Final

McNary Dam Annual Sample and Bypass Report, 2024

McNary Project Juvenile Fish Facility

Prepared for

US Army Corps of Engineers

McNary Lock and Dam

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List of Acronyms

EAS	Environmental Assessment Services
GBT	Gas Bubble Trauma
JFF	Juvenile Fish Facility
kcfs	kilo cubic feet per second
MCN	McNary Dam
PIT	Passive Integrated Transponder
PNNL	Pacific Northwest National Laboratory
PSMFC	Pacific States Marine Fisheries Commission
USACE	United States Army Corps of Engineers

Facility Introduction and Description

McNary Dam is located on the Columbia River at river mile 292 (470 km), near Umatilla, Oregon. Juvenile salmonid smolt passage through McNary Dam (MCN) is facilitated at the spillway and powerhouse. Fish can enter the powerhouse through the turbine intakes, where they either pass through the turbine or are diverted by extended length submersible bar screens into a gatewell slot (each unit has three gatewell slots). Each gatewell slot has a vertical barrier screen to prevent fish from entering the turbine. Fish may pass through one of the two orifices in each gatewell into the juvenile collection channel. The collection channel flows from north to south; fish exit the collection channel through the full flow transport flume located at the south end of the collection channel. The transport flume takes fish to the primary bypass gate at the Juvenile Fish Facility (JFF), located just upstream of the separator. The primary bypass gate is used to switch the system between primary and secondary bypass during the fish passage season. In primary bypass, fish bypass through the JFF and are delivered to the outfall pipe that exits in the tailwater, approximately 1,100 feet downstream of MCN in the center of the channel. Under secondary bypass, a portion of fish can be collected for index and condition sampling. During secondary bypass, both sampled and non-sampled fish are returned to the tailrace via the outfall pipe.

Acknowledgements

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Facility Modifications/Maintenance and Improvements

[To be provided by USACE]

River Conditions

River Flow

Daily average total river flow, powerhouse flow, and spill were compiled from April 1 to September 30, 2024. The average included hourly values collected from 0700 hours of the previous day to 0700 hours of the current day. The 2024 maximum daily average for total river flow was 248.0 kilo cubic feet per second (kcfs) recorded on June 7. The maximum daily average for powerhouse flow was 127.4 kcfs on April 5 and for spill was 188.4 kcfs on June 7. The minimum daily average for total river flow was 63.2 kcfs on September 30, and minimum daily average for powerhouse flow during spill was 49.7 kcfs on July 26. Towards the end of the sampling season, between September 2 to September 30, the daily average spill flow rate reached its minimum, ranging from 1.6 to 2.2 kcfs. Tables 1 and 2 summarize the river flow for the 2024 season.

Table 1. Average Monthly River Flows, 2024

Month	Total Flow (kcfs)	Powerhouse (kcfs)	Spill (kcfs)
April	150.3	74.0	71.7
May	179.7	55.3	119.7
June	192.2	59.9	127.6
July	150.8	60.8	85.3
August	117.2	84.2	28.4
September	81.6	74.7	2.2

Table 2. Season Start, End, Seasonal Average, Maximum, and Minimum River Flows, 2024

Date	Total Flow (kcfs)	Powerhouse (kcfs)	Spill (kcfs)
Season Start (April-1)	126.2	110.2	11.3
Season End (September-30)	63.2	56.9	1.6
Maximum (Date)	248.0 (7-Jun)	127.4 (5-Apr)	188.4 (7-Jun)
Minimum (Date)*	63.2 (30-Sep)	49.7 (26-Jul)	1.6 (2-Sep)

Note:
*There were multiple dates with the minimum spill of 1.6 kcfs: September 2, 6, 7, 8, 9, 24, and 30.

River Temperature

River temperature was recorded at 0700 hours daily in Sample Tank "B" at the JFF from April 1 to September 30. The maximum temperature was 71.4°F on August 11. The minimum temperature was 46.6°F on April 1. River temperatures are summarized in Tables 3 and 4.

Table 3. Average Monthly River Temperatures, 2024

Month	River Temperature (°F)
April	49.2
May	54.7
June	60.0
July	67.8
August	70.0
September	68.4

Table 4. Season Start, End, Average, Maximum, and Minimum River Temperatures, 2024

Date	River Temperature (°F)
Season Start (April-1)	46.6
Season End (September-30)	66.3
Season Average	61.8
Season Maximum (August-11)	71.4
Season Minimum (April-1)	46.6

Juvenile Bypass

Migration, Sampling, and Bypass of Juvenile Salmonids

Smolts navigating from the McNary forebay can pass through the dam either by the spillway or the powerhouse on to the tailwater. Smolts entering turbine intakes of the powerhouse are diverted to the juvenile fish collection channel. Subsets of the smolts are then sampled from the juvenile bypass system by a timed gated system that allows them to be collected into a sample tank. Smolts are no longer being collected for transport from MCN. Bypass numbers represent an estimate of the number of smolts navigating past the dam. The number bypassed is calculated from the number of smolts sampled, the corresponding sampling rate, and by considering the fish mortality rate. Smolts are sampled on an every-other-day basis in the secondary bypass system from April 1 until September 30. There were a few deviations from the every-other-day sampling due to maintenance activities. Sampling did not occur on July 22 due to a broken air conditioning and was moved to July 23. No sampling occurred from September 5 to September 14 due to channel water elevation fluctuations caused by a fault reading from the water gauge

sensor. The collection channel was drained, and the water level gauge was cleaned for it to correctly function. Bypass totals do not include smolts passing over the spillway and down through the powerhouse.

