

# Fish Screen Operations Report

January 2021



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 2020 Annual Fish Screen Operations Report.

### **1.1 Screen Configuration Overview**

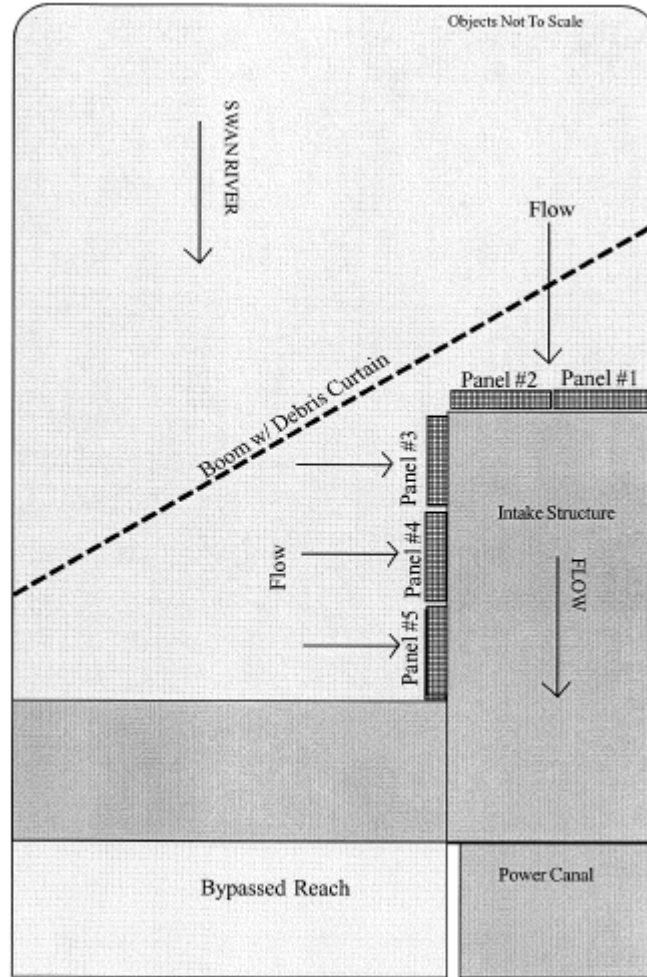
The Bigfork project fish screens are comprised of five separate panels located in front of the intake headgate; two panels are located directly perpendicular to the incoming flow. The remaining three panels are parallel with the flow in the main channel (Figure 2). The fish screens are positioned in 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 showing project features relative to the Swan River and City of Bigfork.**





**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 2020. 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 2020, and interviews with the maintenance foreman,

indicates that no trout were encountered on the screen panels in 2020. 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 2020, 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.

## **2.3 Underwater Screen Inspections**

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.

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.

## **2.4 Temporary Screen Panel**

No deployment of the backup fish screen panels was needed in 2020. 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 2020.**

<b>Date</b>	<b>Species</b>	<b>Number Encountered</b>	<b>Approximate Length (inches)</b>	<b>Condition</b>
1/6/2020	Yellow Perch	4	4-12	3 mortality, 1 alive(released)
1/19/2020	Yellow Perch	2	4-6	Mortality
2/12/2020	Yellow Perch	1	7	Mortality
2/12/2020	Northern Pike	1	18	Mortality
3/1/2020	Yellow Perch	3	4-8	Mortality
3/1/2020	Northern Pike	1	8	Mortality
3/13/2020	Yellow Perch	1	6	Mortality
3/25/2020	Northern Pike	1	14	Mortality
4/2/2020	rainbow trout	1	16	Mortality
April	Largemouth Bass	3	unknown	Mortality
4/22/2020	Northern Pike	1	15	Mortality
5/5/2020	Yellow Perch	3	6-8	Mortality
5/7/2020	Central mudminnow	20-40	3-4	Mortality
5/14/2020	Painted Turtle	1	7	alive(released)
6/2/2020	Central mudminnow	40+	3-4	Mortality
6/10/2020	Painted Turtle	1	5	Mortality

### **3.0 Power Canal fish recoveries during annual maintenance**

On September 14, 2020, 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 2020 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. 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 at the Kearney Rapids boat launch.



### 3.2 Canal Salvage Results

On September 14, 2020, 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 were 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. MFWP provided equipment including electrofishers, nets and seines for our use. PacifiCorp provided a fish tank, buckets, ladder, ropes and pickup truck to transport collected fish.

