

Electrofishing Investigations in Bighill Creek, June 2018

Trout Unlimited Canada Technical Report



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Bighill Creek Preservation Society

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Truite Illimitée Canada

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1.0 Overview

1.1 Objectives

The fish community assemblage and stream habitat were assessed at four sites on Bighill Creek on June 13, 2018 from Highway 567 to the town of Cochrane near the confluence with the Bow River. Trout Unlimited Canada (TUC) conducted this survey to collect baseline monitoring data in Bighill Creek for of the Bighill Creek Preservation Society (BCPS) to identify areas for conservation and restoration potential, and is intended to support the ongoing water quality monitoring efforts by the BCPS at these sites. This baseline data may also be used to quantify infrastructure and land use impacts on the creek in the future.

1.2 Study Area

The fisheries inventory study area extended from the confluence of Bighill Creek and the Bow River, upstream to Highway 567 (Figure 1). Within this study area four electrofishing sites were situated along the Bighill Creek mainstem, with one site including both the mainstem of Bighill Creek and an unnamed tributary of Bighill Creek which flows out of Bighill Springs Provincial Park.

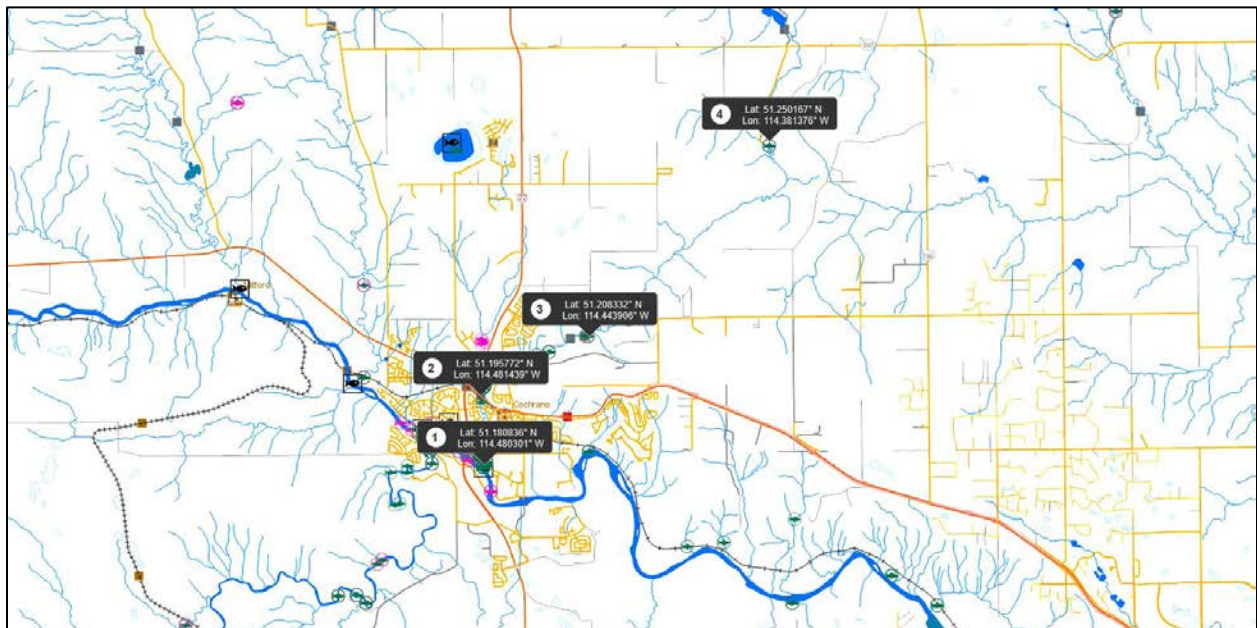


Figure 1. Site locations of electrofishing inventories within the Bighill Creek watershed conducted on June 13, 2018.

Field Crew

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2.0 Methods

2.1 Fish Collection and Habitat Surveys

Fish were collected using a Smith-Root 12B backpack electrofisher. One TUC crew member carried the backpack and the other TUC crew captured fish with a dip net. A volunteer crew member from the BCPS carried a bucket for temporary holding of fish. Reaches 1, 2, and 3 were all approximately 100m in length, reach 4 was approximately 400m in length and fish sampling was conducted at site 4 along an approximately 400 m reach from Bighill Creek to the Bighill Springs Provincial Park boundary. All fish captured were identified to species, enumerated, and measured for fork length to the nearest millimeter. A list of species names and abbreviations is shown in Table 1. Habitat measurements that were recorded include wetted width, rooted width, and maximum, depth at two cross sections within a 50m transect for each site. Water quality data was collected as well including water temperature (°C), pH, and conductivity ($\mu\text{S}/\text{cm}$). All habitat, water quality, and fisheries data were used to complete a Fisheries and Wildlife Information Management System (FWMIS) loadform, and was submitted to Alberta Environment and Parks (AEP). Data from this investigation can be accessed by the public using the Fisheries and Wildlife Internet Mapping Tool (FWIMT).

