ADULT AND JUVENILE FISH FACILITIES MONITORING REPORT

ICE HARBOR DAM

2013

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INTRODUCTION

This report summarizes the operation and maintenance of the adult and juvenile fish passage facilities at Ice Harbor Dam in 2013. The juvenile fish passage facility at Ice Harbor Dam consists of standard length submersible traveling screens (STS's), vertical barrier screens (VBS's), 12 inch orifices (36 orifices), a collection channel and dewatering structure, fish sampling facilities, evaluation separator facilities, and a transportation flume/pipe to the tailrace downstream from the Project. The juvenile fish collection channel is operated with approximately 300 cfs flow (forebay head dependent) which is the design operating flow produced by 20 of the juvenile fish passage orifices open. All but 30 cfs of the flow is removed at the primary dewatering structure and utilized as adult fish attraction water. The remaining 30 cfs flow, which the fish are in, is routed through a transport pipe and flume to the fish sampling facility or directly to the tailwater.

The adult fish passage facilities at Ice Harbor are comprised of separate north and south shore systems. The north shore facilities include a fish ladder with a counting station, an adult fish collection channel, and a three-pump auxiliary water supply system. Only two of three pumps can be operated at a time due to power supply line restriction. The collection system includes two downstream entrances near the navigation lock wall at the base of the dam and one side entrance into the spillway basin (which is bulkheaded off). The downstream entrance nearest the navigation lock wall is normally open for fish passage, and the other two entrances are normally closed. Three electric pumps supply the auxiliary water for fish attraction flow. Two of the three pumps operate continuously during normal operation. The third pump serves as a backup in the case of a pump failure.

The south shore facilities are comprised of a fish ladder with a counting station, two south shore entrances, a powerhouse collection system, and a pumped auxiliary water supply system. The powerhouse collection system includes two downstream entrances and one side entrance into the spillway basin at the north end of the powerhouse (which is bulkheaded off) , twelve floating orifices, and a common fish transportation channel. The fishway entrances used during normal operation include: one south shore entrance nearest the powerhouse, one downstream north powerhouse entrance, and four operating floating orifices. Eight electric pumps are available to supply the auxiliary water for fish attraction. In addition, excess water from the juvenile fish bypass system (approximately 200-270 CFS depending on forebay head) is added to the south shore fish pump discharge chamber from April 1 through December 15.

RIVER CONDITIONS

Peak river flow at Ice Harbor Dam occurred May 14 reaching 136.0 kcfs. River flows intermittently exceeded 100 kcfs May 10 – May 17. Spill for juvenile fish passage began April 3 and continued through August 31. Water temperatures taken at the facility during the juvenile sample season ranged from 47.0 degrees Fahrenheit in early April to 68.0 degrees Fahrenheit July 15.

JUVENILE FISH BYPASS OPERATIONS AND MAINTENANCE

Sampling Summary

The Juvenile Fish Bypass was put in operation March 19, 2013 and continued in operation through December 23. Normal operation of the facilities is to bypass all collected fish directly to the river, except when routine sampling is conducted for monitoring fish condition. Sampling for fish condition in 2013 began April 8 and continued through July 15. Fish were sampled twice a week during this time frame. The goal of a sample event is to sample 100 fish of the predominant species per sample day when fish are available. During the beginning and the later part of the season, fish numbers can be too low to collect these fish in a reasonable time period. When this occurred, the collection time was limited to four hours and the fish collected during this period sampled.

A total of 2,428 fish were sampled at the Ice Harbor Facility in 2013 (Table 1). The 2013 sample numbers of fish decreased by 542 fish from the 2012 sample numbers of fish (Table 2). The species composition and percent of the combined total sample for each species group was: 327 clipped yearling Chinook 13.5%, 271 unclipped yearling Chinook 11.2%, 338 clipped subyearling Chinook 13.9%, 525 unclipped subyearling Chinook 21.6%, 676 clipped steelhead 27.8%, 260 unclipped steelhead 10.7%, 10 clipped sockeye 0.4%, 12 unclipped sockeye 0.5%, and 9 coho 0.4%.

A total of 55 non-target fish and other aquatic life (incidental species) were collected during sampling in 2013 (Table 3). These fish are directed into the sample tank with salmonids during the sampling process. Observed incidental fish are identified, recorded, and released back into the river via the bypass.

