

Fish Screen Operations Report

January 2020



Bigfork Hydroelectric Project
FERC Project No. 2652



Prepared by
PACIFICORP



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1.0 Introduction

The Bigfork Hydroelectric Project (Bigfork project) is a 4.15-megawatt hydroelectric facility located between river mile (RM) 0.1 and RM 1.0 on the Swan River, in Flathead County, Montana (Figure 1). PacifiCorp received a new operating license from the Federal Energy Regulatory Commission (FERC) for the Bigfork project on July 25, 2003. As a requirement of the new license (Article 406), PacifiCorp was required to 1) install fish screens to prevent entrainment of resident fish, 2) develop a Screen Effectiveness Monitoring Plan in consultation with the U.S. Fish and Wildlife Service (USFWS) and Montana Fish Wildlife and Parks (MFWP), and 3) report on the effectiveness of the fish screens through quarterly reports for the first two years, and annual reports documenting screen operations for the term of the license.

PacifiCorp submitted a summary of the two years of quarterly monitoring to the USFWS and MFWP on March 28, 2007. Included in the summary was a recommendation that an automatic trash rake was not needed based on the absence of trout impingement, the results of the hydraulic velocity monitoring, and the insignificant amount of manual effort and lost generation to maintain the fish screens. The USFWS and MFWP concurred with PacifiCorp's determination. PacifiCorp submitted the report to the FERC on May 7, 2007, including comments received by the USFWS and MFWP. The FERC order approving the Fish Screen Effectiveness Monitoring Plan directs PacifiCorp to provide annual reports, following the two-year testing period, detailing annual screen operations for the term of the license. Provided herein is the 2019 Annual Fish Screen Operations Report.

1.1 Screen Configuration Overview

The Bigfork project fish screens are comprised of five separate panels located in front of the intake headgate; two panels are located directly perpendicular to the incoming flow. The remaining three panels are parallel with the flow in the main channel (Figure 2). The fish screens are positioned in front of the existing trash racks which are inclined at an angle of 30 degrees. There are five existing intake bays, each 14 feet wide (clear dimension) and 15 feet deep (floor of intake to top of deck). Each screen panel slides into guides mounted on the trash rack support structure. The guides are fabricated to provide sufficient clearance so each fish screen can slide up and down the guide without touching the trash rack bars. Each fish screen panel consists of a seven-foot wide by 15-foot long screen section and a seven-foot wide by two-foot long blank section bolted to the top of the screen section. An additional 18 inches of panel were added to the top of each screen section in 2006 to provide screening at flows up to the 95 percent exceedance flow. Each screen section consists of a frame into which are fastened four individual pieces of fish screen, each nominally seven feet wide by 3.75 feet long. Each panel is designed to meet an approach velocity of 0.8 feet per second (fps), as measured approximately one-foot upstream from the screen face.

A level sensor installed in the forebay provides elevation readings for comparison with an existing reservoir level sensor. This allows for monitoring water surface elevation in front and behind the fish screen for determining elevation differential. Differential readings available to the local operator indicate when debris loading is restricting flow through the screen panels.



