2023 Annual Fishways Status Report

John Day Dam Project

South fish turbine discharge in the auxiliary water supply conduit

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Date: January 2024

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INTRODUCTION

John Day Dam is located at river mile 216 on the Columbia River and is the third dam upstream from the mouth of the Columbia. The project includes a powerhouse with 16 turbines and 4 skeleton bays (to house additional turbines), a spillway with 20 spill bays (includes 2 top spillway weirs [TSW] located in spill bays 18 and 19), a navigation lock, two fish ladders for upstream migration (North Fish Ladder [NFL], and South Fish Ladder [SFL]), and a complete juvenile bypass system (JBS) with a smolt monitoring facility (SMF) and lab (Figure 1). This document summarizes all fish related activities at John Day Dam in 2023, and all operations were conducted following protocols outlined in the current Fish Passage Plan (Table 1).

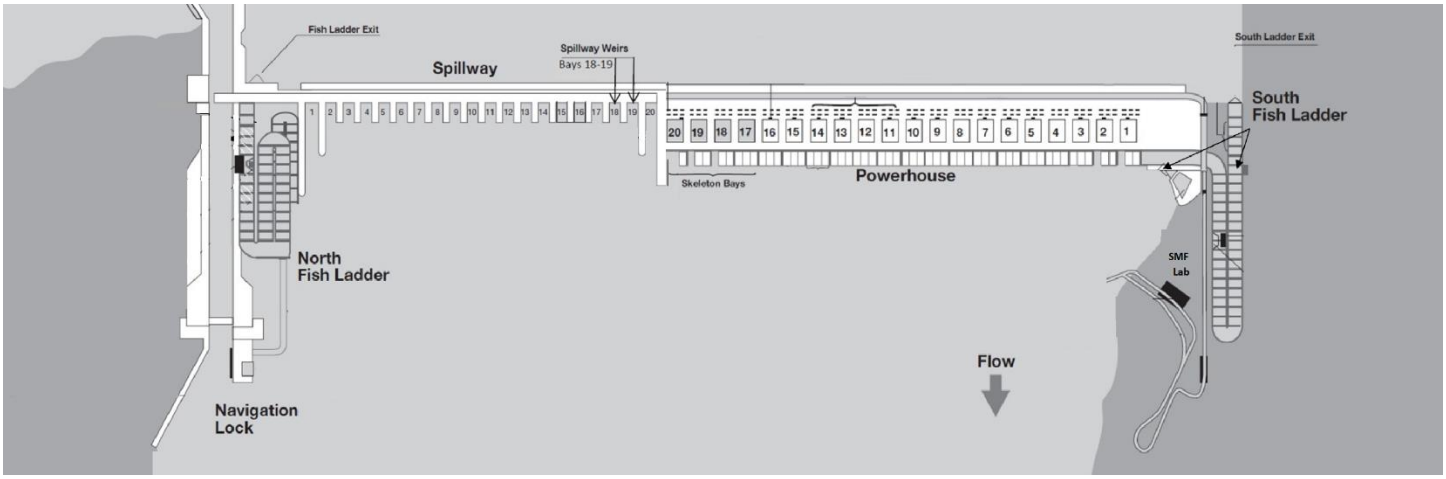


Figure 1: Project layout
An illustration of the John Day project highlighting the location of several fish passage structures.

2023 OPERATING SCHEDULE	
NORTH ADULT FISHWAY	
Regular Operation With AWS	January 12th – December 31st
AWS Off Half Day for ROV Inspection	August 8th
On Orifice Flow - No AWS Operation	N/A
Dewatered for Maintenance	January 1st – 11th
SOUTH ADULT FISHWAY	
Regular Operation With AWS	(January 1st - January 11th) & (February 28th – November 30th)
AWS Off Half Day for ROV Inspection	August 8th
On Orifice Flow – No AWS Operation	(January 12th – 16th) & (December 1st – December 3rd)
Dewatered for Maintenance	(January 17th – February 27th) & (December 4th – December 31st)
SMOLT MONITORING FACILITY	
Dewatered for Maintenance	(January 1st – March 31st) & (November 30th – December 31st)
Sampling (Monday-Friday) 7AM-1PM	April 3rd – June 15th
Sampling (Monday, Wednesday, Friday) 7AM-1PM	(June 16th- July 5th) & (September 8th -15th)
Limited Sampling (Water Temperature > 70F°)	July 6th - September 7th
Bypass for PIT Detections	September 16th - November 29th
JUVENILE BYPASS SYSTEM	
Normal Operation with STSs Deployed	(April 1st - December 15th all units)
SPILLWAY WITH 2 TSWs (Bays 18 &19)	
On Seal	(January 1st - April 9th) & (December 1st - December 31st)
Fish Spill Per FPP Schedule	April 10th - August 31st
1.6 KCFS, Bay 2 Only (for NFL Attraction)	September 1st - November 30th
Early TSW Spill (Due to High Flows)	N/A

Table 1: 2023 operating schedule
This table highlights key fishway operations at the project in accordance with the Fish Passage Plan.

FISHWAY INSPECTION PROCEDURES

The adult fishways and Juvenile Bypass System (JBS) were inspected twice daily during the adult fish passage season (March 1st - November 30th), and once per day during the winter maintenance season ([January 1st - February 28th] & [December 1st- December 31st]). The Smolt Monitoring Facility (SMF) inspections were conducted bihourly throughout the juvenile sampling season (April 1st - Sept 15th). Any out of criteria (OOC) observations were reported in the weekly status reports (Table 2). From March 1, 2023, through March 20, 2023, the SFL was on 1 turbine operation due to repairs (gear box repairs on fish turbine #3 and vibration issues on fish turbine #2). During 1 turbine operation NE-1 was closed and FOGs were removed. This resulted in 40 out of criteria instances during fishway inspections (Table 2). Fish turbine #2 was returned to service on March 21, 2023. Fish turbines #1 & #2 were running at lower speeds to reduce wear and tear on the bearings (original equipment 1967). Once the SFL was returned to 2 turbine operation, NE-1 was re-opened and stayed in criteria the remainder of the year.

	2020		2021		2022		2023	
	Total #	% OOC	Total #	% OOC	Total #	% OOC	Total #	% OOC
Number of Inspections	633	**4.1%**	629	**13.8%**	624	**4.3%**	632	**8.9%**
	North Fishway							
Exit Differential	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Exit regulating weirs position	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Count station differential	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Weir crest depth	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Entrance differential	**2**	**0.3%**	**2**	**0.3%**	0	0.0%	0	0.0%
	South Fishway							
Exit differential	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Exit regulating weirs position	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Count station differential	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Weir crest depth	0	0.0%	0	0.0%	0	0.0%	0	0.0%
South entrance differential	**1**	**0.2%**	**2**	**0.3%**	**1**	**0.2%**	**1**	**0.2%**
Entrance weir SE-1	**8**	**1.3%**	**2**	**0.3%**	**8**	**1.3%**	**8**	**1.3%**
Collection channel velocity	0	0.0%	0	0.0%	0	0.0%	**2**	**0.3%**
Bay 1 differential	0	0.0%	0	0.0%	0	0.0%	0	0.0%
N. Entrance PH (Bay 19) differential	0	0.0%	**3**	**0.5%**	**4**	**0.6%**	**2**	**0.3%**
Entrance weir NE-1	**4**	**0.6%**	**3**	**0.5%**	**7**	**1.1%**	**40**	**6.3%**
Entrance weir NE-2	**5**	**0.8%**	**2**	**0.3%**	**4**	**0.6%**	**3**	**0.5%**
	Juvenile Passage							
Forebay/bypass conduit differential	**6**	**0.9%**	**1**	**0.2%**	**3**	**0.5%**	0	0.0%
Submersible traveling screens	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Turbine trash rack drawdown	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Vertical barrier screen drawdown	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Spill volume	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Spill pattern	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Turbine unit priority	0	0.0%	**72**	**11.4%**	0	0.0%	0	0.0%
Turbine 1% efficiency	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Table 2: Out of criteria discrepancies
Fishways and the number/percentage of out of criteria (OOC) observations (2020-2023). The 40 OOC in 2023 were the result of 1 turbine operation during repairs on fish turbines #1 & #2. There were numerous days when the turbine unit priority was out of criteria in 2021, this was due to the line 1-outage that took place October 19th, 2021 – December 16th, 2021.

FISH SALVAGE PROCEDURES

Fishway Dewatering Procedures

Fishways are dewatered following standard operating procedures (SOPs). When fishways are dewatered, fisheries personnel enter, and salvage stranded fish. Salvaged fish are transported to either the forebay or tailrace depending on circumstances such as: fish species, dewatering location, age-class, or stress levels. Efforts are made to reduce stress by providing a continuous water supply and following minimal fish handling procedures. Follow-up inspections are performed to account for any overlooked fish.

Turbine Dewatering Procedures

When following operational guidelines, turbine dewaterings require minimal fish salvage. If a turbine fails, the operational guidelines cannot always be followed and may result in fish entrainment. Procedures are continually evaluated to determine the best methods to minimize fish stress and mortality. Prior to fish salvage, all necessary equipment including nets, fish bags, and transport tanks, is staged. Typically, fish are transported via fish bag. Transport tanks are only used if fish numbers are higher than the two bags can safely handle since tanked fish are released via crane, and therefore require a crane operator on standby. Additionally, JDA has a trailer mounted transport tank. This tank is primarily used to transport high volumes of lamprey, making it easier to release lamprey well upstream of the dam (release site is approximately 2RM upstream), helping to reduce fallback (Table 3).

2023 John Day Fish Salvage Report

Key; adult=a, juvenile=j, carp=cp, catfish=ct, sculpin=sc, small mouth bass=smb, crappie=cr, whitefish=wf, perch=pr, bluegill=bg, walleye=we, sturgeon=st, shad=sh, chinook=Ch, steelhead=STH, coho=CO, sockeye=SO, su=sucker, lamprey=LA, Released In Good Conditon=RIGC

Date	Event	CH	STH	SO	CO	LA	Shad	Other	Comments	Mort	PIT	Cause
1/17	SFL Upper	0	1a, 2j	0	0	0	0	4	STH - (1a-16") (2j-6"), 1 smb, 3sc	0	0	N/A
1/17	SFL LTS	0	0	0	0	370 a	0	0	RIGC at GF boat ramp	0	0	N/A
1/19	JBS Collection Ch	0	0	0	0	0	0	4	4-sc	0	0	N/A
1/24	MU5 Scroll Case	0	0	0	0	0	0	0	No Fish	0	0	N/A
1/25	MU5 Draft Tube	0	0	0	0	0	0	0	No Fish	0	0	N/A
5/17	12 B Gatewell	31			1	27j		6000	12B orifice slide gate had broken off from the shaft and blocked the opening leaving fish with no egress from that gatewell. ~6000 live smolts were removed and RIGC in adjacent gatewell. Gatewell was dewatered and 31 clipped CH and 1 unclipped CO morts were recovered as well as 27j LA (alive).	32		No egress
6/12	MU6 Scroll Case	0	0	0	0	0	0	0	No Fish	0	0	N/A
6/27	MU8 Scroll Case	0	0	0	0	0	0	0	No Fish	0	0	N/A
6/28	MU8 Draft Tube	0	0	0	0	0	0	1	1 juvenile 10" sturgeon RIGC in the tailrace	0	0	N/A
7/25	12 B Gatewell	0	0	0	0	0	0	400	Orifice slide gate broke off again.Gatewell was dipped on 7/24 ~400 live smolts removed and RIGC in the forebay. Dewatered on 7/25, no fish	0	0	N/A
7/25	MU7 Scroll Case	0	0	0	0	0	0	0	No Fish	0	0	N/A
7/26	MU7 Draft Tube	0	1	0	0	0	0	210	200 ct and 10 st RIGC in the tailrace	0	0	N/A
7/31	MU15 Scroll Case	0	0	0	0	0	0	0	No Fish	0	0	N/A
8/1	MU15 Draft Tube	0	0	0	0	0	0	0	No fish	0	0	N/A
11/30	SMF (PDS)	35	35	0	0	20A, 4j	0	56	1-st, 5-we, 12-ct, 38-sc	0	unk	N/A
12/4	SFL LTS	0	5	0	0	100	25	5	1-wf, 2-ct, 2-we,	0	unk	N/A
12/11	SFL CC	0	8	0	0	0	10	9	3 -we, 3-ct, 1-su, 4-sc	0	unk	N/A
12/12	SFL CC	0	0	0	0	1	0	4	1-we, 1-wf, 1-pr, 1- smb	0	unk	N/A
12/13	SFL Triangle	0	6	1	0	0	0	5	1-ct, 2-smb, 2-we, (1- sth, 1- so mort observed previously dead)	2	unk	N/A
12/14	SFL AWS Channel	0	0	0	0	0	0	1	1-smb	1	unk	N/A

Table 3: Results from 2023 fish salvage operations

FISH COUNTING

Fish counting (visual and/or video) occurred year-round for the 2023 adult fish passage season, and all fish count data was posted to the Fish Passage Center (FPC) website (fpc.org). Fish counts were conducted at both the north fish ladder (NFL) and south fish ladder (SFL). Fish counts were conducted, under contract, by Four Peaks Environmental Science & Data Solutions.

