APPENDIX O

AQUATICS BASELINE

O-1 2022/2023 Aquatics Baseline
O-2 2021 Aquatics Baseline
O-3 2020 Aquatics Baseline

2021 Aquatic Resources Baseline Report

Springpole Gold Project
First Mining Gold Corp.

ONS2104

Prepared by:
Wood Environment & Infrastructure Americas
a Division of Wood Canada Limited

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2021 Aquatic Resources Baseline Report Springpole Gold Project

Red Lake District, Northwest Ontario
Project #ONS2104

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EXECUTIVE SUMMARY

This report provides the results from the 2021 Springpole Gold Project (Project) aquatic resources assessment. Field studies were conducted by Wood Environment & Infrastructure Americas, a Division of Wood Canada Limited (Wood) on behalf of First Mining Gold Corp. The studies were conducted within previously unsampled habitats that are within the Project development area, within close proximity to Project features or within large lake environs to contribute additional baseline information to the existing conditions dataset. The proposed assessment locations included:

- Inland waterbodies unnamed lake 17 (L-17) and L-18 within the footprint of the proposed co-disposal facility;
- Inland waterbody L-19 positioned east of the proposed plant site that may experience indirect impacts from the Project;
- Inland waterbody L-20 located southeast of the Project site that may experience indirect impacts from the Project; and
- Springpole Lake and Birch Lake deep basin locations.

Sampling occurred during three seasonal periods; spring, summer and fall, with the following study components:

- Surface water quality in-field measurements, physicochemical profiles and laboratory samples;
- Fish community and habitat surveys, including assessment of contaminant levels in fish tissues;
- Lower trophic level / primary productivity sampling for planktonic taxa (phytoplankton and zooplankton);
- Bathymetric surveys with underwater video reconnaissance to assess potential spawning habitat suitability for coldwater species;
- Sediment quality surveys; and
- Benthic invertebrate community surveys.

The 2021 spring sampling focused on surface water quality and small bodied fish community and tissue sampling, as well as surface water quality and primary productivity sample collection. During the summer period, forest fires within the Red Lake region and specifically near the Project site resulted in overland access restrictions that were implemented by the Ministry of Northern Development, Mines, Natural Resources and Forestry. The restrictions prevented site access to some locations. The large lake environments were accessible; however, inland waterbodies were not sampled during the summer sampling campaign. The fall surveys included sediment quality and benthic invertebrate community surveys, fish habitat assessments, as well as surface water quality and primary productivity sample collection.

In respect of the Indigenous Nations and Peoples engaged for this Project, translation of fish names from English to the Ojibway / Anishinaabemowin names has been included throughout the report text in square brackets; however, English fish species names that did not have an Ojibway / Anishinaabemowin name available, are referred to using English only. A table including fish species in Ojibway / Anishinaabemowin, English and their Scientific Names is provided within the report.

Inland Waterbodies

The surveyed inland waterbodies L-17, L-18 and L-19 were generally shallow (less than 4 metres deep) with dense aquatic vegetation, mostly within the nearshore areas. The in-field surface water quality and laboratory results were generally within the relevant provincial and federal quality guidelines. These waterbodies contained small-bodied fish communities [giigoozens] dominated by species such as Finescale Dace and Fathead Minnow. Fish tissue composite samples of these species and Brook Stickleback were

collected; however, these laboratory results were not available for inclusion in this report and will be provided in the final report or as an addendum to the final report.

The sediment quality results showed parameters such as total Kjeldahl nitrogen and total organic carbon were greater than their respective provincial or federal quality guidelines. The benthic invertebrate community sample results were not available for inclusion in this report and will be provided in the final report or as an addendum to the final report.

Springpole Lake

The Springpole Lake assessments were conducted primarily within the five deep basins located in the north basin (L-15-B1 to L-15-B4 and L-15-B6) and one deep basin within the southeast arm (L-15-B5). Springpole Lake receives the Birch River inflow from Cromarty Lake at the west end of the lake and the Birch River outlets at the east end of the southeast arm. Fish habitat surveys were also conducted within the southeast arm, where suitable substrates were observed to support coldwater spawning species such as Lake Trout [namegos].

In-field surface water quality measurements and profile data were generally within the relevant provincial and federal quality guidelines. The temperature and dissolved oxygen profile data were used to calculate the mean volume weighed hypolimnetic dissolved oxygen values as per the NDMNRF assessment criteria. These data showed the most optimal Lake Trout habitat was located within the north basins L-15-B1 and L-15-B6. The southeast arm contained usable habitat, but not optimal habitat as per the assessment criteria.

Primary productivity results showed variability in phytoplankton biovolumes with the greatest amounts present in L-15-B3. Zooplankton biomass and density was highest in June for nearly all stations with Cyclopoida and Calanoida representing the majority of taxa in these samples.

Fish community sampling targeted small bodied species within the southeast arm to support future monitoring programs associated with the candidate treated effluent discharge location in the southeast arm. Seine nets and minnow traps caught six species of fish, and these data will contribute to the existing baseline dataset. Composite samples of Spottail Shiner, Mimic Shiner and Blacknose Shiner were collected; however, these laboratory results were not available for inclusion in this report and will be provided in the final report or as an addendum to the final report.

The sediment quality results for the north basin and southeast arm showed parameters such as arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, total Kjeldahl nitrogen, total organic carbon and total phosphorus, which exceeded the provincial and/or federal guidelines at most locations. This is a characteristic of depositional environments with high organic sediment content and reflects natural baseline condition, frequently observed in northern Ontario lakes. The benthic invertebrate community sample results were not available for inclusion in this report and will be provided in the final report or as an addendum to the final report.

Birch Lake

The Birch Lake assessments were conducted in two basins; one located upstream (northeast) of the Project (BIRCH-B1), and one located north of the proposed co-disposal facility. The in-field surface water quality measurements and profile data were generally within the relevant provincial and federal quality guidelines. The temperature and dissolved oxygen profile data were used to calculate the mean volume weighed hypolimnetic dissolved oxygen values as per the NDMNRF assessment criteria (MNR 2018). These data showed the sampled basins were not optimal Lake Trout habitat; however, the BIRCH-B2 location showed mostly usable habitat.

Primary productivity results showed that variability in phytoplankton biovolumes were greater in BIRCH-B2 compared to BIRCH-B1, with Bacillariophyceae, Chrysophyceae, and Cryptophyceae representing the most abundant taxa. Zooplankton biomass and density was highest in June for both stations with Cyclopoida and Calanoida representing the majority of taxa in these samples.

Fish community sampling targeted small bodied species within the nearshore areas of Birch Lake in the general vicinity of the BIRCH-B1 and BIRCH-B2 sample locations, and these data will contribute to the existing baseline dataset. Composite samples of Yellow Perch [asawe] and Bluntnose Minnow were collected; however, these laboratory results were not available for inclusion in this report and will be provided in the final report or as an addendum to the final report.

The sediment quality results for Birch Lake showed parameters such as arsenic, cadmium, chromium, copper, iron, lead, nickel, manganese, total Kjeldahl nitrogen, total organic carbon, and total phosphorus exceeded the relevant provincial and/or federal guidelines at these locations due to natural characteristics of the basins. This is a characteristic of depositional environments with high organic sediment content and reflects natural baseline condition, frequently observed in northern Ontario lakes. The benthic invertebrate community sample results were not available for inclusion in this report and will be provided in the final report or as an addendum to the final report.

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Fish species in Ojibway / Anishinaabemowin have been included in square brackets upon first use in the report text; however, where translation of fish species from Ojibway / Anishinaabemowin to English was not available, they are referred to in English only. Scientific names have been provided in the below table and have not been included in the report text to support interpretation by non-technical reviewers.

Ojibway / Anishinaabemowin	English Common Name	Scientific Name
	Blacknose Shiner	*Notropis heterolepis*
	Bluntnose Minnow	*Pimephales notatus*
	Brook Stickleback	*Culaea inconstans*
mizay	Burbot, Ling, Ling-cod, Eelpout	*Lota lota*
odoonibiins	Cisco	*Coregonus sp.*
	Common Shiner	*Luxilus cornutus*
	Emerald Shiner	*Notropis atherinoides*
	Fathead Minnow	*Pimephales promelas*
	Finescale Dace	*Chrosomus neogaeus*
	Golden Shiner	*Notemigonus crysoleucas*
	Iowa Darter	*Etheostoma exile*
	Johnny Darter	*Etheostoma nigrum*
	Lake Chub	*Couesius plumbeus*
name	Lake Sturgeon	*Acipenser fulvescens*
namegos	Lake Trout	*Salvelinus namaycush*
adikameg	Lake Whitefish	*Coregonus clupeaformis*
	Logperch	*Percina caprodes*
	Longnose Dace	*Rhinichthys cataractae*
giigoozens	Minnow (small-bodied fish)	*Various: cyprinidae, etc.*
	Mimic Shiner	*Notropis volucellus*
	Mottled Sculpin	*Cottus bairdii*
	Redhorse species	*Moxostoma sp.*
	Northern Pearl Dace	*Margariscus nachtriebi*
ginoozhe	Northern Pike, Jackfish, Northern	*Esox lucius*
	Northern Redbelly Dace	*Chrosomus eos*
ashigan	Rock Bass	*Ambloplites rupestris*
	River Darter	*Percina shumardi*
	Shorthead Redhorse	*Moxostoma macrolepidotum*
	Slimy Sculpin	*Cottus cognatus*
	Spoonhead Sculpin	*Cottus ricei*
	Spottail Shiner	*Notropis hudsonius*
nambin	Sucker species	*Catostomus sp.*
	Trout-perch	*Percopsis omiscomaycus*
ogaans	Walleye	*Sander vitreus*
	White Sucker	*Catostomus commersonii*
asawe	Yellow Perch	*Perca flavescens*

Sources: The Ojibwe People's Dictionary (https://ojibwe.lib.umn.edu/), Cat Lake Ojibway mobile app (https://apps.apple.com/ca/app/cat-lake/id1332458093) and Holm et al. (2010).

LIST OF ABBREVIATIONS AND UNITS

BIC	Benthic invertebrate community
BsM	Provincial Broadscale Monitoring
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
cm	Centimetres
CSQG	Canadian Sediment Quality Guidelines
DO	Dissolved oxygen
dwt	Dry weight
EA	Environmental Assessment
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EPT	Ephemeroptera, Plecoptera and Trichoptera
FEQG	Federal Environmental Quality Guidelines
FMG	First Mining Gold Corp.
g	Grams
km	Kilometres
LEL	Lowest Effect Level
LSA	Local Study Area
m	Metre
m^2	Square metres
MDMER	Metal and Diamond Mining Effluent Regulations
mg/L	Milligrams per litre
mg/m^3	Milligrams per cubic metre
mL	Millilitre
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MOECC	Ministry of the Environment and Climate Change
MOEE	Ministry of Environment and Energy
MVWHDO	Mean volume weighed hypolimnetic dissolved oxygen
NAD	North American Datum
NDMNRF	Ministry of Northern Development, Mines, Natural Resources and Forestry
PDA	Project Development Area
PEL	Probable Effect Level
Project	Springpole Gold Project
PSQG	Ontario Provincial Sediment Quality Guidelines
PWQO	Ontario Provincial Water Quality Objectives
SEL	Severe Effect Level
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
Wood	Wood Environment & Infrastructure Americas, a division of Wood Canada Limited
wwt	Wet weight
µm	Micron
μm^3	Cubic micrometers
µS/cm	Microsiemens per centimeter

1.0 INTRODUCTION

First Mining Gold Corp. (FMG) proposes to develop, operate and eventually decommission / close an open pit mine and ore process plant with supporting facilities known as the Springpole Gold Project (Project). The Project is located in a remote area of northwestern Ontario, approximately 110 kilometres (km) northeast of the Municipality of Red Lake and 145 km north of the Municipality of Sioux Lookout (Figure 1-1).

