Pinewood River Annual Terms of Reference and Biological Monitoring Report (2020)

Prepared for:
New Gold Inc.
Emo, Ontario

Prepared by:
Minnow Environmental Inc.
Georgetown, Ontario

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<original signed by>

Tyrell Worrall, M.Sc.
Project Manager

<original signed by>

Pierre Stecko, M.Sc., EP, RP Bio.
Senior Project Advisor

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ACRONYMS AND ABBREVIATIONS

ANCOVA – Analysis of Covariance
BCMECCS – British Columbia Ministry of Environment & Climate Change Strategy
CWQG – Canadian Water Quality Guidelines
DFO – Department of Fisheries and Oceans
EA – Environmental Assessment
ECA – Environmental Compliance Approval
LDL – Lowest Detection Limit
MECP – Ministry of Environment, Conservation, and Parks
PTTW – Permit to Take Water
PWFF – Pinewood River Far-field Area
PWNF – Pinewood River Near-field Area
PWQO – Provincial Water Quality Objectives
PWREF – Pinewood River Reference Area
QA/QC – Quality Assurance / Quality Control
RRM – Rainy River Mine
RRP – Rainy River Project
TMA – Tailings Management Area
WWT – Wet Weight

1 INTRODUCTION

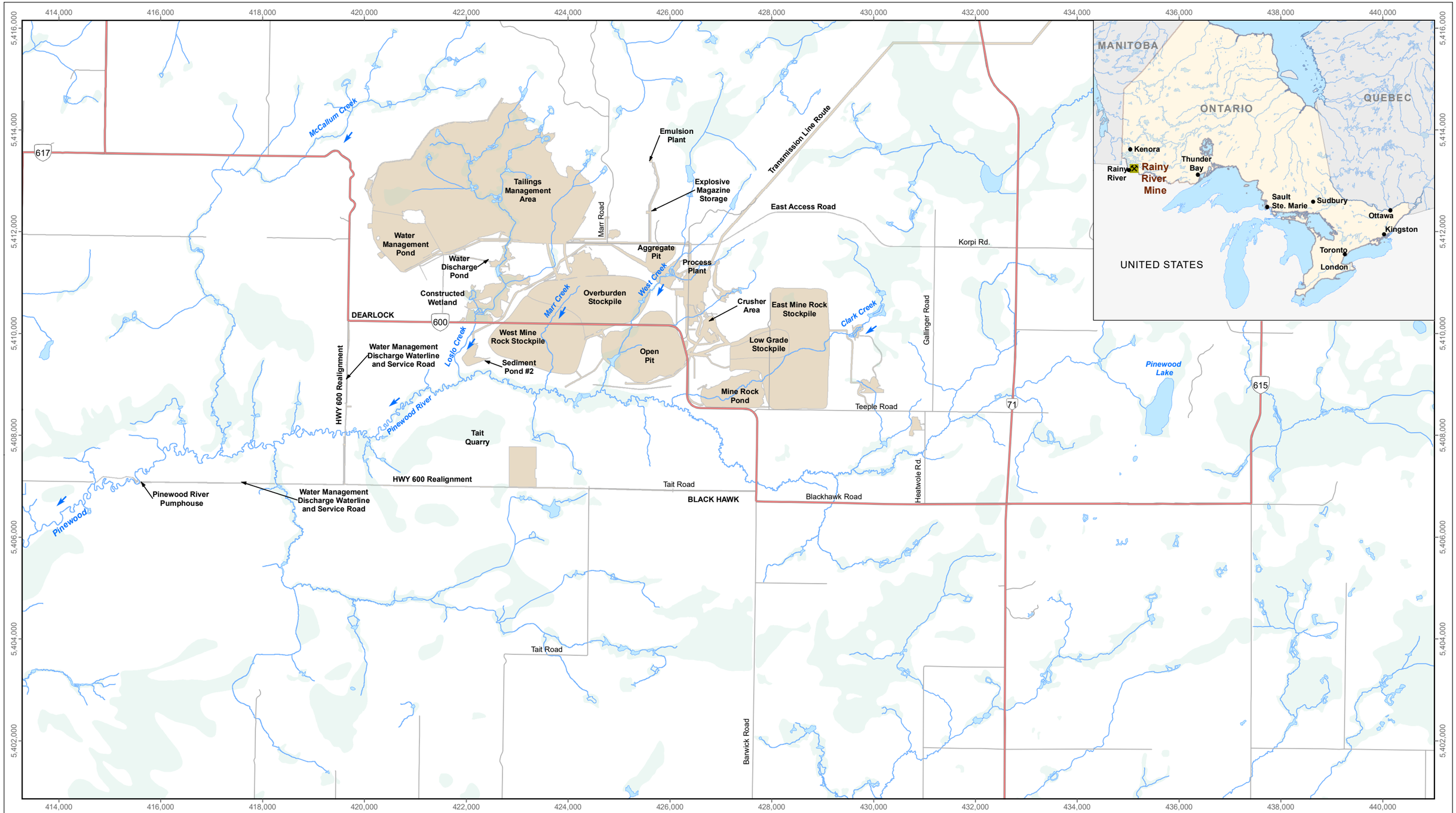
1.1 Site Description

New Gold Inc. owns and operates the Rainy River Mine (RRM), located in western Ontario in the Township of Chapple and District of Rainy River, approximately 65 km northwest of Fort Frances and approximately 420 km west of Thunder Bay (Figure 1.1). The RRM is located within the Pinewood River watershed. The Pinewood River flows past the RRM and drains into the Rainy River approximately 37 km downstream.

Earliest exploration of the Rainy River Project (RRP) began in 1967. Rainy River Resources Ltd. acquired the project in 2005 and began conducting baseline studies in 2008. The RRP was acquired by New Gold Inc. in 2013 and an Environmental Assessment (EA) report was submitted in 2014 (AMEC 2014). Site construction began following provincial and federal EA approvals in 2015. In 2017, site construction was largely completed, and the project transitioned to an operational mine which includes an open pit mine, ore storage facilities, a process plant, a Tailings Management Area (TMA), watercourse diversions, site drainage works, a fuel tank farm, explosives manufacturing facilities, explosives storage facilities, and plans for a future underground operation. The RRM was officially commissioned in September 2017.

1.2 Purpose and Objectives

The annual biological monitoring of the Pinewood River includes four components: monitoring of water levels, water concentrations of mercury and sulphate, fish community, and fish tissue mercury concentrations. The objective of this report is to summarize the results of associated monitoring in the Pinewood River in the vicinity of RRM for 2020.



LEGEND

Mine Infrastructure

0 1 2 4
km

N
W E
S

Map Projection: UTM Zone 15 NAD 1983
Data Source: Reproduced under licence from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Location and Layout, RRM 2020

Date: March 2020
Project 197202.0045

minnow environmental inc.

Figure 1.1

Document Path: S:\Projects\197202\197202.0045 - Rainy River Mine Small Body Assessment\GIS\Report\19-45 Figure 1.1 Layout.mxd

2 METHODS

2.1 Pinewood River Annual Monitoring Overview

The Pinewood River Annual Biological Monitoring Program was conducted from July 14th to 24th, 2020. This survey focused on fish community and fish tissue quality assessments, targeting the Pinewood River near RRM (Table 2.1; Figure 2.1). These areas are monitored to determine if changes in flow and historical effluent discharge have altered the fish community and fish tissue quality downstream of RRM. The study locations include a near-field mine exposed area (PWNF), a far-field mine exposed area (PWFF), and an upstream reference area (PWREF; Figure 2.1). PWREF corresponds with Area 4 in the 2017 study (AMEC 2018a), PWNF corresponds with Area 3, and PWFF is located downstream of all areas.

The annual biological monitoring of Pinewood River is conducted to fulfil a number of Provincial and Federal requirements. These include Ontario Ministry of Environment, Conservation, and Parks (MECP) Environmental Compliance Approval (ECA) #7004-BC7KQ5 Conditions 9(3) and 10(10), Permit to Take Water (PTTW) #8776-9W2QN3 Condition 4.2.2, and Department of Fisheries and Oceans (DFO) *Fisheries Act Authorization* #15-HCAA-0039 Condition 2.2.4. Within each area of the Pinewood River, fish habitat and fish communities were assessed utilizing the following methods.

2.2 Water Level Monitoring

Solinst 3001 LT Levelogger Edge M10 water level loggers were installed by Wood PLC (formerly AMEC Foster Wheeler) to monitor water levels in the Pinewood River. Eight loggers were installed between June 10th and 14th, 2017 (Figure 2.1); four loggers were installed in narrow non-impounded habitat (Type 1) and four loggers were installed in impounded habitat (Type 2; AMEC 2018a). River depth and temperature data were recorded every 15 minutes and were compensated with the Solinst 3001 Barologger Edge. RRM Environment Department staff download the data quarterly; the latest download was collected between February 3rd and 28th, 2021.

2.3 Water Quality Monitoring

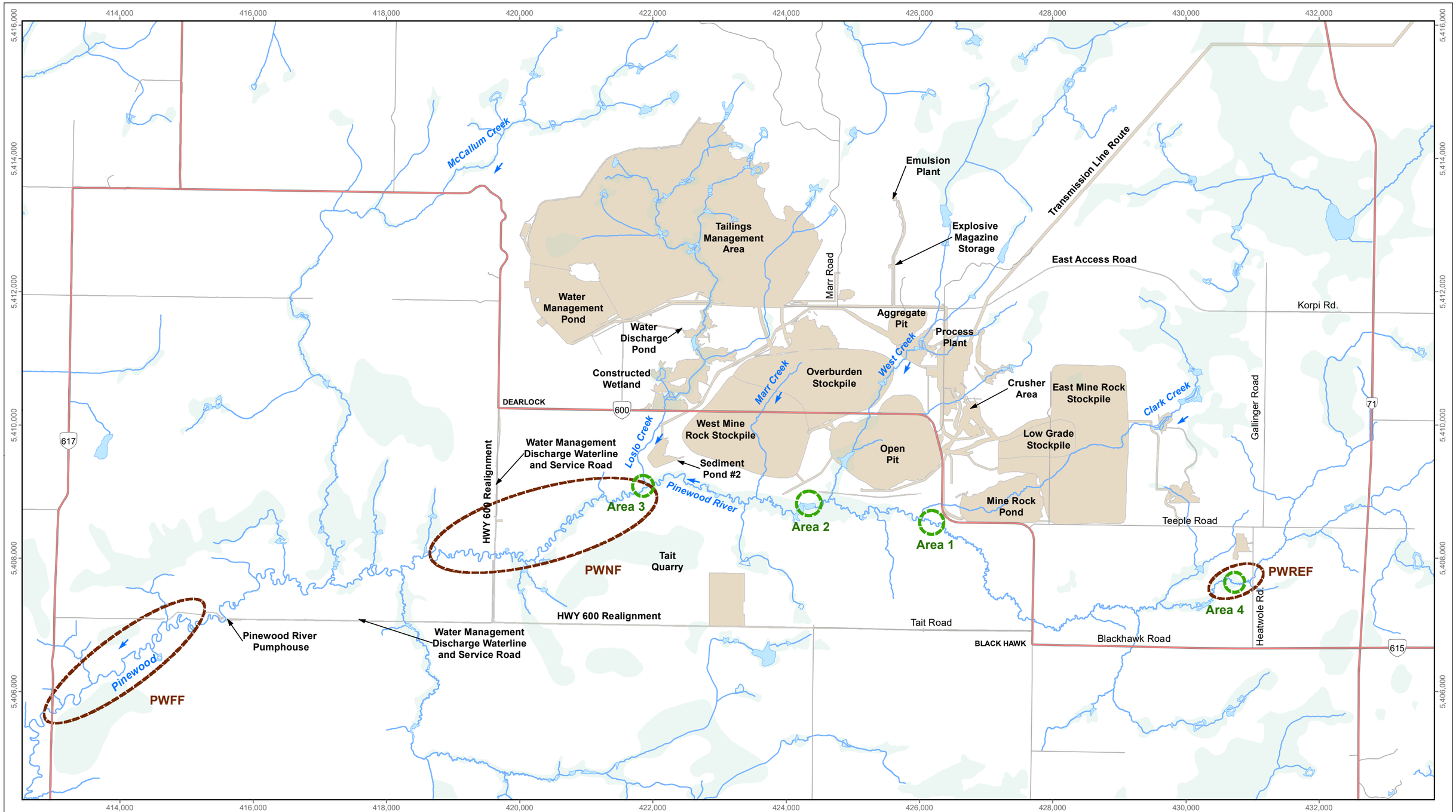
2.3.1 Sample Collection

Routine water quality samples were collected at two upstream reference areas and four downstream mine-exposed areas (Figure 2.2). Samples were collected below the water surface to avoid floating material and facing upstream to avoid any potential influence of the individual collecting the sample. Samples were collected into pre-labelled and pre-preserved (if required) bottles provided by ALS Thunder Bay laboratory.

Table 2.1: Components Associated with Annual Pinewood River Monitoring Plan

Attribute	Monitoring Requirements	Report Schedule[a]
Fish Habitat	Water level measurements[a] (2 loggers per area, 1 for non-impounded [Type 1] habitat and 1 for impounded [Type 2] habitat).	Annual Monitoring Reports due to Ministry of Environment, Conservation, and Parks and Department of Fisheries and Oceans on or before March 31
Fish Species Presence, Life Cycle Usage, Abundance, and Tissue Quality	Fish sampling will be conducted annually during the summer for 5 years.	
	Tissue quality sample size per area: 50 adult common shiner (*Luxilus cornutus*).	
	Minimum fishing effort per area: gill nets (6 sets [12 to 16 hours per set]), minnow traps (600 trap hours), seine nets (9 individual [15 m] net hauls), and electrofishing (3,000 seconds). Additional effort and methods may be used to confirm larger bodied species and species presence.	

[a] Data collected by Rainy River Mine and provided to Minnow for annual reports.



LEGEND

- Water Level Logger
- Fish Sampling Location
- Mine Infrastructure

0 0.75 1.5 3 km

N W E S

Map Projection: UTM Zone 15 NAD 1983

Water Level and Fish Community Study Locations, RRM 2020

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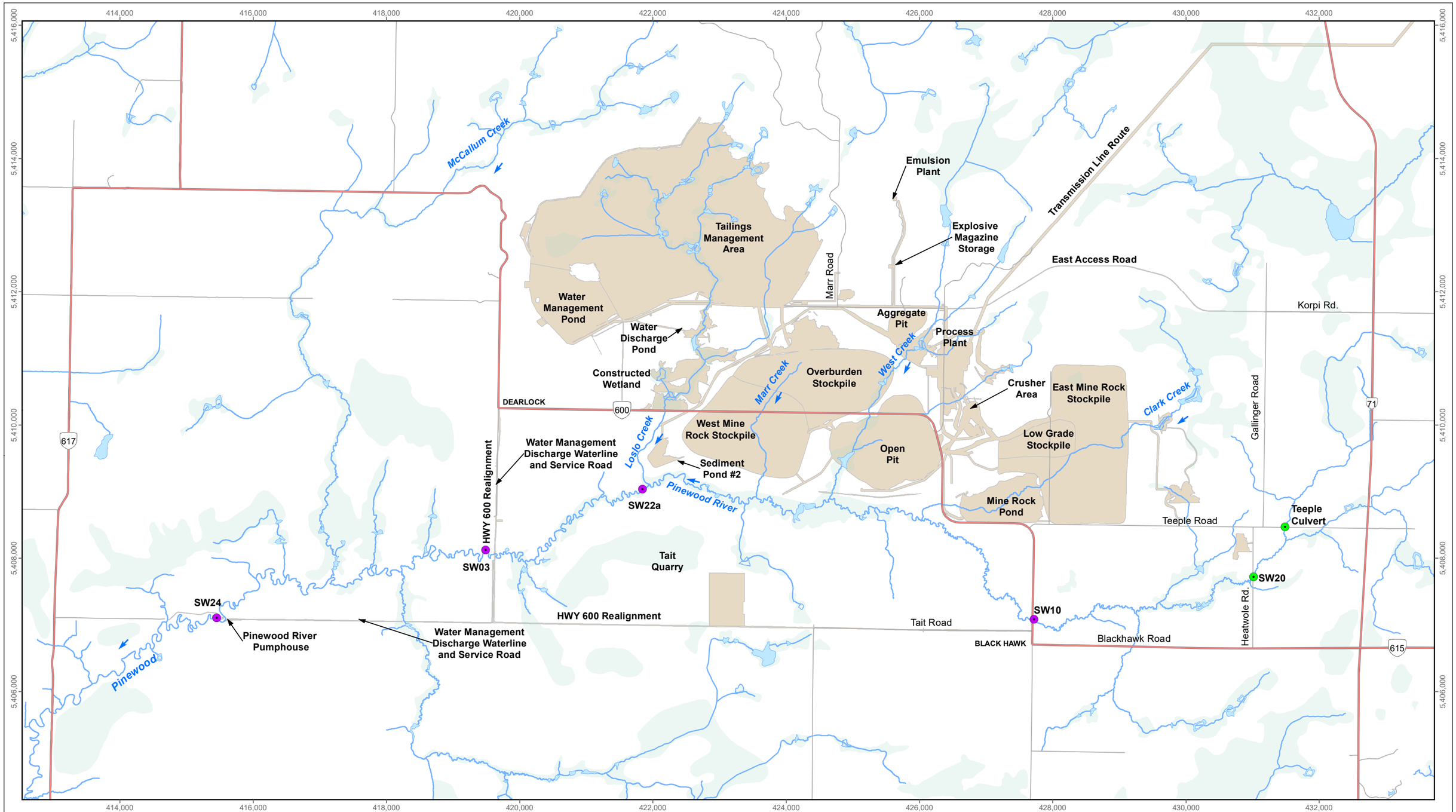
Figure 2.1

Document Path: S:\Projects\197202\197202.0045 - Rainy River Mine Small Body Assessment\GIS\Report\19-45 Figure 2.1 Biological Monitoring Study Locations.mxd



LEGEND

Surface Water Quality Monitoring Location

- Exposed
- Reference
- Mine Infrastructure

0 0.75 1.5 3 km

N W E S

Map Projection: UTM Zone 15 NAD 1983

Surface Water Quality Monitoring Locations, RRM 2020

Date: March 2021
Project 197202.0045

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Figure 2.2

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\New Gold Inc - 197202.0045 - Small Body Assessment\GIS\Report 2020\19-45 Figure 2.2 Surface WQ Stations.mxd

Immediately after sampling, the samples were placed into coolers on ice for transport to the mine environmental laboratory for immediate shipment to ALS Thunder Bay. If the samples were not shipped immediately, they were placed in a refrigerator at the mine environmental laboratory for shipment the next day. Analytes included mercury (total, dissolved, and methyl) and sulphate.

2.3.2 Data Analysis

All water quality data were evaluated by qualitative comparison of concentrations among areas (i.e., comparison of concentrations at the mine-exposed areas to reference areas), among years (2017, 2018, 2019, and 2020), and by comparison to water quality objectives for the protection of aquatic life. Provincial Water Quality Objectives (PWQO; OMOEE 1994) and British Columbia Ministry of Environment & Climate Change Strategy water quality guidelines (BCMECCS 2019, 2021) were considered in the evaluation of surface water quality data.

2.4 Fish Community Survey

2.4.1 Sample Collection

Fish sampling was performed under an Ontario Ministry of Natural Resources and Forestry License to Collect Fish for Scientific Purposes (Licence No. 1095762; Appendix B). Fishing was conducted in the Pinewood River in the vicinity of RRM (Figure 2.1). Fish communities of the Pinewood River were assessed using the following collection methods[1]; overnight gill netting, backpack electrofishing, seine netting, and overnight minnow trapping, which targeted different microhabitats (pools, riffles, undercut banks, etc.) until the prescribed fishing effort was attained for each sampling area (Table 2.1). Backpack electrofishing units were adjusted to appropriate voltage and duty cycle settings based on water conductivity and temperature to minimize the risk of harm to fish. Minnow traps were baited with dry cat food, placed in the preferred habitats of local species (Scott and Crossman 1998), and checked daily.

2.4.2 Fish Tissue Quality Survey

Common shiner (*Luxilus cornutus*) were sampled as this species is found at all three areas at the required densities, are consistently exposed to mine effluent, and to align with the 2019 study. Fish tissue samples were collected during the fish community survey. Fifty (50) adult specimens were targeted from each of the areas. All retained fish were measured to determine length (fork and total) and weight. Lengths were measured to the nearest millimetre on a fish board. Weights were measured using a Scout Pro analytical scale to the nearest milligram.

[1] Gill netting, electrofishing, and to a lesser extent seine netting are considered more quantitative methods for determination of species abundance compared to minnow trapping. This is because many species are not effectively captured by minnow trapping (Jackson and Harvey 1997). Therefore, results will be presented in the following order; gill netting, electrofishing, seine netting, and minnow trapping.

Aging structures (otoliths) were collected from each sacrificed fish for the determination of age. The remainder of each fish were collected, placed in clean, labeled Whirl-Pak™ bags, and frozen until analysis for tissue chemistry.

Upon completion of the sampling program, tissue samples were submitted to ALS Environmental in Thunder Bay, Ontario, along with a chain-of-custody record, a list of expected Lowest Detection Limits (LDLs), and laboratory QA/QC requirements (Appendix A). Aging structures were shipped to AAE Tech Services Inc. in Winnipeg, Manitoba, along with a chain-of-custody record for determination of fish ages.

2.4.3 Data Analysis

Health Canada has established a standard of 0.5 mg/kg wet weight (wwt) as the maximum acceptable concentration of mercury in commercially sold fish, enforceable by the Canadian Food Inspection Agency (Health Canada 2007). Although this guideline is only applicable to commercially sold fish, 0.5 mg/kg wwt is also the level at which the MECP recommends a complete consumption restriction for vulnerable populations (i.e., women of child-bearing age and children under 15; MECP 2015). Although it is not expected that common shiner would be consumed by humans, this guideline provides some perspective on concentrations relative to what might be of concern in edible fish. In addition to evaluating mercury concentrations relative to health guidelines, relationships between mercury concentrations in fish muscle tissue and fork length were explored graphically.

A statistical comparison of mercury tissue concentration in near-field and far-field areas was conducted using Analysis of Covariance (ANCOVA), with log10-transformed mercury tissue concentration (wet weight) as the response variable, Area as a factor, and log10-transformed Fork Length as a covariate. Mercury tissue concentration and Fork Length were transformed to meet the assumption of normality. Main effects (i.e. Area and Fork Length) were assessed at alpha = 0.1 and the interaction between Area and Fork Length were assessed using an alpha = 0.05. If the interaction was significant, the difference in mercury concentration between areas was dependent on the covariate values. Two calculations of a magnitude of difference (MOD) in the predicted values of the response variables were then conducted at the minimum and maximum values of the overlap in covariate values between areas. MOD was calculated using the following equation:

$$MOD = MCTExp - MCTRef/MCTRef \times 100$$

Where MCT denotes measure of central tendency and MCTRef and MCTExp are the predicted geometric mean mercury tissue concentrations at the reference area (MCTRef) and the near-field and far-field exposed areas (MCTExp) respectively.

3 RESULTS

3.1 Water Level

3.1.1 Non-impounded Habitat (Type 1)

The non-impounded habitat water levels showed variable responses to precipitation throughout the year, where water levels were not directly correlated with precipitation (Figure 3.1). This is possibly due to the level of beaver activity within the Pinewood River(Figure 3.1). Area 4 is the upstream reference area and is therefore located furthest upstream in the watershed and thus has lower base flow than downstream areas due to a smaller watershed area (Figure 3.1). Area 3 is the furthest downstream, and therefore receives more surface runoff which contributes to higher water levels at this station. However, higher water levels were not observed in 2020 where Area 3 had similar water levels to the upstream reference and had consistently lower water levels than Area 2 (Figure 3.1). Areas 1 and 3 showed the greatest fluctuations, while Areas 2 and 4 showed similar water levels throughout the year. As was the case in previous years (Minnow 2020), these water level results suggest that upstream mine-related activities have not impacted seasonal flow patterns within non-impounded areas, as all areas show similar water level fluctuations and responses to precipitation events.

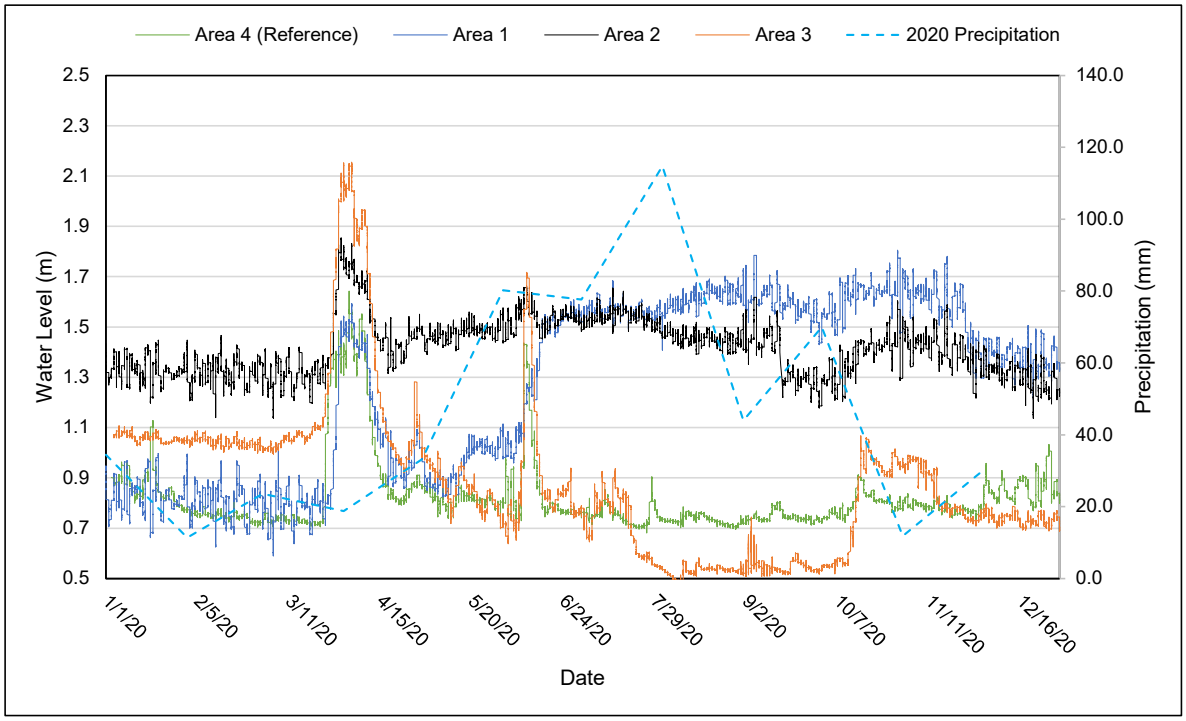
3.1.2 Impounded Habitat (Type 2)

Water levels within impounded habitat had greater variability in response to precipitation throughout the year when compared with non-impounded habitat in 2020 (Figure 3.1). The different areas did not respond to precipitation in the same way (i.e., Area 2 having greater levels than Area 3), which is likely due to the level of beaver activity within each of the areas. Like the non-impounded water levels, Area 3 had the greatest fluctuations and Areas 1 and 2 had the lowest fluctuations (Figure 3.1). These water level results suggest upstream mine-related activities have not impacted seasonal flow patterns within impounded areas, as all impounded areas show similar water level fluctuations and responses to precipitation events albeit less pronounced than in the non-impounded habitat from each area. Of note, the level logger was removed from Area 3 from September to October 2020 for installation of EDL2 discharge structure.

