

WILLAMETTE VALLEY FISH PASSAGE MONITORING – BULK MARKING & RESERVOIR DISTRIBUTION

Bi-Weekly Report: June 01, 2024 – June 15, 2024



Prepared for: United States Army Corps of Engineers

Prepared by: Cramer Fish Sciences

June 21, 2024

BULK MARKING SCHEDULE

Table 1. Tentative release schedule for brood years 2022 and 2023. Green rows highlight the release groups that have been tagged and released. Orange rows highlight release groups that have been tagged but have not yet been released. Date estimate is a rough estimate of when fish should be released to meet the intended target.

2023					
MF Willamette					
Date Estimate	Release Location	Target	Lifestage	#	Tag
Spring 2023	Head of Fall Creek Dam reservoir	Prior to reaching target elevation of 728 feet	fry	10000	8 mm
Spring 2023	Head of Lookout Point Dam reservoir	30 day spill operations	fry	10000	8 mm
Spring 2023	Head of Hills Creek Dam reservoir	Observed fry migration and RO operations	fry	10000	8 mm
9/15/2023	Dexter Dam Tailrace	Fall deep drawdown	subyearling	2000	12 mm
9/15/2023	Head of Lookout Point Dam reservoir	Fall deep drawdown	subyearling	5000	12 mm
9/15/2023	Lookout Point Dam Forebay	Fall deep drawdown	subyearling	5000	12 mm
10/15/2023	Fall Creek Dam Head of Reservoir	2-3 weeks prior to drawdown	subyearling	5000	12 mm
10/15/2023	Fall Creek Dam tailrace	2-3 weeks prior to drawdown	subyearling	1000	12 mm
11/15/2023	Fall Creek Dam Head of Reservoir	Midway between start of drawdown and streambed elevation	subyearling	5000	12 mm
11/15/2023	Fall Creek Dam tailrace	Midway between start of drawdown and streambed elevation	subyearling	1000	12 mm
11/16/2023	Hills Creek Dam Head of Reservoir	Prior to start of fall/winter RO operations	subyearling	5000	12 mm
11/16/2023	Hills Creek Dam 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
North Santiam					
Spring 2023	Breitenbush River	Prior to beginning of spill	fry	7500	8 mm
Spring 2023	North Santiam River	Prior to beginning of spill	fry	7500	8 mm
10/1/2023	Big Cliff Dam Tailrace	Prior to Detroit Reservoir reaching 1520 feet	subyearling	8000	12 mm

10/1/2023	Breitenbush River	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
10/1/2023	North Santiam River	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
11/15/2023	Big Cliff Dam Tailrace	When Detroit reaches 1465 feet	subyearling	6000	12 mm
SF McKenzie					
Spring 2023	Cougar Dam Head of Reservoir	Prior to start of spring drawdown	fry	5000	8 mm
Spring 2023	Cougar Dam Head of Reservoir	After start of drawdown but prior to reaching 1520 feet	fry	5000	8 mm
9/15/2023	Cougar Dam Head of Reservoir	Prior to start of drawdown	subyearling	3000	12 mm
10/15/2023	Cougar Dam Forebay	Prior to reaching target elevation of 1505 feet	subyearling	5000	12 mm
10/15/2023	Cougar Dam 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 Dam Forebay	At 1532 feet when RO is prioritized for day and night spill	subyearling	5000	12 mm
11/15/2023	Cougar Dam 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 in Middle Santiam River	Spill operation block	fry	5000	8 mm
Spring 2023	Green Peter Head of Reservoir in Quartzville Creek	Spill operation block	fry	5000	8 mm
8/30/2023	South Santiam River - Foster Dam Tailrace	Undefined - Late August	subyearling	1000	12 mm
8/30/2023	South Santiam River above Foster Dam	Undefined - Late August	subyearling	2000	12 mm
9/15/2023	Green Peter Reservoir - Head of Reservoir, Middle Santiam River	Fall Operations at Green Peter Dam	subyearling	2500	12 mm
9/15/2023	Green Peter Reservoir - Head of Reservoir, Quartzville Creek	Fall Operations at Green Peter Dam	subyearling	2500	12 mm
10/15/2023	Green Peter Dam Tailrace	Prior to Green Peter reaching 887 feet.	subyearling	4000	12 mm
10/15/2023	Green Peter Reservoir - Head of Reservoir, Middle Santiam River	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm

10/15/2023	Green Peter Reservoir - Head of Reservoir, Quartzville Creek	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2023	South Santiam River - Foster Dam Tailrace	Fall operations at Foster Dam	subyearling	4000	12 mm
10/15/2023	South Santiam River above Foster Dam	Fall operations at Foster Dam	subyearling	5000	12 mm
2024					
MF Willamette					
2/1/2024	Hills Creek Dam Head of Reservoir	Prior to end of fall/winter RO operations	yearling	5000	12 mm
2/1/2024	Hills Creek Dam 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 Dam Head of Reservoir	Prior to beginning of refill	yearling	5000	12 mm
2/28/2024	Fall Creek Dam Tailrace	Prior to beginning of refill	yearling	1000	12 mm
2/28/2024	Head of Lookout Point Dam reservoir	Prior to 30-day spill	yearling	5000	12 mm
2/28/2024	Dexter Dam Tailrace	Prior to 30-day spill	yearling	2000	12 mm
2/28/2024	Lookout Point Dam Forebay	Prior to 30-day spill	yearling	5000	12 mm
3/31/2024	Fall Creek Dam Head of Reservoir	After refill is completed	yearling	5000	12 mm
3/31/2024	Fall Creek Dam Tailrace	After refill is completed	yearling	1000	12 mm
4/1/2024	Head of Lookout Point Dam reservoir	After 30-day spill/beginning of nighttime spill	yearling	5000	12 mm
4/1/2024	Dexter Dam Tailrace	After 30-day spill/beginning of nighttime spill	yearling	2000	12 mm
4/1/2024	Lookout Point Dam Forebay	After 30-day spill/beginning of nighttime spill	yearling	5000	12 mm
North Santiam					
2/1/2024	North Santiam River	Prior to start of Detroit refill	fry	3750	8 mm
2/1/2024	Breitenbush River	Prior to start of Detroit refill	fry	3750	8 mm
4/1/2024	Breitenbush River	Prior to start of Detroit spill	fry	3750	8 mm
4/1/2024	North Santiam River	Prior to start of Detroit spill	fry	3750	8 mm
4/1/2024	Big Cliff Dam Tailrace	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm
4/1/2024	Breitenbush River	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm

4/1/2024	North Santiam River	Prior to Detroit reaching 1541 feet (spillway crest elevation)	yearling	2000	12 mm
10/1/2024	Big Cliff Dam Tailrace	Prior to Detroit Reservoir reaching 1520 feet	subyearling	8000	12 mm
10/1/2024	Breitenbush River	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
10/1/2024	North Santiam River	Prior to Detroit Reservoir reaching 1520 feet	subyearling	5000	12 mm
11/15/2024	Big Cliff Dam Tailrace	When Detroit reaches 1465 feet	subyearling	6000	12 mm
SF McKenzie					
2/28/2024	Cougar Dam Forebay	Prior to beginning of spring drawdown	yearling	2000	12 mm
2/28/2024	Cougar Dam 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 Dam Forebay	After start of drawdown but prior to reaching 1520 feet	yearling	2000	12 mm
3/30/2024	Cougar Dam 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 in Middle Santiam River	At the start of the first spring spill block	fry	2500	8 mm
4/1/2024	Green Peter Head of Reservoir in Quartzville Creek	At the start of the first spring spill block	fry	2500	8 mm
4/1/2024	Green Peter Dam 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 Reservoir - Head of Reservoir, Middle Santiam River	At the start of Green Peter spring spill	yearling	1000	12 mm
4/1/2024	Green Peter Reservoir - 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	South Santiam River - Foster Dam Tailrace	Prior to start of Foster refill	yearling	4000	12 mm
4/1/2024	South Santiam River above Foster Dam	Prior to start of Foster refill	yearling	5000	12 mm
4/20/2024	South Santiam River - Foster Dam Tailrace	Post refill operations	yearling	2000	12 mm

4/20/2024	South Santiam River above Foster Dam	Post refill operations	yearling	1000	12 mm
4/15/2024	Green Peter Head of Reservoir in Middle Santiam River	At the start of the second spring spill block	fry	2500	8 mm
4/15/2024	Green Peter Head of Reservoir in Quartzville Creek	At the start of the second spring spill block	fry	2500	8 mm
8/30/2024	South Santiam River - Foster Dam Tailrace	Undefined - Late August	subyearling	1000	12 mm
8/30/2024	South Santiam River above Foster Dam	Undefined - Late August	subyearling	2000	12 mm
9/15/2024	Green Peter Reservoir - Head of Reservoir, Middle Santiam River	Fall Operations at Green Peter Dam	subyearling	2500	12 mm
9/15/2024	Green Peter Reservoir - Head of Reservoir, Quartzville Creek	Fall Operations at Green Peter Dam	subyearling	2500	12 mm
10/15/2024	Green Peter Dam Tailrace	Prior to Green Peter reaching 887 feet.	subyearling	4000	12 mm
10/15/2024	Green Peter Reservoir - Head of Reservoir, Middle Santiam River	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2024	Green Peter Reservoir - Head of Reservoir, Quartzville Creek	Prior to Green Peter reaching 887 feet.	subyearling	2500	12 mm
10/15/2024	South Santiam River - Foster Dam Tailrace	Fall operations at Foster Dam	subyearling	4000	12 mm
10/15/2024	South Santiam River above Foster Dam	Fall operations at Foster Dam	subyearling	5000	12 mm

BULK MARKING SUMMARY

No marking activities took place during this reporting period. Cramer Fish Sciences is scheduled to resume tagging on June 24th.