Juvenile Fish Condition

The combined annual descaling rate for all fish sampled in 2013 was 3.0% (Table 4,4a, and 5). The descaling rate decreased from 2012 by 0.5% (Table 5). Annual descaling rates in 2013 by species group were: clipped yearling Chinook 3.67%, unclipped yearling Chinook 3.32%, clipped subyearling Chinook 1.48%, unclipped subyearling Chinook 2.48%, clipped steelhead 2.48%, unclipped steelhead 3.40%, clipped sockeye 2.69%, unclipped sockeye 30.00%, and coho 0.0% (Table 4). Descaling data was collected from live sample fish. Facility fish mortalities were included in the sample number of fish.

Total juvenile facility percent mortality for all groups combined was 0.4% (Table 6). Facility mortalities by species group included: 1 clipped Steelhead.

Eye injuries are observed in sampled fish. This type of physical condition is not reflected in the descaling criteria, but could be significant in the survival of the animal.

Table 1. Number of fish sampled by day at Ice Harbor Dam, 2013.

Date	Yearling Chinook		Sub-Yr Chinook		Steelhead		Sockeye		Coho	Daily
	Clipped	Unclipped[1]	Clipped	Unclipped[1]	Clipped	Unclipped[1]	Clipped	Unclipped[1]		Total
8-Apr	4	6	---	---	---	---	---	---	---	10
10-Apr	2	3	---	---	---	2	---	---	---	7
16-Apr	42	43	---	---	5	5	---	1	---	96
18-Apr	21	17	---	---	19	6	---	---	1	64
22-Apr	18	12	---	---	65	10	---	---	---	105
24-Apr	20	13	---	---	54	7	---	---	---	94
30-Apr	3	7	---	---	39	---	---	---	---	49
2-May	35	38	---	---	28	3	---	---	---	104
6-May	43	17	---	---	50	3	---	---	---	113
8-May	34	26	---	---	41	4	---	---	---	105
14-May	14	5	---	1	67	15	---	---	---	102
16-May	12	2	---	---	81	12	---	---	---	107
20-May	15	16	6	8	25	24	2	---	2	98
22-May	19	12	1	---	35	18	5	9	---	99
28-May	9	12	3	4	61	37	1	1	---	128
30-May	1	1	1	1	5	3	---	---	---	12
3-Jun	3	10	3	3	45	16	1	1	5	87
5-Jun	25	22	5	9	9	12	1	---	1	84
11-Jun	2	5	67	57	5	---	---	---	---	136
13-Jun	2	---	48	59	4	1	---	---	---	114
17-Jun	3	2	70	61	---	2	---	---	---	138
19-Jun	---	2	29	28	15	70	---	---	---	144
25-Jun	---	---	4	5	1	1	---	---	---	11
27-Jun	---	---	20	30	5	5	---	---	---	60
1-Jul	---	---	27	72	10	3	---	---	---	112
3-Jul	---	---	8	18	5	1	---	---	---	32
9-Jul	---	---	20	56	1	---	---	---	---	77
11-Jul	---	---	9	23	1	---	---	---	---	33
15-Jul	---	---	17	90	---	---	---	---	---	107
Totals	327	271	338	525	676	260	10	12	9	2,428
% Totals	13.47%	11.16%	13.92%	21.62%	27.84%	10.71%	0.41%	0.49%	0.37%	***

[1]includes unclipped hatchery reared fish
--- No fish of this species sampled.

Table 2. Number of fish sampled at Ice Harbor Dam, 2007- 2013.

Year	Yearling Chinook Clipped	Yearling Chinook Unclipped[1]	Subyearling Chinook Clipped	Subyearling Chinook Unclipped[1]	Steelhead Clipped	Steelhead Unclipped[1]	Sockeye/Kokanee Clipped	Sockeye/Kokanee Unclipped[1]	All Coho	Total
2008	819	463	710	662	923	355	18	5	38	3,993
2009	632	431	472	600	1201	328	24	30	36	3,754
2010	364	158	265	435	1,061	227	1	4	7	2,522
2011	624	566	456	630	722	205	14	74	14	3,305
2012	639	631	240	494	585	325	0	18	35	2,970
2013	327	271	338	525	676	260	10	12	9	2,428

[1]includes unclipped hatchery reared fish

Table 3. Collection of incidental species during sampling at Ice Harbor Dam, 2013.

