WILLAMETTE VALLEY DOWNSTREAM FISH PASSAGE MONITORING

Biannual Report Summary

July through December 2024

Prepared for:

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INTRODUCTION

For over 50 years, the U.S. Army Corps of Engineers (USACE) has managed and operated 13 dams in the Willamette River basin as part of the Willamette Valley Project (WVP). Each of these dams contributes to a system that provides flood control, power generation, and recreation. Management of the WVP is a complex process and presents challenges in meeting competing demands such as instream flows, fish passage, flood control, and recreation. Adding to the complexities are the listings of three fish species under the Endangered Species Act (ESA), spring Chinook salmon *Oncorhynchus tshawytscha*, steelhead *Oncorhynchus mykiss*, and bull trout *Salvelinus confluentus* (NMFS 2008; USFWS 2008). In 2008, the USACE, the U.S. Bureau of Reclamation, and the Bonneville Power Administration (BPA) (jointly known as the Action Agencies) consulted with the National Marine Fisheries Service (NMFS) to evaluate the impact of the WVP on ESA-listed salmon and trout, which resulted in NMFS issuing the 2008 Willamette River Biological Opinion (BiOp; NMFS 2008). In the BiOp, NMFS identified a Reasonable and Prudent Alternative (RPA) that set forth specific actions the Action Agencies could implement to satisfy their legal obligations under the ESA to "…avoid the likelihood of jeopardizing the continued existence of the ESA listed species or the destruction or adverse modification of their designated critical habitat (NMFS 2008)."

On September 2021, the U.S. District Court for the District of Oregon issued an Interim Injunction Order directing the USACE to implement certain interim injunctive measures to improve fish passage and water quality at several WVP dam sites to benefit UWR spring Chinook salmon and winter steelhead while a reinitiated ESA consultation was completed. In the interim, the Court approved an Expert Panel to define the implementation plans of specific measures, which were required to "provide meaningful research, monitoring, and evaluation ("RM&E") of the interim injunctive measures." On February 28, 2022, the Expert Panel submitted its proposed "long term" plan for the RM&E to accompany the interim injunction measures for the remainder of the duration of the injunction. This study is a component of the RM&E measures identified by the Expert Panel.

The purpose of this project is to contribute to the understanding of downstream passage of juvenile Chinook salmon and winter steelhead in the Willamette Valley Project. Monitoring includes the North Santiam, South/Middle Santiam, South Fork McKenzie, and Middle Fork Willamette River subbasins, including Fall Creek (Figure 1). In order to understand migration timing and survival within the WVP and interim management measures hypothesized to contribute to greater survival of juvenile and adult salmonids, this project consists of interrelated studies including (1) the bulk marking of juvenile Chinook salmon with PIT (Passive Integrated Transponder) tags to aid in the evaluation of these measures, (2) rotary screw traps (RST) sampling at multiple locations across the WVP, and (3) sampling within Green Peter and Lookout Point Reservoirs to understand how water management strategies may influence migration patterns and survival.

This report summarizes the work conducted in 2024 through December 31, 2024 under contract with the U.S. Army Corps of Engineers for bulk marking and sampling in Lookout Point and Green Peter reservoirs. The summary of rotary screw trap results has been submitted separately (EAS 2025).

Figure 1. Location of Willamette River Basin in Northwestern Oregon

PROJECT SCHEDULE

This report is the fourth bi-annual report of the project, covering results of the bulk marking and reservoir distribution studies from June through December 2024, and to date since the project commenced in March 2023.

The contract for this project was awarded in early March 2023, and it was anticipated that it would take approximately two months to initiate 2023 field activities associated with the bulk marking and reservoir distribution studies. The anticipated schedule for 2023 was to begin bulk marking in early April and reservoir studies in the first week in May. Due to the permitting process, availability of equipment due to continued supply chain issues, coordination with hatcheries and training of field staff, a significant amount of advance work was necessary resulting in field activities ultimately beginning later than envisioned. Bulk marking of Chinook salmon fry began in mid-May 2023 and reservoir sampling started in mid-June 2023. Bulk marking activities have continued seasonally with tagging and release of subyearlings in Fall 2023, yearlings in winter/spring 2024, fry in spring 2024, and subyearlings in fall 2024. Reservoir sampling during the 2023 field season continued through the first week of December in Lookout Point Reservoir and through the end of September in Green Peter Reservoir. Reservoir sampling resumed during the first week of February 2024 and continued through the first week of November on Green Peter Reservoir and the end of November 2024 on Lookout Point Reservoir. Sampling on Green Peter Reservoir was suspended in early November 2024 due to access and safety concerns related to the drawdown. Rotary screw trap (RST) sampling has been conducted both under a separate contract with Environmental Assessment Services (EAS) and as part of this contract. RST sampling under these contracts has occurred up to year-round between January 1, 2023 and December 31, 2024, with specific dates of operation dependent on trap location (EAS 2024a, EAS 2024b, EAS 2025).

Project reporting occurs bi-weekly and bi-annually. Bi-annual reporting periods cover January-June and July-December, with each report summarizing results during the reporting period as well as findings to date. RST sampling methods and results are presented separately (EAS 2024b, EAS 2024c, EAS 2025). Future reports will expand on these results as more data are collected (e.g., PIT tagged fish released as part of this project are still potentially outmigrating, and future reports will update the analyses for efforts conducted during this reporting period).

Table 1. Summary of field sampling effort, schedule and life stage targeted as part of this project.

Activity	Year	Timing	Target Life stage (Chinook salmon)
Bulk Marking (PIT tagging) of juvenile Chinook salmon	2023 2024	Spring (starting May) and Fall Winter/Spring and Fall	Fry, parr, and yearlings
Rotary Screw Trapping*	2023 2024	Year-round Year-round	Fry, parr, and yearlings
Reservoir Sampling (littoral and limnetic)	2023 2024	June through December February through November	Fry, parr, and yearlings

*Results from rotary screw trap sampling is contained in a separate report.

BULK MARKING

Bulk marking of juvenile Chinook salmon with PIT tags provides an opportunity to evaluate how individuals behave, grow, and move through the Willamette Basin, provided they are redetected or recaptured at downstream locations. The primary purpose of this project is to assess how water management actions (e.g., reservoir drawdowns, surface spill) influence the movement patterns and downstream passage rates of juvenile Chinook

salmon. While estimating survival remains a long-term goal, current efforts focus on understanding detection rates and their relationship to dam operations. All Chinook salmon used in the bulk marking portion of the project originated from hatcheries operated by the Oregon Department of Fish and Wildlife (ODFW) in the Willamette Valley.

Methods

The following provides detailed procedures for work done to mark, hold, transport, and release juvenile Chinook salmon in the Willamette River basin during 2023 and 2024.

Government Supplied Hatchery Fish

Juvenile Chinook salmon used for bulk marking were sourced from sub-basin stocks corresponding to their intended release locations. The Oregon Department of Fish and Wildlife (ODFW) reared all fish at various Willamette Valley hatchery facilities before Cramer Fish Sciences (CFS) conducted PIT tagging and release. Fish for the North Santiam basin were reared at ODFW's Marion Forks hatchery near Idanha, OR. Those for the South/Middle Santiam and Middle Fork Willamette basins were reared at ODFW's Willamette Hatchery in Oakridge, OR. Fish for the South Fork McKenzie Basin were reared at ODFW's Leaburg and McKenzie Hatcheries near Leaburg, OR.

CFS coordinated with hatchery managers to ensure adequate space and water supplies for holding fish both pre- and post-tagging at each rearing site. The holding and tagging facilities varied across locations to accommodate different life stages and quantities of fish. At Marion Forks Hatchery, Chinook salmon for the North Santiam Basin were held in either indoor flow-through ("Canadian") troughs measuring 21 ft x 1.67 ft x 1.75 ft or outdoor circular ponds with dimensions of 24 ft x 2.16 ft. For the South/Middle Santiam and Middle Fork Willamette Basins, fish were held at Willamette Hatchery. Fry were kept in indoor troughs (16 ft x 2.67 ft x 1.75 ft) or indoor circular tanks (6 ft x 4 ft). Yearlings and subyearlings were accommodated in large raceways measuring 100 ft x 20 ft x 3.75 ft. In the South Fork McKenzie basin, fry were held pre- and post-tagging at ODFW's McKenzie Hatchery in indoor flow-through troughs (20 ft x 2.67 ft x 1.67 ft). Yearlings and subyearlings tagged in fall were kept at Leaburg Hatchery in net pens (6 ft x 6 ft x 3 ft) placed within the hatchery's large outdoor ponds. Hatchery management made six outdoor ponds or cement circulars available at Leaburg or McKenzie hatchery, each measuring 20 ft in diameter and 3.66 ft deep. Net pens were used across all hatchery locations (6 ft x 6 ft x 3 ft) to enable separation and containment of hatchery release groups within the large outdoor ponds and raceways.

Fish Holding Conditions and Husbandry following delivery to CFS

Fish holding conditions were consistent with ODFW hatchery management practices and each hatchery's existing protocols were followed. ODFW hatchery staff supported the project by conducting daily feedings, water quality monitoring, observation of abnormalities, and removal of mortalities at hatchery sites. Fish were under daily observation for abnormalities including poor swimming performance, fungus, unusual feeding behavior, direct mortalities, or any unusual marks.

Bulk/Batch Marking

All release groups were uniquely marked with a passive integrated transponder (PIT) tag (Biomark, Inc.). An additional 3% of fish were marked for each release group to account for tagging mortality and ensure sufficient tag numbers of fish are achieved for each release group (Table 3). Fish were tagged within the Cramer Fish Sciences fish marking trailer, which is disinfected then moved to each basin's holding site for bulk marking events. The marking trailer is equipped with 110V electricity and flow-through fish holding tanks. During tagging, temperature, dissolved oxygen, and water chemistry were monitored, and the water was aerated and cooled with ice when necessary. Tagging ceased when the temperature of tanks exceeded 17 degrees Celsius or deviated more than 2 deg C from source/return water (Table 3).

Working in small batches (30-50 fish), fish were anesthetized using 50 mg/L tricaine methanesulfonate (MS-222) buffered with sodium bicarbonate. To minimize fish stress, anesthetic exposure did not exceed five minutes (PIT Tag Steering Committee 2014). Fish were then tagged based on fork length (FL). Fry greater than 45 mm but less than 65 mm were marked with 8 mm PIT tags and fry greater than 65 mm were marked with a 12 mm PIT tag. All fish >45 mm were adipose fin clipped, either by ODFW or by CFS staff with surgical scissors. All subyearlings and yearlings are tagged with 12 mm PIT tags. Fork length to the nearest millimeter and weight to the nearest 0.01 g were collected for 3% of each release group. For each fish, the tag code was recorded before fish were transferred to a flow-through tank for a 30-minute recovery and observation period. Any mortalities during this period were documented. After fish had recovered, the bulk of each release group (95%) were held for a minimum of 48 hours prior to release with each uniquely tagged release group held in a separate tank or holding pen where feeding commenced. The remaining 5% were held separately to be used for tag retention/mortality holding trials, as described below under "Tag Retention and Mortality Holding Trials."

VIE Batch Marking

Before the start of the spring tagging season in 2023, we initially planned to use Visual Implant Elastomer (VIE) tags for marking fry. However, due to the timing of marking activities following contract award and setup—by which time the fry had grown to over 45mm—and after consulting experienced elastomer taggers and reviewing how VIE marks change as fish develop, we collaborated with the Corps to explore alternatives. Handling fry smaller than 45mm proved challenging and VIE tags on small fry often become difficult to read as the fish grow, especially during recapture efforts (e.g., in rotary screw traps after extended rearing in reservoirs or streams), rendering the tags unreliable for long-term tracking. Consequently, we opted to use 8mm PIT tags for fish measuring between 45mm and 65mm. While this approach delays releases until fish reach 45mm and precludes data collection on smaller fry, it ensures that each recaptured fish can be accurately identified throughout its life stages, enhancing the reliability and value of our data despite the trade-off.

PIT Tag Bulk Marking

PIT tagging procedures followed the methods detailed in the PIT Tag Marking Procedures Manual (PIT Tag Steering Committee 2014). Feeding was ceased 24-48 hours in advance of tagging and resumed 24-28 hours post tagging, in order to reduce the risk of shed tags and lower the chance of hitting vital organs when injecting the PIT tags into the peritoneal cavity (PIT Tag Steering Committee 2014). Fish were tagged using single-use pre-loaded injector needles, pulled from trays holding sequentially numbered PIT tags. Tags were inserted using a MK25 PIT tag implanter (Biomark, Inc.). A new needle was loaded on the implanter for each fish. Fish were held in the hand with the belly of the fish facing up with the tail oriented toward the thumb, and the insertion point lined up with the middle finger. The middle finger was used to exert a slight pressure on the side of the fish's belly to ease needle penetration. The injector was laid in the hand so that the needle bevel faced toward the body of the fish. Tags were injected into the peritoneal cavity between the posterior tip of the pectoral fin and the anterior point of the pelvic girdle 1 to 2 mm from the mid-ventral line. Care was taken to keep the needle as parallel to the body axis as possible to keep the tag against the body wall, with minimal needle penetration (approximately 1-2 mm of the needle tip for small fish). Once the needle penetrated the abdominal wall, the tag was injected by pressing the trigger. After insertion, the used needle tip was ejected, and the fish scanned to read the tag code before transfer to the recovery tank.

A tag record includes information about the tagging session (i.e., date and location of tagging event, date and location of release) and the fish that were tagged (i.e., species, run, rearing type, PIT tag code, fork length, and weight for the 3% subsample). Data during tagging were recorded using P4 software developed by PTAGIS[1]. Prior to release, holding tanks and the fish transport truck were examined to remove mortalities and scanned with a magnet to collect any shed PIT tags. PIT tag codes from sheds and mortalities were removed from the tag record. The PIT tag data were inspected for data quality before being uploaded to PTAGIS at the time of release.

Fish Transport

Fish were transported in a 400-gallon insulated fish transport tank (Reiff Manufacturing). The tank was placed and secured in the bed of a Ford F350 truck. The tank is equipped with a water pump to circulate oxygenated water within the tank, and an oxygen tank was secured vertically in the bed of the truck and used to supply oxygen to the tank. Transport fish densities were between 20 – 50 g/L (equivalent to 0.17 – 0.42 lbs/gallon) and dissolved oxygen was monitored and maintained between 80-120%, following the juvenile Chinook salmon transport methods applied by the USGS (Kock et al. 2019). Temperature and dissolved oxygen are monitored during transport by using a water quality meter with a cable that extends to the truck cab. Prior to transport, the temperature of the release location was measured and if necessary, the temperature of tank water was manipulated during transport so that fish experience at most a 1.0 ºC change in temperature at release. Water temperature manipulations during transport were made by adding either ice or warm water to the tank at a rate that ensures fish experience a targeted less than 0.5 ºC change in temperature per 15 minutes (Kock et al. 2019) to stay in compliance with NMFS criteria.

The fish transport tank was disinfected when switching between basins to prevent disease transmission. The inside of the tank was disinfected through exposure to 200 ppm chlorine for 30 minutes, after which it was thoroughly flushed with clean water (IHOT 1994).

[1] https://www.ptagis.org/Software/P4/P4

Release

The following outlines the primary marking and release locations for the remainder of this study, extending through spring 2025 (Table 2). In 2023, early spring fry marking was delayed due to various challenges, as previously discussed. These included delays in the permitting process, equipment shortages stemming from ongoing supply chain issues, coordination with hatcheries, and the training of field staff, all of which required substantial preparatory work. Despite these obstacles, Chinook salmon fry were eventually marked and released, though at a later date and at a correspondingly larger size.

Table 2. Tentative (target) release schedule for brood years 2022 and 2023. Release dates are approximate and depend upon operations and conditions such as reservoir elevation, road closures, etc. Note that no releases are listed for the South Fork McKenzie or Middle Fork Willamette subbasins for brood year 2023 due to the unavailability of BY2023 fish in those areas, resulting in shortfalls for certain periods.

Date Estimate	Release Location	Target	Life Stage	#	Tag
2023					
MF Willamette					
Spring 2023	Fall Creek Head of Reservoir	Prior to reaching target elevation of 728 feet	fry	10000	8 mm
Spring 2023	Lookout Point Head of Reservoir	30 day spill operations	fry	10000	8 mm
Spring 2023	Hills Creek Head of Reservoir	Observed fry migration and RO operations	fry	10000	8 mm
9/15/2023	Dexter Tailrace	Fall deep drawdown	subyearling	2000	12 mm
9/15/2023	Lookout Point Head of Reservoir	Fall deep drawdown	subyearling	5000	12 mm
9/15/2023	Lookout Point Forebay	Fall deep drawdown	subyearling	5000	12 mm
10/15/2023	Fall Creek Head of Reservoir	2-3 weeks prior to drawdown	subyearling	5000	12 mm
10/15/2023	Fall Creek Tailrace	2-3 weeks prior to drawdown	subyearling	1000	12 mm
11/15/2023	Fall Creek Head of Reservoir	Midway between start of drawdown and streambed elevation	subyearling	5000	12 mm
11/15/2023	Fall Creek Tailrace	Midway between start of drawdown and streambed elevation	subyearling	1000	12 mm
11/16/2023	Hills Creek Head of Reservoir	Prior to start of fall/winter RO operations	subyearling	5000	12 mm
11/16/2023	Hills Creek Tailrace	Prior to start of fall/winter RO operations	subyearling	3000	12 mm
11/16/2023	Hills Creek Forebay or Mid-Reservoir	Prior to start of fall/winter RO operations	subyearling	5000	12 mm
SF McKenzie					
Spring 2023	Cougar Head of Reservoir	Prior to start of spring drawdown	fry	5000	8 mm
Spring 2023	Cougar Head of Reservoir	After start of drawdown but prior to reaching 1520 feet	fry	5000	8 mm
9/15/2023	Cougar Head of Reservoir	Prior to start of drawdown	subyearling	3000	12 mm
10/15/2023	Cougar Forebay	Prior to reaching target elevation of 1505 feet	subyearling	5000	12 mm
10/15/2023	Cougar Tailrace	Prior to reaching target elevation of 1505 feet	subyearling	4000	12 mm
10/15/2023	Cougar Head of Reservoir	Prior to reaching target elevation of 1505 feet	subyearling	4000	12 mm
11/15/2023	Cougar Forebay	At 1532 feet when RO is prioritized for day and night spill	subyearling	5000	12 mm
11/15/2023	Cougar Tailrace	At 1532 feet when RO is prioritized for day and night spill	subyearling	4000	12 mm
11/15/2023	Cougar Head of Reservoir	At 1532 feet when RO is prioritized for day and night spill	subyearling	4000	12 mm
South Santiam					
Spring 2023	Green Peter Head of Reservoir, Middle Santiam	Spill operation block	fry	5000	8 mm

Date Estimate	Release Location	Target	Life Stage	#	Tag
Spring 2023	Green Peter Head of Reservoir, Quartzville Creek	Spill operation block	fry	5000	8 mm
8/30/2023	Foster Tailrace	Undefined - Late August	subyearling	1000	12 mm
8/30/2023	Foster Head of Reservoir	Undefined - Late August	subyearling	2000	12 mm
9/15/2023	Green Peter Head of Reservoir, Middle Santiam	Fall Operations at Green Peter	subyearling	2500	12 mm
9/15/2023	Green Peter Head of Reservoir, Quartzville Creek	Fall Operations at Green Peter	subyearling	2500	12 mm
10/15/2023	Green Peter Tailrace	Prior to Green Peter reaching 887 feet.	subyearling	4000	12 mm
10/15/2023	Green Peter Head of Reservoir, Middle Santiam	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2023	Green Peter Head of Reservoir, Quartzville Creek	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2023	Foster Tailrace	Fall operations at Foster	subyearling	4000	12 mm
10/15/2023	Foster Head of Reservoir	Fall operations at Foster	subyearling	5000	12 mm
		North Santiam			
Spring 2023	Detroit Head of Reservoir, Breitenbush	Prior to beginning of spill	fry	7500	8 mm
Spring 2023	Detroit Head of Reservoir, North Santiam	Prior to beginning of spill	fry	7500	8 mm
10/1/2023	Big Cliff Tailrace	Prior to Detroit Reservoir reaching 1520 feet	subyearling	8000	12 mm
10/1/2023	Detroit Head of Reservoir, Breitenbush	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
10/1/2023	Detroit Head of Reservoir, North Santiam	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
11/15/2023	Big Cliff Tailrace	When Detroit reaches 1465 feet	subyearling	6000	12 mm
		2024			
		MF Willamette			
2/1/2024	Hills Creek Head of Reservoir	Prior to end of fall/winter RO operations	yearling	5000	12 mm
2/1/2024	Hills Creek Tailrace	Prior to end of fall/winter RO operations	yearling	3000	12 mm
2/1/2024	Hills Creek Forebay or Mid-Reservoir	Prior to end of fall/winter RO operations	yearling	5000	12 mm
2/28/2024	Fall Creek Head of Reservoir	Prior to beginning of refill	yearling	5000	12 mm
2/28/2024	Fall Creek Tailrace	Prior to beginning of refill	yearling	1000	12 mm
2/28/2024	Lookout Point Head of Reservoir	Prior to 30-day spill	yearling	5000	12 mm
2/28/2024	Dexter Tailrace	Prior to 30-day spill	yearling	2000	12 mm
2/28/2024	Lookout Point Forebay	Prior to 30-day spill	yearling	5000	12 mm
3/31/2024	Fall Creek Head of Reservoir	After refill is completed	yearling	5000	12 mm
3/31/2024	Fall Creek Tailrace	After refill is completed	yearling	1000	12 mm
4/1/2024	Lookout Point Head of Reservoir	After 30-day spill/beginning of nighttime spill	yearling	5000	12 mm
4/1/2024	Dexter Tailrace	After 30-day spill/beginning of nighttime spill	yearling	2000	12 mm

Date Estimate	Release Location	Target	Life Stage	#	Tag
4/1/2024	Lookout Point Forebay	After 30-day spill/beginning of nighttime spill	yearling	5000	12 mm
		SF McKenzie			
2/28/2024	Cougar Forebay	Prior to beginning of spring drawdown	yearling	2000	12 mm
2/28/2024	Cougar Tailrace	Prior to beginning of spring drawdown	yearling	1000	12 mm
2/28/2024	Cougar Head of Reservoir	Prior to beginning of spring drawdown	yearling	2000	12 mm
3/30/2024	Cougar Forebay	After start of drawdown but prior to reaching 1520 feet	yearling	2000	12 mm
3/30/2024	Cougar Tailrace	After start of drawdown but prior to reaching 1520 feet	yearling	1000	12 mm
3/30/2024	Cougar Head of Reservoir	After start of drawdown but prior to reaching 1520 feet	yearling	2000	12 mm
		South Santiam			
4/1/2024	Green Peter Head of Reservoir, Middle Santiam	At the start of the first spring spill block	fry	2500	8 mm
4/1/2024	Green Peter Head of Reservoir, Quartzville Creek	At the start of the first spring spill block	fry	2500	8 mm
4/1/2024	Green Peter Tailrace	At the start of Green Peter spring spill	yearling	1000	12 mm
4/1/2024	Green Peter Reservoir - Forebay	At the start of Green Peter spring spill	yearling	2000	12 mm
4/1/2024	Green Peter Head of Reservoir, Middle Santiam	At the start of Green Peter spring spill	yearling	1000	12 mm
4/1/2024	Green Peter Head of Reservoir, Quartzville Creek	At the start of Green Peter spring spill	yearling	1000	12 mm
4/1/2024	Green Peter Reservoir, Mid-Reservoir	At the start of Green Peter spring spill	yearling	2000	12 mm
4/1/2024	Foster Tailrace	Prior to start of Foster refill	yearling	4000	12 mm
4/1/2024	Foster Head of Reservoir	Prior to start of Foster refill	yearling	5000	12 mm
4/20/2024	Foster Tailrace	Post refill operations	yearling	2000	12 mm
4/20/2024	Foster Head of Reservoir	Post refill operations	yearling	1000	12 mm
4/15/2024	Green Peter Head of Reservoir, Middle Santiam	At the start of the second spring spill block	fry	2500	8 mm
4/15/2024	Green Peter Head of Reservoir, Quartzville Creek	At the start of the second spring spill block	fry	2500	8 mm
8/30/2024	Foster Tailrace	Undefined - Late August	subyearling	1000	12 mm
8/30/2024	Foster Head of Reservoir	Undefined - Late August	subyearling	2000	12 mm
9/15/2024	Green Peter Head of Reservoir, Middle Santiam	Fall Operations at Green Peter	subyearling	2500	12 mm
9/15/2024	Green Peter Head of Reservoir, Quartzville Creek	Fall Operations at Green Peter	subyearling	2500	12 mm
10/15/2024	Green Peter Tailrace	Prior to Green Peter reaching 887 feet.	subyearling	4000	12 mm
10/15/2024	Green Peter Head of Reservoir, Middle Santiam	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2024	Green Peter Head of Reservoir, Quartzville Creek	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2024	Foster Tailrace	Fall operations at Foster	subyearling	4000	12 mm
10/15/2024	Foster Head of Reservoir	Fall operations at Foster	subyearling	5000	12 mm

Date Estimate	Release Location	Target	Life Stage	#	Tag
		North Santiam			
2/1/2024	Detroit Head of Reservoir, North Santiam	Prior to start of Detroit refill	fry	3750	8 mm
2/1/2024	Detroit Head of Reservoir, Breitenbush	Prior to start of Detroit refill	fry	3750	8 mm
4/1/2024	Detroit Head of Reservoir, Breitenbush	Prior to start of Detroit spill	fry	3750	8 mm
4/1/2024	Detroit Head of Reservoir, North Santiam	Prior to start of Detroit spill	fry	3750	8 mm
4/1/2024	Big Cliff Tailrace	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm
4/1/2024	Detroit Head of Reservoir, Breitenbush	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm
4/1/2024	Detroit Head of Reservoir, North Santiam	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm
10/1/2024	Big Cliff Tailrace	Prior to Detroit Reservoir reaching 1520 feet	subyearling	8000	12 mm
10/1/2024	Detroit Head of Reservoir, Breitenbush	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
10/1/2024	Detroit Head of Reservoir, North Santiam	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
11/15/2024	Big Cliff Tailrace	When Detroit reaches 1465 feet	subyearling	6000	12 mm
		2025			
		South Santiam			
4/1/2025	Green Peter Head of Reservoir in Middle Santiam River	At the start of the first spring spill block	fry	2500	8 mm PIT
4/1/2025	Green Peter Head of Reservoir in Quartzville Creek	At the start of the first spring spill block	fry	2500	8 mm PIT
4/1/2025	Green Peter Tailrace	At the start of Green Peter spring spill	yearling	1000	12 mm PIT
4/1/2025	Green Peter Reservoir - Forebay	At the start of Green Peter spring spill	yearling	2000	12 mm PIT
4/1/2025	Green Peter Head of Reservoir, Middle Santiam	At the start of Green Peter spring spill	yearling	1000	12 mm PIT
4/1/2025	Green Peter Head of Reservoir, Quartzville Creek	At the start of Green Peter spring spill	yearling	1000	12 mm PIT
4/1/2025	Green Peter Reservoir, Mid-Reservoir	At the start of Green Peter spring spill	yearling	2000	12 mm PIT
4/1/2025	Foster Tailrace	Prior to start of Foster refill	yearling	1000	12 mm PIT
4/1/2025	Foster Head of Reservoir	Prior to start of Foster refill	yearling	4000	12 mm PIT
4/15/2025	Green Peter Head of Reservoir in Middle Santiam River	At the start of the second spring spill block	fry	2500	8 mm PIT
4/15/2025	Green Peter Head of Reservoir in Quartzville Creek	At the start of the second spring spill block	fry	2500	8 mm PIT
4/20/2025	Foster Head of Reservoir	Post refill operations	yearling	5000	12 mm PIT
4/20/2025	Foster Tailrace	Post refill operations	yearling	2000	12 mm PIT
		North Santiam			
2/1/2025	Breitenbush River	Prior to start of Detroit refill	fry	3750	8 mm PIT
2/1/2025	North Santiam River	Prior to start of Detroit refill	fry	3750	8 mm PIT
4/1/2025	Breitenbush River	Prior to start of Detroit spill	fry	3750	8 mm PIT

Date Estimate	Release Location	Target	Life Stage	#	Tag
4/1/2025	North Santiam River	Prior to start of Detroit spill	fry	3750	8 mm PIT
4/1/2025	Big Cliff Tailrace	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm PIT
4/1/2025	Detroit Head of Reservoir, Breitenbush	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm PIT
4/1/2025	Detroit Head of Reservoir, North Santiam	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm PIT

Release Methods

Maps of release locations are provided in Figure 2-Figure 6. The method of release from the transport truck depended on the release location and reservoir elevation. When release locations were at boat ramps, the truck was backed down to the water's edge, where fish were then volitionally released from the tank by attaching 6" collapsible tube, 6" semi-rigid tube, or 3" semi-rigid tube to the sluice gate at the bottom of the tank. Prior to fish release, the tubes were filled with water to prevent fish injury. To ensure fish were fully flushed from the tube at the end of the release, buckets of release location water were used to flush the tube after the tank emptied. A generator and trash pump were also used occasionally to pump river water into the tank to assist in flushing fish from the tank. At roadside release locations, the same methods were used, however the truck was parked at the nearest road shoulder.

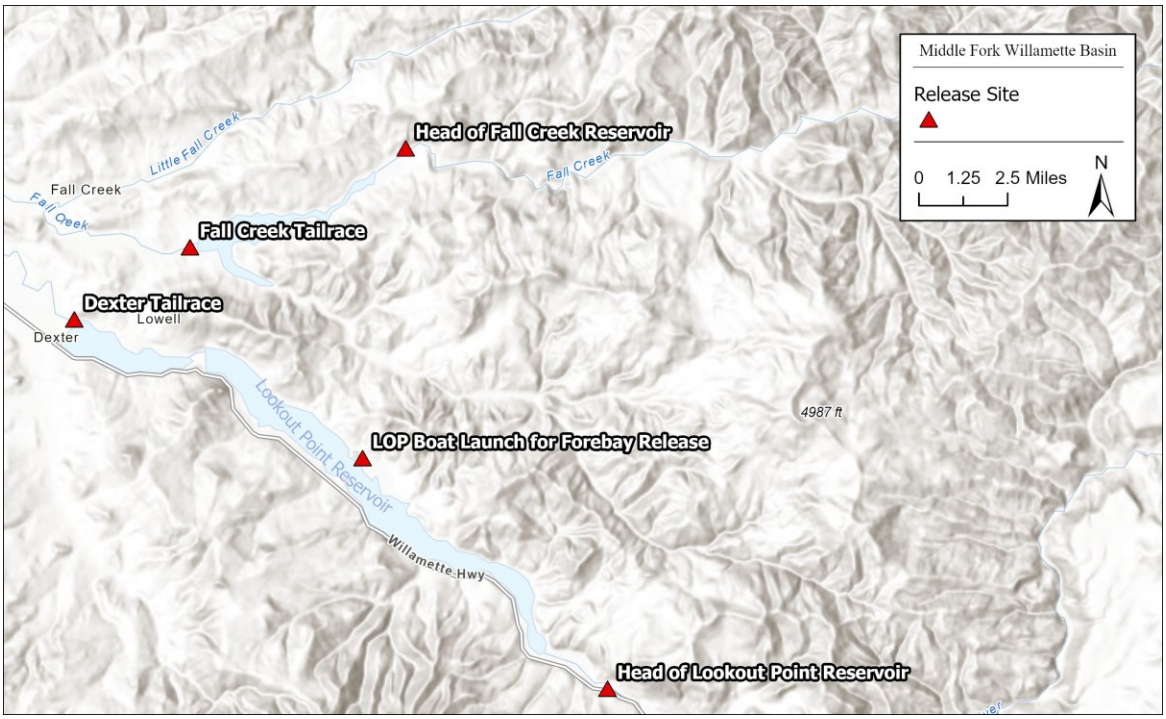

Figure 2. Map of Lookout Point, Dexter tailrace and Fall Creek release locations within the Middle Fork Willamette Basin. Head of Lookout Pt reservoir at Hampton Boat Launch (Black Canyon Campground as backup). Head of Fall Creek reservoir is at the location of the decommissioned boatramp approximately 800 meters below Dolly Varden Campground.

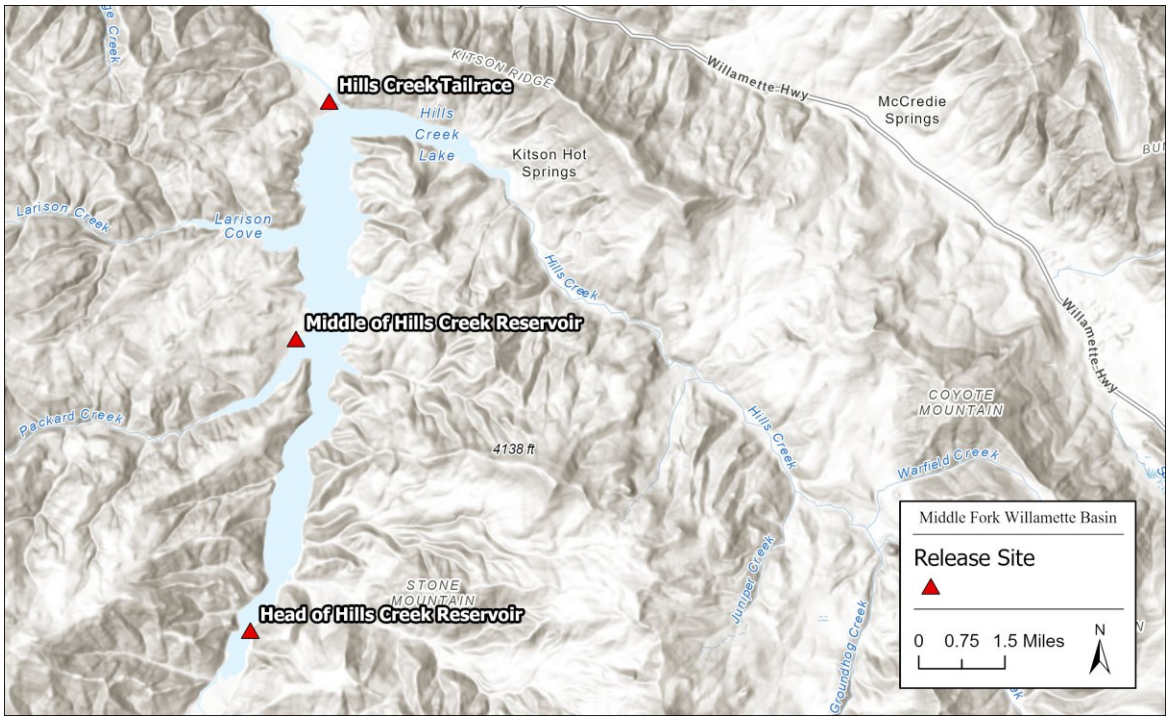

Figure 3. Map of Hills Creek Reservoir release locations within the Middle Fork Willamette Basin. The mid-reservoir release location occurs at Packard boat ramp. The Head of Reservoir release location occurs at the upper reservoir bridge crossing.

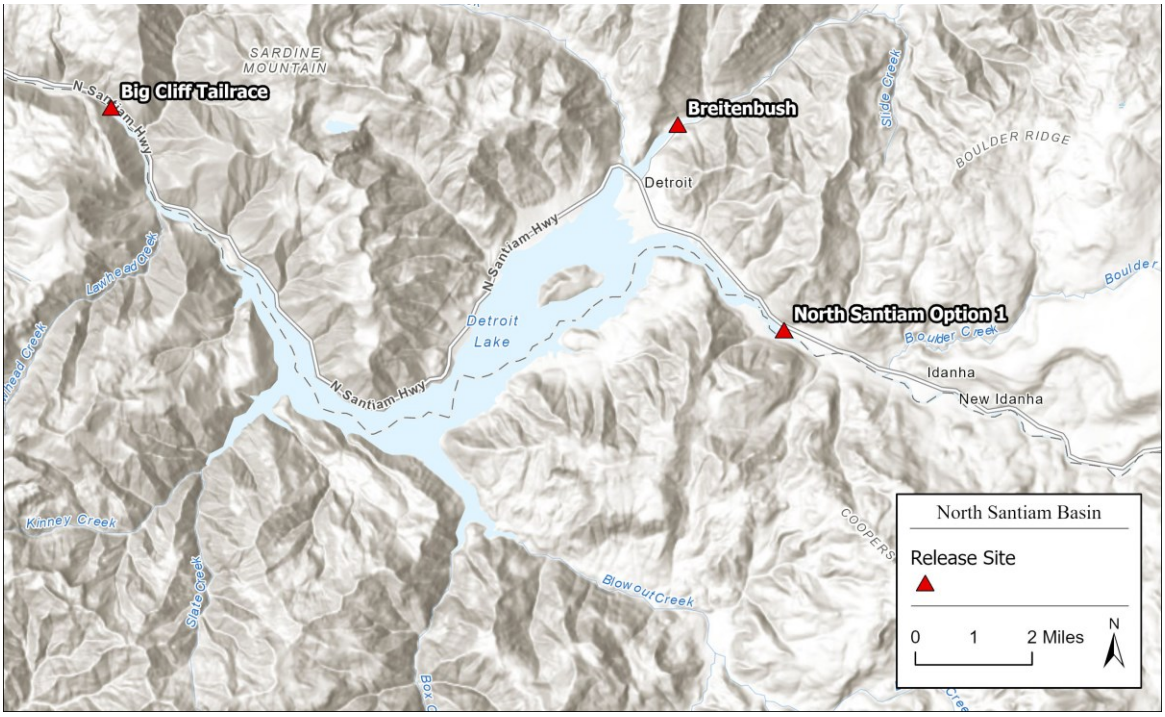

Figure 4. Map of release locations within the North Santiam Basin. The North Santiam Head of Reservoir release site is the Santiam Falls Campground or Hoover Campground. The Breitenbush release site is at the USGS gaging station.

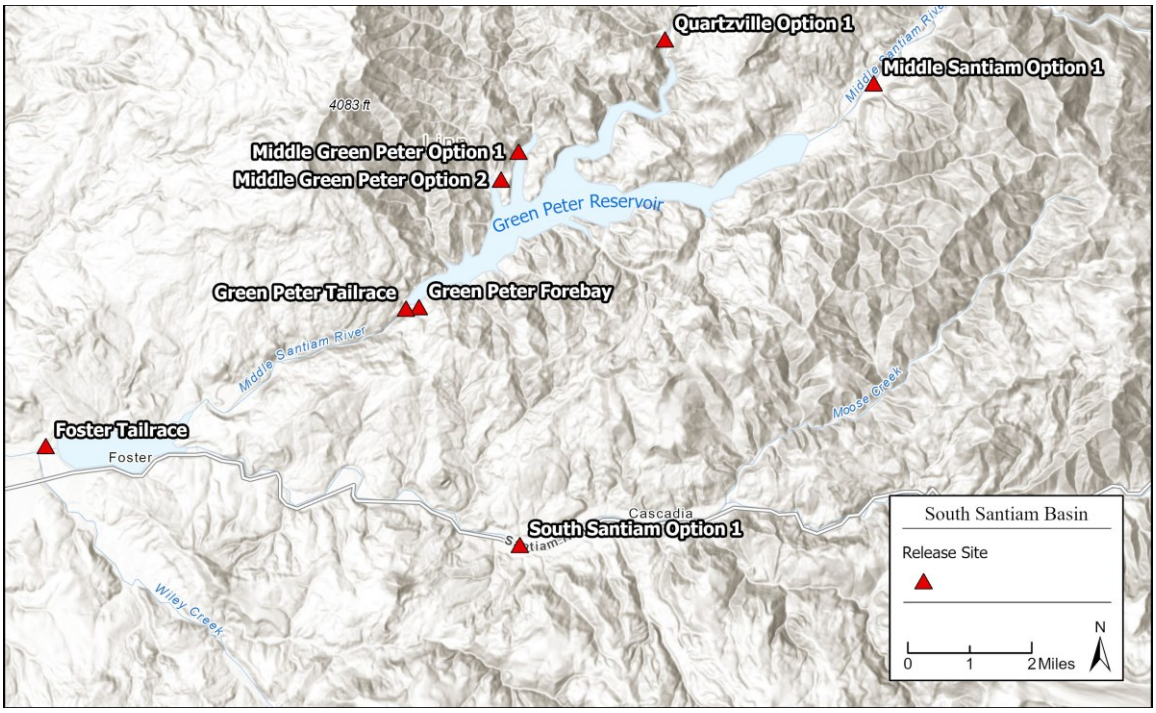

Figure 5. Map of release locations in the Middle/South Santiam basin including Green Peter Reservoir. Green Peter forebay releases are at Billings Park. Middle Santiam Head of Reservoir releases occur at the bridge crossing at the top of the reservoir or at the USGS gaging station. Quartzville Head of Reservoir releases occur at one of the multiple river access sites along the Quartzville Dr depending on conditions at the time of release. Whitcomb County Park and Thistle Creek boat ramp are alternate release locations.

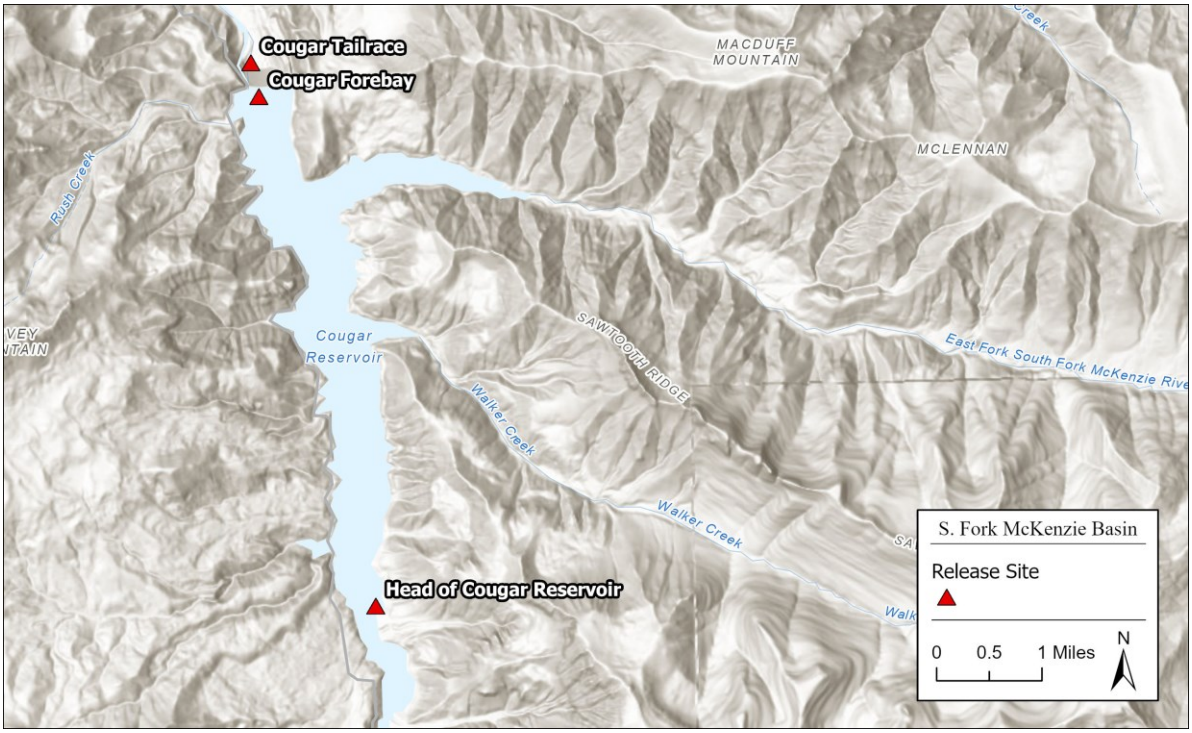

Figure 6. Map of release locations in Cougar Reservoir within the South Fork McKenzie basin. Cougar forebay releases occurred at the face of Cougar dam during drawdown periods as distances were too far for effective forebay releases elsewhere. Cougar Head of Reservoir releases were at Cougar Crossing or Slide Creek Day Use area.

Results: Bulk Marking Summary through 31 December 2024

Overview

From May 2023 through December of 2024, a total of 417,727 juvenile Chinook salmon have been PIT tagged and 392,449 have been released across four basins in the Willamette Valley Project area (Figure 7). The overall tagging and release efforts were distributed across basins as follows:

- Middle Fork Willamette: 166,333 (42.4% of total)
- South Fork McKenzie: 49,281 (12.6% of total)
- South Santiam: 92,929 (23.7% of total)
- North Santiam: 83,906 (21.4% of total)

The overall tagging mortality rate was 1.5% with 6,047 total mortalities observed during the tagging process. Over half of the total tagging mortalities (n = 3,437) occurred during a furunculosis outbreak at Marion Forks hatchery in 2023, tagging mortality rate was generally well under 1% when fish were healthy. Tag shedding was observed in a total 1,306 fish, representing a 0.3% overall tag shed rate.

A total of 5,762 PIT tagged fish have been subsequently redetected, representing approximately 1.5% of the total number of PIT tagged fish released (Table 3). Of those, 59 PIT-tagged fish have been detected at two different locations, and no fish have been detected at more than two locations. The total number of recaptures by release basin are as follows:

- Middle Fork Willamette: 1,748 (30.3% of total recaptures, 1.1% of releases within basin)
- South Fork McKenzie: 2,637 (45.7% of total recaptures, 5.3% of releases within basin)
- South Santiam: 1,102 (19.1% of total recaptures, 1.1% of releases within basin)
- North Santiam: 334 (5.8% of total recaptures, 0.4% of total releases within basin)

Table 3. Summary of unique PIT tag recaptures by release basin and detection method in the Willamette Valley Project area, May 2023 – December 2024.

Basin	Detection Method	Count
Middle Fork Willamette	Screw Trap	1,419
	Instream Array	197
	Towed Array	72
	Predation Mark Recovery	50
	Gill Net	6
	Fyke Net	4
South Fork McKenzie	Screw Trap	2,378
	Instream Array	231
	Predation Mark Recovery	16
	Towed Array	12
South Santiam	Instream Array	658
	Screw Trap	238
	Gillnet	80
	Towed Array	63
	Predation Mark Recovery	56
	Fyke Net	7
North Santiam	Screw Trap	127
	Instream Array	104
	Towed Array	55
	Bypass Sub-Sample	25
	Predation Mark Recovery	23

Rotary screw traps have detected the largest number of PIT tagged fish released overall (n = 4,162) and were the dominant detection method in the Middle Fork Willamette, South Fork McKenzie, and North Santiam basins (Table 3). Instream PIT tag antenna arrays have accounted for a total of 1,190 detections and have detected the greatest number of fish recaptured from releases in the South Santiam basin. Additionally, the Columbia River Estuary Towed Array detected 202 PIT-tagged fish from this study and the Bird Predation Mark Recovery project recovered 145 PIT tags in the Columbia River. Lastly, trap nets and gill nets deployed in Lookout Point Reservoir and Green Peter Reservoir have recaptured 97 PIT-tagged fish. These results indicate that RSTs have been the most effective method for recapturing juvenile Chinook salmon in the Willamette Valley Project area, while instream arrays and in-reservoir research nets also play a role in monitoring fish movements in specific basins and within the Columbia River.

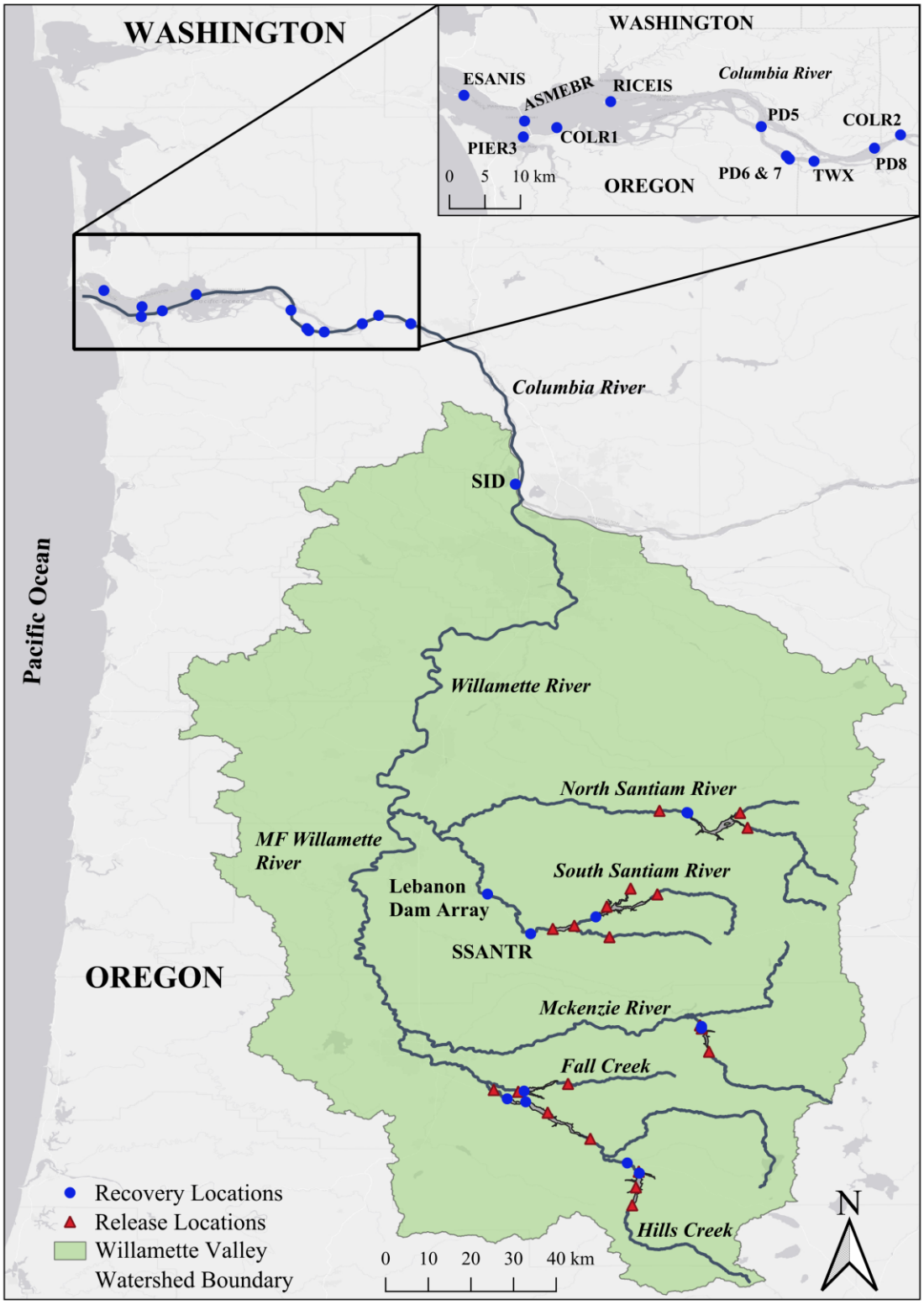

Figure 7. Map of all release and recovery locations within the project area.

Detailed results are presented below for each of the four basins: Middle Fork Willamette, South Fork McKenzie, South Santiam, and North Santiam, focusing on brood year 2022. In 2023, some broodstock returned to the Middle

Fork Willamette and South Fork McKenzie basins; however, the numbers were insufficient to support spawning, rearing, and subsequent use for research, monitoring, and evaluation purposes. As a result, brood year 2023 results are only reported for the South Santiam and North Santiam basins.

Middle Fork Willamette

Initially, we planned to PIT tag and release 116,000 brood year 2022 Middle Fork Willamette (MFW) stock juvenile Chinook salmon (Table 2). However, due to a surplus of BY22 research fish in the MFW basin, we were able to acquire an additional 51,000 juvenile Chinook salmon for the purpose of PIT tagged release groups, resulting in a total of 166,333 being tagged and released (Table 4). These fish were released in 36 groups across three project areas: Hills Creek (61,706 fish), Lookout Point (71,619 fish), and Fall Creek (33,635 fish). Among the released fish, yearling juvenile Chinook salmon made up the largest proportion (n = 99,774), followed by subyearlings (n = 36,981), and fry (29,578). In contrast, insufficient brood stock returned in the Middle Fork Willamette to produce BY23 study fish, resulting in no releases of BY23 research fish in this subbasin.

Table 4. Release details for PIT-tagged juvenile Chinook salmon in the Middle Fork Willamette (MFW) basin, including release location, date, brood year (BY), number of fish (N), mean fork length (mm), mean weight (g), and life stage.

Release Location	Release Date	Brood Year	N	Mean Length (mm)	Mean Weight (g)	Life Stage
Hills Creek Head of Reservoir	5/18/2023 15:50	2022	509	55.8	1.9	Fry
LOP Head of Reservoir	5/30/2023 10:30	2022	9647	63.1	2.9	Fry
Hills Creek Head of Reservoir	6/5/2023 10:30	2022	9784	64.7	2.8	Fry
Fall Creek Head of Reservoir	6/12/2023 15:00	2022	9638	67.4	3.2	Fry
LOP Head of Reservoir	9/18/2023 8:15	2022	4998	122.9	23.8	Subyearling
LOP Forebay	9/18/2023 17:00	2022	5002	128.3	25.1	Subyearling
LOP Tailrace	9/19/2023 11:30	2022	2011	128.4	25.2	Subyearling
Fall Creek Head of Reservoir	9/28/2023 14:45	2022	5006	133.5	29.1	Subyearling
Fall Creek Tailrace	9/28/2023 19:15	2022	1001	134.8	29.8	Subyearling
Fall Creek Head of Reservoir	11/6/2023 15:40	2022	4999	139.4	32.2	Subyearling
Fall Creek Tailrace	11/6/2023 19:00	2022	1000	134.9	30.2	Subyearling
Hills Creek Head of Reservoir	11/7/2023 15:45	2022	4997	135.2	28.6	Subyearling
Hills Creek Mid Reservoir	11/8/2023 15:15	2022	4998	145.3	36.9	Subyearling
Hills Creek Dam Tailrace	11/9/2023 14:35	2022	2969	129.6	27	Subyearling
LOP Head of Reservoir	1/3/2024 16:45	2022	4634	143.3	33.7	Yearling
LOP Head of Reservoir	1/4/2024 16:30	2022	4828	143.3	33.7	Yearling
LOP Head of Reservoir	1/8/2024 15:40	2022	3789	143.3	33.7	Yearling
LOP Head of Reservoir	1/9/2024 16:15	2022	5115	143.3	33.7	Yearling
LOP Head of Reservoir	1/25/2024 11:30	2022	7617	143.6	34.3	Yearling
Hills Creek Dam Tailrace	1/31/2024 14:05	2022	24861	141.6	34.7	Yearling
Hills Creek Head of Reservoir	2/6/2024 11:15	2022	4963	153.8	40.9	Yearling
Hills Creek Mid Reservoir	2/7/2024 10:10	2022	5000	155.9	41.7	Yearling
Hills Creek Dam Tailrace	2/7/2024 15:20	2022	2998	151.3	42.8	Yearling

Release Location	Release Date	Brood Year	N	Mean Length (mm)	Mean Weight (g)	Life Stage
Fall Creek Head of Reservoir	2/20/2024 12:45	2022	4993	148.4	38.9	Yearling
Fall Creek Tailrace	2/20/2024 16:05	2022	1002	150.5	39.9	Yearling
LOP Head of Reservoir	2/28/2024 11:30	2022	4994	141.5	34.2	Yearling
LOP Forebay	2/28/2024 16:30	2022	4988	144.2	35.9	Yearling
LOP Tailrace	2/29/2024 11:00	2022	1998	149.7	39.2	Yearling
Fall Creek Head of Reservoir	4/2/2024 11:00	2022	2500	146	37.1	Yearling
Fall Creek Head of Reservoir	4/3/2024 10:55	2022	2497	154.6	43.2	Yearling
Fall Creek Tailrace	4/3/2024 14:05	2022	999	159.5	44.5	Yearling
LOP Head of Reservoir	4/9/2024 10:35	2022	2499	150.9	41.2	Yearling
LOP Head of Reservoir	4/9/2024 13:00	2022	2499	150.9	41.2	Yearling
LOP Forebay	4/10/2024 11:00	2022	2500	150.7	39.7	Yearling
LOP Forebay	4/11/2024 11:55	2022	2500	150.7	39.7	Yearling
LOP Tailrace	4/11/2024 15:25	2022	2000	149	38.9	Yearling

The additional group of 51,000 fish were all released immediately after tagging and as such we were not able to evaluate tagging mortality and tag shed rate for those fish. The mean tagging mortality rate was 0.31% and the mean tag shed rate was 0.26% across all other fish tagged in the Middle Fork Willamette during 2023 (Table 5). Poor broodstock returns in 2023 resulted in no brood year 2023 Middle Fork Willamette stock juveniles being available from ODFW for tagging and release in calendar year 2024 and 2025.

Table 5. Summary of PIT tagging sessions for juvenile Chinook salmon in the Middle Fork Willamette basin (MFW), including number of fish tagged (N), tagging dates, mortalities, and tag shedding rates.

Mark Group	N	Date Start	Date End	Morts	%	Sheds	%
Lookout Point Head of Reservoir Fry	10,041	5/22/2023	5/24/2023	39	0.39	53	0.53
Hills Creek Head of Reservoir Fry	10,117	5/30/2023	6/1/2023	22	0.22	9	0.09
Fall Creek Head of Reservoir Fry	10,040	6/1/2023	6/7/2023	68	0.68	30	0.30
MFW – Fall 23 & Spring 24 Bulk Group	85,233	7/26/2023	12/7/2023	380	0.45	340	0.40
MFW – Additional 51,000 Group	51,000	1/1/2024	1/31/2021	NA	NA	NA	NA

The following results detail PIT tag release groups released above the Hills Creek, Lookout Point, and Fall Creek projects.

Hills Creek Dam

The Hills Creek Dam project area (Figure 8) is governed by Injunction Measure 8d. The injunction states that the USACE will implement regulating outlet operations daily from 6:00 PM to 10:00 PM at Hills Creek Dam when the reservoir elevation is less than or equal to 50 feet over the turbine intake (1460 feet). The anticipated duration of regulating outlet operations is December 1 through March 1.

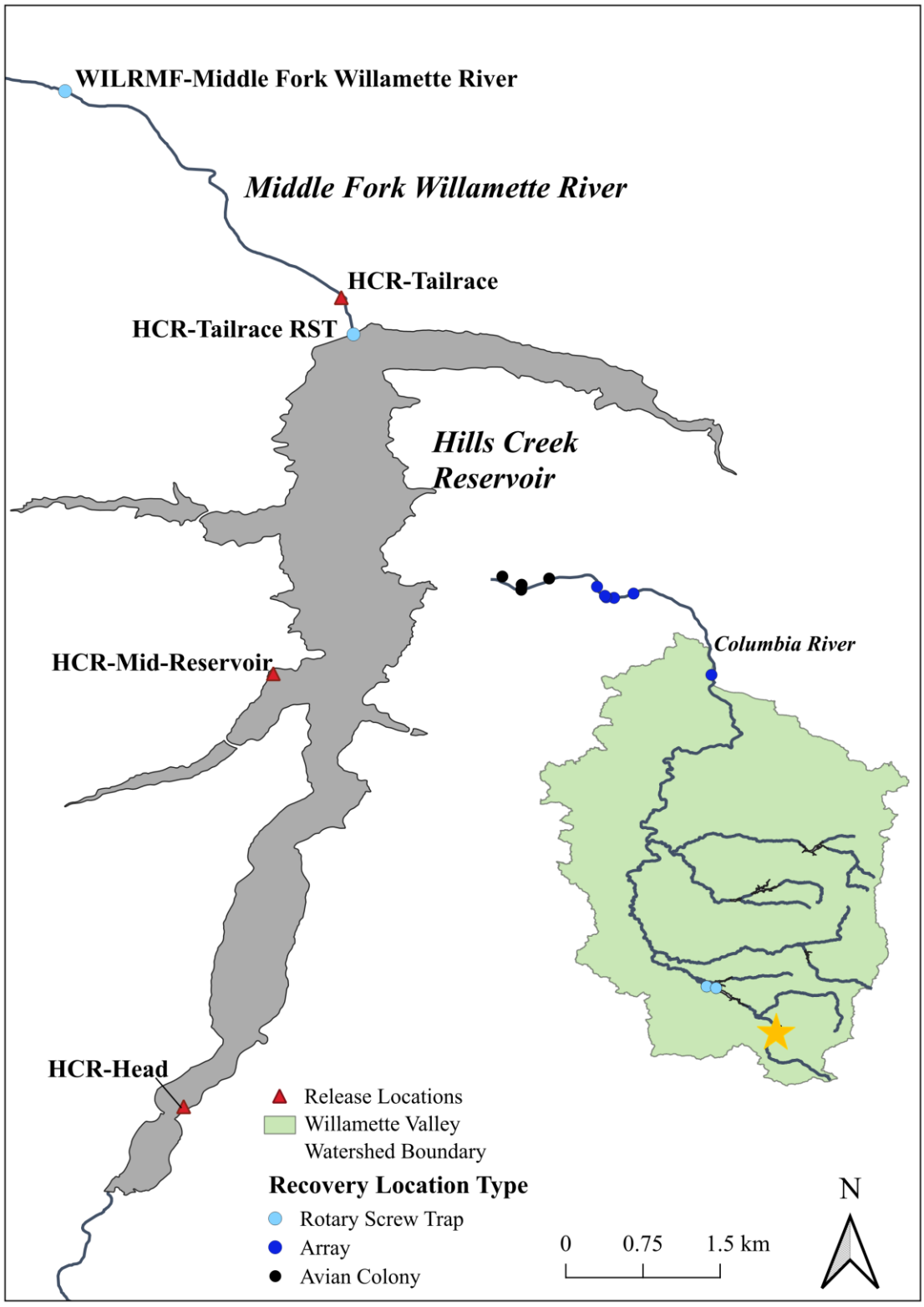

Figure 8. Map of the Hills Creek Project area release and recovery locations.

Target: Spring Fry Migration - Late Winter/Early Spring Regulating Outlet Operation

The first release in the Hills Creek project area was initially planned to align with the run-of-river fry migration, aiming to provide insights into how regulating outlet operations at Hills Creek Dam influence downstream movement patterns. However, delays in finalizing the contract resulted in a need to shift the release to later in the year. This release group ended up evaluating summer movement patterns and the effects of fall reservoir drawdown operations.

On June 5, 2023, 9,784 PIT-tagged BY2022 Chinook salmon fry were released at the head of reservoir (Table 4; Figure 3). These fish had a mean fork length of 64.7 mm and a mean weight of 2.9 g. At the time of release, the forebay elevation was approximately 1513 feet, near its annual peak. Over the following months, the elevation gradually decreased, entering a period of fall drawdown starting mid-November and lasting through the winter. This phase was punctuated by significant rain events, as outlined in Figure 9. According to the injunction plan, the USACE was to implement regulating outlet spill daily from 6:00 PM to 10:00 PM when the reservoir elevation was less than or equal to 50 feet over the turbine intakes (i.e., 1460 feet). In 2023, consistent regulating outlet spill began in mid-November when the forebay elevation was approximately 1474 feet and continued through early February 2024. Hills Creek Reservoir began refilling in mid-February and the forebay elevation reached 1530 feet by June 30, 2024 (Figure 9).

A total of 83 fish from this release group were later detected downstream, yielding an overall detection rate of 0.8%. Of those, the greatest number of detections took place in the RSTs directly below Hills Creek Dam. A total of 73 fish were captured in those traps, 45 in the powerhouse channel trap (sampling only the powerhouse channel) and 28 in the tailrace channel trap (sampling below the confluence of the tailrace channel and the regulating outlet channel; Table 6).

The mean fork lengths were 190.4 mm for fish captured in the powerhouse channel and 202.4 mm for those captured in the tailrace channel. These measurements show an increase from the estimated mean fork length at release, which was 64.7 mm, suggesting that fish were approximately 125.7 mm (for powerhouse) and 137.7 mm (for tailrace) larger at capture than at release (Table 6).

The earliest redetection took place on September 16, 2023 in the powerhouse channel RST, translating to a minimum travel time of 103 days from release. This initial detection aligned with regulating outlet operations and a forebay elevation of approximately 1475 feet (depth of RO inlet: 1408-1421.25 ft). The median travel time from release to recapture at the powerhouse and tailrace channel traps was 183 and 189 days, respectively. A large portion of detections, approximately 47%, were clustered between December 5 and December 15, 2023 (Figure 9). These dates correspond to a large increase of inflow into the project, forebay elevation increasing from 1460 feet to 1475 feet, and regulating outlet spill ramping up from an average of 100 cfs per day to 2,450 cfs per day (Figure 9). A total of 49 (67%) detections in the Hills Creek RSTs took place during active regulating outlet operations at Hills Creek Dam. In addition to the detections that took place at the powerhouse channel and tailrace channel RSTs, seven fish were detected at the Lookout Point Dam RSTs and three fish were detected at the Dexter Dam RSTs (Table 6).

Table 6. Detection summary of PIT-tagged juvenile Chinook salmon released in Hills Creek Reservoir (HCR) project area. Release locations: Head = Head of Reservoir, Mid = Mid-Reservoir, Tailrace. Observation locations: HCR PH = Hills Creek Powerhouse, HCR TR = Hills Creek Tailrace, LOP = Lookout Point, DEX = Dexter, WILRMF = Middle Fork Willamette River, PD5-8 = Columbia River Pile Dike Arrays 5-8, TWX = Columbia River Towed Array, ASMEBER = Astoria Meglar Bridge, ESANIS = East Sand Island, CRESIS = Crescent Island, COLR2 = Columbia River rkm 49-140. Headers: Count =

Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Mean Fork Length = mean fork length at release and recapture.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
HCR	6/5/2023	Head	HCR PH	RST	45	0.46	103.0	183.1	220.1	64.7	190.4
HCR	6/5/2023	Head	HCR TR	RST	28	0.29	160.1	189.1	232.1	64.7	202.4
HCR	6/5/2023	Head	LOP	RST	7	0.07	171.1	192.1	233.1	64.7	202.7
HCR	6/5/2023	Head	DEX	RST	3	0.03	181.1	182.1	191.1	64.7	191.0
HCR	11/7/2023	Head	HCR PH	RST	34	0.68	4.8	58.8	385.8	135.2	174.8
HCR	11/7/2023	Head	HCR TR	RST	41	0.82	11.8	34.8	384.8	135.2	163.4
HCR	11/7/2023	Head	LOP	RST	10	0.2	36.8	41.3	77.8	135.2	175.4
HCR	11/7/2023	Head	DEX	RST	3	0.06	26.8	27.8	74.8	135.2	170.7
HCR	11/8/2023	Mid	HCR PH	RST	48	0.96	3.9	31.9	343.8	145.3	171.3
HCR	11/8/2023	Mid	HCR TR	RST	55	1.1	9.9	31.9	314.8	145.3	168.6
HCR	11/8/2023	Mid	LOP	RST	19	0.38	14.9	36.9	92.9	145.3	180.2
HCR	11/8/2023	Mid	DEX	RST	4	0.08	30.9	75.9	93.9	145.3	186.5
HCR	11/8/2023	Mid	WILRMF	RST	1	0.02	16.9	16.9	16.9	145.3	132.0
HCR	11/8/2023	Mid	PD7	Array	1	0.02	53.1	53.1	53.1	145.3	NA
HCR	11/8/2023	Mid	ESANIS	Predation	1	0.02	NA	NA	NA	145.3	NA
HCR	11/9/2023	Tailrace	LOP	Trap Net	2	0.07	5.9	5.9	5.9	129.6	NA
HCR	11/9/2023	Tailrace	LOP	RST	9	0.3	3.9	6.9	35.9	129.6	125.2
HCR	11/9/2023	Tailrace	DEX	RST	6	0.2	9.9	11.9	24.9	129.6	135.5
HCR	11/9/2023	Tailrace	PD6	Array	1	0.03	167.3	167.3	167.3	129.6	NA
HCR	1/31/2024	Tailrace	HCR PH	RST	2	0.01	12.9	26.4	39.9	141.6	148.0
HCR	1/31/2024	Tailrace	CRESIS	Predation	1	0	NA	NA	NA	141.6	NA
HCR	1/31/2024	Tailrace	LOP	RST	15	0.06	63.9	88.9	106.9	141.6	156.1
HCR	1/31/2024	Tailrace	DEX	RST	15	0.06	3.9	41.9	95.9	141.6	149.9
HCR	1/31/2024	Tailrace	WILRMF	Trap Net	2	0.01	6.9	14.4	21.9	141.6	NA
HCR	1/31/2024	Tailrace	PD8	Array	3	0.01	83.3	85.2	117.7	141.6	NA
HCR	1/31/2024	Tailrace	TWX	Array	15	0.06	62.8	92.2	107.3	141.6	NA
HCR	1/31/2024	Tailrace	PD7	Array	7	0.03	25.8	52.1	68.1	141.6	NA
HCR	1/31/2024	Tailrace	PD6	Array	19	0.08	54.4	57.4	158.4	141.6	NA
HCR	1/31/2024	Tailrace	PD5	Array	8	0.03	68.2	76.6	120.7	141.6	NA
HCR	1/31/2024	Tailrace	ASMEBR	Predation	5	0.02	NA	NA	NA	141.6	NA
HCR	1/31/2024	Tailrace	COLR2	Predation	1	0	NA	NA	NA	141.6	NA
HCR	2/6/2024	Head	HCR PH	RST	26	0.52	3.0	4.5	84.0	153.8	162.9
HCR	2/6/2024	Head	HCR TR	RST	4	0.08	1.0	8.5	75.0	153.8	158.5
HCR	2/6/2024	Head	LOP	RST	2	0.04	74.0	87.0	100.0	153.8	173.0
HCR	2/7/2024	Mid	HCR PH	RST	24	0.48	1.1	3.1	82.0	155.9	162.6
HCR	2/7/2024	Mid	HCR TR	RST	7	0.14	3.1	3.1	84.0	155.9	166.0
HCR	2/7/2024	Tailrace	HCR TR	RST	2	0.07	-0.1	0.9	1.9	151.3	152.0
HCR	2/7/2024	Mid	LOP	RST	1	0.02	293.1	293.1	293.1	155.9	230.0
HCR	2/7/2024	Tailrace	LOP	RST	1	0.03	80.8	80.8	80.8	151.3	157.0
HCR	2/7/2024	Tailrace	DEX	RST	2	0.07	65.8	74.8	83.8	151.3	146.0

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
HCR	2/7/2024	Tailrace	TWX	Array	3	0.1	68.7	70.8	84.7	151.3	NA
HCR	2/7/2024	Tailrace	PD7	Array	1	0.03	35.6	35.6	35.6	151.3	NA
HCR	2/7/2024	Tailrace	PD6	Array	3	0.1	49.3	84.3	90.2	151.3	NA
HCR	2/7/2024	Tailrace	PD5	Array	1	0.03	91.0	91.0	91.0	151.3	NA
HCR	2/7/2024	Tailrace	ASMEBR	Predation	2	0.07	NA	NA	NA	151.3	NA

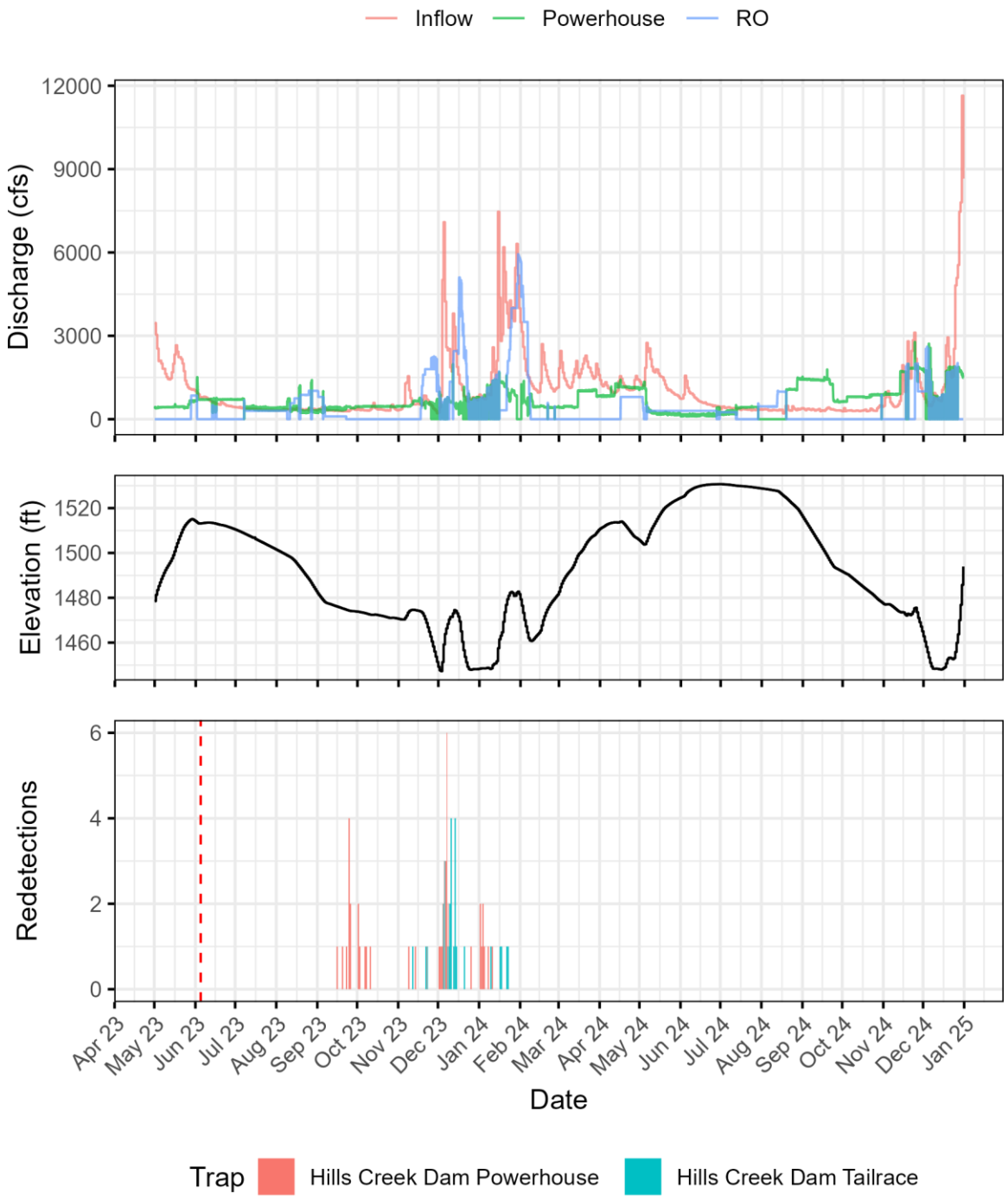

Figure 9. Hills Creek project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Hills Creek on June 5, 2023 and subsequently recaptured in the Hills Creek tailrace screw traps (bottom panel). Approximate release date is represented by the dashed vertical line.