The JFF bypassed 507,958 smolts during the 2024 season. The estimated number of smolts passing during the 2024 season was lower than the 5-year average of 757,841 smolts. Total number of salmonid smolts that bypassed the dam from 2020 to 2024 along with the 5-year average are compared in Table 5. Figure 1 compares total salmonid smolts bypassed during 2024 with daily average river flow throughout the 2024 season.

The predominant species bypassed in 2024 was Chinook salmon (52.8% yearling Chinook salmon and 26.8% subyearling Chinook salmon). Table 6 compares the number of salmonids collected by species and clip type for the past 5 years with the 5-year average.

Juvenile salmonids exhibit a wide range of migration strategies that vary in their seasonal timing and age at migration onset. At MCN, this translates into two semi-distinct peaks in the number of smolts collected—one in the spring and one in the summer, though annual variation exists. The spring migration is typically dominated by yearling Chinook salmon, steelhead, sockeye salmon, and coho salmon smolts. Subyearling Chinook salmon fry are also present. The summer migration is primarily subyearling Chinook salmon smolts. The spring collection peak of 35,860 smolts occurred on May 9 and comprised 83.9% yearling Chinook salmon, 12.7% steelhead, 1.8% coho salmon, 1.4% sockeye salmon, and 0.3% subyearling Chinook salmon. The summer collection peak of 14,550 occurred on June 22 and was composed of 98.6% subyearling Chinook salmon, 0.3% yearling Chinook salmon, 0.3% steelhead, 0.3% coho salmon, 0.3% sockeye salmon. Collection peaks for each species are summarized in Table 7.

Table 5. Bypassed by Species and Clip Type, 2024–2020 (from start of season to September 30) and 5-Year Average

Bypassed											
Year	Yearling Chinook		Subyearling Chinook		Steelhead		Coho		Sockeye		Total
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	
2024	207,413	60,641	60,187	75,840	43,248	9,095	5,461	11,668	0	34,405	507,958
2023	129,909	22,879	125,918	208,098	24,339	8,163	4,148	13,472	4,100	21,839	562,865
2022	84,013	12,458	379,912	324,216	36,611	9,084	4,754	10,507	2,500	78,050	942,105
2021	207,739	42,329	180,014	165,760	62,730	14,359	8,369	18,257	4,370	30,136	734,063
2020	210,703	50,189	247,672	355,825	36,893	10,426	13,908	16,268	5,450	94,870	1,042,204
5 YR AVG	**167,955**	**37,699**	**198,741**	**225,948**	**40,764**	**10,225**	**7,328**	**14,034**	**3,284**	**51,860**	**757,839**

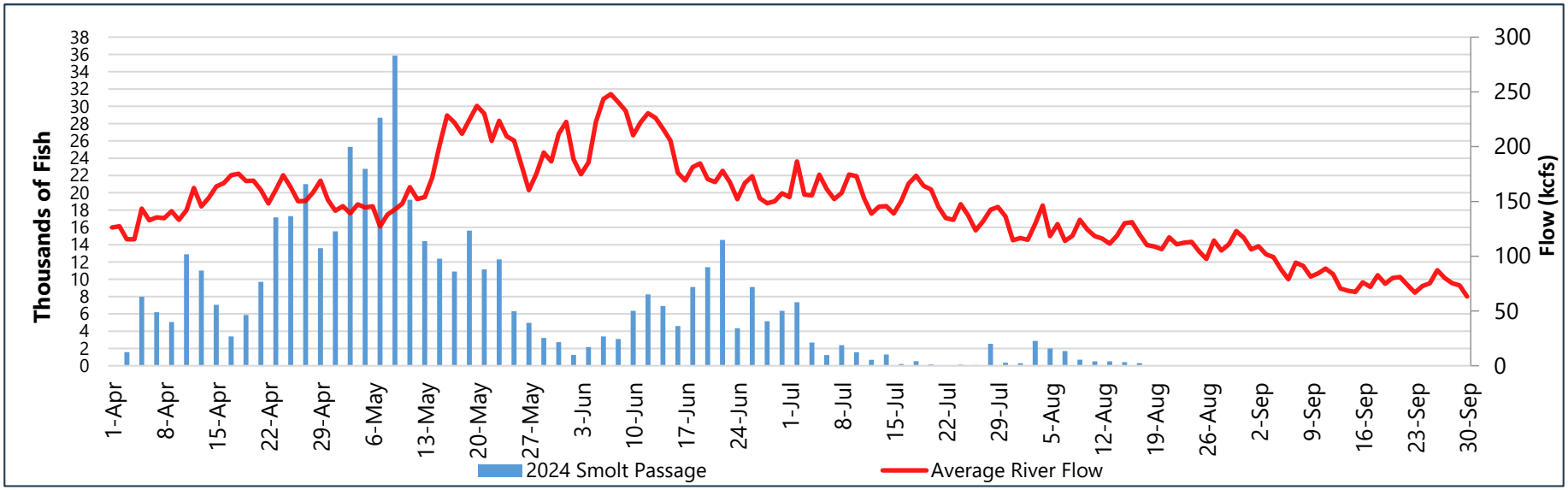

Figure 1. Daily Smolt Passage vs. Average Daily River Flow, 2024

Table 6. Collected by Species and Clip Type, 2024–2020 (from start of season to September 30) and 5-Year Average