3.2 Water Quality

Pinewood River aqueous mercury concentrations (total, dissolved, and methyl) downstream of the mine were similar to upstream reference areas in 2020 (Figure 3.2). Both dissolved and methylmercury water concentrations were well below respective water quality criteria

a) Non-impounded Habitat (Type 1)



b) Impounded Habitat (Type 2)

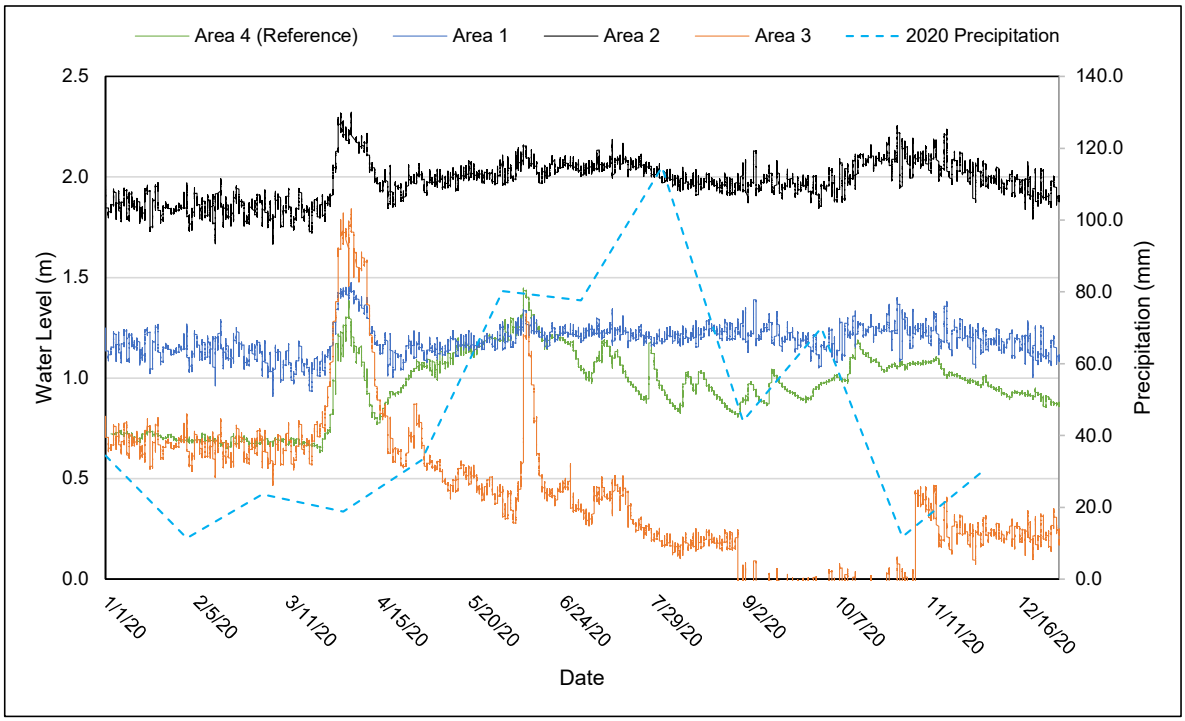


Figure 3.1: Water Levels in the Pinewood River for a) Non-impounded (Type 1) and b) Impounded (Type 2) Habitat, RRM 2020

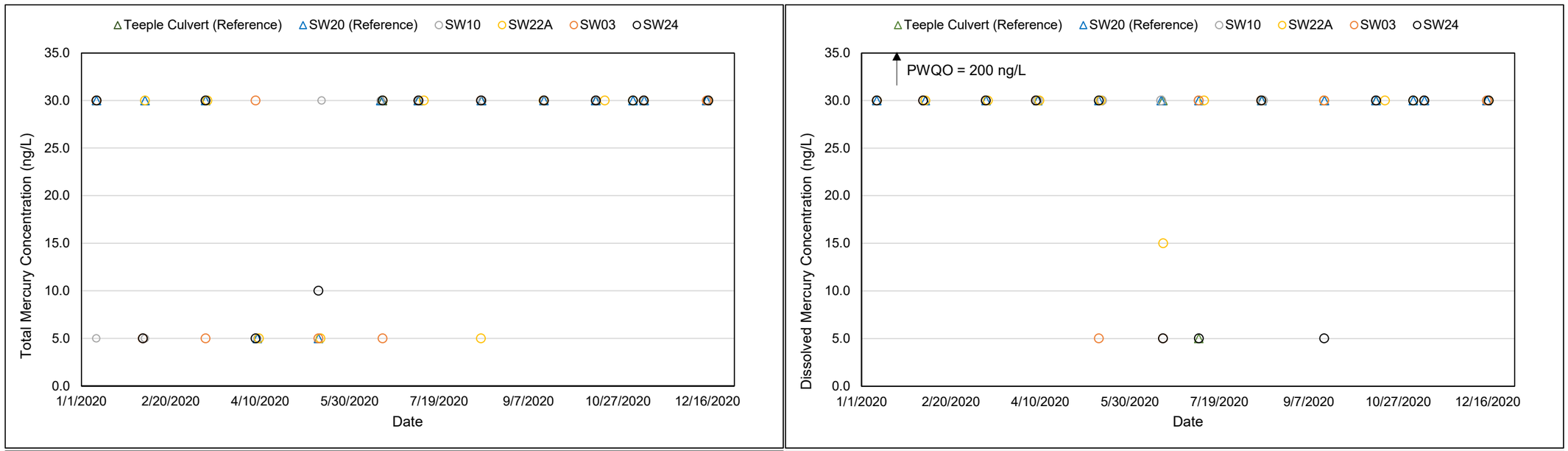


Figure 3.2: Surface Water Concentrations of Select Analytes in the Pinewood River, RRM 2020

Note: Open symbols indicate sample concentration below detection limit.
[a] Hardness dependent guideline, with 0 to 30 mg/L hardness = 128 mg/L, 31 to 75 mg/L hardness = 218 mg/L, 76 to 180 mg/L hardness = 309 mg/L, and 181 to 250 mg/L hardness = 429 mg/L, British Columbia Ministry of Environment and Climate Change Strategy guideline.

(Figure 3.2; Appendix Table A.11). The majority of total and dissolved mercury concentrations were below method detection limits (MDL) for all areas (Figure 3.2; Appendix Table A.11).

The surface water quality data suggests there is no evidence of increased mercury concentrations within the Pinewood River associated with mine-activities (Figure 3.2; Appendix Table A.11).

Sulphate concentrations were generally elevated downstream of the mine compared to the upstream reference areas; with surface water concentrations elevated compared to the more conservative water quality guidelines in the three most downstream stations (SW22A, SW03, and SW24) in October and November 2020 (Figure 3.2; BCMECCS). This is likely due to increased effluent discharge volumes (3 discharge points [EDL1, EDL2, and SP2] in Oct and November and only 2 prior to October 2020 [EDL1 and SP2]) coupled with an increased effluent sulphate concentrations within EDL1 and EDL2 in October and November 2020 (Appendix Table A.12). These increased sulphate concentrations are likely a result of the use of copper-sulphate as a major reagent during ore processing.

The 2020 annual mean surface water mercury (total, dissolved, and methyl) and sulphate concentrations were compared to 2019, 2018 and 2017 data (Figure 3.3). Comparison with previous data showed that methylmercury surface water concentrations in 2020 were within the range of previously reported years (Figure 3.3). Additionally, surface water sulphate concentrations were similar to concentrations from previous years for reference and SW10 surface water stations, however, 2020 sulphate concentrations were elevated in the three most downstream stations (SW22A, SW03, and SW24) compared to previous years (Figure 3.3). Comparison with previous data showed that 2020 total and dissolved mercury concentrations in surface water were elevated compared to previous years (2017, 2018, and 2019), but this was the result of high detection limits rather than as a result of upstream mine-activities due to the majority of samples being below MDLs (Figure 3.3). These results indicate that RRM has increased Pinewood River surface water sulphate concentrations downstream of the mine over the past year but has not increased mercury concentrations during the same time period (Figure 3.3).

Overall, 2020 surface water concentrations of total and dissolved mercury were elevated compared to previous years, however, this is likely due to the higher than previous laboratory detection limits and not a result of upstream mine-activities during this time period, as evidenced by the low concentrations of methylmercury during this same time period (Figure 3.3; Appendix Table A.11). Sulphate concentrations were elevated in the Pinewood River downstream of the mine and have increased in 2020 compared to previous years, likely due to increased effluent discharge in October and November 2020 (Appendix Table A.12) and increased effluent sulphate concentrations caused by the use of copper-sulphate as a major reagent during ore processing.

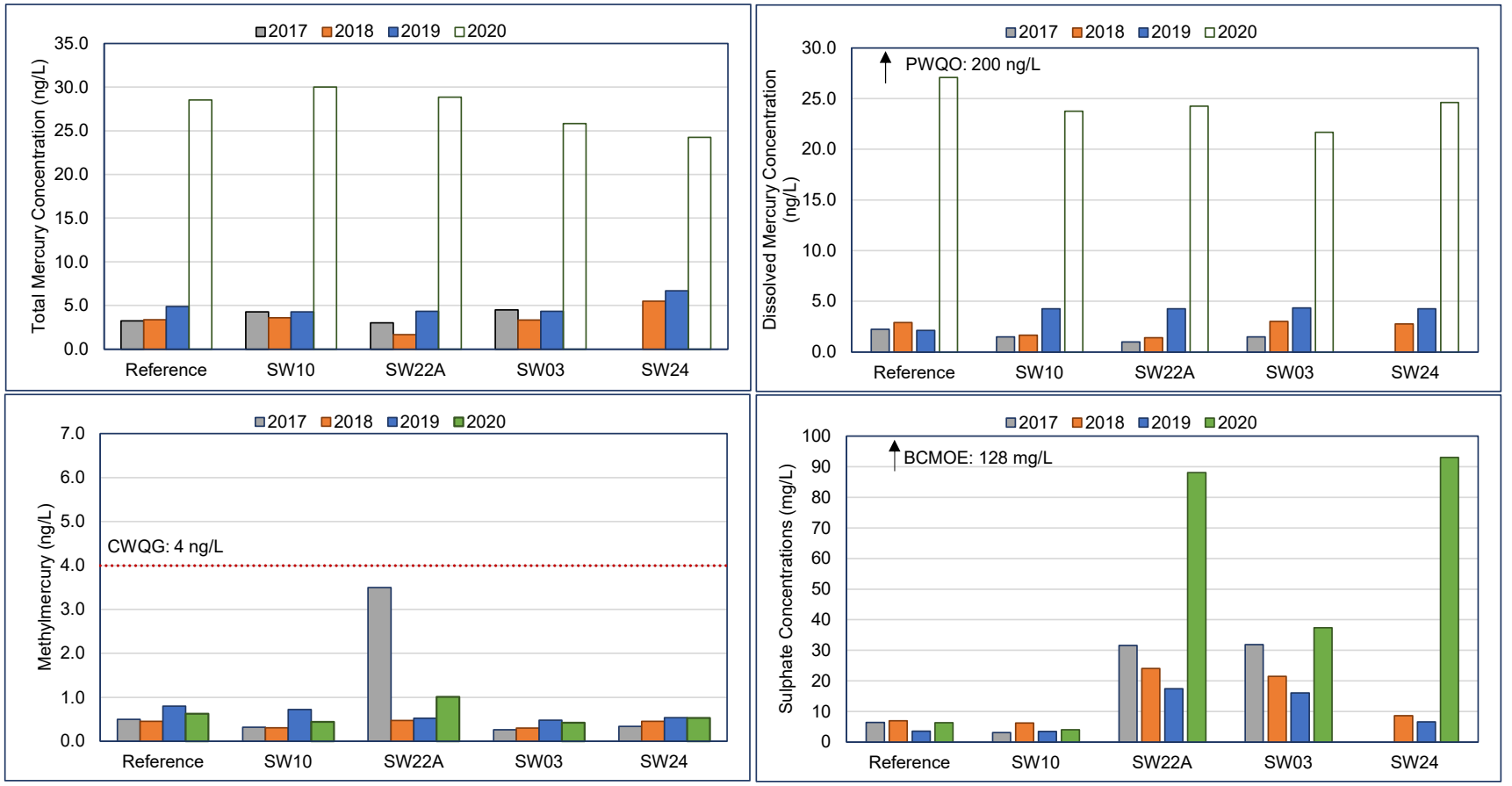


Figure 3.3: Mean Annual Surface Water Concentrations of Select Analytes in the Pinewood River, 2017 to 2020

Note: Reference mean values are Teeple Culvert and SW20 surface water concentrations combined. Open symbol denotes all values were less than detection.

Although mean surface water concentrations of sulphate were below water quality objective/guidelines at all stations, several October and November 2020 samples from SW22A, SW03, and SW24 exceeded the most conservative BCMECCS water quality guideline, however hardness values at SW22A are routinely greater than 200 mg/L for which the sulphate guideline is 429 mg/L, which all samples were below in 2020 (Figure 3.2; Appendix Table A.11).

3.3 Fish Community

A total of 1,731 fish representing 13 species were captured at PWREF (Table 3.1). These included the following species in order of abundance: brook stickleback (*Culaea inconstans*), finescale dace (*Chrosomus neogaeus*), central mudminnow (*Umbra limi*), northern redbelly dace (*Chrosomus eos*), common shiner (*Luxilus cornutus*), brassy minnow (*Hybognathus hankinsoni*), fathead minnow (*Pimephales promelas*), pearl dace (*Margariscus margarita*), northern pike (*Esox Lucius*), white sucker (*Catostomus commersonii*), creek chub (*Semotilus atromaculatus*), golden shiner (*Notemigonus crysoleucas*), and brown bullhead (*Ameiurus nebulosus*; Table 3.1; Appendix Table A.1). Fishing CPUEs for PWREF were 1.3 fish captured per gill net hour, 2.4 fish captured per minute of electrofishing effort, 148.3 fish captured per seine net haul, and 0.16 fish captured per minnow trap hour (Table 3.2; Appendix Tables A.7 to A.10). Multiple age classes of several fish species were observed during the 2020 survey (Appendix Figure A.1).

A total of 1,060 fish representing 14 species were captured at PWNF (Table 3.1). These included the following species in order of abundance: golden shiner, brown bullhead, johnny darter (*Etheostoma nigrum*), white sucker, common shiner, northern pike, central mudminnow, finescale dace, brassy minnow, blackside darter (*Percina maculate*), trout-perch (*Percopsis omiscomaycus*), creek chub, blacknose dace (*Rhinichthys atratulus*), and fathead minnow (Table 3.1; Appendix Table A.2). Fishing CPUEs for PWNF were slightly lower than reference for all methods with 0.26 fish captured per gill net hour, 2.0 fish captured per minute of electrofishing effort, 74.7 fish captured per seine net haul, and 0.03 fish captured per minnow trap hour (Table 3.2; Appendix Tables A.7 to A.10). Multiple age classes of several fish species were observed during the 2020 survey (Appendix Figure A.2).

A total of 556 fish representing 11 species were captured at PWFF, these included the following species in order of abundance; johnny darter, common shiner, white sucker, central mudminnow, trout-perch, blackside darter, brassy minnow, golden shiner, northern pike, brook stickleback, and creek chub (Table 3.1; Appendix Table A.3). Fishing CPUEs for PWFF were lower than both PWNF and PWREF for all methods with 0.18 fish captured per gill net hour, 1.0 fish captured per minute of electrofishing effort, 37.2 fish captured per seine net haul, and 0.005 fish captured per

.

Table 3.1: Fish Species Total Catch Summary During Pinewood River Annual Monitoring, RRM 2020

Area	Blackside Darter	Blacknose Dace	Brassy Minnow	Brook Stickleback	Brown Bullhead	Central Mudminnow	Common Shiner
Pinewood River Reference Area	0	0	79	361	1	117	107
Pinewood River Near-field Area	13	1	16	0	153	33	54
Pinewood River Far-field Area	21	0	15	5	0	32	55

Area	Creek Chub	Cyprinid sp. (Juvenile)	Fathead Minnow	Finescale Dace	Golden Shiner	Johnny Darter	Northern Pike
Pinewood River Reference Area	12	487	54	279	4	0	44
Pinewood River Near-field Area	3	99	1	21	402	131	35
Pinewood River Far-field Area	1	8	0	0	10	319	8

Area	Northern Redbelly Dace	Pearl Dace	Trout Perch	White Sucker	All Species
Pinewood River Reference Area	114	46	0	26	1,731
Pinewood River Near-field Area	0	0	6	93	1,061
Pinewood River Far-field Area	0	0	31	51	556

Table 3.2: Fish Catch and Effort Summary for the Upper Pinewood River, 2017, 2019, and 2020

Area[a]	Gill Netting								
	Effort (hours)			Total Catch			CPUE (no. fish/hour)		
	2017	2019	2020	2017	2019	2020	2017	2019	2020
PWREF	81	117	114	16	476	153	0.2	4.1	1.3
PWNF	96	129	109	4	24	28	0.04	0.2	0.3
PWFF	-	77	102	-	6	18	-	0.1	0.2

Area[a]	Electrofishing								
	Effort (seconds)			Total Catch			CPUE (no. fish/minute)		
	2017	2019	2020	2017	2019	2020	2017	2019	2020
PWREF	3,030	3,000	3,003	57	185	119	1.1	3.7	2.4
PWNF	6,108	5,510	3,325	10	85	113	0.1	0.9	2.0
PWFF	-	3,002	3,000	-	99	51	-	2.0	1.0

Area[a]	Seine Netting								
	Effort (hauls)			Total Catch			CPUE (no. fish/haul)		
	2017	2019	2020	2017	2019	2020	2017	2019	2020
PWREF	9	9	9	201	1,272	1,335	22.3	141.3	148.3
PWNF	9	16	12	19	325	897	2.1	20.3	74.8
PWFF	-	16	13	-	753	484	-	47.1	37.2

Area[a]	Minnow Trapping								
	Effort (hours)			Total Catch			CPUE (no. fish/hour)		
	2017	2019	2020	2017	2019	2020	2017	2019	2020
PWREF	659	971	792	360	57	124	0.5	0.1	0.2
PWNF	622	3,480	701	18	83	22	0.03	0.02	0.03
PWFF	-	1,644	654	-	14	3	-	0.01	0.005

Note: "-" indicates no fish captured in 2017 for that area.

[a] PWREF denotes Pinewood River Reference Area, PWNF denotes Pinewood River Near-field Area, and PWFF denotes Pinewood River Far-field Area.

minnow trap hour (Table 3.2; Appendix Tables A.7 to A.10). Multiple age classes of several fish species were observed during the 2020 survey (Appendix Figure A.3) 2020 fishing effort and capture data were compared to the 2017 and 2019 results (no fishing was completed in 2018). Comparison with previous data showed that overall, more fish were captured in 2020 than in 2017, with similar catch numbers to 2019 (Table 3.2). Like the previous years, the 2020 CPUE for all methods was greater than in 2017 except for minnow trapping (Table 3.2). Despite a greater number of fish captured in 2020, species richness was similar among years (Table 3.1).

Overall, the fish community of the Pinewood River was similar among the two downstream mine-exposed areas (PWNF and PWFF) and the upstream reference area (PWREF) during the 2017, 2019, and 2020 surveys indicating minimal impact to the resident fish communities of the Pinewood River by operation of RRM. Notably, fish abundance is consistently lower in both PWNF and PWFF compared to PWREF as evidenced by CPUE numbers (Table 3.2). This is likely a result of habitat differences rather than an effect due to mine-activities, as PWNF and PWFF are traditional lotic habitats whereas PWREF[2] exhibits characteristics of lentic habitat due to increased ponding caused by extensive beaver activities in the upper reaches of the Pinewood River (Figure 2.1).

3.4 Fish Tissue Quality

In 2020, RRM effluent discharge had very low mercury concentrations with the majority of samples below detection limits (83% for total mercury and 81% for dissolved mercury samples; Appendix Table A.12), suggesting that effluent may not meaningfully contribute to mercury accumulation in Pinewood River fish (Table 3.3; Appendix Table A.12).

Common shiner whole body tissue collected in 2020 contained average mercury concentrations below consumption guidelines with all mercury concentrations in muscle tissue well below the restriction level for sensitive populations (0.5 mg/kg; Table 3.3; Figure 3.4; MECP 2015). There were significant interactions between area and fork length among PWNF, PWFF, and PWREF where tissue mercury concentrations were significantly higher at PWNF and PWFF than at PWREF for small common shiner but were lower for larger ones (Table 3.4; Figure 3.5). Unexpectedly, tissue concentrations decreased with fork length for PWNF, but the opposite was observed at both PWFF and PWREF where tissue mercury concentrations increased with size, which is the expected relationship. Although mercury concentrations were significantly higher in smaller fish downstream of the mine (199% and 29% for PWNF and PWFF respectively; Table 3.4), common shiner captured downstream of the mine had tissue mercury concentrations

[2] Due to private property rights in vicinity of PWREF, upstream of this site is unavailable for sampling.

Table 3.3: Summary of Common Shiner Whole Body Mercury Concentrations (mg/kg wwt) in the Upper Pinewood River in 2019 and 2020

Area[a]	Minimum		Maximum		Mean		Median	
	2019	2020	2019	2020	2019	2020	2019	2020
PWREF	-[b]	0.027	-[b]	0.167	-[b]	0.084	-[b]	0.084
PWNF	0.246	0.049	0.717	0.177	0.432	0.107	0.408	0.102
PWFF	0.084	0.038	0.382	0.139	0.198	0.056	0.198	0.051

Note: "-" indicates no samples for PWREF.

[a] PWREF denotes Pinewood River Reference Area, PWNF denotes Pinewood River Near-field Area, and PWFF denotes Pinewood River Far-field Area.

[b] PWREF fish tissue samples were lost in 2019.

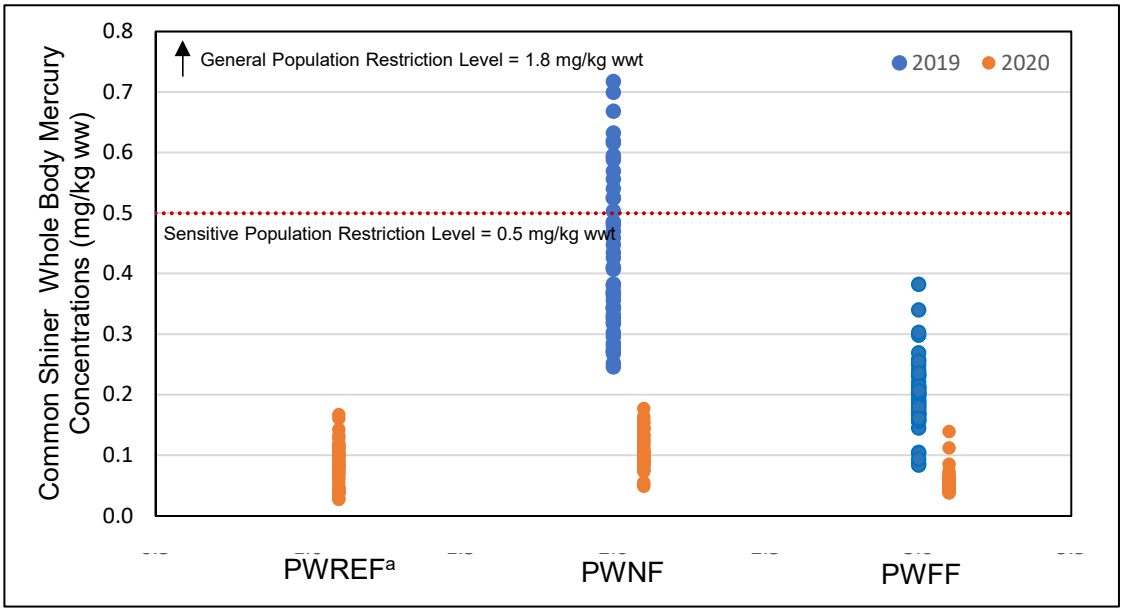


Figure 3.4: Whole Body Mercury Concentrations for Common Shiner Captured at Pinewood River Reference and Mine-exposed areas for 2019 and 2020

[a] PWREF samples were lost in 2019, therefore mercury analysis could not be completed in 2019.

Table 3.4: ANCOVA Results Comparing Tissue Mercury Concentrations (wet weight) in Common Shiners between PWNF, PWFF, and PWREF, RRM 2020

ANCOVA Results			Fork Length Low Range (mean = 4.94)					
			Geometric Mean			MOD (%)[a]		
Test	Variable	P-value	PWREF	PWNF	PWFF	PWNF vs. PWREF	PWFF vs. PWREF	PWFF vs. PWNF
ANCOVA	Area	-	0.0387	0.116	0.0501	+199	+29	-57
	Fork Length	-						
	Area*Fork Length	0.001						
ANCOVA Results			**Fork Length High Range (mean = 11.6)**					
			Geometric Mean			MOD (%)[a]		
Test	Variable	P-value	PWREF	PWNF	PWFF	PWNF vs. PWREF	PWFF vs. PWREF	PWFF vs. PWNF
ANCOVA	Area	-	0.118	0.0870	0.0609	-26	-49	-30
	Fork Length	-						
	Area*Fork Length	0.001						

P-Value < 0.05

P-Value < 0.05 and MOD > 0

P-Value < 0.05 and MOD < 0

[a] $MOD = MCT_{Exp} - MCT_{Ref}/MCT_{Ref} \times 100$, where MCT is the geometric mean and Ref is the first site in the comparison and Exp is the second site in the comparison.