Target: Fall Subyearling Migration - Fall/Winter Regulating Outlet Operations

The next releases of BY2022 juvenile Chinook salmon into the Hills Creek project area in 2023 targeted fall and winter regulating outlet operations at Hills Creek Dam. The regulating outlet was scheduled to operate daily from 6:00 PM to 10:00 PM when the forebay elevation was less than or equal to 50 feet over the turbine intakes. The goal of this operation measure is to provide downstream fish passage and high survival for juvenile Spring

Chinook salmon through Hills Creek reservoir and dam (Injunction 8d, ref). The releases were conducted on November 7, 8, and 9, with 5,000, 4,999, and 2,999 subyearlings released at the Head of Reservoir, Mid-Reservoir, and Tailrace, respectively (Table 4). Fish released at the Head of Reservoir had mean fork lengths and weights of 135.2 mm and 28.6 g, respectively. Those released at Mid-Reservoir had mean fork lengths of 145.3 mm and weights of 36.9 g. Fish released in the Tailrace had mean fork lengths of 129.6 mm and weights of 27.0 g. The releases coincided with a substantial increase of inflow into the reservoir (inflow increased from 508 cfs on November 4 to 1546 cfs on November 7), an average forebay elevation of 1473 feet, and all discharge being directed through the powerhouse (Figure 10).

A total of 235 fish from the Head of Reservoir and Mid-Reservoir release groups were later detected at locations below Hills Creek Dam, resulting in an overall redetection rate of 2.4%. The majority of these detections occurred in two RSTs operating directly below Hills Creek Dam (n = 178). Of these, 82 were detected in the powerhouse channel RST (recapture rate: 0.81%) and 96 were detected in the tailrace channel (recapture rate: 0.96%).

Depending on the release location (head of reservoir vs. mid-reservoir), the mean fork lengths at detection ranged from 171.3 mm to 174.8 mm for fish detected in the powerhouse channel, and from 163.4 mm to 168.6 mm for those in the tailrace channel. These measurements indicate an increase from the estimated mean fork length at release, ranging from 23.3 to 39.6 mm (Table 6).

The first detection at the Hills Creek Tailrace RST occurred on November 12, when the forebay elevation was approximately 1,475 feet, with all discharge still routed through the powerhouse. By January 23, 2024, the majority of recaptures had occurred (n = 162). During this period, the forebay elevation ranged between 1,447 and 1,481 feet, averaging 1,463 feet. This corresponded to an average depth to the turbine and regulating outlets of 61.6 and 42.3 feet, respectively. Discharge was consistently routed through both the powerhouse (daily mean = 651 cfs) and the regulating outlet (daily mean = 1066 cfs) during the period of time when the majority of recaptures occurred. A total of 153 fish were detected in the Hills Creek tailrace and powerhouse channel RSTs during regulating outlet operations, representing 87% of the total number of recaptures in those two traps (Table 6). Mean and median travel times from release to detection were shorter for fish released at Mid-Reservoir than for those released at the Head of Reservoir. Travel time was also shorter for fish detected in the tailrace trap (which samples both the regulating outlet and powerhouse channels) compared to those detected in the powerhouse trap (which samples the powerhouse channel only). Notably, 13 fish were detected in the Hills Creek RSTs between September 17, 2024 and November 27, 2024. This indicates that some individuals from this release group migrated past Hills Creek the next fall as two-year smolts, having maximum travel times from release to detection below Hills Creek Dam of up to 386 days.

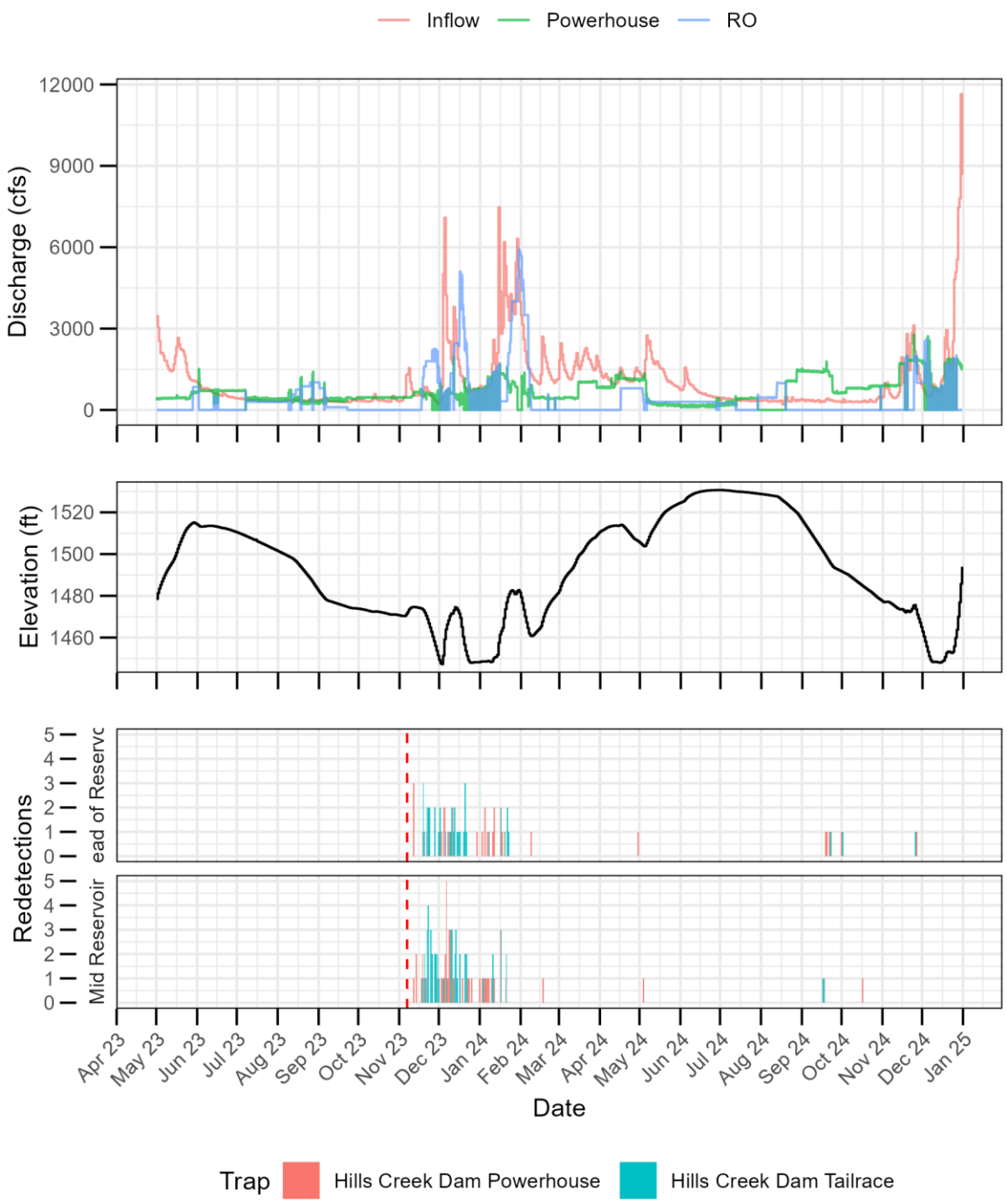

Figure 10. Hills Creek project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the Hills Creek Head of Reservoir and Hills Creek Mid-Reservoir on November 7, 2023 and November 8, 2023. Subsequent recaptures in the Hills Creek tailrace screw traps are depicted in the bottom panel. Approximate release date is represented by the dashed vertical line.

In addition to the fish recaptured directly below Hills Creek Dam, a total of 57 fish from the Head of Reservoir and Mid-Reservoir release groups were subsequently detected downstream. There were 29 detections at the Lookout Point Dam RSTs, seven at the Dexter Dam RSTs, and a single detection each at the Middle Fork

Willamette RST (Lookout Point head of reservoir), the Columbia River Pile Dike Array 7 (at river kilometer 70), and the East Sand Island (Columbia River) avian colony (Table 6).

Target: Spring Yearling Migration - Late Phase Regulating Outlet Operation

The final releases of BY2022 Middle Fork Willamette stock juvenile Chinook salmon above Hills Creek Dam occurred on February 6 and 7, 2024, at the head of the reservoir and mid-reservoir, respectively. These releases were designed to assess the impact of Hills Creek Dam operations on yearling juvenile Chinook salmon, with a specific focus on evaluating the effects of late-phase winter regulating outlet operation. The release timing coincided with a forebay elevation of approximately 1,463 feet and occurred at the conclusion of a significant increase in both reservoir inflow and regulating outlet discharge (Figure 11). Following the release of the head of reservoir group, the regulating outlet operated for only five days (February 6, 7, 8, 21, and 26) before consistent regulating operations resumed on April 16, 2024.

The head of reservoir release consisted of 4,963 yearling Chinook salmon, with a mean fork length of 153.8 mm and a mean weight of 40.9 g. The mid-reservoir release included 5,000 yearlings, with a mean fork length of 155.9 mm and a mean weight of 41.7 g (Table 4). A total of 64 fish from these release groups were later detected downstream, resulting in an overall detection rate of 0.6% (Table 6). The majority of detections (61 fish) occurred in the RSTs operating directly below Hills Creek Dam.

From the head of reservoir release group, 32 individuals were detected, resulting in a detection rate of 0.6%. Of these, 26 were detected in the powerhouse channel rotary screw trap (RST), four in the tailrace channel RST, and two in the Lookout Point Dam RSTs. Similarly, the mid-reservoir release group yielded 32 detections, also corresponding to a detection rate of 0.6%. As with the head of reservoir group, the majority of detections from the mid-reservoir release were observed in the powerhouse channel RST, where 24 individuals were detected.

Depending on the release location (head of reservoir vs. mid-reservoir), the mean fork lengths at detection ranged from 162.6 mm to 162.9 mm for fish captured in the powerhouse channel, and from 158.5 mm to 166.0 mm for those in the tailrace channel. These measurements indicate an increase from the estimated mean fork length at release, ranging from 4.7 to 10.1 mm (Table 6).

Individuals from the mid-reservoir release group exhibited faster travel times compared to those from the head of reservoir release group. The mean and median travel times to the powerhouse channel RST were 6.7 and 3.1 days, respectively, for the mid-reservoir group, compared to 10.4 and 4.5 days for the head of reservoir group (Table 6). Similarly, travel times to the tailrace channel RST were shorter for the mid-reservoir group, with a mean of 15.9 days and a median of 3.1 days, compared to a mean of 23.3 days and a median of 8.5 days for the head of reservoir group. The majority of fish from these release groups that were subsequently detected were observed within 12 days of release (n = 56; 87.5%), regardless of release location (Figure 11). During this initial 12-day period, only three fish were detected when the regulating outlet was operational suggesting that the fish from this release group were able to pass in relatively large numbers through the powerhouse. Beyond the 12-day period, five fish were detected in RSTs directly below Hills Creek Dam, four of which were detected during periods when the regulating outlet was active.

Additionally, one fish from the mid-reservoir release group was detected on November 26, 2024, in the Lookout Point RSTs. This detection provides more evidence that a small proportion of these fish are migrating as two-year smolts, a rare but known juvenile life history for Willamette spring Chinook salmon (Shroeder et al. 2016, EAS 2024a, EAS 2024b, EAS 2024c).

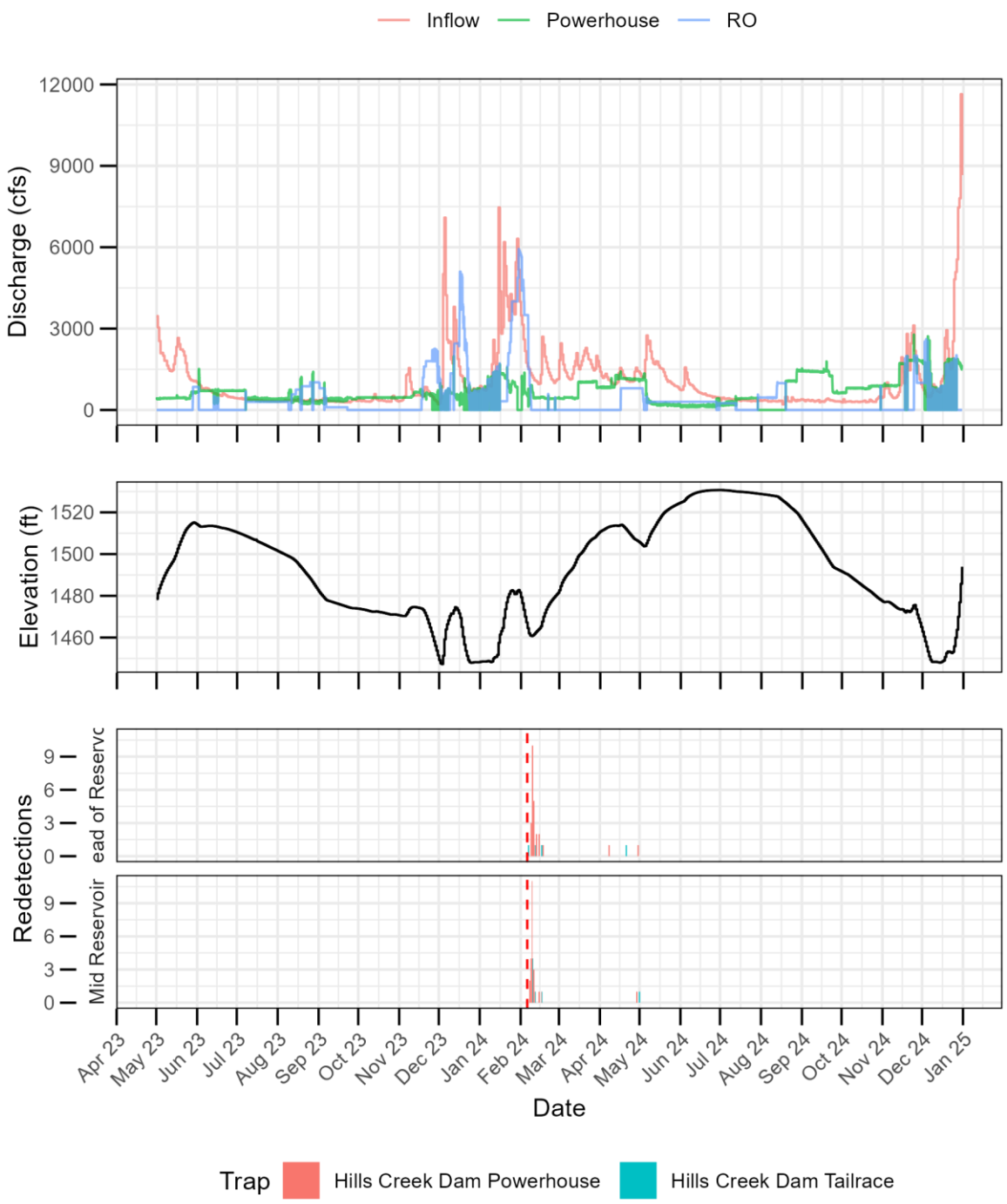

Figure 11. Hills Creek project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the Hills Creek Head of Reservoir and Hills Creek Mid-Reservoir on February 6, 2024 and February 7, 2024. Subsequent recaptures in the Hills Creek tailrace screw traps are depicted in the bottom panel. Approximate release date is represented by the dashed vertical line.

Summary – Hills Creek

The Hills Creek Dam project area is governed by Injunction Measure 8d. The injunction states that the USACE will implement regulating outlet operations daily from 6:00 PM to 10:00 PM at Hills Creek Dam when the reservoir elevation is less than or equal to 50 feet over the turbine intake (1460 feet).

The June 5, 2023 release of 9,784 PIT-tagged fry resulted in a 0.8% detection rate (83 fish), with median travel times of 183–189 days to downstream traps. Of the detections in the Hills Creek dam RSTs 47% were clustered during December 5–15, 2023, coinciding with increased regulating outlet discharge and reservoir drawdown to 1,460 ft. In total, 67% of the detections at the RSTs took place during active regulating outlet operations suggesting that the majority of the fish in this release group passed Hills Creek when the regulating outlet was active.

The November 7–9, 2023 releases (12,998 subyearlings) had a 2.4% overall detection rate (235 fish) and shorter median travel times (31.9–58.8 days), with 87% of detections occurring during active regulating outlet operations. The majority of detections coincided with a mean forebay elevation of 1,463 feet. Fish released at mid-reservoir exhibited faster migration (median 31.9 days) than head-of-reservoir counterparts (58.8 days).

The February 6–7, 2024 yearling releases (9,963 fish) yielded a 0.6% detection rate (64 fish), with 87.5% of detections occurring within 12 days of release. In contrast with the previous release groups, 89% of the detections from this group in the Hills Creek RSTs took place when the regulating outlet was inactive. Mid-reservoir releases again showed faster migration (median 3.1 days vs. 4.5 days for head releases). The majority of fish that were detected passed the dam within 12 days of release during a period of primarily powerhouse operations when forebay elevations averaged approximately 1,461 feet, suggesting that fish were able to move quickly through the project area during the winter even in the absence of regulating outlet spill.

There were a total of 14 fish across all releases above Hills Creek Dam that demonstrated two-year smolt migration patterns with detections up to 386 days post-release.

Lookout Point and Dexter Dams

Operations at Lookout Point Dam (Figure 12) are governed by two key Injunction Measures. Injunction Measure 16 requires a deep drawdown of Lookout Point Reservoir, targeting an elevation of 750 feet by November 15. This drawdown operation begins after the spring surface spill operation ends, typically in June or July, with a slow drawdown rate of 1 foot per day when practicable. The reservoir is held at or near 750 feet until December 15, unless refill is required for flood control. Once the reservoir drops below minimum power pool (El. 819 ft), regulating outlets (ROs) are used for temperature management and fish passage. Injunction Measure 17 mandates spring surface spill operations, which involve refilling the reservoir starting February 1, implementing 30 days of ungated spill once elevation 890 feet is reached, followed by nighttime spill and daytime power generation until the reservoir drops below spillway crest. These measures aim to improve downstream passage and survival for juvenile spring Chinook salmon while balancing other operational constraints and considerations.

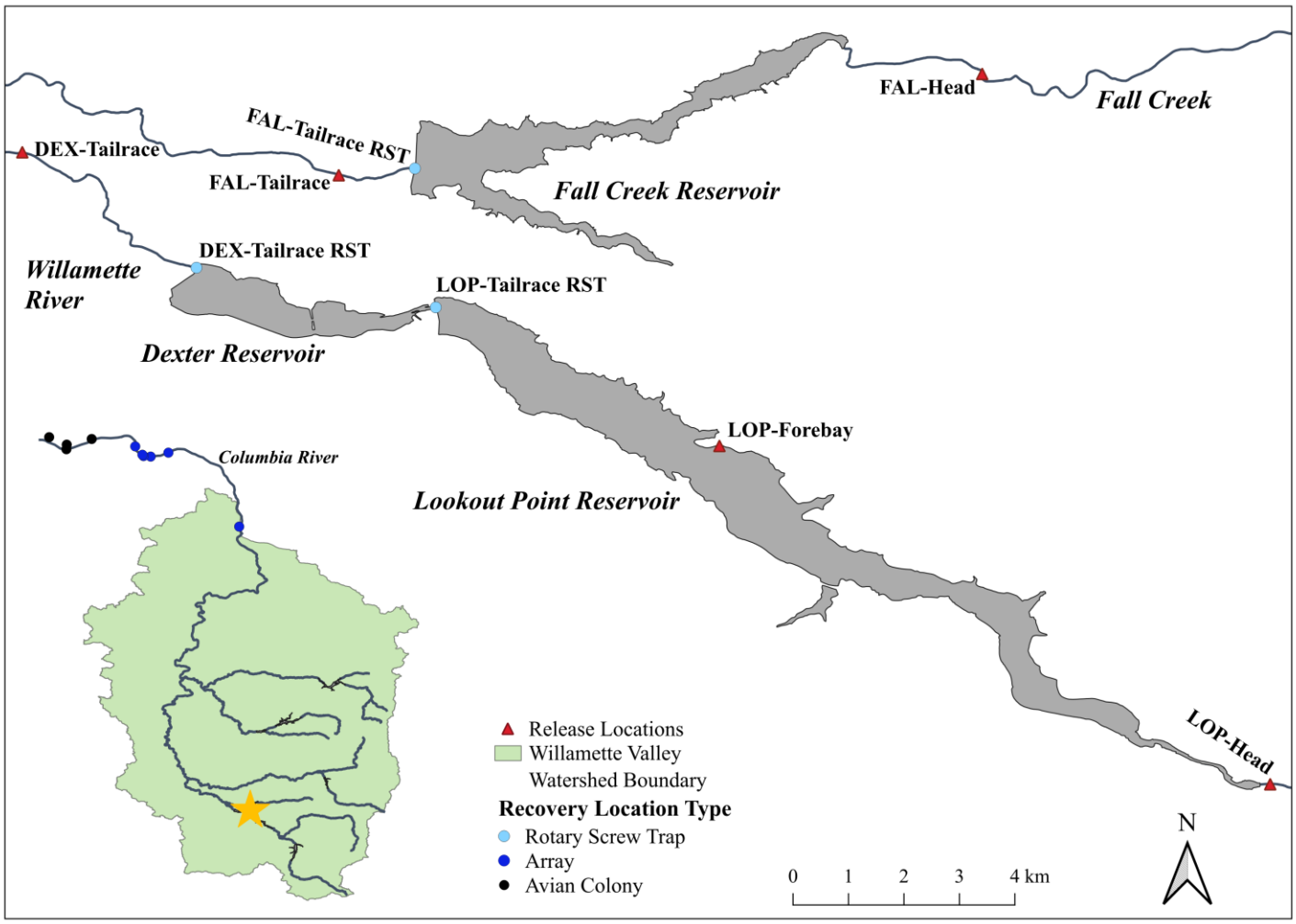

Figure 12. Map of release and recovery locations within the Lookout Point Project and Fall Creek Project areas.

Target: Spring Fry Migration - Spring Spill Operations

The Lookout Point project received its first release of PIT-tagged juvenile Chinook salmon on May 30, 2023, when 9,647 BY2022 fry were liberated at the head of Lookout Point Reservoir (Table 4; Figure 2). This release was intended to coincide with the run-of-river fry migration and inform how spring surface spill operations at Lookout Point Dam influence downstream movement patterns. However, due to contract finalization delays, this release group ended up being targeted towards evaluating summer movement patterns and fall reservoir drawdown operations.

This release occurred when the forebay elevation was approximately 890 feet, before the start of deep drawdown dam operations in early June. The reservoir level was consistently lowered until early November, reaching a deep drawdown target of around 750 feet, as shown in Figure 10. The reservoir stayed at this level until early December, when heavy rainfall caused a rapid rise in inflow, increasing the reservoir levels. During the study period, dam flows initially came from the powerhouse, then shifted to regulating outlets by mid-September, continuing until December 20, when flows returned to the powerhouse. Redetections of fish from this release group were extremely rare. Out of the 9,647 fry released, only two were redetected downstream. One was caught in an Oneida net within Lookout Point Reservoir 82.1 days post-release, and another was captured in the Dexter Tailrace screw trap 36 days post-release (Table 7).

Table 7. Detection summary of PIT-tagged juvenile Chinook salmon released in the Lookout Point Reservoir (LOP) project area. Release locations: Head = Head of Reservoir, Mid = Mid-Reservoir, Tailrace. Observation locations: ASMEBER = Astoria Meglar Bridge, COLR1 = Columbia River rkm 0 – 49, COLR2 = Columbia River rkm 49-140, DEX = Dexter, ESANIS = East Sand Island, LOP = Lookout Point, PD5-8 = Columbia River Pile Dike Arrays 5-8, RICEIS = Rice Island, TWX = Columbia River Towed Array, WILRMF = Middle Fork Willamette River. Headers: Count = Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Travel Rate = Minimum, median, and maximum travel rate in km/day.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
LOP	5/30/2023	Head	LOP	Trap Net	1	0.01	27.9	27.9	27.9	63.1	NA
LOP	5/30/2023	Head	DEX	RST	1	0.01	82.0	82.0	82.0	63.1	171.0
LOP	9/18/2023	Forebay	LOP	Trap Net	1	0.02	30.8	30.8	30.8	128.3	NA
LOP	9/18/2023	Forebay	LOP	RST	1	0.02	86.8	86.8	86.8	128.3	129.0
LOP	9/18/2023	Head	LOP	Trap Net	3	0.06	2.0	2.1	35.0	122.9	NA
LOP	9/18/2023	Head	LOP	RST	1	0.02	88.2	88.2	88.2	122.9	136.0
LOP	9/18/2023	Forebay	DEX	RST	5	0.1	9.8	33.8	61.8	128.3	170.6
LOP	9/18/2023	Head	DEX	RST	1	0.02	43.1	43.1	43.1	122.9	189.0
LOP	9/18/2023	Head	PD7	Array	1	0.02	35.3	35.3	35.3	122.9	NA
LOP	1/3/2024	Head	LOP	RST	33	0.71	2.8	20.8	21.8	143.3	147.5
LOP	1/3/2024	Head	DEX	RST	8	0.17	3.8	21.8	118.8	143.3	145.5
LOP	1/3/2024	Head	PD8	Array	1	0.02	132.4	132.4	132.4	143.3	NA
LOP	1/3/2024	Head	PD7	Array	3	0.06	29.4	41.9	50.4	143.3	NA
LOP	1/3/2024	Head	PD6	Array	6	0.13	84.4	85.8	94.0	143.3	NA
LOP	1/3/2024	Head	PD5	Array	1	0.02	106.9	106.9	106.9	143.3	NA
LOP	1/3/2024	Head	ASMEBR	Predation	1	0.02	NA	NA	NA	143.3	NA
LOP	1/3/2024	Head	COLR2	Predation	1	0.02	NA	NA	NA	143.3	NA
LOP	1/4/2024	Head	LOP	RST	32	0.66	2.8	19.8	115.8	143.3	148.9
LOP	1/4/2024	Head	DEX	RST	11	0.23	5.8	19.8	72.8	143.3	148.1
LOP	1/4/2024	Head	PD7	Array	1	0.02	55.6	55.6	55.6	143.3	NA
LOP	1/4/2024	Head	PD6	Array	1	0.02	92.9	92.9	92.9	143.3	NA
LOP	1/4/2024	Head	PD5	Array	3	0.06	96.5	110.1	112.2	143.3	NA
LOP	1/8/2024	Head	LOP	RST	26	0.69	13.9	15.9	23.9	143.3	133.7
LOP	1/8/2024	Head	DEX	RST	5	0.13	8.9	15.9	29.9	143.3	154.8
LOP	1/8/2024	Head	PD8	Array	1	0.03	105.1	105.1	105.1	143.3	NA
LOP	1/8/2024	Head	TWX	Array	1	0.03	100.8	100.8	100.8	143.3	NA
LOP	1/8/2024	Head	PD7	Array	2	0.05	44.8	50.8	56.9	143.3	NA
LOP	1/8/2024	Head	PD6	Array	5	0.13	77.3	108.1	119.5	143.3	NA
LOP	1/9/2024	Head	LOP	RST	35	0.68	12.8	14.8	85.8	143.3	136.5
LOP	1/9/2024	Head	DEX	RST	10	0.2	4.8	16.3	75.8	143.3	157.5
LOP	1/9/2024	Head	PD7	Array	3	0.06	49.8	69.4	70.9	143.3	NA
LOP	1/9/2024	Head	PD6	Array	4	0.08	78.2	78.6	80.3	143.3	NA
LOP	1/9/2024	Head	ASMEBR	Predation	4	0.08	NA	NA	NA	143.3	NA
LOP	1/9/2024	Head	COLR1	Predation	1	0.02	NA	NA	NA	143.3	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
LOP	1/25/2024	Head	LOP	RST	10	0.13	6.0	7.0	108.0	143.6	142.4
LOP	1/25/2024	Head	DEX	RST	10	0.13	8.0	35.5	57.0	143.6	147.5
LOP	1/25/2024	Head	TWX	Array	3	0.04	74.0	103.9	104.4	143.6	NA
LOP	1/25/2024	Head	PD7	Array	1	0.01	42.0	42.0	42.0	143.6	NA
LOP	1/25/2024	Head	PD6	Array	10	0.13	60.5	63.1	169.0	143.6	NA
LOP	1/25/2024	Head	PD5	Array	2	0.03	75.7	82.5	89.4	143.6	NA
LOP	1/25/2024	Head	ASMEBR	Predation	3	0.04	NA	NA	NA	143.6	NA
LOP	1/25/2024	Head	COLR2	Predation	1	0.01	NA	NA	NA	143.6	NA
LOP	2/28/2024	Forebay	LOP	RST	12	0.24	11.8	60.3	61.8	144.2	153.8
LOP	2/28/2024	Head	LOP	RST	9	0.18	36.0	61.0	90.0	141.5	166.8
LOP	2/28/2024	Head	DEX	RST	4	0.08	45.0	48.5	88.0	141.5	148.8
LOP	2/28/2024	Forebay	PD8	Array	3	0.06	56.1	65.9	72.5	144.2	NA
LOP	2/28/2024	Head	PD8	Array	3	0.06	61.2	63.5	71.4	141.5	NA
LOP	2/28/2024	Forebay	TWX	Array	6	0.12	49.7	64.6	71.2	144.2	NA
LOP	2/28/2024	Head	TWX	Array	8	0.16	34.9	64.4	76.5	141.5	NA
LOP	2/28/2024	Forebay	PD7	Array	1	0.02	36.9	36.9	36.9	144.2	NA
LOP	2/28/2024	Forebay	PD6	Array	6	0.12	29.5	55.3	99.5	144.2	NA
LOP	2/28/2024	Head	PD6	Array	3	0.06	47.0	71.3	73.5	141.5	NA
LOP	2/28/2024	Forebay	PD5	Array	6	0.12	49.6	56.1	161.4	144.2	NA
LOP	2/28/2024	Head	PD5	Array	4	0.08	43.9	63.8	71.4	141.5	NA
LOP	2/28/2024	Forebay	ASMEBR	Predation	2	0.04	NA	NA	NA	144.2	NA
LOP	2/28/2024	Head	ASMEBR	Predation	2	0.04	NA	NA	NA	141.5	NA
LOP	2/28/2024	Forebay	ESANIS	Predation	1	0.02	NA	NA	NA	144.2	NA
LOP	2/28/2024	Head	ESANIS	Predation	1	0.02	NA	NA	NA	141.5	NA
LOP	2/28/2024	Forebay	COLR1	Predation	1	0.02	NA	NA	NA	144.2	NA
LOP	2/29/2024	Tailrace	TWX	Array	2	0.1	41.0	41.5	42.0	149.7	NA
LOP	2/29/2024	Tailrace	PD7	Array	2	0.1	10.6	20.9	31.2	149.7	NA
LOP	2/29/2024	Tailrace	PD6	Array	8	0.4	28.4	33.7	41.5	149.7	NA
LOP	2/29/2024	Tailrace	PD5	Array	1	0.05	52.7	52.7	52.7	149.7	NA
LOP	2/29/2024	Tailrace	ASMEBR	Predation	1	0.05	NA	NA	NA	149.7	NA
LOP	4/9/2024	Head	LOP	RST	9	0.18	18.9	21.0	49.0	150.9	158.1
LOP	4/9/2024	Head	PD8	Array	3	0.06	21.6	26.8	47.6	150.9	NA
LOP	4/9/2024	Head	TWX	Array	12	0.24	23.4	27.6	54.4	150.9	NA
LOP	4/9/2024	Head	PD6	Array	4	0.08	15.5	22.0	60.3	150.9	NA
LOP	4/9/2024	Head	PD5	Array	2	0.04	29.3	31.9	34.5	150.9	NA
LOP	4/9/2024	Head	RICEIS	Predation	1	0.02	NA	NA	NA	150.9	NA
LOP	4/9/2024	Head	ESANIS	Predation	3	0.06	NA	NA	NA	150.9	NA
LOP	4/10/2024	Forebay	LOP	RST	7	0.28	4.0	20.0	43.0	150.7	152.0
LOP	4/10/2024	Forebay	DEX	RST	3	0.12	8.0	10.0	10.0	150.7	170.3
LOP	4/10/2024	Forebay	WILRMF	Trap Net	1	0.04	7.0	7.0	7.0	150.7	NA
LOP	4/10/2024	Forebay	PD8	Array	3	0.12	35.8	43.9	48.8	150.7	NA
LOP	4/10/2024	Forebay	TWX	Array	6	0.24	26.4	36.9	43.6	150.7	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
LOP	4/10/2024	Forebay	PD6	Array	1	0.04	43.9	43.9	43.9	150.7	NA
LOP	4/10/2024	Forebay	PD5	Array	2	0.08	12.8	21.3	29.8	150.7	NA
LOP	4/10/2024	Forebay	RICEIS	Predation	1	0.04	NA	NA	NA	150.7	NA
LOP	4/10/2024	Forebay	ESANIS	Predation	1	0.04	NA	NA	NA	150.7	NA
LOP	4/11/2024	Forebay	LOP	RST	15	0.6	15.0	31.0	42.0	150.7	165.1
LOP	4/11/2024	Forebay	DEX	RST	1	0.04	25.0	25.0	25.0	150.7	150.0
LOP	4/11/2024	Forebay	PD8	Array	1	0.04	30.7	30.7	30.7	150.7	NA
LOP	4/11/2024	Tailrace	PD8	Array	3	0.15	11.6	15.6	20.3	149.0	NA
LOP	4/11/2024	Forebay	TWX	Array	10	0.4	12.0	21.9	35.5	150.7	NA
LOP	4/11/2024	Tailrace	TWX	Array	3	0.15	10.6	19.2	19.6	149.0	NA
LOP	4/11/2024	Forebay	PD6	Array	1	0.04	37.6	37.6	37.6	150.7	NA
LOP	4/11/2024	Forebay	PD5	Array	1	0.04	30.0	30.0	30.0	150.7	NA
LOP	4/11/2024	Tailrace	PD5	Array	2	0.1	10.5	12.4	14.3	149.0	NA
LOP	4/11/2024	Tailrace	ASMEBR	Predation	3	0.15	NA	NA	NA	149.0	NA
LOP	4/11/2024	Forebay	ESANIS	Predation	1	0.04	NA	NA	NA	150.7	NA
LOP	4/11/2024	Tailrace	COLR1	Predation	1	0.05	NA	NA	NA	149.0	NA
LOP	4/11/2024	Tailrace	COLR1	Predation	1	0.05	NA	NA	NA	3.04	3.04

Target: Fall Subyearling Migration - Fall Deep Drawdown Operations

The next set of PIT tagged juvenile Chinook salmon releases above Lookout Point Dam were intended to target the fall deep drawdown of Lookout Point Reservoir. Injunction Measure 16 states that the USACE shall conduct an annual Lookout Point Reservoir deep drawdown operation from November 15 through December 15 to improve downstream fish passage. The drawdown should begin around June 15 and reach a target elevation of 750 feet (+/- 3 feet) by no later than November 15. The target elevation is to be maintained until December 15 unless delayed by flood risk management. Beginning on December 16, the reservoir will start to refill to the minimum flood control pool elevation of 825 feet. The target elevation of 750 feet (+/- 3 feet) was reached on November 1, 2024.

These releases occurred on September 18, 2023, with 4,998 BY2022 subyearlings released at the head of the reservoir and 5,002 released at the forebay (Table 4). The mean fork length and weight of fish released at head of reservoir (123 mm, 23.8 g) was slightly less than that the fork length and weight of the fish released into the forebay (128 mm, 25.1 g).

A total of 10 fish from these releases were later detected downstream of Lookout Point Dam (Table 7), resulting in an overall detection rate of 0.1%. A single fish from each release site was later detected in the Lookout Point Tailrace RSTs, with travel times of 88 and 86 days, respectively. At Dexter Tailrace, one fish from the head of the reservoir group was detected after 43 days, while five from the forebay group had a mean travel time of 36.0 days. Additionally, the PD7 array in the Columbia River at river kilometer 70 detected a single fish from the head of the reservoir release 35.4 days post-release. In-reservoir research gillnets captured three fish from the head of the reservoir release and one from the forebay group, with mean travel times of 13.1 and 30.7 days.

Target: Spring Yearling Migration - Spring Spill Operations

Between January 3 and January 25, 2024, a series of releases occurred at Lookout Point Reservoir to utilize surplus study fish (Table 4). The purpose of these releases was twofold: to disperse the fish throughout Lookout Point Reservoir to aid in the Reservoir Distribution study and to evaluate how spring spill operations affect the movement patterns of yearling juvenile Chinook salmon. Spring surface spill operations at Lookout Point Dam are initiated as early as possible in March, with a mandate for continuous spill (24/7) for at least 30 days. Following this initial block, spill transitions to nighttime operations with daytime generation, continuing as long as water availability and downstream conditions permit. In 2024, there were continuous spill phases implemented from January 31 to February 11th and from March 15 to April 15, 2024, after which nighttime spill operations commenced on April 16, 2024, and lasted until June 27, 2024.

A total of 25,983 PIT tagged BY2022 yearling Chinook salmon were released in five groups at the head of Lookout Point Reservoir during January 2024. Groups of fish were released on January 3 (n = 4,634), January 4 (n = 4,828), January 8 (n = 3,789), January 9 (n = 5,115), and January 25, 2024 (n = 7,617; Table 4). A total of 239 fish from these releases were later detected downstream of Lookout Point Dam, resulting in an overall detection rate of 0.9% (Table 7).

Of those, 136 were detected in the Lookout Point Dam RSTs (Table 7). The highest proportion of detections coincided with a large increase in flow through the powerhouse during winter 2024 which appeared to be in response to a large inflow event at Lookout Point Reservoir (Figure 13). The increase in flow through the powerhouse began on January 23, 2024 ramping up from approximately 4,590 cfs to approximately 8,110 cfs. Of the 126 fish that were recaptured from the January 3 – January 9 release groups, 90 (70%) were recaptured on January 23 and January 24. The January 3 – January 9 release groups had average detection rates ranging from 0.66 – 0.71 percent at the Lookout Point tailrace while the January 25 release group had a detection rate of 0.13 percent (n = 10). Although this release group was intended to evaluate spring spill operations, the majority of fish movement occurred during periods of high discharge through the powerhouse, not during surface spill operations. Overall, 120 fish (88%) from these release groups were captured at a time when all flow through Lookout Point Dam was being directed through the powerhouse, while just 16 were captured during spill operations.

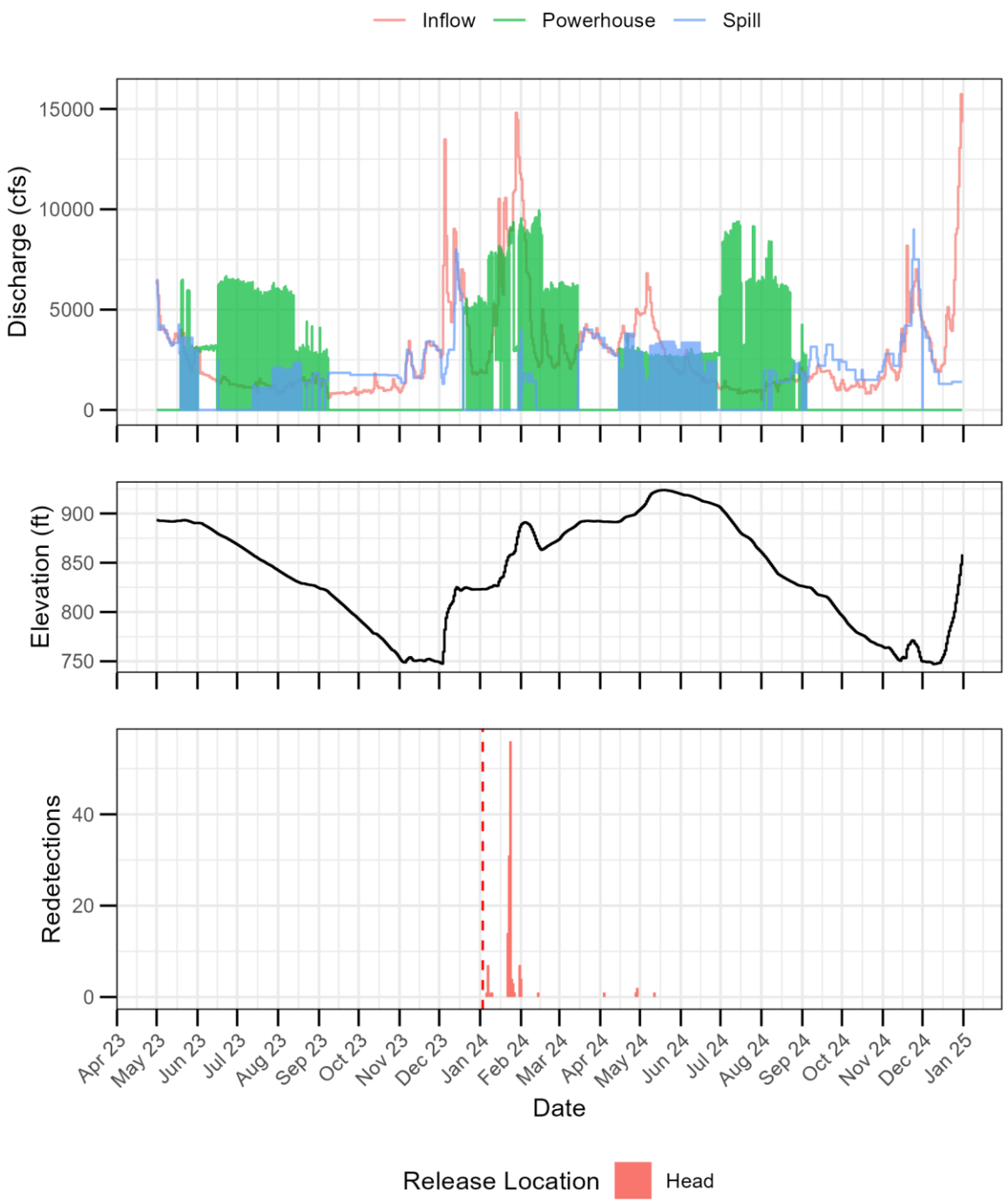

Figure 13. Lookout Point project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the Lookout Point head of reservoir on January 3, 4, 8, 9, and 25, 2024. Subsequent recaptures in the Lookout Point Dam tailrace screw traps are depicted in the bottom panel. Approximate release date is represented by the dashed vertical line.

On February 28, 2024, two groups of yearling juvenile Chinook salmon were released to further assess the impact of spring spill operations on their movement patterns within the reservoir (Table 4). One group, consisting of 4,994 yearlings, was released at the head of the reservoir (mean fork length = 141.5 mm; mean weight = 34.2 g), while another group of 4,988 yearlings was released at Signal Point in the forebay (mean fork length = 144.2 mm;

mean weight = 35.9 g). Spring spill operations, as described previously with the surplus release groups, began on March 15, 2024 and ended on June 27, 2024.

A total of 72 fish from these releases were later detected downstream of Lookout Point Dam, yielding an overall detection rate of 0.72% (Table 7). Of these, 21 were detected in the Lookout Point Dam tailrace RSTs, with 12 originating from the forebay release and 9 from the head of reservoir release. Notably, all but one of these detections coincided with active spill operations at Lookout Point Dam (Figure 14). The earliest detection from the forebay release group was on March 11, 2024, resulting in a minimum travel time of 11.8 days, while the first detection from the head of reservoir group was on April 4, 2024, with a travel time of 36 days. Despite these differences in initial detections, the median travel times from release to recapture in those RSTs were nearly identical for both groups, at 60.9 days for the head of reservoir release and 60.3 days for the forebay release. The final detections were recorded on April 30, 2024, for the forebay release group (travel time of 61.7 days) and on May 28, 2024, for the head of reservoir group (90 days). The mean fork length at detection was 166.8 mm for fish from the head of the reservoir release and 153.8 mm for those from the forebay release (Table 7). These measurements were 25.3 mm and 9.6 mm larger, respectively, than the mean fork lengths at release.

The mean fork length at detection was 166.8 mm for fish from the head of the reservoir release and 153.8 mm for those from the forebay release (Table 7). These measurements were 25.3 mm and 9.6 mm larger, respectively, than the mean fork lengths at release.

In contrast to the January release groups, where the majority of fish movement occurred during periods of high powerhouse discharge rather than spill operations, the February 28 release groups showed a strong association with active spill conditions. While only 16 of 136 fish from the January releases were detected during spill operations, 20 of the 21 detections from the February 28 releases occurred during spill, highlighting a clear difference in movement patterns between the two release groups. This suggests that spill operations may have played a more significant role in facilitating downstream movement for the February 28 release groups compared to the earlier releases.

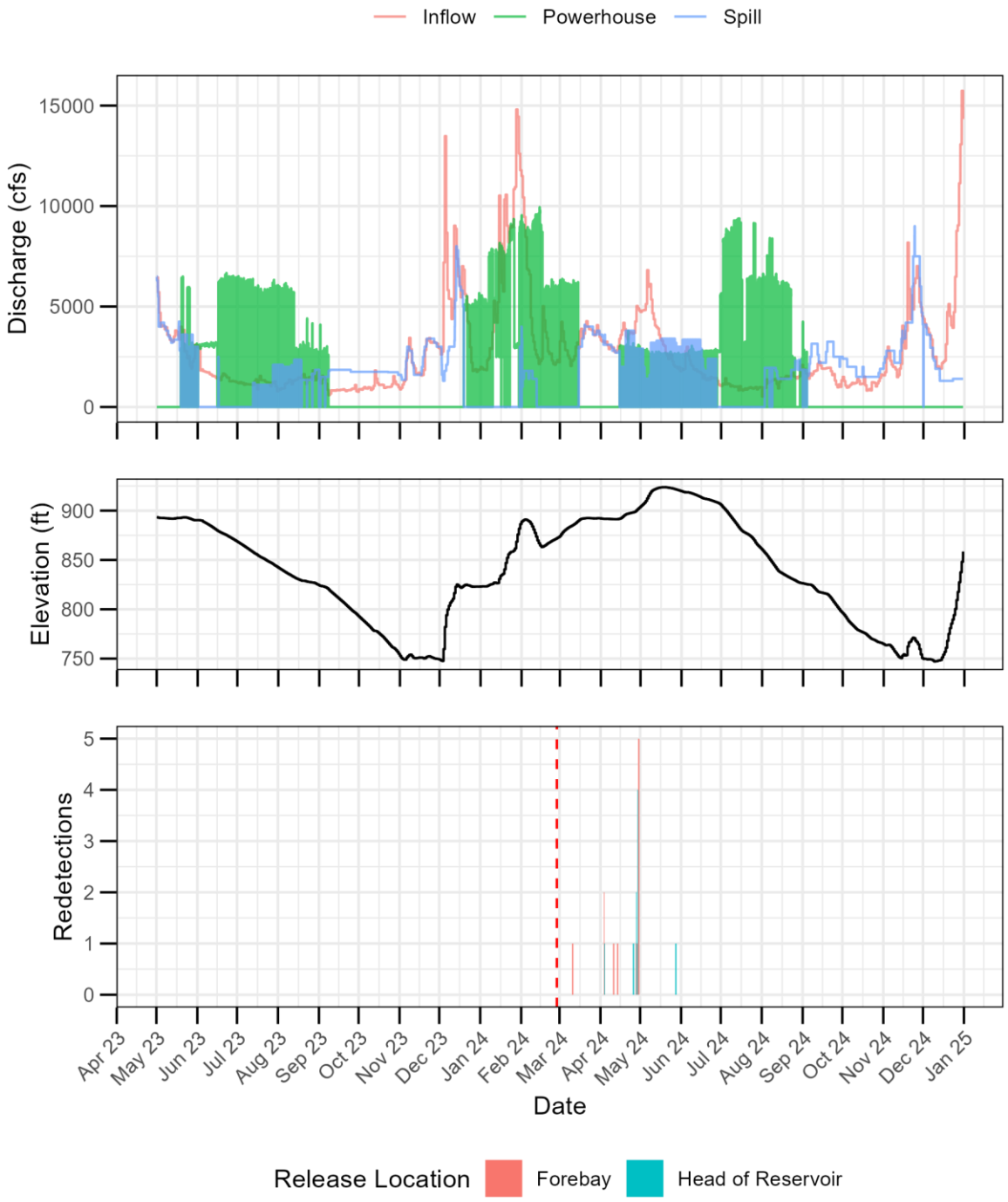

Figure 14. Lookout Point project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head and forebay of Lookout Point on February 28, 2024 and subsequently recaptured in the Lookout Point tailrace screw traps (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date of first release group is represented by the dashed vertical line.

The final release of brood year 2022 yearlings above Lookout Point Dam took place on April 9 (n = 4,988 at the head of the reservoir), April 10 (n = 2,500 at the forebay), and April 11, 2024 (n = 2,500 at the forebay), near the conclusion of the 30-day spill block before the transition to nighttime spill operations. These fish had a mean fork length of 150.7 mm and a mean weight of 39.7 g (Table 4).

A total of 89 fish from these releases were later detected downstream of Lookout Point Dam, yielding an overall detection rate of 0.8%. Of these, 31 were detected directly below Lookout Point Dam in RSTs, with all captures occurring during spill operations (Figure 15). The median travel times from release to recapture in the Lookout Point RSTs varied from 20.0 to 30.1 days, contingent on the release location and date (Table 7).

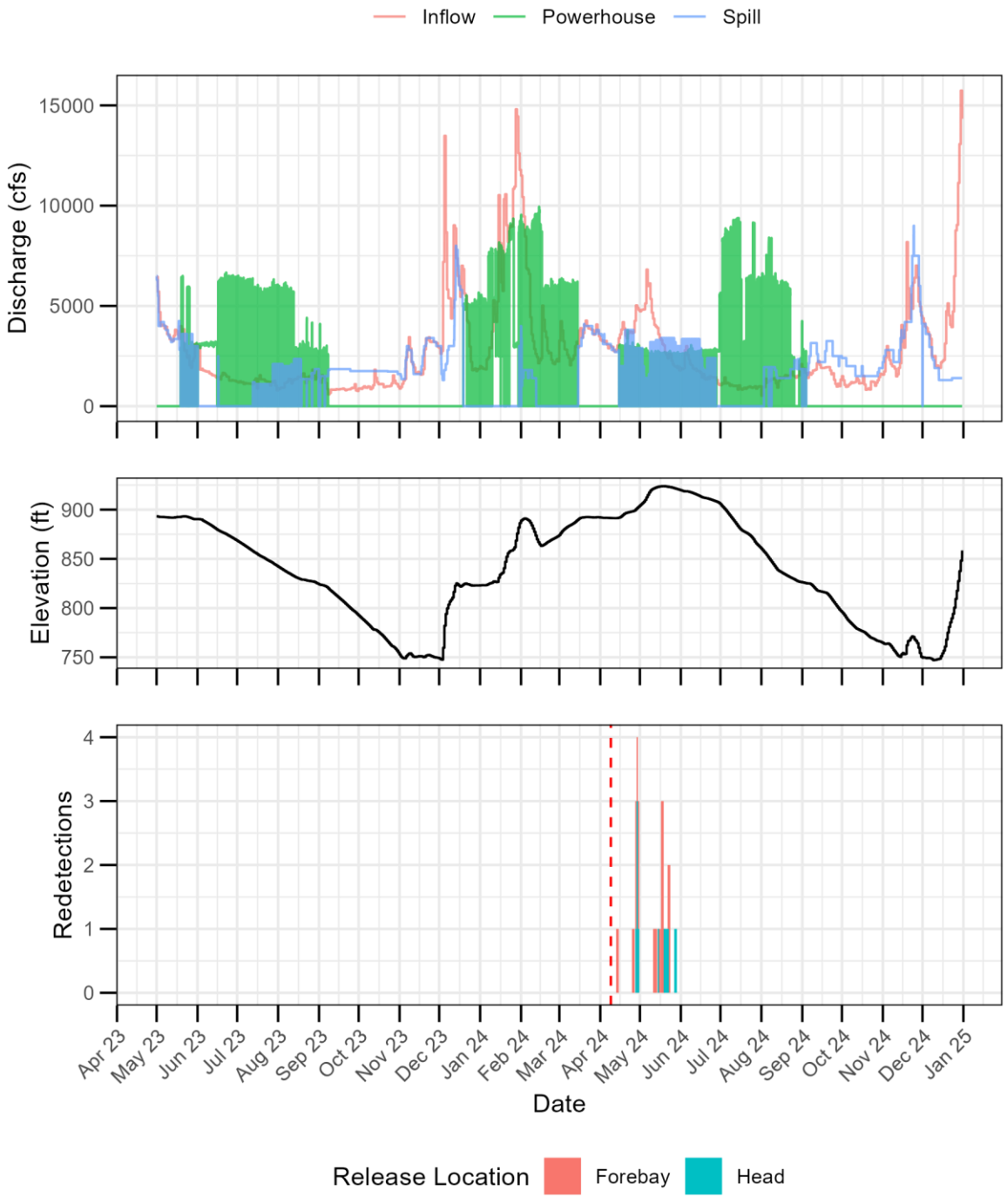

Figure 15. Lookout Point project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head and forebay of Lookout Point on April 9, 2024 and subsequently recaptured in the Lookout Point tailrace screw traps (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date of first release group is represented by the dashed vertical line.

Summary – Lookout Point

Operations at Lookout Point Dam are governed by two key Injunction Measures aimed at enhancing juvenile salmon migration. Injunction Measure 16 mandates a deep drawdown of Lookout Point Reservoir, targeting an elevation of 750 feet by November 15, beginning after the spring spill operation ends, typically in June or July, and maintaining this level until December 15 unless refill is needed for flood control. Injunction Measure 17 requires spring spill operations, starting as early as possible in March with a continuous spill (24/7) for at least 30 days, followed by nighttime spill and daytime power generation until the reservoir drops below the spillway crest. These measures aim to improve downstream passage and survival for juvenile spring Chinook salmon, balancing operational constraints.

Describing movement patterns and passage timing based on detections of PIT-tagged juvenile Chinook salmon at Lookout Point Dam is challenging due to the very low number of detections. For example, the spring fry release on May 30, 2023, resulted in an extremely low detection rate, with only 2 out of 9,647 tagged fry detected downstream. Similarly, the fall subyearling release on September 18, 2023, designed to evaluate the fall deep drawdown, yielded only 10 downstream detections, with just one individual detected in the rotary screw traps (RSTs) below Lookout Point Dam.

The combined releases of yearlings from January 3 to January 25, 2024 achieved the highest detection rate of 0.9% with the greatest proportion of detections (88%) in the RSTs directly below Lookout Point Dam taking place when all flow was being directed through the powerhouse.

The February 28, 2024, release of yearlings had a detection rate of 0.72%. Detections from that release showed an association with spill operations where 20 out of 21 detections occurred during active spill. Finally, releases from April 9 to April 11, 2024, near the end of the 30-day continuous spill block, had a detection rate of 0.8%, and all captures in the Lookout Point rotary screw traps (RSTs) occurred during spill operations.

It's important to note that the capture efficiency of rotary screw traps below Lookout Point Dam is extremely low, often around 0.1 percent. This low efficiency complicates the assessment of the effectiveness of the injunction measures. The sparse data collected from these traps means that results must be interpreted with caution; these low detection rates do not accurately reflect the true movement or passage rates.

Fall Creek Dam

Operations at Fall Creek Dam (Figure 12) are governed by two key Injunction Measures. Injunction Measure 19 requires that the reservoir be drawn down to streambed elevation (680 - 685 feet) by December 1, maintaining this level until January 15. Following this, refilling to an elevation of 700 feet begins, which must be maintained until the initiation of spring passage operations as per Injunction Measure 20. This measure stipulates that the forebay elevation should be held at 700 feet until March 15, with exceptions made for flood control or sediment management needs. Refill, following the rule curve, will begin on March 16. It is crucial to acknowledge that the operation of the tailrace screw trap is frequently disrupted during the fall drawdown, especially when the reservoir is at streambed elevation, due to sediment accumulation. Notable interruptions in screw trap operations during this study period occurred from July 15 to October 1, 2023 (no sampling due to low juvenile salmonid passage based on previous studies), October 16 to 17, 2023 (due to debris), and from December 1, 2023, to January 12, 2024 (due to excessive sediment).

Target: Spring Fry Migration - Spring Dam Operations

The first release of PIT-tagged juvenile Chinook salmon into the Fall Creek Dam project area was initially intended to assess the spring dam operations as dictated by Injunction Measure 20. However, due to delays in contract finalization, this release was postponed and ultimately served to evaluate summer movement patterns of fry/parr as well as summer/fall dam operations at Fall Creek Dam. The release occurred on June 12, 2023, involving 9,649 fry released at the head of the reservoir (Table 4; Figure 2). On the release day, the forebay elevation stood at approximately 750 feet above mean sea level. The fish released had a mean length of 67 millimeters and a mean weight of 3 grams.

Subsequent detection data from the June 12, 2023, release showed that 14 fish were detected downstream of Fall Creek dam, representing an overall detection rate of 0.1% (Table 8). All detections occurred in the Fall Creek Dam tailrace RST. The fish detected in the Fall Creek Dam RST had a mean fork length of 153.8 mm, which was 86.4 mm larger than their mean fork length at release. The median travel time from release to detection was 128.8 days. The earliest detection occurred on October 18, 2023, which corresponds to a minimum travel time of 127.9 days post-release. This coincided with the start of the first fall drawdown on October 16, which caused a sharp increase in outflow from the dam, rising from around 61 cfs to over 2,400 cfs by October 18 (Figure 16). This rapid increase in outflow led to a significant drop in reservoir level, from approximately 741 feet to around 691 feet, with the drawdown concluding by October 22. Notably, 12 of the 14 fish were detected between October 18 and October 21, suggesting a potential link between the drawdown operations and increased fish passage through Fall Creek Dam. It's also worth noting from previous studies that juvenile salmonid passage tends to be low under dam operations from July 15 to October 1, influencing both the rate and timing of recaptures.

Table 8. Detection summary of PIT-tagged juvenile Chinook salmon released in the Fall Creek (FCA) project area. Release locations: Head = Head of Reservoir, Tailrace. Observation locations: ASMEBER = Astoria Meglar Bridge, COLR2 = Columbia River rkm 49-140, PD5-8 = Columbia River Pile Dike Arrays 5-8, RICEIS = Rice Island, TTOWER = Transmission Towers near Troutdale, OR, TWX = Columbia River Towed Array. Headers: Count = Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Travel Rate = Minimum, median, and maximum travel rate in km/day.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
FCA	6/12/2023	Head	FCA	RST	14	0.15	127.8	128.8	236.9	67.4	153.8
FCA	9/28/2023	Head	FCA	RST	142	2.84	19.8	20.8	44.9	133.5	145.6
FCA	9/28/2023	Head	PD7	Array	2	0.04	28.3	28.9	29.4	133.5	NA
FCA	9/28/2023	Head	PD5	Array	1	0.02	197.7	197.7	197.7	133.5	NA
FCA	9/28/2023	Head	ASMEBR	Predation	1	0.02	NA	NA	NA	133.5	NA
FCA	11/6/2023	Head	DEX	RST	1	0.02	7.9	7.9	7.9	139.4	138.0
FCA	11/6/2023	Head	FCA	RST	280	5.6	0.9	1.9	102.9	139.4	138.7
FCA	11/6/2023	Head	PD7	Array	2	0.04	33.9	92.4	150.9	139.4	NA
FCA	11/6/2023	Tailrace	PD7	Array	1	0.1	152.4	152.4	152.4	134.9	NA
FCA	11/6/2023	Head	PD5	Array	1	0.02	157.2	157.2	157.2	139.4	NA
FCA	11/6/2023	Head	RICEIS	Predation	1	0.02	NA	NA	NA	139.4	NA
FCA	2/20/2024	Head	FCA	RST	210	4.21	1.0	2.0	18.9	148.4	140.7
FCA	2/20/2024	Head	TWX	Array	3	0.06	45.0	51.9	57.8	148.4	NA
FCA	2/20/2024	Head	PD7	Array	7	0.14	9.0	33.6	129.2	148.4	NA
FCA	2/20/2024	Tailrace	PD7	Array	3	0.3	18.7	28.6	44.9	150.5	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
FCA	2/20/2024	Head	PD6	Array	12	0.24	38.4	43.2	52.4	148.4	NA
FCA	2/20/2024	Tailrace	PD6	Array	3	0.3	45.4	53.2	63.3	150.5	NA
FCA	2/20/2024	Head	PD5	Array	4	0.08	52.3	56.6	116.6	148.4	NA
FCA	2/20/2024	Head	ASMEBR	Predation	2	0.04	NA	NA	NA	148.4	NA
FCA	2/20/2024	Tailrace	ASMEBR	Predation	1	0.1	NA	NA	NA	150.5	NA
FCA	2/20/2024	Head	COLR2	Predation	2	0.04	NA	NA	NA	148.4	NA
FCA	4/2/2024	Head	FCA	RST	26	1.04	187.0	220.0	224.0	146.0	248.6
FCA	4/2/2024	Head	PD7	Array	1	0.04	230.2	230.2	230.2	146.0	NA
FCA	4/2/2024	Head	PD6	Array	1	0.04	227.9	227.9	227.9	146.0	NA
FCA	4/3/2024	Head	FCA	RST	38	1.52	185.0	220.1	224.1	154.6	246.7
FCA	4/3/2024	Tailrace	TTOWER	Predation	1	0.1	NA	NA	NA	159.5	NA
FCA	4/3/2024	Head	PD7	Array	1	0.04	217.4	217.4	217.4	154.6	NA
FCA	4/3/2024	Tailrace	PD7	Array	3	0.3	9.3	14.1	101.7	159.5	NA
FCA	4/3/2024	Head	PD6	Array	1	0.04	215.5	215.5	215.5	154.6	NA
FCA	4/3/2024	Tailrace	PD6	Array	2	0.2	13.9	14.2	14.6	159.5	NA
FCA	4/3/2024	Tailrace	PD5	Array	3	0.3	12.5	15.3	17.0	159.5	NA
FCA	4/3/2024	Tailrace	ASMEBR	Predation	2	0.2	NA	NA	NA	159.5	NA

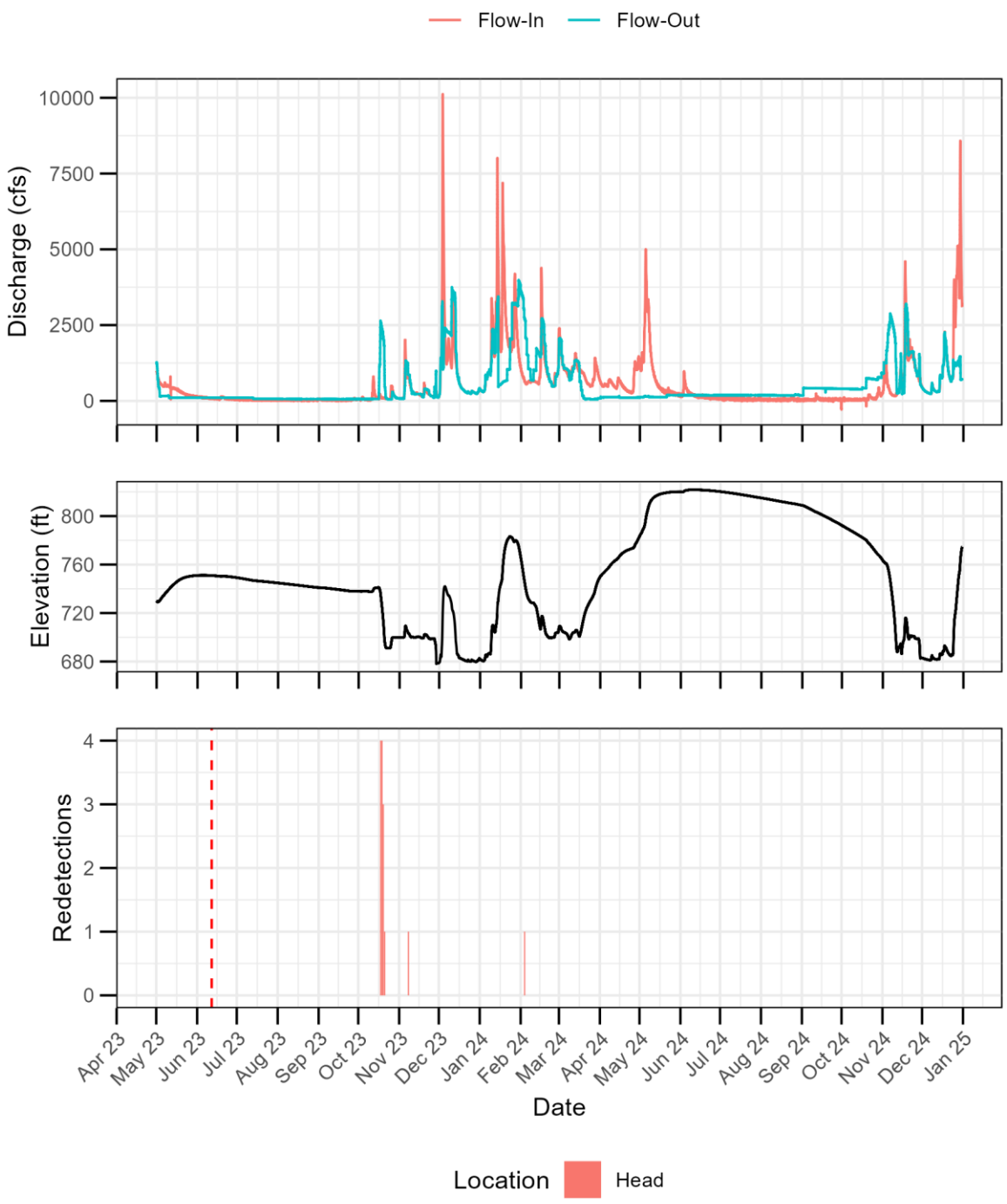

Figure 16. Fall Creek inflow and outflow (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Fall Creek on July 12, 2023 and subsequently recaptured in the Fall Creek tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date of first release group is represented by the dashed vertical line.

Target: Fall Subyearling Migration - Early Fall Deep Drawdown

The next PIT-tag releases above Fall Creek Dam occurred in the fall to assess subyearling juvenile Chinook salmon movement patterns and the initial phase of the fall deep drawdown of Fall Creek Reservoir. On September 28, 2023, 5,006 subyearlings were released at the head of Fall Creek Reservoir. These fish had a mean length of 134 millimeters and a mean weight of 29.4 grams, with the forebay elevation at release being approximately 738 feet. The deep drawdown began on October 17, 2024.

A total of 146 fish from this release were subsequently detected downstream of Fall Creek Dam, resulting in an overall capture rate of 2.9%. Most of these detections occurred in the Fall Creek tailrace RST, totaling 142 fish. The first detection was on October 18, aligning with the start of the first fall drawdown event. The median travel time for these fish was 20.9 days. Notably, 112 fish, representing 77% of the total detected, were recorded during the rapid reservoir drawdown from October 18 to 20, reinforcing the observation that fish tend to exit the reservoir during these operations (Figure 17). Additionally, there was a notable increase in detections on November 5 and 6, which coincided with spikes in reservoir inflow on November 4 and 5 (Figure 14). This release group showed both a faster travel time and a higher capture rate compared to the June 12, 2023, release of fry (Table 8).

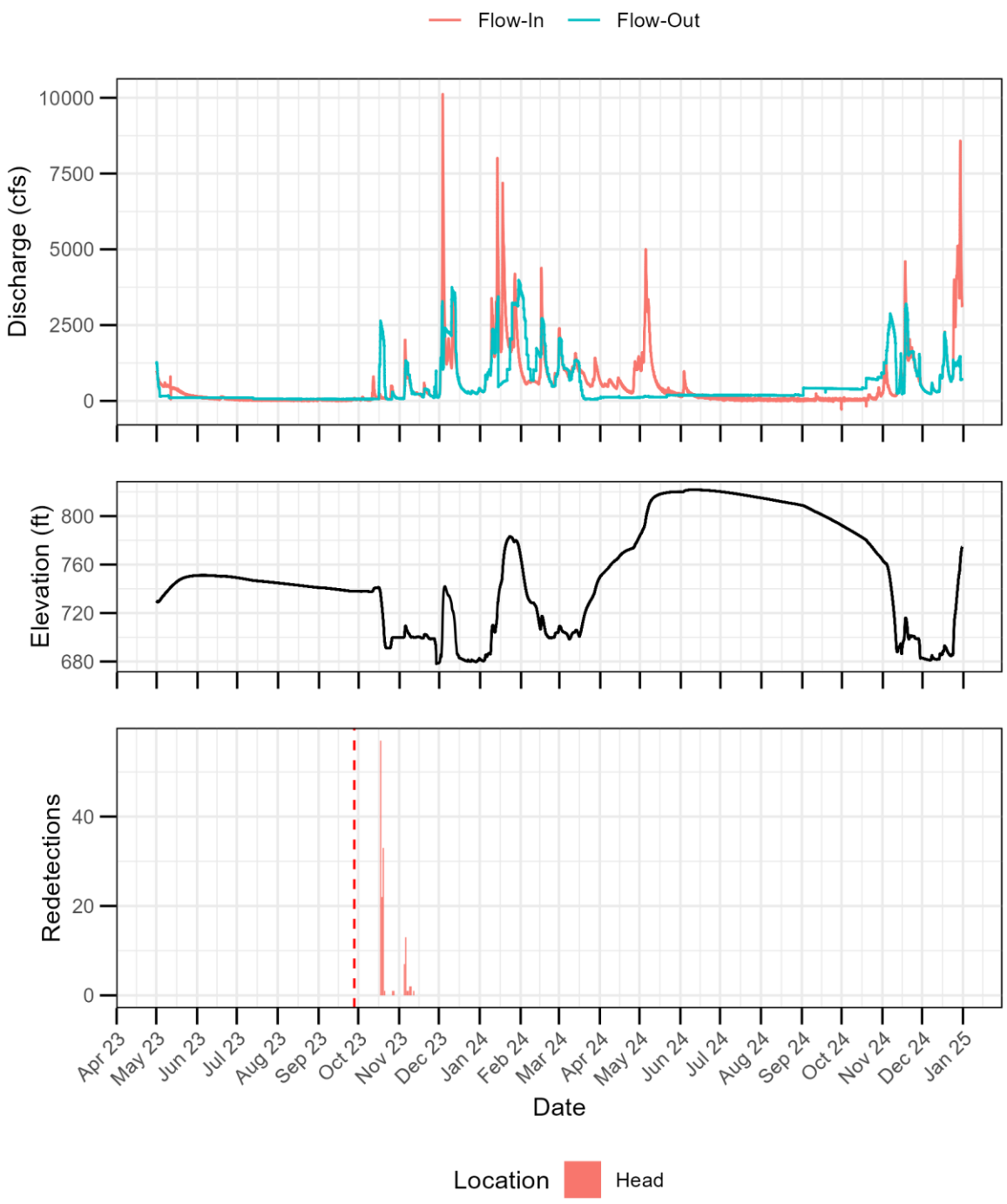

Figure 17. Fall Creek inflow and outflow (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Fall Creek on September 28, 2023 and subsequently recaptured in the Fall Creek tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date of first release group is represented by the dashed vertical line.

Target: Fall Subyearling Migration - Mid Deep Drawdown

The final group of PIT-tagged fish released above Fall Creek Dam in 2023 aimed to evaluate the movement patterns of subyearling Chinook salmon during the mid-phase of the deep drawdown operations at Fall Creek Dam. The release took place on November 6, with the introduction of 4,999 PIT-tagged BY2022 subyearling

Chinook salmon into the head of Fall Creek Reservoir. These fish had average fork lengths of 137 millimeters and average weights of 31.1 grams.

A total of 286 fish from this release were subsequently detected downstream of Fall Creek Dam, resulting in an overall capture rate of 5.7%. The largest number of detections from this release group were observed at the Fall Creek tailrace RST (n = 280; capture rate: 5.6%). This group of fish had much shorter travel times from release to the tailrace RST compared to the previous release groups, with a median travel time of 1.9 days. This group exhibited rapid movement through the Fall Creek project. Almost all of the recaptured fish navigated through Fall Creek Dam within four days of their release (n = 276) indicating that these fish exited the reservoir prior to it reaching streambed elevation (680 feet). Average forebay elevation across those four days was 702 feet. Several factors may have contributed to the rapid movement of these fish. Firstly, the reservoir elevation was at fall drawdown levels, providing a more direct route for the fish to follow and easier access to passage routes once they reached the dam face. Additionally, an increase of inflow coincided with this release, potentially providing a stronger current that expedited their downstream migration (Figure 18).