An environmental assessment (EA) pursuant to the *Canadian Environmental Assessment Act, 2012* and the Ontario *Environmental Assessment Act* is required to be completed for the Project.

This document is one of a series of baseline reports prepared by Wood Environment & Infrastructure Americas, a division of Wood Canada Limited (Wood) on behalf of FMG to describe the current environmental conditions and update existing information.

1.1 Purpose and Objective of the Report

This Aquatic Resources Baseline Report has been prepared to summarize the findings of the fish and fish habitat assessments conducted during 2021 and from previous baseline surveys to update fish community distribution data (Appendices A to D). The 2021 scope of work to assess fish and fish habitat included:

- Multi-season physicochemical profile measurements and laboratory water quality sample collection within deep basins of Springpole (n=6) and Birch (n=2) lakes;
- Primary productivity (plankton and benthic invertebrates) assessment within the deep basins of Springpole (n=6) and Birch (n=2) lakes;
- Assessment of fish community and habitat within previously unsampled inland waterbodies (n=4); and
- Spring small-bodied fish species lethal sampling to assess contaminants in fish tissue, age assessment and to characterize the baseline conditions as well as support future Metal and Diamond Mining Effluent Regulations (MDMER) Environmental Effects Monitoring (EEM) biological study design.

1.2 Project Overview

The ore body is located under a small portion of Springpole Lake. To allow for the development and safe operation of the open pit mine, cofferdams will be established to facilitate controlled dewatering of the mining area. Ore from the open pit will be processed in an onsite processing plant at approximately 30,000 tonnes per day. Tailings resulting from the processing of ore will be stored in a co-disposal facility.

The main components of the Project include:

- Open pit;
- Cofferdams;
- Co-disposal facility for mine rock and tailings;
- Surficial soil stockpile
- Ore stockpiles;
- Process plant complex;
- Buildings and supporting infrastructure;
- Water management and treatment facilities;
- Fish habitat development area;
- Accommodations complex;
- Aggregate operation(s);

- Transmission line; and
- Mine access road.

The Project is expected to be developed over a three-year period in which the installation of the cofferdams will be established to support the dewatering of an isolated area for open pit mining. The mine will be operated for a period of approximately 12 years. Decommissioning and closure of the site is expected to be five years in length and will be followed by a period of environmental monitoring.

The baseline studies were designed to assess the existing conditions within a regional context, as well as local aquatic environs that may have potential interactions with the Project Development Area (PDA). The study areas are defined below and presented on Figure 1-2:

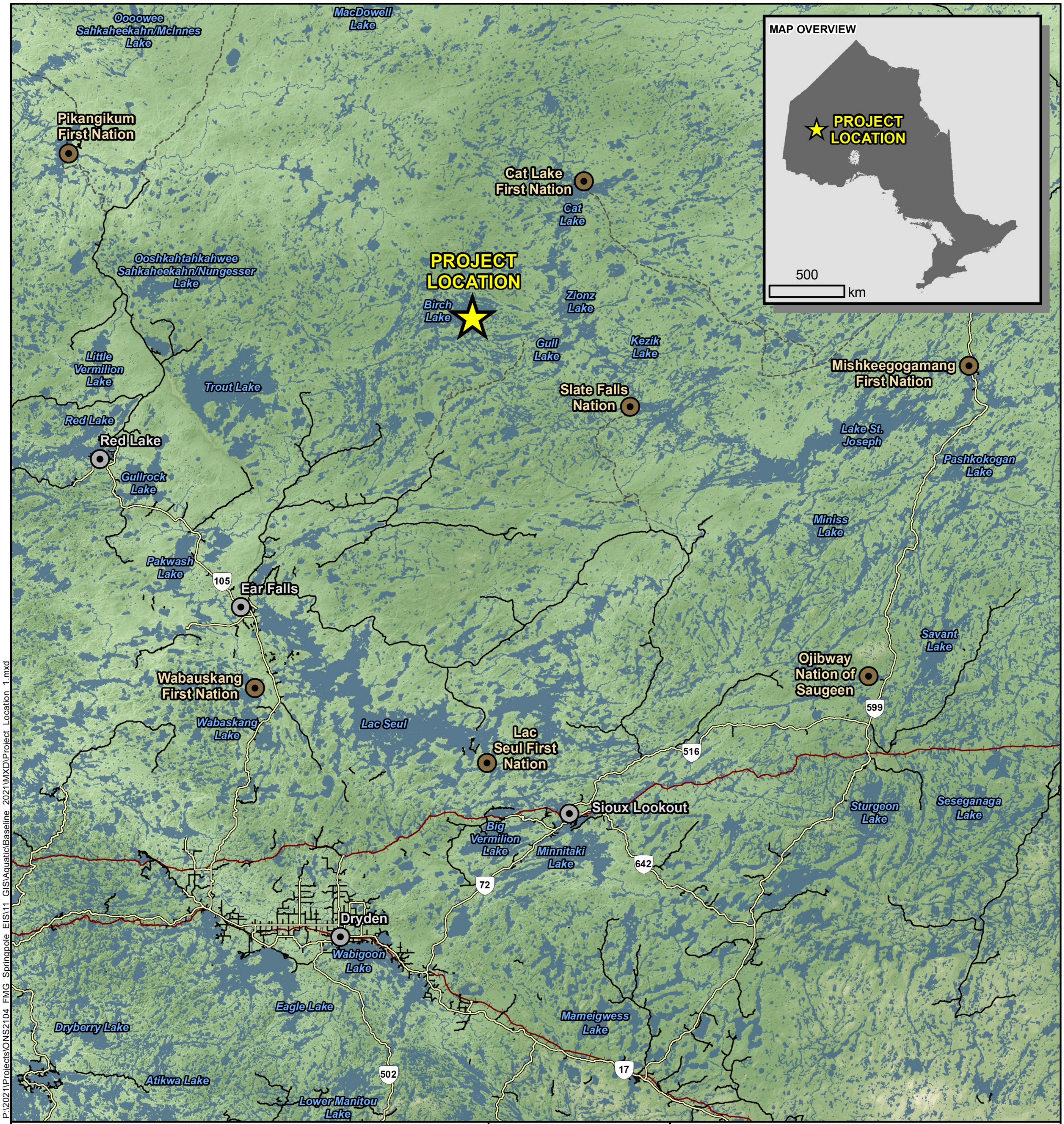
- **Regional Study Area – Biophysical:** that encompasses and extends beyond the PDA and local study area. This study area is used to provide context for the assessment of potential Project effects, the assessment of cumulative effects and is the maximum geographical extent or zone of influence in which effects from the Project may be identifiable; and
- **Local Study Area (LSA):** that extends beyond the PDA and was defined by applying a buffer around the PDA in order to reflect the primary area of expected effects. The size of the LSA is intended to capture anticipated direct effects from the Project (such as emissions, discharges and habitat loss) and indirect effects resulting from the Project.

1.3 Overview of Baseline Studies

Fish community and fish habitat studies have been conducted for this Project and as part of the Provincial Broadscale Monitoring (BsM) program within the Regional Study Area – Biophysical and LSA since 2009 (Figure 1-2). A summary of the baseline studies and general scope of work conducted within each year is provided below:

- 2009 – Cycle 1 BsM; Birch Lake (NDMNRF 2020a);
- 2011 – Summer Springpole Lake, Birch Lake and inland waterbodies fish community survey (FMG and Portt 2018);
- 2012 – Spring, summer and fall inland waterbodies and watercourses, as well as large area lakes (e.g., Springpole, Seagrave, Birch) fish community and fish habitat surveys, acoustic telemetry surveys, bathymetric mapping and physicochemical profile data collection (FMG and Portt 2018);
- 2013 – Spring, summer and fall inland waterbodies and watercourses, as well as Springpole Lake fish community and fish habitat surveys, acoustic telemetry receiver deployment and download, and detailed bathymetric mapping with substrate hardness characterization (FMG and Portt 2018);
- 2014 – Cycle 2 BsM; Birch Lake (NDMNRF 2020b);
- 2015 – Summer inland waterbodies and watercourses fish community and fish habitat surveys, acoustic telemetry receiver download (FMG and Portt 2018);
- 2017 – Summer and fall inland waterbodies and watercourses fish community and fish habitat surveys (FMG and Portt 2018);
- 2019 – Summer and fall inland waterbodies and watercourses, as well as Springpole Lake fish community and fish habitat surveys (Wood 2021a);
- 2019 – Cycle 3 BsM survey in Birch Lake (NDMNRF 2020c); and
- 2020 – Springpole Lake candidate outfall benthic invertebrate community surveys, and sediment quality assessment (Wood 2021a).

In addition, Land Use Plans and Traditional Knowledge and Land Use studies documented the presence of culturally valued fish species including Lake Sturgeon, Walleye / Pickerel, Northern Pike, Lake Whitefish, Crappie, Sauger, Lake Trout, as well as baitfish species in the Project area (PFN 2006; Morin et al. 2014; NDMNRF 2019; NWES 2020; MNO 2021).



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LEGEND

- ★ Project Location
- Town
- First Nation Reserve
- Highway
- Secondary Road
- Resource / Winter Road
- Railway

0 12.5 25 50 75 100 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.