Collected											
Year	Yearling Chinook		Subyearling Chinook		Steelhead		Coho		Sockeye		Total
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	
2024	207,474	60,654	60,225	75,932	43,257	9,102	5,462	11,668	0	34,412	508,186
2023	129,942	22,887	125,958	208,165	24,347	8,164	4,148	13,472	4,100	21,840	563,023
2022	84,061	12,467	379,943	324,324	36,620	9,087	4,754	10,509	2,500	78,064	942,329
2021	207,763	42,334	180,033	165,813	62,737	14,362	8,370	18,263	4,370	30,140	734,185
2020	210,728	50,195	247,702	355,967	36,900	10,430	13,910	16,271	5,450	94,878	1,042,431
5 YR AVG	**167,994**	**37,707**	**198,772**	**226,040**	**40,772**	**10,229**	**7,329**	**14,037**	**3,284**	**51,867**	**758,031**

Table 7. Peak Collection Date by Species and Clip Types, 2024–2020

Peak Collection Dates									
Year	Yearling Chinook	Subyearling Chinook	Clipped Steelhead	Unclipped Steelhead	Coho	Clipped Sockeye	Unclipped Sockeye	Total Smolts	Juvenile Lamprey
2024	9-May	22-Jun	9-May	25-Apr	5-Apr	---	19-May	9-May	16-Jun
	30,075	14,350	4,052	805	1,670	---	5,630	35,860	8,500
2023	19-May	8-Jul	1-May	19-May	19-May	19-May	19-May	19-May	13-May
	21,073	28,300	5,701	1,407	5,400	2,400	4,800	48,901	103,800
2022	11-May	18-Jun	11-May	21-May	12-Jun	25-May	21-May	18-Jun	8-Jun
	9,199	122,300	3,251	1,862	2,400	800	6,200	123,901	65,000
2021	9-May	24-Jun	25-Apr	9-May	29-May	17-May	9-May	24-Jun	8-Jun
	26,800	115,550	9,600	1,200	2,901	1,200	2,800	115,700	750
2020	7-May	4-Jun	7-May	11-May	27-May	21-May	17-May	4-Jun	2-Jun
	32,601	80,097	3,000	1,200	2,650	1,700	9,900	81,702	26,100

Note: "---" refers to no fish were collected.

Sampling

Sampling for smolt migration indexing and condition evaluation was conducted every other day when the system was in secondary bypass from April 1 to September 30, 2024.

The target number is to have at least 100 fish of the predominant salmonid species condition sampled during a sampling event. As the water temperature increased above 70°F during the latter half of the season, the sample number for salmonids decreased due to warm water sampling protocols outlined in the 2024 Fish Passage Plan. At the end of season, there were 17,408 smolts sampled, composed of 44.8% subyearling Chinook salmon, 31.4% yearling Chinook salmon, 10.4% steelhead, 8.7% sockeye salmon, and 4.7% coho salmon. The number of sampled fish is listed by species and clip type in Table 8.

In 2024, the number of salmonids sampled was slightly above the 5-year average of 17,098. Yearling Chinook and coho, yearling Chinook, and sockeye salmon were up from the 5-year average. Subyearling Chinook and Steelhead were down from the five-year average. No clipped sockeye salmon were encountered during this year's sampling season. However, unclipped sockeye seen an increase of 43.2% from the 5-year average. The largest increase from the 5-year average occurred with unclipped coho, an increase of 81.4% for sampling season.

The average sample rate for the season was 11.39%. Table 9 summarizes average monthly and seasonal sample rates.

Table 8. Sampled by Species and Clip Type, 2024–2020 (from start of season to September 30), and 5-Year Average

Sampled											
Year	Yearling Chinook		Subyearling Chinook		Steelhead		Coho		Sockeye		Total
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	
2024	6,061	1,738	1,437	4,034	1,447	361	182	628	0	1,520	17,408
2023	3,378	580	2,420	4,091	733	173	84	128	22	217	11,826
2022	3,692	610	2,595	6,719	1,840	375	191	226	39	1,980	18,267
2021	4,365	754	3,391	5,318	2,147	396	178	431	49	505	17,534
2020	4,885	1,302	2,898	7,836	1,177	413	453	318	61	1,122	20,465
5 YR AVG	**4,476**	**997**	**2,548**	**5,600**	**1,469**	**344**	**218**	**346**	**34**	**1,069**	**17,100**

Table 9. Average Monthly and Seasonal Sample Rate, 2024

Month	Rate
April	5.00%
May	5.45%
June	2.40%
July	14.07%
August	20.31%
September	25.00%
Season	11.39%

Migration, Sampling, and Bypass of Juvenile Lamprey

Lampreys belong to a group of fishes that are eel-like in form. They are an ancient form of fish that lacks jaws and paired fins, and their identification largely depends on the number, position, and structure of the teeth found within the mouth of the adult. The primary species found at MCN is the Pacific lamprey (*Entosphenus tridentatus*) characterized by the presence of three large teeth and posterior teeth on the oral disc. Pacific lampreys spawn in similar habitats to salmon. Spawning occurs between March and July, depending upon location within their range.

