

WILLAMETTE VALLEY FISH PASSAGE MONITORING – BULK MARKING

Bi-Weekly Report: May 5, 2023 – May 31, 2023

Prepared for: United States Army Corps of Engineers

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June 9, 2023

BULK MARKING SCHEDULE

Table 1. Tentative release schedule for brood year 2022. Green rows highlight the release groups that have been tagged and released so far this year.

| Release Year | Release Date (estimated) | Release Basin | Release Area | Release Location | Life stage | N |
|--------------|--------------------------|---------------|-------------------------|-------------------------------|--------------|------|
| 2023 | February | North Santiam | Detroit Reservoir | Breitenbush River | fry | 3750 |
| 2023 | February | North Santiam | Detroit Reservoir | North Santiam River | fry | 3750 |
| 2023 | March | MF Willamette | Fall Creek Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | March | MF Willamette | Lookout Point Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | March | MF Willamette | Hills Creek Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | March | SF McKenzie | Cougar Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | March | SF McKenzie | Cougar Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | March | MF Willamette | Fall Creek Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | April | MF Willamette | Lookout Point Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | April | North Santiam | Detroit Reservoir | Breitenbush River | fry | 3750 |
| 2023 | April | North Santiam | Detroit Reservoir | North Santiam River | fry | 3750 |
| 2023 | April | South Santiam | Green Peter Reservoir | Head of Middle Santiam Arm | fry | 2500 |
| 2023 | April | South Santiam | Green Peter Reservoir | Head of Quartzville Creek Arm | fry | 2500 |
| 2023 | April | MF Willamette | Hills Creek Reservoir | Head of Reservoir | fry | 5000 |
| 2023 | April | South Santiam | Green Peter Reservoir | Head of Middle Santiam Arm | fry | 2500 |
| 2023 | April | South Santiam | Green Peter Reservoir | Head of Quartzville Creek Arm | fry | 2500 |
| 2023 | August | South Santiam | Foster Reservoir | Tailrace | sub-yearling | 1000 |
| 2023 | August | South Santiam | Foster Reservoir | Head of Reservoir | sub-yearling | 2000 |
| 2023 | September | MF Willamette | Dexter Reservoir | Tailrace | sub-yearling | 2000 |
| 2023 | September | MF Willamette | Lookout Point Reservoir | Head of Reservoir | sub-yearling | 5000 |
| 2023 | September | MF Willamette | Lookout Point Reservoir | Forebay | sub-yearling | 5000 |
| 2023 | September | SF McKenzie | Cougar Reservoir | Head of Reservoir | sub-yearling | 3000 |
| 2023 | September | South Santiam | Green Peter Reservoir | Head of Middle Santiam Arm | sub-yearling | 2500 |
| 2023 | September | South Santiam | Green Peter Reservoir | Head of Quartzville Creek Arm | sub-yearling | 2500 |
| 2023 | October | North Santiam | Big Cliff Reservoir | Big Cliff Reservoir Tailrace | sub-yearling | 8000 |
| 2023 | October | North Santiam | Detroit Reservoir | Breitenbush River | sub-yearling | 5000 |
| 2023 | October | North Santiam | Detroit Reservoir | North Santiam River | sub-yearling | 5000 |
| 2023 | October | MF Willamette | Fall Creek Reservoir | Head of Reservoir | sub-yearling | 5000 |
| 2023 | October | MF Willamette | Fall Creek Reservoir | Tailrace | sub-yearling | 1000 |
| 2023 | October | SF McKenzie | Cougar Reservoir | Forebay | sub-yearling | 5000 |
| 2023 | October | SF McKenzie | Cougar Reservoir | Tailrace | sub-yearling | 4000 |
| 2023 | October | SF McKenzie | Cougar Reservoir | Head of Reservoir | sub-yearling | 4000 |
| 2023 | October | South Santiam | Green Peter Reservoir | Tailrace | sub-yearling | 4000 |
| 2023 | October | South Santiam | Green Peter Reservoir | Head of Middle Santiam Arm | sub-yearling | 2500 |
| 2023 | October | South Santiam | Green Peter Reservoir | Head of Quartzville Creek Arm | sub-yearling | 2500 |
| 2023 | October | South Santiam | Foster Reservoir | Tailrace | sub-yearling | 4000 |
| 2023 | October | South Santiam | Foster Reservoir | Head of Reservoir | sub-yearling | 5000 |
| 2023 | November | MF Willamette | Fall Creek Reservoir | Head of Reservoir | sub-yearling | 5000 |

