



**Pinewood River Annual Terms of  
Reference and Biological Monitoring  
Report (2019)**

Prepared for:  
**New Gold Inc.**  
Emo, Ontario

Prepared by:  
**Minnow Environmental Inc.**  
Georgetown, Ontario

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# Pinewood River Annual Terms of Reference and Biological Monitoring Report (2019)

**Tyrell Worrall, M.Sc.**  
Project Manager

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<original signed by>

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**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.

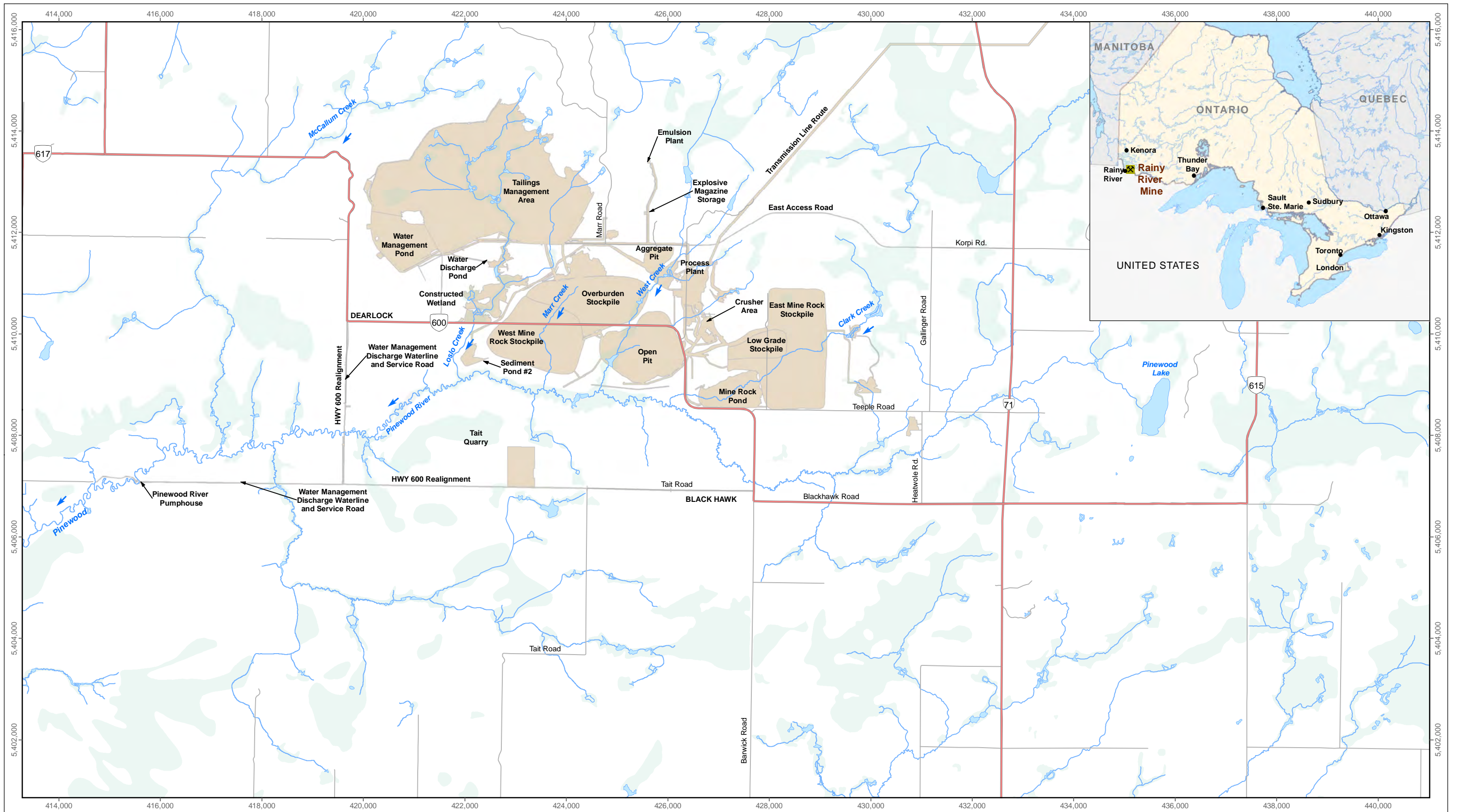
Earliest exploration of the Rainy River Project (RRP) began in 1967. Rainy River Resources Ltd. acquired the project in 2005 and began conducting baseline studies in 2008. The RRP was acquired by New Gold Inc. in 2013 and an Environmental Assessment (EA) report was submitted in 2014 (AMEC 2014). Site 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 future underground operation. The RRM was officially commissioned in September 2017.

## 1.2 Purpose and Objectives

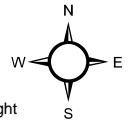
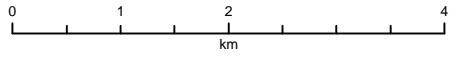
The annual biological monitoring of Pinewood River includes four components; monitoring of water levels, water concentrations of mercury and sulphate, fish community, and fish tissue mercury concentrations. The objective of this report is to summarize the results of associated monitoring in the Pinewood River in the vicinity of RRM for 2019.







**LEGEND**  
 Mine Infrastructure



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**Location and Layout, Rainy River Mine**

Date: March 2020  
 Project 197202.0045



**Figure 1.1**

## 2 METHODS

### 2.1 Pinewood River Annual Monitoring Overview

The Pinewood River Annual Biological Monitoring Program was conducted from July 16<sup>th</sup> to 23<sup>rd</sup>, 2019. 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), 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) #5178-9TUPD9 Condition 8(5)(7), ECA #5781-9VJQ2J Condition 10(5), 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 (formerly AMEC Foster Wheeler) to monitor water levels in the Pinewood River. Eight loggers were installed between June 10<sup>th</sup> and 14<sup>th</sup>, 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 3<sup>rd</sup> and 28<sup>th</sup>, 2020.

### 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 at arm's length 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.

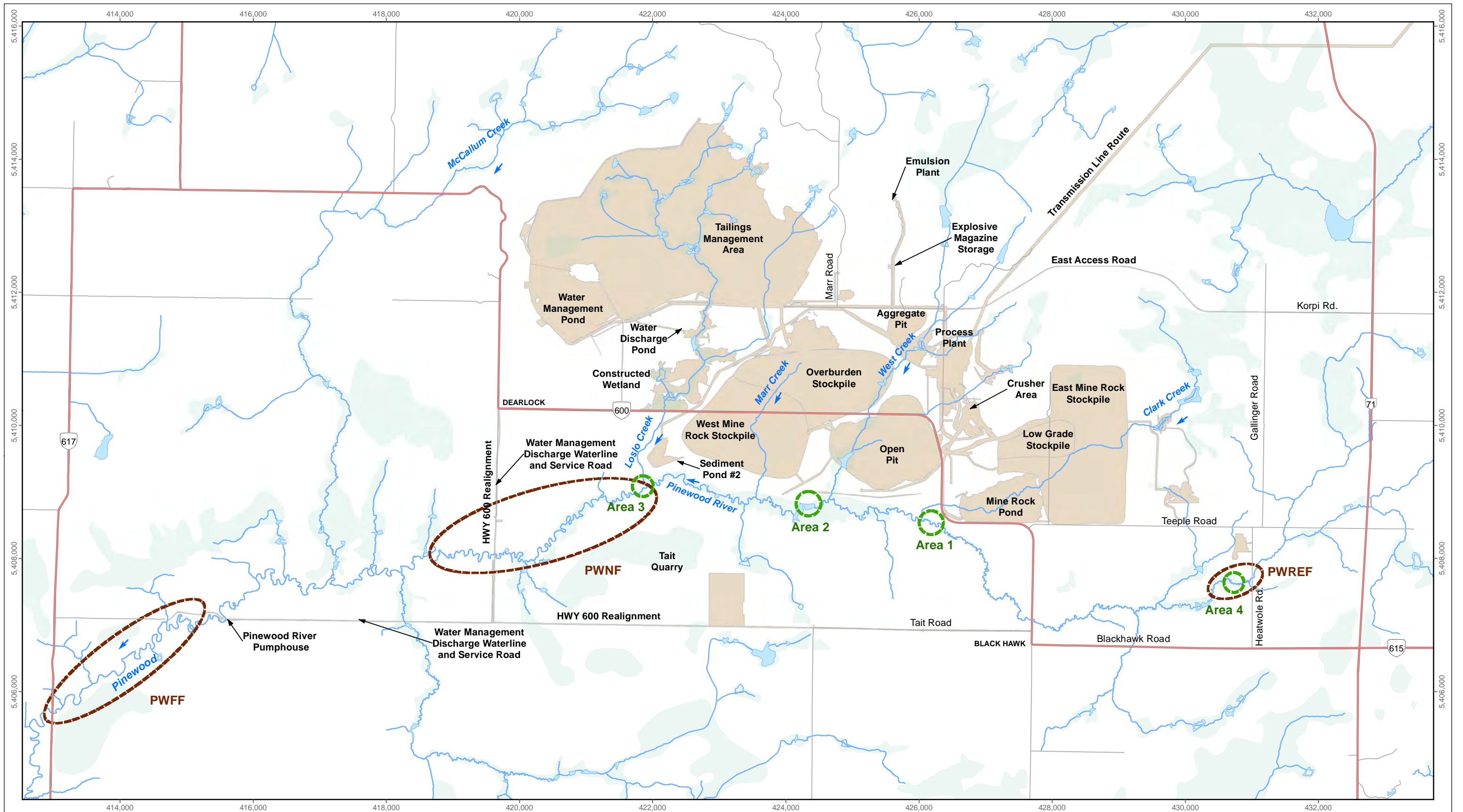







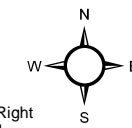
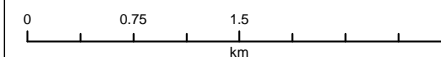
**Table 2.1: Components Associated with Annual Pinewood River Monitoring Plan**

Attribute	Monitoring Requirements	Report Schedule <sup>a</sup>
<b>Fish Habitat</b>	Water level measurements <sup>a</sup> per area (2 loggers per area, 1 for non-impounded [Type 1] habitat and 1 for impounded [Type 2] habitat).	Annual Monitoring Reports due to MECP and DFO on or before March 31
<b>Fish Species Presence, Life Cycle Usage, Abundance, and Tissue Quality</b>	Fish sampling will be conducted annually during the summer for 5 years.	
	Tissue quality sample size per area: 50 adult common shiner ( <i>Luxilus cornutus</i> ).	
	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.	

<sup>a</sup> Data collected by RRM and provided to Minnow for annual reports.



- LEGEND**
-  Water Level Logger
  -  Fish Sampling Location
  -  Mine Infrastructure



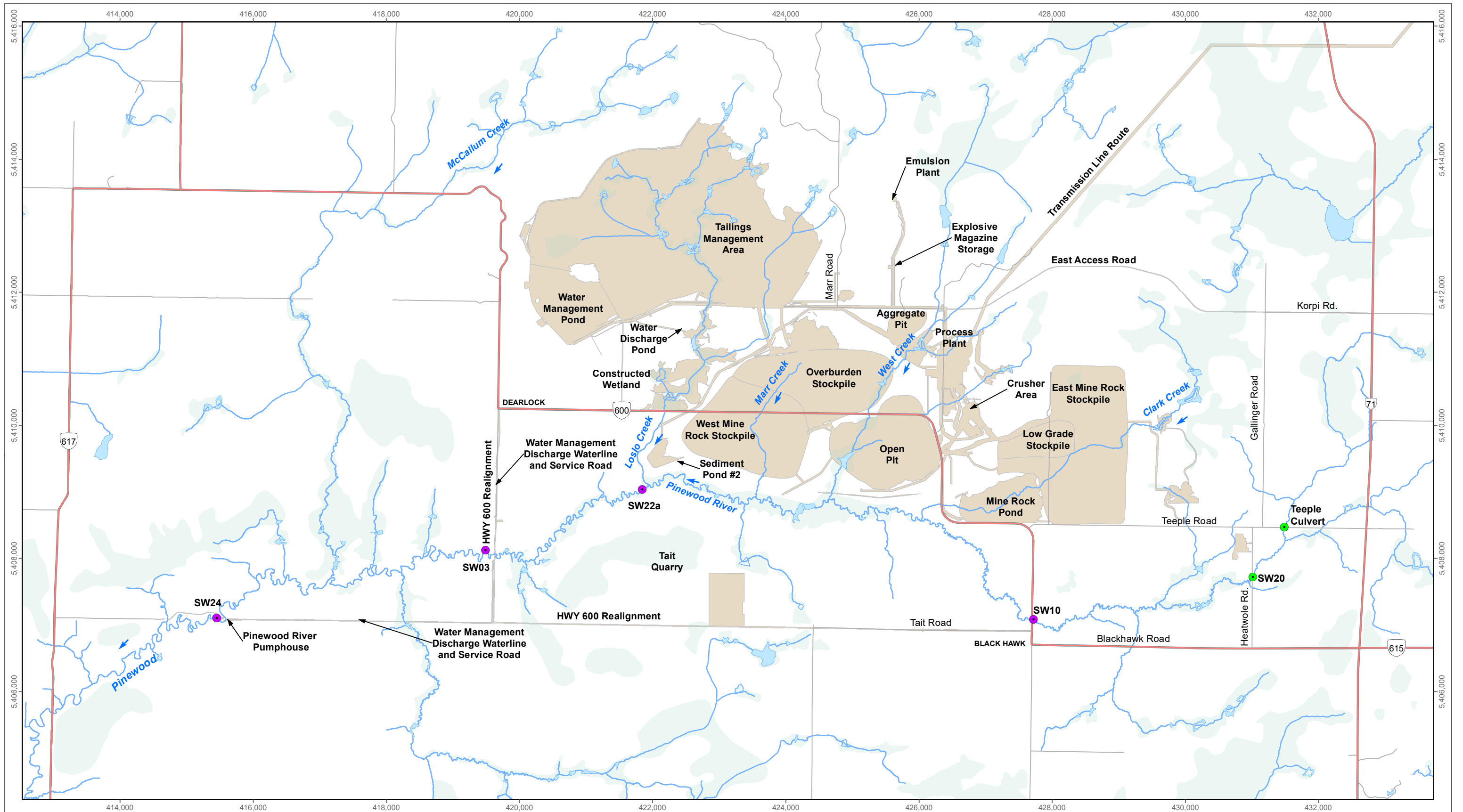
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**Water Level and Fish Community Study Locations, RRM 2019**

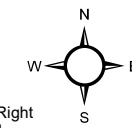
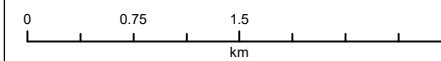
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 Project 197202.0045



**Figure 2.1**



- LEGEND**
- Surface Water Quality Monitoring Location**
- Exposed
  - Reference
  - Mine Infrastructure



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**Surface Water Quality Monitoring Locations**

Date: March 2020  
 Project 197202.0045



**Figure 2.2**

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, and 2019), and by comparison to water quality objectives for the protection of aquatic life. Provincial Water Quality Objectives (PWQO; OMOEE 1994), Canadian Water Quality Guidelines (CWQG; CCME 2017), and British Columbia Ministry of Environment & Climate Change Strategy water quality guidelines (BCMECCS 2019) were considered in the evaluation of surface water quality data.

### 2.4 Fish Community Survey

Fish sampling was performed under an Ontario Ministry of Natural Resources and Forestry License to Collect Fish for Scientific Purposes (Licence No. 1093597; 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<sup>1</sup>; 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 stream (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.

### 2.5 Fish Tissue Quality Survey

Brook stickleback (*Culaea inconstans*) were the target fish species in the original study design (AMEC 2016a,b), however due to low capture numbers, common shiner (*Luxilus cornutus*) was selected as the alternative species. 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

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<sup>1</sup> 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.





to the nearest milligram. Otoliths (heads) were collected from each sacrificed fish for the determination of age. Headless body samples were collected from each fish, 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. Of note, the tissue samples from the reference area (PWREF) were lost, these samples were accidentally left out of the freezer and subsequently degraded beyond use.

### 2.5.1 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. Mercury concentrations could not be compared to previous studies as different sentinel species were chosen for each study (AMEC 2018b).

A statistical comparison of mercury tissue concentration in near-field and far-field areas was conducted using Analysis of Covariance (ANCOVA), with log<sub>10</sub>-transformed mercury tissue concentration (wet weight) as the response variable, Area as a factor, and log<sub>10</sub>-transformed Fork Length as a covariate. Both 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:

$$\text{MOD} = ((\text{MCTexp1} - \text{MCTexp2}) / \text{MCTexp2}) * 100,$$



where MCTexp1 and MCTexp2 are the predicted geometric mean mercury tissue concentrations at the near-field and far-field exposed areas respectively.





## 3 RESULTS

### 3.1 Water Level

#### 3.1.1 Non-impounded Habitat (Type 1)

The non-impounded habitat water levels showed predictable responses to precipitation throughout the year (Figure 3.1). Area 4 is the upstream reference area (Figure 3.1) and is therefore located furthest upstream in the watershed and thus has lower base flow than downstream areas due to a smaller watershed area. Conversely, Area 3 is the furthest downstream, and therefore receives more surface runoff which contributes to higher water levels at this station. Area 3 showed the greatest fluctuations of the areas, while Areas 1 and 4 showed similar water levels throughout the year<sup>2</sup>. As was the case in 2017, these water level results suggest 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 2019 (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, which was not quantified. Like the non-impounded water levels, Area 3 had the greatest fluctuations with Areas 1 and 2 having 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 areas show similar water level fluctuations and responses to precipitation events albeit less pronounced than the non-impounded habitat from each area.

### 3.2 Water Quality

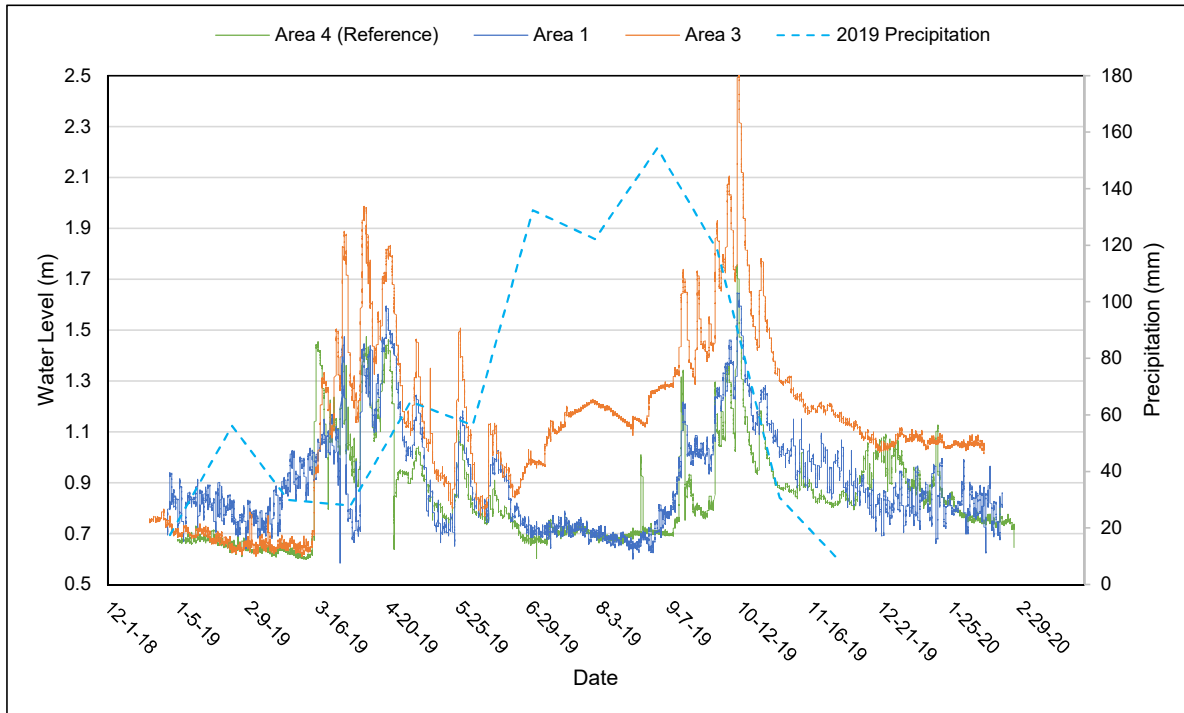
Pinewood River mercury concentrations (total, dissolved, and methyl) downstream of the mine were similar to upstream reference areas in 2019 (Figure 3.2). The majority of total and dissolved mercury concentrations were below method detection limits for all areas (Figure 3.2; Appendix Table A.11). All mercury concentrations were much lower than respective water quality criteria. The water quality data suggests there is no evidence of increased mercury concentrations within the Pinewood River associated with mine-activities.

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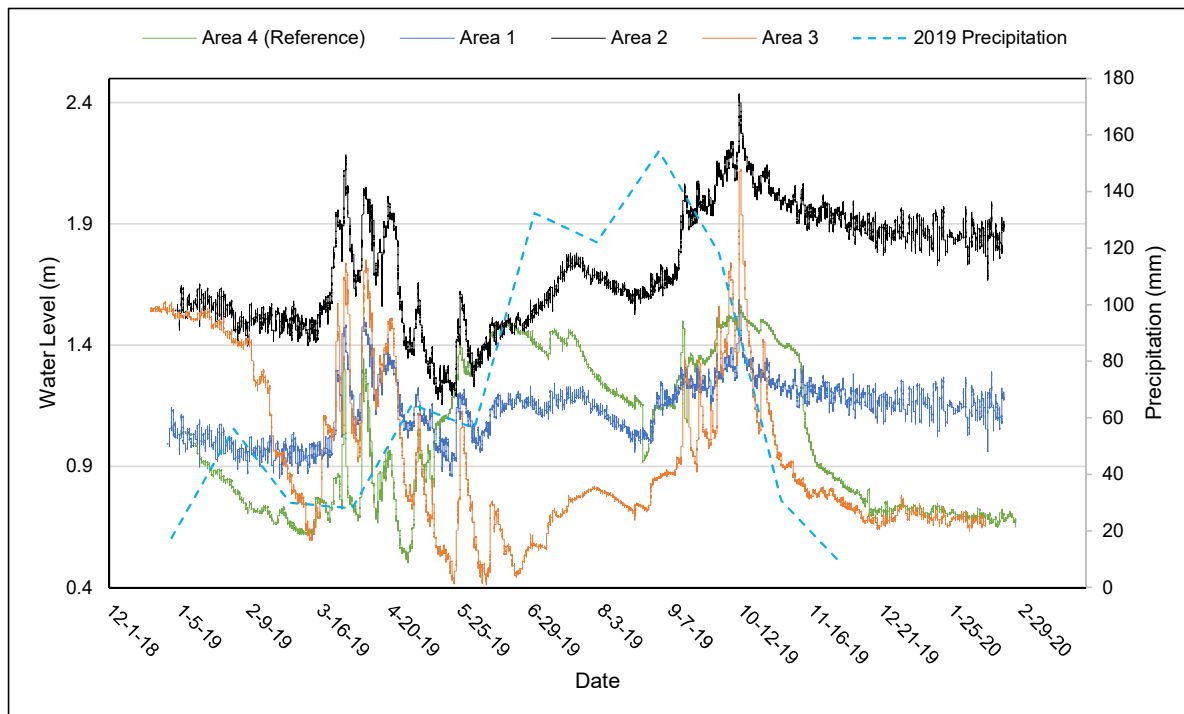
<sup>2</sup> The water level logger for the Area 2 non-impounded (Type 1) habitat was lost during the 2019 winter and therefore no data were plotted.



**a) Non-impounded Habitat (Type 1)**

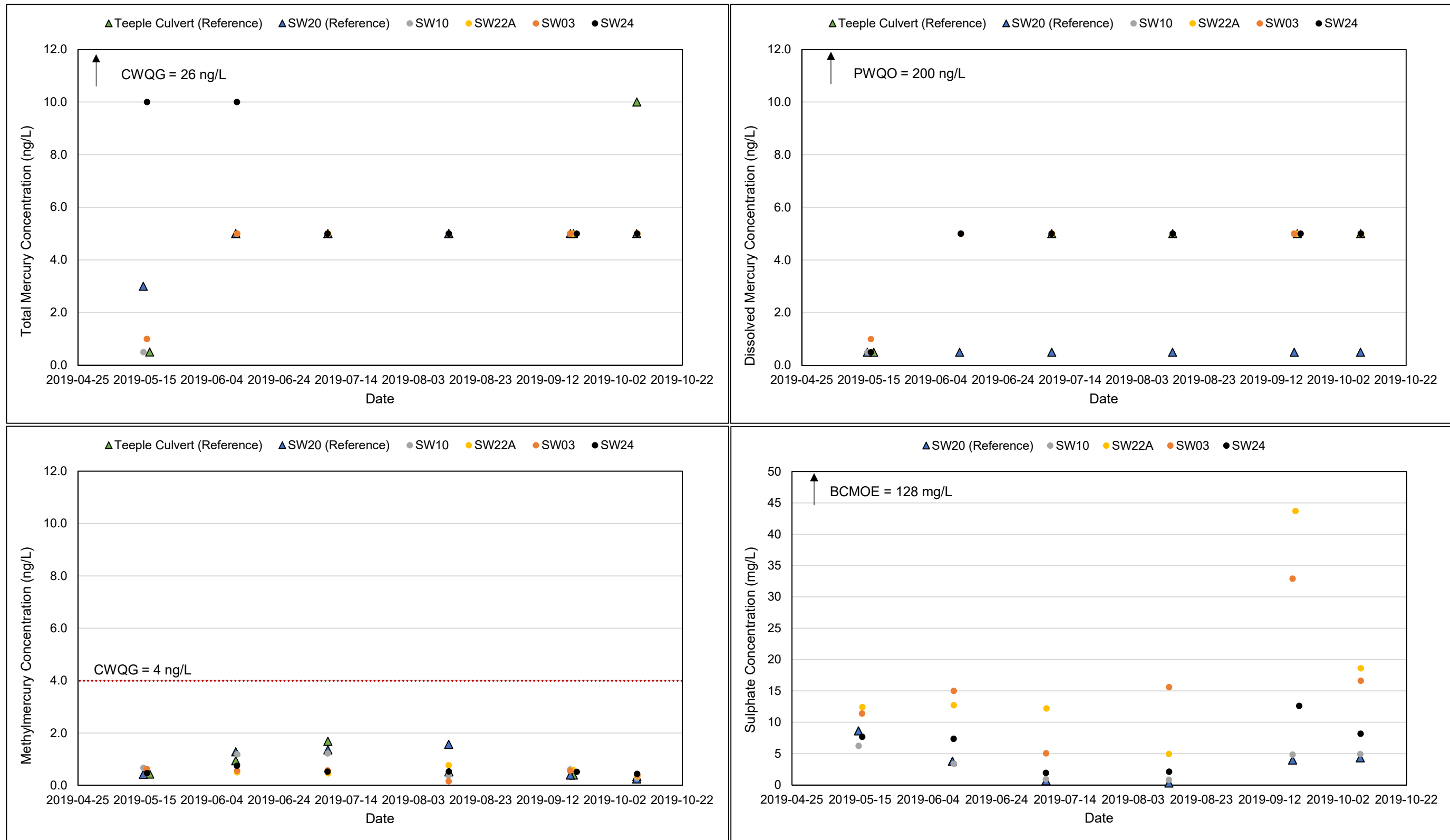


**b) Impounded Habitat (Type 2)**



**Figure 3.1: Water Levels in the Pinewood River for a) Non-impounded (Type 1) and b) Impounded (Type 2) Habitat, RRM 2019**

Note: The Area 2 non-impounded habitat level logger was lost during the winter therefore level data was not plotted.



**Figure 3.2: Surface Water Concentrations of Select Analytes in the Pinewood River, RRM 2019**

Note: Teeple Culvert was not sampled for sulphate in 2019.