Metamorphosis from the larvae stage (ammocoetes) to the juvenile stage (macropthalmia) occurs over a period of several months. During this time, they develop eyes, teeth, and become free swimming. They drift and swim downstream as they migrate to the ocean. It is during the macropthalmia stage when most of the lampreys end up in the sample collection at the JFF. Collected, sampled, and mortality data for Pacific lamprey juvenile life stages are presented in Table 10. In addition, the 5-year averages of collected, sampled, and mortality data are also presented. Mortality includes sample tank mortality only. PSMFC collected 517 fin clips for the season, for the Columbia River Inter-Tribal Fish Commission. All juvenile lamprey sampled for fin clips were released unharmed. Pacific Northwest National Laboratory (PNNL) collected 306 macropthalmia lamprey for survivability study.

Table 10. Pacific Lamprey Collected, Sampled, and Mortality, 2024–2020 (from start of season to September 30)

	2024	2023	2022	2021	2020	5 YR AVG
Collected	55,110	345,374	298,028	6,203	119,750	164,893
Sampled	1,110	3,299	4,364	254	2,757	2,357
Mortality	68	35	84	6	86	56

Incidental Species Sampled (Including Adults)

Non-target fish and invertebrates incidentally sampled with target species were weighed, measured, and counted at the time of the every-other-day smolt sampling. Juvenile American shad (*Alosa sapidissima*) were the most prevalent incidental species encountered in 2024, followed by Pacific lamprey macropthalmia and smallmouth bass (*Micropterus dolomieu*). Juvenile American shad were first sampled on July 16 and due to the high quantity, their numbers were estimated by subsampling and enumerated using a weighing technique (instead of counting) from July 20 to September 30. There were 22 Siberian prawns (*Exopalaemon modestus*) that were sampled for the season. All incidental species sampled were bypassed to the tailrace excluding the Siberian Prawns, which were humanely euthanized and disposed of. Table 11 summarizes incidental species sampled for the 2020 to 2024 seasons.

Table 11. Incidental Species Sampled, 2024–2020

Common Name	Species Name	2024	2023	2022	2021	2020
American Shad (Adult)	*Alosa sapidissima*	1	0	1	3	1
American Shad (Juvenile)	*A. sapidissima*	93,063	456,369	62,434	21,062	99,457
Banded Killifish	*Fundulus diaphanus*	6	6	9	36	10
Bass, Largemouth	*Micropterus salmoides*	0	2	0	1	1
Bass, Smallmouth	*M. dolomieu*	371	215	675	231	332
Bluegill/Pumpkin Seed	*Lepomis* spp.	14	10	4	6	26
Bridgelip Sucker	*Catostomus columbianus*	0	0	0	0	0
Bullhead	*Ameiurus* spp.	6	8	13	19	4
Channel Catfish	*Ictalurus punctatus*	3	12	9	2	5
Chinook Salmon (Mini-Jack)	*Oncorhynchus tshawytscha*	3	1	0	0	0
Common Carp	*Cyprinus carpio*	16	4	5	4	18
Crappie	*Pomoxis* spp.	3	1	7	1	3
Crayfish	*Pacifastacus* spp.	3	10	6	19	2
Kokanee	*O. nerka*	0	1	0	0	0
Dace, Longnose	*Rhinichthys cataractae*	2	1	9	1	1
Mountain Sucker	*C. platyrhynchus*	2	0	0	0	3
Mountain Whitefish	*Prosopium williamsoni*	0	21	8	0	6
Northern Pikeminnow	*Ptychocheilus oregonensis*	14	0	0	0	1
Pacific Lamprey (Adult)	*Entosphenus tridentatus*	11	9	5	1	0
Pacific Lamprey (Ammocoete)	*E. tridentatus*	1	0	7	0	5
Pacific Lamprey (Macropthalmia)	*E. tridentatus*	1,109	3,299	4,357	254	2,752
Peamouth	*Mylocheilus caurinus*	0	*0*	*0*	0	0
Sculpin	*Cottus* spp.	6	15	3	6	5
Siberian Prawn	*Exopalaemon modestus*	22	49	0	11	3
Speckled Dace	*R.osculus*	0	0	0	0	0
Steelhead (Clipped kelt)	*O. mykiss*	0	0	0	0	0
Steelhead (Unclipped kelt)	*O. mykiss*	0	0	0	0	0
Sturgeon	*Acipenser* spp.	0	0	0	0	0
Sucker	*Catostomus* spp.	0	2	0	0	1
Tench	*Tinca tinca*	0	0	0	0	1
Three-spine Stickleback	*Gasterosteus aculeatus*	22	36	86	90	81
Umatilla Dace	*R. umatilla*	0	0	0	0	0
Walleye	*Sander vitreus*	60	14	13	64	4
Yellow Perch	*Perca flavescens*	25	16	21	11	62
Annual Total		**94,763**	**460,101**	**67,654**	**21,822**	**102,784**

Adult Fallbacks

Since 2018, adult fish information is no longer included in the juvenile annual report. All adult fish data can be found in the U.S. Army Corps of Engineers report.

Separator Efficiency

Historically, when MCN was included in the Juvenile Fish Transportation Program, separator efficiency was monitored to measure the percentage of sampled smolts segregated into the desired sample holding tank. In 2013, MCN was no longer included in the transportation program (switched to 100% bypass), but separator efficiency monitoring continued through 2018. Beginning in 2019, separator efficiency was no longer monitored.

Fish Condition

Descaling

All sampled salmonid smolts greater than 60 millimeters in total length were examined for descaling. A smolt with descaling greater than or equal to 20% of the area on one side of its body was recorded as descaled. Unclipped steelhead had the highest descale rate (3.9%) for the 2024 season and clipped subyearling Chinook salmon had the lowest descaling rate (0.5%). Weekly descaling rates for all juvenile salmonids examined in 2024 are summarized in Table 12 and compared to the 4-year average (2020 to 2023). The descaling rate for all species combined was 1.7% for the season (301 descaled salmonids out of 17,251 examined for descaling; Table 13).