| | | | | | | |
|------|----------|---------------|-------------------------|--------------------------|--------------|------|
| 2023 | November | MF Willamette | Fall Creek Reservoir | Tailrace | sub-yearling | 1000 |
| 2023 | November | North Santiam | Big Cliff Reservoir | Tailrace | sub-yearling | 6000 |
| 2023 | November | SF McKenzie | Cougar Reservoir | Forebay | sub-yearling | 5000 |
| 2023 | November | SF McKenzie | Cougar Reservoir | Tailrace | sub-yearling | 4000 |
| 2023 | November | SF McKenzie | Cougar Reservoir | Head of Reservoir | sub-yearling | 4000 |
| 2023 | November | MF Willamette | Hills Creek Reservoir | Head of Reservoir | sub-yearling | 5000 |
| 2023 | November | MF Willamette | Hills Creek Reservoir | Tailrace | sub-yearling | 3000 |
| 2023 | November | MF Willamette | Hills Creek Reservoir | Forebay or Mid Reservoir | sub-yearling | 5000 |
| 2024 | February | MF Willamette | Hills Creek Reservoir | Head of Reservoir | yearling | 5000 |
| 2024 | February | MF Willamette | Hills Creek Reservoir | Tailrace | yearling | 3000 |
| 2024 | February | MF Willamette | Hills Creek Reservoir | Forebay or Mid Reservoir | yearling | 5000 |
| 2024 | February | MF Willamette | Fall Creek Reservoir | Head of Reservoir | yearling | 5000 |
| 2024 | February | MF Willamette | Fall Creek Reservoir | Tailrace | yearling | 1000 |
| 2024 | March | MF Willamette | Lookout Point Reservoir | Head of Reservoir | yearling | 5000 |
| 2024 | March | MF Willamette | Dexter Reservoir | Tailrace | yearling | 2000 |
| 2024 | March | MF Willamette | Lookout Point Reservoir | Forebay | yearling | 5000 |
| 2024 | February | SF McKenzie | Cougar Reservoir | Forebay | yearling | 2000 |
| 2024 | February | SF McKenzie | Cougar Reservoir | Tailrace | yearling | 1000 |
| 2024 | February | SF McKenzie | Cougar Reservoir | Head of Reservoir | yearling | 2000 |
| 2024 | March | SF McKenzie | Cougar Reservoir | Forebay | yearling | 2000 |
| 2024 | March | SF McKenzie | Cougar Reservoir | Tailrace | yearling | 1000 |
| 2024 | March | SF McKenzie | Cougar Reservoir | Head of Reservoir | yearling | 2000 |
| 2024 | March | MF Willamette | Fall Creek Reservoir | Head of Reservoir | yearling | 5000 |
| 2024 | March | MF Willamette | Fall Creek Reservoir | Tailrace | yearling | 1000 |
| 2024 | March | MF Willamette | Lookout Point Reservoir | Head of Reservoir | yearling | 5000 |
| 2024 | March | MF Willamette | Dexter Reservoir | Tailrace | yearling | 2000 |
| 2024 | March | MF Willamette | Lookout Point Reservoir | Forebay | yearling | 5000 |
| 2024 | April | North Santiam | Big Cliff Reservoir | Tailrace | yearling | 2000 |
| 2024 | April | North Santiam | Detroit Reservoir | Breitenbush River | yearling | 2000 |
| 2024 | April | North Santiam | Detroit Reservoir | North Santiam River | yearling | 2000 |

