CENWW-ODO GRIFFITH February 2024

MEMORANDUM THRU:
Scott Green, Operations Project Manager, Lower Monumental Dam

FOR Chief, Operations Division
ATTN: Christopher Peery and Tiffany Stoeckig-Dixon

SUBJECT: Submission of 2023 Juvenile Fish Collection and Bypass Report, Lower Monumental Dam Juvenile Fish Facility.

1. Enclosed find the 2023 Juvenile Fish Collection and Bypass Report for Lower Monumental Dam as requested.

2. If you have any questions contact Denise Griffith at Lower Monumental Dam, (509) 282-7211.

DENISE S. GRIFFITH
Supervisory Fisheries Biologist, Lower Monumental Dam

Enclosure

2023 JUVENILE COLLECTION AND BYPASS REPORT
LOWER MONUMENTAL PROJECT JUVENILE FISH FACILITY

February 2024

United States Army Corps of Engineers
Lower Monumental Lock and Dam
5520 Devils Canyon Road
Kahlotus, Washington 99335

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LIST OF ACRONYMS

BiOp – Biological Opinion for Operations
BPA – Bonneville Power Administration
CFS – Cubic feet per second
FCRPS – Federal Columbia River Power System
FPC – Fish Passage Center
FPP – Fish Passage Plan
GBT – gas bubble trauma
HSS – hydraulic steel structure
JBS – Juvenile Bypass System
JCC – Juvenile Collection Channel
JFF – Juvenile Fish Facility
JSATS – Juvenile Salmon Acoustic Telemetry System
KCFS – kilo cubic feet per second
LMN – Lower Monumental Lock and Dam
LWG – Lower Granite Lock and Dam
MW – megawatt
OOS – Out of service
PIT – Passive Integrated Transponder
PDS – Primary dewatering structure
PNNL – Pacific Northwest National Laboratory
PSMFC – Pacific States Marine Fisheries Commission
STS – Submersible traveling screens
RCC – Reservoir Control Center
RSW – Removable spill weir
USACE – United States Army Corps of Engineers
USDA-WS – United States Department of Agriculture-Wildlife Services
VBS – vertical barrier screen

SUMMARY

Juvenile fish transportation and bypass operations occurred at Lower Monumental Dam (LMN) Juvenile Fish Facility (JFF) in 2023. Submersible traveling screens (STSs) for all operating units were installed between February 21 and February 23. The Juvenile Collection Channel JCC and primary dewatering structure (PDS) were watered up on February 21. The JFF and wetlab were fully watered up on February 28. Fish collection for condition sampling began at 0700 hours on March 1 and continued until 0700 hours on October 1. Sampling occurred at 0700 until April 23, when a partial sample occurred at 1300, from a collection period of 0700 to 1300, to transition to every-day sampling on a 1300 to 1300 schedule for transport season (April 24 to June 20). Collection/sampling was suspended due to high river temperatures from July 27 through August 7, and then August 18 through 22.

Fish were transported by barge from April 24 through June 20. Barge loading at LMN occurred without any issues during the 2023 transport season, except for May 4, 5 and 6, when all collected fish were bypassed due to the transport barge already being full of fish from upriver sites, Little Goose and Lower Granite dams. No truck transport occurred at LMN in 2023.

Total smolt collection in the 2023 season was 2,113,966. This includes expanded numbers of those sampled during pre-transport. Of the fish collected in the 2023 season, 1,629,520 were barged, and 483,077 were bypassed. This season's total collection by species group included 984,722 clipped yearling Chinook salmon, 186,615 unclipped yearling Chinook salmon, 45,882 clipped subyearling Chinook salmon, 106,831 unclipped subyearling Chinook salmon, 585,467 clipped steelhead, 174,945 unclipped steelhead, 15,404 clipped sockeye/kokanee salmon, 1,095 unclipped sockeye/kokanee salmon, and 13,005 combined clipped/unclipped coho salmon.

Oregon Department of Fish and Wildlife (ODFW) technicians examined 1,262 fish for gas bubble trauma (GBT) in 2023. Examinations were conducted once a week from April 11 through August 11.

FACILITY INTRODUCTION AND DESCRIPTION

Lower Monumental Dam is located at river mile 41.6 on the Snake River. The dam is located at the head of Lake Sacajawea, the reservoir created by Lower Monumental Dam. Lower Monumental has six 135,000-kilowatt turbine units. To bypass the turbines, the juvenile system begins with trash racks, submersible traveling screens (STS) and vertical barrier screens (VBS). When fish enter the turbines' intake, they are diverted into the gatewell slots by the STSs. Each unit has three gatewell slots. Each gatewell slot has two orifices where lights are directed at each open orifice to enhance fish movement into the collection channel. The fish pass through these twelve-inch orifices to the juvenile collection channel which terminates at the PDS where all but 30 cubic feet second (cfs) flow is removed. The remaining 30 cfs flow and fish are routed through the transport flume to the separator. Upon reaching the separator, adult and non-target adult fish are released to the river and juvenile fish pass below the separator bars and enter the distribution system. The full distribution system includes transport flumes, Passive Integrated Transponder (PIT) tag bypass, sampling facilities, holding facilities, and barge and truck loading capabilities.

Downstream of the separator in the A and B flumes are the PIT tag bypass. The A and B sides each have a set of sample and PIT tag systems. Inside the JFF building is the wet lab where the fish condition sample occurs.

Finally, Lower Monumental Dam has 8 spillbays with a removable spillway weir (RSW) in spillbay 8. The RSW was installed to provide a surface passage rout and improve conditions for out-migrating juveniles.

FACIILTY MODIFICATION/MAINTENANCE AND IMPROVEMENTS

Maintenance and improvements for the 2023 year which are made to enhance the system performance over the previous seasons include installing a new breaker box on January 11 for the fire protection system and repairing fish flumes around the JCC. Once all the flumes were power washed, all flume leaks were repaired in October by removing old silicone and replacing new silicone where the old gasket material had decomposed.

River Conditions

During the 2023 season, the average daily river flow did not exceed 173.5 thousand cubic feet per second (kcfs) (Figure 1). The average flow for the season was 52.3 kcfs, with the highest daily average flow for the season of 173.5 kcfs on June 12, and the lowest daily average flow for the season occurring on March 1 with a flow of 16.3 kcfs. Spring spill mandated by the National Oceanic and Atmospheric Administration Biological Opinion for Operation of the Federal Columbia River Power System (BiOp) occurred for 79 days from April 3 through midnight on June 20, with a maximum daily average spill of 98.5 kcfs on May 23. The RSW was put into operation for spring steelhead migration on March 1 to March 31 and spring spill at 0100 hours on April 3, following the initiation of BiOp-mandated spill, and was taken out of service (OOS) for the season on August 4, due to high river temperatures with low river flows. Summer spill ended at 2359 hours on August 31. The 2023 river flow and spill averages were lower than the 5-year average in early spring but surpassed the 5-year average in late spring. Summer spill was higher than the 5-year average. Average monthly flow and spill for the 2018 to 2023 collection seasons are provided in Table 1.

Table 1. Comparison of average monthly flow and spill at Lower Monumental Dam, 2019-2023 and the 5-year average.

Flow (kcfs)						
Month	**2019**	**2020**	**2021**	**2022**	**2023**	**2019–2023 Avg**
March	--	--	--	--	26.6	26.6
April	115.8	53.5	51	42.2	53.1	63.12
May	62.6	103.7	68.9	84	132	90.24
June	87.8	92.9	52.7	132.4	69.8	87.12
July	37.7	47.3	26.9	44.6	36.9	38.68
August	26.8	26.8	22.9	28.5	26.4	26.28
September	24.4	22.8	18.9	20	22.9	21.8
Spill (kcfs)						
Month	**2019**	**2020**	**2021**	**2022**	**2023**	**2019–2023 Avg**
March	--	--	--	--	0.6	0.6
April	41.3	35.9	33.7	24.2	36.1	34.24
May	38.3	71.7	47.9	55.2	69	56.42
June	36.4	54.9	33.1	62.2	36.4	44.6
July	16.8	17.4	13.4	17	17.1	16.34
August	13.5	11.2	9.4	11.7	11.1	11.38
September	0.2	0.2	0.2	0.8	0.8	0.44

--Data not available for the month of March during these years

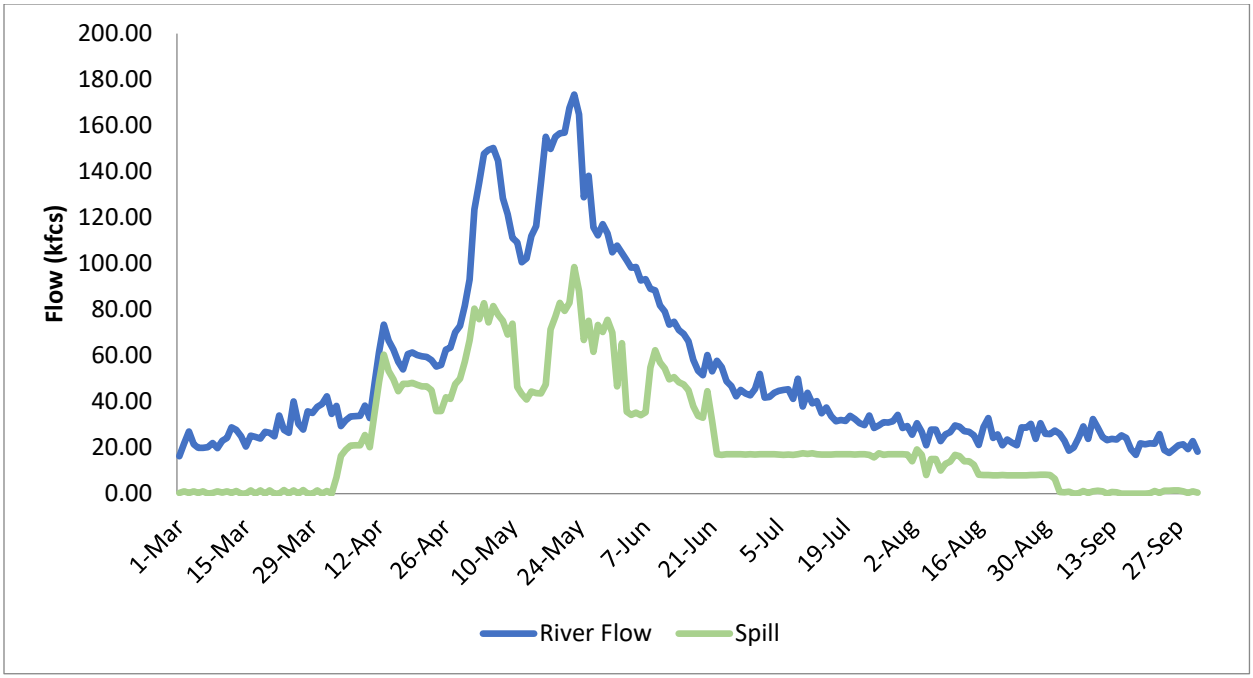

Figure 1. Comparison of daily powerhouse flow and spill at Lower Monumental Dam, 2023.

River Temperature

River temperature is measured daily in the JFF wetlab freshwater supply at 1300 hours during barging season, and at 0700 hours during periods of bypass. Temperatures observed in the wetlab were higher than the 5-year average in all months except April for years that were comparable (Table 2). River temperature averaged 61.0°F for the 2023 season and ranged from the low of 38.0°F on March 2 and March 6, to the high of 70.5°F recorded on August 1.