Other Injury and Disease

Subsamples of up to 100 smolts per species from the daily sample were examined for conditions including injuries, diseases, and predator marks. All individuals of a species were examined from the sample if 100 or fewer individuals were present. Injuries included recently acquired damage to the head, eyes, body, and fins. Diseases included fungus, *columnaris*, bacterial kidney disease, parasites, and deformities of the spine, operculum, or other body parts. Predator marks included injury or marks consistent with scratches or bites from birds, fish, or lamprey. Conditions reported here do not include descaling because descaling was calculated separately for all sampled smolts.

Out of 9,330 smolts examined for injuries, disease, and other conditions in the subsample, 6.4% were observed with at least one condition and 1.3% had multiple conditions. Table 14 summarizes the prevalence of conditions in examined fish for 2024. Disease was present in 0.8% of fish examined. The trematode parasite responsible for blackspot, the most common disease noted, affected 0.3% of smolts examined. Out of the 70 smolts with disease noted, 29 were marked as having the trematode parasite (41.4%), 28 of the salmonids marked as having blackspot were subyearling Chinook, and 1 was a yearling Chinook. Table 15 summarizes the number and percentage of smolts observed with disease by species. Injuries were observed in 1.8% of smolts. Unclipped steelhead experienced the highest injury rate at 2.6%, followed by clipped steelhead salmon (2.4%), and clipped yearling Chinook (2.0%). Table 16 summarizes the numbers and percentage of injuries by species. Predator marks were present in 0.9% of smolts, with bird most prevalent predator mark at 0.5% of fish examined. Steelhead had the highest rate of predator marks of all species examined at roughly 2.7% combined, largely attributed to birds. Table 17 summarizes the number and type of predator mark sustained by species in 2024.

Table 12. Weekly Descaling in Percentages and Actual Count of Descaled Fish, 2024 Compared to Past 4-Year Average, 2020-2023

Weekly Descaling in Percentages and Actual Count of Descaled Fish Examined																	
2024 Week Ending Date	Current YR	Yearling Chinook		Subyearling Chinook		Clipped Steelhead		Unclipped Steelhead		Coho		Clipped Sockeye		Unclipped Sockeye		Total	
Week Number	4 YR AVG	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
4-Apr	2024	6	1.9	0	0.0	0	0.0	0	0.0	2	3.1	0	0.0	0	0.0	8	2.0
1	AVG	27	3.3	0	0.0	10	3.8	2	5.1	1	8.3	0	0.0	0	0.0	40	3.6
11-Apr	2024	15	1.1	0	0.0	1	2.2	0	0.0	1	0.5	0	0.0	0	0.0	17	1.0
2	AVG	19	3.0	0	0.0	13	11.1	3	10.8	1	5.5	0	0.0	1	5.6	35	4.7
18-Apr	2024	6	2.1	0	0.0	2	1.8	0	0.0	0	0.0	0	0.0	0	0.0	8	1.7
3	AVG	13	2.4	0	0.0	24	23.3	3	6.0	2	2.1	0	0.0	0	2.8	41	6.0
25-Apr	2024	26	2.6	0	0.0	2	0.7	2	3.3	0	0.0	0	0.0	0	0.0	30	2.1
4	AVG	17	2.7	0	0.0	21	7.1	4	10.6	1	2.2	0	0.0	1	1.5	43	4.1
2-May	2024	17	2.4	0	0.0	2	1.3	1	3.7	0	0.0	0	0.0	1	4.2	21	2.3
5	AVG	29	3.5	0	0.0	28	8.6	3	7.3	2	9.9	0	0.0	5	2.3	66	4.8
9-May	2024	81	2.8	0	0.0	20	3.4	2	3.2	1	1.1	0	0.0	5	4.9	109	2.9
6	AVG	13	2.8	0	0.0	16	14.7	3	16.0	1	7.9	0	0.0	6	2.1	39	4.8
16-May	2024	9	1.7	0	0.0	3	2.8	2	6.9	1	3.2	0	0.0	1	2.2	16	2.1
7	AVG	16	3.9	0	0.0	16	14.8	2	8.0	1	4.6	1	2.9	7	2.6	42	5.1
23-May	2024	6	1.2	0	0.0	3	4.3	3	8.1	2	3.0	0	0.0	14	2.1	28	1.9
8	AVG	13	4.4	1	0.2	12	11.6	3	10.8	2	3.9	2	8.3	5	2.9	38	4.5
30-May	2024	2	1.8	1	0.2	1	2.2	4	10.0	2	2.2	0	0.0	11	2.6	21	1.8
9	AVG	12	6.2	3	0.6	13	13.3	2	10.7	1	1.8	1	16.9	6	2.9	39	3.0
6-Jun	2024	1	2.0	5	0.9	1	3.0	0	0.0	3	2.7	0	0.0	3	1.5	13	1.3
10	AVG	4	1.5	2	0.4	8	3.5	1	8.1	0	2.1	0	0.0	5	1.7	20	2.0
13-Jun	2024	0	0.0	2	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.6
11	AVG	3	5.2	7	1.1	4	22.9	1	17.8	1	3.9	0	0.0	2	1.0	17	2.2
20-Jun	2024	0	0.0	3	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.7