BULK MARKING SUMMARY

Cramer Fish Sciences initiated the bulk marking of hatchery-reared juvenile Upper Willamette River Chinook salmon at Willamette Hatchery (Oakridge, OR) on May 15th, 2023. Under the direction of the Corps, Green Peter Head of Reservoir release groups were prioritized so that their release would coincide with spill operations at Green Peter Dam. During the period from May 15th to May 18th, 2023, a total of 10,274 South Santiam stock (24H) juvenile Chinook salmon were marked with adipose clips and Passive Integrated Transponder (PIT) tags. These marked fish were categorized into two release groups: those headed for the Middle Santiam arm (N = 5071) and those bound for the Quartzville Creek arm of Green Peter Reservoir (N = 5203; refer Table 2). Between the commencement of tagging and the release of these fish on May 22nd, 2023, mortality rates due to tagging were observed at 1.46 percent for the Middle Santiam group and 0.35 percent for the Quartzville Creek group. The tag shed rate mirrored the mortality rate, being higher for the Middle Santiam release group at 0.63 percent, compared to the Quartzville Creek group at 0.35 percent.

After adjusting for these losses, we estimate that 4,965 PIT tagged salmon were released into the Middle Santiam arm and 5,167 into the Quartzville Creek arm of the reservoir (Table 3; Appendix A - Figure 4). It is noteworthy that at the time of release, water temperatures were approximately 18 degrees Celsius in both reservoir arms, and our teams observed piscivory by smallmouth bass. Additionally, there was a miscommunication between field staff that resulted in failing to retain a three percent subsample of this release group to evaluate long-term mortality and tag shed rate.

Since the bulk marking operation was already set up at Willamette Hatchery, it was a logical step to proceed by marking the remaining spring release groups of Middle Fork Willamette stock (22H). Between May 22, 2023 and May 24, 2023 we tagged a total of 10,041 juvenile Chinook salmon for the Lookout Point Head of Reservoir release group (Table 2). Prior to their release we observed a tagging mortality rate of 0.39 percent and a tag shed rate of 0.51 percent for the Lookout Point Head of Reservoir group. We set aside 300 individuals for this release group to be held for at least two weeks to evaluate long-term mortality and tag shed rates. After accounting for the long-term mortality sub-sample, observed tagging mortality, and shed tags, we estimate that a total of 9,651 PIT tagged salmon were released into the head of Lookout Point Reservoir on May 30th, 2023 (Table 3, Appendix A – Figure 1). Fish were released at the Black Canyon Campground boat ramp where water temperatures were approximately 13 degrees C.

Bulk marking continued on May 30th with the Hills Creek Head of Reservoir release group, but we did not finish tagging that group within the current reporting period. The results of those tagging efforts will be presented in the next bi-weekly update. After the Hills Creek release group is completed, we will tag the Fall Creek release group and then move operations to Marion Forks Hatchery and begin marking and tagging the North Santiam release groups.

Table 2. Bulk marking summary statistics. Total number of fish marked (N), mean fork length (FL), mean weight, start date of marking, end date of marking, total mortalities, mortality percentage, total shed tags, and shed tag percentage.

| Mark Group | N | Mean FL (mm) | Mean Weight (g) | Date Start | Date End | Morts | Mort. % | Sheds | Shed % |
|---|--------|--------------|-----------------|------------|-----------|-------|---------|-------|--------|
| Green Peter Head of Reservoir - Middle Santiam Arm | 5,071 | 56.1 | | 5/15/2023 | 5/16/2023 | 74 | 1.46 | 32 | 0.63 |
| Green Peter Head of Reservoir - Quartzville Creek Arm | 5,203 | 58.5 | | 5/17/2023 | 5/18/2023 | 18 | 0.35 | 18 | 0.35 |
| Lookout Point Head of Reservoir | 10,041 | 63.1 | 2.9 | 5/22/2023 | 5/24/2023 | 39 | 0.39 | 51 | 0.51 |