Datum: NAD83
Projection: UTM Zone 15N

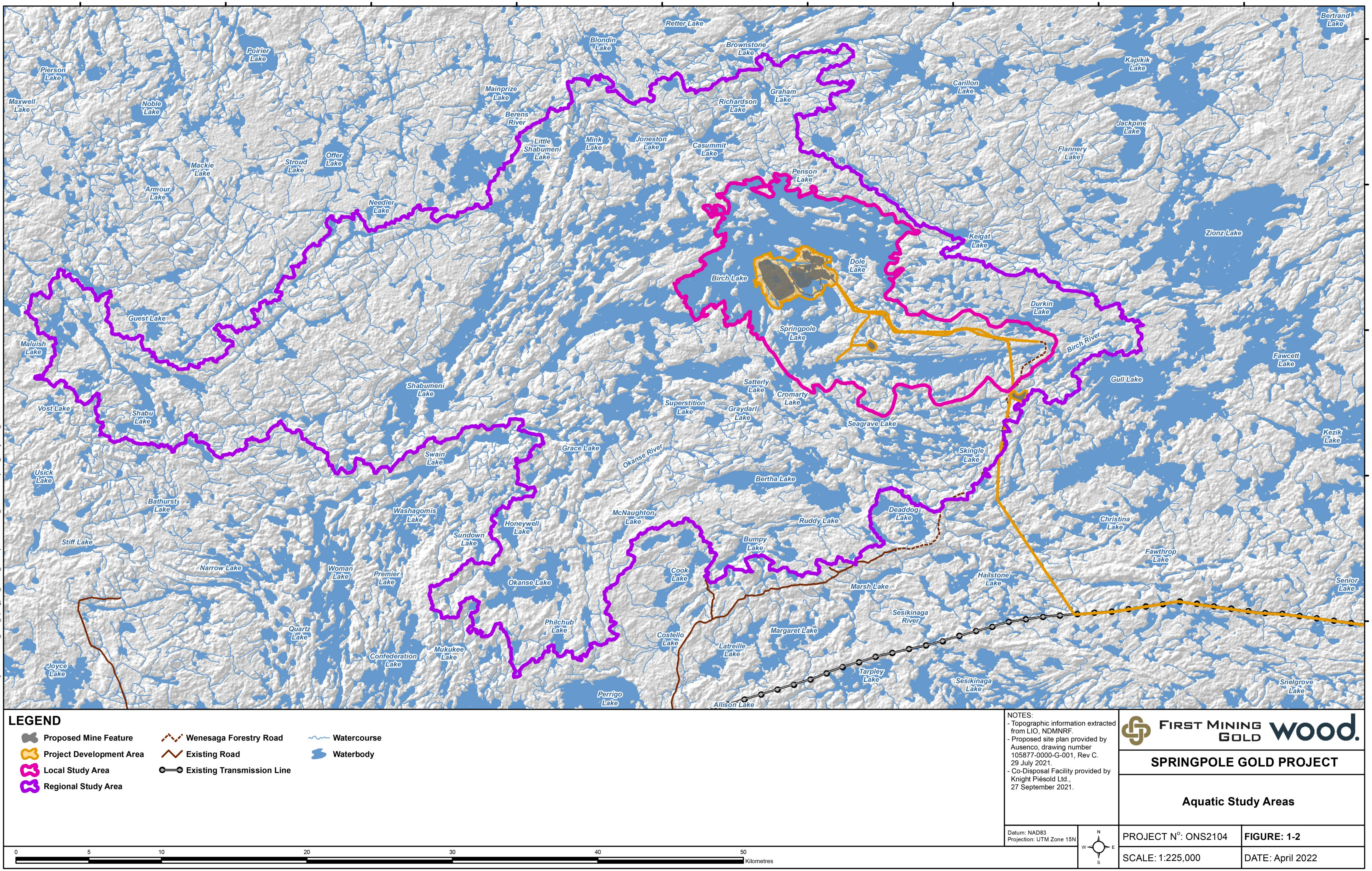
N W E S

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Project Location

PROJECT N°: ONS2104	**FIGURE: 1-1**
SCALE: 1:1,500,000	DATE: April 2022



NOTES:
- Topographic information extracted from LIO, NDMNRF.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD
wood.

SPRINGPOLE GOLD PROJECT

Aquatic Study Areas

PROJECT N°: ONS2104

FIGURE: 1-2

SCALE: 1:225,000

DATE: April 2022

2.0 METHODOLOGY

2.1 Assessment Overview

The 2021 aquatic resources assessment field studies supplemented previous data collection and addressed any optimizations in the Project footprint. The summer biological field study objectives were only partially completed due to regional forest fires and overland access restrictions implemented by the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) to protect public safety. As such, some of the 2021 study components are planned to occur during the 2022 field season. The 2021 sample locations are presented on Figure 2-1a, with gear-specific sampling locations shown on Figures 2-1b to 2-1e. A summary of the 2021 aquatic resources assessment sampling effort by season is provided in Table 2-1, with a summary of the fish community sampling gear-specific efforts by area and season in Table 2-2. Fish habitat types within the LSA have been characterized during the baseline studies and descriptions of the habitat types are provided in Section 2.2, with a summary of the sampled locations shown in Table 3-1.

2.2 Fish Habitat Assessments

Habitat assessments were conducted at representative riverine (lotic) and ponded or lake (lentic) stations within the LSA during the 2021 field studies. These assessments characterized the habitat types and supported delineation of homogeneous habitat throughout the study area. Habitat types were classified using a number of criteria that includes a combination of the following categories of natural features:

- Watercourse or Waterbody type;
- Permanence;
- Stream Order (as applicable); and
- Using a modified Ontario Stream Assessment Protocol where appropriate.

In-field surface water quality measurements were recorded at each sample location using handheld portable water quality meters. Physicochemical parameter profiles at 1-metre (m) intervals were also collected within the deep basins of Springpole Lake (n=6) and Birch Lake (n=2). The water quality instruments were calibrated daily as needed and measured the following parameters:

- Temperature;
- pH;
- Conductivity;
- Dissolved oxygen (DO); and
- Depth of parameter measurement.

2.3 Fish Community

Fish community assessments were conducted during spring, summer and fall as per conditions of the Licence to Collect Fish for Scientific Purposes #1098854 and 1099428 issued by the Red Lake District NDMNRF. The following gear types were utilized as per site-specific habitat conditions:

- Baited gee-style minnow traps;
- Gillnets (various stretched mesh sizes, including Riverine Index Nets); and
- Seine nets.

A summary of the fish sampling gear utilized at each sampling area by field program is presented in Table 2-2. All fish captured were identified to species level by qualified fisheries staff; measured for length (total and fork) and fresh weight; scrutinized for visible malformation, parasites, or evidence of disease; sex was determined when possible; and non-lethal age structures were collected. Additionally, lethal age structures and baseline fish tissue of target fish species were collected during the fall inland waterbody assessments.

2.4 Lake Trout MVWHDO Assessment

The mean volume weighted hypolimnetic dissolved oxygen concentration (MVWHDO) was calculated for each of the Springpole Lake and Birch Lakes deep basin profile locations where August 2021 data were collected as per the provincial guideline (MNR 2018). June and September 2021 data were utilized for those locations that did not have a hypolimnion present (no defined thermocline) or where August data were unavailable, to calculate the MVWHDO for all sampled locations. End-of-summer values are typically used in MVWHDO calculations, as they represent worst-case conditions for coldwater biota such as Lake Trout (Evans et al. 1996). Springpole Lake has two distinct basins (north basin and the southeast arm), and bathymetric stage storage curves were calculated separately for each general basin. Temperature and dissolved oxygen (DO) data were collected concurrently during lake profiles and plotted to determine the top of the hypolimnion (where the temperature difference between depth meters is less than 1°C). Optimum habitat for Lake Trout is defined as the volume at 10°C (optimal growth temperature) and a minimum of 6 mg/L DO, whereas useable habitat is defined as the volume up to 15°C and at least 4 mg/L DO. These physiological boundaries create a threshold, that when crossed can influence the survival and reproduction of Lake Trout (MNR 2018).

2.5 Spawning Habitat Surveys

Lake Trout spawning habitat surveys were conducted using bathymetric surveys with side-scan sonar paired with underwater video reconnaissance to document habitat conditions within the southeast arm of Springpole Lake. Initial desktop review of the available bathymetric data were used to identify candidate locations for field surveys. The field surveys included driving a boat equipped with sonar instrumentation along transects across the survey areas. The sonar included a global positioning system to geo-reference the bathymetry and substrate mapping information. Additionally, a Secchi disk was used to provide a size reference for the underwater video locations, confirming approximate aggregate diameter and existing sedimentation and biofilm conditions of the substrate.

These surveys were conducted to confirm if candidate spawning habitat occurred within the selected locations that may also be used by Lake Trout. These data contribute to the previously documented habitat survey information and potential use within the northern basins of Springpole Lake (FMG and Portt 2018).

2.6 Lower Trophic / Primary Productivity Assessment

The lower trophic and primary productivity assessment evaluated eutrophication indicators including: chlorophyll *a* (the primary pigment of photosynthesis for algae, cyanobacteria and plants), phytoplankton (microalgae; primary producers) biomass, and zooplankton (first order consumers; animal component of the planktonic community) biomass. The former two plankton groups are within the lowest trophic levels of an aquatic ecosystem which support the upper level fish community. These components were sampled three times during the 2021 open-water season: June, July and September, from Springpole Lake and Birch Lake deep basins shown on Figure 2-1a.

2.6.1 Chlorophyll *a*

Chlorophyll *a* samples were collected concurrently with the composite water sample collected for the phytoplankton community analysis at the sample locations shown on Figure 2-1a. In-field depth integrated composite samples were collected and stored in black high density polyethylene bottles, kept cool (on ice or with ice packs) and away from direct light for shipment to ALS Environmental, Thunder Bay, Ontario.

2.6.2 Phytoplankton

A Kemmerer bottle water sampler was used to collect phytoplankton samples from within the euphotic zone (uppermost layer of a body of water that receives sunlight). At sampling stations with euphotic zones greater than 2 m in depth, water was collected at 2 m intervals and combined into a composite sample in a clean container (e.g., bucket). A sub-sample of the water was poured into a pre-labelled 500 milliliter (mL) opaque plastic bottle and preserved with 2 mL of Lugol's solution. Phytoplankton samples were kept cool (although not frozen) and in the dark for shipment to ALS Environmental, Thunder Bay, Ontario for analyses of taxonomic composition, abundance, and biomass.

2.6.3 Zooplankton

Zooplankton sampling methods followed a standardized protocol utilizing a 0.13 m diameter, 63 micron (µm) mesh Wisconsin plankton net with a detachable collection bucket (codend) to collect zooplankton samples from the water column. The plankton net was lowered until the bottom of the collection bucket was approximately 30 centimeters (cm) above the bottom sediment and then towed vertically to the surface at a rate of approximately 0.5 metres per second. Approximately half an Alka-Seltzer tablet was added as a narcotizing agent to prevent contortion of organisms prior to the sample being transferred from the codend to a prelabelled container and preserved with 10% buffered formalin. Zooplankton samples were kept cool (although not frozen) for shipment to IdentaZoop, Sudbury, Ontario for taxonomic analysis (i.e., species composition, density and biomass).

2.6.4 Data Analysis

The lower trophic and primary productivity results analyses focused on total biomass and community composition. Biomass data can be used to interpret ecological significance and has food web linkages. Community composition was analyzed to species-level for both phytoplankton and zooplankton, and figures were created based on class-level and order-level identifications, respectively. Calculations were completed using Microsoft Excel and plots were created using RStudio 3.6.2.

2.7 Sediment and Benthic Invertebrate Surveys

2.7.1 Field Sampling

Surficial sediment samples were collected concurrently with benthic invertebrate community (BIC) samples using a Petite Ponar grab sampler during the fall sampling programs. Each ponar grab sampled a surface area of 0.023 square metres (m^2). Three grab sub-samples were taken at lake sample locations within similar depths and pooled (homogenized) into one composite sample to account for localized habitat heterogeneity and represent the substrates within the sampling location. Homogenizing the benthic samples also increased the likelihood of sampling all available taxa from the BIC by reducing the effects of intra-sample variation inherent to benthic communities.

The substrate physicochemical properties at each benthic sampling location (i.e., metal and nutrient concentrations) were characterized to further support interpretation of the benthic community between and among sample locations. All surficial sediment sampling followed the protocols as set out by Canadian Association for Laboratory Accreditation (CALA) Guide to Current Sampling Practices (Fowlie 2014) and Environment Canada's technical guidance for environmental effects monitoring (EC 2012).

The following quality assurance and quality control measures were implemented during benthic sample collection:

- Sampling gear utilized was appropriate for substrate present.
- Laboratory gloves (e.g., nitrile) were worn throughout the sampling process and replaced at each sampling location.
- Equipment was thoroughly rinsed and cleaned using appropriate cleansers and decontaminant agents prior to use between sampling locations.
- BIC samples were stored in appropriate containers using appropriate preservatives as directed by the laboratory.
- Sediment samples were placed in clean, pre-labeled, laboratory prepared glass jars.
- Blind field duplicate sediment quality samples were collected for 10% of total samples.
- Sample identification, location, date and other pertinent information was recorded in a field logbook / log sheet, on the sample container and on laboratory Chain of Custody forms.
- An experienced taxonomist was used for identification of freshwater macroinvertebrates.
- Electronic data received from the taxonomist were checked to ensure correctness by qualified staff.

All benthic samples were labeled with unique identification numeration. BIC samples were field sieved and preserved with 10% buffered formalin solution within six hours of sample collection to maintain sample integrity and minimize the likelihood of within sample predation or decomposition, before transport to the taxonomist.