Recaptures

A total of 20 fish from this project were both detected and uploaded to PTAGIS during the most reporting period. The majority of the redetections or observations that were reported to PTAGIS came from locations on the Columbia River. A total of 8 fish from this project were redetected by the Columbia River Estuary Towed Array (TWX), 4 were observed at Columbia River Pile Dike Array 6, 3 at Pile Dike Array 5, and 2 at Pile Dike Array 8. There were 3 detections at the Lebanon Dam array. We estimate that a total of 4,888 PIT tags from this project have been detected since we began releasing fish in May of 2023 (Table 4).

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

Mark Group	N	Mean FL (mm)	Mean Weight (g)	Date Start	Date End	Mort	Mort. %	Sheds	Shed %
Green Peter Head of Reservoir - Middle Santiam	5,071	56.2	NA	5/15/2023	5/16/2023	74	1.46	32	0.63
Green Peter Head of Reservoir - Quartzville Creek	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 Arm	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	67.3	3.5	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	TBD	TBD	TBD	TBD
Green Peter Head of Reservoir	5,006	50.1	1.4	3/1/2024	3/3/2024	TBD	TBD	TBD	TBD
Green Peter Head of Reservoir	5,000	54.9	1.7	3/18/2024	3/19/2024	TBD	TBD	TBD	TBD
Detroit Head of Reservoir North Santiam Arm	7,500	46.7	1.2	5/13/2024	5/15/2024	TBD	TBD	TBD	TBD
Detroit Head of Reservoir Breitenbush Arm	7,500	46.7	1.2	5/15/2024	5/17/2024	TBD	TBD	TBD	TBD

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

Basin	Release Location	Release Date	N	Mean Length	Mean Weight	Lifestage
MFW	Hills Creek Head of Reservoir	5/18/2023 15:50	509	55.8	1.9	Fry

Basin	Release Location	Release Date	N	Mean Length	Mean Weight	Lifestage
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	5/22/2023 13:00	5,171	58.5		Fry
SST	Green Peter Head of Reservoir - Middle Santiam Arm	5/22/2023 20:30	4,961	56.2		Fry
MFW	LOP Head of Reservoir - Black Canyon	5/30/2023 10:30	9,647	63.1	2.9	Fry
MFW	Hills Creek Head of Reservoir	6/5/2023 10:30	9,784	64.7	2.8	Fry
MFW	Fall Creek Head of Reservoir - Old Boat Ramp	6/12/2023 15:00	9,638	67.4	3.2	Fry
NST	Marion Forks Hatchery Escape	6/16/2023 12:00	1,247	66.5	3.4	Fry
NST	Detroit Head of Reservoir - Breitenbush River	7/13/2023 8:45	7,000	66.8	3.6	Fry
NST	Detroit Head of Reservoir - North Santiam River	7/13/2023 11:35	6,638	67	3.6	Fry
SST	Foster Tailrace - South Santiam Hatchery	8/23/2023 16:30	1,030	115.7	18.2	Subyearling
SST	Foster Reservoir Head of Reservoir - Cascadia Covered Bridge	8/24/2023 10:00	2,059	105.6	14.5	Subyearling
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	8/29/2023 11:30	5,198	67.9	3.6	Fry
MFW	LOP Head of Reservoir - Black Canyon	9/18/2023 8:15	4,998	122.9	23.8	Subyearling
MFW	LOP Forebay - Signal Point	9/18/2023 17:00	5,002	128.3	25.1	Subyearling
MFW	LOP Tailrace - Pengra	9/19/2023 11:30	2,011	128.4	25.2	Subyearling
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	9/20/2023 14:00	2,518	113.5	19.5	Subyearling
SST	Green Peter Head of Reservoir - Middle Santiam Arm	9/21/2023 13:40	2,508	117.1	20.7	Subyearling
NST	Detroit Head of Reservoir - Breitenbush River	9/26/2023 10:45	5,002	106.5	11.8	Subyearling
NST	Detroit Head of Reservoir - North Santiam River	9/26/2023 16:00	4,997	102.6	10.4	Subyearling
NST	Big Cliff Tailrace - Packsaddle Boat Ramp	9/27/2023 15:30	8,009	106.5	11.9	Subyearling
MFW	Fall Creek Head of Reservoir - Old Boat Ramp	9/28/2023 14:45	5,006	133.5	29.1	Subyearling
MFW	Fall Creek Tailrace	9/28/2023 19:15	1,001	134.8	29.8	Subyearling
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	10/2/2023 14:20	5,005	117.2	18.9	Subyearling
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	10/2/2023 19:05	3,006	116.7	19	Subyearling
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	10/3/2023 12:45	2,502	122.8	25.1	Subyearling
SST	Green Peter Head of Reservoir - Middle Santiam Arm	10/4/2023 14:40	2,516	119.6	23.8	Subyearling
SST	Green Peter Tailrace - Sunnyside Boat Ramp	10/9/2023 16:05	4,002	125.9	26.4	Subyearling
SST	Foster Reservoir Head of Reservoir - Cascadia Covered Bridge	10/10/2023 14:20	5,000	125.8	24.5	Subyearling
SST	Foster Tailrace - South Santiam Hatchery	10/11/2023 15:20	4,000	135.2	31.8	Subyearling

Basin	Release Location	Release Date	N	Mean Length	Mean Weight	Lifestage
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	10/18/2023 11:50	3,977	118.4	19.8	Subyearling
MCK	Cougar Forebay	10/18/2023 18:00	5,010	120.8	21	Subyearling
MCK	Cougar Tailrace - USGS	10/19/2023 12:40	4,000	112.5	16.8	Subyearling
MFW	Fall Creek Head of Reservoir - Old Boat Ramp	11/6/2023 15:40	4,999	139.4	32.2	Subyearling
MFW	Fall Creek Tailrace	11/6/2023 19:00	1,000	134.9	30.2	Subyearling
MFW	Hills Creek Head of Reservoir	11/7/2023 15:45	4,997	135.2	28.6	Subyearling
MFW	Hills Creek Mid Reservoir - Packard Creek Boat Ramp	11/8/2023 15:15	4,998	145.3	36.9	Subyearling
MFW	Hills Creek Dam Tailrace	11/9/2023 14:35	2,969	129.6	27	Subyearling
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	11/13/2023 13:15	3,999	121.3	23	Subyearling
MCK	Cougar Forebay	11/14/2023 15:15	4,995	124.6	23.8	Subyearling
MCK	Cougar Tailrace - USGS	11/15/2023 11:45	2,411	120.1	21.5	Subyearling
NST	Big Cliff Tailrace - Packsaddle Boat Ramp	11/20/2023 16:50	5,998	112.4	16.6	Subyearling
MFW	LOP Head of Reservoir - Black Canyon	1/3/2024 16:45	4,634	143.3	33.7	Yearling
MFW	LOP Head of Reservoir - Black Canyon	1/4/2024 16:30	4,828	143.3		Yearling
MFW	LOP Head of Reservoir - Black Canyon	1/8/2024 15:40	3,789	143.3		Yearling
MFW	LOP Head of Reservoir - Black Canyon	1/9/2024 16:15	5,115	143.3		Yearling
MFW	LOP Head of Reservoir - Black Canyon	1/25/2024 11:30	7,617	143.6	34.3	Yearling
MFW	Hills Creek Dam Tailrace	1/31/2024 14:05	24,861	141.6	34.7	Yearling
MFW	Hills Creek Head of Reservoir	2/6/2024 11:15	4,963	153.8	40.9	Yearling
MFW	Hills Creek Mid Reservoir - Packard Creek Boat Ramp	2/7/2024 10:10	5,000	155.9	41.7	Yearling
MFW	Hills Creek Dam Tailrace	2/7/2024 15:20	2,998	151.3	42.8	Yearling
MFW	Fall Creek Head of Reservoir - Old Boat Ramp	2/20/2024 12:45	4,993	148.4	38.9	Yearling
MFW	Fall Creek Tailrace	2/20/2024 16:05	1,002	150.5	39.9	Yearling
SST	Green Peter Head of Reservoir - Middle Santiam Arm	2/21/2024 12:00	1,004	164.4	51.6	Yearling
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	2/22/2024 11:45	1,014	150.8	40.2	Yearling
SST	Green Peter Mid Reservoir - Thistle Boat Ramp	2/22/2024 17:45	2,006	153.8	42.9	Yearling
SST	Green Peter Mid Reservoir - Thistle Boat Ramp	2/23/2024 10:40	2,003	159.4	46.5	Yearling
SST	Green Peter Tailrace - Sunnyside Boat Ramp	2/23/2024 14:15	1,014	163.4	50.1	Yearling