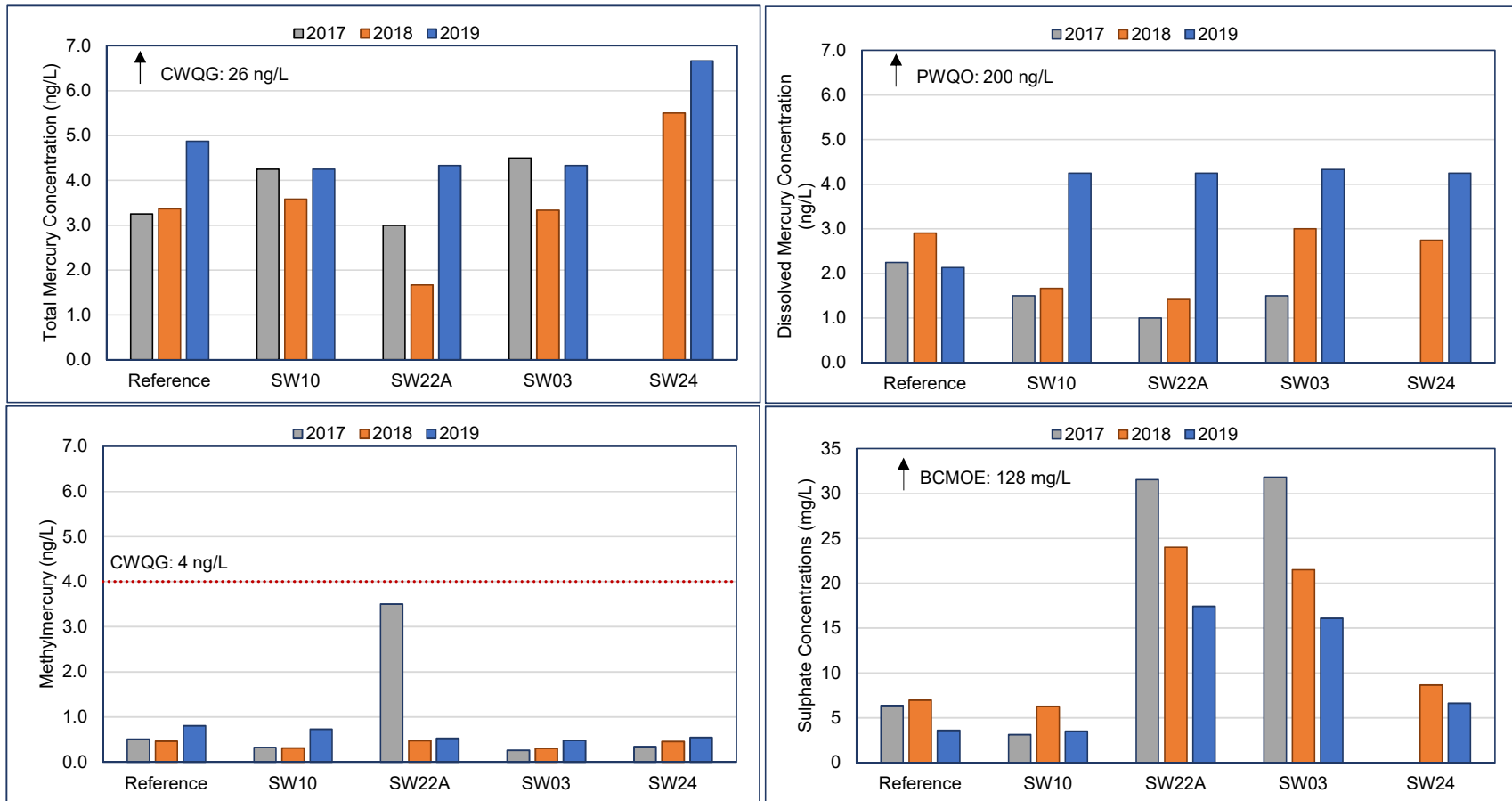
Sulphate concentrations were generally elevated downstream of the mine compared to the upstream reference areas; however, these concentrations were low compared to conservative water quality guidelines (128 mg/L; Figure 3.2; BCMECCS). Although there is evidence of increased sulphate concentrations within the Pinewood River downstream of RRM in 2019, these concentrations were low compared to guidelines (Figure 3.2).

The 2019 annual mean surface water mercury (total, dissolved and methyl) and sulphate concentrations were compared to 2018 and 2017 data (Figure 3.3). Comparison with previous data showed that 2019 mercury concentrations in surface water have generally remained within the 2017 and 2018 range, but that dissolved mercury concentrations were slightly elevated in 2019 (Figure 3.3.). However, concentrations in all years were much lower than water quality criteria, with most values below method detection levels (Figure 3.3; Appendix Table A.11). The cause of the apparent slight elevation in dissolved mercury concentrations over time was a higher method detection limit in 2019 compared to previous years (Appendix Table A.11). Sulphate concentrations decreased consecutively from 2017 to 2019, with all concentrations lower than water quality guidelines (Figure 3.3). Overall, 2019 surface water concentrations of select analytes were comparable to previous years and were well below respective water quality objectives/guidelines, with the majority of 2019 mercury concentrations below detectable levels (Appendix Table A.11), indicating that RRM has not increased mercury concentrations in Pinewood River downstream of mine-activities during this time period. Sulphate concentrations were elevated in the Pinewood River downstream of the mine but have decreased during this time period and remain low compared to guidelines.

### 3.3 Fish Community

A total of 1,990 fish representing 13 species were captured at PWREF, including brook stickleback (*Culaea inconstans*), northern redbelly dace (*Chrosomus eos*), common shiner (*Luxilus cornutus*), white sucker (*Catostomus commersonii*), creek chub (*Semotilus atromaculatus*), brassy minnow (*Hybognathus hankinsoni*), pearl dace (*Margariscus margarita*), central mudminnow (*Umbra limi*), finescale dace (*Chrosomus neogaeus*), mimic shiner (*Notropis volucellus*), fathead minnow (*Pimephales promelas*), eastern blacknose dace (*Rhinichthys atratulus*), and golden shiner (*Notemigonus crysoleucas*; Table 3.1; Appendix Table A.1). Fishing CPUEs for PWREF were 4.08 fish captured per gill net hour, 0.06 fish captured per second of electrofishing effort, 141.33 fish captured per seine net haul, and 0.06 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 2019 survey (Appendix Figure A.1).





**Figure 3.3: Mean Annual Surface Water Concentrations of Select Analytes in the Pinewood River, 2017 to 2019**

Note: Reference mean values are Teeple Culvert and SW20 surface water concentrations combined.

**Table 3.1: Fish Species Capture Summary During Pinewood River Annual Monitoring, RRM 2019**

**Total Catch**

Area	Blacknose Dace	Blackside Darter	Brassy Minnow	Brook Stickleback	Brown Bullhead	Central Mudminnow	Common Shiner
Pinewood River Reference Area	8	0	49	478	0	40	82
Pinewood River Near-field Area	5	3	6	7	81	50	112
Pinewood River Far-field Area	0	66	72	4	0	24	51

Area	Creek Chub	Cyprinid sp. (Juvenile)	Fathead Minnow	Finescale Dace	Golden Shiner	Johnny Darter	Mimic Shiner
Pinewood River Reference Area	55	898	12	35	3	0	20
Pinewood River Near-field Area	55	1	0	0	53	17	0
Pinewood River Far-field Area	3	46	41	0	12	293	3

Area	Northern Pike	Northern Redbelly Dace	Pearl Dace	Rock Bass	Trout Perch	White Sucker
Pinewood River Reference Area	0	193	42	0	0	68
Pinewood River Near-field Area	56	0	0	0	8	98
Pinewood River Far-field Area	7	6	0	1	126	127



A total of 517 fish representing 13 species were captured at PWNF including, common shiner, white sucker, brown bullhead (*Ameiurus nebulosus*), northern pike (*Esox Lucius*), creek chub, golden shiner, central mudminnow, johnny darter (*Etheostoma nigrum*), trout-perch (*Percopsis omiscomaycus*), brook stickleback, brassy minnow, eastern blacknose dace, and blackside darter (*Percina maculate*; Table 3.1; Appendix Table A.2). Fishing CPUEs for PWNF were 0.19 fish captured per gill net hour, 0.02 fish captured per second of electrofishing effort, 20.31 fish captured per seine net haul, and 0.02 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 2019 survey (Appendix Figure A.2).

A total of 882 fish representing 15 species were captured at PWFF, including johnny darter, white sucker, trout-perch, brassy minnow, blackside darter, common shiner, fathead minnow, central mudminnow, golden shiner, northern pike, northern redbelly dace, brook stickleback, creek chub, mimic shiner, and rock bass (*Ambloplites rupestris*; Table 3.1; Appendix Table A.3). Fishing CPUEs for PWFF were 0.08 fish captured per gill net hour, 0.03 fish captured per second of electrofishing effort, 47.06 fish captured per seine net haul, and 0.01 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 2019 survey (Appendix Figure A.3).

2019 fishing effort and capture data were compared to the 2017 results (no fishing was completed in 2018). Comparison with previous data showed that overall more fish were captured in 2019 with greater CPUE for all methods except minnow trapping compared to the 2017 results (Table 3.2). Despite a greater number of fish captured in 2019, species richness was similar between years (Table 3.2).

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 both the 2017 and 2019 surveys indicating minimal impact to the resident fish communities of the Pinewood River by operation of RRM.

### 3.4 Fish Tissue Quality

Up until May 2018 (when RRM ceased effluent discharge until September 2019), there had been no detectable mercury concentrations in effluent and receiving water quality samples (Minnow 2019), suggesting that effluent may not meaningfully contribute to mercury accumulation in Pinewood River fish. 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).



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

Area <sup>a</sup>	Gill Netting					
	Effort (hours)		Total Catch		CPUE (no. fish/hour)	
	2017	2019	2017	2019	2017	2019
PWREF	81	117	16	476	0.22	4.08
PWNF	96	129	4	24	0.04	0.19
PWFF	-	77	-	6	-	0.08

Area <sup>a</sup>	Electrofishing					
	Effort (seconds)		Total Catch		CPUE (no. fish/second)	
	2017	2019	2017	2019	2017	2019
PWREF	3,030	3,000	57	185	0.02	0.06
PWNF	6,108	5,510	10	85	0.002	0.02
PWFF	-	3,002	-	99	-	0.03

Area <sup>a</sup>	Seine Netting					
	Effort (hauls)		Total Catch		CPUE (no. fish/haul)	
	2017	2019	2017	2019	2017	2019
PWREF	9	9	201	1,272	22.33	141.33
PWNF	9	16	19	325	2.11	20.31
PWFF	-	16	-	753	-	47.06

Area	Minnow Trapping					
	Effort (hours)		Total Catch		CPUE (no. fish/hour)	
	2017	2019	2017	2019	2017	2019
PWREF	659	971	360	57	0.55	0.06
PWNF	622	3,480	18	83	0.03	0.02
PWFF	-	1,644	-	14	-	0.01

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

<sup>a</sup> PWREF denotes Pinewood River Reference Area, PWNF denotes Pinewood River Near-field Area, and

Methylated mercury is biomagnified through the food chain resulting in elevated concentrations in predatory fish species such as northern pike and walleye (Evers et al. 2011; Kidd and Batchelar 2012). In addition, methylated mercury 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).

Common shiner whole body tissue collected in 2019 contained an average mercury concentration below consumption guidelines (Table 3.3; Figure 3.4). However, fifteen common shiners from PWNF had mercury concentrations above consumption guidelines for vulnerable populations (0.5 mg/kg; Figure 3.4; Appendix Tables A.4 to A.6). Despite these exceptions, all mercury concentrations in muscle tissue were well below the complete consumption restriction level for the general population (1.8 mg/kg; Figure 3.4; MECP 2015). There was a significant interaction between PWNF and PWFF where tissue mercury concentrations were higher at PWNF than at PWFF for small common shiner but were more similar for larger ones (Table 3.4; Figure 3.5). Unexpectedly, tissue concentrations decreased with fork length for PWNF, but the opposite was observed at PWFF where tissue mercury concentrations increased with size, which is the expected relationship, these results were divergent. Although mercury concentrations were significantly higher in fish closer to the mine (PWNF), a large majority (70%) of common shiner captured at PWNF had mercury concentrations 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 these increased concentrations due to very low 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 2019 mercury concentrations in muscle cannot be compared to 2017 data (no fishing occurred in 2018; AMEC 2018b), as different species were sampled for each survey (i.e., brook stickleback in 2017 and common shiner in 2019).



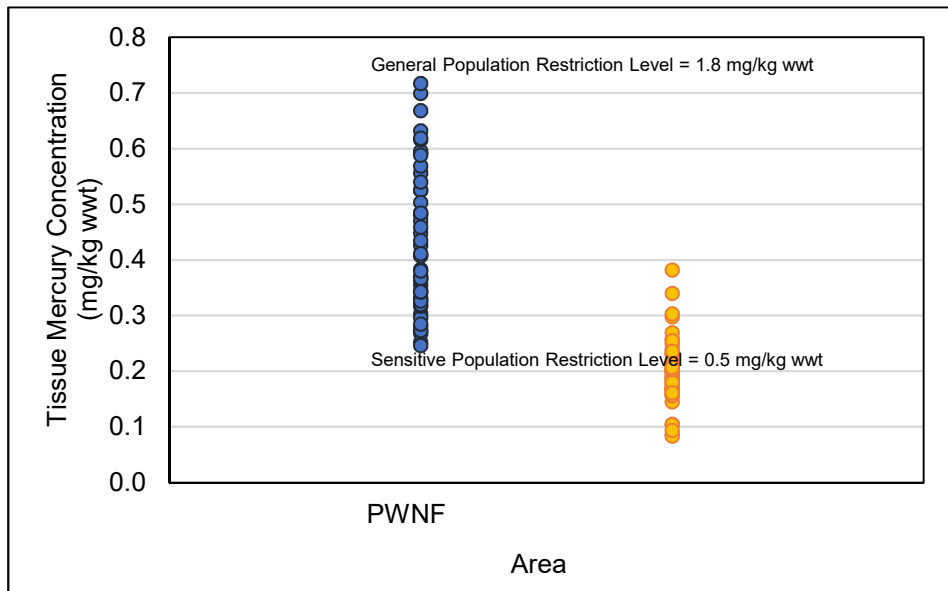
**Table 3.3: Summary of Common Shiner Whole Body Mercury Concentrations (mg/kg ww) in the Upper Pinewood River, RRM 2019**

Area <sup>a</sup>	Minimum	Maximum	Mean	Standard Error
	2019	2019	2019	2019
PWREF <sup>b</sup>	-	-	-	-
PWNF	0.246	0.717	0.432	0.018
PWFF	0.084	0.382	0.198	0.008

Note: "-" indicates no samples for PWREF.

<sup>a</sup> PWREF denotes Pinewood River Reference Area, PWNF denotes Pinewood River Near-field Area, and PWFF denotes Pinewood River Far-field Area.

<sup>b</sup> PWREF fish tissue samples were lost in 2019.



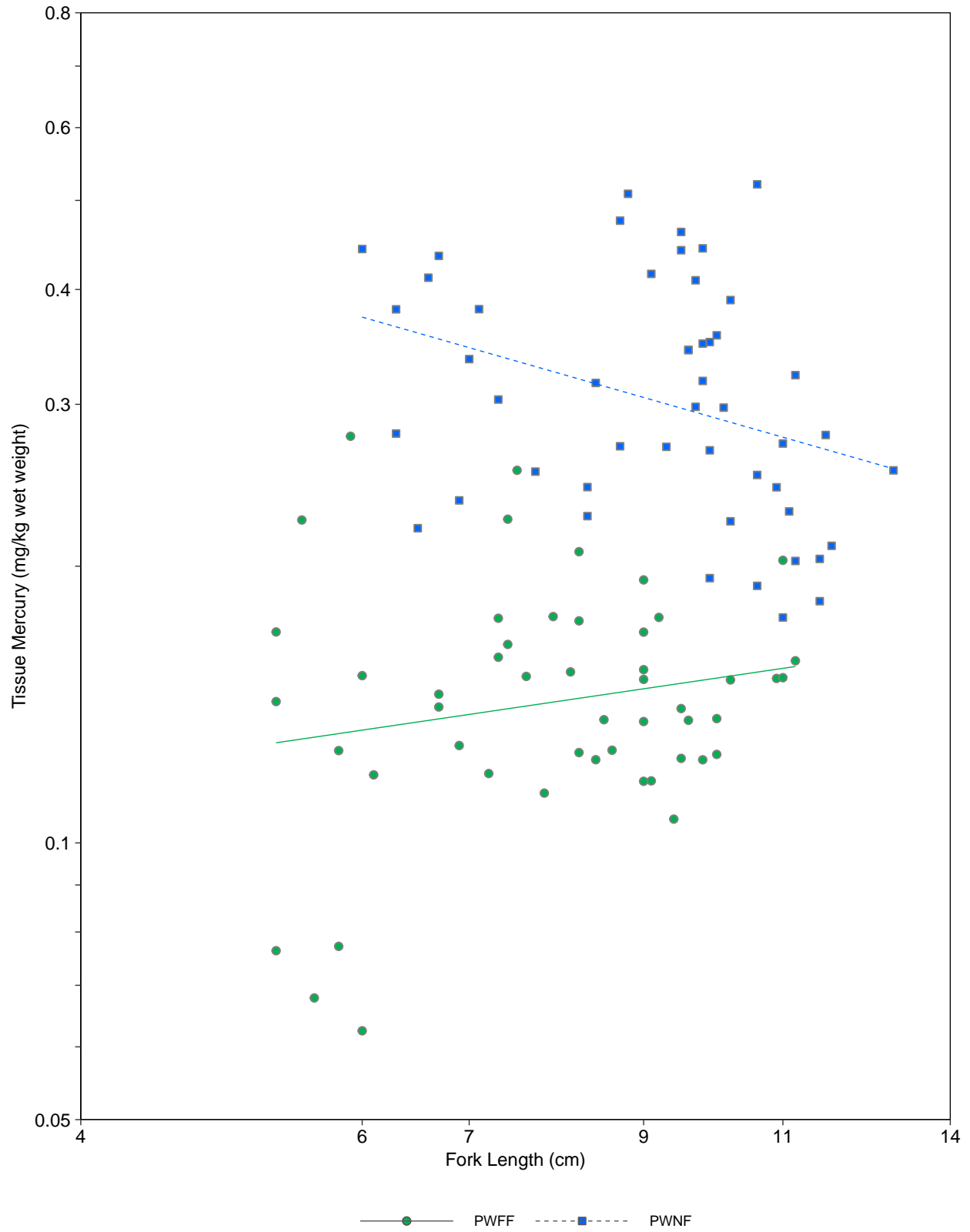
**Figure 3.4: Whole Body Mercury Concentrations for Common Shiner Captured at Pinewood River Mine-exposed areas, RRM 2019**

**Table 3.4: ANCOVA Results Comparing Whole Body Tissue Mercury Concentrations (wet weight) in Common Shiners between Pinewood River Far-field (PWFF) and Pinewood River Near-field (PWNF) Areas, RRM 2019**

ANCOVA Results			Fork Length Low Range (mean = 6.00)			Fork Length High Range (mean = 11.2)		
Test	Variable	P-value	Geometric Mean		MOD (%)	Geometric Mean		MOD (%)
			PWFF	PWNF		PWFF	PWNF	
ANCOVA	Area	-	0.133	0.373	181	0.156	0.274	76
	Fork Length	-						
	Area*Fork Length	0.010						

 P-Value < 0.05

Notes: No comparison to Pinewood Reference Area was completed due to lost tissue samples, "-" indicates you can add a note: factor p-values not shown when interaction is significant.



**Figure 3.5: Relationship Between Fork Length and Tissue Mercury Concentration in Common Shiners, RRM, 2019**



## 4 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 Conclusions

Conclusions of the 2019 Pinewood River Annual Biological Monitoring Program are listed below.

1. Water levels were similar among mine-exposed and upstream reference areas and consistently responded in a similar way to precipitation among areas indicating minimal impact on Pinewood River flows in the vicinity of the mine.
2. Surface water mercury (total, dissolved, and methyl) concentrations were similar among mine-exposed areas and upstream reference areas with all concentrations below respective water quality criteria. Although surface water mercury concentrations appear to be increasing over time, this is an artifact associated with an increased method detection limit for water samples collected in 2019 compared to previous years. Surface water sulphate concentrations were elevated downstream of mine-activities compared to reference areas; however, concentrations were well below guidelines and are decreasing over time.
3. Fish communities and catchability (CPUE) in 2019 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 2019 compared with 2017. Fish community composition was similar to 2017 for sampled areas.
4. Common shiner mean whole body tissue samples contained mercury concentrations that were below available human consumption benchmarks (although it is not assumed nor recommended that common shiner be consumed). However, although mean mercury concentrations were below benchmarks, mercury concentrations in fifteen individuals exceeded the most conservative benchmark for sensitive populations (0.5 mg/kg ww).
5. Whole body mercury concentrations were significantly greater for PWNF common shiners relative to PWFF (181%) when individuals at the lower end of fork length (covariate) distribution were compared. When commons shiners of the upper end of fork length were compared, there was a smaller difference compared to PWFF (76%). This therefore indicates whole body mercury concentration results were dependent on fish size. These opposing results between tissue mercury concentrations and fork length made these findings equivocal. Notably, mercury concentrations in tissue of fish are often naturally high in northern environments (Evers et al. 2011) and these results do not indicate that the RRM has influenced fish tissue quality. Based on comparisons to human



consumption benchmarks, 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, fish community abundance and composition, and common shiner tissue mercury concentrations in Pinewood River in the vicinity of RRM. There is evidence suggesting upstream mine-activities have increased surface water sulphate concentrations downstream of the mine, however, these concentrations were well below guidelines and are decreasing over the 2017 to 2019 time period.

#### **4.2 Recommendations**

Based on information acquired during the 2019 Annual Pinewood River Monitoring Study, recommendations for future monitoring include:

1. Install a new water level logger at Area 2 non-impounded habitat to replace the lost monitoring instrument.
2. Continue monitoring of common shiner whole body mercury concentrations. This will allow for consistent year to year comparisons.
3. Submit tissue samples to analytical laboratory directly after monitoring survey is completed to eliminate any potential for sample loss.



## 5 REFERENCES

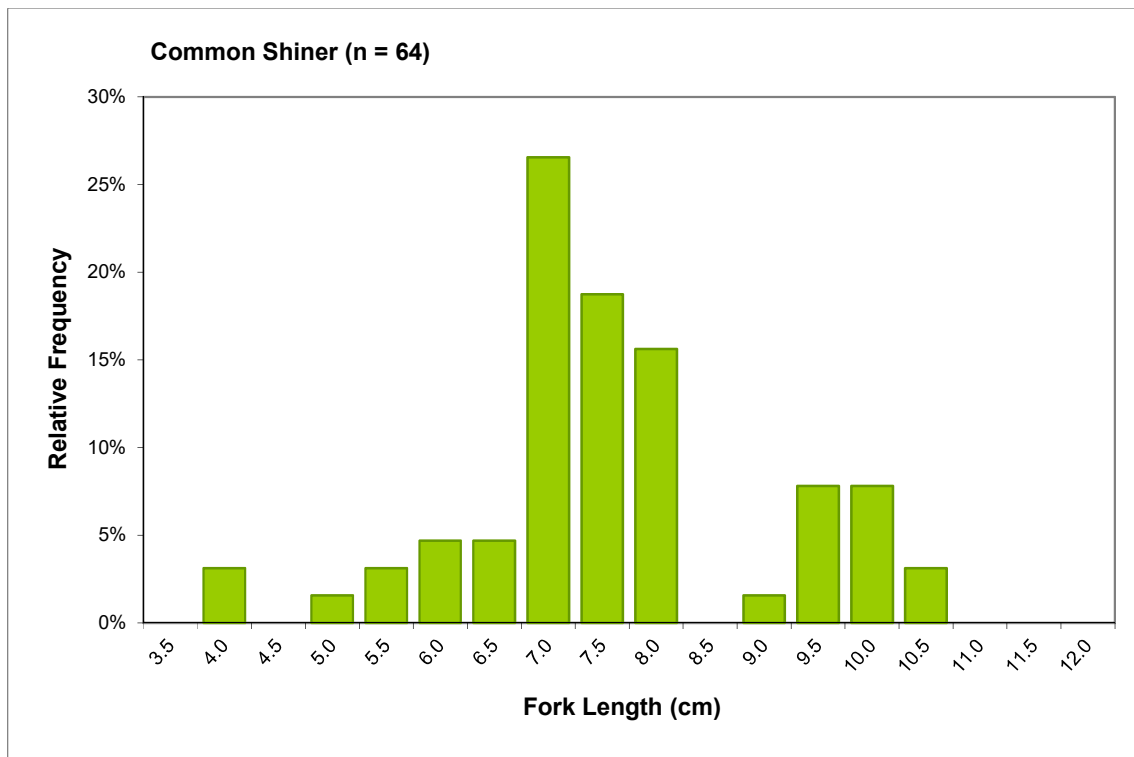
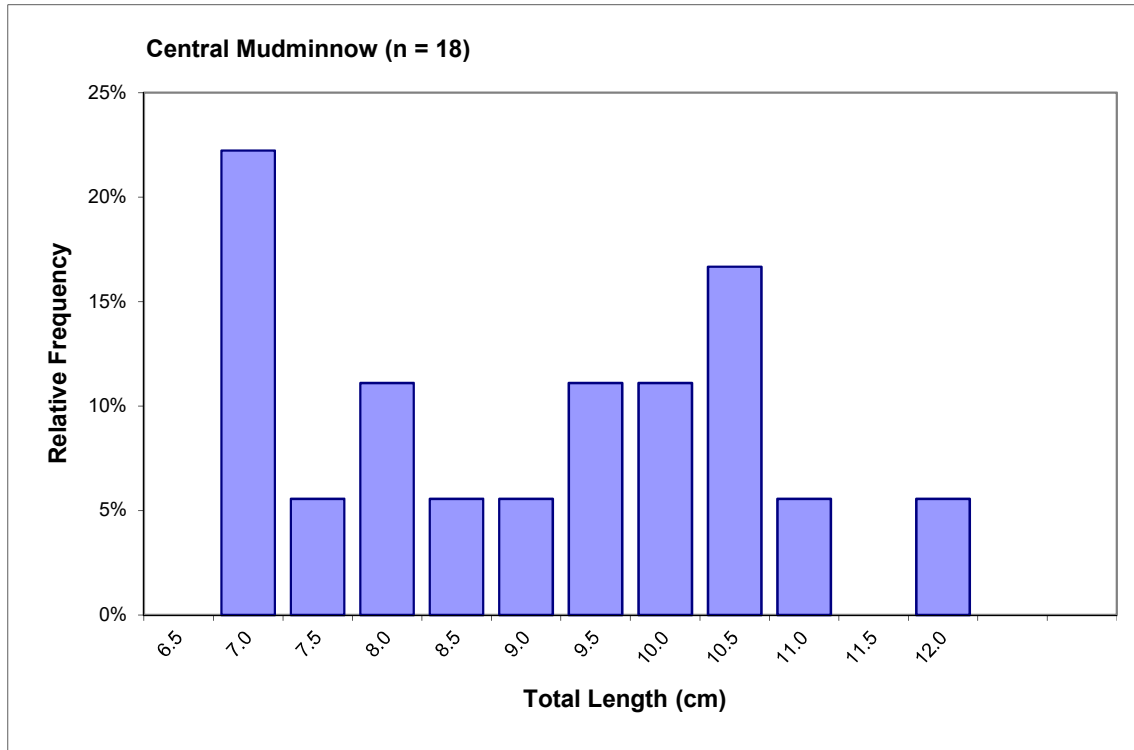
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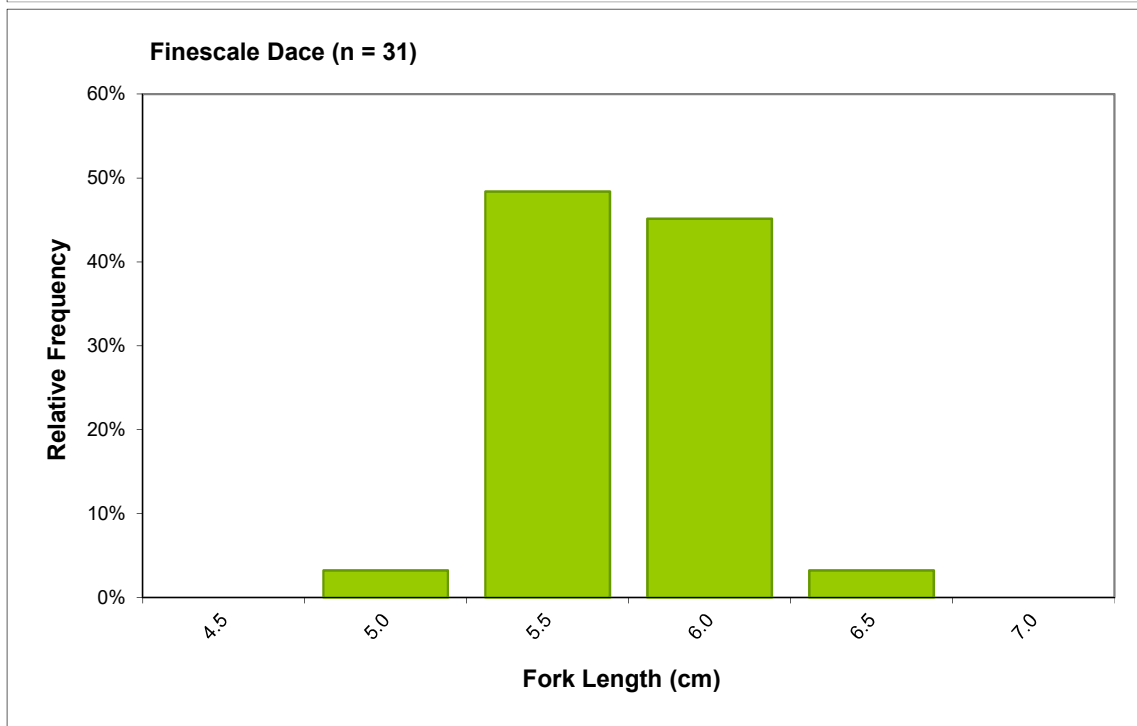
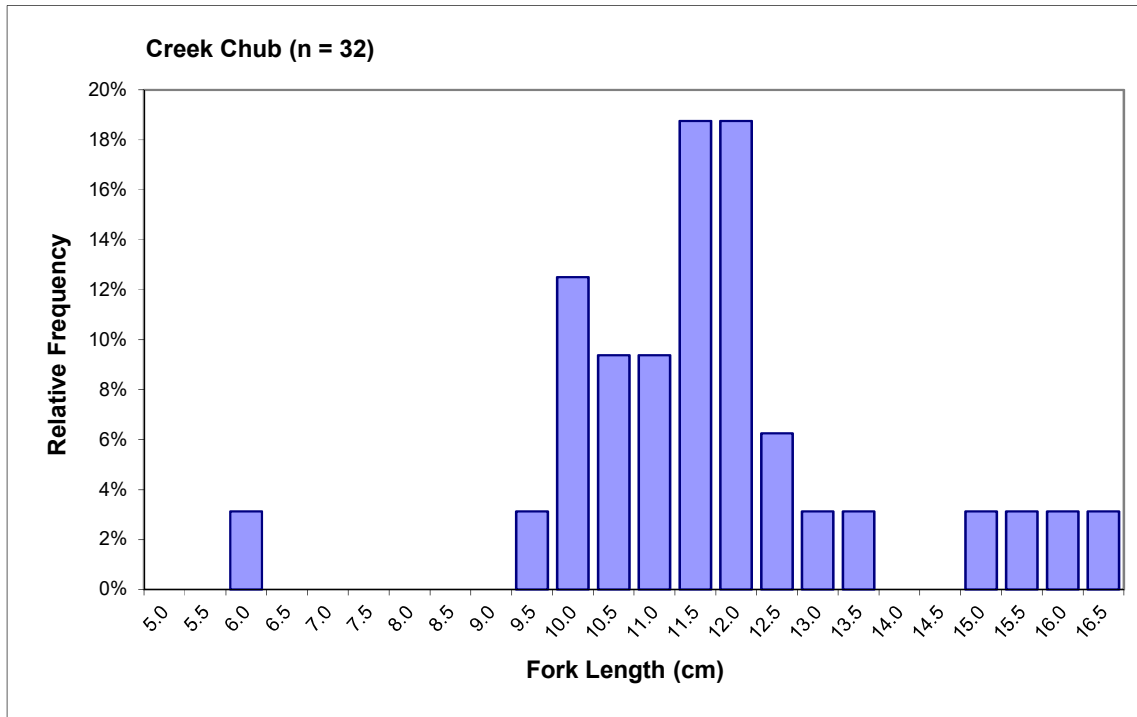
**APPENDIX A  
DETAILED DATA**