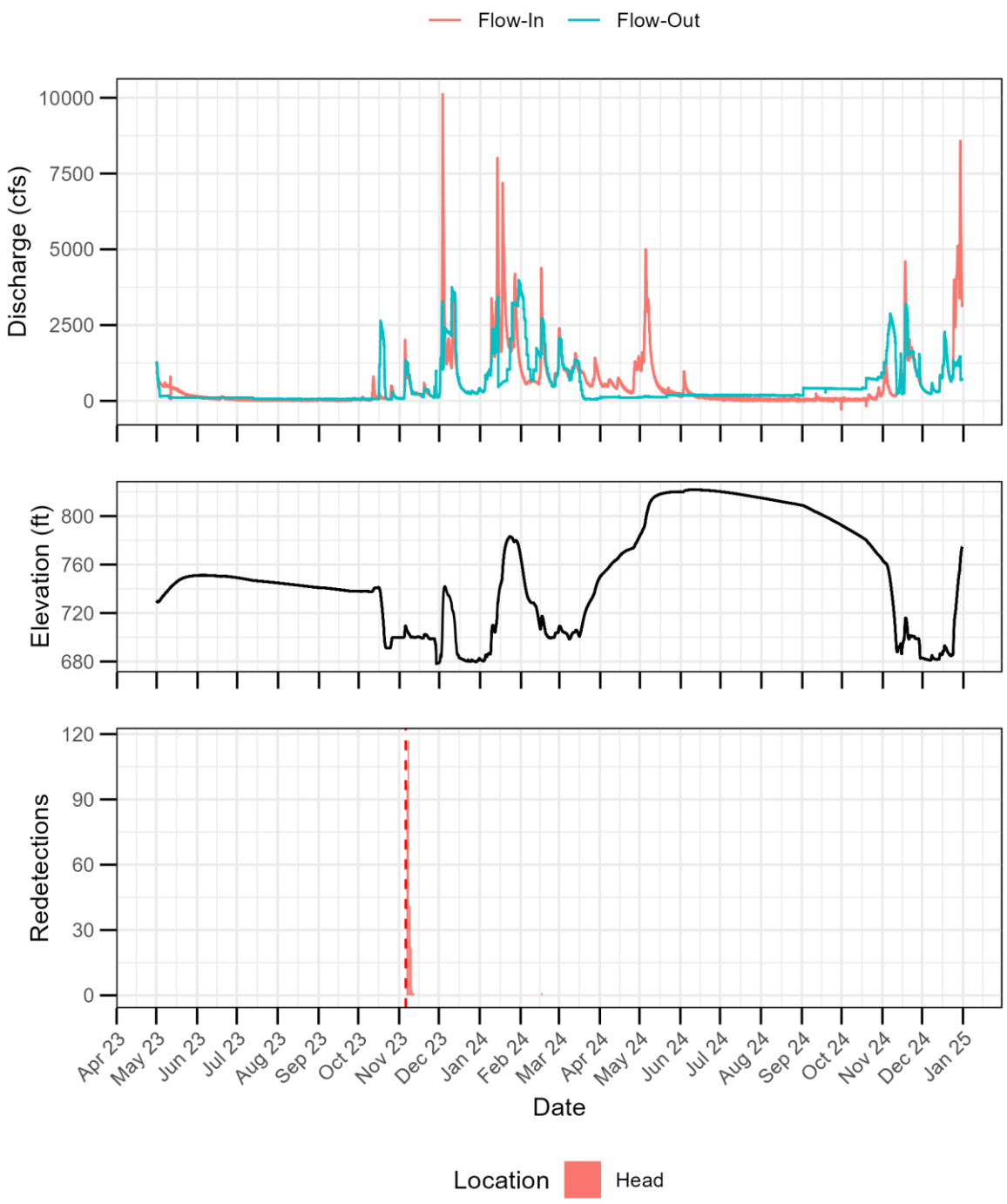

Figure 18. Fall Creek inflow and outflow (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Fall Creek on November 6, 2023 and subsequently recaptured in the Fall Creek tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date of first release group is represented by the dashed vertical line.

Target: Spring Yearling Migration - Spring Dam Operations

The first release of PIT-tagged juvenile Chinook salmon into the Fall Creek project area in 2024 took place on February 20, targeting pre-refill conditions at Fall Creek Reservoir. A total of 4,993 yearlings were released at the head of the reservoir (mean FL = 148.4 mm; mean weight = 38.9 g).

A total of 247 fish from this release group were subsequently detected downstream of Fall Creek Dam, resulting in an overall detection rate of 4.9%. Similar to the November release of subyearlings, this group migrated through the Fall Creek project area rapidly, with a median travel time of 2.0 days (Table 8; Figure 17). Released while the reservoir was at a drawdown elevation of approximately 700 feet, 211 fish from this group were captured in the tailrace RST, yielding a recapture rate of 4.2%. Of these, 210 were recaptured within six days of release when the Fall Creek reservoir maintained a mean elevation of 700 feet (20 feet above streambed elevation). These outcomes further support the observation that fish move quickly through the project when the reservoir is in a drawdown state, even if it hasn't reached full streambed elevation.

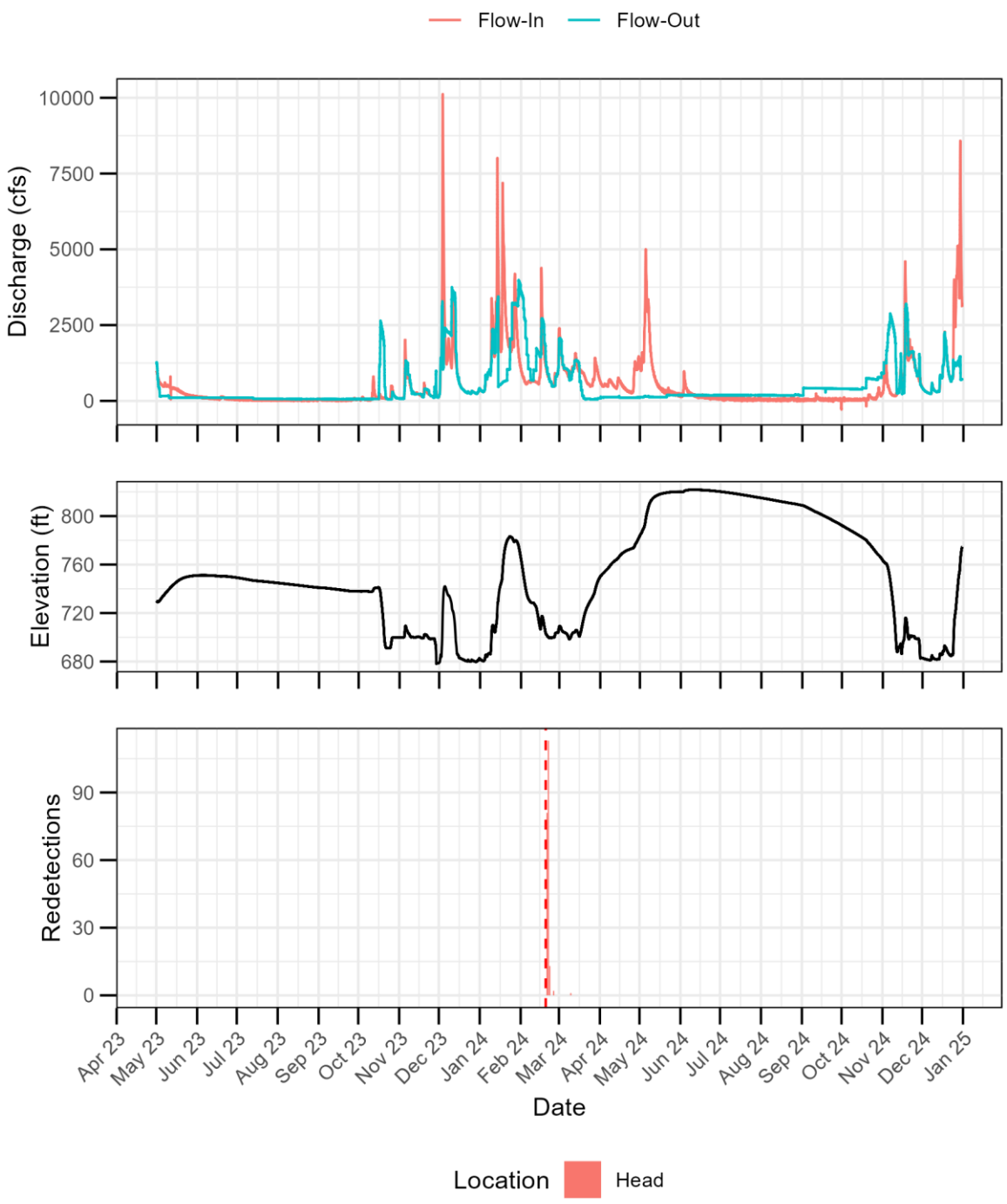

Figure 19. Fall Creek inflow and outflow (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Fall Creek on February 20, 2024 and subsequently recaptured in the Fall Creek tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release is represented by the dashed vertical line.

Target: Spring Yearling Migration - Post-Spring Refill Operations

This release group was intended to assess spring yearling movement patterns during post-refill reservoir conditions. Originally scheduled to occur after the spring refill was completed, it was moved up due to limited rearing space at the Willamette Hatchery. On April 2, 2,500 yearlings were released at the head of the reservoir (mean FL = 146 mm; mean weight = 37.1 g), followed by another 2,497 yearlings the next day (mean FL = 154.6 mm; mean weight = 43.2 g). At the time of release, the reservoir was mid-refill, with a forebay elevation of 752 feet and an outflow of 118 cfs. Unfortunately, the outflow was insufficient to operate the screw trap in the tailrace (the screw trap requires approximately 350 cfs to reliable spin the cone at this location) from the time of release until September 1, 2024, confounding the ability to evaluate fish passage during that time period.

A total of 68 fish from this release group were subsequently detected downstream of Fall Creek Dam, resulting in an overall detection rate of 1.4%. The majority of these, 64 fish, were captured in the Fall Creek Dam tailrace RST. The earliest capture occurred on October 5, 2024, 185 days post-release when the forebay elevation was approximately 790 feet. The captured fish from this release group had a median travel time of 220 days from release to the tailrace RST. The final detection in the tailrace was on November 13, 2024, indicating that all captured fish were caught during fall drawdown operations. Forebay elevation during that time period ranged from 690 – 790 feet with a mean of 760 feet.

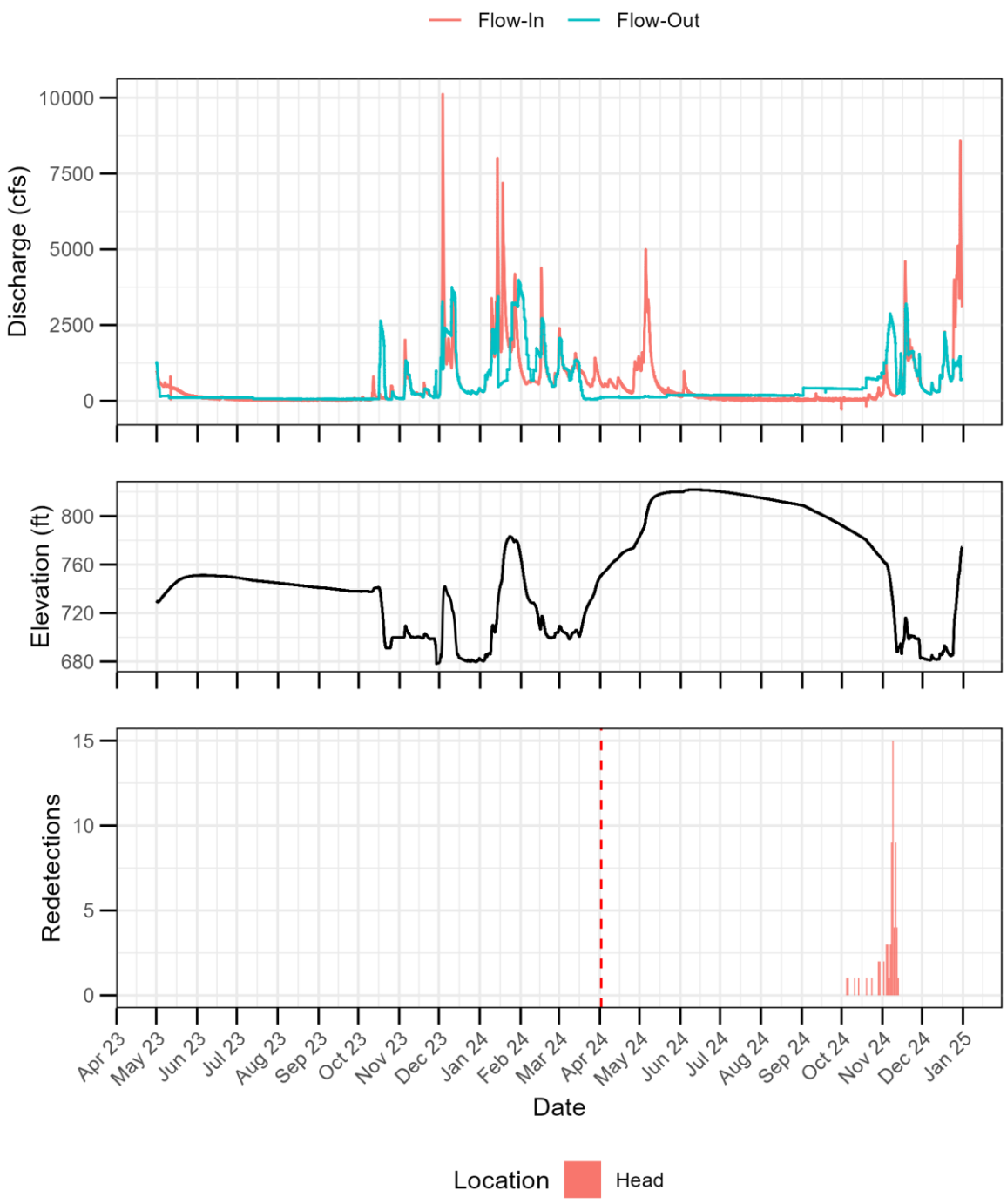

Figure 20. Fall Creek inflow and outflow (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Fall Creek on April 2 and April 3, 2024 and subsequently recaptured in the Fall Creek tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release is represented by the dashed vertical line.

Summary – Fall Creek

The different release groups of juvenile Chinook salmon at Fall Creek Dam exhibited varied movement patterns and detection rates, directly influenced by the timing of releases in relation to the injunction measures governing dam operations.

The June 2023 fry release, occurring outside of the major drawdown and refill periods, had a low detection rate of 0.1% and a long median travel time of 128.8 days, reflecting less favorable passage conditions during summer conditions under normal dam operations.

In contrast, the fall releases in September and November 2023, targeting Injunction Measure 19's deep drawdown to streambed elevation by December 1, showed higher detection rates (2.9% and 5.7% respectively) and much quicker median travel times (20.9 and 1.9 days), indicating that the drawdown operations facilitated faster migration as intended by the measure. Similarly, the February 2024 release during the pre-refill phase before the reservoir reached 700 feet (as per Injunction Measure 20) also demonstrated rapid movement and a 4.9% detection rate, supporting the effectiveness of the drawdown for juvenile passage.

South Fork McKenzie

The objective in the South Fork McKenzie River basin was to PIT tag and release 49,000 juvenile Chinook salmon (brood year 2022, McKenzie River stock 23H) during 2023 and the Spring of 2024 (Table 2). Ultimately, 49,281 PIT-tagged juveniles from brood year 2022 were released (Table 9, Figure 6). Tagging mortality rates across all groups ranged from 2.18% to 8.4%, and tag shed rates ranged from 0.13% to 0.78% (Table 10). Low returns of adult Chinook salmon to the McKenzie River in 2023 resulted in insufficient broodstock to produce juveniles for the project, preventing their use as fry in spring 2024 or as subyearlings in fall 2024.

Table 9. Release details for PIT-tagged juvenile Chinook salmon in the South Fork McKenzie (MCK) basin, including release location, date, brood year, number of fish (N), mean fork length (mm), mean weight (g), and life stage.

Release Location	Release Date	Brood Year	N	Mean Length (mm)	Mean Weight (g)	Life Stage
Cougar Head of Reservoir	8/29/2023 11:30	2022	5198	67.9	3.6	Fry
Cougar Head of Reservoir	10/2/2023 14:20	2022	5005	117.2	18.9	Subyearling
Cougar Head of Reservoir	10/2/2023 19:05	2022	3006	116.7	19	Subyearling
Cougar Head of Reservoir	10/18/2023 11:50	2022	3977	118.4	19.8	Subyearling
Cougar Forebay	10/18/2023 18:00	2022	5010	120.8	21	Subyearling
Cougar Tailrace	10/19/2023 12:40	2022	4000	112.5	16.8	Subyearling
Cougar Head of Reservoir	11/13/2023 13:15	2022	3999	121.3	23	Subyearling
Cougar Forebay	11/14/2023 15:15	2022	4995	124.6	23.8	Subyearling
Cougar Tailrace	11/15/2023 11:45	2022	2411	120.1	21.5	Subyearling
Cougar Head of Reservoir	3/8/2024 11:20	2022	4799	136.9	31	Yearling
Cougar Forebay	3/11/2024 11:25	2022	4800	136.5	29.5	Yearling
Cougar Tailrace	3/11/2024 15:10	2022	2081	129.5	25.4	Yearling

Table 10. Summary of PIT tagging sessions for juvenile Chinook salmon in the Middle Fork Willamette basin (MFW), including number of fish tagged (N), tagging dates, mortalities, and tag shedding rates.

Mark Group	N	Date Start	Date End	Mort	Mort. %	Sheds	Shed %
Spring Fry	5,626	6/20/2023	6/20/2023	475	8.40	44	0.78
Fall 23 & Spring 24 Bulk Group	45,210	8/30/2023	2/14/2024	987	2.18	60	0.13

The juvenile Chinook salmon that were reared at Leaburg Hatchery were subject to various pathogen outbreaks during the summer and fall of 2023. We started PIT tagging juvenile Chinook salmon at Leaburg Hatchery on June 20, 2023, aiming to tag 10,000 fish. However, on the first day, we noted high mortality rates among both tagged fish and those waiting in the staging trough. Of the 3,553 salmon tagged that day, 93 died by day's end, a rate of 2.3%. This rate was alarming to our crew, as we had been averaging a tagging mortality rate of less than 1 percent up to that point in the project. Also surprising was the discovery of several dead fish in the staging trough (i.e., fish that had not been tagged or handled yet), a situation we had not observed to this extent in the staging area earlier in the year. By this date, our crews were highly experienced, water temperatures were averaging 10.4 degrees Celsius, and we had been using the same stock solution of anesthesia that had resulted in low mortality rates in the weeks prior. The hatchery manager informed us that pathogen outbreaks, particularly Proliferative Kidney Disease (PKD), had been common at Leaburg in recent years. Consequently, we halted our tagging activities and contacted the state pathologist, Dr. Aimee Reed. Throughout the summer and into the fall, the juvenile Chinook salmon at Leaburg underwent various treatments by ODFW staff under the guidance of the state pathologist. Pathogens continued to be an issue at Leaburg well into the fall and are the likely cause of the relatively high mortality rates of our tagged fish in this basin (Table 10).

The following results outline the PIT tag release groups released above Cougar Dam and their subsequent detections downstream.

Cougar Dam

Injunction measures for Cougar Dam (Figure 21) aim to balance water management and fish passage operations. Injunction Measure 14 outlines the fall and winter operational strategy, which involves drawing down Cougar Reservoir to an elevation of 1,505 feet from early November through December 15. During this period, the regulating outlets (ROs) are prioritized for nighttime discharge once the reservoir reaches an elevation of 1,571 feet, and full priority is given to the ROs at elevations below 1,532 feet. Refilling of the reservoir begins on December 16, with nighttime RO operations until an elevation of 1,532 feet is reached. Injunction measure 15 states that following the winter drawdown, refilling continues with the goal of reaching a minimum conservation pool of 1,532 feet by March 1. Cougar Reservoir is then drafted to an elevation of 1,520 feet by April 1 to provide a downstream flow signal that encourages fish outmigration. Refill is delayed as long as possible, with the target of reaching 1,571 feet by July 1. Adaptive management, guided by hydrologic data and fish migration patterns, is employed to determine the optimal refill timing. Elevation of the turbine inlet is 1474 feet and elevation of the regulating outlet is 1491.5 feet.

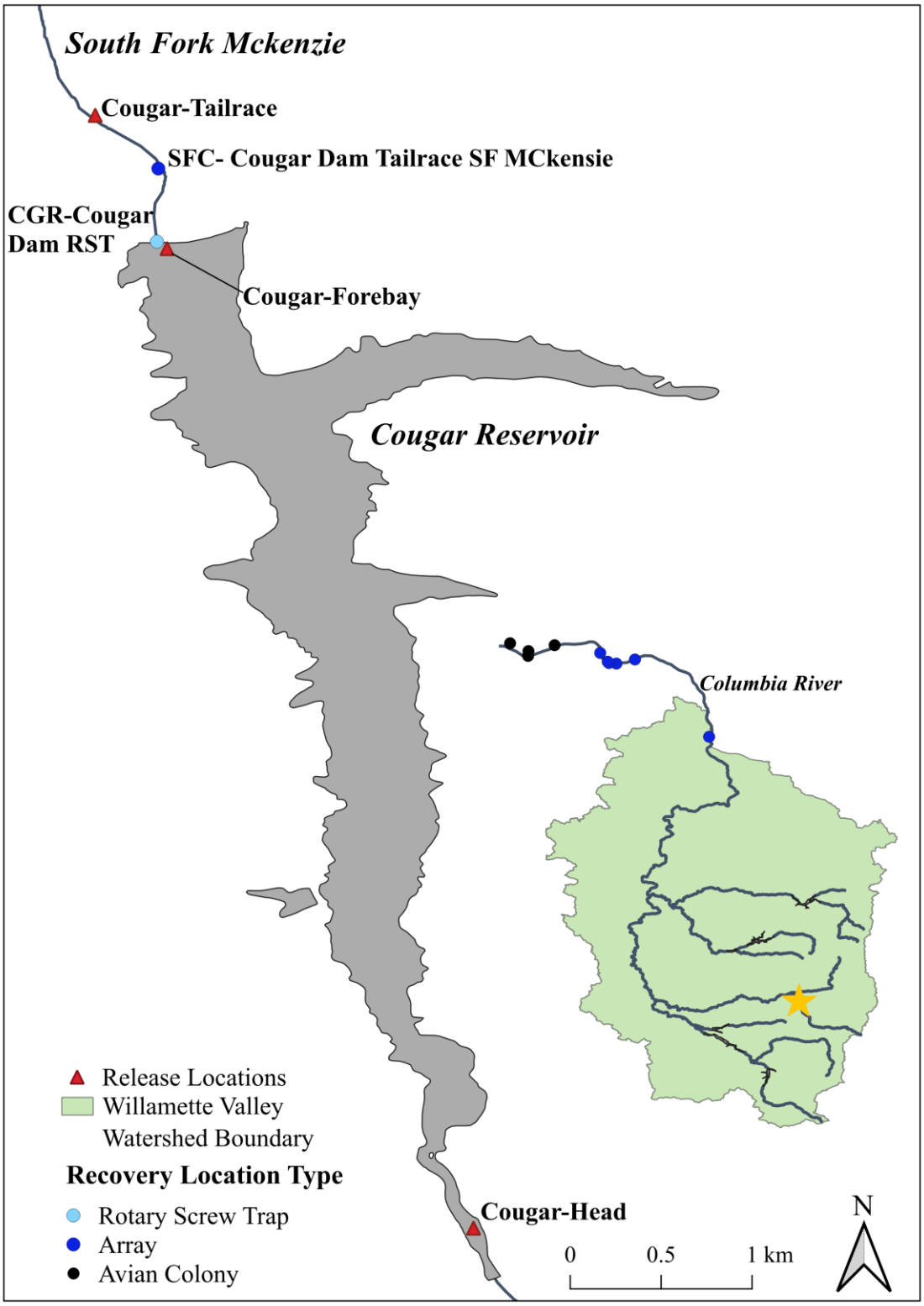

Figure 21. Map of release and recovery locations within the Cougar Dam Project area.

Target: Spring Fry Migration - Spring Dam Operations

The first release group of PIT-tagged juvenile Chinook salmon into the Cougar Dam project area was intended to target spring dam operations, which start in early March, but due to the late awarding of the project and unforeseen fish health issues, this target was not met. Rather, this group ended up assessing summer movement patterns of subyearling and fall dam operations.

This group of brood year 2022 subyearling Chinook salmon were released at the head of Cougar Reservoir on August 29, 2023 (n = 5,198; Table 9). At marking, these fish had an average fork length of 67.9 millimeters and an average weight of 4 grams; however, a subset was not measured prior to release, so specific length and weight data for this group are unavailable. This group was released upstream of the rotary screw trap operated by Environmental Assessment Services, with all subsequent releases at the head of Cougar Reservoir occurring below the Cougar Crossing Bridge.

At the time of release, the reservoir was slowly drafting (forebay elevation: 1590 feet), with all flow being directed through the powerhouse (Figure 22). This flow pattern continued until regulating outlet operations began on October 6, 2023. A total of 32 fish from this release group were detected subsequently detected downstream, yielding an overall detection rate of 0.6%. Of these, 31 fish were detected in the RSTs operating in the Cougar Dam tailrace. Of those, 27 were detected in the regulating outlet and 4 in the powerhouse channel. Fish detected in the regulating outlet RST showed a much faster median travel time of 66.0 days compared to 108 days for those detected in the powerhouse RST. The majority of the detected fish did not begin to pass Cougar Dam until mid-October, when regulating outlet spill operations were in full effect and the forebay elevation was drafting toward the drawdown target (Figure 22). Mean forebay elevation at the time of recapture was 1526 feet, with mean depths to turbine and regulating outlet intakes of 52 feet and 35 feet, respectively.

Fish detected in the regulating outlet RST had an average fork length of 113.8 mm while fish redetected in the powerhouse channel measured 89.7 mm.

In addition to the fish captured in the RSTs below Cougar Dam, a single fish was detected at the Cougar Dam Tailrace array (operated by ODFW), on February 18, 2024. The Cougar Dam Tailrace array is installed in both the regulating outlet and powerhouse channels in the tailrace of Cougar Dam. Interestingly, on September 23, 2024 a single fish from this release group was detected passing the South Fork McKenzie array (operated by USGS), located upstream of the head of reservoir release location. This unusual finding could indicate a two-year smolt that reared upstream of the array (which was non-functional at the release date), a precocial male migrating upstream to spawn, or a tag carried in the belly of piscivorous fish, such as bull trout common in the South Fork McKenzie.

Table 11. Detection summary of PIT-tagged juvenile Chinook salmon released in the Cougar Dam (CGR) project area. Release locations: Head = Head of Reservoir, Forebay, Tailrace. Observation locations: ASMEBER = Astoria Meglar Bridge, CGR PH = Cougar Dam Powerhouse, CGR RO = Cougar Dam Regulating Outlet, COLR1 = Columbia River rkm 49-140 (another segment), COLR2 = Columbia River rkm 49-140, MCKESF = McKenzie River at South Fork RST, PD5-8 = Columbia River Pile Dike Arrays 5-8, RICEIS = [Rice Island], SFC = Cougar Dam Tailrace Array (ODFW), SFM = South Fork McKenzie River Array (USGS), TWX = Columbia River Towed Array. Headers: Count = Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Mean Fork Length = mean fork length at release and recapture.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
CGR	8/29/2023	Head	SFM	Array	1	0.02	391.0	391.0	391.0	NA	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
CGR	8/29/2023	Head	CGR PH	RST	4	0.08	106.0	108.0	205.0	NA	89.7
CGR	8/29/2023	Head	CGR RO	RST	27	0.52	45.0	66.0	201.0	NA	113.8
CGR	8/29/2023	Head	SFC	Array	1	0.02	173.5	173.5	173.5	NA	NA
CGR	8/29/2023	Head	MCKESF	RST	134	2.58	1.0	2.0	292.8	NA	89.9
CGR	10/2/2023	Head	CGR PH	RST	21	0.26	5.7	75.9	167.7	117.0	119.7
CGR	10/2/2023	Head	CGR RO	RST	460	5.74	8.9	29.7	403.9	117.0	130.6
CGR	10/2/2023	Head	SFC	Array	31	0.39	4.4	32.4	207.2	117.0	NA
CGR	10/2/2023	Head	SID	Array	1	0.01	121.7	121.7	121.7	117.0	NA
CGR	10/2/2023	Head	PD8	Array	1	0.01	204.6	204.6	204.6	117.0	NA
CGR	10/2/2023	Head	TWX	Array	1	0.01	224.3	224.3	224.3	117.0	NA
CGR	10/2/2023	Head	PD7	Array	1	0.01	47.7	47.7	47.7	117.0	NA
CGR	10/18/2023	Forebay	CGR PH	RST	6	0.12	127.8	132.8	245.7	120.8	139.8
CGR	10/18/2023	Forebay	CGR RO	RST	346	6.91	0.7	13.7	183.7	120.8	128.4
CGR	10/18/2023	Forebay	SFC	Array	23	0.46	4.2	18.2	156.2	120.8	NA
CGR	10/18/2023	Head	CGR PH	RST	10	0.25	56.0	128.5	259.0	118.4	138.1
CGR	10/18/2023	Head	CGR RO	RST	260	6.54	2.0	14.0	195.0	118.4	127.6
CGR	10/18/2023	Head	SFC	Array	15	0.38	5.5	14.5	148.5	118.4	105.0
CGR	10/18/2023	Forebay	SID	Array	1	0.02	86.4	86.4	86.4	120.8	NA
CGR	10/18/2023	Forebay	TWX	Array	1	0.02	176.6	176.6	176.6	120.8	NA
CGR	10/18/2023	Forebay	PD7	Array	2	0.04	32.1	62.9	93.7	120.8	NA
CGR	10/18/2023	Forebay	PD6	Array	2	0.04	171.1	173.2	175.2	120.8	NA
CGR	10/18/2023	Head	PD6	Array	2	0.05	178.5	180.4	182.3	118.4	NA
CGR	10/18/2023	Forebay	ASMEBR	Predation	2	0.04	NA	NA	NA	120.8	NA
CGR	10/19/2023	Tailrace	SFC	Array	1	0.03	33.4	33.4	33.4	112.5	NA
CGR	10/19/2023	Tailrace	TWX	Array	1	0.03	202.9	202.9	202.9	112.5	NA
CGR	10/19/2023	Tailrace	PD7	Array	1	0.03	173.8	173.8	173.8	112.5	NA
CGR	10/19/2023	Tailrace	ASMEBR	Predation	1	0.03	NA	NA	NA	112.5	NA
CGR	11/13/2023	Head	CGR PH	RST	49	1.23	30.0	32.0	212.9	121.3	134.7
CGR	11/13/2023	Head	CGR RO	RST	236	5.9	1.0	27.0	195.9	121.3	131.0
CGR	11/13/2023	Head	SFC	Array	39	0.98	0.4	93.4	167.4	121.3	NA
CGR	11/13/2023	Head	TWX	Array	3	0.08	154.8	180.7	182.3	121.3	NA
CGR	11/13/2023	Head	PD6	Array	2	0.05	144.3	154.8	165.4	121.3	NA
CGR	11/13/2023	Head	RICEIS	Predation	1	0.03	NA	NA	NA	121.3	NA
CGR	11/13/2023	Head	COLR2	Predation	3	0.08	NA	NA	NA	121.3	NA
CGR	11/14/2023	Forebay	CGR PH	RST	31	0.62	28.9	99.9	213.8	124.6	140.1
CGR	11/14/2023	Forebay	CGR RO	RST	455	9.11	0.9	0.9	371.9	124.6	125.0
CGR	11/14/2023	Forebay	SFC	Array	33	0.66	0.3	39.4	130.4	124.6	NA
CGR	11/14/2023	Forebay	PD8	Array	1	0.02	164.7	164.7	164.7	124.6	NA
CGR	11/14/2023	Forebay	TWX	Array	1	0.02	173.3	173.3	173.3	124.6	NA
CGR	11/14/2023	Forebay	PD7	Array	1	0.02	138.0	138.0	138.0	124.6	NA
CGR	11/14/2023	Forebay	PD6	Array	4	0.08	148.6	173.0	174.2	124.6	NA
CGR	11/14/2023	Forebay	PD5	Array	1	0.02	153.0	153.0	153.0	124.6	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
CGR	11/14/2023	Forebay	ASMEBR	Predation	3	0.06	NA	NA	NA	124.6	NA
CGR	11/15/2023	Tailrace	SFC	Array	1	0.04	18.5	18.5	18.5	120.1	NA
CGR	11/15/2023	Tailrace	PD7	Array	1	0.04	146.0	146.0	146.0	120.1	NA
CGR	11/15/2023	Tailrace	PD6	Array	2	0.08	148.5	152.6	156.7	120.1	NA
CGR	11/15/2023	Tailrace	PD5	Array	1	0.04	149.4	149.4	149.4	120.1	NA
CGR	3/8/2024	Head	SFM	Array	2	0.04	208.1	214.2	220.2	136.9	NA
CGR	3/8/2024	Head	CGR PH	RST	15	0.31	12.0	94.0	120.0	136.9	153.0
CGR	3/8/2024	Head	CGR RO	RST	92	1.92	0.0	19.0	55.0	136.9	158.2
CGR	3/8/2024	Head	SFC	Array	4	0.08	13.5	18.0	34.5	136.9	NA
CGR	3/8/2024	Head	MCKESF	RST	4	0.08	96.9	102.4	103.9	136.9	NA
CGR	3/8/2024	Head	PD8	Array	1	0.02	46.3	46.3	46.3	136.9	NA
CGR	3/8/2024	Head	TWX	Array	2	0.04	54.4	57.4	60.4	136.9	NA
CGR	3/8/2024	Head	PD7	Array	1	0.02	34.6	34.6	34.6	136.9	NA
CGR	3/8/2024	Head	PD6	Array	1	0.02	54.5	54.5	54.5	136.9	NA
CGR	3/8/2024	Head	PD5	Array	3	0.06	39.6	59.9	61.4	136.9	NA
CGR	3/8/2024	Head	ASMEBR	Predation	1	0.02	NA	NA	NA	136.9	NA
CGR	3/8/2024	Head	COLR1	Predation	1	0.02	NA	NA	NA	136.9	NA
CGR	3/11/2024	Forebay	SFM	Array	1	0.02	205.1	205.1	205.1	136.5	NA
CGR	3/11/2024	Forebay	CGR PH	RST	18	0.37	2.0	67.5	110.0	136.5	150.6
CGR	3/11/2024	Forebay	CGR RO	RST	183	3.81	0.0	1.0	221.0	136.5	138.9
CGR	3/11/2024	Forebay	SFC	Array	11	0.23	0.5	9.5	37.5	136.5	NA
CGR	3/11/2024	Forebay	MCKESF	RST	1	0.02	97.9	97.9	97.9	136.5	NA
CGR	3/11/2024	Forebay	PD8	Array	1	0.02	58.7	58.7	58.7	136.5	NA
CGR	3/11/2024	Tailrace	PD8	Array	2	0.1	47.7	58.1	68.5	129.5	NA
CGR	3/11/2024	Forebay	TWX	Array	3	0.06	35.8	41.8	57.6	136.5	NA
CGR	3/11/2024	Tailrace	PD7	Array	2	0.1	6.5	15.5	24.5	129.5	NA
CGR	3/11/2024	Forebay	PD6	Array	5	0.1	26.4	37.2	58.7	136.5	NA
CGR	3/11/2024	Tailrace	PD6	Array	6	0.29	21.3	26.7	33.3	129.5	NA
CGR	3/11/2024	Forebay	PD5	Array	3	0.06	25.7	31.9	45.8	136.5	NA
CGR	3/11/2024	Tailrace	PD5	Array	6	0.29	29.7	40.8	60.2	129.5	NA
CGR	3/11/2024	Forebay	ASMEBR	Predation	1	0.02	NA	NA	NA	136.5	NA
CGR	3/11/2024	Tailrace	ASMEBR	Predation	3	0.14	NA	NA	NA	129.5	NA

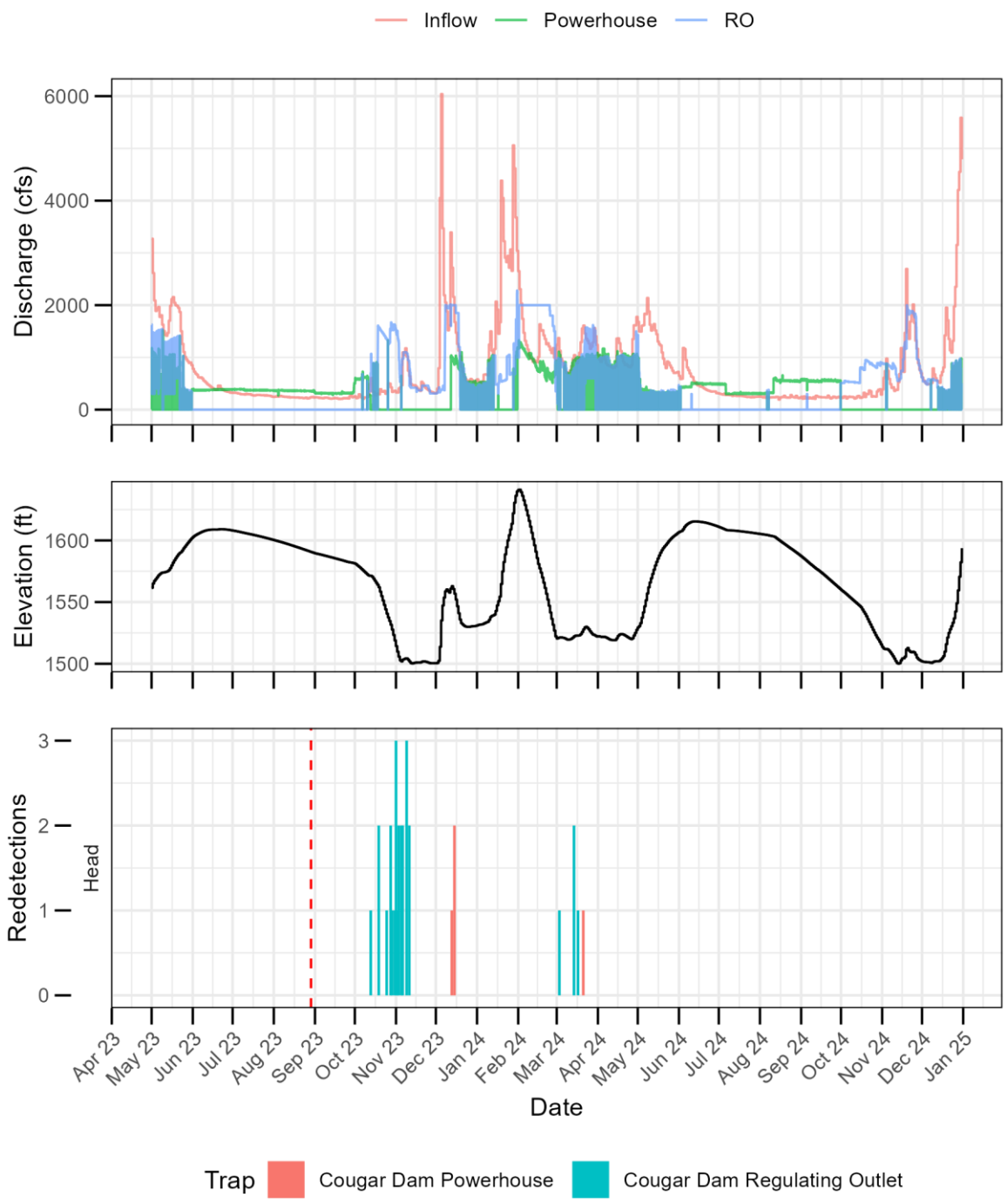

Figure 22. Cougar project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Cougar reservoir on August 29, 2023 and subsequently recaptured in the Cougar tailrace screw traps (bottom panel). Release date is represented by the dashed vertical line.

Target: Fall Subyearling Migration - Early Fall Drawdown Operations

The next release in the Cougar Dam project area took place on October 2, 2023, when a total of 8,011 subyearling Chinook salmon were released at the head of Cougar Reservoir (Table 9). The size of this release group was impacted by pathogen outbreaks; the original intent was to release 3,000 fish. However, to compensate for the

5,000 fish shortfall in the previous release, the decision was made to increase the release size to approximately 8,000. This group was released to coincide with the start of the fall drawdown of Cougar Reservoir, which began on October 1, 2023. The fish in this group had an average fork length of 117 millimeters and an average weight of 19 grams.

The fall drawdown started on October 1, 2023, and achieved the target forebay elevation of approximately 1,505 feet by November 3, 2023. The reservoir remained at this elevation until December 4, 2023, when refilling began. During this drawdown, all flow was directed through the regulating outlet (Figure 23).

Of the 8,011 fish released, 516 were subsequently detected downstream of Cougar Dam, giving an overall redetection rate of 6.4%. The most detections occurred in the Cougar Dam RSTs, with 460 in the regulating outlet channel and 21 in the powerhouse channel (Table 11). The first detection in the powerhouse channel happened just six days post-release on October 8, 2023. The median travel time to the regulating outlet was 29.7 days, and to the powerhouse channel was 76.0 days. These times were significantly shorter by about 30 days compared to the first group released on August 29th, indicating that despite the one-month difference in release dates, both groups largely passed the dam during the drawdown period.

Most redetections occurred while the reservoir was drafting towards or at the target elevation of 1,505 feet (n = 433; Figure 23). There were 13 detections in December when both the regulating outlet and powerhouse were operational. Additionally, a pulse of detections occurred in February and March 2024, corresponding with the typical migration period for yearling juvenile Chinook salmon.

Fish redetected in the powerhouse channel averaged a fork length of 119.7 mm, while those in the regulating outlet channel averaged 130.6 mm.

Beyond the RSTs at Cougar, 31 fish were detected at the Cougar Tailrace Array with a median travel time of 32.4 days. One fish was detected at the Sauvie Island Array, and three were detected at various arrays in the Columbia River.

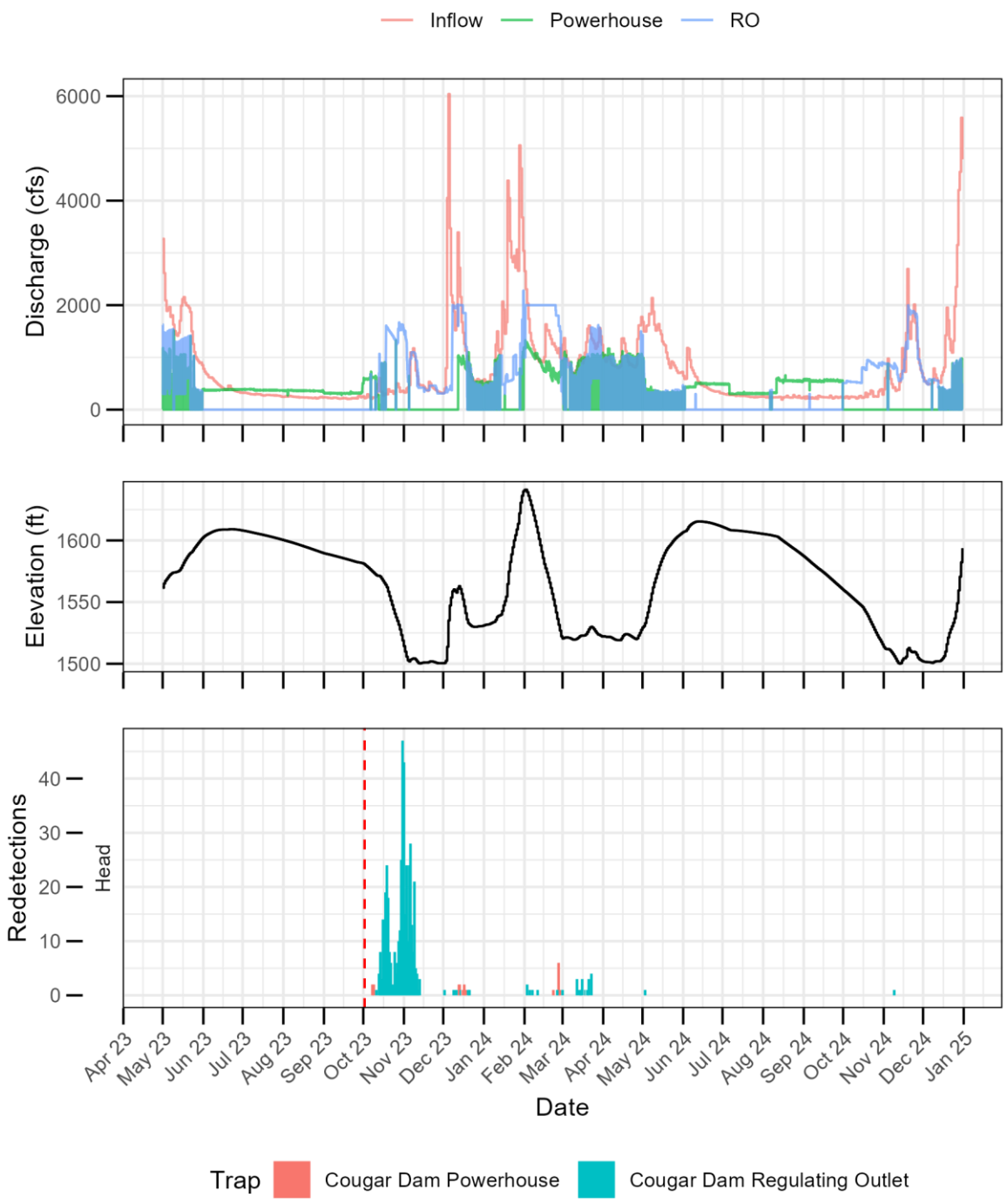

Figure 23. Cougar project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Cougar reservoir on October 2, 2023 and subsequently recaptured in the Cougar tailrace screw traps (bottom panel). Release date is represented by the dashed vertical line.

Target: Fall Subyearling Migration - Mid-Fall Drawdown Operations

The next groups of PIT tagged fish were released to assess movement patterns of subyearling Chinook salmon mid-way through the fall drawdown of Cougar Reservoir. The releases took place on October 18 and October 19, 2023, with the release of 3,979 subyearlings at the head of Cougar Reservoir (mean FL = 118 mm; mean weight

= 20 g) and 5,010 into the Cougar Dam forebay (mean FL = 121 mm; mean weight = 21 g). The forebay elevation averaged 1563 feet a time of release. Cougar's forebay reached the target elevation of 1505 feet on November 3, 2023.

A total of 670 fish from these release groups were later detected downstream of Cougar Dam, yielding an overall detection rate of 7.5% (Table 11). The RSTs below Cougar recorded 622 detections, with 606 of those in the regulating channel. Detection rates were consistent across different release locations. Specifically, the regulating outlet RST detected 6.9% of the fish released in the forebay and 6.5% of those released at the head of the reservoir. The minimum travel time to the regulating outlet channel was slightly shorter for fish from the forebay release compared to the head of reservoir release (0.7 vs. 2.0 days). Median travel times were quite similar between the two release locations, with 14.0 days from the head of the reservoir to the regulating outlet and 13.7 days from the forebay to the same point. However, travel times for fish detected in the powerhouse channel (n = 16) were significantly longer; the median travel time from the head of the reservoir and the forebay to the powerhouse channel was 128.2 and 132.8 days, respectively, with most powerhouse channel detections occurring the following spring. The extended travel time to the powerhouse channel are largely attributable to dam operations: for the first 55 days post-release, all flow was routed almost exclusively through the regulating outlet, with the powerhouse offline during this period. This likely facilitated the downstream passage of most fish from this group through the regulating outlet, as evidenced by the high number of detections there. By the time the powerhouse operations resumed, fewer fish remained available for detection, reducing the likelihood of powerhouse channel detections compared to what might have been observed with concurrent regulating outlet and powerhouse flow.

Reflecting the pattern observed with the October 2 release, most redetections from these groups occurred while the reservoir was drafting towards or at the target elevation of 1,505 feet with a pulse of detections occurring in February and March 2024, corresponding with the typical migration period for yearling juvenile Chinook salmon (Figure 24).

In addition to the fish captured in the Cougar tailrace RSTs, the Cougar Tailrace Array detected a total of 38 fish, eight fish were detected across various Columbia River Arrays, and two PIT tags were recovered at the Astoria-Meglar Bridge Avian Predation survey location (Table 11).

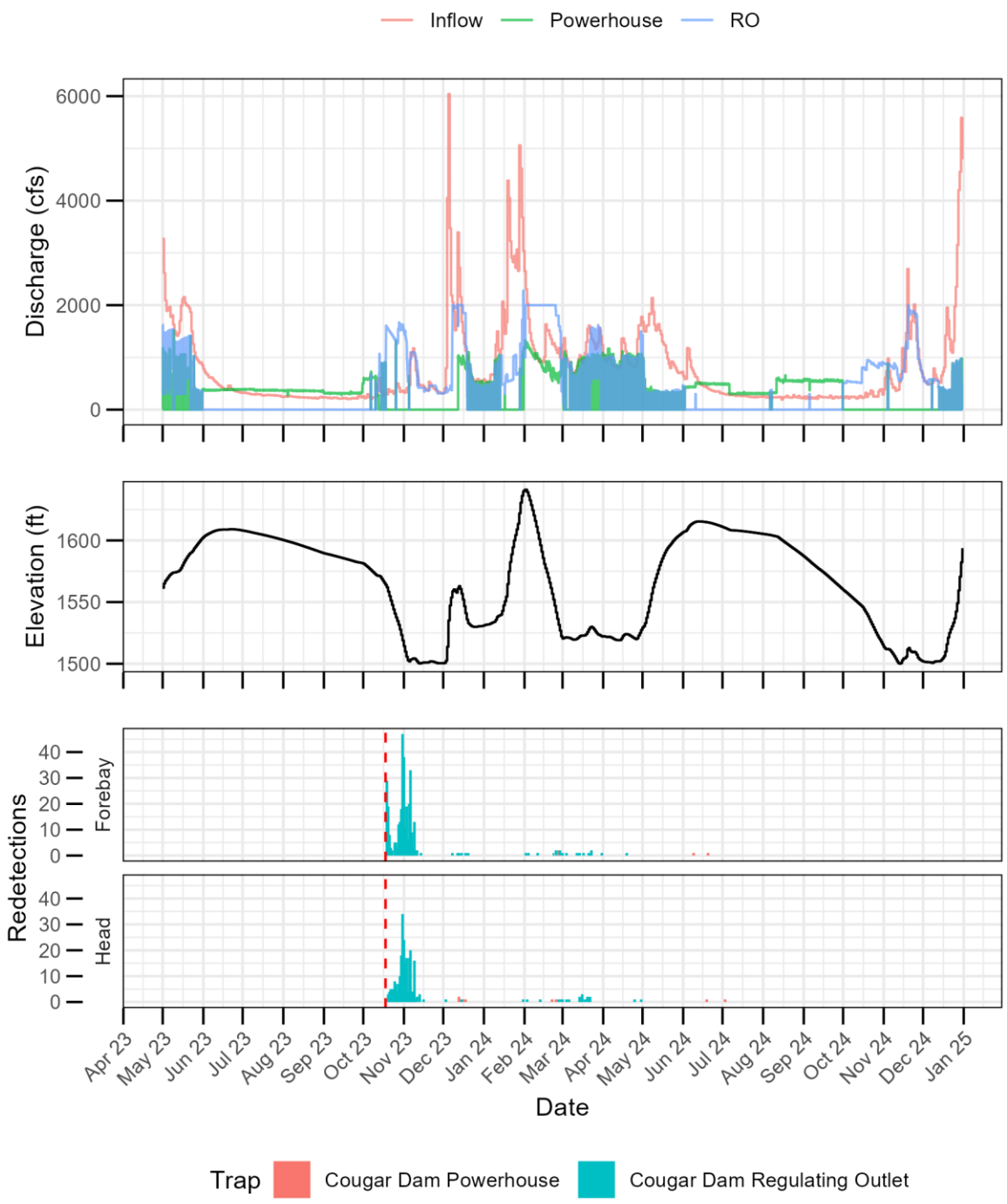

Figure 24. Cougar project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Cougar reservoir and in the Forebay on October 18, 2023 and subsequently recaptured in the Cougar tailrace screw traps (bottom panel). Release date is represented by the dashed vertical line.

Target: Fall Subyearling Migration – Late Fall Drawdown Operations

The next groups of PIT tagged fish were released to target the movement patterns of subyearling Chinook salmon during full fall drawdown at Cougar Dam. We released 3,999 fish at the head of reservoir on November 13, 2023 (mean FL = 121.3 mm; mean weight = 23 g) and 4,995 at the forebay on November 14, 2023 (mean FL = 124.6 mm; mean weight = 24 g). These releases happened while the reservoir was being maintained at the full fall

drawdown level (~1505 feet), as depicted in Figure 25. The reservoir elevation would remain a full drawdown until refill began on December 4, 2023.

There were 863 detections of fish downstream of Cougar Dam from these release groups, yielding an overall detection rate of 9.6% (Table 11). Of these, 771 were detected at the Cougar tailrace rotary screw traps (RSTs), resulting in a detection rate of 8.6%. Out of those, 691 were detected in the regulating outlet channel, and 80 in the powerhouse channel. Fish released in the forebay were detected in the tailrace at a higher rate (9.1%) than those released at head of reservoir (7.1%).

There was a significant disparity in travel time between fish released at the head of reservoir and those released at the forebay. The median travel time from the head of the reservoir to detection in the regulating outlet was 27.0 days, whereas it was just 0.9 days from the forebay to the regulating outlet (Table 11). For detections in the powerhouse channel, median travel times were 99.9 days from the head of the reservoir versus 32.0 days from the forebay. Fish from the forebay had exceptionally fast travel time, with half of them detected within one day, and 75% within five days. As with the prior release, these patterns are influenced by dam operations, with all flow routed through the regulating outlet for the first 29 days post-release, favoring quicker passage via that route.

However, not all fish from the forebay release group followed this pattern. Two notable exceptions were detected much later in the following year, on October 11, 2024, and November 20, 2024, respectively, both in the regulating outlet RST.

Beyond the immediate tailrace of Cougar Dam, an additional 72 detections were recorded at the Cougar Tailrace Array and 13 at various arrays along the Columbia River, confirming successful passage of these fish beyond Cougar Dam. Additionally, seven tags recovered from avian predation monitoring projects in the Columbia estuary indicate that some fish were predated after passing the dam.

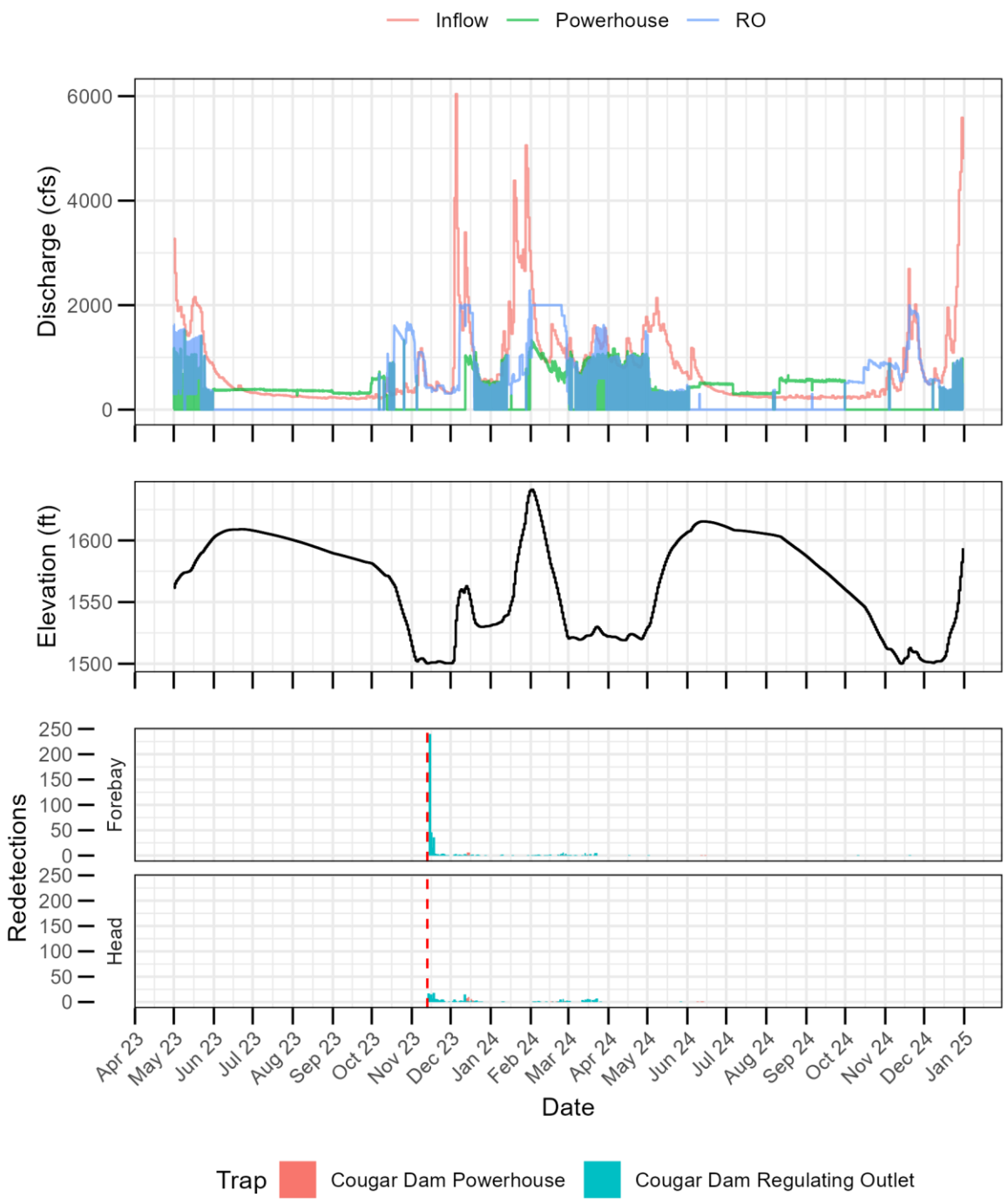

Figure 25 Cougar project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released at the head of Cougar reservoir and in the Forebay on November 13, 2023 and subsequently recaptured in the Cougar tailrace screw traps (bottom panel). Release date is represented by the dashed vertical line.

Target: Spring Yearling Migration – Spring Dam Operations

The final releases of brood year 2022 juvenile Chinook salmon yearlings above Cougar Dam were intended to evaluate yearling movement patterns during the spring drawdown. The first group was intended to be released prior to the beginning of the spring drawdown, and the second group was intended to be released before the reservoir forebay reached an elevation of 1520 feet. The original anticipated date for the spring drawdown was

February 28, while the anticipated date for reaching 1520 feet was March 30. The spring drawdown began on February 1, and the elevation target was reached on March 1. Unaware of the dam operation schedule shift by one month, we did not release these fish until early March. We released 4,799 yearlings at the head of Cougar Reservoir on March 8, 2024; 4,800 in the forebay and 2,081 into the tailrace on March 11 (we were further delayed due to having to clear logs blocking the forebay boat ramp). These yearlings had a mean fork length of 134.3 mm and a mean weight of 28.6 grams. Flow was being directed through both the powerhouse and the regulating outlet at the time of release (Figure 26).

A total of 354 fish from these release groups were detected downstream of Cougar Dam, resulting in an overall redetection rate of 3.6%. Of these, 308 were recorded at the rotary screw traps below the dam, with detections predominantly in the regulating outlet channel (n = 275) compared to the powerhouse channel (n = 33), consistent with patterns from previous releases. Unlike prior releases, however, flow through Cougar Dam following release was split between the RO and powerhouse, though the RO channel remained the primary detection route.

Fish released in the forebay showed a higher detection rate in the regulating outlet channel RST (3.8%) compared to those released at the head of the reservoir (1.9%). Minimum travel times to the regulating outlet were rapid—less than one day from both locations—but median travel times differed sharply: just 1 day for forebay releases, where fish bypass reservoir navigation entirely, versus 19 days for head-of-reservoir releases, which must traverse the reservoir (Table 11). Of the fish detected in the powerhouse channel, 15 yearling Chinook salmon from the head-of-reservoir release group (0.31% detection rate) had a median travel time of 94 days, while 18 fish from the forebay release group (0.38% detection rate) had a median travel time of 68 days (Table 11). These findings indicate that navigating the reservoir reduces passage rates, as fish released farther upstream appear to face greater challenges in locating the outlet. This has implications for wild run-of-the-river juveniles, which may experience lower passage success due to similar difficulties in navigating reservoirs to find and pass dam outlets.

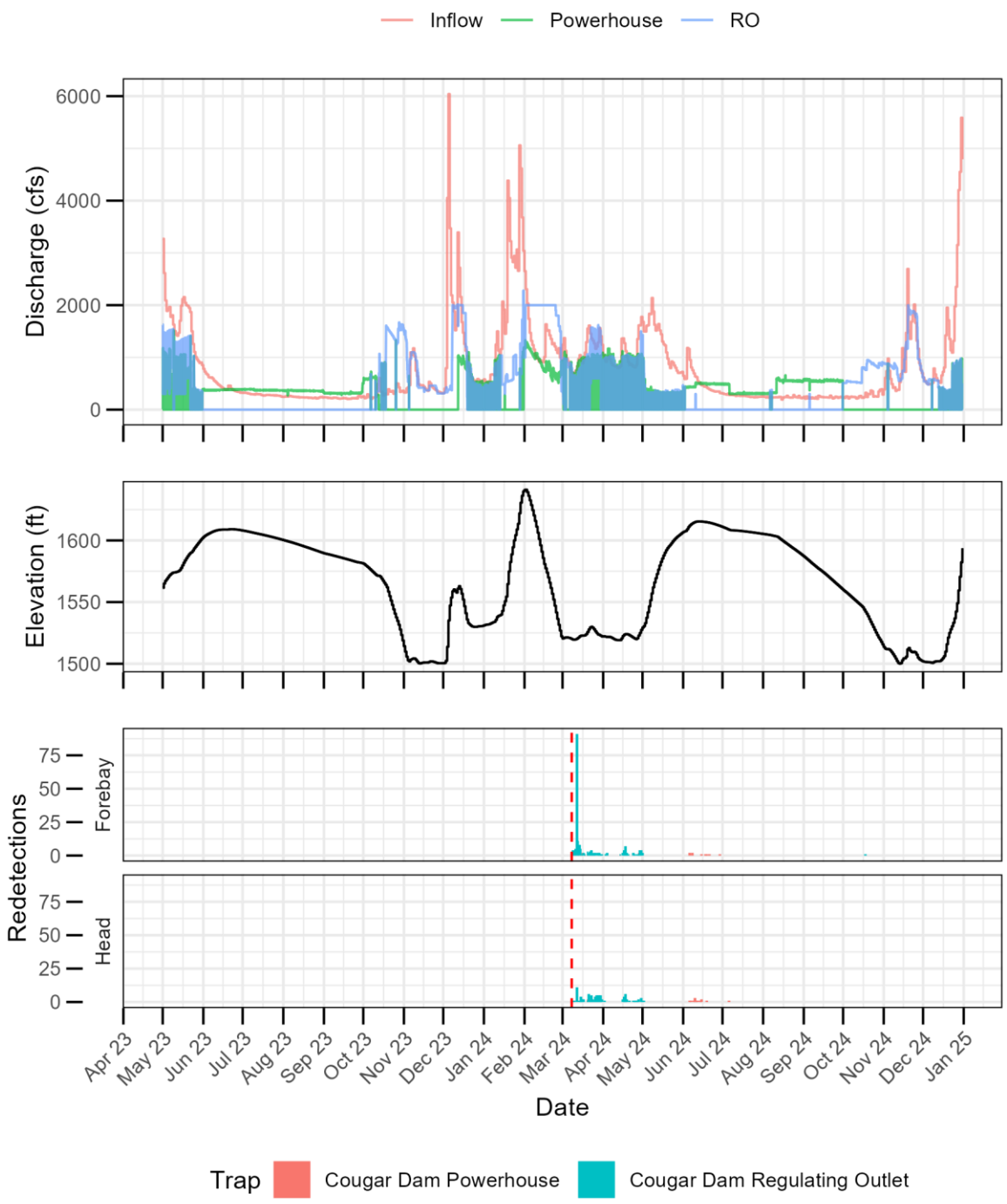

Figure 26. Cougar project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released at the head of Cougar reservoir and in the Forebay on March 8, and March 11, 2024 and subsequently recaptured in the Cougar tailrace screw traps (bottom panel). Approximate release date is represented by the dashed vertical line.

Summary – Cougar Dam

The injunction measures at Cougar Dam, designed to balance water management and fish passage, include specific operational strategies such as the fall drawdown to an elevation of 1,505 feet from early November through December 15, followed by refilling to a minimum conservation pool of 1,532 feet by March 1, and a spring drawdown to 1,520 feet by April 1 to encourage fish outmigration. These measures aim to create favorable conditions for juvenile Chinook salmon passage, particularly during critical migration periods. Using PIT-tagged

hatchery fish as proxies for wild fish we evaluated how these operational strategies influenced movement patterns, detection rates, and travel times.

Detection rates were highest during the fall drawdown (October–November) when the reservoir was drafting toward or maintained at 1,505 feet, ranging from 6.4% to 9.6%, with the highest rate (9.6%) observed for the November 13–14 releases. In contrast, detection rates were lower outside drawdown periods, dropping to 0.6% for the August 29 release (slow drafting, powerhouse-only flow) and 3.6% for the March 8–11 release (split flow). Fish released in the forebay generally had higher RO detection rates than those released at the head of the reservoir during split-flow or late fall drawdown periods (e.g., 9.1% vs. 7.1% in November, 3.81% vs. 1.92% in March), though rates were more similar during mid-fall drawdown with RO-only flow (6.91% vs. 6.54% in October 18–19). Across all releases, the RO channel consistently dominated detections (e.g., 691 vs. 80 in November, 275 vs. 33 in March), even when flow was split.

Travel times to the RO were shortest during the fall drawdown, particularly for forebay releases, with medians as low as 0.9 days (November 14) compared to 27.0 days for head-of-reservoir releases in the same period. Head-of-reservoir releases consistently showed longer RO travel times across releases, ranging from 14.0 days (October 18) to 66.0 days (August 29). Powerhouse travel times were significantly longer, often with detections the following spring (e.g., 132.8 days for forebay releases in October 18–19, 94.0 days for head-of-reservoir releases in March 8–11). Dam operations influenced these patterns: RO-only flow during the fall drawdown (October 2, October 18–19, November 13–14) coincided with higher detection rates and shorter RO travel times, while powerhouse-only flow (August 29) resulted in the lowest detection rate and longest travel times. Split flow in March 8–11 reduced overall detection rates but allowed some powerhouse passage, though the RO remained the primary route. These findings highlight that dam operations, particularly the timing and routing of flow, play a key role in shaping downstream passage rates and travel times at Cougar Dam.

South Santiam

We have tagged and released a total of 57,210 brood year 2022 and 35,719 brood year 2023 South Santiam stock juvenile Chinook salmon by the end of this reporting period (Table 12). Additionally, we have tagged 9,281 brood year 2023 juveniles for release as yearlings in the spring of 2025 (Table 13). The mean tagging mortality rate for the brood year 2022 fish in the South Santiam basin was 0.38%, with a mean tag shed rate of 0.26%. For the brood year 2023 fish, the mean tagging mortality rate was 0.16%, and the mean tag shed rate was 0.26% (Table 13).

Table 12. Release details for PIT-tagged juvenile Chinook salmon in the South Santiam (SST) basin, including release location, date, brood year, number of fish (N), mean fork length (mm), mean weight (g), and life stage.

Release Location	Release Date	Brood Year	N	Mean Length	Mean Weight	Life Stage
Green Peter HOR Quartzville	5/22/2023 13:00	2022	5171	58.5	25.4	Fry
Green Peter HOR Middle Santiam	5/22/2023 20:30	2022	4961	56.2	25.4	Fry
Foster Tailrace	8/23/2023 16:30	2022	1030	115.7	18.2	Subyearling
Foster Head of Reservoir	8/24/2023 10:00	2022	2059	105.6	14.5	Subyearling
Green Peter HOR Quartzville	9/20/2023 14:00	2022	2518	113.5	19.5	Subyearling
Green Peter HOR Middle Santiam	9/21/2023 13:40	2022	2508	117.1	20.7	Subyearling
Green Peter HOR Quartzville	10/3/2023 12:45	2022	2502	122.8	25.1	Subyearling
Green Peter HOR Middle Santiam	10/4/2023 14:40	2022	2516	119.6	23.8	Subyearling
Green Peter Tailrace	10/9/2023 16:05	2022	4002	125.9	26.4	Subyearling
Foster Head of Reservoir	10/10/2023 14:20	2022	5000	125.8	24.5	Subyearling

Foster Tailrace	10/11/2023 15:20	2022	4000	135.2	31.8	Subyearling
Green Peter HOR Middle Santiam	2/21/2024 12:00	2022	1004	164.4	51.6	Yearling
Green Peter HOR Quartzville	2/22/2024 11:45	2022	1014	150.8	40.2	Yearling
Green Peter Mid Reservoir	2/22/2024 17:45	2022	2006	153.8	42.9	Yearling
Green Peter Mid Reservoir	2/23/2024 10:40	2022	2003	159.4	46.5	Yearling
Green Peter Tailrace	2/23/2024 14:15	2022	1014	163.4	50.1	Yearling
Green Peter HOR Middle Santiam	3/6/2024 15:30	2023	2506	50.1	1.4	Fry
Green Peter HOR Quartzville	3/6/2024 17:30	2023	2500	51.3	1.4	Fry
Foster Head of Reservoir	3/26/2024 13:30	2022	2997	156.3	44.1	Yearling
Foster Head of Reservoir	3/27/2024 11:00	2022	3001	145.3	38	Yearling
Foster Tailrace	3/28/2024 13:30	2022	3005	154.6	43.8	Yearling
Foster Tailrace	4/1/2024 12:55	2022	2991	156	44.3	Yearling
Foster Head of Reservoir	4/4/2024 13:15	2022	1908	145.4	37.2	Yearling
Green Peter HOR Middle Santiam	4/12/2024 11:50	2023	2350	52.4	1.5	Fry
Green Peter HOR Quartzville	4/12/2024 13:15	2023	2500	54.9	1.7	Fry
Foster Head of Reservoir	8/27/2024 13:40	2023	2000	NA	NA	Subyearling
Foster Tailrace	8/27/2024 18:55	2023	934	NA	NA	Subyearling
Green Peter HOR Quartzville	9/9/2024 17:55	2023	2492	120.5	18.4	Subyearling
Green Peter HOR Middle Santiam	9/10/2024 16:35	2023	2496	122.4	19.7	Subyearling
Green Peter HOR Middle Santiam	10/8/2024 16:00	2023	2500	130.4	23	Subyearling
Green Peter HOR Quartzville	10/9/2024 15:30	2023	2450	131.5	24.6	Subyearling
Green Peter Tailrace	10/10/2024 15:30	2023	3999	133.2	26.3	Subyearling
Foster Head of Reservoir	10/15/2024 13:45	2023	4994	137.5	28.6	Subyearling
Foster Tailrace	10/15/2024 19:45	2023	3998	136.9	28.7	Subyearling

Table 13. Summary of PIT tagging sessions for juvenile Chinook salmon in the South Santiam basin (SST), including number of fish tagged (N), tagging dates, mortalities, and tag shedding rates.

Mark Group	N	Date Start	Date End	Mort	Mort. %	Sheds	Shed %
Green Peter Head of Reservoir Fry	5,071	5/15/2023	5/16/2023	74	1.46	32	0.63
Green Peter Head of Reservoir Fry	5,203	5/17/2023	5/18/2023	18	0.35	19	0.37
Fall 23 & Spring 2024 Bulk Group	47,407	8/14/2023	12/20/2023	128	0.27	101	0.21
Green Peter Head of Reservoir Fry	5,006	3/1/2024	3/3/2024	17	0.33	13	0.25
Green Peter Head of Reservoir Fry	5,000	3/18/2024	3/19/2024	12	0.23	20	0.39
Fall 24 & Spring 25 Bulk Group	45,000	6/26/2024	7/18/2024	62	0.14	108	0.24

Green Peter Dam

Injunction measures for Green Peter Dam (Figure 27) aim to balance water management and fish passage operations. Injunction Measure 12(a) outlines the spring and fall operational strategies to support juvenile salmon passage and improve downstream survival. In the spring, once Green Peter Reservoir reaches an elevation of 971 feet, continuous spilling begins and continues until May 1 or for at least 30 days, whichever is longer. Two spill strategies are tested: continuous (24/7) spill through a minimum gate opening of 1.5 feet and nighttime-only spill with a 3–4 foot gate opening from one hour before sunset to one hour after sunrise. In the fall, Green Peter

Reservoir is drawn down to a target elevation of 780 feet by November 15 and maintained at that elevation until December 15. During this period, regulating outlets are prioritized for flow discharge once the reservoir falls below the minimum power pool elevation of 887 feet. Refilling of the reservoir begins after December 15, with operations guided by hydrologic conditions and fish passage needs.

To assess the efficacy of the injunction measures at Green Peter Dam in improving downstream passage and reducing reservoir residence time for juvenile salmon, we released targeted groups of PIT-tagged fish. These fish were released upstream of Green Peter Dam, and their movements were tracked through the reservoir and downstream. The data collected provides insights into the effectiveness of the spill and drawdown operations outlined in Injunction Measure 12(a), particularly in enhancing fish passage and reducing residency in the reservoir. The following sections provide details pertaining to the release of PIT-tagged juvenile Chinook salmon, and analysis of their passage timing, downstream detection rates, and behavior relative to reservoir operations.

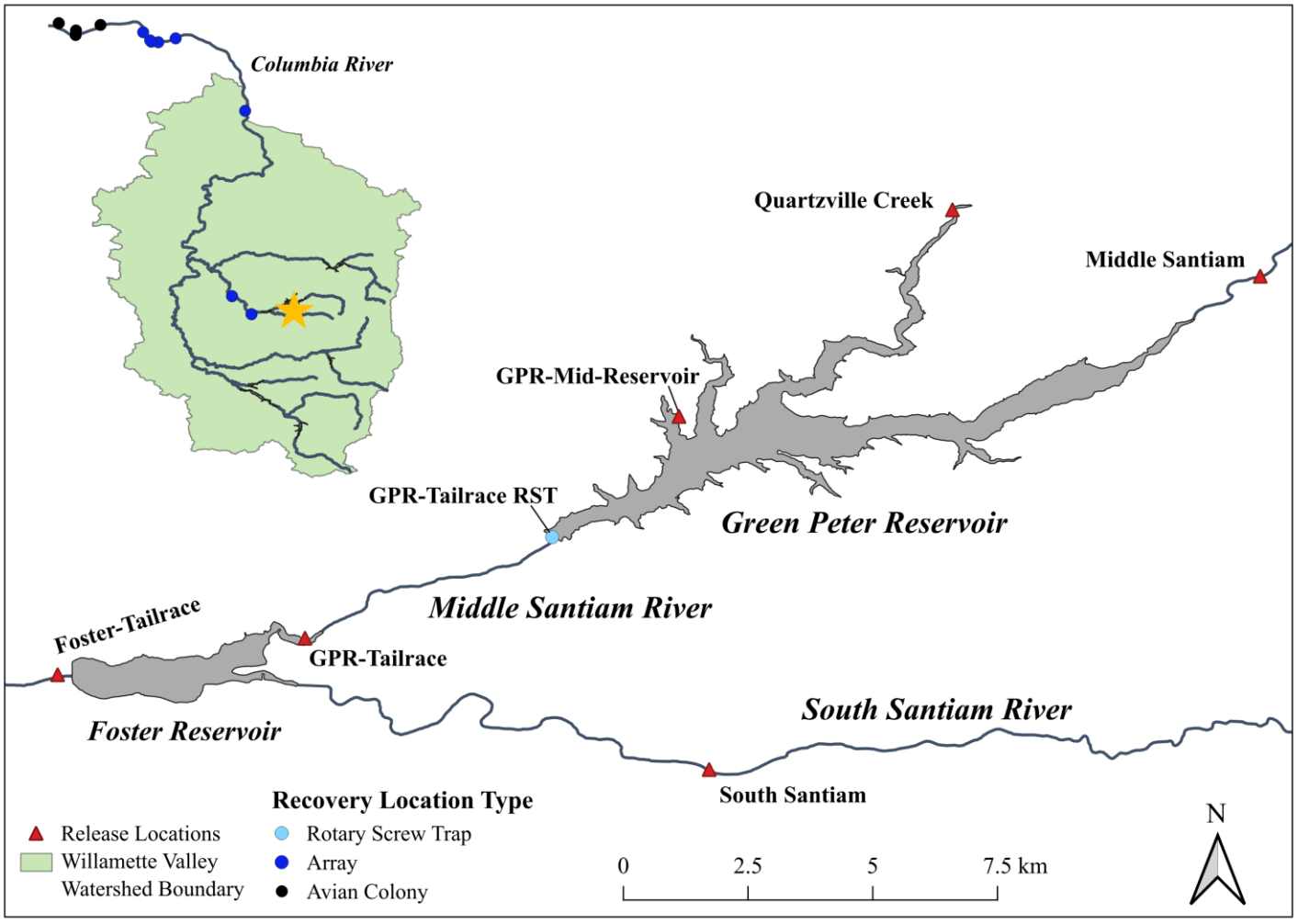

Figure 27. Map of release and recovery locations within the Green Peter Dam and Foster Dam project areas.