Fish Counting Schedule
March 1st – October 31st visual daily counts (0500 - 2100 PST)
June 15th – September 30th nighttime video counts (primarily for lamprey) (2000 - 0400 PST)
November 1st, 2023 – February 29th, 2024 (day video counts)

Improvements were made to the NFL entrance between 2010 and 2012 to help improve fish passage for salmonids and lamprey. In 2023 the total salmonid counts ranged from 22-35% at the NFL vs. 65-78% at the SFL (Figure 2) and the 14-year averages (Figure 3) at the NFL ranged from 25-59% vs. 41-75% for the SFL. Salmonids consistently have higher counts at the SFL vs the NFL. Total Chinook counts (386,667) were slightly lower than last year but were still the second highest since 2017. Sockeye counts (281,845) were less than half of the return from last year and coho counts (58,850) were slightly lower than last year. Steelhead counts (87,359) have been low the past several years, but this year was the second highest return since 2017. Lamprey, on the other hand, appear to prefer the NFL over the SFL, this was true again this season with the NFL receiving 53% of the lamprey counts. Lamprey returns (17,670) were slightly lower than last year but were still the second highest in six years.

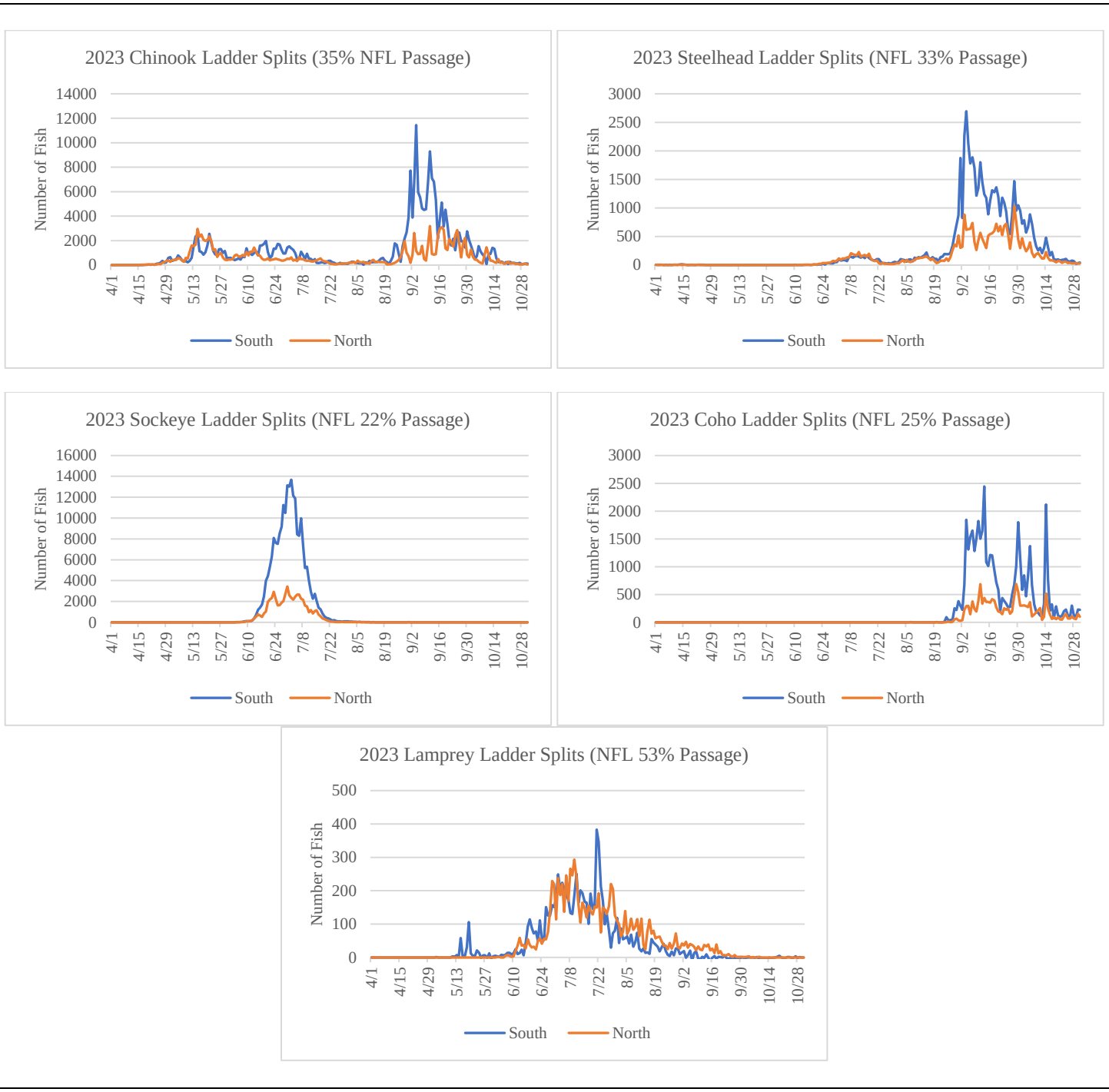


Figure 2: Ladder splits by species

Graphs comparing adult fish counts between fish ladders for 5-different fish species (Chinook, steelhead, sockeye, coho, and lamprey) during the 2023 adult fish count season. There were 14 pink salmon that passed JDA in 2023, 7 via the NFL and 7 via the SFL.

Figure 3: Total fish ladder counts (north and south combined) over a 14-year span (2010-2023) for 5-different fish species (Chinook, steelhead, sockeye, coho, and lamprey), and the percentage that use the north fish ladder.

LAMPREY COLLECTION

Lamprey can be collected from both fish ladders (north and south) at JDA. The two systems collect lamprey differently, and collection efficiency varies. The north fish ladder (NFL) has a ramp system that utilizes gravity fed water to attract lamprey. When lamprey climb the ramp, they drop into a holding tank. The NFL system is primarily accessed by elevator (when operational). Modifications were made to the NFL lamprey passage system (LPS) prior to the 2023 collection season to help improve collection efficiency and to reduce stress on lamprey.

The south fish ladder (SFL) utilizes a trap system. Lamprey navigate the ladder and enter the trap near the counting station. Once there, they swim under grating and are guided into a trap box. This box is lifted by a fixed jib crane for collection. An elevator is not required to access the SFL system.

North Fish Ladder Lamprey Passage System

The NFL has a lamprey passage system (LPS). When lamprey enter the NFL, they navigate a bollard field. This field breaks up velocities and guides lamprey to the LPS entrance. Lamprey must climb a ramp to reach the holding tank. A rest box is located halfway up the ramp so lamprey can recover during their journey. Once lamprey climb the ramp, they enter an upwelling box. This is where gravity-fed water enters the system. The water percolates through porosity plating, and either down the ramp (for attraction) or into the holding tank (to circulate water in the holding tank). The lamprey travel through the upwelling box then drop into the holding tank for retrieval (Figure 4).

Note The only methods to transport collected lamprey are by stairs, elevator, or winch. It is 100-foot climb to the intake deck (access area). It is difficult on personnel, and fish to transport them by stairs. The elevator is outdated and unreliable, so a winch system was created for backup. The winch has been deemed unsafe as personnel must reach over a ledge to retrieve the bag. Access is the most limiting factor for this system.

Prior to the 2023 lamprey collection season, improvements were made to the NFL LPS system. The previous design relied on pumped water to feed the system. There were no indicators for a failed pump and failure would result in lamprey fatalities as air temperatures can reach well over 100°F. Without a constant flow of cooler water, temperatures within the tank would quickly rise to lethal levels.

New improvements consisted of a gravity fed water supply coming from the NFL drain. This drain is located near the count station (deemed fish-free water). This line then travels ~200-feet along the fish ladder to the upwelling box and holding tank. Additionally, the holding tank was replaced with a larger (~50-ft^3) version that has a built-in auxiliary water supply line to help keep water temperatures cooler.

Figure 4: Images of the NFL LPS
(*Note* the first picture is facing east, and the second picture is facing north): (A) bollard field (B) access ramp (C) resting box (D) ramp entering the upwelling box (E) upwelling box (F) holding tank (G) water supply line (H) valve for tank and upwelling box.

South Fish Ladder Lamprey Trapping System

The SFL lamprey trapping system (LTS) is located near the SFL count station, lamprey approach this area and enter the system below a grating structure on the deck. Once inside, they travel into a conduit which leads them up a small ramp, and into a trap box. This trap box can then be lifted, by a fixed jib crane, allowing personnel to collect the lamprey (Figure 5). This system generally operates flawlessly; however, success is variable. One issue with the LTS is that lamprey tend to mill in the conduit/ramp area. The flows are ideal in this area, and they may reside there for long periods of time (actual residing times unknown). Every year, during winter maintenance, several lamprey are collected/released that exit the conduit/ramp area.

Figure 5: Images of the SFL LTS
(A) entrance (B) diversion conduit (C) count station window/crowder (D) trap box guide (E) trap box (with access hatch removed) (F) lamprey entrance port (G) trap hoisting jib crane. *Note* when in operation picketed leads rest atop the LTS entrance (A), and upriver from the trap box guide (D). These picketed leads guide non-trapped fish to the count station window (C) for counting.

Collected Lamprey Data

Adult lamprey collections were conducted from June 13th through September 6th during the 2023 passage season. The Columbia River Inter-Tribal Fish Commission (CRITFC) operated all traps and collected the lamprey. Collected lamprey were translocated in accordance with the Tribal Pacific Lamprey Restoration Plan (TPLRP). In addition to the NFL LPS and SFL LTS, CRITFC utilized three PVC tube traps near the NFL count station between the picketed leads. The NFL PVC tube traps are located between the picketed leads as lamprey can get under them, this however, is not the case at the SFL. Since lamprey have the ability to go under the picketed leads at the NFL, total counts at the NFL may actually be higher (bypass count window and tube traps). Lamprey collection efficiency varies annually, however, 2023 was the highest trapping season to date, and the SFL trap caught the most lamprey since its inception (Table 4).