**Appendix Figure A.1: Length-frequency Distributions for Fish Collected at Pinewood River Reference Area (PWREF), RRM 2019**

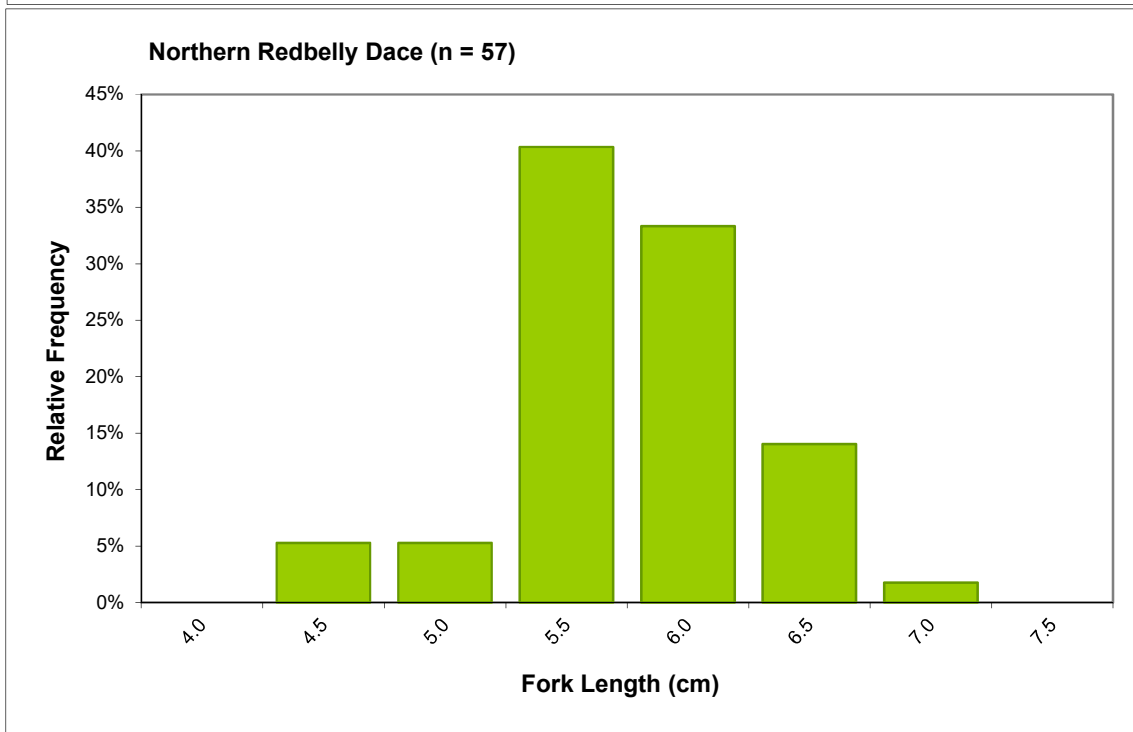
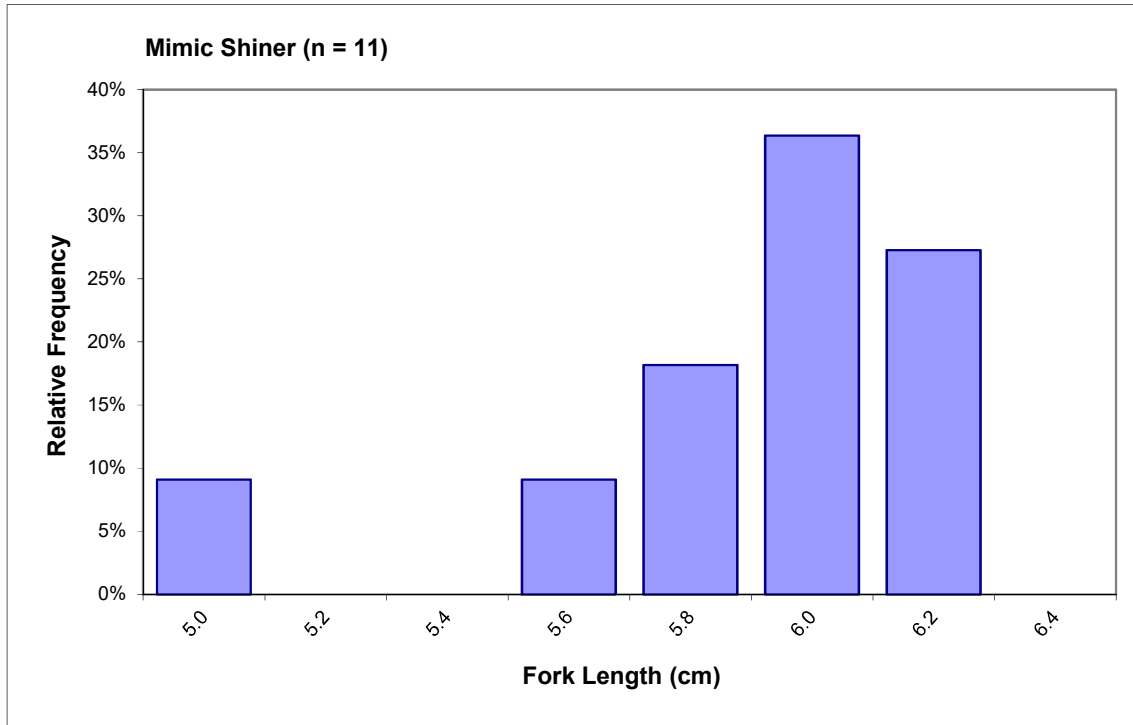
Note: Brassy Minnow (n=3), golden shiner (n=3), and white sucker (n=3) not plotted due to low capture numbers.





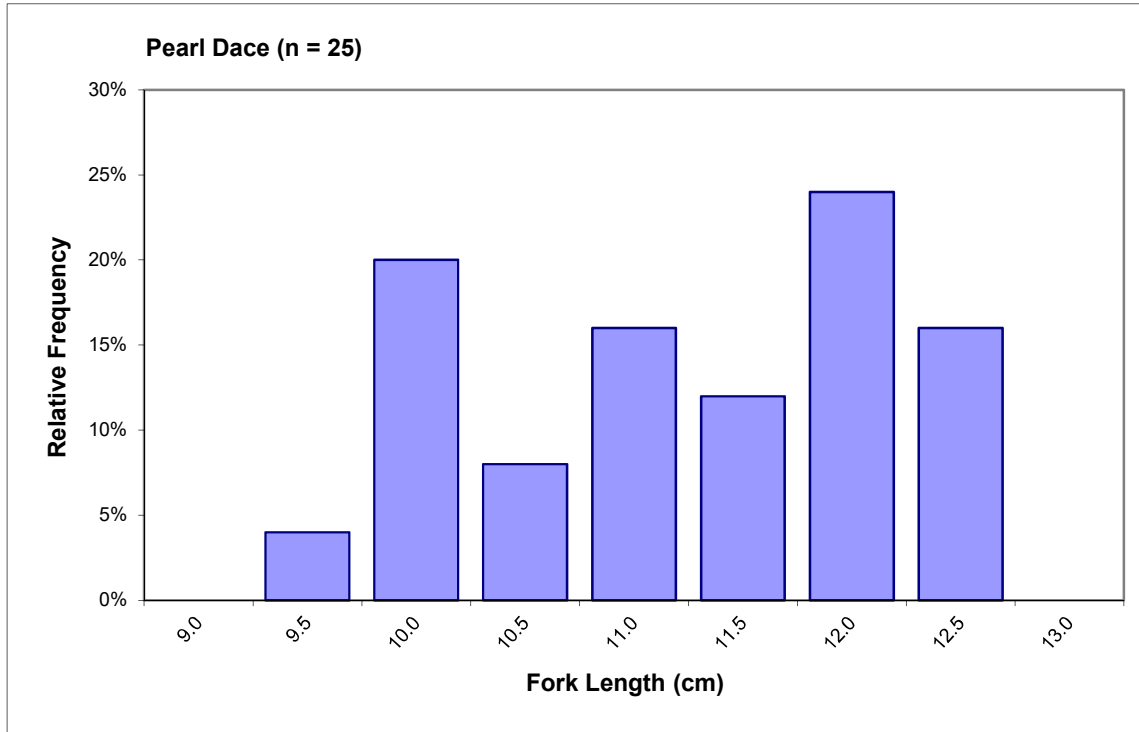
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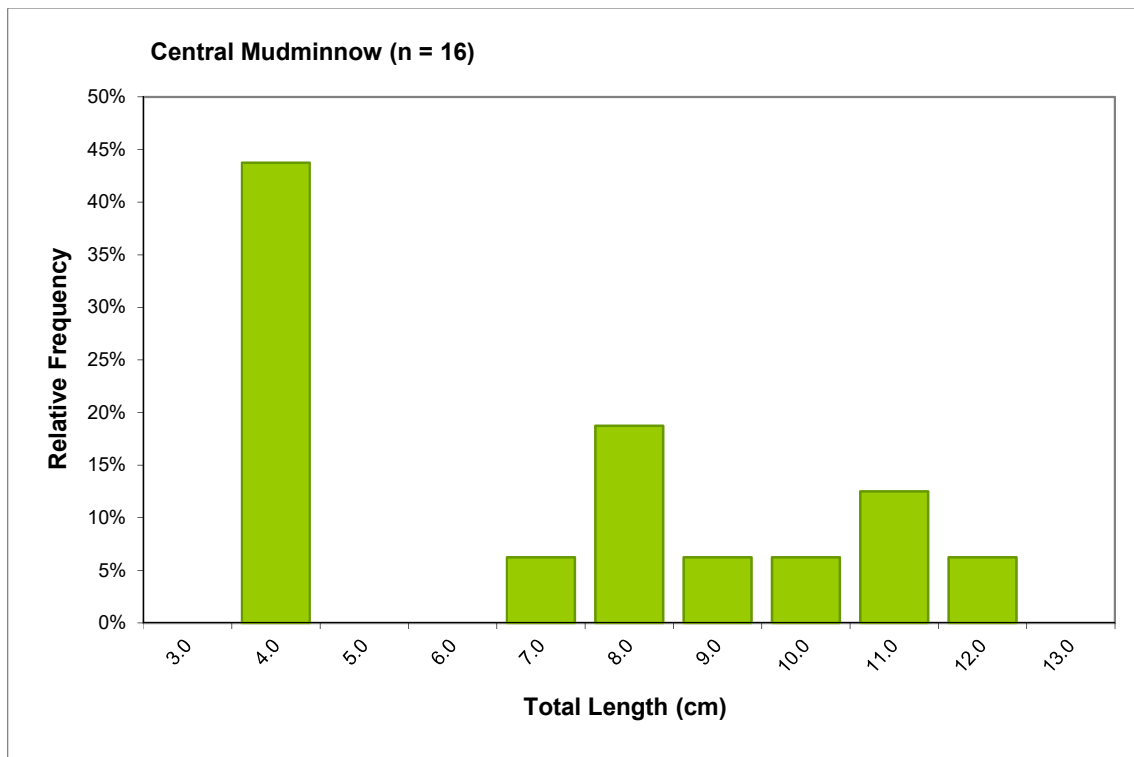
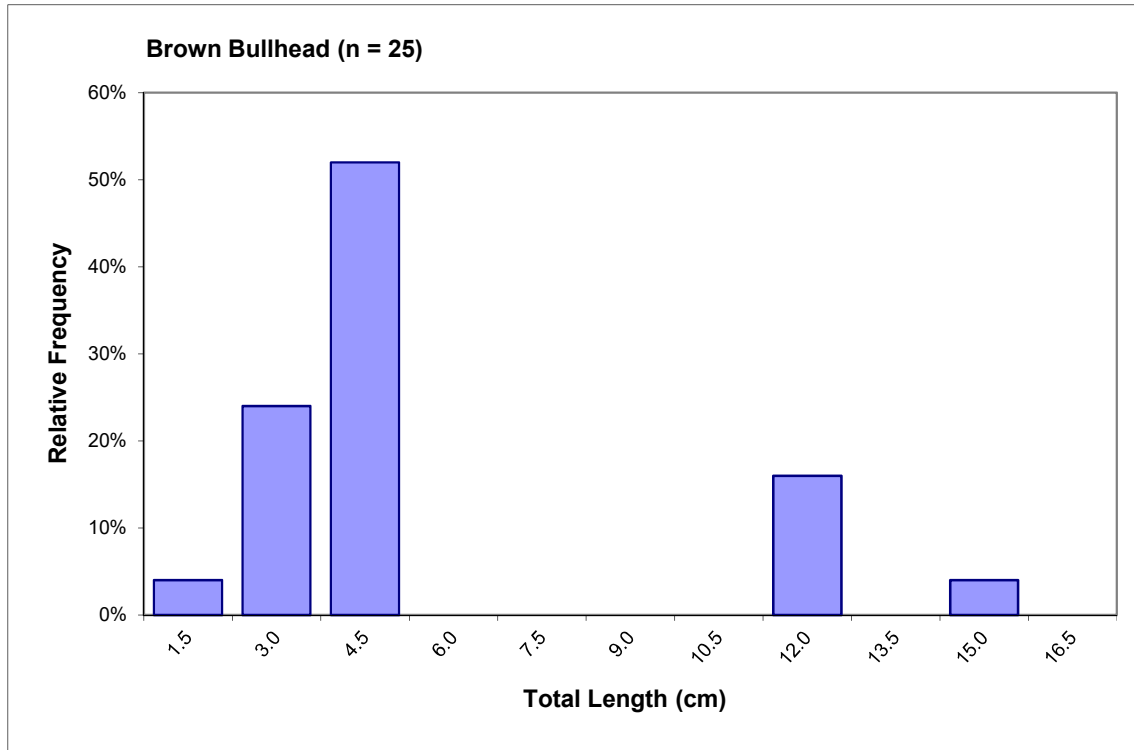
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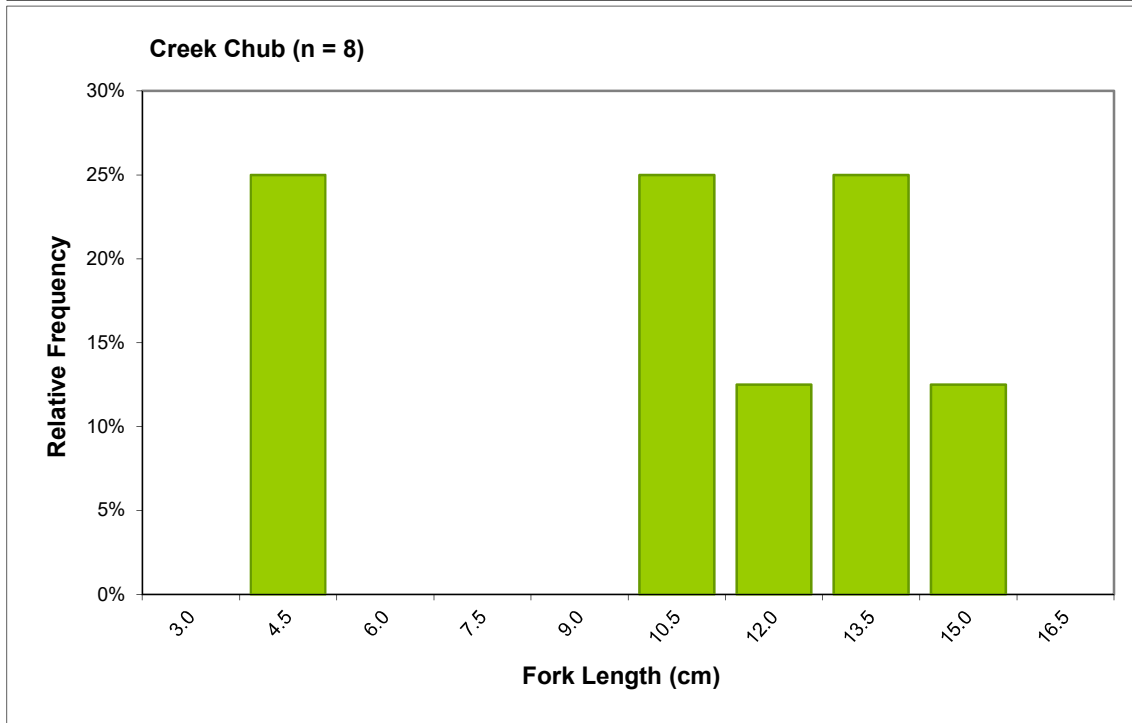
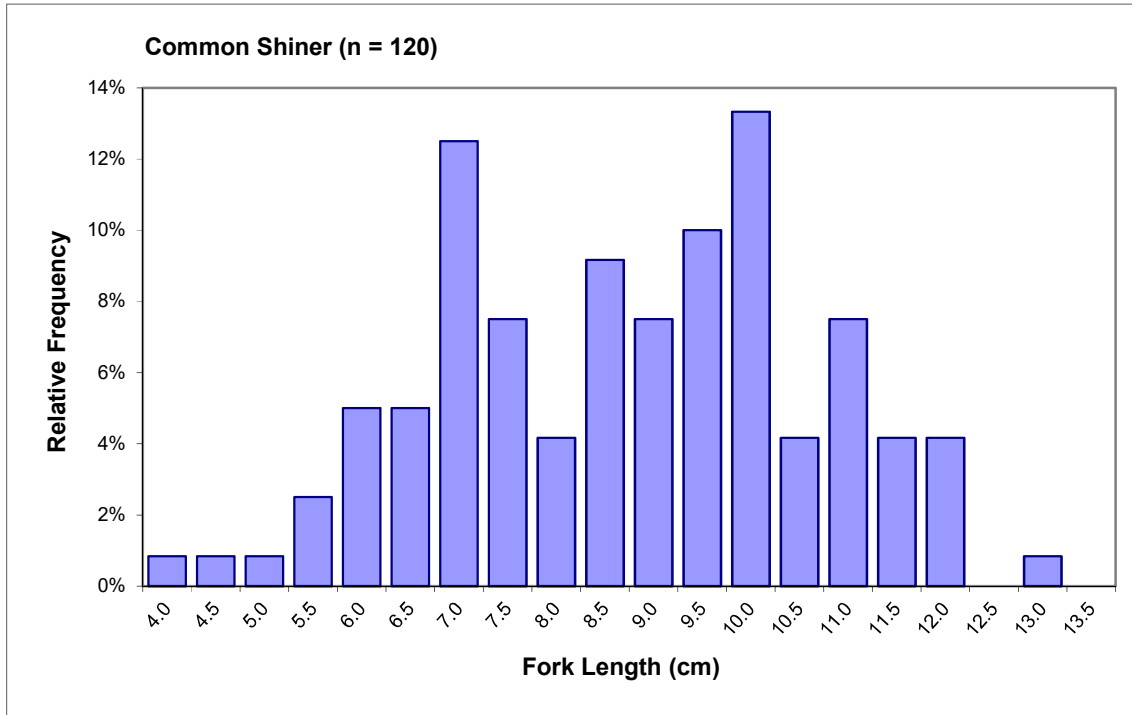
**Appendix Figure A.1: Length-frequency Distributions for Fish Collected at Pinewood River Reference Area (PWREF), RRM 2019**

Note: Brassy Minnow (n=3), golden shiner (n=3), and white sucker (n=3) not plotted due to low capture numbers.



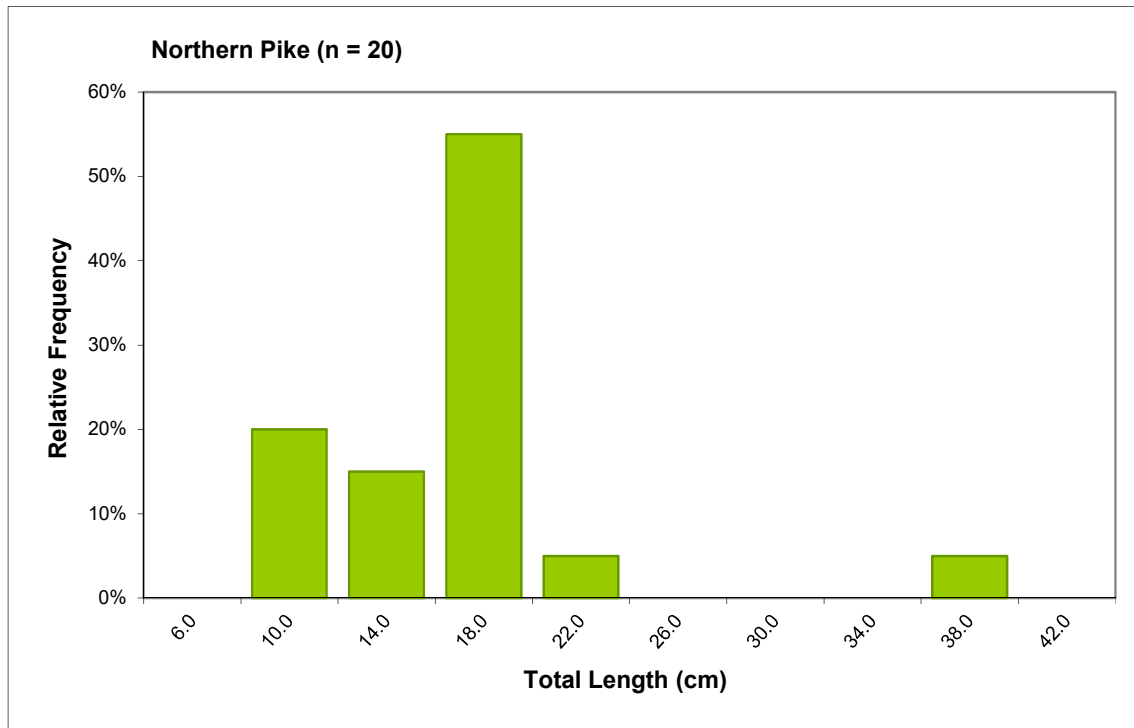
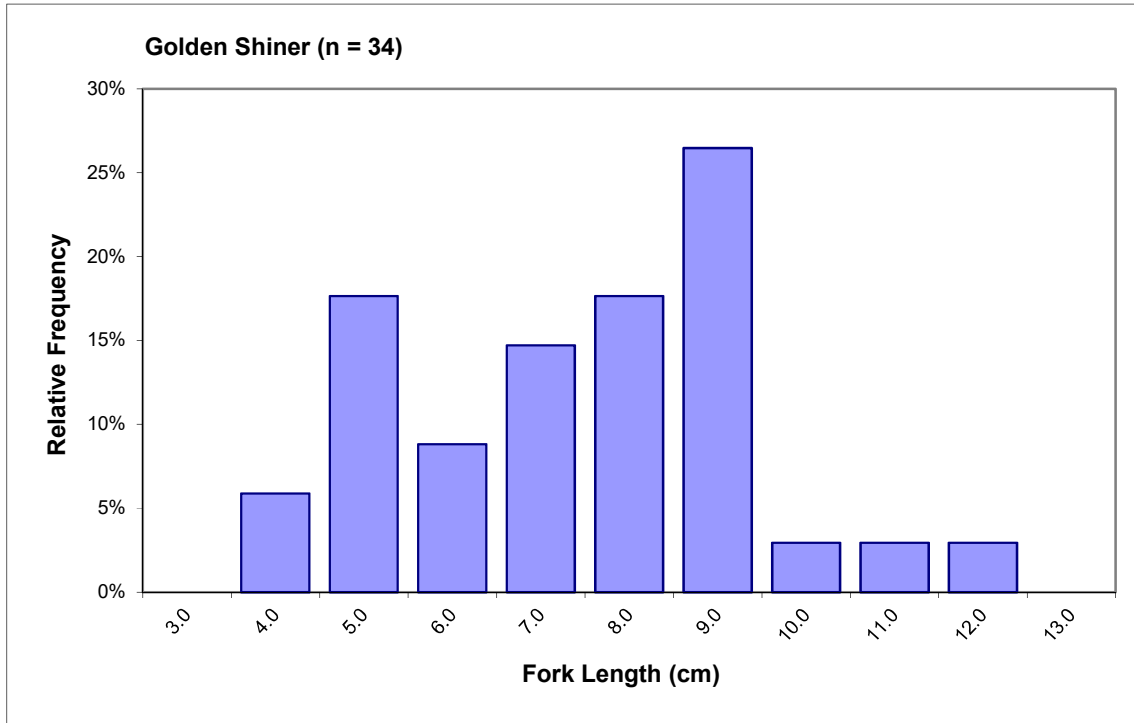
**Appendix Figure A.2: Length-frequency Distributions for Fish Collected at Pinewood River Near-field Mine-exposed Area (PWNF), RRM 2019**

Note: Brassy minnow (n=1), johnny darter (n=1), and trout perch (n=2) not plotted due to low capture numbers.