Figure 1. Bigfork Vicinity Map

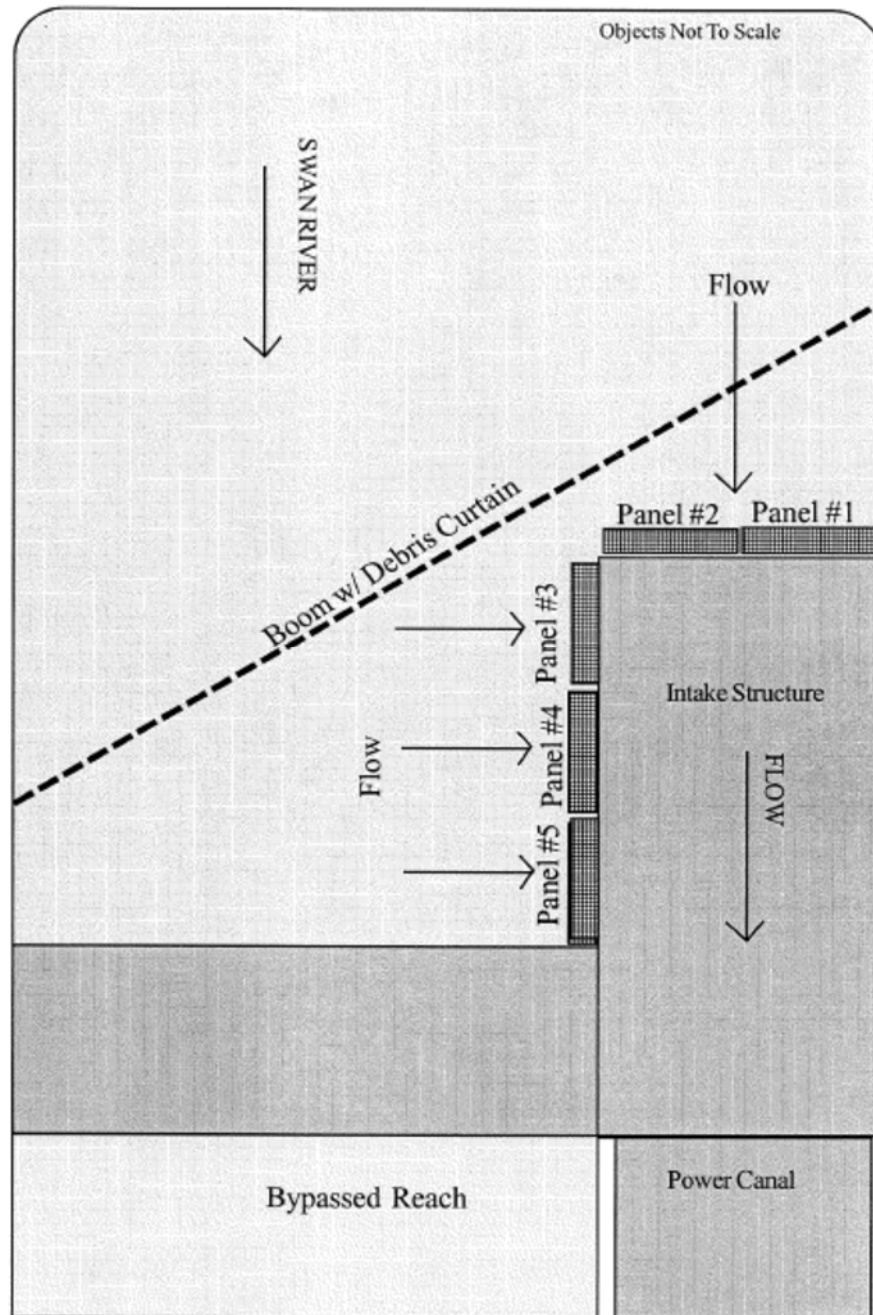


Figure 2. Bigfork Fish Screen Panel Configuration and Flow Pattern

2.0 Fish Screen Operations

This report focuses on the daily operations of the fish screen during calendar year 2019. PacifiCorp will maintain ongoing documentation for annual reporting of: 1) trout found impinged on the screens; 2) observed damage to the fish screen panels; 3) instances when temporary panels were employed; 4) log boom cleaning; and 5) results of any canal fish salvages triggered by canal maintenance activities.

2.1 Trout Impingement

The Bigfork operator performs daily maintenance of the fish screen. Part of that daily screen maintenance includes debris removal and recording any occurrences of fish found impinged on the screen panels. A review of the logs for 2019, and interviews with the maintenance foreman, indicates that no trout were encountered on the screen panels in 2019. Other species found on the screens included central mudminnow, northern pike and largemouth bass (Table 1).

2.2 Fish Screen Condition

During daily inspections by the operator, the fish screen is assessed for any malformations or damage. In 2019, operations staff found no visible damage to the fish screens during routine daily inspections.