Table 2. Average monthly river temperatures (°F), 2019-2023 and 5-year average.

Month	2019	2020	2021	2022	2023	2019–2023 Avg
March	--	--	--	--	40.4	40.4
April	49.3	49.9	49.4	48.6	48	49.0
May	54.8	53.4	55	52.3	54.8	54.1
June	61.6	58.9	61.5	55.9	62.6	60.1
July	67.1	65.8	69.6	66.6	68.6	67.5
August	69.1	68.8	69.9	69.4	69.8	69.4
September	68	66.4	66.4	67.7	67.1	67.1

--Data not available for the month of March during these years

JUVENILE BYPASS

Migration, Collection and Transportation of Juvenile Salmonids

Collection

Pre-transport primary bypass occurred from 0700 hours April 1 through 0700 hours April 23. Fish collection for barge transportation began at 0700 hours on April 23 and continued until 0100 hours July 5. An estimated 2,134,966 juvenile salmonids were collected in 2023 (Table 3). Within each species group, the number collected, and percent of the total collection was 984,722 clipped yearling Chinook salmon (46.6%), 186,615 unclipped yearling Chinook salmon (8.8%), 45,882 clipped subyearling Chinook salmon (2.2%), 106,831 unclipped subyearling Chinook salmon (5.1%), 585,467 clipped steelhead (27.7%), 174,945 unclipped steelhead (8.3%), 15,404 clipped sockeye salmon (0.7%), 1,095 unclipped sockeye/kokanee salmon (<0.1%), and 12,775 coho salmon (0.6%). Post-season bypass occurred from October 1 through December 15.

By May 7, 53.2% of the total yearly collection for 2023 had arrived. The percent of the total collection arriving by the end of June and the end of July was 99.3% and 99.9%, respectively. Juvenile salmonids passing through the LMN JFF in August and September contributed just 0.007% of the 2023 season collection total and consisted primarily of unclipped subyearling Chinook salmon.

In 2023, the peak daily collection total and date for each species group were 112,800 clipped yearling Chinook salmon (May 5), 16,800 unclipped yearling Chinook salmon (May 6), 3,203 clipped subyearling Chinook salmon (May 17), 7,800 unclipped subyearling Chinook salmon (May 13), 96,525 clipped steelhead (May 4), 17,600 unclipped steelhead (May 5), 5,400 clipped sockeye/kokanee salmon (May 16), 400 unclipped sockeye/kokanee salmon (May 14), and 2,200 coho salmon (May 22). Total daily collection in 2023 peaked at 223,600 smolts on May 5. Peak collection date and daily collection total by species group are listed in Table 4 and shown in Figure 2.

Table 3. Annual collection, bypass, and transport at Lower Monumental Dam, 2019-2023.

Year	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/Unclip	
Collection										
2019	886,572	289,846	80,401	142,992	1,330,906	324,527	40,875	3,233	30,700	3,130,052
2020	378,434	97,869	53,739	113,590	195,230	57,550	8,145	214	18,451	923,222
2021	104,155	17,085	27,414	56,418	68,200	22,481	2,042	1,564	7,488	306,847
2022	667,322	119,882	103,561	131,483	366,940	131,149	17,045	1250	23,040	1,561,672
2023	984,722	186,615	45,882	106,831	585,467	174,945	15,404	1,095	13,005	2,113,966
5-Yr Avg	604,241	142,259	62,199	110,263	509,349	142,130	16,702	1,471	18,537	1,607,152
Bypass										
2019	222,211	131,218	886	4,139	543,987	86,555	0	128	3424	992,548
2020	4,030	1,877	26085	65890	2,799	739	0	10	287	101,717
2021	20,522	1,096	17923	41,511	13,984	1,791	8	72	598	97,505
2022	18,559	9,378	71,250	92,170	23,492	10367	295	150	7290	232,951
2023	236,774	39,374	6,181	25,001	139,984	35,635	0	1	127	483,077
5-Yr Avg	100,419	36,589	24,465	45,742	144,849	27,017	61	72	2,345	381,560
Truck										
2019	0	0	13	59	2	0	0	0	0	74
2020	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0	0	0
5-Yr Avg	0	0	3	12	0	0	0	0	0	15
Barge										
2019	663,488	158,459	79,350	138,693	786,712	237,927	40,873	3,104	27,272	2,135,878
2020	374,299	95,939	27,619	47,643	192,349	56,792	8,142	204	18,157	821,144
2021	83,586	15,976	9,482	14,887	54,167	20,679	2,029	1,490	6,885	209,181
2022	648,440	110,397	32,297	39,295	343,343	120,754	16,749	1091	15,747	1,328,113
2023	746,835	147,019	39,632	82,183	445,224	139,261	15,398	1,093	12,875	1,629,520
5-Yr Avg	503,330	105,558	37,676	64,540	364,359	115,083	16,638	1,396	16,187	1,224,767
Total Transported										
2019	663,488	158,459	79,363	138,752	786,714	237,927	40,873	3,104	27,272	2,135,952
2020	374,299	95,939	27,619	47,643	192,349	56,792	8,142	204	18,157	821,144
2021	83,586	15,976	9,482	14,887	54,167	20,679	2,029	1,490	6,885	209,181
2022	648,440	110,397	32,297	39,295	343,343	120,754	16,749	1091	15,747	1,328,113
2023	746,835	147,019	39,632	82,183	445,224	139,261	15,398	1,093	12,875	1,629,520
5-Yr Avg	503,330	105,558	37,679	64,552	364,359	115,083	16,638	1,396	16,187	1,224,782

Table 4. Annual peak collection dates at Lower Monumental Dam, 2019-2023.

Peak Collection Dates											
Year	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total	Juvenile
	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip	Unclip	Clip/Unclip	Smolt	Lamprey
2019	24-Apr 51,000	25-Mar 17,800	31-May 7,700	31-May 23,100	24-Apr 114,600	25-Apr 28,818	20-May 14,000	19-May 1,000	18-May 1,800	24-Apr 205,200	-- --
2020	May 17 31,200	May 23 5,300	Jul 03 3,100	Jul 03 6,660	Apr 26 25,300	May 08 5,400	May 17 1,600	May 19 100	May 22 1,700	Apr 26 46,600	-- --
2021	9-May 14,050	9-May 2,050	30-Jun 4,482	30-Jun 10,415	22-Apr 5,257	9-May 1,950	14-May 320	2-May 220	8-May 725	9-May 21,700	-- --
2022	9-May 74,400	8-May 9,400	10-Jun 7,200	9-Jun 8,800	9-May 39,600	18-May 13,600	19-May 6400	16-May 400	6-Jun 1650	9-May 127,200	7-Jun 479
2023	5-May 112,800	6-May 16,800	17-May 3,203	13-May 6,803	4-May 96,525	5-May 17,600	16-May 5,400	14-May 400	22-May 2,200	5-May 223,600	12-May 336

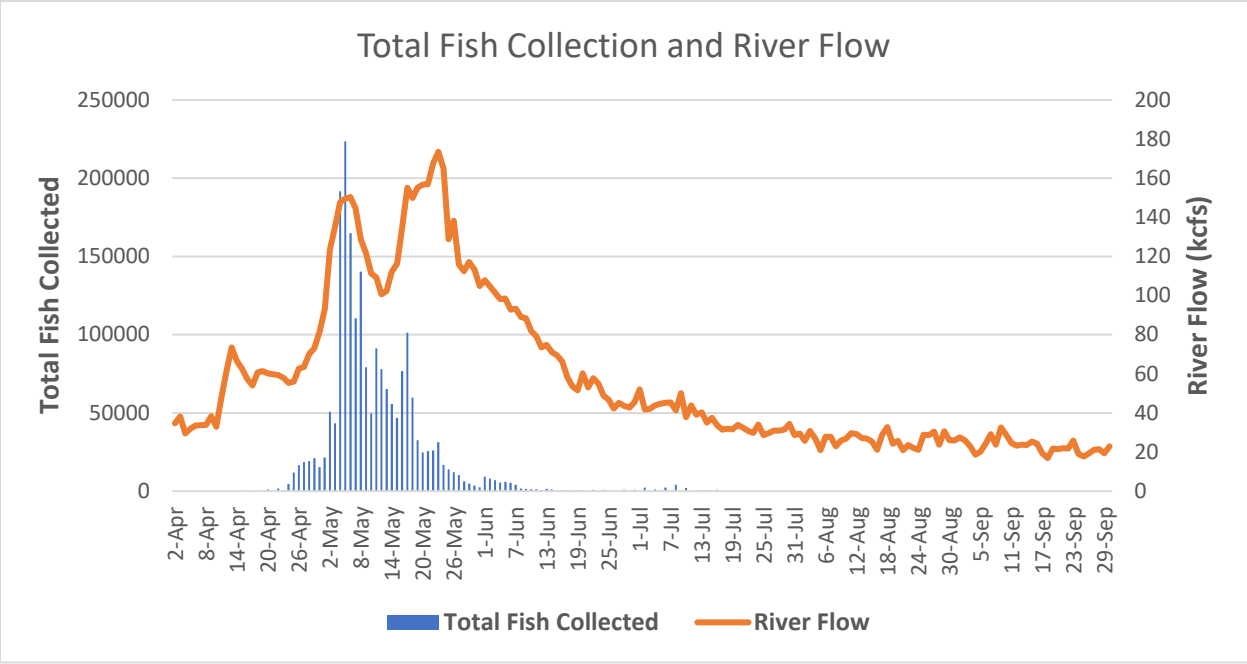

Figure 2. Daily juvenile salmonid collection, all species combined, versus daily average river flow at Lower Monumental Dam, 2023.

Sampling

Sampling is defined as diverting and segregating groups of fish in a consistent fashion so data collected from those segregated groups will accurately represent all fish collected. Fish were sampled at LMN to monitor fish condition, ensure the collection system is operating correctly, and to train personnel on facility operation and sampling protocols. This type of sampling is termed "sampling for condition". EAS is the contractor conducting condition sampling. ESA staff aim to condition sample 100 individuals of each species present in that day's sample in accordance with the Fish Passage Center (FPC) condition sampling protocols. Individuals present in the sample that are not part of the condition sample are enumerated and examined for descaling only then routed to transport areas or bypassed, depending on which mode the JFF is operating in.

Collection for fish condition sampling began at 0700 hours on March 1 and continued until 0700 hours on October 1. Sampling occurred at 0700 until April 23, when a partial sample occurred at 1300, from a collection period of 0700 to 1300 to transition to every-day sampling on a 1300 to 1300 schedule for transport season (April 24 to June 20). Daily fish sampling concluded on June 20, at which point barging had ended and sampling was moved to an every-other-day schedule. Collection/sampling was suspended twice due to high river temperatures during the 2023 season. First, July 27 through August 7, and then August 18 through 22.

Total sampling includes both "condition sampling" as well as "non-condition sampling," which was conducted during the 2023 operating year. A total of 22,842 fish (1.1% of the total collection) were sampled in 2023. Within each species group, the number and percent sampled of those collected in that group was 6,609 clipped yearling Chinook salmon (0.7%), 2,433 unclipped yearling Chinook salmon (1.3%), 2,671 clipped subyearling Chinook salmon (5.8%), 4,293 unclipped subyearling Chinook salmon (4.0%), 4,979 clipped steelhead (0.9%), 1,486 unclipped steelhead (0.8%), 86 clipped sockeye salmon (0.6%), 22 unclipped sockeye/kokanee salmon (1.8%), and 263 coho salmon (2.1%) (Table 5).

Table 5. Annual percentage sampled of each juvenile salmonid species group at Lower Monumental Dam, 2019-2023.