Target: Spring Fry Migration – Spring Spill Operations

Brood Year 2022

This release group of BY 2022 PIT-tagged juvenile Chinook salmon fry was intended to assess movement patterns and passage rates during the spring spill operations at Green Peter Dam. Spill operations began on April 10, 2023, at a forebay elevation of approximately 976 feet. Continuous 24/7 spill operations lasted through June 5, 2023, before transitioning to powerhouse flow during the day and 50 cfs of regulating outlet flow at night through September. Starting in early October, dam operations directed all flow through the regulating outlet through the end of 2023. The release took place on May 22, 2023, at the head of the reservoir and consisted of 5,171 fish released into Quartzville Creek and 4,961 fish released into the Middle Santiam River. These fish had a mean fork length of 58 millimeters. The release coincided with a forebay elevation of 1007 feet and continuous spill operations.

A single fish from this release group was detected downstream of Green Peter Dam in the Green Peter tailrace RST, resulting in an overall recapture rate of 0.01%. This fish had a travel time of 5.6 days (Table 14).

Table 14. Detection summary of PIT-tagged juvenile Chinook salmon released in the Green Peter Dam (GPR) project area. Release locations: Mid = Mid-Reservoir, MST = Head of Reservoir Middle Santiam Arm, Tailrace, QTZ = Head of Reservoir Quartzville Arm. Observation locations: ASMEBER = Astoria Meglar Bridge, GPR = Green Peter Dam, Lebanon = Lebanon Dam Array, PD5-8 = Columbia River Pile Dike Arrays 5-8, MSANTR = Middle Santiam River, RICEIS = Rice Island, TTOWER = Transmission Towers near Troutdale, TWX = Columbia River Towed Array. Headers: Count = Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Mean Fork Length = mean fork length at release and recapture.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
GPR	5/22/2023	MST	GPR	RST	1	0.02	5.6	5.6	5.6	56.2	54.0
GPR	9/20/2023	QTZ	GPR	RST	1	0.04	208.9	208.9	208.9	113.5	151.0
GPR	9/20/2023	QTZ	Lebanon	Array	4	0.16	43.0	76.6	248.2	113.5	NA
GPR	9/20/2023	QTZ	TWX	Array	1	0.04	226.8	226.8	226.8	113.5	NA
GPR	9/20/2023	QTZ	PD6	Array	1	0.04	227.0	227.0	227.0	113.5	NA
GPR	9/20/2023	QTZ	ASMEBR	Predation	1	0.04	NA	NA	NA	113.5	NA
GPR	9/21/2023	MST	GPR	RST	12	0.48	10.9	18.9	207.9	117.1	155.2
GPR	9/21/2023	MST	Lebanon	Array	2	0.08	49.9	60.6	71.2	117.1	NA
GPR	9/21/2023	MST	TWX	Array	1	0.04	223.3	223.3	223.3	117.1	NA
GPR	9/21/2023	MST	PD6	Array	1	0.04	227.6	227.6	227.6	117.1	NA
GPR	9/21/2023	MST	PD5	Array	2	0.08	221.0	224.4	227.8	117.1	NA
GPR	10/3/2023	QTZ	GPR	RST	13	0.52	12.9	26.9	215.9	122.8	146.4
GPR	10/3/2023	QTZ	Lebanon	Array	9	0.36	27.3	35.5	193.4	122.8	NA
GPR	10/3/2023	QTZ	TWX	Array	2	0.08	211.3	216.8	222.3	122.8	NA
GPR	10/4/2023	MST	GPR	RST	12	0.48	4.9	25.9	197.9	119.6	143.7
GPR	10/4/2023	MST	Lebanon	Array	5	0.2	23.7	31.6	196.4	119.6	NA
GPR	10/4/2023	MST	TWX	Array	2	0.08	181.8	199.1	216.5	119.6	NA
GPR	10/4/2023	MST	PD7	Array	1	0.04	33.0	33.0	33.0	119.6	NA
GPR	10/4/2023	MST	PD5	Array	1	0.04	223.4	223.4	223.4	119.6	NA
GPR	10/9/2023	Tailrace	Lebanon	Array	49	1.22	4.0	33.2	83.8	125.9	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
GPR	10/9/2023	Tailrace	TWX	Array	1	0.02	189.6	189.6	189.6	125.9	NA
GPR	10/9/2023	Tailrace	PD7	Array	3	0.07	14.3	15.0	150.8	125.9	NA
GPR	10/9/2023	Tailrace	PD6	Array	1	0.02	184.4	184.4	184.4	125.9	NA
GPR	10/9/2023	Tailrace	PD5	Array	1	0.02	189.9	189.9	189.9	125.9	NA
GPR	2/21/2024	MST	GPR	RST	1	0.1	57.0	57.0	57.0	164.4	145.0
GPR	2/21/2024	MST	MSANTR	RST	2	0.2	1.0	1.0	1.0	164.4	149.0
GPR	2/21/2024	MST	Lebanon	Array	1	0.1	46.4	46.4	46.4	164.4	NA
GPR	2/21/2024	MST	PD8	Array	2	0.2	63.9	67.8	71.6	164.4	NA
GPR	2/21/2024	MST	PD7	Array	1	0.1	60.1	60.1	60.1	164.4	NA
GPR	2/21/2024	MST	PD6	Array	1	0.1	62.7	62.7	62.7	164.4	NA
GPR	2/21/2024	MST	PD5	Array	3	0.3	49.3	62.3	64.8	164.4	NA
GPR	2/21/2024	MST	ASMEBR	Predation	2	0.2	NA	NA	NA	164.4	NA
GPR	2/22/2024	QTZ	QUARTC	Trap Net	1	0.1	5.9	5.9	5.9	150.8	NA
GPR	2/22/2024	Mid	GPR	RST	8	0.4	55.7	57.7	72.7	153.8	149.6
GPR	2/22/2024	QTZ	GPR	RST	2	0.2	7.0	33.0	59.0	150.8	184.0
GPR	2/22/2024	Mid	MSANTR	Trap Net	1	0.05	10.8	10.8	10.8	153.8	NA
GPR	2/22/2024	Mid	Lebanon	Array	4	0.2	32.3	39.0	58.5	153.8	NA
GPR	2/22/2024	QTZ	Lebanon	Array	2	0.2	47.2	53.0	58.7	150.8	NA
GPR	2/22/2024	Mid	PD8	Array	1	0.05	63.2	63.2	63.2	153.8	NA
GPR	2/22/2024	QTZ	PD8	Array	1	0.1	60.7	60.7	60.7	150.8	NA
GPR	2/22/2024	Mid	TWX	Array	3	0.15	70.1	70.1	71.1	153.8	NA
GPR	2/22/2024	QTZ	TWX	Array	2	0.2	74.5	76.7	79.0	150.8	NA
GPR	2/22/2024	Mid	PD6	Array	4	0.2	43.1	59.2	69.5	153.8	NA
GPR	2/22/2024	QTZ	PD6	Array	2	0.2	43.6	49.6	55.7	150.8	NA
GPR	2/22/2024	Mid	PD5	Array	1	0.05	58.1	58.1	58.1	153.8	NA
GPR	2/22/2024	QTZ	PD5	Array	6	0.59	43.3	56.7	65.3	150.8	NA
GPR	2/22/2024	Mid	ASMEBR	Predation	2	0.1	NA	NA	NA	153.8	NA
GPR	2/22/2024	QTZ	ASMEBR	Predation	1	0.1	NA	NA	NA	150.8	NA
GPR	2/23/2024	Mid	GPR	RST	4	0.2	55.0	56.5	62.0	159.4	155.8
GPR	2/23/2024	Mid	Lebanon	Array	6	0.3	27.2	42.6	46.4	159.4	NA
GPR	2/23/2024	Tailrace	Lebanon	Array	1	0.1	17.4	17.4	17.4	163.4	NA
GPR	2/23/2024	Mid	TTOWER	Predation	1	0.05	NA	NA	NA	159.4	NA
GPR	2/23/2024	Mid	PD8	Array	1	0.05	96.0	96.0	96.0	159.4	NA
GPR	2/23/2024	Mid	TWX	Array	5	0.25	40.0	55.0	70.8	159.4	NA
GPR	2/23/2024	Tailrace	TWX	Array	1	0.1	75.9	75.9	75.9	163.4	NA
GPR	2/23/2024	Mid	PD7	Array	2	0.1	45.3	58.7	72.2	159.4	NA
GPR	2/23/2024	Mid	PD6	Array	4	0.2	36.5	44.1	68.3	159.4	NA
GPR	2/23/2024	Mid	PD5	Array	4	0.2	48.5	57.6	71.7	159.4	NA
GPR	2/23/2024	Tailrace	PD5	Array	2	0.2	44.2	49.0	53.8	163.4	NA
GPR	2/23/2024	Mid	ASMEBR	Predation	2	0.1	NA	NA	NA	159.4	NA
GPR	2/23/2024	Tailrace	COLR2	Predation	1	0.1	NA	NA	NA	163.4	NA
GPR	3/6/2024	MST	QUARTC	Trap Net	1	0.04	161.9	161.9	161.9	50.1	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
GPR	3/6/2024	QTZ	QUARTC	Trap Net	1	0.04	20.7	20.7	20.7	51.3	NA
GPR	3/6/2024	QTZ	QUARTC	Trap Net	1	0.04	202.8	202.8	202.8	51.3	NA
GPR	3/6/2024	MST	GPR	RST	6	0.24	55.8	62.3	93.8	50.1	101.5
GPR	3/6/2024	QTZ	GPR	RST	3	0.12	63.7	93.7	95.7	51.3	111.7
GPR	3/6/2024	MST	MSANTR	Trap Net	2	0.08	7.7	41.7	75.8	50.1	NA
GPR	3/6/2024	MST	MSANTR	Trap Net	6	0.24	154.8	167.8	245.9	50.1	NA
GPR	3/6/2024	MST	MSANTR	RST	28	1.12	0.9	0.9	245.9	50.1	67.0
GPR	3/6/2024	QTZ	MSANTR	Trap Net	3	0.12	244.7	244.8	244.9	51.3	NA
GPR	3/6/2024	QTZ	MSANTR	RST	1	0.04	245.8	245.8	245.8	51.3	273.0
GPR	3/6/2024	MST	Lebanon	Array	2	0.08	75.9	86.9	97.9	50.1	NA
GPR	3/6/2024	QTZ	Lebanon	Array	3	0.12	69.4	98.1	104.0	51.3	NA
GPR	3/6/2024	MST	TWX	Array	1	0.04	77.6	77.6	77.6	50.1	NA
GPR	3/6/2024	QTZ	TWX	Array	2	0.08	96.5	97.8	99.0	51.3	NA
GPR	3/6/2024	MST	RICEIS	Predation	1	0.04	NA	NA	NA	50.1	NA
GPR	4/12/2024	QTZ	QUARTC	Trap Net	2	0.08	179.9	186.4	192.9	54.9	NA
GPR	4/12/2024	MST	GPR	RST	4	0.17	57.0	58.5	59.0	52.4	118.5
GPR	4/12/2024	QTZ	GPR	RST	11	0.44	55.9	57.9	187.9	54.9	134.0
GPR	4/12/2024	MST	MSANTR	Trap Net	2	0.09	52.9	52.9	52.9	52.4	NA
GPR	4/12/2024	MST	MSANTR	Trap Net	11	0.47	167.0	208.0	208.9	52.4	NA
GPR	4/12/2024	MST	MSANTR	RST	28	1.19	1.0	1.0	210.0	52.4	106.9
GPR	4/12/2024	QTZ	MSANTR	Trap Net	11	0.44	68.8	208.8	209.0	54.9	NA
GPR	4/12/2024	QTZ	MSANTR	RST	5	0.2	202.9	209.0	210.0	54.9	259.2
GPR	4/12/2024	MST	Lebanon	Array	3	0.13	62.5	72.2	223.8	52.4	NA
GPR	4/12/2024	QTZ	Lebanon	Array	3	0.12	40.3	91.2	209.7	54.9	NA
GPR	9/9/2024	QTZ	GPR	RST	1	0.04	34.7	34.7	34.7	120.5	159.0
GPR	9/9/2024	QTZ	MSANTR	Trap Net	10	0.4	42.6	57.8	58.8	120.5	NA
GPR	9/9/2024	QTZ	MSANTR	RST	7	0.28	58.8	59.8	60.8	120.5	188.6
GPR	9/9/2024	QTZ	Lebanon	Array	4	0.16	57.4	60.1	61.5	120.5	NA
GPR	9/9/2024	QTZ	PD6	Array	1	0.04	67.3	67.3	67.3	120.5	NA
GPR	9/10/2024	MST	GPR	RST	5	0.2	33.8	35.8	50.8	122.4	168.8
GPR	9/10/2024	MST	MSANTR	Trap Net	18	0.72	1.7	56.8	57.9	122.4	NA
GPR	9/10/2024	MST	MSANTR	RST	7	0.28	53.8	58.8	58.8	122.4	171.7
GPR	9/10/2024	MST	Lebanon	Array	2	0.08	57.3	63.7	70.1	122.4	NA
GPR	10/8/2024	MST	GPR	RST	11	0.44	3.8	4.8	20.8	130.4	137.4
GPR	10/8/2024	MST	MSANTR	Trap Net	8	0.32	27.8	28.4	29.8	130.4	NA
GPR	10/8/2024	MST	MSANTR	RST	8	0.32	28.8	30.8	32.8	130.4	157.9
GPR	10/8/2024	MST	Lebanon	Array	6	0.24	34.2	36.3	69.6	130.4	NA
GPR	10/9/2024	QTZ	QUARTC	Trap Net	1	0.04	13.8	13.8	13.8	131.5	NA
GPR	10/9/2024	QTZ	GPR	RST	25	1.02	2.8	4.8	19.8	131.5	134.2
GPR	10/9/2024	QTZ	MSANTR	Trap Net	7	0.29	26.8	27.9	28.9	131.5	NA
GPR	10/9/2024	QTZ	MSANTR	RST	6	0.24	25.9	30.9	31.9	131.5	158.2
GPR	10/9/2024	QTZ	Lebanon	Array	11	0.45	12.8	30.6	68.7	131.5	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (mm)	
							Min	Median	Max	Release	Recapture
GPR	10/10/2024	Tailrace	Lebanon	Array	33	0.83	1.3	2.0	41.6	133.2	NA
GPR	10/10/2024	Tailrace	PD6	Array	2	0.05	13.3	19.8	26.2	133.2	NA

Brood Year 2023

On March 6, 2024, PIT-tagged BY 2023 Chinook salmon fry were released to target the first spring spill block—nighttime spill—at Green Peter Dam. A total of 2,506 fry were released at the head of the reservoir in the Middle Santiam Arm (mean FL = 50.1 mm; mean weight = 1.4 g), and 2,500 fry were released at the head of the reservoir in the Quartzville Creek Arm (mean FL = 51.3 mm; mean weight = 1.4 g). Nighttime spill operations commenced on March 13, 2024.

A total of 19 fish from the March 6 release group were detected downstream of Green Peter Dam, resulting in an overall detection rate of 0.3% (Table 14). Of these, nine fish were detected at the Green Peter tailrace RST with six detections occurring during the continuous spill block and three during a short surface spill event in June (Figure 28).

In addition to the fish detected at the Green Peter tailrace RST, five fish were detected at the Lebanon Dam array, three were detected in the Columbia Towed array, and a single PIT tag was recovered from the Rice Island avian colony.

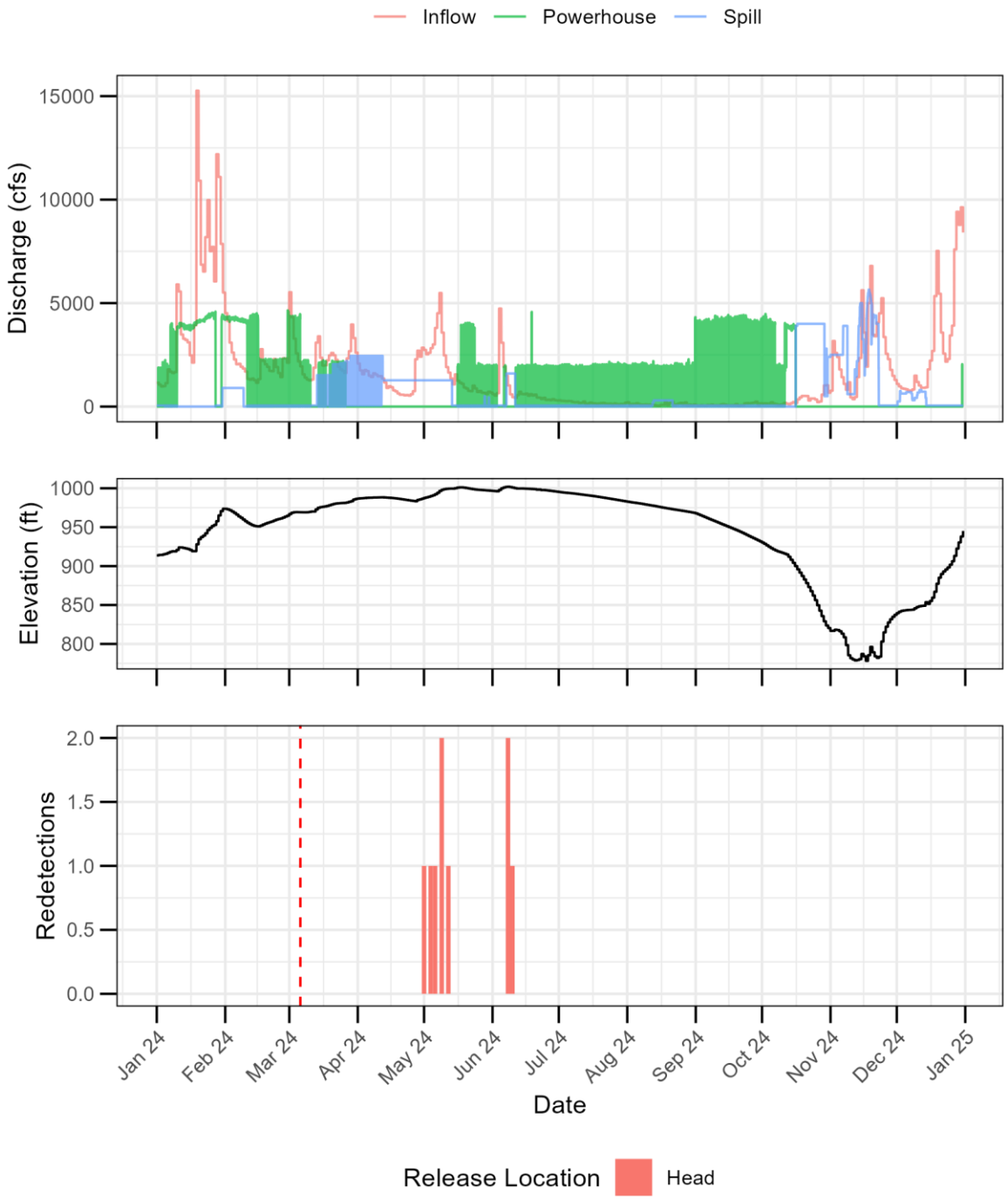

Figure 28. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Green Peter Reservoir on March 6, 2024 and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Approximate release date is represented by the dashed vertical line.

On April 12, 2024, a second group of fry was released to target the second spring spill block—continuous spill—at Green Peter Dam. This release included 2,350 fry in the Middle Santiam Arm (mean FL = 52.4 mm; mean weight = 1.5 g) and 2,500 fry in the Quartzville Creek Arm (mean FL = 54.9 mm; mean weight = 1.7 g). Continuous spill commenced on April 12, 2024.

There were a total of 21 detections from this release group at locations downstream of Green Peter Dam, resulting in an overall detection rate of 0.4% (Table 14). Of these, 15 detections occurred at the Green Peter tailrace RST, with 11 fish from the Quartzville Creek release and four from the Middle Santiam River release, both showing a median travel time of 58 days to the tailrace. The majority of these detections (14 fish) were recorded in the tailrace RST between June 7 and June 11, 2024, during a period of continuous surface spill. Notably, this spill event occurred after the scheduled continuous surface spill block (ending June 5, 2023) and was implemented to adjust temperatures in Foster Reservoir for a triathlon. The single remaining detection occurred during regulating outlet operations in fall 2024, coinciding with the deep drawdown period (Figure 29).

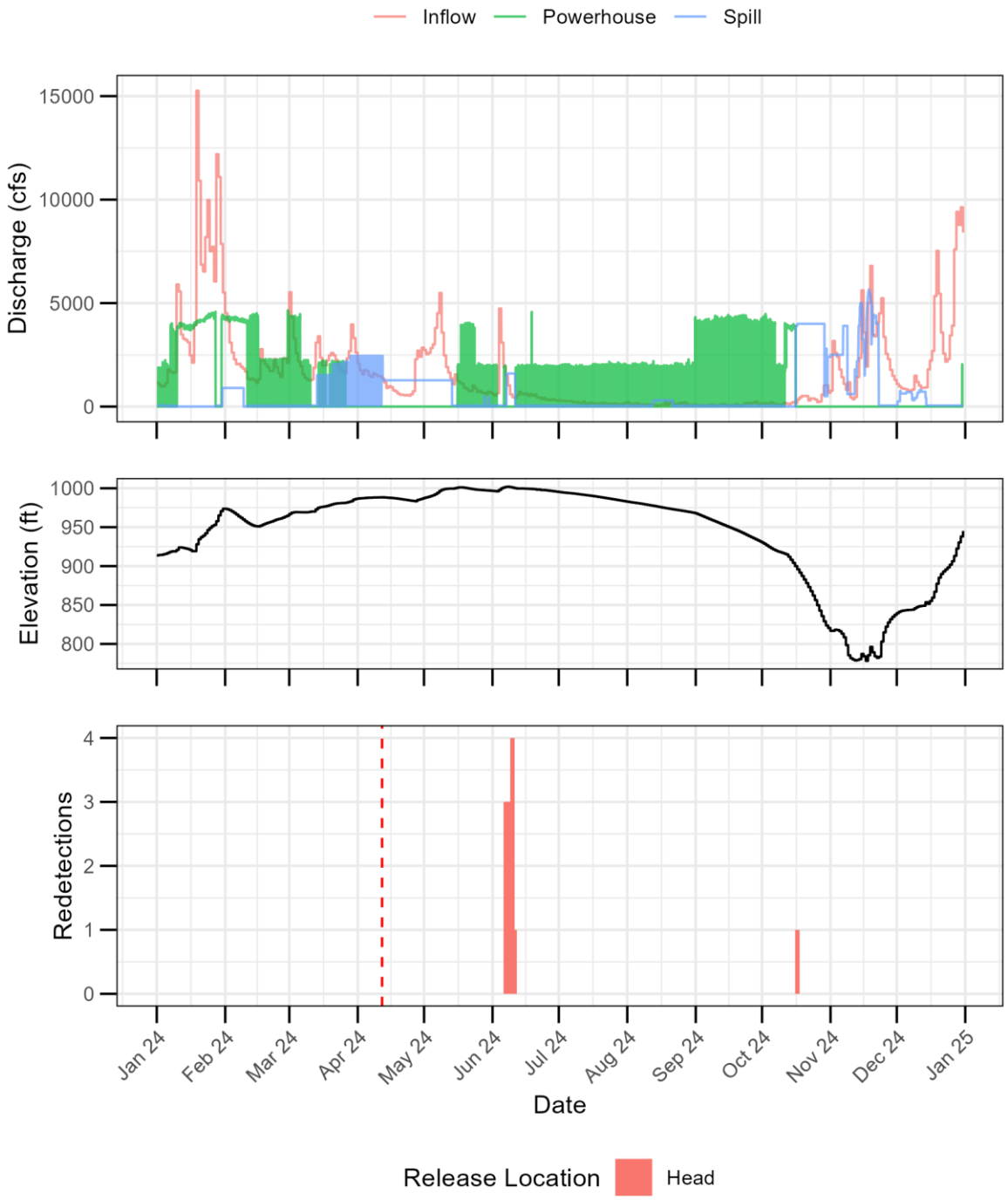

Figure 29. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Green Peter Reservoir on April 12, 2024 and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Comparison

For BY 2022 10,132 PIT-tagged fry were released during continuous 24/7 spill, resulting in only one detection downstream (detection rate: 0.01%), though low detection rates do not necessarily indicate low passage success, as undetected fish may have also passed. For BY 2023, two release groups targeted nighttime and continuous spill blocks during spring 2024. The first release (5,006 fry) during nighttime spill yielded 18 detections (detection

rate: 0.3%), while the second release (4,850 fry) during continuous spill resulted in 21 detections (detection rate: 0.4%), with the vast majority of detections occurring during spring surface spill operations. While detection rates were very low overall, all detections from these release groups below Green Peter Dam took place during non-powerhouse operations.

Target: Fall Subyearling Migration – Early Phase Fall Deep Drawdown Operations

Brood Year 2022

This release group of BY 2022 PIT-tagged juvenile Chinook salmon was intended to assess movement patterns and passage rates of subyearling Chinook salmon during the initial phase of the fall deep drawdown at Green Peter Dam. On September 20 and 21, 2023, a group of 5,026 subyearlings was split between the Quartzville and Middle Santiam arms at the head of the reservoir. Fish released into the Quartzville Creek arm (n = 2,518) had a mean fork length of 114 millimeters and a mean weight of 20 grams, while the group of fish released into the Middle Santiam arm (n = 2,508) had a mean fork length of 117 millimeters and a mean weight of 21 grams. At the time of release, the forebay elevation was approximately 908 feet, with discharge primarily directed through the powerhouse and 50 cfs through nighttime regulating outlet spill.

A total of 26 fish from the head of reservoir releases were subsequently detected downstream of Green Peter Dam, resulting in an overall detection rate of 0.5%. Of these, eight detections were from fish released in the Quartzville arm and 18 from the Middle Santiam arm, with the largest number of downstream detections at the Green Peter Dam RST (n = 13), followed by the Lebanon Dam array (n = 6), various Columbia River arrays (n = 6), and the Astoria Meglar Bridge avian colony (n = 1). At the Green Peter RST, the median travel time to detection was 18.9 days for the Middle Santiam Arm release, while the single detection from the Quartzville Creek Arm took 209 days. Of the 13 RST detections, 11 occurred between October 2 and October 30, 2023, as the reservoir elevation drew down from 900 feet to 807 feet (Figure 30). During this period, dam operations split flow between the powerhouse and regulating outlet from October 2 to October 5 (six detections), before directing all flow through the regulating outlet starting October 6 (five detections). The remaining two RST detections occurred the following spring during the continuous surface spill block. All detections from this release group coincided with the deep drawdown or spring surface spill, suggesting that these measures may have facilitated downstream passage for the detected fish.

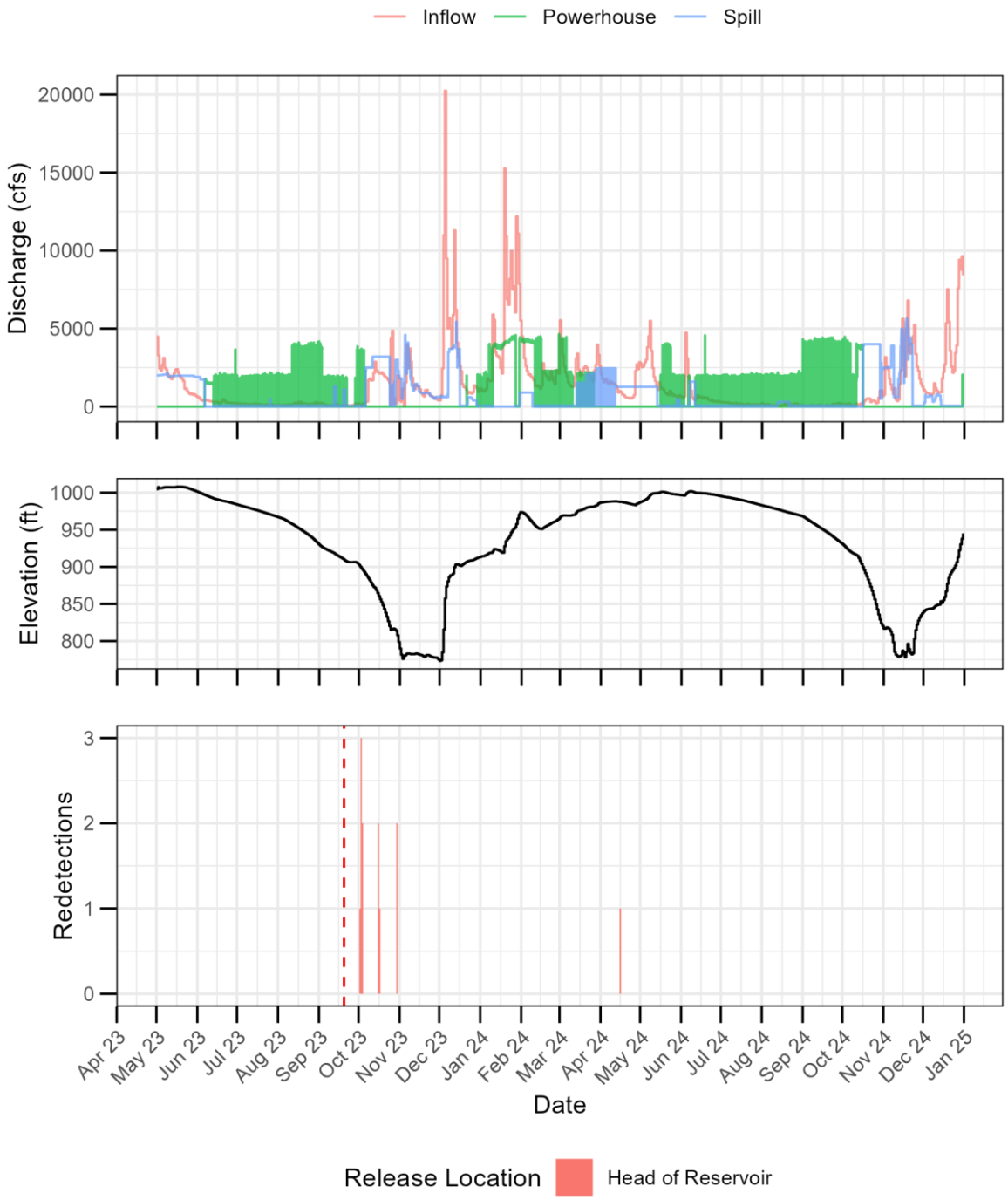

Figure 30. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Green Peter Reservoir on September 20-21, 2023 and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Brood Year 2023

A total of 4,992 BY 2023 juvenile Chinook salmon were released at the head of Green Peter Reservoir to evaluate subyearling movement patterns during the early phase of the fall deep drawdown. Of these, 2,492 fish (mean fork length: 120.5 mm; mean weight: 18.4 g) were released into Quartzville Creek on September 9, 2024, and 2,496

fish (mean fork length: 122.4 mm; mean weight: 19.7 g) were released into the Middle Santiam on September 10, 2024. At the time of release, the forebay elevation was approximately 958 feet, and flow was directed almost entirely through the powerhouse. Drafting of the reservoir increased on October 13, 2024, at a rate of approximately four feet per day, marking the start of the fall deep drawdown. Regulating outlet operations commenced on October 16, 2024, and the target drawdown elevation of 780 feet was reached by November 11, 2024.

A total of 13 fish from this release have subsequently been detected downstream of Green Peter Dam, resulting in an overall detection rate of 0.2%. Of those, just six were detected in the Green Peter tailrace RST (one from Quartzville and five from the Middle Santiam). These fish had a median travel time from release to the tailrace of approximately 35 days. All of these fish were detected in the tailrace between October 14 and October 31, 2024 during the fall deep drawdown (Figure 31).

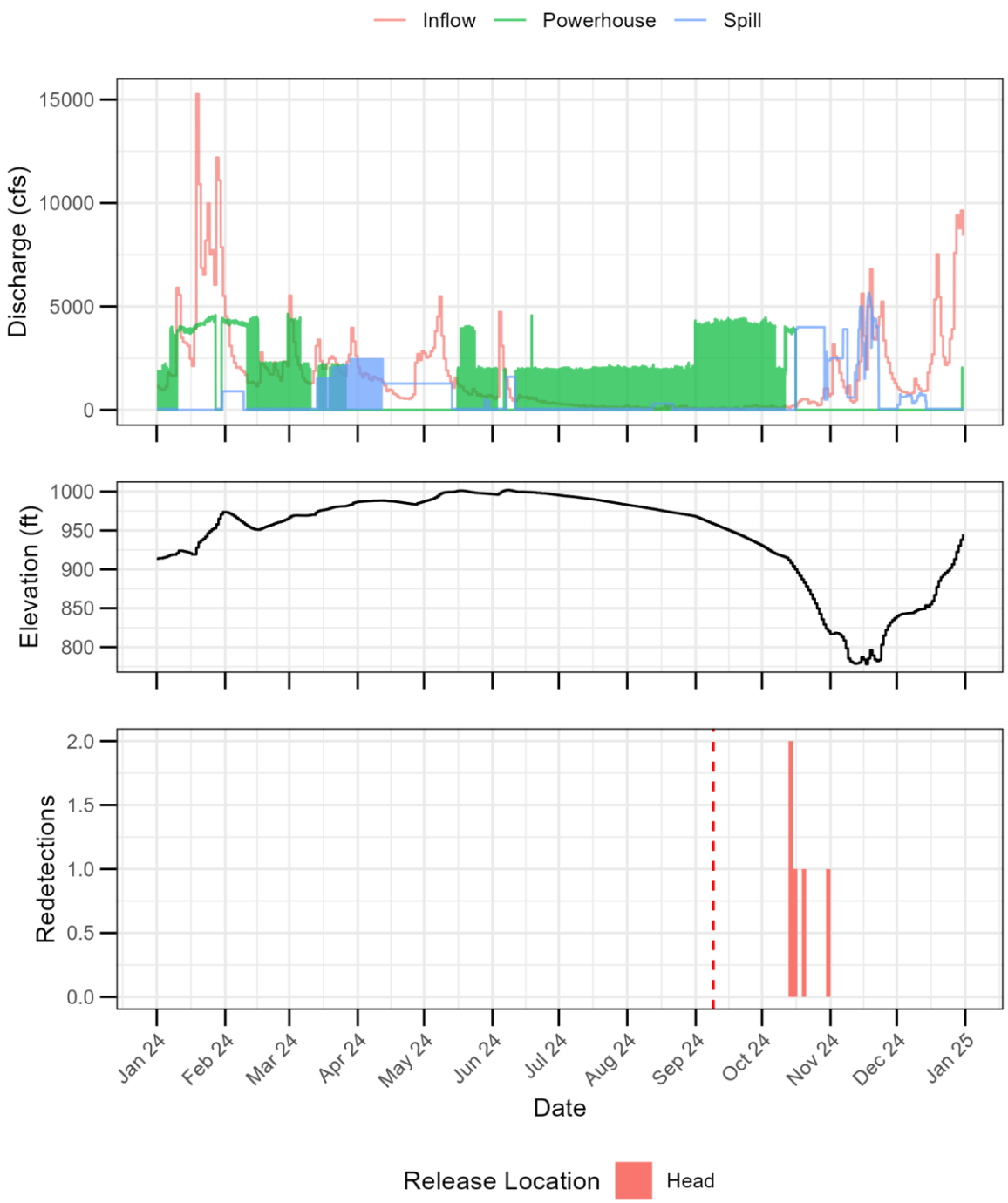

Figure 31. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Green Peter Reservoir on September 9, and September 20, 2024 and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Comparison

For brood year 2022, 5,026 subyearlings were released at the head of Green Peter Reservoir, resulting in an overall downstream detection rate of 0.5% (26 fish detected). Of the 13 fish detected at the Green Peter Dam RST, 11 were recorded during the fall deep drawdown (October 2–30, 2023), with six detections during split flow

(powerhouse and regulating outlet) and five during regulating outlet-only flow, while the remaining two detections occurred during the spring surface spill block in 2024. For brood year 2023, 4,992 subyearlings were released, with a lower overall detection rate of 0.2% (13 fish detected). Of these, six fish were detected at the Green Peter Dam RST, all during the fall deep drawdown between October 14 and October 31, 2024, coinciding with regulating outlet operations. Across both release groups targeting the early phase of the fall drawdown at Green Peter Dam, 39 fish were detected downstream of the dam, and all RST detections coincided with injunction-driven operations (fall drawdown or spring spill). However, the low detection rates (0.2%–0.5%) indicate that these observations reflect only a small fraction of the released fish, limiting the ability to confidently infer a broader relationship between injunction measures and fish passage at Green Peter Dam.

Target: Fall Subyearling Migration – Mid Deep Drawdown Operations

Brood Year 2022

This release group of PIT-tagged juvenile Chinook salmon was intended to assess movement patterns and passage rates of subyearling Chinook salmon during the middle of the fall deep drawdown at Green Peter Dam. On October 3 and 4, releases were conducted at the head of the reservoir. The head of the reservoir release was split between the Quartzville Creek arm (n = 2,502) and the Middle Santiam arm (n = 2,516). The Quartzville Creek group had a mean fork length of 123 millimeters and a mean weight of 25 grams, while the Middle Santiam group had a mean fork length of 120 millimeters and a mean weight of 24 grams. These fish were released mid-deep drawdown when the forebay elevation was approximately 896 feet, and discharge was distributed through both spill and powerhouse operations.

There were 45 detections of this release group downstream of Green Peter Dam, resulting in an overall detection rate of 0.8 percent. Of those, 25 were detected in the Green Peter tail exhibiting median travel times from release to detection of 25.9 for the Middle Santiam group and 26.9 days for the Quartzville Creek group. (Table 14). Detection rate at the Green Peter RST was nearly identical between release groups. The Middle Santiam group had 12 detections (recapture rate; 0.48%) and the Quartzville Creek group had 13 detections (recapture rate: 0.52). Mean fork lengths at redetection ranged from 143.7 to 146.4 millimeters, depending on the release group, representing a mean increase of approximately 24 millimeters compared to the mean fork length at release.

The majority of these fish were detected during the deep drawdown of the reservoir (n = 21), but there were also a few detections during the first spring spill block of the following year (Figure 32). All of the redetections at the Green Peter Dam RST occurred during non-powerhouse operations. In addition to the recaptures in the tailrace, there was a total of 14 detections at the Lebanon Dam PIT tag array. These included nine detections from the Quartzville Creek group, with a mean travel time of 36 days, and 5 detections from the Middle Santiam group, with a median travel time of 32 days. Lastly there were six detection across various Columbia River arrays.

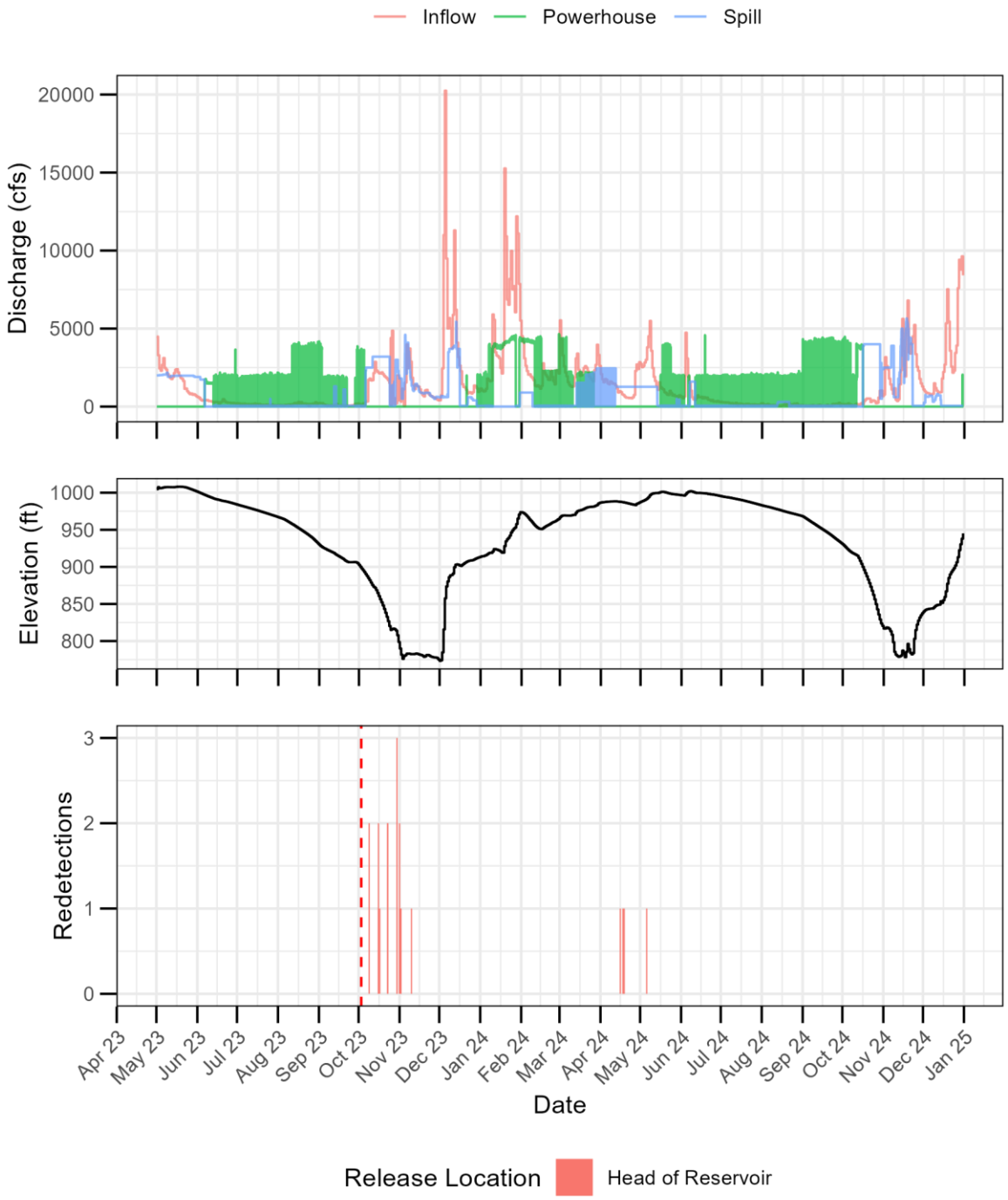

Figure 32. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Green Peter Reservoir on October 3, and October 4, 2023, and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Brood Year 2023

A total of 4,450 BY 2023 juvenile Chinook salmon were released at the head of reservoir to evaluate the movement and passage rates of subyearlings during mid-deep drawdown operations at Green Peter Dam. Of these 2,500 were released into the Middle Santiam (mean fork length: 130.4 mm; mean weight: 23.0 g) on October 8,

2024 and 2,450 were released into Quartzville Creek (mean fork length: 131.5 mm; mean weight 24.6 g) on October 9, 2024 (Table 14). At release, mean forebay elevation was approximately 918 feet and the majority of discharge was through the powerhouse. Drafting of the reservoir increased on October 13, 2024, at a rate of approximately four feet per day, marking the start of the fall deep drawdown. Regulating outlet operations commenced on October 16, 2024, and the target drawdown elevation of 780 feet was reached by November 11, 2024.

A total of 53 fish from this release group were subsequently detected downstream of Green Peter Dam, resulting in an overall detection rate of 1.2% (Table 14). Of these, 36 were detected in the Green Peter tailrace RST, representing a recapture rate of 0.8%. Among the tailrace detections, 25 fish were from the Quartzville arm and 11 were from the Middle Santiam arm. The median travel time from release to redetection in the tailrace was 4.8 days for both groups. All detections at the tailrace RST occurred between October 12 and October 29, during which the forebay elevation drafted from 914 feet to 828 feet. Notably, all detections between October 12 and October 15 occurred when discharge was directed entirely through the powerhouse (n = 24), while detections between October 16 and October 29 coincided with discharge being directed entirely via spill (n = 12; Figure 33).

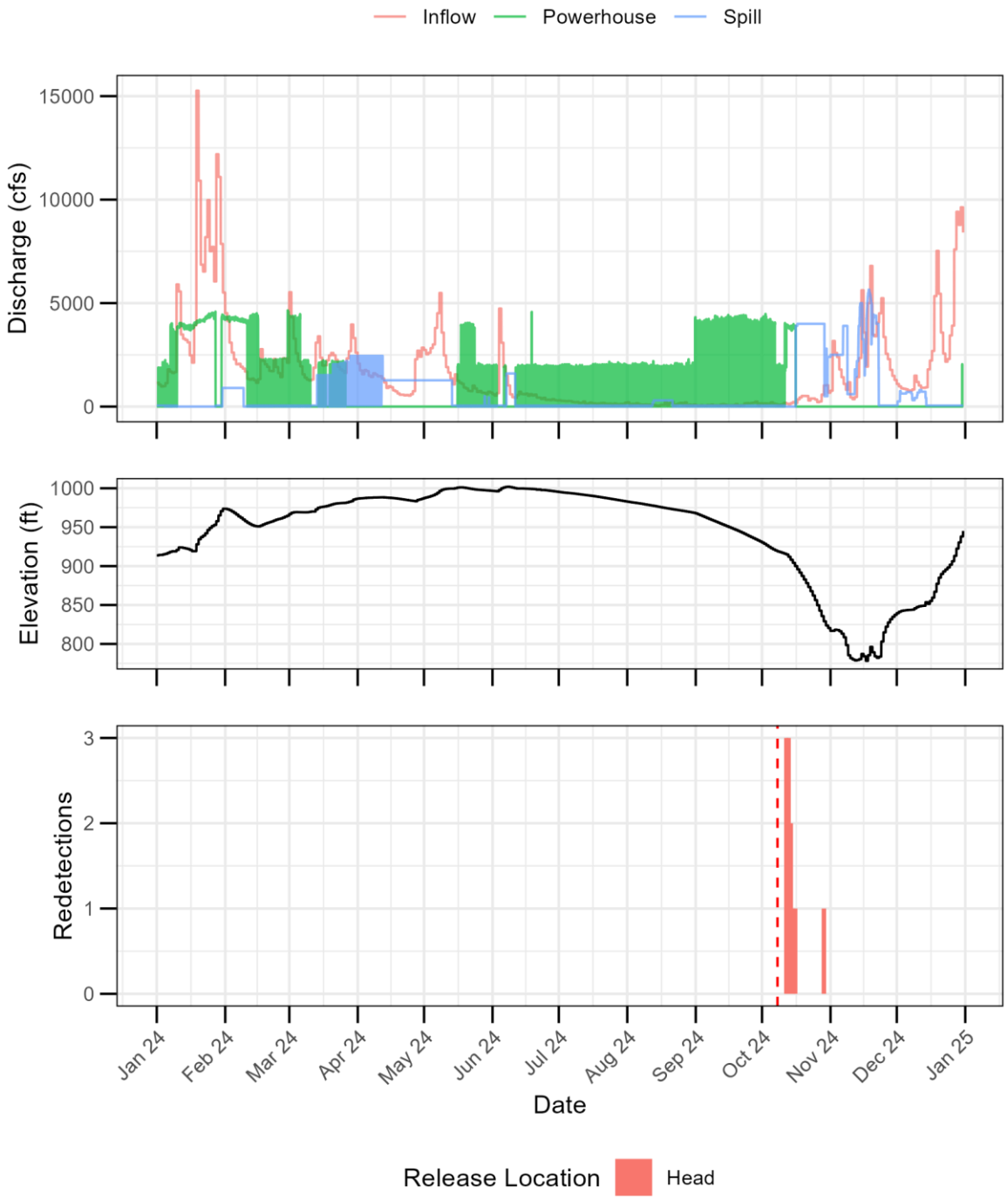

Figure 33. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of Green Peter Reservoir on October 8, and October 9, 2024, and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Comparison

A total of 5,018 BY 2022 subyearlings were released into the Quartzville Creek and Middle Santiam arms of the reservoir during mid-drawdown, with an overall downstream detection rate of 0.8% (45 fish detected). A total of 25 fish were detected directly below Green Peter Dam in the tailrace RST. Median travel times to the Green Peter

tailrace RST were 25.9 days for the Middle Santiam group and 26.9 days for the Quartzville Creek group. All of the detections in the Green Peter RST coincided with spill operations, and 84% of those (n = 21), took place during the fall deep drawdown.

Compared to BY 2022, the release of BY 2023 subyearlings has had a higher overall downstream detection rate of 1.2% (53 fish detected) and a shorter median travel time from release to the Green Peter tailrace of 4.8 days. Note that these metrics will likely change as new detection data becomes available in 2025. Generally speaking, in both years detections at the tailrace RST have been concentrated during the deep drawdown period.

Target: Spring Yearling Migration – Spring Spill Operations

This release group of PIT-tagged yearling juvenile Chinook salmon was intended to assess movement patterns and passage rates of yearling Chinook salmon during spring spill operations at Green Peter Dam. On February 21, 1,004 yearlings were released at the head of the reservoir in the Middle Santiam Arm (mean FL = 164.4 mm; mean weight = 51.6 g; Table 14). The following day, February 22, saw the release of 1,014 yearlings at the head of the reservoir in the Quartzville Creek Arm (mean FL = 150.8 mm; mean weight = 40.2 g), and 2,006 yearlings at the Thistle Boat Ramp in the mid-reservoir area (mean FL = 153.8 mm; mean weight = 42.9 g). On February 23, another 2,003 yearlings were released at the Thistle Boat Ramp (mean FL = 159.4 mm; mean weight = 46.5 g). Forebay elevation averaged 957 feet at the time of release with most discharge being directed through the powerhouse and an average of 50 cfs via nighttime spill (Figure 34).

A total of 81 fish from these releases were later detected at various locations downstream of Green Peter Dam, resulting in an overall detection rate of 1.4% (Table 14). Surprisingly, only 15 of those detections occurred at the Green Peter Dam RST (recapture rate: 0.25%). The largest number of detections was recorded across a variety of Columbia River arrays (the Pile Dike arrays and the Towed array), with a total of 43 detections. There were also 13 detections at the Lebanon Dam array and eight tags recovered between the Astoria Meglar Bridge and Transmission Towers near Troutdale avian colonies.

All of the fish detected below Green Peter Dam at the RST were detected during continuous spring surface spill operations. While the detection rate below Green Peter Dam at the RST was low (0.25%), the relatively high detection rate at locations further downstream suggests that the spring spill operations were likely effective at safely passing a large number of juvenile Chinook salmon from these release groups. This is supported by the 43 detections across various Columbia River arrays, 13 detections at the Lebanon Dam array, and eight tag recoveries at the Astoria Meglar Bridge and Transmission Towers near Troutdale avian colonies.

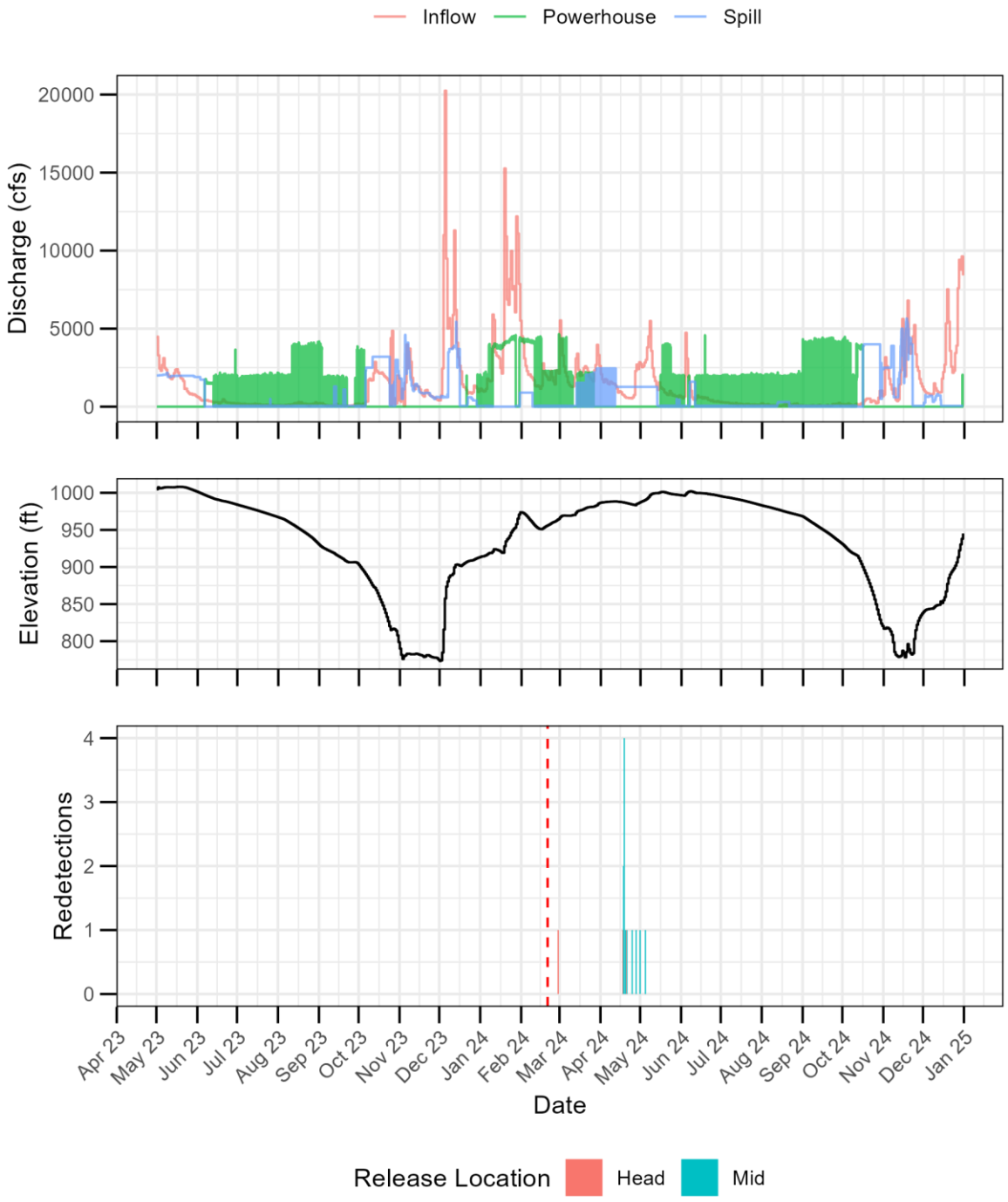

Figure 34. Green Peter project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released at the head of reservoir and at mid-reservoir in late February 2024 and subsequently recaptured in the Green Peter tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Summary – Green Peter

The data from PIT-tagged juvenile Chinook salmon at Green Peter Dam indicate that spill and drawdown operations may contribute to downstream passage, though low detection rates introduce significant uncertainty in assessing movement patterns and passage rates. Spill operations show signs of aiding fish passage; for example, during the spring migration of brood year 2022 yearlings, all detections at the Green Peter Dam rotary screw trap

occurred during continuous spill, and a downstream detection rate of 1.4% (81 fish) at Columbia River arrays and other locations suggests that spill operations may have supported passage for a notable number of fish.

Drawdown operations also appear to influence fish passage, particularly during the fall subyearling migration. For BY 2022 subyearlings, detections were concentrated during the early and mid-fall drawdown while the reservoir was drafting and regulating outlet operations were active. This suggests that the active drawdown period may create conditions that prompt rapid downstream movement.

The results provide some evidence that the injunction measures at Green Peter Dam, particularly the spill and drawdown strategies outlined in Injunction Measure 12(a), are effective in supporting downstream passage for juvenile Chinook salmon. The concentration of detections during spill operations and the faster travel times during active drawdown periods suggest that these measures are creating favorable conditions for juvenile Chinook salmon movement. However, the low detection rates at the Green Peter Dam RST (ranging from 0.01% to 1.4%) highlight the challenges of inferring true passage rates and movement patterns. Many fish likely passed undetected due to the limitations of screw trap capture efficiency, and the observed detections may not fully represent the behavior of the entire population. For instance, while only 15 fish were detected at the RST during the spring yearling migration of the 2022 cohort, the 43 detections at Columbia River arrays indicate that many more fish successfully navigated downstream. This underscores the importance of considering downstream detections when evaluating passage success.

In conclusion, the data suggest that the injunction measures at Green Peter Dam, particularly continuous spill and active drawdown operations, are effective in facilitating downstream passage for juvenile Chinook salmon. However, the low detection rates near the dam complicate efforts to fully understand movement patterns and true passage rates. Adaptive management strategies, informed by continued monitoring and refinement of detection methods, will be essential to optimize these operations and improve outcomes for juvenile salmon.

Foster Dam

Operations at Foster Dam (Figure 27) are governed by two primary injunction measures, Injunction Measure 13a and Injunction Measure 13b. Under Injunction Measure 13a, starting after Labor Day, the reservoir is drawn down to a forebay elevation of 620–625 feet by October 1. From October 1 to December 15, the spillway operates from one hour before sunset to one-half hour after sunrise, while turbine unit 1 operates minimally to balance total dissolved gas (TDG) levels. During daylight hours, full power generation occurs through turbines, and the spillway is used only when necessary for flood risk management.

Under Injunction Measure 13b, in spring, beginning February 1, the reservoir is maintained at a minimum conservation pool elevation of 613 feet, with spill prioritized during nighttime hours. Refill begins on May 15, targeting full pool by Memorial Day. These measures aim to improve fish passage and survival, focusing on juvenile salmon and steelhead, while balancing water temperature and TDG levels downstream through adaptive management strategies.

Target: Late Summer/Fall Subyearling Movement Patterns – Fall Spill Operations

Brood Year 2022

The first release of PIT-tagged juvenile Chinook salmon above Foster Dam occurred on August 24, 2023. A total of 2,059 subyearlings were released into the head of Foster Reservoir (Table 15; Figure 5). The purpose of this

release was to evaluate BY 2022 fall subyearling movement patterns and fall spill operations at Foster Dam. The fish released at the head of the reservoir had an average fork length of 106 millimeters and an average weight of 15 grams. At the time of release, the forebay elevation was approximately 636 feet, with all flow directed through the powerhouse, as illustrated in Figure 30. Forebay elevation remained relatively stable throughout the summer and into the fall until fall drawdown operations began on October 1, 2023. These operations directed a significant proportion of the flow through the spill gates, which continued until mid-December when all flow was transitioned back to the powerhouse.

Only three fish from this release group were later redetected downstream of Foster Dam. Two were detected at the Lebanon Dam array during night time spill operations in November and one was detected during continuous spill the following spring.

Table 15. Detection summary of PIT-tagged juvenile Chinook salmon released in the Foster (FOS) project area. Release locations: Head = Head of Reservoir, Tailrace. Observation locations: ASMEBER = Astoria Meglar Bridge, ESANIS = East Sand Island, Lebanon = Lebanon Dam Array, PD5-8 = Columbia River Pile Dike Arrays 5-8, PIER3 = Pier 3 Boat Yard, Astoria, RICEIS = Rice Island, SSANTR = South Santiam River, TWX = Columbia River Towed Array. Headers: Count = Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Mean Fork Length = mean fork length at release and recapture.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)		
							Min	Median	Max
FOS	8/23/2023	Tailrace	Lebanon	Array	21	2.04	0.4	1.3	96.4
FOS	8/24/2023	Head	Lebanon	Array	3	0.15	76.9	85.1	267.4
FOS	10/10/2023	Head	Lebanon	Array	54	1.08	4.4	41.4	128.6
FOS	10/10/2023	Head	PD8	Array	1	0.02	215.4	215.4	215.4
FOS	10/10/2023	Head	PD7	Array	3	0.06	18.6	22.6	58.9
FOS	10/10/2023	Head	ASMEBR	Predation	1	0.02	NA	NA	NA
FOS	10/11/2023	Tailrace	Lebanon	Array	74	1.85	0.2	23.1	127.7
FOS	10/11/2023	Tailrace	PD8	Array	1	0.03	201.9	201.9	201.9
FOS	3/26/2024	Head	Lebanon	Array	11	0.37	2.9	5.4	58.7
FOS	3/26/2024	Head	PD8	Array	1	0.03	31.7	31.7	31.7
FOS	3/26/2024	Head	TWX	Array	18	0.6	9.8	37.9	52.6
FOS	3/26/2024	Head	PD6	Array	7	0.23	7.5	21.5	40.2
FOS	3/26/2024	Head	PD5	Array	10	0.33	12.8	24.6	59.2
FOS	3/26/2024	Head	ASMEBR	Predation	3	0.1	NA	NA	NA
FOS	3/26/2024	Head	ESANIS	Predation	2	0.07	NA	NA	NA
FOS	3/27/2024	Head	Lebanon	Array	11	0.37	1.0	3.9	56.1
FOS	3/27/2024	Head	PD8	Array	3	0.1	29.6	47.6	48.8
FOS	3/27/2024	Head	TWX	Array	10	0.33	7.9	39.2	69.4
FOS	3/27/2024	Head	PD7	Array	4	0.13	10.8	13.9	29.3
FOS	3/27/2024	Head	PD6	Array	7	0.23	10.7	26.9	45.5
FOS	3/27/2024	Head	PD5	Array	9	0.3	22.2	32.5	49.7
FOS	3/27/2024	Head	ASMEBR	Predation	7	0.23	NA	NA	NA
FOS	3/27/2024	Head	ESANIS	Predation	1	0.03	NA	NA	NA
FOS	3/28/2024	Tailrace	Lebanon	Array	3	0.1	0.3	0.4	2.3
FOS	3/28/2024	Tailrace	PD8	Array	4	0.13	26.4	28.5	34.0
FOS	3/28/2024	Tailrace	TWX	Array	2	0.07	5.8	13.3	20.8

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)		
							Min	Median	Max
FOS	3/28/2024	Tailrace	PD7	Array	5	0.17	20.0	23.1	31.7
FOS	3/28/2024	Tailrace	PD6	Array	8	0.27	5.6	22.6	28.6
FOS	3/28/2024	Tailrace	PD5	Array	7	0.23	14.3	23.3	29.9
FOS	3/28/2024	Tailrace	PIER3	Predation	1	0.03	NA	NA	NA
FOS	3/28/2024	Tailrace	ASMEBR	Predation	11	0.37	NA	NA	NA
FOS	3/28/2024	Tailrace	COLR2	Predation	1	0.03	NA	NA	NA
FOS	4/1/2024	Tailrace	Lebanon	Array	27	0.9	0.5	0.5	4.3
FOS	4/1/2024	Tailrace	PD8	Array	3	0.1	22.4	22.7	32.1
FOS	4/1/2024	Tailrace	TWX	Array	8	0.27	6.9	15.8	39.3
FOS	4/1/2024	Tailrace	PD6	Array	8	0.27	11.4	17.5	25.4
FOS	4/1/2024	Tailrace	PD5	Array	8	0.27	7.6	16.7	30.6
FOS	4/1/2024	Tailrace	ASMEBR	Predation	10	0.33	NA	NA	NA
FOS	4/1/2024	Tailrace	ESANIS	Predation	1	0.03	NA	NA	NA
FOS	4/1/2024	Tailrace	COLR2	Predation	1	0.03	NA	NA	NA
FOS	4/4/2024	Head	Lebanon	Array	19	1	1.8	3.5	45.3
FOS	4/4/2024	Head	SSANTR	RST	26	1.36	0.9	0.9	0.9
FOS	4/4/2024	Head	PD8	Array	6	0.31	18.6	25.0	37.3
FOS	4/4/2024	Head	TWX	Array	4	0.21	25.3	34.1	43.5
FOS	4/4/2024	Head	PD6	Array	7	0.37	11.8	19.3	36.3
FOS	4/4/2024	Head	PD5	Array	2	0.1	10.4	12.1	13.9
FOS	4/4/2024	Head	ASMEBR	Predation	5	0.26	NA	NA	NA
FOS	4/4/2024	Head	COLR2	Predation	1	0.05	NA	NA	NA
FOS	8/27/2024	Tailrace	Lebanon	Array	78	8.35	0.7	1.9	79.4
FOS	10/15/2024	Head	Lebanon	Array	20	0.4	2.7	12.9	44.3
FOS	10/15/2024	Tailrace	Lebanon	Array	25	0.63	0.2	0.9	43.2
FOS	10/15/2024	Tailrace	PD7	Array	1	0.03	39.7	39.7	39.7
FOS	10/15/2024	Head	PD6	Array	4	0.08	19.4	21.4	31.3
FOS	10/15/2024	Tailrace	PD6	Array	4	0.1	13.4	17.3	34.1

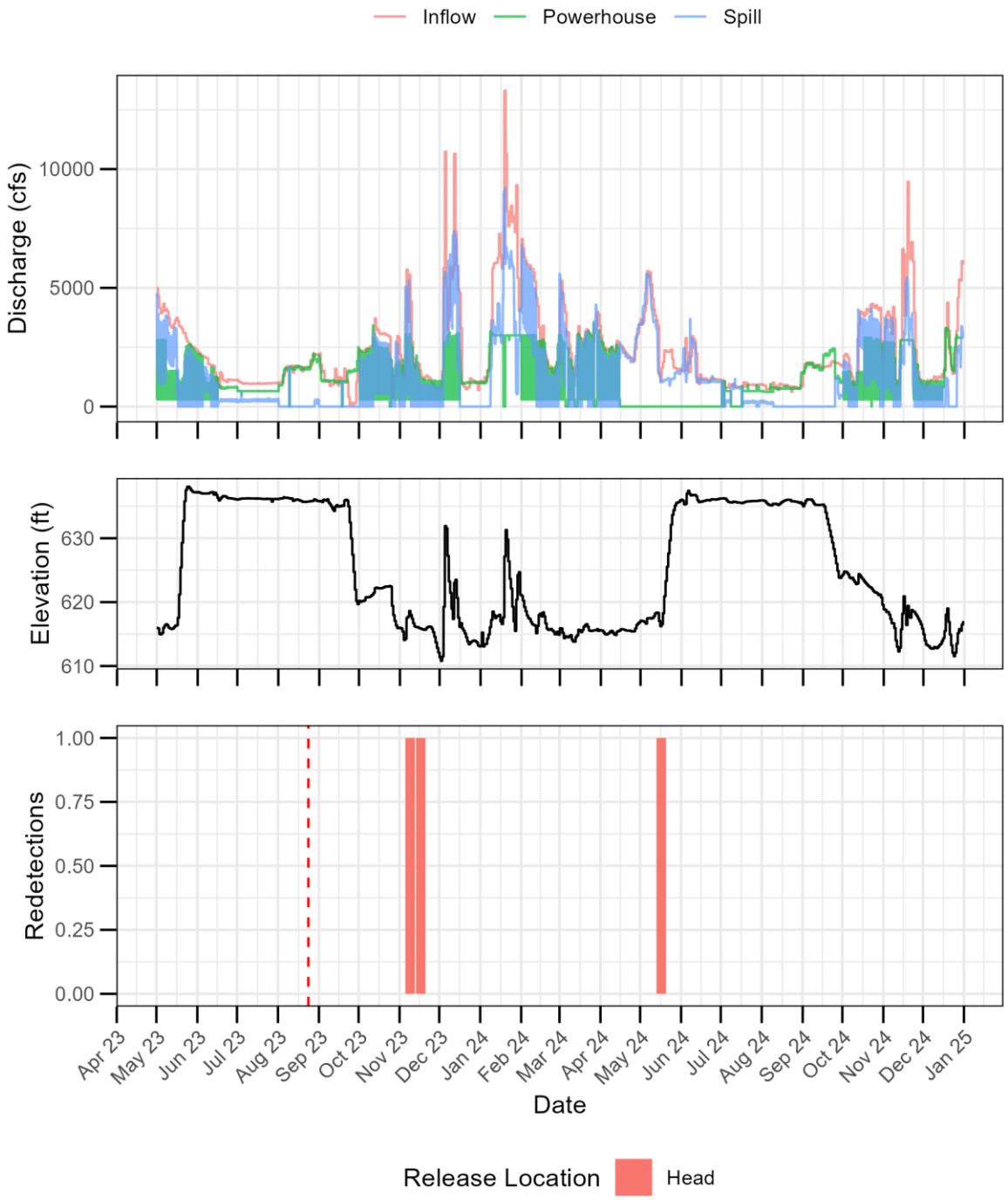

Figure 35. Foster project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released in late August 2023 at the head of Foster and subsequently redetected at the Lebanon Dam PIT tag array (bottom panel). Approximate release date is represented by the dashed vertical line.

Brood Year 2023

On August 27, 2024 a group of 2,000 subyearling Chinook salmon were released at the head of Foster Reservoir. The purpose of this release was to evaluate BY 2023 fall subyearling movement patterns and fall spill operations at Foster Dam. Forebay elevation was 635 feet at the time of release and all flow was directed through the

powerhouse. Continuous spill operations commenced on September 25, 2024 and transitioned to nighttime spill on October 5, 2024.

No fish from this release group have been detected to date.

Comparison

In 2023, BY 2022 subyearlings were released into Foster Reservoir on August 24, with spill operations beginning approximately five weeks later on October 1. Only three fish were detected downstream of Foster Dam, two of which were observed at the Lebanon Dam array during nighttime spill operations in November, while one was detected during continuous spill the following spring, resulting in an overall detection rate of 0.15%. For BY 2023, a release of subyearlings occurred on August 27, 2024, with spill operations commencing on September 25 and transitioning to nighttime spill on October 5. No fish from this release group have been detected downstream of Foster Dam to date. These findings reflect low detection rates for subyearlings in both years despite differences in operational timing.

Target: Fall Subyearling Migration – Fall Nighttime Spill Operations

Brood Year 2022

This release group of BY 2022 PIT-tagged subyearling Chinook salmon was intended to evaluate movement patterns during fall nighttime spill operations at Foster Dam. On October 10, 2023, 5,000 subyearlings (mean FL = 126 mm; mean weight = 26 g) were released at the head of Foster Reservoir, followed by 4,000 subyearlings (mean FL = 135 mm; mean weight = 32 g) released in the tailrace on October 11, 2023. At the time of release, the forebay elevation was 621 feet, and nighttime spill operations were underway, with continuous spill commencing on October 11 in response to a large increase in reservoir inflow (Figure 36).

A total of 59 fish from the head of reservoir release group were subsequently detected downstream of Foster Reservoir, resulting in an overall detection rate of 1.2%. Of these, 54 detections occurred at the Lebanon Dam array. The median travel time from release to detection at the array was 41.4 days compared to 23.1 days for fish released in the tailrace. Of the 56 detections, 41 coincided (76%) with active spill operations at Foster Dam.

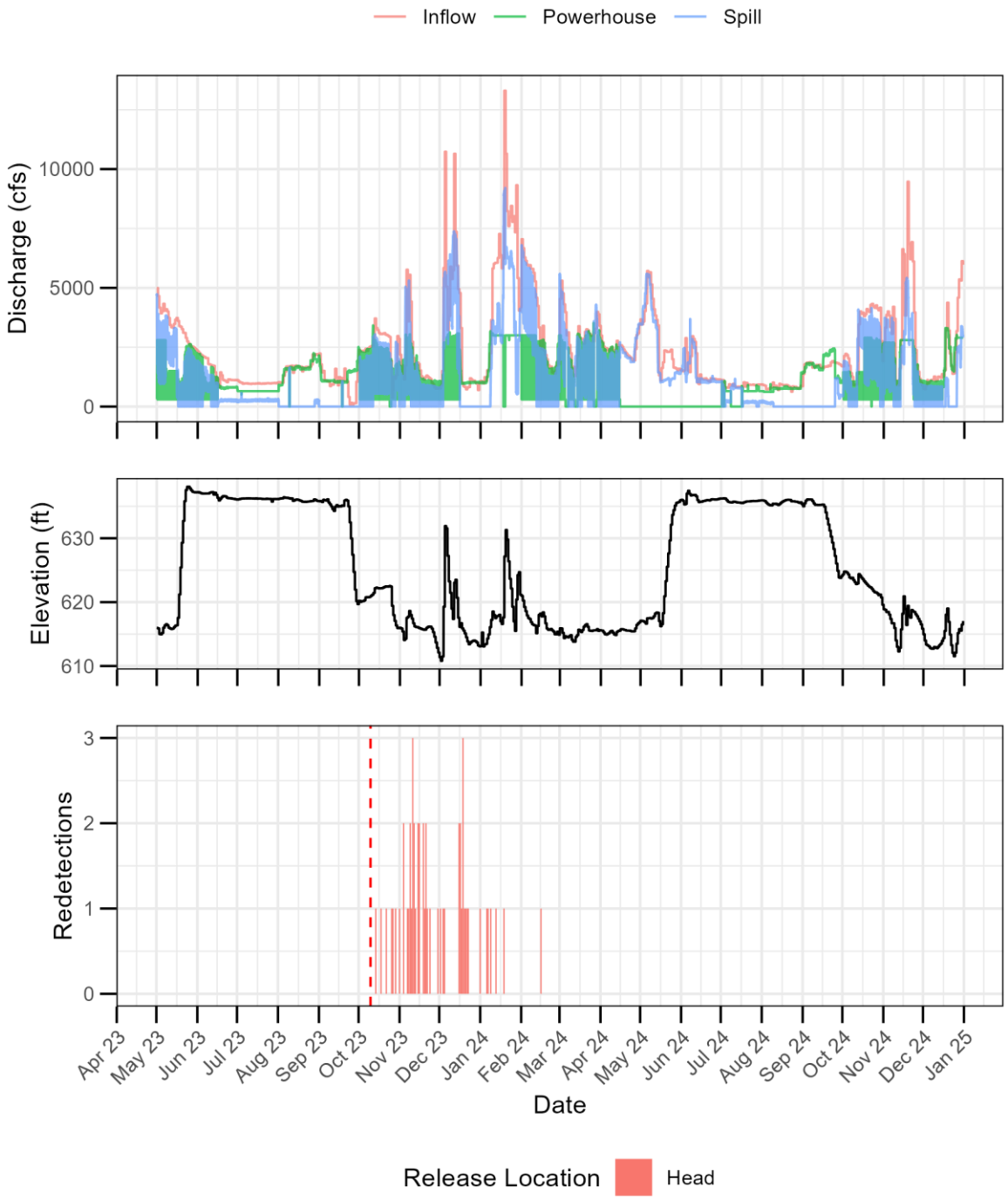

Figure 36. Foster project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released on October 10, 2023 at the head of Foster and subsequently redetected at the Lebanon Dam PIT tag array (bottom panel). Approximate release date is represented by the dashed vertical line.