Prior to the 2022 lamprey passage season, the grating at the SFL trap entrance was modified in an attempt to improve trapping efficiency. Previously, the grating to the entrance was oriented perpendicular to the flow of the ladder. During dewaterings high sediment volumes accumulated at the entrance. There were concerns that the sediment deterred lamprey from the system, so project personnel replaced the grating and oriented it parallel to the ladder flow (Figure 6). It is unknown whether altering the grating's orientation improved the trapping efficiency; however, the project will continue to monitor trapping efficiency. It should be noted that in addition to the 1,679-lamprey collected from the SFL trap in 2023, there were an additional 100 lamprey salvaged from the trap area during the winter dewatering (Table 4).

JDA Lamprey Collection Data (2016-2023)								
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Total SFL Counts	4,229	11,615	4,200	1,799	1,109	3,319	6,750	8,324
Total NFL Counts	5,540	11,789	4,342	2,790	1,932	2,869	15,556	9,346
SFL Trap	467	125	325	272	140	533	1,349	1,679
SFL LTS - Dewater	75	101	180	26	12	UNK	370	100
NFL LPS	346	419	1,873	3	162	42	624	825
NFL PVC Trap #1	-	-	-	33	70	152	70	485
NFL PVC Trap #2	-	-	-	0	60	3	2	73
NFL PVC Trap #3	-	-	-	183	2	23	18	81
NFL PVC Trap #4	-	-	-	-	-	13	-	-
Not Specified	205	227	-	-	-	-	-	-
Total Handled	**1,018**	**771**	**2,198**	**491**	**434**	**766**	**2,433**	**3,143**
Known SFL Usage	4,771	11,841	4,705	2,097	1,261	3,852	8,469	10,103
Known NFL Usage	5,886	12,208	6,215	3,009	2,226	3,102	16,270	10,810

Table 4: Lamprey collection and counts (2016-2023)
The UNK mark indicates the number was not recorded.

Figure 6: SFL LTS grating
The red arrow indicates the entrance to the lamprey trap, and the yellow line indicates the grating orientation.

NORTHERN PIKEMINNOW DAM ANGLING

The 2023 Northern Pikeminnow (NPM) angling season took place May 8th through October 12th. Angling occurred at the tailrace (powerhouse section) and was performed by a Washington Department of Fish and Wildlife (WDFW) crew.
In 2023 the NPM catch per effort-hour (NPM/H) increased for the first time since (at least) 2016 (Table 5). In 2023 the average was 1.6 NPM/H. It should be noted the effort hours dropped significantly for 2023 which may have played a role in the increased NPH/H. No gut analyses were taken during the 2023 NPMP angling season.

Northern Pikeminnow Catches at JDA (2016 - 2023)			
	Total NPM	**Effort (Hours)**	**NPM/Hour**
2016	3,002	787.25	3.8
2017	3,472	1042.5	3.3
2018	3,089	1199.25	2.6
2019	1,894	760.5	2.5
2020	1,782	743.75	2.4
2021	1,269	785.25	1.6
2022	522	556.5	0.9
2023	447	284	1.6
Average	**1,935**	**769.88**	**2.3**

Table 5: Northern Pikeminnow catches (2016-2023)

Bycatch Data

Dam anglers often catch bycatch while targeting northern pikeminnow (smallmouth bass, walleye, American shad, white sturgeon, channel catfish, suckers, etc.). Some of these are piscivorous fish that target juvenile salmonids. Historically bycatch was released back into the river. However, in 2023 the Washington Department of Fish and Wildlife (WDFW) authorized anglers to lethally take non-native/invasive bycatch species.

The two most commonly caught piscivorous fish are smallmouth bass and walleye (Figures 7 and 8). The 10-year catch average for walleye was 264.7/year and the 10-year catch per hour average (CPUE) was 0.32. The 10-year average for smallmouth bass was 627.2/year and the 10-year CPUE average was 0.75. During the 2023 NPM dam angling season 160-smallmouth bass, 112-walleye, and 7-channel catfish were caught. All were lethally removed.

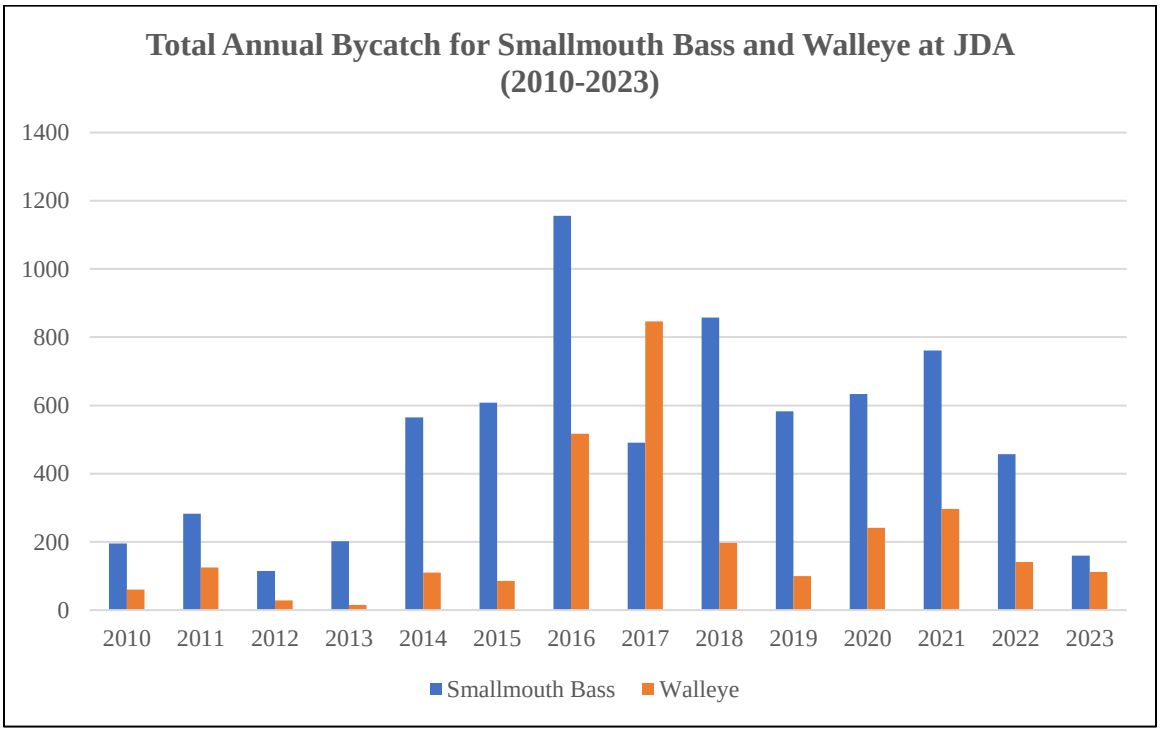


Figure 7: Total annual walleye and smallmouth bass bycatch (2010-2023)

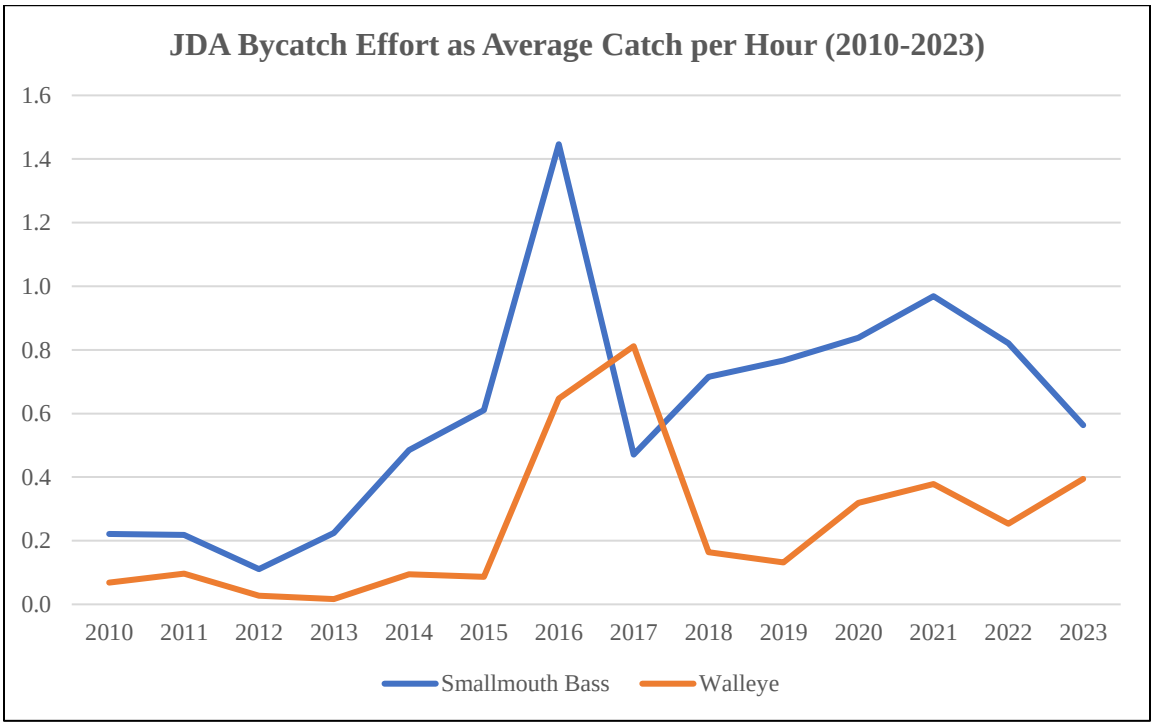


Figure 7: Bycatch as average catch per hour (2010-2023)

AVIAN PREDATOR ABATEMENT

Bypassing smolts through the JBS, spill and TSWs has been a critical part of fish passage operations. Unfortunately, piscivorous bird (mainly gull, pelican, and cormorant) predation on smolt in the tailrace's Boat Restricted Zone (BRZ) has increased during this time. In response, a comprehensive grid of 125 avian lines was installed above the tailrace BRZ in 2010 (Figure 9). The avian lines wore out quicker than expected, and before replacement (in April 2018) 29-lines were missing (23% of the grid). The grid was upgraded from Plasma lines to Vectran™ lines to reduce breakage, and the improved grid has held up well. One avian line (#68 in the spillway) rubbed on a tree branch and snapped in 2020, JDF continues to monitor trees in the area and have them trimmed back as needed. Seven lines were knocked down by contractors conducting the line repair in 2021, and the contractor replaced the broken lines (#92 and #98-103 in the powerhouse section) on March 29, 2022. Several lines broke in 2022 (#80, #81, #83, #85, #90, #96 in the powerhouse section and #59 in the navlock section). The repair to the avian lines was going through the contracting phase earlier this year, but due to additional lines that broke this season (13 additional lines #48-49 in the navlock section, and #82, #84, #86-89, #91-95 in the powerhouse section), the contract was cancelled in order to add all the lines that needed repair. Currently there are 21 missing lines (17% of the avian grid). USDA is scheduled to replace the 17 missing lines from the powerhouse section before the start of spill season in 2024.

In addition to avian lines, supplemental boat hazing by the U.S. Department of Agriculture (USDA) has occurred annually since 2010 (April 16th – July 31st). Hazing occurred 8 hours per day, 7 days a week, with the start and end times of shifts varying to help keep birds from becoming habituated. The hazing is boat based using various pyrotechnics (15mm banger and screamer variants and 15mm extended range rockets). The 125 avian line grid combined with USDA boat hazing has helped to reduce gull predation, however, gulls have started to habituate to these deterrents and other methods may be warranted. The avian grid does not seem to deter American White Pelicans (AWPE) and they will readily feed under the grid. In 2022 (after hazing season ended) WDFW concluded their periodic status review for AWPE and downlisted them from threatened to sensitive. This downlisting allowed USDA to haze AWPE for the first time this season with mixed results. USDA hazing seems very effective against double-crested cormorants (DCCO) in the JDA tailrace, and their presence is almost nonexistent during smolt outmigration season.