Table 3. Release summary statistics. Date of release, number of marked fish released, transport tank water temperature and the beginning and end of the transport, and water temperature at the release location.

| Release Location | Release Date | Fish Released | Transport Temp Start | Transport Temp End | Release Site Temp |
|---|--------------|---------------|----------------------|--------------------|-------------------|
| Green Peter Head of Reservoir - Quartzville Creek Arm | 5/22/2023 | 5,203 | 12 | 13.2 | 18 |
| Green Peter Head of Reservoir - Middle Santiam Arm | 5/22/2023 | 5,071 | 11.9 | 12.9 | 18.3 |
| Lookout Point Head of Reservoir | 5/30/2023 | 9,741 | 11.9 | 12.5 | 13.2 |

Appendix A. Release Site Maps

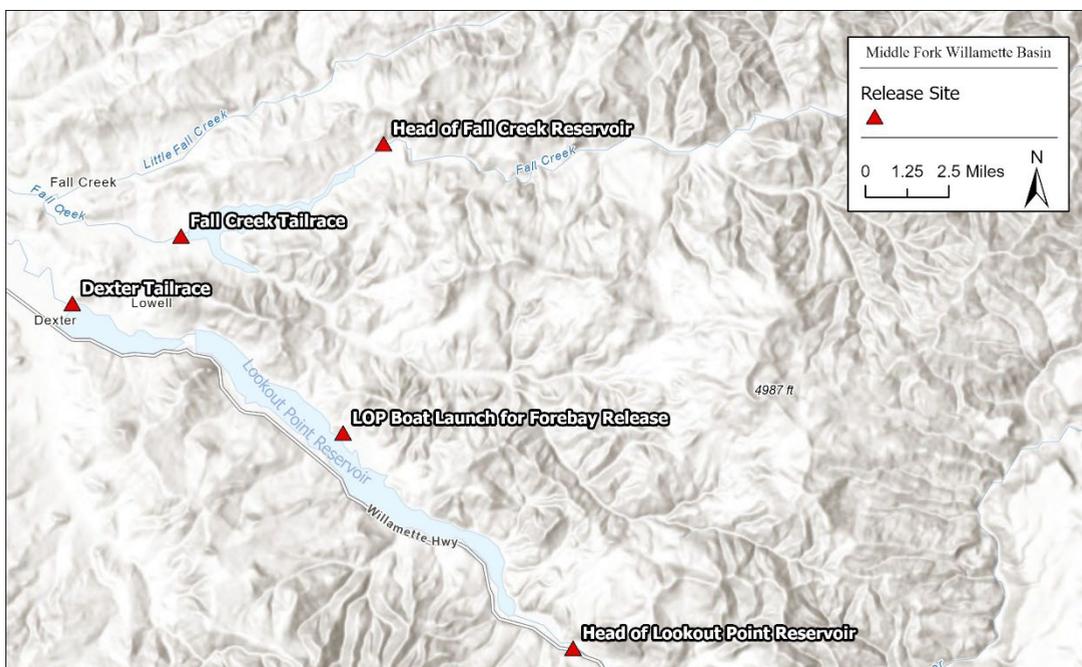


Figure 1. Map of Lookout Point, Dexter tailrace and Fall Creek release locations within the Middle Fork Willamette Basin.