Year	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/Unclip	
2019	0.7	1.0	5.5	5.5	0.6	0.6	0.6	1.1	1.3	1.3
2020	1.3	2.4	8.9	9.8	1.9	1.7	0.8	1.9	1.9	3.1
2021	4.3	9.2	13.5	11.8	4.4	5.2	4.9	5.5	7.5	6.9
2022	0.7	1.1	2.4	3.1	1.0	0.9	0.3	1.4	1.4	1.1
2023	0.7	1.3	5.8	4.0	0.9	0.8	0.6	1.8	2.1	1.1

Average weekly sample rates can be found in Table 6 and ranged from 0.3% to 100.00%.

Table 6. Weekly average sample rates in percent and sample totals at Lower Monumental Dam, 2023.

Week Ending	Weekly Rate	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/ Kokanee		Coho	
	(%)	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip /Unclip	Totals*
2-Mar	100.0%	4	179	0	0	0	0	0	1	0	184
9-Mar	50.0%	0	19	0	0	0	1	0	0	0	20
16-Mar	50.0%	0	12	0	0	0	1	0	0	0	13
23-Mar	50.0%	0	31	0	0	0	3	0	0	0	34
30-Mar	50.0%	0	16	0	0	0	2	0	0	0	18
6-Apr	50.0%	60	5	0	0	0	2	0	0	0	67
13-Apr	50.0%	361	7	0	3	111	5	0	0	0	487
20-Apr	50.0%	462	138	2	21	279	48	0	0	0	950
27-Apr	13.5%	1,339	658	2	6	1,221	291	0	1	0	3,518
4-May	0.8%	890	253	0	0	1,409	202	0	2	0	2,756
11-May	0.3%	1,264	193	0	2	497	173	0	0	1	2,130
18-May	0.5%	1,297	190	72	180	402	184	65	2	15	2,407
25-May	1.0%	457	127	70	165	476	200	16	4	40	1,555
1-Jun	4.9%	390	493	172	284	360	228	4	3	70	2,004
8-Jun	3.9%	58	52	367	576	141	90	0	7	38	1,329
15-Jun	14.3%	7	14	524	484	29	24	0	3	30	1,115
22-Jun	23.3%	19	29	188	275	33	24	1	1	53	623
29-Jun	25.0%	0	0	189	295	8	7	0	0	8	507
6-Jul	25.0%	0	0	714	908	9	1	0	0	6	1,638
13-Jul	10.0%	0	0	310	661	2	0	0	0	0	973
20-Jul	17.5%	1	1	43	189	0	0	0	0	0	234
27-Jul	25.0%	0	0	13	124	0	0	0	0	0	137
3-Aug	--	0	0	0	0	0	0	0	0	0	0
10-Aug	50.0%	0	1	0	1	2	0	0	0	0	4
17-Aug	100.0%	0	1	0	15	0	0	0	0	0	16
24-Aug	100.0%	0	0	1	4	0	0	0	0	0	5
31-Aug	100.0%	0	12	0	54	0	0	0	0	0	66
7-Sep	100.0%	0	0	4	29	0	0	0	0	0	33
14-Sep	100.0%	0	1	0	10	0	0	0	0	0	11
21-Sep	100.0%	0	1	0	6	0	0	0	0	0	7
28-Sep	50.0%	0	0	0	1	0	0	0	0	0	1
5-Oct	100.0%	0	0	0	0	0	0	0	0	0	0
Total Sampled		6,609	2,433	2,671	4,293	4,979	1,486	86	22	261	22,842
% of Sample		28.9	10.7	11.7	18.8	21.8	6.5	0.4	0.1	1.1	100.0
% of Collection		0.7	1.3	5.8	4.0	0.9	0.8	0.6	1.8	2.0	1.1

* Daily 24-hour sampling at Lower Monumental Dam began on April 22 this season.
-- No sampling occurred due to warm water temperatures.

Transportation-Barge Loading Operations

An estimated 1,629,520 juvenile salmonids (77.1% of the collection total) were transported from LMN in 2023. All were transported by barge; no fish were trucked in 2023. Within each species

group, the number transported and percent of those collected in each group was 746,835, clipped yearling Chinook salmon (45.8%), 147,019 unclipped yearling Chinook salmon (9.0%), 39,632 clipped subyearling Chinook salmon (2.4%), 82,183 unclipped subyearling Chinook salmon (5.0%), 445,224 clipped steelhead (27.3%), 139,261 unclipped steelhead (8.5%), 15,398 clipped sockeye salmon (0.9%), 1,093 unclipped sockeye/kokanee salmon (0.1%), and 12,875 coho salmon (0.8%) (Table 3).

Fish were transported by barge from April 24 through June 20. Barge loading at LMN occurred without any issues during the 2023 transport season, except for May 4, 5 and 6, when all collected fish were bypassed due to the transport barge already being full from high numbers of fish at upriver sites, Little Goose and Lower Granite dams.

Transportation-Truck Loading Operations

Juvenile fish were scheduled to be transported by truck from August 1 to October 1. Per the 2023 Fish Operations Plan, the Lower Monumental trucking schedule is contingent upon the Technical Management Team approval; the Technical Management Team decision was that no truck transport would take place from Lower Monumental Dam during the 2023 transport season.

Bypass

During the 2023 season, a total of 483,077 fish were bypassed (22.3% of the collection total) (Table 3). Within each species group, the number bypassed and percent of those collected in each group was 236,774 clipped yearling Chinook salmon (49.0%), 39,374 unclipped yearling Chinook (8.2%) 6,181 clipped subyearling Chinook salmon (1.3%), 12,482 unclipped subyearling Chinook salmon (2.6%), 139,984 clipped steelhead (29.0%), 35,635 unclipped steelhead (7.4%), 1 unclipped sockeye salmon (<0.1%), and 127 coho salmon (<0.1%). No clipped sockeye/kokanee salmon were bypassed for the 2023 season. These numbers do not include fish bypassed by the PIT-tag diversion system.

Juvenile salmonids were bypassed rather than transported for the following purposes this season:

1. Condition sampling and secondary bypass occurred (see condition sampling frequency in sampling section).

2. Salmonid fry measuring less than 60 millimeters (mm) were bypassed and not sampled due to smolt monitoring protocol.

3. The PTAGIS database revealed 25,764 PIT-tagged fish of different species groups were bypassed through the PIT-tag system. These fish are not included in the facility bypass total. PIT-tag diversion gates are set to bypass PIT-tagged fish when sample rates are 20% or higher and during sampling intervals when fish are being collected for research to prevent anesthetizing study fish a second time.

4. The fish rearing designation used by PTAGIS is hatchery/wild, not clipped/unclipped;

therefore, the hatchery/wild designation is used to report the PIT-tag numbers in the following section rather than the clipped/unclipped designation used throughout the rest of this report. According to the PTAGIS database, the total of PIT-tagged fish that were detected in the JFF was 53,310. The total by unit group was as follows: 29,205 Chinook salmon (25,405 hatchery, 3,797 wild and 3 of unknown designation), 22,598 steelhead (19,602 hatchery, 2,992 wild and 4 of unknown designation), 1,092 sockeye salmon (1,090 hatchery,1 wild and 1 of unknown designation), 322 coho salmon (320 hatchery and 2 wild), and 83 fish of unknown species. An unknown number of other fish were bypassed incidentally with the PIT-tagged fish as the PIT-tag diversion gates opened and closed to divert the PIT-tagged fish.

Migration, Sampling, and Bypass of Juvenile Lamprey

Pacific lamprey, *Entosphenus tridentatus,* the primary species found at Lower Monumental Dam and are characterized by the presence of three large anterior and two posterior teeth on the oral disc. Pacific lamprey spawn in similar habitats to salmon. Spawning occurs between March and July, depending upon location within their range.

Metamorphosis from the sedentary larvae stage (ammocoetes) to the migrant juvenile stage (macrophthalmia) 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 the macrophthalmia stage that makes up the majority of lamprey in the JFF sample. Sampled data for Pacific lamprey juvenile life stages are presented in Table 7. In addition, the 5-year averages of the total collection, sampled, and fish in the separator are also presented.

Table 7. Pacific lamprey in the sample and separator, and the total collection for both life stages, 2019-2023. These totals are not expanded by the sample rate.

Pacific lamprey (Juvenile)				
Year	**Sample**	**Separator**	**Mortalities**	**Total Collection**
2019	65,843	0	0	65,843
2020	37,361	2	1	37,363
2021	2,930	0	1	2,930
2022	2,863	13	10	2,886
2023	3,552	4	41	3,597
5 YR AVG	22,510	4	11	22,524
Pacific lamprey (Ammocoete)				
Year	**Sample**	**Separator**	**Mortalities**	**Total Collection**
2019	388	0	0	388
2020	1,096	1	0	1,097
2021	22	0	0	22
2022	408	4	18	430
2023	76	0	1	77
5 YR AVG	398	1	4	403

Incidental Species

Non-target fish species that were too large to pass through the separator bars were recorded and bypassed through the adult release pipe at the separator. Those small enough to pass through the separator bars were either sampled and bypassed or held in the raceways and transported with the juvenile salmonids. Fortunately, most incidental fishes generally arrive late in the season when a high percentage of the collection is sampled. At this time, incidental species are removed while working up the sample, therefore avoiding transport. Sample fish from each incidental species were counted and their total numbers were calculated using the sample rate. These numbers were then added with separator counts of the same group to estimate the total collection for each species. The most common incidental species groups for 2023 included the following: juvenile Pacific lamprey macrophthalmia (509,842); juvenile American shad, *Alosa sapidissima* (47,759); larval Pacific lamprey ammocoete (4,161); Siberian prawn, *Exopalaemon modestus* (3,252); walleye, *Sander vitreus* (1,221); rainbow trout, *Oncorhynchus mykiss* (1,085); sculpin, *Cottus* spp. (853); and crappie, *Pomoxis spp.* (400) (Table 8).

The number of juvenile shad, 47,759, in 2023 is roughly half the 82,970 collected in the 2022 operating year. In the 2023 season, 509,842 juvenile Pacific lamprey macrophthalmia were collected, compared to 305,417 in the 2022 season. Pacific lamprey ammocoete numbers decreased from 20,063 in 2022 to 4,161 in 2023. Walleye numbers have stayed mostly the same from the 2022 to the 2023 season. Approximately 1,221 walleye were collected in the 2023 season, while 1,274 were collected in the 2022 season. Yellow perch numbers decreased significantly when compared to the 2022 season. Approximately 1,026 perch were collected in the 2022 season compared to the 91 collected in 2023. Estimated numbers of some groups may also become exaggerated high or low due to the low sample rates at the time of their collection. A summary of incidental fish collection during 2023 sampling efforts is provided in Table 8.

Table 8. Estimated collection of incidental species at Lower Monumental Dam, 2023.