The crew consisted of the following people:

Erik Lesko – PacifiCorp, Fisheries Biologist (permit holder), electrofisher operator  
Steve Gordon – PacifiCorp, Hydro Operator  
Arik Lybeck – Sandy Construction  
Josh Sandy – Sandy Construction

The crew met at approximately 9:45 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 10:30 AM.

The crew started at the downstream end of the canal at the junction of the canal and underground HDPE 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 about 100 feet downstream of the electrofishing sampler. The purpose of the seining crew was to prevent fish from swimming past the electrofishing crew. The seining crew followed the electrofishing sampler upstream to the head gates. We did not notice any fish swim by the 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. All fish were released into the Swan River at the Kearney Rapids boat launch.

At approximately 1:40 PM, Steve Gordon and Erik Lesko entered the underground HDPE pipe portion of the canal. Fish present in the pipe were identified to species and enumerated as the crew worked downstream to the canal drain. All fish observed were either ‘chased’ downstream to the canal drain or collected in dip nets and placed into the canal drain. The canal drain discharges into the Swan River immediately upstream of the powerhouse. The survey of the power canal was completed at approximately 3:00 PM.

In total, 74 fish were removed from the canal. Rainbow Trout (*Onchorynchus mykiss*) were the primary catch representing 47 percent of the catch (Table 2). Mountain Whitefish (*Prosopium williamsoni*) and smallmouth bass (*Micropterus dolomieu*) represented 26 percent each. No mortalities were observed.



*Photograph of crew measuring and releasing collected juveniles (Kearney Rapids).*

#### **4.0 Discussion**

The number of fish captured in the canal in 2020 represents the second smallest total number of fish captured in any previous year. For the first time since surveys began in 2009, smallmouth bass were observed as part of the fish collection. While bass are reported on the fish screens in some years, no bass have been collected in the canal during previous surveys. The proportion of smallmouth bass (26%) observed as part of the total catch was also surprising. All smallmouth bass measured less than 100 mm in total length, indicating these captures are all subyearlings (hatched in the spring or early summer of 2020).

No emergency dewaterings of the canal occurred between the October 14, 2019, survey and the September 2020 survey. Therefore, the relatively low number of observed fish in the canal were not subject to any interim removal activities due to operations.

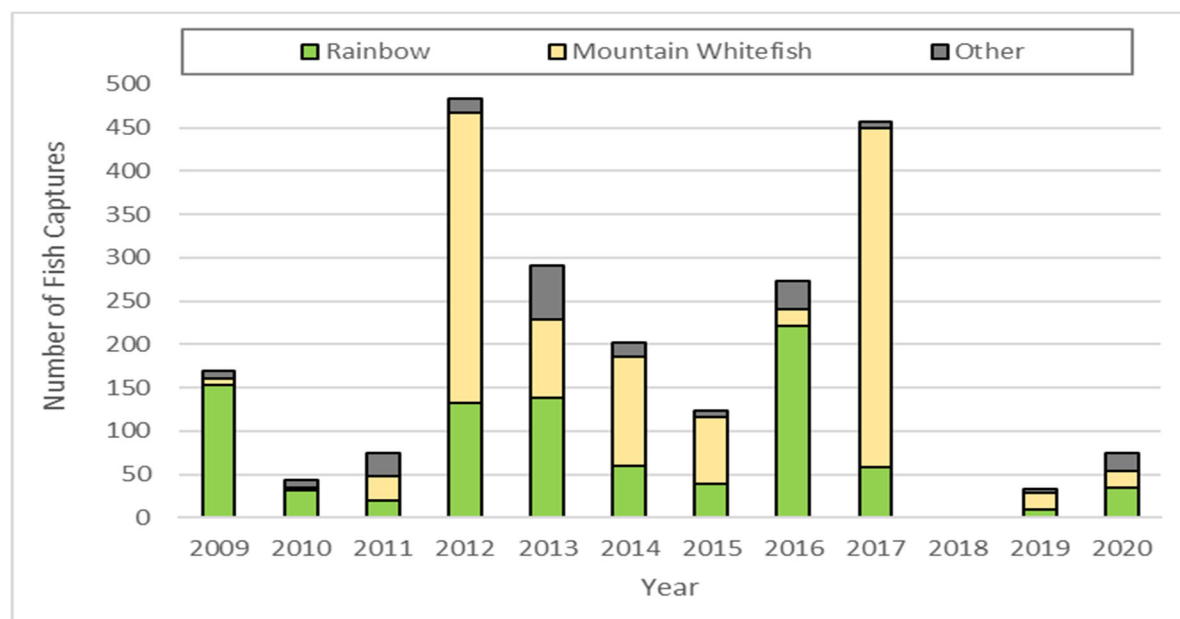
As in previous years, several large rainbow trout were recovered in the canal. It is not known how these larger fish (largest being 470 mm, TL) are entering the canal as the screens appear to be functioning normally and at no time were panels damaged or removed in 2020.