Brood Year 2023

On October 15, 2024, we released 4,994 PIT-tagged brood year 2023 subyearling Chinook salmon at the head of Foster Reservoir (mean FL = 137 mm; mean weight = 28 g) and 3,998 into the tailrace of Foster Dam (mean FL = 137 mm; mean weight = 28 g). At the time of release, the forebay elevation was 624 feet, and continuous spill operations were underway, transitioning to nighttime spill on October 29, 2024. The objective of this release

group was to evaluate movement patterns and detection rates during fall nighttime spill operations at Foster Dam. As of reporting, 24 fish from the head-of-reservoir release group have been detected, resulting in a preliminary detection rate of 0.48% (Table 15). Of these, 20 were detected at the Lebanon Dam array with a median travel time of 12.9 days, while 25 fish from the tailrace release group were detected, primarily at the Lebanon Dam array (n = 25), with a median travel time of 0.9 days. All detections occurred between October 18 and November 28, 2024, and coincided with spill operations at Foster Dam.

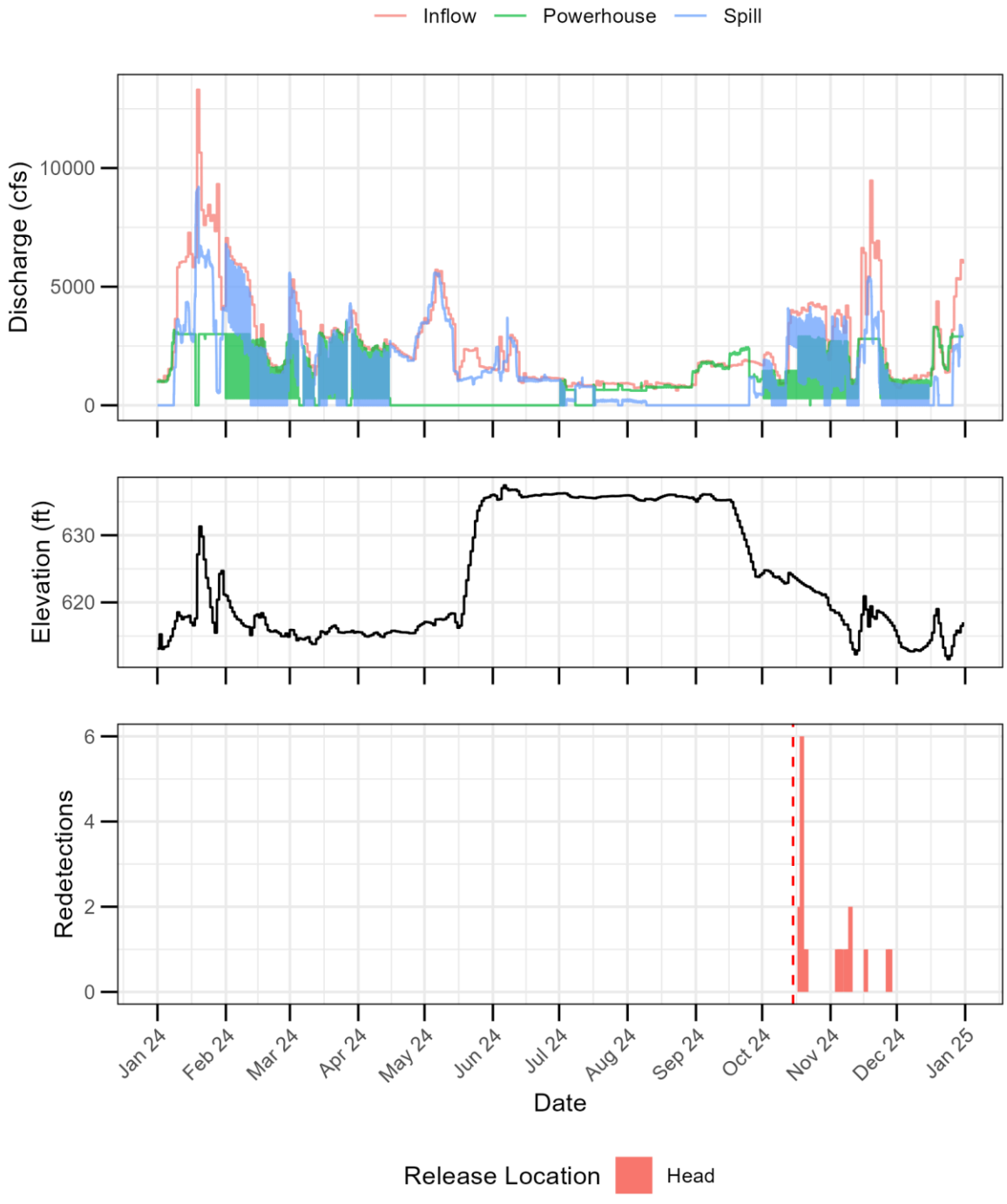

Figure 37. Foster project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released on October 15, 2024 at the head of Foster and subsequently redetected at the Lebanon Dam PIT tag array (bottom panel). Approximate release date is represented by the dashed vertical line.

Comparison

BY 2022 and BY 2023 subyearling Chinook salmon releases during fall nighttime spill operations at Foster Dam exhibited both similarities and key differences in movement patterns, detection rates, and timing of detections. For both years, the majority of downstream detections coincided with spill operations, indicating that spill provides a cue or pathway for downstream movement. BY 2022 had a higher detection rate (1.2%) compared to BY 2023 (0.48%), despite similar release group sizes and spill conditions. BY 2022 fish had a median travel time of 41.4 days to the Lebanon Dam array, whereas BY 2023 fish had a much shorter median travel time of 12.9 days. Both years demonstrated that a significant proportion of detections occurred during spill operations (76% for BY 2022 and 100% so far for BY 2023), emphasizing the importance of spill for facilitating subyearling passage.

Target: Spring Yearling Migration – Spring Spill Operations

Brood Year 2022

On March 26, 2024, 2,997 PIT tagged yearlings were released at the head of the reservoir (mean FL = 156.3 mm; mean weight = 44.1 g). The following day, March 27, an additional 3,001 yearlings were released at the head of the reservoir (mean FL = 145.3 mm; mean weight = 38 g). The objective of these releases was to evaluate the movement patterns of BY 2022 yearling Chinook salmon during spring spill operations at Foster Dam. At the time of release, the forebay elevation was 615 feet, and continuous spill operations were underway. Regular nighttime spring spill operations resumed on March 29, 2024.

A total of 104 fish from this release group were subsequently detected downstream of Foster Dam, resulting in an overall detection rate of 1.7%. Notably, the majority of redetections occurred at various arrays in the Columbia River (PD5, PD6, PD7, PD8, and TWX; n = 69). Additionally, 22 fish were redetected at the Lebanon Dam array, with a median travel time of approximately 4.5 days. All detections at the Lebanon Dam array occurred between March 28, 2024, and May 24, 2024, and all of those coincided with spring spill operations at Foster Dam.

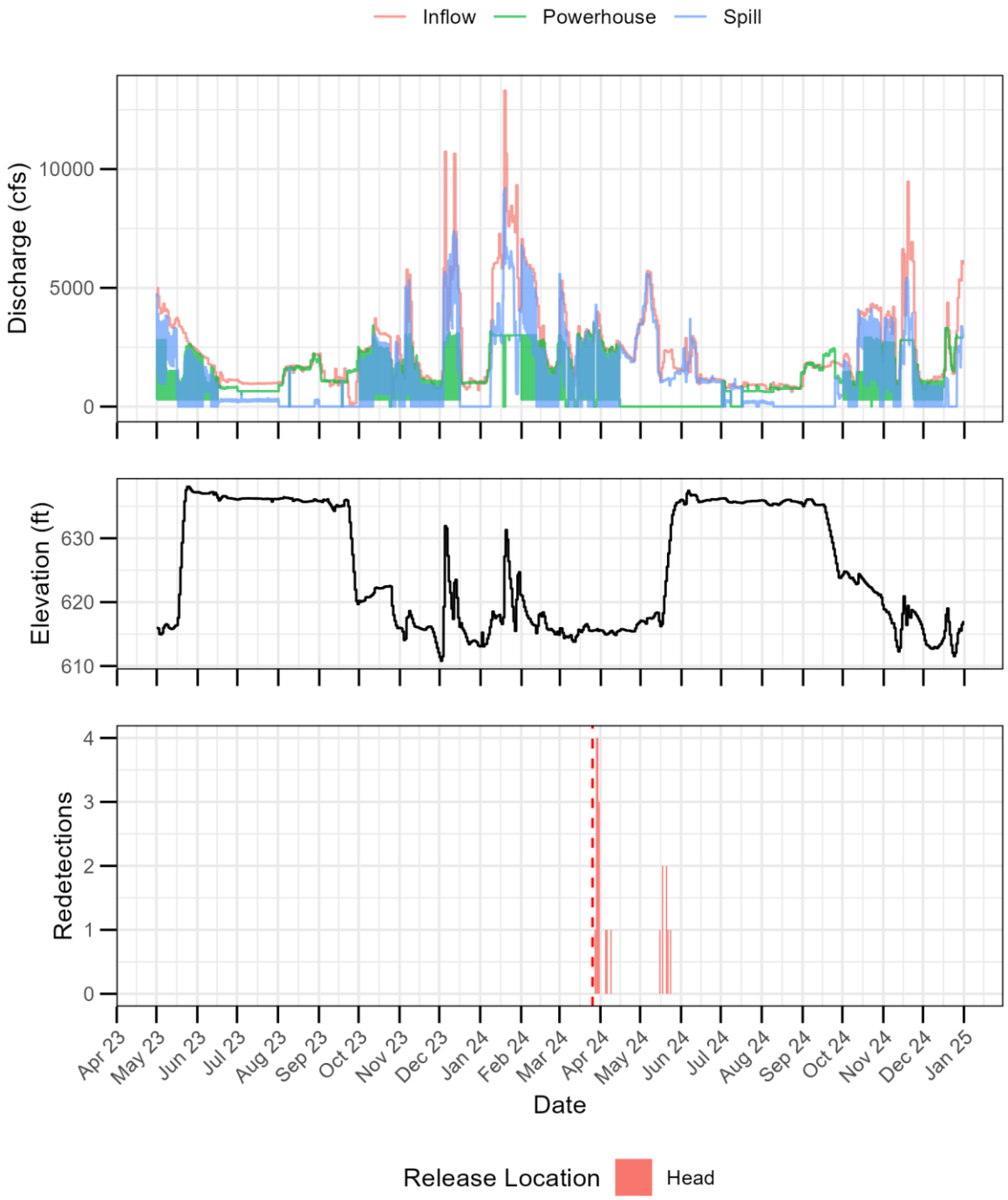

Figure 38. Foster project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged juvenile Chinook salmon released in March, 2024 at the head of Foster and in the tailrace and subsequently redetected at the Lebanon Dam PIT tag array (bottom panel). Approximate release date is represented by the dashed vertical line.

Summary - Foster

Subyearlings released at the head of reservoir in the late summer exhibited extremely low detection rates downstream. Brood year 2022 subyearlings released on August 24, 2023, had a detection rate of 0.15%, with only three fish detected downstream of Foster Dam and none of BY 2023 subyearlings, released on August 27, 2024, have been detected downstream.

Downstream detections of subyearlings released to evaluate fall nighttime spill operations showed that the majority of detected fish from head of reservoir releases passed Foster Dam during active spill operations. For brood year 2022, releases on October 10–11, 2023, at the head (5,000 fish) and tailrace (4,000 fish) resulted in detection rates of 1.2% (59 fish) and 1.88% (75 fish), respectively, with 76% of head-of-reservoir detections (41/54) coinciding with spill operations; median travel times to the Lebanon Dam array were 41.4 days (head) and 23.1 days (tailrace). For brood year 2023, releases on October 15, 2024, at the head (4,994 fish) and tailrace (3,998 fish) resulted in detection rates of 0.48% (24 fish) and 0.63% (25 fish), respectively, with 100% of head-of-reservoir detections coinciding with spill operations; median travel times to the Lebanon Dam array were 12.9 days (head) and 0.9 days (tailrace). However, it is important to note that not all brood year 2023 subyearlings may have migrated downstream yet, and these results may change as additional data become available.

The highest downstream detection rate was observed for brood year 2022 yearlings released on March 26–27, 2024, during spring spill operations at Foster Dam. These fish had an overall detection rate of 1.7%, with 104 fish detected downstream. Most detections occurred at Columbia River arrays (n = 69), while 22 were detected at the Lebanon Dam array with a median travel time of 4.5 days. All detections at the Lebanon Dam array coincided with spring spill operations, highlighting a pattern of spill-associated passage. While the high number of Columbia River detections indicates successful passage beyond the dam for these fish, the overall detection rate remains low, limiting broader conclusions about passage efficiency. Overall, the results indicate that detections consistently coincided with spill operations across releases, suggesting spill facilitates downstream passage for detected fish from head-of-reservoir releases, though low detection rates (0%–1.7%) highlight the need for further data to assess the broader effectiveness of these operations at Foster Dam.

North Santiam River

We PIT-tagged and released a total of 44,889 Brood Year (BY) 2022 juvenile Chinook salmon in the North Santiam basin (Table 16). For BY 2022, the mean tagging mortality rate was 7.5%, and the mean tag shed rate was 0.32% across all tagged fish in the North Santiam basin (

Table 17). For BY 2023, we have tagged and released 39,017 juvenile Chinook salmon out of a planned total of 45,000 for the North Santiam basin. The mean tagging mortality rate for BY 2023 was 0.35%, and the mean tag shed rate was 0.71%.

Table 16. Release details for PIT-tagged juvenile Chinook salmon in the North Santiam (NST) basin, including release location, date, brood year, number of fish (N), mean fork length (mm), mean weight (g), and life stage.

Basin	Release Location	Release Date	Brood Year	N	Mean Length	Mean Weight	Lifestage
NST	Detroit HOR - Breitenbush	7/13/2023 8:45	2022	7000	66.8	3.6	Fry
NST	Detroit HOR - North Santiam	7/13/2023 11:35	2022	6638	67	3.6	Fry
NST	Detroit HOR - Breitenbush	9/26/2023 10:45	2022	5002	106.5	11.8	Subyearling
NST	Detroit HOR - North Santiam	9/26/2023 16:00	2022	4997	102.6	10.4	Subyearling
NST	Big Cliff Tailrace	9/27/2023 15:30	2022	8009	106.5	11.9	Subyearling
NST	Big Cliff Tailrace	11/20/2023 16:50	2022	5998	112.4	16.6	Subyearling
NST	Detroit HOR - North Santiam	3/20/2024 14:45	2022	2000	128.4	25.5	Yearling
NST	Detroit HOR - Breitenbush	3/21/2024 11:15	2022	2000	124	21.3	Yearling
NST	Big Cliff Tailrace	3/21/2024 16:30	2022	1998	129.4	24.1	Yearling
NST	Detroit HOR - North Santiam	5/20/2024 12:00	2023	7530	47	1.2	Fry

NST	Detroit HOR - Breitenbush	5/20/2024 18:00	2023	7491	47	1.2	Fry
NST	Detroit HOR - Breitenbush	9/24/2024 15:45	2023	5004	103.2	12.9	Subyearling
NST	Detroit HOR - North Santiam	9/24/2024 17:35	2023	4997	104.2	13	Subyearling
NST	Big Cliff Tailrace	9/25/2024 16:20	2023	7998	101.3	12.1	Subyearling

Table 17. Summary of PIT tagging sessions for juvenile Chinook salmon in the North Santiam basin (SST), including number of fish tagged (N), tagging dates, mortalities, and tag shedding rates.

Mark Group	N	Date Start	Date End	Mort	Mort. %	Sheds	Shed %
Detroit - Breitenbush Fry	7,530	6/13/2023	6/14/2023	82	1.09	24	0.32
Detroit – N. Santiam Fry	7,528	6/14/2023	6/15/2023	83	1.10	25	0.32
Fall 23 & Spring 24 Bulk Group	30,680	6/26/2023	7/20/2023	3,437	10.60	99	0.32
Detroit – N. Santiam Fry	7,500	5/13/2024	5/15/2024	58	0.77	70	0.93
Detroit – Breitenbush Fry	7,500	5/15/2024	5/17/2024	58	0.77	63	0.84
Fall 24 & Spring 25 Bulk Group	31,035	7/15/2024	11/6/2024	47	0.15	196	0.63

The alarming mortality rate among brood year 2022 fish was due to an outbreak of furunculosis at Marion Forks Hatchery. Tagging for fall releases began in late June 2023. During the week of June 26, 2023, a total of 15,195 BY 2022 Chinook salmon were PIT tagged and adipose clipped by Cramer Fish Sciences staff. The tagged fish were held for recovery in indoor troughs for 2 days without feeding. On the 3rd day, they were transferred to an outdoor pond, C-10, where they were to rear until their release in the fall of 2023 or spring of 2024. Feeding resumed once they were ponded. Water temperatures were closely monitored during tagging and recorded hourly, with a maximum observed temperature of 15.2 degrees Celsius.

Of the 15,195 BY2022 Chinook salmon tagged, there were a total of 2,809 mortalities (approximately 18%) when hatchery staff arrived at work on July 3, 2023. Fearing that we might have inadvertently brought a pathogen from Leaburg, we immediately halted operations, contacted state pathology (Dr. Sarah Bjork), and disinfected all our equipment. On July 5, 2023, Dr. Sarah Bjork, ODFW Fish Health Specialist, visited Marion Forks Hatchery to examine the mortalities and take samples for culturing. Her initial suspicion was confirmed on July 7, 2023, when bacteria cultures revealed the presence of furunculosis, a pathogen previously found at Marion Forks Hatchery that typically emerges at around 12-14 degrees Celsius. Dr. Bjork recommended medicated feed for the fish. Once treated, mortality rates returned to normal, and we were able to resume tagging. We estimate that the furunculosis outbreak led to well over 3,000 mortalities. No pathogen outbreaks affected our work in 2024.

Detroit and Big Cliff Dams

Interim Measures 5 and 7 govern dam operations at Detroit and Big Cliff Dams (Figure 39). Interim Measure 5 was implemented to enhance downstream fish passage conditions and manage water temperature at Detroit Dam during the fall drawdown and winter months, when downstream fish passage rates are high. The measure prioritizes flow releases through non-turbine outlets once the Detroit Reservoir elevation drops below 100 feet above the turbine intakes (Elevation 1450–1500 feet). During this period, all flow is directed through the Upper and/or Lower Regulating Outlet (RO) structures at night, from dusk until dawn, with no turbine operation (except for Station Service in emergencies). This operational strategy remains in effect until reservoir refill begins in the spring.

The purpose of Interim Measure 7 is to provide downstream fish passage in the spring and water temperature management throughout late spring and summer at Detroit and Big Cliff Dams through strategic use of the

spillway, turbines and regulating outlets. Spillway operations will start when the reservoir reaches spillway crest elevation (El. 1541.0 ft) and continue until the reservoir is drafted below the spillway crest. From there, a combination of turbine and regulating outlet (RO) discharges will be implemented until water temperature management is no longer possible due to reservoir turnover. With adaptive management, the spill ratio will be adjusted so water temperatures (as measured at the USGS gage downstream of Big Cliff) can best meet targets.

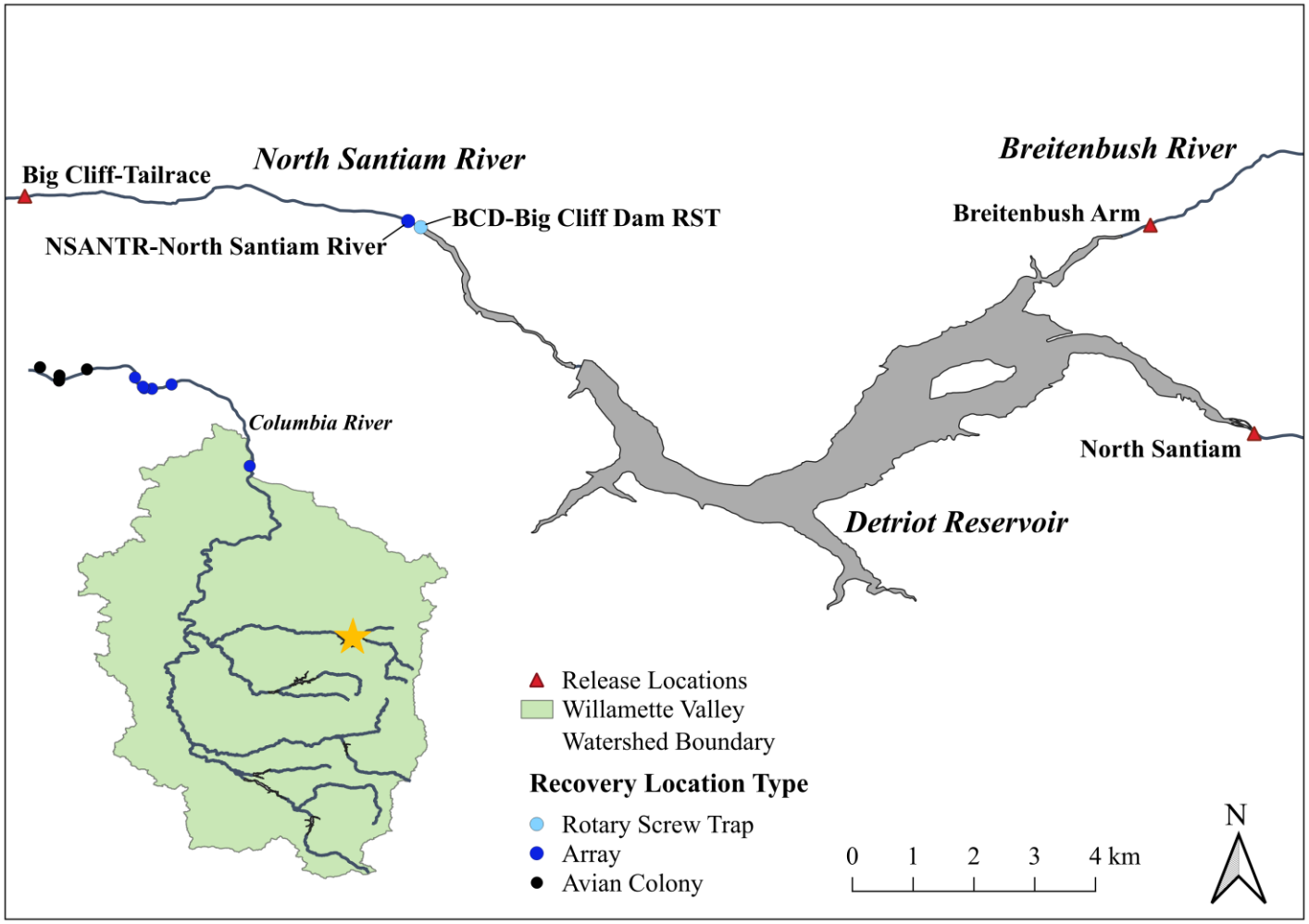

Figure 39. Map of release and recovery locations within the Detroit – Big Cliff Dam project area.

Target: Spring Fry Migration – Spring Dam Operations

Brood Year 2022

The first release of PIT tagged juvenile Chinook salmon into the head of the Detroit - Big Cliff project area occurred on July 13, 2023 with the release of 7,000 BY 2022 fry into the Breitenbush River and 6,638 fry into the North Santiam River. These fish all had average fork lengths of 67 millimeters and average weights of 3.6 grams. At the time of release, dam operations at Detroit were directing flow through both the powerhouse and the spill gates and the reservoir was being drafted (Figure 40). These operations continued until early August when all discharge through Detroit Dam was transitioned to the powerhouse. All discharge through Detroit was directed through the powerhouse until late September when discharge began to be transitioned to the regulating outlet spill and by late October all flow through Detroit Dam was via regulating outlet spill. Regulating outlet operations

continued until early December when dam operations switched to a mix of both regulating outlet and powerhouse flow.

A total of 27 fish from these release groups were subsequently detected downstream of Big Cliff Dam, resulting in an overall detection rate of 0.2 % (Table 18). Of these, 17 were detected in the Big Cliff tailrace RST. The median travel time from release to the Big Cliff tailrace was 172 days for fish from the North Santiam (n = 9) and 279 days for fish from the Breitenbush (n = 8). Redetections in the Big Cliff tailrace occurred between October 6, 2023, and May 9, 2024. All but one fish were detected while spill was active at Detroit Dam. Six fish were detected during the fall and winter subyearling migration, while the remaining 11 were detected during the yearling migration the following spring (Figure 40).

Table 18. Detection summary of PIT-tagged juvenile Chinook salmon released in the Detroit Dam (DET) project area. Release locations: Breitenbush = Breitenbush River, ESANIS = East Sand Island, N. Santiam = North Santiam River, Tailrace = Big Cliff Tailrace. Observation locations: ASMEBER = Astoria Meglar Bridge, BCL = Big Cliff Dam, HANIS = Islands in the Hanford Reach of the Middle Columbia River, NSANTR = North Santiam River, PD5-8 = Columbia River Pile Dike Arrays 5-8, TWX = Columbia River Towed Array. Headers: Count = Number of fish detected, Rate = Detection rate as a percentage, Travel Time = Minimum, median, and maximum travel time in days, Mean Fork Length = mean fork length at release and recapture.

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (m)	
							Min	Median	Max	Release	Recapture
DET	7/13/2023	Breitenbush	HANIS	Predation	1	0.01	NA	NA	NA	66.8	NA
DET	7/13/2023	Breitenbush	BCL	RST	8	0.11	90.1	278.6	296.1	66.8	148.25
DET	7/13/2023	N. Santiam	BCL	RST	9	0.14	85.0	172.0	301.0	67.0	151.55556
DET	7/13/2023	Breitenbush	NSANTR	Bypass	1	0.01	105.1	105.1	105.1	66.8	NA
DET	7/13/2023	N. Santiam	NSANTR	Bypass	2	0.03	89.9	113.9	138.0	67.0	NA
DET	7/13/2023	Breitenbush	TWX	Array	3	0.04	280.1	301.7	303.0	66.8	NA
DET	7/13/2023	Breitenbush	PD6	Array	1	0.01	323.9	323.9	323.9	66.8	NA
DET	7/13/2023	N. Santiam	PD5	Array	2	0.03	292.6	301.3	310.1	67.0	NA
DET	9/26/2023	Breitenbush	BCL	RST	9	0.18	108.1	207.0	247.0	106.5	140.33333
DET	9/26/2023	N. Santiam	BCL	RST	14	0.28	32.8	204.8	251.8	102.6	137.21429
DET	9/26/2023	Breitenbush	TWX	Array	1	0.02	229.8	229.8	229.8	106.5	NA
DET	9/26/2023	N. Santiam	TWX	Array	4	0.08	222.4	230.4	258.6	102.6	NA
DET	9/26/2023	Breitenbush	PD6	Array	2	0.04	220.6	224.6	228.5	106.5	NA
DET	9/26/2023	N. Santiam	PD6	Array	2	0.04	200.6	207.1	213.7	102.6	NA
DET	9/26/2023	Breitenbush	PD5	Array	1	0.02	210.9	210.9	210.9	106.5	NA
DET	9/26/2023	N. Santiam	PD5	Array	4	0.08	210.2	228.4	231.3	102.6	NA
DET	9/26/2023	N. Santiam	ASMEBR	Predation	2	0.04	NA	NA	NA	102.6	NA
DET	3/20/2024	N. Santiam	BCL	RST	22	1.1	23.8	41.3	93.8	128.4	140.95455
DET	3/20/2024	N. Santiam	NSANTR	Bypass	1	0.05	48.7	48.7	48.7	128.4	NA
DET	3/20/2024	N. Santiam	PD8	Array	3	0.15	46.2	55.6	79.0	128.4	NA
DET	3/20/2024	N. Santiam	TWX	Array	14	0.7	43.3	54.2	78.3	128.4	NA
DET	3/20/2024	N. Santiam	PD6	Array	7	0.35	42.4	51.3	72.6	128.4	NA
DET	3/20/2024	N. Santiam	PD5	Array	4	0.2	53.0	54.2	82.3	128.4	NA
DET	3/20/2024	N. Santiam	ASMEBR	Predation	1	0.05	NA	NA	NA	128.4	NA
DET	3/20/2024	N. Santiam	ESANIS	Predation	1	0.05	NA	NA	NA	128.4	NA

Project	Release Date	Release Location	Observation Location	Method	Count	Rate %	Travel Time (days)			Mean Fork Length (m)	
							Min	Median	Max	Release	Recapture
DET	3/21/2024	Breitenbush	BCL	RST	16	0.8	31.0	43.5	60.0	124.0	138.46667
DET	3/21/2024	Breitenbush	SID	Array	1	0.05	51.1	51.1	51.1	124.0	NA
DET	3/21/2024	Breitenbush	PD8	Array	5	0.25	49.8	56.8	78.5	124.0	NA
DET	3/21/2024	Breitenbush	TWX	Array	19	0.95	41.4	53.3	80.5	124.0	NA
DET	3/21/2024	Breitenbush	PD6	Array	5	0.25	42.7	49.3	70.6	124.0	NA
DET	3/21/2024	Breitenbush	PD5	Array	9	0.45	52.5	59.8	88.1	124.0	NA
DET	3/21/2024	Breitenbush	ASMEBR	Predation	2	0.1	NA	NA	NA	124.0	NA
DET	5/20/2024	Breitenbush	BCL	RST	16	0.21	40.7	102.2	213.8	47.0	135.3125
DET	5/20/2024	N. Santiam	BCL	RST	20	0.27	53.0	95.5	219.0	47.0	147.42105
DET	5/20/2024	N. Santiam	NSANTR	RST	1	0.01	62.0	62.0	62.0	47.0	71
DET	9/24/2024	Breitenbush	BCL	RST	3	0.06	70.8	71.8	95.8	103.2	146.66667
DET	9/24/2024	N. Santiam	BCL	RST	4	0.08	66.8	72.3	83.8	104.2	142.25
DET	9/24/2024	Breitenbush	NSANTR	RST	1	0.02	37.8	37.8	37.8	103.2	107
DET	9/24/2024	Breitenbush	PD6	Array	1	0.02	65.2	65.2	65.2	103.2	NA
DET	9/24/2024	N. Santiam	PD6	Array	4	0.08	66.2	69.7	72.3	104.2	NA

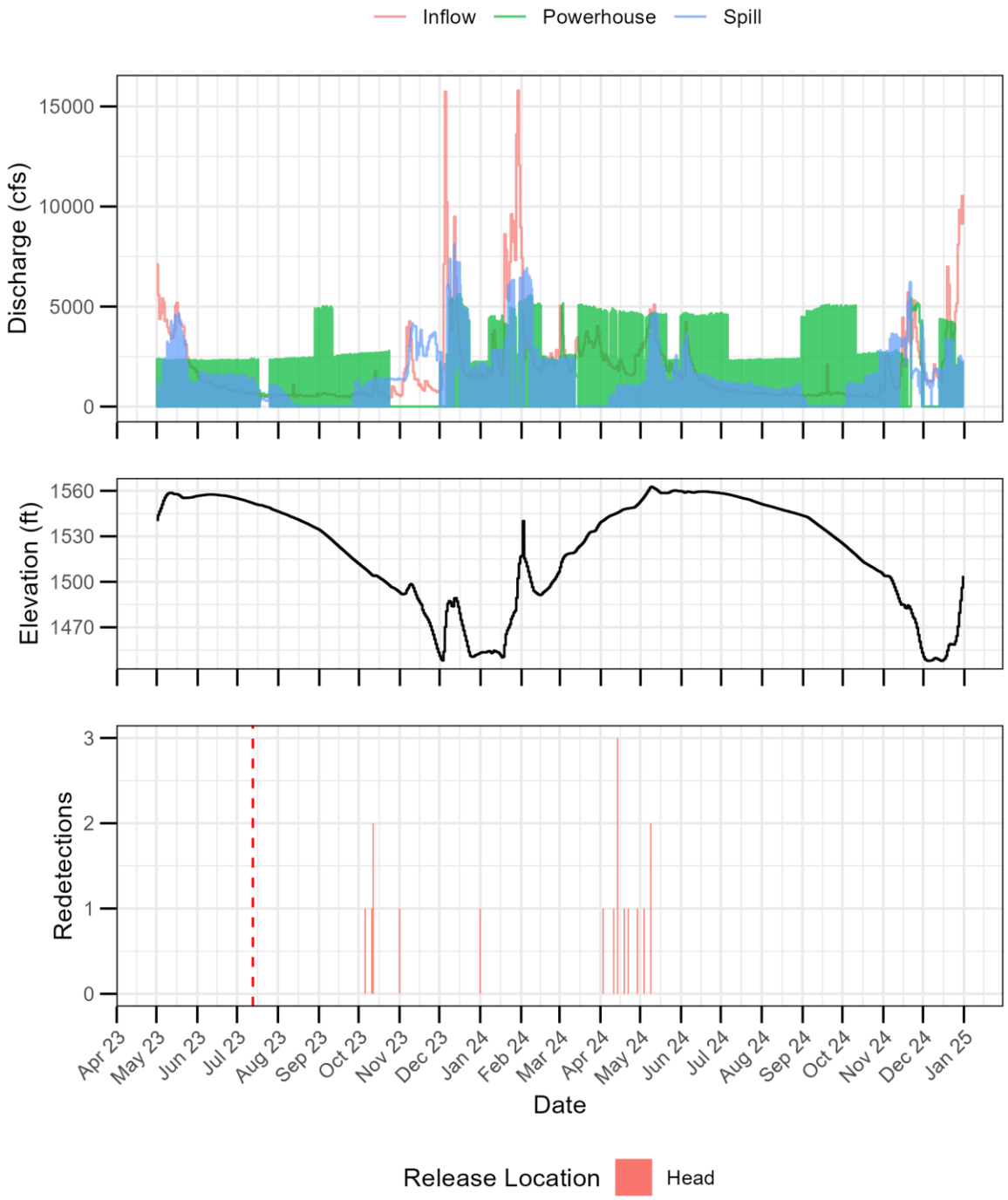

Figure 40. Detroit project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released on June 13, 2023 at the head of Detroit Reservoir and subsequently redetected at the Big Cliff tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Brood Year 2023

On May 20, 2024, 7,533 BY2023 fry were released at the head of the reservoir in the North Santiam River (mean FL = 47 mm; mean weight = 1.2 g). On the same day, 7,494 fry were released at the head of the reservoir in the Breitenbush River (mean FL = 47 mm; mean weight = 1.2 g). These releases aimed to evaluate fry movement

patterns during spring dam operations at the Detroit – Big Cliff project area. The use of 8-mm PIT tags requires a minimum fork length of 45 mm for tagging, which delayed the release until the fry reached this size. In the North Santiam basin, colder water temperatures slow growth rates, often resulting in releases later than ideal for evaluating spring operations. At the time of release, the forebay elevation was approximately 1,558 feet, with flow directed through the powerhouse during the day and via spill at night.

A total of 36 fish from this release group were detected downstream of Big Cliff Dam, resulting in an overall detection rate of 0.2% (Table 18). All detections occurred at the Big Cliff tailrace RST. Fish originating from the Breitenbush had a median travel time of 102 days (n = 16), while those from the North Santiam had a median travel time of 95.5 days (n = 20). Detections spanned from June 30, 2024, through December 25, 2024. All but three detections occurred while spill operations were active at Detroit Dam (Figure 41).

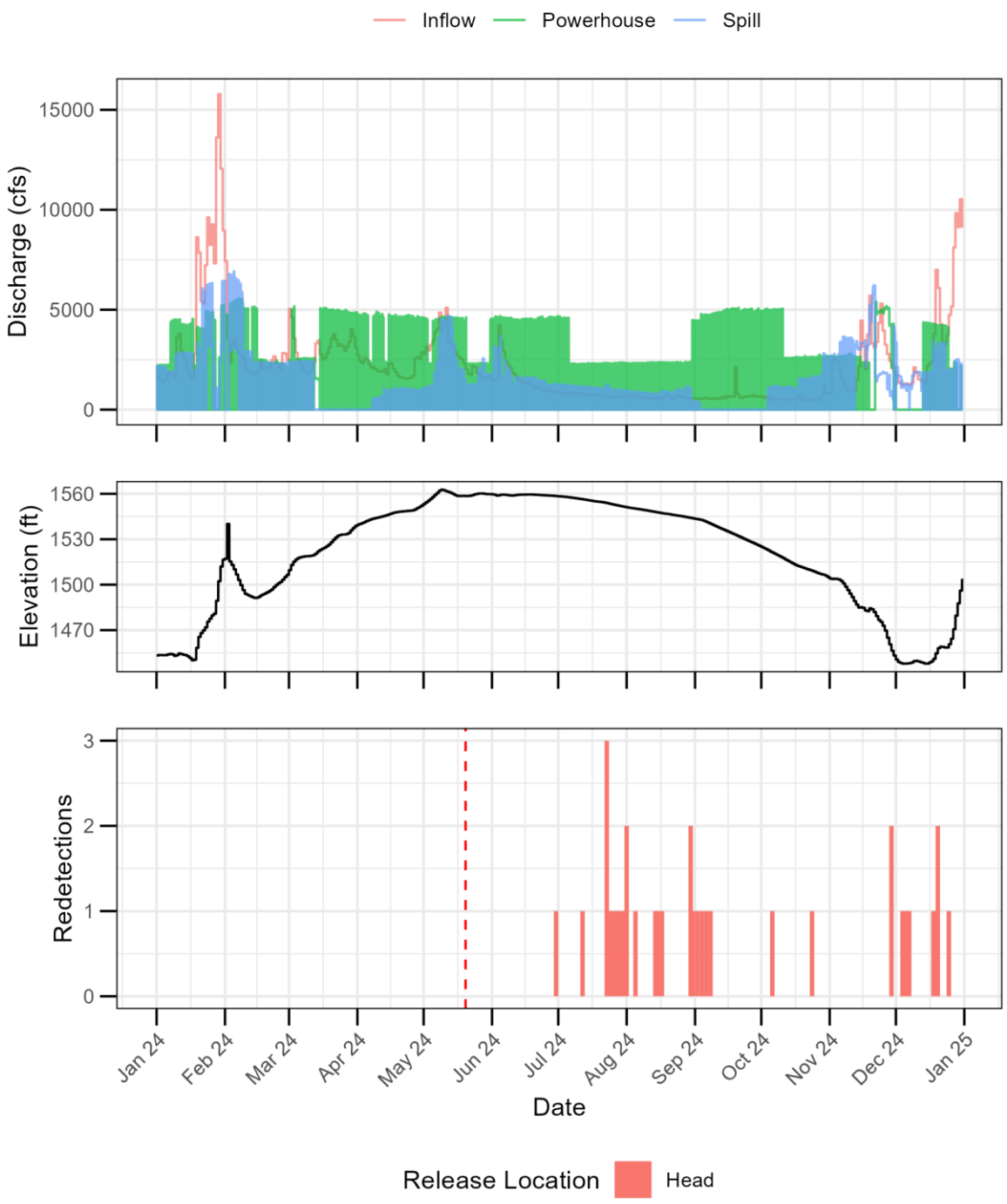

Figure 41. Detroit project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released on May 20, 2024 at the head of Detroit Reservoir and subsequently redetected at the Big Cliff tailrace screw trap (bottom panel). Spill is either surface spill, regulating outlet spill, or a combination thereof. Approximate release date is represented by the dashed vertical line.

Comparison

For brood year 2022, 13,638 fry were released on July 13, 2023, with an overall detection rate of 0.2% (27 fish detected). Of the 17 fish detected at the Big Cliff tailrace RST, 16 were detected during active spill operations, with median travel times of 172 days (North Santiam) and 279 days (Breitenbush). Most detections (11/17)

occurred during the spring yearling migration in 2024, likely reflecting the late release timing (July) and powerhouse-only flow until late September. For brood year 2023, 15,027 fry were released on May 20, 2024, also with a 0.2% detection rate (36 fish detected). All 36 detections occurred at the Big Cliff tailrace RST, with 33 during active spill operations; median travel times were shorter at 95.5 days (North Santiam) and 102 days (Breitenbush). The earlier release (May vs. July) and nighttime spill at release for brood year 2023 likely contributed to the shorter travel times, though detections still spanned into late 2024.

Target: Fall Subyearling Migration – Fall Dam Operations

Brood Year 2022

The next release group consisted of 9,999 subyearling Chinook salmon released at the head of Detroit Reservoir on September 26, 2023, split evenly between the Breitenbush and North Santiam Rivers. This release aimed to evaluate subyearling movement patterns during fall operations at Detroit Dam. A total of 5,002 tagged subyearlings were released into the Breitenbush River (mean fork length = 107 mm; mean weight = 12 g) and 4,997 into the North Santiam River (mean fork length = 103 mm; mean weight = 10 g). At the time of release, the forebay elevation at Detroit Dam was approximately 1,515 feet, with flow being directed either entirely through the powerhouse or entirely through the spillway, depending on the time of day, as part of nighttime spill operations.

A total of 39 fish from this release group were detected below Big Cliff Dam, yielding an overall detection rate of 0.4%. Of these, 23 fish were detected at the Big Cliff tailrace rotary screw trap (RST). The median travel time from the Breitenbush River to the tailrace was 207 days (n = 9), while the median travel time from the North Santiam River was 205 days (n = 14). Detection dates ranged from October 29, 2023, to June 4, 2024, with all but one detection occurring during fall regulating outlet or spring spill operations at Detroit Dam. The majority of detections (19) occurred during the yearling migration in the spring of 2024 (Figure 46).

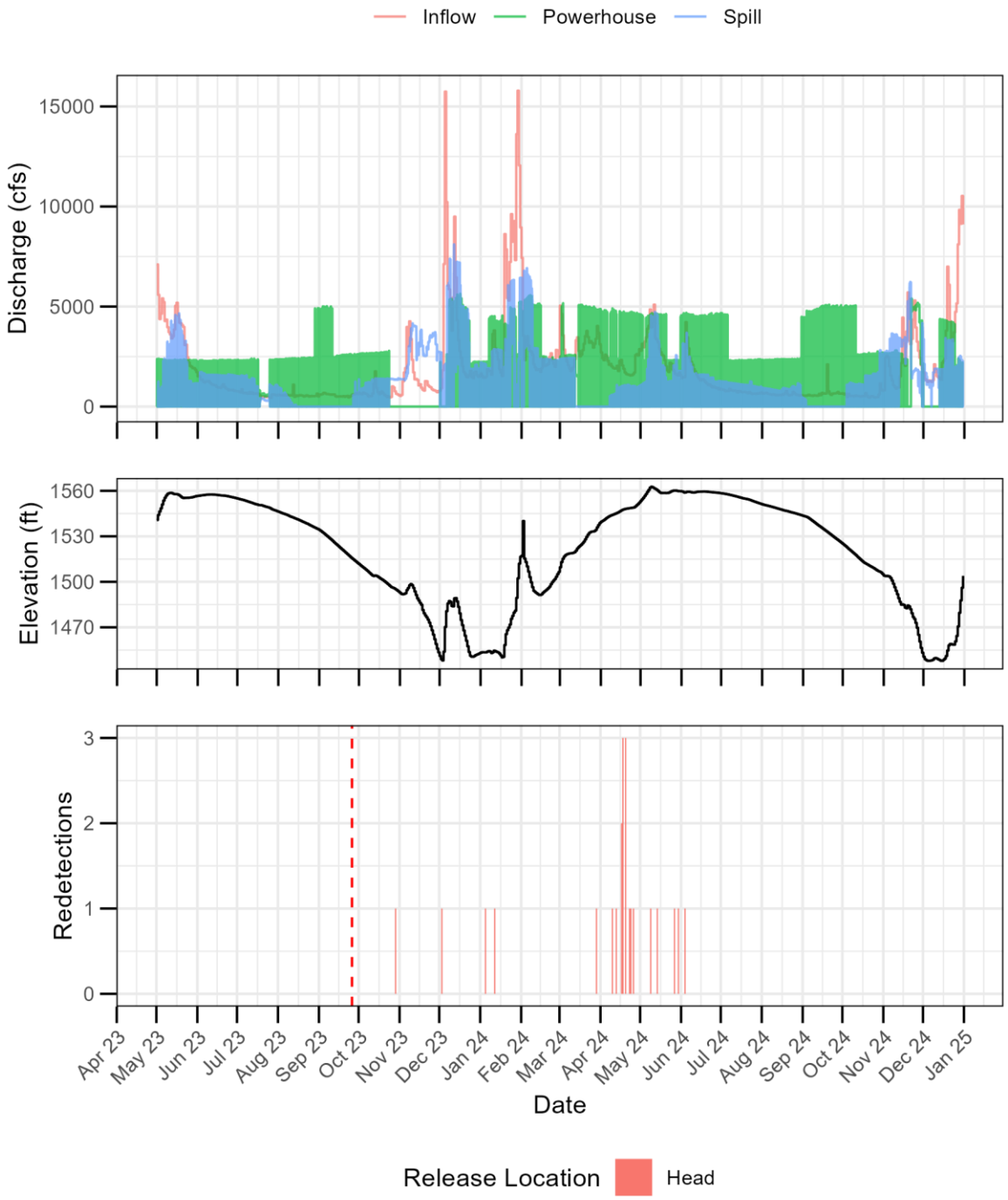

Figure 42. Detroit project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released on September 26, 2023 at the head of Detroit Reservoir and subsequently redetected at the Big Cliff tailrace screw trap (bottom panel). Approximate release date is represented by the dashed vertical line.

Brood Year 2023

A total of 10,001 BY 2023 subyearling Chinook salmon were released at the head of Detroit Reservoir on September 24, 2024, to evaluate subyearling movement patterns during fall dam operations at Detroit Dam. The fish were split evenly between the Breitenbush and North Santiam Rivers and had mean fork lengths of 104 mm

and mean weights of 13 g. At the time of release, the forebay elevation at Detroit was approximately 1,530 feet, with all flow being directed through the powerhouse. Nighttime spill operations began on October 4, 2024.

As of reporting, 13 fish from this release group have been detected below Big Cliff Dam, resulting in a preliminary detection rate of 0.13% (Table 18). The median travel time, regardless of release location, is 72 days. Of the detected fish, three were from the Breitenbush River and four from the North Santiam River. All detections have occurred during active spill operations at Detroit Dam (Figure 44).

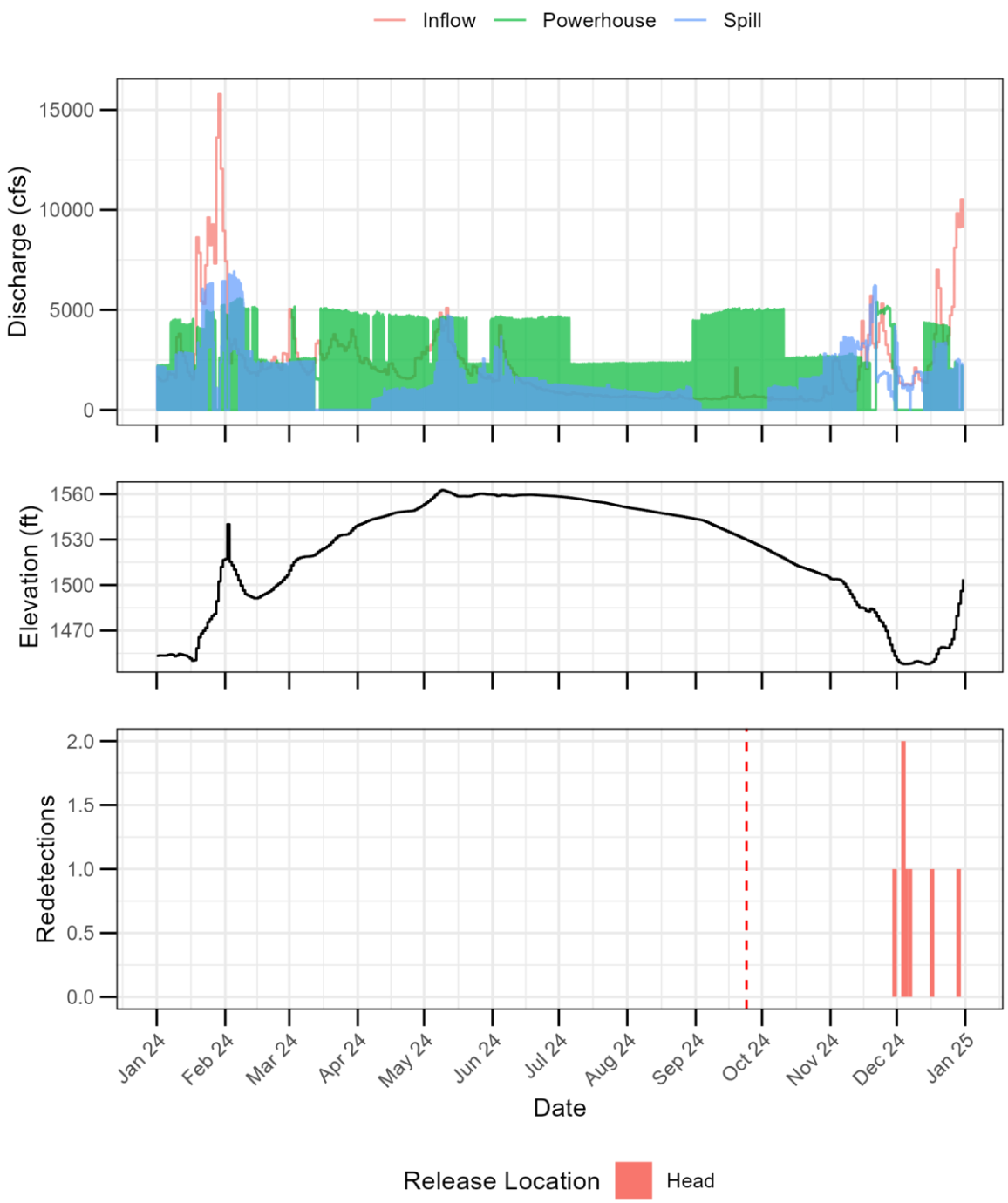

Figure 43. Detroit project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released on September 24, 2023 at the head of Detroit Reservoir and subsequently redetected at the Big Cliff tailrace screw trap (bottom panel). Approximate release date is represented by the dashed vertical line.

Comparison

For brood year 2022, 9,999 subyearlings were released on September 26, 2023, with an overall detection rate of 0.4% (39 fish detected). Of the 23 fish detected at the Big Cliff tailrace RST, 22 were detected during fall regulating outlet or spring spill operations, with median travel times of 205 days (North Santiam) and 207 days (Breitenbush). Most detections (19/23) occurred during the spring yearling migration in 2024, indicating delayed passage during fall of 2023. For brood year 2023, 10,001 subyearlings were released on September 24, 2024, with

a preliminary detection rate of 0.13% (13 fish detected through December 31, 2024). All 7 RST detections occurred during active spill (after October 4, 2024), with a median travel time of 72 days. Additional detections in spring 2025 are likely, which may increase the detection rate and extend the travel time, similar to the brood year 2022 pattern.

Target: Spring Yearling Migration – Spring Dam Operations

The final release of BY 2022 fish into the Detroit-Big Cliff project area involved a total of 4,000 yearlings. These were released at the head of the reservoir in two groups: 2,000 fish in the North Santiam Arm on March 20, 2024, and 2,000 fish in the Breitenbush Arm on March 21, 2024. These releases occurred before the reservoir elevation reached the spillway crest at Detroit Dam. At the time of release, the forebay elevation at Detroit Dam was 1,528 feet, and all flow was being directed through the powerhouse (Figure 44).

A total of 110 fish from this release group were detected downstream of Big Cliff Dam, resulting in an overall detection rate of 2.8% (Table 18). The largest number of detections from this group collectively occurred across the multiple Columbia River arrays. The Towed Array detected 33 fish and the Pile Dike arrays detected 34 fish. These detections all took place between May 10 and June 17, 2024.

A total of 38 were detected in the Big Cliff tailrace RST (detection rate: 1%). The median time from release to detection in the tailrace was 42 days for fish released in the North Santiam and 43 days for those released in the Breitenbush. All fish detected in the Big Cliff tailrace were detected when spill was active at Detroit (Figure 44).

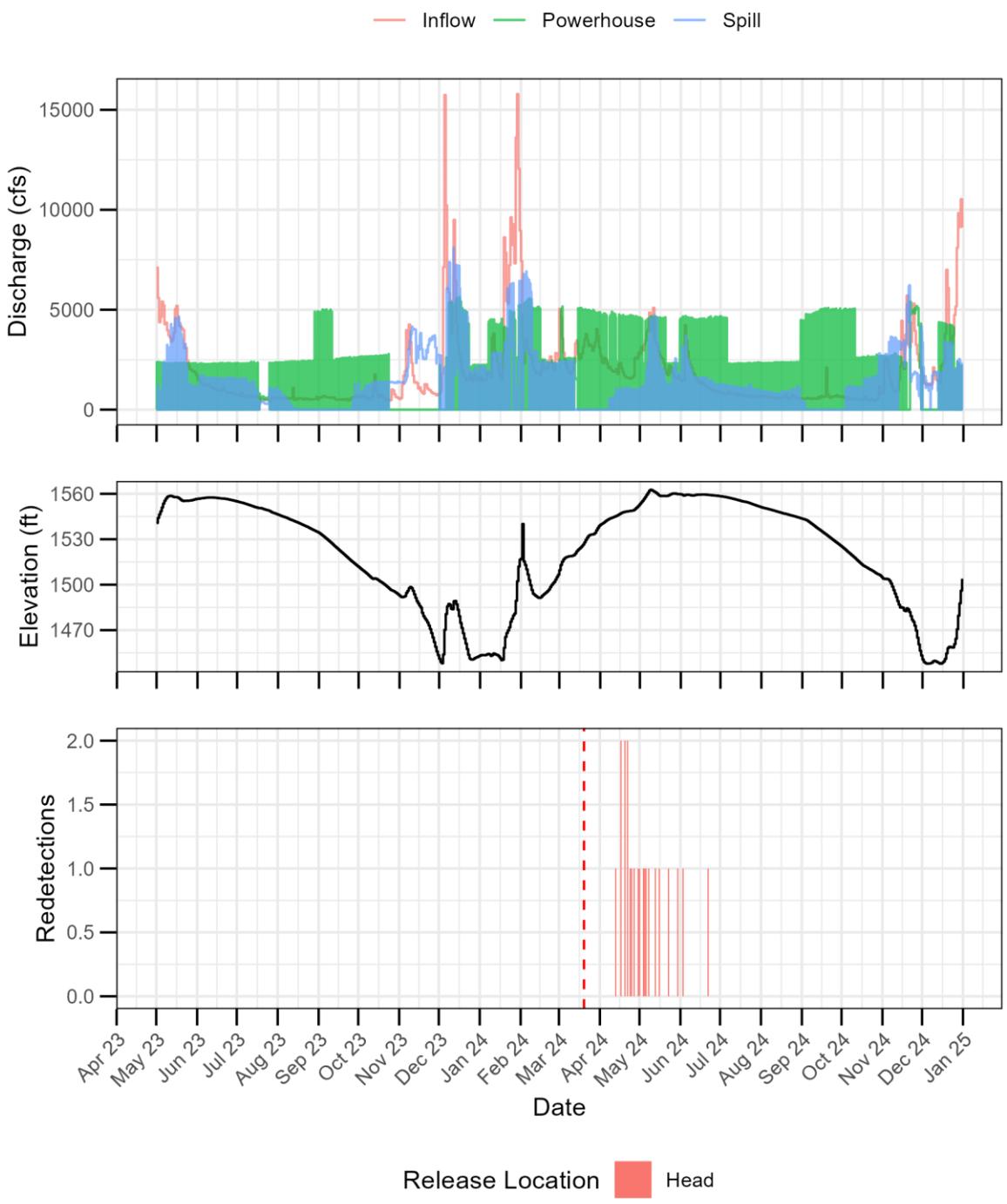

Figure 44. Detroit project discharge (top panel), forebay elevation (middle panel), and recaptures of PIT tagged salmon released on March 20, 2024 at the head of Detroit Reservoir and subsequently redetected at the Big Cliff tailrace screw trap (bottom panel). Approximate release date is represented by the dashed vertical line.

Summary – North Santiam

Detection rates of PIT-tagged juvenile Chinook salmon above Detroit Dam were low across all release groups (0.13%–2.8%). The downstream detection rate of fry released to evaluate spring dam operations at Detroit Dam was 0.2% for both brood years. Across both brood years, a total of 53 fish from these releases were subsequently detected in the Big Cliff tailrace RST, with 49 detected during active spill or regulating outlet operations at Detroit Dam. Travel times varied between brood years, with BY 2023 showing shorter travel times (95.5–102 days) than

BY 2022 (172–279 days), likely due to earlier release timing (May vs. July) and nighttime spill at release for brood year 2023.

For subyearling releases in September 2023 and 2024 to evaluate fall dam operations, detection rates ranged from 0.13% (BY 2023, preliminary through December 31, 2024) to 0.4% (BY 2022). Of the 30 fish detected at the Big Cliff tailrace RST across both brood years, 29 were detected during spill or regulating outlet operations at Detroit Dam. Brood year 2022 subyearlings had longer travel times (205–207 days), with most detections during the spring yearling migration in 2024, while brood year 2023 had shorter travel times (72 days) due to spill starting soon after release. However, BY 2023 data are preliminary, and additional detections in spring 2025 may increase the detection rate and extend the travel time, as observed in brood year 2022.

The highest overall detection rate across all release groups (2.8%) came from the release of BY 2022 yearlings in March 2024 before spillway crest elevation was reached, with all flow through the powerhouse at release. Of the 38 fish detected at the Big Cliff tailrace RST, all were detected during active spill operations, with median travel times of 42–43 days. Notably, the largest proportion of these detections took place in the Columbia River across the various Pile Dike arrays and Towed Array (67 fish), indicating successful downstream passage but suggesting low RST capture efficiency during peak migration. Overall, detections consistently coincided with spill or regulating outlet operations across all releases, suggesting these operations facilitate downstream passage for detected fish, though the low number of detections makes it difficult to assess how effectively the majority of fish are passing the dams.

RESERVOIR DISTRIBUTION STUDIES

Methods

Reservoir distribution studies were conducted during 2023 and 2024 in Green Peter and Lookout Point reservoirs to understand the life history characteristics and body condition of juvenile Chinook salmon and *O. mykiss* utilizing the reservoir environment, including nearshore and longitudinal distribution of Chinook salmon and *O. mykiss* in relation to dam operations.

Data Collection

Juvenile Chinook Salmon and O. mykiss longitudinal distribution & body condition

Biological Data

Past research in Willamette reservoirs indicates that Chinook salmon fry (<50 mm fork length [FL]) are closely associated with shallow nearshore habitat in spring before beginning to move offshore in June and shifting farther offshore and into deeper waters later in summer when water temperatures are at their maximum (Monzyk et al. 2015). Fish sampling methodology was selected to be consistent with past efforts (e.g. Monzyk et al. 2015) and to account for seasonal habitat use by juvenile Chinook salmon. To capture nearshore migration, floating box minnow traps and Oneida Lake traps were used to sample shallow nearshore environments. In summer and fall, small mesh suspended gill nets were used, set in the pelagic zone at depths corresponding with typical Chinook salmon thermal preferences as determined by past vertical distribution evaluations in Lookout Point Reservoir (Monzyk et al. 2013, Kock et al. 2019a).

Subyearling nearshore distribution

Sampling was conducted biweekly in nearshore habitats between mid-June and mid-July in Green Peter and Lookout Point reservoirs during 2023. Initiation of sampling in 2023 was delayed from our target of early May because our net supplier was unable to meet its delivery deadline due to unanticipated supply chain issues. In 2024, nearshore sampling began the first week of February and continued through mid-June to capture the entire spring outmigration period. Sampling events consisted of four days on each reservoir, including one day of setting traps and three days of checking and moving traps to new locations each day. Each reservoir was sampled on alternate weeks (i.e. Green Peter one week, Lookout Point the following week) for a total of two weeks of sampling effort on each reservoir per month.

Nearshore trapping was conducted following the methods of Monzyk et al. 2015. A stratified random sampling design was used for selection of daily trap locations. Each reservoir was stratified into three longitudinal zones (lower, middle and upper) where each zone represents approximately one third of the reservoir length (Figure 45; Figure 46). In Green Peter Reservoir, an additional zone was created to capture the Quartzville Creek arm of the reservoir (labeled "Quartzville" in Figure 46). Within each reservoir zone, the maximum conservation pool shoreline[2] was split into reaches of approximately 850 m. In Lookout Point Reservoir, nearshore shoreline reaches were altered slightly to be consistent with those used by ODFW in past studies (Brandt et al. 2016).

In Lookout Point Reservoir, three shoreline reaches within each longitudinal zone (lower, middle and upper) were randomly selected each sampling day for floating box trap placement (n = 9 total), and one location was randomly

[2] https://geospatialusace.opendata.arcgis.com/datasets/03e322d7e89b48a9b48e9c3f4bcaf29e_0/explore?location=34.797101%2C-97.473165%2C5.00

selected per zone for Oneida Lake trap placement (n = 3 total). These same trap allocations were used for Green Peter Reservoir, however, in addition, one Oneida trap and one floating box trap were placed in randomly selected shoreline reaches within the Quartzville zone, for a total of n=10 box traps and n=4 Oneida Lake traps per day in Green Peter Reservoir. Within each selected shoreline segment, trap placement was determined in the field based on suitability of site access and tie off locations. Traps were fished for approximately 24 hours, before being checked and moved to a new random location.

Floating box traps and Oneida Lake traps were constructed by Research Nets, Inc. following the specifications of Monzyk et al. 2015, with the exception that mesh sizes were decreased from 0.4 cm to 0.32 cm. Box traps were 0.61 x 0.61 x 0.91 m (W x H x L) and wrapped with 0.32 cm (1/8 inch) delta mesh, with a 51 mm throat opening to allow for entrance of small fish but sized to exclude larger predator fish. A 5 m lead net (0.91 m deep) was set perpendicular to shore to direct fish into the trap and a "tongue" fyke net (0.32 cm mesh) was attached below the trap opening to help direct fish into the trap. Small Oneida Lake traps consisted of a 1.2 x 1.2 x 1.2 m box wrapped in 0.32 cm delta mesh, with a 102 mm throat opening. A 20 m lead net (1.8 m deep, 0.32 cm delta mesh) was set perpendicular to shore to direct fish into the trap.

During each daily trap check, the time the trap was checked was recorded. All fish were then removed from the trap using nylon mesh dip nets and transferred to buckets filled with well-oxygenated fresh reservoir water. Non-target fish (i.e., fish other than juvenile Chinook salmon and adipose fin intact *O. mykiss)* were identified to species and coarse size class, enumerated and the first 10 of each species and size class were measured for FL to the nearest mm and released. Non-target species were also checked for presence/absence of the ectoparasitic copepod *Salmincola californiensis* and the number of fish with copepods was recorded. Size classes were estimated in the field based on relative size differences between cohorts. When size modes were indistinct, size classes were based on 50 mm fork length bins. During 2023 sampling, *O. mykiss* were processed in the field as a non-target species, but in 2024 they were processed as a target species following the same protocol as Chinook salmon, described below.

Captured Chinook salmon were examined for marks (adipose fin clips, PIT, VIE and CWT tags). All marked target species less than 300 mm were anesthetized in small batches using 50 mg/L MS-222 buffered with sodium bicarbonate. They then had their mark/tag information recorded and were measured for FL to the nearest mm, weighed to the nearest 0.01 g, and assessed for physical condition. The physical condition assessment included percent descaling, injuries, evidence of disease or pathogens, and parasite presence and intensity. Fish were examined systematically for *S. californiensis* infection intensity following methods used by Romer et al. (2017). Field crews examined the brachial cavity and fins for the presence of copepods and the number of copepods in each location were recorded. Following physical assessment, fish were transferred to a bucket filled with well-oxygenated fresh reservoir water to recover before release. Chinook salmon greater than 300 mm were to be checked for marks, measured for length and immediately released.

Unmarked Chinook salmon less than 300 mm and unmarked *O. mykiss* less than 200 mm were anesthetized and tagged in the field accordingly based on fork length[3]. Fish under 43 mm were tagged using visual implant elastomer (VIE) tags to distinguish fish based on capture month and reservoir zone. Fish over 43 mm were tagged with uniquely identifiable PIT tags. Fish 43-65 mm were implanted with 8 mm PIT tags, and fish over 65 mm were tagged using 12 mm PIT tags. Fish tagged in the field had their tag information recorded, fork length and weight measured, and were given a physical condition assessment. After being processed, fish recovered in buckets prior to release. Data on PIT tagged fish were uploaded to PTAGIS.

[3] 200 mm was used for *O. mykiss* to reduce the risk of anesthetizing catchable size fish.

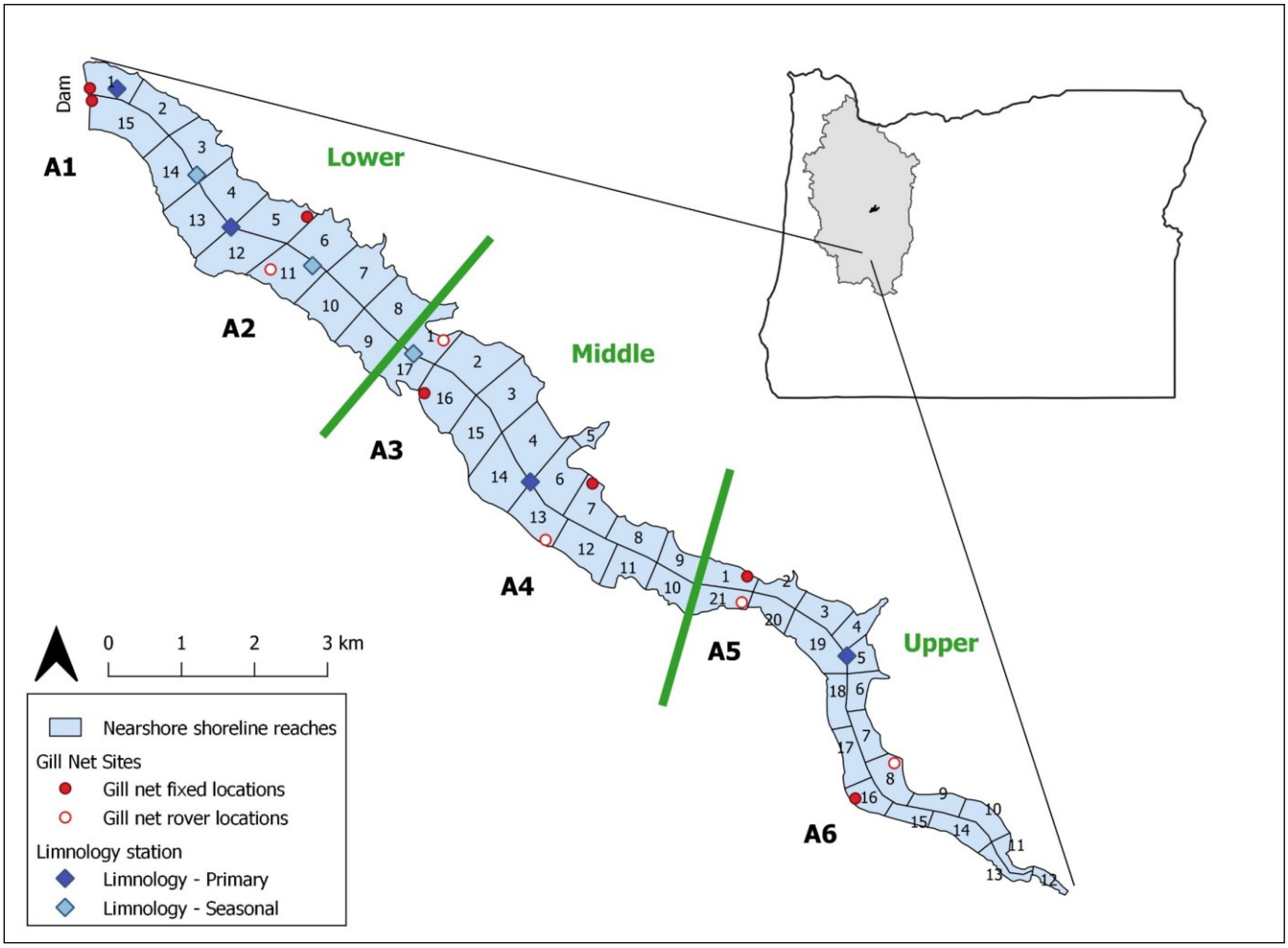

Figure 45. Map of Lookout Point Reservoir nearshore shoreline reaches, reservoir zones (lower, middle and upper), gill netting sampling areas and limnological stations.

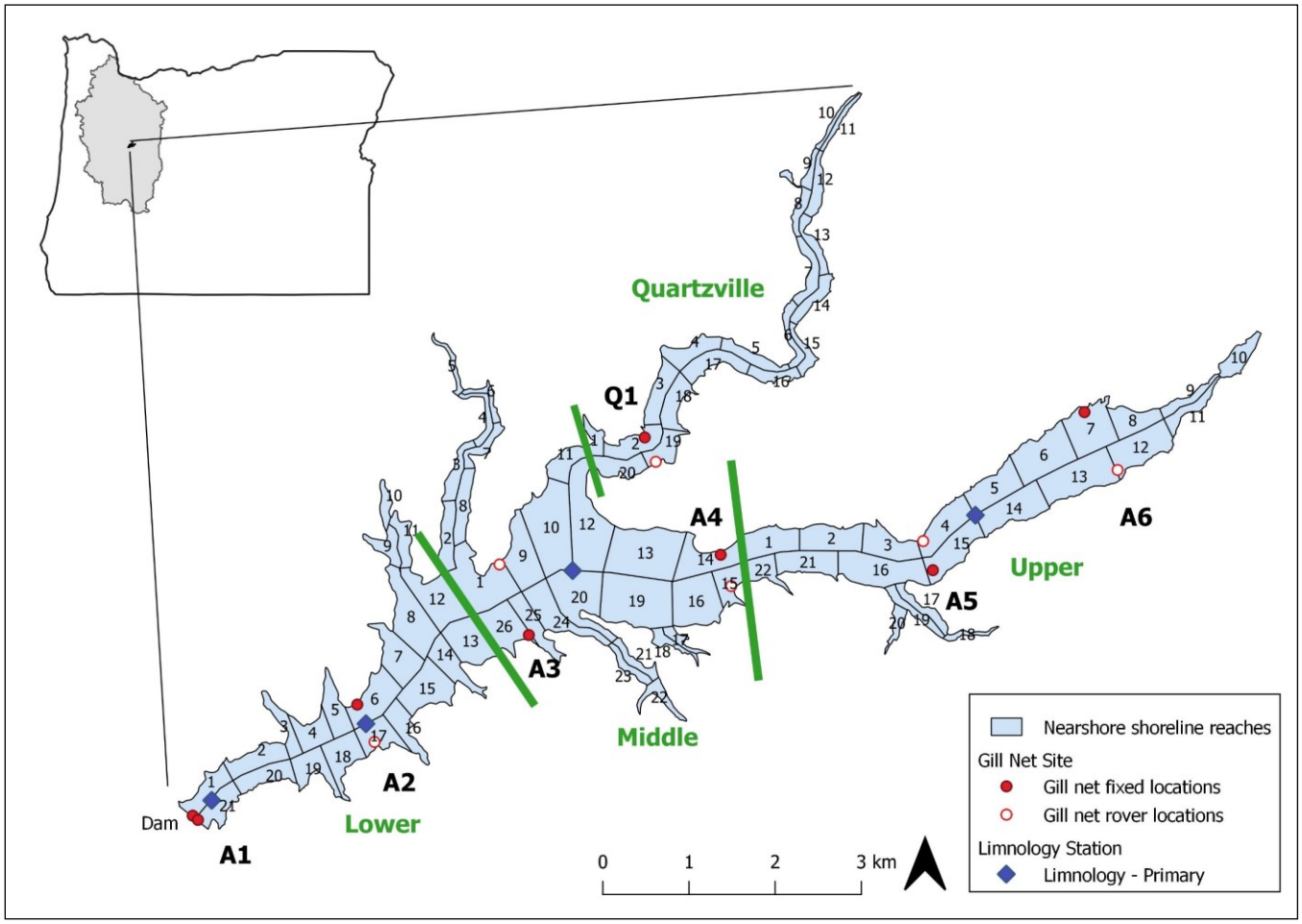

Figure 46. Map of Green Peter Reservoir nearshore shoreline reaches, reservoir zones (lower, middle, upper and Quartzville), gill netting sampling areas and limnological stations.