Basin	Release Location	Release Date	N	Mean Length	Mean Weight	Lifestage
MFW	LOP Head of Reservoir - Black Canyon	2/28/2024 11:30	4,994	141.5	34.2	Yearling
MFW	LOP Forebay - Signal Point	2/28/2024 16:30	4,988	144.2	35.9	Yearling
MFW	LOP Tailrace - Pengra	2/29/2024 11:00	1,998	149.7	39.2	Yearling
SST	Green Peter Head of Reservoir - Middle Santiam Arm	3/6/2024 15:30	2,506	50.1	1.4	Fry
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	3/6/2024 17:30	2,500	51.3	1.4	Fry
MCK	Cougar Head of Reservoir - Cougar Crossing Bridge	3/8/2024 11:20	4,799	136.9	31	Yearling
MCK	Cougar Forebay	3/11/2024 11:25	4,800	136.5	29.5	Yearling
MCK	Cougar Tailrace - USGS	3/11/2024 15:10	2,081	129.5	25.4	Yearling
NST	Detroit Head of Reservoir - North Santiam River	3/20/2024 14:45	2,000	128.4	25.5	Yearling
NST	Detroit Head of Reservoir - Breitenbush River	3/21/2024 11:15	2,000	124	21.3	Yearling
NST	Big Cliff Tailrace - Packsaddle Boat Ramp	3/21/2024 16:30	1,998	129.4	24.1	Yearling
SST	Foster Reservoir Head of Reservoir - Cascadia Covered Bridge	3/26/2024 13:30	2,997	156.3	44.1	Yearling
SST	Foster Reservoir Head of Reservoir - Cascadia Covered Bridge	3/27/2024 11:00	3,001	145.3	38	Yearling
SST	Foster Tailrace - South Santiam Hatchery	3/28/2024 13:30	3,005	154.6	43.8	Yearling
SST	Foster Tailrace - South Santiam Hatchery	4/1/2024 12:55	2,991	156	44.3	Yearling
MFW	Fall Creek Head of Reservoir - Old Boat Ramp	4/2/2024 11:00	2,500	146	37.1	Yearling
MFW	Fall Creek Head of Reservoir - Old Boat Ramp	4/3/2024 10:55	2,497	154.6	43.2	Yearling
MFW	Fall Creek Tailrace	4/3/2024 14:05	999	159.5	44.5	Yearling
SST	Foster Reservoir Head of Reservoir - Cascadia Covered Bridge	4/4/2024 13:15	1,908	145.4	37.2	Yearling
MFW	LOP Head of Reservoir - Black Canyon	4/9/2024 10:35	2,499	150.9	41.2	Yearling
MFW	LOP Head of Reservoir - Black Canyon	4/9/2024 13:00	2,499	150.9		Yearling
MFW	LOP Forebay - Signal Point	4/10/2024 11:00	2,500	150.7	39.7	Yearling
MFW	LOP Forebay - Signal Point	4/11/2024 11:55	2,500	150.7		Yearling
MFW	LOP Tailrace - Pengra	4/11/2024 15:25	2,000	149	38.9	Yearling
SST	Green Peter Head of Reservoir - Middle Santiam Arm	4/12/2024 11:50	2,350	52.4	1.5	Fry
SST	Green Peter Head of Reservoir - Quartzville Creek Arm	4/12/2024 13:15	2,500	54.9	1.7	Fry
NST	Detroit Head of Reservoir - North Santiam River	5/20/2024 12:00	7,533	47	1.2	Fry
NST	Detroit Head of Reservoir - Breitenbush River	5/20/2024 18:00	7,494	47	1.2	Fry

Table 4. PIT tag recovery summary at established interrogation sites, rotary screw traps (RST), and reservoir sampling locations. Recoveries during screw trap efficiency testing that were recaptured during the test (i.e., within one week of release) are not included in this table.

Observation Location	Event Capture Method Name	Total	Reporting Period Total
CGR - Cougar Dam	Screw Trap	1,637	0
CGRTAL - CGR - Release into the Tailrace within 0.5 km downstream of Dam	Screw Trap	567	0
FAL - Fall Creek Dam (USACE), MF Willamette River	Screw Trap	434	0
HCR - Hills Creek Dam, Middle Fork Willamette River	Screw Trap	239	0
FALTAL - FAL - Release into the Tailrace within 0.5 km downstream of Dam	Screw Trap	213	0
TWX - Estuary Towed Array (Exp.)	Passive	195	19
PD6 - Columbia River Estuary rkm 68	Passive	178	4
LOP - Lookout Point Dam (USACE), MF Willamette River	Screw Trap	171	0
MCKESF - South Fork McKenzie River	Screw Trap	134	0
PD5 - Columbia River Estuary rkm 62	Passive	134	8
LD3 - Lebanon Dam Diversion Bypass	Passive	125	2
GPD - Green Peter Dam	Screw Trap	100	0
PD7 - Columbia River Estuary rkm 70	Passive	82	0
LD1 - Lebanon Dam South Ladder	Passive	77	7
LD2 - Lebanon Dam North Ladder	Passive	65	6
HCDTAL - HCD - Release into the Tailrace within 0.5 km downstream of Dam	Screw Trap	61	0
BCLTAL - BCL - Release into the Tailrace within 0.5 km downstream of Dam	Screw Trap	60	0
PD8 - Columbia River Estuary rkm 82	Passive	60	13
LD4 - Lebanon Dam Spillway	Passive	52	1
DEXTAL - DEX - Release into the Tailrace within 0.5km downstream of Dam	Screw Trap	50	0
WILRMF - Middle Fork Willamette River	Screw Trap	43	0
DEX - Dexter Dam (USACE), Middle Fork Willamette River	Screw Trap	42	0
SID - Sauvie Island Dairy Creek	Passive	26	0
SSANTR - South Santiam River, Oregon	Screw Trap	26	0
NSANTR - North Santiam River, Oregon	Bypass Sub-Sample	25	0

Observation Location	Event Capture Method Name	Total	Reporting Period Total
MSANTR - Middle Santiam River, Oregon	Screw Trap	22	0
LOPTAL - LOP - Release into the Tailrace within 0.5 km downstream of Dam	Screw Trap	18	0
BCL - Big Cliff Dam - North Santiam River	Screw Trap	9	0
HCRTUR - HCR - Release into the Turbine Channel of the Tailrace within 0.5 km of Dam	Screw Trap	8	0
LOP - Lookout Point Dam (USACE), MF Willamette River	Gillnet Fishery or Research	6	0
NSANTR - North Santiam River, Oregon	Screw Trap	3	0
LOP - Lookout Point Dam (USACE), MF Willamette River	Fyke Net	1	0
ML1 - Lower Mill Creek (MILL4C)	Passive	1	0

RESERVOIR DISTRIBUTION SUMMARY

Reservoir sampling during the reporting period was conducted in the nearshore of Lookout Point and Green Peter reservoirs using Oneida lake traps and box minnow traps (Table 5). Reservoirs were sampled on alternating weeks. This was the final reporting period of 2024 utilizing nearshore traps. Beginning 6/16/2024, sampling transitioned to offshore gill netting due to rising reservoir water temperatures.

Green Peter Reservoir was sampled this reporting period from 6/3/2024 through 6/6/2024 (Table 5). Effort consisted of three days of 24-hour trap sets, requiring four days on the water. One Oneida trap and 3 box minnow traps were set in each reservoir longitudinal zone per day. Traps were set at the surface in each reservoir zone (Lower, Middle, Upper, Quartzville). Surface temperatures at trap locations averaged 18.1 C (Table 6, Figure 2). Over three days of sampling (n=12 Oneida sets, n=30 box minnow sets), 6 juvenile Chinook salmon, 3 juvenile northern pikeminnow, 52 bluegill and one juvenile smallmouth bass were captured (Tables 7-9). Chinook salmon catch consisted of two natural origin subyearlings, one natural origin yearling and three adipose clipped hatchery subyearlings (two recaptures from the bulk marking project). No Chinook salmon were tagged this reporting period in Green Peter Reservoir as nearshore surface temperatures at trap locations exceeded 17C, the upper limit for tagging as directed by our sampling permit.

Lookout Point Reservoir was sampled 6/10/2024 – 6/13/2024 (Table 5). Sampling consisted of three days of 24-hour trap sets, requiring four days on the water. One Oneida trap and 3 box minnow traps were set in each reservoir longitudinal zone per day (Lower, Middle, Upper). Traps were set at the surface in each reservoir zone. Surface temperatures at trap locations averaged 20.3 C (Table 6, Figure 1). Over three days of sampling (n=9 Oneida sets, n=27 box minnow sets), 2 yearling natural origin *O. mykiss*, 264 sculpin, 3 bluegill, one juvenile smallmouth bass, and 116 larval unidentified centrarchids were captured (Tables 7-9). No target species were PIT tagged due to warm (>17C) surface waters at trap locations. Permitted incidental mortality was exceeded on the final day of sampling (nets set on 6/12/2024) for sculpin. Twenty-two sculpin (FL range 18-26mm) were found dead on arrival at two Oneida traps with no indication of trauma or predation. The cause of this mortality is uncertain but high water temperatures at trap locations (approximately 20.5C) may have contributed. Traps were not reset, and ODFW district biologists were alerted to the permit violation on 6/21/2024. Nearshore trapping was concluded for the year due to rising temperatures and incidental non-target mortality.