2.2 Permitting

All electrofishing efforts were conducted under the conditions outlined in Fish Research License (FRL) issued by the Cochrane Fish and Wildlife office of AEP. Once the data were compiled and digitized, TUC submitted all capture and effort data to AEP using the downloadable Fisheries Loadform available on the AEP website under the Fisheries and Wildlife Management Information System (FWMIS).

Table 1. Scientific names, common names, and species codes for fish sampled in Bighill Creek on June 13, 2018.

Code	Common Name	Scientific name
BKST	Brook Stickleback	<i>Culaea inconstans</i>
BKTR	Brook Trout	<i>Salvelinus fontinalis</i>
BNTR	Brown Trout	<i>Salmo trutta</i>

LNDC	Longnose Dace	<i>Rhinichthys cataractae</i>
LNSC	Longnose Sucker	<i>Catostomus catostomus</i>
MNSC	Mountain Sucker	<i>Catostomus platyrhynchus</i>
MNWH	Mountain Whitefish	<i>Prosopium williamsoni</i>
RNTR	Rainbow Trout	<i>Oncorhynchus mykiss</i>
WHSC	White Sucker	<i>Catostomus commersonii</i>

3.0 Results

3.1 Water Quality Results

Water temperature, pH, and conductivity varied between each of the sampling sites, a summary of all water quality results measured can be seen below in Table 1. The lowest water temperature was measured at site 4b along the Bighill Springs Creek at 9.3 °C with the highest water temperature recorded nearby in the mainstem of Bighill Creek at 17.3 °C. Conductivity ranged from a low of 693 µS/cm at Site 3, with the highest conductivity being measured at sites 1 and 2 at 817 µS/cm. pH values showed a slightly alkaline pH ranging from a low of 8.05 at site 4b to a high of 8.62 at site 2.

Table 2. Water Quality Results by Sampling Site.

Site	Water Temperature (°C)	pH	Conductivity (µS/cm)
Site 1	11.8	8.49	817
Site 2	14.0	8.62	817
Site 3	14.8	8.33	693
Site 4a	17.3	8.55	N/A
Site 4b	9.3	8.05	741

3.2 Site 1 - BCPS Sampling Site 5

Site 1 was located within the Town of Cochrane (51.180829, -114.480287) approximately 90m upstream from the confluence of Bighill Creek with the Bow River. At this site, Bighill Creek flows through a public park adjacent to a multi-use pathway. This reach of Bighill Creek has deep undercut banks and cool water; the substrate in this reach consisted primarily of large gravel and cobbles with abundant riffles and abundant macrophyte growth; site 1 is pictured in Figure 2. A summary of stream measurements for site 1 are outlined below in Table 3.

Table 3. Stream measurements in a 50 m transect at Site 1 along Bighill Creek, measured on June 13, 2018.

Point	Wetted Width (m)	Rooted Width (m)	Maximum Depth (m)
1	3.16	2.95	0.28
2	3.53	3.42	0.39

% pool - % riffle - % run: 4-90-6



Figure 2. Site 1 looking upstream.

3.3 Electrofishing results

A total of 23 fish were captured in 697 seconds of electrofishing at Site 1, of the 5 species encountered, Longnose Dace were the most abundant; the frequency distribution for fish species encountered at site 1 is displayed in Figure 3. Brown Trout and Rainbow Trout were the only sport fish present, with captured Brown Trout ranging in size from 112mm to 160mm fork length, the length frequency distribution for fish captured at site 1 is displayed in Figure 4.