The concrete supporting the screen framework has undergone repairs in 2009, 2010 and 2011. These repairs included grout patching and installation of steel plates around areas of spalling concrete that allowed fish to pass the screens. On December 9, 2013, divers from Deep Six, LLC inspected the screen structure and surrounding concrete for damage, holes, alignment and spalling concrete. Visual inspection showed no holes, damage or misalignment allowing fish to pass through the screen. The downstream concrete transition was found to be in acceptable condition with some exposed aggregate in areas near the surface. The divers were unable to visually inspect the bottom of the screen where it meets the concrete sill. Debris has inundated this area preventing a thorough evaluation of this part of the screen structure. A second underwater inspection was completed on September 15, 2015 to more closely inspect the bottom sill of the structure (see section 2.4).

2.3 Temporary Screen Panel

No deployment of the backup fish screen panels was needed in 2019. In the event of deployment, local operations staff is trained on the installation of the backup panels. Procedures for their installation are included in the FERC approved plan. PacifiCorp maintains backup fish screen panels on-site that would be deployed in the event that a screen panel is damaged.

Table 1. Date, species, number, length and condition of fish found on the fish screen panels during routine cleaning in 2019.

Date	Species	Number Encountered	Approximate Length (mm)	Condition
1/4/2019	Northern Pike	1	280	dead
3/26/2019	Central Mudminnow	100+	80-100	dead
3/27/2019	Central Mudminnow	100+	80-100	dead
3/28/2019	Central Mudminnow	100+	80-100	dead
3/30/2019	Central Mudminnow	100+	80-100	dead
4/1/2019	Central Mudminnow	100+	80-100	dead
4/1/2019	Perch	6	120-150	dead
4/1/2019	Bass	4	100-150	dead
4/2/2019	Perch	2	100-150	dead
4/9/2019	Bass	1	150	dead
4/9/2019	sunfish	1	100	dead
4/11/2019	perch	4	100-150	dead
4/14/2019	Bass	1	125	dead

2.4 Underwater Screen Inspection Results

On September 15, 2015, a second underwater inspection of the screen structure was completed. This second inspection focused on the bottom sill where the fish screen structure rests on the concrete sill. The sill area was pressure cleaned prior to inspection by the diver. The cleaning removed debris that precluded inspection during the initial dive in 2013. The diver inspected along the entire sill portion of the screen as well as all screen panels, joints and guides. As in 2013, no visible gaps, holes or misalignment was noted in the screens or concrete. The diver also inspected from the downstream side (inside) of the fish screens. No visual gaps were noted. For future reference, a copy of the video footage taken during both inspection dives are available through either Leo Rosenthal of Montana, Fish, Wildlife and Parks (MFWP) or Erik Lesko of PacifiCorp in Portland, Oregon.

3.0 Power Canal fish recoveries during annual maintenance

On October 14, 2019, PacifiCorp fisheries biologist (Erik Lesko) and maintenance staff performed a fish recovery in the Bigfork power canal to prepare for annual maintenance activities and dewatering of the power canal. Annual maintenance was a planned event and PacifiCorp provided notification to Montana Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service prior to the planned fish salvage (Appendix A).

Provided below are the procedures for performing fish recovery and the results of the 2019 Monitoring Plan. Fish recoveries in the canal are conducted anytime planned maintenance dictates the need for canal dewatering, or during any emergency canal dewaterings.

3.1 Canal Salvage Procedures

On the day of the dewatering event, project headgates are set to manual in the control room and “tagged” out. The canal intake gates are slowly lowered to an opening of approximately two inches. The operator then manually lowers the canal headgates slowly until complete closure is reached. The closure of the headgate causes water in the canal to be lowered to a depth of approximately 1.5 feet. Water from the canal is directed back into the Swan River through an 8-inch diameter pipe attached to the drain in the forebay area. Ramp rates in the Swan River following rewatering of the canal were tested in 2004 and 2006 and were found to range between 1.0 and 2.6 inches an hour.