Table 5. Start and end date by statistical week.

Week	Start	End	Reservoir	Net Type	Effort (# sets)	Effort (hrs)
6	2/5/2024	2/8/2024	Lookout	Box minnow	21	501
6	2/5/2024	2/8/2024	Lookout	Oneida	7	166
7	2/12/2024	2/15/2024	Green	Box minnow	30	710
7	2/12/2024	2/15/2024	Green	Oneida	12	283
8	2/19/2024	2/22/2024	Lookout	Box minnow	27	608
8	2/19/2024	2/22/2024	Lookout	Oneida	9	203
9	2/26/2024	3/4/2024	Green Peter	Box minnow	30	1680
9	2/26/2024	3/4/2024	Green Peter	Oneida	12	670

Week	Start	End	Reservoir	Net Type	Effort (# sets)	Effort (hrs)
10	3/5/2024	3/7/2024	Lookout	Box minnow	18	422
10	3/5/2024	3/7/2024	Lookout	Oneida	6	138
11	3/11/2024	3/14/2024	Green Peter	Box minnow	30	715
11	3/11/2024	3/14/2024	Green Peter	Oneida	12	283
12	3/18/2024	3/21/2024	Lookout	Box minnow	27	621
12	3/18/2024	3/21/2024	Lookout	Oneida	9	206
13	3/25/2024	3/28/2024	Green Peter	Box minnow	30	700
13	3/25/2024	3/28/2024	Green Peter	Oneida	12	280
14	4/1/2024	4/4/2024	Lookout	box minnow	27	629
14	4/1/2024	4/4/2024	Lookout	oneida	9	208
15	4/8/2024	4/11/2024	Green Peter	box minnow	30	711
15	4/8/2024	4/11/2024	Green Peter	oneida	12	283
16	4/15/2024	4/18/2024	Lookout	box minnow	27	632
16	4/15/2024	4/18/2024	Lookout	oneida	9	209
17	4/22/2024	4/25/2024	Green Peter	box minnow	30	708
17	4/22/2024	4/25/2024	Green Peter	oneida	12	280
18	4/29/2024	5/2/2024	Lookout	box minnow	27	657
18	4/29/2024	5/2/2024	Lookout	oneida	9	217
19	5/8/2024	5/10/2024	Green Peter	box minnow	20	465
19	5/8/2024	5/10/2024	Green Peter	oneida	8	188
20	5/13/2024	5/16/2024	Lookout	box minnow	27	636
20	5/13/2024	5/16/2024	Lookout	oneida	9	208
21	5/20/2024	5/23/2024	Green Peter	box minnow	30	707
21	5/20/2024	5/23/2024	Green Peter	oneida	12	283
22	5/27/2024	5/30/2024	Lookout	box minnow	27	558
22	5/27/2024	5/30/2024	Lookout	oneida	9	207
23	6/3/2024	6/6/2024	Green Peter	box minnow	30	689
23	6/3/2024	6/6/2024	Green Peter	oneida	12	277
24	6/10/2024	6/13/2024	Lookout	box minnow	27	619
24	6/10/2024	6/13/2024	Lookout	oneida	9	209

Table 6. Mean surface water temperature measure during each trap net deployment.

Week	Reservoir	Mean Water Surface Temperature °C
6	Lookout Point	8.0
7	Green Peter	8.2
8	Lookout Point	8.9
9	Green Peter	8.4
10	Lookout Point	8.3
11	Green Peter	8.5

Week	Reservoir	Mean Water Surface Temperature °C
12	Lookout Point	9.6
13	Green Peter	9.7
14	Lookout Point	10.6
15	Green Peter	12.2
16	Lookout Point	11.7
17	Green Peter	13.6
18	Lookout Point	13.6
19	Green Peter	15.1
20	Lookout Point	16.1
21	Green Peter	16.8
22	Lookout Point	17.4
23	Green Peter	18.1
24	Lookout Point	20.3

Table 7. Summary of total catch by reservoir. CHS – Chinook salmon, RBT – *O. mykiss*, CUT - Cutthroat trout, NPM - Northern Pikeminnow, SCU – Sculpin, BLG - Bluegill, LWB – Western Brook Lamprey, BBH- Brown bullhead, LSS - Large-scale sucker, SMB - Smallmouth Bass, UNID – unidentified. *Unidentified larval centrarchid.

Week	Reservoir	CHS	RBT	CUT	NPM	SCU	BLG	LWB	BBH	LSS	SMB	UNID
6	Lookout Point	4	2	2	1	1	0	0	0	0	0	0
7	Green Peter	7	6	2	1	0	8	1	0	0	0	0
8	Lookout Point	6	9	1	1	0	1	0	0	0	0	0
9	Green Peter	12	3	0	0	0	11	0	0	0	0	0
10	Lookout Point	1	2	0	1	0	0	0	0	0	0	0
11	Green Peter	19	0	0	0	0	11	0	0	0	0	0
12	Lookout Point	2	2	0	2	0	0	0	0	0	0	0
13	Green Peter	1	1	0	0	0	6	0	0	0	0	0
14	Lookout Point	1	7	0	3	0	0	0	9	3	0	0
15	Green Peter	9	2	4	0	0	5	0	0	0	2	0
16	Lookout Point	2	2	2	0	0	0	0	0	1	0	0
17	Green Peter	0	1	2	3	0	6	0	0	0	0	0
18	Lookout Point	0	5	0	0	0	0	0	0	1	0	0
19	Green Peter	1	1	0	3	0	5	0	0	0	0	0
20	Lookout Point	2	6	0	5	0	2	0	0	0	0	0
21	Green Peter	2	0	0	17	0	8	0	0	0	0	0
22	Lookout Point	0	3	0	4	0	0	0	0	0	0	0
23	Green Peter	6	0	0	3	0	52	0	0	0	1	0
24	Lookout Point	0	2	0	0	264	3	0	0	0	1	116*

Table 8. Catch summary of target species by reservoir zone. CHS-AD = ad clipped Chinook salmon, CHS-natural = natural origin Chinook salmon, RBT-AD = ad clipped *O. mykiss*, RBT-natural = natural origin *O. mykiss*.

Week	Reservoir	Species	Lifestage	LOWER	MIDDLE	UPPER	QUARTZVILLE
6	Lookout Point	RBT-natural	yearling	1	1	0	0
6	Lookout Point	CHS-AD	yearling	0	1	0	0
6	Lookout Point	CHS-natural	yearling	0	2	1	0
7	Green Peter	CHS-natural	fry	1	5	1	0
7	Green Peter	RBT-natural	adult	1	0	0	0
7	Green Peter	RBT-natural	yearling	1	0	0	1
7	Green Peter	RBT-natural	fry	0	0	3	0
8	Lookout Point	RBT-natural	yearling	2	4	3	0
8	Lookout Point	CHS-AD	yearling	0	1	0	0
8	Lookout Point	CHS-natural	yearling	0	1	4	0
9	Green Peter	CHS-AD	yearling	1	0	0	1
9	Green Peter	CHS-natural	fry	0	2	5	1
9	Green Peter	CHS-natural	yearling	0	1	1	0
9	Green Peter	RBT-natural	fry	0	0	1	1
9	Green Peter	RBT-natural	yearling	0	0	1	0
10	Lookout Point	RBT-natural	yearling	0	1	0	0
10	Lookout Point	CHS-natural	fry	0	0	1	0
10	Lookout Point	RBT-natural	Adult	0	0	1	0
11	Green Peter	CHS-AD	fry	1	3	11	3
11	Green Peter	CHS-natural	fry	0	0	1	0
12	Lookout Point	CHS-natural	fry	0	1	0	0
12	Lookout Point	CHS-natural	yearling	0	1	0	0
12	Lookout Point	RBT-natural	yearling	0	1	1	0
13	Green Peter	RBT-natural	yearling	1	0	0	0
13	Green Peter	CHS-AD	parr	0	0	0	1
14	Lookout Point	RBT-natural	yearling	4	1	2	0
14	Lookout Point	CHS-natural	yearling	0	0	1	0
15	Green Peter	CHS-natural	fry	0	0	0	3
15	Green Peter	CHS-natural	parr	0	1	5	0
15	Green Peter	RBT-AD	adult	0	1	0	0
15	Green Peter	RBT-natural	yearling	0	0	1	0
16	Lookout Point	CHS-AD	yearling	1	0	0	0
16	Lookout Point	CHS-natural	parr	0	1	0	0
16	Lookout Point	RBT-natural	yearling	0	1	1	0
17	Green Peter	RBT-AD	adult	1	0	0	0
18	Lookout Point	RBT-natural	yearling	1	1	3	0
19	Green Peter	CHS-natural	parr	0	0	0	1
19	Green Peter	RBT-natural	yearling	0	0	0	1

Week	Reservoir	Species	Lifestage	LOWER	MIDDLE	UPPER	QUARTZVILLE
20	Lookout Point	CHS-natural	fry	0	0	2	0
20	Lookout Point	RBT-AD	yearling	0	0	1	0
20	Lookout Point	RBT-natural	yearling	0	0	5	0
21	Green Peter	CHS-natural	subyearling	0	1	0	1
21	Green Peter	CHS-AD	subyearling	0	0	1	0
22	Lookout Point	RBT-natural	yearling	0	1	2	0
23	Green Peter	CHS-natural	subyearling	1	0	1	0
23	Green Peter	CHS-natural	yearling	1	0	0	0
23	Green Peter	CHS-AD	subyearling	0	0	3	0
24	Lookout Point	RBT-natural	yearling	1	0	1	0

Table 9. Summary of target species lengths, tags implanted and recaptures.