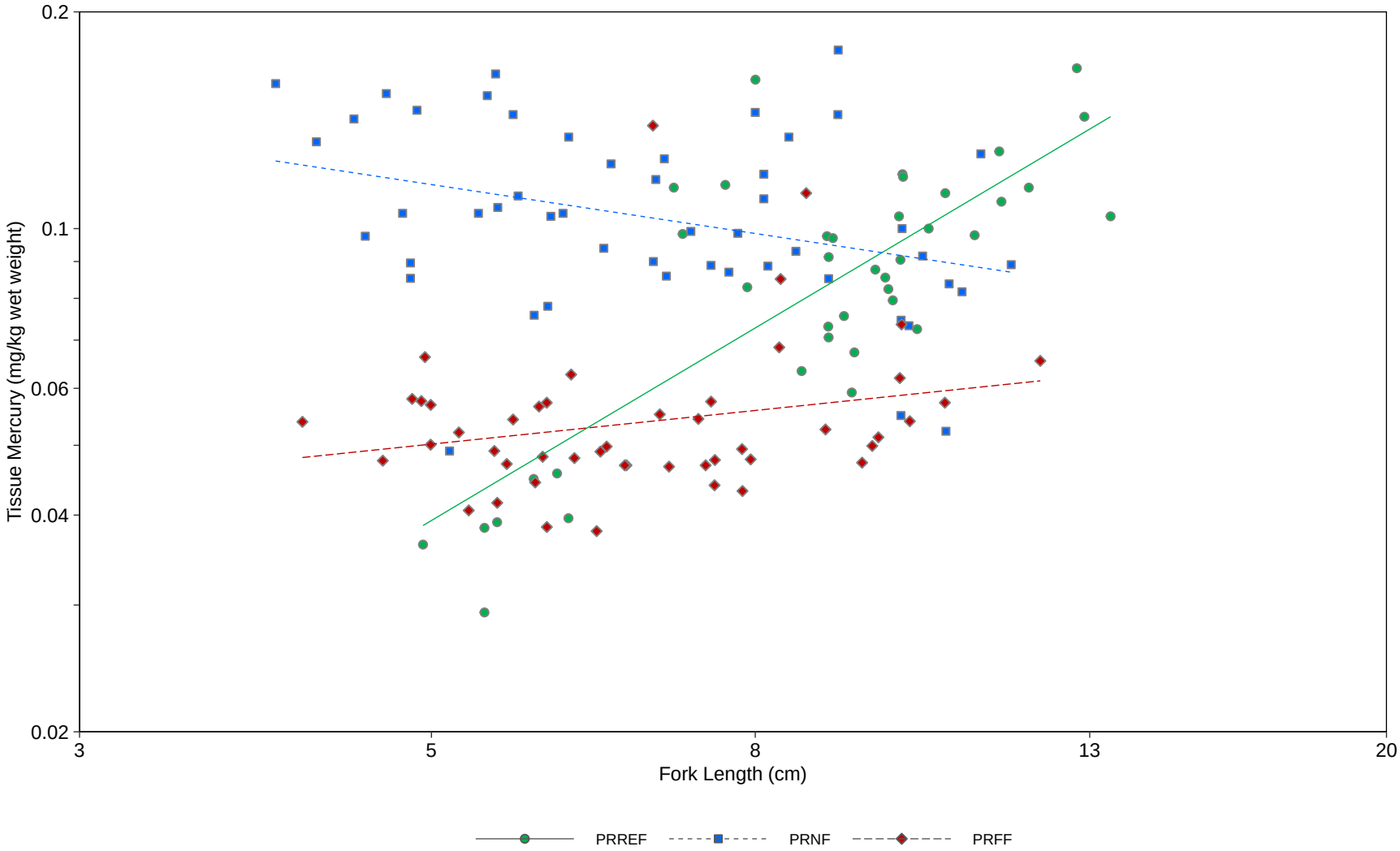


Figure 3.5: Relationship Between Forklength and Tissue Mercury Concentration in Common Shiners, Rainy River Mine, 2020

Both the x and y axes are log transformed.

ranging from 0.038 to 0.177 mg/kg wet weight, which are well below the most conservative guideline for sensitive populations (0.5 mg/kg ww; Appendix Tables A.4 to A.6). It is unlikely that RRM has contributed to resident fish tissue mercury concentrations due to very low effluent and surface water mercury concentrations in the Pinewood River in the vicinity of the mine since monitoring began in 2017 and these results align with the data from previous fish tissue quality surveys (Minnow 2017, 2018, 2019; AMEC 2018b).

The 2020 mercury concentrations in muscle were compared to 2019 data (no fishing occurred in 2018; AMEC 2018b), and different species were sampled in 2017 (i.e., brook stickleback in 2017 and common shiner in 2019 and 2020). Overall, 2020 muscle tissue mercury concentrations were much lower than 2019 concentrations with average wet weight tissue mercury concentrations of 0.43 mg/kg and 0.11 mg/kg at PWNF in 2019 and 2020 respectively and 0.20 mg/kg and 0.056 mg/kg at PWFF in 2019 and 2020 respectively (Figure 3.4; Appendix Table A.5 and A.6; Minnow 2020).

It should be noted that naturally elevated mercury concentrations are often observed in fish (particularly for predatory species) in northern lakes and depositional rivers due to naturally elevated environmental mercury levels, atmospheric deposition of mercury, and biogeochemical conditions that favour mercury methylation (Evers et al. 2011; Kidd and Batchelar 2012). Methylated mercury is biomagnified through the food chain and has a long residence time in tissues and, with continued exposure, will bioaccumulate over the organism's lifetime (Evers et al. 2011; Kidd and Batchelar 2012).

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Conclusions of the 2020 Pinewood River Annual Biological Monitoring Program are listed below.

1. Water levels were similar among mine-exposed and upstream reference areas; however, responses to precipitation were more variable than previous year (2019), possibly indicating increased beaver activity in the vicinity of some of the level loggers. These level data indicate minimal impact on Pinewood River flows in the vicinity of the mine, with beaver activity as the main driver for water levels within the river.

2. Surface water mercury (total, dissolved, and methyl) concentrations were similar among mine-exposed areas and upstream reference areas. Surface water sulphate concentrations were elevated downstream of mine-activities compared to reference areas with October and November samples from the three most downstream stations (SW22A, SW03, and SW24) above most conservative water quality criterion (128 mg/L; BCMECCS 2020, 2021). However, sulphate is a hardness derived guideline and aqueous hardness values are often greater than 180 mg/L within the Pinewood River downstream of the mine, at these hardness values the guideline becomes 429 mg/L which all 2020 samples were below. These elevated sulphate surface water concentrations were likely a result of the increased effluent sulphate concentrations during that time period.

3. Fish communities and catchability (CPUE) in 2020 were generally consistent with the results of previous sampling efforts, with higher CPUE for gill netting, seine netting, and electrofishing but lower minnow trap CPUE in 2020 compared with 2017. Fish community composition was similar to 2017 and 2019 for sampled areas. As with the previous year, fish abundance decreased from upstream (PWREF) to downstream (PWFF) in 2020, however this pattern is likely a result of habitat differences within the Pinewood River rather than a result of mine-activities. The upper reaches of the Pinewood River (PWREF) have more ponding as a result of extensive beaver activity and have a much greater proportion of lentic habitat compared to downstream stations (PWNF and PWFF) providing greater amounts of fish habitat.

4. Common shiner mean whole body tissue samples contained mercury concentrations that were far below available human consumption benchmarks (although it is not assumed nor recommended that common shiner be consumed). Additionally, 2020 tissue mercury concentrations were substantially lower than 2019.

5. Whole body mercury concentrations were significantly higher in common shiner captured at PWNF and PWFF relative to PWREF (199% and 29% respectively) when individuals at the lower end of fork length (covariate) distribution were compared. When common shiners of the upper end of fork length were compared mine-exposed fish had significantly lower tissue mercury concentrations than reference (26% and 49% respectively). This indicates that whole body mercury concentration results were dependent on fish size. These equivocal findings make attributing these significant interactions to any single cause problematic. Based on comparisons to human consumption benchmarks and very low effluent mercury concentrations, it appears that the RRM has not influenced mercury concentrations in muscle tissues of exposed common shiner.

Overall, the data indicate that the Rainy River Mine has not significantly influenced flow, surface water mercury concentrations, or fish community composition in Pinewood River in the vicinity of RRM. Although fish abundances were lower at the mine-exposed areas, this was likely a result in habitat differences rather than an effect of upstream mine-activities. Downstream common shiner tissue mercury concentrations were significantly higher than reference fish at smaller fork lengths, however the opposite was true for larger fish, these equivocal findings make attributing these significant interactions to any single cause problematic. However, due to very low (majority non-detect) mercury concentrations in RRM effluent and Pinewood River surface water samples indicate that RRM have not likely contributed to fish tissue mercury concentrations in the Pinewood River. Mining activities have increased surface water sulphate concentrations downstream of the mine, especially in the three most downstream stations where sample concentrations were substantially higher than previous years.

4.2 Recommendations

Based on information acquired during the 2020 Annual Pinewood River Monitoring Study, recommendations for future monitoring include:

1. Continue monitoring of common shiner whole body mercury concentrations. This will allow for consistent year to year comparisons.

2. Request that the analytical laboratory increase method detection resolution for total and dissolved mercury to achieve the same limits as previous years.

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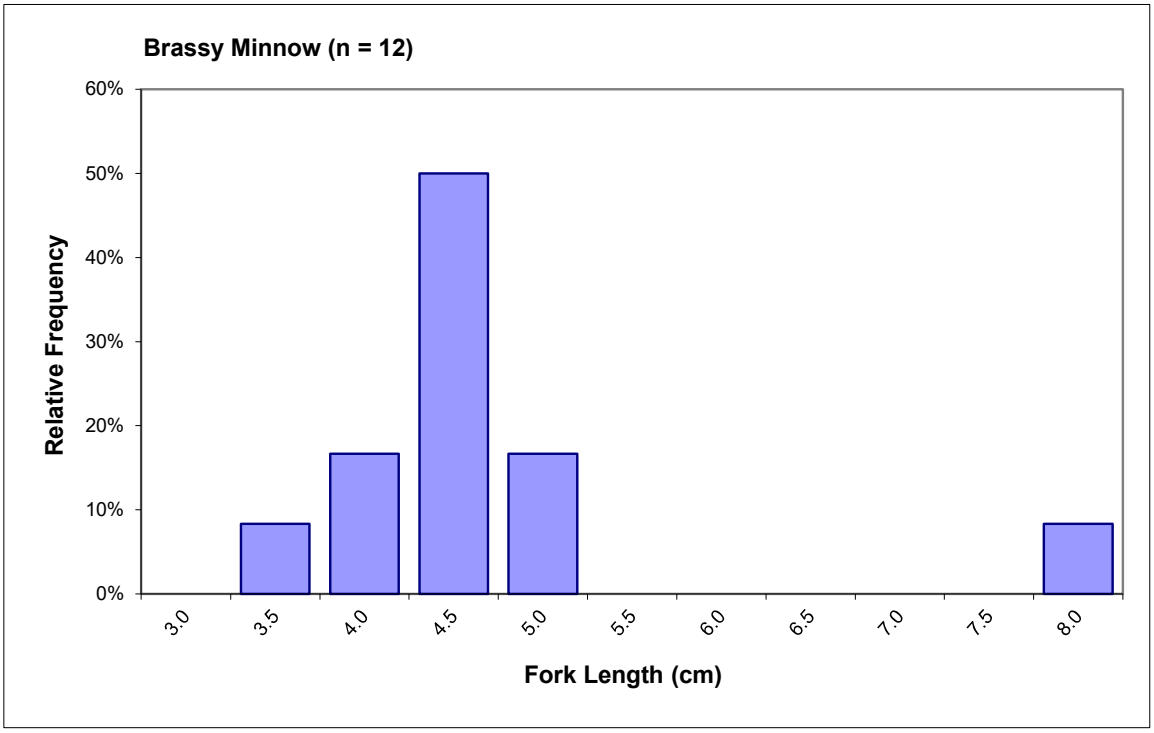
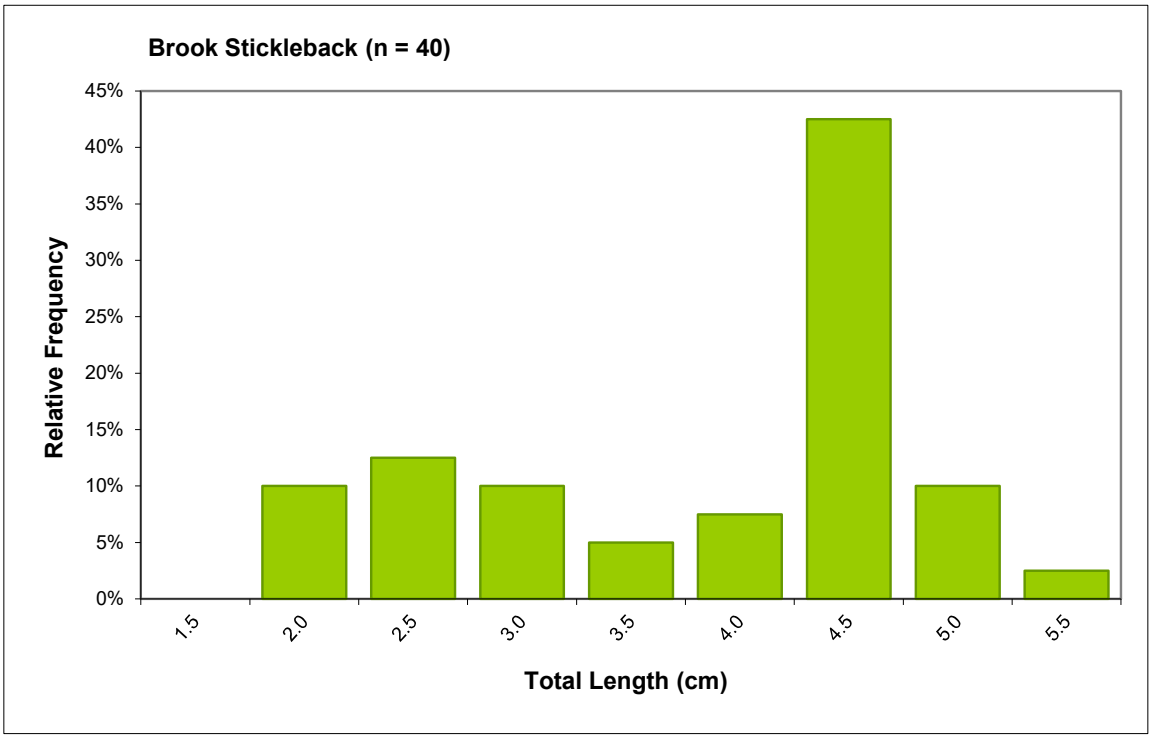
APPENDIX A

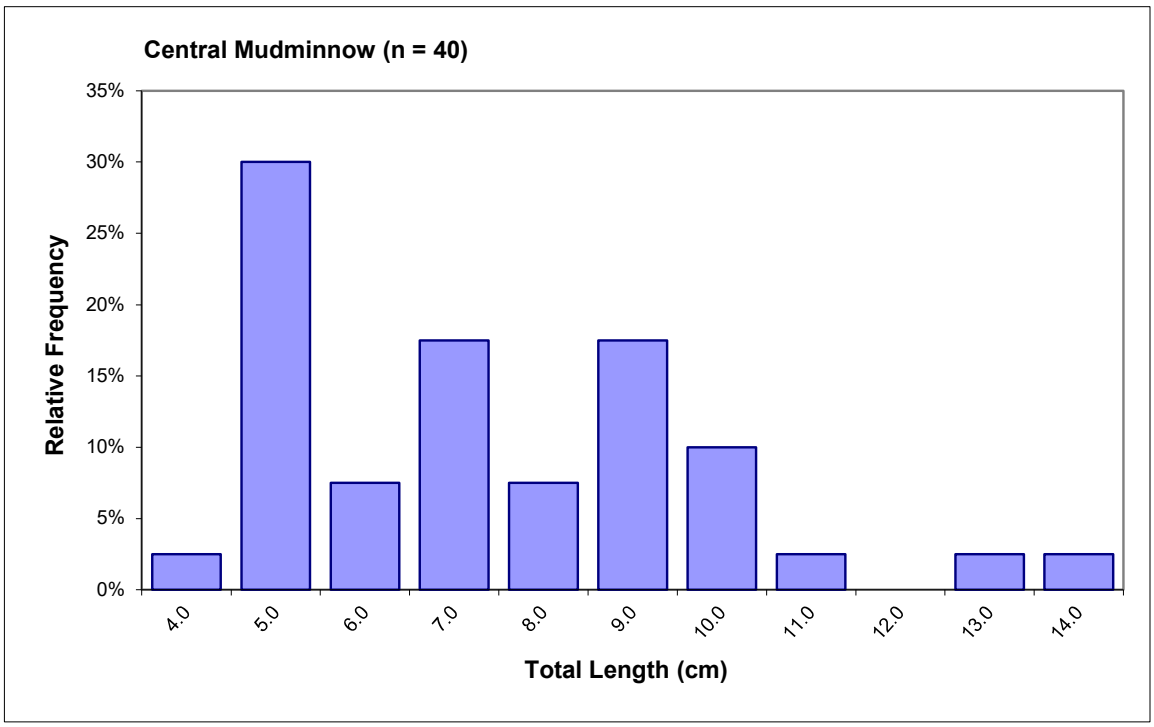
DETAILED DATA

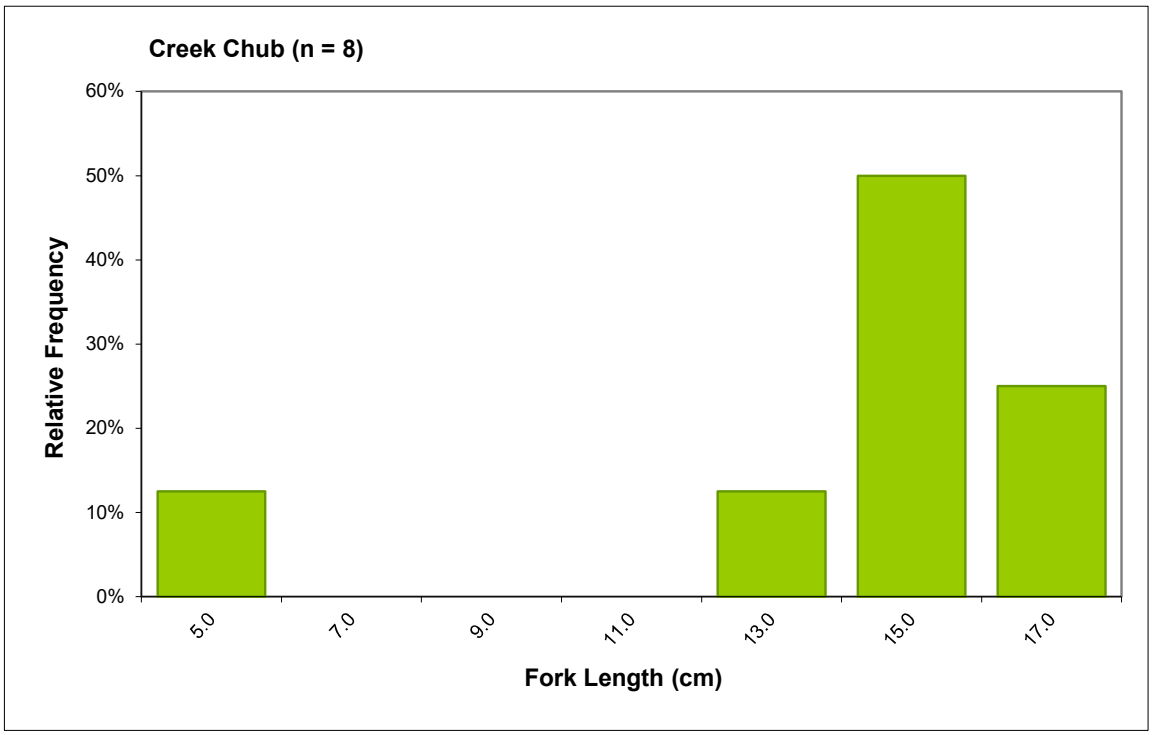




Appendix Figure A.1: Length-frequency Distributions for Fish Collected at Pinewood River Reference Area (PWREF), RRM 2020

Note: Brown bullhead (n=1) and golden shiner (n=2) not plotted due to low capture numbers.





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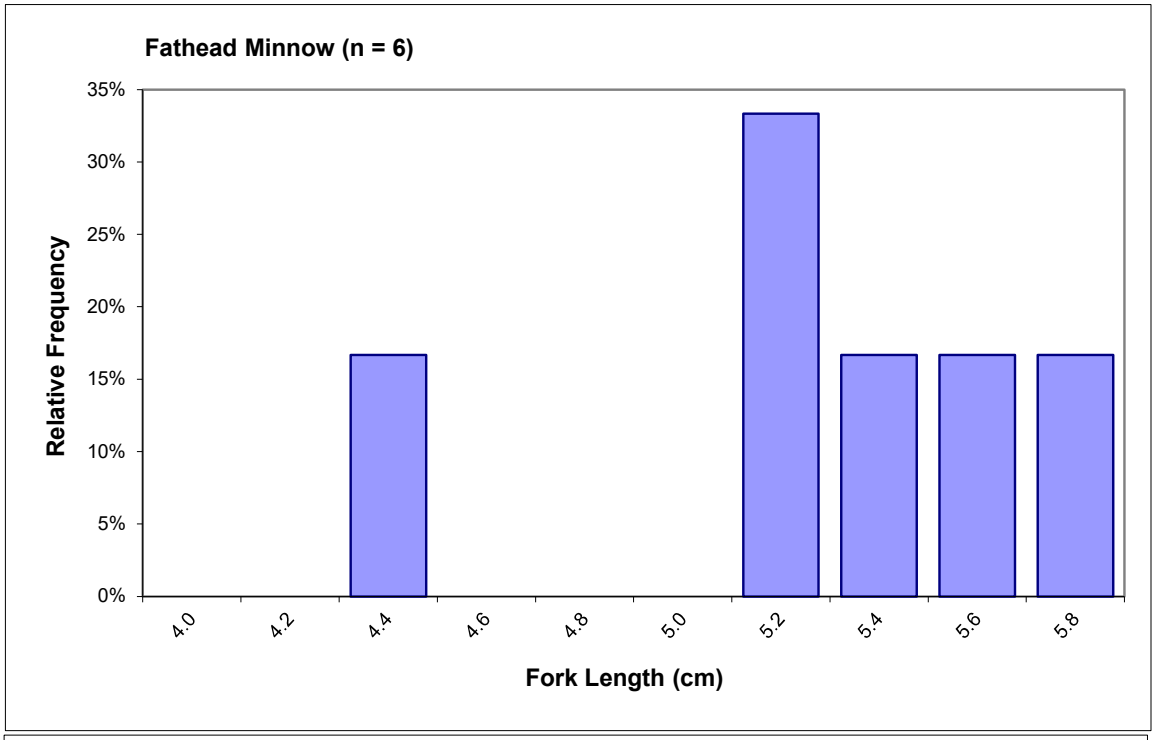

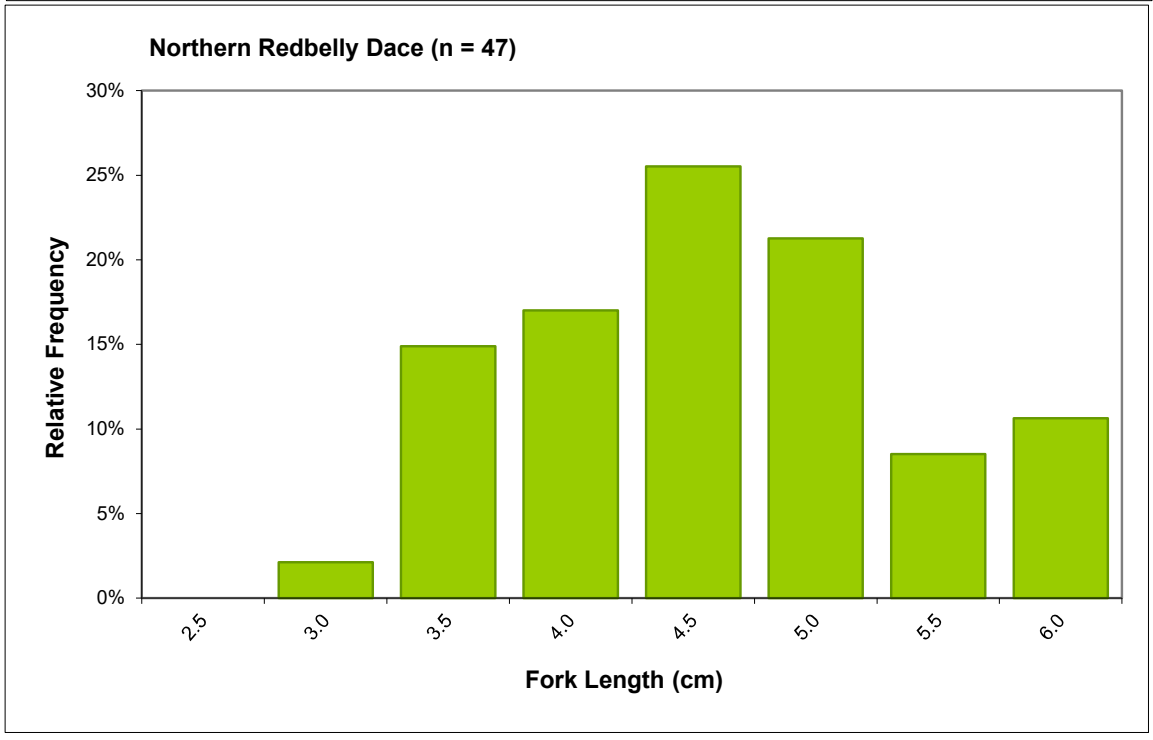

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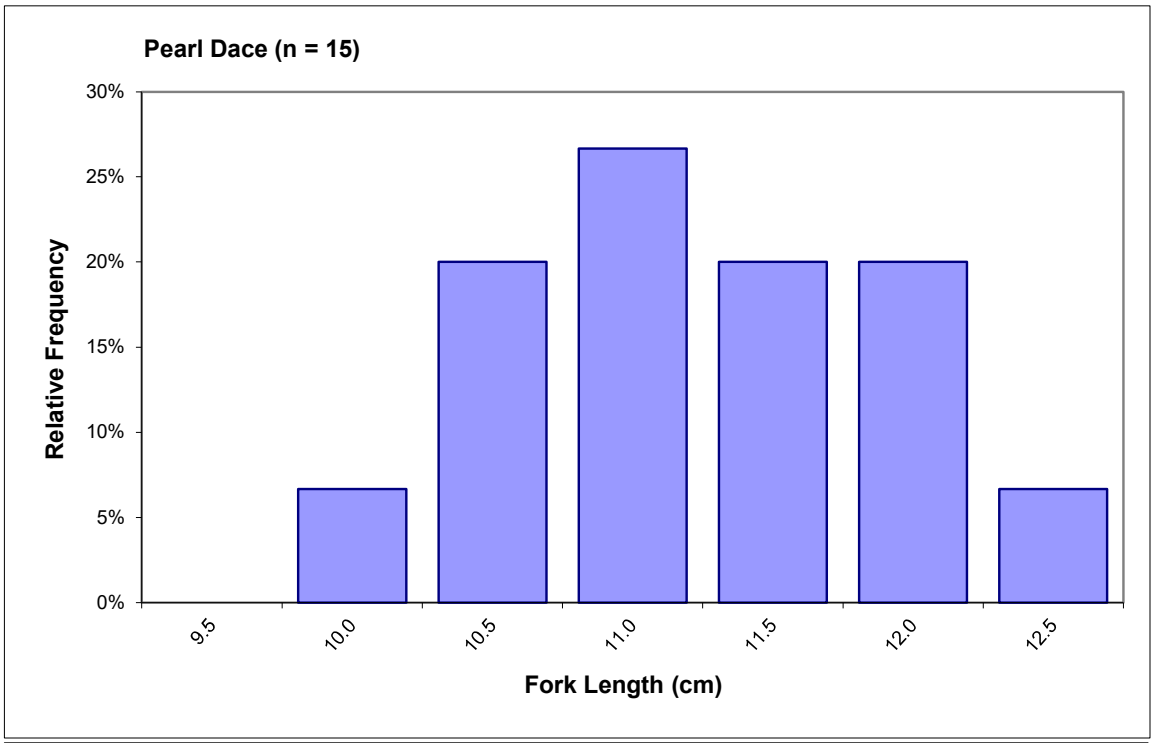