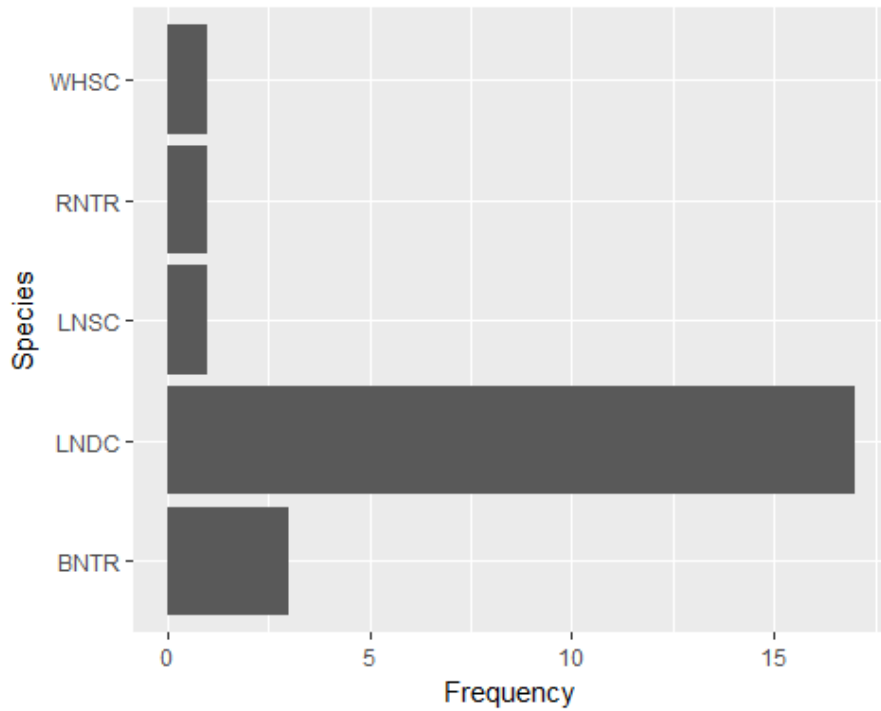


Figure 3. Frequency distribution of fish species sampled at Site 1 along Bighill Creek.

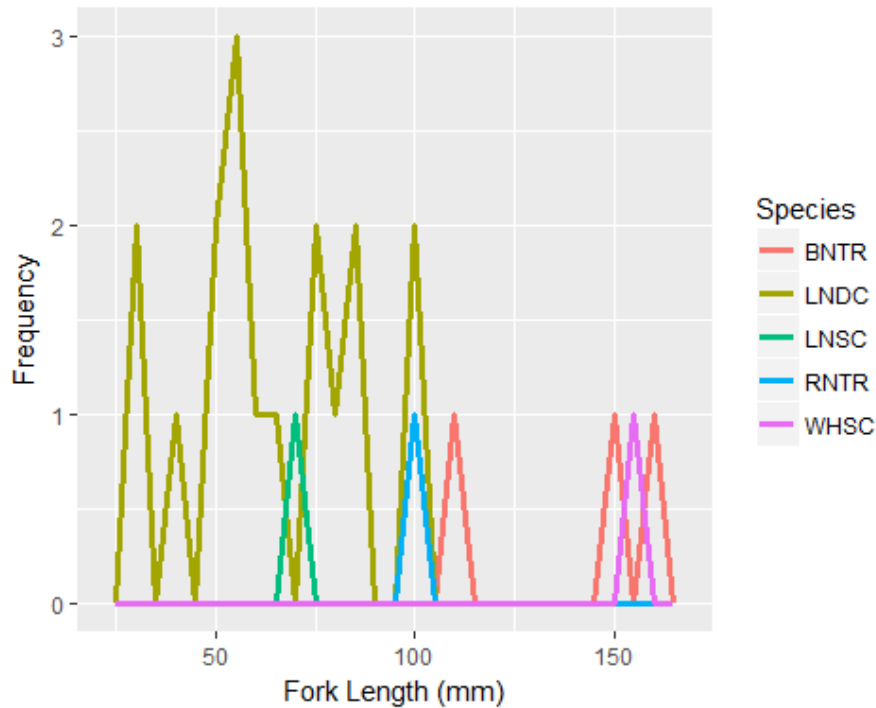


Figure 4. Length of fish species sampled at Site 1 along Bighill Creek on June 13, 2018.

4.0 Site 2

Site 2 was located within the Town of Cochrane at the Cochrane Ranche, immediately upstream of the Highway 1A crossing (51.1937, -114.4795). Site 2 had the most fish collected at any of the four sites visited. Brown Trout, Brook Trout and Mountain Whitefish were all collected at Site 2. Non-sportfish collected included Longnose Dace, White Sucker, Longnose Sucker, and Mountain Sucker. Mountain Sucker (*Catostomus platyrhynchus*) adults are typically smaller than White Suckers and Longnose Suckers as adults (120 to 150 mm) and can be identified by the “notches” on the corners of the mouth. During spawning season (spring to early summer) Mountain Suckers develop an orange to red lateral band and bumps on their fins. A Mountain Sucker specimen captured at site 2 is pictured in Figure 5. This reach of Bighill Creek had abundant undercut banks and healthy vegetation cover with deep rooted vegetation including several large overhanging willows. Substrates in this reach were largely comprised of fines, with sections of gravel and cobbles present in faster flowing riffles and runs, a summary of stream habitat measurements is displayed below in Table 4. Bighill Creek was slightly warmer at this site than downstream at Site 1, although still within the tolerable temperature range for coldwater fish species (Table 2).