Week	Reservoir	Species	Lifestage	Catch	length_min	length_mean	length_max	# VIE tagged	# PIT tagged	# recap
6	Lookout Point	CHS-AD	yearling	1	117	117	117	0	0	1
6	Lookout Point	CHS-natural	yearling	3	80	84	88	0	3	0
6	Lookout Point	RBT-natural	yearling	2	79	88	97	0	1	0
7	Green Peter	CHS-natural	fry	7	37	40.6	46	7	0	0
7	Green Peter	RBT-natural	adult	1	305	305	305	0	1	0
7	Green Peter	RBT-natural	fry	3	35	36.7	38	3	0	0
7	Green Peter	RBT-natural	yearling	2	149	168.5	188	0	2	0
8	Lookout Point	CHS-AD	yearling	1	174	174	174	0	0	1
8	Lookout Point	CHS-natural	yearling	5	73	87.6	101	0	4	0
8	Lookout Point	RBT-natural	yearling	9	103	153.2	206	0	9	0
9	Green Peter	CHS-AD	yearling	2	83	89	95	0	1*	2
9	Green Peter	CHS-natural	fry/parr	8	36	41.6	51	8	0	0
9	Green Peter	CHS-natural	yearling	2	117	118.5	120	0	2	0
9	Green Peter	RBT-natural	fry	2	34	35	36	1	0	0
9	Green Peter	RBT-natural	yearling	1	169	169	169	0	1	0
10	Lookout Point	CHS-natural	fry/parr	1	47	47.0	47	1	0	0
10	Lookout Point	RBT-natural	adult	1	296	296.0	296	0	1	0
10	Lookout Point	RBT-natural	yearling	1	108	108.0	108	0	1	0
11	Green Peter	CHS-AD	fry/parr	1	56	56.0	56	0	0	1
11	Green Peter	CHS-natural	fry/parr	18	34	41.7	58	11	4	0
12	Lookout Point	CHS-natural	fry	1	38	38	38	1	0	0
12	Lookout Point	CHS-natural	yearling	1	97	97	97	0	1	0
12	Lookout Point	RBT-natural	yearling	2**	107	126.5	146	0	0	0
13	Green Peter	CHS-AD	fry/parr	1	58	58	58	0	0	1
13	Green Peter	RBT-natural	yearling	1**	157	157	157	0	0	0
14	Lookout Point	CHS-natural	yearling	1	93	93	93	0	1	0

Week	Reservoir	Species	Lifestage	Catch	length_min	length_mean	length_max	# VIE		
								tagged	# PIT tagged	# recap
14	Lookout Point	RBT-natural	yearling	7**	96	148	174	0	0	0
15	Green Peter	CHS-natural	fry	3	32	37.7	42	2	0	0
15	Green Peter	CHS-natural	parr	6	51	59.8	74	0	6	0
15	Green Peter	RBT-AD	adult	1	229	229	229	0	0	0
15	Green Peter	RBT-natural	yearling	1**	149	149	149	0	0	0
16	Lookout Point	CHS-AD	yearling	1	119	119	119	0	0	1
16	Lookout Point	CHS-natural	parr	1	73	73	73	0	1	0
16	Lookout Point	RBT-natural	yearling	2	145	165.5	186	0	1	0
17	Green Peter	RBT-AD	adult	1	290	290	290	0	0	0
18	Lookout Point	RBT-natural	yearling	5	135	143.8	157	1	5	0
19	Green Peter	CHS-natural	parr	1	50	50	50	0	1	0
19	Green Peter	RBT-natural	yearling	1	116	116	116	0	1	0
20	Lookout Point	CHS-natural	fry	2	43	43.5	44	0	1	0
20	Lookout Point	RBT-AD	yearling	1	169	169	169	0	1	0
20	Lookout Point	RBT-natural	yearling	5	96	120	138	0	4	0
21	Green Peter	CHS-AD	subyear	1	140	140	140	0	0	1
21	Green Peter	CHS-natural	subyear	2	65	84	103	0	0	0
22	Lookout Point	RBT-natural	yearling	3	130	137.3	146	0	0	0
23	Green Peter	CHS-AD	subyear	3	96	104	113	0	0	2
23	Green Peter	CHS-natural	subyear	2	85	86.5	88	0	0	0
23	Green Peter	CHS-natural	yearling	1	169	169	169	0	0	0
24	Lookout Point	RBT-natural	yearling	2	131	136.5	142	0	0	0

*One recaptured fish was inadvertently tagged with a 2nd PIT tag. ** Not tagged, awaiting permit modification to allow for tagging RBT (modification has since been granted effective 4/16/2024).

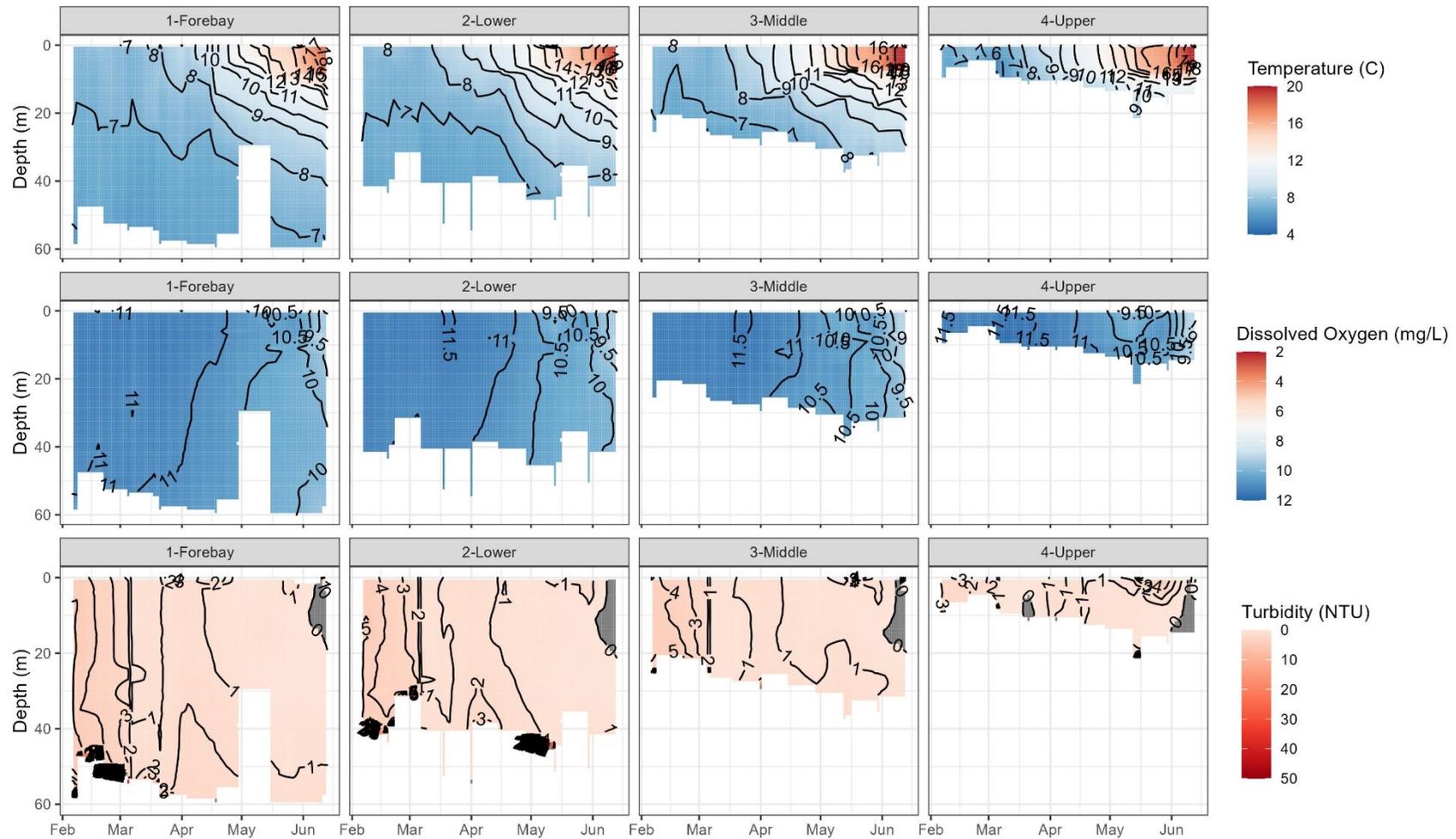


Figure 1. Lookout Point 2024 limnology data. Note that turbidity data in gray are suspect due to a sensor malfunction/calibration issue. Readings in gray were slightly negative (erroneous) but secchi measurements taken concurrently support that turbidity was near zero.