Common Name	Scientific Name	Sample	Separator	Total[1] 2023 Collection
American shad (Adult)	*Alosa sapidissima*	2	77	79
American shad (Juvenile)	*A. sapidissima*	24,108	23,651	47,759
Bullhead (misc.)	*Ameiurus* spp.	4	6	10
Bull Trout	*Salvelinus confluentus*	0	0	0
Channel catfish	*Ictalurus punctatus*	1	3	4
Chiselmouth	*Acrocheilus alutaceus*	0	1	1
Common carp	*Cyprinus carpio*	1	15	16
Crappie	*Pomoxis* spp.	364	36	400
Kokanee	*Oncorhynchus nerka*	14	0	14
Northern Pikeminnow	*Ptychocheilus oregonensis*	0	0	0
Pacific lamprey (Adult)	*Lampetra tridentatus*	62	7	69
Pacific lamprey (Juvenile)	*L. tridentatus*	509,829	13	509,842
Pacific lamprey (Ammocoete)	*L. tridentatus*	4,159	2	4,161
Peamouth	*Mylocheilus caurinus*	10	0	10
O. mykiss other (Rainbow Trout)	*Oncorhynchus mykiss*	950	135	1,085
Sandroller	*Percopsis transmontana*	0	0	0
Sculpin	*Cottus* spp.	852	1	853
Siberian Shrimp/Prawn	*Exopalaemon modestus*	3,203	49	3,252
Largemouth/Smallmouth bass	*Micropterus dolomieu/salmoides*	56	1	57
Sucker (misc.)	*Catostomus* spp.	171	26	197
Whitefish	*Prosopium* spp.	8	1	9
White Sturgeon	*Acipenser transmontanus*	0	4	4
Walleye	*Sander vitreus*	1,126	95	1,221
Yellow perch	*Perca flavescens*	77	14	91
Others	----------	244	3	247
Total		545,241	24,140	569,381

[1]Incidental species collection estimates are based on sampled number of groups expanded by the sample rate plus separator count.

Adult Fallbacks

A total of 510 adult salmonids fell back through the juvenile bypass system and were bypassed from the separator between March 2 and October 1. The total includes 87 adult Chinook salmon, 29 jack Chinook salmon, 135 clipped steelhead, 248 unclipped steelhead, 8 sockeye salmon, and 3 coho salmon (Table 9).

As has been the case in previous years, most adult fallbacks in 2023 were steelhead and most steelhead fallback (72.3%) occurred during the month of May (Table 10). Total monthly adult fallbacks for all salmonid species peaked in May, with 62.0% of all fallbacks being observed during the month of May.

Table 9. Annual totals of adult salmonids released from the separator at Lower Monumental Dam, 2019-2023.

Year	Chinook	Chinook Jack	Steelhead Clipped	Steelhead Unclip	Sockeye	Coho	Total
2019	71	25	246	363	1	0	706
2020	83	44	79	112	21	8	347
2021	46	20	23	49	5	5	148
2022	125	23	153	114	2	1	418
2023	87	29	135	248	8	3	510

Table 10. Monthly totals of adult salmonids released from the separator at Lower Monumental Dam, 2023.

Month	Chinook	Chinook Jack	Steelhead Clipped	Steelhead Unclip	Sockeye	Coho	Total
March	0	0	10	13	0	0	23
April	0	0	9	16	0	0	25
May	24	15	95	182	0	0	316
June	20	6	7	20	0	0	53
July	13	5	1	1	7	0	27
August	9	0	2	6	0	0	17
September	21	3	11	10	1	3	49
Total	87	29	135	248	8	3	510

The condition of adult salmonids was evaluated as the fish were released from the separator. Their condition was predominantly (85.3%) good to fair (Table 11). Condition ratings of the adults examined were as follows: 339 good (66.5%), 96 fair (18.8%), 72 poor (14.1%), and 3 dead (0.6%). All three mortalities were steelhead, with two clipped steelhead mortalities and one unclipped steelhead mortality.

Table 11. Condition of adult salmonids released from the separator at Lower Monumental Dam, 2023.

Condition	Chinook	Chinook Jack	Steelhead Clipped	Steelhead Unclip	Sockeye	Coho	Total
Good	76	28	90	139	4	2	339
Fair	11	1	19	60	4	1	96
Poor	0	0	24	48	0	0	72
Dead	0	0	2	1	0	0	3
Total	87	29	135	248	8	3	510

Separator Efficiency

The separator is designed with bar spacing to allow only smaller smolts—subyearling Chinook and sockeye salmon—to divert to the A-side of the collection facility. Larger smolts—steelhead and yearling Chinook salmon—divert to the B-side through wider spaced bars. Separator efficiency for 2023 by species group was as follows: clipped yearling Chinook salmon (57.3%), unclipped yearling Chinook salmon (51.6%), subyearling Chinook salmon (49.5%), clipped steelhead (55.2%), unclipped steelhead (89.2%), clipped sockeye salmon (73.9%), and unclipped sockeye/kokanee salmon (41.2%) (Table 12).

Table 12. Annual separator efficiency in percent at Lower Monumental Dam, 2019-2023.

Year	Yearling Chinook		Subyearling Chinook	Steelhead		Sockeye	Sockeye/Kokanee
	Clipped	Unclip	Clipped/Unclip	Clipped	Unclip	Clipped	Unclip
	A-side	A-side	A-side	B-side	B-side	A-side	A-side
2019	51.0	47.1	46.5	88.8	69.1	44.3	5.6
2020	71.9	65.1	42.4	44.8	26.9	34.5	56.4
2021	67.6	55.3	29.2	69.0	66.8	60.4	29.9
2022	71.4	57.9	50.1	49.9	76.9	54.6	49.8
2023	57.3	51.6	49.5	55.2	89.2	73.9	41.2

FISH CONDITION

Descaling

Descaling data were collected from all live sample fish (full sample) rather than just a portion (subsample). Full-sample data collection provides a larger sample size and therefore a better representation of fish condition.

The descaling rate for all fish sampled in 2023 was 0.9%. The annual descaling rate by species group were as follows: clipped yearling Chinook salmon (0.4%), unclipped yearling Chinook salmon (0.5%), clipped subyearling Chinook salmon (0.1%), unclipped subyearling Chinook salmon (0.4%), clipped steelhead (1.9%), unclipped steelhead (3.6%), clipped sockeye salmon (0%), unclipped sockeye/kokanee salmon (0%), and coho salmon (0.4%) (Table 13).

Table 13. Annual descaling rates in percent for fish sampled at Lower Monumental Dam, 2019-2023.

Year	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/Unclip	
2019	1.6	1.6	2.7	2.2	2.5	2.9	2.4	0.0	2.2	2.2
2020	1.5	1.6	1.6	1.1	2.5	2.9	2.4	0.0	2.9	1.9
2021	1.0	1.6	1.2	1.4	3.2	3.0	4.1	4.7	3.6	1.7
2022	1.2	1.6	1.4	2.2	2.2	1.7	0.0	0.0	2.3	1.7
2023	0.4	0.5	0.1	0.4	1.9	3.6	0.0	0.0	0.4	0.9
Avg	1.1	1.4	1.4	1.5	2.5	2.8	1.8	0.9	2.2	1.7

In 2023, the highest weekly descaling rate for all species combined was 9.7% for the week ending September 7 (with fish sampled in a week of condition sampling), while no descaling (0.0%) occurred in multiple week blocks early and late in the season (Table 14).

Table 14. Weekly descaling rates in percent for fish sample at Lower Monumental Dam, 2023.

Week Ending	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/ Unclip	
2-Mar	0.0%	0.0%	---	---	0.8%	0.0%	---	---	---	0.38%
9-Mar	---	---	---	---	---	---	---	---	---	0.00%
16-Mar	---	---	---	---	---	---	---	---	---	0.00%
23-Mar	---	---	---	---	---	---	---	---	---	0.00%
30-Mar	---	---	---	---	---	---	---	---	---	0.00%
6-Apr	0.0%	---	---	---	---	---	---	---	---	0.00%
13-Apr	0.0%	0.0%	---	0.0%	0.0%	0.0%	---	---	---	0.00%
20-Apr	0.0%	0.7%	0.0%	0.0%	0.4%	2.1%	---	---	---	0.32%
27-Apr	0.0%	0.2%	0.0%	0.0%	0.3%	0.7%	---	0.0%	---	0.20%
4-May	0.3%	0.5%	---	---	1.0%	4.5%	---	---	0.0%	0.95%
11-May	0.9%	0.5%	---	0.0%	5.3%	8.2%	---	---	0.0%	2.45%
18-May	0.7%	0.5%	0.0%	0.0%	9.5%	9.8%	0.0%	0.0%	0.0%	2.76%
25-May	0.2%	0.0%	0.0%	0.0%	1.5%	1.5%	0.0%	0.0%	0.0%	0.71%
1-Jun	0.5%	0.4%	0.6%	0.4%	1.1%	2.2%	0.0%	0.0%	0.0%	0.75%
8-Jun	0.0%	2.0%	0.3%	0.3%	1.5%	1.1%	---	0.0%	0.0%	0.53%
15-Jun	0.0%	7.1%	0.0%	0.0%	0.0%	4.2%	---	0.0%	3.3%	0.27%
22-Jun	0.0%	0.0%	0.0%	0.4%	0.0%	4.2%	0.0%	0.0%	0.0%	0.32%
29-Jun	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	---	---	0.0%	0.20%
6-Jul	0.0%	1.3%	0.0%	0.7%	0.0%	0.0%	---	---	0.0%	0.43%
13-Jul	---	---	0.0%	0.2%	0.0%	---	---	---	---	0.10%
20-Jul	0.0%	0.0%	0.0%	0.5%	---	---	---	---	---	0.43%
27-Jul	---	---	0.0%	0.0%	---	---	---	---	---	0.00%
3-Aug	---	---	---	---	---	---	---	---	---	0.00%
10-Aug	---	0.0%	---	0.0%	0.0%	---	---	---	---	0.00%
17-Aug	---	0.0%	---	0.0%	---	---	---	---	---	0.00%
24-Aug	---	---	0.0%	0.0%	---	---	---	---	---	0.00%
31-Aug	---	---	0.0%	5.4%	---	---	---	---	---	4.35%
7-Sep	---	---	25.0%	7.4%	---	---	---	---	---	9.68%
14-Sep	---	---	0.0%	0.0%	---	---	---	---	---	0.0%
21-Sep	---	---	0.0%	0.0%	---	---	---	---	---	0.0%
28-Sep	---	---	0.0%	0.0%	---	---	---	---	---	0.0%
5-Oct	---	---	0.0%	0.0%	---	---	---	---	---	0.0%
Total Descaled	25	13	3	16	95	53	--	--	1	206
Total Examined	6,866	2,639	2,364	4,064	4,946	1,480	84	22	261	22,726
% Descaled	0.4	0.5	0.1	0.4	1.9	3.6	0.0	0.0	0.4	0.9

---No fish sampled during this week.

Other Injury and Disease

Injury and disease data were collected from a subsample goal of 100 of the dominant species and not more than 100 each of the non-dominant species. During the 2023 season, this number was exceeded on two sample days. A total of 12,715 fish were examined for condition. The most

common symptoms observed in 2023 were fin injury (413) and fin hemorrhage (252). No injury and disease were observed for coho salmon for 2023.

Blood pooling is defined as the vasodilatation of the capillaries in fins (also referred to as pink fin). It seems to be a symptom of anesthetic use during higher water temperatures and is mostly found on subyearling Chinook salmon. Evidence of blood pooling was found on 0.1% of all fish examined. The incidence of blood pooling by species group was as follows: yearling Chinook salmon 0.1% and subyearling Chinook salmon 0.2%. Blood pooling was not found on steelhead or sockeye/kokanee salmon.

Fin injuries were found on 3.2% of all fish examined. The incidence of fin injury was as follows: yearling Chinook salmon 4.7%, subyearling Chinook salmon 1.6%, steelhead 3.2%, and sockeye/kokanee salmon 15.1%. Fin hemorrhaging often coincided with split fin injuries.