Table 4. Stream measurements in a 50 m transect at Site 2 along Bighill Creek, measured on June 13, 2018.

Point	Wetted Width (m)	Rooted Width (m)	Maximum Depth (m)
1	3.15	3.15	0.53
2	3.60	3.65	0.26

% pool - % riffle - % run: 99-1-0



Figure 5. Mountain Sucker sampled at Site 2 on Bighill Creek.

4.1 Electrofishing Results

A total of 54 fish were captured in 728 seconds of electrofishing at Site 2, of the 7 species encountered, Longnose Dace was the most abundant; the frequency distribution for fish species encountered at site 2 is displayed in Figure 6. Brown Trout, Brook Trout, and Mountain Whitefish were the sport fish species present, the length frequency distribution for fish captured at site 2 is displayed in Figure 7. A photograph of a Longnose Sucker (*Catostomus Catostomus*) specimen captured at site 2 is pictured in Figure 9 below. Longnose Sucker are a common species which feed on worms, molluscs, crustaceans, detritus, and aquatic insect larvae. The “nose” of the Longnose Sucker protrudes past the mouth, hence the name, and is a key feature used to identify this species.

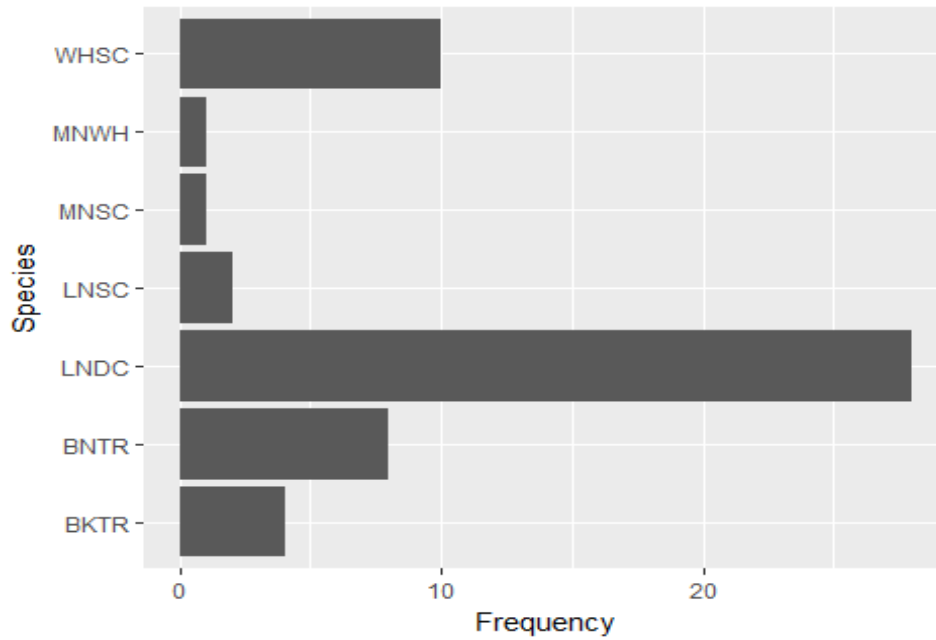


Figure 6. Frequency distribution of fish species sampled at Site 2 along Bighill Creek.