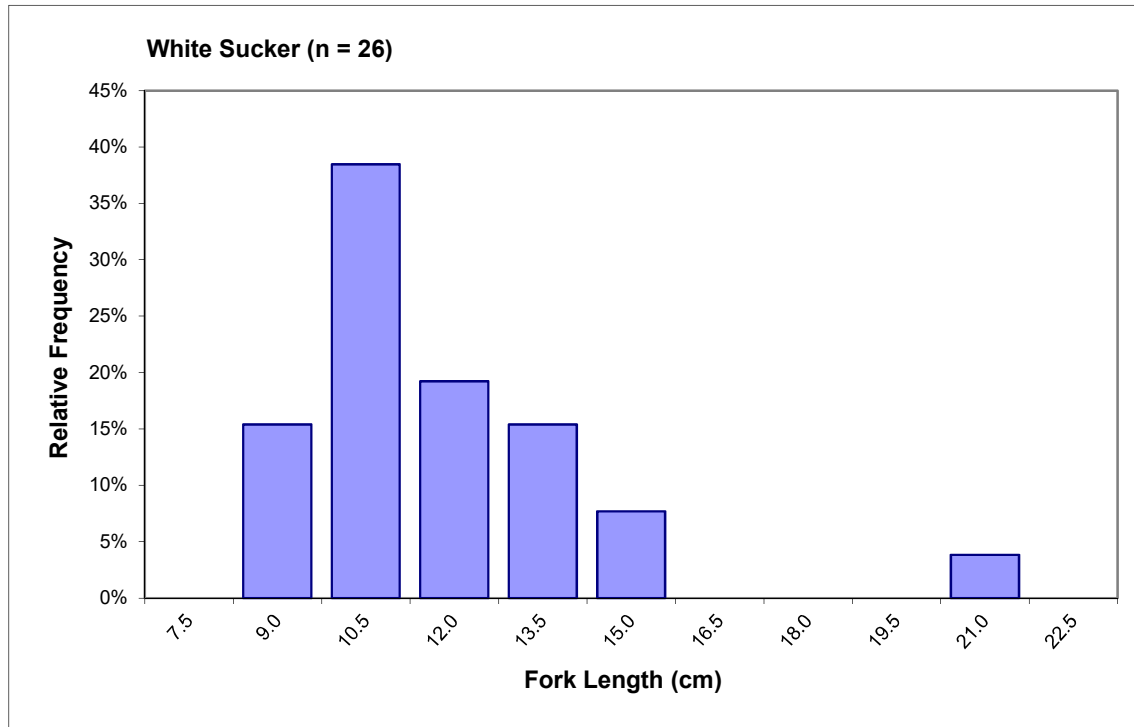
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Note: Brassy minnow (n=1), johnny darter (n=1), and trout perch (n=2) not plotted due to low capture numbers.



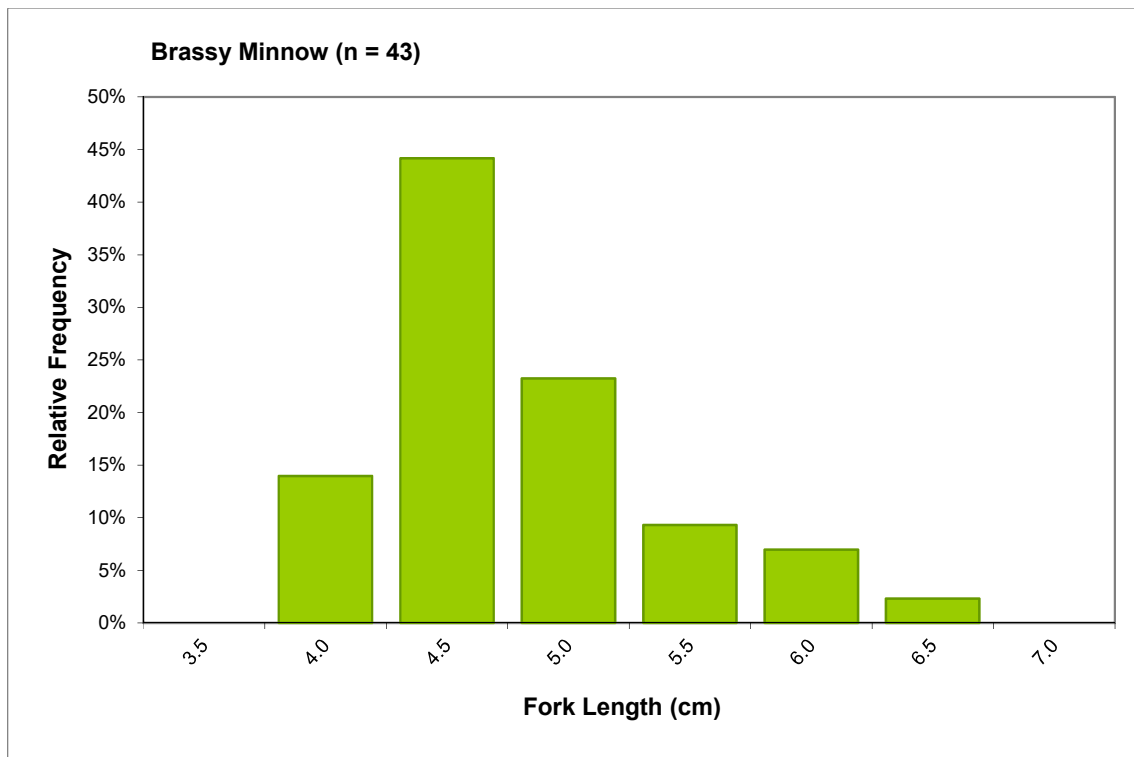
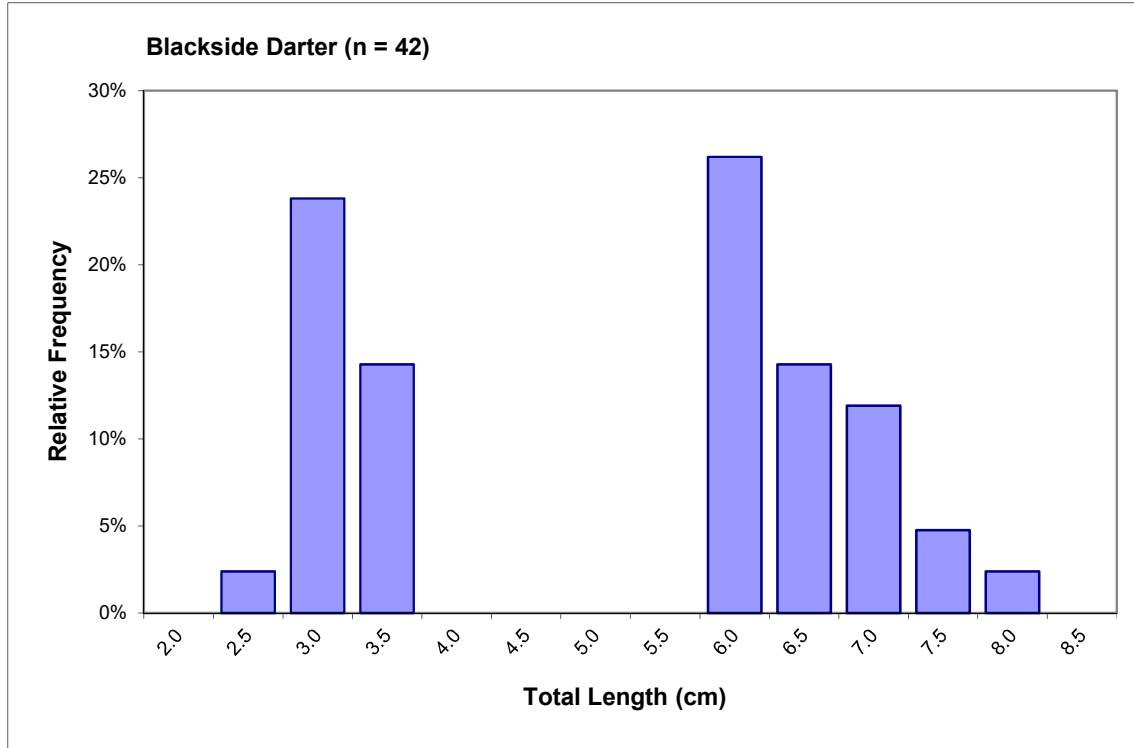
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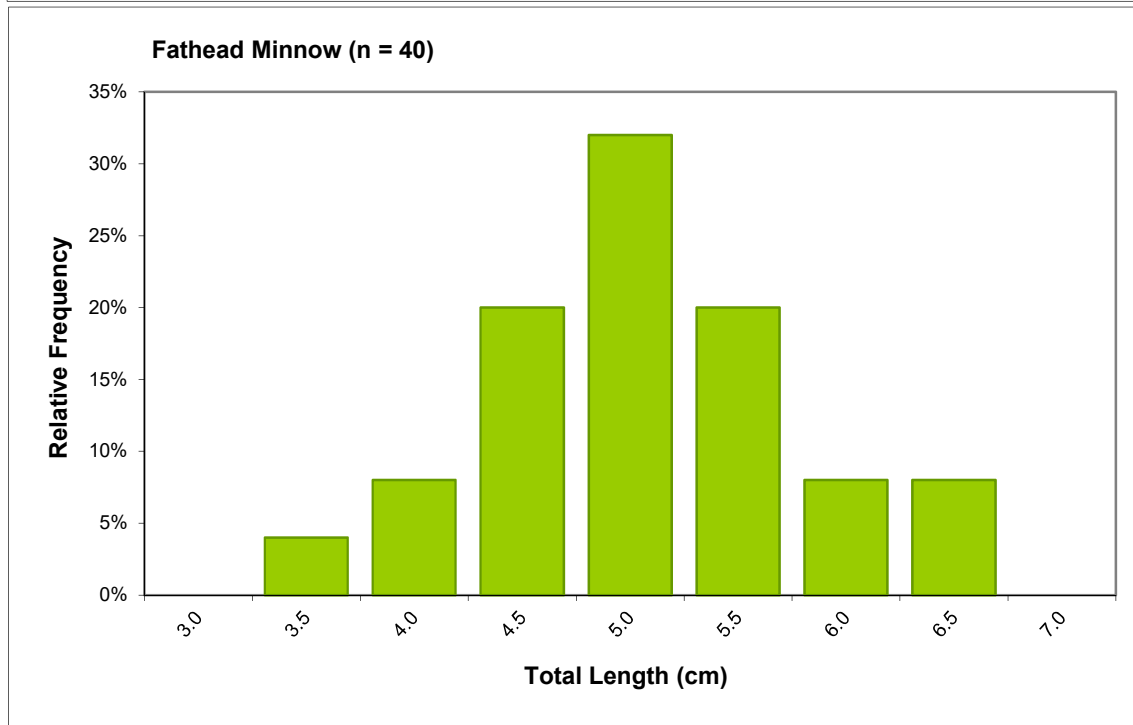
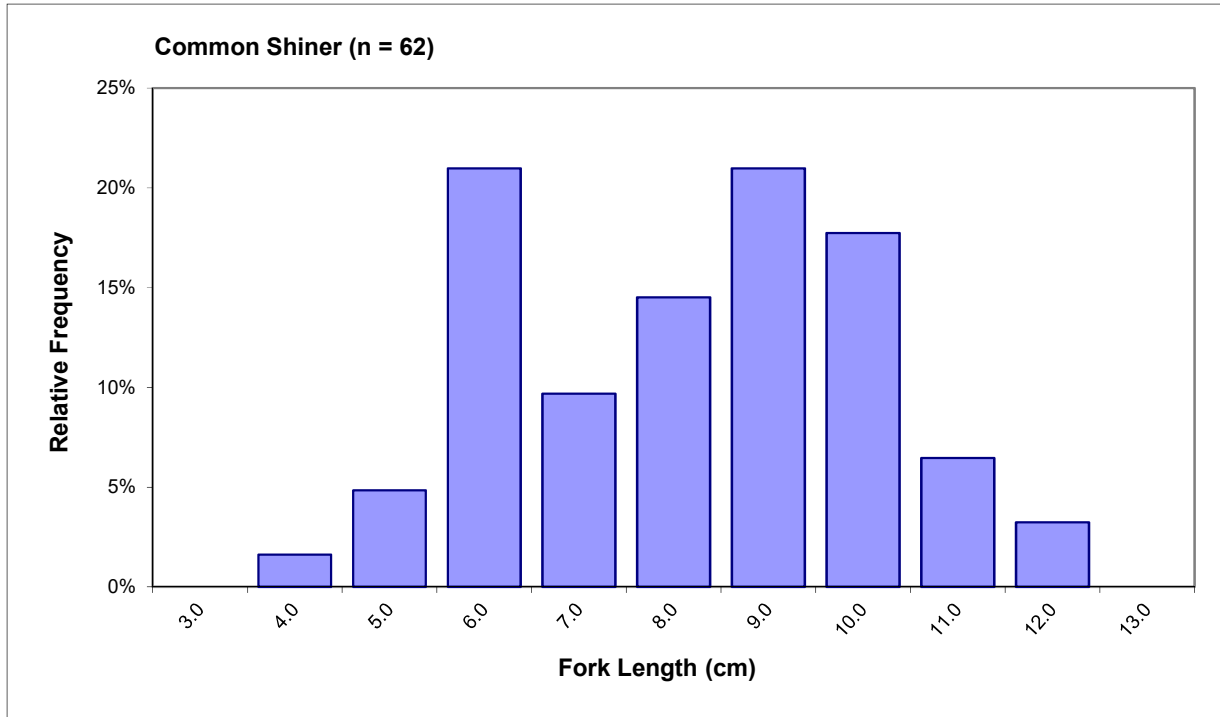
Note: Brassy minnow (n=1), johnny darter (n=1), and trout perch (n=2) not plotted due to low capture numbers.



**Appendix Figure A.3: Length-frequency Distributions for Fish Collected at Pinewood River Far-field Mine-exposed Area (PWFF), RRM 2019**

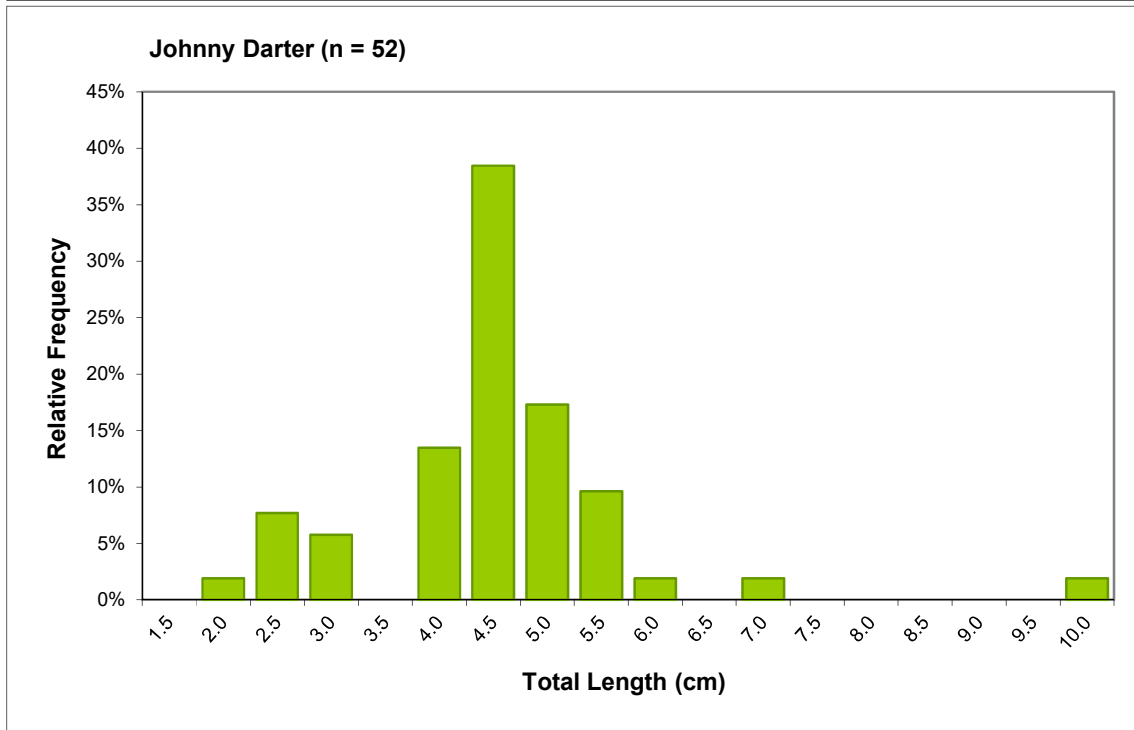
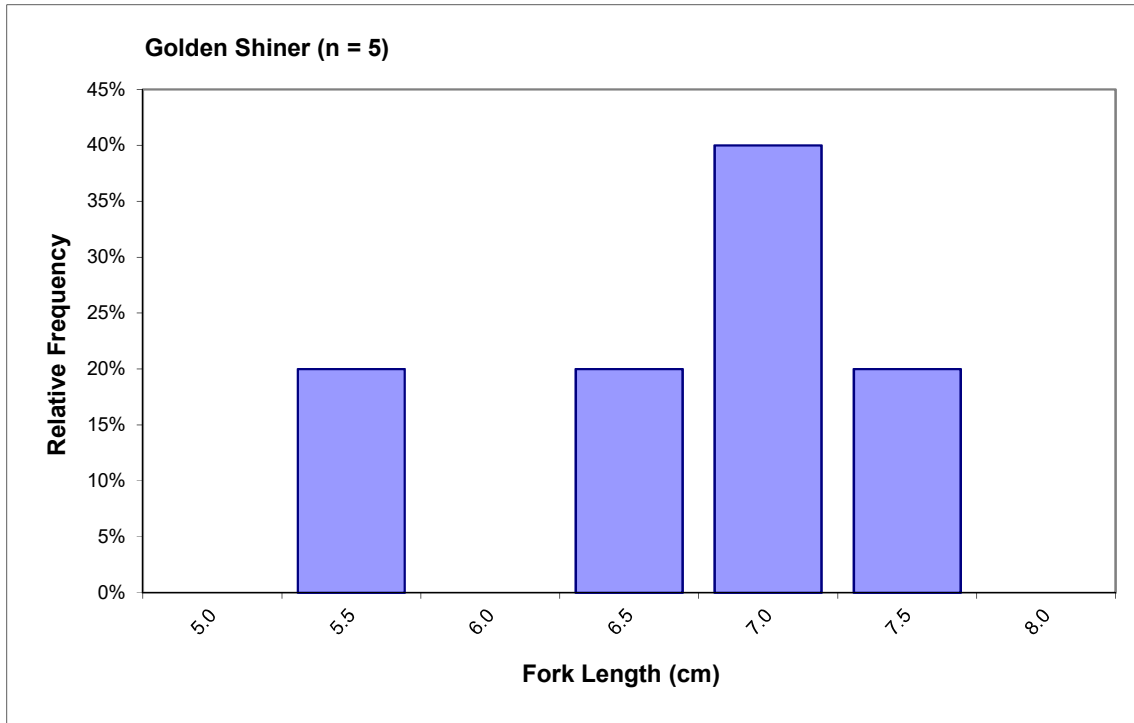
Note: Brook stickleback (n=1), central mudminnow (n=2), northern pike (n=2), and rock bass (n=2) not plotted due to low capture numbers or minimal variation in lengths.





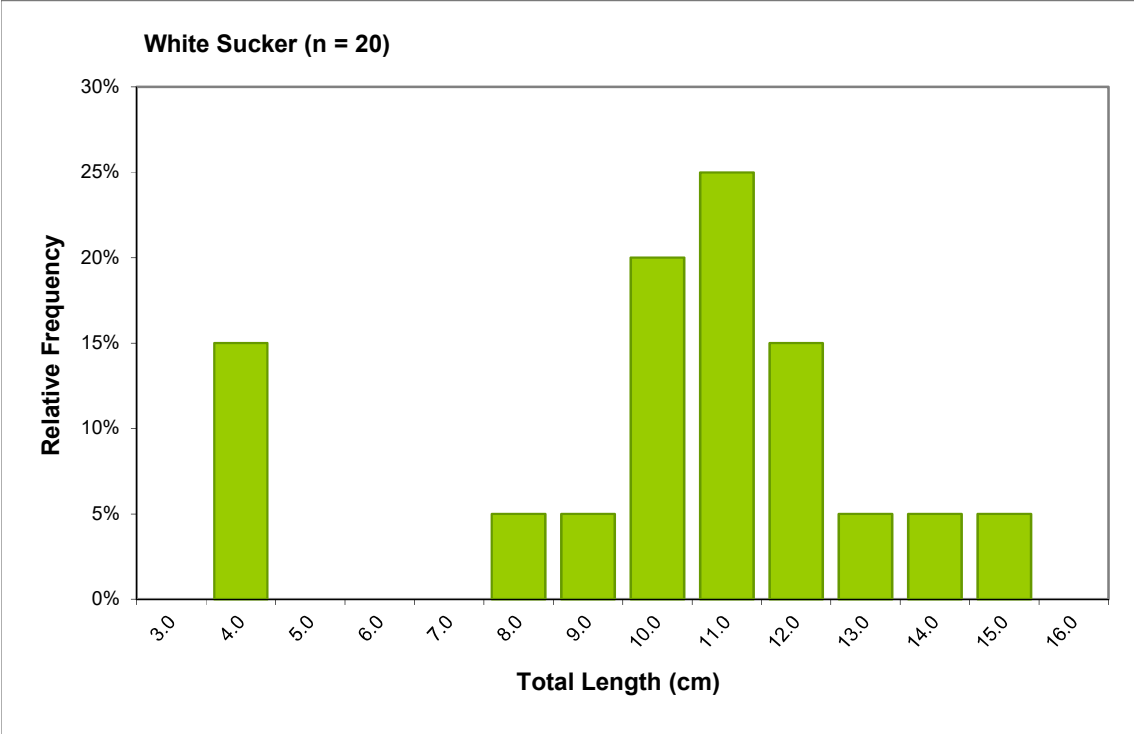
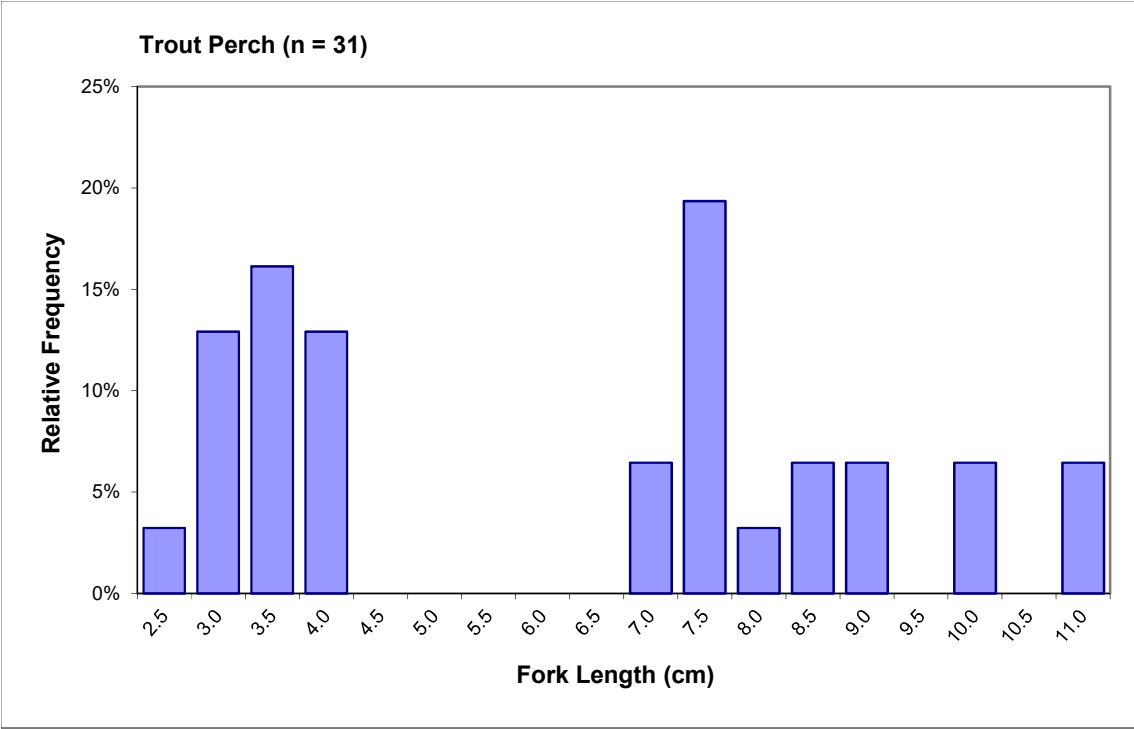
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Note: Brook stickleback (n=1), central mudminnow (n=2), northern pike (n=2), and rock bass (n=2) not plotted due to low capture numbers or minimal variation in lengths.



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Note: Brook stickleback (n=1), central mudminnow (n=2), northern pike (n=2), and rock bass (n=2) 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 2019**

Note: Brook stickleback (n=1), central mudminnow (n=2), northern pike (n=2), and rock bass (n=2) not plotted due to low capture numbers or minimal variation in lengths.

**Appendix Table A.1: Non-destructive Fish Measurements for Pinewood River Reference Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Brassy Minnow	18-Jul-19	GN	5.5	5.3	1.65	-
Brassy Minnow	18-Jul-19	GN	5.5	5.1	1.47	Black spot
Brassy Minnow	19-Jul-19	MT	7.1	6.8	2.63	-
Central Mudminnow	17-Jul-19	MT	7.2	-	-	-
Central Mudminnow	17-Jul-19	MT	7.6	-	-	-
Central Mudminnow	17-Jul-19	MT	7.6	-	4.66	-
Central Mudminnow	17-Jul-19	MT	9.4	-	10.68	-
Central Mudminnow	18-Jul-19	GN	10.0	-	12.00	-
Central Mudminnow	18-Jul-19	GN	10.6	-	12.40	-
Central Mudminnow	18-Jul-19	GN	10.4	-	12.30	-
Central Mudminnow	18-Jul-19	GN	10.1	-	12.40	-
Central Mudminnow	18-Jul-19	GN	11.8	-	16.40	-
Central Mudminnow	18-Jul-19	MT	7.0	-	3.58	-
Central Mudminnow	18-Jul-19	MT	9.0	-	7.91	-
Central Mudminnow	18-Jul-19	MT	6.8	-	3.78	Black spot
Central Mudminnow	18-Jul-19	MT	8.3	-	7.37	-
Central Mudminnow	18-Jul-19	MT	7.0	-	2.29	-
Central Mudminnow	18-Jul-19	MT	9.2	-	8.52	-
Central Mudminnow	19-Jul-19	MT	9.6	-	10.86	Black spot
Central Mudminnow	19-Jul-19	MT	10.4	-	12.62	Black spot
Central Mudminnow	19-Jul-19	MT	6.8	-	3.29	-
Common Shiner	18-Jul-19	GN	10.7	9.9	14.00	-
Common Shiner	18-Jul-19	GN	9.9	9.1	10.80	-
Common Shiner	18-Jul-19	GN	10.4	9.8	13.00	-
Common Shiner	18-Jul-19	GN	10.9	10.2	15.00	-
Common Shiner	18-Jul-19	GN	10.4	9.5	11.20	-
Common Shiner	18-Jul-19	GN	10.4	9.6	10.80	-
Common Shiner	18-Jul-19	GN	10.6	-	11.20	-
Common Shiner	18-Jul-19	GN	9.9	9.0	9.20	-
Common Shiner	18-Jul-19	GN	10.6	10.2	13.80	-
Common Shiner	18-Jul-19	GN	12.6	12.1	18.20	-
Common Shiner	18-Jul-19	GN	10.6	9.7	13.20	-
Common Shiner	18-Jul-19	GN	10.0	9.2	10.80	-
Common Shiner	18-Jul-19	GN	10.1	9.4	12.10	-
Common Shiner	18-Jul-19	GN	10.9	-	13.50	-
Common Shiner	18-Jul-19	GN	10.8	10.0	12.80	-
Common Shiner	18-Jul-19	GN	10.2	9.5	12.30	-
Creek Chub	17-Jul-19	MT	10.5	9.8	12.08	-
Creek Chub	18-Jul-19	GN	12.0	11.4	9.30	-
Creek Chub	18-Jul-19	GN	11.0	10.6	9.50	-
Creek Chub	18-Jul-19	GN	10.5	10.1	9.40	-
Creek Chub	18-Jul-19	GN	10.4	9.9	8.10	-
Creek Chub	18-Jul-19	GN	12.1	11.6	11.80	-
Creek Chub	18-Jul-19	GN	10.7	9.9	13.00	-
Creek Chub	18-Jul-19	GN	10.1	9.6	11.80	-
Creek Chub	18-Jul-19	GN	12.7	12.0	22.00	-
Creek Chub	18-Jul-19	GN	13.9	13.3	26.20	-
Creek Chub	18-Jul-19	GN	12.6	12.1	17.20	-
Creek Chub	18-Jul-19	GN	13.1	12.4	24.00	-
Creek Chub	18-Jul-19	GN	12.2	11.9	19.00	-
Creek Chub	18-Jul-19	GN	16.0	15.4	52.00	-
Creek Chub	18-Jul-19	GN	12.4	11.6	22.00	-
Creek Chub	18-Jul-19	GN	11.9	11.2	17.30	-
Creek Chub	18-Jul-19	GN	11.6	11.1	15.00	-
Creek Chub	18-Jul-19	GN	11.7	11.1	21.00	-