2.7.2 Laboratory Sample Processing

Substrate composition was characterized through qualitative visual field assessments and quantitative laboratory grain size analysis. Laboratory chemical analysis was conducted by ALS Environmental, Thunder Bay, which is accredited by the CALA in accordance with ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories* for the tested parameters. The occurrence of large particle sizes (cobble and boulder) within representative reaches and sections of the rivers and creeks was recorded by field staff during habitat assessment.

Taxonomist laboratory BIC sample processing procedures included subsampling as required for samples containing large amounts of organic material and/or large sample volumes, to identify a minimum of 100 individuals. Sorting included washing samples through 250 and 500 µm sieves, and organism sorting / identification using a stereomicroscope (10x multiplication). All invertebrates were identified to the lowest practical level and generally to the genus level, with the exception of leeches; oligochaetes, stoneflies, mayflies, dragonflies, amphipods, and adult beetles and bugs, which were identified to the species level.

2.7.3 Sediment Quality Data Analysis

The analytical sediment results were compared to the Ontario Provincial Sediment Quality Guidelines (PSQG; MOE 2008) and Canadian Sediment Quality Guidelines (CSQG) for the Protection of Aquatic Life. The CSQG criteria are established based on the formal federal protocol to evaluate potential adverse biological effects in aquatic environments. They prescribe a level of contamination at which there are probable effects (Probable Effect Level [PEL]). The PSQG are guidelines which promote the protection of aquatic life and are based on sound scientific information. The PSQG establish three levels of effects that reflect potential chronic and long-term effects of contaminants on benthic invertebrates as follows:

- **No Effect Level:** fish and sediment-dwelling organisms are not affected by chemicals in the sediment; the sediment is considered clean.

- **Lowest Effect Level (LEL):** level of sediment contamination that can be tolerated by the majority of sediment-dwelling benthic invertebrates; the sediment is considered to be clean to marginally contaminated.
- **Severe Effect Level (SEL):** level of sediment contamination at which pronounced disturbance of the sediment-dwelling community can be expected; the sediment is considered heavily contaminated.

Sediment grain size and chemical analyses were conducted at a lab accredited by the CALA in accordance with ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*.

2.7.4 Data Analysis

The BIC taxonomic data from each sample location were characterized using a series of community descriptor indices and metrics listed below:

- Taxonomic invertebrate density (TID);
- Taxon richness;
- Simpson's Diversity Index;
- Simpson's Evenness Index;
- The percentage of community represented by Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) (EPT) taxa;
- The percentage of community represented by Chironomids (Chironomidae); and
- The percentage of community represented by each taxon (relative abundance).

These indices were calculated and summarized using the guidelines for Environmental Effects Monitoring as stipulated by Environment Canada (EC 2012).

2.8 Contaminants in Fish Tissue

Fish tissue samples for contaminant analysis were comprised of whole-body composite samples for small-bodied species. Sentinel species retained for analysis were determined based on presence and abundance of the species within each sample area, and to support future ecological assessment and monitoring programs.

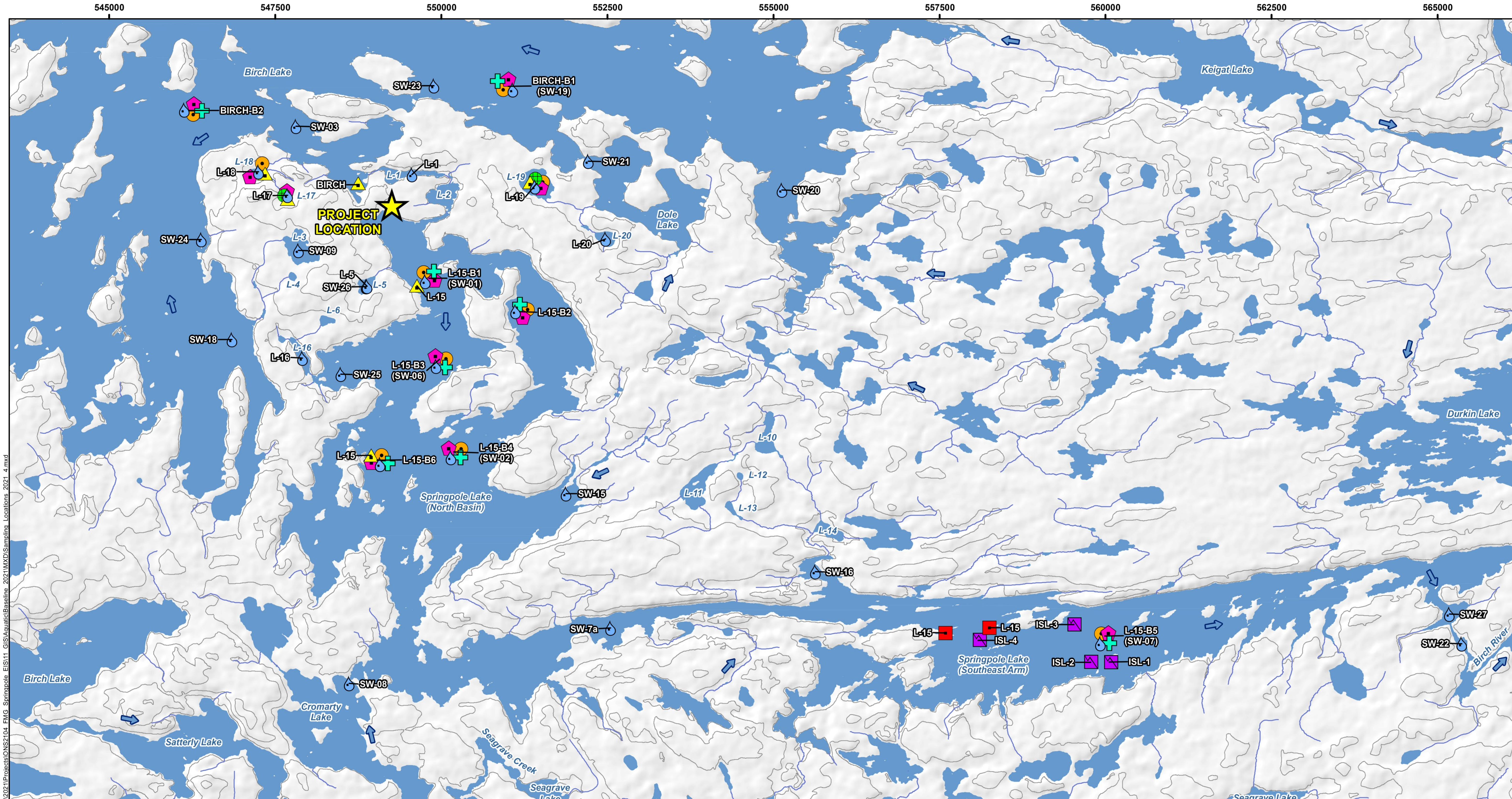
Small-bodied sentinel fish species retained for tissue analysis during the 2021 field studies included: Finescale Dace, Northern Redbelly Dace, Bluntnose Minnow, young-of-the-year Yellow Perch, Blacknose Shiner, Mimic Shiner, Spottail Shiner, Brook Stickleback and Fathead Minnow. Whole body composite samples each consisted of enough fish for a total mass greater than 20 grams (g) wet weight (target of 50 g to reduce likelihood of insufficient laboratory sample mass). Number of fish per composite sample varied based on individual fish size. The smallest fish in each sample was generally greater than or equal to 85% of the total length of the largest fish chosen for the sample. If the smallest fish was not within 85% of the largest fish, the size difference (largest to smallest) was not greater than 75%. Individuals from the sampled populations representing the full range of total lengths were submitted for age assessment using species appropriate ageing structures (e.g., otoliths).

Fish tissue samples collected by Wood during the 2021 field studies were submitted to ALS Environmental, Thunder Bay, Ontario, for total metals including mercury, methylmercury, and selenium speciation, as well as percent moisture.

Metals of interest analyzed for this study included deleterious substances measured in mining effluent under the MDMER, and metals known to have a negative effect on the health of aquatic life and consumers of aquatic biota: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. Fish tissue metal concentrations were compared among sample areas. Mercury and selenium are often of particular interest when assessing baseline conditions as these metals are known to have negative effects on the health of aquatic life and consumers of aquatic biota, discussed in more detail as follows.

The total mercury concentrations measured in large-bodied species fish tissue were compared to the provincial consumption guidelines (MOECC 2015) and federal food and nutrition standards (Health Canada 2011). Concentrations for all fish species were also compared to the Canadian Tissue Residue Guideline for the Protection of Wildlife Consumers of Aquatic Biota – methylmercury (CCME 2000). Where methylmercury concentrations were not available, the total mercury concentrations in fish tissue were used to assess methylmercury criteria. The proportion of methylmercury to total mercury in fish muscle tissue has been reported as ranging from 80 to 100% for freshwater adult fish, with the majority of these indicating a percent greater than 90% (Bishop and Neary 1975; Huckabee et al. 1979; Jackson 1990; Bloom 1992; Lasorsa and Allen-Gil 1995; Kannan et al. 1998; Jewett et al. 2003).

Selenium is often considered a metal of concern because it can have negative effects on human and aquatic life. It can be released into aquatic environments naturally through weathering or anthropogenic sources (US EPA 2016). Concentrations of selenium were measured in fish tissue during the 2021 studies to determine baseline concentrations and for future reference if needed. The Federal Environmental Quality Guidelines (FEQG) criteria established for selenium in whole body fish tissue were compared to the study results.



P:\2021\Projects\ONS2104 FMG Springpole EIS\11 GIS\AquaticBaseline 2021\MXD\Sampling Locations 2021 4.mxd

LEGEND

- Project Location
- Contour (10 m intervals)
- Watercourse
- Waterbody
- Flow Direction

2021 Sampling Locations

- Lower Trophic Level
- Surface Water Quality
- Benthic
- Sediment
- Gill Net
- Minnow Trap
- Seine Net
- Spawning Habitat Assessment

NOTES:
- Topographic information extracted from LIO, NDMNRF.