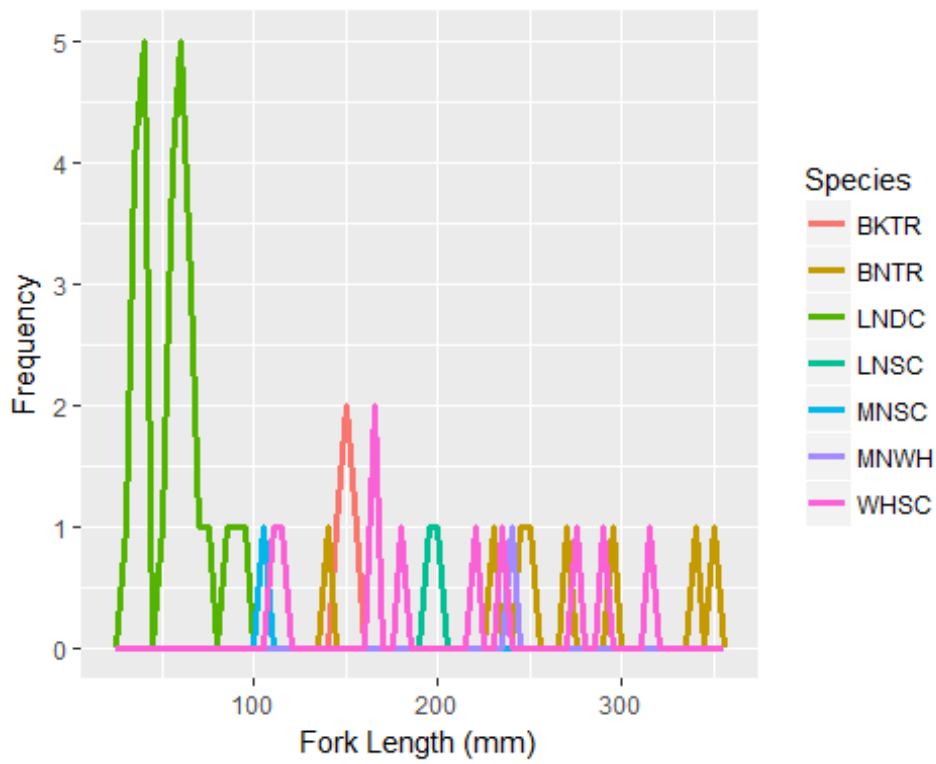


Figure 7. Length of fish species sampled at Site 2 along Bighill Creek.



Figure 8. Site 2 looking upstream.

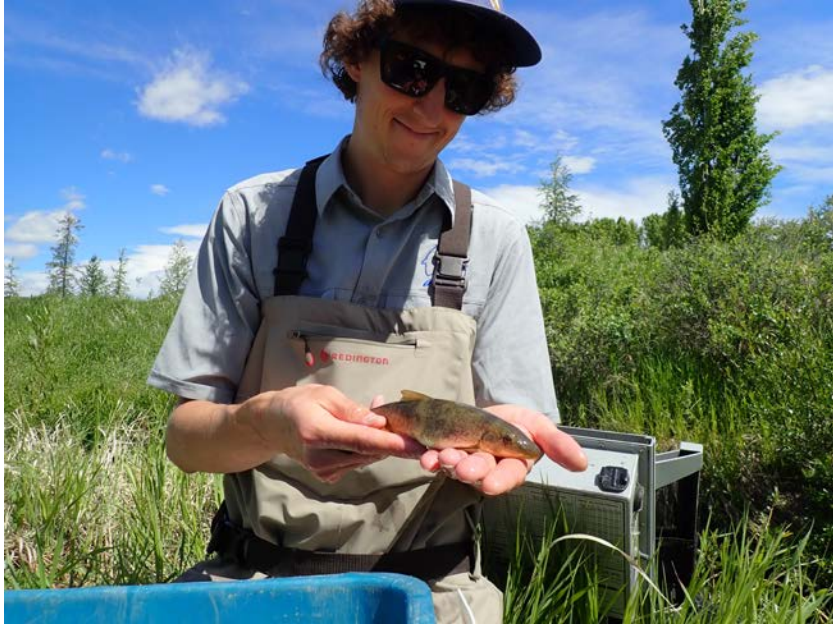


Figure 9. Longnose Sucker sampled at Site 2 on Bighill Creek.

5.0 Site 3 - BCPS Sampling Site 4

Site 3 was located north of Cochrane Ranche along Ranche Road (51.2085, -114.4449). The fish community at this site was dominated by Longnose Dace, as shown in Figure 10. Length frequency distribution of fish captured at Site 4 is displayed in Figure 11. Channel width at this site was almost twice as wide as Sites 1 and 2, with abundant coarse woody debris and overhanging vegetation along both streambanks. A summary of stream habitat measurements is displayed below in Table 5. The water temperature and other physical properties measured here did not substantially differ from Site 2 (Table 2).

Table 5. Stream Measurements in a 50 m transect at Site 3 along Bighill Creek, measured on June 13, 2018.

Point	Wetted Width (m)	Rooted Width (m)	Maximum Depth (m)
1	6.92	6.48	0.16
2	3.55	4.33	0.35

% pool - % riffle - % run: 10-70-20

5.1 Electrofishing Results

A total of 52 fish were captured in 674 seconds of electrofishing at Site 3, of the two species encountered Longnose Dace were the most abundant; the frequency distribution for fish species encountered at site 3 is displayed in Figure 10. Length frequency distribution for fish captured at

site 3 is displayed in Figure 11. Longnose Dace (*Rhinichthys cataractae*) were the most abundant fish captured at site 3. Longnose Dace are a small bodied minnow (up to approximately 14 cm) and prefer rocky habitat with riffles. Individuals can adjust the size of their air bladder to suit various currents and remain on the creek or river bottom. Spawning females have a reddish-orange tinge at the base of their fins and on the upper lip; note the bright reddish-orange on the lips and at the base of the fins of the individual captured in Figure 12.