**Appendix Table A.1: Non-destructive Fish Measurements for Pinewood River Reference Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Creek Chub	18-Jul-19	GN	12.2	11.5	20.20	-
Creek Chub	18-Jul-19	GN	16.5	15.8	46.00	-
Creek Chub	18-Jul-19	GN	13.4	12.7	20.40	-
Creek Chub	18-Jul-19	GN	12.6	11.8	20.00	-
Creek Chub	18-Jul-19	GN	11.3	10.4	14.30	-
Creek Chub	18-Jul-19	GN	12.1	11.7	17.80	-
Creek Chub	18-Jul-19	GN	11.0	10.7	13.00	-
Creek Chub	18-Jul-19	GN	17.0	16.2	54.00	-
Creek Chub	18-Jul-19	GN	10.9	10.1	14.40	-
Creek Chub	18-Jul-19	GN	11.1	10.6	14.20	-
Creek Chub	18-Jul-19	GN	15.6	14.7	35.33	-
Creek Chub	18-Jul-19	GN	10.0	9.4	10.54	-
Creek Chub	18-Jul-19	GN	12.2	11.5	19.59	-
Creek Chub	18-Jul-19	GN	6.1	5.7	1.96	-
Creek Chub	18-Jul-19	GN	5.9	5.5	1.83	-
Creek Chub	18-Jul-19	GN	5.6	5.2	1.66	-
Finescale Dace	18-Jul-19	GN	5.6	5.2	1.50	-
Finescale Dace	18-Jul-19	GN	5.8	5.5	1.55	-
Finescale Dace	18-Jul-19	GN	5.2	5.4	1.73	-
Finescale Dace	18-Jul-19	GN	6.0	5.8	1.83	-
Finescale Dace	18-Jul-19	GN	6.1	5.8	2.29	-
Finescale Dace	18-Jul-19	GN	5.6	5.1	1.38	-
Finescale Dace	18-Jul-19	GN	5.7	5.3	1.73	-
Finescale Dace	18-Jul-19	GN	5.8	5.5	1.61	-
Finescale Dace	18-Jul-19	GN	5.7	5.6	1.81	-
Finescale Dace	18-Jul-19	GN	4.9	4.9	1.75	-
Finescale Dace	18-Jul-19	GN	6.0	5.8	2.04	-
Finescale Dace	18-Jul-19	GN	5.7	5.4	1.81	-
Finescale Dace	18-Jul-19	GN	5.8	5.5	1.68	-
Finescale Dace	18-Jul-19	GN	5.8	5.7	2.12	-
Finescale Dace	18-Jul-19	GN	5.6	5.3	1.89	-
Finescale Dace	18-Jul-19	GN	5.4	5.2	1.70	-
Finescale Dace	18-Jul-19	GN	5.7	5.5	1.65	-
Finescale Dace	18-Jul-19	GN	5.9	5.7	2.17	-
Finescale Dace	18-Jul-19	GN	5.7	5.4	1.71	-
Finescale Dace	18-Jul-19	GN	6.0	5.6	1.90	Squished
Finescale Dace	18-Jul-19	GN	5.8	5.5	1.81	-
Finescale Dace	18-Jul-19	GN	5.7	5.6	1.92	-
Finescale Dace	18-Jul-19	GN	5.9	5.6	1.75	-
Finescale Dace	18-Jul-19	GN	5.8	5.4	2.22	-
Finescale Dace	18-Jul-19	GN	6.7	6.3	2.41	-
Finescale Dace	18-Jul-19	GN	6.1	5.7	1.70	-
Finescale Dace	18-Jul-19	GN	5.9	5.5	1.81	-
Finescale Dace	18-Jul-19	GN	5.4	5.1	1.66	-
Finescale Dace	18-Jul-19	GN	5.8	5.6	2.00	-
Finescale Dace	18-Jul-19	GN	5.8	5.5	1.74	-
Finescale Dace	18-Jul-19	GN	5.7	5.4	1.77	-
Golden Shiner	18-Jul-19	GN	10.0	8.9	8.50	-
Golden Shiner	18-Jul-19	GN	9.2	8.3	7.60	Black spot
Golden Shiner	18-Jul-19	GN	6.5	6.1	2.48	-
Mimic Shiner	18-Jul-19	GN	6.1	5.8	1.96	-
Mimic Shiner	18-Jul-19	GN	6.5	6.2	2.33	-
Mimic Shiner	18-Jul-19	GN	6.3	6.1	2.44	-
Mimic Shiner	18-Jul-19	GN	6.1	6.0	1.90	-
Mimic Shiner	18-Jul-19	GN	6.2	5.9	2.07	-

**Appendix Table A.1: Non-destructive Fish Measurements for Pinewood River Reference Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Mimic Shiner	18-Jul-19	GN	5.8	5.6	1.84	-
Mimic Shiner	18-Jul-19	GN	6.3	6.0	2.21	-
Mimic Shiner	18-Jul-19	GN	6.3	5.9	2.00	-
Mimic Shiner	18-Jul-19	GN	6.2	5.9	1.85	-
Mimic Shiner	18-Jul-19	GN	6.2	5.6	2.12	-
Mimic Shiner	18-Jul-19	GN	5.4	5.0	1.59	-
Northern Redbelly Dace	17-Jul-19	MT	7.3	6.8	3.32	-
Northern Redbelly Dace	17-Jul-19	MT	4.7	4.5	0.93	Growth on chin
Northern Redbelly Dace	17-Jul-19	MT	5.9	5.6	1.76	-
Northern Redbelly Dace	17-Jul-19	MT	4.8	4.5	0.87	-
Northern Redbelly Dace	17-Jul-19	MT	4.9	4.6	1.07	-
Northern Redbelly Dace	17-Jul-19	MT	4.8	4.5	0.99	-
Northern Redbelly Dace	18-Jul-19	GN	6.0	5.7	2.23	-
Northern Redbelly Dace	18-Jul-19	GN	5.9	5.6	1.99	-
Northern Redbelly Dace	18-Jul-19	GN	5.9	5.3	1.76	-
Northern Redbelly Dace	18-Jul-19	GN	5.5	5.1	1.57	-
Northern Redbelly Dace	18-Jul-19	GN	5.5	5.1	1.59	-
Northern Redbelly Dace	18-Jul-19	GN	5.6	5.4	1.75	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.4	1.84	-
Northern Redbelly Dace	18-Jul-19	GN	5.5	5.3	1.52	-
Northern Redbelly Dace	18-Jul-19	GN	6.9	6.2	2.40	-
Northern Redbelly Dace	18-Jul-19	GN	6.1	5.8	2.07	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.6	1.94	-
Northern Redbelly Dace	18-Jul-19	GN	5.7	5.4	1.60	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.4	1.80	-
Northern Redbelly Dace	18-Jul-19	GN	6.1	5.8	2.31	-
Northern Redbelly Dace	18-Jul-19	GN	5.1	4.9	1.44	-
Northern Redbelly Dace	18-Jul-19	GN	5.1	4.9	1.39	-
Northern Redbelly Dace	18-Jul-19	GN	5.3	5.2	1.52	-
Northern Redbelly Dace	18-Jul-19	GN	5.7	5.4	2.07	-
Northern Redbelly Dace	18-Jul-19	GN	6.6	6.3	1.61	-
Northern Redbelly Dace	18-Jul-19	GN	5.6	5.2	1.76	-
Northern Redbelly Dace	18-Jul-19	GN	5.5	5.0	1.79	-
Northern Redbelly Dace	18-Jul-19	GN	6.7	6.1	2.18	-
Northern Redbelly Dace	18-Jul-19	GN	5.3	6.5	1.49	-
Northern Redbelly Dace	18-Jul-19	GN	5.4	5.2	1.75	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.4	1.90	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.5	1.83	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.5	2.00	-
Northern Redbelly Dace	18-Jul-19	GN	6.5	6.2	2.22	-
Northern Redbelly Dace	18-Jul-19	GN	5.7	5.5	1.68	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.5	1.81	-
Northern Redbelly Dace	18-Jul-19	GN	6.0	5.5	1.80	-
Northern Redbelly Dace	18-Jul-19	GN	6.1	5.7	2.09	-
Northern Redbelly Dace	18-Jul-19	GN	5.6	5.3	1.58	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.4	1.81	-
Northern Redbelly Dace	18-Jul-19	GN	5.8	5.6	1.77	-
Northern Redbelly Dace	18-Jul-19	GN	6.5	6.1	2.37	-
Northern Redbelly Dace	18-Jul-19	GN	5.6	5.5	2.05	-
Northern Redbelly Dace	18-Jul-19	GN	6.0	5.7	1.85	-
Northern Redbelly Dace	18-Jul-19	GN	6.1	5.8	1.57	-
Northern Redbelly Dace	18-Jul-19	GN	5.5	5.2	1.61	-
Northern Redbelly Dace	18-Jul-19	GN	6.1	5.7	1.94	-
Northern Redbelly Dace	18-Jul-19	GN	5.9	5.5	1.83	-
Northern Redbelly Dace	18-Jul-19	GN	5.6	5.4	1.58	-
Northern Redbelly Dace	18-Jul-19	GN	6.2	6.0	2.04	-

**Appendix Table A.1: Non-destructive Fish Measurements for Pinewood River Reference Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Northern Redbelly Dace	18-Jul-19	GN	6.0	5.8	2.02	-
Northern Redbelly Dace	18-Jul-19	GN	6.3	6.0	1.85	-
Northern Redbelly Dace	18-Jul-19	GN	6.0	5.7	1.72	-
Northern Redbelly Dace	18-Jul-19	GN	6.5	6.1	2.19	-
Northern Redbelly Dace	18-Jul-19	GN	5.5	5.1	1.23	-
Northern Redbelly Dace	18-Jul-19	GN	6.4	5.9	2.23	-
Northern Redbelly Dace	18-Jul-19	GN	5.9	5.7	1.76	-
Pearl Dace	18-Jul-19	GN	9.8	9.6	6.50	-
Pearl Dace	18-Jul-19	GN	12.0	11.4	16.00	-
Pearl Dace	18-Jul-19	GN	12.0	11.4	19.60	-
Pearl Dace	18-Jul-19	GN	12.0	11.7	19.00	-
Pearl Dace	18-Jul-19	GN	11.3	10.6	14.00	-
Pearl Dace	18-Jul-19	GN	10.6	9.9	10.00	-
Pearl Dace	18-Jul-19	GN	10.6	10.0	10.20	-
Pearl Dace	18-Jul-19	GN	11.2	11.6	14.20	-
Pearl Dace	18-Jul-19	GN	13.0	12.2	19.00	-
Pearl Dace	18-Jul-19	GN	11.8	-	16.40	-
Pearl Dace	18-Jul-19	GN	12.1	11.6	16.80	-
Pearl Dace	18-Jul-19	GN	12.5	11.8	19.00	-
Pearl Dace	18-Jul-19	GN	12.4	11.7	19.00	-
Pearl Dace	18-Jul-19	GN	13.2	12.4	18.10	-
Pearl Dace	18-Jul-19	GN	12.5	12.1	19.20	-
Pearl Dace	18-Jul-19	GN	11.1	10.4	15.60	-
Pearl Dace	18-Jul-19	GN	11.2	10.7	13.80	-
Pearl Dace	18-Jul-19	GN	12.7	12.1	22.20	-
Pearl Dace	18-Jul-19	GN	11.3	10.8	13.60	-
Pearl Dace	18-Jul-19	GN	10.2	9.6	11.30	-
Pearl Dace	18-Jul-19	GN	12.0	11.2	18.20	-
Pearl Dace	18-Jul-19	GN	11.3	10.8	14.20	-
Pearl Dace	18-Jul-19	GN	10.9	10.3	13.40	-
Pearl Dace	18-Jul-19	GN	10.3	9.7	13.00	-
Pearl Dace	18-Jul-19	MT	9.5	9.1	5.42	Eaten by leech
Pearl Dace	19-Jul-19	MT	12.9	12.0	17.72	-
White Sucker	18-Jul-19	GN	26.3	25.0	195	-
White Sucker	18-Jul-19	GN	28.6	26.6	245	-
White Sucker	18-Jul-19	GN	23.1	21.7	105	-

Note: "-" indicates not sampled.

<sup>a</sup> Catch methods: GN = gill net, SN = seine net, MT = minnow trap

**Appendix Table A.2: Non-destructive Fish Measurements for Pinewood River Near-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Brassy Minnow	19-Jul-19	MT	6.1	5.8	1.98	-
Brown Bullhead	19-Jul-19	GN	11.8	11.6	25.00	-
Brown Bullhead	19-Jul-19	MT	11.5	-	20.41	-
Brown Bullhead	19-Jul-19	MT	10.8	-	16.89	-
Brown Bullhead	22-Jul-19	MT	14.2	-	33.40	-
Brown Bullhead	23-Jul-19	SN	10.7	-	14.90	-
Brown Bullhead	23-Jul-19	SN	3.1	-	0.33	YOY
Brown Bullhead	23-Jul-19	SN	3.2	-	0.39	YOY
Brown Bullhead	23-Jul-19	SN	2.9	-	0.32	YOY
Brown Bullhead	23-Jul-19	SN	3.2	-	0.54	YOY
Brown Bullhead	23-Jul-19	SN	3.0	-	0.36	YOY
Brown Bullhead	23-Jul-19	SN	3.1	-	0.35	YOY
Brown Bullhead	23-Jul-19	SN	3.4	-	0.58	YOY
Brown Bullhead	23-Jul-19	SN	3.2	-	0.48	YOY
Brown Bullhead	23-Jul-19	SN	3.8	-	0.22	YOY
Brown Bullhead	23-Jul-19	SN	1.5	-	0.11	YOY
Brown Bullhead	23-Jul-19	SN	3.1	-	0.41	-
Brown Bullhead	23-Jul-19	SN	3.3	-	0.38	-
Brown Bullhead	23-Jul-19	SN	3.3	-	0.45	-
Brown Bullhead	23-Jul-19	SN	3.0	-	0.38	-
Brown Bullhead	23-Jul-19	SN	3.5	-	0.46	-
Brown Bullhead	23-Jul-19	SN	3.2	-	0.45	-
Brown Bullhead	23-Jul-19	SN	1.6	-	0.10	-
Brown Bullhead	23-Jul-19	SN	3.3	-	0.32	-
Brown Bullhead	23-Jul-19	SN	1.7	-	0.21	-
Brown Bullhead	23-Jul-19	SN	2.8	-	0.29	-
Central Mudminnow	19-Jul-19	MT	8.3	-	5.39	-
Central Mudminnow	19-Jul-19	MT	10.2	-	14.40	-
Central Mudminnow	19-Jul-19	MT	10.1	-	12.75	-
Central Mudminnow	19-Jul-19	MT	11.7	-	18.76	-
Central Mudminnow	23-Jul-19	SN	3.8	-	0.34	-
Central Mudminnow	23-Jul-19	SN	3.4	-	0.40	-
Central Mudminnow	23-Jul-19	SN	6.1	-	2.83	-
Central Mudminnow	23-Jul-19	SN	9.3	-	9.54	-
Central Mudminnow	23-Jul-19	SN	7.7	-	4.87	-
Central Mudminnow	23-Jul-19	SN	7.4	-	4.60	-
Central Mudminnow	23-Jul-19	SN	3.2	-	0.38	-
Central Mudminnow	23-Jul-19	SN	7.1	-	4.17	-
Central Mudminnow	23-Jul-19	SN	3.1	-	0.38	-
Central Mudminnow	23-Jul-19	SN	3.1	-	0.31	-
Central Mudminnow	23-Jul-19	SN	3.2	-	0.29	-
Central Mudminnow	23-Jul-19	SN	3.2	-	0.32	-
Common Shiner	19-Jul-19	GN	6.3	5.6	2.01	-
Common Shiner	19-Jul-19	GN	7.8	6.9	3.99	-
Common Shiner	19-Jul-19	SN	7.5	6.6	3.65	-
Common Shiner	19-Jul-19	SN	7.7	7.0	4.54	-
Common Shiner	22-Jul-19	GN	6.0	5.4	2.10	-
Common Shiner	22-Jul-19	GN	6.2	5.6	2.10	-
Common Shiner	22-Jul-19	MT	10.6	9.7	12.20	-
Common Shiner	23-Jul-19	SN	6.0	5.3	1.44	-
Common Shiner	23-Jul-19	SN	8.3	7.6	4.30	-
Common Shiner	23-Jul-19	SN	7.4	6.8	3.82	-
Common Shiner	23-Jul-19	SN	11.0	10.2	16.84	-
Common Shiner	23-Jul-19	SN	6.2	5.6	1.74	-
Common Shiner	23-Jul-19	SN	9.4	8.7	7.86	-
Common Shiner	23-Jul-19	SN	12.9	11.5	22.07	-
Common Shiner	23-Jul-19	SN	7.7	7.0	3.79	-
Common Shiner	23-Jul-19	SN	7.1	6.5	2.66	-
Common Shiner	23-Jul-19	SN	9.8	8.9	9.23	-
Common Shiner	23-Jul-19	SN	11.0	10.4	17.75	-



**Appendix Table A.2: Non-destructive Fish Measurements for Pinewood River Near-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Common Shiner	23-Jul-19	SN	12.1	11.1	20.88	-
Common Shiner	23-Jul-19	SN	9.1	8.4	7.26	-
Common Shiner	23-Jul-19	SN	10.0	9.3	9.61	-
Common Shiner	23-Jul-19	SN	8.9	8.2	7.09	-
Common Shiner	23-Jul-19	SN	10.1	9.5	10.43	-
Common Shiner	23-Jul-19	SN	8.1	7.4	4.31	-
Common Shiner	23-Jul-19	SN	9.1	8.2	6.13	-
Common Shiner	23-Jul-19	SN	5.4	-	1.18	-
Common Shiner	23-Jul-19	SN	9.8	8.8	7.93	-
Common Shiner	23-Jul-19	SN	9.9	9.0	9.34	-
Common Shiner	23-Jul-19	SN	5.7	5.3	1.47	-
Common Shiner	23-Jul-19	SN	8.1	7.5	4.32	-
Common Shiner	23-Jul-19	SN	7.9	7.0	4.13	-
Common Shiner	23-Jul-19	SN	6.7	-	2.31	Cut caudal fin
Common Shiner	23-Jul-19	SN	7.8	7.2	4.05	-
Common Shiner	23-Jul-19	SN	5.4	4.8	1.20	-
Common Shiner	23-Jul-19	SN	9.9	9.3	11.77	-
Common Shiner	23-Jul-19	SN	7.9	7.2	4.13	-
Common Shiner	23-Jul-19	SN	8.5	7.6	5.23	-
Common Shiner	23-Jul-19	SN	7.1	6.6	3.32	-
Common Shiner	23-Jul-19	SN	6.6	6.1	2.49	-
Common Shiner	23-Jul-19	SN	7.8	7.1	4.16	-
Common Shiner	23-Jul-19	SN	8.6	8.1	5.73	-
Common Shiner	23-Jul-19	SN	8.0	7.3	4.64	-
Common Shiner	23-Jul-19	SN	7.1	6.6	2.99	-
Common Shiner	23-Jul-19	SN	6.6	6.0	2.21	-
Common Shiner	23-Jul-19	SN	4.5	4.0	0.64	-
Common Shiner	23-Jul-19	SN	7.6	7.0	3.85	-
Common Shiner	23-Jul-19	SN	8.7	7.9	5.94	-
Common Shiner	23-Jul-19	SN	4.8	4.4	0.85	-
Common Shiner	23-Jul-19	SN	10.5	9.5	12.05	-
Common Shiner	23-Jul-19	SN	10.7	10.0	12.64	-
Common Shiner	23-Jul-19	SN	9.9	9.0	10.65	-
Common Shiner	23-Jul-19	SN	10.3	9.4	11.93	-
Common Shiner	23-Jul-19	SN	11.8	10.9	18.00	-
Common Shiner	23-Jul-19	SN	5.2	5.7	1.09	-
Common Shiner	23-Jul-19	SN	9.0	8.3	6.35	-
Common Shiner	23-Jul-19	SN	11.8	10.8	21.25	-
Common Shiner	23-Jul-19	SN	9.1	8.4	7.83	-
Common Shiner	23-Jul-19	SN	10.5	9.6	11.80	-
Common Shiner	23-Jul-19	SN	7.9	7.0	4.16	-
Common Shiner	23-Jul-19	SN	9.6	8.7	8.54	-
Common Shiner	23-Jul-19	SN	10.9	10.0	14.09	-
Common Shiner	23-Jul-19	SN	8.6	7.9	6.23	-
Common Shiner	23-Jul-19	SN	9.3	8.4	7.65	-
Common Shiner	23-Jul-19	SN	8.0	7.2	4.82	-
Common Shiner	23-Jul-19	SN	7.1	6.5	3.04	-
Common Shiner	23-Jul-19	SN	11.7	10.8	17.15	-
Common Shiner	23-Jul-19	SN	9.9	9.1	9.26	-
Common Shiner	23-Jul-19	SN	7.8	7.0	3.92	-
Common Shiner	23-Jul-19	SN	9.1	8.4	7.34	-
Common Shiner	23-Jul-19	SN	10.5	9.6	12.14	-
Common Shiner	23-Jul-19	SN	10.1	9.2	11.13	-
Common Shiner	23-Jul-19	SN	12.8	11.7	24.49	-
Common Shiner	23-Jul-19	SN	10.1	9.3	8.59	Body collected for aging
Creek Chub	23-Jul-19	SN	15.6	15.0	39.84	-
Creek Chub	23-Jul-19	SN	12.8	12.1	21.55	-
Creek Chub	23-Jul-19	SN	10.7	10.1	12.59	-
Creek Chub	23-Jul-19	SN	14.1	13.4	26.16	-
Creek Chub	23-Jul-19	SN	10.4	9.9	10.90	-
Creek Chub	23-Jul-19	SN	12.4	11.9	20.59	-
Creek Chub	23-Jul-19	SN	3.5	3.3	0.25	-
Creek Chub	23-Jul-19	SN	4.2	3.9	0.30	-

**Appendix Table A.2: Non-destructive Fish Measurements for Pinewood River Near-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Golden Shiner	19-Jul-19	GN	9.2	8.3	6.68	-
Golden Shiner	19-Jul-19	GN	11.6	10.7	13.86	-
Golden Shiner	19-Jul-19	SN	9.4	8.8	7.52	-
Golden Shiner	19-Jul-19	SN	7.5	6.7	3.57	-
Golden Shiner	23-Jul-19	SN	5.8	5.4	1.81	-
Golden Shiner	23-Jul-19	SN	8.7	7.9	5.29	-
Golden Shiner	23-Jul-19	SN	8.2	7.4	4.07	-
Golden Shiner	23-Jul-19	SN	9.9	8.8	7.78	-
Golden Shiner	23-Jul-19	SN	9.7	8.6	7.80	-
Golden Shiner	23-Jul-19	SN	9.7	8.8	6.69	-
Golden Shiner	23-Jul-19	SN	9.8	8.8	8.14	-
Golden Shiner	23-Jul-19	SN	10.0	9.0	9.18	-
Golden Shiner	23-Jul-19	SN	7.0	6.4	3.05	-
Golden Shiner	23-Jul-19	SN	8.0	7.3	4.21	-
Golden Shiner	23-Jul-19	SN	8.1	7.4	4.73	-
Golden Shiner	23-Jul-19	SN	6.5	-	2.11	-
Golden Shiner	23-Jul-19	SN	6.4	5.8	2.16	-
Golden Shiner	23-Jul-19	SN	7.4	6.6	3.76	-
Golden Shiner	23-Jul-19	SN	9.0	8.1	5.99	-
Golden Shiner	23-Jul-19	SN	5.8	5.3	1.51	-
Golden Shiner	23-Jul-19	SN	7.8	7.1	3.94	-
Golden Shiner	23-Jul-19	SN	7.0	6.4	2.77	-
Golden Shiner	23-Jul-19	SN	6.7	6.3	2.47	-
Golden Shiner	23-Jul-19	SN	4.6	4.3	0.76	-
Golden Shiner	23-Jul-19	SN	4.4	4.2	0.65	-
Golden Shiner	23-Jul-19	SN	3.9	3.4	0.45	-
Golden Shiner	23-Jul-19	SN	4.6	4.2	0.76	-
Golden Shiner	23-Jul-19	SN	4.0	3.4	0.37	-
Golden Shiner	23-Jul-19	SN	4.6	4.2	0.57	-
Golden Shiner	23-Jul-19	SN	5.0	4.4	-	-
Golden Shiner	23-Jul-19	SN	4.5	4.1	0.61	-
Golden Shiner	23-Jul-19	SN	9.0	8.1	5.94	-
Golden Shiner	23-Jul-19	SN	8.4	7.7	5.06	-
Golden Shiner	23-Jul-19	SN	10.1	9.1	9.88	-
Golden Shiner	23-Jul-19	SN	13.0	11.6	17.84	-
Johnny Darter	23-Jul-19	SN	4.8	-	0.75	-
Northern Pike	19-Jul-19	GN	37.2	35.0	360.00	-
Northern Pike	19-Jul-19	GN	11.3	10.7	9.75	-
Northern Pike	19-Jul-19	GN	16.8	16.0	30.50	-
Northern Pike	19-Jul-19	SN	15.4	14.7	22.00	-
Northern Pike	21-Jul-19	MT	10.9	10.4	7.20	-
Northern Pike	22-Jul-19	GN	20.3	-	55.20	-
Northern Pike	23-Jul-19	SN	11.6	11.5	7.78	-
Northern Pike	23-Jul-19	SN	7.3	6.9	2.10	-
Northern Pike	23-Jul-19	SN	14.7	14.1	18.85	-
Northern Pike	23-Jul-19	SN	14.6	14.2	21.31	-
Northern Pike	23-Jul-19	SN	16.3	15.8	23.97	-
Northern Pike	23-Jul-19	SN	10.2	9.8	5.76	-
Northern Pike	23-Jul-19	SN	8.8	8.2	3.47	-
Northern Pike	23-Jul-19	SN	18.5	18.1	39.10	-
Northern Pike	23-Jul-19	SN	16.9	16.2	27.00	-
Northern Pike	23-Jul-19	SN	15.6	14.8	22.37	-
Northern Pike	23-Jul-19	SN	16.0	15.1	24.90	-
Northern Pike	23-Jul-19	SN	16.8	15.8	26.20	-
Northern Pike	23-Jul-19	SN	8.4	7.8	3.57	-
Northern Pike	23-Jul-19	SN	15.9	14.3	21.98	-
Northern Pike	23-Jul-19	SN	18.2	17.6	32.17	-
Trout-Perch	23-Jul-19	SN	9.9	9.0	8.71	-
Trout-Perch	23-Jul-19	SN	3.3	-	0.20	-
White Sucker	19-Jul-19	MT	11.5	11.0	13.74	-
White Sucker	19-Jul-19	MT	10.7	10.3	11.87	-
White Sucker	21-Jul-19	MT	14.6	13.9	32.25	-
White Sucker	21-Jul-19	MT	8.2	7.7	5.10	-

**Appendix Table A.2: Non-destructive Fish Measurements for Pinewood River Near-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
White Sucker	23-Jul-19	MT	10.5	9.9	11.50	-
White Sucker	23-Jul-19	SN	13.6	12.9	24.65	-
White Sucker	23-Jul-19	SN	12.1	11.4	17.58	-
White Sucker	23-Jul-19	SN	10.7	10.1	11.44	-
White Sucker	23-Jul-19	SN	20.5	19.6	88.00	-
White Sucker	23-Jul-19	SN	10.5	10.0	11.07	-
White Sucker	23-Jul-19	SN	9.2	8.6	7.64	-
White Sucker	23-Jul-19	SN	12.6	12.0	20.24	-
White Sucker	23-Jul-19	SN	9.1	8.6	7.68	-
White Sucker	23-Jul-19	SN	9.7	9.1	8.76	-
White Sucker	23-Jul-19	SN	8.7	8.4	6.70	-
White Sucker	23-Jul-19	SN	10.7	10.2	11.82	-
White Sucker	23-Jul-19	SN	12.1	11.4	18.37	-
White Sucker	23-Jul-19	SN	10.4	9.9	10.79	-
White Sucker	23-Jul-19	SN	13.3	12.9	22.66	-
White Sucker	23-Jul-19	SN	11.6	10.9	14.81	-
White Sucker	23-Jul-19	SN	10.6	10.0	12.38	-
White Sucker	23-Jul-19	SN	14.7	14.1	32.50	-
White Sucker	23-Jul-19	SN	11.1	10.5	13.57	-
White Sucker	23-Jul-19	SN	14.1	13.3	26.82	-
White Sucker	23-Jul-19	SN	10.9	10.3	12.66	-
White Sucker	23-Jul-19	SN	12.8	12.1	23.40	-

Note: "-" indicates not sampled.