Fin hemorrhaging is the discharge of blood outside the fin tissue. Fin hemorrhaging is a sign of trauma and was found on 2.0% of all fish examined for injuries. The incidence of fin hemorrhaging was as follows: yearling Chinook salmon 1.5%, subyearling Chinook salmon 4.2%, and steelhead 0.1%. No fin hemorrhaging was observed on sockeye/kokanee salmon.

Bird marks were observed on 1.3% of all fish examined. The incidence of bird marks was as follows: yearling Chinook salmon 0.8%, subyearling Chinook salmon 0.6%, steelhead 2.6%, and sockeye/kokanee salmon 0.9%. Bird marks observations were similar to fish examined in 2022.

Predatory fish marks were found on 0.2% of all fish examined. The incidence of fish marks was as follows: yearling Chinook salmon 0.2%, subyearling Chinook salmon 0.2%, and steelhead 0.2%. No predatory fish marks were observed on sockeye/kokanee salmon.

Fungus was found on 0.3% of all fish examined. Fungus on fish was often found concurrently with body injuries. The incidence of fungus was as follows: yearling Chinook salmon 0.4%, subyearling Chinook salmon <0.1%, steelhead 0.5%, and sockeye/kokanee salmon 1.9%.

Columnaris was observed in 2023, but in lower rates than in 2022. It occurs most frequently in subyearling Chinook salmon but has been seen on coho salmon and steelhead as well. Typically, it is found on the fish during the warmer water conditions of July, August, and September. Columnaris can be recognized by the presence of yellowish lesions on the belly, as well as some damage to the gills, pelvic fins, snout, and caudal fins. It has also been found in the dorsal region. This year, sockeye salmon showed the highest incidence of Columnaris-affected fish (1.0%).

Mortality

Annual facility mortality for all groups combined was 0.08% in 2023 (Table 15) and totaled 1,773 fish. Within each species group, the number of facility mortalities and percent of those collected in that group was 1,114 clipped yearling Chinook salmon (0.11%), 222 unclipped yearling Chinook salmon (0.12%), 69 clipped subyearling Chinook salmon (0.15%), 50 unclipped subyearling Chinook salmon (0.05%), 259 clipped steelhead (0.04%), 49 unclipped

steelhead (0.03%), 6 clipped sockeye/kokanee salmon (0.04%), 1 unclipped sockeye/kokanee salmon (0.08%), and 3 coho salmon (0.02%). In 2023, the highest weekly rate of mortality was 6.06% on the week ending September 7 and the lowest rate of mortality was 0%, occurring on multiple weeks (Table 16).

Table 15. Annual facility mortality in percent at Lower Monumental Dam, 2019-2023.

Year	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/Unclip	
2019	0.1%	--	0.3%	0.4%	0.1%	0.1%	0.0%	0.0%	0.7%	0.2%
2020	0.03%	0.05%	0.07%	0.05%	0.04%	0.03%	0.04%	--	0.04%	0.03%
2021	0.05%	0.08%	0.03%	0.04%	0.07%	0.05%	0.24%	0.13%	0.07%	0.05%
2022	0.05%	0.09%	0.01%	0.01%	0.03%	0.02%	0.01%	0.80%	0.01%	0.04%
2023	0.11%	0.12%	0.15%	0.05%	0.04%	0.03%	0.04%	0.08%	0.02%	0.08%

Annual sample mortality for all groups combined in 2023 was 0.5% and totaled 112 fish. The number of sample mortalities and mortality rate by species group was 36 clipped yearling Chinook salmon (0.5%), 3 unclipped yearling Chinook salmon (0.1%), 14 clipped subyearling Chinook salmon (0.5%), 16 unclipped subyearling Chinook salmon (0.4%), 33 clipped steelhead (0.7%), 6 unclipped steelhead (0.4%), 2 clipped sockeye kokanee (2.3%), and 2 coho salmon (0.8%) (Table 17). There were no unclipped sockeye/kokanee salmon sample tank mortalities for the season.

Table 16. Weekly facility mortality in percent at Lower Monumental Dam, 2023.

Week Ending	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/Unclip	
2-Mar	25.00%	0.56%	---	---	0.00%	0.00%	---	0.00%	---	0.00%
9-Mar	---	0.00%	---	---	---	0.00%	---	---	---	0.00%
16-Mar	---	0.00%	---	0.00%	---	0.00%	---	---	---	0.00%
23-Mar	---	0.00%	---	0.00%	---	0.00%	---	---	---	0.00%
30-Mar	---	0.00%	---	0.00%	---	0.00%	---	---	---	0.00%
6-Apr	0.00%	0.00%	---	0.00%	0.00%	0.00%	---	---	---	0.00%
13-Apr	0.27%	0.00%	---	0.00%	0.00%	0.00%	---	---	---	0.20%
20-Apr	0.10%	0.00%	0.00%	0.00%	0.17%	0.00%	---	---	---	0.10%
27-Apr	0.27%	0.09%	0.00%	0.33%	0.09%	0.11%	---	0.00%	---	0.15%
4-May	1.01%	0.61%	---	0.00%	0.06%	0.06%	---	---	0.00%	0.35%
11-May	0.05%	0.05%	---	0.00%	0.02%	0.01%	---	---	0.00%	0.04%
18-May	0.09%	0.09%	0.03%	0.02%	0.03%	0.01%	0.04%	0.00%	0.00%	0.07%
25-May	0.18%	0.09%	0.13%	0.04%	0.05%	0.02%	0.05%	0.00%	0.00%	0.09%
1-Jun	0.04%	0.06%	0.24%	0.08%	0.09%	0.05%	0.00%	0.00%	0.00%	0.07%
8-Jun	2.16%	2.61%	0.34%	0.09%	2.00%	0.59%	---	0.41%	0.11%	0.57%
15-Jun	0.00%	0.00%	0.06%	0.06%	0.51%	0.00%	---	0.00%	0.00%	0.06%
22-Jun	0.00%	0.00%	0.00%	0.08%	0.71%	0.00%	0.00%	0.00%	0.00%	0.07%
29-Jun	---	---	0.13%	0.17%	0.00%	0.00%	---	---	3.13%	0.20%
6-Jul	---	---	0.04%	0.00%	0.00%	0.00%	---	---	0.00%	0.02%
13-Jul	---	---	0.32%	0.00%	0.00%	---	---	---	---	0.09%
20-Jul	0.00%	0.00%	0.32%	0.08%	---	---	---	---	---	0.13%
27-Jul	---	---	0.00%	0.00%	---	---	---	---	---	0.00%
6-Apr	0.00%	0.00%	---	0.00%	0.00%	0.00%	---	---	---	0.00%
13-Apr	0.27%	0.00%	---	0.00%	0.00%	0.00%	---	---	---	0.20%
3-Aug	---	---	---	---	---	---	---	---	---	---
10-Aug	---	0.00%	---	0.00%	0.00%	---	---	---	---	0.00%
17-Aug	---	0.00%	---	0.00%	---	---	---	---	---	0.00%
24-Aug	---	---	0.00%	0.00%	---	---	---	---	---	0.00%
31-Aug	---	0.00%	---	3.70%	---	---	---	---	---	3.03%
3-Aug	---	---	---	---	---	---	---	---	---	---
10-Aug	---	0.00%	---	0.00%	0.00%	---	---	---	---	0.00%
17-Aug	---	0.00%	---	0.00%	---	---	---	---	---	0.00%
31-Aug	---	0.00%	---	3.70%	---	---	---	---	---	3.03%
7-Sep	---	---	0.00%	6.90%	---	---	---	---	---	6.06%
14-Sep	---	0.00%	0.00%	0.00%	---	---	---	---	---	0.00%
21-Sep	---	---	0.00%	0.00%	---`	---	---	---	---	0.00%
28-Sep	---	---	---	0.00%	---	---	---	---	---	0.00%
5-Oct	---	---	---	---	---	---	---	---	---	---

---No fish collected during the week.

Table 17. Annual sample mortality in percent at Lower Monumental Dam, 2019-2023.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clipped	Unclip	Clip/ Unclip	Total
2019	0.1%	0.2%	0.3%	0.4%	0.1%	0.1%	0.0%	0.0%	0.7%	0.2%
2020	0.2%	0.3%	0.3%	0.4%	0.2%	0.3%	1.5%	0.0%	0.0%	0.3%
2021	0.6%	0.6%	0.2%	0.2%	0.4%	0.4%	2.0%	1.2%	0.4%	0.7%
2022	0.7%	0.8%	0.3%	0.2%	0.3%	0.4%	0.0%	0.0%	0.0%	0.4%
2023	0.5%	0.1%	0.5%	0.4%	0.7%	0.4%	2.3%	0.0%	0.8%	0.5%

RESEARCH

Gas Bubble Trauma

Juvenile Chinook salmon and steelhead were sampled once a week for gas bubble trauma (GBT) from April 11, 2023, to August 11, 2023. This season, 1,262 fish were sampled for GBT. ODFW personnel examined up to 100 individuals of each of the following groups: yearling Chinook salmon, subyearling Chinook salmon, and juvenile steelhead. The fish were examined for evidence of bubbles in paired and unpaired fins and in the eye, as per Fish Passage Center GBT protocols. GBT-sample fish were bypassed to the river after examination. Weekly GBT sampling continued for up to 4 hours or until 100 fish had been sampled per species group. The number of fish sampled for GBT, by species group, was: 303 clipped yearling Chinook salmon, 93 unclipped yearling Chinook salmon, 161 clipped subyearling Chinook salmon, 177 unclipped subyearling Chinook salmon, 385 clipped steelhead, and 143 unclipped steelhead. In the 2023 season, 24 fish showed signs of GBT in the fins (1.90%).

PNNL Lamprey Study

Pacific Northwest National Laboratory (PNNL) was contracted by the United States Army Corps of Engineers (USACE), Walla Walla District to perform a dam passage survival study of juvenile Pacific lamprey through Federal Columbia River Power Systems (FCRPS) hydroelectric projects on the Snake River. The study will evaluate lamprey passage and survival and performance of dam configuration and operations from the forebay of Lower Granite Lock and Dam (LWG) on the Snake River Downstream to the mouth of the Snake River near its confluence with the Columbia River. The study seeks to implement a plan to continue to improve Pacific lamprey passage conditions at USACE dams. PNNL used Juvenile Salmon Acoustic Telemetry Systems (JSATS) Eel and Lamprey Acoustic Tags and nodes in the river to track the fish. Fish were released 20 kilometers above LWG at Blyton Landing. At LMN, 12 larval lamprey were collected, 9 were tagged and bypassed at Blyton Landing, and 3 were not utilized and bypassed at LWG. Another 730 juvenile lamprey were collected at LMN, 615 were tagged and released at Blyton Landing, 102 were not tagged, from March 30 to September 30. Lamprey tagging will conclude for the study by the end of LWG sampling on or before November 1.

Steelhead Kelt Study

Efforts to recover declining steelhead stocks within the Columbia River Basin (CRB) have ranged from harvest reduction, habitat restoration, passage improvements at mainstem Columbia River hydropower facilities, and hatchery propagation. More recently, the use of kelt reconditioning has been investigated to increase total reproductive potential of steelhead populations (Hatch et al. 2020). Kelt reconditioning consists of the collection of post-spawned steelhead and the administration of prophylactics and feed for the purpose of improving survival relative to the untreated condition. Upon release, these fish are intended to return to natal populations, thereby increasing escapement and productivity if reconditioned individuals successfully spawn. Nez Perce staff began setting up equipment on March 20, 2023. Collection for the Nez Perce steelhead kelt study and rehabilitation began with the adult fish collected on April 3, 2023. The last fish was collected on June 23, 2023. On August 2, all study equipment was removed, and the holding tank was power washed to prepare for the following year. The holding tank will remain at the project till the end of the 2024 season.