Offshore longitudinal distribution

Biweekly gill netting was conducted between mid-June and the first week of December in 2023 to assess the longitudinal distribution of Chinook salmon parr offshore. Consistent with nearshore sampling, each sampling event consisted of four days on each reservoir, including one day of setting gill nets and three days of checking nets. Green Peter and Lookout Point reservoirs were sampled on alternate weeks for a total of two weeks of sampling effort on each reservoir per month. During the fall drawdown period, the boat ramps on both reservoirs were no longer accessible and research boats were moored in the forebay of each reservoir. The boat on Green Peter Reservoir unexpectedly sank on 10/2/2023. Because accessing the reservoir from the shoreline on a routine basis for purposes of this study was deemed unsafe due to steeply inclined banks and deep, sinking mud, gill netting on Green Peter Reservoir was suspended for the remainder of 2023 and sampling effort was reallocated to Lookout Point Reservoir, which was sampled every week from mid-October through the first week of December. In 2024, gill netting commenced during mid-June and continued through early November on Green Peter Reservoir and the end of November on Lookout Point Reservoir. Gill net sampling on Green Peter Reservoir was suspended when crews were no longer able to safely access the shoreline on a routine basis. In 2024, this occurred when the reservoir elevation dropped below approximately 800 ft in early November.

Gill netting was conducted following methods modified from Monzyk et al. 2015. In each reservoir, floating gill net sampling stations were established at six fixed locations (A1-A6) evenly spaced from the head of the reservoir to the dam (Figure 45; Figure 46). A seventh fixed sampling location was used in Green Peter Reservoir within

the Quartzville arm (station Q1). Our initial sampling scheme was to set a total of 8 nets each day in Lookout Point Reservoir and 9 nets in Green Peter Reservoir. In each reservoir, two nets were set in the forebay (station A1), while one net was set at each of the remaining sites (stations A2-A6, and station Q1 in Green Peter). Lastly, each day one "rover" net was set across the reservoir from a fixed site to increase sampling effort (see Figure 45 and Figure 46 for rover locations). The rover site was selected systematically each day to ensure as close as possible to equal supplemental sampling effort among sites each month. Due to dropping reservoir elevations, upstream stations became dewatered and were not sampled when there was insufficient depth or unsafe boat access. Lost effort from upstream sites was reallocated downstream to additional rover locations and to sample additional depths. During peak drawdown, stations were also added between established stations (notated as A1.5, A2.5, and A3.5) to span the remaining reservoir footprint more evenly. Because the reservoir became very narrow during the drawdown, it also became necessary to stagger placement of nets at each station rather than having primary and rover nets directly across from each other. During 2023, after netting was suspended on Green Peter Reservoir, nets from that reservoir were taken for use on Lookout Point to increase effort, with up to 12 net sets per day.

Nets were set perpendicular to shore at depths corresponding to typical Chinook salmon habitat use and thermal preferences (Monzyk et al. 2015, Kock et al. 2019a, Monzyk et al. 2013). During past work in Lookout Point Reservoir, net depths used were greatest during peak thermal stratification (top of net at approximately 9.1 m July and August, 15.2 m early September), before returning to near the surface by the end of October (Monzyk et al. 2015). To capture this range, we set gill nets at 10m, 12m, 14m, 16m, 18m, and 20m at the start of the offshore season in August and early September of 2023 to try to locate the depth with greatest target fish densities. It became apparent, however, that the thermocline was deeper in 2023 and the shallow nets were fishing in waters warmer than 20ºC and unlikely to capture Chinook salmon. We modified our approach mid-season to begin selecting net depths based on the vertical temperature profile taken on the first day of each sampling week, with nets set as close as possible to 15ºC, which had the highest modal catch in past studies (Kock et al. 2019a, Monzyk et al. 2013). At shallow stations where it was not possible to reach the depth of 15ºC, nets were set as deep as possible while staying approximately 1-2 m off the bottom to minimize entanglement with stumps and other hazards visible on the depth sounder. With this depth selection method, net depth varied weekly and by station, with specific depths used reported in Appendix Table A3. During summer and early fall 2024 while thermal stratification was still established, gill net depths were selected to target the center of the net on 15C (or as close to that depth as site depth would allow) based on the vertical thermal profile taken on the first day of the sampling week. After thermal stratification broke down (approximately mid-October), gill nets were set at 0m, 5m, 10m and 15m.

In 2023, our intent was to match our gill net dimensions and mesh sizes to those used by ODFW in previous work (e.g. Monzyk et al. 2015) to enable direct comparisons of CPUE between years. We ordered a full set of custom 24.4 m long by 4.6 m (80 x 15 ft) deep gill nets, comprised of four 6.1 m panels (square mesh sizes: 9.5, 12.7, 19.1 and 25.4 mm) from Research Nets, Inc., however only 2 of these nets were delivered by our supplier in time for use during the season, with supply chain issues indefinitely delaying the rest of the order. To enable sampling to commence, we ordered replacement nets from Duluth Nets that were available immediately. These nets were the AFS Experimental Gill Net Small Fish Option which are 9.1 m (30 ft) long by 1.8 m (6 ft) deep, comprised of three 3 m panels (square mesh sizes: 9.5, 12.7 and 15.9 mm). This represents a reduction in net area and a shift to smaller mesh sizes in comparison with the ODFW nets. During the first sampling week in Green Peter Reservoir, both the 30' and 80' nets were trialed, however because only two of the larger nets were available and it wasn't possible to evenly distribute them across our stations, we elected to only use the 30' nets for the duration of the 2023 field season in both reservoirs. A comparison of effort between this study's 2023 protocol and past evaluations, in terms of net area, is provided in the discussion to provide context on observed differences in CPUE. Larger nets matching the ODFW specifications were procured prior to the start of the 2024 gill net field

season, which were used for the duration of 2024 offshore sampling. An exception to this is that beginning October 14, 2024 and continuing through the end of November, the gill net 9.5 mm (3/8") and 12.7 mm (1/2") panels were bundled (closed off) on Lookout Point Reservoir. This change became necessary because of extremely high catch rates of young-of-year non-target species in the smallest mesh sizes, particularly for white crappie. High catches of non-target species were causing high mortality as well as severely limiting the number of nets our crews could set and process each day. Comparatively, few target species were being captured in the smallest mesh sizes, thus we elected to bundle the small mesh panels to enable use of a greater quantity of nets using only the larger mesh panels that were more likely to capture our target species. All sets that were bundled have been notated as such in results tables and figures.

Net suspension methods followed Ingram and Korn (1969). For each net set, we recorded site GPS, set and pull date and time, site depth, net depth, and described the weather. Nets were fished for approximately 24 hours between pulls. All fish caught were identified to species and coarse size class, the mesh size where each fish was captured was recorded, and each fish was assessed for copepod presence. The first 10 of each non-target species and size class were measured for FL before disposal/release. All mortalities were sunk after puncturing the swim bladder, while live non-target fish were immediately released after measurement. Chinook salmon captured were examined for marks (fin clips, PIT or VIE tags). Marks and tag codes were recorded, and mortalities were measured for FL and weight and assessed for physical condition, including copepod infestation prevalence and intensity. Any live target species less than 300 mm FL were handled following the same procedures as for nearshore sampling and if unmarked, were tagged. Consistent with nearshore sampling, *O. mykiss* were processed as non-target fish during 2023 offshore sampling, but were processed as target species following the protocol for Chinook salmon during 2024.

Limnological Sampling

Three primary limnological sampling stations were established in each reservoir, positioned in the upper, middle, and lower thirds along the longitudinal axis (Figure 45, Figure 46). Biweekly sampling efforts began with crews collecting vertical profiles of temperature and dissolved oxygen (DO) at each station using a YSI instrument. From June to early September 2023, a YSI ProODO with a 30 m cable was used to collect temperature and DO readings at 1 m intervals to a maximum depth of 30 m. From September to December 2023, and throughout all 2024 sampling, a YSI ProDSS equipped with a depth sensor and a 100 m cable was used. The ProDSS provided temperature, DO, and turbidity readings at 1-second intervals (approximately every 0.25 m) during descent until the maximum station depth was reached. All profile data were downloaded and archived in an electronic database.

As reservoir drawdown progressed in late summer and fall 2023 at Lookout Point Reservoir, the upper and middle primary stations became too shallow to sample, and the lower station was insufficiently deep to capture the entire thermocline. To address this, a new primary station was established in the reservoir forebay in September 2023 to collect deeper profiles. Additionally, seasonal stations were added between the primary stations as the drawdown reduced the reservoir footprint, ensuring that at least three sampling stations were maintained along the longitudinal axis each week (Figure 45).

During 2024, limnological sampling was conducted at the forebay, lower, middle, and upper primary stations in each reservoir, where accessible. Seasonal stations were again added as needed during drawdown to maintain spatial coverage and to adapt to changing reservoir conditions.

Data Analysis

Chinook Salmon and O. mykiss Longitudinal Distribution

Nearshore Chinook salmon longitudinal distribution was evaluated by comparing catch rates between reservoir zones and distance along the reservoir axis. GPS coordinates of each trap were converted to a percent of the reservoir length along the centerline to estimate distance from the head of the reservoir (HoR 0%, at dam 100%). The centerline of each reservoir was digitized in QGIS and sampling locations were snapped to the nearest location on the centerline to determine distance. Catches and catch per unit effort (CPUE, number of fish captured per 24 hr set) were compared between reservoir zones and sampling periods to evaluate nearshore distribution. Catch was plotted versus percent of reservoir length to further evaluate patterns of catch. Sizes of Chinook salmon captured in nearshore traps were evaluated using summary statistics.

Offshore catch and CPUE were evaluated by station and net set locations were converted to percent of reservoir length to allow for evaluation of catch in relation to distance from the head of the reservoir. Catch was plotted by station and versus percent of reservoir length, as well as by month to evaluate patterns of catch. Sizes of Chinook salmon captured in offshore traps were evaluated using summary statistics. Exploratory data analysis was completed to evaluate the relationship between water temperature, net depth and Chinook salmon catch rates. Net temperature of gill nets was estimated by taking the mean temperature of the vertical temperature profile across the range of depths spanned by the gill net. This exploratory analysis revealed that Chinook salmon were never caught in offshore nets with mean temperature greater than 20ºC during 2023, thus the nets set at those temperatures were dropped from subsequent Chinook salmon CPUE comparisons among reservoir zones. All other net depths were aggregated for analyses in this report, however detailed catch and CPUE for all net depths including those over 20ºC has been retained in the Appendix of this report (Appendix Table A3).

Chinook Salmon Abundance Index

CPUE was used as an abundance index and compared to dam operations. Too few PIT-tagged Chinook salmon were recaptured during 2023 to allow for a mark-recapture-based abundance estimate. For 2024, biometricians evaluated the data and determined that the number of recaptures and data properties were unsuitable for the Jolly-Seber POPAN model, thus a mark-recapture estimate was not produced at this time. Dam operations data were downloaded from the USACE Northwestern Division Dataquery 2.0 web portal[4]. Data was obtained for percent full conservation pool, forebay elevation, and flow in and out of each reservoir.

Copepod Infestation

Copepod infestation was evaluated by calculating the prevalence rate as the number of fish with copepods present versus the total number of fish assessed. This evaluation was completed for all salmonid species captured.

Chinook Salmon Growth

Change in mean fork length and weight between seasons was evaluated for natural and hatchery origin Chinook salmon to estimate growth in the reservoir. Additionally, growth was examined for PIT tagged juvenile Chinook salmon recaptured in the reservoirs. Size at release (mean for the release group) was compared to mean size at capture relative to travel time (days between release and recapture).

[4] https://www.nwd-wc.usace.army.mil/dd/common/dataquery/www/

Catch Composition and Predator Bycatch

Catch composition of all sets was evaluated using both total catch and CPUE. Predator bycatch was further evaluated using total catch and CPUE but only for fish greater than 200 mm and for species known to be piscivorous.

Results: Reservoir Study Summary through 31 Dec 2024

Limnological sampling

Lookout Point Reservoir

Vertical profiles of temperature, and dissolved oxygen were taken in Lookout Point Reservoir across the duration of the 2023 sampling period (late June – early December). Turbidity profiles were added later in the sampling period and were recorded starting in October 2023. Temperature, dissolved oxygen and turbidity were measured for the duration of the 2024 field season (February – November).

In 2023, thermal stratification in Lookout Point Reservoir was pronounced in June and July with surface temperatures of over 20ºC (Figure 47). As summer progressed, all depths of the reservoir warmed, with temperatures of 19-21ºC seen down to 30 m depth in August. Later in the season and as reservoir elevations dropped with the drawdown, the reservoir was well mixed with little change in temperature with depth. By the end of the 2023 sampling period in December, reservoir water temperatures had dropped to 8ºC. With temperatures optimal for juvenile Chinook salmon rearing between 12 and 17 degrees Celsius (Independent Science Panel 1996), it would suggest that Lookout Point reservoir had unsuitably warm temperatures across all depths (no thermal refuge) during August and September of 2023, except for a small pocket in the forebay where depths exceeded 30 m. However, this pocket also had low dissolved oxygen (DO) (<5 mg/L) that would have produced stressful conditions for juvenile salmonids. Juvenile salmonids begin to show symptoms of oxygen stress (reduced swimming efficiency, reduced growth and food conversion efficiency) below 6 mg/L, with most fish exhibiting impairment below 4.25 mg/L (Bjornn and Reiser 1991). All other depths and sampling periods had sufficient DO for salmonid use. Turbidity in Lookout Point Reservoir was high (exceeding 200 NTU), particularly in November of 2023 coinciding with peak drawdown and in early December during a storm event when the reservoir elevation was rapidly increased for flood control (Figure 47).

During 2024, the reservoirs were cold and well mixed in late winter, with high dissolved oxygen and low turbidity (< 1 NTU) (Figure 47). Lookout Point Reservoir began to warm in April with pronounced thermal stratification and surface waters > 15C beginning in June. Surface temperatures in Lookout Point Reservoir peaked during July and August, with temperatures exceeding 22C. During peak thermal stratification, temperatures of >18C extended down to a depth of approximately 20m in the forebay and covered the entire water column at the lower limnology station (shallower depth station than the forebay). At that time, the depth of the forebay was approximately 30m, creating a zone from 20-30m depth where temperatures ranged from 14-18C, which are typically suitable for salmonid use. Temperatures cooled and thermal stratification broke down in October. While dissolved oxygen decreased during summer down to 6-7 mg/L at depth, it never fell below 6 mg/L and thus juvenile salmonids were unlikely to have exhibited symptoms of low dissolved oxygen stress. Turbidity was low for most of the 2024 field season, with the exception that increases were seen during late fall as the drawdown progressed. By conclusion of sampling in mid-November, turbidity had increased to range from 30-77 NTU across the water column (Figure 47).

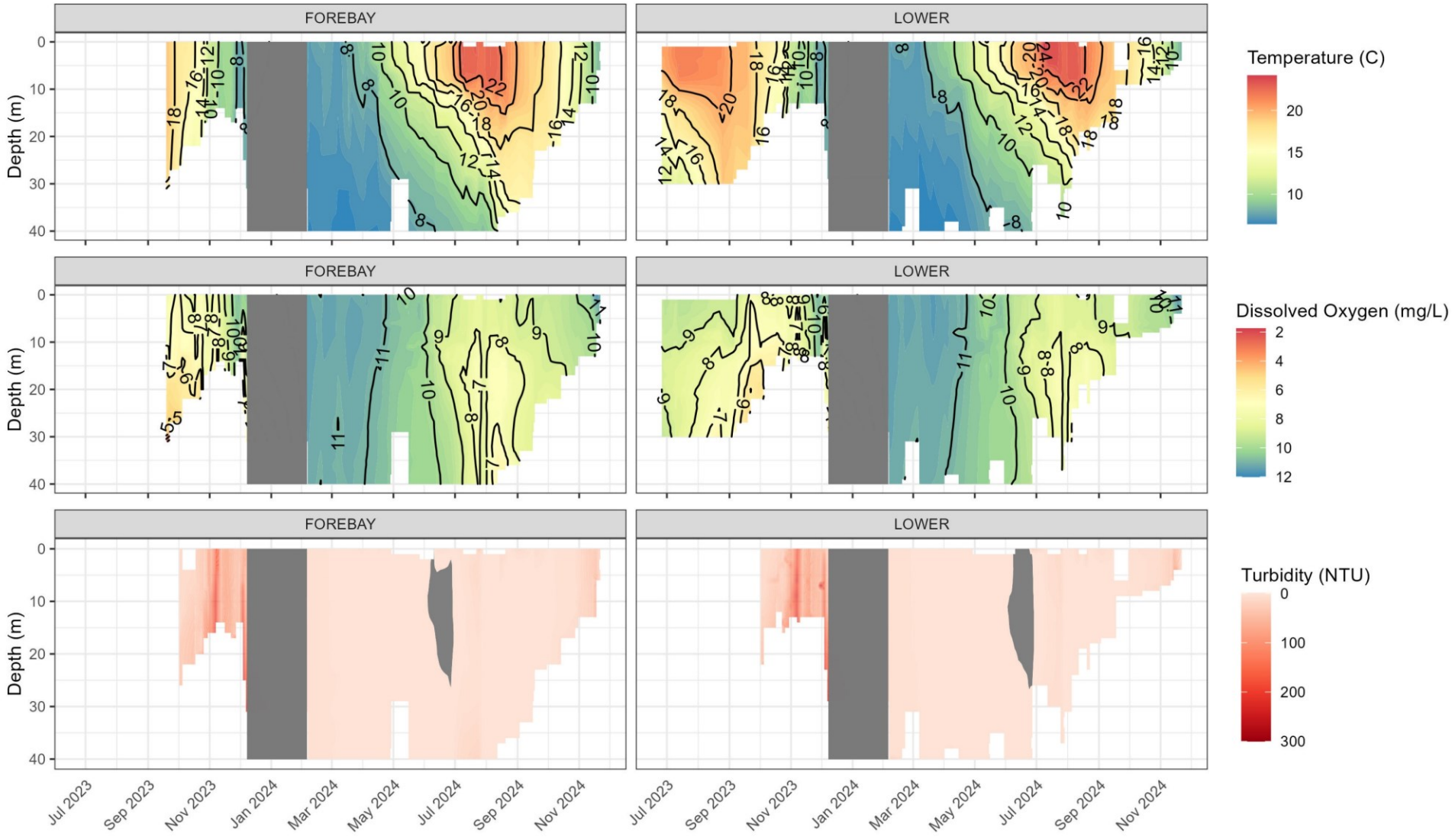

Figure 47. Lookout Point vertical temperature (°C), dissolved oxygen (mg/L) and turbidity (NTU) profiles taken at the Forebay and Lower limnology stations. Note that the Forebay location was added in mid-September 2023 and no data were collected between Dec 2023 and Feb 2024 (dark gray). Turbidity sampling was added in October 2023. Gray turbidity values in spring 2024 represent data removed due to a sensor calibration issue.

Green Peter Reservoir

In 2023, vertical profiles of temperature and dissolved oxygen were recorded in Green Peter Reservoir from late June through early October, coinciding with fish sampling weeks. Profiles were taken down to 30 m depth until mid-September, after which profiles were taken down to each station's maximum depth. Water surface temperatures during summer ranged from 20-25ºC, with pronounced thermal stratification (Figure 48). The thermocline depth varied across the season, ranging from approximately 9 m down to 25 m. Below the thermocoline, temperatures were less than 10ºC. Because Green Peter has a greater maximum depth than Lookout Point Reservoir, depths with suitable temperature and dissolved oxygen for salmonid use persisted throughout the 2023 sampling season. Turbidity profiles were not taken in Green Peter Reservoir during 2023 sampling; however, turbidity data was collected by the USGS in the Green Peter tailrace between mid-August and the end of the year[5]. The USGS data shows relatively low turbidity (<2 FNU) through early October, before drastically increasing during the fall coinciding with the drawdown, with values regularly exceeding 200 FNU and peaks of over 1,000 FNU. Turbidity data were not collected at the USGS site in previous years.

Vertical profiles taken in Green Peter Reservoir during 2024 show warming beginning in April and peak thermal stratification occurring between late June and September (Figure 48). During early summer the thermocline was at approximately 10 m depth, before deepening to approximately 25 m depth by late summer. At the end of October, the reservoir became mixed, with ~18C seen across the thermal profile. During late October and early November, the reservoir rapidly cooled to 10-12C before the conclusion of sampling on November 7, 2024. Dissolved oxygen decreased during the warmest water months but never fell below levels that would be stressful for juvenile salmonids (i.e., 6 mg/L). Turbidity was low except during fall, coincident with when the drawdown was accelerated, and the reservoir was approaching its minimum elevation. Prior to late October, turbidity was generally <10 NTU. In late October, turbidity increased to approximately 20-25 NTU, and by early November sampling, turbidity exceeded 500 NTU throughout the water column (Figure 48).

[5] https://waterdata.usgs.gov/monitoring-location/14186200/#parameterCode=63680&showMedian=false&startDT=2023-07-01&endDT=2023-12-31

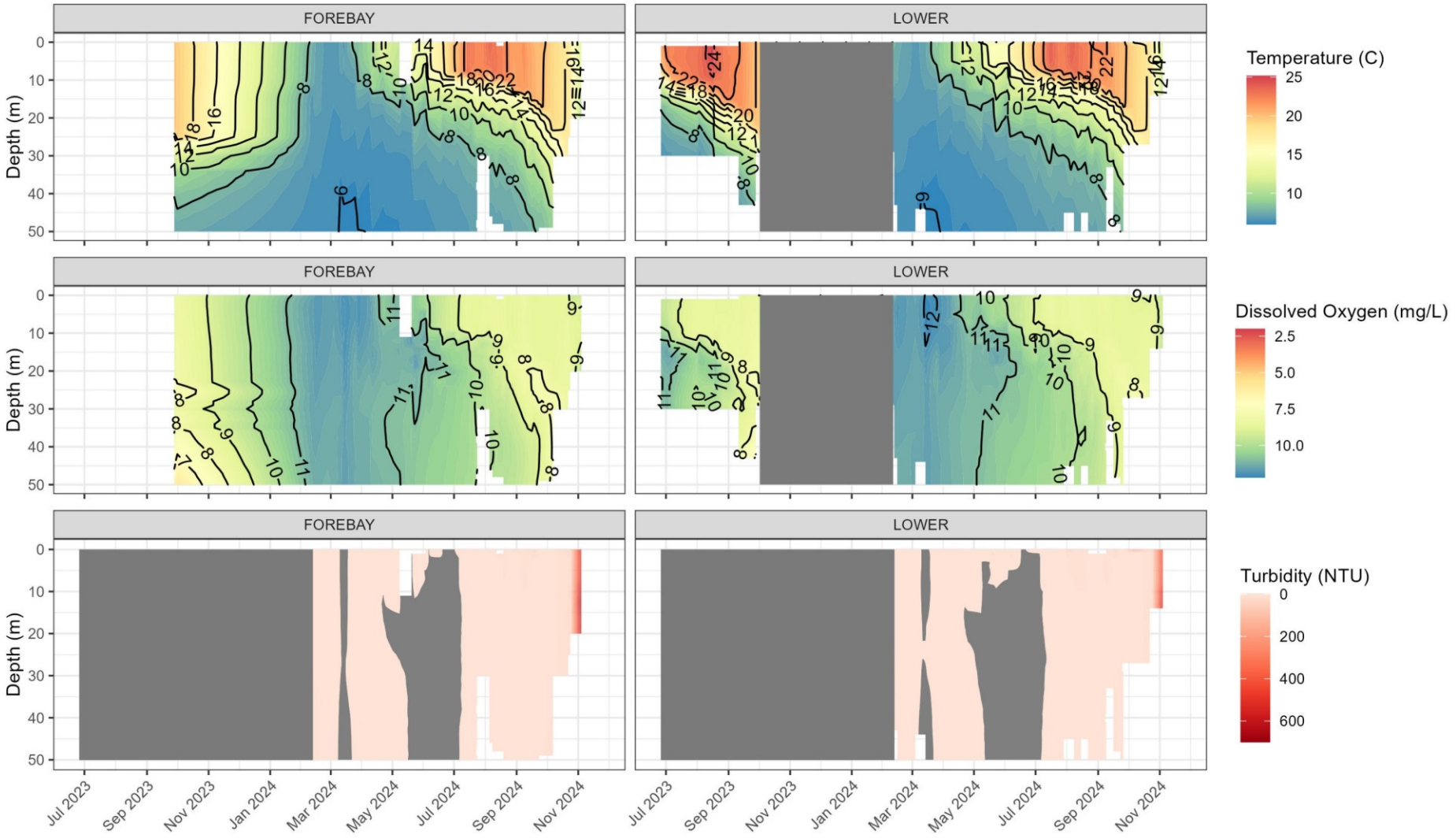

Figure 48. Green Peter vertical temperature (°C), dissolved oxygen (mg/L) profiles taken at the forebay and lower limnology stations. The forebay station was not consistently sampled in 2023, nor was turbidity. Gray shading indicates no data. Negative turbidity readings from spring 2024 were removed as erroneous due to a sensor calibration issue but Secchi disk reading suggest turbidity was low during that time.

Summary of fish sampling effort

While fish sampling was initially planned to begin in early May of 2023, initiation of sampling in 2023 was delayed until mid-June because our net supplier had supply chain issues and missed their delivery deadline. We received our first shipment of nets during the 24th week of the year (June 11 – June 17, 2023) and immediately conducted test deployments in Green Peter Reservoir to work out any issues with net configurations and logistics associated with the deployment and operation of the trap nets. Sampling began in earnest the following week. Sampling with nearshore nets in Green Peter Reservoir was conducted between mid-June and early July of 2023 (see Appendix Figure A5 for a map of trapping locations). Nearshore sampling in Lookout Point reservoir occurred between late June and mid-July of 2023 (see Appendix Figure A4 for a map of trapping locations). Offshore sampling using suspended gill nets was conducted in Green Peter Reservoir between late July and the end of September. No offshore sampling was conducted in Green Peter after September during 2023 because the CFS boat moored on that reservoir sank on 10/2/2023. Due to the reservoir drawdown, CFS was not able to identify safe routine access to the reservoir for the purposes of this study, thus sampling was suspended for the 2023 season. Offshore gill net sampling in Lookout Point reservoir was conducted between mid-August and early December in 2023. Effort increased in the late fall (# of sets and sampling weekly instead of biweekly) because effort was reallocated to Lookout Point reservoir after sampling on Green Peter was suspended.

Sampling for 2024 began in early February with nearshore trapping. Nearshore trapping continued through mid-June before being suspended due to rising surface temperatures and increased non-target incidental mortality. In mid-June we transitioned to using suspended offshore gill nets. Gill netting on Green Peter reservoir during 2024 continued through the first week of November. At that point, our crews were no longer able to safely access our boat moored on the reservoir via the shoreline because of steeply inclined banks and dangerous sediment conditions (reservoir elevation ~800 ft). With no routine safe access, sampling on Green Peter was suspended for the remainder of the field season. Crews investigated alternative access points later in November to develop options for use during 2025 sampling on Green Peter Reservoir. Lookout Point Reservoir was sampled using gill nets from mid-June through late November of 2024. Effort by year, reservoir, sampling week and gear type are summarized in Table 19.

Table 19. Sampling seasons, number of sets and juvenile adipose-clipped hatchery Chinook salmon (CHS-AD), natural origin Chinook salmon (CHS-Natural) and natural origin *O. mykiss* (RBT-Natural) catch by year, reservoir and net type. Total number of sets is how many nets were set over the course of the season. Number of sets for CPUE removes a small subset of sets that were not fishing properly and should not be considered for CPUE analyses. These nets were removed for various reasons (e.g. tampered with, lead disconnected from shore, log damage, etc.). RBT-Natural were not counted during 2023.

						# of sets	Catch		
Reservoir	Habitat	Season Start	Season End	Net Type	Total # of sets	for CPUE	CHS-AD	CHS-Natural	RBT-Natural
				2023					
Green Peter	Nearshore	6/20/2023	7/5/2023	box minnow	60	59	0	0	-
	Nearshore	6/15/2023	7/5/2023	oneida	26	26	0	0	-
	Offshore	7/31/2023	9/30/2023	gill net 30'	111	108	0	1	-
	Offshore	7/31/2023	8/1/2023	gill net 80'	3	2	0	0	-
Lookout Point	Nearshore	6/26/2023	7/12/2023	box minnow	54	51	0	1	-
	Nearshore	6/26/2023	7/12/2023	oneida	18	18	1	15	-
	Offshore	8/22/2023	12/6/2023	gill net 30'	311	309	9	4	-
				2024					

Reservoir	Habitat	Season Start	Season End	Net Type	Total # of sets	# of sets for CPUE	Catch		
							CHS-AD	CHS-Natural	RBT-Natural
Green Peter	Nearshore	2/12/2024	6/5/2024	box minnow	260	257	0	1	0
	Nearshore	2/12/2024	6/5/2024	oneida	104	104	8	49	12
	Offshore	7/30/2024	7/30/2024	gill net 30'	1	1	0	0	0
	Offshore	6/17/2024	11/6/2024	gill net 80'	345	336	125	425	72
Lookout Point	Nearshore	2/5/2024	6/12/2024	box minnow	255	247	0	4	1
	Nearshore	2/5/2024	6/12/2024	oneida	85	85	3	11	38
	Offshore	6/24/2024	11/21/2024	gill net 80'	224	216	125	54	90

Nearshore Chinook salmon and *O. mykiss* longitudinal distribution

Lookout Point

During the 2023 nearshore sampling period (mid-June through mid-July), only 17 subyearling (BY22) Chinook salmon were captured in box minnow and Oneida lake traps in Lookout Point Reservoir, of which 16 where natural origin and one was a hatchery origin Chinook salmon (one recapture from the bulk marking project) (Table 20, Table 21). All but one Chinook salmon were captured in Oneida lake traps. Based on fork length (see Figure 61, Table 21), all fish captured were assigned as subyearlings. The majority of trap sets had zero Chinook salmon catch, however, those that did were in the upper and middle reservoir zones, with 13 caught in the upper zone nearest the head of the reservoir, four in the middle zone, and zero captured in the lower zone (Figure 49, Figure 50). Because only two weeks were sampled in the nearshore environment in 2023, changes in nearshore longitudinal distribution were not evaluated over time. Weekly mean surface water temperatures of nearshore trap sets ranged from 21.0 - 23.6ºC depending on the zone and sampling week (Table 22).

Nearshore sampling during 2024 spanned from February through mid-June, during which three hatchery yearling (BY22) Chinook salmon (all bulk marking project recaptures), five natural origin Chinook salmon subyearlings (BY23), 10 natural origin Chinook salmon yearlings (BY22), 37 natural origin *O. mykiss* (adipose intact) juveniles (<200mm), and two natural origin *O. mykiss* adults (>200mm) were captured (Table 20). Hatchery Chinook salmon were captured in the middle and lower reservoir zones, and natural origin Chinook salmon were captured in the upper and middle zones (none in lower). Natural origin *O. mykiss* were caught in all reservoir zones (Figure 49).

Details on effort by sampling week, and detailed catch and catch per unit effort (CPUE) information for nearshore trapping in both reservoirs are presented in Appendix Tables A1 and A2.

Table 20. Catch of target species (Chinook salmon and natural origin *O. mykiss*) caught in Lookout Point and Green Peter Reservoirs during 2023-2024 sampling, and the number implanted with a tag in the field (VIE or PIT), the number of recaptures and mortalities. All recaptures were PIT tagged fish except where noted. There were no VIE recaptures. *USGS acoustic tag recaptures. CHS-natural = natural origin Chinook salmon, CHS-AD = hatchery Chinook salmon, RBT-natural = natural origin *O. mykiss*.

Reservoir	Species	Life stage	Trap Type	Total Catch	# VIE tagged	# PIT tagged	# Recap	Mortalities
2023								
Green Peter	CHS-natural	Sub-Yearling BY22	Gill net	1	0	0	0	1

Reservoir	Species	Life stage	Trap Type	Total Catch	# VIE tagged	# PIT tagged	# Recap	Mortalities
Lookout Point	CHS-AD	Sub-Yearling BY22	Nearshore trap	1	0	0	1	0
	CHS-natural	Sub-Yearling BY22	Nearshore trap	16	0	1	0	0
	CHS-AD	Sub-Yearling BY22	Gill net	9	0	3	6	3
	CHS-natural	Sub-Yearling BY22	Gill net	4	0	0	0	2
			2024					
Green Peter	CHS-AD	Sub-Yearling BY23	Nearshore trap	6	0	0	5	0
	CHS-AD	Yearling BY22	Nearshore trap	2	0	0	2	0
	CHS-natural	Sub-Yearling BY23	Nearshore trap	47	28	11	0	2
	CHS-natural	Yearling BY22	Nearshore trap	3	0	2	0	0
	RBT-natural	Adult	Nearshore trap	1	0	1	0	0
	RBT-natural	Juvenile	Nearshore trap	11	4	4	0	0
	CHS-AD	Adult	Gill net	1	0	0	0	0
	CHS-AD	Sub-Yearling BY23	Gill net	124	0	1	86	114
	CHS-natural	Sub-Yearling BY23	Gill net	422	0	15	0	380
	CHS-natural	Yearling BY22	Gill net	3	0	0	0	3
	RBT-natural	Adult	Gill net	60	0	0	0	49
	RBT-natural	Juvenile	Gill net	12	0	0	0	11
Lookout Point	CHS-AD	Yearling BY22	Nearshore trap	3	0	0	3	1
	CHS-natural	Sub-Yearling BY23	Nearshore trap	5	2	2	0	1
	CHS-natural	Yearling BY22	Nearshore trap	10	0	9	0	1
	RBT-natural	Adult	Nearshore trap	2	0	2	0	0
	RBT-natural	Juvenile	Nearshore trap	37	1	20	0	2
	CHS-AD	Sub-Yearling BY23	Gill net	123	0	0	9*	115
	CHS-AD	Yearling BY22	Gill net	2	0	0	0	2
	CHS-natural	Sub-Yearling BY23	Gill net	50	0	0	0	44
	CHS-natural	Yearling BY22	Gill net	4	0	0	0	4
	RBT-natural	Adult	Gill net	86	0	0	0	72
	RBT-natural	Juvenile	Gill net	4	0	0	0	4

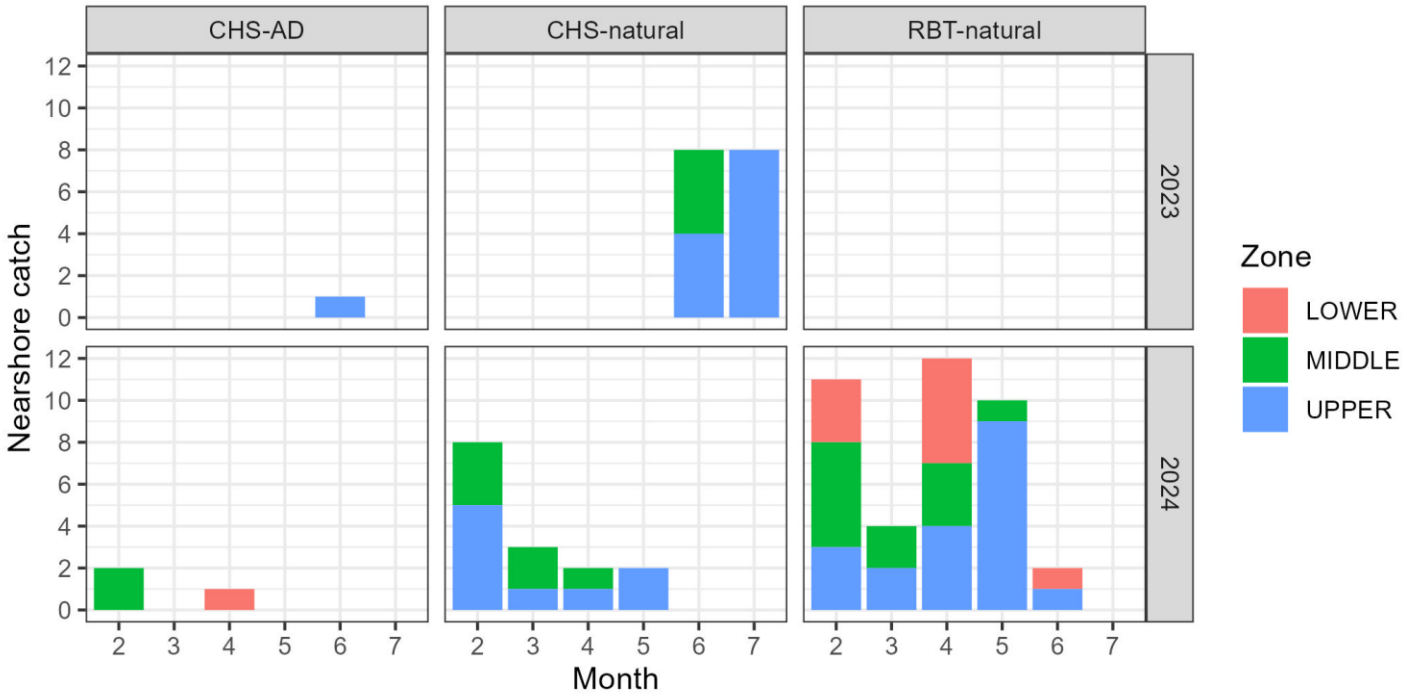

Figure 49. Lookout Point Reservoir nearshore catch of target species by sampling month and zone for 2023 and 2024. Note that *O. mykiss*/RBT were not treated as target species and evaluated for mark status in 2023, so data is only shown for 2024 for that species.

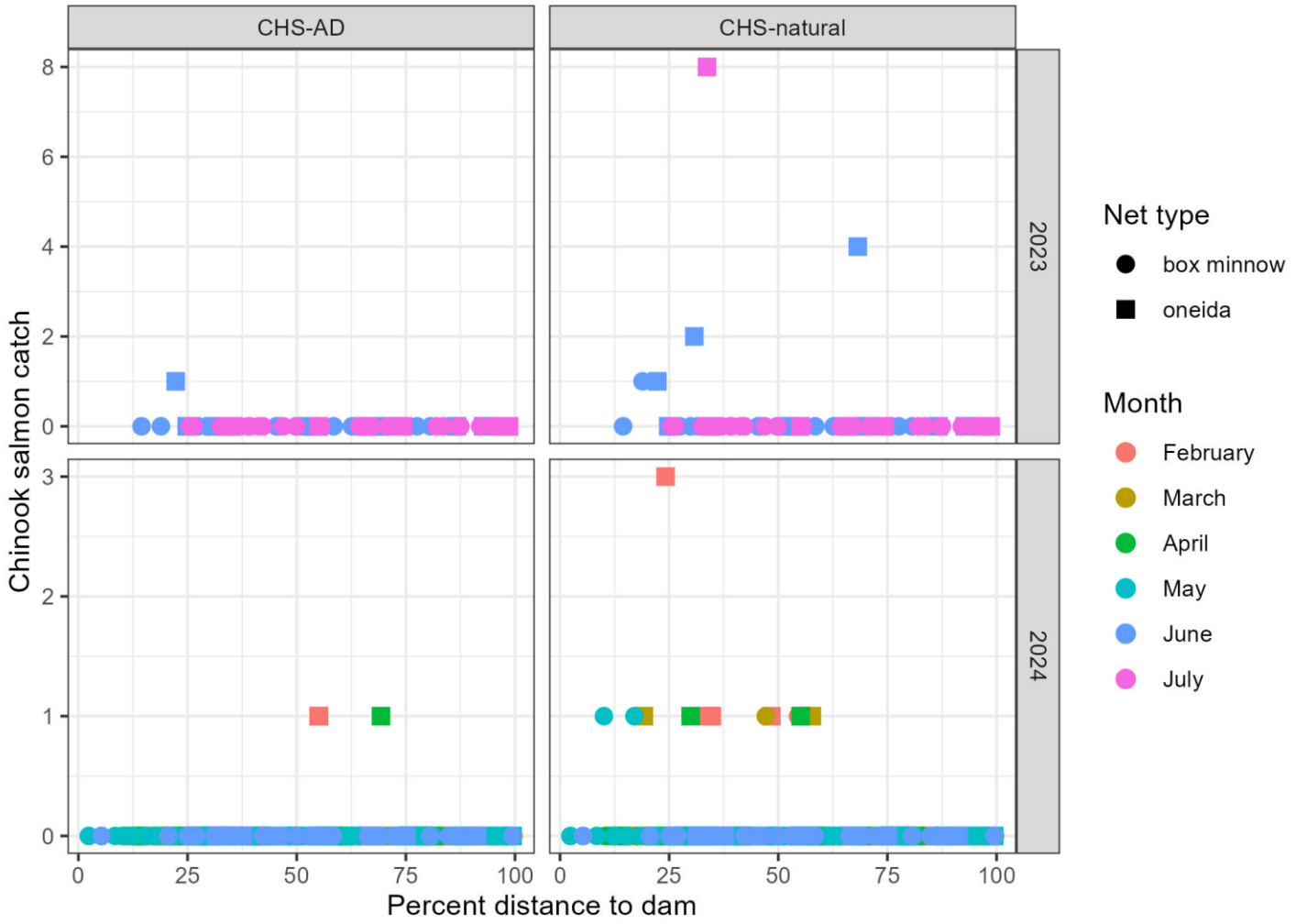

Figure 50. Chinook salmon catch in nearshore traps in Lookout Point reservoir by sampling month and gear type (box minnow or Oneida lake trap) relative to the percent distance to the dam along the reservoir centerline.

Table 21. Fork lengths (mm) of Chinook salmon (CHS) caught in nearshore traps by month and reservoir zone. Values are the mean followed by the range in parentheses.

					Reservoir Zone			
Reservoir	**Month**	**Species**	**Age class**	**Net type**	**LOWER**	**MIDDLE**	**UPPER**	**QUARTZVILLE**
				2023				
Lookout Point	June	CHS-AD	Sub-Yearling BY22	oneida			95 (95-95)	-
	June	CHS-natural	Sub-Yearling BY22	oneida		87.2 (80-92)	81 (73-90)	-
	June	CHS-natural	Sub-Yearling BY22	box minnow			80 (80-80)	-
	July	CHS-natural	Sub-Yearling BY22	oneida			84.8 (77-100)	-
				2024				
Green Peter	Feb	CHS-AD	Yearling BY22	oneida	83 (83-83)			95 (95-95)
	Feb	CHS-natural	Sub-Yearling BY23	oneida	46 (46-46)	40.6 (37-42)	39.3 (36-44)	51 (51-51)
	Feb	CHS-natural	Yearling BY22	oneida		120 (120-120)	117 (117-117)	
	Mar	CHS-AD	Sub-Yearling BY23	oneida			56 (56-56)	58 (58-58)
	Mar	CHS-natural	Sub-Yearling BY23	oneida	53 (53-53)	54.7 (49-58)	38.2 (34-44)	37.5 (37-38)
	Mar	CHS-natural	Sub-Yearling BY23	box minnow				38 (38-38)
	Apr	CHS-natural	Sub-Yearling BY23	oneida		74 (74-74)	57 (51-63)	37.7 (32-42)
	May	CHS-AD	Sub-Yearling BY23	oneida			140 (140-140)	
	May	CHS-natural	Sub-Yearling BY23	oneida		103 (103-103)		57.5 (50-65)

Reservoir	Month	Species	Age class	Net type	Reservoir Zone			
					LOWER	MIDDLE	UPPER	QUARTZVILLE
	June	CHS-AD	Sub-Yearling BY23	oneida			104 (96-113)	
	June	CHS-natural	Sub-Yearling BY23	oneida	88 (88-88)		85 (85-85)	
	June	CHS-natural	Yearling BY22	oneida	169 (169-169)			
Lookout Point	Feb	CHS-AD	Yearling BY22	oneida		145.5 (117-174)		
	Feb	CHS-natural	Yearling BY22	oneida		90.5 (80-101)	85 (73-96)	
	Feb	CHS-natural	Yearling BY22	box minnow		84 (84-84)		
	Mar	CHS-natural	Sub-Yearling BY23	oneida			47 (47-47)	
	Mar	CHS-natural	Yearling BY22	oneida		97 (97-97)		
	Mar	CHS-natural	Sub-Yearling BY23	box minnow		38 (38-38)		
	Apr	CHS-AD	Yearling BY22	oneida	119 (119-119)			
	Apr	CHS-natural	Sub-Yearling BY23	oneida		73 (73-73)		
	Apr	CHS-natural	Yearling BY22	oneida			93 (93-93)	
	May	CHS-natural	Sub-Yearling BY23	box minnow			43.5 (43-44)	

Green Peter

No subyearling (BY22) Chinook salmon were captured in nearshore traps set in Green Peter reservoir during 2023, however the sampling period was shorter and later than originally planned (late June through mid-July) (Table 20). Weekly mean surface water temperatures of trap locations ranged from 20.0 – 24.2ºC, depending on zone and sampling week, with temperatures approximately 1ºC cooler at trapping locations in the Quartzville arm than the rest of the reservoir (Table 22).

In 2024, nearshore sampling was conducted from February through mid-June, during which six subyearling (BY23) hatchery Chinook salmon (five bulk marking project recaptures), two hatchery Chinook salmon yearlings (BY22) (two bulk marking project recaptures), 47 natural origin Chinook salmon subyearlings (BY23), three natural origin Chinook salmon yearlings (BY22), one natural origin *O. mykiss* adult, and 11 natural origin *O. mykiss* juveniles were captured (Table 20). Catch of hatchery Chinook salmon occurred in the lower, upper and Quartzville zones during February and March, but catches were only seen in the upper zone during May and June (Figure 51, Figure 52). Natural origin Chinook salmon were found in all zones of the reservoir, but the largest catches occurred during February and March in the upper and middle zones. Fork lengths of natural origin Chinook salmon caught in the upper zone tended to be smaller than those seen in other zones (Table 21). Natural origin *O. mykiss* were caught in the greatest number during February, spread between the upper, lower and Quartzville zones. Nearshore trapping in Green Peter Reservoir was suspended for the year in mid-June when surface waters at trapping locations were approaching 20C (Table 22).

See Appendix Table A2 for detailed nearshore effort and CPUE data.

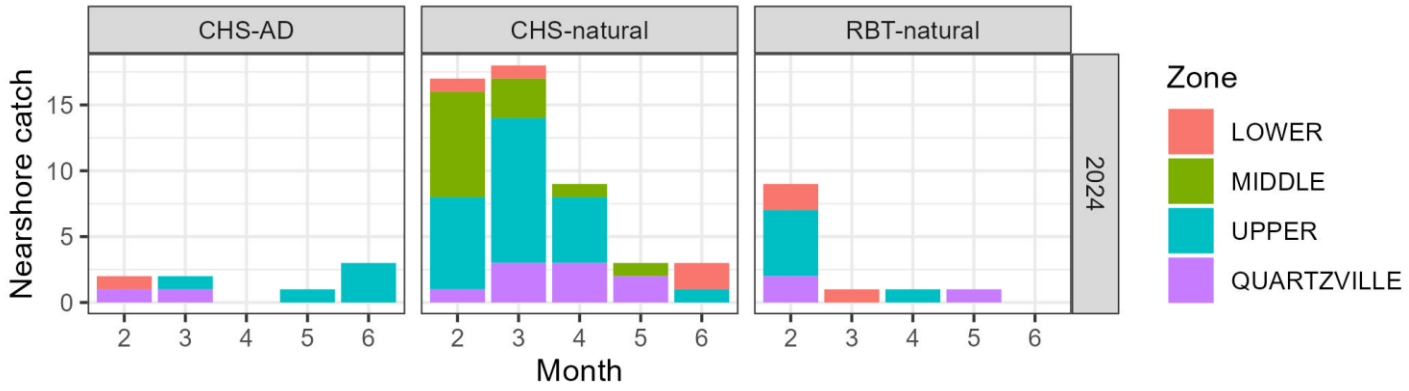

Figure 51. Nearshore catch of target species by month and reservoir zone for Green Peter Reservoir in 2024. No target species were captured during nearshore sampling in 2023 on Green Peter.

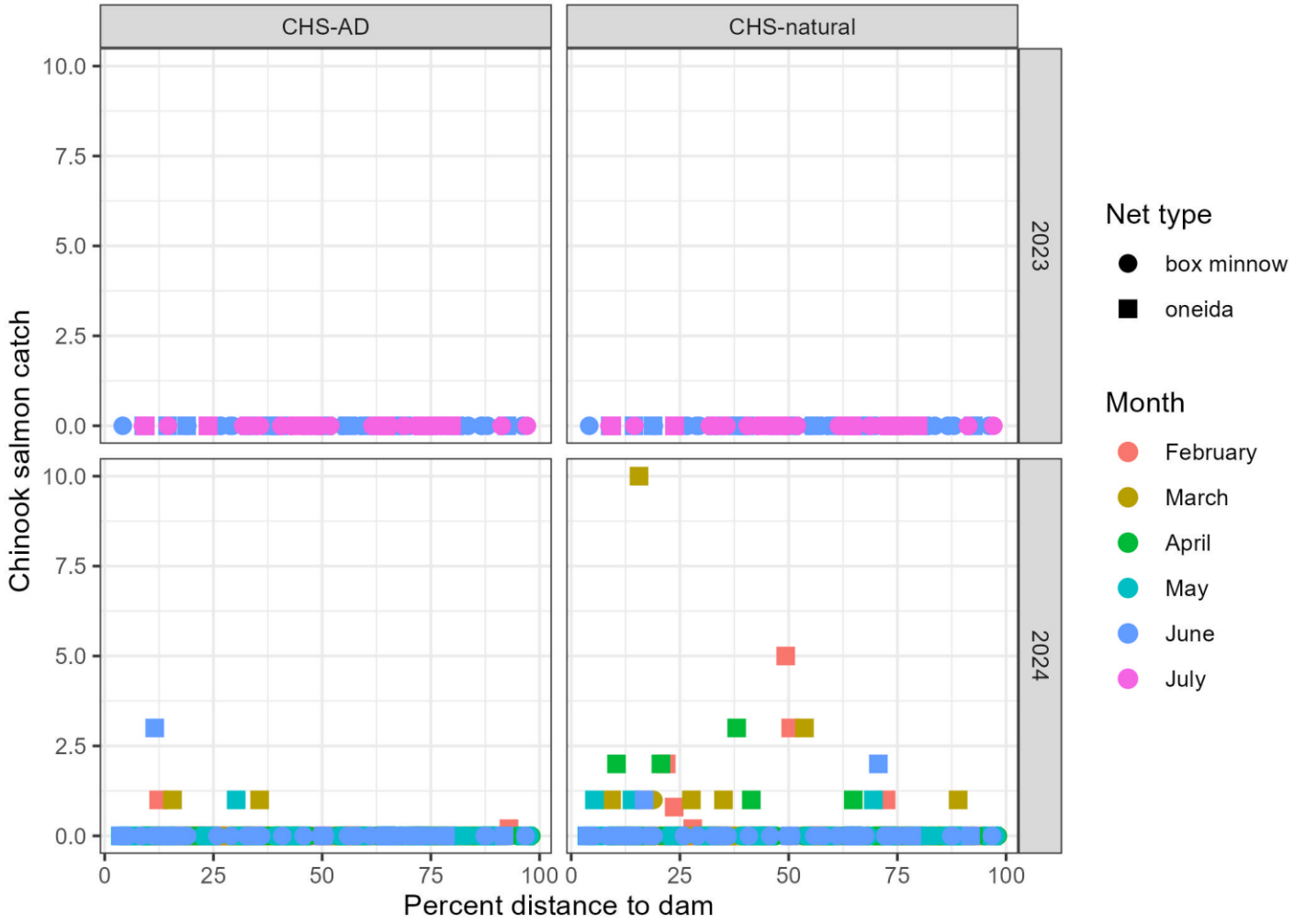

Figure 52. Chinook salmon catch in nearshore traps in Green Peter Reservoir by sampling month and gear type (box minnow or Oneida lake trap) relative to the percent distance to the dam along the reservoir centerline.

Table 22. Water surface temperatures at nearshore trapping locations. Values shown are the mean, with the range in parentheses.

			Reservoir Zone			
Reservoir	**Month**	**Week**	**LOWER**	**MIDDLE**	**UPPER**	**QUARTZVILLE**
2023						
Green Peter	June	24	20 (20 - 20)	21 (21 - 21)	-	-
	June	25	21.2 (20.6 - 22)	21.4 (20.7 - 22.1)	21.2 (20.7 - 22)	20.3 (19.9 - 21)
	July	27	23.9 (23.2 - 24.6)	24.2 (23.4 - 24.8)	24.4 (23.7 - 24.9)	23.5 (22.1 - 24.3)
Lookout Point	June	26	21.9 (21.5 - 22.4)	22 (21.1 - 22.6)	21 (17.4 - 22.6)	-
	July	28	23.3 (22.7 - 24.1)	23.6 (23.2 - 24)	23.1 (21.7 - 23.9)	-
2024						
Green Peter	Feb	7	8.2 (7.9 - 8.7)	8.4 (7.8 - 9)	8.1 (7.4 - 8.5)	8.2 (7.6 - 8.4)
	Feb	9	8.3 (8 - 8.8)	8.6 (8.2 - 8.9)	8.4 (7.7 - 8.9)	8 (6.9 - 8.9)
	Mar	11	8.8 (8.3 - 10.2)	8.9 (8 - 10.7)	8.3 (7.4 - 9)	8 (7.3 - 8.5)
	Mar	13	9.4 (9 - 9.8)	9.8 (9.5 - 10)	9.8 (8.7 - 10.2)	9.8 (9.6 - 10.1)
	Apr	15	11.8 (10.9 - 12.4)	12.4 (11.8 - 12.8)	12.2 (11.3 - 13)	12.3 (12.1 - 12.7)
	Apr	17	13.3 (12.9 - 13.6)	13.9 (13.5 - 14.5)	14 (12.7 - 14.6)	14.2 (14 - 14.5)
	May	19	15.4 (14 - 16.9)	16.2 (14.3 - 19.9)	13.8 (12.6 - 14.9)	14.7 (13.5 - 16.6)
	May	21	16.5 (14.3 - 17.3)	16.8 (15.6 - 18.1)	17.3 (16.1 - 17.6)	16.9 (16.2 - 17.4)
	June	23	17.9 (16.7 - 18.4)	18.2 (17.5 - 19.1)	18 (16.5 - 19.3)	18.2 (17.5 - 19)
Lookout Point	Feb	6	8 (7.6 - 8.2)	8.3 (8.2 - 8.4)	7.8 (7.4 - 8.3)	-
	Feb	8	9.3 (9.1 - 9.6)	8.9 (8.6 - 9.2)	8.6 (8.4 - 8.7)	-
	Mar	10	9.1 (9 - 9.3)	8.5 (7.5 - 9.5)	7.2 (6.8 - 7.6)	-
	Mar	12	10 (9.5 - 11)	9.9 (9.2 - 12.6)	9.2 (8.7 - 9.5)	-
	Apr	14	10.8 (10 - 11.9)	10.8 (10.4 - 11.2)	10.3 (9.7 - 10.7)	-
	Apr	16	12.3 (11.8 - 13.1)	12.2 (11.6 - 12.5)	10.6 (8.5 - 12.1)	-
	Apr	18	13.8 (13.2 - 14.5)	13.8 (13.2 - 14.6)	13.4 (13 - 13.9)	-
	May	18	13.4 (13.3 - 13.7)	13.9 (13.6 - 14.1)	13.4 (13.2 - 13.5)	-
	May	20	15.9 (14 - 17.5)	16.4 (15.8 - 17.3)	16.1 (15 - 16.9)	-
	May	22	17.1 (15.9 - 18)	17.6 (17.2 - 18.2)	17.4 (16.6 - 18.3)	-
	June	24	20.2 (19.3 - 20.9)	20.4 (20.2 - 20.6)	20.4 (19.9 - 20.9)	-

Offshore juvenile Chinook salmon and *O. mykiss* longitudinal distribution

Lookout Point

Offshore suspended gill net sampling in Lookout Point reservoir was conducted from late August through early December during 2023. A total of 13 Chinook salmon were caught over the course of the 2023 sampling season in Lookout Point Reservoir, of which nine were hatchery origin (six recaptures from the bulk marking project and three ad-clipped hatchery Chinook salmon), and four were natural origin (Table 19, Table 20). Based on evaluation of fork lengths and PIT tag release information, all were subyearlings (BY22) (Figure 54, Figure 61, Table 24). Due to dropping reservoir elevations and shallow depths in the upper zone of the reservoir, offshore gill netting was restricted to stations downstream of station A4 for the duration of the offshore sampling period (only the middle and lower zones sampled). As the drawdown progressed, nets that were intended for use at stations A4-6 were relocated downstream to increase the number of nets set at permanent sites (A1-A3) and temporary sampling stations were additionally established between permanent sites to increase spatial coverage (A1.5, A2.5, and A3.5). Because of low catch rates, the ability to draw inferences on the offshore longitudinal distribution of Chinook salmon during 2023 is limited, however general distribution patterns of offshore catch

are described here. No Chinook salmon were captured during August gill netting (Figure 53, Table 23). In September, two hatchery origin Chinook salmon were captured, both of which were sampled near the center of the reservoir (stations A3 and A3.5). During October, four subyearling (BY22) Chinook salmon were captured spread across stations A1-A3. Chinook salmon caught in November (n=7) were sampled at A1-A2. No Chinook salmon were captured in the first week of December (last week of sampling). Overall, the distribution of offshore catches during 2023 reflected the shrinking footprint of the reservoir during the drawdown period.

Offshore gill netting in Lookout Point Reservoir during 2024 was conducted from mid-June through late November. A total of 123 hatchery subyearling (BY23) Chinook salmon, two hatchery yearling (BY22) Chinook salmon, 50 natural origin Chinook salmon subyearlings (BY23), four natural origin Chinook salmon yearlings (BY22), 86 natural origin adult (>200 mm) *O. mykiss* and four juvenile (<200 mm) natural origin *O. mykiss* were captured (Table 20). No juvenile Chinook salmon tagged with PIT tags as part of the bulk marking project were recaptured during 2024 gillnet sampling in Lookout Point Reservoir. However, nine juvenile Chinook salmon fitted with USGS acoustic tags were recaptured. In late June, all subyearling (BY23) Chinook salmon were captured at station A1 in the lower reservoir zone. During July and August, subyearlings (BY23) were distributed across multiple stations, including A5 (upper), A3 (middle), A2 (lower), and A1 (lower) (Figure 53). Starting in September, reservoir drawdown and declining water levels prevented sampling in the upper zone, and by late fall, the middle zone was also too shallow to access. Consequently, all Chinook salmon during these months were captured at stations within the lower zone. Sizes of subyearling (BY23) Chinook salmon were similar among stations, with the exception that fish tended to be smaller at the uppermost station (A6) during July (Figure 54). Natural origin *O. mykiss* were captured at station A6 (upper zone) during June, and were captured in all zones but predominately the lower zone during July. Beginning in August, natural origin *O. mykiss* were exclusively captured in the lower reservoir zone (A1-A2) (Figure 53).

Detailed catch and CPUE data for each year, sampling week and zone are provided in Appendix Table A3.

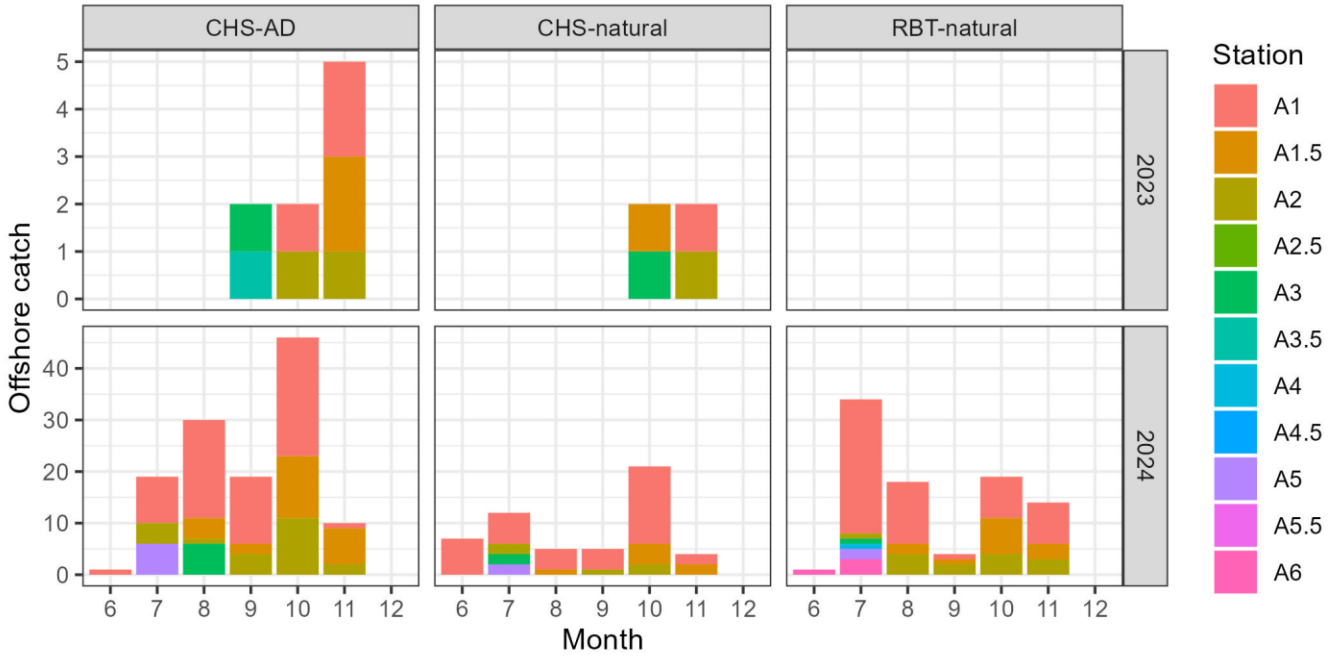

Figure 53. Total catch of Chinook salmon and natural origin *O. mykiss* (RBT-Natural) in gill nets set offshore in Lookout Point reservoir by station. Station A1 is at the dam, and station A6 is most upstream. Note that *O. mykiss*/RBT were not treated as target species and evaluated for mark status in 2023, so data is only shown for 2024 for that species.

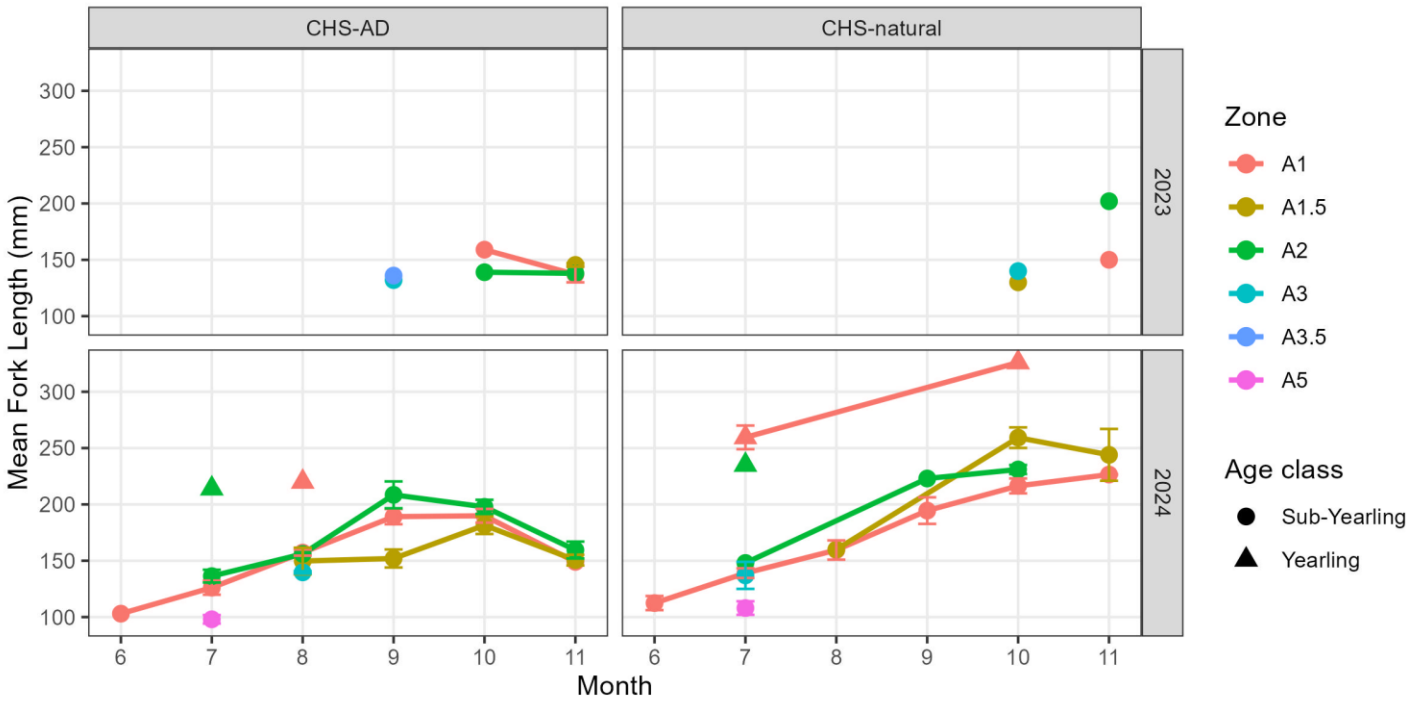

Figure 54. Lookout Point offshore juvenile Chinook salmon mean fork length (mm) by station and sampling month for hatchery (CHS-AD) and natural origin (CHS-natural). In 2023, subyearlings were BY22. In 2024, subyearlings were BY23 and yearlings BY22. Error bars are one standard error.

Green Peter

Offshore sampling in Green Peter during 2023 was conducted from late July through the end of September using suspended gill nets. Only one subyearling (BY22) Chinook salmon was caught during offshore sampling in Green Peter Reservoir (Table 23). The lone specimen was a 119 mm fork length natural origin subyearling, caught at station A5 in the upper zone of the reservoir at the end of September. Because only one specimen was captured, no inferences can be drawn regarding the longitudinal distribution of Chinook salmon in Green Peter reservoir during 2023.

Offshore sampling in Green Peter for 2024 began in mid-June and continued through the first week of November. Over the course of the sampling season, a total of one adult Chinook salmon (an ODFW floy-tagged specimen that was a fallback from the outplant on the Middle Santiam), 124 hatchery subyearling (BY23) Chinook salmon (86 PIT tagged recaptures from the bulk marking project with the remaining 38 assumed to be fish released by EAS for rotary screw trap efficiency trials), 422 natural origin subyearling (BY23) Chinook salmon, three natural origin yearling (BY22) Chinook salmon, 60 adult (>200 mm FL) natural origin *O. mykiss* and 12 juvenile (<200 mm FL) natural origin *O. mykiss* were captured (Table 20). The majority of the offshore Chinook salmon catch occurred during the month of November; however the same pattern was not observed for natural origin *O. mykiss* (Figure 55). During late June through September, Chinook salmon were distributed throughout the reservoir and captured in all zones. Starting in October, sampling in the upper zone (A5-A6) was suspended due to declining reservoir elevations, but Chinook salmon remained distributed among the sampled zones. In November, the Quartzville zone became inaccessible and was also not sampled, with Chinook distributed in the lower zone of the reservoir (stations A1, A2, and A2.5). Fork lengths for natural origin subyearling (BY23) Chinook salmon increased over the sampling season from 106 ± 4.09 mm (mean ± SE) in June to 252 ± 1.42 mm by early November (Figure 56). Sample sizes were low, but during June and July, fork length tended to be lowest at the

stations closest to the tributary mouths (A6 in the upper zone and Q1 in the Quartzville arm) (Figure 56). Natural origin *O. mykiss* were distributed across all reservoir zones throughout the sampling season (Figure 55).

Detailed effort and CPUE data for offshore sampling are provided in Appendix Table A3.

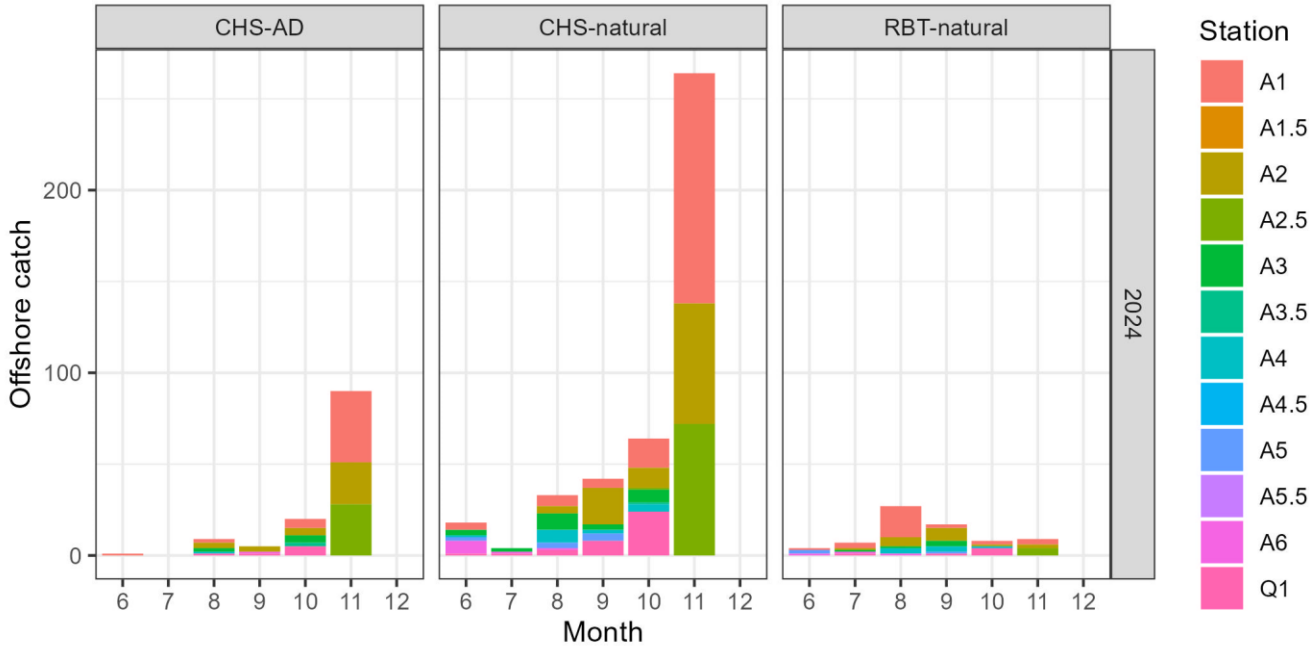

Figure 55. Total catch of Chinook salmon and natural origin *O. mykiss* (RBT-Natural) in gill nets set offshore in Green Peter reservoir by station. Station A1 is at the dam, and station A6 is most upstream. A single CHS-natural was captured in September of 2023 at station A5 (not shown).

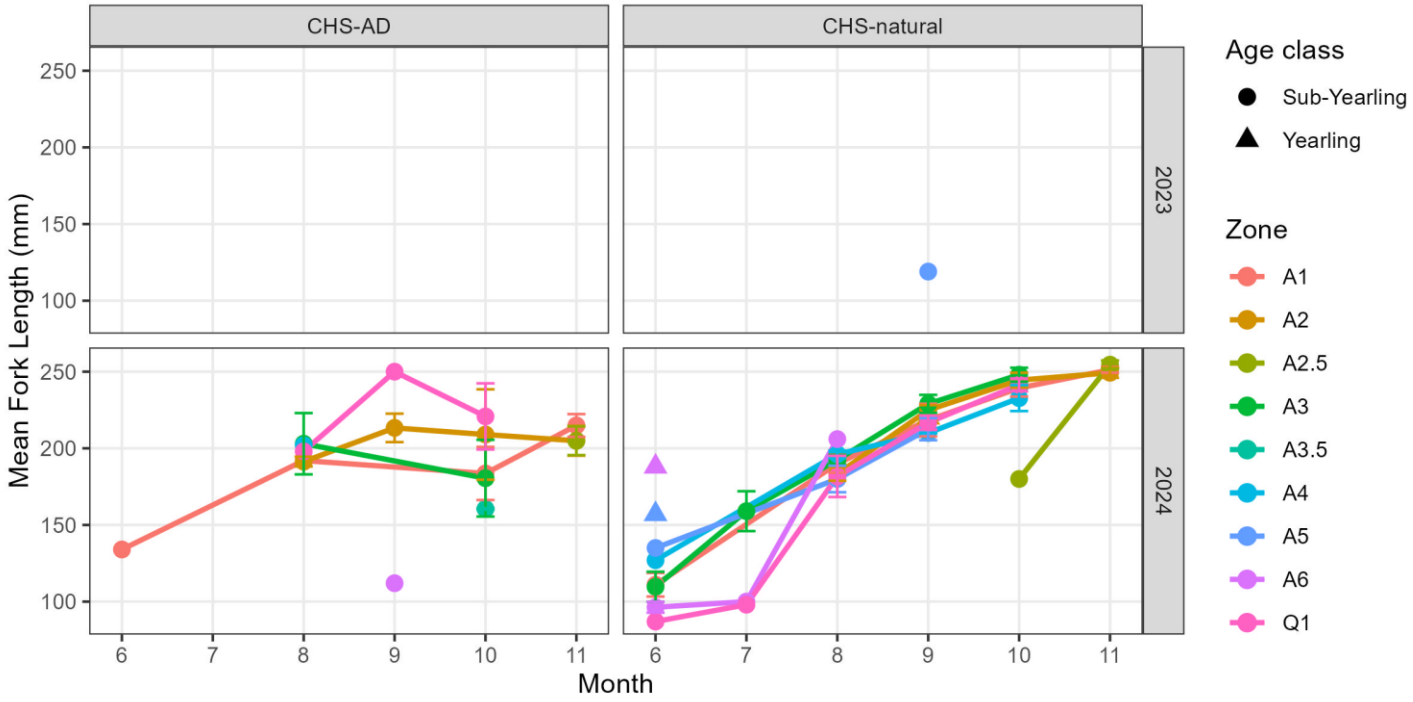

Figure 56. Green Peter Reservoir offshore juvenile Chinook salmon mean fork length (mm) by station and sampling month for hatchery (CHS-AD) and natural origin (CHS-natural). In 2023, sub-yearlings were BY22. In 2024, subyearlings were BY23 and yearlings BY22. Error bars are one standard error.

Abundance index of Chinook salmon within longitudinal reservoir zones

Catch per unit effort (CPUE) was used as an abundance index to compare hatchery and natural origin subyearling Chinook salmon catches over time and between reservoir longitudinal zones and gear types. CPUE was calculated for each set and species-origin as the number of fish captured per 24 hr set. Mean CPUE was evaluated for each reservoir, sampling week, gear type and reservoir longitudinal zone. CPUE was used to display spatial and temporal patterns of catch in relation to reservoir elevation and dam operations.