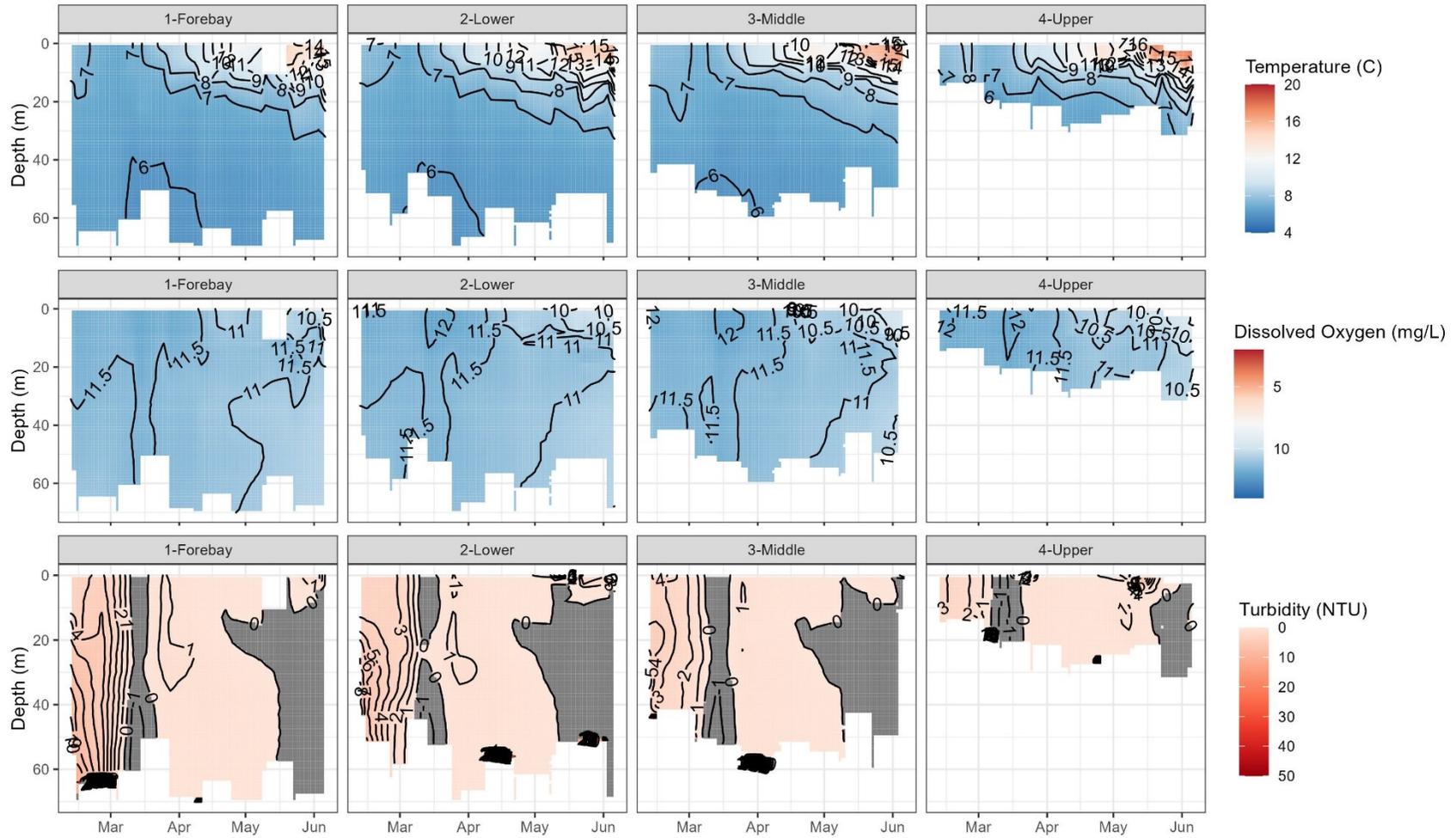


Figure 2. Green Peter 2024 limnology data. Note that turbidity data in gray are suspect due to a sensor malfunction/calibration issue. Readings in gray were slightly negative (erroneous) but secchi measurements taken concurrently support that turbidity was near zero.

Appendix A. Release Site Maps

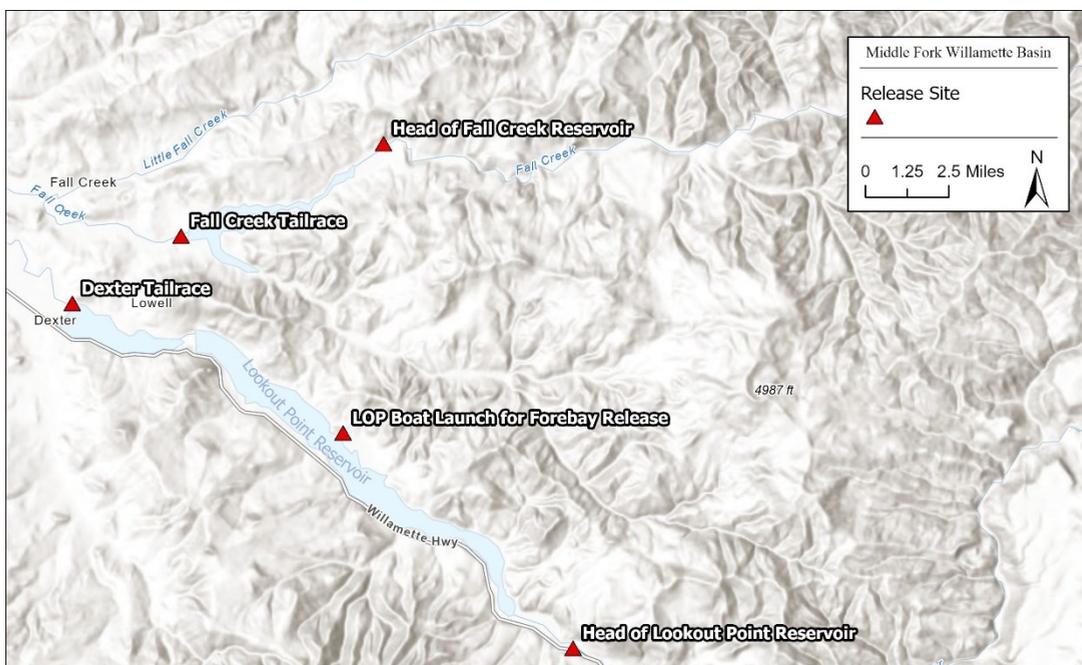


Figure 1. Map of Lookout Point, Dexter tailrace and Fall Creek release locations within the Middle Fork Willamette Basin.

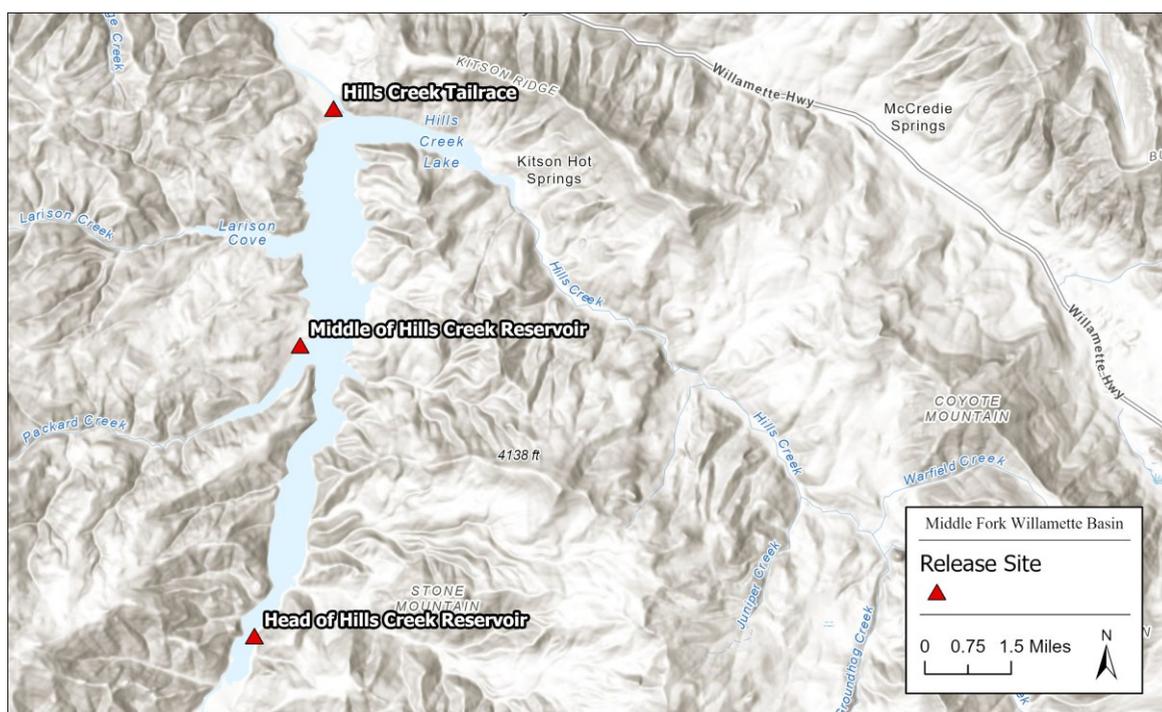


Figure 2. Map of Hills Creek Reservoir release locations within the Middle Fork Willamette Basin.