This was the third year of a three-year Blalock operation to raise the John Day pool to flood low-lying islands in the Blalock Island complex to deter Caspian Terns from nesting there. The operation kept the forebay elevations between 264.5-266.5ft from April 10th – June 1st to flood potential nesting habitat for the birds. The operation was successful, and there have been no nesting terns during the last three years on the islands.

This was the second year that Yakama nation conducted gull hazing at Miller Rocks using a combination of falconry, egg take, and pyrotechnics and they plan to continue their hazing efforts next season as well.

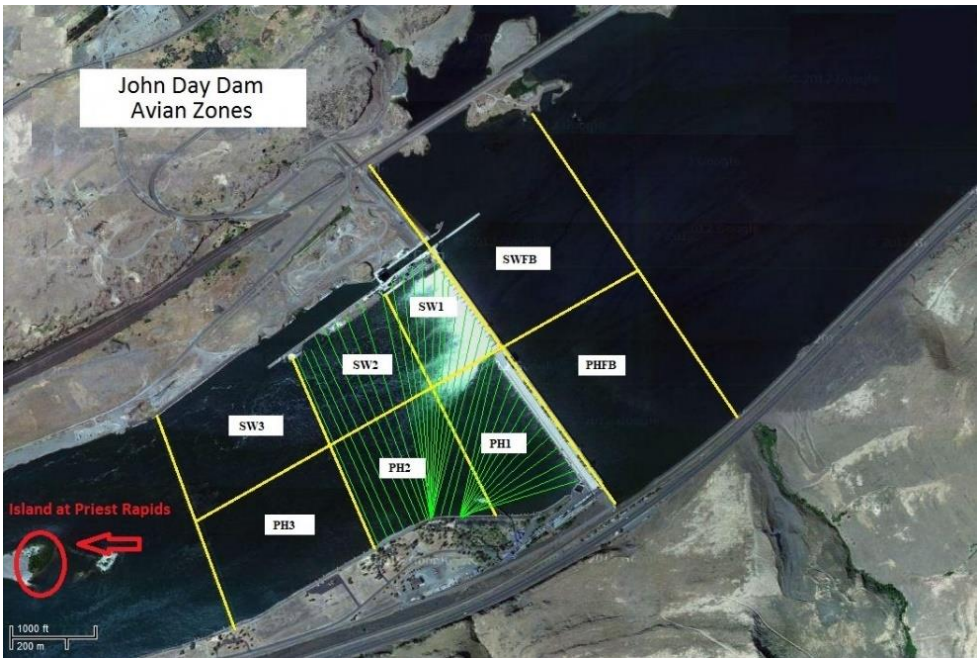


Figure 8: Avian array

An overview of the avian line grid at the JDA tailrace BRZ [powerhouse forebay=PHFB, spillway forebay=SWFB, spillway tailrace zones 1-3 (SWT1-SWT3), powerhouse tailrace zones 1-3 (PHT1-PHT3)]. Red circle indicates Preacher's Island where American white pelicans loaf between feedings.

AVIAN PREDATION

Bird counts are conducted year-round with two counts daily March 1 – November 30, and 1 count per day December 1 – February 28. Birds are counted from end of the tailrace deck, the southwest corner of the navlock, and the intake deck, depending on which zones are being counted and the best location for visibility that day. Time of day for the counts varies day to day, with one in the morning and one in the afternoon when two counts are conducted per day, and as time allows when counting once a day in the winter. Counts are conducted using Vulture HD 15x56 binoculars or the naked eye depending on the location.

The three main piscivorous birds observed at JDA are gulls (predominantly California and Ring-Billed), American White Pelicans (AWPE) and Double-Crested Cormorants (DCCO), with gulls being the main focus as they are the largest known piscivorous threat to listed fish at JDA. Western Grebes are also present in the PHFB section for most of the smolt outmigration and counts are reported in the weekly report. Caspian Terns are infrequently seen at JDA, and JDF crew rarely see them during their bird counts. USDA hazing crew, having more opportunity for sightings, did see a few foraging Caspian Terns (max of 6 at a time) during the hazing season. Other piscivorous birds encountered in small numbers on the project include Bald Eagles (during the winter months), Osprey (mainly April-September), Common Merganser (in the fall) and Great Blue Heron (year-round).

In 2023, gulls started to arrive in the tailrace to forage in late April when out-migrating smolts numbers started to pick up. The highest numbers of foraging gulls occurred in May during the height of the outmigration. Gull numbers were significantly lower in June this season compared to last possibly due to increased hazing efforts and/or the influx of AWPE. Gull numbers then increased in the late summer and fall, coinciding with the end of the hazing season and dispersal of AWPE to feed on the abundance of juvenile shad at that time. Large numbers were seen resting on the wingwall and on the water in SWFB and PHFB throughout the fall and into early winter (Figure 10).

Pelican sightings have increased significantly since 2012 and avian lines do not deter them. This was the first season USDA was permitted to haze pelicans due to their protected status being downlisted from threatened to sensitive. Pelicans start arriving in small numbers as early as March, however the biggest influx is June – August which corresponds to the adult shad upstream migration (Figure 11). Most pelicans leave the area in late summer/early fall; however, this was the fifth-year pelicans have overwintered in the area. A couple are seen around the project occasionally and opportunistic sightings occur at the mouth of the Deschutes River when the JDF crew are traveling to and from the project. Despite an influx of pelicans at JDA, predatory impacts on listed fish are not fully known.

Cormorants are present for most of the year except May-July when hazing occurs, and they leave the area during that time. One theory is that they move down to The Dalles Dam to find mates and reproduce during this time. The Dalles sees an increase in cormorants that time of year and have nesting sites on towers at their project. They start to return to the project in August and remain for the rest of the year with small numbers foraging in the tailrace, but mainly seen exhibiting non foraging behavior on the riprap in zone SW2 or roosting on towers in PHFB (Figure 12).

Grebe abundance was mostly confined to zone PHFB and was therefore unaffected by USDA boat hazing. Grebes were seen foraging mainly during the spring and early summer (Figure 13) in zone PHFB. Over the late summer and fall grebe numbers decreased, and they were completely dispersed by winter. Figure 14 shows the breakdown of where all the foraging activity occurs by species and zone.

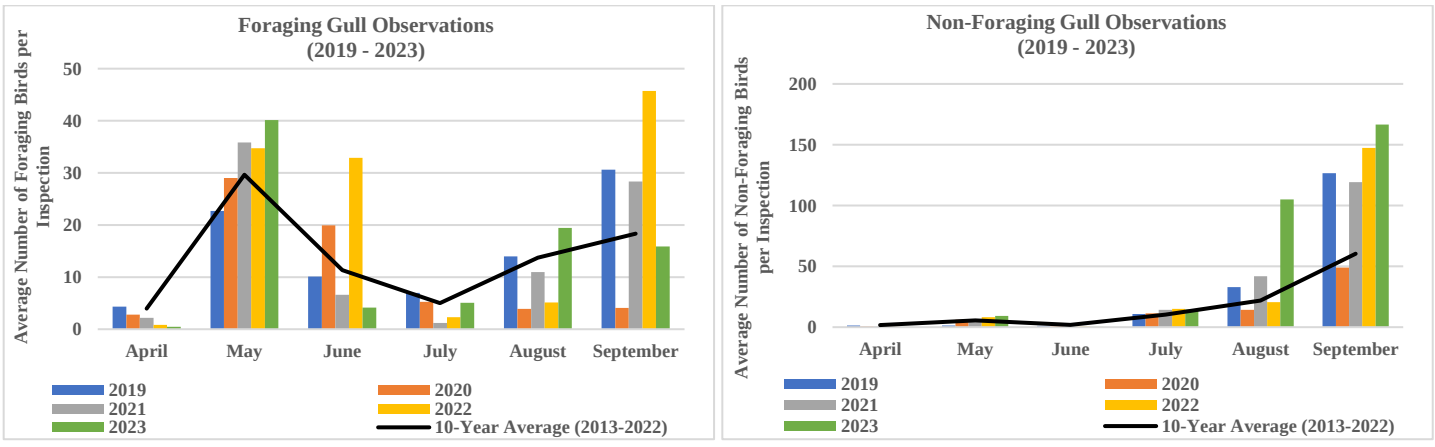
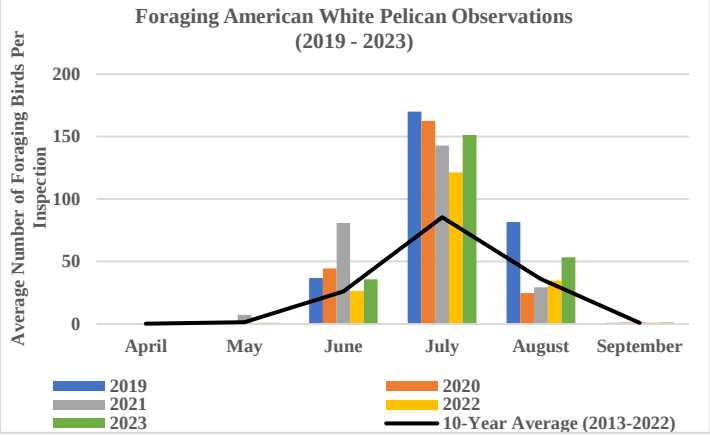


Figure 9: Monthly gull observations shown as average number of birds per inspection (2-inspections daily) over a five-year period (2019-2023). The left graph represents actively foraging gull observations, and the right chart represents non-foraging gull observations. Gulls are present year-round, however April – September correlates with smolt outmigration at JDA.



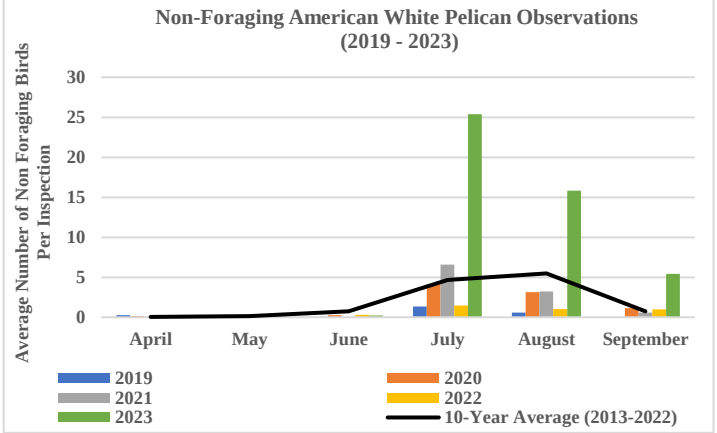


Figure 10: Monthly American White Pelican observations
shown as average number of birds per inspection (2-inspections daily) over a five-year period (2019-2023). The left graph represents actively foraging AWPE observations, and the right chart represents non-foraging AWPE observations. Pelicans linger in small numbers beyond September (fewer than 20) however, April – September correlates with smolt outmigration at JDA.

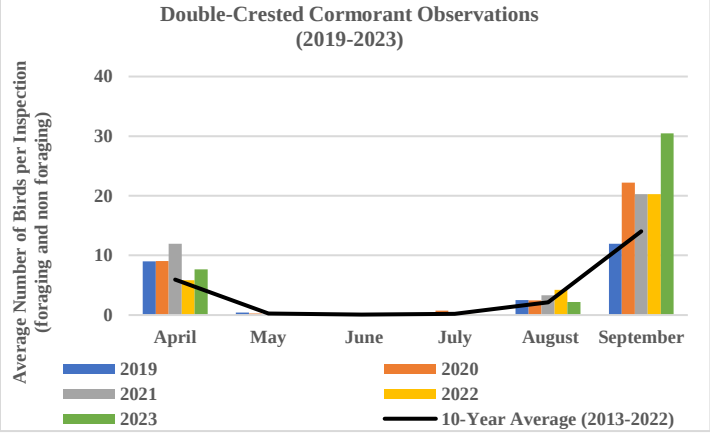


Figure 11: Monthly Double-Crested Cormorant observations
shown as average number of birds per inspection (2-inspections daily) over a five-year period (2019-2023).