*Photograph of juvenile smallmouth bass recovered in the earthen portion of the canal, September 14, 2020.*

**Table 2. Comparison of the total number of fish removed from the Bigfork Hydroelectric Project power canal by species between 2009 and 2020.**

	Number Captured by Year													
SPECIES	10/11/09	6/22/10	9/12/11	10/22/12	10/7/13	10/6/14	9/14/15	9/19/16	7/18/17	No salvage	7/10/05	10/14/19	9/14/20	TOTAL
Rainbow Trout	153	31	20	132	139	60	39	222	58		10	35	899	
Catostomids	3	6	17	16	59	10	3	29	7		4	1	155	
Mountain Whitefish	7	3	28	335	90	125	77	18	391		18	19	1111	
Cottids	0	2	9	0	2	2	1	2	0		0	0	18	
Brook Trout	0	0	0	0	0	1	0	0	0		0	0	1	
Northern Pike	6	0	0	0	1	4	4	1	1		1	0	18	
Brook Stickleback	0	1	0	0	0	0	0	0	0		0	0	1	
Northern Pikeminnow	0	0	1	0	0	0	0	0	0		0	0	1	
Smallmouth Bass	0	0	0	0	0	0	0	0	0		0	19	19	
Central Mudminnow	0	0	0	0	0	0	0	1	0	0	0	1		
TOTAL	169	43	75	483	291	202	124	273	457		33	74	2224	



**Figure 3. Total number of fish removed from the Bigfork Canal by year: 2009 – 2020.**

# ATTACHMENT A

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

Notification of Annual Canal Maintenance - Bigfork Hydropower Project, September 14, 2020



Lesko, Erik (PacifiCorp)

To ○ Leo Rosenthal (lrosenthal@mt.gov); ○ Kevin Aceituno (Kevin\_Aceituno@fws.gov); ○ Scott Hawxhurst (shawxhurst@mt.gov)  
Cc ○ McGrath, Ian (PacifiCorp)

Reply Reply All Forward ...

Fri 8/14/2020 12:00 PM

Hello Everyone –

I have been notified that annual maintenance at our Bigfork power canal will begin on **Monday, September 14**. This will include the usual canal dewatering and associated fish collection activity on Monday morning. The dewatering will allow us to inspect and perform canal maintenance and repairs.

I am planning on being on site Monday morning. However, given COVID restrictions, I am unsure of your availability, or your respective agency policies to assist with the fish collection effort. To help me plan for the event, would you please let me know whether staff or equipment is available to support this effort? We will have the truck, fish tank and driver available as usual. If you are available, I suggest we meet at the powerhouse around 10:00 AM where we can sign the necessary tag outs before entering the canal.

I am very appreciative of the essential support provided by both MFWP and USFWS for this annual effort, but also understand COVID restrictions are affecting just about everything we do these days. I look forward to hearing from you and hopefully seeing you in September.

Thank you,

Erik

Erik Lesko

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  
September 14, 2020.**

	Rainbow Trout	Mountain Whitefish	Catostomids	Smallmouth Bass	
Subsample of fish length (TL, mm)	470	267	102	74	
	375	267			
	432	286			
	235	159			
	229	260			
	229				
	298				
	343				
<hr/>					
Fish Collected					
<i>Open Canal Section</i>	<b>32</b>	<b>13</b>	<b>1</b>	<b>1</b>	
<i>Underground HDPE Pipe</i>	<b>3</b>	<b>6</b>		<b>18</b>	
<hr/>					
<b>Total Fish Collected</b>	<b>35</b>	<b>19</b>	<b>1</b>	<b>19</b>	<b>74</b>