Lookout Point

Catch rates in 2023 were very low, consequently CPUE results were interpreted cautiously and were not used to formally evaluate the effects of the injunction measures on juvenile salmon. During nearshore sampling in June and July of 2023, mean CPUE of both natural and hatchery origin Chinook salmon tended to be higher in the upper and middle reservoir zones in comparison to the lower zone (Figure 57, Table 23). The nearshore sampling period in 2023 occurred after the initiation of reservoir drawdown associated with the interim injunction measures (Figure 57). Offshore gill net mean CPUE for hatchery Chinook salmon suggests offshore abundance was highest in late September in the middle zone, then was highest in the lower zone in mid-November during peak drawdown when only the lower zone remained (Figure 57). Similarly, catches suggest natural origin Chinook salmon offshore CPUE peaked in the middle zone during early October and in the lower zone in mid-November of 2023 (Figure 57).

Catch rates were also low during 2024 sampling on Lookout Point Reservoir. Nearshore CPUE was slightly elevated in February, coinciding with a period of increased flow out of the reservoir (cfs) (Figure 57). Mean CPUE was near zero for most of the nearshore sampling season (February through mid-June). Offshore CPUE was higher for juvenile Chinook salmon relative to nearshore nets but remained low. CPUE for offshore sets was similar among zones. Offshore CPUE appeared to slightly increase in fall, but there was no significant effect of sampling month on hatchery (one-way ANOVA, $p=0.28$) or natural origin Chinook salmon CPUE (one-way ANOVA, $p=0.91$) for gill net sets. However, that analysis includes sets from after October 14, 2024, when we began bundling the small mesh panels (3/8 and ½" mesh) of all net sets to reduce young-of-year non-target bycatch. In the month leading up to when we began bundling the small mesh panels, the small mesh panels accounted for 50% of net area, but approximately 23% of the juvenile Chinook salmon catch. CPUE for after October 14, 2024 is likely artificially depressed by roughly the same percentage.

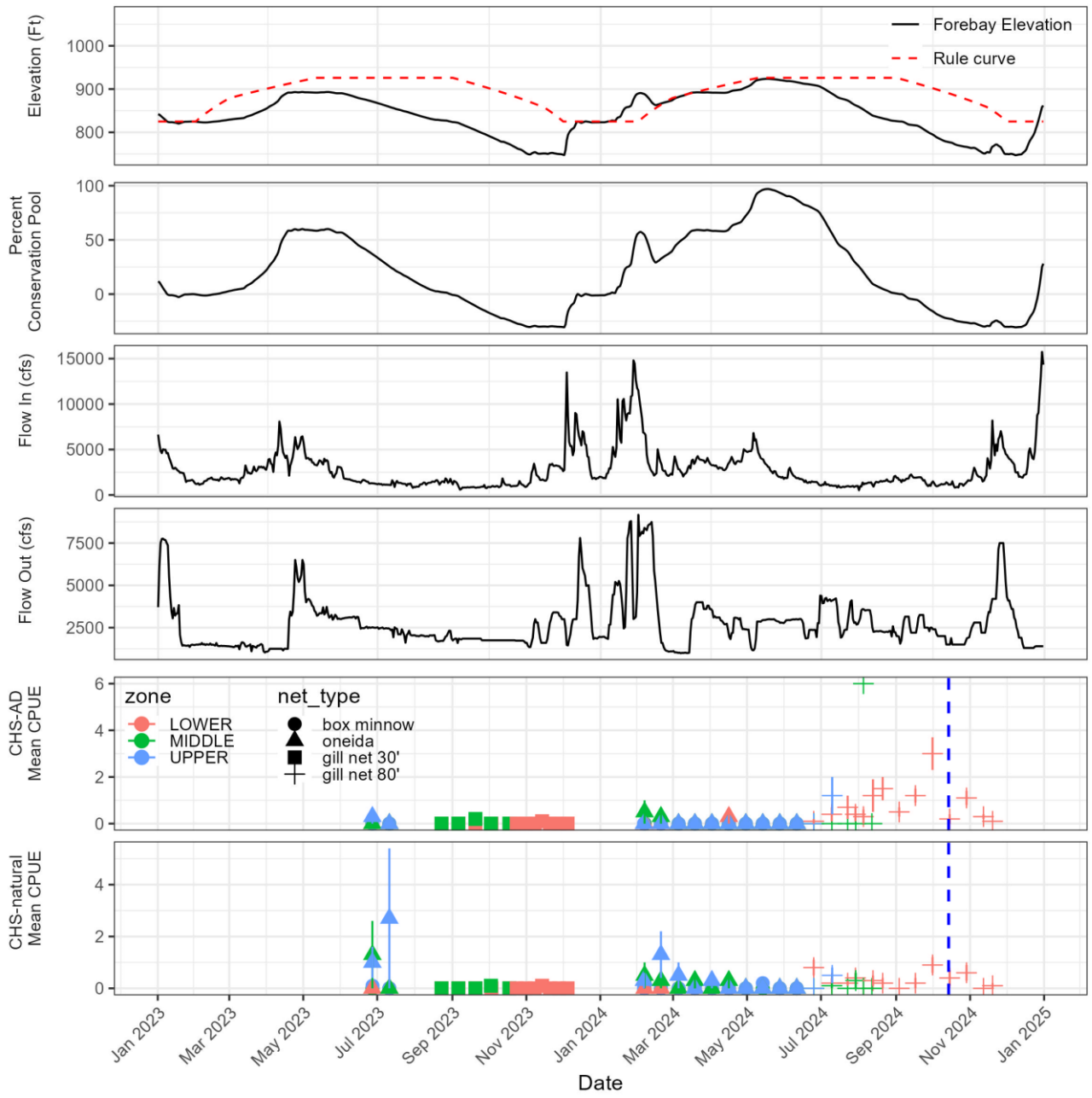

Figure 57. Lookout Point Reservoir elevation (percent of full conservation pool elevation and forebay elevation relative to rule curve) and flow in and out of the reservoir (cfs) in comparison to hatchery (CHS-AD) and natural origin (CHS-Natural) juvenile Chinook salmon mean CPUE (catch/24 hr set). Mean CPUE is for all nets set in each sampling week and is plotted on the x-axis by the mean sampling date for the week. Mean CPUE is presented for each reservoir longitudinal zone and net type. CPUE for gill net sets is shown for only nets with mean temperature of less than 20 ºC with all net depths combined. In the lowermost panels, the dotted blue vertical line represents the date after which small mesh panels of gill nets were bundled/closed off to reduce non-target bycatch.

Green Peter

During 2023, only one Chinook salmon was captured in Green Peter Reservoir. That specimen was captured offshore in the upper zone during late September during the drawdown and coincided with an increase in flow

out (cfs) of the reservoir (Figure 58, Table 23). No comparisons are being made of CPUE for 2023 due to insufficient catches.

Nearshore CPUE in 2024 was highest during February and March for natural origin Chinook salmon, and in June for hatchery Chinook salmon (Figure 58). The CPUE peak seen in February corresponds with roughly a week after there was a peak in flow into and out of the reservoir (Figure 58). The hatchery Chinook nearshore CPUE peak in June was primarily comprised of bulk marking project fry released at the head of the reservoir in April 2024 and coincided with a small spike of flow into the reservoir. Offshore CPUE was fairly consistent across the sampling season and among zones, with the exception of early November when CPUE of both hatchery and natural origin Chinook salmon peaked. The offshore CPUE peak coincided with the final stages of the deep drawdown phase and a peak of flow out of the reservoir (RO spill) (Figure 58). The hatchery component of the November peak was comprised of 30% RST TE fish and 70% PIT tagged bulk marking project fish. The TE fish were not individually marked thus it is not possible to determine their specific release dates (2024 TE releases occurred on: 2/8/2024, 3/6/2024, 3/14/2024, 4/2/2024, 4/12/2024, 5/15/2024, 6/5/2024, 7/9/2024, 8/14/2024, 9/10/2024, 10/9/2024 and 11/5/2024). The PIT tagged bulk marking fish caught in November were from several releases spanning from early March 2024 through early October 2024, thus it does not appear that the CPUE peak was affiliated with a specific hatchery release event.

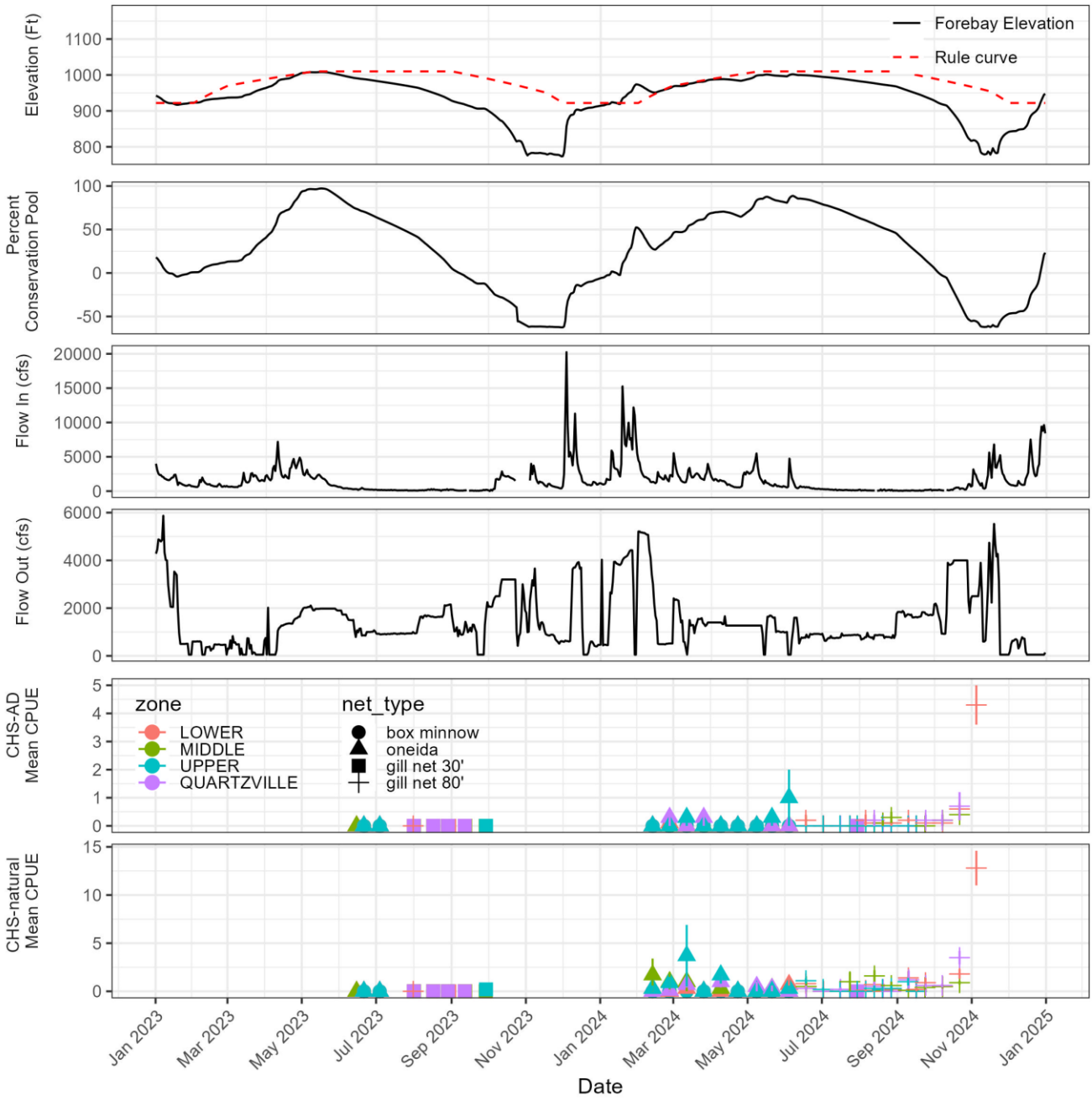

Figure 58. Green Peter Reservoir elevation (percent of full conservation pool elevation and forebay elevation relative to rule curve) and flow in and out of the reservoir (cfs) in comparison to natural origin (CHS-Natural) juvenile Chinook salmon mean CPUE (catch/24 hr set). Mean CPUE is presented for each reservoir longitudinal zone and net type. Mean CPUE is for all nets set in each sampling week and is plotted on the x-axis by the mean sampling date for the week. CPUE for gill net sets is shown for only nets with mean temperature of less than 20 ºC with all net depths combined.

Table 23. Total CHS catch and percentage of catch caught in each reservoir zone in relation to how full the reservoir was during fish sampling. Total catch is summed across all gear types and includes both hatchery and natural origin Chinook salmon. Reservoir fullness was assessed by the minimum and maximum percent of full conservation pool elevation observed during fish sampling days.

		% Cons. Pool		Total	Percent of CHS catch by zone			
Reservoir	Month	Min	Max	catch	LOWER	MIDDLE	UPPER	QUARTZVILLE
2023								
Green Peter	6	69.5	73.9	0	-	-	-	-
	7	43.7	63.0	0	-	-	-	-
	8	7.1	43.7	0	-	-	-	-
	9	-15.9	-14.2	1	0.0	0.0	100.0	0.0
Lookout Point	6	36.0	37.9	9	-	44.4	55.6	-
	7	23.9	24.9	8	-	-	100.0	-
	8	1.5	2.0	0	-	-	-	-
	9	-10.7	-10.1	2	-	100.0	-	-
	10	-26.9	-18.6	4	75.0	25.0	-	-
	11	-30.2	-29.9	7	100.0	-	-	-
2024								
Green Peter	2	26.7	42.8	19	10.5	42.1	36.8	10.5
	3	48.6	62.7	20	5.0	15.0	60.0	20.0
	4	70.1	70.7	9	0.0	11.1	55.6	33.3
	5	84.0	86.1	4	0.0	25.0	25.0	50.0
	6	81.0	88.2	25	28.0	16.0	52.0	4.0
	7	67.3	78.8	4	0.0	50.0	25.0	25.0
	8	47.0	61.1	42	35.7	45.2	9.5	9.5
	9	12.4	33.8	47	59.6	10.6	10.6	19.1
	10	-39.4	-2.2	84	44.0	21.4	-	34.5
	11	-58.2	-55.0	354	100.0	-	-	-
Lookout Point	2	31.3	55.6	10	0.0	50.0	50.0	-
	3	46.8	59.2	3	0.0	66.7	33.3	-
	4	58.4	62.3	3	33.3	33.3	33.3	-
	5	96.1	96.5	2	0.0	0.0	100.0	-
	6	77.7	79.5	8	100.0	0.0	0.0	-
	7	27.0	58.2	31	67.7	6.5	25.8	-
	8	4.3	20.3	35	82.9	17.1	-	-
	9	-15.6	0.2	24	100.0	-	-	-
	10	-26.6	-15.6	67	100.0	-	-	-
	11	-30.1	-24.6	14	100.0	-	-	-

Chinook salmon catch by net temperature and depth

Temperatures in both reservoirs, but particularly in Lookout Point, were high during much of the 2023 sampling season. Juvenile Chinook salmon catch was examined by net temperature to examine trends in Chinook salmon habitat use. Water surface temperature was used for nearshore traps while the mean temperature of the vertical temperature profile over the range of depths spanned by each net was used for gill nets. This evaluation is observational and opportunistic as the sampling design was not intended to evaluate catch by water temperature or depth.

General patterns observed are that in Lookout Point Reservoir Chinook salmon were captured in nearshore traps up to 23.6ºC during 2023, and to 16.5ºC during 2024 (Figure 59). In the Lookout Point offshore environment, Chinook salmon were captured from 7.8 to 20.0ºC during 2023, and from 8.0 to 22.8ºC during 2024. Only one Chinook salmon was captured in Green Peter Reservoir during 2023, captured in the offshore in a net at 19.9ºC. During 2024, Chinook salmon in the nearshore of Green Peter were captured in waters of up to 19.2 C, and in the offshore up to 22.8ºC (Figure 59).

Chinook salmon in Lookout Point Reservoir were captured from 0 to 12 m depth during 2023 (Figure 60). Numerous deeper nets were set primarily during late summer and early fall of 2023 to try to target 15ºC, but zero Chinook salmon were captured in the deeper nets. During 2024, Chinook salmon were captured from 0 to 32 m in Lookout Point Reservoir. The lone Chinook salmon captured in Green Peter reservoir during 2023 was captured in a 5 m deep gill net set in September, while in 2024, Chinook salmon were captured across 0 to 22 m depth.

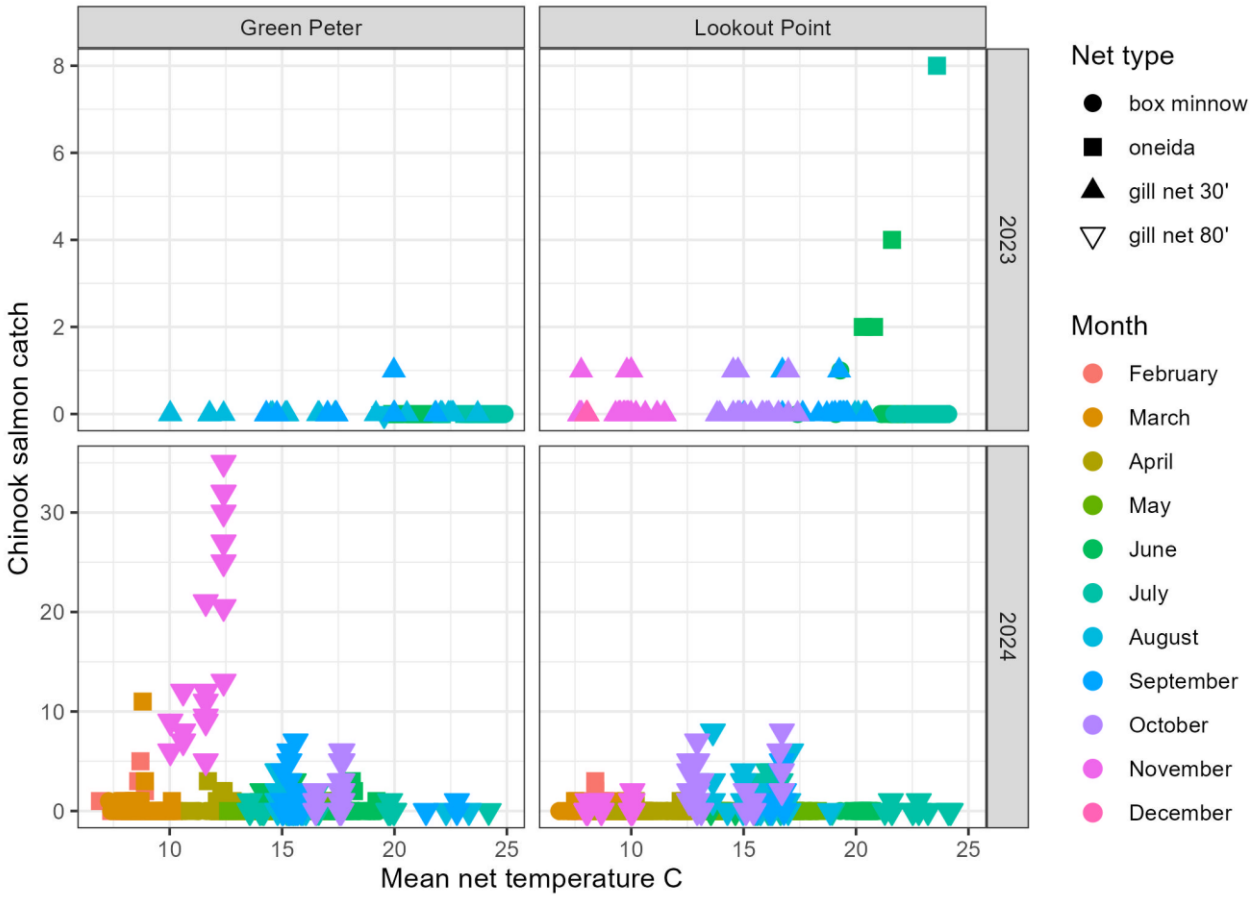

Figure 59. Catch of juvenile Chinook salmon (marked and natural origin combined) by mean net/trap temperature (ºC). Mean net water temperature is surface temperature for nearshore traps (box minnow and Oneida), and the mean temperature of the limnology profile over the range of depths covered by gill nets.

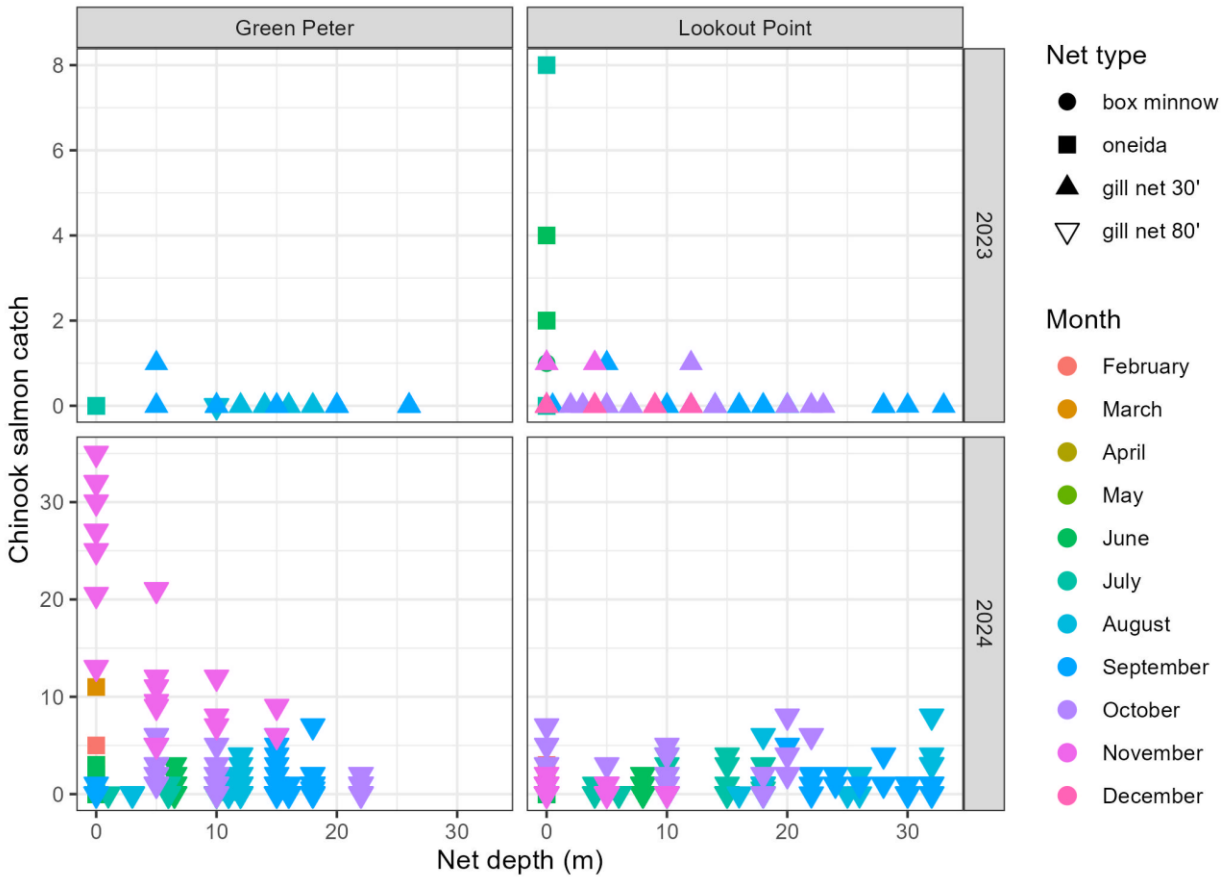

Figure 60. Catch of juvenile Chinook salmon (marked and natural origin combined) in nets by mean net/trap depth (m). Net depth is the top of the net.

Reservoir Recaptures

Over the course of 2023 reservoir sampling, we recaptured seven PIT tagged subyearling Chinook salmon marked and released by the bulk marking project, all within Lookout Point Reservoir (Table 24). One Chinook salmon was released in spring (5/30/2023) at the head of the reservoir (Black Canyon) release site and recaptured approximately a month later in the Upper zone of the reservoir. Of the fall bulk releases, one Chinook salmon released from Signal Point boat launch (Middle reservoir zone – A3) was released on 9/18/2023 and recaptured in the forebay (A1) a month later. Three fish released on 9/18/2023 at the Head of Reservoir Black Canyon site were recaptured, two of which were recaptured a day later in the middle zone of the reservoir. The final recapture from that group was recaptured over a month after release in the Lower zone (A2). Lastly, two fish released on 11/9/2023 at the Hills Creek Dam tailrace were recaptured five days later in the Lower zone at gill net stations in or near the forebay (A1 and A1.5). The two fish released during the maximum drawdown period (November) rapidly transited downstream to the forebay (Table 24).

We recaptured 3 juvenile Chinook salmon from the bulk marking project during our 2024 Lookout Point reservoir sampling efforts (Table 24). All three were released as yearlings and were recaptured within a month of release. In addition, we recaptured nine acoustic tagged juvenile Chinook salmon released by USGS (Table 25). Green Peter Reservoir sampling during 2024 produced 88 recaptures from the bulk marking project. Two were released as yearlings in late February and were recaptured within a week. Forty were recaptured that were released as fry in spring at approximately 50 mm fork length. Mean travel time for fry release groups ranged from 153-193 days, with most recaptured during the fall with mean growth in fork length of 132-195 mm. Lastly, 46 recaptures were of Chinook salmon released as subyearlings during late summer and fall. Releases from late August through mid-

September were recaptured 1-58 days later, while releases from October were captured between 13 and 29 days later (Table 24).

All Chinook salmon and unclipped *O. mykiss* captured in the reservoirs were examined for existing VIE tags, but no recaptures were encountered. No PIT tagged *O. mykiss* were encountered.

Table 24. Capture information for PIT tagged hatchery Chinook salmon recaptured during reservoir sampling by release group. Release information (release location, release date, lifestage, and mean FL of group at release), recapture information (number of recaptures and mean recapture date), travel time (mean, min and max days between release and recapture for the group) and mean change in FL (mean capture length minus mean FL at release) are provided. Apparent negative change in FL occurred occasionally with very low sample size and abnormally small individuals recaptured relative to the mean for the release group.

Capture Reservoir	Release Location	Release Date	Release Lifestage	Release group mean FL (mm)	# Recaps	Mean Recapture Date	Mean Travel Time	Min Travel Time	Max Travel Time	Mean Change in FL (mm)
			2023							
Lookout Point	LOP Head of Reservoir - Black Canyon	5/30/2023	Fry (BY22)	63.1	1	6/26/2023	27.0	27	27	31.9
	LOP Forebay - Signal Point	9/18/2023	Subyearling (BY22)	128.3	1	10/19/2023	31.0	31	31	30.7
	LOP Head of Reservoir - Black Canyon	9/18/2023	Subyearling (BY22)	122.9	3	9/30/2023	12.3	1	35	12.8
	Hills Creek Dam Tailrace	11/9/2023	Subyearling (BY22)	129.6	2	11/14/2023	5.0	5	5	8.9
			2024							
Green Peter	Green Peter Head of Reservoir - Quartzville Creek Arm	2/22/2024	Yearling (BY22)	150.8	1	2/27/2024	5.0	5	5	-55.8
	Green Peter Mid Reservoir - Thistle Boat Ramp	2/22/2024	Yearling (BY22)	153.8	1	2/28/2024	6.0	6	6	-70.8
	Green Peter Head of Reservoir - Middle Santiam Arm	3/6/2024	Fry (BY23)	50.1	9	8/5/2024	152.6	7	245	132.1
	Green Peter Head of Reservoir - Quartzville Creek Arm	3/6/2024	Fry (BY23)	51.3	5	9/12/2024	190.6	20	244	164.3
	Green Peter Head of Reservoir - Middle Santiam Arm	4/12/2024	Fry (BY23)	52.4	13	10/6/2024	177.8	52	208	188.6
	Green Peter Head of Reservoir - Quartzville Creek Arm	4/12/2024	Fry (BY23)	54.9	13	10/22/2024	193.3	68	208	195.0
	Foster Tailrace - South Santiam Hatchery	8/27/2024	Subyearling (BY23)	120	1	10/23/2024	57.0	57	57	56.0

Capture Reservoir	Release Location	Release Date	Release Lifestage	Release group mean FL (mm)	# Recaps	Mean Recapture Date	Mean Travel Time	Min Travel Time	Max Travel Time	Mean Change in FL (mm)
	Green Peter Head of Reservoir - Quartzville Creek Arm	9/9/2024	Subyearling (BY23)	120.5	10	11/2/2024	54.3	42	58	70.2
	Green Peter Head of Reservoir - Middle Santiam Arm	9/10/2024	Subyearling (BY23)	122.4	18	10/31/2024	51.4	1	57	64.3
	Green Peter Head of Reservoir - Middle Santiam Arm	10/8/2024	Subyearling (BY23)	130.4	8	11/4/2024	27.5	27	29	51.4
	Green Peter Head of Reservoir - Quartzville Creek Arm	10/9/2024	Subyearling (BY23)	131.5	9	11/2/2024	24.0	13	28	22.8
Lookout Point	Hills Creek Dam Tailrace	1/31/2024	Yearling (BY22)	141.6	2	2/13/2024	13.5	6	21	3.9
	LOP Forebay - Signal Point	4/10/2024	Yearling (BY22)	150.7	1	4/16/2024	6.0	6	6	-31.7

Table 25. Capture information for acoustic tagged Chinook salmon recaptured during reservoir sampling on Lookout Point Reservoir. Acoustic tagged fish were released by USGS and had both an acoustic tag and PIT tag.

Capture Reservoir	Capture Date	Station	Zone	Capture FL (mm)	Species	Lifestage	PIT code	Release date
				2024				
Lookout Point	8/21/2024	A1.5	Lower	117	CHS	Subyearling (BY23)	3DD.003BD61A38	8/9/2024
	9/17/2024	A1.5	Lower	160	CHS	Subyearling (BY23)	3DD.003BD61AFB	8/7/2024
	10/29/2024	A1	Lower	182	CHS	Subyearling (BY23)	3DD.003BD61B53	9/18/2024
	10/29/2024	A1.5	Lower	170	CHS	Subyearling (BY23)	3DD.003BD61E88	10/17/2024
	10/31/2024	A1.5	Lower	155	CHS	Subyearling (BY23)	3DD.003BD61F37	10/17/2024
	10/31/2024	A1	Lower	144	CHS	Subyearling (BY23)	3DD.003BD61D44	10/2/2024
	10/31/2024	A1	Lower	154	CHS	Subyearling (BY23)	3DD.003BD61F04	10/18/2024
	11/13/2024	A1.5	Lower	168	CHS	Subyearling (BY23)	3DD.003BD61AEF	8/7/2024
	11/21/2024	A1.5	Lower	155	CHS	Subyearling (BY23)	3DD.003BD62135	11/20/2024

Growth of juvenile salmon

We evaluated growth in the reservoir graphically by plotting fork length by capture date for hatchery and wild Chinook salmon (Figure 61). Additionally, we compared mean size (fork length and weight) between seasons (Table 26) and between release and recapture for bulk mark project release groups (Table 24).

During 2023, only one Chinook salmon was captured in Green Peter reservoir, thus no assessments of growth are possible for that reservoir in that year. In Lookout Point Reservoir during 2023, hatchery subyearling (BY22) Chinook grew from 95 mm in early summer (n=1) to on average 141 mm by fall (n=9) (Table 26). Natural origin subyearling (BY22) Chinook salmon grew from 84 mm (n=16) in early summer to 156 mm by fall (n=4). This represents an average growth rate of 0.61 mm fork length/day between mean capture dates for natural origin Chinook salmon.

Growth assessments for 2024 sampling in Green Peter Reservoir indicate that hatchery subyearling (BY23) Chinook salmon grew from on average 85 mm in spring (n=3) to 168 mm in summer (n=12) and were on average 206 mm by fall (n=115). Natural origin subyearling (BY23) Chinook salmon grew from an average of 46 mm in spring (n=45) to 157 mm in summer (n=55) and were 246 mm by fall (n=369). This equates to an average growth rate of 0.89 mm fork length/day between mean spring and fall capture dates. High growth rates within Green Peter Reservoir are supported by the rapid growth seen for known age PIT tag release groups recaptured in the reservoir (Table 24) and ages were verified for a subset of specimens using scale analysis (n=19). Subyearling (BY23) hatchery Chinook salmon in Lookout Point Reservoir during 2024 grew from an average of 139 mm in summer (n=48) to 185 mm in fall (n=75). Natural origin Chinook salmon subyearlings (BY23) grew from 49 mm in spring (n=5) to 132 mm in summer (n=21) and were 223 mm in fall (n=29). Scales were also used to verify age designations for a subset of Chinook salmon from Lookout Point Reservoir (n=19). The average growth rate for natural origin Chinook salmon in Lookout Point was 0.91 mm fork length/day between mean capture dates.

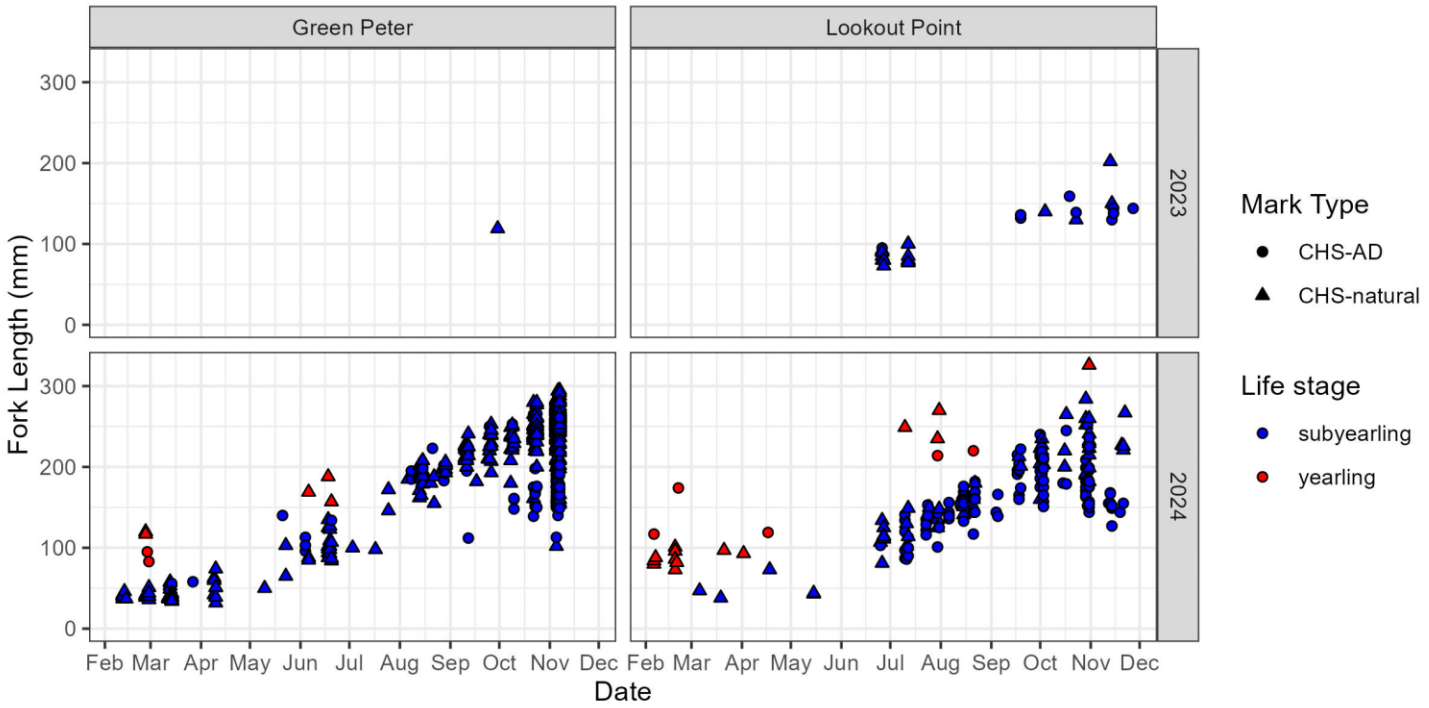

Figure 61. Fork length (mm) of juvenile Chinook salmon caught in Lookout Point and Green Peter reservoirs. Subyearlings captured during 2023 were BY22. During 2024 sampling, subyearlings were BY23 and yearlings BY22.

Table 26. Mean fork length and weight of subyearling Chinook salmon caught in Lookout Point and Green Peter reservoirs by season.

Reservoir	Season	Mean Capture Date	Species	N	Mean Fork Length (mm)	SE Fork Length	Mean Weight (g)	SE Weight
			2023					
Green Peter	Fall	9/30/2023	CHS-natural (BY22)	1	119	-	-	-
Lookout Point	Summer	6/26/2023	CHS-AD (BY22)	1	95.0	-	-	-
	Fall	10/28/2023	CHS-AD (BY22)	9	141.0	2.9	-	-
	Summer	7/4/2023	CHS-natural (BY22)	16	84.4	2.0	5	0

Reservoir	Season	Mean Capture Date	Species	N	Mean Fork Length (mm)	SE Fork Length	Mean Weight (g)	SE Weight
	Fall	10/29/2023	CHS-natural (BY22)	4	155.5	16.0	-	-
			2024					
Green Peter	Spring	4/9/2024	CHS-AD (BY23)	3	84.7	27.7	-	-
	Summer	7/24/2024	CHS-AD (BY23)	12	168.2	12.7	-	-
	Fall	10/30/2024	CHS-AD (BY23)	115	206.4	4.4	73.8	19.9
	Spring	3/15/2024	CHS-natural (BY23)	45	45.7	1.9	-	-
	Summer	7/25/2024	CHS-natural (BY23)	55	157.4	5.9	76.8	5.2
	Fall	10/27/2024	CHS-natural (BY23)	369	246.3	1.2	177.1	9.3
Lookout Point	Summer	8/2/2024	CHS-AD (BY23)	48	138.7	3.5	58.3	6.9
	Fall	10/13/2024	CHS-AD (BY23)	75	184.5	3.3	127.3	21.0
	Spring	4/13/2024	CHS-natural (BY23)	5	49.0	6.2	-	-
	Summer	7/18/2024	CHS-natural (BY23)	21	132.3	5.2	-	-
	Fall	10/21/2024	CHS-natural (BY23)	29	223.1	5.2	-	-

Copepod infection prevalence

While crews assessed copepod presence during 2023, we determined after the field season concluded that a protocol error had occurred, and the data were unreliable. Thus, 2023 copepod data is not presented in this report. The protocol error was corrected prior to the initiation of 2024 sampling. All salmonids handled during 2024 were carefully examined for parasitic copepod presence on the gills and fins. The number and sizes of salmonids examined for parasitic copepod presence are presented in Table 27 for each species and reservoir.

In Green Peter Reservoir, 45% of hatchery Chinook salmon were infected with parasitic copepods with prevalence increasing during summer and fall. Natural origin Chinook salmon had a 65% prevalence rate. *O. mykiss* copepod prevalence rates were 40% and 36% for hatchery and natural origin respectively. Cutthroat trout and kokanee had 0% prevalence rates, however sample sizes were lower (Table 27).

Copepod infection prevalence in Lookout Point Reservoir was 24% for hatchery Chinook salmon and 38% for natural origin. Hatchery rainbow trout were highly infected (65% prevalence rate) with copepods with a lower rate (26%) seen for natural origin *O. mykiss*. Only 5 cutthroat trout were captured (0% prevalence rate), all early in the year before the reservoir warmed.

Table 27. Parasitic copepod infection prevalence for salmonids captured in Green Peter and Lookout Point reservoirs. Number of fish examined for copepod presence (N), mean and range of fork length and copepod prevalence rate (# fish with copepods/N) are presented. Data are only shown for 2024.

Reservoir	Species	N	Mean Capture Week	Mean Fork Length (mm)	Min Fork Length (mm)	Max Fork Length (mm)	Copepod prevalence
			2024				
Green Peter	CHS-AD	132	41.8	198.4	56	290	45.45%
	CHS-natural	475	38.9	216	32	295	65.26%
	CUT	9	14.3	98.8	80	113	0.00%

Reservoir	Species	N	Mean Capture Week	Mean Fork Length (mm)	Min Fork Length (mm)	Max Fork Length (mm)	Copepod prevalence
	KOK	11	44.3	318	277	364	0.00%
	RBT-AD	669	34.9	308.9	154	393	40.42%
	RBT-natural	84	32.2	232.8	34	355	35.71%
Lookout Point	CHS-AD	128	37.1	166.7	86	252	24.22%
	CHS-natural	69	31.2	166	38	326	37.68%
	CUT	5	10.4	92	72	111	0.00%
	RBT-AD	20	34.5	349.9	169	502	65.00%
	RBT-natural	129	29.8	240.3	79	485	25.58%

Catch composition

Catch composition by reservoir, month and species is provided below in Table 28, and detailed total catch and CPUE by sampling week and gear type is provided in Appendix Tables A2 and A3.

In Lookout Point Reservoir during 2023 sampling, the most abundant fish encountered was white crappie (Table 28). Numerous nearshore trap sets had very large catches in June and July of young of the year crappie *spp.* (classified as white crappie for reporting based on the recommendation of ODFW district biologists). These sets also had high catches of young of the year bass. Later in the season, the most abundant fish species caught in gill nets was walleye. Fork lengths for all fish species captured are provided in Appendix Figures A6-A8, however as our sampling methods were targeted for small fish, the sizes of fish captured may not be reflective of the true size distribution of fish species present in the reservoir. In 2024 sampling, our most abundant nearshore trap species in Lookout Point Reservoir was juvenile sculpin, followed by young of year unidentified centrarchids (Table 28). Young of year white crappie, followed by smallmouth bass and black crappie were numerically the most dominant species in offshore gill net catch within Lookout Point Reservoir during 2024. While crappie and bass catch declined after July in 2023, high catch rates persisted through October during 2024, necessitating that we bundle and close off the small mesh panels of our gill nets to reduce catch of young-of-year fishes.

Catches in Green Peter Reservoir during 2023 were numerically dominated by bluegill of multiple size/age classes in June and July nearshore sampling. Bass were also encountered in moderate numbers in nearshore traps. Kokanee and *O. mykiss* had the highest catch rates in offshore gill net sampling. In 2024 Green Peter Reservoir sampling, Chinook salmon and bluegill were most encountered for nearshore traps. Once offshore gillnetting commenced, adult hatchery rainbow trout, natural origin Chinook salmon, bluegill, and smallmouth bass dominated catches (Table 28). Fork lengths for all species captured are in Appendix Figures A6-A8.

Table 28. Total fish catch by reservoir by month for each species encountered. CHS-Natural – Natural origin Chinook salmon, CHS-AD – hatchery Chinook salmon, UnID Salmonid – unidentified salmonid, KOK – kokanee, CUT - Cutthroat trout, RBT- *O. mykiss*, SMB - Smallmouth Bass, LMB - Largemouth bass, WAL – Walleye, BLC - Black Crappie, BLG - Bluegill, NPM - Northern Pikeminnow, BBH- brown bullhead, YBH -yellow bullhead, SCU – Sculpin, LSS - Large-scale sucker, LWB – western brook lamprey. *Asterisk indicates net sets that had small mesh gill net panels bundled to reduce small non-target bycatch.

Reservoir	Month	CHS-natural	CHS-AD	RBT	RBT-AD	RBT-natural	KOK	CUT	UnID Salmonid	SMB	LMB	WAL	WHC	BLC	BLG	Unid centrarchid	NPM	BBH	YBH	SCU	LSS	LWB	Total catch
											2023												
Green Peter	June	0	0	0	0	0	0	1	0	8	52	0	0	2	348	0	1	0	0	0	0	0	412
	July	0	0	3	0	0	1	2	0	26	2	0	0	1	253	0	2	0	0	0	0	0	290
	Aug	0	0	8	0	0	7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	16
	Sep	1	0	0	0	0	8	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	11
Lookout Point	June	8	1	0	0	0	0	0	0	1	283	4	6474	0	0	0	0	0	0	16	1	0	6788
	July	8	0	0	0	0	0	0	0	1	109	1	6000	0	0	0	3	1	0	1	0	0	6124
	Aug	0	0	0	0	0	0	0	0	0	0	29	2	0	0	0	0	0	0	0	0	0	31
	Sep	0	2	1	0	0	0	0	0	0	1	59	4	0	0	0	0	0	0	0	0	0	67
	Oct	2	2	0	0	0	0	0	0	0	0	85	3	2	0	0	0	0	0	0	0	0	94
	Nov	2	5	0	0	0	0	0	1	0	0	7	2	1	0	0	0	0	0	0	0	0	18
											2024												
Green Peter	Feb	17	2	0	0	9	0	2	0	0	0	0	0	0	19	0	1	0	0	0	0	1	51
	March	18	2	0	0	1	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	38
	April	9	0	0	2	1	0	6	0	2	0	0	0	0	11	0	3	0	0	0	0	0	34
	May	3	1	0	0	1	0	1	0	0	0	0	0	0	13	0	20	0	0	0	0	0	39
	June	21	4	0	51	4	0	0	0	1	0	0	0	0	52	0	5	0	0	0	0	0	138
	July	4	0	0	84	7	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	101
	Aug	33	9	0	284	27	0	0	0	45	0	0	0	0	14	0	6	0	11	0	1	0	430
	Sep	42	5	0	140	17	0	0	0	103	3	0	1	4	67	0	1	0	35	0	0	0	418
	Oct	64	20	0	22	8	3	0	0	52	1	0	0	2	108	0	16	0	41	0	1	0	338
	Nov	264	90	0	97	9	8	0	0	21	6	0	0	0	53	0	10	0	7	0	0	0	565
Lookout Point	Feb	8	2	0	0	11	0	3	0	0	0	0	0	0	1	0	2	0	0	1	0	0	28
	March	3	0	0	0	4	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	10
	April	2	1	0	0	12	0	2	0	0	0	0	0	0	0	0	3	9	0	0	5	0	34
	May	2	0	0	1	10	0	0	0	0	0	0	0	0	2	0	9	0	0	0	0	0	24
	June	7	1	0	1	3	0	0	0	3	0	0	0	4	3	116	0	0	0	264	1	0	403
	July	12	19	0	8	34	0	0	0	321	3	46	885	297	0	0	19	1	0	0	2	0	1647
	Aug	5	30	0	4	18	0	0	0	1626	9	0	4929	705	0	0	0	0	0	0	0	0	7326
	Sep	5	19	0	0	4	0	0	0	810	4	5	5143	509	0	0	0	0	0	0	0	0	6499

Reservoir	Month	CHS-natural	CHS-AD	RBT	RBT-AD	RBT-natural	KOK	CUT	UnID Salmonid	SMB	LMB	WAL	WHC	BLC	BLG	Unid centrarchid	NPM	BBH	YBH	SCU	LSS	LWB	Total catch
	Oct*	21	46	0	2	19	0	0	0	114	11	49	3016	226	1	0	30	0	0	0	7	0	3542
	Nov*	4	10	0	4	14	0	0	0	21	3	14	46	51	2	0	38	0	0	2	5	0	214

Predator bycatch

Capture methods were targeted to sample juvenile Chinook salmon and other small fish, thus we only evaluated predator (>200 mm fork length piscivorous fish species) captured as bycatch and we did not systematically sample the entire size range of the predator community. Large (>200 mm) bycatch excluded from this analysis were Chinook salmon subyearlings, largescale suckers, kokanee and brown bullhead as these species do not typically consume fish prey as a significant portion of their diet. Total catch and catch per unit effort (CPUE, fish/24h set) were used to assess relative abundance of predator bycatch (Table 29). Catch per unit effort (CPUE) was used as a measure of relative abundance for predators for each reservoir and gear type.

We encountered a total of 14 potential predatory fishes in Green Peter Reservoir and 10 potential predators in Lookout Point Reservoir during the 2023 sampling period. Green Peter predator sized fish were comprised of *O. mykiss* (200-290 mm), smallmouth bass (200-220 mm) and cutthroat trout (217 mm) (Table 29, Figure 62). Lookout Point predators were comprised of walleye (213-560 mm), smallmouth bass (200-220 mm), northern pikeminnow (210 mm), *O. mykiss* (432 mm), white crappie (305 mm), black crappie (305-310 mm) and unidentified adult salmonid (this live fish was loosely hooked by the gill net and fell out of the net before being processed, estimated at 550 mm) (Table 29, Figure 62). For both reservoirs, potential predators were scanned for PIT tags in case they had consumed PIT tagged prey, but none were encountered. No stomach contents were removed from any fish in this study.

During 2024 sampling, we encountered 833 potential predatory fishes within Green Peter Reservoir (Table 29, Figure 62). In Lookout Point Reservoir, 291 potential predators were captured during 2024. The most numerous predators encountered in Green Peter Reservoir were adult hatchery (213-393 mm) and natural origin *O. mykiss* (267-355 mm), and smallmouth bass (225-325 mm). Lookout Point dominant predators included walleye (200-428 mm), adult natural origin O. mykiss (203-485 mm), and northern pikeminnow (200-490 mm). While catches were higher in 2024 than in 2023, effort was also greater and different gear specifications were used for offshore gill netting. For 2024 sampling, we transitioned to using larger 80’ long gill nets (80’ long by 15’ deep, net area = 1200 ft^2 or 111.5 m^2) with larger mesh sizes (3/8 - 1 inch) relative to the 30’ long (30’ long by 6’ deep, net area = 180 ft^2 or 16.7 m^2, mesh size range 3/8 - 5/8 inch) gill nets used in the first year of the study.

Table 29. Total catch, mean CPUE and lengths of predator species over 200mm caught as bycatch during the sampling period by month and reservoir zone (includes all net depths). RBT – *O. mykiss*, SMB – Smallmouth bass, CUT – cutthroat, NMP – northern pikeminnow, WAL – walleye, BLC – black crappie, WHC – white crappie, UnID Salmonid – unidentified adult salmonid. *Contains some net sets with bundled small mesh panels. **Estimated length

Reservoir	Net type	Species	Effort (# sets)	Total Catch	Mean CPUE (#/set)	Mean Fork Length (mm)	Min Fork Length (mm)	Max Fork Length (mm)
			2023					
Green Peter	gill net 30'	CUT	108	1	0.01	217	217	217
Green Peter	gill net 30'	RBT	108	2	0.02	269.5	255	284
Green Peter	gill net 30'	SMB	108	1	0.01	220	220	220
Green Peter	gill net 80'	RBT	2	9	4.5	260.2	225	290
Green Peter	gill net 80'	SMB	2	1	0.5	200	200	200
Lookout Point	oneida	NPM	18	1	0.06	210	210	210
Lookout Point	oneida	SMB	18	2	0.11	210	200	220
Lookout Point	gill net 30'	BLC	309	2	0.01	307.5	305	310
Lookout Point	gill net 30'	RBT	309	1	0	432	432	432
Lookout Point	gill net 30'	UnID Salmonid	309	1	0	550**	550	550

Reservoir	Net type	Species	Effort (# sets)	Total Catch	Mean CPUE (#/set)	Mean Fork Length (mm)	Min Fork Length (mm)	Max Fork Length (mm)
Lookout Point	gill net 30'	WAL	309	2	0.01	386.5	213	560
Lookout Point	gill net 30'	WHC	309	1	0	305	305	305
			2024					
Green Peter	oneida	RBT-AD	104	2	0.02	259.5	229	290
Green Peter	oneida	RBT-natural	104	1	0.01	305	305	305
Green Peter	oneida	SMB	104	2	0.02	250.5	225	276
Green Peter	gill net 80'	NPM	336	21	0.06	266	220	350
Green Peter	gill net 80'	RBT-AD	336	671	2	309.8	213	393
Green Peter	gill net 80'	RBT-natural	336	60	0.18	266.8	200	355
Green Peter	gill net 80'	SMB	336	76	0.23	225.2	200	325
Lookout Point	oneida	RBT-natural	85	2	0.02	251	206	296
Lookout Point	oneida	SMB	85	1	0.01	220	220	220
Lookout Point	gill net 80'	BLC	216*	5	0.02	305	280	320
Lookout Point	gill net 80'	NPM	216*	39	0.18	251.3	200	490
Lookout Point	gill net 80'	RBT-AD	216*	19	0.09	359.4	265	502
Lookout Point	gill net 80'	RBT-natural	216*	85	0.39	287.5	203	485
Lookout Point	gill net 80'	SMB	216*	23	0.11	277.4	204	390
Lookout Point	gill net 80'	WAL	216*	100	0.46	263.7	200	428
Lookout Point	gill net 80'	WHC	216*	17	0.08	303.5	250	360

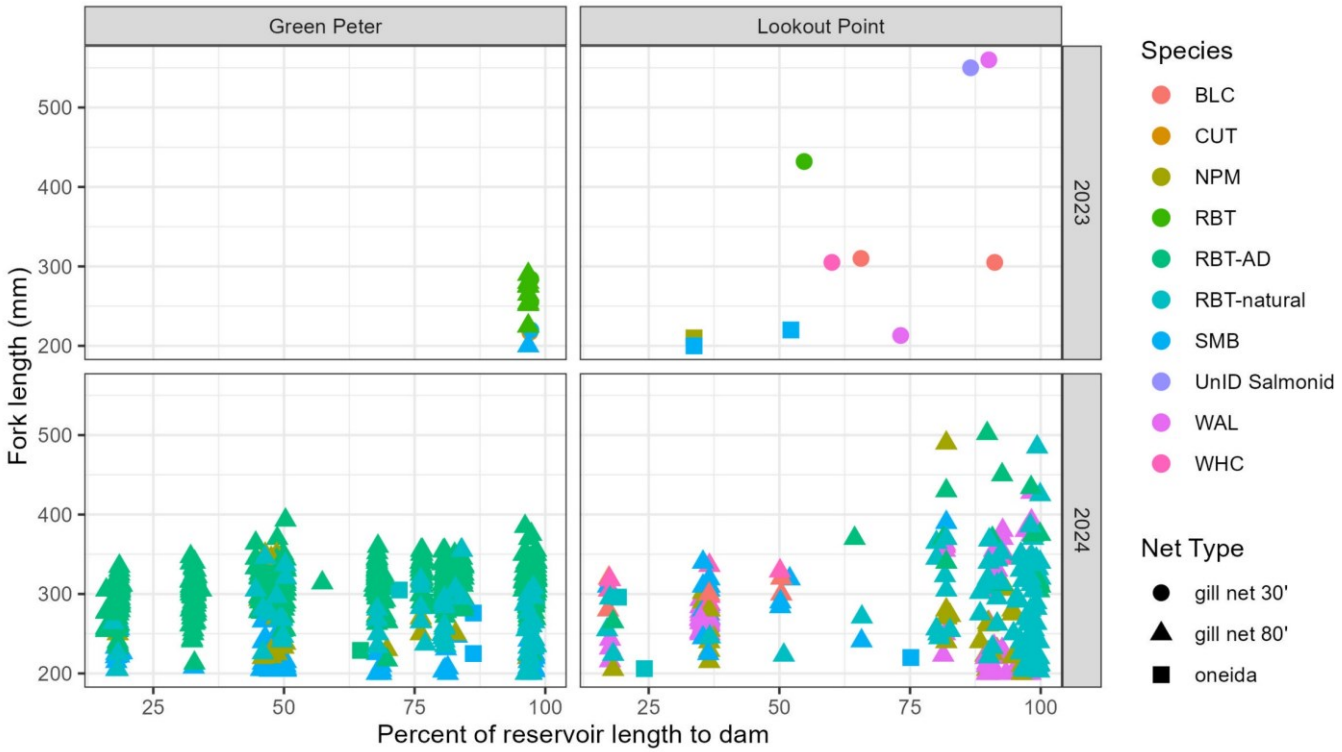

Figure 62. Fork lengths of predators >200mm captured in Green Peter and Lookout Point reservoirs in relation to percent of reservoir length to the dam (0=head of the reservoir, 100=dam).

DISCUSSION

This biannual report summarizes the efforts and results of bulk marking and reservoir distribution studies completed during the reporting period of June through December 2024 and to date, including final reporting for all activities completed from contract award through December 2024.

The bulk marking project, a major effort to understand juvenile Chinook salmon movement patterns across the Upper Willamette River Basin, focused on how Willamette Valley Project dam operations influence those patterns. Targeting the Middle Fork Willamette, South Santiam, North Santiam, and South Fork McKenzie River basins, the project sought to tag tens of thousands of fish per basin, creating a comprehensive dataset for tracking and analysis. As of December 31, 2024, we have tagged and released 392,449 juvenile Chinook salmon in the project area.

Although the project has yielded valuable insights into fish movement, the total redetection rate across the project area remained low (~1.5 percent). This constraint limits our ability to draw robust conclusions, as the small number of redetections may not fully capture the movement of the broader population. Consequently, the results presented here should be interpreted cautiously.

The subsequent recapture of PIT-tagged juvenile Chinook salmon in the Upper Willamette River Basin has provided some insight into the post-release movement patterns of those fish. A total of 5,762 PIT-tagged juvenile Chinook salmon have been redetected across various observation locations in the basin through December 2024, resulting in an overall detection rate of 1.5 percent. Across all basins, we observed that fish released further downstream tended to travel through the project area more quickly. For example, travel times to the Cougar Dam tailrace were shorter for fish released into the forebay compared to those released at the head of the reservoir. Fish released in the Cougar forebay on November 14, 2023, had a median travel time of 0.9 days, with a detection rate of 9.1%, whereas those released at the head of the reservoir on November 13, 2023, had a median travel time of 27.0 days and a detection rate of 7.1%. Similarly, yearling Chinook salmon released at the head of Cougar Reservoir on March 8, 2024, had a median travel time of 19.0 days and a detection rate of 1.92%, compared to 1.0 day and 3.81% for yearlings released in the forebay on March 11, 2024.

There was also evidence that dam operations impacted travel times and detection rates, interacting with the seasonal migration patterns of juvenile Chinook salmon. For example, mean travel time from the head of Fall Creek Reservoir to the Fall Creek tailrace decreased from 128.8 days for fish released on June 12, 2023 (detection rate 0.1%), outside typical migration periods, to 20.9 days for fish released on September 28, 2023 (detection rate 2.9%), and to 1.9 days for subyearlings released on November 6, 2023 (detection rate 5.7%), as the reservoir transitioned from full pool to full drawdown under Injunction Measure 19, aligning with fall migration timing. Similarly, in the Cougar project area, the results illustrated that travel times were influenced by dam operations and reservoir elevation levels. The August 29, 2023, release had a detection rate of 0.6% and a median travel time of 66.0 days, reflecting slower passage in late summer, contrasting with the November 13–14, 2023, releases during fall drawdown (Injunction Measure 14), which had detection rates up to 9.6% and travel times as low as 0.9 days, facilitating passage during a key fall window. The Hills Creek releases further emphasized the role of dam operations on migration efficiency. Early releases on June 5, 2023, saw a detection rate of 0.8% and median travel times of 183–189 days, suggesting rearing outside peak migration seasons, while November 7–9, 2023, releases during fall regulating outlet operations (Injunction Measure 8d) had a detection rate of 2.4% and travel times of 31.9–58.8 days, and February 6–7, 2024, releases during powerhouse flow had a detection rate of 0.6% and travel times of 3.1–4.5 days, aligning with spring movement. Across basins, detections consistently coincided with dam operations mandated by injunction measures. For instance, 87% of Hills Creek subyearling detections (November 2023) occurred during regulating outlet operations, 100% of Foster's head-of-reservoir detections from the October 15, 2024, release (detection rate 0.48%) aligned with nighttime spill under Injunction Measure

13a, and 49 of 53 North Santiam fry detections (across brood years 2022 and 2023) occurred during spill or regulating outlet operations under Interim Measures 5 and 7. Similarly, all detections at Green Peter's rotary screw trap for spring yearlings (detection rate 1.4%, brood year 2022) and at Fall Creek during November 2023 (detection rate 5.7%) coincided with spill or drawdown operations specified by Injunction Measures 12(a) and 19, respectively. These patterns suggest that injunction-mandated operations, such as spill and drawdown events, play a critical role in facilitating downstream passage of juvenile Chinook salmon across the study area when aligned with their natural migration periods.

Unfortunately, we did not have enough recoveries to make meaningful insights about the impact of the deep drawdowns at Lookout Point and Green Peter reservoirs. The total redetection rate of 1.5 percent across the project area limits our ability to draw robust conclusions from the data alone. With such low redetection rates, the summary data presented here may not be fully representative of the population at large, and these observations should be interpreted cautiously. Pooling data across years and seasons on subsequent reports may improve precision. Additionally, the data summaries presented herein do not account for survival versus delayed migration. It is possible that some fish experienced delayed migration due to reservoir conditions rather than being lost from the population, and this needs to be considered in future analyses.

The addition of the Lebanon Dam PIT antennas on the South Santiam River will help future iterations of this project evaluate the deep drawdown at Green Peter Reservoir. Currently, there are no operational PIT detection arrays downstream of Lookout Point Reservoir in the Middle Fork Willamette River. Adding detection arrays downstream of Lookout Point Reservoir may benefit the evaluation of the efficacy of the Lookout Point Reservoir deep drawdown on fish passage at Lookout Point Dam. However, it is important to note that PIT detection in the Willamette Basin faces many challenges, including limited numbers of PIT-tagged salmonids, difficulties associated with installing and maintaining PIT detection systems, and unknown detection efficiencies. Even with additional PIT detection infrastructure, low redetection rates may limit the ability to gather enough data to draw meaningful conclusions, particularly within the short timeframes.

Future analyses could enhance our understanding of juvenile Chinook salmon migration and survival if current limitations are addressed. A more comprehensive dataset, with higher redetection rates, a broader spatial distribution of detection locations, and improved PIT tag detection efficiencies, would enable detailed survival analyses, such as with the Cormack-Jolly-Seber model. Of the 5,762 fish redetected study-wide, only 59 were detected at more than one location, and none at more than two, precluding survival estimation with such models, which require multiple recaptures to estimate survival probabilities. Enabling these analyses would necessitate a network of detection sites providing at least two downstream recaptures for a significant proportion of released fish, achievable through expanded PIT tag detection infrastructure, increased tagging efforts, and enhanced detection efficiencies. Pooling data across years and seasons in subsequent reports may improve precision as additional data accumulate over time. In subsequent reports, we will explore incorporating these analyses as data and infrastructure improve, potentially providing more detailed insights into now dam operations influence downstream passage, mortality during migration, and survival factors for juvenile Chinook salmon in the project area.

The reservoir distribution studies task involved sampling the fish communities of Lookout Point and Green Peter Reservoirs. The objectives of this work were to evaluate juvenile salmonid distribution, passage timing, growth and body condition in relation to water management strategies implemented under the Interim Injunction measures. For both reservoirs, sampling was conducted during spring in the nearshore (littoral) environment using surface traps and in the offshore (pelagic) environment during summer and fall using suspended small mesh gill nets.

On Lookout Point Reservoir, nearshore sampling in 2023 occurred between June 26 and July 12 and was delayed from our target start of early May due to supply chain and permitting delays. During that period, we only captured one subyearling (BY22) Chinook salmon in box minnow sets (n=51 sets) and 16 in oneida sets (n=18 sets). No juvenile *O. mykiss* were captured in 2023 nearshore traps. We presumed our low catch rates were most likely due to missing the key period of the outmigration season and that we sampled after nearshore surface temperatures had risen to unsuitable levels for salmonids. Surface water temperatures at trap locations were over 20^{o}C for the duration of 2023 nearshore sampling, except for a few isolated traps in the upper zone of the reservoir. Biweekly nearshore sampling during the 2024 field season began February 05 and continued through June 12, at which point we suspended nearshore surface trapping due to rising surface temperatures and transitioned to offshore suspended gill nets. During the 2024 nearshore sampling period on Lookout Point Reservoir, we captured a total of four juvenile Chinook salmon in box minnow sets (n=247 sets) and 14 in oneida sets (n=85 sets). Despite sampling across the entire spring period, catch rates of juvenile Chinook salmon did not increase in 2024. In comparison, past nearshore sampling in Lookout Point Reservoir using identical gear specifications (Oneida and box traps) and sampling design that sampled from March 05 through June 20, 2014 captured a total of 650 subyearling Chinook salmon in box minnow traps (n= 390 sets) and 1,047 in Oneida net sets (n=54 sets) (Monzyk et al. 2015). Similar scale catches were seen in 2013 as well (1,893 subyearlings captured in 393 box traps and 12 oneida sets) (Monzyk et al. 2014). One possible explanation for the lower catch rates in Lookout Point nearshore sets is the reduced number of adult female spawners outplanted upstream of the reservoir during our study years. Fewer female spawners would have resulted in fewer juvenile Chinook salmon. In 2013, 875 adult females (out of 1,966 total adult spawners) were outplanted upstream of Lookout Point Reservoir (Sharpe et al. 2015). This number dropped to 510 females (1,142 total spawners) in 2022 (ODFW 2022) and further declined to just 21 females (71 total spawners) in 2023 (ODFW 2023). These figures represent a 1.7-fold decrease in female outplants in 2022 and a 42-fold decrease in 2023 relative to 2013. While the number of spawners helps explain differences in catch rates across years, it does not fully account for them. It is also possible that we failed to capture fish that were present. Our traps appeared to be fishing properly and did result in some large >1,000 specimen non-target catches. Chinook salmon fry exhibit schooling behavior and it is possible that a patchy distribution, paired with small sample size relative to the size of the reservoir, may have contributed to our low encounter and catch rates. Catch per set in previous studies (Monzyk et al 2014; Monzyk et al. 2015) did show high variance, particularly for sets in March and April when a large proportion of the season's total catch came from approximately 10 high catch sets in the upper zone (Monzyk et al. 2015, see Figure 1-3).

Nearshore trapping was conducted in Green Peter Reservoir during 2023 from June 15 through July 05, but zero juvenile Chinook salmon and *O. mykiss* were captured during this period. In 2024, nearshore collections in Green Peter Reservoir occurred between February 12 and June 05, resulting in one juvenile Chinook salmon captured in box minnow traps (n=257 sets) and 57 captured in Oneida traps (n=104 sets). Zero natural origin *O. mykiss* were captured in box minnow traps, but 12 were caught in Oneida traps (n=104 sets). Unclipped *O. mykiss* are presumed to be rainbow trout as winter steelhead are not released above Green Peter Reservoir. During fall 2022 and 2023, ODFW released 800 total adult Chinook salmon spawners annually upstream of Green Peter Reservoir (ODFW 2022, ODFW 2023). ODFW also releases triploid hatchery rainbow trout in Green Peter. No past nearshore sampling studies exist for a direct comparison of capture rates within Green Peter Reservoir. However, relative to Lookout Point Reservoir, Chinook salmon catch rates during 2024 nearshore sampling were lower in Green Peter for box minnow traps (4-fold lower), higher for Oneida traps (3-fold higher), and lower for natural origin *O. mykiss* (4-fold lower). Results from sampling during 2024 in Green Peter suggest that nearshore habitat use by natural origin Chinook salmon was greatest during February and March, before tapering off through the remainder of spring. Early season catches were predominantly in the upper, middle and Quartzville zones, with a higher percentage of catch in the lower zone seen in June.

Offshore catch rates during 2023 sampling were extremely low for both reservoirs. In Lookout Point Reservoir during 2023, offshore suspended small mesh gill netting was conducted between August 22 and December 6 at biweekly or weekly intervals using 30'x6' gill nets. Over that period, only 13 subyearling Chinook salmon were captured in 296 sets (0.04 Chinook salmon/net) in waters less than 20ºC (n=309 total sets across all temperatures). Comparatively, ODFW captured a total of 1,090 subyearling Chinook from 282 gill net sets (3.9 Chinook salmon/net) conducted over July-August and October-November in 2014 in Lookout Point Reservoir (Monzyk et al. 2014). This drastic difference in catch per net likely stems from multiple causes. First, the gill nets we used in 2023 were of much smaller surface area and contained smaller mesh sizes than those used previously by ODFW. While efforts were taken to duplicate ODFW's custom net specifications, supply chain issues and the timeline of the project necessitated using nets of different specifications. By net area, nets used in 2023 were 16.7 m^2 (9.1 x 1.8 m) compared with 111.4 m^2 (24.4 x 4.6m) in 2014, a 6.7-fold reduction in area per net. Expanding by the number of net sets in each respective study, our gill net effort by net area in 2023 was effectively 16% of that of ODFW's efforts in 2014. Net area accounts for some of the difference in catch rates, but not all as our 2023 catch was approximately 1% of ODFW's. It is also possible that our offshore gill net catches were lower in 2023 due to using smaller mesh sizes (2023: 9.5, 12.7 and 15.9 mm square mesh; 2014: 9.5, 12.7, 19.1 and 25.4 mm). Most of our Chinook salmon catch was in 15.9 mm mesh, followed by 12.7 with no catch in 9.5 mm. Other factors that may have come into play to reduce Chinook salmon catch rates during 2023 include the drawdown, high turbidity, high temperatures throughout the water column during August and September, and as mentioned previously, lower numbers of adult Chinook salmon spawners outplanted upstream of Lookout Point Reservoir in recent years.

We secured new gill nets matching the ODFW specifications for use in 2024 offshore sampling. Offshore sampling began on Lookout Point Reservoir starting 6/24/2024 and continued through 11/21/2024. Over the 2024 offshore field season, 179 juvenile Chinook salmon and 90 natural origin *O. mykiss* were captured in 216 gill net sets (0.83 Chinook salmon/net; 0.42 *O. mykiss*/net). Lookout Point offshore Chinook catch rates increased dramatically (20-fold) during 2024 relative to 2023, but were still roughly a fifth of ODFW's catch rates from 2014. Offshore sampling in Green Peter Reservoir occurred from 7/31/2023 through 9/30/2023 and from 6/17/2024 through 11/6/2024. During 2023, only one juvenile Chinook salmon was captured out of 108 gill net sets (0.01 Chinook salmon/net), while during 2024 offshore sampling using the larger 80' ODFW gill nets, 550 juvenile Chinook salmon and 72 natural origin *O. mykiss* were captured from 336 sets (1.64 Chinook salmon/net; 0.21 *O. mykiss*/net). Juvenile Chinook salmon CPUE during 2024 was roughly double for Green Peter offshore sampling relative to Lookout Point.

For Lookout Point Reservoir, spring injunction measures consisted of 30 days ungated surface spill followed by nighttime surface spill and daytime power generation. Green Peter Reservoir spring injunction measures consisted of a month of continuous surface spill followed by a month of nighttime only spill. Low catch rates for juvenile Chinook salmon in nearshore sampling during both study years severely limits our ability to infer distributional patterns, passage timing, abundance and the effects of spring injunction measures on outmigrants for either reservoir. While general patterns of catch and CPUE can be reported, nearshore results should be interpreted cautiously and not be used in isolation to evaluate the success of spring injunction measures. Fall injunction measures being evaluated consisted of a deep drawdown of both reservoirs. The deep drawdown of Lookout Point Reservoir begins in summer and targets an elevation of 750 ft by November 15th, which is then maintained for one month. The Green Peter drawdown targets an elevation of 780 ft by November 15th, which is also targeted to be maintained for one month. Fall spill during the drawdown is through the regulating outlets (RO). Juvenile salmonid capture rates for offshore sampling were comparatively better than for nearshore sampling, particularly during 2024, and can be used to support evaluation of the effects of the fall deep drawdown on juvenile Chinook salmon distribution and passage.

In Lookout Point Reservoir, 2023 nearshore sampling found natural-origin Chinook salmon primarily in the upper and middle zones, though sampling was limited to late June through mid-July. In contrast, 2024 sampling (February–June) recorded the highest CPUE for Chinook salmon yearlings (BY22) in February in the upper and middle zones, while fry (BY23) were captured from February through May, also concentrated in these zones. Past studies suggest seasonal shifts in nearshore Chinook salmon longitudinal distribution. Monzyk et al. (2015) observed peak catches in the upper zones early in the season, followed by a transition to the lower zone by June. However, our 2024 nearshore results did not show comparable downstream movement, though low catch rates may have limited our ability to detect this pattern. In offshore sampling, juvenile Chinook salmon were distributed throughout the reservoir prior to the drawdown. In both years, we observed a downstream shift in juvenile Chinook salmon catches during the fall drawdown, with sampling restricted to the lower zone as upstream zones became dewatered. Offshore CPUE during 2024 peaked in August for hatchery Chinook salmon and in October for natural origin. The offshore CPUE peaks coincided with the drawdown period while RO spill was occurring.

RST data from the Lookout Point tailrace trap in 2023 showed peak natural origin Chinook salmon catches during January, mid-spring (late April to mid-May), and December, coinciding with spill events, with few captures from June to October (EAS 2024b). At the head of reservoir trap, peak catches occurred in April/May with a smaller December peak (EAS 2024b). RST catches at the trap above Lookout Point in 2024 peaked in spring between February and June for Chinook salmon with fewer individuals captured sporadically during September and October (EAS 2025). At the Lookout Point tailrace trap in 2024, catches peaked during late January (yearlings BY22), with only small intermittent catches of subyearlings (BY23) during mid and late spring, and in late fall (November and December) (EAS 2025). A 2023 USGS acoustic telemetry study found forebay redetections increased in October, with most fish passing to the tailrace between October and late November (Hance et al. 2024). Overall, RST and telemetry data align with our findings for Lookout Point Reservoir, showing a yearling pulse in late winter, low catches through most of the year, and a smaller outmigration peak in late fall during accelerated drawdown.

In Green Peter Reservoir during 2024 offshore sampling, Chinook salmon and natural origin *O. mykiss* were distributed throughout the reservoir before the drawdown peak. Offshore Chinook salmon catches peaked in November 2024 during the drawdown, coinciding with the reservoir's maximum extent of dewatering. In contrast, *O. mykiss* catch rates did not exhibit a similar peak. Catches at the RST above Green Peter on the Middle Santiam support early spring (late January through March) as the peak timing for Chinook salmon entering the reservoir (EAS 2025). The Green Peter Tailrace RST had a small peak in catch during April through June, and a much larger peak starting in October that peaked during early November, coincident with our highest offshore catch period during reservoir sampling, supporting that fish were actively outmigrating during that period (EAS 2025).

In 2024, infection prevalence of the copepod *S. californiensis* peaked during late summer and fall in both reservoirs with 45% of hatchery Chinook salmon and 65% of natural origin Chinook salmon infected within Green Peter Reservoir and 24% and 38% infection prevalence for hatchery and natural Chinook salmon respectively in Lookout Point Reservoir. These rates are slightly reduced from prevalence rates observed in Lookout Point during previous years, but are similar to rates observed below Lookout Point Reservoir in RSTs in 2023. Prior observations of reservoir rearing subyearling Chinook salmon report an infection rate of 75% from October-November in Lookout Point Reservoir (Monzyk et al. 2015). Similar magnitude prevalence rates were seen in 2012 and 2013, with a trend of increasing prevalence over the July through December period (Monzyk et al. 2015). At the Lookout Point Reservoir tailrace RST location, copepod infection prevalences in 2023 were 32% and 34% for natural origin and hatchery Chinook salmon respectively, compared with 0.7% for natural origin Chinook salmon above the reservoir at the Lookout Point Head of Reservoir trap location (EAS 2024b).