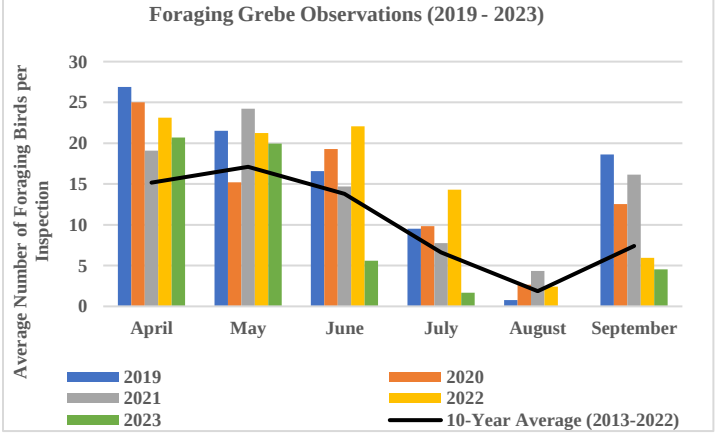


Figure 12: Monthly grebe observations
shown as average number of birds per inspection (2-inspections daily) over a five-year period (2019-2023).

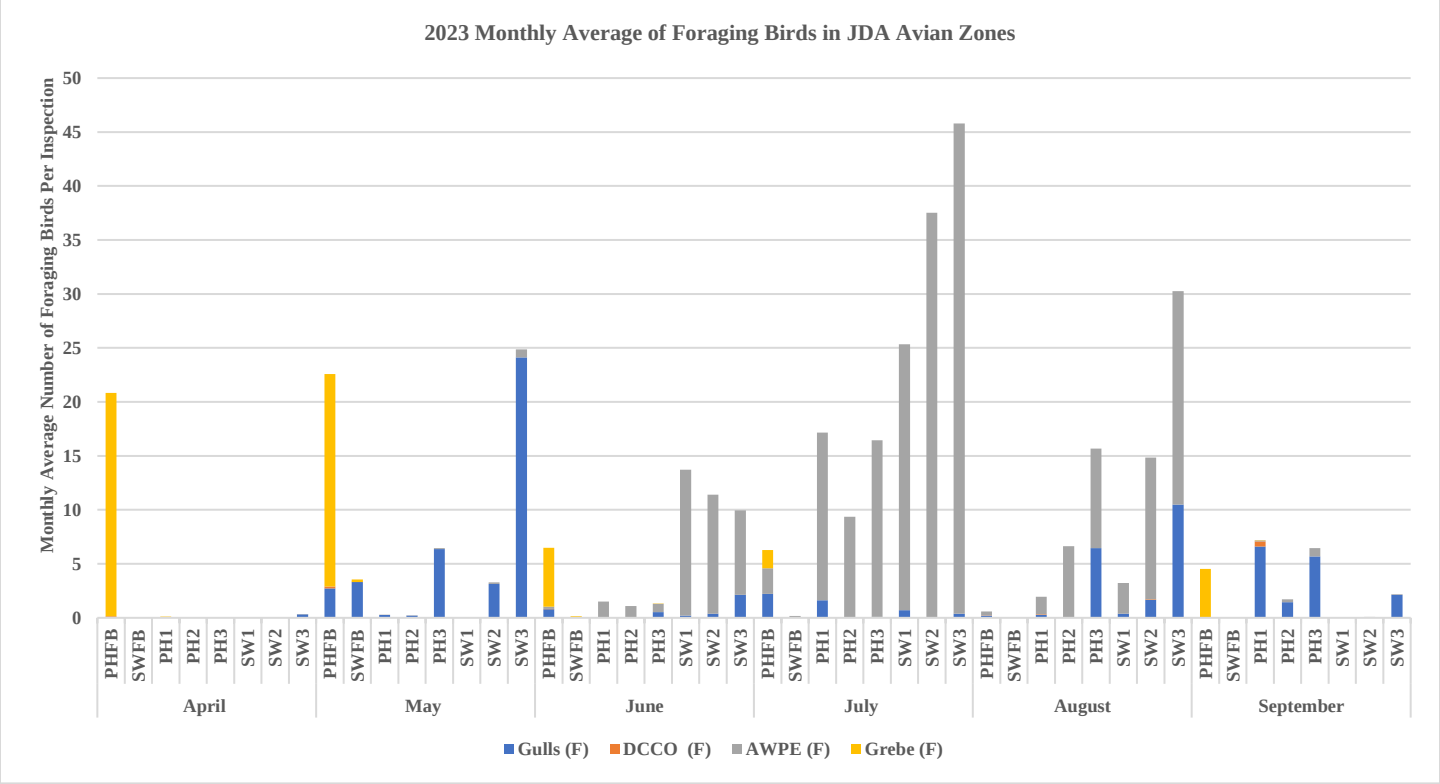


Figure 13: 2023 Monthly average of foraging birds broken down into avian zones

PIT Tag Detections from Preacher's Island

Preacher's island is a dredged material island located approximately 1 mile downstream of John Day Dam. It is a known loafing spot for American white pelicans (AWPE) and other piscivorous birds such as gulls and double-crested cormorants, however AWPE and gulls are the main avian predators on the island during the smolt outmigration. To help better understand predation rates on smolts, John Day Fisheries (JDF) personnel coordinate yearly passive integrated transponder (PIT) tag scans on the island. In total, 2,516 PIT tags have been recovered on Preacher's Island over the course of 5 years (2019-2023). With a high number of recovered PIT tags, JDF submitted a request to the Columbia Basin PIT Tag Information System (PTAGIS) for the island to become a mark, recovery, recapture (MRR) site. The request was approved, and Preacher's Island (JDPI) was implemented as a MRR site in December 2021. All recovered PIT tags have been uploaded and recorded into PTAGIS.

The fifth annual island scan was conducted on October 17, 2023, using Biomark HPR Plus readers. The JDF crew scanned the whole island focusing on areas where birds are known to congregate and recovered 713 unique PIT tags (Figure 15). This was the first year an attempt was made to get detection efficiencies for the island. On April 5, 2023, 50 tags were sown under the heron nests on the island, and 50 tags were sown on the peninsula of the island which is a main loafing site for pelicans. Then on October 17, 2023, 50 additional tags were sown under the heron nests and 50 on the peninsula right before the island was scanned that day. The detection efficiency under the heron nests was 56% pre-season and 82% post-season, and for the peninsula loafing site was 42% pre-season, and 70% post-season.

The species breakdown of the 713 unique PIT tags recovered this year are as follows: Steelhead - 504, Chinook - 148, Coho - 31, Orphan – 19, Sockeye - 8, Smallmouth Bass - 2, and other - 1. The predominate species of ALL the PIT tags that have been recovered on JDPI over five years is Steelhead (56%) followed by Chinook (35%) (Figure 16). Figure 17 shows the migration year from all the recovered PIT tags ranging from 1998-2023, with 2021 being the year with the most PIT tags recovered (218-tags).

Figure 14: Preacher's Island with recovered PIT tag coordinate locations
The white circled location is the heron colony on the island.

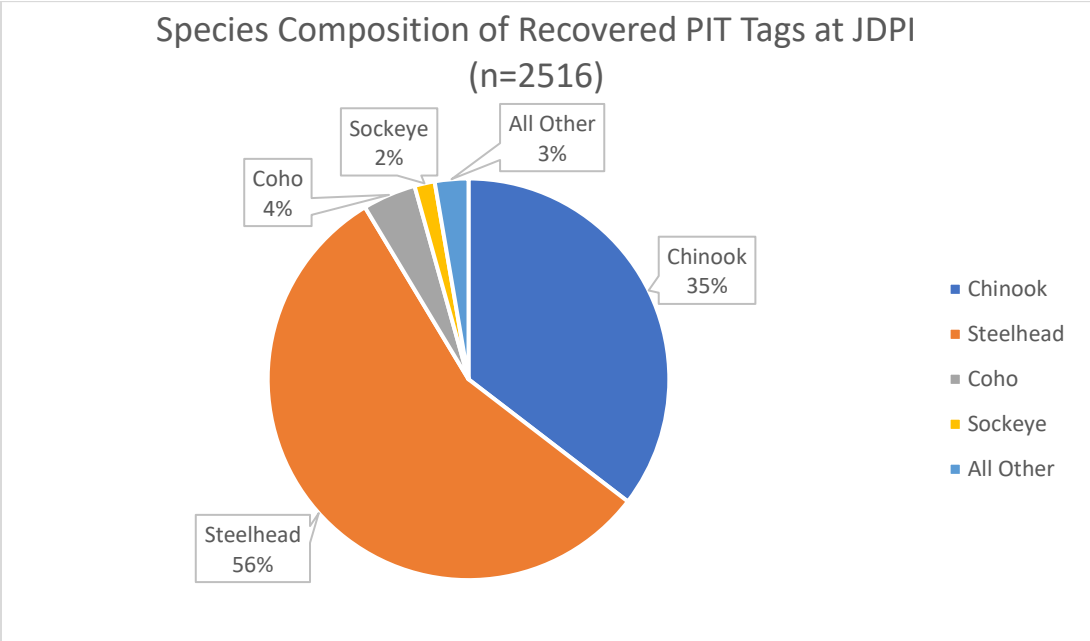


Figure 15: Species composition of all recovered PIT tags from Preacher's Island from all survey years (n=2516). "All Other" category consists of orphan (43), smallmouth bass (15), other (7) American shad (1), pacific lamprey (1), and white sturgeon (1).

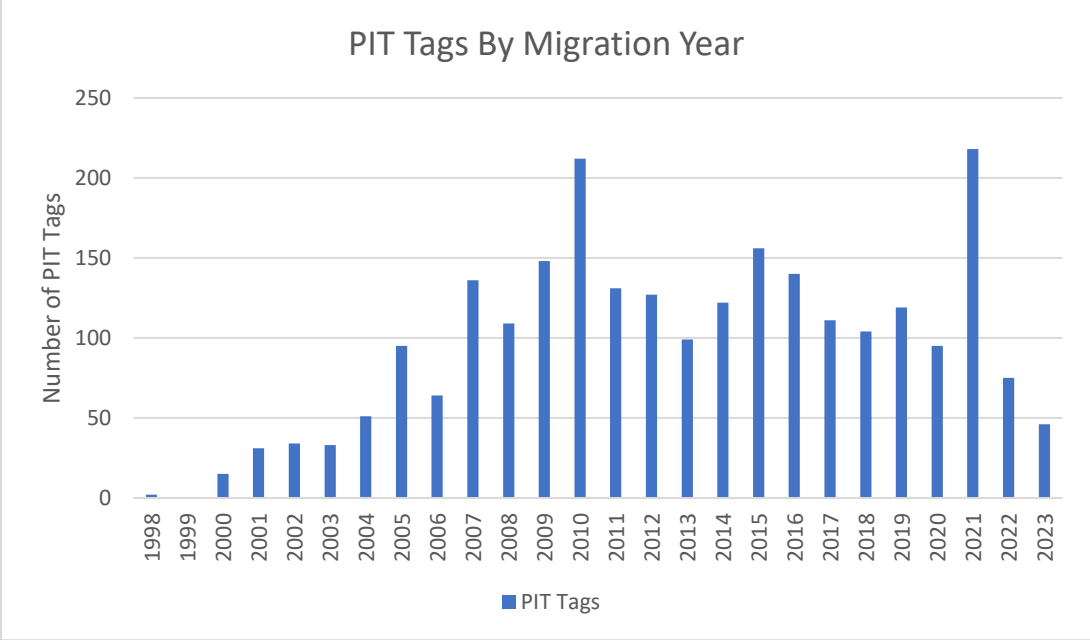


Figure 16: PIT tags recovered by migration year.
Total number of PIT tags with known migration year is 2,473 (43 orphan tags)

WATER QUALITY

Forebay Water Temperatures

The JDA forebay water temperatures were obtained from a United States Geological Survey (USGS) temperature sensor (Figure 18). This sensor is located at the upstream end of the navigation lock guide-wall. The USGS forebay temperature probe was deployed from April 5th – September 18th in 2023. The forebay water temperature started off below the 10-year average until the end of April when it exceeded it. The forebay water temperature remained above the 10-year average until the end of August when it dropped below the 10-year average until it was removed mid-September.