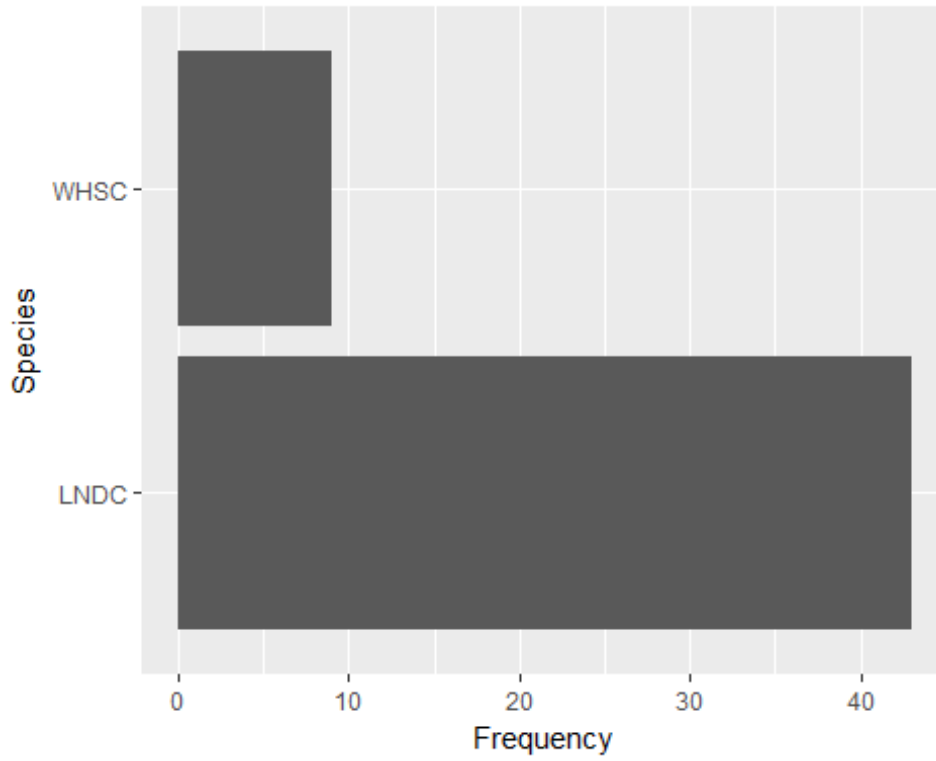


Figure 10. Frequency distribution of fish species sampled at Site 3 along Bighill Creek.

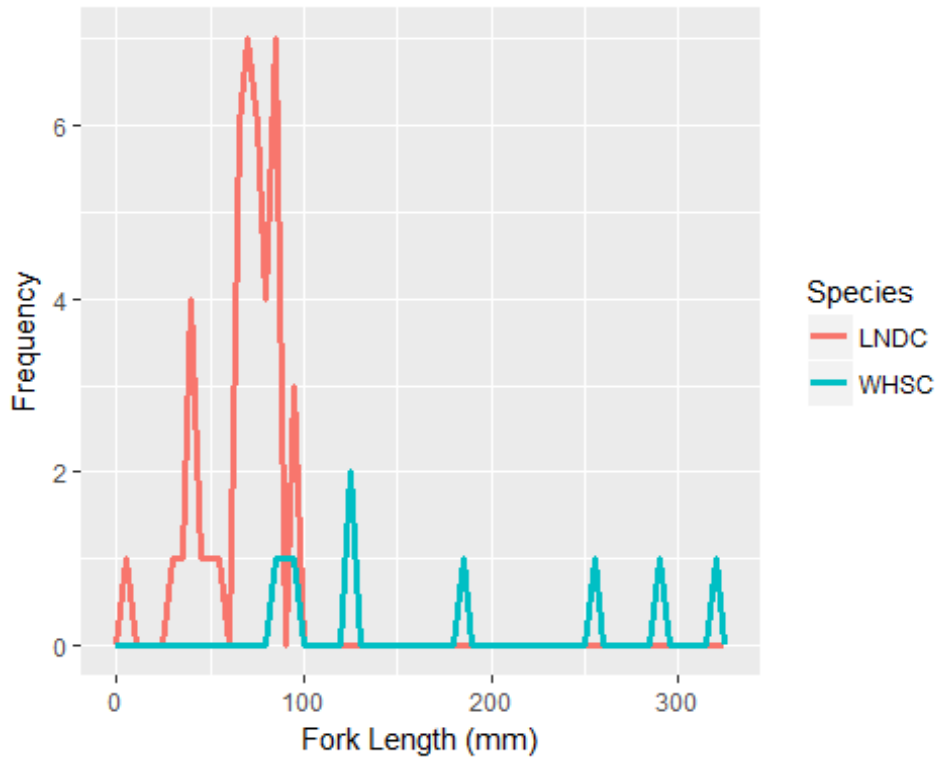


Figure 11. Length of fish species sampled at Site 3 along Bighill Creek.