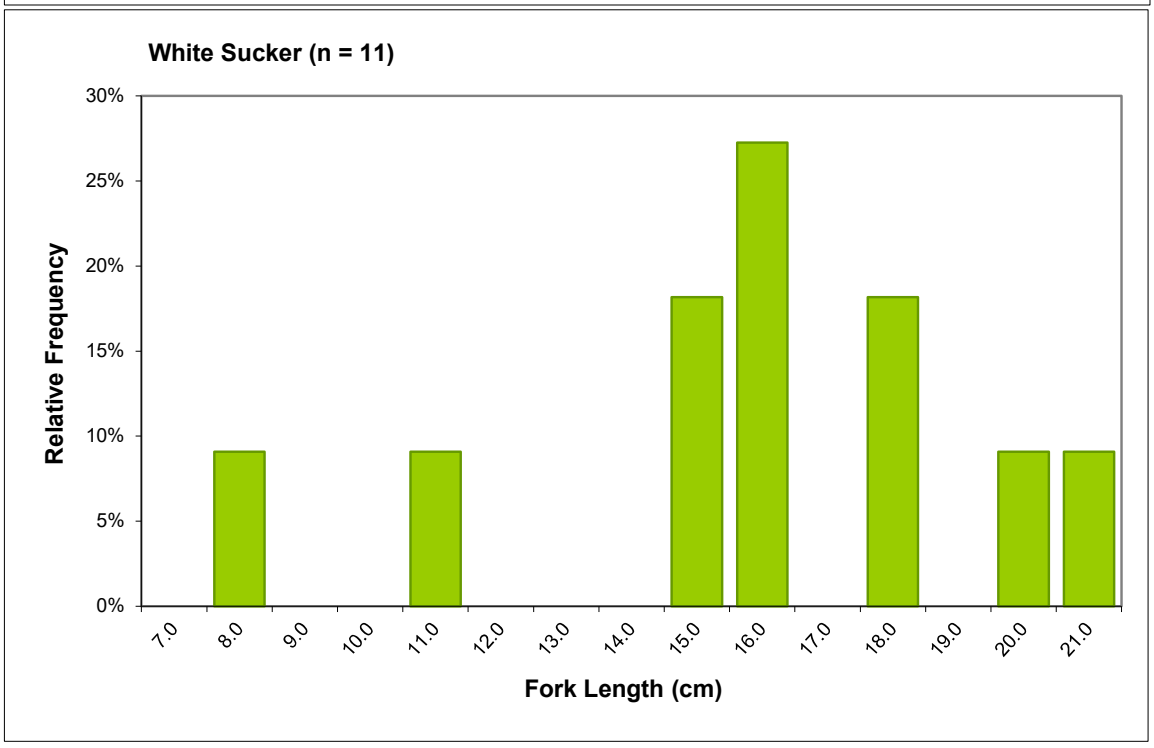

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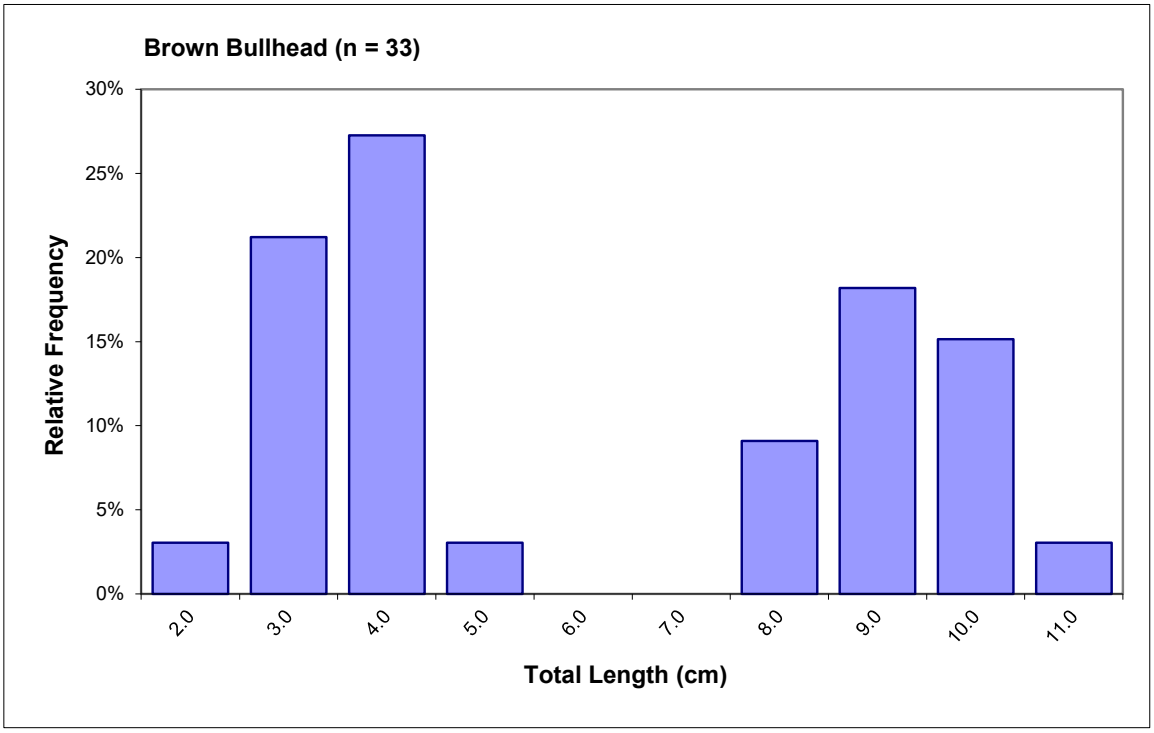
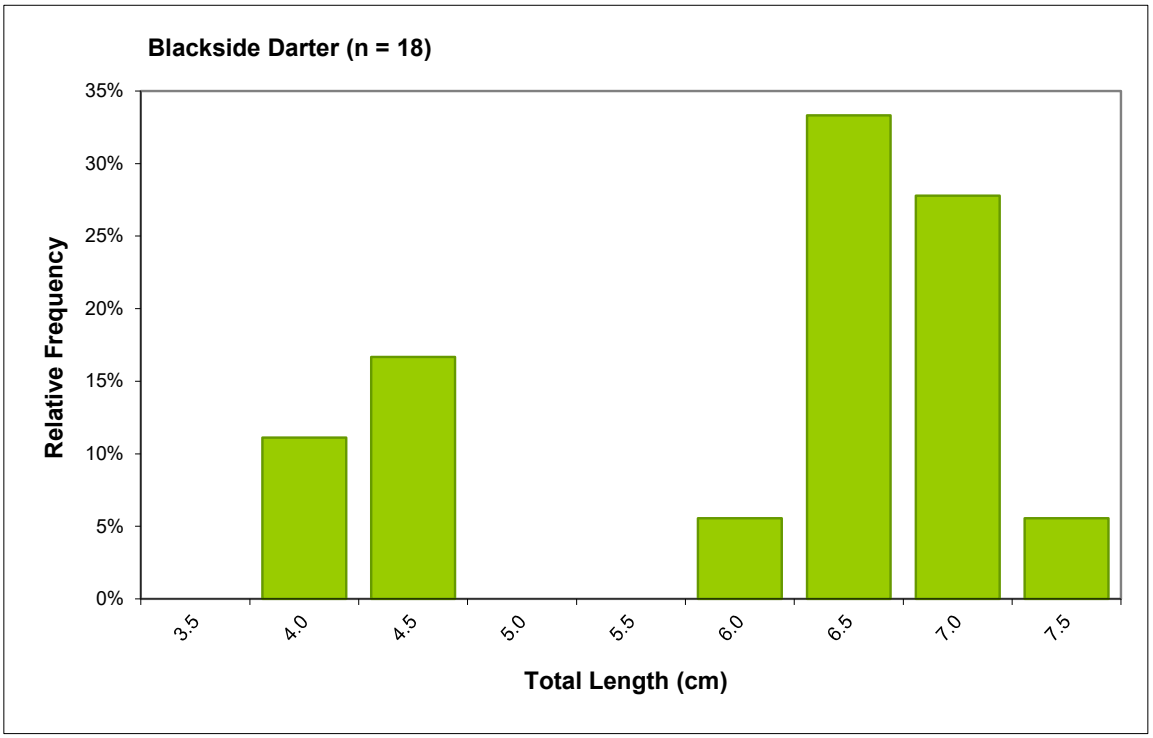
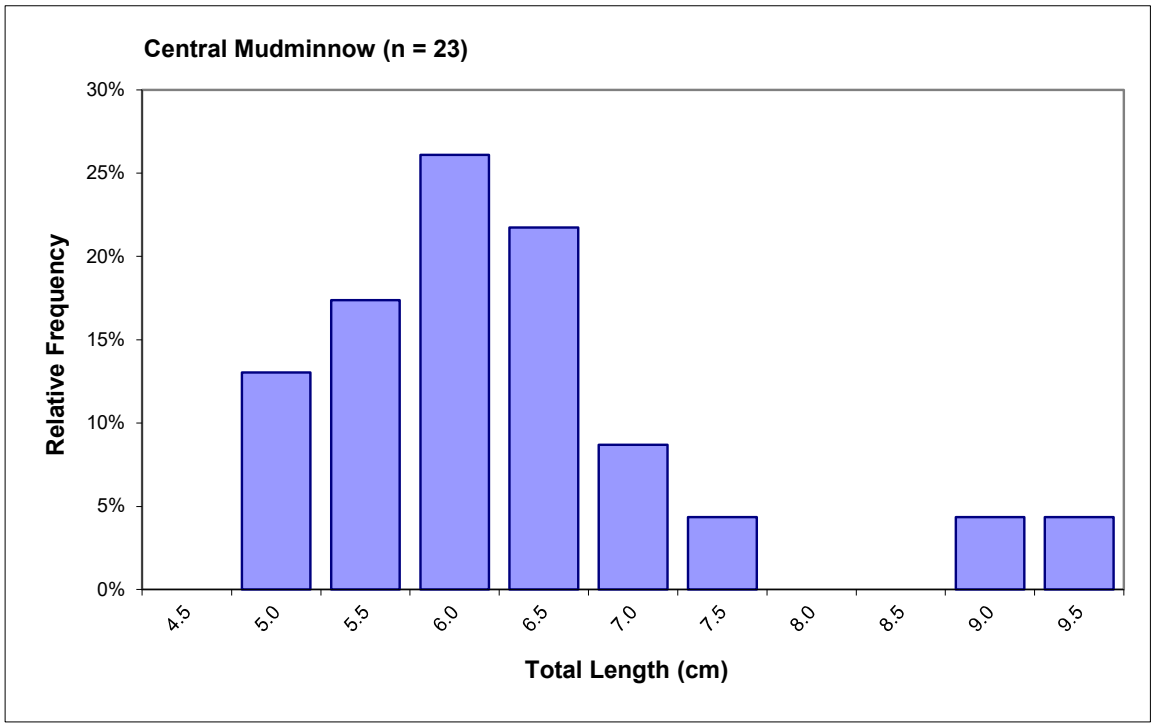
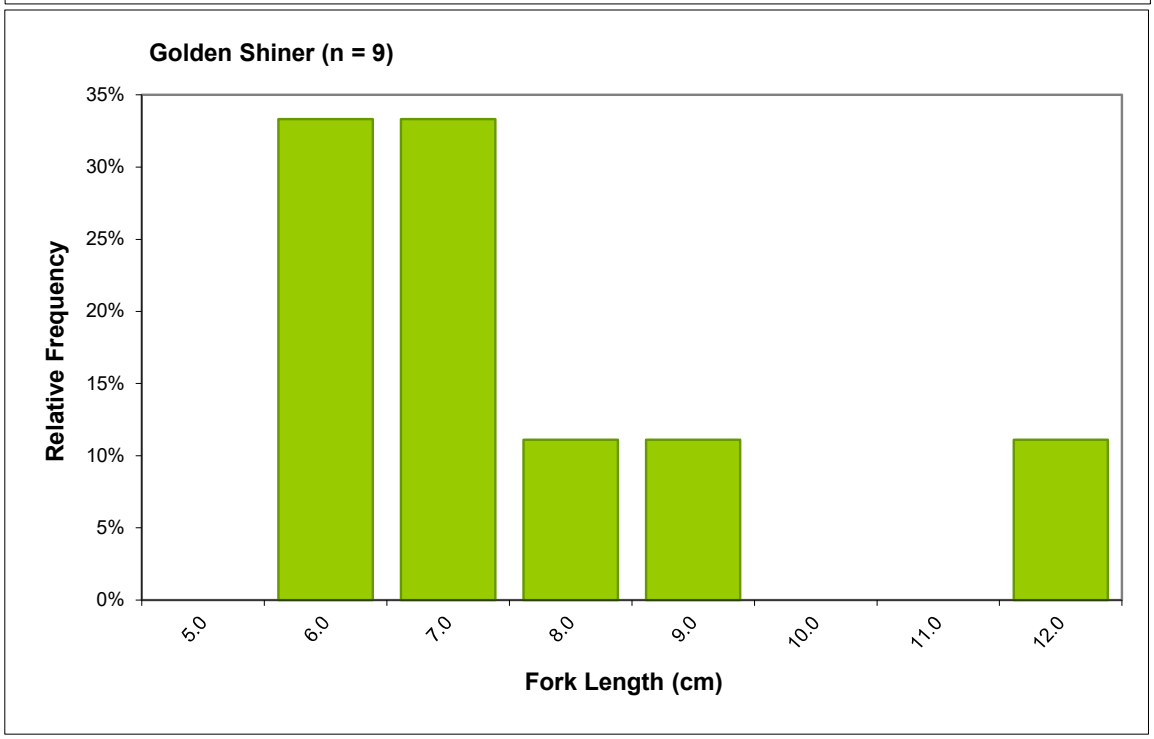




Appendix Figure A.2: Length-frequency Distributions for Fish Collected at Pinewood River Near-field Mine-exposed Area (PWNF), RRM 2020

Note: Brassy minnow (n=1), Blacknose dace (n=1), and Creek chub (n=2) not plotted due to low capture numbers.





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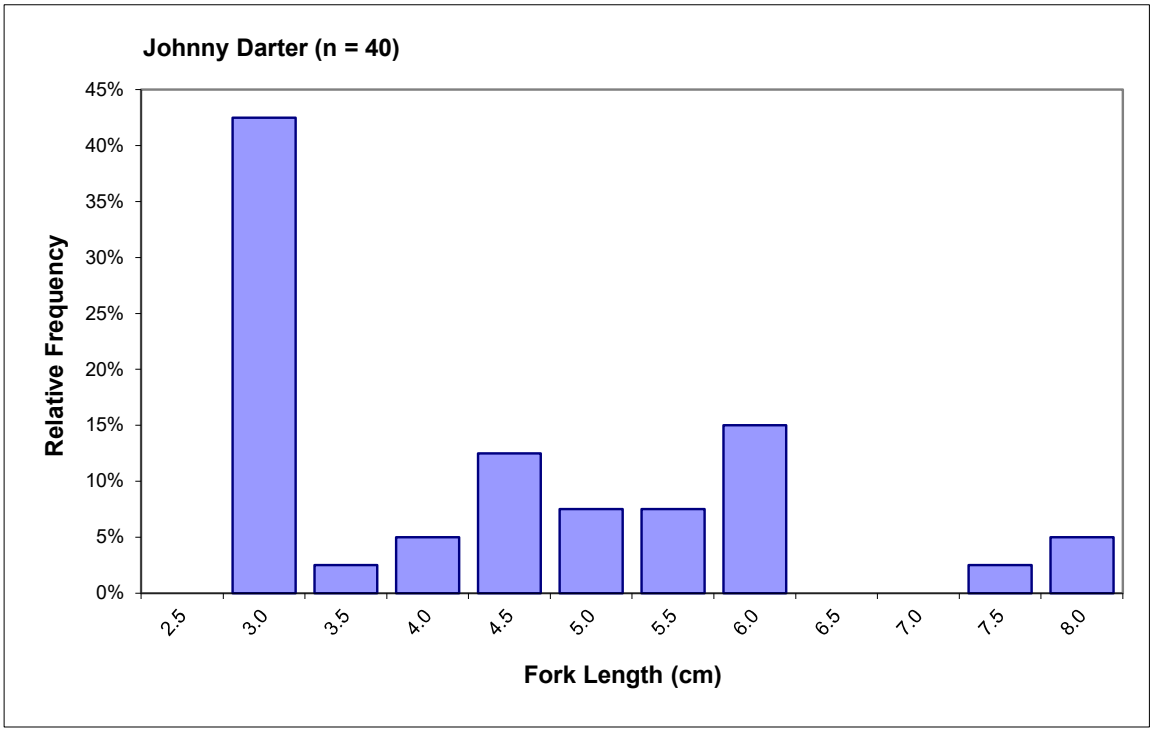

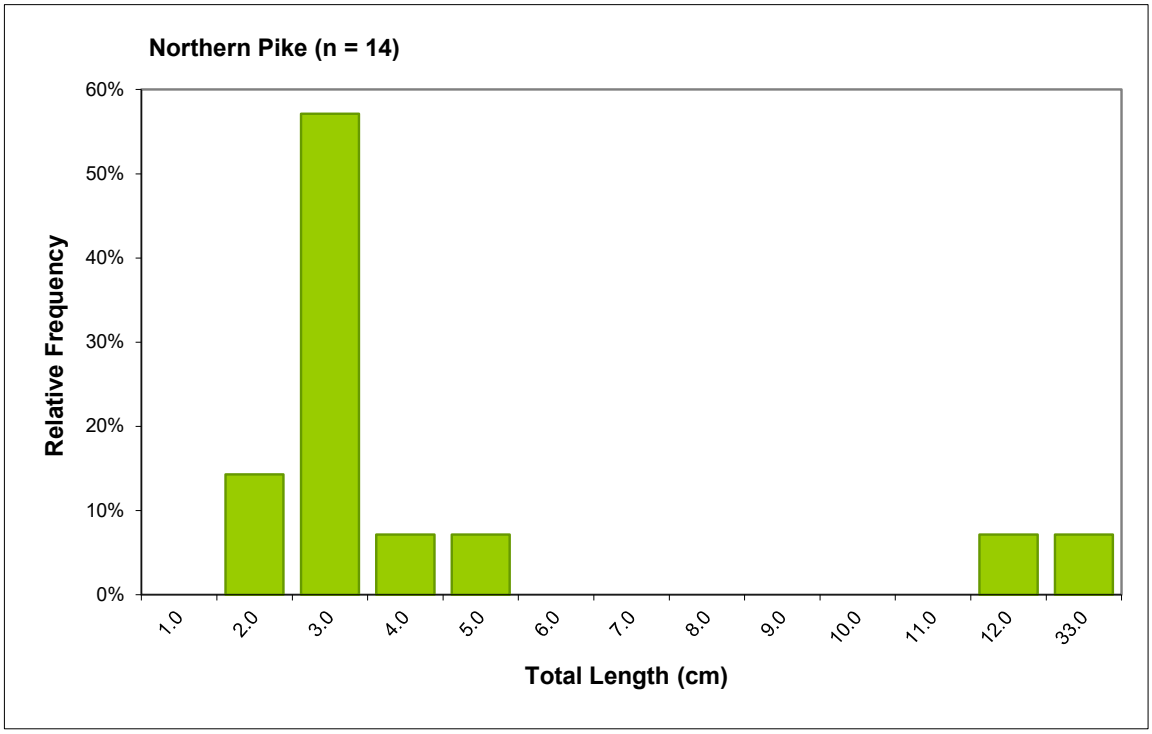

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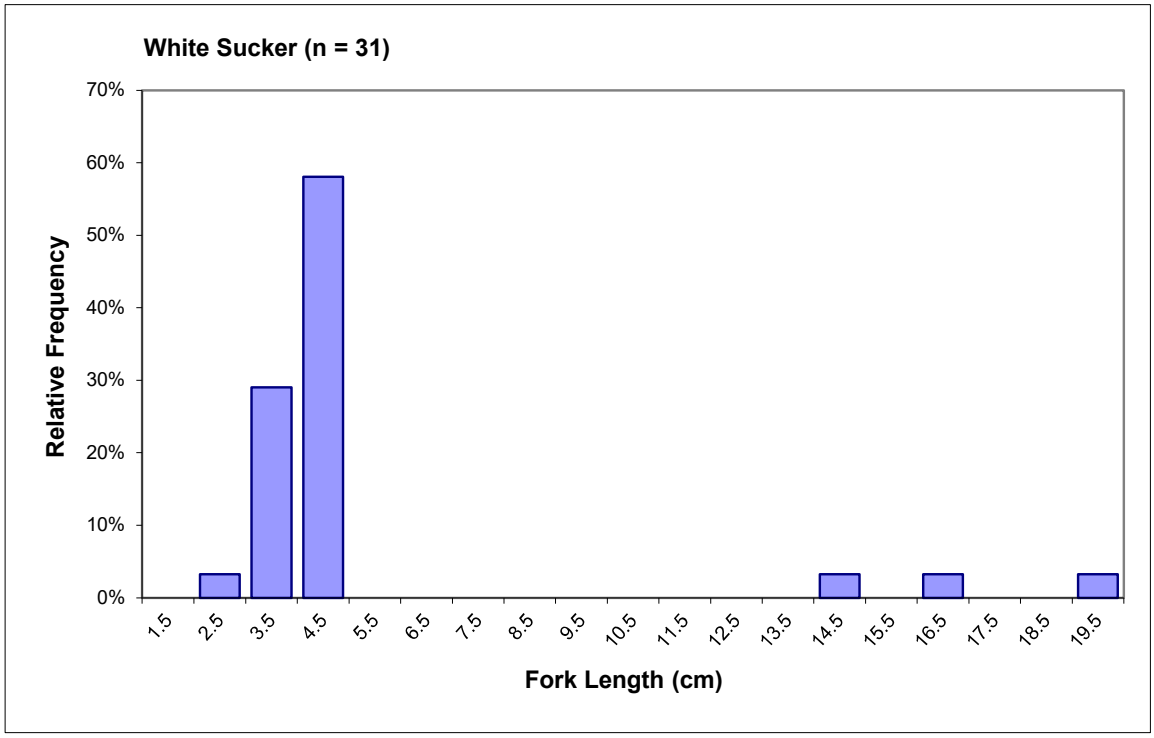

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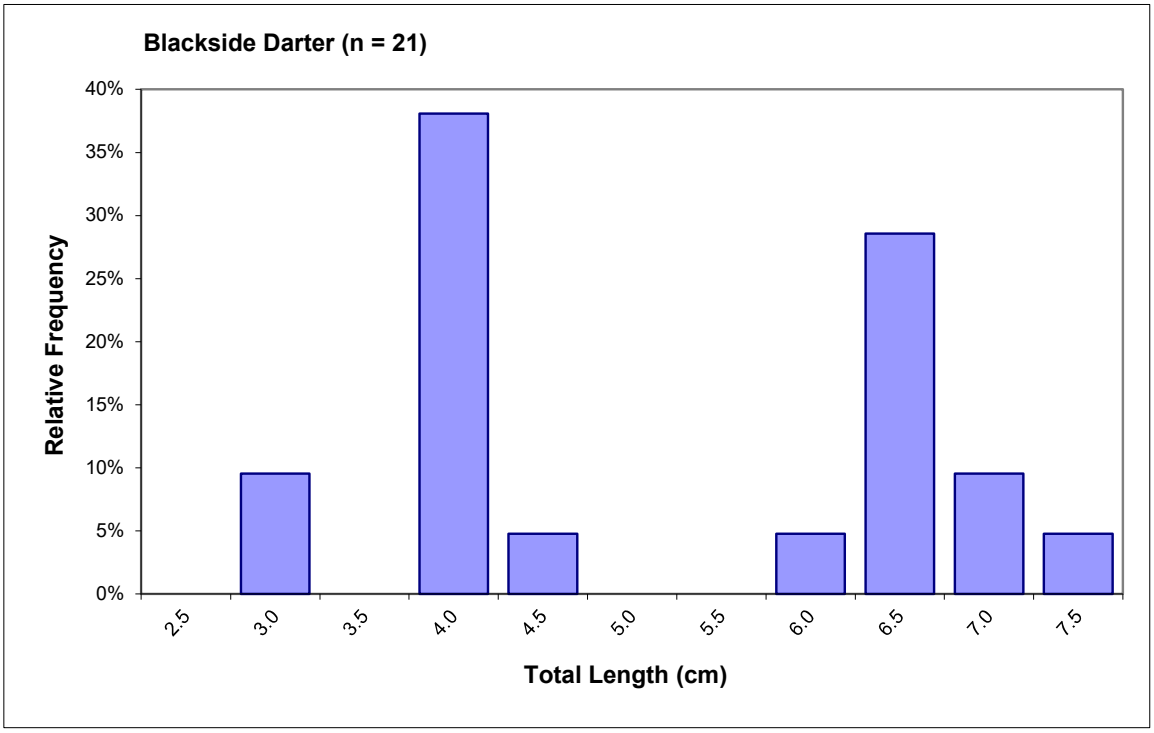
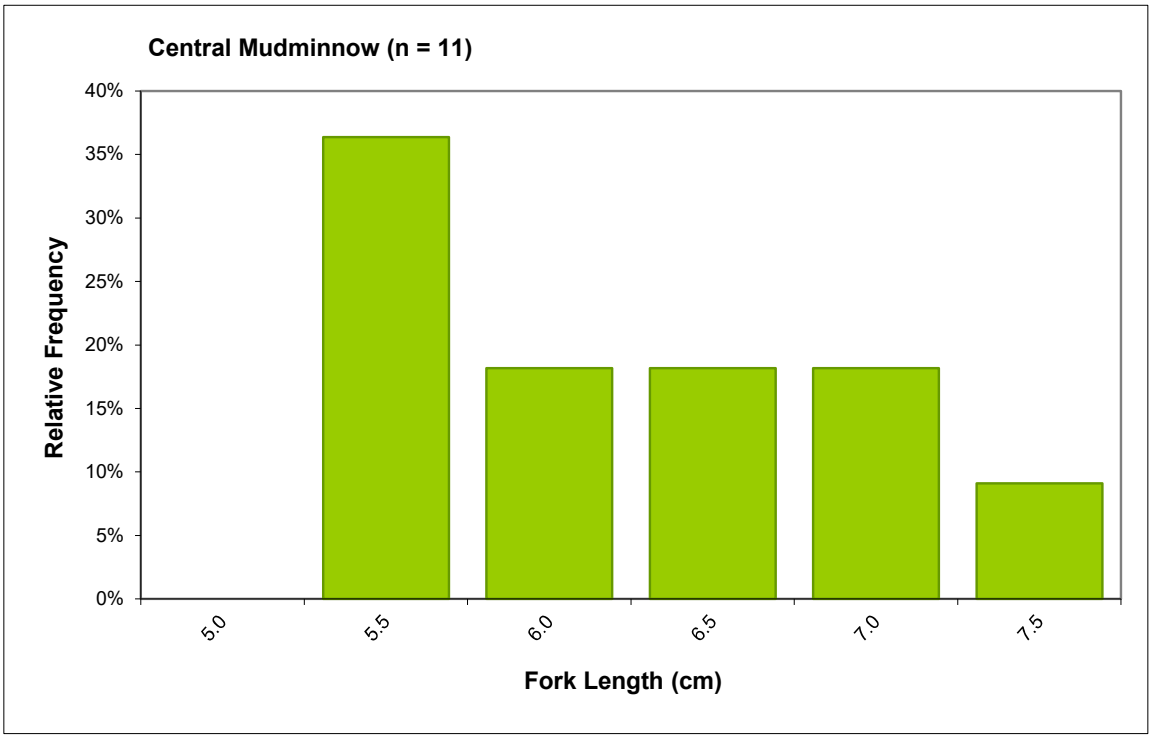
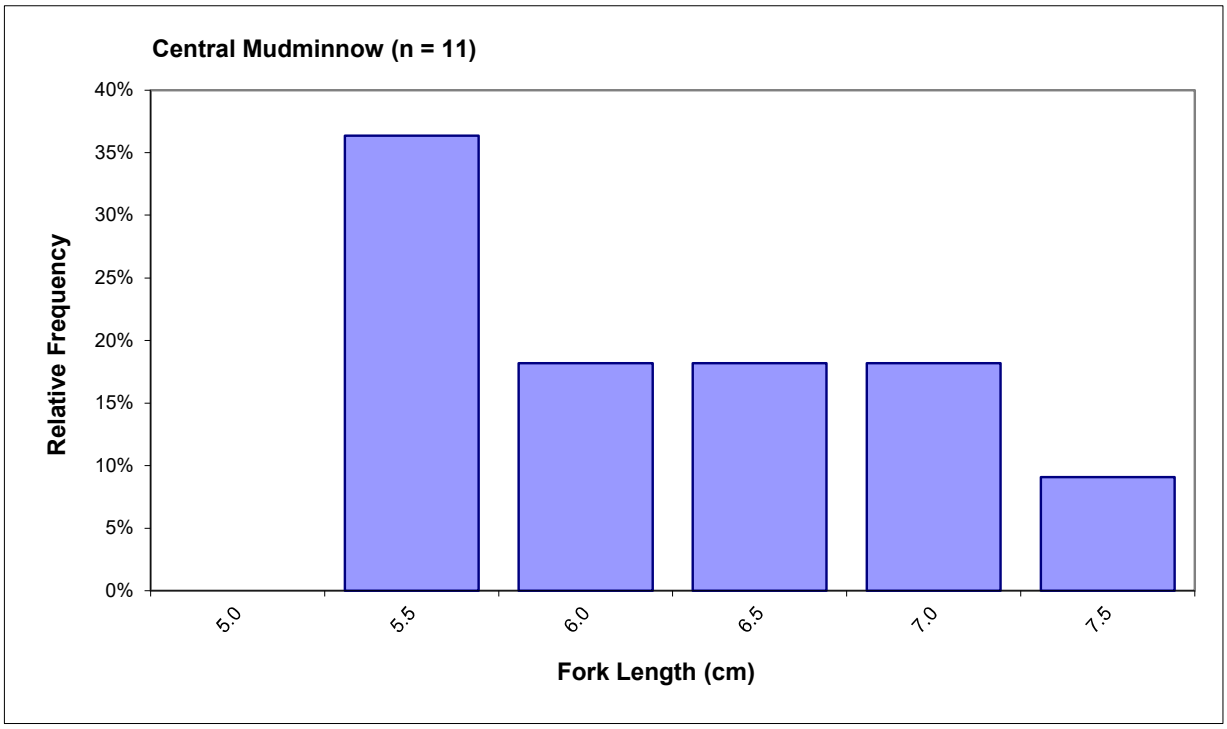
Note: Brassy minnow (n=1), Blacknose dace (n=1), and Creek chub (n=2) not plotted due to low capture numbers.