When JDA forebay water temperatures reach 70°F, JDF switches into 70°F juvenile sampling mode. During this time, condition samples are only taken Mondays and Thursdays, from 7AM – 1PM, this helps reduce stress on out-migrating smolts.

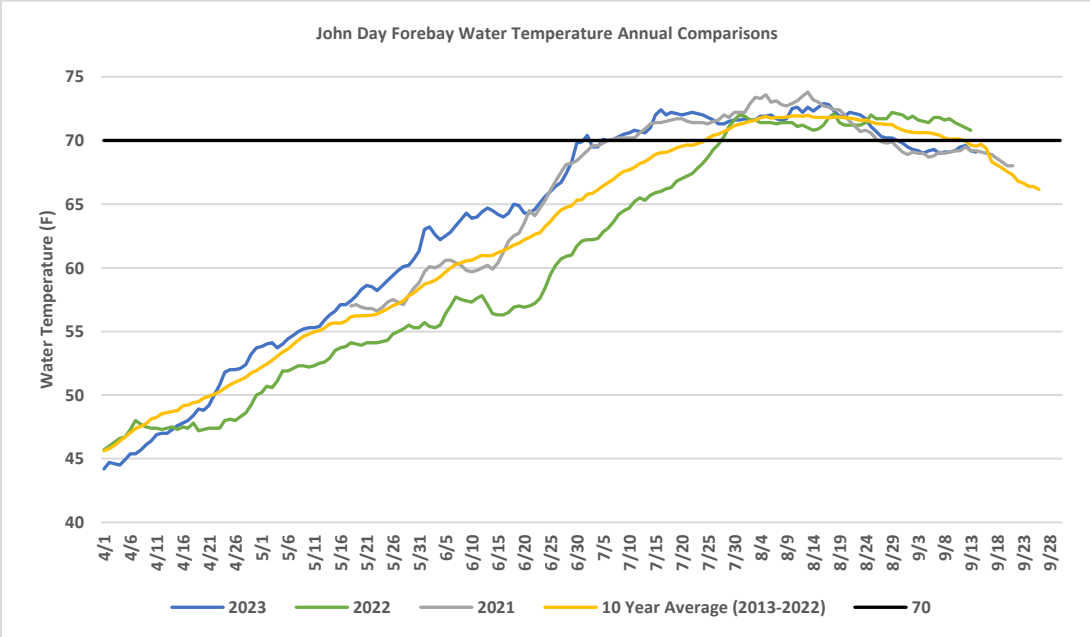


Figure 17: Average daily forebay temperatures (2021-2023) compared to the 10-year average (2013-2022)
The black line represents the 70-degree threshold for juvenile sampling.

In 2023, JDA fisheries deployed a forebay temperature string near the SFL exit following the guidelines and location (SS-2) set forth in the Lower Columbia River Dam Forebays Temperature Depth Profile Study for 2019 (Lundell et al 2019). Onset Hobo temperature probes (model: U22-001) were used at depth intervals of 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100-feet and temperatures were taken hourly from May 3rd, 2023 – December 6th, 2023 (Figure 19). The intent was to locate cooling water for the SFL exit. Forebay temperatures reached 70°F from July 2nd – September 17th, 2023 (Figure 20). All probes were tested against each other for accuracy by submerging them in a bucket of water. This was done before and after deployment. The average temperature reading was calculated for each probe, and all probes tested within 0.22°F (21-readings) of each other before deployment and 0.30°F (354-readings) of each other after deployment. All averages were within the factory accuracy standards of 0.38°F.

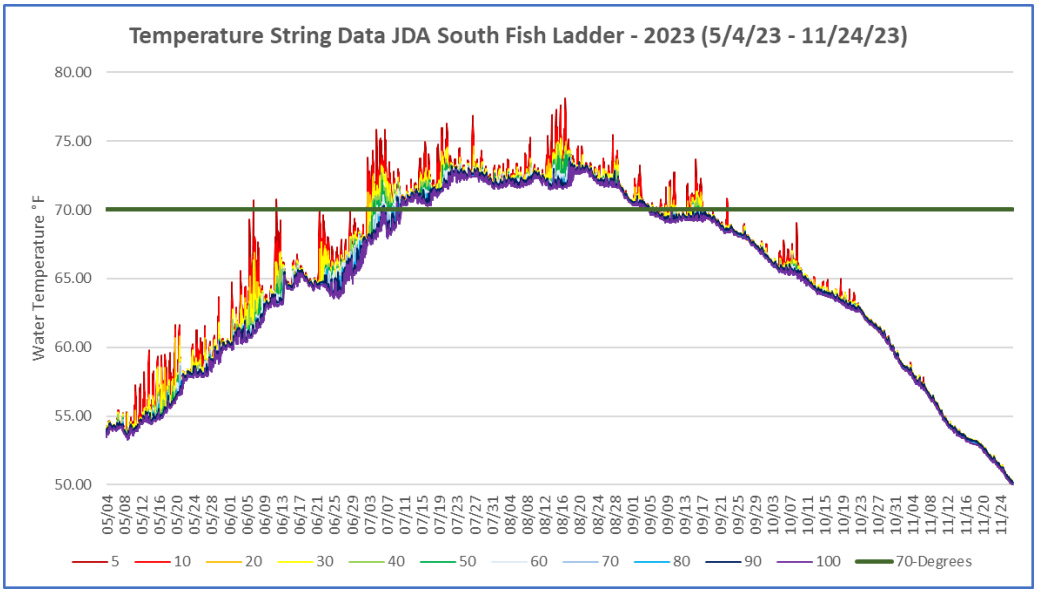


Figure 18: 2023 Forebay temperature string
Temperatures were measured at 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100-feet.
The solid line is to illustrate 70°F water temperature. Colors range from red at the shallowest (5-feet) to purple at the deepest (100-feet)

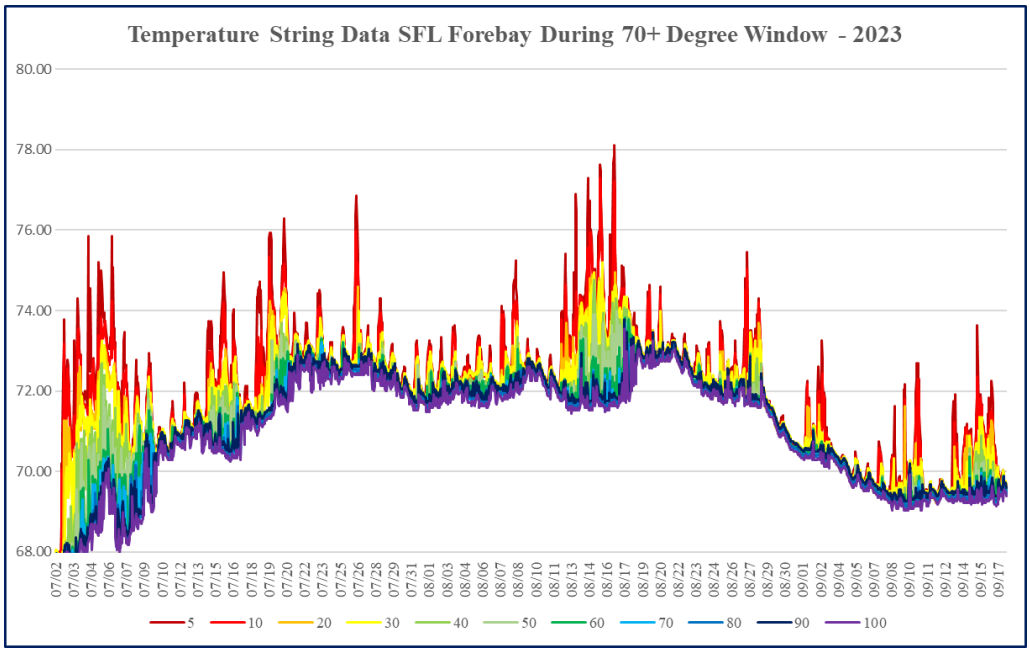


Figure 19: Temperature string data for 70°F+ water temperatures
(July 2nd – September 17th, 2023) in the JDA SFL forebay. The data point numbers (5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100) equal the depth in feet.

Fish Ladder Water Temperatures

John Day fisheries personnel (JDF) record ladder temperatures at the entrance and exit of both fish ladders (Figure 21). The exit temperatures are recorded upstream of the diffusers, and just downstream of the control sections (modulating weirs). These temperatures are measured using Hobo® (P/N: U22-001) temperature loggers. The temperatures are offloaded weekly and sent to FPC. These temperatures are also graphed and displayed in the weekly status reports Similarly, to the forebay temperatures, the fish ladder temperatures started off below the 10-year average until the end of April/beginning of May when it exceeded it. The ladder temperatures remained above the 10-year average until the end of August when it dropped below the 10-year average and then tracked it closely until the end of the season (Figures 22 and 23).