Weekly Descaling in Percentages and Actual Count of Descaled Fish Examined																	
2024 Week Ending Date	**Current YR**	**Yearling Chinook**		**Subyearling Chinook**		**Clipped Steelhead**		**Unclipped Steelhead**		**Coho**		**Clipped Sockeye**		**Unclipped Sockeye**		**Total**	
Week Number	**4 YR AVG**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**
12	AVG	4	1.3	4	0.4	1	1.7	1	2.4	1	2.4	1	3.9	2	0.6	13	1.7
27-Jun	2024	0	0.0	5	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	0.9
13	AVG	2	8.5	5	0.9	1	4.4	1	2.9	0	0.0	1	4.4	2	0.4	11	1.3
4-Jul	2024	0	0.0	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.5
14	AVG	1	0.7	5	0.5	0	25.0	0	0.0	0	0.0	0	0.0	1	13.0	7	0.7
11-Jul	2024	0	0.0	2	1.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.9
15	AVG	0	1.3	4	0.6	0	6.3	0	0.0	0	0.0	0	0.0	0	0.6	5	0.7
18-Jul	2024	0	0.0	2	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.8
16	AVG	0	0.0	3	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	25.0	3	0.5
25-Jul	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
17	AVG	0	0.0	6	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	12.5	6	0.9
1-Aug	2024	0	0.0	7	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	0.9
18	AVG	0	0.0	3	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	12.5	4	0.6
8-Aug	2024	0	0.0	3	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.5
19	AVG	0	0.0	2	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.7
15-Aug	2024	0	0.0	3	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.9
20	AVG	0	0.0	10	1.3	0	0.0	0	0.0	0	0.0	0	0.0	0	25.0	10	1.4
22-Aug	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
21	AVG	0	0.0	6	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	12.5	6	2.3
29-Aug	2024	0	0.0	1	2.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	2.0
22	AVG	0	0.0	1	4.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	4.1
5-Sep	2024	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	AVG	0	0.0	3	3.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	3.9
12-Sep	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Weekly Descaling in Percentages and Actual Count of Descaled Fish Examined																	
2024 Week Ending Date	Current YR	Yearling Chinook		Subyearling Chinook		Clipped Steelhead		Unclipped Steelhead		Coho		Clipped Sockeye		Unclipped Sockeye		Total	
Week Number	4 YR AVG	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
24	AVG	0	0.0	6	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	0.7
19-Sep	2024	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	AVG	0	0.0	3	18.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	18.0
26-Sep	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
26	AVG	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
30-Sep	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
27	AVG	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Table 13. Season Total Descaled Salmonids by Species, 2024

Species	Yearling Chinook		Subyearling Chinook		Steelhead		Coho		Sockeye		Total
Clip Type	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	
Total Descaled	136	33	7	29	35	14	1	11	0	35	301
Total Examined	6,023	1,728	1,420	3,956	1,444	355	181	628	0	1,513	17,251
Percent	2.26%	1.91%	0.49%	0.73%	2.42%	3.94%	0.55%	1.75%	--	2.31%	1.74%

Table 14. Summary of Smolt Conditions Excluding Descaling in Subsample, 2024

	Yearling Chinook				Subyearling Chinook				Steelhead				Coho				Sockeye				Annual Total	
	Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Total Conditions	151	7.3%	49	8.2%	60	6.2%	162	6.3%	151	13.9%	40	13.1%	7	3.9%	37	6.6%	0	0.0%	64	6.5%	721	7.7%
	200				222				191				44				64					
Smolts with Conditions	126	6.1%	43	7.2%	50	5.2%	120	4.7%	128	11.8%	36	11.8%	7	3.9%	30	5.3%	0	0.0%	59	6.0%	599	6.4%
	169		6.3%		170		4.8%		164		11.8%		37		5.0%		59		6.0%			
Total Fish Examined	2,063		599		970		2,572		1,089		306		179		561		0		991		9,330	
	2,662				3,542				1,395				740				991					

Table 15. Number and Percentage of Smolts Observed with Disease in the Subsample, 2024

	Yearling Chinook				Subyearling Chinook				Steelhead				Coho				Sockeye				Total	
	Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Total	19	0.9%	2	0.3%	9	0.9%	29	1.1%	6	0.6%	1	0.3%	0	0.0%	2	0.4%	0	--	2	0.2%	70	0.8%
	#		%		#		%		#		%		#		%		#		%			
	21		0.8%		38		1.1%		7		0.5%		2		0.3%		2		0.2%			

Table 16. Number and Percentage of Smolts Observed with Injury in the Subsample, 2024

	Yearling Chinook				Subyearling Chinook				Steelhead				Coho				Sockeye				Total	
	Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Total	41	2.0%	10	1.7%	18	1.9%	46	1.8%	26	2.4%	8	2.6%	1	0.6%	10	1.8%	0	0.0%	10	1.0%	170	1.8%
	#		%		#		%		#		%		#		%		#		%			
	51		1.9%		64		1.8%		34		2.4%		11		1.5%		10		1.0%			

Table 17. Number and Percentage of Smolts Observed with Predator Marks in the Subsample, 2024