<sup>a</sup> Catch methods: GN = gill net, SN = seine net, MT = minnow trap

**Appendix Table A.3: Non-destructive Fish Measurements for Pinewood River Far-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Blackside Darter	20-Jul-19	MT	7.2	-	3.00	-
Blackside Darter	20-Jul-19	SN	6.1	-	1.50	-
Blackside Darter	20-Jul-19	SN	3.0	-	0.10	-
Blackside Darter	20-Jul-19	SN	2.7	-	0.10	-
Blackside Darter	20-Jul-19	SN	3.1	-	0.10	-
Blackside Darter	20-Jul-19	SN	3.1	-	0.10	-
Blackside Darter	20-Jul-19	SN	3.1	-	0.10	-
Blackside Darter	20-Jul-19	SN	6.1	-	2.00	-
Blackside Darter	20-Jul-19	SN	6.8	-	2.30	-
Blackside Darter	20-Jul-19	SN	3.0	-	-	-
Blackside Darter	20-Jul-19	SN	5.7	-	1.50	-
Blackside Darter	20-Jul-19	SN	2.6	-	0.10	-
Blackside Darter	20-Jul-19	SN	7.0	-	3.00	-
Blackside Darter	20-Jul-19	SN	3.4	-	0.25	-
Blackside Darter	21-Jul-19	SN	6.0	-	2.05	-
Blackside Darter	21-Jul-19	SN	3.0	-	0.18	-
Blackside Darter	21-Jul-19	SN	5.8	-	1.74	-
Blackside Darter	21-Jul-19	SN	5.6	-	1.40	-
Blackside Darter	21-Jul-19	SN	6.0	-	1.94	-
Blackside Darter	21-Jul-19	SN	6.2	-	2.35	-
Blackside Darter	21-Jul-19	SN	7.6	-	4.00	-
Blackside Darter	21-Jul-19	SN	6.1	-	1.50	-
Blackside Darter	21-Jul-19	SN	6.0	-	1.25	-
Blackside Darter	21-Jul-19	SN	6.0	-	1.50	-
Blackside Darter	21-Jul-19	SN	5.9	-	1.60	-
Blackside Darter	21-Jul-19	SN	6.8	-	2.50	-
Blackside Darter	21-Jul-19	SN	5.7	-	1.50	-
Blackside Darter	21-Jul-19	SN	3.0	-	0.10	-
Blackside Darter	21-Jul-19	SN	6.5	-	2.25	-
Blackside Darter	21-Jul-19	SN	7.0	-	2.25	-
Blackside Darter	21-Jul-19	SN	6.7	-	2.50	-
Blackside Darter	21-Jul-19	SN	5.6	-	1.00	-
Blackside Darter	21-Jul-19	SN	7.2	-	2.70	-
Blackside Darter	21-Jul-19	SN	5.6	-	1.25	-
Blackside Darter	21-Jul-19	SN	6.1	-	2.00	-
Blackside Darter	21-Jul-19	SN	2.6	-	0.10	-
Blackside Darter	21-Jul-19	SN	2.6	-	0.10	-
Blackside Darter	21-Jul-19	SN	2.9	-	0.10	-
Blackside Darter	21-Jul-19	SN	2.3	-	0.10	-
Blackside Darter	21-Jul-19	SN	3.1	-	0.10	-
Blackside Darter	21-Jul-19	SN	3.1	-	0.10	-
Blackside Darter	21-Jul-19	SN	2.8	-	0.10	-
Brassy Minnow	20-Jul-19	MT	5.0	4.8	1.10	-
Brassy Minnow	21-Jul-19	SN	4.5	4.3	0.83	-
Brassy Minnow	21-Jul-19	SN	5.1	4.7	0.91	-
Brassy Minnow	21-Jul-19	SN	4.4	4.3	0.75	-
Brassy Minnow	21-Jul-19	SN	4.5	4.2	0.50	-
Brassy Minnow	21-Jul-19	SN	5.0	4.6	1.00	-
Brassy Minnow	21-Jul-19	SN	4.9	4.6	0.75	-
Brassy Minnow	21-Jul-19	SN	4.7	4.4	0.75	-
Brassy Minnow	21-Jul-19	SN	4.5	4.2	0.75	-
Brassy Minnow	21-Jul-19	SN	5.8	5.5	1.50	-
Brassy Minnow	21-Jul-19	SN	4.6	4.3	0.25	-
Brassy Minnow	21-Jul-19	SN	3.9	3.7	0.25	-
Brassy Minnow	21-Jul-19	SN	6.1	5.8	-	fell off
Brassy Minnow	21-Jul-19	SN	6.1	5.8	1.50	-
Brassy Minnow	21-Jul-19	SN	4.6	4.4	0.75	-
Brassy Minnow	21-Jul-19	SN	4.6	4.3	0.50	-
Brassy Minnow	21-Jul-19	SN	4.6	4.3	0.60	-
Brassy Minnow	21-Jul-19	SN	4.6	4.4	0.50	-

**Appendix Table A.3: Non-destructive Fish Measurements for Pinewood River Far-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Brassy Minnow	21-Jul-19	SN	6.7	6.4	1.50	-
Brassy Minnow	21-Jul-19	SN	6.3	5.9	2.00	-
Brassy Minnow	21-Jul-19	SN	5.8	5.4	1.50	-
Brassy Minnow	21-Jul-19	SN	4.8	4.5	0.75	-
Brassy Minnow	21-Jul-19	SN	5.7	5.5	1.50	-
Brassy Minnow	21-Jul-19	SN	4.6	4.3	0.50	-
Brassy Minnow	21-Jul-19	SN	5.0	4.7	1.00	-
Brassy Minnow	21-Jul-19	SN	5.2	4.9	1.00	-
Brassy Minnow	21-Jul-19	SN	5.0	4.7	0.50	-
Brassy Minnow	21-Jul-19	SN	5.2	4.9	1.00	-
Brassy Minnow	21-Jul-19	SN	4.5	4.2	0.75	-
Brassy Minnow	21-Jul-19	SN	5.1	4.9	-	-
Brassy Minnow	21-Jul-19	SN	5.3	4.9	1.00	-
Brassy Minnow	21-Jul-19	SN	4.5	4.2	0.50	-
Brassy Minnow	21-Jul-19	SN	4.5	4.2	0.50	-
Brassy Minnow	21-Jul-19	SN	4.4	4.1	0.50	-
Brassy Minnow	21-Jul-19	SN	5.0	4.2	1.25	-
Brassy Minnow	21-Jul-19	SN	4.6	4.3	0.75	-
Brassy Minnow	21-Jul-19	SN	5.7	5.4	1.50	-
Brassy Minnow	21-Jul-19	SN	4.5	4.1	0.50	-
Brassy Minnow	21-Jul-19	SN	4.1	3.8	0.50	-
Brassy Minnow	21-Jul-19	SN	4.1	3.9	0.50	-
Brassy Minnow	21-Jul-19	SN	4.3	4.0	0.25	-
Brassy Minnow	21-Jul-19	SN	4.2	3.8	0.25	-
Brassy Minnow	21-Jul-19	SN	4.1	3.8	-	-
Brook Stickleback	20-Jul-19	SN	2.2	-	0.10	-
Central Mudminnow	20-Jul-19	MT	5.9	-	2.00	-
Central Mudminnow	20-Jul-19	SN	3.3	-	0.60	-
Common Shiner	20-Jul-19	SN	7.3	6.8	2.80	-
Common Shiner	20-Jul-19	SN	10.2	9.5	11.50	-
Common Shiner	20-Jul-19	SN	5.3	5.0	1.00	-
Common Shiner	20-Jul-19	SN	5.6	5.1	0.80	-
Common Shiner	20-Jul-19	SN	6.8	5.5	1.50	-
Common Shiner	21-Jul-19	SN	3.4	3.2	0.27	-
Common Shiner	21-Jul-19	SN	4.6	4.2	0.50	-
Common Shiner	21-Jul-19	SN	4.9	4.5	0.75	-
Common Shiner	21-Jul-19	SN	10.5	9.6	11.25	-
Common Shiner	21-Jul-19	SN	5.6	5.2	1.25	-
Common Shiner	21-Jul-19	SN	12.1	11.1	19.75	-
Fathead Minnow	20-Jul-19	SN	6.3	6.0	2.80	-
Fathead Minnow	20-Jul-19	SN	6.5	6.1	2.60	-
Fathead Minnow	20-Jul-19	SN	5.2	4.9	-	Lost fish
Fathead Minnow	20-Jul-19	SN	5.1	4.7	1.30	-
Fathead Minnow	20-Jul-19	SN	5.4	4.9	1.00	-
Fathead Minnow	20-Jul-19	SN	6.2	5.8	2.25	-
Fathead Minnow	20-Jul-19	SN	5.8	5.2	1.25	-
Fathead Minnow	20-Jul-19	SN	5.5	5.1	1.50	-
Fathead Minnow	20-Jul-19	SN	4.8	4.5	0.75	-
Fathead Minnow	20-Jul-19	SN	4.3	4.1	0.50	-
Fathead Minnow	20-Jul-19	SN	5.0	4.6	1.00	-
Fathead Minnow	20-Jul-19	SN	5.2	5.0	1.00	-
Fathead Minnow	20-Jul-19	SN	5.7	5.4	1.50	-
Fathead Minnow	20-Jul-19	SN	4.9	4.6	0.50	-
Fathead Minnow	20-Jul-19	SN	4.8	4.5	0.75	-
Fathead Minnow	20-Jul-19	SN	4.9	4.6	0.50	-
Fathead Minnow	20-Jul-19	SN	4.0	3.8	0.50	-
Fathead Minnow	20-Jul-19	SN	4.9	4.6	1.00	-
Fathead Minnow	20-Jul-19	SN	4.4	4.2	0.50	-
Fathead Minnow	20-Jul-19	SN	5.9	3.6	1.00	-
Fathead Minnow	21-Jul-19	SN	4.5	4.3	0.78	-

**Appendix Table A.3: Non-destructive Fish Measurements for Pinewood River Far-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Fathead Minnow	21-Jul-19	SN	3.7	3.5	0.41	-
Fathead Minnow	21-Jul-19	SN	5.6	5.4	1.50	-
Fathead Minnow	21-Jul-19	SN	5.9	5.5	2.00	-
Fathead Minnow	21-Jul-19	SN	6.4	6.1	2.50	-
Golden Shiner	20-Jul-19	SN	7.3	6.5	2.75	-
Golden Shiner	20-Jul-19	SN	7.1	6.9	2.00	-
Golden Shiner	20-Jul-19	SN	8.1	7.2	4.25	-
Golden Shiner	21-Jul-19	SN	7.3	6.7	3.00	-
Golden Shiner	21-Jul-19	SN	5.9	5.4	1.50	-
Johnny Darter	20-Jul-19	SN	2.6	-	0.10	-
Johnny Darter	20-Jul-19	SN	2.3	-	0.10	-
Johnny Darter	20-Jul-19	SN	5.4	-	1.30	-
Johnny Darter	20-Jul-19	SN	5.0	-	0.80	-
Johnny Darter	20-Jul-19	SN	4.4	-	0.50	-
Johnny Darter	20-Jul-19	SN	2.2	-	0.10	-
Johnny Darter	20-Jul-19	SN	5.4	-	1.00	-
Johnny Darter	20-Jul-19	SN	4.4	-	0.60	-
Johnny Darter	20-Jul-19	SN	4.5	-	0.70	-
Johnny Darter	20-Jul-19	SN	4.3	-	0.50	-
Johnny Darter	20-Jul-19	SN	4.1	-	0.40	-
Johnny Darter	20-Jul-19	SN	4.2	-	0.50	-
Johnny Darter	20-Jul-19	SN	4.4	-	0.50	-
Johnny Darter	20-Jul-19	SN	4.7	-	0.75	-
Johnny Darter	20-Jul-19	SN	3.9	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.5	-	0.54	-
Johnny Darter	21-Jul-19	SN	4.3	-	0.70	-
Johnny Darter	21-Jul-19	SN	4.6	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.5	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.4	-	0.40	-
Johnny Darter	21-Jul-19	SN	2.4	-	0.10	-
Johnny Darter	21-Jul-19	SN	2.7	-	0.25	-
Johnny Darter	21-Jul-19	SN	5.9	-	1.50	-
Johnny Darter	21-Jul-19	SN	5.1	-	0.75	-
Johnny Darter	21-Jul-19	SN	4.6	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.2	-	0.50	-
Johnny Darter	21-Jul-19	SN	9.7	-	0.50	-
Johnny Darter	21-Jul-19	SN	3.8	-	0.25	-
Johnny Darter	21-Jul-19	SN	4.6	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.6	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.6	-	0.60	-
Johnny Darter	21-Jul-19	SN	6.6	-	1.50	-
Johnny Darter	21-Jul-19	SN	4.3	-	0.50	-
Johnny Darter	21-Jul-19	SN	3.8	-	0.40	-
Johnny Darter	21-Jul-19	SN	4.3	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.1	-	0.25	-
Johnny Darter	21-Jul-19	SN	1.8	-	0.10	-
Johnny Darter	21-Jul-19	SN	5.3	-	1.00	-
Johnny Darter	21-Jul-19	SN	4.6	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.3	-	0.50	-
Johnny Darter	21-Jul-19	SN	3.8	-	0.25	-
Johnny Darter	21-Jul-19	SN	3.8	-	0.50	-
Johnny Darter	21-Jul-19	SN	2.9	-	0.10	-
Johnny Darter	21-Jul-19	SN	4.2	-	-	-
Johnny Darter	21-Jul-19	SN	3.8	-	0.25	-
Johnny Darter	21-Jul-19	SN	4.0	-	0.25	-
Johnny Darter	21-Jul-19	SN	4.5	-	0.50	-
Johnny Darter	21-Jul-19	SN	4.2	-	0.25	-
Johnny Darter	21-Jul-19	SN	4.9	-	0.60	-
Johnny Darter	21-Jul-19	SN	5.1	-	1.00	-
Johnny Darter	21-Jul-19	SN	4.5	-	0.50	-

**Appendix Table A.3: Non-destructive Fish Measurements for Pinewood River Far-Field Area, RRM 2019**

Fish Species	Processing Date	Catch Method <sup>a</sup>	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Comments
Johnny Darter	21-Jul-19	SN	2.5	-	0.10	-
Northern Pike	20-Jul-19	SN	13.6	13.2	12.00	-
Northern Pike	20-Jul-19	SN	11.9	11.2	8.75	-
Rock Bass	20-Jul-19	SN	18.1	17.7	131.00	-
Rock Bass	21-Jul-19	SN	10.8	10.5	23.50	-
Trout Perch	20-Jul-19	SN	3.0	2.9	0.10	-
Trout Perch	20-Jul-19	SN	3.2	3.0	0.25	-
Trout Perch	20-Jul-19	SN	3.9	3.6	0.25	-
Trout Perch	20-Jul-19	SN	3.7	3.7	0.50	-
Trout Perch	20-Jul-19	SN	8.7	7.8	5.25	-
Trout Perch	20-Jul-19	SN	3.8	3.6	0.25	-
Trout Perch	20-Jul-19	SN	7.4	7.0	3.00	-
Trout Perch	20-Jul-19	SN	7.4	6.9	4.00	-
Trout Perch	20-Jul-19	SN	8.8	7.1	4.25	-
Trout Perch	21-Jul-19	SN	7.9	7.3	4.70	-
Trout Perch	21-Jul-19	SN	9.0	8.2	6.28	-
Trout Perch	21-Jul-19	SN	8.0	7.4	4.04	-
Trout Perch	21-Jul-19	SN	3.2	3.1	0.35	-
Trout Perch	21-Jul-19	SN	3.9	3.6	0.55	-
Trout Perch	21-Jul-19	SN	11.2	10.6	12.50	-
Trout Perch	21-Jul-19	SN	3.6	3.3	0.50	-
Trout Perch	21-Jul-19	SN	10.0	9.0	9.25	-
Trout Perch	21-Jul-19	SN	9.8	8.9	8.50	-
Trout Perch	21-Jul-19	SN	7.9	7.2	4.50	-
Trout Perch	21-Jul-19	SN	7.8	7.3	4.25	-
Trout Perch	21-Jul-19	SN	7.6	7.2	4.25	-
Trout Perch	21-Jul-19	SN	3.5	3.2	0.25	-
Trout Perch	21-Jul-19	SN	3.6	3.3	0.25	-
Trout Perch	21-Jul-19	SN	2.1	2.8	0.10	-
Trout Perch	21-Jul-19	SN	3.2	3.0	0.10	-
Trout Perch	21-Jul-19	SN	2.7	2.5	0.10	-
Trout Perch	21-Jul-19	SN	11.8	10.8	16.00	-
Trout Perch	21-Jul-19	SN	10.6	9.7	9.00	-
Trout Perch	21-Jul-19	SN	9.1	8.3	6.00	-
Trout Perch	21-Jul-19	SN	10.7	9.9	10.50	-
Trout Perch	21-Jul-19	SN	3.4	3.1	0.40	-
White Sucker	20-Jul-19	SN	12.4	12.0	16.75	-
White Sucker	20-Jul-19	SN	11.3	11.1	13.50	-
White Sucker	20-Jul-19	SN	10.3	9.8	12.00	-
White Sucker	21-Jul-19	SN	11.5	10.9	12.50	-
White Sucker	21-Jul-19	SN	10.3	9.7	10.00	-
White Sucker	21-Jul-19	SN	12.9	12.0	21.25	-
White Sucker	21-Jul-19	SN	10.7	10.1	12.25	-
White Sucker	21-Jul-19	SN	10.2	9.8	11.00	-
White Sucker	21-Jul-19	SN	4.0	3.8	0.25	-
White Sucker	21-Jul-19	SN	16.1	15.0	49.50	-
White Sucker	21-Jul-19	SN	14.0	13.1	26.50	-
White Sucker	21-Jul-19	SN	11.2	10.5	13.50	-
White Sucker	21-Jul-19	SN	8.5	7.9	5.50	-
White Sucker	21-Jul-19	SN	9.5	8.9	8.75	-
White Sucker	21-Jul-19	SN	11.1	10.4	14.50	-
White Sucker	21-Jul-19	SN	13.1	12.1	21.50	-
White Sucker	21-Jul-19	SN	11.2	10.4	14.25	-
White Sucker	21-Jul-19	SN	10.0	9.5	10.00	-
White Sucker	21-Jul-19	SN	3.5	3.2	0.25	-
White Sucker	21-Jul-19	SN	3.9	3.7	0.25	-

Note: "-" indicates not sampled.

<sup>a</sup> Catch methods: GN = gill net, SN = seine net, MT = minnow trap

**Appendix Table A.4: Detailed Fish Measurements for Tissue Samples Captured at Pinewood River Reference Area, RRM 2019**

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected <sup>a</sup>	Age	Tissue Collected	Comments
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-01	8.3	7.5	5.42	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-02	6.8	6.4	1.93	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-03	5.9	5.5	1.84	oto (head)	0	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-04	6.2	5.7	1.85	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-05	3.9	3.6	0.46	oto (head)	0	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-06	4.0	3.8	0.40	oto (head)	0	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-07	5.8	5.3	1.53	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-08	7.6	7.1	3.85	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-09	8.2	7.8	4.77	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-10	6.2	5.8	1.67	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-11	6.1	5.8	1.86	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-12	8.2	7.6	4.55	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-13	7.6	7.0	3.93	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-14	8.6	8.0	5.90	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-15	8.5	7.8	5.96	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-16	8.0	7.4	4.30	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-17	7.5	7.0	3.79	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-18	7.6	7.2	4.25	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-19	7.6	7.0	3.99	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-20	7.2	6.8	3.77	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-21	7.4	6.9	3.57	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-22	8.5	8.0	6.04	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-23	7.7	7.0	4.36	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-24	7.3	6.8	3.95	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-25	8.2	7.7	4.41	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-26	7.7	7.2	4.29	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-27	7.7	7.0	4.14	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-28	7.4	7.0	4.13	oto (head)	3	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-29	7.4	6.9	3.46	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-30	7.7	7.0	3.93	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-31	6.8	6.4	2.46	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-32	8.1	7.5	4.88	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-33	7.6	7.1	3.27	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-34	7.9	7.4	3.91	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-35	7.3	6.8	2.97	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-36	7.8	7.4	4.03	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-37	7.5	7.0	3.91	oto (head)	3	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-38	7.9	7.5	6.25	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-39	8.5	8.0	4.47	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-40	7.4	7.0	4.19	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-41	8.4	7.8	6.09	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-42	6.7	6.3	2.31	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-43	7.8	7.4	4.04	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-44	7.5	7.1	3.62	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-45	8.3	7.9	5.83	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-46	7.5	7.0	3.51	oto (head)	3	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-47	7.3	6.8	3.44	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-48	5.3	5.0	1.09	oto (head)	1	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-49	7.8	7.0	3.86	oto (head)	2	Body	-
PW-REF	24-Jul-19	Common Shiner	PW-REF-CS-50	8.2	7.7	5.14	oto (head)	2	Body	-
<b>total sample size</b>				<b>112</b>	<b>62</b>	<b>112</b>	-	<b>50</b>	-	-
<b>average</b>				<b>6.5</b>	<b>6.7</b>	<b>2.78</b>	-	<b>2</b>	-	-
<b>median</b>				<b>6.1</b>	<b>7.0</b>	<b>2.01</b>	-	<b>2</b>	-	-
<b>standard deviation</b>				<b>1.2</b>	<b>1.0</b>	<b>1.4</b>	-	<b>0.7</b>	-	-
<b>standard error</b>				<b>0.11</b>	<b>0.13</b>	<b>0.13</b>	-	<b>0.10</b>	-	-
<b>minimum</b>				<b>3.9</b>	<b>3.6</b>	<b>0.40</b>	-	<b>0</b>	-	-
<b>maximum</b>				<b>8.6</b>	<b>8.0</b>	<b>6.25</b>	-	<b>3</b>	-	-

Note: "-" indicates not sampled.

<sup>a</sup> Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin.



**Appendix Table A.5: Detailed Fish Measurements for Tissue Samples Captured at Pinewood River Near-field Area, July 2019**

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected <sup>a</sup>	Age	Mercury Concentration (mg/kg ww)	Tissue Collected	Comments
PW-NF	23-Jul-19	Common Shiner	PW-NF-CS-01	10.1	9.3	8.587	oto (head)	3	0.70	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-02	12.6	11.8	23.534	oto (head)	3	0.28	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-03	10.3	9.6	11.007	oto (head)	2	0.49	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-04	11.5	10.6	16.536	oto (head)	3	0.27	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-05	9.5	8.7	9.148	oto (head)	1	0.37	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-06	10.5	9.7	11.136	oto (head)	1	0.41	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-07	10.7	10.0	13.476	oto (head)	2	0.48	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-08	7.7	7.0	3.671	oto (head)	1	0.45	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-09	10.8	9.9	11.175	oto (head)	1	0.47	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-10	9.2	8.4	6.815	oto (head)	1	0.43	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-11	7.2	6.5	3.328	oto (head)	1	0.30	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-12	9.2	8.3	6.993	oto (head)	1	0.30	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-13	11.7	10.9	17.377	oto (head)	2	0.33	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-14	10.6	9.9	11.755	oto (head)	2	0.36	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-15	10.5	9.8	10.293	oto (head)	3	0.59	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-16	6.7	6.3	2.880	oto (head)	1	0.53	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-17	10.1	9.3	11.191	oto (head)	2	0.36	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-18	11.8	11.0	19.000	oto (head)	3	0.37	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-19	11.1	10.2	15.072	oto (head)	2	0.32	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-20	11.1	10.2	14.977	oto (head)	3	0.53	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-21	10.2	9.8	12.138	oto (head)	2	0.46	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-22	7.1	6.6	3.690	oto (head)	1	0.56	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-23	13.5	12.9	24.250	oto (head)	4	0.35	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-24	9.6	8.8	8.656	oto (head)	3	0.67	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-25	7.7	6.9	4.241	oto (head)	2	0.32	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-26	12.1	11.1	18.900	oto (head)	3	0.33	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-27	12.5	11.6	21.250	oto (head)	3	0.25	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-28	12.5	11.6	22.000	oto (head)	3	0.27	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-29	6.7	6.0	2.608	oto (head)	2	0.60	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-30	12.1	11.2	20.043	oto (head)	3	0.44	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-31	10.4	9.5	11.787	oto (head)	3	0.62	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-32	12.4	11.7	26.960	oto (head)	3	0.37	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-33	9.7	9.1	10.143	oto (head)	3	0.57	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-34	6.8	6.3	2.848	oto (head)	1	0.38	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-35	8.6	7.3	6.148	oto (head)	2	0.41	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-36	7.4	6.7	3.519	oto (head)	2	0.59	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-37	9.0	8.7	7.261	oto (head)	2	0.63	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-38	9.0	8.3	7.439	oto (head)	1	0.33	Body	-
PW-NF	24-Jul-19	Common Shiner	PW-NF-CS-39	7.8	7.1	4.099	oto (head)	2	0.50	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-40	11.0	10.1	14.307	oto (head)	3	0.38	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-41	10.7	9.8	11.835	oto (head)	1	0.41	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-42	11.5	10.6	13.364	oto (head)	3	0.72	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-43	10.2	9.7	12.057	oto (head)	3	0.54	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-44	10.5	9.5	10.469	oto (head)	2	0.62	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-45	11.3	11.0	16.355	oto (head)	3	0.25	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-46	10.4	9.6	11.143	oto (head)	3	0.48	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-47	10.9	9.9	14.602	oto (head)	2	0.27	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-48	11.3	10.6	20.683	oto (head)	2	0.34	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-49	12.3	11.2	22.442	oto (head)	3	0.29	Body	-
PW-NF	25-Jul-19	Common Shiner	PW-NF-CS-50	8.3	7.7	6.172	oto (head)	2	0.34	Body	-
<b>total sample size</b>				<b>50</b>	<b>50</b>	<b>50</b>	-	<b>50</b>	<b>50</b>	-	-
<b>average</b>				<b>10</b>	<b>9</b>	<b>12</b>	-	<b>2</b>	<b>0.43</b>	-	-
<b>median</b>				<b>10</b>	<b>10</b>	<b>11</b>	-	<b>2</b>	<b>0.41</b>	-	-
<b>standard deviation</b>				<b>1.8</b>	<b>1.7</b>	<b>6.4</b>	-	<b>0.8</b>	<b>0.13</b>	-	-
<b>standard error</b>				<b>0.25</b>	<b>0.24</b>	<b>0.91</b>	-	<b>0.12</b>	<b>0.02</b>	-	-
<b>minimum</b>				<b>7</b>	<b>6</b>	<b>3</b>	-	<b>1</b>	<b>0.25</b>	-	-
<b>maximum</b>				<b>14</b>	<b>13</b>	<b>27</b>	-	<b>4</b>	<b>0.72</b>	-	-

Denotes tissue concentration above mercury guideline for sensitive populations

Note: "-" indicates not sampled.

<sup>a</sup> Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin.