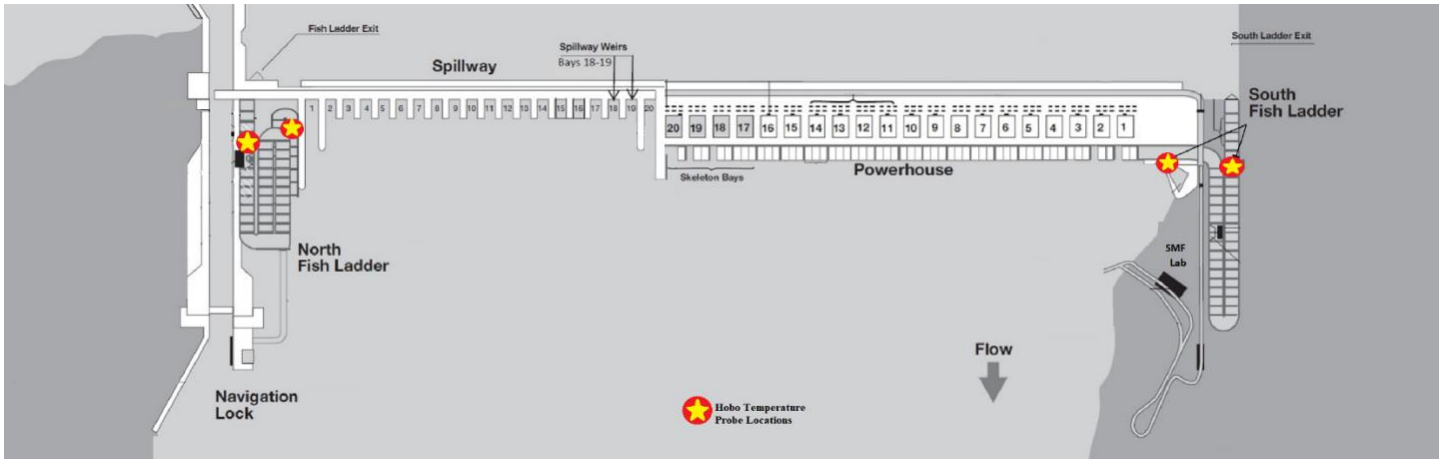


Figure 20: Fish ladder water temperature probe locations

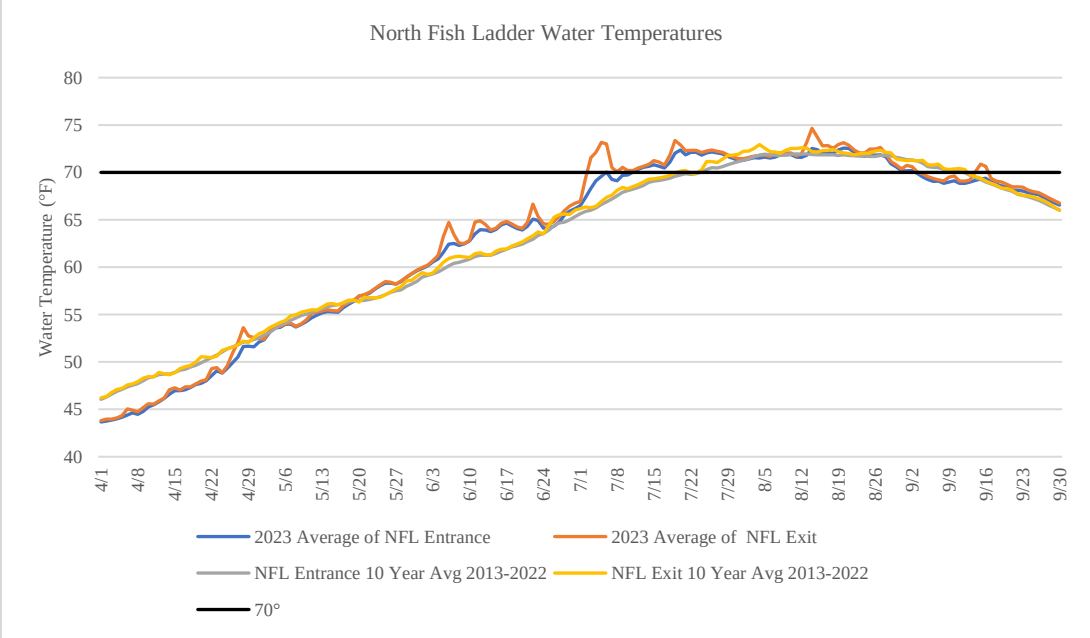


Figure 21: Average daily water temperature and 10-year averages (2013-2022) for the NFL

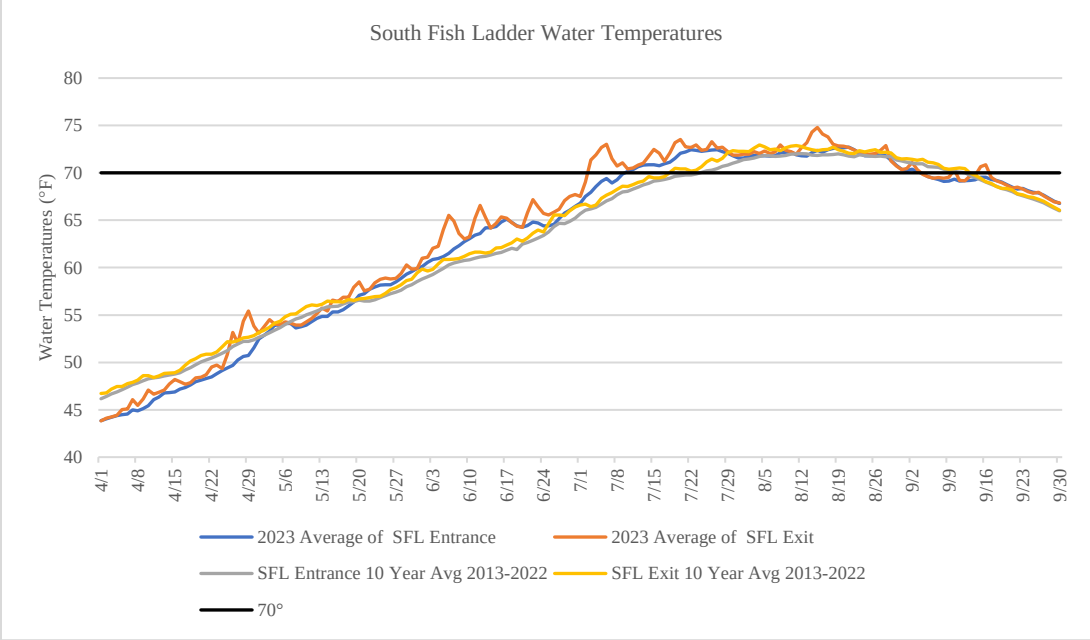


Figure 22: Average daily water temperature and 10-year averages (2013-2022) for the SFL

Water Clarity

A Secchi disk was used to measure water clarity at the NFL (just upstream from the count station) (Figure 24). Daily measurements are taken at the NFL (SFL when NFL is down for winter maintenance) for many reasons including ease of access, river conditions, and convenience. Unfortunately, due to water depth, the maximum obtainable measurement is 6-feet. The clarity is typically maxed out at 6-feet except during the spring freshet when sediment washes out from upstream tributaries. Daily and average-weekly clarity readings are reported in the weekly status reports.

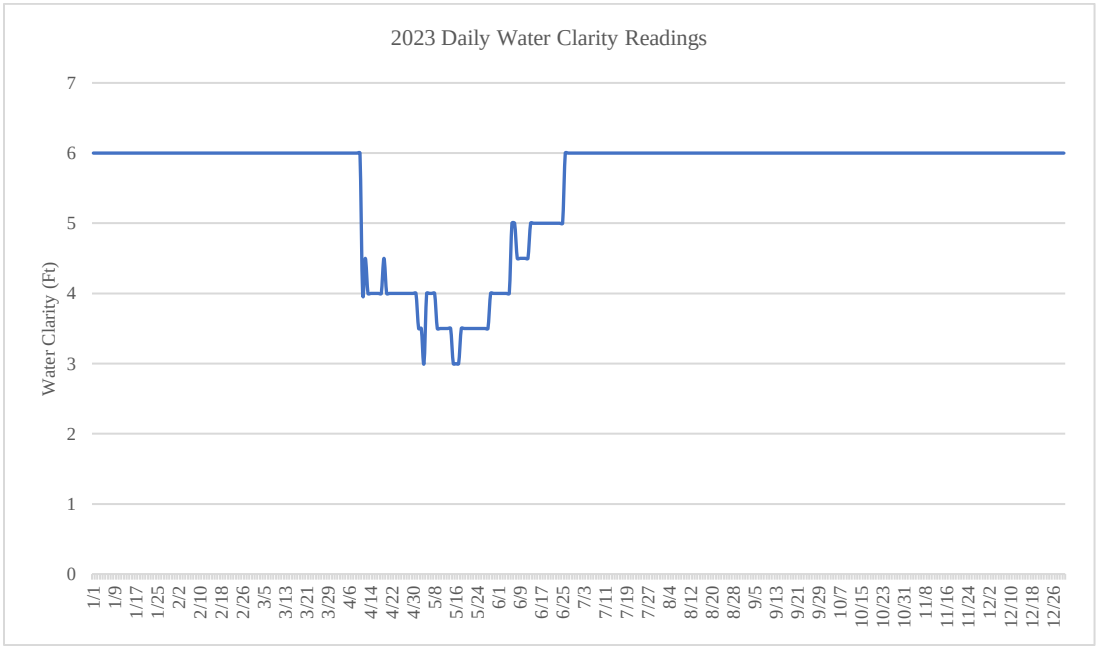


Figure 23: Daily water clarity readings

River Flow

Total dissolved gas (TDG) data was obtained from USGS gauges located in the forebay and tailrace (Figure 25). Tailwater TDG started off below the 10-year average until the end of April where it exceeded it until the beginning of June then tracked it closely for the remainder of the spill season. It peaked at 125% saturation for a week starting May 17th and did not exceed the gas cap set for the year. Flow and spill data were obtained from the FPC website (Figures 26-27 respectively).

Total river flows were below the ten-year average, until May when they exceeded the ten-year average for the month before again dropping below the average. Flows stayed below that average until the middle of August when it closely tracked the average for the remainder of the year. Flows peaked on May 21st at 417.4 kilo cubic feet per second (kcfs). This was about 7% lower than the 2022 peak river flow (446.8 kcfs).

Spill for juvenile fish passage started April 10th and ended on August 31st. Adult attraction spill for the NFL continued with spill bay 2 open one stop (1.6 kcfs) through November 30th. Spill (kcfs) was lower than the 10-year average until the beginning of May when it exceeded it until the middle of June when it dropped below the 10-year average for the remainder of the season. Spill (kcfs) peaked on May 14th at 211.8 kcfs, almost a full month earlier than last year (June 12th at 217.3 kcfs). The highest spill (shown as percent of river flow) peaked on May 31st at 64.7%. Table 6 shows the monthly averages of flow and spill during the spill season.

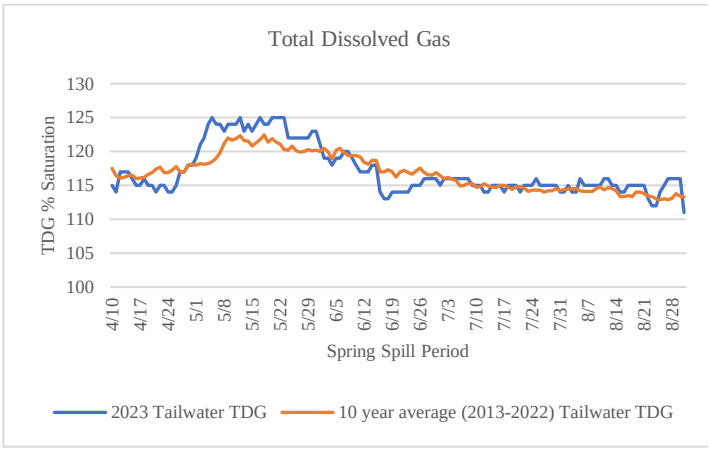


Figure 24: Average Daily TDG

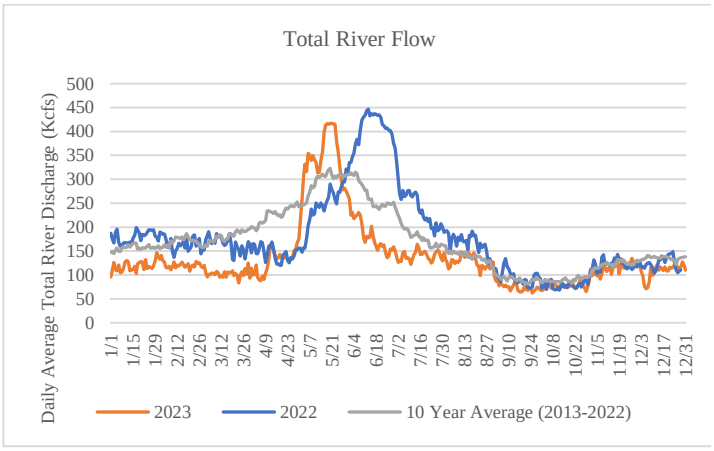
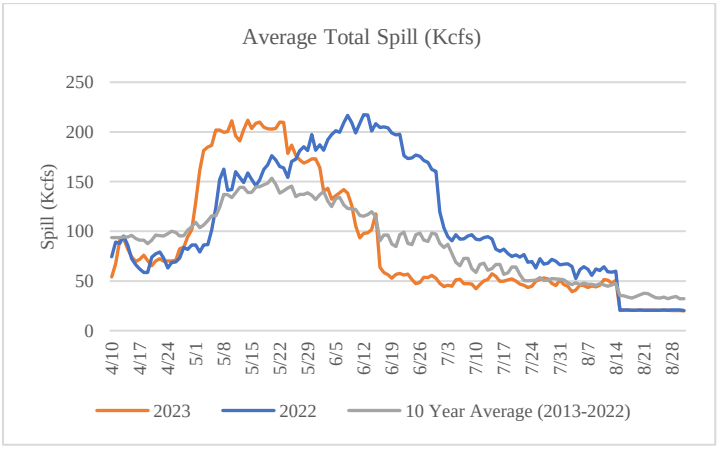