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

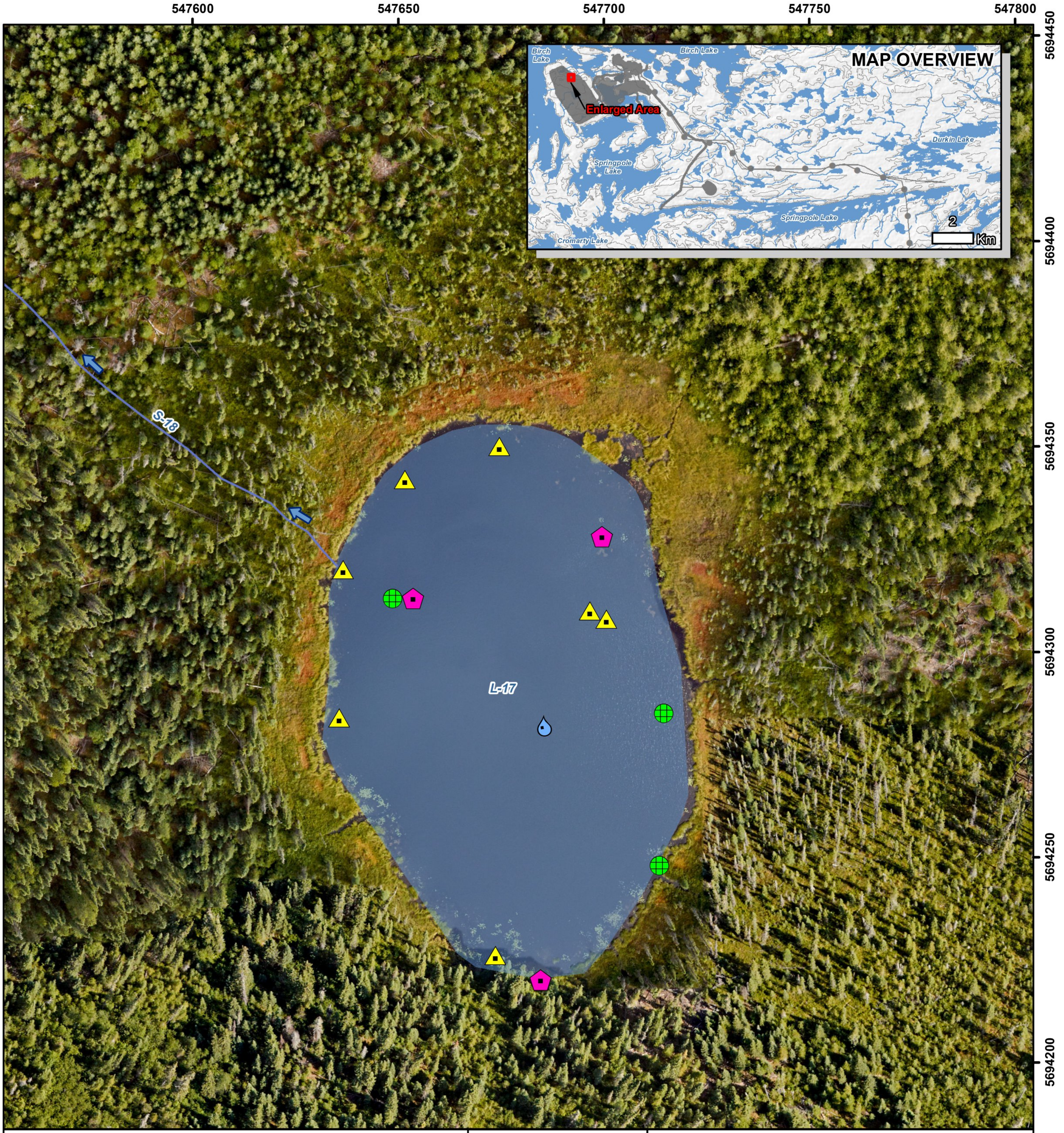
2021 Sampling Locations Overview

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 10 Kilometres

PROJECT N^{o}: ONS2104 | **FIGURE: 2-1a**

SCALE: 1:55,000 | DATE: April 2022



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LEGEND

- Watercourse
- Waterbody
- Flow Direction

2021 Sampling Locations

- Surface Water Quality
- Benthic
- Gill Net
- Minnow Trap

NOTES:
- Topographic information extracted from LIO, NDMNRF.
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

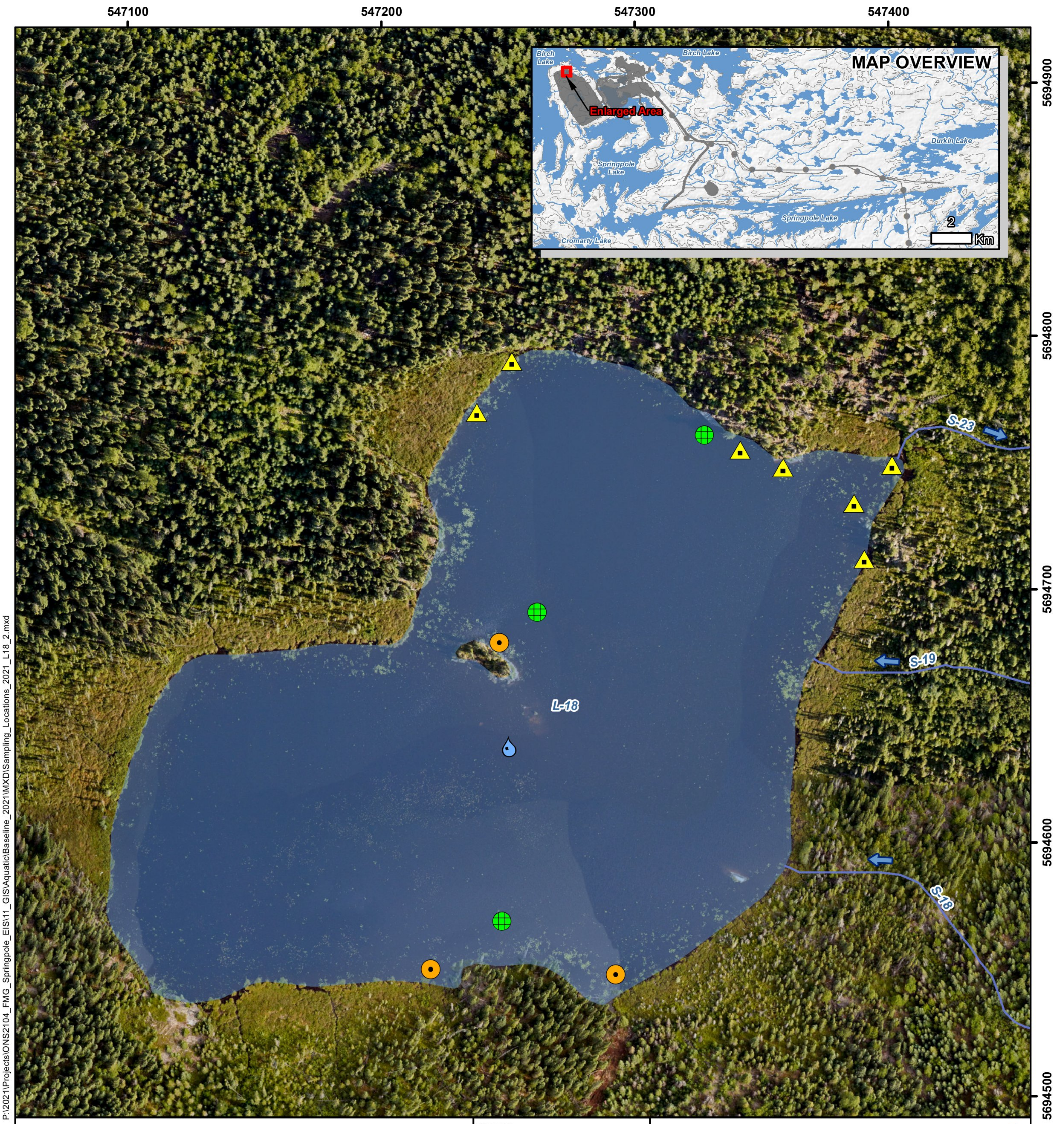
0 10 20 40 60 80 100 Metres

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

2021 Sampling Locations
L-17

PROJECT N^{o}: ONS2104	**FIGURE: 2-1b**
SCALE: 1:1,250	DATE: April 2022



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LEGEND

- Watercourse
- Waterbody
- Flow Direction

2021 Sampling Locations

- Surface Water Quality
- Sediment/Benthic
- Gill Net
- Minnow Trap

NOTES:
- Topographic information extracted from LIO, NDMNRF.
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

0 10 20 40 60 80 100 Metres

N W E S

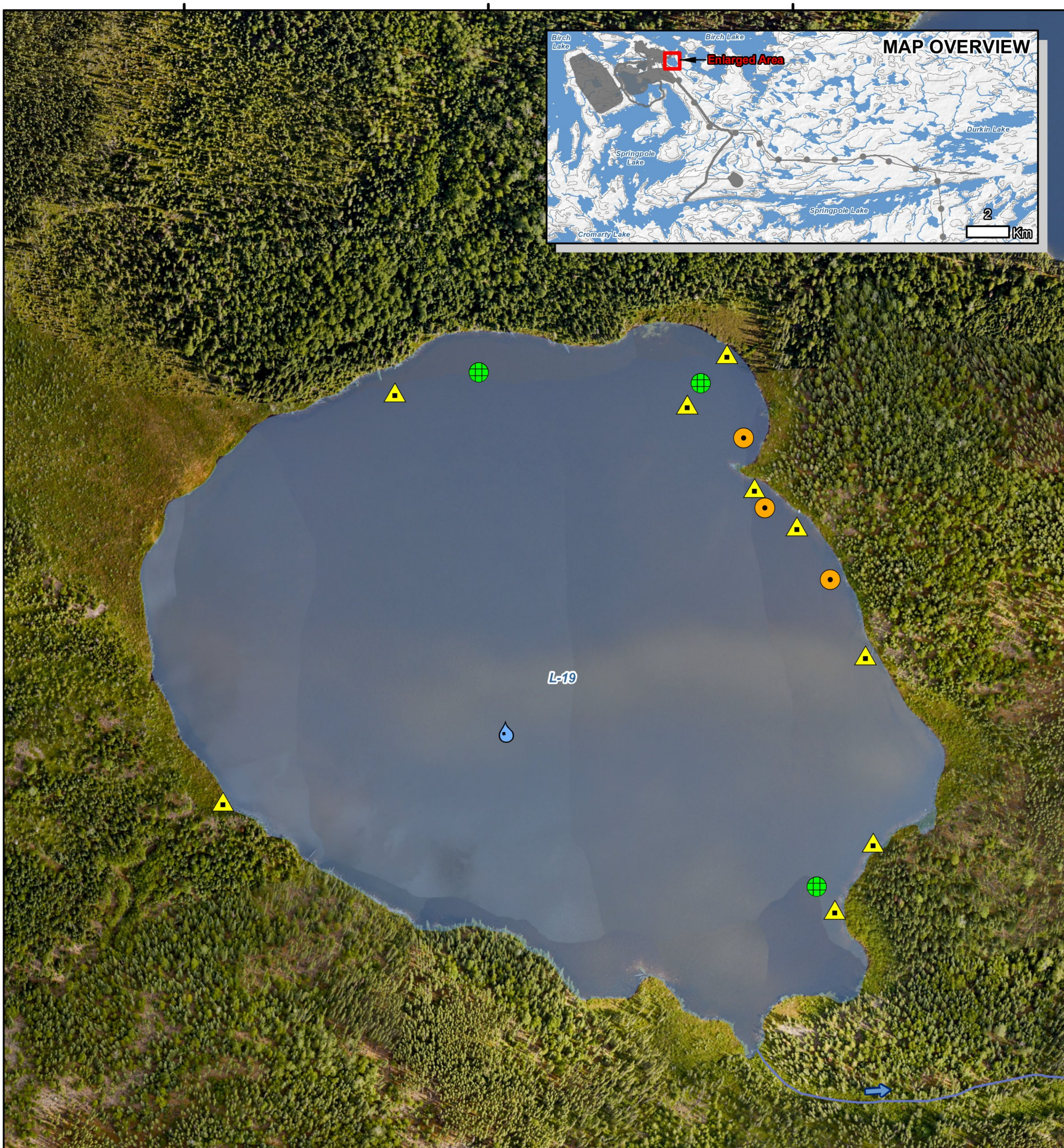
FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

2021 Sampling Locations
L-18

PROJECT N°: ONS2104 | **FIGURE: 2-1c**

SCALE: 1:2,000 | DATE: April 2022



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LEGEND

- Watercourse
- Waterbody
- Flow Direction

2021 Sampling Locations

- Surface Water Quality
- Sediment/Benthic
- Gill Net
- Minnow Trap

NOTES:
- Topographic information extracted from LIO, NDMNRF.
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