During the recovery, fish are collected from the canal and sometimes the underground flow line and forebay depending on outage length and leakage in the canal. Water depth is maintained between 0.5 and 1.5 feet of water over the length of these features from headgate leakage. Fish are collected using two backpack electroshockers and dip nets. A stick seine is also used to facilitate sampling within the concrete flume portion of the canal where most fish congregate. A crew of two biologists follow the electroshocking team with the seine deployed as they work upstream towards the headgates. This prevents fish from escaping downstream. Once the crew is in close proximity to the headgates the seine is fixed and the seining team assists the electroshocking crew in netting fish (see cover page picture). All captured fish are lifted by bucket to a water tank in a pickup truck. Once completed with the concrete flume section, the crews work downstream from the bridge in the earthen portion of the canal with electrofishers and netters. Depending on outage length, the underground HDPE pipe may also be walked. All collected fish are identified to species and a representative subsample of each species is measured for length (total length). All fish are released upstream of the project into the Swan River.



3.2 Canal Salvage Results

On October 14, 2019, at approximately 0630, the headgates to the Bigfork power canal were closed for annual maintenance. Water in the canal was allowed to drain for approximately 3.5 hours to reach a water level of less than one foot in the concrete flume portion. The primary purpose of the salvage is to remove and relocate any fish present in the canal prior to full dewatering. The salvage also provides an opportunity to quantify the number and species in the canal on an annual basis. All fish captured are enumerated and identified prior to release. A subsample of captured fish are measured for length to provide an indication of size (age) classes found in the canal (Appendix B). All captured fish are transported and released upstream into the Swan River at the Kearny Rapids boat launch.

The fish salvage crew consisted of staff from both PacifiCorp and Sandy Construction – a PacifiCorp contractor. Because the salvage occurred during a federally recognized holiday, no personnel from MFWP or USFWS were available to assist this year. However, MFWP did provide equipment including electrofishers, nets and seines for our use. PacifiCorp provided a fish tank, buckets, ladder, ropes and pickup truck to hold tank and transport collected fish.

The crew consisted of the following people:

Erik Lesko – PacifiCorp, Fisheries Biologist (permit holder)
Steve Gordon – PacifiCorp, Hydro Operator
Eve Lefcourt – Sandy Construction
Bill Cotter – Sandy Construction
Brian Toole – Sandy Construction

The crew met at approximately 9:00 AM at the Bigfork powerhouse to review the plan, conduct a safety ‘tailboard’ meeting and sign necessary tag outs. Fish recovery efforts began at about 10:00 AM.

The crew started at the downstream end of the canal at the junction of the canal and underground pipe (sagpipe). The benefit of starting in this section is that the earthen section tends to shallow up quickly and potentially strand fish. Also, by working upstream from this point, turbidity is reduced allowing netters to see and net fish more effectively.

Once the crew arrived at the concrete flume portion of the canal (bridge crossing), a seine was deployed by two workers about 100 feet downstream of the electrofishing crew. The purpose of the seining crew was to prevent fish from swimming past the electrofishing crew. The seining crew followed the electrofishing crew upstream to the head gates. We did not notice any fish swim by either crew as we moved up to the head gates. At the head gates, the seine was fixed to both sides of the canal wall to prevent fish from leaving the area. We made multiple passes with the electrofisher in and around the head gates structures removing all fish present.

In total, only 33 fish were removed from the canal. Mountain Whitefish (*Prosopium williamsoni*) represented 55 percent of total captures (Table 2). Most of the mountain whitefish were subyearlings based on their average lengths. Rainbow trout (*Onchorhynchus mykiss*)

represented 30 percent of captures followed by catostomids at about 12 percent. No mortalities were observed.



4.0 Discussion

The number of fish captured in the canal in 2019 represented the smallest total number of fish captured in any previous year. The low number of captures may be related to an emergency dewatering event occurring between August 6, and October 26, 2018, whereby the canal was dry while crews installed a liner to prevent erosion along a portion of the earthen canal. This prolonged drawdown caused fish that may have been in the canal to be directed through the canal drain leading to the Swan River. Additionally, a minor one day drawdown in April 2019 was noted to install a steel plate in a leaking portion of the concrete flume.