Figure 12. Longnose Dace in breeding condition sampled from site 3 on Bighill Creek.

6.0 Site 4

Site 4a was located amidst agricultural lands adjacent to Bighill Springs Provincial Park approximately 5 m upstream of the confluence with the spring creek flowing out of the Provincial Park (Bighill Springs Creek). Site 4b was a reach of Bighill Springs Creek, a spring-fed tributary to Bighill Creek immediately downstream of Bighill Springs Provincial Park boundary. Stream habitat measurements were collected at site 4b, and are summarized below in Table 6. Water quality measurements were taken at both sites 4a and 4b because there were significant differences observed between the two sites with respect to habitat and water quality. The observed water temperature at site 4a was higher at this site than at Sites 1 to 3, and substantially higher than site 4b. Brook Stickleback, a thermally tolerant fish, were relatively abundant in this area. The highest density of Brook Trout within reach 4 occurred at the confluence of Bighill Creek and Bighill Springs Creek, likely due to the thermal preference of Brook Trout for the cold water from Bighill Springs. The water temperature in Bighill Springs Creek was dramatically colder than all other sites and only supported Brook Trout (Table 2).

Table 6. Stream Habitat Measurements in a 50m transect at Site 4b along Bighill Creek, measured on June 13, 2018.

Point	Wetted Width (m)	Rooted Width (m)	Maximum Depth (m)
1	1.78	1.78	0.31
2	1.38	1.38	0.30

% pool - % riffle - % run: 0-40-60

6.1 Electrofishing Results

A total of 27 fish were captured in 1958 seconds of electrofishing at Site 4, the frequency distribution for fish species encountered at site 4 is displayed in Figure 13. Length frequency distribution for fish captured at site 4 is displayed in Figure 14. Of the three species encountered Brook Trout were the most abundant. Brook Trout are a non-native, naturalized sportfish in Alberta. Brook Trout can be identified by white leading edges on their fins, vermiculation on their back, and pink or red spots on their sides with blue halos. Brook Trout frequent cool streams and eat caddis fly larvae, chironomids, mayflies, amphipods, and Daphnia. One of the Brook Trout captured immediately below the Bighill Springs Provincial Park boundary is pictured in Figure 15.

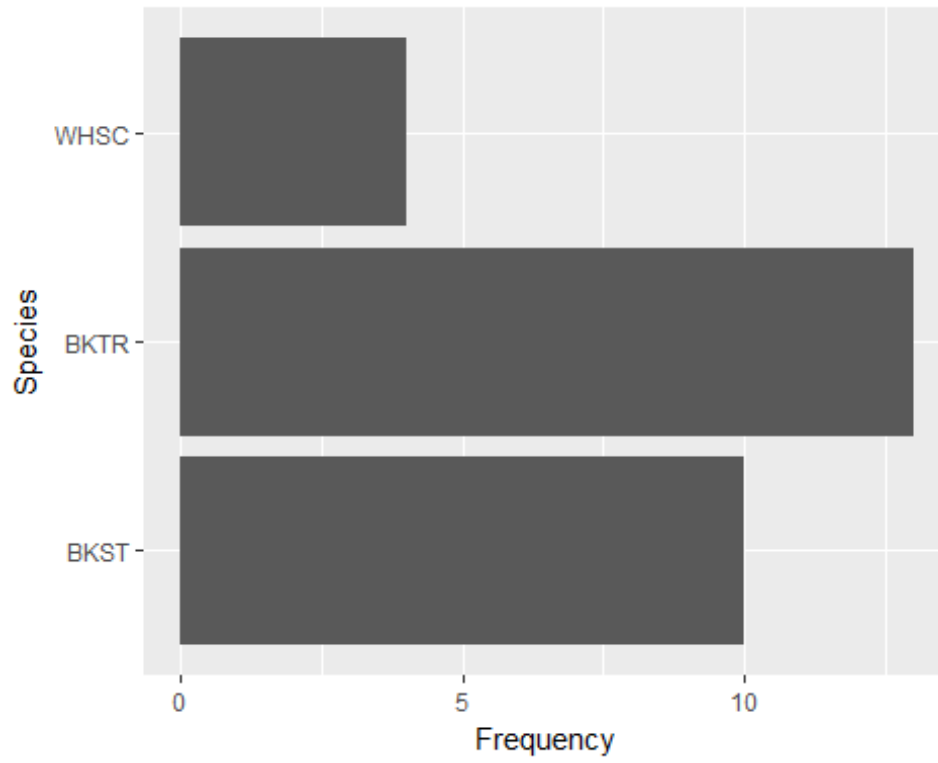


Figure 13. Frequency distribution of fish species sampled at Site 4 along Bighill Creek.