Common Name	Scientific Name	Number of fish
Crappie	*Promxis nigromaculatus*	0
Lamprey	*Lampetra tridentatus*	0
Peamouth	*Mylocheilus caurinus*	0
Mountain Whitefish	*Prosopium* sp.	2
Siberian Prawn	*Exopalaemon modestus*	44
Yellow Perch	*Perca flavescens*	2
Carp	*Cyprinus carpio*	0
Sandroller	*Percopsis transmontana*	0
Smallmouth Bass	*Micropterus dolomieu*	1
Tench	*Tinca tinca*	0
American Shad	*Alosa sapidissima*	1
Bluegill	*Lepomis macrochirus*	1
Total		51

Table 4. Sampling event-descaling rates in percent for fish sampled at Ice Harbor Dam, 2013

Date	Yearling Chinook		All Subyearling Chinook[1]	Steelhead		Sockeye/Kokanee		All Coho
	Clipped	Unclipped[1]		Clipped	Unclipped[1]	Clipped	Unclipped[1]	
8-Apr	---	---	---	---	---	---	---	---
10-Apr	---	---	---	---	---	---	---	---
16-Apr	4.76%	4.65%	---	---	---	---	---	---
18-Apr	4.76%	5.88%	---	---	---	---	---	---
22-Apr	---	8.33%	---	---	1.54%	30.00%	---	---
24-Apr	5.00%	---	---	---	5.56%	---	---	---
30-Apr	---	14.29%	---	---	2.56%	---	---	---
2-May	5.71%	5.26%	---	---	3.57%	---	---	---
6-May	9.30%	5.88%	---	---	4.00%	---	---	---
8-May	2.94%	3.85%	---	---	---	---	---	---
14-May	---	---	---	---	1.49%	---	---	---
16-May	8.33%	---	---	---	2.47%	---	---	---
20-May	---	---	---	---	8.00%	8.33%	50.00%	---
22-May	---	---	---	---	5.71%	---	20.00%	---
28-May	---	---	---	---	4.92%	---	---	---
30-May	---	---	---	---	20.00%	---	---	---
3-Jun	---	---	---	---	4.44%	6.25%	100.00%	---
5-Jun	---	---	---	---	---	---	---	---
11-Jun	---	---	1.49%	1.75%	---	---	---	---
13-Jun	---	---	2.08%	1.69%	---	---	---	---
17-Jun	---	---	2.86%	9.84%	---	---	---	---
19-Jun	---	---	---	3.57%	6.67%	---	---	---
25-Jun	---	---	---	---	---	---	---	---
27-Jun	---	---	---	---	---	20.00%	---	---
1-Jul	---	---	---	2.78%	---	---	---	---
3-Jul	---	---	---	---	20.00%	---	---	---
9-Jul	---	---	5.00%	1.79%	---	---	---	---
11-Jul	---	---	---	---	---	---	---	---
15-Jul	---	---	---	1.11%	---	---	---	---
% Totals	3.67%	3.32%	1.48%	2.48%	3.40%	2.69%	30.00%	0.00%

--- No fish of this species sampled.
[1]includes unclipped hatchery reared fish

Table 4a. Number of sample fish descaled at Ice Harbor Dam 2013.

Date	Yearling Chinook Clipped	Yearling Chinook Unclipped[1]	Subyearling Chinook Clipped	Subyearling Chinook Unclipped[1]	Steelhead Clipped	Steelhead Unclipped[1]	Sockeye/Kokanee Clipped	Sockeye/Kokanee Unclipped[1]	All Coho	Total
8-Apr	0	0	0	0	0	0	0	0	0	0
10-Apr	0	0	0	0	0	0	0	0	0	0
16-Apr	2	2	0	0	0	0	0	0	0	4
18-Apr	1	1	0	0	0	0	0	0	0	2
22-Apr	0	1	0	0	1	3	0	0	0	5
24-Apr	1	0	0	0	3	0	0	0	0	4
30-Apr	0	1	0	0	1	0	0	0	0	2
2-May	2	2	0	0	1	0	0	0	0	5
6-May	4	1	0	0	2	0	0	0	0	7
8-May	1	1	0	0	0	0	0	0	0	2
14-May	0	0	0	0	1	0	0	0	0	1
16-May	1	0	0	0	2	0	0	0	0	3
20-May	0	0	0	0	2	2	1	0	0	5
22-May	0	0	0	0	2	0	1	0	0	3
28-May	0	0	0	0	3	0	0	0	0	3
30-May	0	0	0	0	1	0	0	0	0	1
3-Jun	0	0	0	0	2	1	1	0	0	4
5-Jun	0	0	0	0	0	0	0	0	0	0
11-Jun	0	0	1	1	0	0	0	0	0	2
13-Jun	0	0	1	1	0	0	0	0	0	2
17-Jun	0	0	2	6	0	0	0	0	0	8
19-Jun	0	0	0	1	1	0	0	0	0	2
25-Jun	0	0	0	0	0	0	0	0	0	0
27-Jun	0	0	0	0	0	1	0	0	0	1
1-Jul	0	0	0	2	0	0	0	0	0	2
3-Jul	0	0	0	0	1	0	0	0	0	1
9-Jul	0	0	1	1	0	0	0	0	0	2
11-Jul	0	0	0	0	0	0	0	0	0	0
15-Jul	0	0	0	1	0	0	0	0	0	1
Totals	12	9	5	13	23	7	3	0	0	72

[1]includes unclipped hatchery reared fish

Table 5. Annual descaling rates in percent for fish sampled at Ice Harbor Dam, 2009 – 2013.