0 25 50 100 150 200 Metres

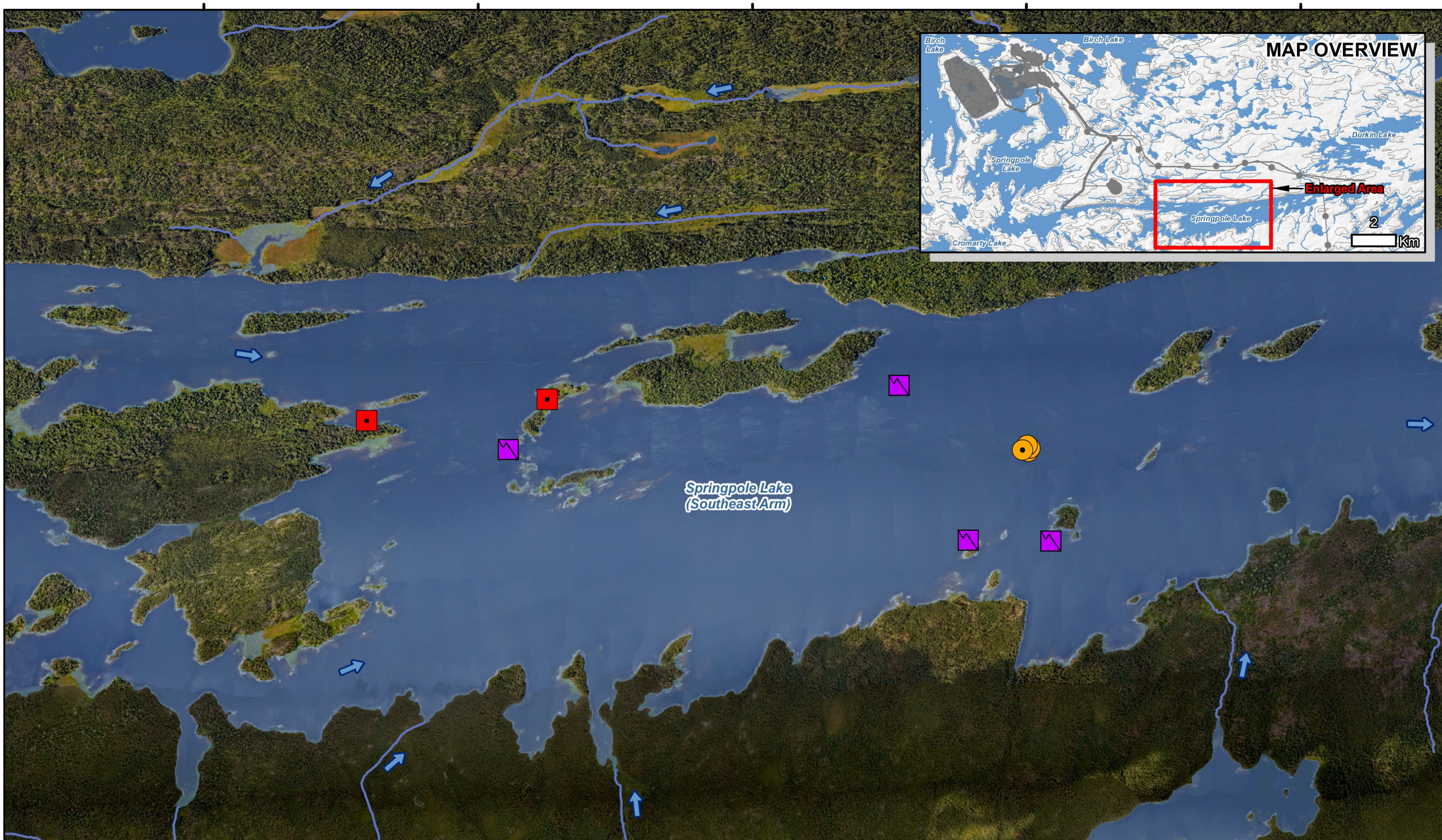
First Mining Gold wood.

SPRINGPOLE GOLD PROJECT

2021 Sampling Locations
L-19

PROJECT N°: ONS2104 | **FIGURE: 2-1d**

SCALE: 1:3,500 | DATE: April 2022



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LEGEND

- Watercourse
- Waterbody
- Flow Direction

2021 Sampling Locations

- Surface Water Quality
- Sediment/Benthic
- Seine Net
- Spawning Habitat Assessment

NOTES:
- Topographic information extracted from LIO, NDMNRF.
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

0 250 500 1,000 1,500 2,000 Metres

FIRST MINING GOLD

wood.

SPRINGPOLE GOLD PROJECT

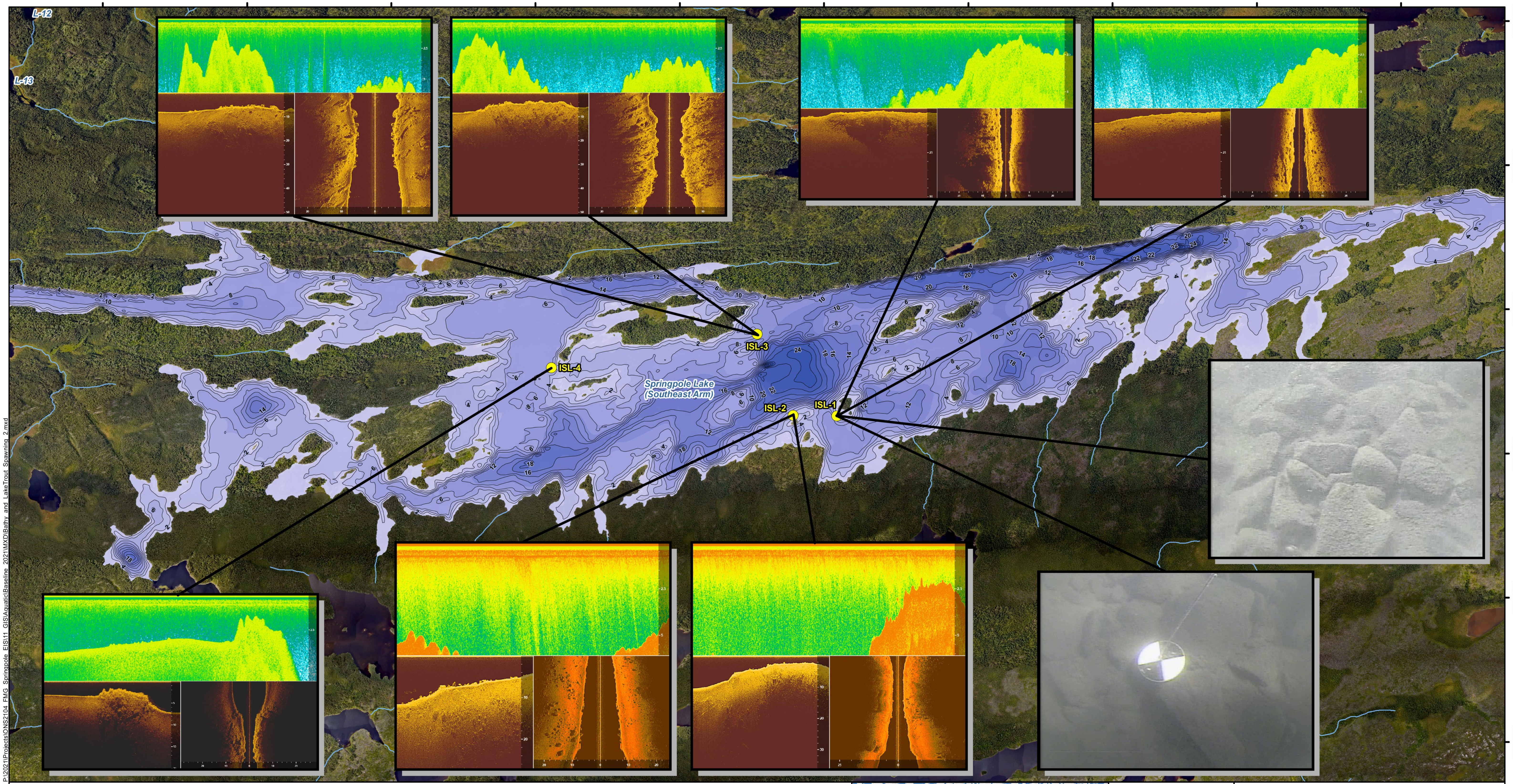
2021 Sampling Locations
Springpole Lake (Southeast Arm)

PROJECT N°: ONS2104

FIGURE: 2-1e

SCALE: 1:20,000

DATE: April 2022

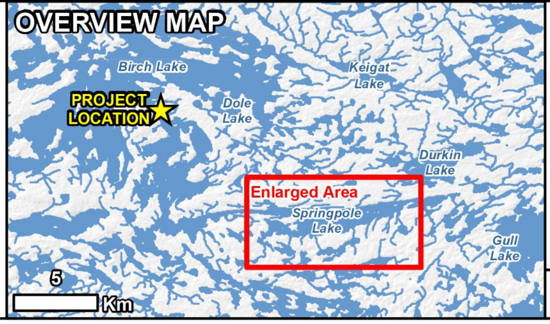


LEGEND

- Project Location
- Spawning Habitat Assessment Location
- Watercourse
- Bathymetry Contours (2 m interval)

Filled Bathymetry Contours (Depth in metres)

0 - 2	10 -12	20 - 22
2 - 4	12 -14	22 - 24
4 - 6	14 -16	24 - 26
6 - 8	16 -18	26 - 28
8 - 10	18 -20	28 - 30



NOTES:
- Topographic information extracted from LIO, MNRF.
- Springpole Lake bathymetry provided by Story Environmental Inc, 2017/2019.

Datum: NAD83
Projection: UTM Zone 15N

0 0.5 1 2 3 4 5 Kilometres

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Springpole Lake Bathymetry and Lake Trout Spawning Areas

PROJECT N°: ONS2104	**FIGURE: 2-2**
SCALE: 1:25,000	DATE: April 2022

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Table 2-1: Aquatic Resources Field Study Locations 2021

Waterbody	Sample ID	UTM Easting (m)	UTM Northing (m)	Habitat Observations	Sediment and Benthos Sampling	Fish Community	Fish Body Burdens
Birch Lake	BIRCH-B1	551082	5695872	-	Fa	-	-
Birch Lake	BIRCH-B2	546134	5695587	-	Fa	Sp^	Sp^
Springpole Lake (Lake 15)	L-15-B1	549752	5693000	-	Fa	Sp	-
Springpole Lake (Lake 15)	L-15-B2	551129	5692543	-	Fa	-	-
Springpole Lake (Lake 15)	L-15-B3	549958	5691732	-	Fa	-	
Springpole Lake (Lake 15)	L-15-B4	550197	5690385	-	Fa	-	-
Springpole Lake (Lake 15)	L-15-B5	559999	5687605	-	Fa	Sp*	Sp*
Springpole Lake (Lake 15)	L-15-B6	549073	5690230	-	Fa	-	-
Lake 17	L-17	547678	5694292	Fa	Fa	Fa	Fa
Lake 18	L-18	547322	5694729	Fa	Fa	Fa	Fa
Lake 19	L-19	551445	5694478	Fa	Fa	Fa	Fa
Lake 20	L-20	552476	5693616	Fa	-	-	-

Notes:

1 Coordinates provided represent the approximate midpoint of the study area in Universal Transverse Mercator (UTM) Zone 15U, North American Datum (NAD) 83.

2 Sp data collected during the 2021 spring field study (June 8 to 15).

3 Fa data collected during the 2021 fall field study (September 22 to October 1).

4 ^ South bay closest to Project.

5 * Island shoals east of L-15-B5, Springpole Lake southeast arm.