Figure 25: Total River flow (kcfs)



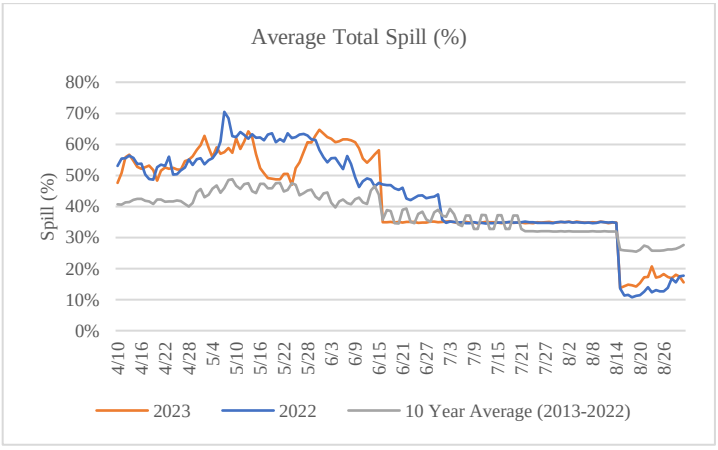


Figure 26: Average daily total spill (kcfs) left and average daily total spill (%) right

2023 Monthly Averages

Month	Total Flow (kcfs)	Powerhouse (kcfs)	Spill (kcfs)	Spill (%)
April	129.79	75.31	53.34	37.08%
May	341.83	149.91	190.72	56.47%
June	182.77	91.69	89.88	47.24%
July	140.00	90.04	48.79	34.85%
August	128.18	95.09	31.91	24.80%
September	74.49	72.36	0.97	1.32%

Table 6: 2023 Monthly total flow averages

South Fish Ladder Collection Channel Velocities

JDF monitors water velocities from the SFL collection channel. Historically velocities were calculated by recording the travel time of floats down the length of the collection channel. The times were recorded at every 2nd monolith, and this revealed velocities along the entire channel. In 2020 JDF began using a General Oceanics (model: 2030) velocity meter to obtain more accurate readings, (Figure 28) and continued using this velocity meter for 2023. Velocities are measured at 2-different locations, for at least 5-minutes, along the collection channel (Bays 4 & 12) (Figure 29). There were no time guidelines included with the meter, the times were established onsite. From March 1, 2023, through March 20, 2023, the SFL was on a 1 turbine operation due to gear box repairs on fish turbine #3 and vibration issues on fish turbine #2. During the 1 turbine operation NE-1 was closed and FOGs were removed. On March 1st when turbine #2 was forced out of service due to the vibration issues, a velocity was taken and was found to be out of criteria. NE-2 and SE-1 were adjusted to maintain velocity per FPP.

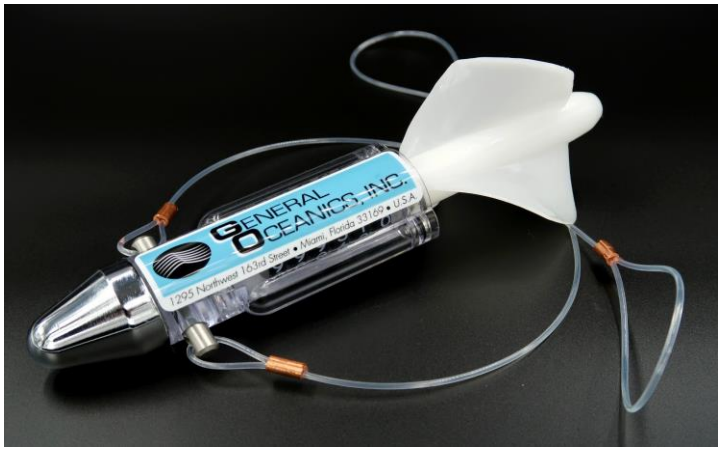


Figure 27: General Oceanics (model:2030) flow meter

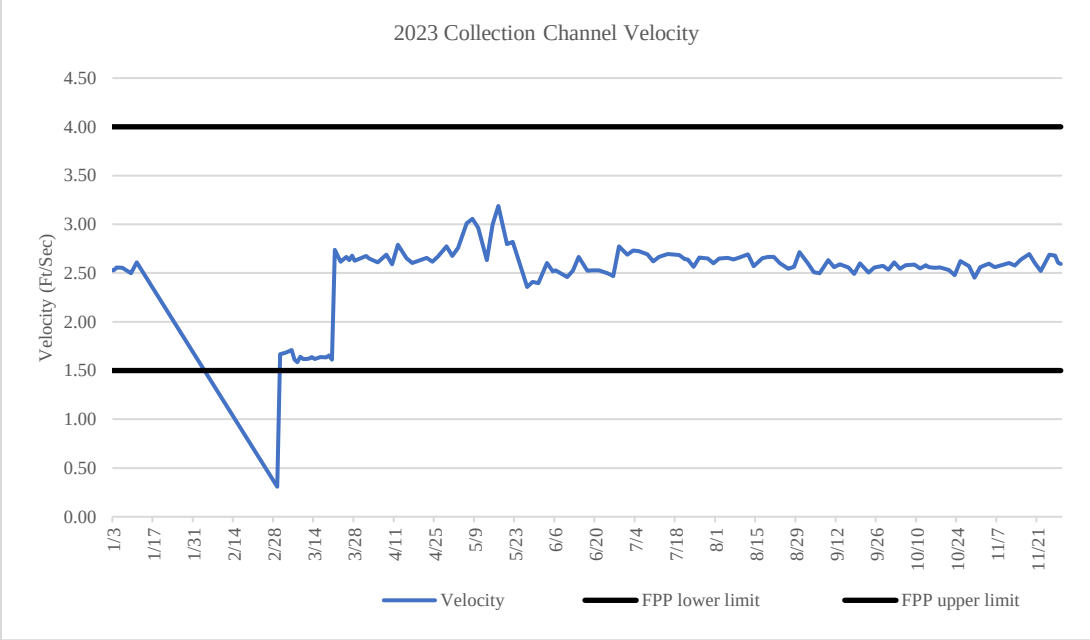


Figure 28: SFL collection channel velocities
Dark black lines represent the FPP criteria range of 1.5 - 4.0 feet per second (Ft/Sec)

Shad Mode Operation

The John Day project is required to operate both fish ladders (NFL & SFL) in "shad mode" on an annual basis to help shad navigate through the ladders more efficiently. The operation timing is variable and is dependent on shad counts taken at the Bonneville project (Table 7). When counts exceed 5,000 shad/day the water depth over both fish ladder weirs is increased from 1.0' (±0.1') to 1.3' (±0.1'). When shad counts drop below the 5,000/day threshold, the ladders are returned to normal operation (commonly referred to as "salmon mode").

Shad Mode Timeframes		
Year	Start	End
2014	5/22	7/16
2015	5/26	7/15
2016	6/1	7/18
2017	6/5	7/20
2018	5/24	7/23
2019	5/30	7/29
2020	6/4	8/4
2021	6/3	7/20
2022	5/31	7/21
2023	5/30	7/11
Average	5/30	7/20

Table 7 Shade Mode Operations (2014-2023)

PROJECT MODIFICATIONS

North Fish Ladder

2010 - Control Section of ladder completed.
2012- Entrance modification to ladder completed
2012 - Electric auxiliary water supply pumps installed
2017 - PIT tag readers installed in ladder
2023 - Lamprey passage system upgraded with gravity fed water supply and larger trap box

South Fish Ladder

2003 - Control section of ladder completed
2013 - Lamprey trap box installed

2017 - PIT tag readers installed in ladder
2023 - Auxiliary water supply turbine #3 gear box repair

Juvenile Bypass System/Smolt Monitoring Facility
1987 - Extended JBS conduit (MU10 – 16)
1998 - SMF completed
2007 - Full flow PIT tag readers installed
2020 - SCADA system upgrade

JDA Project
2010 - Avian line grid completed
2013 - Permanent top spillway weirs installed in bays 18 & 19
2018 - Avian line grid line replacement
2019 - New intake crane completed
2021 - Power generation line replacement and tower modifications
2022 - Trash rack replacement started; MU 16 completed
2023 - New trash rack crane completed

ACKNOWLEDGEMENTS

Kudos to all John Day Maintenance, Operations, Electrical, Natural Resources, Administration and Fisheries personnel for their dedication and hard work on improving fish passage at John Day Dam. A special thank you goes to Michael Lotspeich and Laura Ricketts for putting this report together.

RESEARCH

Columbia River Inter-Tribal Fish Commission (CRITFC): Collected adult Pacific lamprey for the Tribal Pacific Lamprey Restoration Plan (TPLRP) and collected genetic samples on out-migrating juvenile lamprey.

Four Peaks Environmental Science & Data Solutions: Conducted fish ladder counts for the USACE Adult Fish Counting Program.

Oregon Department of Fish and Wildlife: Performed the monthly Fish Passage Operations and Maintenance (FPOM) directed inspections of all JDA adult and juvenile fishways (see the FPC's annual report.).

Pacific States Marine Fish Commission (PSMFC): Sampled juvenile salmonids, lamprey, and bycatch at the JDA SMF April 1st through September 15th. Additionally, PSMFC collected PIT tag readings from both fish ladders and the full-flow PIT tag detector.

United States Department of Agriculture (USDA): Performed piscivorous avian hazing below the JDA tailrace.

United States Geological Survey (USGS): Monitored total dissolved gas (TDG). Additionally, monitored forebay and tailrace water temperatures.

Washington Department of Fisheries and Wildlife (WDFW): Performed northern pikeminnow dam angling from the JDA tailrace.

REFERENCES

Lundell et al. 2019. Lower Columbia River dam forebays temperature depth profile study for 2019. U.S. Army Corps of Engineers, Portland District.

ACRONYMS

AWPE: American White Pelican
AWS: Auxiliary Water Supply
FPP: Fish Passage Plan
JBS: Juvenile Bypass System
JDA: John Day Project
JDF: John Day Fisheries
LPS: Lamprey Passage System
LTS: Lamprey Trapping System
NFL: North Fish Ladder
OOC: Out of Criteria
SMF: Smolt Monitoring Facility
SCADA: Supervisory Control and Data Acquisition
SFL: South Fish Ladder
DCCO: Double-Crested Cormorant
BRZ: Boat Restricted Zone
TDG: Total Dissolved Gas
KCFS: Kilo Cubic Feet per Second
NPM: Northern Pikeminnow
PIT: Passive Integrated Transponder
TSW: Top Spillway Weir
USDA: United States Department of Agriculture

Approved by Patricia Miller, John Day/ Willow Creek Operations Manager