During the August 2018 event, the canal was dry for over a month and it is very unlikely any fish not recovered or entering the drain would have been able to survive. Therefore, we assume that all fish recovered in 2019 entered the canal between the dewatering event in August 2018 and the salvage on October 14, 2019. Fish removal is also conducted prior to annual maintenance typically occurring in the fall each year. While fish removal is not likely to capture and remove every fish, we do not typically observe many, if any, fish after removal. Fish remaining in the canal after removal are not likely to survive as the water continues to drain and these fish would be subject to predators over the following weeks of annual maintenance activities. Therefore, the relatively low number of fish removed in 2019, is more likely related to natural water conditions or fish populations status in the Swan River rather than any operations changes in 2019 or 2018.

As in previous years, several large rainbow were recovered in the canal. It is not known how these larger fish (largest being 437 mm) are entering the canal as the screens appear to be functioning normally and at no time were panels damaged or removed in 2019.

Table 2. Comparison of the total number of fish removed from the Bigfork Hydroelectric Project power canal by species between 2009 and 2019.

SPECIES	Number Captured										TOTAL	
	10/11/09	06/22/10	09/12/11	10/22/12	10/07/13	10/06/14	09/14/15	09/19/16	07/18/17	2018		10/14/19
Rainbow Trout	153	31	20	132	139	60	39	222	58	No salvage	10	864
Catostomids	3	6	17	16	59	10	3	29	7		4	154
Mountain Whitefish	7	3	28	335	90	125	77	18	391		18	1092
Cottids	0	2	9	0	2	2	1	2	0		0	18
Brook Trout	0	0	0	0	0	1	0	0	0		0	1
Northern Pike	6	0	0	0	1	4	4	1	1		1	18
Brook Stickleback	0	1	0	0	0	0	0	0	0		0	1
Northern Pikeminnow	0	0	1	0	0	0	0	0	0		0	1
Central Mudminnow	0	0	0	0	0	0	0	1	0		0	1
TOTAL	169	43	75	483	291	202	124	273	457		33	2150