Table 2-2: Fish Community Sampling by Sample Area and Season 2021

Sample Location	Gillnet	Minnow Trap	Seine Net
Birch Lake	-	Sp	Sp
Springpole Lake (L-15)	-	Sp	Sp
Lake 17 (L-17)	Fa	Fa	-
Lake 18 (L-18)	Fa	Fa	-
Lake 19 (L-19)	Fa	Fa	-
Lake 20 (L-20)	-	-	-

Notes:

1 Sp data collected during the 2021 spring field study (June 8 to 15).

2 Fa data collected during the 2021 fall field study (September 22 to October 1).

3.0 RESULTS AND DISCUSSION

The updated fish habitat types are provided in Section 3.1, with the 2021 aquatic resources assessment results presented by waterbody and field program components in Sections 3.2 to 3.6. The field programs also included the collection of surface water quality samples (near surface and discrete depth intervals at select locations) with the results presented under a separate cover and earlier baseline data are summarized in the 2011 to 2020 cumulative surface water quality report (Wood 2021b).

Field data summary tables and figures, including gear-specific fish catch records and fish habitat assessment features are provided in Appendix A. The fish habitat characterization results, including previous baseline habitat type delineations are shown on Figure 3-1a to Figure 3-1d, and described below. The contaminants in fish tissue summary tables and figures are provided in Appendix B, with fish age determination results in Appendix C. The sediment quality results are provided in Appendix D and the BIC taxonomic data with summary tables and figures is provided in Appendix D. A photographic record of the sampled locations with representative fish species and habitat images is provided in Appendix E.

Where applicable, baseline data from earlier project studies have been included in the results analysis and data presentation, thereby summarizing the larger project-specific data set.

The following appendix sections (and associated tables and figures) provide area-specific assessment results for the inland waterbodies, Springpole and Birch lakes, including as appropriate:

- In-field physicochemical surface water quality parameters (Table A1-1);
- Fish habitat and community survey results including gear-specific capture results listing fish species occurrence in each waterbody (Tables A1-2 to A1-5; Figures A1-1 to A1-3);
- Lower trophic / primary productivity results (Tables A2-1 to A2-2; Figures A2-1 to A2-6);
- Temperature and DO profiles (Figures A3-1 to A3-8);
- Concentrations of select contaminants of concern in fish tissue, including total mercury and methylmercury (Tables B1-1 to B1-4; Figures B1-1 to B1-2);
- Sediment quality (Table D1-1); and
- The BIC results including descriptive community-based metrics for each sample area, as well as the raw data and associate community metrics plots (Table D2-1; Figures D2-1 to D2-7).

3.1 Fish Habitat Types

The following subsections provide a description of the fish habitat types within the LSA, which have been updated using the 2021 field study results and as per review comments provided through engagement with government agencies and Indigenous communities associated with the anticipated combined Environmental Impact Statement / Environmental Assessment (EIS/EA).

3.1.1 Habitat Type A

Habitat type A represents lentic (lake / pond) habitat characterizing the smaller, shallow inland waterbodies within the LSA that are likely to support spawning, rearing and foraging for a variety of small body species with potential of large body fish species such as Northern Pike [ginoozhe] and Yellow Perch. Substrate composition in habitat type A includes predominantly soft, fine-grained sediments with some localized boulder / bedrock and cobble / sand occurrences, as well as coarse woody debris with detritus. Vegetation in the upland zones was composed mainly of mixed forest dominated by Black Spruce and Tamarack; while vegetation near to the riparian zone included wood shrub species such as Alder, and herbaceous species such as Sweetgale and grasses. In general, two types of riparian zone vegetation were observed in habitat type A: a grassy floating mat with mosses, Sweetgale and herbaceous species; or a narrow riparian zone with overhanging shrubs and rushes (such as Hardstem Bulrush) that extended into the open water littoral zone covering a portion of the open water surface. Nearshore, shallow areas are also commonly populated by other emergent and submergent or floating aquatic macrophytes such as yellow pond lily and pondweed species.

3.1.2 Habitat Type B

Habitat type B represents lentic habitat characterizing the deep (>4 m total depth) inland waterbodies within the LSA. The total depth is the primary difference between habitat types A and B, which can also influence fish species community and thermal regime. Habitat type B is also likely to support a variety of small and large body species of all life stages. Substrate composition in habitat type B is similar to habitat type A with predominantly soft, fine grained sediments with greater abundance of localized boulder / bedrock and cobble / sand occurrences, as well as coarse woody debris with detritus. Vegetation in the upland zones are mainly mixed forest dominated by Black Spruce and Tamarack; while vegetation near to the riparian zone included wood shrub species such as Alder, and herbaceous species such as Sweetgale and grasses. In general, two types of riparian zone vegetation were observed in habitat type B; a grassy floating mat with mosses, Sweetgale and herbaceous species; or a narrow riparian zone with overhanging shrubs and rushes (such as Hardstem Bulrush) that extended into the open water littoral zone covering a portion of the open water surface. Nearshore, shallow areas are also commonly populated by other emergent and submergent or floating aquatic macrophytes such as yellow pond lily and pondweed species.

3.1.3 Habitat Type C

Habitat type C represents deep water lentic habitat characterizing the large lake environs such as Springpole and Birch lakes. These lakes support a variety of forage fish, large body fish and sport fish (Lake Trout, Walleye [ogaans] and Lake Whitefish [adikameg]) indicative of deep water and rocky shoals habitat. Substrate composition nearshore is mostly comprised of exposed bedrock and boulder, with localized areas of soft fine grained sediments commonly associated with tributary inflows and sheltered embayments. Coarse wood structure (e.g., driftwood) and some localized areas of aquatic macrophytes within the soft sediment substrate areas is present. Vegetation in the upland zones include mainly mixed forest dominated by Black Spruce and Tamarack; while vegetation near to the riparian zone included woody shrub species such as alder and herbaceous species.

3.1.4 Habitat Type D

Habitat type D represents ephemeral stream environments characterized as low-lying areas that may contain diffused pockets of standing water and only convey overland flow during periods of heavy rainfall or during spring freshet (snowmelt). Habitat type D was also commonly associated with a complete loss of defined channel, transitioning into areas of muskeg drainage / underground flow and is not likely considered fish habitat. Overall, this habitat characterized the subsurface channels and flow paths connecting waterbodies such as L-6 and L-16 (Table 3-1). This habitat was dominated by willow, grasses, alder and Sweetgale, with some Black Spruce, Mosses and Tamarack. Where open channels were observed, the substrate composition within this habitat type was almost exclusively fines, with some boulder and bedrock observed.

3.1.5 Habitat Type E

Habitat type E represents intermittent riverine habitat that only experiences flow during some part of each year (generally said to occur between 10 to 80% of the time), with little to no floodplain, steep banks and shrub riparian vegetation providing nearly complete canopy cover. The substrate is mostly exposed bedrock and boulder with some isolated pockets of fine-grained substrate. This habitat type is likely to support small body and large body fish species with preference to flowing water during spawning season (e.g., spring freshet). Riparian vegetation is dense alder and willow species, with upland by Black Spruce, Poplar and

Tamarack. This habitat type commonly occurs within gradient changes between inland streams and habitat type C waterbodies.

3.1.6 Habitat Type F

Habitat type F represents riverine habitat with moderate beaver activity creating alternating series of pools and impoundments (via beaver dams). These areas are also characterized by side overflow channels created during high flow events. The pool habitat has abundant coarse and fine wood debris, with soft fine-grained sediments that support dense aquatic macrophytes. Riparian vegetation is mostly comprised of grasses and sedges with alder and willow species further upland adjacent to Black Spruce, Poplar and Tamarack forest. Habitat type F typically occurs between inland waterbodies and at the downstream extent of the habitat types G and H reaches, where beavers have utilized the narrowing, natural topography to construct dams. These pooled areas are likely to hold a variety of small body fish species that were trapped due to beaver activity and support all life cycles seasonally.

3.1.7 Habitat Type G

Habitat type G represents riverine habitat with a broad floodplain and extensive floating mats of herbaceous species typical of muskeg and beaver ponds. This habitat is primarily represented by flat channel morphology with occasional pools in the thalweg of meander bends and back bays of the channel and likely to provide habitat for various small body fish. The substrate is characterized by soft fine-grained sediment with occasional boulders and localized areas of exposed bedrock. Dense aquatic macrophyte growth and coarse wood debris contribute most of the instream cover. Vegetation in the upland zones are mainly mixed forest dominated by Black Spruce, Poplar and Tamarack; while vegetation near to the riparian zone includes alder, willow and herbaceous species.

3.1.8 Habitat Type H

Habitat type H represents riverine habitat with a moderate to broad floodplain similar to habitat type G; however, wetted width is much wider than habitat type G and was observed at fewer locations within the assessed areas. As with habitat type G, the type H habitat is characterized by flat channel morphology with occasional pools and likely to provide habitat for various small body fish. The substrate is characterized by soft fine-grained sediment with few boulders. Abundant aquatic macrophytes and coarse wood debris are present. The riparian zone consists mostly of grasses and sedges. Upland areas are mainly mixed forest dominated by Black Spruce, Poplar and Tamarack; while vegetation near to the riparian zone includes alder, willow and herbaceous species.

3.1.9 Habitat Type I

Habitat type I represents the Birch River habitat characterizing fast flowing river sections with cobble, boulder and bedrock riffle and rapids habitat. This area was characteristic of steeper gradients and generally shallow channel cross-sections. The upland and riparian vegetation communities were mainly mixed forest dominated by Black Spruce and sparse Tamarack and Poplar species; however, recent forest fire damage shows an early succession stage of growth for these species. Macrophyte growth was observed in low abundance within the area, however, algae covering rocks and Pondweed growing in the fast current between rocks were noted in some less turbulent areas.

3.2 Lake 17 (L-17)

Lake 17 (L-17) is located within the proposed PDA and would be directly overprinted by the Project. As such, field studies within L-17 occurred during the following seasonal periods:

- Winter – March 31, 2021 (surface water quality sampling and physicochemical measurements only);
- Spring – June 11, 2021;
- Summer – field studies were not possible due to NDMNRF overland access restrictions preventing site access; and
- Fall – September 29, 2021.

3.2.1 Fish Habitat

Lake 17 (L-17) is a shallow, isolated pond characterized as habitat type A (Table 3-1) which is indirectly connected to Birch Lake through a terrestrial flow path reporting to L-18. The connecting drainage between L-17 and L-18 represents habitat type E (Table 3-1; Figure 3-1b). The submergent and emergent macrophytes exist in sparse patches and some moderately dense growth along the shallow margins of L-17. The riparian vegetation consists mostly of dense grasses and sedge in flooded conditions, with moderate abundance of alders, willows, and other herbaceous species. Beyond the approximately 10 m riparian boundary, mixed poplars, spruce, and pine dominate the forest upland, however nearly all forest cover was burned during the July 2021 forest fires.

3.2.2 Fish Community

The L-17 fish community was assessed during the fall 2021 sampling campaign. Finescale Dace was the only species captured (Table 3-2; Appendix A, Tables A1-3 to A1-5). Baited minnow traps and small mesh gillnets were used to sample the waterbody (Figure 2-1b). Baited minnow traps were the most effective capture gear, collecting most specimens. A total of 976 individuals were captured during the September field program and based on measured temperatures and fish species (Finescale Dace), the thermal regime of L-17 supports coolwater fish species (Hasnain et al. 2010; Coker et al. 2001).

3.2.3 Fish Tissue

A total of five Finescale Dace composite samples were submitted for fish tissue analysis from L-17. Composite samples included 11 to 18 individuals based on minimum sample mass target (Table B1-1). No obvious abnormalities or external parasites were noted for these fish.