FACILITY OPERATIONS AND MAINTENANCE

Turbine Operations

Efforts were made to operate all turbine units within 1% of peak efficiency from April 3 to August 31, 2023. Deviations were infrequent and brief or required by the Bonneville Power Administration (BPA). Unit priority was in effect from March 1 to November 30. Individual units were taken out of service (OOS) for various reasons throughout the year.

On March 23, BPA tested units 2 through unit 6, A & B controllers. On May 31, the project was notified that on May 17 between 1720 hours to 1742 hours, unit 2 went out of 1%-unit efficiency for 14.7 minutes. The unit went up to 136 megawatts (MW) during that time. Reservoir Control Center (RCC) was aware of the operation.

Unit 5 was taken OOS on July 24 to August 3 and placed on “speed no load” to supply station service power for T1 Doble testing during working hours and returned to service each night during the outage. Unit 6 was taken out of service at 0600 hours on July 24 to August 3 for T1 Doble testing during working hours and returned to service each night.

Unit 4 ran out of priority for testing on August 30 and 31. The testing took approximately 4 hours each day. The operation was coordinated per Appendix C of the FPP.

In addition, Table 18 provides a summary of unit outages and causes.

Table 18. Unit outages and causes at Lower Monumental, 2023.

Dates out of service (OOS)	Unit	Reason out of service (OOS)
October 25, 2022 - January 1, 2023	Unit 1	Annual maintenance, packing and replacement
24-Jan	Unit 5	Inspection servo-lock wiring
January 30	All Units	T2 line isolation for oil addition

Dates out of service (OOS)	Unit	Reason out of service (OOS)
February 3	Unit 1 - 4	Power outage for T2 return to service
February 6 - February 9	All Units	Line outage
February 21 - February 23	All Units	STS installation
March 28	Unit 2	Faulty turbine bearing pressure switch
March 3 - 8	Unit 2	Thrust bearing pressure switch
March 28	Unit 2	2B STS failure
April 3 - April 4	Unit 1	Fixed leaking servo
April 4 - April 6	All Units	STS inspections
April 5	Unit 6	RAS issue
April 13 - April 17	Unit 1	Replaced wicket gate and shaft packing
May 2 - May 4	All Units	STS inspections
May 8	All Units	Trash raking
June 5	Unit 4	Field ground alarm
June 6 - June 8	All Units	STS inspections
June 6 - June 8	Unit 5	5B STS out of service
June 7 - June 12	Unit 2	Wicket gate packing
June 12	Unit 4	TGB high oil level, HC pump line broke
June 13 - July 28	Unit 5	6-year maintenance overhaul/T2 repairs
July 10 - September 28	Unit 4	Annual maintenance
July 11 - July 13	All Units	STS inspections
June 20 - July 6	Unit 5	Annual maintenance
June 20	Unit 3	Trash raking
June 23	Unit 1	Bad Nexus board
July 12	Unit 1	Cooler replacement
July 13	Unit 1	Water in turbine bearing oil
July 19 - July 20	Units 1 - 4	Trash raking
July 24 to August 3	All Units	Doble Testing
August 1 - August 2	All Units	STS inspections
August 1 - 18	Unit 2	Annual maintenance/exciter replacement
August 3 - October 7	Unit 5	T2 outage repairs
August 3 - December 5	Unit 6	T2 outage repairs
August 22	Unit 1-4	Preparation for T2 repair
August 22 - November 4	Unit 5	T2 repairs
August 22 - November 7	Unit 6	Annual maintenance/T2 repairs
September 5 - September 7	All Units	STS inspections
September 26 - October 13	Unit 4	Annual maintenance
October 3 - October 5	All Units	STS inspections
October 6 - October 7	Unit 1	T2 commissioning/testing
November 6 - November 22	Unit 3	Annual maintenance/OPTO upgrade

Dates out of service (OOS)	Unit	Reason out of service (OOS)
November 13	Unit 1, 2, 4, 5	T2 upgrades
November 7 - November 9	All Units	STS inspections
November 17	Unit 1, 2	T2 upgrades
November 27 - December 14	Unit 1	Annual maintenance
December 18 - December 21	All Units	STS removal
December 26 - December 28	Unit 1	Generator heater repair
Monthly (2-3 days)	All Units	STS/VBS inspection/hub tapping on fixed blade units

Spill Operations

Prior to spill season, spill only occurred if it was needed for flow in excess of powerhouse capacity. Limited spill through the RSW for adult steelhead passage occurred from March 1 to 31 and again from September 1 through November 15. The spring spill program began at 0001 hours April 3 and ended 0000 hours on June 20. The summer spill program began at 0001 hours on June 21 and ended at 0000 hours on August 31.

Spillgate 8 went OOS at 1930 hours on May 2 and did not operate after being closed for fish barging. The spillgate RTS on May 3 at 1340 hours. On June 1, total spill was lowered due to the potential of increased TDG in the tailrace.

Spillgate 5 was taken OOS for seal replacement on September 13 with an estimated RTS of September 30. When spillgate 5 was taken OOS for the replacement, the gearbox was found to no longer be usable and needed to be replaced. The RTS date was estimated to be September 30, 2024. The seal for this spillgate was replaced on November 29.

Spillgate 8 was taken OOS on September 13 for hydraulic steal structure (HSS) inspections. During that time, spillgate 8's gearbox was found defective. Spillgate 8's gearbox was replaced with a gearbox from spillgate 7, due to the importance of the RSW which is placed at spillgate 8. Spillgate 8 was RTS on September 16. With the removal of the gearbox from spillgate 7, the gate was no longer operational. The RTS date for spillgate 7 was estimated to be September 30, 2024.

During the spill seasons, spill adjustments for navigation were made as required. After spill season ended, spill only occurred if needed for excess of powerhouse capacity.

Removable Spillway Weir

Surface spill was implemented through the RSW as a means of providing non-powerhouse downstream passage for adult steelhead that overshoot natal tributaries prior to spawning or that strive to repeat a subsequent reproduction cycle. The conditions of the Biological Opinion call for surface spill via the RSW from March 1 through March 30 and from October 1 through November 15, three times a week on non-consecutive days for four hours in the morning.

The RSW was used for this purpose in 2023 and maintained those dates with a few exceptions due to issues with spillgate 8, as mentioned in the Spill Operations section of this report. When Spillgate 8 could not be operated, spillgate 6 was used to make up the missed surface spill. This occurred from September 16 through September 28.

Regular operation of the RSW began at 0001 hours on April 3, with the start of the spring spill program. Due to low river flows, the RSW was closed on July 31. Once summer spill ended on August 31, the RSW was used to resume the surface spill for adult steelhead.

On June 18, a blockage of large woody debris was seen in the RSW. After the powerhouse operator was informed, the level of the RSW was adjusted to allow all the debris to break free and fall into the tailrace.

Forebay Debris

Forebay debris was moderately heavy for the year. The maximum amount of debris observed during ladder inspections was around 4,100 yards squared, observed on June 3. The debris level fluctuated throughout the year, depending on river flows and debris spills, mostly consisting of small to large woody debris. The first debris spill was schedule on March 29 to remove the accumulated debris in the forebay. An additional debris spill occurred on June 7 to remove the large amount of woody debris from the forebay, which had increased due to the river flow and forebay water levels. A large woody debris blockage was removed from the RSW on June 18, as discussed in the RSW section of this report.

Trash Racks

During the winter, trash rack measurements were not taken. Before the juvenile passage season, trash racks were cleaned at all slots from February 13 through February 15. Approximately 100 cubic yards of debris, mostly consisting of tumbleweeds, small sticks and logs were removed. No fish were observed during the trash rack cleaning.

The trash racks were cleaned again on May 8 to remove any build up. Approximately 16 yards of debris was removed from the trash racks mostly consisting of tumbleweeds. On June 20, the trash racks were cleaned at units 3 and 4. The crane had a complication, and the trash racks were unable to be completed. Repairs were planned for the crane in hopes to complete the trash rack cleaning at some point. Very little debris was removed from the slots at units 3 and 4.

No problems were observed during any cleanings.

Gatewells

During the season, gatewell slots were checked during ladder inspections, approximately three times per week. The gatewell drawdown benchmark measurements were taken for all units on February 23 and February 27.

Due to personnel shortages at the JFF, gatewell drawdowns could not be performed the week of April 28 through May 4. Standardized drawdowns were performed May 8 with units operating at 105 MW load to ensure the units were in criteria after missing the previous weeks measurements.

During the season amounts of woody material were noted in the gatewell slots, and when the coverage exceeded 50%, cleaning of the slots occurred. Woody debris was dipped from the gatewells on June 1 from all slots at units 1 and 2. Gatewell 1B was recorded at 50% coverage during the November 8 inspection. On that same day, the powerhouse personnel dipped the slot removing the woody debris. Gatewell 2B was recorded at 50% during the November 20 inspection and at 60% during the November 21 inspection. The powerhouse operator was notified, and a trouble report was created for the slots to be dipped when staffing became available. On November 22, the gatewells at slots 1A, 1B, 1C and 2A were dipped to remove the woody debris.

Submersible Traveling Screens

During the winter maintenance season, electrical cables, gearboxes, motors, and screens were examined and repaired or replaced as required. The STS were inspected and tested on February 15 prior to installation. All screens were found in good condition and working order. The STSs were deployed in all slots from February 21 through February 23.

STSs are usually operated in cycle mode when the average fork length of subyearling Chinook salmon and/or sockeye salmon is greater than 120 mm, and in continuous run mode when either is less than 120 mm. The STSs were placed in cycle-run mode when first deployed on February 21 through February 23; they were changed to continuous-run mode on April 16 at 1330 hours due to average sub-yearling Chinook and sockeye lengths being less than 120 mm. They were changed back to cycle-run mode on August 1 when the average lengths of collected fish were greater than 120 mm.

The STS deployed in slot 1A was found torn in three locations during the STS inspections on August 1. The unit was not returned to service until the repairs were made on August 2.

The STS deployed in slot 1C was found torn during the STS inspection on November 8. The STS was removed, the repairs were made, and the STS was redeployed the same day.

STSs were raised in preparation for the collection channel dewater and winter maintenance. Units 1 and 2 were raised on December 18. Units 3 and 4 were raised on December 19. Finally, units 5 and 6 were raised on December 20. After the screens were raised, they were visually inspected by the biologist on December 19 and December 20. The STSs appeared clean and had no apparent damage to them.

Vertical Barrier Screens

VBS differentials are not measured daily at Lower Monumental due to the general structure of the VBSs. Instead, they are spot checked during the monthly STS inspections and annually they

are inspected thoroughly during the early spring. A thorough VBS inspection occurred this year between May 2 and May 4. A few small issues were found during the camera inspection of the VBSs in slots 1A, 2A, 3A, 3B, 4B, 5B, 5C and 6B. These issues were small gaps above the frame of the VBS and the concrete wall. A video was made of all the gaps and sent the powerhouse maintenance foreman for review. The gaps were found to be very minor and not an issue for fish.

No other issues were found throughout the year.

Juvenile Collection Channel (JCC) Orifices

During the 2023 season, the number of open orifices continually operated with 18 open. The orifices were opened on February 21, after the winter maintenance period. Orifices were cycled and backflushed with air daily to remove debris. Orifice attraction lights were also checked daily. If a light was not working, flow was directed to the other orifice in the slot until repairs could be made.