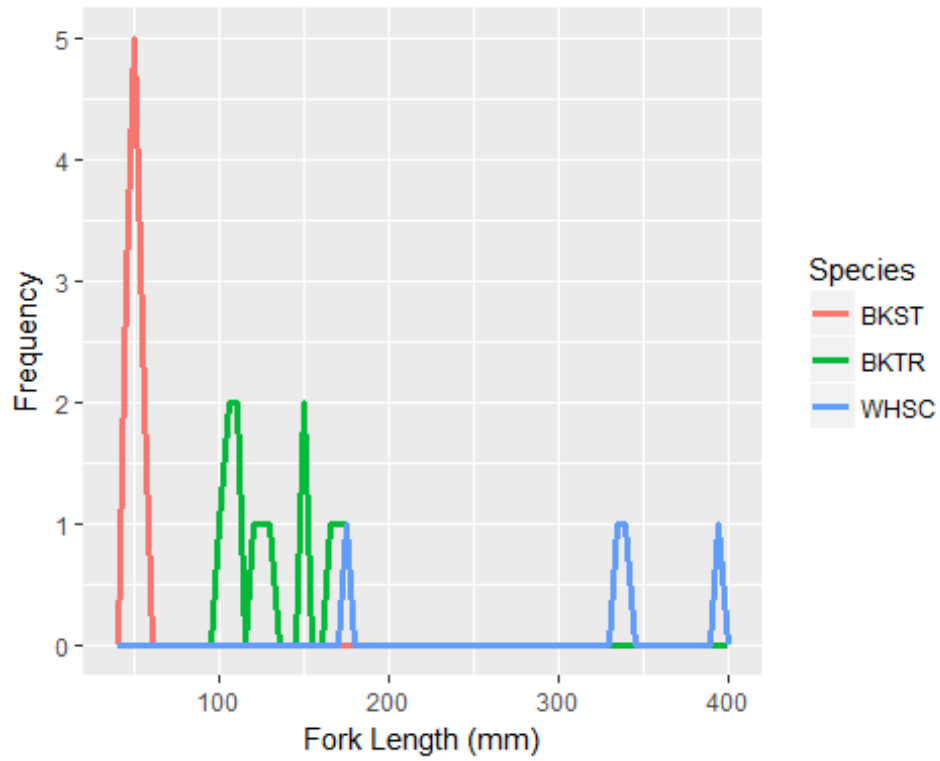


Figure 14. Length of fish species sampled at Site 4 along Bighill Creek.



Figure 15. Brook Trout sampled from Site 4b on Bighill Creek.

7.0 Discussion/Recommendations

Fish inventory data gathered at each of the four sites is intended to provide a snapshot of the current overall fish community assemblage along Bighill Creek at the time of sampling. Continued efforts by the BCPS and other stakeholders to monitor water quality and additional indicators of aquatic and riparian health throughout the watershed will help inform the BCPS and management agencies so that rehabilitation and conservation efforts along the creek can be as targeted and effective as possible. Continuous water temperature monitoring using submersible data loggers is one example of a cost-effective and relatively simple method of collecting data which could help the BCPS to identify areas where water temperature may be a concern. Besides helping to identify potential opportunities for rehabilitation efforts, monitoring efforts offer opportunities to engage with landowners and stakeholders.

A cursory review of available satellite imagery e.g. Google Earth™ is another useful tool for identifying potential areas of concern within the Bighill Creek watershed. There are apparent areas of concern upstream of Cochrane along tributaries of Bighill Creek and the Bighill Creek mainstem including channelization; impacts to riparian and aquatic habitat from livestock grazing; and impoundments of the stream which may present barriers to fish passage and could have negative effects on stream temperature, dissolved oxygen, and sediment transport.

Riparian health inventories (conducted by the Alberta Riparian Habitat Management Society (Cows and Fish)) are another excellent tool which would provide baseline assessment of current riparian conditions within a chosen area, establish an overall score, and provides management recommendations for improving this score within a site specific report card. Inventories can also be repeated several years later to assess changes due to management changes or rehabilitation efforts.

We recommend that any efforts to conserve, protect, and/or rehabilitate fish populations in the Bighill Creek watershed should focus on native fish communities as a priority. Increasing the overall resilience and ecological function and integrity of Bighill Creek will ensure that both native and naturalized fish species can thrive and persist in this stream into the future. Ensuring a high degree of resilience will help to mitigate impacts from climate change, development, and other human-caused or natural events which may threaten the health of the stream corridor.