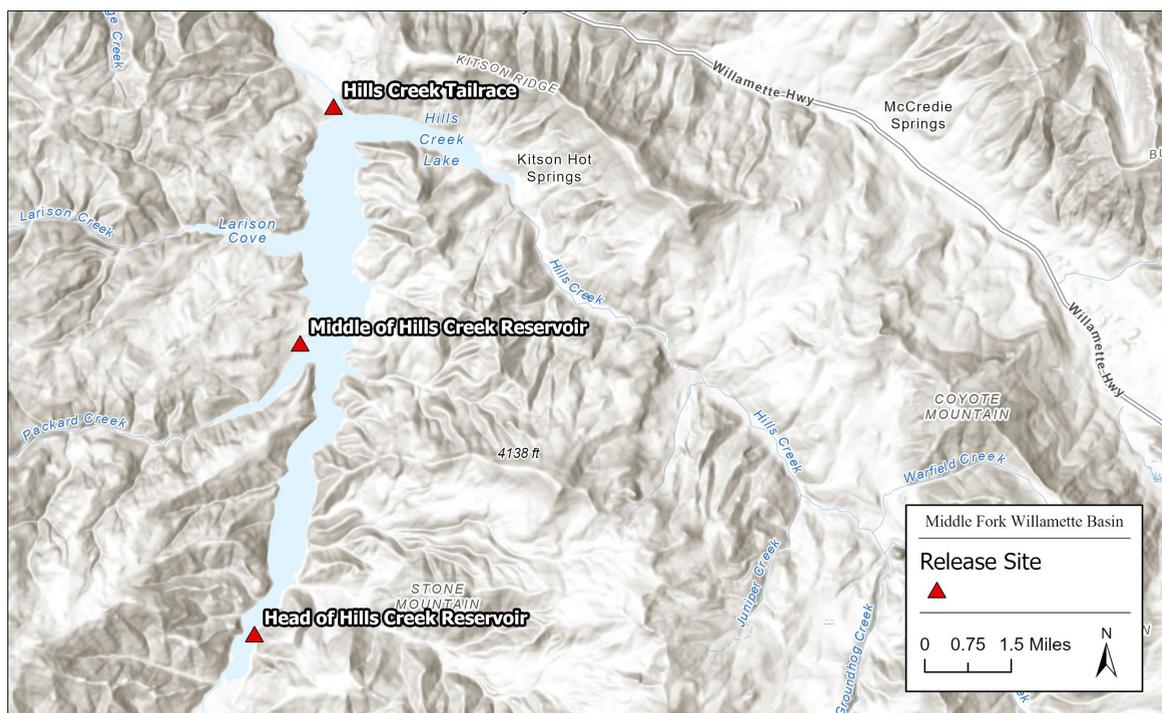


Figure 2. Map of Hills Creek Reservoir release locations within the Middle Fork Willamette Basin.