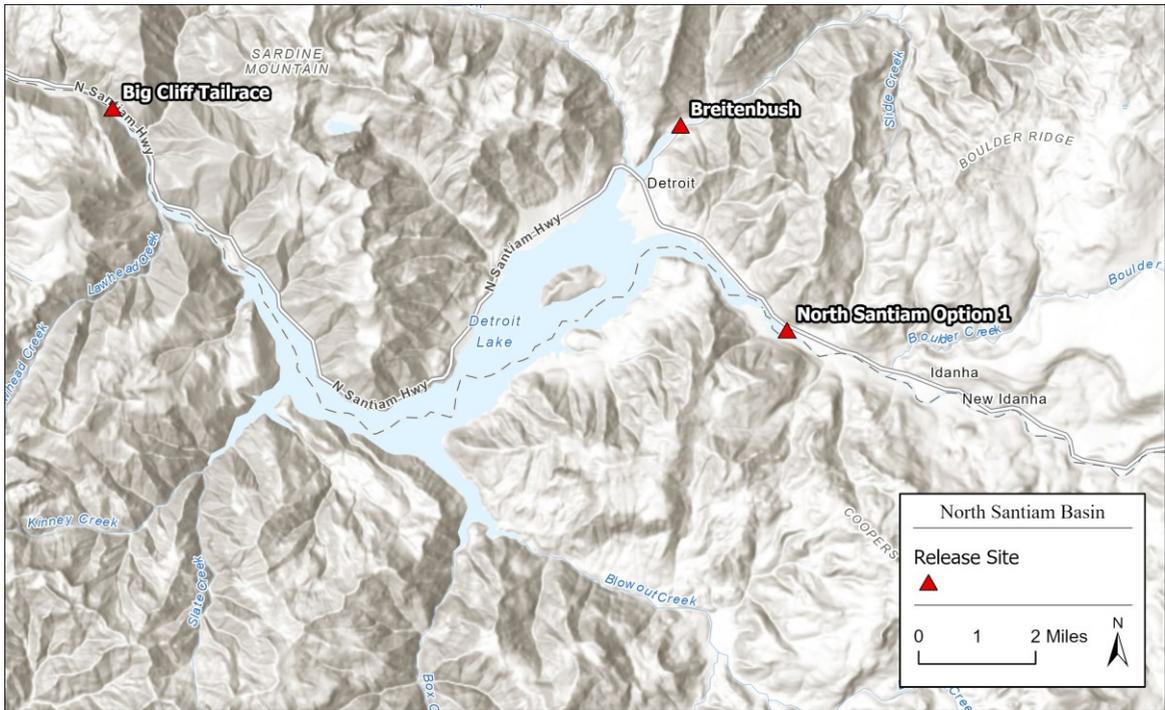


Figure 3. Map of release locations within the North Santiam Basin.

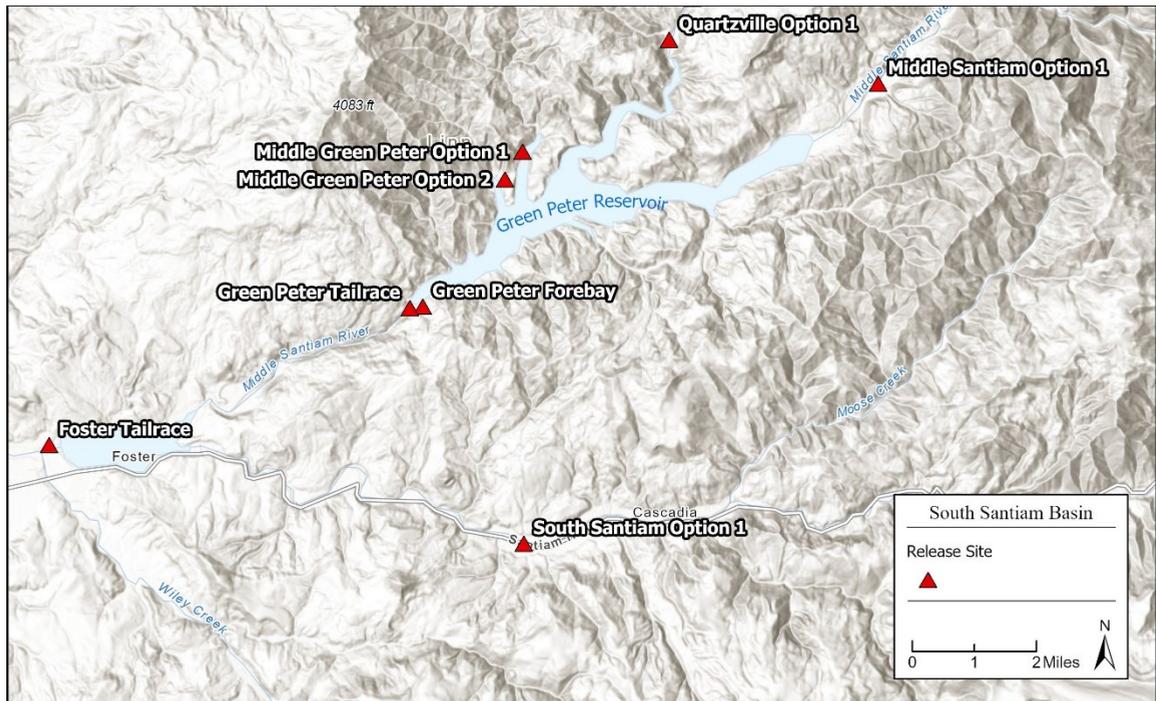


Figure 4. Map of release locations in the Middle/South Santiam basin including Green Peter Reservoir.

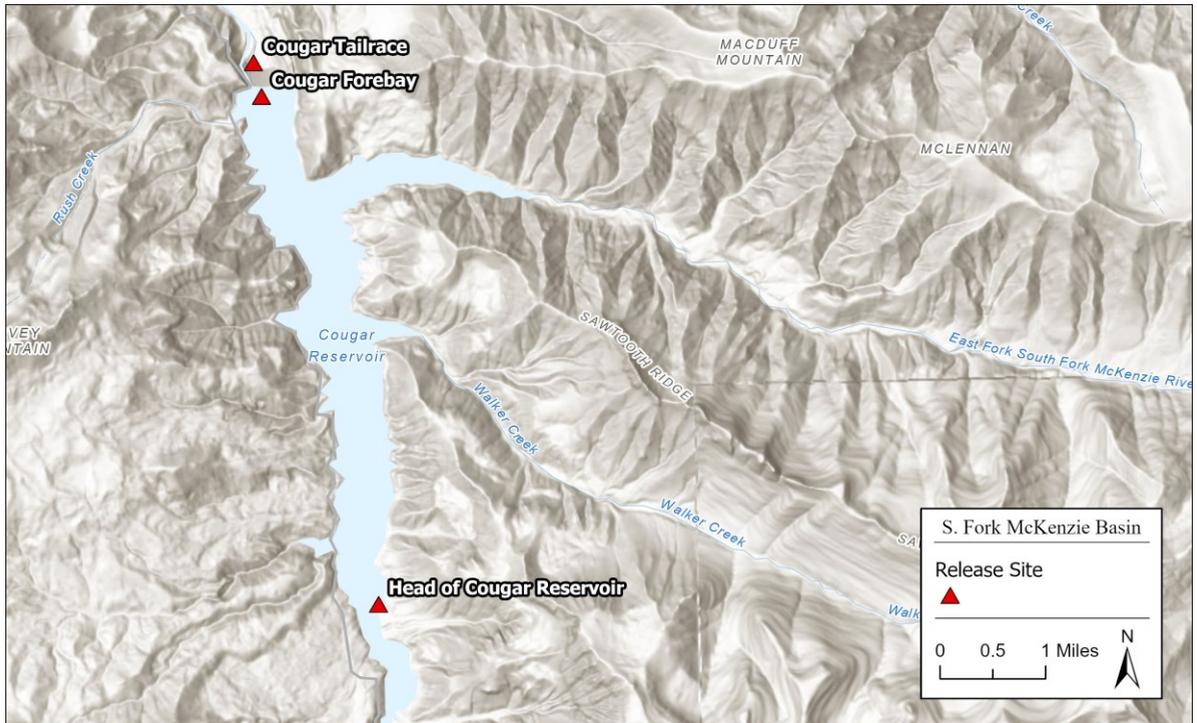


Figure 5. Map of release locations at Cougar Reservoir.