Predator Mark	Yearling Chinook				Subyearling Chinook				Steelhead				Coho				Sockeye				Total	
	Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip		Clip		Unclip			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Bird	5	0.2	1	0.2	1	0.1	0	0.0	31	2.8	4	1.3	1	0.6	1	0.2	0	--	1	0.1	45	0.5
Fish	5	0.2	0	0.0	0	0.0	3	0.1	0	0.0	1	0.3	1	0.6	2	0.4	0	--	0	0.0	12	0.1
Lamprey	1	0.0	0	0.0	9	0.9	13	0.5	1	0.1	1	0.3	0	0.0	0	0.0	0	--	2	0.2	27	0.3
Total	#				#				#				#				#					
	11	0.5	1	0.2	10	1.0	16	0.6	32	2.9	6	2.0	2	1.1	3	0.5	0	--	3	0.3	84	0.9
	12		0.5		26		0.7		38		2.7		5		0.7		3		0.3			

Mortality

Total facility mortality is composed of mortalities found in the separator, sample tanks, and the sample recovery raceway, and is expressed as the rate of mortality of the number of fish collected. Total facility mortality for all species combined was less than 0.1% (0.04%) in 2024. The highest monthly total mortality rate of 2.3% occurred in September, there were 2 mortalities out of the 88 smolts collected. Table 18 summarizes monthly and annual total facility mortality for 2024.

Sample mortality is composed of the mortalities found in the sample tank. The rate of mortality of the sample population for all species combined was 0.7% in 2024. Subyearling Chinook salmon had the highest number of sample mortalities at 59 for the season. The highest monthly sample mortality rate was in September at 9.1%, there were 2 mortalities out of the 22 fish sampled. Table 19 summarizes monthly and annual sample mortality for 2024. A weekly comparison of 2024 and the average mortalities for the last 4 years is presented in Table 20. The first week of sampling for 2024 ended on April 4, and the final week for the season ended on October 3, with the final sample being conducted on September 30.

Table 18. Monthly and Total Facility Mortality, 2024 Season

Month	Yearling Chinook				Subyearling Chinook						Steelhead				Coho				Sockeye				Total	
	Clip		Unclip		Clip		Unclip		Fry		Clip		Unclip		Clip		Unclip		Clip		Unclip			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
April	17	<0.1	7	<0.1						0.0	6	<0.1		0.0		0.0		0.0				0.0	30	<0.1
May	43	<0.1	6	<0.1		0.0	2	<0.1		0.0	3	<0.1	7	<0.1	1	<0.1		0.0			4	<0.1	66	<0.1
June	1	<0.1		0.0	17	<0.1	8	<0.1				0.0		0.0		0.0		0.0			3	<0.1	29	<0.1
July		0.0		0.0	21	<0.1	64	<0.1										0.0				0.0	85	<0.1
August				0.0		0.0	16	<0.1														0.0	16	<0.1
September							2	2.4														0.0	2	2.3
Total	61	<0.1	13	<0.1	38	<0.1	92	<0.1		0.0	9	<0.1	7	<0.1	1	<0.1		0.0			7	<0.1	228	<0.1
	74		<0.1		130		<0.1				16		<0.1		1		<0.1		7		<0.1			

Table 19. Monthly and Total Sample Mortality, 2024 Season

Month	Yearling Chinook				Subyearling Chinook						Steelhead				Coho				Sockeye				Total	
	Clip		Unclip		Clip		Unclip		Fry		Clip		Unclip		Clip		Unclip		Clip		Unclip			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
April	7	<0.1	6	0.6						0.0	2	1.4		0.0		0.0		0.0				0.0	15	<0.1
May	31	0.9	4	0.5		0.0	1	<0.1		0.0	1	<0.1	6	0.7	1	0.9		0.0			4	<0.1	48	0.6
June		0.0		0.0	8	0.8	7	0.9				0.0		0.0		0.0		0.0			3	4.2	18	0.9
July		0.0			9	4.4	25	2.0										0.0				0.0	34	2.3
August				0.0		0.0	7	0.6														0.0	7	0.6
September							2	9.5														0.0	2	9.1
Total	38	0.6	10	0.6	17	1.2	42	1.1		0.0	3	<0.1	6	1.7	1	0.5		0.0			7	<0.1	124	0.7
	48		0.6		59		1.1				9		<0.1		1		<0.1		7		<0.1			

Table 20. Weekly Sample Mortality in Percentages and Actual Count of Sample Mortality, 2024 Compared to Past 4-Year Average, 2020-2023

Weekly Sample Mortality in Percentages and Actual Count of Sample Mortality																	
Week Ending Date	Current YR	Yearling Chinook		Subyearling Chinook		Clipped Steelhead		Unclipped Steelhead		Coho		Clipped Sockeye		Unclipped Sockeye		Total	
Week Number	4 YR AVG	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
4-Apr	2024	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3
1	AVG	5	0.8	0	0.0	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0	6	0.6
11-Apr	2024	4	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.2
2	AVG	3	0.5	0	0.0	0	0.1	0	1.3	0	0.0	0	0.0	0	0.0	4	0.5
18-Apr	2024	2	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.4
3	AVG	1	0.1	0	0.0	0	0.0	1	0.9	1	0.2	0	0.0	0	0.0	2	0.2
25-Apr	2024	3	0.3	0	0.0	2	0.7	0	0.0	0	0.0	0	0.0	0	0.0	5	0.3
4	AVG	5	0.7	0	0.0	2	0.7	0	0.0	0	0.0	0	0.0	0	0.4	7	0.6
2-May	2024	4	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.4
5	AVG	3	0.5	0	0.0	1	0.4	0	0.3	1	0.4	0	0.0	1	0.7	6	0.5
9-May	2024	15	0.5	0	0.0	1	0.2	2	3.1	1	1.1	0	0.0	1	1.0	20	0.5
6	AVG	5	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7	6	0.7
16-May	2024	7	1.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	0.9
7	AVG	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	3	0.4
23-May	2024	5	1.0	0	0.0	0	0.0	2	5.1	0	0.0	0	0.0	2	0.3	9	0.6
8	AVG	3	1.1	1	0.7	0	0.4	0	0.0	0	0.3	0	0.0	1	0.5	6	0.8
30-May	2024	3	2.6	0	0.0	0	0.0	2	4.8	0	0.0	0	0.0	0	0.0	5	0.4
9	AVG	2	5.2	1	0.1	0	0.0	0	0.0	1	0.3	0	0.0	0	0.1	4	0.8
6-Jun	2024	4	7.4	3	0.5	0	0.0	0	0.0	0	0.0	0	0.0	2	1.0	9	0.9
10	AVG	1	4.5	4	0.6	0	0.0	0	1.2	1	1.0	0	0.0	0	0.0	6	0.8
13-Jun	2024	0	0.0	2	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.6
11	AVG	0	0.0	3	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.3