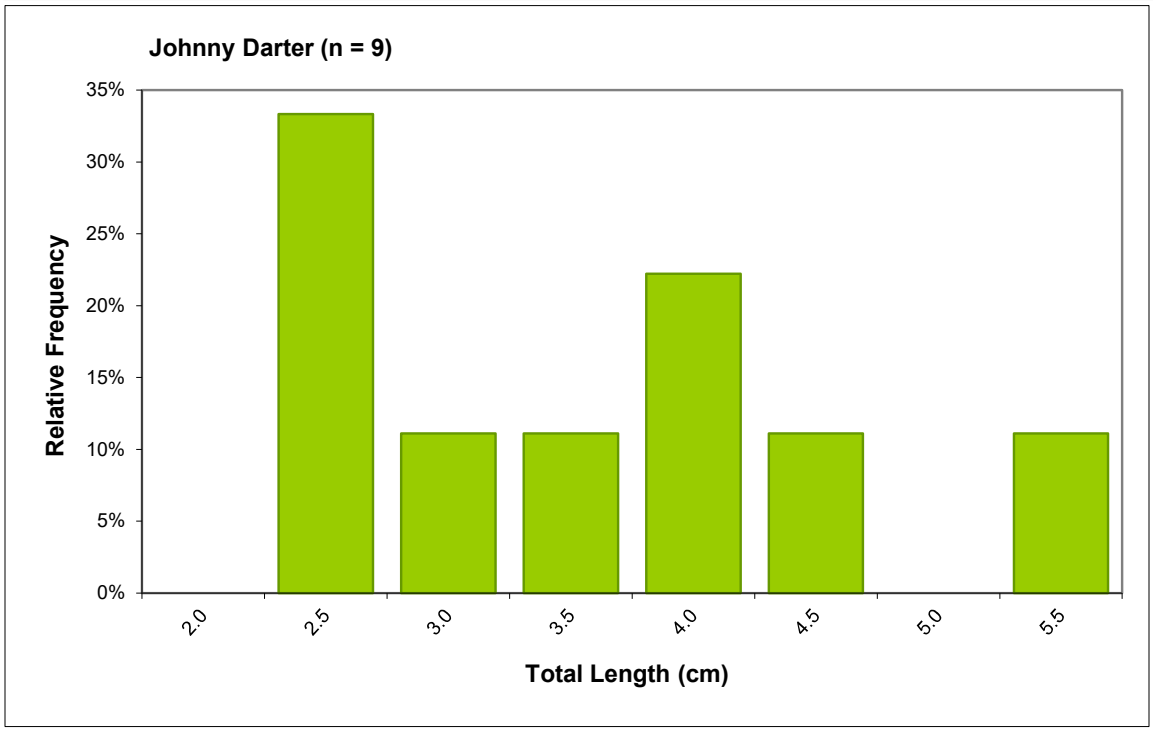




Appendix Figure A.3: Length-frequency Distributions for Fish Collected at Pinewood River Far-field Mine-exposed Area (PWFF), RRM 2020

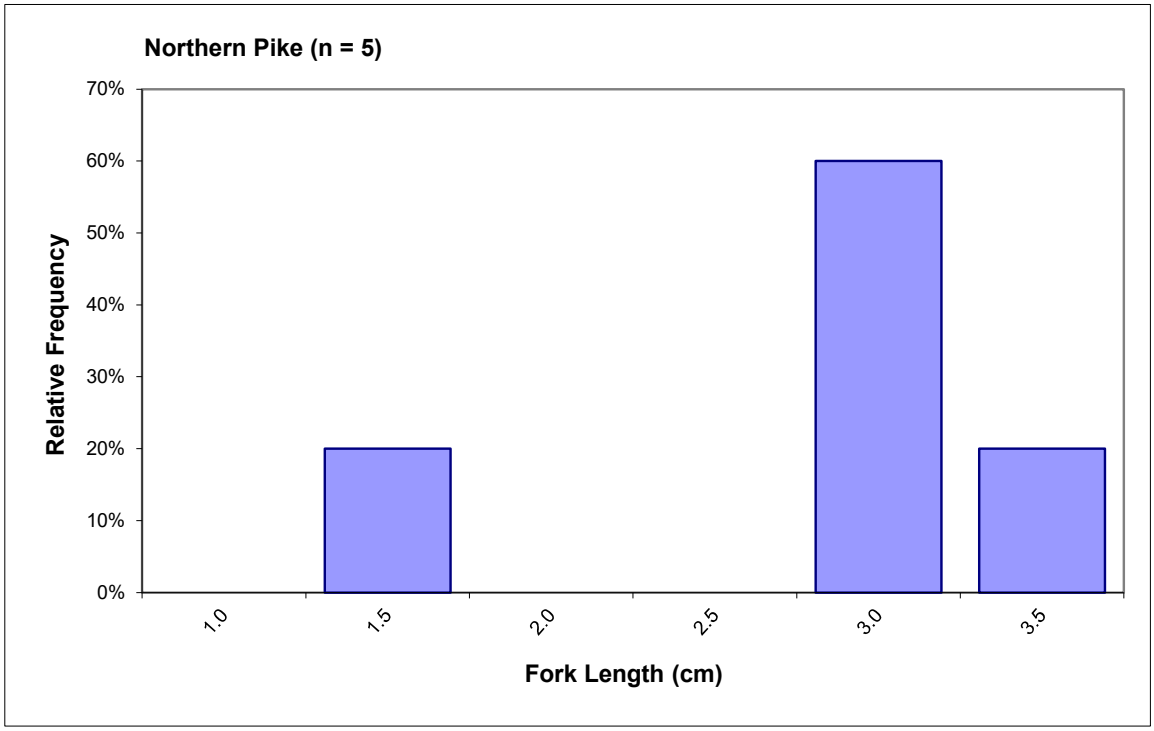
Note: Creek chub (n=1) and Golden shiner (n=1) not plotted due to low capture numbers or minimal variation in lengths.

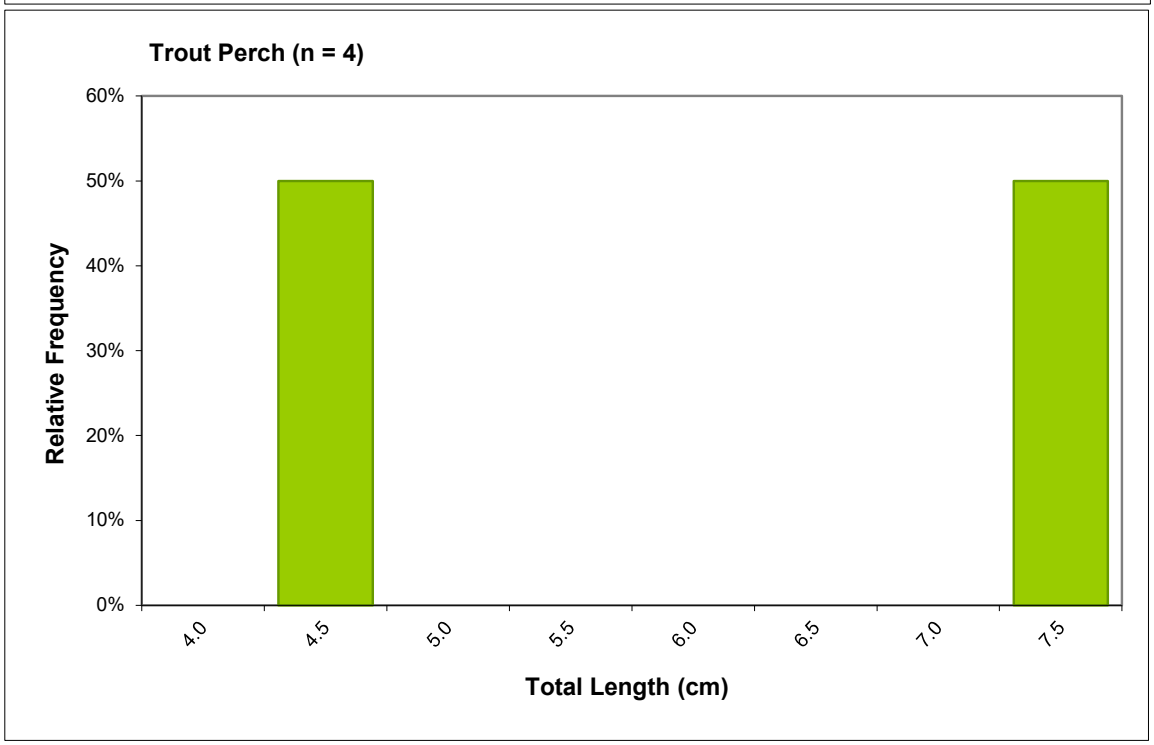




Appendix Figure A.3: Length-frequency Distributions for Fish Collected at Pinewood River Far-field Mine-exposed Area (PWFF), RRM 2020

Note: Creek chub (n=1) and Golden shiner (n=1) not plotted due to low capture numbers or minimal variation in lengths.





Appendix Figure A.3: Length-frequency Distributions for Fish Collected at Pinewood River Far-field Mine-exposed Area (PWFF), RRM 2020

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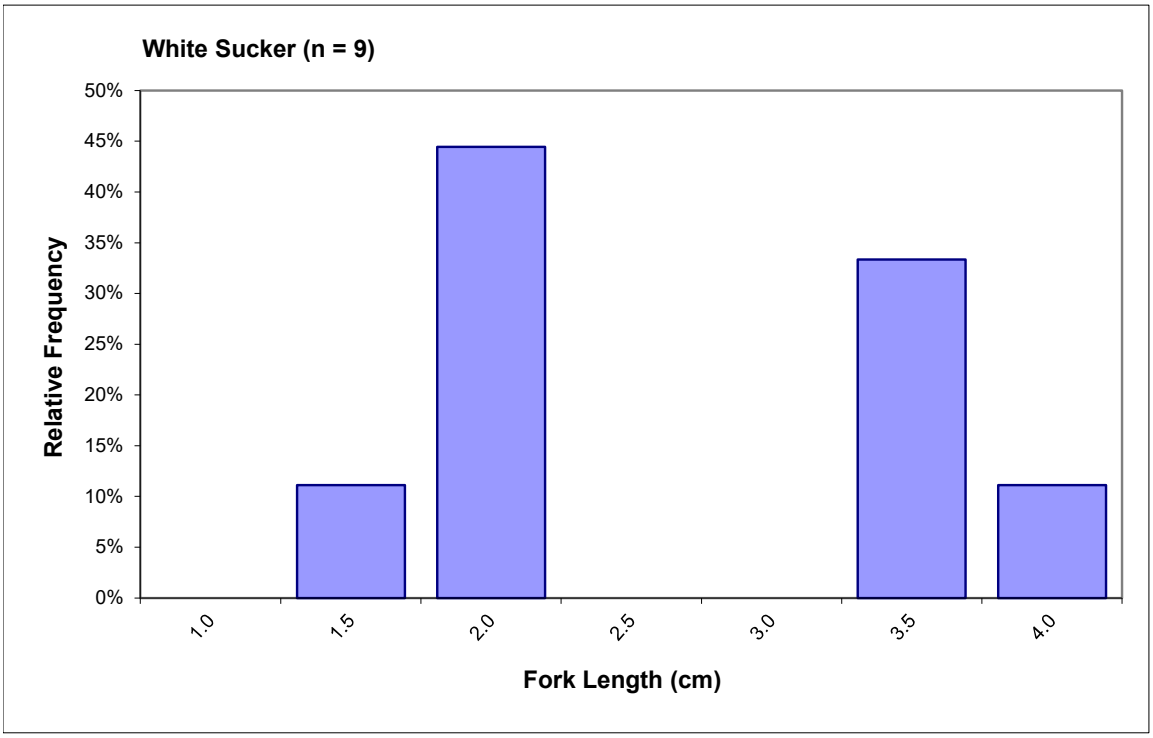

Appendix Figure A.3: Length-frequency Distributions for Fish Collected at Pinewood River Far-field Mine-exposed Area (PWFF), RRM 2020

Note: Creek chub (n=1) and Golden shiner (n=1) not plotted due to low capture numbers or minimal variation in lengths.

Appendix Table A.1: Fish Data Measurements for Reference Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWREF	21-Jul-20	Brown Bullhead	PRREF-BB-01	16.2	-	72.404	-
PWREF	20-Jul-20	Brassy Minnow	PRREF-BM-01	8.2	7.8	4.608	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-02	4.9	4.7	1.411	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-03	4.8	4.4	1.179	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-04	4.8	4.5	1.114	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-05	4.8	4.5	1.320	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-06	4.9	4.5	1.338	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-07	4.4	3.9	0.678	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-08	4.9	4.5	1.268	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-09	5.1	4.7	1.457	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-10	4.5	4.1	1.074	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-11	4.4	3.9	0.943	-
PWREF	24-Jul-20	Brassy Minnow	PRREF-BM-12	3.8	3.5	0.705	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-01	3.7	-	0.522	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-02	4.1	-	0.707	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-03	4.7	-	1.177	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-04	5.1	-	1.403	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-05	4.5	-	0.710	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-06	4.1	-	1.005	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-07	4.5	-	0.792	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-08	4.1	-	7.117	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-09	3.5	-	0.248	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-10	4.4	-	1.035	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-11	4.0	-	0.620	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-12	4.5	-	0.631	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-13	4.5	-	0.861	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-14	4.1	-	0.665	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-15	4.7	-	1.042	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-16	4.3	-	0.842	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-17	4.3	-	0.774	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-18	4.6	-	0.919	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-19	4.3	-	0.941	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-20	4.4	-	0.585	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-21	1.9	-	0.101	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-22	4.1	-	0.726	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-23	4.3	-	1.122	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-24	3.8	-	0.704	-
PWREF	20-Jul-20	Brook Stickleback	PRREF-BSB-25	2.2	-	0.212	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-26	4.4	-	0.989	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-27	2.5	-	0.225	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-28	2.4	-	0.191	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-29	3.5	-	0.556	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-30	2.7	-	0.220	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-31	2.4	-	0.207	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-32	4.2	-	0.719	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-33	2.0	-	0.153	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-34	2.0	-	0.175	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-35	2.8	-	0.289	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-36	2.3	-	0.217	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-37	4.9	-	1.093	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-38	2.6	-	0.247	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-39	2.9	-	0.336	-
PWREF	24-Jul-20	Brook Stickleback	PRREF-BSB-40	1.7	-	0.078	-

Appendix Table A.1: Fish Data Measurements for Reference Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-01	13.3	-	30.532	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-02	8.4	-	7.801	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-03	6.7	-	4.054	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-04	9.9	-	12.232	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-05	8.2	-	6.072	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-06	8.7	-	7.782	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-07	6.5	-	3.770	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-08	12.4	-	22.798	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-09	4.4	-	1.136	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-10	10.4	-	16.057	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-11	4.6	-	1.284	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-12	4.1	-	7.683	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-13	6.3	-	3.400	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-14	5.1	-	1.755	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-15	4.7	-	1.592	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-16	4.7	-	1.387	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-17	5.2	-	1.937	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-18	4.8	-	1.608	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-19	8.5	-	6.359	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-20	9.6	-	9.635	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-21	8.3	-	6.936	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-22	7.5	-	4.788	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-23	6.5	-	3.887	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-24	9.4	-	9.362	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-25	7.9	-	7.069	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-26	5.3	-	2.082	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-27	7.3	-	4.370	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-28	9.3	-	9.454	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-29	4.7	-	1.385	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-30	4.8	-	1.354	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-31	6.1	-	2.911	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-32	8.3	-	6.602	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-33	4.6	-	1.366	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-34	6.3	-	3.056	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-35	4.6	-	1.463	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-36	4.2	-	0.965	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-37	8.6	-	7.421	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-38	6.5	-	4.471	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-39	4.0	-	1.217	-
PWREF	20-Jul-20	Central Mudminnow	PRREF-CMM-40	4.9	-	1.509	-
PWREF	21-Jul-20	Creek Chub	PRREF-CC-01	14.3	13.4	34.072	-
PWREF	21-Jul-20	Creek Chub	PRREF-CC-02	12.2	11.7	16.207	-
PWREF	21-Jul-20	Creek Chub	PRREF-CC-03	14.8	14.1	41.409	-
PWREF	21-Jul-20	Creek Chub	PRREF-CC-04	17.2	16.4	48.451	-
PWREF	24-Jul-20	Creek Chub	PRREF-CC-05	5.4	5.0	1.850	-
PWREF	24-Jul-20	Creek Chub	PRREF-CC-06	14.1	13.3	32.606	-
PWREF	24-Jul-20	Creek Chub	PRREF-CC-07	14.9	14.1	34.728	-
PWREF	24-Jul-20	Creek Chub	PRREF-CC-08	17.9	16.8	61.429	-
PWREF	20-Jul-20	Fathead Minnow	PRREF-FHM-01	5.9	5.5	2.211	-
PWREF	24-Jul-20	Fathead Minnow	PRREF-FHM-02	6.3	5.8	2.971	-
PWREF	24-Jul-20	Fathead Minnow	PRREF-FHM-03	5.8	5.2	5.525	-
PWREF	24-Jul-20	Fathead Minnow	PRREF-FHM-04	5.6	5.3	2.092	-
PWREF	24-Jul-20	Fathead Minnow	PRREF-FHM-05	5.6	5.1	2.101	-
PWREF	24-Jul-20	Fathead Minnow	PRREF-FHM-06	4.6	4.3	1.194	-

Appendix Table A.1: Fish Data Measurements for Reference Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-01	4.8	4.5	1.526	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-02	8.6	8.2	6.207	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-03	5.0	4.8	1.666	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-04	8.4	8.0	6.679	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-05	5.1	4.8	1.618	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-06	5.3	5.0	1.748	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-07	6.0	5.8	2.857	-
PWREF	20-Jul-20	Finescale Dace	PRREF-FSD-08	5.3	5.1	1.799	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-09	5.1	4.9	1.505	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-10	5.4	5.1	1.289	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-11	4.6	4.3	0.994	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-12	3.8	3.6	0.551	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-13	3.7	3.5	0.601	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-14	4.9	4.5	0.441	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-15	3.9	3.8	0.565	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-16	3.0	2.8	0.239	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-17	6.3	5.9	2.351	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-18	5.8	5.4	2.215	-
PWREF	24-Jul-20	Finescale Dace	PRREF-FSD-19	5.6	5.2	2.013	-
PWREF	21-Jul-20	Golden Shiner	PRREF-GS-01	9.7	8.8	8.493	-
PWREF	24-Jul-20	Golden Shiner	PRREF-GS-02	8.3	7.5	5.638	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-01	6.3	6.0	2.356	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-02	6.1	5.8	2.755	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-03	4.5	4.3	1.098	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-04	4.2	3.9	0.853	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-05	4.8	4.5	1.250	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-06	4.7	4.5	1.164	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-07	6.7	6.0	3.466	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-08	4.8	4.5	1.306	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-09	5.2	4.8	1.232	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-10	4.2	4.0	0.978	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-11	4.3	3.9	0.816	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-12	5.1	4.8	1.364	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-13	4.4	4.2	1.001	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-14	4.8	4.5	1.414	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-15	5.0	4.7	1.555	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-16	4.4	4.3	1.043	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-17	5.8	5.5	1.874	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-18	5.5	5.2	1.798	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-19	4.8	4.5	1.093	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-20	4.5	4.3	1.068	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-21	5.8	5.5	2.667	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-22	5.3	5.0	1.624	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-23	5.1	4.8	1.465	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-24	6.4	6.0	2.680	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-25	5.3	5.0	1.629	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-26	5.1	4.8	1.557	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-27	4.3	4.0	1.023	-
PWREF	20-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-28	5.3	5.0	1.495	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-29	5.2	4.8	1.362	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-30	4.6	4.3	1.136	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-31	5.9	5.4	1.944	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-32	4.1	3.8	0.679	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-33	5.9	5.6	2.316	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-34	3.5	3.4	0.478	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-35	3.8	3.6	0.606	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-36	3.5	3.3	0.516	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-37	4.1	3.6	0.668	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-38	3.7	3.5	0.550	-

Appendix Table A.1: Fish Data Measurements for Reference Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-39	3.8	3.5	0.651	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-40	3.5	3.2	0.429	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-41	3.2	3.0	0.345	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-42	3.6	3.3	0.494	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-43	3.7	3.4	0.494	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-44	5.3	4.9	1.580	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-45	4.6	4.3	1.007	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-46	4.8	4.5	1.077	-
PWREF	24-Jul-20	Norther Redbelly Dacce	PRREF-NRBD-47	3.9	3.6	0.642	-
PWREF	20-Jul-20	Pearl Dace	PRREF-PD-01	11.5	10.9	14.913	-
PWREF	20-Jul-20	Pearl Dace	PRREF-PD-02	10.4	9.9	9.559	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-03	11.9	11.3	16.213	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-04	11.3	10.6	12.732	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-05	11.8	11.0	15.254	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-06	10.9	10.3	12.471	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-07	12.3	11.6	15.743	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-08	12.1	11.6	15.451	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-09	12.5	12.1	20.585	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-10	11.7	11.0	15.376	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-11	11.5	10.8	13.621	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-12	12.3	11.6	16.671	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-13	10.8	10.4	12.590	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-14	12.0	11.5	14.773	-
PWREF	21-Jul-20	Pearl Dace	PRREF-PD-15	11.0	10.4	12.350	-
PWREF	21-Jul-20	White Sucker	PRREF-WS-01	18.5	17.5	58.781	-
PWREF	21-Jul-20	White Sucker	PRREF-WS-02	16.6	15.7	47.262	-
PWREF	21-Jul-20	White Sucker	PRREF-WS-03	16.9	15.9	46.680	-
PWREF	21-Jul-20	White Sucker	PRREF-WS-04	16.0	14.9	45.487	-
PWREF	21-Jul-20	White Sucker	PRREF-WS-05	15.6	14.9	43.404	-
PWREF	24-Jul-20	White Sucker	PRREF-WS-06	22.3	20.9	113.000	-
PWREF	24-Jul-20	White Sucker	PRREF-WS-07	11.2	10.7	16.868	-
PWREF	24-Jul-20	White Sucker	PRREF-WS-08	7.8	7.3	4.812	-
PWREF	24-Jul-20	White Sucker	PRREF-WS-09	20.6	19.4	95.000	-
PWREF	24-Jul-20	White Sucker	PRREF-WS-10	16.4	15.3	40.688	-
PWREF	24-Jul-20	White Sucker	PRREF-WS-11	18.7	17.8	7.500	-
			total sample size	**201**	**120**	**201**	**-**
			average	**7**	**7**	**7**	**-**
			median	**5**	**5**	**2**	**-**
			standard deviation	**4.0**	**4.2**	**15.5**	**-**
			standard error	**0.28**	**0.39**	**1.09**	**-**
			minimum	**2**	**3**	**0.0780**	**-**
			maximum	**22**	**21**	**113**	**-**

Appendix Table A.2: Fish Data Measurements for Near-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-01	8.0	-	9.022	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-02	9.7	-	11.355	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-03	8.1	-	7.204	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-04	9.4	-	12.658	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-05	7.9	-	7.122	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-06	8.9	-	10.866	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-07	8.0	-	7.216	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-08	3.2	-	0.556	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-09	9.1	-	11.621	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-10	9.1	-	10.852	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-11	8.9	-	10.283	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-12	3.5	-	0.693	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-13	8.7	-	8.256	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-14	10.2	-	15.194	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-15	8.7	-	10.506	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-16	9.7	-	13.225	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-17	8.4	-	9.367	-
PWNF	19-Jul-20	Brown Bullhead	PRNF-BB-18	3.6	-	0.777	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-19	1.0	-	18.000	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-20	3.5	-	0.889	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-21	3.2	-	0.602	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-22	2.5	-	0.269	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-23	3.6	-	0.774	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-24	4.3	-	0.566	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-25	2.1	-	0.192	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-26	2.5	-	0.269	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-27	2.5	-	0.255	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-28	2.5	-	0.313	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-29	3.2	-	0.570	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-30	3.3	-	0.529	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-31	2.9	-	0.378	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-32	3.7	-	0.938	-
PWNF	22-Jul-20	Brown Bullhead	PRNF-BB-33	2.8	-	0.406	-
PWNF	22-Jul-20	Brassy Minnow	PRNF-BM-01	4.1	3.9	0.736	-
PWNF	22-Jul-20	Blacknose Dace	PRNF-BND-01	3.9	3.5	0.588	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-01	4.2	-	0.818	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-02	7.0	-	3.801	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-03	5.8	-	2.065	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-04	4.3	-	0.702	black spot
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-05	6.6	-	2.728	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-06	4.3	-	0.743	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-07	6.5	-	2.587	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-08	7.5	-	4.463	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-09	3.9	-	0.684	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-10	6.3	-	2.392	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-11	3.8	-	0.494	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-12	6.6	-	2.754	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-13	6.3	-	2.348	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-14	6.7	-	3.277	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-15	6.1	-	2.061	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-16	6.5	-	2.685	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-17	6.5	-	3.069	-
PWNF	22-Jul-20	Blackside Darter	PRNF-BSD-18	6.7	-	3.308	-