Year	Yearling Chinook Clipped	Yearling Chinook Unclipped[1]	Subyearling Chinook Clipped	Subyearling Chinook Unclipped[1]	Steelhead Clipped	Steelhead Unclipped[1]	Sockeye/Kokanee Clipped	Sockeye/Kokanee Unclipped[1]	All Coho	Total
2009	3.5	1.9	1.1	1.2	2.3	2.4	0.0	6.7	0.0	2.2
2010	3.9	2.5	3.4	3.0	2.2	3.1	0.0	0.0	0.0	2.8
2011	3.9	2.3	0.7	1.6	3.3	3.9	0.0	5.4	0.0	2.6
2012	2.7	3.2	4.2	2.0	5.5	3.7	0.0	0.0	0.0	3.5
2013	3.7	3.3	1.5	2.5	3.4	2.7	30.0	0.0	0.0	3.0

[1]includes unclipped hatchery reared fish

Table 6. Facility sample mortality number and weekly percent of species mortality sampled at Ice Harbor Dam 2013.

Date	Yearling Chinook Clipped	Yearling Chinook Unclipped[1]	All Subyearling Chinook[1]	Steelhead Clipped	Steelhead Unclipped[1]	Sockeye/Kokanee Clipped	Sockeye/Kokanee Unclipped[1]	All Coho	Daily Total
8-Apr	0	0	0	0	0	0	0	0	0
10-Apr	0	0	0	0	0	0	0	0	0
16-Apr	0	0	0	0	0	0	0	0	0
18-Apr	0	0	0	0	0	0	0	0	0
22-Apr	0	0	0	0	0	0	0	0	0
24-Apr	0	0	0	0	0	0	0	0	0
30-Apr	0	0	0	0	0	0	0	0	0
2-May	0	0	0	0	0	0	0	0	0
6-May	0	0	0	0	0	0	0	0	0
8-May	0	0	0	0	0	0	0	0	0
14-May	0	0	0	0	0	0	0	0	0
16-May	0	0	0	0	0	0	0	0	0
20-May	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0
28-May	0	0	0	0	0	0	0	0	0
30-May	0	0	0	0	0	0	0	0	0
3-Jun	0	0	0	0	0	0	0	0	0
5-Jun	0	0	0	0	0	0	0	0	0
11-Jun	0	0	0	0	0	0	0	0	0
13-Jun	0	0	0	0	0	0	0	0	0
17-Jun	0	0	0	0	0	0	0	0	0
19-Jun	0	0	0	1	0	0	0	0	0
25-Jun	0	0	0	0	0	0	0	0	0
27-Jun	0	0	0	0	0	0	0	0	0
1-Jul	0	0	0	0	0	0	0	0	0
3-Jul	0	0	0	0	0	0	0	0	0
9-Jul	0	0	0	0	0	0	0	0	0
11-Jul	0	0	0	0	0	0	0	0	0
15-Jul	0	0	0	0	0	0	0	0	0
Totals	0	0	0	1	0	0	0	0	0
Percent of Species mortality	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%

[1]includes unclipped hatchery reared fish

Table 7. Dam Mortalities Ice Harbor Dam, 2013

Date	Number and Fish	**Location**
5-6-13	1 - Non Clipped Adult Steelhead	SS Fish Ladder Picketed Leads
5-13-13	1 - Clipped Adult Chinook	SS Fish Ladder Fish Trap
6-11-13	1 - Non Clipped Adult Chinook	NS Fish Ladder Picketed Leads
7-8-13	2 – Non Clipped Juvenile Chinook	SS Fish Ladder Road Way
7-11-13	1 - Non Clipped Adult Chinook	SS Fish Ladder Road Way
9-3-13	1 - Clipped Adult Steelhead	Juvenile Collection Channel
10-17-13	1 – Non Clipped Adult Steelhead	Juvenile Collection Channel

Adult Salmon Fallbacks

05-16-13	1 Adult unclipped Chinook	Separator
05-28-13	1 Adult clipped steelhead	Separator
06-05-13	1 Jack clipped Chinook	Separator
06-19-13	1 Adult unclipped Chinook	Separator
07-03-13	1 Adult unclipped Chinook	Separator

Main Turbine Cooling Water Strainer Inspections

Main turbine cooling water strainers were inspected the entire year on a monthly basis at Ice Harbor from January 2013 to December 2013. A total of 289 juvenile lamprey morts were removed from the cooling water strainers in 2013, a decrease of 1,841 from 2012. Total aquatic life removed included: 289 juvenile lamprey, 3 adult lamprey, approximately 2,035 juvenile shad, 1 juvenile unclipped Chinook, 6 juvenile catfish, and 7 Siberian prawns were found and removed from the main turbine cooling water strainers in 2013. These numbers are estimates due to the condition of the fish carcus' in the strainers.

