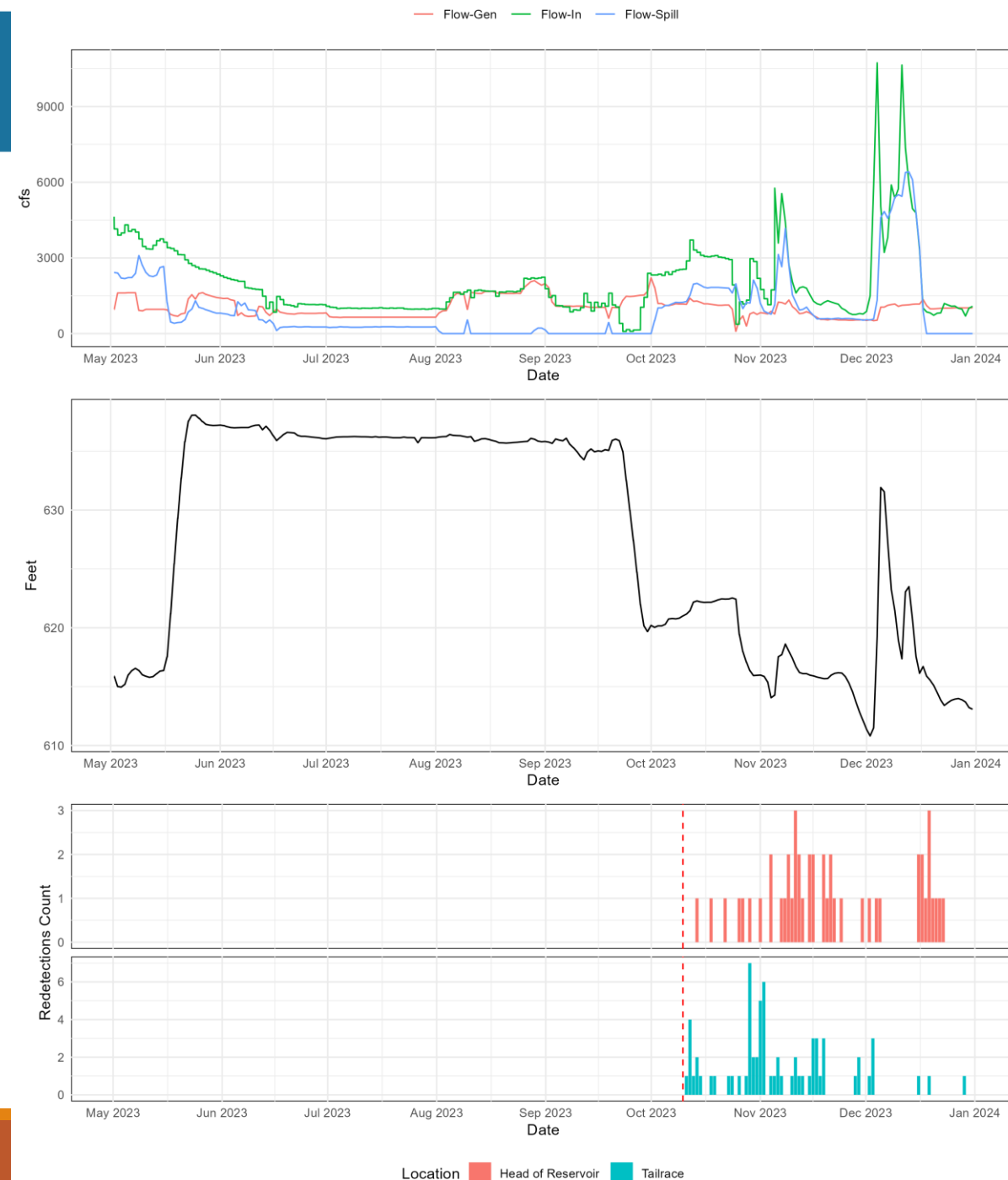


- Tagged and released 24,178 juvenile Chinook salmon
- Tagging mortality: 0.29 – 0.9%
- Tag shed rate: 0.23 – 0.63%
- 10,132 fry released in late May
- 5,026 released mid September targeting start of fall deep drawdown
- 9,020 released early October targeting full deep drawdown 887 feet
- Total of 33 redetections at tailrace across all releases (0.1%)
- Insufficient redetections to evaluate how dam operations influence movement patterns



Results – Foster Summary

- Tagged and released 12,089 juvenile Chinook salmon
- Tagging mortality 0.29 %
- Tag shed rate: 0.23 %
- 3,089 released mid August split between the head of reservoir (2,059) and the tailrace (1,030)
 - Insufficient redetections from HOR group
- 9,000 released in early October split between head of reservoir (5,000) and tailrace (4,000).
 - HOR: 47 observations at Lebanon (0.9%)
 - Tailrace: 68 observations at Lebanon (1.7%)
- Some evidence of relationship between in-flow and redetection count



Results – North Santiam



Results – Detroit-Big Cliff Summary



- Tagged and released 37,644 subyearlings
- Furunculosis outbreak
- Tagging mortality 1.09 – 10.6 %
- Tag shed rate: 0.32 %
- Total of 26,637 released at Detroit head of reservoir
 - 13,638 fry mid July
 - 9,999 subyearlings late September targeting spill operations
- Total of six recaptures at Big Cliff tailrace trap (0.03%)
- Insufficient redetections to evaluate how dam operations influence movement patterns



Summary



- PIT tagged and released 178,858 juvenile Chinook salmon the project area
- Tagging mortality and tag shed rates were low in the absence of pathogen outbreaks
- A total of 2,772 fish were redetected in 2023 and uploaded to PTAGIS.
- Where redetections were adequate, results suggest that dam operations may influence travel times and passage rates
 - Shorter travel times and higher redetection rates associated with drawdowns/lower forebay elevation and spill/regulating outlet operations
- PIT tag redetection is poor at many project sites, and throughout the greater Willamette River Basin, limiting the ability to make inferences about movement patterns of tagged fish



Questions & Feedback?

CONTACT: RYAN FLAHERTY
(RYAN.FLAHERTY@FISHSCIENCES.NET)