Appendix Table A.2: Fish Data Measurements for Near-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-01	6.5	-	3.071	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-02	6.1	-	2.586	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-03	6.5	-	2.991	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-04	5.9	-	1.886	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-05	5.4	-	2.066	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-06	5.6	-	2.184	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-07	6.0	-	2.464	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-08	6.4	-	2.915	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-09	8.9	-	8.556	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-10	5.0	-	1.464	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-11	5.6	-	2.127	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-12	5.3	-	1.818	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-13	5.2	-	1.697	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-14	7.0	-	3.827	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-15	9.4	-	9.645	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-16	4.8	-	1.471	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-17	5.4	-	1.707	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-18	5.0	-	1.607	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-19	5.7	-	2.353	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-20	5.6	-	2.132	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-21	6.1	-	2.687	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-22	6.1	-	-	-
PWNF	22-Jul-20	Central Mudminnow	PRNF-CMM-23	7.2	-	4.284	-
PWNF	22-Jul-20	Creek Chub	PRNF-CC-01	7.1	6.6	3.730	-
PWNF	22-Jul-20	Creek Chub	PRNF-CC-02	13.9	12.9	24.970	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-01	11.1	10.0	13.000	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-02	5.2	4.8	1.106	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-03	5.8	5.3	1.572	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-04	6.2	5.6	1.758	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-05	6.2	-	1.889	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-06	5.6	5.3	2.187	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-07	7.0	6.2	2.826	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-08	7.6	6.7	3.986	-
PWNF	22-Jul-20	Golden Shiner	PRNF-GS-09	8.2	7.4	4.684	-
PWNF	19-Jul-20	Johnny Darter	PRNF-JD-01	7.7	-	5.348	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-02	7.3	-	4.078	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-03	5.9	-	2.124	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-04	6.0	-	2.104	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-05	4.1	-	0.794	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-06	5.2	-	1.363	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-07	4.2	-	0.757	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-08	3.8	-	0.553	None
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-09	3.0	-	0.205	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-10	4.6	-	0.806	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-11	4.7	-	0.967	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-12	2.9	-	0.193	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-13	5.7	-	1.525	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-14	4.0	-	0.644	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-15	4.2	-	0.624	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-16	5.7	-	1.699	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-17	5.6	-	1.664	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-18	2.6	-	0.209	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-19	2.8	-	0.252	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-20	5.6	-	1.825	-

Appendix Table A.2: Fish Data Measurements for Near-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-21	5.4	-	1.418	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-22	5.3	-	1.305	-
PWNF	22-Jul-20	Johnny Darter	PRNF-JD-23	4.8	-	0.982	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-24	2.8	-	0.138	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-25	2.9	-	0.165	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-26	2.8	-	0.165	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-27	2.5	-	0.122	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-28	2.9	-	0.184	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-29	2.7	-	0.112	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-30	2.5	-	0.161	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-31	2.7	-	0.149	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-32	2.6	-	0.131	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-33	7.7	-	4.368	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-34	4.4	-	0.710	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-35	2.8	-	0.157	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-36	3.1	-	0.194	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-37	2.7	-	0.135	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-38	2.5	-	0.128	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-39	2.7	-	0.146	-
PWNF	23-Jul-20	Johnny Darter	PRFF-JD-40	4.3	-	0.671	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-01	3.2	3.0	211.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-02	3.0	2.8	177.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-03	3.0	2.9	160.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-04	3.1	2.9	180.000	black spot
PWNF	22-Jul-20	Northern Pike	PRNF-NP-05	2.7	2.5	122.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-06	2.8	2.7	120.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-07	1.5	1.4	19.124	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-08	3.8	3.4	278.000	black spot
PWNF	22-Jul-20	Northern Pike	PRNF-NP-09	2.7	2.5	124.000	black spot
PWNF	22-Jul-20	Northern Pike	PRNF-NP-10	4.4	4.2	540.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-11	2.6	2.5	127.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-12	1.4	1.3	15.000	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-13	13.3	12.0	11.418	-
PWNF	22-Jul-20	Northern Pike	PRNF-NP-14	34.9	32.1	261.000	-
PWNF	19-Jul-20	White Sucker	PRNF-WS-01	4.5	4.3	1.047	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-02	20.6	19.4	94.000	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-03	1.7	1.6	46.000	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-04	4.1	3.6	0.776	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-05	3.5	3.3	0.441	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-06	17.1	16.0	48.996	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-07	4.3	4.0	1.028	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-08	4.8	4.5	1.083	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-09	3.6	3.4	0.490	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-10	4.2	4.0	0.839	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-11	3.5	3.3	0.458	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-12	3.6	3.4	0.429	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-13	4.1	3.4	0.517	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-14	4.1	3.8	0.756	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-15	4.2	3.9	0.598	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-16	3.7	3.5	0.456	-
PWNF	22-Jul-20	White Sucker	PRNF-WS-17	15.0	14.1	34.695	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-18	4.0	3.7	0.606	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-19	4.2	4.0	0.633	-

Appendix Table A.2: Fish Data Measurements for Near-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWNF	23-Jul-20	White Sucker	PRNF-WS-20	4.0	3.8	0.554	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-21	4.2	4.0	0.683	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-22	3.8	3.7	0.598	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-23	4.0	4.0	0.708	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-24	4.4	4.2	0.795	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-25	4.5	4.2	0.777	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-26	3.6	3.4	0.422	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-27	3.9	3.8	0.550	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-28	3.6	3.4	0.401	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-29	3.5	3.3	0.396	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-30	4.0	3.8	0.631	-
PWNF	23-Jul-20	White Sucker	PRNF-WS-31	4.4	4.1	0.752	-
			total sample size	**172**	**57**	**171**	**-**
			average	**5**	**5**	**17**	**-**
			median	**4**	**4**	**2**	**-**
			standard deviation	**3.6**	**5.0**	**59.3**	**-**
			standard error	**0.27**	**0.67**	**4.54**	**-**
			minimum	**1**	**1**	**0**	**-**
			maximum	**35**	**32**	**540**	**-**

Appendix Table A.3: Fish Data Measurements for Far-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-01	6.4	-	2.539	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-02	6.0	-	2.088	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-03	3.8	-	0.635	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-04	6.8	-	3.156	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-05	6.1	-	2.423	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-06	6.4	-	2.464	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-07	7.1	-	3.500	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-08	6.5	-	3.071	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-09	5.8	-	1.925	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-10	3.8	-	0.539	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-11	3.6	-	0.474	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-12	4.0	-	0.599	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-13	3.6	-	0.437	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-14	3.9	-	0.561	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-15	3.6	-	0.417	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-16	2.9	-	0.231	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-17	3.6	-	0.394	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-18	3.0	-	0.265	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-19	4.1	-	0.621	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-20	6.9	-	3.353	
PWFF	23-Jul-20	Blackside Darter	PRFF-BSD-21	6.2	-	2.544	
PWFF	15-Jul-20	Central Mudminnow	PRFF-CMM-01	6.8	-	3.386	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-02	5.8	-	2.451	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-03	6.4	-	3.363	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-04	5.4	-	2.156	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-05	6.6	-	3.280	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-06	5.6	-	2.291	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-07	5.1	-	-	
PWFF	23-Jul-20	Central Mudminnow	PRFF-CMM-08	5.1	-	1.824	
PWFF	25-Jul-20	Central Mudminnow	PRFF-CMM-09	6.2	-	2.828	
PWFF	25-Jul-20	Central Mudminnow	PRFF-CMM-10	5.2	-	1.685	
PWFF	25-Jul-20	Central Mudminnow	PRFF-CMM-11	7.1	-	4.115	
PWFF	20-Jul-20	Creek Chub	PRFF-CC-01	13.8	13.0	29.792	s. black spot
PWFF	23-Jul-20	Golden Shiner	PRFF-GS-01	8.2	7.4	4.955	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-01	5.1	-	1.241	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-02	3.9	-	0.452	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-03	2.3	-	0.129	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-04	3.8	-	0.441	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-05	3.4	-	0.339	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-06	4.2	-	0.608	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-07	2.5	-	0.141	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-08	2.5	-	0.166	
PWFF	23-Jul-20	Johnny Darter	PRFF-JD-09	2.6	-	0.154	
PWFF	20-Jul-20	Northern Pike	PRFF-NP-01	2.9	2.7	0.150	
PWFF	20-Jul-20	Northern Pike	PRFF-NP-02	3.0	2.8	0.181	s. black spot
PWFF	20-Jul-20	Northern Pike	PRFF-NP-03	2.7	2.6	14.400	s. black spot
PWFF	20-Jul-20	Northern Pike	PRFF-NP-04	1.5	-	21.497	s. black spot
PWFF	20-Jul-20	Northern Pike	PRFF-NP-05	3.5	3.3	25.800	s. black spot
PWFF	23-Jul-20	Trout Perch	PRFF-TP-01	8.0	7.5	5.178	
PWFF	23-Jul-20	Trout Perch	PRFF-TP-02	4.5	4.1	0.865	
PWFF	23-Jul-20	Trout Perch	PRFF-TP-03	8.3	7.5	5.278	
PWFF	23-Jul-20	Trout Perch	PRFF-TP-04	4.4	4.2	0.861	

Appendix Table A.3: Fish Data Measurements for Far-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Abnormalities
PWFF	20-Jul-20	White Sucker	PRFF-WS-01	1.7	1.6	0.625	
PWFF	20-Jul-20	White Sucker	PRFF-WS-02	1.7	1.6	0.563	
PWFF	20-Jul-20	White Sucker	PRFF-WS-03	1.7	1.6	0.514	
PWFF	23-Jul-20	White Sucker	PRFF-WS-04	2.1	2.0	0.980	
PWFF	23-Jul-20	White Sucker	PRFF-WS-05	1.5	1.4	0.333	
PWFF	23-Jul-20	White Sucker	PRFF-WS-06	3.8	3.5	0.464	
PWFF	23-Jul-20	White Sucker	PRFF-WS-07	3.3	3.2	0.344	
PWFF	23-Jul-20	White Sucker	PRFF-WS-08	3.8	3.5	0.553	
PWFF	23-Jul-20	White Sucker	PRFF-WS-09	3.6	3.4	0.483	
			total sample size	**61**	**19**	**60**	**-**
			average	**4.6**	**4.0**	**2.952**	**-**
			median	**4.0**	**3.3**	**0.863**	**-**
			standard deviation	**2.2**	**2.9**	**5.742**	**-**
			standard error	**0.3**	**0.7**	**0.741**	**-**
			minimum	**1.5**	**1.4**	**0.129**	**-**
			maximum	**13.8**	**13.0**	**29.792**	**-**

[a] Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin.

Appendix Table A.4: Fish Data Measurements for Reference Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected [a]	Age	Mercury Concentration (mg/kg wwt)	Abnormalities
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-01	8.4	7.9	6.37	Head	3	0.0829	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-02	9.6	8.9	9.27	Head	2	0.0976	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-03	10.8	9.9	12.48	Head	2	0.1190	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-04	12.3	11.4	21.05	Head	3	0.1090	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-05	11.4	10.5	14.22	Head	3	0.1120	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-06	7.7	7.1	3.95	Head	2	0.1140	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-07	9.3	8.6	6.95	Head	2	0.0634	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-08	8.3	7.7	5.92	Head	2	0.1150	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-09	8.9	8.0	6.90	Head	3	0.1610	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-10	11.0	10.1	13.63	Head	3	0.0725	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-11	11.8	11.0	13.44	Head	3	0.0979	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-12	10.0	9.1	9.97	Head	2	0.0756	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-13	7.9	7.2	5.08	Head	2	0.0983	-
PW-REF	20-Jul-20	Common Shiner	PRREF-CS-14	9.6	8.9	8.60	Head	2	0.0913	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-15	14.2	13.4	36.65	Head	3	0.1040	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-16	10.8	9.9	13.01	Head	3	0.1040	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-17	10.9	9.9	12.62	Head	3	0.1180	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-18	10.5	9.9	12.56	Head	3	0.0905	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-19	9.8	9.0	8.56	Head	3	0.0970	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-20	10.3	9.2	8.51	Head	3	0.0673	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-21	10.3	9.5	11.12	Head	3	0.0877	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-22	9.8	8.9	9.17	Head	2	0.0731	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-23	10.7	9.8	11.03	Head	2	0.0795	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-24	13.8	12.8	30.54	Head	3	0.1670	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-25	14.1	12.9	31.03	Head	5	0.1430	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-26	11.1	10.3	13.82	Head	4	0.1000	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-27	9.7	8.9	7.64	Head	3	0.0706	-
PW-REF	21-Jul-20	Common Shiner	PRREF-CS-28	10.4	-	10.10	Head	3	0.0833	slightly degraded
PW-REF	23-Jul-20	Common Shiner	PRREF-CS-29	10.5	9.7	10.83	Head	3	0.0855	slightly degraded
PW-REF	23-Jul-20	Common Shiner	PRREF-CS-30	5.7	4.9	1.34	Head	2	0.0364	-
PW-REF	23-Jul-20	Common Shiner	PRREF-CS-31	10.5	9.7	11.28	Head	3	0.0824	really degraded
PW-REF	23-Jul-20	Common Shiner	PRREF-CS-32	9.9	9.2	8.99	Head	3	0.0592	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-33	12.4	11.4	19.18	Head	4	0.1280	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-34	12.0	11.9	16.05	Head	4	0.1140	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-35	6.7	6.1	2.75	Head	2	0.0396	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-36	5.8	5.4	1.76	Head	2	0.0384	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-37	5.9	5.5	1.84	Head	1	0.0391	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-38	6.4	6.0	2.23	Head	2	0.0457	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-39	5.8	5.4	1.96	Head	1	0.0293	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-40	6.1	5.8	2.17	Head	1	0.0449	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-41	6.8	6.3	2.96	Head	2	0.0815	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-42	6.1	5.5	2.10	Head	1	0.0274	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-43	6.2	5.7	1.95	Head	1	0.0401	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-44	5.9	5.5	1.83	Head	1	0.0390	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-45	5.8	5.4	1.61	Head	2	0.0448	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-46	4.8	4.3	0.91	Head	1	0.0525	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-47	7.1	6.5	2.96	Head	2	0.0451	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-48	11.7	10.7	15.44	Head	3	0.1330	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-49	10.5	9.8	11.48	Head	3	0.1020	-
PW-REF	24-Jul-20	Common Shiner	PRREF-CS-50	9.9	9.3	9.10	Head	3	0.1000	-
total sample size				**50**	**49**	**50**	**-**	**50**	**50**	**-**
average				**9**	**9**	**9.70**	**-**	**2.5**	**0.0840**	**-**
median				**10**	**9**	**9.04**	**-**	**3.0**	**0.0844**	**-**
standard deviation				**2.4**	**2.3**	**7.76**	**-**	**0.89**	**0.0341**	**-**
standard error				**0.34**	**0.33**	**1.10**	**-**	**0**	**0.0048**	**-**
minimum				**5**	**4**	**0.91**	**-**	**1**	**0.0274**	**-**
maximum				**14**	**13**	**36.65**	**-**	**5**	**0.1670**	**-**

[a] Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin.

Appendix Table A.5: Fish Data Measurements for Near-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected [a]	Age	Mercury Concentration (mg/kg wwt)	Abnormalities
PW-NF	19-Jul-20	Common Shiner	PRNF-CS-01	10.7	9.9	12.224	Head	2	0.075	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-02	10.5	9.9	12.668	Head	2	0.055	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-03	11.0	10.6	16.309	Head	2	0.052	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-04	6.3	5.8	1.179	Head	2	0.076	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-05	8.8	8.1	6.496	Head	2	0.089	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-06	5.3	4.9	1.215	Head	1	0.085	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-07	5.3	4.9	1.201	Head	2	0.090	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-08	6.6	6.1	2.349	Head	2	0.134	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-09	9.8	8.9	8.710	Head	3	0.085	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-10	5.6	5.4	2.163	Head	1	0.105	-
PW-NF	22-Jul-20	Common Shiner	PRNF-CS-11	9.2	8.4	8.143	Head	2	0.134	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-12	10.4	9.9	16.035	Head	2	0.100	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-13	11.1	10.0	13.736	Head	3	0.073	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-14	12.7	11.6	22.273	Head	2	0.089	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-15	11.6	10.6	17.318	Head	2	0.084	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-16	12.1	11.1	20.534	Head	3	0.127	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-17	11.8	10.8	17.706	Head	2	0.082	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-18	10.9	10.2	13.798	Head	2	0.092	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-19	9.0	8.1	7.829	Head	2	0.119	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-20	7.7	6.9	4.718	Head	1	0.090	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-21	8.7	7.8	7.423	Head	2	0.099	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-22	9.1	8.0	8.029	Head	2	0.145	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-23	8.6	7.7	6.295	Head	1	0.087	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-24	8.9	8.1	6.662	Head	2	0.110	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-25	7.9	7.0	4.350	Head	1	0.086	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-26	1.1	7.0	4.206	Head	1	0.125	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-27	7.6	6.9	4.128	Head	1	0.117	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-28	8.2	7.5	5.425	Head	2	0.089	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-29	9.3	8.5	7.087	Head	2	0.093	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-30	9.9	9.0	9.702	Head	3	0.177	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-31	9.8	9.0	9.023	Head	2	0.144	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-32	7.9	7.3	4.658	Head	2	0.099	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-33	6.7	6.1	2.636	Head	2	0.105	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-34	7.0	6.5	3.424	Head	1	0.123	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-35	5.6	5.1	1.354	Head	1	0.049	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-36	6.4	5.7	2.246	Head	1	0.111	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-37	6.6	5.9	2.558	Head	1	0.104	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-38	7.2	6.4	3.027	Head	1	0.094	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-39	6.1	5.5	1.797	Head	1	0.107	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-40	5.1	4.5	0.988	Head	1	0.098	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-41	4.6	4.2	0.896	Head	1	0.132	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-42	6.3	5.6	2.144	Head	2	0.144	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-43	6.1	5.5	1.927	Head	1	0.164	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-44	6.0	5.4	1.857	Head	1	0.153	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-45	6.6	5.9	2.112	Head	2	0.078	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-46	5.5	4.9	1.242	Head	1	0.146	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-47	5.2	4.8	1.249	Head	1	0.105	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-48	5.0	4.5	0.884	Head	1	0.142	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-49	4.3	4.0	0.585	Head	1	0.159	-
PW-NF	25-Jul-20	Common Shiner	PRNF-CS-50	5.3	4.7	1.008	Head	2	0.154	-
			total sample size	**50**	**50**	**50**	**-**	**50**	**50**	**-**
			average	**8**	**7**	**6**	**-**	**2**	**0.107**	**-**
			median	**8**	**7**	**4**	**-**	**2**	**0.102**	**-**
			standard deviation	**2.5**	**2.1**	**5.8**	**-**	**0.6**	**0.030**	**-**
			standard error	**0.35**	**0.30**	**0.82**	**-**	**0.09**	**0.004**	**-**
			minimum	**1**	**4**	**1**	**-**	**1**	**0.049**	**-**
			maximum	**13**	**12**	**22**	**-**	**3**	**0.177**	**-**

[a] Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin

Appendix Table A.6: Fish Data Measurements for Far-Field Pinewood River, July 2020

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected [a]	Age	Mercury Concentration (mg/kg wwt)	Abnormalities
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-01	5.8	5.3	1.526	head	1	0.0406	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-02	6.2	5.6	1.901	head	2	0.0543	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-03	5.3	4.7	1.164	head	1	0.0476	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-04	5.8	4.9	1.487	head	2	0.058	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-05	5.6	5.2	1.400	head	2	0.0521	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-06	6.2	5.5	1.677	head	2	0.0491	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-07	6.6	5.8	1.982	head	2	0.0444	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-08	5.5	5.0	1.284	head	1	0.0663	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-09	5.6	4.9	1.281	head	1	0.0576	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-10	6.5	5.9	2.245	head	2	0.0482	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-11	4.6	4.1	0.731	head	1	0.0539	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-12	9.0	8.3	7.808	head	2	0.0684	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-13	9.7	8.9	9.805	head	2	0.0526	growth
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-14	10.9	10.0	13.910	head	2	0.054	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-15	10.4	9.6	11.905	head	2	0.0513	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-16	8.4	7.9	5.838	head	2	0.0432	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-17	7.0	6.2	2.335	head	1	0.048	-
PW-FF	18-Jul-20	Common Shiner	PRFF-CS-18	6.5	5.9	2.145	head	1	0.0385	-
PW-FF	19-Jul-20	Common Shiner	PRFF-CS-19	14.0	-	33.960	head	2	0.0435	missing part of caudal and eyes
PW-FF	19-Jul-20	Common Shiner	PRFF-CS-20	16.3	-	53.376	head	3	0.0594	missing part of caudal and eyes
PW-FF	19-Jul-20	Common Shiner	PRFF-CS-21	7.5	6.9	4.028	head	3	0.139	-
PW-FF	20-Jul-20	Common Shiner	PRFF-CS-22	9.0	8.3	9.344	head	2	0.0851	-
PW-FF	20-Jul-20	Common Shiner	PRFF-CS-23	13.3	12.1	26.865	head	2	0.0655	-
PW-FF	23-Jul-20	Common Shiner	PRFF-CS-24	11.4	10.5	14.876	head	2	0.0573	-
PW-FF	23-Jul-20	Common Shiner	PRFF-CS-25	10.1	9.3	9.989	head	3	0.0473	-
PW-FF	23-Jul-20	Common Shiner	PRFF-CS-26	8.6	7.9	5.499	head	2	0.0478	-
PW-FF	23-Jul-20	Common Shiner	PRFF-CS-27	5.4	5.0	1.193	head	1	0.0569	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-28	7.3	6.6	3.337	head	2	0.0469	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-29	8.0	7.1	4.218	head	2	0.0467	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-30	8.2	6.4	2.182	head	2	0.038	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-31	8.3	7.5	5.262	head	2	0.044	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-32	8.6	7.8	5.976	head	1	0.0494	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-33	6.3	5.8	2.200	head	1	0.0566	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-34	7.0	6.4	2.793	head	1	0.049	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-35	8.3	7.5	4.884	head	2	0.0477	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-36	6.1	5.6	1.963	head	1	0.0471	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-37	6.3	5.5	2.051	head	1	0.0416	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-38	6.8	6.1	2.471	head	2	0.0627	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-39	9.1	8.6	7.217	head	2	0.112	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-40	10.9	9.9	12.935	head	2	0.0736	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-41	8.1	7.5	4.634	head	2	0.0575	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-42	7.4	7.0	3.715	head	2	0.0552	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-43	10.6	9.9	11.749	head	3	0.062	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-44	5.8	5.0	1.358	head	2	0.0501	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-45	7.3	6.6	3.315	head	2	0.0469	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-46	10.4	9.5	12.477	head	2	0.0499	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-47	7.3	6.4	2.975	head	2	0.0498	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-48	8.1	7.4	4.567	head	2	0.0544	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-49	6.4	5.9	2.159	head	2	0.0573	-
PW-FF	25-Jul-20	Common Shiner	PRFF-CS-50	8.3	7.4	5.495	head	2	0.0469	-
total sample size				**50**	**48**	**50**	**-**	**50**	**50**	**-**
average				**8.0**	**7.0**	**6.79**	**-**	**2**	**0.056**	**-**
median				**7.5**	**6.6**	**3.53**	**-**	**2**	**0.051**	**-**
standard deviation				**2.4**	**1.8**	**9.3**	**-**	**0.6**	**0.017**	**-**
standard error				**0.34**	**0.26**	**1.31**	**-**	**0.08**	**0.002**	**-**
minimum				**4.6**	**4.1**	**0.73**	**-**	**1**	**0.038**	**-**
maximum				**16.3**	**12.1**	**53.38**	**-**	**3**	**0.139**	**-**

[a] Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin.

Appendix Table A.7: Gill Net Records for Fish Caught in July 2020

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Effort (Fishing Hours)	Depth Range (m)		Set			Brown Bullhead			Central Mudminnow			Common Shiner			Creek Chub			Cyprinind sp.		
		Easting	Northing								Length (ft)	Mesh (inches)	Description	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]
PW-REF	PW-REF-GN-01	430648	5407685	20-Jul-20	21-Jul-20	14:29	11:00	20.52	shore	1.2	75	1	off beaver dam out into the main beaver pond	0	0	0.000	12	11	0.585	1	1	0.049	1	1	0.049	0	0	0.000
	PW-REF-GN-02	430672	5407653	20-Jul-20	21-Jul-20	14:35	10:25	19.83	shore	1.0	75	1	tied to cattails into lower section of major beaver pond	0	0	0.000	31	29	1.563	7	7	0.353	0	0	0.000	0	0	0.000
	PW-REF-GN-03	430875	5407634	20-Jul-20	21-Jul-20	15:02	10:20	19.30	shore	1.4	150	1, 2, 3, 4	following main channel upstream of beaver dam	1	1	0.052	9	9	0.466	2	2	0.104	1	1	0.052	0	0	0.000
	PW-REF-GN-04	430940	5407672	20-Jul-20	21-Jul-20	15:09	9:45	18.60	shore	-	150	1, 2, 3, 4	around first bend downstream of beaver dam, across pond lily stretch	0	0	0.000	3	3	0.161	2	2	0.108	1	1	0.054	0	0	0.000
	PW-REF-GN-05	430977	5407698	20-Jul-20	21-Jul-20	15:18	9:25	18.12	shore	1.0	150	1, 2, 3, 4	tied off near the beaver dam, across the channel towards the road	0	0	0.000	3	3	0.166	0	0	0.000	0	0	0.000	0	0	0.000
	PW-REF-GN-06	430984	5407710	20-Jul-20	21-Jul-20	15:26	9:12	17.77	1	1.5	150	1, 2, 3, 4	from inside culvert under road along channel up to the GN-05	0	0	0.000	6	6	0.338	3	3	0.169	0	0	0.000	0	0	0.000
							Total	**114.13**						**1**	**1**	**0.009**	**64**	**61**	**0.561**	**15**	**15**	**0.131**	**3**	**3**	**0.026**	**0**	**0**	**0.000**
PW-NF	PW-NF-GN-01	419884	5408087	21-Jul-20	22-Jul-20	15:00	11:55	20.92	shore	2.0	75	1	Strung across deep beaver pond	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-GN-02	419776	5408119	21-Jul-20	22-Jul-20	15:23	12:25	21.03	1	1.2	150	1, 2, 3, 4	In main channel of old beaver pool ~100 downstream of GN-01	1	1	0.048	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-GN-03	419720	5408043	21-Jul-20	22-Jul-20	16:07	9:45	17.63	1	1.2	150	1, 2, 3, 4	In main river channel, tied to base of of old beaver dam	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-GN-04	419507	5408120	21-Jul-20	22-Jul-20	16:31	9:05	16.57	shore	1.2	150	1, 2, 3, 4	in large pool downstream of highway 600 bridge	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-GN-05	419526	5408095	21-Jul-20	22-Jul-20	16:50	9:15	16.42	1.2	1.4	150	1, 2, 3, 4	In beaver pond upstream of GN-04	0	0	0.000	0	0	0.000	2	2	0.122	0	0	0.000	0	0	0.000
	PW-NF-GN-06	419565	5408068	21-Jul-20	22-Jul-20	17:00	9:45	16.75	0.5	1.2	150	1, 2, 3, 4	In pool where MT-06 was set	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
							Total	**109.32**						**1**	**1**	**0.009**	**0**	**0**	**0.000**	**2**	**2**	**0.018**	**0**	**0**	**0.000**	**0**	**0**	**0.000**
PW-FF	PW-FF-GN-01	414897	5407160	18-Jul-20	19-Jul-20	17:35	9:45	16.17	0.3	1.5	100	1, 2, 3	-	0	0	0.000	0	0	0.000	3	2	0.186	0	0	0.000	0	0	0.000
	PW-FF-GN-02	414907	5407148	19-Jul-20	20-Jul-20	16:00	10:25	18.42	0.3	1.0	75	1	stretched across deep pool	0	0	0.000	0	0	0.000	1	1	0.054	0	0	0.000	2	0	0.109
	PW-FF-GN-03	414838	5407058	19-Jul-20	20-Jul-20	16:15	10:45	18.50	0.3	1.0	150	1, 2, 3, 4	zig-zag across channel near main seine area	0	0	0.000	0	0	0.000	1	1	0.054	0	0	0.000	0	0	0.000
	PW-FF-GN-04	412957	5405692	19-Jul-20	20-Jul-20	16:57	9:15	16.30	shore	1.5	75	1	below pumphouse bridge across the deep pool from shore	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-GN-05	412988	5405681	19-Jul-20	20-Jul-20	17:05	9:10	16.08	0.3	1.0	150	1, 2, 3, 4	across channel upstream of pump house bridge	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-GN-06	413026	5405676	19-Jul-20	20-Jul-20	17:09	9:35	16.43	0.3	1.2	150	1, 2, 3, 4	across channel upstream of pump house bridge; across beaver "hole"	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.061	0	0	0.000
							Total	**101.90**						**0**	**0**	**0.000**	**0**	**0**	**0**	**5**	**4**	**0.0491**	**1**	**0**	**0.0098**	**2**	**0**	**0.020**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the gill net sets in one area.