Debris/Trash Racks

Main unit trash rack raking was completed the week of March 25. Approximately 21 cubic yards of debris were removed. Turbine units 1 and 2 trash racks held the most debris. No additional trash rack raking was required during the season. No fish mortalities were observed on the trash racks this season.

Submersible Traveling Screens

The STS' installation was completed on all units the week March 25 (after trash rack raking) without problems. Problems with STS' found during monthly inspections were:

Date	Unit #	Slot	Screen location	Observations
April – November 2013	1-6	A-B-C	All inspection locations	No observable problems found

Vertical Barrier Screens

Project personnel inspected the vertical barrier screens (VBS's) while conducting STS inspections. Each VBS was inspected independently once each month during STS inspections. No problems were found with the VBS screens this season.

Gate Wells

Gate well debris was moderate at Ice Harbor Dam in 2013 and never approached the 50% coverage criteria point for mandatory cleaning. Slots were dipped for debris removal prior to installing the STS screens.

Orifices/Collection Channel

During the 2013 season, the collection channel was operated with 20 open orifices. Orifices were routinely cycled and back flushed by powerhouse operators and fish facility personnel. During periods of higher fish and debris loads (April 1 through July 31), the orifices were back flushed and cycled once per shift. Orifice lights were checked daily and replaced when required. The push to replace incondensence lighting with LED replacements will require future investigation into a comparable light wave length in LED format.

Primary Dewatering Structure

The primary dewatering screen cleaner brush performed fairly well this season. The drive wire did not need to be changed in season as it has in the past. The largest problem this season was the cleaner brush shive needs replaced due to wear. This repair was accomplished during the winter maintenance period.

Sampling System

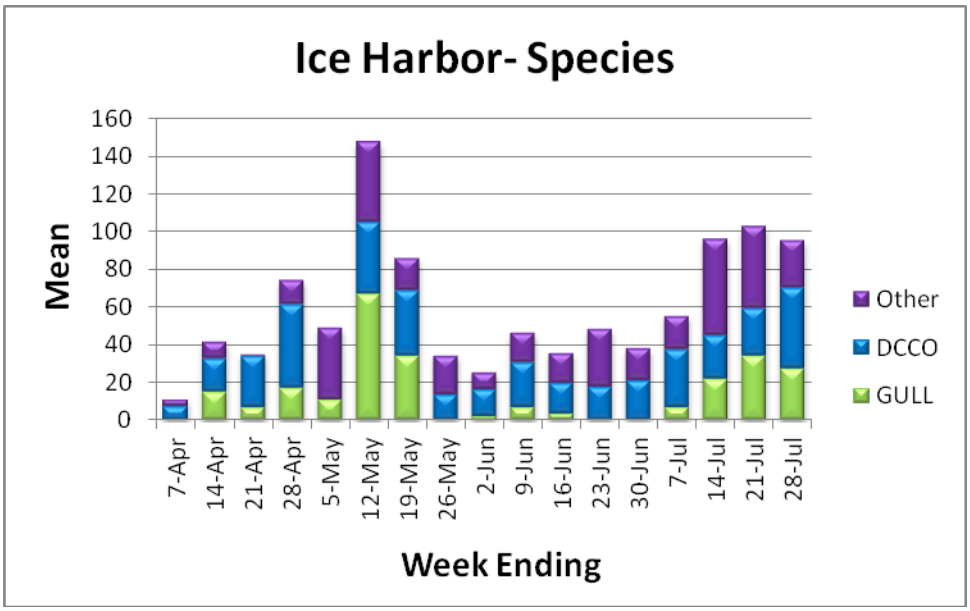
The sampling system functioned well this season. No problems were associated with sampling. Only one juvenile sample mortality occurred.

Removable Spillway Weir

No problems with the operation of the removable spillway weir. The RSW was operated April – August 2012.

Avian Predation

The U.S. Department of Agriculture (APHIS) provided bird hazing April – June. Bird deterrent structures are maintained on area lighting along the navigation lock and upstream navigation lock guide wall in addition to a wire array in the tailrace. The following is a table showing the mean of avian predators observed by COE fisheries personnel during the juvenile fish out migration period at Ice Harbor Dam.