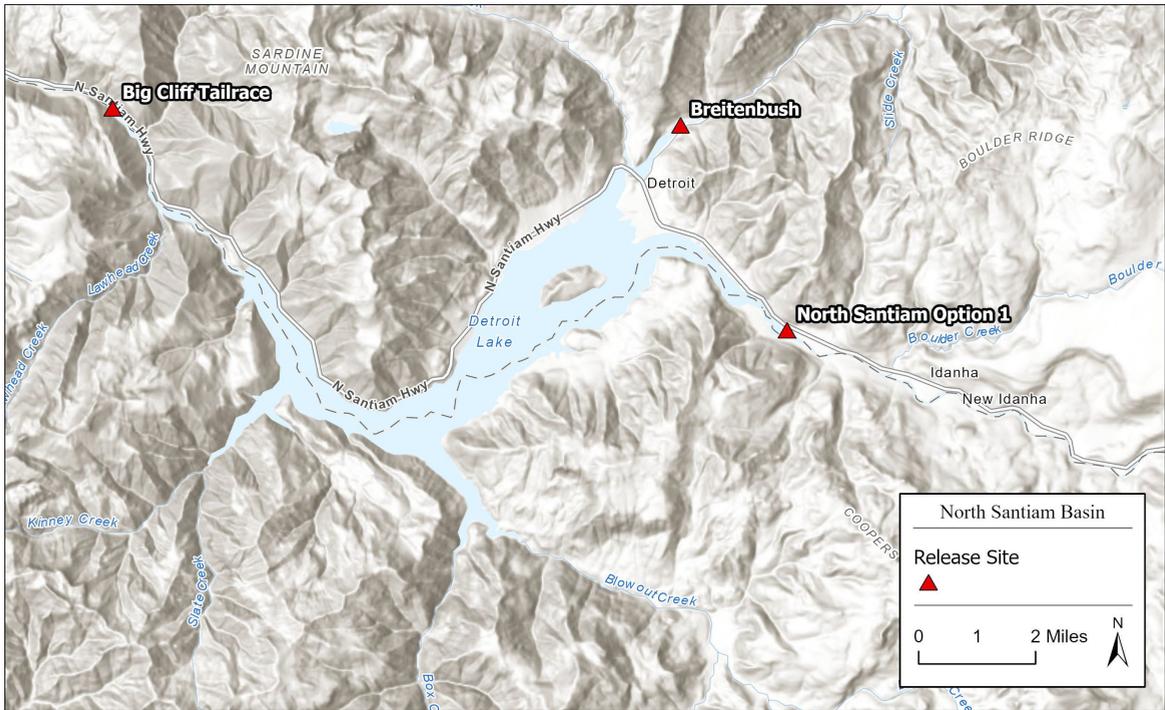


Figure 3. Map of release locations within the North Santiam Basin.

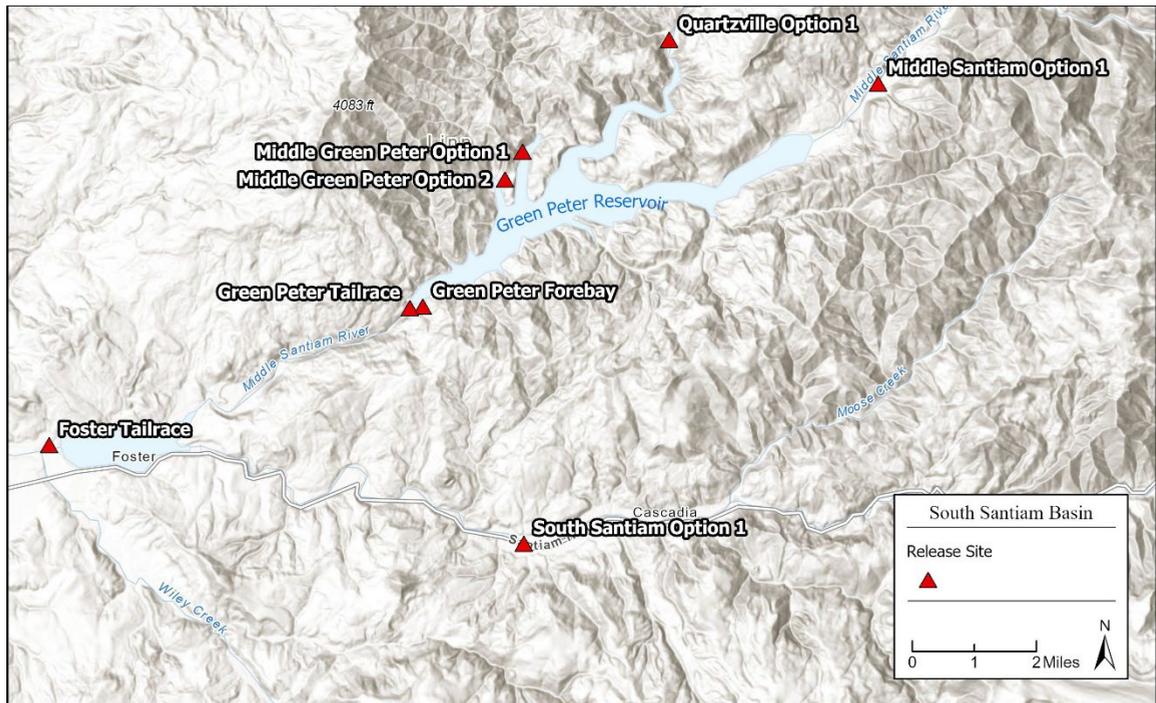


Figure 4. Map of release locations in the Middle/South Santiam basin including Green Peter Reservoir.