Appendix Table A.7: Gill Net Records for Fish Caught in July 2020

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Effort (Fishing Hours)	Depth Range (m)		Set			Golden Shiner			Northern Pike			Northern Redbelly Dace			Pearl Dace			White Sucker		
		Easting	Northing								Length (ft)	Mesh (inches)	Description	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]	Catch	mortalities / sacrificed	CPUE[a]
PW-REF	PW-REF-GN-01	430648	5407685	20-Jul-20	21-Jul-20	14:29	11:00	20.52	shore	1.2	75	1	off beaver dam out into the main beaver pond	0	0	0.000	0	0	0.000	1	0	0.049	4	4	0.195	1	1	0.049
	PW-REF-GN-02	430672	5407653	20-Jul-20	21-Jul-20	14:35	10:25	19.83	shore	1.0	75	1	tied to cattails into lower section of major beaver pond	2	1	0.101	0	0	0.000	11	3	0.555	20	19	1.008	8	5	0.403
	PW-REF-GN-03	430875	5407634	20-Jul-20	21-Jul-20	15:02	10:20	19.30	shore	1.4	150	1, 2, 3, 4	following main channel upstream of beaver dam	0	0	0.000	0	0	0.000	0	0	0.000	5	5	0.259	4	3	0.207
	PW-REF-GN-04	430940	5407672	20-Jul-20	21-Jul-20	15:09	9:45	18.60	shore	-	150	1, 2, 3, 4	around first bend downstream of beaver dam, across pond lily stretch	0	0	0.000	0	0	0.000	0	0	0.000	6	6	0.323	2	2	0.108
	PW-REF-GN-05	430977	5407698	20-Jul-20	21-Jul-20	15:18	9:25	18.12	shore	1.0	150	1, 2, 3, 4	tied off near the beaver dam, across the channel towards the road	0	0	0.000	0	0	0.000	0	0	0.000	3	3	0.166	0	0	0.000
	PW-REF-GN-06	430984	5407710	20-Jul-20	21-Jul-20	15:26	9:12	17.77	1	1.5	150	1, 2, 3, 4	from inside culvert under road along channel up to the GN-05	0	0	0.000	0	0	0.000	0	0	0.000	3	3	0.169	0	0	0.000
							Total	**114.13**						**2**	**1**	**0.018**	**0**	**0**	**0.000**	**12**	**3**	**0.105**	**41**	**40**	**0.359**	**15**	**11**	**0.131**
PW-NF	PW-NF-GN-01	419884	5408087	21-Jul-20	22-Jul-20	15:00	11:55	20.92	shore	2.0	75	1	Strung across deep beaver pond	0	0	0.000	1	1	0.048	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-GN-02	419776	5408119	21-Jul-20	22-Jul-20	15:23	12:25	21.03	1	1.2	150	1, 2, 3, 4	In main channel of old beaver pool ~100 downstream of GN-01	0	0	0.000	8	3	0.380	0	0	0.000	0	0	0.000	3	0	0.143
	PW-NF-GN-03	419720	5408043	21-Jul-20	22-Jul-20	16:07	9:45	17.63	1	1.2	150	1, 2, 3, 4	In main river channel, tied to base of of old beaver dam	0	0	0.000	4	3	0.227	0	0	0.000	0	0	0.000	2	0	0.113
	PW-NF-GN-04	419507	5408120	21-Jul-20	22-Jul-20	16:31	9:05	16.57	shore	1.2	150	1, 2, 3, 4	in large pool downstream of highway 600 bridge	0	0	0.000	2	1	0.121	0	0	0.000	0	0	0.000	1	1	0.060
	PW-NF-GN-05	419526	5408095	21-Jul-20	22-Jul-20	16:50	9:15	16.42	1.2	1.4	150	1, 2, 3, 4	In beaver pond upstream of GN-04	0	0	0.000	1	0	0.061	0	0	0.000	0	0	0.000	1	0	0.061
	PW-NF-GN-06	419565	5408068	21-Jul-20	22-Jul-20	17:00	9:45	16.75	0.5	1.2	150	1, 2, 3, 4	In pool where MT-06 was set	0	0	0.000	2	2	0.119	0	0	0.000	0	0	0.000	0	0	0.000
							Total	**109.32**						**0**	**0**	**0.000**	**18**	**10**	**0.165**	**0**	**0**	**0.000**	**0**	**0**	**0.000**	**7**	**1**	**0.064**
PW-FF	PW-FF-GN-01	414897	5407160	18-Jul-20	19-Jul-20	17:35	9:45	16.17	0.3	1.5	100	1, 2, 3	-	0	0	0.000	1	0	0.062	0	0	0.000	0	0	0.000	1	0	0.062
	PW-FF-GN-02	414907	5407148	19-Jul-20	20-Jul-20	16:00	10:25	18.42	0.3	1.0	75	1	stretched across deep pool	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-GN-03	414838	5407058	19-Jul-20	20-Jul-20	16:15	10:45	18.50	0.3	1.0	150	1, 2, 3, 4	zig-zag across channel near main seine area	0	0	0.000	2	1	0.108	0	0	0.000	0	0	0.000	2	1	0.108
	PW-FF-GN-04	412957	5405692	19-Jul-20	20-Jul-20	16:57	9:15	16.30	shore	1.5	75	1	below pumphouse bridge across the deep pool from shore	0	0	0.000	3	1	0.184	0	0	0.000	0	0	0.000	1	0	0.061
	PW-FF-GN-05	412988	5405681	19-Jul-20	20-Jul-20	17:05	9:10	16.08	0.3	1.0	150	1, 2, 3, 4	across channel upstream of pump house bridge	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-GN-06	413026	5405676	19-Jul-20	20-Jul-20	17:09	9:35	16.43	0.3	1.2	150	1, 2, 3, 4	across channel upstream of pump house bridge; across beaver "hole"	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
							Total	**101.90**						**0**	**0**	**0.000**	**6**	**2**	**0.059**	**0**	**0**	**0.000**	**0**	**0**	**0.000**	**4**	**1**	**0.0393**

[a] Total catch-per-unit-effort (CPUE) calculated as the total catch of a single species over the total effort for all the gill net sets in one area.

Appendix Table A.8: **Detailed Electrofishing Catch Results, RRM 2020**

Station	UTM		Date	Length of Run	Voltage	Frequency	Pass	Effort (sec)	Blackside Darter	Brassy Minnow	Brook Stickleback	Brown Bullhead	Central Mudminnow	Common Shiner	Creek Chub	Fathead Minnow	Finescale Dace	Golden Shiner	Johnny Darter	Northern Pike	Northern Redbelly Dace	Trout Perch	White Sucker	Young-of-Year Cyprinid
	Easting	Northing																						
PWREF	430653	5407686	24-Jul-20	400	400	60	pass 1	1,500	0	8	8	0	0	2	3	4	10	0	0	0	19	0	5	0
							pass 2	1,503	0	3	15	0	0	23	0	0	0	0	0	0	0	0	1	18
							Total	**3,003**	**0**	**11**	**23**	**0**	**0**	**25**	**3**	**4**	**10**	**0**	**0**	**0**	**19**	**0**	**6**	**18**
PWNF	419487	5408114	22-Jul-20	350	400	60	pass 1	2,000	4	0	0	10	14	10	0	0	0	5	12	13	0	0	14	0
	419790	5408096	23-Jul-20	310			pass 3	1,325	0	0	0	0	0	0	0	0	0	0	17	0	0	0	14	0
							Total	**3,325**	**4**	**0**	**0**	**10**	**14**	**10**	**0**	**0**	**0**	**5**	**29**	**13**	**0**	**0**	**28**	**0**
PWFF	414873	5407097	23-Jul-20	292	300	55	pass 1	3,000	21	0	0	0	10	0	0	0	0	1	9	0	0	4	6	0
							Total	**3,000**	**21**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**1**	**9**	**0**	**0**	**4**	**6**	**0**

Appendix Table A.9: Seine Catch Records for Fish Caught in July 2020

Area	Station ID	Date	Time	UTM (NAD83, 15U)		Length (m)	Distance (m)	# of Hauls	Area Seined (m^2)	Blackside Darter				Brown Bullhead				Brassy Minnow				Brook Stickleback				Central Mudminnow			
				Easting	Northing					Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]
PW-REF	PW-REF-SN-01	24-Jul-20	12:05	430647	5407700	25	10	1	250	0	0	0.000	0.000	0	0	0.000	0.000	2	0	0.008	37	0	0.148	4	0	0.016
	PW-REF-SN-02	24-Jul-20	12:25	430637	5407697	25	25	1	625	0	0	0.000	0.000	0	0	0.000	0.000	10	0	0.016	56	0	0.090	3	0	0.005
	PW-REF-SN-03	24-Jul-20	12:50	430757	5407616	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	16	0	0.043	88	0	0.235	0	0	0.000
	PW-REF-SN-04	24-Jul-20	13:15	430787	5407625	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	60	0	0.160	3	0	0.008
	PW-REF-SN-05	24-Jul-20	13:50	430890	5407661	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	2	0	0.005	0	0	0.000
	PW-REF-SN-06	24-Jul-20	14:25	430930	5407676	25	10	1	250	0	0	0.000	0.000	0	0	0.000	0.000	3	0	0.012	16	0	0.064	0	0	0.000
	PW-REF-SN-07	24-Jul-20	14:50	430856	5407637	25	30	1	750	0	0	0.000	0.000	0	0	0.000	0.000	13	0	0.017	24	0	0.032	0	0	0.000
	PW-REF-SN-08	24-Jul-20	15:25	430799	5407609	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	15	0	0.040	1	0	0.003
	PW-REF-SN-09	24-Jul-20	15:45	430992	5407717	25	25	1	625	0	0	0.000	0.000	0	0	0.000	0.000	22	0	0.035	15	0	0.024	0	0	0.000
							Total	**9**	**4,000**	**0**	**0**	**0.000**	**0**	**0**	**0**	**0**	**67**	**0**	**0.017**	**313**	**0**	**0.078**	**11**	**0**	**0.003**
PW-NF	PW-NF-SN-01	25-Jul-20	10:00	420067	5407952	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-SN-02	25-Jul-20	10:25	419654	5408081	25	10	1	250	0	0	0.000	0.000	19	0	0.076	0.076	0	0	0.000	0	0	0.000	1	0	0.004
	PW-NF-SN-03	25-Jul-20	10:45	419656	5408026	25	15	1	375	1	0	0.003	0.003	20	0	0.053	0.053	0	0	0.000	0	0	0.000	2	0	0.005
	PW-NF-SN-04	25-Jul-20	11:05	419681	5408017	25	20	1	500	2	0	0.004	0.004	4	0	0.008	0.008	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-SN-05	25-Jul-20	11:20	419717	5408032	25	15	1	375	0	0	0.000	0.000	10	0	0.027	0.027	0	0	0.000	0	0	0.000	1	0	0.003
	PW-NF-SN-06	25-Jul-20	11:35	419710	5408095	25	10	1	250	1	0	0.004	0.004	2	0	0.008	0.008	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-SN-07	25-Jul-20	12:00	419772	5408110	25	15	1	375	2	0	0.005	0.005	7	0	0.019	0.019	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-SN-08	25-Jul-20	12:40	419796	5408075	25	15	1	375	1	0	0.003	0.003	1	0	0.003	0.003	8	0	0.021	0	0	0.000	6	0	0.016
	PW-NF-SN-09	25-Jul-20	13:10	419844	5408107	25	20	1	500	1	0	0.002	0.002	10	0	0.020	0.020	7	0	0.014	0	0	0.000	0	0	0.000
	PW-NF-SN-10	25-Jul-20	13:40	419783	5408109	25	20	1	500	0	0	0.000	0.000	4	0	0.008	0.008	1	0	0.002	0	0	0.000	3	0	0.006
	PW-NF-SN-11	25-Jul-20	14:05	419509	5408120	25	15	1	375	0	0	0.000	0.000	45	0	0.120	0.120	0	0	0.000	0	0	0.000	0	0	0.000
	PW-NF-SN-12	25-Jul-20	14:35	419539	5408080	25	20	1	500	1	0	0.002	0.002	2	0	0.004	0.004	0	0	0.000	0	0	0.000	5	0	0.010
							Total	**12**	**4,750**	**9**	**0**	**0.002**	**124**	**0**	**0.03**	**16**	**0**	**0.003**	**0**	**0**	**0**	**18**	**0**	**0.004**
PW-FF	PW-FF-SN-01	18-Jul-20	13:29	414889	5407161	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	6	0	0.016	0	0	0.000	3	0	0.008
	PW-FF-SN-02	18-Jul-20	13:40	414873	5407150	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	1	0	0.002
	PW-FF-SN-03	18-Jul-20	13:52	414868	5407145	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-SN-04	18-Jul-20	14:02	414869	5407144	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0	0	0.000	0	0	0.000
	PW-FF-SN-05	18-Jul-20	15:46	414861	5407142	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-SN-06	18-Jul-20	16:21	414863	5407116	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	1	0	0.003	1	0	0.003
	PW-FF-SN-07	18-Jul-20	16:30	414845	5407077	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-SN-08	18-Jul-20	16:56	414841	5407060	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-FF-SN-09	18-Jul-20	17:05	414851	5407080	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	4	0	0.011	0	0	0.000
	PW-FF-SN-10	19-Jul-20	15:00	414868	5407030	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	7	0	0.014
	PW-FF-SN-11	19-Jul-20	15:15	414879	5407002	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0	0	0.000	5	0	0.010
	PW-FF-SN-12	18-Jul-20	15:25	414880	5406965	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	7	0	0.019	0	0	0.000	3	0	0.008
	PW-FF-SN-13	18-Jul-20	15:45	414842	5406957	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.002	0	0	0.000	0	0	0.000
							Total	**13**	**5,625**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0.003**	**5**	**0**	**0.001**	**20**	**0**	**0.004**

[a] Total catch-per-unit-effort (CPUE; number of fish / m^2) calculated as the number of fish caught over the area seined.

Appendix Table A.9: Seine Catch Records for Fish Caught in July 2020

Area	Station ID	Date	Time	UTM (NAD83, 15U)		Length (m)	Distance (m)	# of Hauls	Area Seined (m^2)	Common Shiner				Creek Chub				Cyprinid sp. (Juvenile)				Fathead Minnow				Finescale Dace				Golden Shiner			
				Easting	Northing					Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]
PW-REF	PW-REF-SN-01	24-Jul-20	12:05	430647	5407700	25	10	1	250	0	0		0.000	0	0		0.000	1	0		0.004	1	0		0.004	4	0		0.016	0	0		0.000
	PW-REF-SN-02	24-Jul-20	12:25	430637	5407697	25	25	1	625	1	1		0.002	2	0		0.003	0	0		0.000	3	0		0.005	50	0		0.080	0	0		0.000
	PW-REF-SN-03	24-Jul-20	12:50	430757	5407616	25	15	1	375	4	4		0.011	0	0		0.000	2	0		0.005	6	0		0.016	95	0		0.253	2	0		0.005
	PW-REF-SN-04	24-Jul-20	13:15	430787	5407625	25	15	1	375	2	2		0.005	0	0		0.000	403	0		1.075	0	0		0.000	42	0		0.112	0	0		0.000
	PW-REF-SN-05	24-Jul-20	13:50	430890	5407661	25	15	1	375	0	0		0.000	0	0		0.000	12	0		0.032	0	0		0.000	0	0		0.000	0	0		0.000
	PW-REF-SN-06	24-Jul-20	14:25	430930	5407676	25	10	1	250	8	8		0.032	0	0		0.000	0	0		0.000	2	0		0.008	4	0		0.016	0	0		0.000
	PW-REF-SN-07	24-Jul-20	14:50	430856	5407637	25	30	1	750	26	26		0.035	3	0		0.004	0	0		0.000	7	0		0.009	16	0		0.021	0	0		0.000
	PW-REF-SN-08	24-Jul-20	15:25	430799	5407609	25	15	1	375	2	2		0.005	0	0		0.000	50	0		0.133	2	0		0.005	10	0		0.027	0	0		0.000
	PW-REF-SN-09	24-Jul-20	15:45	430992	5407717	25	25	1	625	10	10		0.016	1	0		0.002	1	0		0.002	28	0		0.045	37	0		0.059	0	0		0.000
							Total	**9**	**4,000**	**53**	**53**		**0.11**	**6**	**0**		**0.002**	**469**	**0**		**0.117**	**49**	**0**		**0.01**	**258**	**0**		**0.06**	**2**	**0**		**0.001**
PW-NF	PW-NF-SN-01	25-Jul-20	10:00	420067	5407952	25	15	1	375	0	0		0.000	0	0		0.000	1	0		0.003	0	0		0.000	0	0		0.000	0	0		0.000
	PW-NF-SN-02	25-Jul-20	10:25	419654	5408081	25	10	1	250	2	2		0.008	0	0		0.000	20	0		0.080	0	0		0.000	0	0		0.000	2	0		0.008
	PW-NF-SN-03	25-Jul-20	10:45	419656	5408026	25	15	1	375	1	1		0.003	0	0		0.000	10	0		0.027	0	0		0.000	0	0		0.000	0	0		0.000
	PW-NF-SN-04	25-Jul-20	11:05	419681	5408017	25	20	1	500	7	7		0.014	1	0		0.002	2	0		0.004	0	0		0.000	0	0		0.000	3	0		0.006
	PW-NF-SN-05	25-Jul-20	11:20	419717	5408032	25	15	1	375	15	15		0.040	0	0		0.000	15	0		0.040	0	0		0.000	0	0		0.000	19	0		0.051
	PW-NF-SN-06	25-Jul-20	11:35	419710	5408095	25	10	1	250	5	5		0.020	1	0		0.004	10	0		0.040	0	0		0.000	0	0		0.000	12	0		0.048
	PW-NF-SN-07	25-Jul-20	12:00	419772	5408110	25	15	1	375	0	0		0.000	0	0		0.000	10	0		0.027	0	0		0.000	0	0		0.000	11	0		0.029
	PW-NF-SN-08	25-Jul-20	12:40	419796	5408075	25	15	1	375	0	0		0.000	0	0		0.000	1	0		0.003	1	0		0.003	7	0		0.019	123	0		0.328
	PW-NF-SN-09	25-Jul-20	13:10	419844	5408107	25	20	1	500	5	5		0.010	0	0		0.000	0	0		0.000	0	0		0.000	13	0		0.026	80	0		0.160
	PW-NF-SN-10	25-Jul-20	13:40	419783	5408109	25	20	1	500	0	0		0.000	0	0		0.000	10	0		0.020	0	0		0.000	1	0		0.002	15	0		0.030
	PW-NF-SN-11	25-Jul-20	14:05	419509	5408120	25	15	1	375	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	120	0		0.320
	PW-NF-SN-12	25-Jul-20	14:35	419539	5408080	25	20	1	500	6	6		0.012	1	0		0.002	20	0		0.040	0	0		0.000	0	0		0.000	12	0		0.024
							Total	**12**	**4,750**	**41**	**41**		**0.01**	**3**	**0**		**0.001**	**99**	**0**		**0.021**	**1**	**0**		**0**	**21**	**0**		**0.004**	**397**	**0**		**0.084**
PW-FF	PW-FF-SN-01	18-Jul-20	13:29	414889	5407161	25	15	1	375	6	0		0.016	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000
	PW-FF-SN-02	18-Jul-20	13:40	414873	5407150	25	20	1	500	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000
	PW-FF-SN-03	18-Jul-20	13:52	414868	5407145	25	20	1	500	4	0		0.008	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	2	0		0.004
	PW-FF-SN-04	18-Jul-20	14:02	414869	5407144	25	15	1	375	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000
	PW-FF-SN-05	18-Jul-20	15:46	414861	5407142	25	15	1	375	3	0		0.008	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	2	0		0.005
	PW-FF-SN-06	18-Jul-20	16:21	414863	5407116	25	15	1	375	1	0		0.003	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	1	0		0.003
	PW-FF-SN-07	18-Jul-20	16:30	414845	5407077	25	15	1	375	7	0		0.019	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000
	PW-FF-SN-08	18-Jul-20	16:56	414841	5407060	25	20	1	500	1	0		0.002	0	0		0.000	1	0		0.002	0	0		0.000	0	0		0.000	1	0		0.002
	PW-FF-SN-09	18-Jul-20	17:05	414851	5407080	25	15	1	375	4	0		0.011	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	1	0		0.003
	PW-FF-SN-10	19-Jul-20	15:00	414868	5407030	25	20	1	500	5	0		0.010	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000
	PW-FF-SN-11	19-Jul-20	15:15	414879	5407002	25	20	1	500	4	0		0.008	0	0		0.000	5	0		0.010	0	0		0.000	0	0		0.000	1	0		0.002
	PW-FF-SN-12	18-Jul-20	15:25	414880	5406965	25	15	1	375	11	0		0.029	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000
	PW-FF-SN-13	18-Jul-20	15:45	414842	5406957	25	20	1	500	4	0		0.008	0	0		0.000	0	0		0.000	0	0		0.000	0	0		0.000	1	0		0.002
							Total	**13**	**5,625**	**50**	**0**		**0.009**	**0**	**0**		**0.000**	**6**	**0**		**0.001**	**0**	**0**		**0.000**	**0**	**0**		**0.000**	**9**	**0**		**0.002**

[a] Total catch-per-unit-effort (CPUE; number of fish / m^2) calculated as the number of fish caught over the area seined.

Appendix Table A.9: Seine Catch Records for Fish Caught in July 2020

Area	Station ID	Date	Time	UTM (NAD83, 15U)		Length (m)	Distance (m)	# of Hauls	Area Seined (m^2)	Johnny Darter				Northern Pike				Northern Redbelly Dace				Pearl Dace				Trout-Perch				White Sucker			
				Easting	Northing					Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]	Catch	Mortalities / Sacrificed		CPUE [a]
PW-REF	PW-REF-SN-01	24-Jul-20	12:05	430647	5407700	25	10	1	250	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-REF-SN-02	24-Jul-20	12:25	430637	5407697	25	25	1	625	0	0	0.000	0.000	0	0	0.000	0.000	24	0	0.038	0.038	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-REF-SN-03	24-Jul-20	12:50	430757	5407616	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	14	0	0.037	0.037	0	0	0.000	0.000	0	0	0.000	0.000	2	0	0.005	0.005
	PW-REF-SN-04	24-Jul-20	13:15	430787	5407625	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0.003
	PW-REF-SN-05	24-Jul-20	13:50	430890	5407661	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-REF-SN-06	24-Jul-20	14:25	430930	5407676	25	10	1	250	0	0	0.000	0.000	0	0	0.000	0.000	5	0	0.020	0.020	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-REF-SN-07	24-Jul-20	14:50	430856	5407637	25	30	1	750	0	0	0.000	0.000	0	0	0.000	0.000	13	0	0.017	0.017	2	0	0.003	0.003	0	0	0.000	0.000	2	0	0.003	0.003
	PW-REF-SN-08	24-Jul-20	15:25	430799	5407609	25	15	1	375	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-REF-SN-09	24-Jul-20	15:45	430992	5407717	25	25	1	625	0	0	0.000	0.000	44	0	0.070	0.070	0	0	0.000	0.000	0		0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
							Total	**9**	**4,000**	**0**	**0**	**0.000**	**0.000**	**44**	**0**	**0.01**	**0.01**	**56**	**0**	**0.01**	**0.01**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**
PW-NF	PW-NF-SN-01	25-Jul-20	10:00	420067	5407952	25	15	1	375	40	0	0.107	0.107	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	12	0	0.032	0.032
	PW-NF-SN-02	25-Jul-20	10:25	419654	5408081	25	10	1	250	0	0	0.000	0.000	1	0	0.004	0.004	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-NF-SN-03	25-Jul-20	10:45	419656	5408026	25	15	1	375	4	0	0.011	0.011	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-NF-SN-04	25-Jul-20	11:05	419681	5408017	25	20	1	500	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.002	0.002	0	0	0.000	0.000
	PW-NF-SN-05	25-Jul-20	11:20	419717	5408032	25	15	1	375	4	0	0.011	0.011	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	2	0	0.005	0.005	5	0	0.013	0.013
	PW-NF-SN-06	25-Jul-20	11:35	419710	5408095	25	10	1	250	1	0	0.004	0.004	1	0	0.004	0.004	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.004	0.004	3	0	0.012	0.012
	PW-NF-SN-07	25-Jul-20	12:00	419772	5408110	25	15	1	375	14	0	0.037	0.037	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-NF-SN-08	25-Jul-20	12:40	419796	5408075	25	15	1	375	8	0	0.021	0.021	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0.003	16	0	0.043	0.043
	PW-NF-SN-09	25-Jul-20	13:10	419844	5408107	25	20	1	500	24	0	0.048	0.048	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.002	0.002	15	0	0.030	0.030
	PW-NF-SN-10	25-Jul-20	13:40	419783	5408109	25	20	1	500	6	0	0.012	0.012	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	3	0	0.006	0.006
	PW-NF-SN-11	25-Jul-20	14:05	419509	5408120	25	15	1	375	0	0	0.000	0.000	1	0	0.003	0.003	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0.003
	PW-NF-SN-12	25-Jul-20	14:35	419539	5408080	25	20	1	500	0	0	0.000	0.000	1	0	0.002	0.002	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	2	0	0.004	0.004
							Total	**12**	**4,750**	**101**	**0**	**0.021**	**0.021**	**4**	**0**	**0.001**	**0.001**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0.001**	**0.001**	**57**	**0**	**0.012**	**0.012**
PW-FF	PW-FF-SN-01	18-Jul-20	13:29	414889	5407161	25	15	1	375	9	0	0.024	0.024	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0.003
	PW-FF-SN-02	18-Jul-20	13:40	414873	5407150	25	20	1	500	6	0	0.012	0.012	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-FF-SN-03	18-Jul-20	13:52	414868	5407145	25	20	1	500	33	0	0.066	0.066	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.002	0.002	6	0	0.012	0.012
	PW-FF-SN-04	18-Jul-20	14:02	414869	5407144	25	15	1	375	22	0	0.059	0.059	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0.003
	PW-FF-SN-05	18-Jul-20	15:46	414861	5407142	25	15	1	375	50	0	0.133	0.133	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	8	0	0.021	0.021	9	0	0.024	0.024
	PW-FF-SN-06	18-Jul-20	16:21	414863	5407116	25	15	1	375	32	0	0.085	0.085	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	3	0	0.008	0.008	7	0	0.019	0.019
	PW-FF-SN-07	18-Jul-20	16:30	414845	5407077	25	15	1	375	9	0	0.024	0.024	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	4	0	0.011	0.011	2	0	0.005	0.005
	PW-FF-SN-08	18-Jul-20	16:56	414841	5407060	25	20	1	500	24	0	0.048	0.048	1	0	0.002	0.002	0	0	0.000	0.000	0	0	0.000	0.000	2	0	0.004	0.004	5	0	0.010	0.010
	PW-FF-SN-09	18-Jul-20	17:05	414851	5407080	25	15	1	375	22	0	0.059	0.059	1	0	0.003	0.003	0	0	0.000	0.000	0	0	0.000	0.000	6	0	0.016	0.016	3	0	0.008	0.008
	PW-FF-SN-10	19-Jul-20	15:00	414868	5407030	25	20	1	500	17	0	0.034	0.034	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000
	PW-FF-SN-11	19-Jul-20	15:15	414879	5407002	25	20	1	500	14	0	0.028	0.028	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.002	0.002	0	0	0.000	0.000
	PW-FF-SN-12	18-Jul-20	15:25	414880	5406965	25	15	1	375	16	0	0.043	0.043	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.003	0.003	3	0	0.008	0.008
	PW-FF-SN-13	18-Jul-20	15:45	414842	5406957	25	20	1	500	55	0	0.110	0.110	0	0	0.000	0.000	0	0	0.000	0.000	0	0	0.000	0.000	1	0	0.002	0.002	4	0	0.008	0.008
							Total	**13**	**5,625**	**309**	**0**	**0.055**	**0.055**	**2**	**0**	**0.000**	**0.000**	**0**	**0**	**0.000**	**0.000**	**0**	**0**	**0.000**	**0.000**	**27**	**0**	**0.005**	**0.005**	**41**	**0**	**0.007**	**0.007**

[a] Total catch-per-unit-effort (CPUE; number of fish / m^2) calculated as the number of fish caught over the area seined.