Recommendations

1. Install a water line in the primary dewaterer to provide flush water to the transportation flume.
2. Modify the juvenile collection channel to allow fish that are handled during dewatering to be put into the bypass pipe and returned to the river.
3. Pave the road and provide curbing that would direct any water runoff away from the juvenile facility and the hillside.
4. Install a hopper in the main bypass pipe below the sampling stations. This would permit unwatering event rescued fish to be returned to the tailrace via the bypass pipe.
5. Install a crowding mechanism in the juvenile collection channel that would encourage adult fish to exit.
6. Replace the outfall pipe water cannon black iron pipe with stainless steel to prevent corrosion. In addition, replace the pump and water gun.
7. Install handrail along the north and south adult fishway ladders.

8. Install a debris bubbler system under the entire incline screen located in the juvenile fish collection channel.
9. Reposition/replace the orifice fish attraction lights in the juvenile fish collection channel.
10. Repaint the juvenile bypass pipes and supports.

Research

Idaho Cooperative Fisheries Research Unit

The Unit conducted an evaluation of adult salmon and steelhead migration past the Snake and Columbia River Dams and monitored lamprey passage in the north shore and south shore adult fish ladders by half duplex PIT tag and video equipment.

USGS

The Service tracked juvenile fall Chinook passing Ice Harbor Dam by radio telemetry.

University of Idaho/UC Davis

This was a cooperative effort identifying and documenting the number of adult lamprey upstream passage at the adult fish counting windows in the north and south fish ladders.

Univeristy of California - Davis

Operated the adult fish trap for the study ADS-W-13-1 titled "Adult Steelhead and Chinook Salmon Passage, Survival, and Conversion through the Lower Snake River."

PNNL

Conducted noise testing in the tailrace.

ADULT FISH FACILITY

Operations and Maintenance

The nouth shore fish ladder was unwatered for inspection January 2, 2013 - January 10, 2013. The south shore fish ladder was unwaterd to tailwater elevation January 12, 2013 and returned to service March 5, 2013. The lower south shore fish ladder and powerhouse collection channel were inspected by underwater video camera (ROV). No problems were found. Maintenance work performed on both ladders and juvenile collection channel included: debris removal, picketed lead and staff gage cleaning, adult fish counting/viewing window cleaning, and maintenance of auxiliary water supply pumps.

Areas that were dewatered in 2013 season that required fish removal are listed below.

January 2	Upper North Fish Ladder
January 9	Unit 1 Scroll Case
January 14	Upper South Fish Ladder
February 4	Unit 3 Scroll Case
August 6	Unit 4 Scroll Case
August 26	Unit 3 Scroll Case
September 17	Unit 2 Scroll Case
September 17	Unit 2 Gatewell
September 17	Unit 6 Scroll Case
September 18	Unit 6 Draft Tube
September 24	Unit 6 Gatewell
November 5	Unit 1 Scroll Case
December 20	Unit 5 Scroll Case

The total estimated number of fish handled during unwatering events in the 2013 season was 488. The species composition of the fish handled was 83 adult steelhead, 130 juvenile steel head, 2 adult chinook salmon, 101 juvenile chinook, 72 catfish, 1 smallmouth bass, 31 juvenile sturgeon, 6 adult shad, 59 juvenile shad, 1 juvenile lamprey , and 2 crayfish.

Modifications

A new adult fish trap was installed near the south adult fish ladder exit.

Adult Fish Trap Operation

The adult fish trap was operated in 2013.

Auxiliary water supply

All three fish pumps on the north shore and eight on the south shore were available for operation in 2013 with the exceptions listed below. Up to 8 south fish pumps were operated maintaining criteria in the south adult fishway. The north shore two pump operation makes the third north fish pump a backup. This allows normal two pump operation in the event one pump needs to be placed out of service. Each north shore fish pump operates at 350 CFS and each south shore fish pump operates at 300 CFS. In addition, approximately 270 CFS is added to the south adult fish pump chamber from excess water in the juvenile collection channel.

North fish pump 2 tripped out but within 15 min. it was restarted.	July 6, 2013 – July 6, 2013
South fish pump 8 tripped out and was not turned back on until needed again.	July 19, 2013 – August 1, 2013

Adult Fishway Inspections

Visual inspections

The Corps project fishery personnel conducted visual inspections of the adult fishways during the fish passage season March through December. In addition, the powerhouse operators conducted daily inspections of the fishways. Fishery personnel averaged 4 to 5 inspections each week with 187 inspections completed from March through December. The inspections were conducted by visually inspecting various areas of the fishways and recording readings on a data form from staff gages, fishway entrance hoists motor selysns, and if needed tape measures. The data was subsequently transferred to a computer spreadsheet (Appendix 2). In addition, an estimate of the amount of debris that accumulated near the fish ladder exits and in the gate wells was made during each visual inspection. When the fishway was out of criteria, the powerhouse operator was informed to make adjustments to the fishway control system or arrange for repairs if needed.