Appendix B. Reservoir Sampling Zones

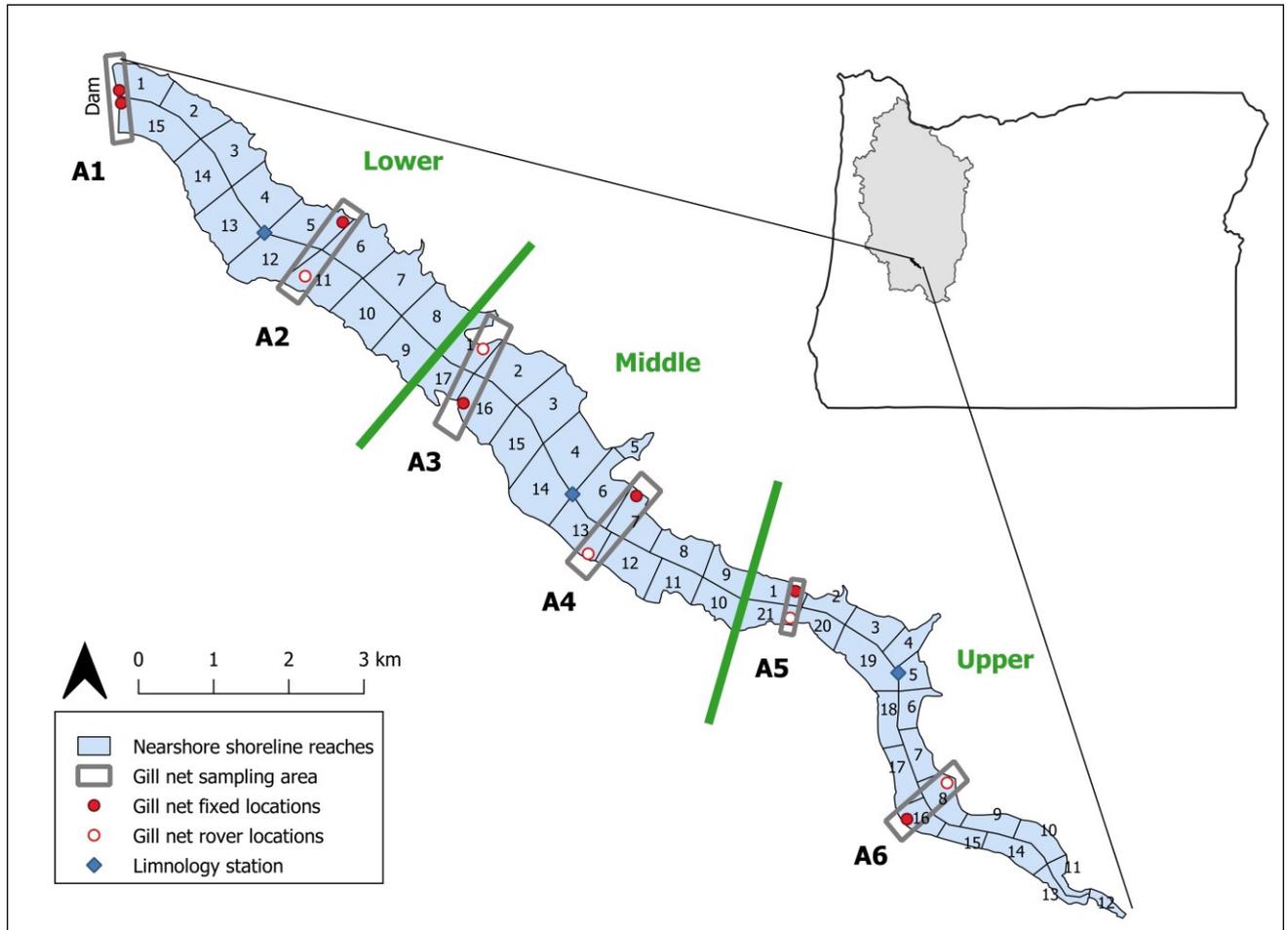


Figure 6. Map of Lookout Point Reservoir nearshore shoreline reaches, reservoir zones (lower, middle and upper), gill netting sampling areas and limnological stations.

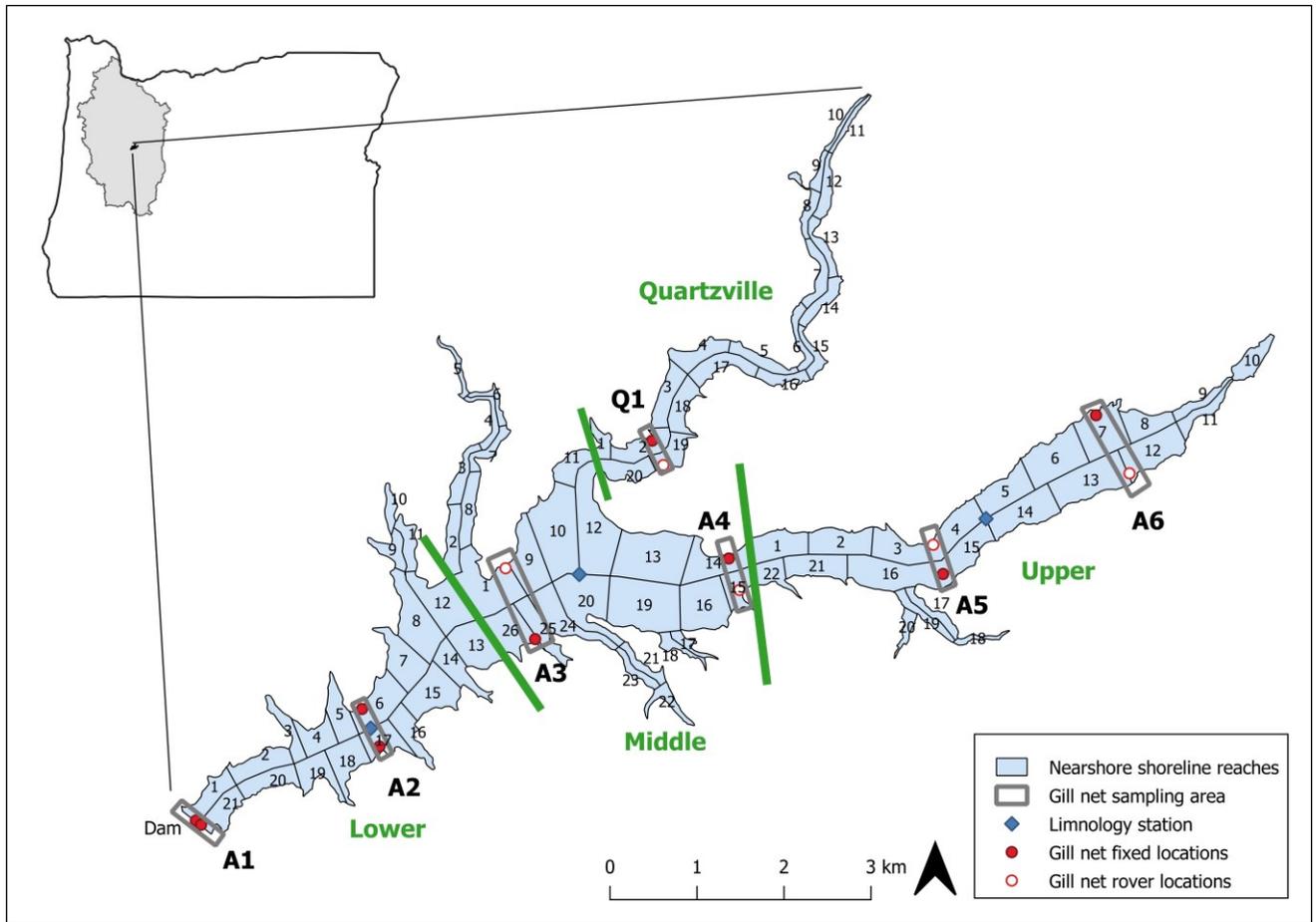


Figure 7. Map of Green Peter Reservoir nearshore shoreline reaches, reservoir zones (lower, middle and upper), gill netting sampling areas and limnological stations.

Appendix C. Hatchery Fish Sourced from ODFW Hatcheries

Table 9. Total brood year 2023 ODFW hatchery fish used for rotary screw trap efficiency tests (EAS) and for the bulk marking project (CFS) through May 2024.

Brood Year 2023 - Juvenile Chinook for RM&E							
Subbasin	Life Stage	Pickup Timing Bulk Releases ¹	Total Allocation ²	Total Used (EAS)	Total Used (CFS)	Total Used	Total Remaining
North Santiam (21H)	Fry	Late February - April 2024	16500		15027	15027	1473
	Subyearling	September - November 2024	47000	1945		1945	45055
	Yearling	February 2025	17000			0	17000
	All	NA	80500	1945	15027	16972	63528
South Santiam (24H)	Fry	Late February - April 2024	11000		9856	9856	1144
	Subyearling	August - October 2024	70000	2,000		2000	68000
	Yearling	February 2025	40000			0	40000
	All	NA	121000	2000	9856	11856	109144
McKenzie (23H)	Fry	February-April 2024	1,900			0	1900
	Subyearling	September-November 2024	4,500	1250		1250	3250
	Yearling	February-March 2025	0			0	0
	All	NA	6400	1250	0	1250	5150
M. Fork Willamette (22H)	Fry	February-May 2024	0			0	0
	Subyearling	August-November 2024	8,000	4500		4500	3500
	Yearling	January-February 2025	0			0	0
	All	NA	8000	4500	0	4500	3500

1 - Stated pickup timing is for bulk release groups. Fish will be picked up at least once per month year-round for screw trap efficiency trials.

2 - Total numbers includes all fish needed for RM&E purposes per Brood Year (i.e., annual basis) and will come from a combination of 'routine production' and 'additional production for RM&E'. Numbers have been rounded up for general planning purposes as 'extra' fish are needed to account for tagging and holding studies.