Weekly Sample Mortality in Percentages and Actual Count of Sample Mortality																
Week Ending Date	Current YR	Yearling Chinook		Subyearling Chinook		Clipped Steelhead		Unclipped Steelhead		Coho		Clipped Sockeye		Unclipped Sockeye		Total	
Week Number	4 YR AVG	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
20-Jun	2024	0	0.0	3	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.7
12	AVG	1	14.6	3	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.4
27-Jun	2024	0	0.0	5	0.9	0	0.0	0	0.0	0	0.0	0	0.0	1	25.0	6	1.1
13	AVG	0	0.0	5	0.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	0.7
4-Jul	2024	0	0.0	11	2.6	0	0.0	0	0.0	0	0.0	0	0.0	1	50.0	12	2.8
14	AVG	1	25.0	9	1.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	1.1
11-Jul	2024	0	0.0	5	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	2.3
15	AVG	0	0.0	11	2.0	0	0.0	0	0.0	0	0.0	0	0.0	0	8.3	12	2.1
18-Jul	2024	0	0.0	17	6.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	17	6.4
16	AVG	0	0.0	5	1.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	1.5
25-Jul	2024	0	0.0	1	1.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.2
17	AVG	0	0.0	6	1.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	1.0
1-Aug	2024	0	0.0	6	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	0.8
18	AVG	0	0.0	5	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	0.8
8-Aug	2024	0	0.0	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.2
19	AVG	0	0.0	3	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.9
15-Aug	2024	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3
20	AVG	0	0.0	11	1.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	11	1.8
22-Aug	2024	0	0.0	1	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.9
21	AVG	0	0.0	7	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	2.3
29-Aug	2024	0	0.0	1	2.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.9
22	AVG	0	0.0	2	2.3	0	0.0	0	25.0	0	0.0	0	0.0	0	0.0	2	2.8
5-Sep	2024	0	0.0	1	5.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	5.3

Weekly Sample Mortality in Percentages and Actual Count of Sample Mortality																	
Week Ending Date	**Current YR**	**Yearling Chinook**		**Subyearling Chinook**		**Clipped Steelhead**		**Unclipped Steelhead**		**Coho**		**Clipped Sockeye**		**Unclipped Sockeye**		**Total**	
Week Number	**4 YR AVG**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**
23	AVG	0	0.0	2	3.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	3.0
12-Sep	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
24	AVG	0	0.0	0	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.3
19-Sep	2024	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	50.0
25	AVG	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
26-Sep	2024	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
26	AVG	0	0.0	0	3.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	3.1

Juvenile Research

Gas Bubble Trauma Monitoring

PSMFC conducted gas bubble trauma (GBT) examinations as part of the Smolt Monitoring Program from April 11 to August 1. Examinations were done twice per week up to July 18 and once per week for the remaining 3 weeks. A combination of up to 100 juvenile Chinook salmon and steelhead were collected from the separator and inspected for GBT.

In 2024, 2,810 smolts and 11 miscellaneous fish (shad) were examined for GBT. Signs of GBT were seen in 11 smolts: 1 clipped yearling Chinook salmon and 4 clipped and 6 unclipped subyearling Chinook salmon. Table 21 summarizes GBT for the year.

Table 21 Gas Bubble Trauma Monitoring, 2024

ANNUAL	Yearling Chinook		Subyearling Chinook		Steelhead		Clip Type Totals		Misc Fish	Annual Total
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip		
Collected	857	219	522	879	255	78	1,634	1,176	11	2821
GBT Signs	1	0	0	0	0	0	1	0	0	1

Pacific Northwest National Laboratory Survivability Study

PNNL took a total of 2,144 smolts and 306 macropthalmia lamprey for a survivability study to be done at MCN. The fish were taken on sample days from April 13 to June 12. There were no fish mortalities of the fish taken during the time taken. The fish were attached with an acoustic passive integrated transponder (PIT) tag and released back upstream.

Table 22 Pacific Northwest National Laboratory Survivability Study Take Record

Season	Yearling Chinook		Steelhead		Lamprey	Total
	Clip	Unclip	Clip	Unclip		
Collected	850	206	926	162	306	2,450

Facility Operations and Maintenance

Debris/Trash-racks

Extended Submerged Bar Screens

Bypass System

Distribution/Sampling System

[To be provided by USACE]

Recommendations for Next Year

Operations

Facility Modifications

[To be provided by USACE]