Automated Fishway Control System

In the 2013 Fish Season, Ice Harbor sensed water levels with a sonar based level sensing system manufactured by Milltronics using the Multi Ranger model. This signal was sent to a Programmable Logic Control Center (PLC) that processed the signals from the Multi Ranger then displayed the reading on a screen in the Control room and if needed sent a signal to raise or lower one of the three weirs in services. The automated fishway control system consists of a PLC which interfaces with process level controllers. The remote terminal units control the fishway weir gates according to set points that either controls the gate at a depth below tailwater or a channel to tailwater head differential. A printout from the printer in the control room contains the following information: date; time (hour, minutes, and seconds); channel temperature; channel and tailwater elevation in feet above mean sea level (MSL) for the north shore, north powerhouse and south shore; elevation in feet above MSL for the fishway entrances; water depth at the fishway entrances; channel/tailwater differential; and set points for the fishway entrances

and the channel/tailwater differential.

The readings from the automated fishway control system printout were recorded and compared to the visual inspection results to ensure that the fishways were operated within criteria. The automated control system was calibrated bi-monthly to ensure its accuracy. The time difference between reading the staff gage and collecting the computer printout in the control room may have been as much as 120 minutes. The time difference between the automated and visual readings may give different inspection results due to operational changes, such as spill, switching units, and other water elevation fluctuations.

Inspection Results

Overall, fishway performance increased for 2013 when compared to that of 2012 (Table 8 and Table 9). Deviations from criteria can be caused by fluctuating water elevations readings at the staff gages during spill. Observable water elevations can vary as much as 1 foot on either side of the average elevation. This condition significantly contributes to incorrect visual readings falsely indicating an out of criteria event. Another contributor to out of criteria events is the location of the staff gages in relationship to the water level sensing equipment. Some staff gages are located several feet from the target area to be regulated. This condition makes accurate calibration impossible due to the relationship between the sensing equipment and the staff gage not being linear. The Project is pushing ahead with correcting this problem by the current upgrade to sonar water level detecting devices and moving the staff gages to the proper positions. This has been an on-going effort due to funding.

While compiling the 2013 annual report, we found the 2012 Adult Fish Way Table calculations incorrect due to the fomulas out of range. We have included a corrected version of the 2012 Adult Fish Way Table at the end of this report.

South Shore Entrance (SFE): The 2013 SFE weir gate percent in criteria (≥ 8 feet or on sill) was 100%, an increase of 23.3% from that of 2012 at 76.7%. The 2013 SFE percent in criteria due to on sill events was 47.7%, an increase of 34.0% from that of 2012 at 13.7%. Most of the out of criteria occurrences can be attributed to unit operation changes, spill, and difficulty in reading staff gages due to fluctuations in water elevation, lower tailwater conditions, and discharges from the navigation lock.

North Powerhouse Entrance (NFE): The 2013 NFE weir gate percent in criteria (≥ 8 feet or on sill) was 97.0%, an increase of 12.7% from that of 2012 at 84.3% . The 2013 NFE weir gate percent in criteria due to on sill events was 46.2%, an increase of 27.0% from that of 2012 at 19.2% . When the SFE and the NFE fish entrances cannot be maintained at 8 feet depth or on sill simultaneously, criteria is sacrificed at the NFE to maintain criteria at the SFE the most used entrance.

North Shore Entrance (NSE): The 2013 NSE weir gate percent in criteria (≥ 8 feet or on sill) was 97.0%, an increase of 28.5% from that of 2012 at 68.5 %. The 2013 NSE weir gate percent in criteria due to on sill events was 63.2%, an increase of 42% from that of 2012 at 21.2% .The

majority of the out of criteria conditions at this entrance are due to the inability to lower the entrance weir to 8 feet depth while maintaining the channel/tailwater differential.