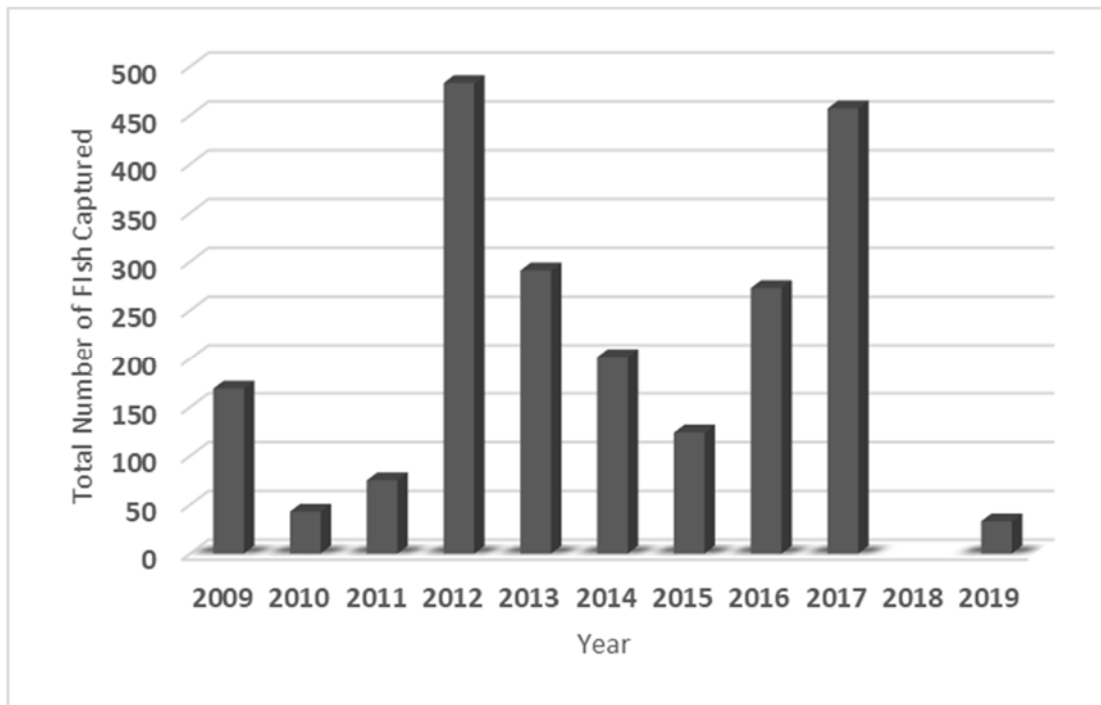


Figure 3. Total number of fish removed from the Bigfork Canal by year: 2009 - 2019

ATTACHMENT A

Notification of Annual Maintenance and power canal dewatering at the Bigfork Hydroelectric Project

From: Lesko, Erik
Sent: Monday, September 9, 2019 8:43 AM
To: Leo Rosenthal (lrosenthal@mt.gov) <lrosenthal@mt.gov>; Kevin Aceituno (Kevin_Aceituno@fws.gov) <Kevin_Aceituno@fws.gov>; 'Scott Hawxhurst (shawxhurst@mt.gov)' <shawxhurst@mt.gov>
Subject: RE: Bigfork Canal Annual Maintenance and fish roundup (REVISED DATE)

Good Morning,

I learned today that **annual maintenance at Bigfork canal has been delayed to Monday, October 14**. Yes, that is Columbus Day and I assume that is a holiday for your agencies? The reason for the delay is due to our concrete contractor's schedule. I have lined up some internal folks to assist that day with the salvage effort.

Leo, I was wondering if it would still be possible to borrow efishers and seine? I could pick up on Friday, October 11 and return to your office on morning of October 15?

Of course, if your offices are open for some reason, any assistance is always greatly appreciated!

Thanks all – hopefully scheduling won't throw us anymore curve balls.

Erik

From: Lesko, Erik
Sent: Friday, August 16, 2019 5:25 PM
To: Leo Rosenthal (lrosenthal@mt.gov) <lrosenthal@mt.gov>; Kevin Aceituno (Kevin_Aceituno@fws.gov) <Kevin_Aceituno@fws.gov>; 'Scott Hawxhurst (shawxhurst@mt.gov)' <shawxhurst@mt.gov>
Subject: Bigfork Canal Annual Maintenance and fish roundup

Hello Everyone –

It's that time of year again. **I have been notified that annual maintenance at our Bigfork power canal will begin on Monday, September 23**. This will include the usual canal dewatering beginning on Monday morning. The dewatering will allow us to perform maintenance on the canal and complete a permanent repair to the leak observed in April of this year. Remember we installed a steel plate as a temporary repair until our planned annual maintenance.

To help plan for this event, would you be willing to assist in the recovery effort on Monday and provide backpack shocker units and a seine as in previous years? We will have the truck and fish tank available as usual. Let me know your schedules and, if necessary, I can probably find some people from our office.

If you are available, I suggest we meet at the powerhouse at 10:00 AM where we can sign the necessary tag outs before entering the canal.

Thank you for any assistance you can provide. Hope to see you in September!

Erik

Erik Lesko
Lewis River Aquatics Program Lead
825 NE Multnomah, 1800 LCT | Portland, OR, 97232
503-813-6624 | Cell : 503-412-8401

ATTACHMENT B
Total lengths of a subsample of fish captured in the Bigfork Power Canal on October 14, 2019.

	Rainbow Trout	Mountain Whitefish	Northern Pike	Catostomids
	(Total Length, mm)			
1	122	165 to 190		104
2	116			128
3	125			132
4	432			116
5	437			
6	381			
7	388			
8	406			
9	394			
10	395			