The attraction light for orifice 6B33 was changed and RTS on July 3. Powerhouse operator found the attraction light for orifice 6A31 out during rounds on August 12, at which time they switched to orifice 6A32. Orifices were switched back when the light was replaced on August 14.

The orifices were closed for the winter maintenance period on December 21 at 0955 hours.

Primary Dewatering Structure

During the winter maintenance period, routine maintenance was performed at the PDS by inspecting the brush, chain, and sprocket. In addition, the air bubbler system and the baffle boards were inspected. All appeared to be in good condition.

The PDS operated from February 21 to December 21. The compressed air screen cleaner functioned well throughout the 2023 season. The PDS mechanical screen cleaner brush functioned well except for the issues listed below.

The PDS mechanical screen cleaner brush was found not to have completed a cycle on March 3. The separator technician operated the brush manually into the park position. Once parked, it was operated again in automatic mode and appeared to have no subsequent problems.

On April 5 the electrical staff and PICK electrical contracting worked on the electrical systems at the PDS from 1000 hours to 1411 hours. The PDS operation was not affected by the work performed.

The PDS weirs were adjusted for water level on April 23.

A high-water alarm came into the separator on June 7 at 1830. The weirs in the PDS were lowered to bring down the elevation of water coming into the separator. It was discovered by an

operator on the weekend that extra orifices, 22 in total, had been left open, adding more water to the Juvenile Bypass System (JBS). Once discovered, the operator reduced the number of orifices down to 18 and the weirs in the PDS were adjusted.

Due to an increase in leaf debris, on August 29 and 30, the brush run times were increased to once an hour. The PDS mechanical screen cleaner brush malfunctioned on August 30 at 1600 hours. The error was cleared, and the brush functioned normally.

JUVENILE FISH FACILITY

Separator

Sudden water level drops at the separator occurred during the year but did not cause significant problems. Water level remained consistent at the separator with manual operation of the automated weirs at the PDS. As has been the case for the last few years, the separator was operated at a higher water level to assure no problem with exposed separator bars would occur.

PIT Tag System

The PIT tag system functioned well this season. There were no problems to report.

The PIT tag system detected 15,249 PIT tagged fish at the JFF from April 1 to October 1. None of these PIT tagged fish are included in the bypass numbers. Juvenile hatchery Chinook salmon, hatchery coho salmon, and hatchery steelhead in the Snake River Basin are normally designated by fin clips, usually the adipose fin, but occasionally one of the pectoral or ventral fins.

Sample

The JFF and wet lab was fully watered up on February 28. Every-third-day collection for fish condition sampling began at 0700 on March 1. The first sample was examined on March 2, and continued every third day up until April 14, after which condition sampling took place every other day. Early-season condition monitoring consisted of a 24-hour sample on target days from 0700 hours to 0700 hours. Every-other-day sampling continued until the start of transportation operations on April 23, at which time sampling was conducted every day. During this period, fish were examined and returned to the river. Every-day sampling continued up until June 20, when the fish facility switched to every-other-day sampling in accordance with the FPP.

During the season there were very few deviations from the sampling schedule. Due to raceways 3 and 4 reaching capacity with the large number of fish, B side collection went into secondary bypass at 0100 hours on May 4. A side was switched to secondary bypass at 0700 hours on May 4. The facility stayed in secondary bypass until barge loading at 0200 hours on May 5. There a total of 127 raceway mortalities found during hourly checks on the May 3 through May 4 sampling period. A total of 103 were clipped yearling Chinook. Many of these fish showed signs of disease, such as bulging of the eyes and necrotic caudal area. In order to not violate the Washington State Permit, the collections scheduled between July 27 and August 7 and then again

from August 18 through August 22 did not occur due to the water temperature in the fish sampling system being higher than 21º C.

During the season, debris in the system was an issue. A plug of debris was found on March 1 at 0400 hours during collection. The plug was removed and no harm to fish was observed. There was a blockage at the B side separator exit flume on June 2 and in the B side flume near the raceways on June 6 due to a heavy amount of woody debris coming into the facility, as documented in a Memorandum For the Record (MFR). In addition, there were 2 minor plugs removed from the B side count tanks. No fish mortality was noted with these plugs. On June 21, a small stick blockage occurred in the B side of the separator, which was easily removed. No mortality was observed from the blockage.

The valve on the B side PIT tanks stuck and would not open or close on April 29. The fish maintenance mechanics worked on the valve and returned the valve to service on April 30. The knife gate to the B side sample anesthetic chamber bolt sheared off and was replaced on May 4. This delayed the sample by approximately 30 minutes. There were no negative effects observed during the replacement.

The PLC for the timing gate stopped receiving connection on April 3 at 1741 hours. Although the PLC could not receive a signal, the gates opened and closed at the correct time. The biological technician working at the time tried to reset the connection several times, however all efforts failed. Pacific States Marine Fisheries Commission was contacted the morning of April 4, at which time the computer program was reset and the system returned to full operation.

The lamprey bypass system had a high-water fault starting on June 10. The system would not reset, and the gates were manually placed in bypass positions on June 11. The system remained in manual mode until June 20 when the powerhouse electricians were able to make the repair. In addition, there was an air leak when the manual valve was left on, and the low air pressure in the pneumatic lines around the raceways caused an approximate 30-minute delay in loading that day's barge while the low air pressure issue was being trouble-shot.

The collection season ended at 0700 on October 1 and the JFF was dewatered for winter maintenance at 1200 hours on October 2.

Other Facility Issues

Power outages occurred at the JFF on June 21 from 0900 to 0908 hours, May 1 from 1030 to 1109 hours, and finally on November 13 from 1400 to 1402 hours, with no noticeable effects to operations.

The fire suppression system which was installed by a contractor in 2023 has not been completed. The completion should occur in early 2024.

FISH SALVAGE

Only juvenile fish salvage at various locations will appear in this report. Fish were not always examined for clips as their survival was a higher priority.

The south fish ladder fish salvage occurred on January 5 from 1000 to 1230 hours. There were no fish observed during this fish salvage.

The north ladder fish salvage occurred on January 31 from 0930 to 1100 hours. Four adult steelhead, unknown clip type, and 2 juvenile steelhead, unknow clip type, were recovered live and released back to the river. In addition, one adult walleye was released to the river.

The fish salvage performed on March 5 from 1500 to 1530 hours recovered 2 unclipped adult steelhead, 1 unclipped yearling Chinook and 1 walleye, which were all relocated to the river. The salvage was performed at the navigation lock's upstream tainter gate to repair the seal.

On July 11 from 1050 to 1110 hours, a fish salvage was performed for the scrollcase on unit 4 and then again on July 18 from 0700 to 0830 hours, a fish salvage was performed of the draft tube of unit 4 for annual maintenance to occur. There were no fish observed from this salvage.

Another fish salvage occurred for unit 4 scrollcase on September 6 from 0920 to 1030 hours in order for repairs to be made to the unit. One live adult catfish was recovered and return to the river.

The juvenile collection channel was dewatered on December 21. The orifices were closed at 1000 hours and the channel dewatering was completed by 1110 hours. All salmonids recovered were found alive and released in good condition to the river at the north ladder. The group consisted of 6 clipped adult steelhead, 6 unclipped steelhead, and 1 juvenile clipped steelhead. Twenty-three juvenile macrophthalmia lamprey and juvenile sculpin were also found alive and released to the river at the north ladder. One juvenile sculpin mortality was found.

COOLING WATER STRAINERS

Turbine unit cooling water strainers were examined for biologic content once per month from January until June and then again in December. The number of each group and percent of the individual groups consisted of 902 juvenile lamprey (61.4%), 537 American shad (36.6%), and 30 salmonid species (2%).

Probability of any individual being alive at the time of strainer cleaning was likely more related to time of entry rather than which unit's strainer it was found in. Units 5 and 6 were unable to be inspected because of mechanical issues with the units on December 8, 2022. Repairs to unit 5 and 6 occurred during the unit outages in January of 2023. Large sticks were discovered to be the issue with both units. Table 19 below reflects the results of this year's main unit cooling water strainer examinations.

Table 19. Cooling Water Strainer Results at Lower Monumental Dam, 2023.

Month	Lamprey Mortality	Live Lamprey	Smolt Mortality	Live Smolts
Jan	56	237	0	0
Feb	0	206	0	0
Mar	0	12	0	0
Apr	0	2	0	0
May	3	381	0	29
Jun	0	5	0	1
Jul	0	0	0	0
Dec	0	0	0	0

INVASIVE SPECIES

During winter maintenance, other dewatering activities and monthly mussel station examinations, no issues were found.

A total of 3,203 Siberian prawns were removed from the sample and disposed of in landfills in accordance with the Washington Department of Fish and Wildlife (WDFW) permit requirements this season. Siberian prawns appeared in many of the samples during the later spring and summer, with the last ones found in the samples during the last few weeks of September.

AVIAN PREDATION

Avian Predation-General

Areas of avian predation monitoring included: forebay, turbine discharge, spillway discharge and JFF bypass outfall. Deterrent measures included: bird wires across the tailrace of the powerhouse, water cannon sprinklers at the exit of the bypass outfall pipe, bird deterrent spikes at common perching areas, and hazing (April 1 through June 2) under the animal control contract with United States Department of Agriculture-Wildlife Services (WS). Two shift hazing coverage (daylight to dusk) occurred from May 3 to June 2.

Avian predators tend to rest in the forebay and chase juvenile fish as they jump. They also spend time perched on the lock wall facing the tailrace. At the downstream navigation lock guidewall, bird wires were added along the top rail of the handrail during winter 2008-2009, which effectively reduced the perching previously seen there, however, to a great extent the perching only relocated to the deck in front of the handrails.

The bird observations take place during fish ladder inspections with supplemental counts by WS or JFF personnel on days with no ladder inspection. Figure 3 shows the daily count of gulls, cormorants, grebes and pelicans in the tailrace from April 1 to September 30.