**Appendix Table A.6: Detailed Fish Measurements for Tissue Samples Captured at Pinewood River Far-field Area, July 2019**

Area	Processing Date	Fish Species	Fish ID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Age Structure Collected <sup>a</sup>	Age	Mercury Concentration (mg/kg ww)	Tissue Collected	Comments
PW-FF	23-Jul-19	Common Shiner	PW-FF-CS-01	7.6	6.9	3.481	oto (head)	2	0.09	Body	
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-02	9.9	9.0	9.855	oto (head)	3	0.26	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-03	10.5	9.6	11.768	oto (head)	2	0.19	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-04	8.2	7.4	4.953	oto (head)	2	0.22	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-05	10.5	9.5	13.460	oto (head)	3	0.17	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-06	7.6	6.9	3.872	oto (head)	1	0.18	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-07	8.2	7.5	5.159	oto (head)	2	0.34	Body	Tumours
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-08	11.2	9.8	12.674	oto (head)	3	0.17	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-09	9.9	9.0	9.070	oto (head)	2	0.23	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-10	6.5	6.0	2.115	oto (head)	2	0.08	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-11	11.9	10.9	20.305	oto (head)	3	0.21	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-12	9.4	8.6	8.316	oto (head)	2	0.17	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-13	9.2	8.4	7.640	oto (head)	2	0.17	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-14	8.0	7.4	4.854	oto (head)	2	0.30	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-15	8.9	7.6	6.079	oto (head)	2	0.20	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-16	10.2	9.4	13.036	oto (head)	2	0.15	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-17	9.0	8.2	3.260	oto (head)	2	0.17	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-18	11.7	10.2	15.954	oto (head)	2	0.20	Body	Back tumours
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-19	10.2	9.5	12.563	oto (head)	1	0.19	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-20	9.1	8.2	7.615	oto (head)	2	0.27	Body	Chin tumours
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-21	9.7	9.0	10.515	oto (head)	2	0.16	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-22	9.8	9.0	11.084	oto (head)	2	0.20	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-23	5.8	5.5	1.675	oto (head)	2	0.30	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-24	6.5	6.1	2.774	oto (head)	2	0.16	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-25	6.5	5.9	2.275	oto (head)	2	0.38	Body	Caudal
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-26	7.4	6.7	3.666	oto (head)	2	0.20	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-27	5.6	5.3	1.420	oto (head)	1	0.11	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-28	5.7	5.3	1.625	oto (head)	2	0.19	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-29	5.9	5.3	1.682	oto (head)	1	0.23	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-30	6.4	6.0	2.127	oto (head)	2	0.21	Body	Caudal
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-31	12.0	11.0	8.821	oto (head)	3	0.20	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-32	11.4	10.0	6.552	oto (head)	3	0.17	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-33	9.0	8.2	7.175	oto (head)	2	0.23	Body	-
PW-FF	24-Jul-19	Common Shiner	PW-FF-CS-34	6.2	5.8	2.118	oto (head)	2	0.10	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-35	9.7	9.0	9.700	oto (head)	2	0.21	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-36	8.5	7.8	5.277	oto (head)	2	0.16	Body	Growth lower half
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-37	11.7	11.2	16.245	oto (head)	2	0.22	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-38	11.0	10.0	13.869	oto (head)	2	0.19	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-39	5.9	5.6	1.843	oto (head)	1	0.09	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-40	8.1	7.3	4.843	oto (head)	2	0.21	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-41	9.4	8.5	7.972	oto (head)	2	0.18	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-42	8.0	7.3	4.859	oto (head)	2	0.25	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-43	6.2	5.8	2.066	oto (head)	2	0.18	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-44	10.0	9.2	9.695	oto (head)	2	0.24	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-45	11.7	11.0	15.460	oto (head)	3	0.26	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-46	9.8	9.0	9.572	oto (head)	2	0.18	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-47	8.6	7.9	6.664	oto (head)	2	0.24	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-48	10.0	9.1	9.711	oto (head)	2	0.16	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-49	8.9	8.1	6.284	oto (head)	2	0.20	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-50	8.5	7.2	4.116	oto (head)	2	0.16	Body	-
PW-FF	25-Jul-19	Common Shiner	PW-FF-CS-51	7.4	6.7	3.669	oto (head)	1	0.21	Body	-
<b>total sample size</b>				<b>51</b>	<b>51</b>	<b>51</b>	-	<b>51</b>	<b>51</b>	-	-
<b>average</b>				<b>9</b>	<b>8</b>	<b>7</b>	-	<b>2</b>	<b>0.20</b>	-	-
<b>median</b>				<b>9</b>	<b>8</b>	<b>7</b>	-	<b>2</b>	<b>0.20</b>	-	-
<b>standard deviation</b>				<b>1.9</b>	<b>1.7</b>	<b>4.6</b>	-	<b>0.5</b>	<b>0.1</b>	-	-
<b>standard error</b>				<b>0.26</b>	<b>0.23</b>	<b>0.65</b>	-	<b>0.07</b>	<b>0.01</b>	-	-
<b>minimum</b>				<b>6</b>	<b>5</b>	<b>1</b>	-	<b>1</b>	<b>0.08</b>	-	-
<b>maximum</b>				<b>12</b>	<b>11</b>	<b>20</b>	-	<b>3</b>	<b>0.38</b>	-	-

Note: "-" indicates not sampled.

<sup>a</sup> Age structures collected: sc - scales, oto - otoliths; ds - dorsal spine; pf - pectoral fin.

Appendix Table A.7: Gill Net Capture Records, RRM 2019

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Effort (Fishing Hours)	Depth Range (m)		Set		Blacknose Dace			Brassy Minnow			Brook Stickleback			Brown Bullhead			Central Mudminnow			Common Shiner						
		Length (ft)	Mesh (inches)								Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>			
PW-REF	PW-REF-GN-01	430663	5407709	17-Jul-19	18-Jul-19	15:05	11:45	20.67	1.2	2.0	100	2.5, 3.0, 4.0, 5.0	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-02	430676	5407661	17-Jul-19	18-Jul-19	15:24	11:30	20.10	1.0	1.8	50	0.5	0	0	0.0000	1	0	0.050	41	41	2.040	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-03	430714	5407624	17-Jul-19	18-Jul-19	15:44	10:50	19.10	0.8	1.5	50	0.5	0	0	0.0000	1	0	0.052	24	24	1.257	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-04	430783	5407630	17-Jul-19	18-Jul-19	16:15	8:30	16.25	0.5	2.0	125	1.0, 1.5, 2.0, 3.0	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	5	0	0.308	17	0	1.046	0	0	0.000	
	PW-REF-GN-05	430655	5407692	24-Jul-19	24-Jul-19	12:00	13:00	1.00	0.5	1.5	75	0.5	0	0	0.0000	0	0	0.000	2	0	2.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-06	430665	5407701	24-Jul-19	24-Jul-19	12:15	13:10	0.92	0.5	1.5	75	0.5	7	0	7.6364	0	0	0.000	4	0	4.364	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-07	430655	5407692	24-Jul-19	25-Jul-19	13:04	8:55	19.85	0	1.5	75	0.5	1	1	0.0504	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	6	6	0.302	0	0	0.000	
	PW-REF-GN-08	430658	5407689	24-Jul-19	25-Jul-19	13:17	8:00	18.72	0.0	2.0	75	0.5	0	0	0.0000	24	24	1.282	0	0	0.000	0	0	0.0000	8	8	0.427	49	49	2.618	0	0	0.000	
<b>Total</b>								<b>95.93</b>					<b>8</b>	<b>1</b>	<b>7.6867</b>	<b>26</b>	<b>24</b>	<b>1.3844</b>	<b>71</b>	<b>65</b>	<b>9.66</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>8</b>	<b>0.7351</b>	<b>72</b>	<b>55</b>	<b>3.9664</b>				
PW-NF	PW-NF-GN-01	420712	5408570	19-Jul-19	19-Jul-19	8:32	17:30	8.97	0.7	1.0	50	0.5	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	1	0	0.112	0	0	0.000	
	PW-NF-GN-02	420709	5408539	19-Jul-19	19-Jul-19	9:01	17:58	8.95	0.5	0.7	50	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-03	420714	5408528	19-Jul-19	19-Jul-19	9:03	17:55	8.87	-	-	15	1.5, 2.0, 2.5, 3.0	0	0+P16	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-04	420737	5408544	19-Jul-19	19-Jul-19	9:27	18:10	8.72	0.2	1.1	7	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-05	420693	5408515	19-Jul-19	19-Jul-19	9:32	18:05	8.55	0.5	0.7	5	0.5	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	2	0	0.234	0	0	0.000	
	PW-NF-GN-06	420680	5408501	19-Jul-19	19-Jul-19	9:33	18:25	8.87	0.5	1.0	18	1	0	0	0.0000	0	0	0.000	0	0	0.000	1	0	0.1128	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-07	420650	5408522	21-Jul-19	22-Jul-19	7:16	11:45	28.48	0.5	1.0	15	4.0, 3.5, 3.0, 2.5	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-08	420728	5408627	21-Jul-19	22-Jul-19	7:24	12:50	29.43	0.7	1.2	50	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	2	1	0.068	0	0	0.000	
	PW-NF-GN-09	419137	5408129	24-Jul-19	25-Jul-19	13:30	7:25	17.92	0.2	1.1	12	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	1	1	0.056	0	0	0.000	
<b>Total</b>								<b>128.75</b>					<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0.1128</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>2</b>	<b>0.4692</b>			
PW-FF	PW-FF-GN-01	413143	5405788	19-Jul-19	19-Jul-19	12:20	19:54	7.57	0.3	0.5	50	0.5	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-02	413159	5405838	19-Jul-19	19-Jul-19	12:32	20:05	7.55	0.3	0.6	50	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-03	413151	5405814	19-Jul-19	19-Jul-19	12:45	19:58	7.22	0.4	0.7	8	2.5, 3	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-04	413158	5405863	19-Jul-19	20-Jul-19	13:08	11:26	22.30	0.2	0.7	50	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-05	413169	5405890	19-Jul-19	20-Jul-19	13:24	11:37	22.22	0.5	1.1	15	1.5, 2.0, 2.5, 3.0	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-06	413190	5405922	19-Jul-19	19-Jul-19	13:34	19:57	6.38	0.3	0.7	50	1	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-07	413190	5405922	20-Jul-19	20-Jul-19	11:50	15:40	3.83	0.2	1.0	150	1.0, 1.5, 2.0, 3.0, 4.0	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
<b>Total</b>								<b>77.07</b>					<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	

<sup>a</sup> 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 Capture Records, RRM 2019

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Effort (Fishing Hours)	Depth Range (m)		Set			Crappie			Creek Chub			Cyprinid sp.			Fathead Minnow			Finescale Dace			Golden Shiner				
		Length (ft)	Mesh (inches)								Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed	CPUE <sup>a</sup>	Catch	mortalities/ sacrificed
PW-REF	PW-REF-GN-01	430663	5407709	17-Jul-19	18-Jul-19	15:05	11:45	20.67	1.2	2.0	100	2.5, 3.0, 4.0, 5.0	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-REF-GN-02	430676	5407661	17-Jul-19	18-Jul-19	15:24	11:30	20.10	1.0	1.8	50	0.5	0	0	0.0000	1	0	0.050	0	0	0.0000	0	0	0.0000	25	3	1.244	0	0	0.000	0	0	0.000
	PW-REF-GN-03	430714	5407624	17-Jul-19	18-Jul-19	15:44	10:50	19.10	0.8	1.5	50	0.5	0	0	0.0000	5	0	0.262	0	0	0.0000	0	0	0.0000	9	0	0.471	1	0	0.052	0	0	0.000
	PW-REF-GN-04	430783	5407630	17-Jul-19	18-Jul-19	16:15	8:30	16.25	0.5	2.0	125	1.0, 1.5, 2.0, 3.0	0	0	0.0000	48	0	2.954	3	0	0.1846	0	0	0.0000	0	0	0.000	2	0	0.123	0	0	0.000
	PW-REF-GN-05	430655	5407692	24-Jul-19	24-Jul-19	12:00	13:00	1.00	0.5	1.5	75	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-REF-GN-06	430665	5407701	24-Jul-19	24-Jul-19	12:15	13:10	0.92	0.5	1.5	75	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-REF-GN-07	430655	5407692	24-Jul-19	25-Jul-19	13:04	8:55	19.85	0	1.5	75	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000
	PW-REF-GN-08	430658	5407689	24-Jul-19	25-Jul-19	13:17	8:00	18.72	0.0	2.0	75	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	8	8	0.4274	0	0	0.000	0	0	0.000	0	0	0.000
<b>Total</b>								<b>95.93</b>					<b>0</b>	<b>0</b>	<b>0</b>	<b>54</b>	<b>0</b>	<b>3.2654</b>	<b>3</b>	<b>0</b>	<b>0.1846</b>	<b>8</b>	<b>8</b>	<b>0.4274</b>	<b>34</b>	<b>3</b>	<b>1.715</b>	<b>3</b>	<b>0</b>	<b>0.1754</b>			
PW-NF	PW-NF-GN-01	420712	5408570	19-Jul-19	19-Jul-19	8:32	17:30	8.97	0.7	1.0	50	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-NF-GN-02	420709	5408539	19-Jul-19	19-Jul-19	9:01	17:58	8.95	0.5	0.7	50	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	2	0	0.223			
	PW-NF-GN-03	420714	5408528	19-Jul-19	19-Jul-19	9:03	17:55	8.87	-	-	15	1.5, 2.0, 2.5, 3.0	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-NF-GN-04	420737	5408544	19-Jul-19	19-Jul-19	9:27	18:10	8.72	0.2	1.1	7	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-NF-GN-05	420693	5408515	19-Jul-19	19-Jul-19	9:32	18:05	8.55	0.5	0.7	5	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	2	0	0.234			
	PW-NF-GN-06	420680	5408501	19-Jul-19	19-Jul-19	9:33	18:25	8.87	0.5	1.0	18	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	1	0	0.113			
	PW-NF-GN-07	420650	5408522	21-Jul-19	22-Jul-19	7:16	11:45	28.48	0.5	1.0	15	4.0, 3.5, 3.0, 2.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-NF-GN-08	420728	5408627	21-Jul-19	22-Jul-19	7:24	12:50	29.43	0.7	1.2	50	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-NF-GN-09	419137	5408129	24-Jul-19	25-Jul-19	13:30	7:25	17.92	0.2	1.1	12	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	3	2	0.167			
<b>Total</b>								<b>128.75</b>					<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>2</b>	<b>0.7376</b>		
PW-FF	PW-FF-GN-01	413143	5405788	19-Jul-19	19-Jul-19	12:20	19:54	7.57	0.3	0.5	50	0.5	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-FF-GN-02	413159	5405838	19-Jul-19	19-Jul-19	12:32	20:05	7.55	0.3	0.6	50	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	1	1	0.132			
	PW-FF-GN-03	413151	5405814	19-Jul-19	19-Jul-19	12:45	19:58	7.22	0.4	0.7	8	2.5, 3	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-FF-GN-04	413158	5405863	19-Jul-19	20-Jul-19	13:08	11:26	22.30	0.2	0.7	50	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	1	0	0.045			
	PW-FF-GN-05	413169	5405890	19-Jul-19	20-Jul-19	13:24	11:37	22.22	0.5	1.1	15	1.5, 2.0, 2.5, 3.0	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-FF-GN-06	413190	5405922	19-Jul-19	19-Jul-19	13:34	19:57	6.38	0.3	0.7	50	1	0	0	0.0000	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
	PW-FF-GN-07	413190	5405922	20-Jul-19	20-Jul-19	11:50	15:40	3.83	0.2	1.0	150	1.0, 1.5, 2.0, 3.0, 4.0	1	0	0.2609	0	0	0.000	0	0	0.0000	0	0	0.0000	0	0	0.000	0	0	0.000			
<b>Total</b>								<b>77.07</b>					<b>1</b>	<b>0</b>	<b>0.2609</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>0.1773</b>		

<sup>a</sup> 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 Capture Records, RRM 2019

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Effort (Fishing Hours)	Depth Range (m)		Set			Mimic Shiner			Northern Pike			Northern Redbelly Dace			Pearl Dace			White Sucker		
		Length (ft)	Mesh (inches)								Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>	Catch	mortalities/sacrificed	CPUE <sup>a</sup>
PW-REF	PW-REF-GN-01	430663	5407709	17-Jul-19	18-Jul-19	15:05	11:45	20.67	1.2	2.0	100	2.5, 3.0, 4.0, 5.0	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	3	3	0.145	
	PW-REF-GN-02	430676	5407661	17-Jul-19	18-Jul-19	15:24	11:30	20.10	1.0	1.8	50	0.5	18	9	0.896	0	0	0.0000	5	0	0.249	0	0	0.000	0	0	0.000	
	PW-REF-GN-03	430714	5407624	17-Jul-19	18-Jul-19	15:44	10:50	19.10	0.8	1.5	50	0.5	2	0	0.105	0	0	0.0000	113	0	5.916	0	0	0.000	0	0	0.000	
	PW-REF-GN-04	430783	5407630	17-Jul-19	18-Jul-19	16:15	8:30	16.25	0.5	2.0	125	1.0, 1.5, 2.0, 3.0	0	0	0.000	0	0	0.0000	0	0	0.000	38	0	2.338	0	0	0.000	
	PW-REF-GN-05	430655	5407692	24-Jul-19	24-Jul-19	12:00	13:00	1.00	0.5	1.5	75	0.5	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-06	430665	5407701	24-Jul-19	24-Jul-19	12:15	13:10	0.92	0.5	1.5	75	0.5	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-07	430655	5407692	24-Jul-19	25-Jul-19	13:04	8:55	19.85	0	1.5	75	0.5	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-GN-08	430658	5407689	24-Jul-19	25-Jul-19	13:17	8:00	18.72	0.0	2.0	75	0.5	0	0	0.000	0	0	0.0000	5	5	0.267	0	0	0.000	0	0	0.000	
<b>Total</b>								<b>95.93</b>					<b>20</b>	<b>9</b>	<b>1.0002</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>123</b>	<b>5</b>	<b>6.4321</b>	<b>38</b>	<b>0</b>	<b>2.3385</b>	<b>0</b>	<b>0</b>	<b>0</b>	
PW-NF	PW-NF-GN-01	420712	5408570	19-Jul-19	19-Jul-19	8:32	17:30	8.97	0.7	1.0	50	0.5	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-02	420709	5408539	19-Jul-19	19-Jul-19	9:01	17:58	8.95	0.5	0.7	50	1	0	0	0.000	3	1	0.3352	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-03	420714	5408528	19-Jul-19	19-Jul-19	9:03	17:55	8.87	-	-	15	1.5, 2.0, 2.5, 3.0	0	0	0.000	1	0	0.1128	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-04	420737	5408544	19-Jul-19	19-Jul-19	9:27	18:10	8.72	0.2	1.1	7	1	0	0	0.000	1	0	0.1147	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-05	420693	5408515	19-Jul-19	19-Jul-19	9:32	18:05	8.55	0.5	0.7	5	0.5	0	0	0.000	1	0	0.1170	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-06	420680	5408501	19-Jul-19	19-Jul-19	9:33	18:25	8.87	0.5	1.0	18	1	0	0	0.000	1	0	0.1128	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-07	420650	5408522	21-Jul-19	22-Jul-19	7:16	11:45	28.48	0.5	1.0	15	4.0, 3.5, 3.0, 2.5	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-08	420728	5408627	21-Jul-19	22-Jul-19	7:24	12:50	29.43	0.7	1.2	50	1	0	0	0.000	1	1	0.0340	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-GN-09	419137	5408129	24-Jul-19	25-Jul-19	13:30	7:25	17.92	0.2	1.1	12	1	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	1	1	0.056	
<b>Total</b>								<b>128.75</b>					<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>2</b>	<b>0.8264</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0.0558</b>	
PW-FF	PW-FF-GN-01	413143	5405788	19-Jul-19	19-Jul-19	12:20	19:54	7.57	0.3	0.5	50	0.5	3	0	0.396	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-02	413159	5405838	19-Jul-19	19-Jul-19	12:32	20:05	7.55	0.3	0.6	50	1	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-03	413151	5405814	19-Jul-19	19-Jul-19	12:45	19:58	7.22	0.4	0.7	8	2.5, 3	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-04	413158	5405863	19-Jul-19	20-Jul-19	13:08	11:26	22.30	0.2	0.7	50	1	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-05	413169	5405890	19-Jul-19	20-Jul-19	13:24	11:37	22.22	0.5	1.1	15	1.5, 2.0, 2.5, 3.0	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-06	413190	5405922	19-Jul-19	19-Jul-19	13:34	19:57	6.38	0.3	0.7	50	1	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-FF-GN-07	413190	5405922	20-Jul-19	20-Jul-19	11:50	15:40	3.83	0.2	1.0	150	1.0, 1.5, 2.0, 3.0, 4.0	0	0	0.000	0	0	0.0000	0	0	0.000	0	0	0.000	0	0	0.000	
<b>Total</b>								<b>77.07</b>					<b>3</b>	<b>0</b>	<b>0.3965</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

<sup>a</sup> 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 2019**

Station	UTM		Date	Length of Run	Voltage	Frequency	Pass	Effort (sec)	Blackside Darter	Brassy Minnow	Brook Stickleback	Central Mudminnow	Common Shiner	Creek Chub	Fathead Minnow	Johnny Darter	Northern Pike	Northern Redbelly Dace	White Sucker	Young-of-Year Cyprinid
	Easting	Northing																		
PW-REF	430932	5407681	24-Jul-19	200.00	500.00	60.00	pass 1	2,007	0	7	7	2	1	0	4	0	0	6	0	0
							pass 2	993	0	0	14	0	0	0	0	0	0	0	2	142
							<b>Total</b>	<b>3,000</b>	<b>0</b>	<b>7</b>	<b>21</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>2</b>	<b>142</b>
PW-NF	419566	5408072	25-Jul-19	500.00	400.00		pass 1	888	1	0	0	8	1	0	0	1	1	0	3	0
							pass 2	1,615	2	0	0	4	3	7	0	3	1	0	8	0
							pass 3	3,007	2	0	0	6	3	9	0	4	5	0	13	0
							<b>Total</b>	<b>5,510</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>7</b>	<b>16</b>	<b>0</b>	<b>8</b>	<b>7</b>	<b>0</b>	<b>24</b>	<b>0</b>
PW-FF	413243	5405950	24-Jul-19	700.00	400.00	50.00	pass 1	3,002	0	7	7	0	1	0	4	73	1	6	0	0
							<b>Total</b>	<b>3,002</b>	<b>0</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>73</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>0</b>

Appendix Table A.9: Seine Net Catch Records, RRM 2019

Area	Station ID	Date	Time	UTM (NAD83, 15U)		Length (m)	Distance (m)	# of Hauls	Area Seined (m <sup>2</sup> )	Blackside Darter			Brassy Minnow			Brook Stickleback			Brown Bullhead			Central Mudminnow			Common Shiner			Creek Chub			Cyprinid sp. (Juvenile)			Fathead Minnow					
				Easting	Northing					Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>			
PW-REF	PW-REF-SN-01	24-Jul-19	8:45	430901	5407651	15	10	1	150	0	0	0.000	0	0	0.000	14	0	0.093	0	0	0.000	1	0	0.007	0	0	0.000	0	0	0.000	0	0	0.000	16	0	0.107	0	0	0.000
	PW-REF-SN-02	24-Jul-19	9:06	430634	5407095	15	10	5	750	0	0	0.000	0	0	0.000	29	0	0.039	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	30	0	0.040	0	0	0.000			
	PW-REF-SN-03	24-Jul-19	9:20	430634	5407695	15	10	5	750	0	0	0.000	0	0	0.000	38	0	0.051	0	0	0.000	0	0	0.000	5	5	0.007	0	0	0.000	109	0	0.145	0	0	0.000			
	PW-REF-SN-04	24-Jul-19	9:55	430634	5407695	15	10	5	750	0	0	0.000	0	0	0.000	89	0	0.119	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	78	0	0.104	0	0	0.000			
	PW-REF-SN-05	24-Jul-19	10:10	430660	5407709	15	10	10	1500	0	0	0.000	0	0	0.000	100	0	0.067	0	0	0.000	0	0	0.000	3	3	0.002	0	0	0.000	500	0	0.333	0	0	0.000			
	PW-REF-SN-06	24-Jul-19	10:30	430666	5407709	15	5	5	375	0	0	0.000	0	0	0.000	23	0	0.061	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-REF-SN-07	24-Jul-19	12:00	430634	5407095	15	10	5	750	0	0	0.000	0	0	0.000	27	0	0.036	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	5	0	0.007	0	0	0.000			
	PW-REF-SN-08	24-Jul-19	12:30	430634	5407095	15	10	5	750	0	0	0.000	0	0	0.000	35	0	0.047	0	0	0.000	1	0	0.001	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-REF-SN-09	24-Jul-19	12:45	430648	5407715	15	10	5	750	0	0	0.000	0	0	0.000	42	0	0.056	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	15	0	0.020	0	0	0.000			
<b>Total</b>									<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.57</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0.01</b>	<b>8</b>	<b>8</b>	<b>0.01</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>753</b>	<b>0</b>	<b>0.76</b>	<b>0</b>	<b>0</b>	<b>0</b>				
PW-NF	PW-NF-SN-01	23-Jul-19	8:00	419566	5408072	15	9	1	135	0	0	0.000	0	0	0.000	2	2	0.015	0	0	0.000	8	0	0.059	3	0	0.022	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-02	23-Jul-19	8:30	419590	5408065	15	10	1	150	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	16	0	0.107	1	0	0.007	0	0	0.000	0	0	0.000			
	PW-NF-SN-03	22-Jul-19	10:15	419659	5408068	15	15	1	225	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.004	0	0	0.000	46	0	0.204	4	0	0.018	0	0	0.000	0	0	0.000			
	PW-NF-SN-04	22-Jul-19	10:45	419645	5408043	15	7	1	105	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	3	0	0.029	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-05	22-Jul-19	13:30	420430	5408201	15	10	1	150	0	0	0.000	0	0	0.000	0	0	0.000	10	0	0.067	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-06	22-Jul-19	14:30	420535	5408305	15	12	1	180	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.006	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-07	22-Jul-19	16:10	420625	5408478	15	12	1	180	0	0	0.000	0	0	0.000	0	0	0.000	10	0	0.056	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-08	23-Jul-19	18:13	420816	5408646	15	12	1	180	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	1	0.006	1	0	0.006	0	0	0.000	0	0	0.000			
	PW-NF-SN-09	23-Jul-19	7:52	421881	5409054	15	5	1	75	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	9	0	0.120	0	0	0.000	0	0	0.000			
	PW-NF-SN-10	24-Jul-19	13:00	419142	5408135	15	10	1	150	0	0	0.000	4	4	0.027	0	0	0.000	2	0	0.013	1	0	0.007	1	1	0.007	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-11	24-Jul-19	17:00	419659	5408068	15	10	1	150	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	12	0	0.080	4	0	0.027	0	0	0.000	0	0	0.000			
	PW-NF-SN-12	24-Jul-19	17:15	419650	5408059	15	5	1	75	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.013	10	10	0.133	6	0	0.080	0	0	0.000	0	0	0.000			
	PW-NF-SN-13	24-Jul-19	18:15	419675	5408017	15	8	1	120	0	0	0.000	0	0	0.000	0	0	0.000	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-NF-SN-14	24-Jul-19	18:30	419654	5408079	15	10	1	150	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.007	4	0	0.027	0	0	0.000	2	0	0.013	0	0	0.000	0	0	0.000			
	PW-NF-SN-15	24-Jul-19	18:45	419583	5408072	15	7	1	105	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	4	0	0.038	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-NF-SN-16	25-Jul-19	10:45	419659	5408068	15	10	1	150	2	0	0.013	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.007	5	5	0.033	6	0	0.040	0	0	0.000	0	0	0.000			
<b>Total</b>									<b>2</b>	<b>0</b>	<b>0.01</b>	<b>4</b>	<b>4</b>	<b>0.03</b>	<b>2</b>	<b>2</b>	<b>0.01</b>	<b>24</b>	<b>0</b>	<b>0.15</b>	<b>23</b>	<b>0</b>	<b>0.18</b>	<b>94</b>	<b>17</b>	<b>0.59</b>	<b>33</b>	<b>0</b>	<b>0.31</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>			
PW-FF	PW-FF-SN-01	20-Jul-19	13:30	413150	5405802	15	10	7	1050	8	0	0.008	5	0	0.005	0	0	0.000	0	0	0.000	3	0	0.003	0	0	0.000	1	0	0.001	13	0	0.012	4	0	0.004			
	PW-FF-SN-02	20-Jul-19	15:00	413166	5405873	15	10	1	150	6	0	0.040	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.007	3	0	0.020	0	0	0.000	0	0	0.000	13	0	0.087			
	PW-FF-SN-03	20-Jul-19	17:15	413279	5405945	15	10	1	150	4	0	0.027	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	5	0	0.033	0	0	0.000	2	0	0.013	15	0	0.100			
	PW-FF-SN-04	21-Jul-19	8:55	413207	5405885	15	7	1	105	4	0	0.038	2	0	0.019	0	0	0.000	0	0	0.000	0	0	0.000	5	0	0.048	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-FF-SN-05	21-Jul-19	9:40	413301	5405821	15	7	1	105	2	0	0.019	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.010	0	0	0.000	0	0	0.000	2	0	0.019			
	PW-FF-SN-06	21-Jul-19	10:25	413360	5405809	15	10	1	150	5	0	0.033	6	0	0.040	0	0	0.000	0	0	0.000	0	0	0.000	3	0	0.020	0	0	0.000	0	0	0.000	2	0	0.013			
	PW-FF-SN-07	21-Jul-19	11:40	413404	5405864	15	10	1	150	17	0	0.113	9	0	0.060	0	0	0.000	0	0	0.000	0	0	0.000	4	0	0.027	0	0	0.000	0	0	0.000	0	0	0.000			
	PW-FF-SN-08	21-Jul-19	14:15	413390	5405977	15	10	1	150	3	0	0.020	25	0	0.167	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.007	0	0	0.000	0	0	0.000	1	0	0.007			
	PW-FF-SN-09	21-Jul-19	15:45	413561	5406113	15	13	1	195	2	0	0.010	3	0	0.015	0	0	0.000	0	0	0.																		