Appendix Table A.10: **Catch-per-unit-effort (CPUE) Records for Fish Caught During Minnow Trapping, July 2020**

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Trap Hours (hrs)	# of Traps	Effort (trap*d)	Brassy Minnow			Brook Stickleback			Brown Bullhead			Central Mudminnow			Common Shiner		
		Easting	Northing								Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
PW-REF	PW-REF-MT-01	430995	5407697	19-Jul-20	20-Jul-20	13:25	16:15	134.17	5	5.59	1	0	0.18	7	0	1.25	0	0	0.00	7	0	1.25	0	0	0.00
	PW-REF-MT-02	430999	5407718	19-Jul-20	20-Jul-20	13:28	15:35	130.58	5	5.44	0	0	0.00	2	0	0.37	0	0	0.00	7	0	1.29	1	0	0.18
	PW-REF-MT-03	430997	5407712	19-Jul-20	20-Jul-20	13:28	15:40	131.00	5	5.46	0	0	0.00	5	0	0.92	0	0	0.00	3	0	0.55	13	0	2.38
	PW-REF-MT-04	430987	5407703	19-Jul-20	20-Jul-20	13:31	16:10	133.25	5	5.55	0	0	0.00	3	0	0.54	0	0	0.00	7	0	1.26	0	0	0.00
	PW-REF-MT-05	430992	5407729	19-Jul-20	20-Jul-20	13:37	16:05	132.33	5	5.51	0	0	0.00	1	0	0.18	0	0	0.00	10	0	1.81	0	0	0.00
	PW-REF-MT-06	431001	5407736	19-Jul-20	20-Jul-20	13:40	15:50	130.83	5	5.45	0	0	0.00	7	0	1.28	0	0	0.00	8	0	1.47	0	0	0.00
							Total	**792.17**	**30**	**33.01**	**1**	**0**	**0**	**25**	**0**	**5**	**0**	**0**	**0**	**42**	**0**	**8**	**14**	**0**	**3**
PW-NF	PW-NF-MT-01	419609	5408081	18-Jul-20	19-Jul-20	11:15	10:35	116.67	5	4.86	0	0	0.00	0	0	0.00	8	0	1.65	0	0	0.00	0	0	0.00
	PW-NF-MT-02	419606	5408074	18-Jul-20	19-Jul-20	11:20	10:40	116.67	5	4.86	0	0	0.00	0	0	0.00	1	0	0.21	0	0	0.00	0	0	0.00
	PW-NF-MT-03	419640	5408089	18-Jul-20	19-Jul-20	11:22	10:25	115.25	5	4.80	0	0	0.00	0	0	0.00	2	0	0.42	0	0	0.00	0	0	0.00
	PW-NF-MT-04	419582	5408072	18-Jul-20	19-Jul-20	11:25	10:42	116.42	5	4.85	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.21	0	0	0.00
	PW-NF-MT-05	419582	5408081	18-Jul-20	19-Jul-20	11:30	11:46	121.33	5	5.06	0	0	0.00	0	0	0.00	4	0	0.79	0	0	0.00	0	0	0.00
	PW-NF-MT-06	419596	5408069	18-Jul-20	19-Jul-20	11:30	10:30	115.00	5	4.79	0	0	0.00	0	0	0.00	3	0	0.63	0	0	0.00	1	0	0.21
							Total	**701.33**	**30**	**29.22**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**4**	**1**	**0**	**0**	**1**	**0**	**0**
PW-FF	PW-FF-MT-01	414774	5407071	14-Jul-20	15-Jul-20	18:00	14:45	103.75	5	4.32	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.23	0	0	0.00
	PW-FF-MT-02	414838	5407068	14-Jul-20	15-Jul-20	18:00	14:45	103.75	5	4.32	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-03	414839	5407048	15-Jul-20	16-Jul-20	15:00	14:30	117.50	5	4.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-04	414838	5407068	15-Jul-20	16-Jul-20	15:00	14:30	117.50	5	4.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-05	414844	5407077	15-Jul-20	16-Jul-20	15:00	14:30	94.00	4	3.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-06	414843	5407085	15-Jul-20	16-Jul-20	15:00	14:30	70.50	3	2.94	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.34	0	0	0.00
	PW-FF-MT-07	414844	5407091	15-Jul-20	16-Jul-20	15:00	14:30	47.00	2	1.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
							Total	**654.00**	**29.00**	**27.25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**

[a] CPUE = total # of fish / trap*d

Appendix Table A.10: **Catch-per-unit-effort (CPUE) Records for Fish Caught During Minnow Trapping, July 2020**

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Trap Hours (hrs)	# of Traps	Effort (trap*d)	Fathead Minnow			Finescale Dace			Johnny Darter			Northern Redbelly Dace			Pearl Dace			White Sucker		
		Easting	Northing								Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]	Catch	Mortalities/ Sacrificed	CPUE [a]
PW-REF	PW-REF-MT-01	430995	5407697	19-Jul-20	20-Jul-20	13:25	16:15	134.17	5	5.59	0	0	0.00	0	0	0.00	0	0	0.00	4	0	0.72	0	0	0.00	0	0	0.00
	PW-REF-MT-02	430999	5407718	19-Jul-20	20-Jul-20	13:28	15:35	130.58	5	5.44	1	0	0.18	0	0	0.00	0	0	0.00	2	0	0.37	0	0	0.00	0	0	0.00
	PW-REF-MT-03	430997	5407712	19-Jul-20	20-Jul-20	13:28	15:40	131.00	5	5.46	0	0	0.00	11	0	2.02	0	0	0.00	16	0	2.93	3	0	0.55	0	0	0.00
	PW-REF-MT-04	430987	5407703	19-Jul-20	20-Jul-20	13:31	16:10	133.25	5	5.55	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.18	0	0	0.00	0	0	0.00
	PW-REF-MT-05	430992	5407729	19-Jul-20	20-Jul-20	13:37	16:05	132.33	5	5.51	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-REF-MT-06	431001	5407736	19-Jul-20	20-Jul-20	13:40	15:50	130.83	5	5.45	0	0	0.00	0	0	0.00	0	0	0.00	4	0	0.73	0	0	0.00	0	0	0.00
							Total	**792.17**	**30**	**33.01**	**1**	**0**	**0**	**11**	**0**	**2**	**0**	**0**	**0**	**27**	**0**	**5**	**3**	**0**	**1**	**0**	**0**	**0**
PW-NF	PW-NF-MT-01	419609	5408081	18-Jul-20	19-Jul-20	11:15	10:35	116.67	5	4.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-NF-MT-02	419606	5408074	18-Jul-20	19-Jul-20	11:20	10:40	116.67	5	4.86	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-NF-MT-03	419640	5408089	18-Jul-20	19-Jul-20	11:22	10:25	115.25	5	4.80	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.21
	PW-NF-MT-04	419582	5408072	18-Jul-20	19-Jul-20	11:25	10:42	116.42	5	4.85	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-NF-MT-05	419582	5408081	18-Jul-20	19-Jul-20	11:30	11:46	121.33	5	5.06	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-NF-MT-06	419596	5408069	18-Jul-20	19-Jul-20	11:30	10:30	115.00	5	4.79	0	0	0.00	0	0	0.00	1	0	0.21	0	0	0.00	0	0	0.00	0	0	0.00
							Total	**701.33**	**30**	**29.22**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
PW-FF	PW-FF-MT-01	414774	5407071	14-Jul-20	15-Jul-20	18:00	14:45	103.75	5	4.32	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-02	414838	5407068	14-Jul-20	15-Jul-20	18:00	14:45	103.75	5	4.32	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-03	414839	5407048	15-Jul-20	16-Jul-20	15:00	14:30	117.50	5	4.90	0	0	0.00	0	0	0.00	1	0	0.20	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-04	414838	5407068	15-Jul-20	16-Jul-20	15:00	14:30	117.50	5	4.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-05	414844	5407077	15-Jul-20	16-Jul-20	15:00	14:30	94.00	4	3.92	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-06	414843	5407085	15-Jul-20	16-Jul-20	15:00	14:30	70.50	3	2.94	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	PW-FF-MT-07	414844	5407091	15-Jul-20	16-Jul-20	15:00	14:30	47.00	2	1.96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
							Total	**654.00**	**29.00**	**27.25**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

[a] CPUE = total # of fish / trap*d

Appendix Table A.11: Surface Water Concentrations of Select Analytes, RRM 2017 to 2020

Area	Date	Dissolved Mercury (mg/L)	Total Mercury (mg/L)	Total Methylmercury (mg/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
1 - Teeple Culvert	7/26/2017	0.000004	0.000004	0.00000088	-	-
1 - Teeple Culvert	8/31/2017	0.000002	0.000004	0.00000046	-	-
1 - Teeple Culvert	9/29/2017	0.000001	0.000004	0.00000034	-	-
1 - Teeple Culvert	10/30/2017	0.000001	0.000002	0.00000032	-	-
1 - Teeple Culvert	5/10/2018	0.000014	0.000002	0.00000045	-	-
1 - Teeple Culvert	6/12/2018	0.000001	0.000006	0.0000003	-	-
1 - Teeple Culvert	7/17/2018	< 0.000001	0.000002	0.00000097	-	-
1 - Teeple Culvert	9/11/2018	0.000002	0.000002	0.00000021	-	-
1 - Teeple Culvert	10/16/2018	0.000004	0.000005	0.0000001	-	-
1 - Teeple Culvert	5/16/2019	< 0.000001	< 0.000001	0.00000044	-	-
1 - Teeple Culvert	6/11/2019	0.0025	0.000005	0.00000095	-	-
1 - Teeple Culvert	7/8/2019	< 0.000005	< 0.000005	0.00000169	-	-
1 - Teeple Culvert	8/13/2019	< 0.000005	< 0.000005	0.00000052	9	-
1 - Teeple Culvert	9/19/2019	< 0.000005	< 0.000005	0.0000004	-	-
1 - Teeple Culvert	10/8/2019	< 0.000005	0.00001	0.00000034	-	-
1 - Teeple Culvert	6/17/2020	< 0.00003	< 0.00003	0.000792	-	-
1 - Teeple Culvert	7/7/2020	0.000005	< 0.00003	0.00152	-	-
1 - Teeple Culvert	8/11/2020	< 0.00003	< 0.00003	0.000659	13	-
1 - Teeple Culvert	9/15/2020	-	-	0.00035	-	-
1 - Teeple Culvert	10/14/2020	< 0.00003	< 0.00003	0.000106	18	-
2 - SW20	7/26/2017	0.000004	0.000004	0.000001	2	-
2 - SW20	8/31/2017	< 0.000001	0.000002	0.00000065	1	-
2 - SW20	9/29/2017	< 0.000001	0.000004	0.00000019	15	-
2 - SW20	10/30/2017	0.000004	0.000002	0.00000019	8	111
2 - SW20	5/10/2018	0.000001	0.000004	0.00000024	8	-
2 - SW20	6/12/2018	0.000004	0.000006	0.00000169	3	149
2 - SW20	7/17/2018	< 0.000001	< 0.000001	0.00000047	1	191
2 - SW20	8/7/2018	< 0.000001	< 0.000001	0.00000021	1	175
2 - SW20	9/11/2018	< 0.000001	0.000002	0.00000024	5	211
2 - SW20	10/16/2018	0.000004	0.000007	0.00000017	25	176
2 - SW20	5/14/2019	< 0.000001	< 0.000005	0.00000042	9	113
2 - SW20	6/11/2019	< 0.000005	0.000005	0.00000129	4	135
2 - SW20	7/8/2019	< 0.000005	< 0.000005	0.00000136	1	166
2 - SW20	8/13/2019	< 0.000005	< 0.000005	0.00000157	0	185
2 - SW20	9/18/2019	< 0.000005	< 0.000005	0.0000004	4	139
2 - SW20	10/8/2019	< 0.000005	< 0.000005	0.00000025	4	110
2 - SW20	1/9/2020	< 0.00003	< 0.00003	-	5	158
2 - SW20	2/5/2020	< 0.00003	< 0.00003	-	6	178
2 - SW20	3/10/2020	< 0.00003	< 0.00003	-	8	179
2 - SW20	4/8/2020	< 0.00003	0.000005	-	3	68
2 - SW20	5/12/2020	< 0.00003	0.000005	-	4	123
2 - SW20	6/16/2020	< 0.00003	< 0.00003	0.000648	1	125
2 - SW20	7/7/2020	< 0.00003	< 0.00003	0.00131	2	166
2 - SW20	8/11/2020	< 0.00003	< 0.00003	0.000396	1	149
2 - SW20	9/15/2020	< 0.00003	< 0.00003	0.000176	3	185
2 - SW20	10/14/2020	< 0.00003	< 0.00003	0.000357	7	186
2 - SW20	11/4/2020	< 0.00003	< 0.00003	-	10	162
2 - SW20	11/10/2020	< 0.00003	< 0.00003	-	8	162
2 - SW20	12/15/2020	< 0.00003	< 0.00003	-	6	164

Appendix Table A.11: Surface Water Concentrations of Select Analytes, RRM 2017 to 2020

Area	Date	Dissolved Mercury (mg/L)	Total Mercury (mg/L)	Total Methylmercury (mg/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
3 - SW10	7/26/2017	< 0.000002	0.000008	0.00000052	1	-
3 - SW10	8/30/2017	< 0.000001	< 0.000001	0.00000019	2	-
3 - SW10	9/29/2017	< 0.000001	0.000004	0.00000029	4	-
3 - SW10	10/30/2017	0.000002	0.000004	0.0000003	6	130
3 - SW10	5/9/2018	< 0.000001	0.000008	0.00000044	6	109
3 - SW10	6/12/2018	0.000002	0.000004	0.00000032	2	145
3 - SW10	7/17/2018	0.000001	< 0.000001	0.00000057	2	214
3 - SW10	8/7/2018	< 0.000001	< 0.000001	0.00000022	2	241
3 - SW10	9/11/2018	< 0.000001	< 0.000001	0.00000014	5	268
3 - SW10	10/16/2018	0.000005	0.000008	0.00000017	21	174
3 - SW10	5/14/2019	< 0.000001	< 0.000001	0.00000067	6	103
3 - SW10	6/11/2019	< 0.000005	< 0.000005	0.00000119	3	132
3 - SW10	7/8/2019	< 0.000005	< 0.000005	0.00000122	1	185
3 - SW10	8/13/2019	< 0.000005	< 0.000005	0.00000037	1	231
3 - SW10	9/18/2019	< 0.000005	< 0.000005	0.00000061	5	133
3 - SW10	10/8/2019	< 0.000005	< 0.000005	0.00000028	5	107
3 - SW10	1/9/2020	< 0.00003	0.000005	-	5	176
3 - SW10	2/5/2020	< 0.00003	0.000005	-	5	190
3 - SW10	3/10/2020	< 0.00003	< 0.00003	-	8	203
3 - SW10	4/8/2020	< 0.00003	0.000005	-	3	76
3 - SW10	5/14/2020	< 0.00003	< 0.00003	-	4	113
3 - SW10	6/16/2020	< 0.00003	< 0.00003	0.000727	1	128
3 - SW10	7/7/2020	< 0.00003	< 0.00003	0.000829	1	148
3 - SW10	8/12/2020	< 0.00003	< 0.00003	0.000298	2	169
3 - SW10	9/15/2020	< 0.00003	< 0.00003	0.000174	2	199
3 - SW10	10/14/2020	< 0.00003	< 0.00003	0.00019	1	174
3 - SW10	11/10/2020	< 0.00003	< 0.00003	-	10	162
3 - SW10	12/15/2020	< 0.00003	< 0.00003	-	8	195
4 - SW22A	7/26/2017	0.000004	0.000004	0.000004	14	-
4 - SW22A	8/30/2017	0.000004	0.000004	0.000004	3	-
4 - SW22A	9/29/2017	0.000002	0.000004	0.000004	73	-
4 - SW22A	10/27/2017	0.000002	0.000002	0.000002	36	-
4 - SW22A	5/9/2018	0.000001	0.000001	0.00000045	12	-
4 - SW22A	6/12/2018	0.000001	0.000002	0.00000083	16	210
4 - SW22A	7/17/2018	< 0.000001	< 0.000001	0.0000005	22	240
4 - SW22A	8/9/2018	< 0.000001	< 0.000001	-	9	238
4 - SW22A	9/11/2018	< 0.000001	< 0.000001	0.00000039	34	291
4 - SW22A	10/16/2018	0.000005	0.000005	0.00000023	51	239
4 - SW22A	5/15/2019	< 0.000001	< 0.000001	0.00000047	12	134
4 - SW22A	6/11/2019	< 0.000005	< 0.000005	0.0000005	13	151
4 - SW22A	7/8/2019	< 0.000005	< 0.000005	0.00000047	12	183
4 - SW22A	8/13/2019	< 0.000005	< 0.000005	0.00000078	5	216
4 - SW22A	9/19/2019	< 0.000005	< 0.000005	0.0000006	44	225
4 - SW22A	10/8/2019	< 0.000005	< 0.000005	0.00000035	19	140
4 - SW22A	1/9/2020	< 0.00003	< 0.00003	-	8	204
4 - SW22A	2/5/2020	< 0.00003	< 0.00003	-	5	198
4 - SW22A	3/11/2020	< 0.00003	< 0.00003	-	10	229
4 - SW22A	4/9/2020	< 0.00003	0.000005	-	5	95
4 - SW22A	5/13/2020	< 0.00003	0.000005	-	10	149
4 - SW22A	6/17/2020	0.000015	< 0.00003	0.00192	8	166
4 - SW22A	7/10/2020	< 0.00003	< 0.00003	0.00126	36	210
4 - SW22A	8/11/2020	< 0.00003	0.000005	0.000785	17	180
4 - SW22A	9/15/2020	< 0.00003	< 0.00003	0.000595	12	224
4 - SW22A	10/19/2020	< 0.00003	< 0.00003	0.000508	286	330
4 - SW22A	11/4/2020	< 0.00003	< 0.00003	-	332	342
4 - SW22A	11/10/2020	< 0.00003	< 0.00003	-	345	330
4 - SW22A	12/16/2020	< 0.00003	< 0.00003	-	71	278

Appendix Table A.11: Surface Water Concentrations of Select Analytes, RRM 2017 to 2020

Area	Date	Dissolved Mercury (mg/L)	Total Mercury (mg/L)	Total Methylmercury (mg/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
5 - SW03	7/26/2017	0.000002	0.000008	0.00000029	15	-
5 - SW03	8/29/2017	< 0.000001	0.000004	0.00000023	5	-
5 - SW03	9/29/2017	< 0.000001	0.000004	0.00000029	72	-
5 - SW03	10/27/2017	0.000002	0.000002	0.00000024	35	-
5 - SW03	5/9/2018	0.000001	0.000004	0.00000038	10	129
5 - SW03	6/12/2018	0.000002	0.000004	0.00000037	8	160
5 - SW03	7/17/2018	< 0.000001	0.000001	0.00000032	14	193
5 - SW03	8/7/2018	< 0.000001	0.000001	0.00000025	15	202
5 - SW03	9/11/2018	0.00001	0.000003	0.00000028	33	228
5 - SW03	10/16/2018	0.000004	0.000007	0.00000021	50	235
5 - SW03	5/15/2019	0.000001	0.000001	0.00000063	11	129
5 - SW03	6/11/2019	< 0.000005	0.000005	0.00000057	15	151
5 - SW03	7/8/2019	< 0.000005	< 0.000005	0.00000057	5	169
5 - SW03	8/13/2019	< 0.000005	< 0.000005	0.00000016	16	208
5 - SW03	9/18/2019	< 0.000005	< 0.000005	0.00000056	33	187
5 - SW03	10/8/2019	< 0.000005	< 0.000005	0.00000039	17	133
5 - SW03	1/9/2020	< 0.00003	< 0.00003	-	7	190
5 - SW03	2/4/2020	< 0.00003	0.000005	-	6	201
5 - SW03	3/10/2020	< 0.00003	0.000005	-	9	225
5 - SW03	4/7/2020	< 0.00003	< 0.00003	-	5	96
5 - SW03	5/12/2020	0.000005	0.000005	-	< 0.3	117
5 - SW03	6/17/2020	0.000005	0.000005	0.000966	6	146
5 - SW03	7/7/2020	< 0.00003	< 0.00003	0.000493	32	203
5 - SW03	8/11/2020	< 0.00003	< 0.00003	0.000154	15	164
5 - SW03	9/15/2020	< 0.00003	< 0.00003	0.000151	18	194
5 - SW03	10/14/2020	< 0.00003	< 0.00003	0.000364	13	170
5 - SW03	11/10/2020	< 0.00003	< 0.00003	-	251	303
5 - SW03	12/15/2020	< 0.00003	< 0.00003	-	86	291
6 - SW24	7/26/2017	-	-	0.00000037	-	-
6 - SW24	8/29/2017	-	-	0.00000027	-	-
6 - SW24	9/29/2017	-	-	0.00000035	-	-
6 - SW24	10/27/2017	-	-	0.00000037	-	-
6 - SW24	5/9/2018	< 0.000001	0.000004	0.00000034	7	-
6 - SW24	6/12/2018	0.000004	0.000006	0.0000006	4	210
6 - SW24	7/17/2018	0.000003	0.000007	0.00000038	3	240
6 - SW24	8/7/2018	< 0.000001	0.000003	0.00000057	3	238
6 - SW24	9/11/2018	0.000003	0.000006	0.00000066	6	291
6 - SW24	10/16/2018	0.000005	0.000007	0.00000017	29	239
6 - SW24	5/15/2019	< 0.000001	0.00001	0.00000047	8	134
6 - SW24	6/11/2019	0.00001	0.000005	0.00000075	7	151
6 - SW24	7/8/2019	< 0.000005	< 0.000005	0.00000053	2	183
6 - SW24	8/13/2019	< 0.000005	< 0.000005	0.00000053	2	216
6 - SW24	9/20/2019	< 0.000005	< 0.000005	0.00000052	13	225
6 - SW24	10/8/2019	< 0.000005	< 0.000005	0.00000044	8	140
6 - SW24	1/9/2020	< 0.00003	< 0.00003	-	4	170
6 - SW24	2/4/2020	< 0.00003	0.000005	-	4	180
6 - SW24	3/10/2020	< 0.00003	< 0.00003	-	7	216
6 - SW24	4/7/2020	< 0.00003	0.000005	-	4	87
6 - SW24	5/12/2020	< 0.00003	0.00001	-	85	168
6 - SW24	6/17/2020	0.000005	< 0.00003	0.000995	3	116
6 - SW24	7/7/2020	0.000005	< 0.00003	0.000693	10	155
6 - SW24	8/11/2020	< 0.00003	< 0.00003	0.000166	109	230
6 - SW24	9/15/2020	0.000005	< 0.00003	0.000471	3	139
6 - SW24	10/14/2020	< 0.00003	< 0.00003	0.000326	275	261
6 - SW24	11/4/2020	< 0.00003	< 0.00003	-	343	313
6 - SW24	11/10/2020	< 0.00003	< 0.00003	-	312	296
6 - SW24	12/16/2020	< 0.00003	< 0.00003	-	51	224

Note: Shading denotes analyte concentrations below method detection limit, "-" denotes analyte not sampled .

Appendix Table A.12: Rainy River Mine Effluent Mercury and Sulphate Concentrations

Sample date	Sulphate (mg/L)			Total Mercury (mg/L)			Dissolved Mercury (mg/L)		
	EDL1	EDL2	SP2	EDL1	EDL2	SP2	EDL1	EDL2	SP2
29-Apr-20	279	-	-	<0.00003	-	-	0.000005	-	-
6-May-20	341	-	-	<0.00003	-	-	<0.00003	-	-
13-May-20	386	-	-	0.00002	-	-	0.00001	-	-
20-May-20	330	-	-	0.00001	-	-	0.00001	-	-
27-May-20	548	-	-	<0.00003	-	-	<0.00003	-	-
24-Jun-20	-	-	77	-	-	<0.00003	-	-	<0.00003
30-Jun-20	-	-	78	-	-	<0.00003	-	-	<0.00003
8-Jul-20	-	-	79	-	-	<0.00003	-	-	<0.00003
15-Jul-20	-	-	76	-	-	0.000005	-	-	<0.00003
7-Sep-20	548	-	-	0.000005	-	-	0.000005	-	-
28-Sep-20	-	-	82	-	-	0.000005	-	-	0.000005
7-Oct-20	-	-	101	-	-	<0.00003	-	-	<0.00003
13-Oct-20	-	-	109	-	-	<0.00003	-	-	<0.00003
14-Oct-20	668	-	-	<0.00003	-	-	<0.00003	-	-
15-Oct-20	-	665	-	-	<0.00003	-	-	<0.00003	-
20-Oct-20	677	656	102	<0.00003	<0.00003	<0.00003	<0.00003	0.000005	<0.00003
21-Oct-20	626	550	98	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
28-Oct-20	677	697	96	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
4-Nov-20	665	657	121	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
11-Nov-20	-	689	95	-	<0.00003	<0.00003	-	<0.00003	<0.00003
18-Nov-20	-	-	105	-	-	<0.00003	-	-	<0.00003
25-Nov-20	-	-	112	-	-	<0.00003	-	-	<0.00003

Note: "-" denotes no sample.