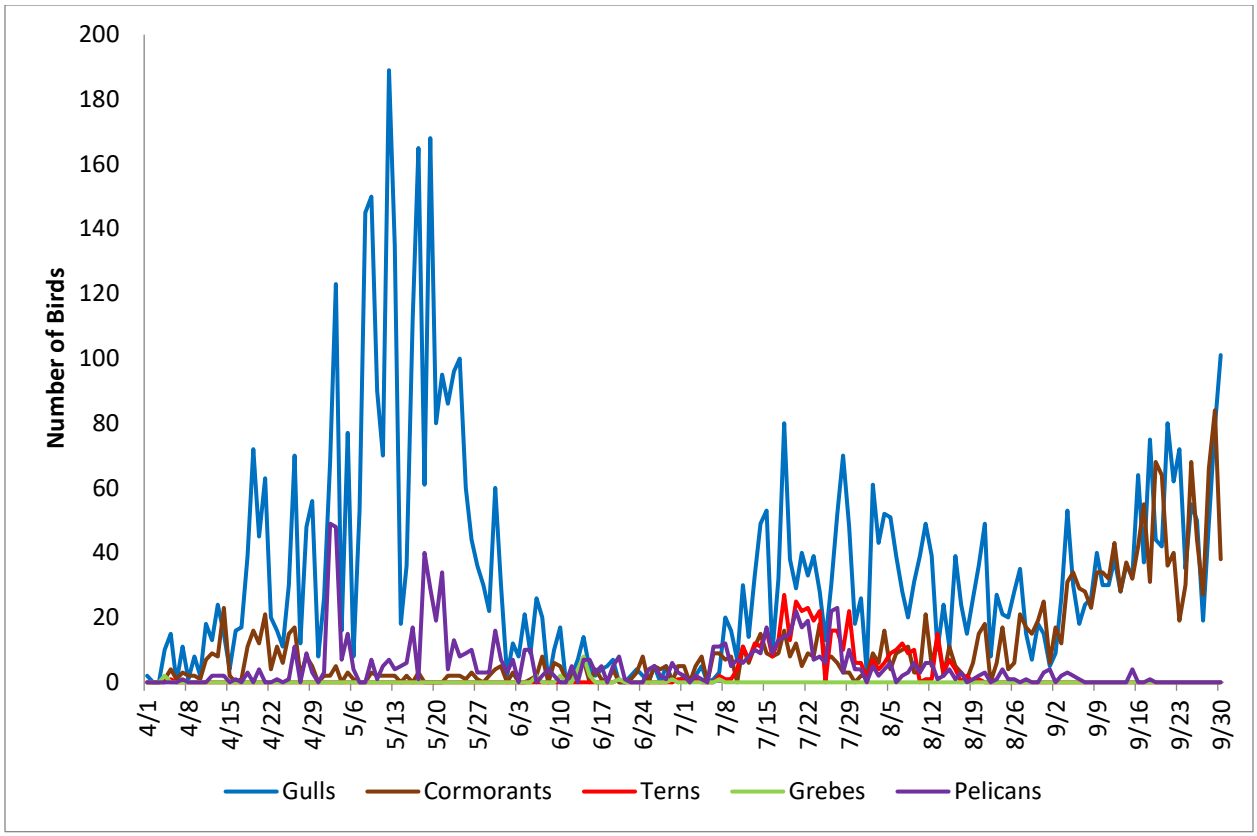

Figure 3. Daily count of gulls, cormorant, grebes and pelicans in the tailrace and forebay, 2023.

Adult Fishway Inspection Bird Counts/Wildlife Services Bird Monitoring

These inspections were conducted at random times and contain counts during active bird hazing as well as in its absence. On Mondays and Thursdays (April 1 through June 2) WS contracted employees collected bird information in the same format as the ladder inspection data and this information was added to the spreadsheet for inclusion in this report. During daylight hours, gulls were present if hazing was not occurring. High juvenile fish numbers passing the dam via spill related to higher gull numbers. In the absence of hazing, gulls appeared to be effective at feeding in the tailrace areas. Each ladder inspection included an avian predator count section for five areas that included: forebay (FB), spillway (SWT1), under the bird wires of the turbine discharge (PHT1), downstream of the bird wires below the turbine discharge (PHT2), and lastly the juvenile bypass outfall (JFOF). Each area included counts of both foraging and resting birds. The following summarizes the data collected from April 1 through September 30 of the 2023 operating year. The averages offered in each category include all data through the period; it is an average of all the Fish Ladder Inspection/WS and JFF supplemented Bird Monitoring Inspections for that condition (feeding/resting) in each zone.

Gulls

Gull numbers were highest from April 11 to May 31 with later waves from June 4 to 10 after the end of hazing efforts and July 8 until September 30 after the end of barge transport. In all areas, gull numbers dropped after May 31 as juvenile salmonid numbers became increasingly sparse

and then numbers increased again as the young of the year American shad became abundant in the area.

The maximum number of gulls observed in all areas was 189 (May 12), with an overall daily average of 34.5 gulls. The number of gulls feeding in the FB ranged from 0 to 25 (May 19) and averaged 1.1 while the number of gulls resting in the FB ranged from 0 to 120 (May 8) and averaged 12.7 gulls. Gulls in the FB are typically seen resting on the navigation lock guide wall. The number of gulls feeding in SWT1 ranged from 0 to 95 (May 19) and averaged 7.7 while the number of resting gulls in SWT1 ranged from 0 to 75 (September 18) and averaged 7.5. Gulls in SWT1 are typically seen avoiding the pyrotechnics of the hazers firing over the spillway discharge from the navigation lock deck (elevation 536). The number of gulls feeding in PHT1 ranged from 0 to 5 (September 20) and averaged <1 gull. The number of gulls resting in PHT1 ranged from 0 to 6 (September 20) and averaged <1 gull. PHT1 gulls are only typically seen when the hazer is not present. The number of gulls feeding in PHT2 ranged from 0 to 80 (May 20) and averaged 3.3 gulls while the number of resting gulls in PHT2 ranged from 0 to 37 (July 18) and averaged <1 gull. Gulls in PHT2 are only typically seen when the hazer is not present. The number of feeding gulls at the JFOF ranged from 0 to 25 (May 19) and averaged 1.5 gulls. Gulls were not observed resting at the JFOF. JFOF gulls are typically seen when large numbers of juvenile salmonids are bypassed.

Hazing was effective at moving gulls out of the area. Two shifts were used to provide daylight to dusk coverage throughout the historic peak of salmonid outmigration, Table 20. The second shift of hazing was equally as effective as the morning shift. On days when hazing did not occur, but fish passage numbers were high, the birds returned and resumed normal feeding behaviors. Gull numbers correlated well with the peak of the juvenile fish outmigration this season, as has been the rule in the past. Observers noticed that during higher spring spill volume, large numbers of feeding gulls were seen just below SWT1, so were not included in the tailrace observation numbers. This newly observed feeding location also decreased the effectiveness of hazing efforts.

Cormorants

Overall cormorant abundance was fairly consistent throughout the season. Cormorants tend to be more prevalent in the fall and winter than during juvenile salmonid outmigration. The maximum number of cormorants observed in all areas was 84 (September 29), with an overall daily average of 10.9 cormorants. The number of cormorants feeding in the FB ranged from 0 to 8 (April 21) and averaged <1 cormorants while the number of cormorants resting in the FB ranged from 0 to 17 (August 27) and averaged 2 cormorants. Cormorants in the FB are commonly seen foraging and are impervious to hazing. The number of cormorants feeding in SWT1 ranged from 0 to 49 (September 20) and averaged 1.1 cormorants while the number of resting cormorants in SWT1 ranged from 0 to 76 (September 29) and averaged 4.6 cormorants. Cormorants in SWT1 are not effectively prevented from foraging by the pyrotechnics of the hazers. The number of cormorants feeding in PHT1 ranged from 0 to 15 (September 4) and averaged <1 cormorant while the number of cormorants resting in PHT1 ranged from 0 to 4 (September 17) and averaged <1 cormorants. Cormorant abundance in PHT1 is erratic and individuals are impervious to hazing. The number of cormorants feeding in PHT2 ranged from 0

to 32 (September 5) and averaged 1 cormorant while the number of resting in PHT2 ranged from 0 to 2 (May 4) and averaged 1.7 cormorants. Cormorant observations in PHT2 are similar to those in PHT1. The number of cormorants feeding at the JFOF ranged from 0 to 4 (August 30) and averaged <1 cormorant while the number of cormorants resting ranged from 0 to 1 (April 11) and averaged <1 cormorant. Feeding cormorants are frequently underwater and hard to accurately count.

Terns

Tern numbers observed were high compared to past seasons. The first one was observed on June 30. The maximum number of terns observed in all areas was 27 (July 18), with an overall daily average of 2.3 terns. The number of terns feeding in the FB ranged from 0 to 2 (July 23) and averaged <1 tern while the number of cormorants resting in the FB ranged from 0 to 17 (August 21) and averaged 1 tern. The number of terns feeding in SWT1 ranged from 0 to 11 (July 22) and averaged <1 tern while the number of resting terns in SWT1 ranged from 0 to 12 (July 18) and averaged <1 tern. There were no terns observed feeding or resting in PHT1. The number of terns feeding in PHT2 ranged from 0 to 7 (July 24) and averaged <1 tern while the number of resting in PHT2 ranged from 0 to 4 (July 11) and averaged <1 tern. Terns were not observed feeding or resting at the JFOF.

Grebes

Grebes were only seen in the forebay (FB) during the season. The number of grebes feeding in FB ranged from 0 to 8 (June 14) and averaged <1 grebe while no grebes were observed resting in the FB. Grebes are frequently underwater and hard to accurately count.

Pelicans

The first pelican was observed on April 13 with the last observation on September 18. The maximum number of pelicans observed in all areas was 49 (May 2), with an overall daily average of 5 pelicans. The number of pelicans feeding in the FB ranged from 0 to 9 (April 28) and averaged <1 pelican with the number of pelicans resting in the FB ranging from 0 to 7 (April 26) and averaging <1 pelican. Pelicans in the FB are typically seen cruising as a group, generally along the north shoreline. The number of pelicans feeding in SWT1 ranged from 0 to 37 (May 18) and averaged 1.6 pelicans while the number of pelicans resting in SWT1 ranged from 0 to 3 (April 20) and averaged <1 pelican. Pelicans in SWT1 are typically not impacted by WS activities. The number of pelicans feeding in PHT1 ranged from 0 to 11 (July 21) and averaged <1 while the number of pelicans resting in PHT1 ranged from 0 to 4 (July 16) and averaged <1 pelican. The number of pelicans feeding in PHT2 ranged from 0 to 34 (May 26) and averaged 1.8 pelicans while the number of pelicans resting in PHT2 ranged from 0 to 7 (June 4) and averaged <1 pelican. The number of pelicans feeding at the JFOF ranged from 0 to 6 (May 19) and averaged <1 pelican while the number of pelicans resting at JFOF ranged from 0 to 2 (July 20) and averaged <1 pelican. Pelicans near the JFOF are typically seen when large numbers of juvenile salmonids are bypassed.

Avian Hazing-United States Department of Agriculture-Wildlife Services

From April 9 to July 1, wildlife specialists provided piscivorous bird hazing coverage for 8 hours of coverage for 7 days a week. Wildlife specialists varied their start and end times of the 8-hour shifts to reduce the habituation of the birds.

From April 23 to June 3, wildlife specialist provided piscivorous bird hazing coverage at 16-hours of coverage for 7 days a week. The 16-hour coverage was separated into an 8-hour AM shift and an 8-hour PM shift.

The WS hazing program is outlined in Table 20.

Table 20. USDA-WS hazing program schedule for Lower Monumental Dam, 2023.

Personnel	Days	Dates	Shift
WS Hazer #1	Monday - Friday	4/9/2023 – 7/1/2023	Regular Coverage
WS Hazer #2	Monday - Friday	4/23/2023 – 6/3/2023	Peak Season
WS Hazer #3	Saturday & Sunday	4/9/2023 – 7/1/2023	Regular Coverage
WS Hazer #4	Saturday & Sunday	4/23/2023 – 6/3/2023	Peak Coverage

Juvenile Outfall Pipe

The outfall bird cannon was RTS on March 20 at 1030 hours after the winter maintenance period was completed.

The outfall bird cannon was taken OOS on June 21 when it was discovered the bird cannon sprinkler was shooting water in abnormal areas. It was RTS at 1030 hours on June 26 when repairs were made. The JFF mechanics found that the U-bolt that held up the vertical sprinkler pipe had fallen off and the pipe had fallen over.

The outfall bird cannon water pump was shut down for winter maintenance at 0800 hours on October 5.

RECOMMENDATIONS

Research a new juvenile count system to replace the Smith-Root count system.

Install a shear boom across the forebay to direct debris to the spillway during the high flow/high debris period to reduce orifice fouling and associated fish injury.

Research converting the pipe system between the PIT facility counter tanks and the PIT facility holding tank exits with an open system that eliminates the need to hold fish in the PIT system holding tanks.

Replace all original adult fishway ladder diffuser grates, support structures, and mud valves.

Install ladder exit debris booms capable of withstanding turbulent waters.

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