Appendix Table A.9: Seine Net Catch Records, RRM 2019

Area	Station ID	Date	Time	UTM (NAD83, 15U)		Length (m)	Distance (m)	# of Hauls	Area Seined (m <sup>2</sup> )	Finescale Dace			Golden Shiner			Johnny Darter			Northern Pike			Northern Redbelly Dace			Rock Bass			Trout-Perch			White Sucker						
				Easting	Northing					Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>	Catch	Worranres / Sacrificed	CPUE <sup>a</sup>				
PW-REF	PW-REF-SN-01	24-Jul-19	8:45	430901	5407651	15	10	1	150	0	0	0.000	0	0	0.000	0	0	0.000	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-REF-SN-02	24-Jul-19	9:06	430634	5407095	15	10	5	750	1	0	0.001	0	0	0.000	0	0	0.000	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-REF-SN-03	24-Jul-19	9:20	430634	5407695	15	10	5	750	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	21	0	0.028	
	PW-REF-SN-04	24-Jul-19	9:55	430634	5407695	15	10	5	750	0	0	0.000	0	0	0.000	0	0	0.000	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-REF-SN-05	24-Jul-19	10:10	430660	5407709	15	10	10	1500	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	47	0	0.031	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-REF-SN-06	24-Jul-19	10:30	430666	5407709	15	5	5	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	0	0	0.000	0	0	0.000	42	0	0.112	
	PW-REF-SN-07	24-Jul-19	12:00	430634	5407095	15	10	5	750	0	0	0.000	0	0	0.000	0	0	0.000	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-REF-SN-08	24-Jul-19	12:30	430634	5407095	15	10	5	750	0	0	0.000	0	0	0.000	0	0	0.000	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-REF-SN-09	24-Jul-19	12:45	430648	5407715	15	10	5	750	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.001	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	
<b>Total</b>									<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
PW-NF	PW-NF-SN-01	23-Jul-19	8:00	419566	5408072	15	9	1	135	0	0	0.000	2	0	0.015	0	0	0.000	2	0	0.015	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-SN-02	23-Jul-19	8:30	419590	5408065	15	10	1	150	0	0	0.000	3	0	0.020	0	0	0.000	5	0	0.033	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	4	0	0.027	
	PW-NF-SN-03	22-Jul-19	10:15	419659	5408068	15	15	1	225	0	0	0.000	2	0	0.009	0	0	0.000	5	0	0.022	0	0	0.000	0	0	0.000	1	0	0.004	15	0	0.067				
	PW-NF-SN-04	22-Jul-19	10:45	419645	5408043	15	7	1	105	0	0	0.000	0	0	0.000	3	0	0.029	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-NF-SN-05	22-Jul-19	13:30	420430	5408201	15	10	1	150	0	0	0.000	5	0	0.033	0	0	0.000	1	0	0.007	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-SN-06	22-Jul-19	14:30	420535	5408305	15	12	1	180	0	0	0.000	2	0	0.011	0	0	0.000	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-NF-SN-07	22-Jul-19	16:10	420625	5408478	15	12	1	180	0	0	0.000	0	0	0.000	0	0	0.000	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-NF-SN-08	23-Jul-19	18:13	420816	5408646	15	12	1	180	0	0	0.000	4	0	0.022	0	0	0.000	2	0	0.011	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	
	PW-NF-SN-09	23-Jul-19	7:52	421881	5409054	15	5	1	75	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.013	0	0	0.000				
	PW-NF-SN-10	24-Jul-19	13:00	419142	5408135	15	10	1	150	0	0	0.000	11	0	0.073	1	0	0.007	6	0	0.040	0	0	0.000	0	0	0.000	6	0	0.040	5	0	0.033				
	PW-NF-SN-11	24-Jul-19	17:00	419659	5408068	15	10	1	150	0	0	0.000	10	0	0.067	1	0	0.007	3	0	0.020	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	7	0	0.047	
	PW-NF-SN-12	24-Jul-19	17:15	419650	5408059	15	5	1	75	0	0	0.000	4	0	0.053	1	0	0.013	5	0	0.067	0	0	0.000	0	0	0.000	0	0	0.000	6	0	0.080				
	PW-NF-SN-13	24-Jul-19	18:15	419675	5408017	15	8	1	120	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.008	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.008				
	PW-NF-SN-14	24-Jul-19	18:30	419654	5408079	15	10	1	150	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.007	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.007				
	PW-NF-SN-15	24-Jul-19	18:45	419583	5408072	15	7	1	105	0	0	0.000	1	0	0.010	0	0	0.000	1	0	0.010	0	0	0.000	0	0	0.000	0	0	0.000	1	0	0.010				
	PW-NF-SN-16	25-Jul-19	10:45	419659	5408068	15	10	1	150	0	0	0.000	1	0	0.007	0	0	0.000	3	0	0.020	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	9	0	0.060	
<b>Total</b>									<b>0</b>	<b>0</b>	<b>0</b>	<b>45</b>	<b>0</b>	<b>0.32</b>	<b>6</b>	<b>0</b>	<b>0.06</b>	<b>35</b>	<b>0</b>	<b>0.26</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
PW-FF	PW-FF-SN-01	20-Jul-19	13:30	413150	5405802	15	10	7	1050	0	0	0.000	0	0	0.000	7	0	0.007	1	0	0.001	0	0	0.000	0	0	0.000	2	0	0.002	9	0	0.009				
	PW-FF-SN-02	20-Jul-19	15:00	413166	5405873	15	10	1	150	0	0	0.000	0	0	0.000	8	0	0.053	1	0	0.007	0	0	0.000	0	0	0.000	1	0	0.007	3	0	0.020				
	PW-FF-SN-03	20-Jul-19	17:15	413279	5405945	15	10	1	150	0	0	0.000	3	0	0.020	2	0	0.013	1	0	0.007	0	0	0.000	0	0	0.000	9	0	0.060	3	0	0.020				
	PW-FF-SN-04	21-Jul-19	8:55	413207	5405885	15	7	1	105	0	0	0.000	0	0	0.000	1	0	0.010	0	0	0.000	0	0	0.000	0	0	0.000	5	0	0.048	0	0	0.000				
	PW-FF-SN-05	21-Jul-19	9:40	413301	5405821	15	7	1	105	0	0	0.000	0	0	0.000	1	0	0.010	0	0	0.000	0	0	0.000	1	0	0.010	0	0	0.000	2	0	0.019				
	PW-FF-SN-06	21-Jul-19	10:25	413360	5405809	15	10	1	150	0	0	0.000	1	0	0.007	5	0	0.033	0	0	0.000	0	0	0.000	0	0	0.000	5	0	0.033	0	0	0.000				
	PW-FF-SN-07	21-Jul-19	11:40	413404	5405864	15	10	1	150	0	0	0.000	1	0	0.007	15	0	0.100	0	0	0.000	0	0	0.000	0	0	0.000	7	0	0.047	4	0	0.027				
	PW-FF-SN-08	21-Jul-19	14:15	413390	5405977	15	10	1	150	0	0	0.000	0	0	0.000	15	0	0.100	0	0	0.000	0	0	0.000	0	0	0.000	3	0	0.020	10	0	0.067				
	PW-FF-SN-09	21-Jul-19	15:45	413561	5406113	15	13	1	195	0	0	0.000	0	0	0.000	5	0	0.026	0	0	0.000	0	0	0.000	0	0	0.000	4	0	0.021	0	0	0.000				
	PW-FF-SN-10	24-Jul-19	11:40	414866	5407143	15	10	4	600	0	0	0.000	0	0	0.000	33	0	0.055	0	0	0.000	0	0	0.000	0	0	0.000	7	0	0.012	8	0	0.013				
	PW-FF-SN-11	24-Jul-19	12:15	414863	540																																



Appendix Table A.10: Catch Records for Minnow Trapping, RRM 2019

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Trap Hours (hrs)	# of Traps	Effort (trap*d)	Blackside Darter			Brassy Minnow			Brook Stickleback			Brown Bullhead			Central Mudminnow			Common Shiner			Creek Chub					
		Eastings	Northing								Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/ Sacrificed	CPUE <sup>a</sup>
PW-REF	PW-REF-MT-01	430997	5407716	16-Jul-19	17-Jul-19	14:15	13:15	115.00	5	4.79	0	0	0.00	0	0	0.00	4	4	0.83	0	0	0.00	5	3	1.04	0	0	0.00	0	0	0.00	0	0	0.00
	PW-REF-MT-02	430932	5407681	16-Jul-19	17-Jul-19	14:37	13:20	113.58	5	4.73	0	0	0.00	0	0	0.00	2	2	0.42	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.21			
	PW-REF-MT-03	430997	5407716	17-Jul-19	18-Jul-19	13:35	12:15	68.00	3	2.83	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	0.71	0	0	0.00	0	0	0.00			
	PW-REF-MT-04	430907	5407651	17-Jul-19	18-Jul-19	14:35	12:10	151.08	7	6.30	0	0	0.00	0	0	0.00	2	1	0.32	0	0	0.00	4	0	0.64	0	0	0.00	0	0	0.00			
	PW-REF-MT-05	430660	5407685	18-Jul-19	19-Jul-19	18:50	16:00	211.67	10	8.82	0	0	0.00	1	0	0.11	0	0	0.00	0	0	0.00	3	0	0.34	0	0	0.00	0	0	0.00			
	PW-REF-MT-06	430997	5407714	24-Jul-19	25-Jul-19	11:00	9:15	155.75	7	6.49	0	0	0.00	1	0	0.15	2	0	0.31	0	0	0.00	4	0	0.62	0	0	0.00	0	0	0.00			
	PW-REF-MT-07	431001	5407730	24-Jul-19	25-Jul-19	11:00	9:20	156.33	7	6.51	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	5	0	0.77	1	1	0.15	0	0	0.00			
<b>Total</b>								<b>971.42</b>	<b>44</b>	<b>40.48</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>7</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>3</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>			
PW-NF	PW-NF-MT-01	420201	5407988	16-Jul-19	17-Jul-19	16:25	9:25	170.00	10	7.08	0	0	0.00	0	0	0.00	0	0	0.00	2	0	0.28	1	0	0.14	0	0	0.00	0	0	0.00			
	PW-NF-MT-02	420711	5408601	17-Jul-19	19-Jul-19	10:35	8:15	456.67	10	19.03	0	0	0.00	1	0	0.05	3	3	0.16	0	0	0.00	3	0	0.16	0	0	0.00	0	0	0.00			
	PW-NF-MT-03	420712	5408562	19-Jul-19	21-Jul-19	8:40	19:00	583.33	10	24.31	0	0	0.00	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-04	420713	5408542	19-Jul-19	21-Jul-19	17:30	19:00	247.50	5	10.31	0	0	0.00	0	0	0.00	0	0	0.00	3	0	0.29	0	0	0.00	0	0	0.00	0	0	0.00			
	PW-NF-MT-05	420713	5408542	21-Jul-19	22-Jul-19	19:20	12:00	83.33	5	3.47	0	0	0.00	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	420711	5408525	21-Jul-19	22-Jul-19	7:30	12:00	427.50	15	17.81	0	0	0.00	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-07	420743	5408555	21-Jul-19	22-Jul-19	7:41	11:30	139.08	5	5.80	0	0	0.00	0	0	0.00	0	0	0.00	5	0	0.86	0	0	0.00	0	0	0.00	0	0	0.00			
	PW-NF-MT-08	421876	5409060	22-Jul-19	23-Jul-19	10:50	19:17	227.15	7	9.46	0	0	0.00	0	0	0.00	2	2	0.21	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00			
	PW-NF-MT-09	420711	540860	22-Jul-19	24-Jul-19	12:30	19:30	220.00	4	9.17	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.11	1	0	0.11	0	0	0.00	0	0	0.00			
	PW-NF-MT-10	419605	5408071	22-Jul-19	24-Jul-19	21:13	9:30	362.83	10	15.12	1	0	0.07	0	0	0.00	0	0	0.00	6	0	0.40	1	0	0.07	10	10	0.66	5	0	0.33			
	PW-NF-MT-11	419560	5408071	23-Jul-19	24-Jul-19	9:52	9:50	119.83	5	4.99	0	0	0.00	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-12	419560	5408071	24-Jul-19	24-Jul-19	10:20	17:00	160.00	24	6.67	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	0	0.45	0	0	0.00	0	0	0.00			
	PW-NF-MT-13	419038	5408117	24-Jul-19	25-Jul-19	12:29	9:00	143.62	7	5.98	0	0	0.00	1	1	0.17	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00			
	PW-NF-MT-14	419160	5408124	24-Jul-19	25-Jul-19	13:42	9:35	139.18	7	5.80	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.17			
<b>Total</b>								<b>3480.03</b>	<b>124</b>	<b>145.00</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>17</b>	<b>0</b>	<b>2</b>	<b>9</b>	<b>0</b>	<b>1</b>	<b>10</b>	<b>10</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>1</b>			
PW-FF	PW-FF-MT-01	413027	5405674	16-Jul-19	17-Jul-19	17:35	7:29	69.50	5	2.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00			
	PW-FF-MT-02	413072	5405733	16-Jul-19	17-Jul-19	17:45	7:45	56.00	4	2.33	0	0	0.00	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	413160	5405812	17-Jul-19	19-Jul-19	7:50	12:22	210.13	4	8.76	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.11	0	0	0.00	0	0	0.00			
	PW-FF-MT-04	413176	5405908	17-Jul-19	19-Jul-19	8:00	12:50	264.17	5	11.01	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.09	0	0	0.00	0	0	0.00			
	PW-FF-MT-05	413243	5405950	19-Jul-19	20-Jul-19	13:40	16:50	244.50	9	10.19	1	0	0.10	1	0	0.10	0	0	0.00	0	0	0.00	1	0	0.10	0	0	0.00	0	0	0.00			
	PW-FF-MT-06	413243	5405950	19-Jul-19	20-Jul-19	20:00	16:50	20.83	1	0.87	1	0	1.15	1	0	1.15	0	0	0.00	0	0	0.00	1	0	1.15	0	0	0.00	0	0	0.00			
	PW-FF-MT-07	413300	5405947	20-Jul-19	21-Jul-19	17:30	8:30	150.00	10	6.25	0	0	0.00	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-08	414632	5407044	21-Jul-19	22-Jul-19	18:01	17:50	309.62	13	12.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00			
	PW-FF-MT-09	408073	5403189	22-Jul-19	23-Jul-19	15:10	8:30	69.33	4	2.89	0	0	0.00	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-10	410343	5403876	22-Jul-19	23-Jul-19	15:45	8:35	50.50	3	2.10	0	0	0.00	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-11	414842	5407048	22-Jul-19	23-Jul-19	18:24	8:40	199.73	14	8.32	0	0	0.00	2	0	0.24	0	0	0.00	0	0	0.00	3	0	0.36	0	0	0.00	0	0	0.00			
<b>Total</b>								<b>1644.32</b>	<b>72</b>	<b>68.51</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>			

<sup>a</sup> Total catch-per-unit-effort (CPUE; number of fish / hour) calculated as the number of fish caught per minnow trap hour.

Appendix Table A.10: Catch Records for Minnow Trapping, RRM 2019

Area	Station ID	UTM (NAD83, 15U)		Set Date	Lift Date	Set Time	Lift Time	Trap Hours (hrs)	# of Traps	Effort (trap*d)	Cyprinid sp. (Juvenile)			Johnny Darter			Northern Pike			Northern Redbelly Dace			Pearl Dace			Trout-Perch			White Sucker						
		Eastings	Northing								Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	Catch	Mortalities/Sacrificed	CPUE <sup>a</sup>	
PW-REF	PW-REF-MT-01	430997	5407716	16-Jul-19	17-Jul-19	14:15	13:15	115.00	5	4.79	0	0	0.00	0	0	0.00	0	0	0.00	6	0	1.25	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	
	PW-REF-MT-02	430932	5407681	16-Jul-19	17-Jul-19	14:37	13:20	113.58	5	4.73	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.21	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	
	PW-REF-MT-03	430997	5407716	17-Jul-19	18-Jul-19	13:35	12:15	68.00	3	2.83	0	0	0.00	0	0	0.00	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-04	430907	5407651	17-Jul-19	18-Jul-19	14:35	12:10	151.08	7	6.30	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.16	0	0	0.00	0	0	0.00	0	0	0.00	
	PW-REF-MT-05	430660	5407685	18-Jul-19	19-Jul-19	18:50	16:00	211.67	10	8.82	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.11	3	0	0.34	0	0	0.00	0	0	0.00	0	0	0.00	
	PW-REF-MT-06	430997	5407714	24-Jul-19	25-Jul-19	11:00	9:15	155.75	7	6.49	0	0	0.00	0	0	0.00	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-07	431001	5407730	24-Jul-19	25-Jul-19	11:00	9:20	156.33	7	6.51	0	0	0.00	0	0	0.00	0	0	0.00	8	0	1.23	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	
<b>Total</b>								<b>971.42</b>	<b>44</b>	<b>40.48</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
PW-NF	PW-NF-MT-01	420201	5407988	16-Jul-19	17-Jul-19	16:25	9:25	170.00	10	7.08	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.14				
	PW-NF-MT-02	420711	5408601	17-Jul-19	19-Jul-19	10:35	8:15	456.67	10	19.03	1	0	0.05	0	0	0.00	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	420712	5408562	19-Jul-19	21-Jul-19	8:40	19:00	583.33	10	24.31	0	0	0.00	0	0	0.00	1	0	0.04	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.04				
	PW-NF-MT-04	420713	5408542	19-Jul-19	21-Jul-19	17:30	19:00	247.50	5	10.31	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.10				
	PW-NF-MT-05	420713	5408542	21-Jul-19	22-Jul-19	19:20	12:00	83.33	5	3.47	0	0	0.00	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	420711	5408525	21-Jul-19	22-Jul-19	7:30	12:00	427.50	15	17.81	0	0	0.00	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-07	420743	5408555	21-Jul-19	22-Jul-19	7:41	11:30	139.08	5	5.80	0	0	0.00	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-08	421876	5409060	22-Jul-19	23-Jul-19	10:50	19:17	227.15	7	9.46	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.11				
	PW-NF-MT-09	420711	540860	22-Jul-19	24-Jul-19	12:30	19:30	220.00	4	9.17	0	0	0.00	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-10	419605	5408071	22-Jul-19	24-Jul-19	21:13	9:30	362.83	10	15.12	0	0	0.00	3	0	0.20	2	0	0.13	0	0	0.00	0	0	0.00	0	0	0.00	12	0	0.79				
	PW-NF-MT-11	419560	5408071	23-Jul-19	24-Jul-19	9:52	9:50	119.83	5	4.99	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	3	0	0.60				
	PW-NF-MT-12	419560	5408071	24-Jul-19	24-Jul-19	10:20	17:00	160.00	24	6.67	0	0	0.00	0	0	0.00	2	0	0.30	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.15				
	PW-NF-MT-13	419038	5408117	24-Jul-19	25-Jul-19	12:29	9:00	143.62	7	5.98	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.17				
	PW-NF-MT-14	419160	5408124	24-Jul-19	25-Jul-19	13:42	9:35	139.18	7	5.80	0	0	0.00	0	0	0.00	1	0	0.17	0	0	0.00	0	0	0.00	0	0	0.00	2	0	0.34				
<b>Total</b>								<b>3480.03</b>	<b>124</b>	<b>145.00</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>0</b>	<b>2</b>			
PW-FF	PW-FF-MT-01	413027	5405674	16-Jul-19	17-Jul-19	17:35	7:29	69.50	5	2.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.35	0	0	0.00				
	PW-FF-MT-02	413072	5405733	16-Jul-19	17-Jul-19	17:45	7:45	56.00	4	2.33	0	0	0.00	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	413160	5405812	17-Jul-19	19-Jul-19	7:50	12:22	210.13	4	8.76	0	0	0.00	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-04	413176	5405908	17-Jul-19	19-Jul-19	8:00	12:50	264.17	5	11.01	0	0	0.00	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	413243	5405950	19-Jul-19	20-Jul-19	13:40	16:50	244.50	9	10.19	0	0	0.00	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	413243	5405950	19-Jul-19	20-Jul-19	20:00	16:50	20.83	1	0.87	0	0	0.00	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	413300	5405947	20-Jul-19	21-Jul-19	17:30	8:30	150.00	10	6.25	0	0	0.00	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-08	414632	5407044	21-Jul-19	22-Jul-19	18:01	17:50	309.62	13	12.90	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00				
	PW-FF-MT-09	408073	5403189	22-Jul-19	23-Jul-19	15:10	8:30	69.33	4	2.89	0	0	0.00	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-10	410343	5403876	22-Jul-19	23-Jul-19	15:45	8:35	50.50	3	2.10	0	0	0.00	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-11	414842	5407048	22-Jul-19	23-Jul-19	18:24	8:40	199.73	14	8.32	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00				
<b>Total</b>								<b>1644.32</b>	<b>72</b>	<b>68.51</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>			

<sup>a</sup> Total catch-per-unit-effort (CPUE; number of fish / hour) calculated as the number of fish caught per minnow trap hour.

**Appendix Table A.11: Surface Water Concentrations of Select Analytes, RRM 2017 to 2019**

Area	Date	Dissolved Mercury (mg/L)	Total Mercury (mg/L)	Total Methylmercury (mg/L)	Sulfate (SO4) (mg/L)
1 - Teeple Culvert	2017-07-26	0.000004	0.000004	0.00000088	-
1 - Teeple Culvert	2017-08-31	0.000002	0.000004	0.00000046	-
1 - Teeple Culvert	2017-09-29	0.000001	0.000004	0.00000034	-
1 - Teeple Culvert	2017-10-30	0.000001	0.000002	0.00000032	-
1 - Teeple Culvert	2018-05-10	0.000014	0.000002	0.00000045	-
1 - Teeple Culvert	2018-06-12	0.000001	0.000006	0.0000003	-
1 - Teeple Culvert	2018-07-17	< 0.000001	0.000002	0.00000097	-
1 - Teeple Culvert	2018-09-11	0.000002	0.000002	0.00000021	-
1 - Teeple Culvert	2018-10-16	0.000004	0.000005	0.0000001	-
1 - Teeple Culvert	2019-05-16	< 0.000001	< 0.000001	0.00000044	-
1 - Teeple Culvert	2019-06-11	0.0025	0.000005	0.00000095	-
1 - Teeple Culvert	2019-07-08	< 0.000005	< 0.000005	0.00000169	-
1 - Teeple Culvert	2019-08-13	< 0.000005	< 0.000005	0.00000052	8.56
1 - Teeple Culvert	2019-09-19	< 0.000005	< 0.000005	0.0000004	-
1 - Teeple Culvert	2019-10-08	< 0.000005	0.00001	0.00000034	-
2 - SW20	2017-07-26	0.000004	0.000004	0.000001	2.3
2 - SW20	2017-08-31	< 0.000001	0.000002	0.00000065	0.5
2 - SW20	2017-09-29	< 0.000001	0.000004	0.00000019	15
2 - SW20	2017-10-30	0.000004	0.000002	0.00000019	8.1
2 - SW20	2018-05-10	0.000001	0.000004	0.00000024	7.7
2 - SW20	2018-06-12	0.000004	0.000006	0.00000169	2.7
2 - SW20	2018-07-17	< 0.000001	< 0.000001	0.00000047	0.8
2 - SW20	2018-08-07	< 0.000001	< 0.000001	0.00000021	0.8
2 - SW20	2018-09-11	< 0.000001	0.000002	0.00000024	4.5
2 - SW20	2018-10-16	0.000004	0.000007	0.00000017	25
2 - SW20	2019-05-14	< 0.000001	< 0.000005	0.00000042	8.6
2 - SW20	2019-06-11	< 0.000005	0.000005	0.00000129	3.8
2 - SW20	2019-07-08	< 0.000005	< 0.000005	0.00000136	0.7
2 - SW20	2019-08-13	< 0.000005	< 0.000005	0.00000157	0.3
2 - SW20	2019-09-18	< 0.000005	< 0.000005	0.0000004	4
2 - SW20	2019-10-08	< 0.000005	< 0.000005	0.00000025	4.3
3 - SW10	2017-07-26	0.000002	0.000008	0.00000052	1.1
3 - SW10	2017-08-30	< 0.000001	< 0.000001	0.00000019	1.5
3 - SW10	2017-09-29	< 0.000001	0.000004	0.00000029	4.2
3 - SW10	2017-10-30	0.000002	0.000004	0.0000003	5.8
3 - SW10	2018-05-09	< 0.000001	0.000008	0.00000044	6.2
3 - SW10	2018-06-12	0.000002	0.000004	0.00000032	1.9
3 - SW10	2018-07-17	0.000001	< 0.000001	0.00000057	1.9
3 - SW10	2018-08-07	< 0.000001	< 0.000001	0.00000022	1.8
3 - SW10	2018-09-11	< 0.000001	< 0.000001	0.00000014	4.8
3 - SW10	2018-10-16	0.000005	0.000008	0.00000017	21
3 - SW10	2019-05-14	< 0.000001	< 0.000001	0.00000067	6
3 - SW10	2019-06-11	< 0.000005	< 0.000005	0.00000119	3
3 - SW10	2019-07-08	< 0.000005	< 0.000005	0.00000122	0.9
3 - SW10	2019-08-13	< 0.000005	< 0.000005	0.00000037	0.8
3 - SW10	2019-09-18	< 0.000005	< 0.000005	0.00000061	4.8
3 - SW10	2019-10-08	< 0.000005	< 0.000005	0.00000028	4.9

**Appendix Table A.11: Surface Water Concentrations of Select Analytes, RRM 2017 to 2019**

Area	Date	Dissolved Mercury (mg/L)	Total Mercury (mg/L)	Total Methylmercury (mg/L)	Sulfate (SO4) (mg/L)
4 - SW22A	2017-07-26	0.000004	0.000004	0.000004	14
4 - SW22A	2017-08-30	0.000004	0.000004	0.000004	2.5
4 - SW22A	2017-09-29	0.000002	0.000004	0.000004	73
4 - SW22A	2017-10-27	0.000002	0.000002	0.000002	36
4 - SW22A	2018-05-09	0.000001	0.000001	0.00000045	12
4 - SW22A	2018-06-12	0.000001	0.000002	0.00000083	16
4 - SW22A	2018-07-17	< 0.000001	< 0.000001	0.0000005	22
4 - SW22A	2018-08-09	< 0.000001	< 0.000001	-	8.6
4 - SW22A	2018-09-11	< 0.000001	< 0.000001	0.00000039	34
4 - SW22A	2018-10-16	0.000005	0.000005	0.00000023	51
4 - SW22A	2019-05-15	< 0.000001	< 0.000001	0.00000047	12
4 - SW22A	2019-06-11	< 0.000005	< 0.000005	0.0000005	13
4 - SW22A	2019-07-08	< 0.000005	< 0.000005	0.00000047	12
4 - SW22A	2019-08-13	< 0.000005	< 0.000005	0.00000078	4.9
4 - SW22A	2019-09-19	< 0.000005	< 0.000005	0.0000006	44
4 - SW22A	2019-10-08	< 0.000005	< 0.000005	0.00000035	19
5 - SW03	2017-07-26	0.000002	0.000008	0.00000029	15
5 - SW03	2017-08-29	< 0.000001	0.000004	0.00000023	5.2
5 - SW03	2017-09-29	< 0.000001	0.000004	0.00000029	72
5 - SW03	2017-10-27	0.000002	0.000002	0.00000024	35
5 - SW03	2018-05-09	0.000001	0.000004	0.00000038	10
5 - SW03	2018-06-12	0.000002	0.000004	0.00000037	8
5 - SW03	2018-07-17	< 0.000001	0.000001	0.00000032	14
5 - SW03	2018-08-07	< 0.000001	0.000001	0.00000025	15
5 - SW03	2018-09-11	0.000001	0.000003	0.00000028	33
5 - SW03	2018-10-16	0.000004	0.000007	0.00000021	50
5 - SW03	2019-05-15	0.000001	0.000001	0.00000063	11
5 - SW03	2019-06-11	< 0.000005	0.000005	0.00000057	15
5 - SW03	2019-07-08	< 0.000005	< 0.000005	0.00000057	5
5 - SW03	2019-08-13	< 0.000005	< 0.000005	0.00000016	16
5 - SW03	2019-09-18	< 0.000005	< 0.000005	0.00000056	33
5 - SW03	2019-10-08	< 0.000005	< 0.000005	0.00000039	17
6 - SW24	2017-07-26	-	-	0.00000037	-
6 - SW24	2017-08-29	-	-	0.00000027	-
6 - SW24	2017-09-29	-	-	0.00000035	-
6 - SW24	2017-10-27	-	-	0.00000037	-
6 - SW24	2018-05-09	< 0.000001	0.000004	0.00000034	7
6 - SW24	2018-06-12	0.000004	0.000006	0.0000006	3.9
6 - SW24	2018-07-17	0.000003	0.000007	0.00000038	2.9
6 - SW24	2018-08-07	< 0.000001	0.000003	0.00000057	2.9
6 - SW24	2018-09-11	0.000003	0.000006	0.00000066	6.2
6 - SW24	2018-10-16	0.000005	0.000007	0.00000017	29
6 - SW24	2019-05-15	< 0.000001	0.000001	0.00000047	7.7
6 - SW24	2019-06-11	0.000001	0.000005	0.00000075	7.3
6 - SW24	2019-07-08	< 0.000005	< 0.000005	0.00000053	1.9
6 - SW24	2019-08-13	< 0.000005	< 0.000005	0.00000053	2.1
6 - SW24	2019-09-20	< 0.000005	< 0.000005	0.00000052	13
6 - SW24	2019-10-08	< 0.000005	< 0.000005	0.00000044	8.2

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