Fish Collection Channel/Tailwater Head Differential: The channel/tailwater head differential was in criteria on most inspections in 2013 (criteria = 1 - 2 feet). The percent in criteria at the SFE, NFE, and NSE was 91.7%, 97.0%, and 91.0% respectively.
Table 8. Adult Fish Way Inspection Results Ice Harbor Dam, 2013

*** Data from Appendix 2**

ICE HARBOR			**-----Not Enough Depth-------**			**--------Too Much Depth---------**		
Criteria and Locations	**No. in Criteria/ No. on Sill/ No. of Inspections**	**% In Criteria/ % On Sill**	No./% Within 0.01-0.1 Foot	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**	**No./% Within 0.01-0.1 Foot**	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**
Channel Velocities	126	97.7	***	***	***	***	***	***
	***	***	***	***	***	***	***	***
	129							
Differentials								
South Fish Ladder								
Ladder Exit	132	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	132							
Ladder Weirs	132	100.0	0	0	0	0	0	0
	***	***	0.0	0.0	0.0	0.0	0.0	0.0
	132							
Counting Station	128	98.5	***	***	***	0	0	2
	***	***	***	***	***	0.0	0.0	1.5
	130							
North Fish Ladder								
Ladder Exit	133	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	133							
Ladder Weirs	132	99.2	0	0	1	0	0	0
	***	***	0.0	0.0	0.8	0.0	0.0	0.0
	133							
Counting Station	132	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	132							
Collection Channels								
South Shore	121	91.7	0	0	1	1	4	5
	***	***	0.0	0.0	0.8	0.8	3.0	3.8
	132							
North Powerhouse	128	97.0	2	1	0	0	1	0
	***	***	1.5	0.8	0.0	0.0	0.8	0.0
	132							
North Shore	121	91.0	1	1	1	2	2	5
	***	***	0.8	0.8	0.8	1.5	1.5	3.8
	133							
Weir Depths								
SFE 1	69	52.3	0	0	0	***	***	***
	63	47.7	0.0	0.0	0.0	***	***	***
	132							
NFE 2	67	50.8	0	0	4	***	***	***
	61	46.2	0.0	0.0	3.0	***	***	***
	132							
NSE 1	45	33.8	0	0	4	***	***	***
	84	63.2	0.0	0.0	3.0	***	***	***
	133							

Recommendations

1. Continue to repair south ladder mud valves in the entrance channel and auxiliary water supply conduit to facilitate dewatering.
2. Modify the top of the downstream navigation lock gate so it will not strand fish.
3. Rehabilitate fish entrance weirs and hoisting equipment.
4. Relocate/replace staff gages and radar units so the staff gage fishway control system reading and the automated fishway control system readings will be closer to the same depth.
5. Initiate a contract to repair leaks and missing concrete areas in the fish ladders.
6. Install a handrail along the outside edge of north and south fish ladders.
7. Replace the north and south fishway exit wooden log booms.
8. Replace adult fishways and adult collection channel grating.

Table 9. Correctioned Adult Fish Way Inspection Results Ice Harbor Dam, 2012

ICE HARBOR			-----Not Enough Depth-------			--------Too Much Depth---------		
Criteria and Locations	**No. in Criteria/ No. on Sill/ No. of Inspections**	**% In Criteria/ % On Sill**	No./% Within 0.01-0.1 Foot	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**	**No./% Within 0.01-0.1 Foot**	**No./% Within 0.11-0.2 Foot**	**No./% >0.2 Foot**
Channel Velocities	121	84.6	***	***	***	***	***	***
	***	***	***	***	***	***	***	***
	143							
Differentials								
South Fish Ladder								
Ladder Exit	146	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	146							
Ladder Weirs	146	100.0	0	0	0	0	0	0
	***	***	0.0	0.0	0.0	0.0	0.0	0.0
	146							
Counting Station	142	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	142							
North Fish Ladder								
Ladder Exit	146	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	146							
Ladder Weirs	146	100.0	0	0	0	0	0	0
	***	***	0.0	0.0	0.0	0.0	0.0	0.0
	146							
Counting Station	143	100.0	***	***	***	0	0	0
	***	***	***	***	***	0.0	0.0	0.0
	143							
Collection Channels								
South Shore	134	91.8	0	0	0	2	3	6
	***	***	0.0	0.0	0.0	1.4	2.1	4.1
	146							
North Powerhouse	142	97.3	0	0	1	0	0	2
	***	***	0.0	0.0	0.7	0.0	0.0	1.4
	146							
North Shore	120	82.2	1	3	3	2	5	12
	***	***	0.7	2.1	2.1	1.4	3.4	8.2
	146							
Weir Depths								
SFE 1	92	63.0	1	4	29	***	***	***
	20	13.7	0.7	2.7	19.9	***	***	***
	146							
NFE 2	95	65.1	1	2	20	***	***	***
	28	19.2	0.7	1.4	13.7	***	***	***
	146							
NSE 1	69	47.3	1	2	40	***	***	***
	31	21.2	0.7	1.4	27.4	***	***	***
	146							