Elevated temperatures were observed in Lookout Point Reservoir during August and September of 2023. From mid-August through late September, the water column down to 30 m was 19-21ºC. At that time, the maximum depth in the forebay was approximately 35 m, and depths greater than 30 m had low dissolved oxygen that would have presented stressful conditions for salmonids (less than 5 mg/L) (Bjornn and Reiser 1991). Thus, during peak temperatures, all habitat available was suboptimal in Lookout Point reservoir for salmonids. These thermal conditions likely influenced Chinook salmon survival and movement. A concurrent 2023 USGS acoustic telemetry study found low apparent survival rates for hatchery Chinook salmon released in late summer, when reservoir temperatures were high throughout the water column relative to fish released later in fall, supporting that elevated temperatures may have led to increased mortality (Hance et al. 2024). The drawdown, which reduced reservoir elevations relative to past years, may have contributed to the change in conditions seen during 2023. Other potential causes include Hills Creek operations, and differences in flows or inflow temperatures between years. A visual comparison of river temperatures at the MF Willamette River Below North Fork Oakridge USGS gage (14148000) upstream of Lookout Point Reservoir for June-September of 2017, 2018 and 2023 shows no drastic differences in water temperatures between years, however 2023 did have slightly warmer temperatures in June by approximately 1 to 2 ºC (no apparent differences for other months).

During 2024 sampling, Lookout Point Reservoir surface temperatures peaked at over 22C with >18C extending down to approximately 20m depth in the forebay. However, unlike in 2023, during 2024 the reservoir below 20m did not have prohibitively low dissolved oxygen, thus a small volume remained suitable for salmonid use. It is worth noting that this "safe zone" did not extend beyond the forebay during peak thermal stratification due to shallower depths farther up the reservoir. A similar zone of suitable temperature was observed during 2017 and 2018 sampling. In 2017 and 2018, temperatures above 18ºC occurred during late summer down to approximately 20 m, however the maximum depth of the reservoir was greater, and a layer of suitable temperature remained throughout the season (Kock et al. 2019b).

Vertical profiles in Lookout Point reservoir and USGS Green Peter tailrace monitoring identified concerns with high turbidity levels in both reservoirs during the 2023 drawdown, with turbidity exceeding 200 NTU in November and December during the peak of the drawdown. During 2024 sampling, turbidity similarly increased in fall associated with the drawdown. However, the magnitude was much reduced for Lookout Point Reservoir relative to 2023 during our sampling period. Through the conclusion of sampling in late November 2024, turbidity was ranging 30-77 NTU across the water column. Green Peter Reservoir saw higher levels though, with turbidity exceeding 500 NTU in early November just prior to when we suspended sampling for the year. Suspended sediments have been associated with negative effects on the spawning, growth, and reproduction of salmonids (Bash et al. 2001). Past studies have found high levels to be fatal to salmonids while lower levels may cause reduced foraging capability, reduced growth, resistance to disease and impaired migration (Lloyd 1987). Adverse effects have been associated with turbidity levels as low as 18-70 NTU (Gregory 1992). Laboratory studies have found that juvenile steelhead and coho avoid areas with mean turbidity of 167 NTUs or higher but no avoidance was seen at the 57-77 NTU range (Sigler et al. 1984). Based on these past studies, the elevated turbidity levels seen in Lookout Point and Green Peter reservoirs during fall 2023 and in Green Peter Reservoir during fall 2024 may have caused avoidance behavior or had other adverse impacts on juvenile salmonids. Based on these criteria, juvenile salmonids within Lookout Point Reservoir during fall 2024 may also have experienced adverse effects from turbidity. Elevated turbidity may have contributed to the relatively modest estimated growth rate seen in 2023 in Lookout Point for natural origin Chinook salmon caught between early summer and fall. The mean growth rate (0.61 mm of fork length/day) observed in 2023 for natural origin Chinook salmon was comparable to rates seen in 2011 (0.61 mm/d fork length) but less than rates observed during 2012-2014 (0.84-0.86 mm/d fork length) (Monzyk et al. 2015). Growth rates seen in 2024 sampling (Green Peter: 0.89 mm/d fork length; Lookout Point: 0.91 mm/d fork length) were considerably higher and more in line with the 2012-2014 years, suggesting that the growth environment was not limiting.

It is possible that higher turbidity during fall of both years may have reduced predation pressure on juvenile salmonids from resident piscivores that rely on visual foraging, as has been documented in other systems (Gregory and Levings 1998). In Lookout Point Reservoir, most predator size (>200 mm) bycatch were walleye, crappie spp., smallmouth bass, *O. mykiss* and northern pikeminnow, however, our sampling methods were not designed to capture predator sized fish. Past work that assessed the predator community in Lookout Point Reservoir during 2013-2015 identified northern pikeminnow, crappie spp., largemouth bass, and walleye as the most abundant predators (Brandt et al. 2016). In floating gill nets, northern pikeminnow were the most abundant species in 2013-2015 (Brandt et al. 2016). However, in our suspended gill nets, crappie, smallmouth bass and walleye had the greatest proportion of the catch, suggesting relative abundance of the predator community may have changed since the previous assessment.

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APPENDIX

Figure A1. Box minnow trap deployment.

Figure A2. Oneida trap deployment.

Figure A3. Gill net deployment.

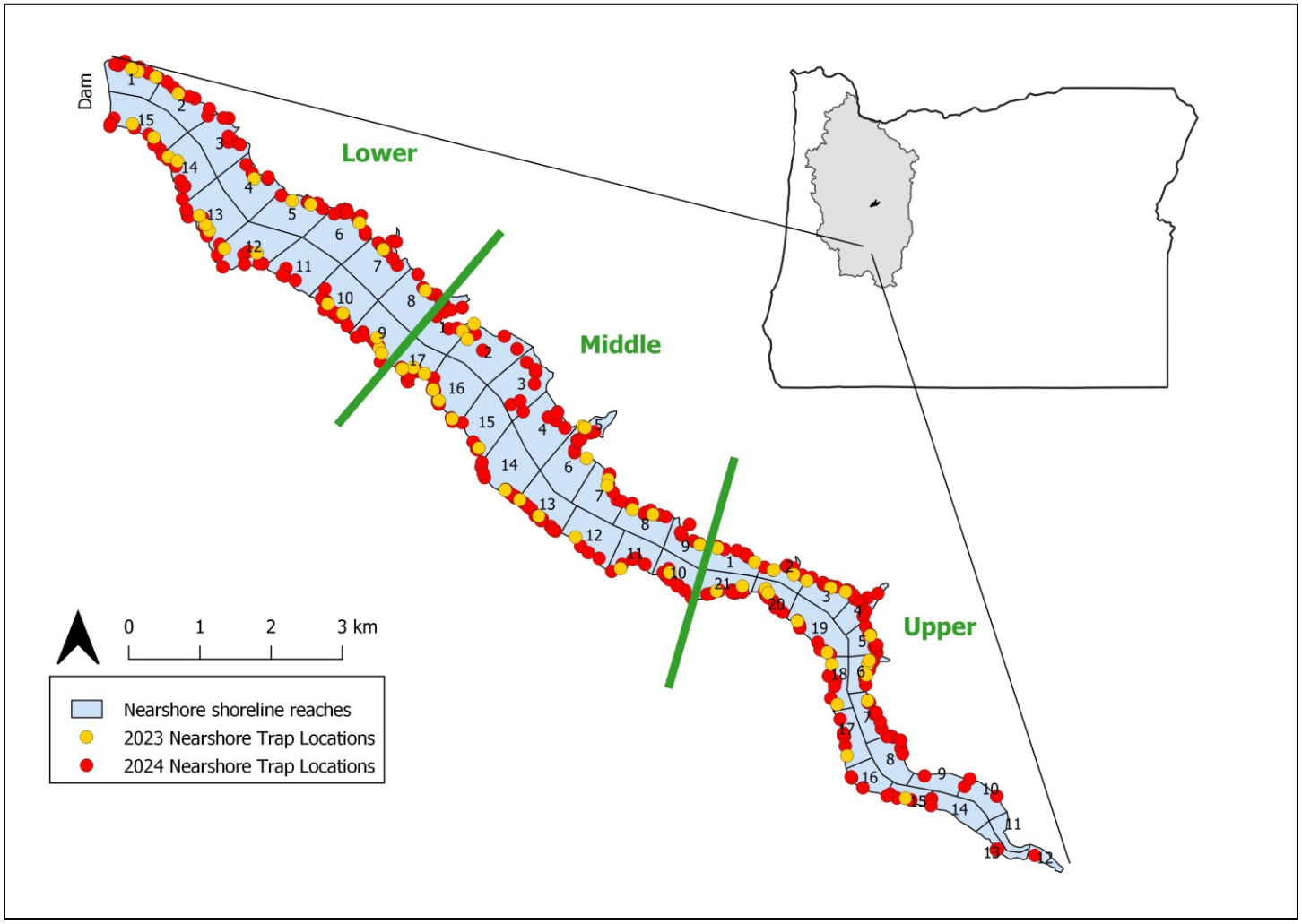

Figure A4. Nearshore trap locations for Lookout Point Reservoir.

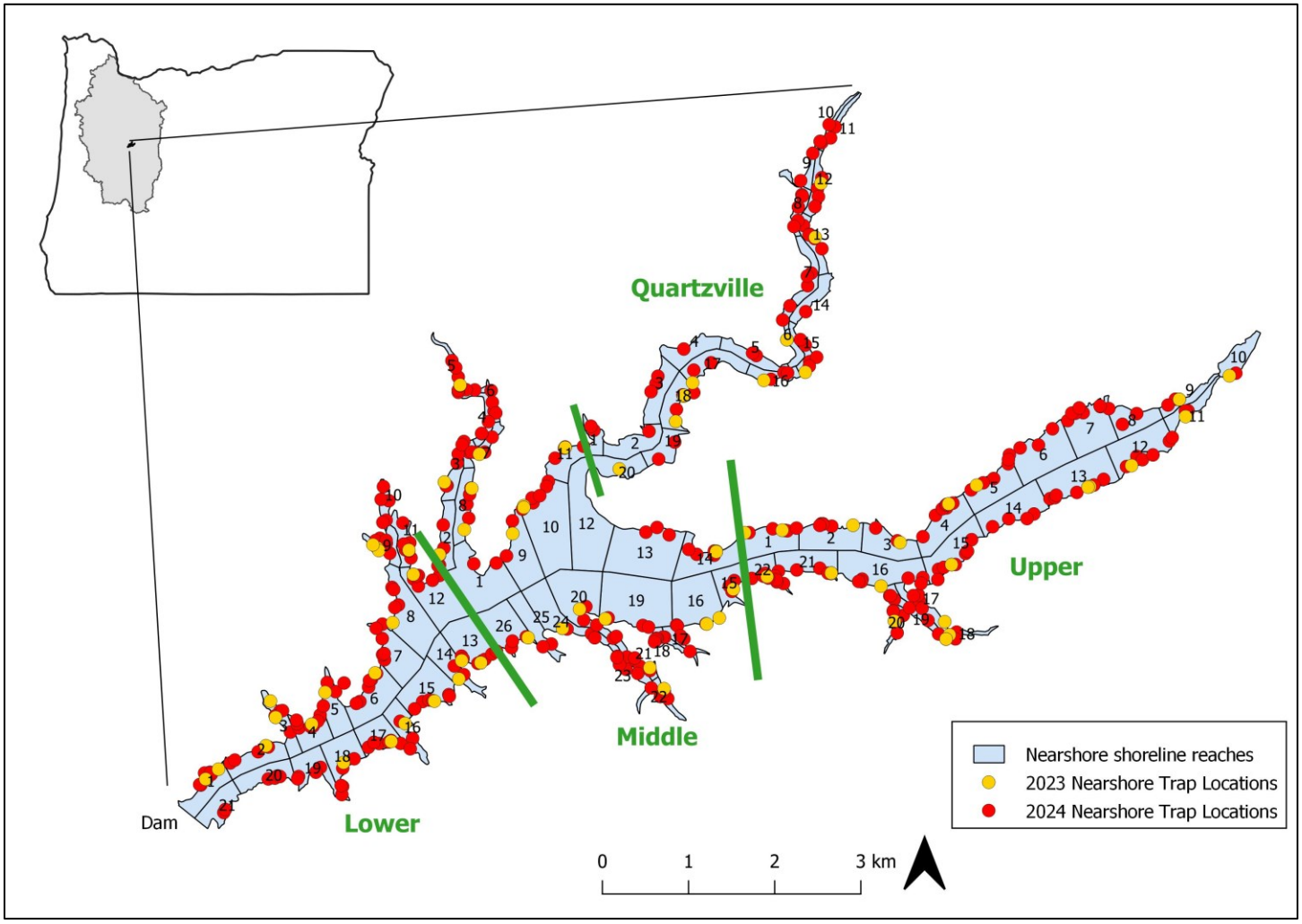

Figure A5. Nearshore trap locations for Green Peter Reservoir.

Table A1. Sampling effort by statistical week. Effort (number of 24 hr sets) is shown for each gear type and reservoir. Values are the total number of sets (net depths aggregated) with the number of sets with mean temperature below 20ºC in parentheses. *Asterisks indicate gill net sets where small mesh panels (3/8 and ½" mesh) were bundled/closed off.

Reservoir	Week	Start	End	Oneida	Box minnow	Gill net 30'	Gill net 80'
			2023				
Green Peter	24	6/15/2023	6/15/2023	2 (0)	0	0	0
	25	6/20/2023	6/22/2023	0	29 (0)	0	0
	25	6/20/2023	6/22/2023	12 (1)	0	0	0
	27	7/3/2023	7/5/2023	0	30 (0)	0	0
	27	7/3/2023	7/5/2023	12 (0)	0	0	0
	31	7/31/2023	8/2/2023	0	0	21 (14)	0
	31	7/31/2023	8/1/2023	0	0	0	2 (2)
	33	8/17/2023	8/17/2023	0	0	9 (6)	0
	35	8/28/2023	8/30/2023	0	0	26 (12)	0
	37	9/11/2023	9/13/2023	0	0	26 (23)	0

Reservoir	Week	Start	End	Oneida	Box minnow	Gill net 30'	Gill net 80'
	39	9/28/2023	9/30/2023	0	0	26 (19)	0
Lookout Point	26	6/26/2023	6/28/2023	0	25 (3)	0	0
	26	6/26/2023	6/28/2023	9 (0)	0	0	0
	28	7/10/2023	7/12/2023	0	26 (0)	0	0
	28	7/10/2023	7/12/2023	9 (0)	0	0	0
	34	8/22/2023	8/24/2023	0	0	24 (12)	0
	36	9/5/2023	9/7/2023	0	0	23 (22)	0
	38	9/19/2023	9/21/2023	0	0	24 (24)	0
	40	10/2/2023	10/4/2023	0	0	24 (24)	0
	42	10/17/2023	10/19/2023	0	0	24 (24)	0
	43	10/23/2023	10/25/2023	0	0	24 (24)	0
	44	10/30/2023	11/1/2023	0	0	22 (22)	0
	45	11/7/2023	11/9/2023	0	0	24 (24)	0
	46	11/13/2023	11/15/2023	0	0	36 (36)	0
	47	11/20/2023	11/21/2023	0	0	24 (24)	0
	48	11/27/2023	11/29/2023	0	0	24 (24)	0
	49	12/4/2023	12/6/2023	0	0	36 (36)	0
			2024				
Green Peter	7	2/12/2024	2/14/2024	0	30 (30)	0	0
	7	2/12/2024	2/14/2024	12 (12)	0	0	0
	9	2/26/2024	2/28/2024	0	28 (28)	0	0
	9	2/26/2024	2/28/2024	12 (12)	0	0	0
	11	3/11/2024	3/13/2024	0	29 (29)	0	0
	11	3/11/2024	3/13/2024	12 (12)	0	0	0
	13	3/25/2024	3/27/2024	0	30 (30)	0	0
	13	3/25/2024	3/27/2024	12 (12)	0	0	0
	15	4/8/2024	4/10/2024	0	30 (30)	0	0
	15	4/8/2024	4/10/2024	12 (12)	0	0	0
	17	4/22/2024	4/24/2024	0	30 (30)	0	0
	17	4/22/2024	4/24/2024	12 (12)	0	0	0
	19	5/8/2024	5/9/2024	0	20 (20)	0	0
	19	5/8/2024	5/9/2024	8 (8)	0	0	0
	21	5/20/2024	5/22/2024	0	30 (30)	0	0
	21	5/20/2024	5/22/2024	12 (12)	0	0	0
	23	6/3/2024	6/5/2024	0	30 (30)	0	0
	23	6/3/2024	6/5/2024	12 (12)	0	0	0
	25	6/17/2024	6/19/2024	0	0	0	22 (22)
	27	7/1/2024	7/3/2024	0	0	0	24 (24)
	29	7/15/2024	7/17/2024	0	0	0	27 (27)
	30	7/24/2024	7/24/2024	0	0	0	7 (6)
	31	7/30/2024	7/30/2024	0	0	1 (1)	0
	31	7/30/2024	7/30/2024	0	0	0	8 (8)
	32	8/5/2024	8/7/2024	0	0	0	26 (26)
	33	8/12/2024	8/14/2024	0	0	0	27 (27)
	34	8/19/2024	8/21/2024	0	0	0	27 (24)
	35	8/26/2024	8/28/2024	0	0	0	26 (23)

Reservoir	Week	Start	End	Oneida	Box minnow	Gill net 30'	Gill net 80'
	37	9/9/2024	9/11/2024	0	0	0	27 (24)
	38	9/16/2024	9/17/2024	0	0	0	17 (15)
	39	9/23/2024	9/25/2024	0	0	0	25 (25)
	41	10/7/2024	10/9/2024	0	0	0	27 (27)
	43	10/21/2024	10/23/2024	0	0	0	27 (27)
	45	11/4/2024	11/6/2024	0	0	0	19 (19)
Lookout Point	6	2/5/2024	2/7/2024	0	20 (20)	0	0
	6	2/5/2024	2/7/2024	7 (7)	0	0	0
	8	2/19/2024	2/21/2024	0	27 (27)	0	0
	8	2/19/2024	2/21/2024	9 (9)	0	0	0
	10	3/5/2024	3/6/2024	0	17 (17)	0	0
	10	3/5/2024	3/6/2024	6 (6)	0	0	0
	12	3/18/2024	3/20/2024	0	27 (27)	0	0
	12	3/18/2024	3/20/2024	9 (9)	0	0	0
	14	4/1/2024	4/3/2024	0	25 (25)	0	0
	14	4/1/2024	4/3/2024	9 (9)	0	0	0
	16	4/15/2024	4/17/2024	0	26 (26)	0	0
	16	4/15/2024	4/17/2024	9 (9)	0	0	0
	18	4/29/2024	5/1/2024	0	25 (25)	0	0
	18	4/29/2024	5/1/2024	9 (9)	0	0	0
	20	5/13/2024	5/15/2024	0	26 (26)	0	0
	20	5/13/2024	5/15/2024	9 (9)	0	0	0
	22	5/27/2024	5/29/2024	0	27 (27)	0	0
	22	5/27/2024	5/29/2024	9 (9)	0	0	0
	24	6/10/2024	6/12/2024	0	27 (4)	0	0
	24	6/10/2024	6/12/2024	9 (1)	0	0	0
	26	6/24/2024	6/26/2024	0	0	0	23 (23)
	28	7/9/2024	7/11/2024	0	0	0	23 (19)
	30	7/22/2024	7/24/2024	0	0	0	24 (12)
	31	7/29/2024	7/30/2024	0	0	0	16 (10)
	32	8/5/2024	8/5/2024	0	0	0	4 (4)
	33	8/12/2024	8/14/2024	0	0	0	10 (10)
	34	8/20/2024	8/22/2024	0	0	0	8 (8)
	36	9/3/2024	9/4/2024	0	0	0	6 (6)
	38	9/16/2024	9/18/2024	0	0	0	8 (8)
	40	9/30/2024	10/2/2024	0	0	0	8 (8)
	42	10/14/2024	10/16/2024	0	0	0	8 (8)*
	44	10/28/2024	10/30/2024	0	0	0	22 (22)*
	46	11/11/2024	11/13/2024	0	0	0	24 (24)*
	47	11/18/2024	11/21/2024	0	0	0	32 (32)*

Table A2. Total catch and mean CPUE for nearshore trap sets. Total catch is presented for each species, followed by mean CPUE in parentheses. "Water temp. C" represents mean water surface temperature at trap sites.

Reservoir	Month	Zone	Net type	Effort (# sets)	Total catch	Water temp. C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
2023																											
Green Peter	6	LOWER	box minnow	9	0	21.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	MIDDLE	box minnow	8	5	21.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.2)	1 (0.1)	1 (0.1)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Green Peter	6	UPPER	box minnow	9	16	21.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (0.7)	0 (0)	10 (1.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	QUARTZ	box minnow	3	1	20.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	LOWER	oneida	4	60	21	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	57 (14.2)	1 (0.2)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	MIDDLE	oneida	4	161	21.3	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	150 (37.5)	3 (0.8)	6 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	UPPER	oneida	3	118	20.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	83 (27.7)	3 (1)	32 (10.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	QUARTZ	oneida	3	51	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	49 (16.3)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	LOWER	box minnow	9	1	23.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	MIDDLE	box minnow	9	6	24.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.6)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	UPPER	box minnow	9	9	24.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	8 (0.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	QUARTZ	box minnow	3	16	23.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	14 (4.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	LOWER	oneida	3	20	23.9	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)
Green Peter	7	MIDDLE	oneida	3	71	24.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	70 (23.3)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	UPPER	oneida	3	77	24.1	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	72 (24)	2 (0.7)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	QUARTZ	oneida	3	85	23.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	84 (28)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)
Lookout Point	6	LOWER	box minnow	8	124	22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	122 (15.2)	0 (0)	0 (0)	2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	MIDDLE	box minnow	9	207	22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	181 (20.1)	0 (0)	0 (0)	26 (2.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	UPPER	box minnow	8	71	20.9	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	51 (6.4)	0 (0)	3 (0.4)	0 (0)	15 (1.9)	0 (0)
Lookout Point	6	LOWER	oneida	3	3003	21.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3003 (1001)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	MIDDLE	oneida	3	1906	21.9	4 (1.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1700 (566.7)	0 (0)	1 (0.3)	200 (66.7)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Lookout Point	6	UPPER	oneida	3	1466	21.2	3 (1)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	1461 (487)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	LOWER	box minnow	9	74	23.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	72 (8)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)
Lookout Point	7	MIDDLE	box minnow	8	35	23.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	23 (2.9)	0 (0)	0 (0)	12 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	UPPER	box minnow	9	76	23.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40 (4.4)	0 (0)	0 (0)	36 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	LOWER	oneida	3	2151	23.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	2150 (716.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	MIDDLE	oneida	3	1846	23.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1844 (614.7)	0 (0)	0 (0)	1 (0.3)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Lookout Point	7	UPPER	oneida	3	1942	22.9	8 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1871 (623.7)	0 (0)	1 (0.3)	59 (19.7)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)
2024																											
Green Peter	2	LOWER	box minnow	18	0	8.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	2	MIDDLE	box minnow	18	0	8.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	2	UPPER	box minnow	17	1	8.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Green Peter	2	QUARTZ	box minnow	5	0	8.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	2	LOWER	oneida	6	5.4	8.3	1 (0.2)	0.2 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	2	MIDDLE	oneida	6	10.2	8.4	8 (1.3)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	2	UPPER	oneida	6	10.8	8.1	3.8 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.8 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)
Green Peter	2	QUARTZ	oneida	6	11.6	8	0.2 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8.4 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	LOWER	box minnow	18	1	9.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	MIDDLE	box minnow	18	0	9.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	UPPER	box minnow	17	0	9.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Effort (# sets)	Total catch	Water temp. C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Green Peter	3	QUARTZ	box minnow	6	1	8.9	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	LOWER	oneida	6	7	9.2	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	MIDDLE	oneida	6	11	9.4	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (1.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	UPPER	oneida	6	15	9	11 (1.8)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	3	QUARTZ	oneida	6	3	9	2 (0.3)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	LOWER	box minnow	18	0	12.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	MIDDLE	box minnow	18	0	13.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	UPPER	box minnow	18	1	13.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	QUARTZ	box minnow	6	0	13.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	LOWER	oneida	6	14	12.6	0 (0)	0 (0)	0 (0)	5 (0.8)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.8)	2 (0.3)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Green Peter	4	MIDDLE	oneida	6	3	13.1	1 (0.2)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	UPPER	oneida	6	7	13	5 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	4	QUARTZ	oneida	6	9	13.3	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)
Green Peter	5	LOWER	box minnow	15	0	16.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	5	MIDDLE	box minnow	15	0	16.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	5	UPPER	box minnow	15	0	15.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	5	QUARTZ	box minnow	5	1	16.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Green Peter	5	LOWER	oneida	5	19	16	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	17 (3.4)	0 (0)	0 (0)
Green Peter	5	MIDDLE	oneida	5	7	16.4	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	5	UPPER	oneida	5	4	15.9	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Green Peter	5	QUARTZ	oneida	5	8	15.9	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Green Peter	6	LOWER	box minnow	9	0	17.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	MIDDLE	box minnow	9	0	18.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	UPPER	box minnow	9	0	18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	QUARTZ	box minnow	3	0	18.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	LOWER	oneida	3	3	17.8	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	MIDDLE	oneida	3	2	18.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	UPPER	oneida	3	10	18.3	1 (0.3)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)
Green Peter	6	QUARTZ	oneida	3	47	18.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	47 (15.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	2	LOWER	box minnow	14	1	8.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	2	MIDDLE	box minnow	15	1	8.7	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	2	UPPER	box minnow	18	1	8.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Lookout Point	2	LOWER	oneida	5	2	8.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	2	MIDDLE	oneida	5	9	8.6	2 (0.4)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	2	UPPER	oneida	6	14	8.2	5 (0.8)	0 (0)	0 (0)	3 (0.5)	0 (0)	0 (0)	0 (0)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	1 (0.2)	0 (0)
Lookout Point	3	LOWER	box minnow	15	0	9.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	3	MIDDLE	box minnow	15	1	9.5	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	3	UPPER	box minnow	14	0	8.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	3	LOWER	oneida	5	0	9.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	3	MIDDLE	oneida	5	4	9	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Lookout Point	3	UPPER	oneida	5	5	8.4	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)
Lookout Point	4	LOWER	box minnow	21	0	11.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	4	MIDDLE	box minnow	23	0	12.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	4	UPPER	box minnow	23	0	11.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	4	LOWER	oneida	8	6	12.2	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Effort (# sets)	Total catch	Water temp. C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Lookout Point	4	MIDDLE	oneida	8	17	12.1	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.4)	9 (1.1)	0 (0)	4 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	4	UPPER	oneida	8	11	10.9	1 (0.1)	0 (0)	0 (0)	2 (0.2)	0 (0)	0 (0)	0 (0)	4 (0.5)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.4)	0 (0)	0 (0)
Lookout Point	5	LOWER	box minnow	20	0	16.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	5	MIDDLE	box minnow	21	0	16.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	5	UPPER	box minnow	21	4	16.3	2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.1)	0 (0)	0 (0)
Lookout Point	5	LOWER	oneida	7	1	15.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Lookout Point	5	MIDDLE	oneida	7	3	16.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Lookout Point	5	UPPER	oneida	7	16	16.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	9 (1.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.7)	0 (0)	0 (0)
Lookout Point	6	LOWER	box minnow	9	81	20.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	46 (5.1)	0 (0)	0 (0)	35 (3.9)	0 (0)
Lookout Point	6	MIDDLE	box minnow	9	89	20.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	25 (2.8)	0 (0)	0 (0)	64 (7.1)	0 (0)
Lookout Point	6	UPPER	box minnow	9	73	20.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (1.7)	0 (0)	0 (0)	58 (6.4)	0 (0)
Lookout Point	6	LOWER	oneida	3	79	20.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	1 (0.3)	0 (0)	30 (10)	0 (0)	0 (0)	46 (15.3)	0 (0)
Lookout Point	6	MIDDLE	oneida	3	58	20.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	56 (18.7)	0 (0)
Lookout Point	6	UPPER	oneida	3	6	20.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (1.7)	0 (0)

Table A3. Total catch and mean CPUE for offshore net sets. Total catch is presented for each species, followed by mean CPUE in parentheses. "Water temp. C" represents mean water temperature of the vertical temperature profile over the range of depths covered by the net. *RBT not identified to natural origin or adipose-clipped (2023 only).

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
2023																												
Green Peter	7	A1	gill net 80'	10	1	4	19.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A2	gill net 30'	14	1	0	15.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A3	gill net 30'	16	1	0	11.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A5	gill net 30'	12	1	0	20.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A6	gill net 30'	10	1	0	22.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	Q1	gill net 30'	16	1	0	11.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	Q1	gill net 30'	18	1	0	10	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A1	gill net 30'	10	4	3	22.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A1	gill net 30'	12	2	0	22.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A1	gill net 30'	18	1	0	14.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A1	gill net 30'	20	1	0	12.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A1	gill net 80'	10	1	9	19.5	0 (0)	0 (0)	0 (0)	0 (0)	3 (3)	6 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A2	gill net 30'	14	5	0	19.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Green Peter	8	A2	gill net 30'	16	1	0	16.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A2	gill net 30'	18	1	0	17	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A3	gill net 30'	16	6	1	16.7	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A3	gill net 30'	20	3	2	15.2	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A4	gill net 30'	12	1	0	21.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A4	gill net 30'	14	3	1	16.1	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A4	gill net 30'	16	3	0	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A4	gill net 30'	18	1	0	17.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A5	gill net 30'	10	4	0	22.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A5	gill net 30'	12	2	0	20.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A5.5	gill net 30'	10	1	0	23.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A6	gill net 30'	10	2	0	22.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	Q1	gill net 30'	14	4	0	21.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	Q1	gill net 30'	16	2	0	11.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	Q1	gill net 30'	18	3	0	12.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A1	gill net 30'	20	5	0	17	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A1	gill net 30'	26	6	4	14.3	0 (0)	0 (0)	0 (0)	1 (0.2)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A2	gill net 30'	15	2	0	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A2	gill net 30'	20	6	0	17	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A2	gill net 30'	26	2	1	14.3	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A3	gill net 30'	15	1	0	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A3	gill net 30'	20	4	0	17.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A3	gill net 30'	26	3	1	14.8	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A4	gill net 30'	20	4	0	17.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A4	gill net 30'	26	4	2	14.8	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A5	gill net 30'	5	4	3	20	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A5	gill net 30'	10	3	0	21.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	Q1	gill net 30'	15	4	0	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Green Peter	9	Q1	gill net 30'	20	4	0	17.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 30'	16	3	1	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 30'	20	3	1	19.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A2	gill net 30'	14	3	0	20.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A2	gill net 30'	18	3	8	19.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A3	gill net 30'	12	3	8	20.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A3	gill net 30'	16	3	8	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	6 (2)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A3.5	gill net 30'	10	3	2	20.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A3.5	gill net 30'	14	3	3	20.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 30'	18	1	0	19	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 30'	20	1	1	18.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 30'	28	7	0	17.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 30'	30	1	0	18.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 30'	33	2	0	15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A2	gill net 30'	14	3	0	19.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A2	gill net 30'	16	3	1	19.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A2	gill net 30'	18	6	1	19.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3	gill net 30'	5	3	44	19.2	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	43 (14.3)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3	gill net 30'	7	3	10	19.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3	gill net 30'	14	3	2	19.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3	gill net 30'	16	3	0	19.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3.5	gill net 30'	0	6	6	16.7	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)	1 (0.2)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3.5	gill net 30'	0.5	1	0	20.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3.5	gill net 30'	10	2	2	19.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A3.5	gill net 30'	12	2	0	19.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 30'	0	2	0	11.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 30'	4	2	2	11.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 30'	7	6	5	14.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.8)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Lookout Point	10	A1	gill net 30'	12	6	1	14.5	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 30'	22	3	0	16	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 30'	23	3	0	16.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 30'	0	5	23	13.4	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22 (4.4)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 30'	4	2	1	11.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 30'	9	3	2	14.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 30'	20	1	0	15.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	0	5	7	13.4	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (1.2)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	4	2	4	11.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (2)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	5	3	0	15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	7	6	3	15.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.5)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	9	2	0	10.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	14	6	0	16.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 30'	20	1	0	15.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2.5	gill net 30'	0	9	3	15.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A2.5	gill net 30'	3	6	15	15.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (2.5)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A3	gill net 30'	0	3	0	13.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A3	gill net 30'	2	3	16	17.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (5)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A3	gill net 30'	4	3	10	17	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (3)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A3.5	gill net 30'	0	4	2	13.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 30'	0	11	2	9.6	0 (0)	2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 30'	4	11	1	9.6	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 30'	9	11	0	9.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 30'	12	7	0	8.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1.5	gill net 30'	0	18	2	9.5	0 (0)	2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1.5	gill net 30'	4	11	2	9.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1.5	gill net 30'	9	7	1	9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A2	gill net 30'	0	18	3	9.5	1 (0.1)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Lookout Point	11	A2	gill net 30'	4	11	6	9.6	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.5)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A2	gill net 30'	9	11	1	9.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1	gill net 30'	0	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1	gill net 30'	4	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1	gill net 30'	9	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1	gill net 30'	12	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1.5	gill net 30'	0	6	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1.5	gill net 30'	4	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A1.5	gill net 30'	9	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A2	gill net 30'	0	6	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A2	gill net 30'	4	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	12	A2	gill net 30'	9	3	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2024																												
Green Peter	6	A1	gill net 80'	6.5	4	12	15.6	4 (1)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	6 (1.5)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	A2	gill net 80'	6.5	1	0	15.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	A3	gill net 80'	6.5	3	12	15.5	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)
Green Peter	6	A4	gill net 80'	6.5	3	1	15.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	A5	gill net 80'	6.5	4	22	14.1	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (4.5)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	6	A6	gill net 80'	6.5	4	24	14.1	7 (1.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (3.8)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Green Peter	6	Q1	gill net 80'	6.5	3	1	15.5	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A1	gill net 80'	6	6	5	19.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A1	gill net 80'	10	7	9	14.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (1.1)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A1	gill net 80'	11	2	15	15.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (6.5)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A2	gill net 80'	6	3	4	19.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	1 (0.3)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A2	gill net 80'	10	3	2	14	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A2	gill net 80'	11	2	4	15.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A3	gill net 80'	6	3	4	19.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A3	gill net 80'	10	5	3	14.7	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Green Peter	7	A3	gill net 80'	11	1	0	15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A4	gill net 80'	6	4	3	19.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A4	gill net 80'	10	4	3	14.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A4	gill net 80'	11	1	1	15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A5	gill net 80'	6	4	1	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A5	gill net 80'	10	4	3	14.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A5	gill net 80'	11	1	1	15.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A6	gill net 80'	1	1	10	24.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (9)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A6	gill net 80'	6	3	14	20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	14 (4.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A6	gill net 80'	10	3	12	13.6	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11 (3.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	A6	gill net 80'	11	1	2	15.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	Q1	gill net 30'	11	1	0	15.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	Q1	gill net 80'	6	4	2	19.8	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	7	Q1	gill net 80'	10	4	3	14.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A1	gill net 80'	11	6	49	15.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	36 (6)	6 (1)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.7)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)
Green Peter	8	A1	gill net 80'	12	18	121	15.6	6 (0.3)	2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	73 (4.1)	11 (0.6)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	5 (0.3)	23 (1.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A2	gill net 80'	11	4	13	15.5	1 (0.2)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	9 (2.2)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A2	gill net 80'	12	10	35	15.6	3 (0.3)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	20 (2)	4 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A3	gill net 80'	11	4	5	15.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A3	gill net 80'	12	10	31	15.1	9 (0.9)	2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	17 (1.7)	1 (0.1)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Green Peter	8	A4	gill net 80'	11	3	9	15.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A4	gill net 80'	12	11	48	15.1	7 (0.6)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	32 (2.9)	3 (0.3)	0 (0)	3 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Green Peter	8	A5	gill net 80'	11	3	16	15.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	4 (1.3)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)
Green Peter	8	A5	gill net 80'	12	9	24	15.3	3 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	19 (2.1)	0 (0)	0 (0)	2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A6	gill net 80'	3	6	10	22.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	4 (0.7)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A6	gill net 80'	11	3	23	15.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22 (7.3)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	A6	gill net 80'	12	4	17	15.2	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (3.2)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	8	Q1	gill net 80'	11	3	1	15.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Green Peter	8	Q1	gill net 80'	12	12	28	15.1	3 (0.2)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	18 (1.5)	0 (0)	0 (0)	2 (0.2)	0 (0)	0 (0)	0 (0)	3 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
Green Peter	9	A1	gill net 80'	15	6	15	15.3	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	14 (2.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A1	gill net 80'	16	4	30	15.3	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (1.2)	1 (0.2)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	21 (5.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A1	gill net 80'	18	6	16	15.6	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.3)	1 (0.2)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	4 (0.7)	5 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A2	gill net 80'	15	3	34	15.3	12 (4)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	14 (4.7)	5 (1.7)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A2	gill net 80'	16	1	8	15.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A2	gill net 80'	18	6	24	15.6	8 (1.3)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	8 (1.3)	2 (0.3)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.2)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A3	gill net 80'	15	3	21	15	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	15 (5)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A3	gill net 80'	16	3	8	15.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)
Green Peter	9	A3	gill net 80'	18	4	24	15.3	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (2.5)	0 (0)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	8 (2)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A4	gill net 80'	15	4	33	15	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	23 (5.8)	2 (0.5)	0 (0)	7 (1.8)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A4	gill net 80'	16	2	10	15.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	6 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A4	gill net 80'	18	4	16	15.3	1.5 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (1.5)	0 (0)	0 (0)	3.5 (0.9)	0 (0)	0 (0)	1 (0.2)	2 (0.5)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A5	gill net 80'	15	4	19	15.9	4 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (2.2)	0 (0)	0 (0)	3 (0.8)	0 (0)	0 (0)	0 (0)	3 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A5	gill net 80'	16	2	8	15.4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.5)	1 (0.5)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	2 (1)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	A6	gill net 80'	0	5	99	22.2	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	0 (0)	0 (0)	5 (1)	0 (0)	4 (0.8)	0 (0)	35 (7)	49 (9.8)	3 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	Q1	gill net 80'	15	4	15	15	5 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	Q1	gill net 80'	16	3	11	15.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	5 (1.7)	0 (0)	0 (0)	0 (0)	2 (0.7)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	9	Q1	gill net 80'	18	5	22	15.3	3 (0.6)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	7 (1.4)	1 (0.2)	0 (0)	2 (0.4)	0 (0)	0 (0)	0 (0)	5 (1)	3 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A1	gill net 80'	5	3	19	17.6	10 (3.3)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	4 (1.3)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A1	gill net 80'	10	3	6	17.6	3 (1)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A1	gill net 80'	22	6	9	17.6	3 (0.5)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	1 (0.2)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A2	gill net 80'	5	3	13	17.6	6 (2)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A2	gill net 80'	10	3	10	17.6	2 (0.7)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	1 (0.3)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	5 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A2	gill net 80'	22	5	8	17.6	3 (0.6)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.4)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A2.5	gill net 80'	22	3	3	17.6	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A3	gill net 80'	5	3	12	17.7	4 (1.3)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A3	gill net 80'	10	3	6	17.6	2 (0.7)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Green Peter	10	A3	gill net 80'	22	2	6	16.5	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	1 (0.5)	3 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A3.5	gill net 80'	22	4	11	16.5	1 (0.2)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (1.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	A4	gill net 80'	5	1	15	17.7	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	9 (9)	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	0 (0)
Green Peter	10	A4	gill net 80'	10	2	77	17.6	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.5)	1 (0.5)	0 (0)	18 (9)	0 (0)	1 (0.5)	0 (0)	27 (13.5)	19 (9.5)	0 (0)	0 (0)	0 (0)	7 (3.5)	0 (0)	0 (0)
Green Peter	10	A4	gill net 80'	22	2	11	16.5	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (2.5)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	10	Q1	gill net 80'	5	4	51	17.7	17 (4.2)	1 (0.2)	0 (0)	0 (0)	1 (0.2)	0 (0)	4 (1)	2 (0.5)	0 (0)	7 (1.8)	0 (0)	0 (0)	0 (0)	3 (0.8)	12 (3)	0 (0)	0 (0)	0 (0)	4 (1)	0 (0)	0 (0)
Green Peter	10	Q1	gill net 80'	10	2	44	17.6	4 (2)	3 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	2 (1)	0 (0)	10 (5)	1 (0.5)	1 (0.5)	0 (0)	10 (5)	9 (4.5)	0 (0)	0 (0)	0 (0)	3 (1.5)	0 (0)	0 (0)
Green Peter	10	Q1	gill net 80'	22	5	37	16.5	3 (0.6)	1 (0.2)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	30 (6)	2 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A1	gill net 80'	0	3	118	12.4	66 (22)	21 (7)	0 (0)	0 (0)	0 (0)	0 (0)	12 (4)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16 (5.3)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A1	gill net 80'	5	3	65	11.6	35 (11.7)	9 (3)	0 (0)	0 (0)	0 (0)	0 (0)	18 (6)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A1	gill net 80'	10	2	22	10.6	13 (6.5)	6 (3)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A1	gill net 80'	15	2	24	10	12 (6)	3 (1.5)	0 (0)	0 (0)	2 (1)	0 (0)	7 (3.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A2	gill net 80'	0	3	127	12.4	50 (16.7)	22 (7.3)	0 (0)	0 (0)	3 (1)	0 (0)	18 (6)	1 (0.3)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	22 (7.3)	5 (1.7)	0 (0)	0 (0)	0 (0)	5 (1.7)	0 (0)	0 (0)
Green Peter	11	A2	gill net 80'	5	1	12	11.6	9 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A2	gill net 80'	10	1	9	10.6	7 (7)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Green Peter	11	A2.5	gill net 80'	0	2	100	12.4	43.5 (21.8)	12 (6)	0 (0)	0 (0)	1.5 (0.8)	0 (0)	13.5 (6.8)	4 (2)	0 (0)	2 (1)	0 (0)	0 (0)	0 (0)	9.5 (4.8)	8 (4)	3.5 (1.8)	0 (0)	0 (0)	2.5 (1.2)	0 (0)	0 (0)
Green Peter	11	A2.5	gill net 80'	5	2	33	11.6	7 (3.5)	7.5 (3.8)	0 (0)	0 (0)	0.5 (0.2)	0 (0)	12.5 (6.2)	0 (0)	0 (0)	1.5 (0.8)	0 (0)	0 (0)	0 (0)	1 (0.5)	2 (1)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)
Lookout Point	6	A1	gill net 80'	8	6	9	15.5	7 (1.2)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	A2	gill net 80'	8	3	0	15.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	A3	gill net 80'	8	3	0	14.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	A4	gill net 80'	8	4	0	14.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	A5	gill net 80'	8	4	2	13.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	6	A6	gill net 80'	8	3	3	13.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A1	gill net 80'	10	5	11	16.6	2 (0.4)	3 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	4 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A1	gill net 80'	15	6	39	16.1	2 (0.3)	6 (1)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.7)	5 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	22 (3.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A1	gill net 80'	18	4	154.5	15.6	1.5 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.5 (0.1)	13 (3.2)	0 (0)	0 (0)	0 (0)	25.5 (6.4)	52 (13)	0 (0)	62 (15.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A2	gill net 80'	5	1	1	21.5	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A2	gill net 80'	6	1	36	21.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	14 (14)	0 (0)	22 (22)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Lookout Point	7	A2	gill net 80'	10	3	1	16.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A2	gill net 80'	15	3	9	16.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A2	gill net 80'	18	3	58.5	15.6	1.5 (0.5)	2.5 (0.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.5 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	39.5 (13.2)	0 (0)	14.5 (4.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A3	gill net 80'	10	4	2	15.7	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A3	gill net 80'	15	3	2	16.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A3	gill net 80'	18	3	66	15.6	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0.5 (0.2)	51.5 (17.2)	0 (0)	12 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A4	gill net 80'	4	2	255	23.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	62 (31)	128 (64)	0 (0)	62 (31)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A4	gill net 80'	6	4	94	22.5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	37 (9.2)	0 (0)	56 (14)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A4	gill net 80'	10	3	0	15.7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A5	gill net 80'	4	4	532	22.8	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	206 (51.5)	253 (63.2)	0 (0)	27 (6.8)	0 (0)	0 (0)	40 (10)	4 (1)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A5	gill net 80'	5	1	0	18.9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A5	gill net 80'	6	4	214	21.6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	193 (48.2)	0 (0)	13 (3.2)	0 (0)	0 (0)	0 (0)	8 (2)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A5	gill net 80'	10	3	9	16.3	2 (0.7)	5 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	7	A6	gill net 80'	0	6	21	24.2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.3)	0 (0)	1 (0.2)	1 (0.2)	0 (0)	6 (1)	7 (1.2)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 80'	18	2	755	17	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	279 (139.5)	0 (0)	471 (235.5)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 80'	25	1	361	16.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	3 (3)	154 (154)	0 (0)	203 (203)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 80'	26	1	153	15.8	0 (0)	2 (2)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)	4 (4)	130 (130)	0 (0)	14 (14)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 80'	30	2	521	14.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	20 (10)	273 (136.5)	0 (0)	226 (113)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1	gill net 80'	32	8	2056	14.6	4 (0.5)	17 (2.1)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.2)	8 (1)	0 (0)	0 (0)	0 (0)	101 (12.6)	1677 (209.6)	0 (0)	245 (30.6)	2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A1.5	gill net 80'	32	3	450	14.5	1 (0.3)	4 (1.3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	2 (0.7)	0 (0)	0 (0)	0 (0)	22 (7.3)	386 (128.7)	0 (0)	34 (11.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A2	gill net 80'	18	1	42	17	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	16 (16)	0 (0)	23 (23)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A2	gill net 80'	25	1	644	16.3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (18)	607 (607)	0 (0)	19 (19)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A2	gill net 80'	26	1	498	15.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3)	0 (0)	0 (0)	0 (0)	10 (10)	357 (357)	0 (0)	128 (128)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A3	gill net 80'	16	1	1528	18.8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	526 (526)	763 (763)	0 (0)	239 (239)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	8	A3	gill net 80'	18	1	164	17.1	0 (0)	6 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	157 (157)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 80'	20	1	614	16.7	0 (0)	2 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	100 (100)	502 (502)	0 (0)	9 (9)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 80'	22	2	1134	16.7	3 (1.5)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	157 (78.5)	898 (449)	0 (0)	73 (36.5)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 80'	24	2	885	16.7	0 (0)	3 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	73 (36.5)	685 (342.5)	0 (0)	124 (62)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reservoir	Month	Zone	Net type	Net depth (m)	Effort (# sets)	Total catch	Water temp C	CHS-natural	CHS-AD	UnID Salmonid	CUT	KOK	RBT	RBT-AD	RBT-natural	BBH	YBH	LSS	BLC	WHC	BLG	SMB	LMB	Unid centrarchid	WAL	NPM	SCU	LWB
Lookout Point	9	A1	gill net 80'	26	1	247	16.7	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	61 (61)	130 (130)	0 (0)	55 (55)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 80'	28	2	945	16.7	1 (0.5)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	36 (18)	731 (365.5)	0 (0)	172 (86)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 80'	30	2	709	16.2	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (6.5)	595 (297.5)	0 (0)	99 (49.5)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1	gill net 80'	32	2	575	15.6	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20 (10)	462 (231)	0 (0)	90 (45)	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1.5	gill net 80'	22	2	744	16.8	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	41 (20.5)	529 (264.5)	0 (0)	171 (85.5)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A1.5	gill net 80'	30	2	339	16.2	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.5)	330 (165)	0 (0)	5 (2.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	9	A2	gill net 80'	20	1	307	16.7	1 (1)	4 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	0 (0)	0 (0)	5 (5)	281 (281)	0 (0)	12 (12)	0 (0)	0 (0)	2 (2)	0 (0)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 80'	0	3*	27	12.9	3 (1)	9 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (1.3)	0 (0)	0 (0)	2 (0.7)	2 (0.7)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	2 (0.7)	4 (1.3)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 80'	5	3*	42	13.1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	18 (6)	17 (5.7)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	3 (1)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 80'	10	4*	62	12.6	7 (1.8)	4 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	19 (4.8)	18 (4.5)	1 (0.2)	4 (1)	1 (0.2)	0 (0)	6 (1.5)	1 (0.2)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 80'	18	5*	139	15.1	3 (0.6)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	24 (4.8)	93 (18.6)	0 (0)	12 (2.4)	0 (0)	0 (0)	2 (0.4)	3 (0.6)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 80'	20	2*	947	16.7	1 (0.5)	3 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	62 (31)	858 (429)	0 (0)	22 (11)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)
Lookout Point	10	A1	gill net 80'	22	1*	751	16.6	1 (1)	5 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	19 (19)	704 (704)	0 (0)	18 (18)	2 (2)	0 (0)	1 (1)	1 (1)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 80'	0	3*	30	12.9	0 (0)	8 (2.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (2)	0 (0)	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	1 (0.3)	5 (1.7)	0 (0)	5 (1.7)	4 (1.3)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 80'	5	3*	32	13.1	2 (0.7)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 (3)	11 (3.7)	0 (0)	2 (0.7)	0 (0)	0 (0)	5 (1.7)	2 (0.7)	0 (0)	0 (0)
Lookout Point	10	A1.5	gill net 80'	10	6*	113	14	2 (0.3)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	1 (0.2)	0 (0)	0 (0)	1 (0.2)	22 (3.7)	38 (6.3)	0 (0)	27 (4.5)	1 (0.2)	0 (0)	13 (2.2)	4 (0.7)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 80'	0	3*	30	12.9	0 (0)	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	3 (1)	0 (0)	0 (0)	3 (1)	3 (1)	4 (1.3)	0 (0)	1 (0.3)	0 (0)	0 (0)	9 (3)	5 (1.7)	0 (0)	0 (0)
Lookout Point	10	A2	gill net 80'	20	2*	1191	16.7	2 (1)	10 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)	21 (10.5)	1141 (570.5)	0 (0)	11 (5.5)	0 (0)	0 (0)	3 (1.5)	2 (1)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 80'	0	8*	42	9.2	2 (0.2)	1 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.5)	0 (0)	0 (0)	0 (0)	15 (1.9)	10 (1.2)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.4)	7 (0.9)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 80'	5	19*	48	9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.2)	0 (0)	0 (0)	0 (0)	10 (0.5)	13 (0.7)	1 (0.1)	6 (0.3)	0 (0)	0 (0)	1 (0.1)	13 (0.7)	0 (0)	0 (0)
Lookout Point	11	A1	gill net 80'	10	1*	0	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lookout Point	11	A1.5	gill net 80'	0	14*	46	9	2 (0.1)	4 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.1)	3 (0.2)	0 (0)	0 (0)	1 (0.1)	12 (0.9)	6 (0.4)	1 (0.1)	0 (0)	3 (0.2)	0 (0)	6 (0.4)	6 (0.4)	0 (0)	0 (0)
Lookout Point	11	A1.5	gill net 80'	5	7*	30	9.7	0 (0)	3 (0.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.6)	7 (1)	0 (0)	7 (1)	0 (0)	0 (0)	3 (0.4)	5 (0.7)	1 (0.1)	0 (0)
Lookout Point	11	A1.5	gill net 80'	10	4*	3	8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)
Lookout Point	11	A2	gill net 80'	0	3*	45	10.1	0 (0)	2 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.7)	3 (1)	0 (0)	0 (0)	4 (1.3)	10 (3.3)	8 (2.7)	0 (0)	8 (2.7)	0 (0)	0 (0)	1 (0.3)	6 (2)	1 (0.3)	0 (0)

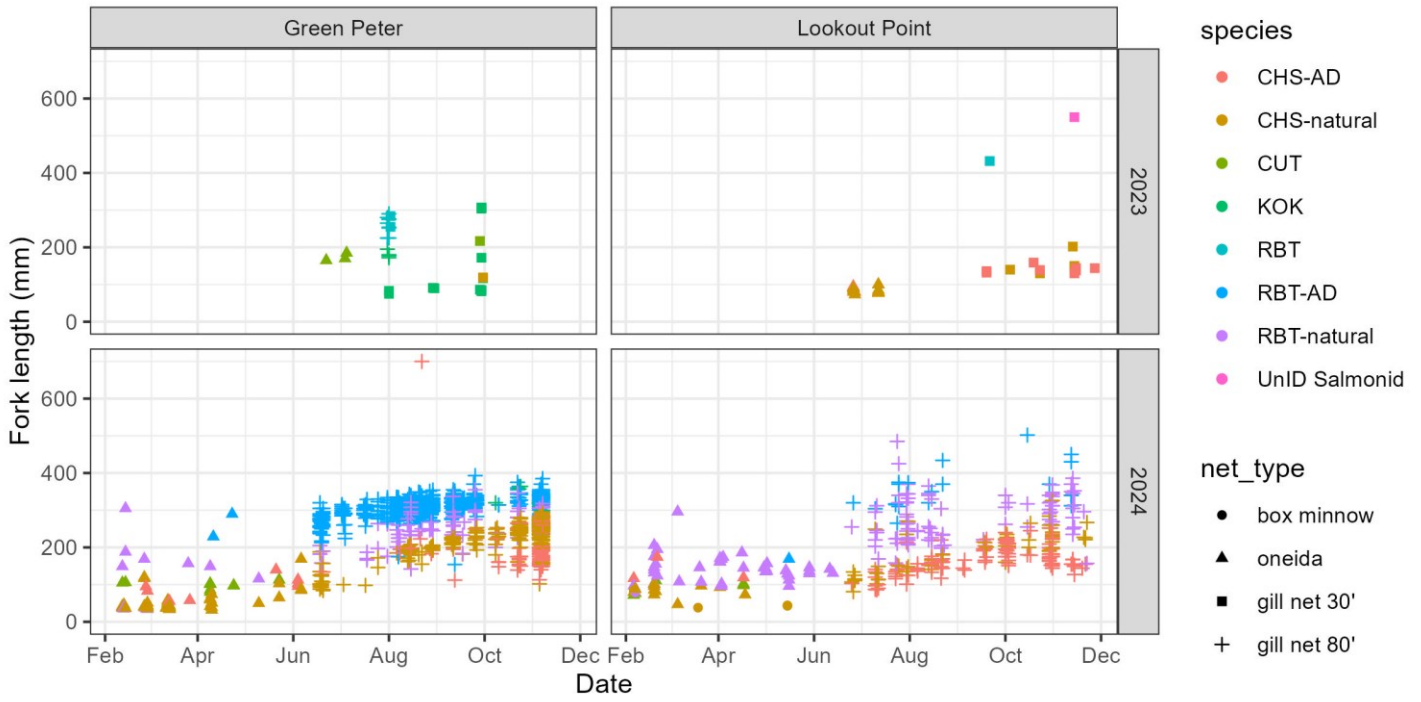

Figure A6. Fork lengths of all salmonid species captured in reservoir sampling by sampling date.

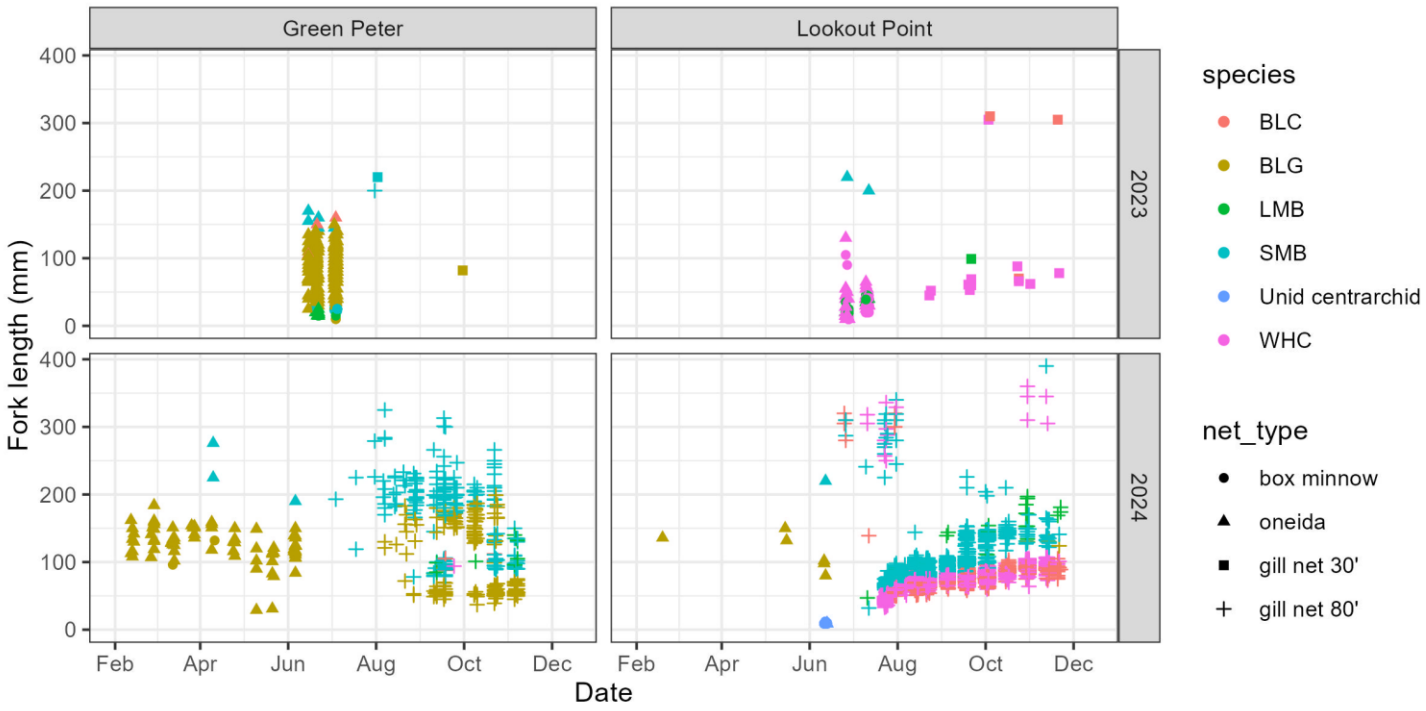

Figure A7. Fork lengths of centrarchid species captured in reservoir sampling by sampling date.

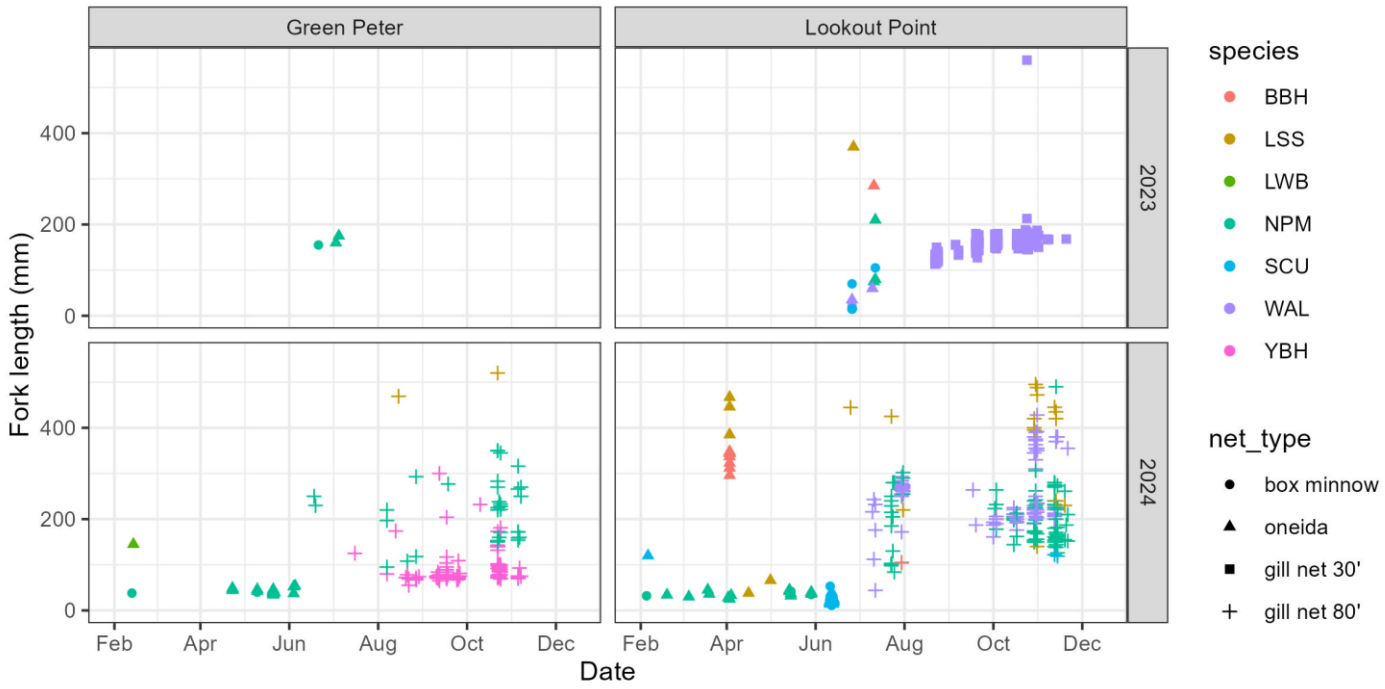

Figure A8. Fork lengths of other species captured in reservoir sampling by sampling date.

Table A4. Results of bulk marking tag retention and mortality trials.

Mark Group	N	Mean FL (mm)	Mean Weight (g)	Date Start	Date End	Mort	Mort. %	Sheds	Shed %
Green Peter Head of Reservoir - Middle Santiam Arm	5,071	56.2	NA	5/15/2023	5/16/2023	74	1.46	32	0.63
Green Peter Head of Reservoir - Quartzville Creek Arm	5,203	58.5	NA	5/17/2023	5/18/2023	18	0.35	19	0.37
Lookout Point Head of Reservoir	10,041	63.1	2.9	5/22/2023	5/24/2023	39	0.39	53	0.53
Hills Creek Head of Reservoir	10,117	64.7	2.9	5/30/2023	6/1/2023	22	0.22	9	0.09
Fall Creek Head of Reservoir	10,040	67.4	3.2	6/1/2023	6/7/2023	68	0.68	30	0.3
Detroit Head of Reservoir Breitenbush Arm	7,530	66.9	3.6	6/13/2023	6/14/2023	82	1.09	24	0.32
Detroit Head of Reservoir - North Santiam	7,528	66.9	3.6	6/14/2023	6/15/2023	83	1.10	25	0.32
Cougar Head of Reservoir	5,626	67.7	3.5	6/20/2023	6/20/2023	475	8.40	44	0.78
North Santiam – Fall 23 & Spring 24 Bulk Group	30,680	NA	NA	6/26/2023	7/20/2023	3,437	10.6	99	0.32
M.F. Willamette – Fall 23 & Spring 24 Bulk Group	85,233	NA	NA	7/26/2023	12/7/2023	380	0.45	340	0.40
South Santiam – Fall 23 & Spring 2024 Bulk Group	43,407	NA	NA	8/14/2023	12/20/2023	128	0.29	101	0.23
McKenzie– Fall 23 & Spring 24 Bulk Group	45,210	NA	NA	8/30/2023	2/14/2024	987	2.18	60	0.13
M.F. Willamette – Additional 51,000 Group	51,000	145.1	35.9	1/1/2024	1/31/2021	NA	NA	NA	NA
Green Peter Head of Reservoir	5,006	50.1	1.4	3/1/2024	3/3/2024	17	0.33	13	0.25
Green Peter Head of Reservoir	5,000	54.9	1.7	3/18/2024	3/19/2024	12	0.23	20	0.39
Detroit Head of Reservoir North Santiam	7,500	46.7	1.2	5/13/2024	5/15/2024	58	0.77	70	0.93
Detroit Head of Reservoir Breitenbush Arm	7,500	46.7	1.2	5/15/2024	5/17/2024	58	0.77	63	0.84
South Santiam – Fall 24 and Spring 25 Bulk Group	13,885	NA	NA	6/26/2024	6/27/2024	TBD	TBD	TBD	TBD

Table A5. Releases of PIT-tagged juvenile Chinook salmon arranged by basin and release date. MFW – Middle Fork Willamette, MCK – McKenzie, SST – South Santiam, NST – North Santiam.

Basin	Release Location	Release Date	Brood Year	Lifestage	N	Mean FL (mm)	Mean Weight (g)
MFW	Hills Creek Head of Reservoir	5/18/2023	2022	Fry	509	55.8	1.9
	LOP Head of Reservoir - Black Canyon	5/30/2023	2022	Fry	9647	63.1	2.9
	Hills Creek Head of Reservoir	6/5/2023	2022	Fry	9784	64.7	2.8
	Fall Creek Head of Reservoir - Old Boat Ramp	6/12/2023	2022	Fry	9638	67.4	3.2
	LOP Head of Reservoir - Black Canyon	9/18/2023	2022	Subyearling	4998	122.9	23.8
	LOP Forebay - Signal Point	9/18/2023	2022	Subyearling	5002	128.3	25.1
	LOP Tailrace - Pengra	9/19/2023	2022	Subyearling	2011	128.4	25.2
	Fall Creek Head of Reservoir - Old Boat Ramp	9/28/2023	2022	Subyearling	5006	133.5	29.1
	Fall Creek Tailrace	9/28/2023	2022	Subyearling	1001	134.8	29.8
	Fall Creek Head of Reservoir - Old Boat Ramp	11/6/2023	2022	Subyearling	4999	139.4	32.2
	Fall Creek Tailrace	11/6/2023	2022	Subyearling	1000	134.9	30.2
	Hills Creek Head of Reservoir	11/7/2023	2022	Subyearling	4997	135.2	28.6
	Hills Creek Mid Reservoir - Packard Creek Boat Ramp	11/8/2023	2022	Subyearling	4998	145.3	36.9
	Hills Creek Dam Tailrace	11/9/2023	2022	Subyearling	2969	129.6	27
	LOP Head of Reservoir - Black Canyon	1/3/2024	2022	Yearling	4634	143.3	33.7
	LOP Head of Reservoir - Black Canyon	1/4/2024	2022	Yearling	4828	143.3	33.7
	LOP Head of Reservoir - Black Canyon	1/8/2024	2022	Yearling	3789	143.3	33.7
	LOP Head of Reservoir - Black Canyon	1/9/2024	2022	Yearling	5115	143.3	33.7
	LOP Head of Reservoir - Black Canyon	1/25/2024	2022	Yearling	7617	143.6	34.3
	Hills Creek Dam Tailrace	1/31/2024	2022	Yearling	24861	141.6	34.7
	Hills Creek Head of Reservoir	2/6/2024	2022	Yearling	4963	153.8	40.9
	Hills Creek Mid Reservoir - Packard Creek Boat Ramp	2/7/2024	2022	Yearling	5000	155.9	41.7
	Hills Creek Dam Tailrace	2/7/2024	2022	Yearling	2998	151.3	42.8
	Fall Creek Head of Reservoir - Old Boat Ramp	2/20/2024	2022	Yearling	4993	148.4	38.9
	Fall Creek Tailrace	2/20/2024	2022	Yearling	1002	150.5	39.9
	LOP Head of Reservoir - Black Canyon	2/28/2024	2022	Yearling	4994	141.5	34.2
	LOP Forebay - Signal Point	2/28/2024	2022	Yearling	4988	144.2	35.9
	LOP Tailrace - Pengra	2/29/2024	2022	Yearling	1998	149.7	39.2

Basin	Release Location	Release Date	Brood Year	Lifestage	N	Mean FL (mm)	Mean Weight (g)
	Fall Creek Head of Reservoir - Old Boat Ramp	4/2/2024	2022	Yearling	2500	146	37.1
	Fall Creek Head of Reservoir - Old Boat Ramp	4/3/2024	2022	Yearling	2497	154.6	43.2
	Fall Creek Tailrace	4/3/2024	2022	Yearling	999	159.5	44.5
	LOP Head of Reservoir - Black Canyon	4/9/2024	2022	Yearling	2499	150.9	41.2
	LOP Head of Reservoir - Black Canyon	4/9/2024	2022	Yearling	2499	150.9	41.2
	LOP Forebay - Signal Point	4/10/2024	2022	Yearling	2500	150.7	39.7
	LOP Forebay - Signal Point	4/11/2024	2022	Yearling	2500	150.7	39.7
	LOP Tailrace - Pengra	4/11/2024	2022	Yearling	2000	149	38.9
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	8/29/2023	2022	Fry	5198	67.9	3.6
	Cougar Head of Reservoir - Cougar Crossing Bridge	10/2/2023	2022	Subyearling	5005	117.2	18.9
	Cougar Head of Reservoir - Cougar Crossing Bridge	10/2/2023	2022	Subyearling	3006	116.7	19
	Cougar Head of Reservoir - Cougar Crossing Bridge	10/18/2023	2022	Subyearling	3977	118.4	19.8
	Cougar Tailrace - USGS	3/11/2024	2022	Yearling	2081	129.5	25.4
	Cougar Forebay	10/18/2023	2022	Subyearling	5010	120.8	21
	Cougar Tailrace - USGS	10/19/2023	2022	Subyearling	4000	112.5	16.8
	Cougar Head of Reservoir - Cougar Crossing Bridge	11/13/2023	2022	Subyearling	3999	121.3	23
	Cougar Forebay	11/14/2023	2022	Subyearling	4995	124.6	23.8
	Cougar Tailrace - USGS	11/15/2023	2022	Subyearling	2411	120.1	21.5
	Cougar Head of Reservoir - Cougar Crossing Bridge	3/8/2024	2022	Yearling	4799	136.9	31
	Cougar Forebay	3/11/2024	2022	Yearling	4800	136.5	29.5
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	5/22/2023	2022	Fry	5171	58.5	NA
	Green Peter Head of Reservoir - Middle Santiam Arm	5/22/2023	2022	Fry	4961	56.2	NA
	Foster Tailrace - South Santiam Hatchery	8/23/2023	2022	Subyearling	1030	115.7	18.2
	Foster Reservoir Head of Reservoir	8/24/2023	2022	Subyearling	2059	105.6	14.5
	Green Peter Head of Reservoir - Quartzville Creek Arm	9/20/2023	2022	Subyearling	2518	113.5	19.5
	Green Peter Head of Reservoir - Middle Santiam Arm	9/21/2023	2022	Subyearling	2508	117.1	20.7
	Green Peter Head of Reservoir - Quartzville Creek Arm	10/3/2023	2022	Subyearling	2502	122.8	25.1
	Green Peter Head of Reservoir - Middle Santiam Arm	10/4/2023	2022	Subyearling	2516	119.6	23.8
	Green Peter Tailrace - Sunnyside Boat Ramp	10/9/2023	2022	Subyearling	4002	125.9	26.4
	Foster Reservoir Head of Reservoir	10/10/2023	2022	Subyearling	5000	125.8	24.5
	Foster Tailrace - South Santiam Hatchery	10/11/2023	2022	Subyearling	4000	135.2	31.8

Basin	Release Location	Release Date	Brood Year	Lifestage	N	Mean FL (mm)	Mean Weight (g)
	Green Peter Head of Reservoir - Middle Santiam Arm	2/21/2024	2022	Yearling	1004	164.4	51.6
	Green Peter Head of Reservoir - Quartzville Creek Arm	2/22/2024	2022	Yearling	1014	150.8	40.2
	Green Peter Mid Reservoir - Thistle Boat Ramp	2/22/2024	2022	Yearling	2006	153.8	42.9
	Green Peter Mid Reservoir - Thistle Boat Ramp	2/23/2024	2022	Yearling	2003	159.4	46.5
	Green Peter Tailrace - Sunnyside Boat Ramp	2/23/2024	2022	Yearling	1014	163.4	50.1
	Green Peter Head of Reservoir - Middle Santiam Arm	3/6/2024	2023	Fry	2506	50.1	1.4
	Green Peter Head of Reservoir - Quartzville Creek Arm	3/6/2024	2023	Fry	2500	51.3	1.4
	Foster Reservoir Head of Reservoir	3/26/2024	2022	Yearling	2997	156.3	44.1
	Foster Reservoir Head of Reservoir	3/27/2024	2022	Yearling	3001	145.3	38
	Foster Tailrace - South Santiam Hatchery	3/28/2024	2022	Yearling	3005	154.6	43.8
	Foster Tailrace - South Santiam Hatchery	4/1/2024	2022	Yearling	2991	156	44.3
	Green Peter Head of Reservoir - Middle Santiam Arm	4/12/2024	2023	Fry	2350	52.4	1.5
	Green Peter Head of Reservoir - Quartzville Creek Arm	4/12/2024	2023	Fry	2500	54.9	1.7
NST	Marion Forks Hatchery Escape	6/16/2023	2022	Fry	1247	66.5	3.4
	Detroit Head of Reservoir - Breitenbush River	7/13/2023	2022	Fry	7000	66.8	3.6
	Detroit Head of Reservoir - North Santiam River	7/13/2023	2022	Fry	6638	67	3.6
	Detroit Head of Reservoir - Breitenbush River	9/26/2023	2022	Subyearling	5002	106.5	11.8
	Detroit Head of Reservoir - North Santiam River	9/26/2023	2022	Subyearling	4997	102.6	10.4
	Big Cliff Tailrace - Packsaddle Boat Ramp	9/27/2023	2022	Subyearling	8009	106.5	11.9
	Big Cliff Tailrace - Packsaddle Boat Ramp	11/20/2023	2022	Subyearling	5998	112.4	16.6
	Detroit Head of Reservoir - North Santiam River	3/20/2024	2022	Yearling	2000	128.4	25.5
	Detroit Head of Reservoir - Breitenbush River	3/21/2024	2022	Yearling	2000	124	21.3
	Big Cliff Tailrace - Packsaddle Boat Ramp	3/21/2024	2022	Yearling	1998	129.4	24.1
	Detroit Head of Reservoir - North Santiam River	5/20/2024	2023	Fry	7533	47	1.2
	Detroit Head of Reservoir - Breitenbush River	5/20/2024	2023	Fry	7494	47	1.2