Whole body Finescale Dace composite tissue results are displayed in Table B1-3 for the following parameters: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. The analytical results display total metals in mg/kg of wet weight (wwt), except for selenium which is shown in mg/kg of dry weight (dwt). Total mercury concentrations ranged from 0.0518 to 0.0948 mg/kg wwt, with a mean of 0.0769 mg/kg wwt. None of the samples exceeded the total mercury Ontario consumption guidelines developed for the general population (1.8 mg/kg) and those developed for women of child-bearing age and children (0.5 mg/kg), nor the Health Canada maximum contaminant concentration (0.5 mg/kg). Total metal concentrations averaged 0.0177, 0.0037, 0.0188, 0.6046, 0.0134, 5.992, 0.0470, and 41.22 mg/kg wwt for arsenic, cadmium, chromium, copper, lead, manganese, nickel and zinc, respectively. Total selenium averaged 0.6156 mg/kg dwt and all selenium concentrations were less than the FEQG criterion for whole body samples (6.7 mg/kg dwt). Methylmercury ranged from 0.0382 to 0.121 mg/kg wwt, averaging 0.068. All composites had methylmercury concentrations greater than the Canadian Council of Ministers of Environment (CCME) guideline of 0.033 mg/kg methylmercury for the protection of wildlife consumers of aquatic biota in all samples.

Individual Finescale Dace age results are displayed in Table C1-1 and age at length in Figure C1-1. Trends in individual Finescale Dace did not show a strong relationship between age and length (R^2=0.32), with a broad range of lengths at age particularly observed for individuals assessed at 3 and 5 years of age.

3.2.4 Water Quality

In situ surface water temperatures measured during winter, spring, and fall were 2.7, 14.5 and 13.7°C, respectively (Table A1-1). The peak summer (warmest) water temperature was not measured due to site access restrictions and is typically used to determine the thermal regime designation; however, the water temperature measured during the May surface water quality sampling visit was 20.6°C (Table A1-1). As such, this measurement and the thermal preferences for resident fish species suggest a coolwater designation. In situ DO measurements during the winter, spring and fall programs were 7.45, 6.94 and 9.26 milligrams per litre (mg/L) respectively (Table A1-1). The DO measurements were within the Ontario Provincial Water Quality Objectives (PWQO) and Canadian Water Quality Guidelines (CWQG) for the general protection of coldwater biota (6.5 mg/L) but not for early coldwater life stages (9.5 mg/L). In situ pH measurements were 7.21, 7.42, and 6.98 respectively which all satisfy the PWQO and CWQG guidelines. Conductivity measurements ranged from 72.8 to 105.9 microsiemens per centimeter (µS/cm) during the assessment period. For additional surface water quality monitoring results and data analysis please refer to the 2021 surface water quality modelling report (Wood 2022).

3.2.5 Sediment Quality

Collection of sediment quality samples was attempted within L-17 during the fall field program, including the deepest reaches of the waterbody at approximately 1.0 to 1.6 m depths. The shallow water depth and isolated conditions with little flow have supported dense vegetation growth within the pond, and sediment sampling was not successful. All recovered ponar grabs consisted mostly of submerged vegetation, grasses and rootlets without sediment.

3.2.6 Benthic Invertebrate Community

A total of three BIC samples were collected within L-17 during the fall field program. Samples were collected within total water depths between 1.2 and 1.6 m. A summary of the taxonomic identification results are presented in Table D2-1.

An average of 445 (140 to 640) individuals from 15 (9 to 19) taxa groups were identified in L-17 samples, with *Chironomidae* (non-biting midges) being the most abundant (more than 31% in each replicate; Figure D2-1 to D2-3). Taxa richness was calculated at the family level, except for Ostracoda, which was identified to the class taxonomic level. Individuals from the metal sensitive Tanytarsus genus were present in all three samples containing Chironomids, composing 29.41, 31.25 and 9.09% of the Chironomid communities. EPT taxa were present in L-17, composing on average only 11% of the population (Figure D2-4). Mean TID was 6,456 (2,029 to 9,275) and mean evenness was 0.33 (0.23 to 0.43; Figure D2-5 and D2-6). Mean Simpson's Diversity, which takes account of both richness and evenness, was 0.78 (0.46 to 0.61) and was the highest at L-17 out of all locations sampled (Figure D2-7). These values indicate that the benthic community, although diverse, is dominated by a few species.

3.3 Lake 18 (L-18)

Lake 18 (L-18) is located within the PDA and would be directly overprinted by the Project. As such, field studies within L-18 occurred during the following seasonal periods:

- Winter – March 31, 2021 (surface water quality sampling and physicochemical measurements only);
- Spring – June 15, 2021;
- Summer – August 30, 2021 (surface water quality sampling and physicochemical measurements only – aquatic field studies were not possible due to forest fire restrictions preventing site access); and
- Fall – September 30, 2021.

3.3.1 Fish Habitat

Lake 18 (L-18) is located within the footprint of the PDA, south of Birch Lake and is best represented by habitat type A (Table 3-1). The riparian vegetarian consisted of grasses and sedges as well as cattails and is surrounded by mixed deciduous and coniferous forests with an understory comprised of seedlings, and shrub species. The shallow margins of this lake support low-moderate abundance of emergent and submergent macrophytes. The land along the southeastern side of the waterbody was impacted by the July 2021 forest fires to within approximately 100 m from the waterbody.

3.3.2 Fish Community

Three fish species were captured at site L-18 during the September field program, including Brook Stickleback, Finescale Dace and Northern Redbelly Dace (Table 3-1; Appendix A, Tables A1-3 to A1-5). Baited minnow traps and gillnets were used to sample the waterbody (Figure 2-1c). A total of 1,176 individuals were captured from the minnow traps during the September field program. Brook Stickleback were the most abundant fish species captured, followed by Northern Redbelly Dace. The recorded in situ temperatures and resident fish species suggest the thermal regime supports coolwater fish species (Hasnain et al. 2010; Coker et al. 2001).

3.3.3 Fish Tissue

A total of four Brook Stickleback composite samples and one Northern Redbelly Dace composite sample were submitted for fish tissue analysis from L-18. Composite samples included 22 to 34 Brook Stickleback individuals, and 19 individuals comprised the Northern Redbelly Dace composite sample to meet the minimum sample mass target (Table B1-1). No obvious abnormalities or external parasites were noted for these fish.

Whole body Brook Stickleback and Northern Redbelly Dace composite tissue results are displayed in Table B1-3 for the following parameters: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. Total mercury wwt concentrations in Brook Stickleback ranged from 0.0465 to 0.0577 mg/kg wwt, with a mean of 0.0525 mg/kg wwt, and was measured at 0.0599 mg/kg wwt for the one Northern Redbelly Dace composite. None of the samples exceeded the total mercury Ontario consumption guidelines developed for the general population (1.8 mg/kg) and those developed for women of child-bearing age and children (0.5 mg/kg), nor the Health Canada maximum contaminant concentration (0.5 mg/kg). Total arsenic concentrations averaged 0.0292 mg/kg wwt, total cadmium 0.0071 mg/kg wwt, total chromium 0.0153 mg/kg wwt, total copper 2.16 mg/kg wwt, total lead 0.0167 mg/kg wwt, total manganese 9.56 mg/kg wwt, total nickel 0.04 mg/kg wwt, and total zinc 38.075 mg/kg wwt for the Brook Stickleback composites. The Northern Redbelly Dace composite had concentrations of 0.0361 mg/kg wwt for total arsenic, 0.0067 mg/kg wwt for total cadmium, 0.03 mg/kg wwt for total chromium, 1.94 mg/kg wwt for total copper, 0.0139 mg/kg wwt for total lead, 5.4 mg/kg wwt for total manganese, 0.04 mg/kg wwt for total nickel, and 66.1 mg/kg wwt for total zinc. Total selenium in dwt averaged 1.085 mg/kg for the Brook Stickleback and was 0.719 for the Northern Redbelly Dace. All selenium concentrations were less than the FEQG criterion for whole body samples (6.7 mg/kg dwt). Methylmercury ranged from 0.0498 to 0.0582 mg/kg wwt, averaging 0.0529 in Brook Stickleback and was recorded at 0.0723 mg/kg wwt in the Northern Redbelly Dace composite. All composites had methylmercury concentrations greater than the CCME guideline of 0.033 mg/kg methylmercury for the protection of wildlife consumers of aquatic biota in all samples.

Individual Brook Stickleback and Northern Redbelly Dace age results are displayed in Table C1-1 and age at length in Figure C1-2. A well-defined trend in Northern Redbelly Dace showed that older fish tended to be larger (R^2=0.85), with the broadest range of size at age observed for individuals assessed at 3-years. The majority of Brook Stickleback individuals were assessed as 1-year of age with a broad range of total lengths, and as such, these data did not show a strong relationship between age and length (R^2=0.36).

3.3.4 Water Quality

In situ water temperatures measured during the winter, spring, summer and fall were 2.9, 23.2, 19.3, and 16.2°C respectively (Table A1-1). The spring and summer data, as well as fish community results show a coolwater thermal designation. In situ DO measurements for winter, spring, summer and fall were 4.25, 8.45, 8.55 and 10.17 mg/L respectively. The DO measurements met the PWQO range in all seasons except winter. These measurements also met the CWQG guidelines for the general protection of coldwater biota (6.5 mg/L) except for the winter season and only the fall season met CWQG guidelines for coldwater species early life stages (9.5 mg/L). In situ pH measurements ranged from 6.84 to 7.84 which all meet the PWQO and CWQG guidelines. Conductivity measurements ranged from 64.6 to 111 µS/cm during the assessment period. For additional surface water quality monitoring results and data analysis please refer to the 2021 surface water quality modelling report (Wood 2022).

3.3.5 Sediment Quality

Sediment samples were collected from three locations within L-18 during the fall field program. Grab samples were collected within total water depths between 1.2 and 1.4 m. Samples consisted mostly of silt (62.2 to 92.9%) with some fine sand (21.7%) in sample L-18-SED1, and trace fine sand in L-18-SED1 and L-18-SED3. Trace medium sand and clay was also reported in all samples (Table D1-1).

Nutrient and total metal parameters met some PSQG and CSQG concentrations with few values greater than the PSQG LEL, as well as concentrations greater than the PSQG SEL and/or CSQG PEL as noted below:

- Total Kjeldahl nitrogen (TKN) and total organic carbon (TOC) exceeded the PSQG SEL guideline; and
- Copper exceeded the PSQG LEL guideline.

3.3.6 Benthic Invertebrate Community

A total of three BIC samples were collected within L-18 during the fall field program. Samples were collected within total water depths between 1.2 and 1.4 m. A summary of the taxonomic identification results are presented in Table D2-1.

An average of 179 (124 to 244) individuals from 13 (9 to 20) taxa groups were identified in L-18 samples, with *Chironomidae* being the most abundant (more than 29% in each replicate; Figure D2-1 to D2-3). Taxa richness was calculated at the family level, except for Arachnida, which was identified to the class taxonomic level. Individuals from the Tanytarsus genus were present in all three samples, composing on average of 21.67% of the Chironomid communities. EPT taxa were present in L-18, composing 19% of the population on average, but was the highest out of all the sampled locations (Figure D2-4). Mean TID was 2,594 (1,797 to 3,536) and mean evenness was 0.36 (0.10 to 0.62; Figure D2-5 and D2-6). Mean Simpson's Diversity was 0.67 (0.52 to 0.82; Figure D2-7). L-18 had the lowest abundance and density out of the inland lakes sampled, and these values indicate that the benthic community is dominated by a few species.

3.4 Lake 19 (L-19)

Lake 19 (L-19) is not anticipated to receive site drainage or direct impacts from the Project; however, an aquatic assessment was conducted due to its proximity to the proposed site infrastructure. As such, field studies within L-19 occurred during the following seasonal periods:

- Winter – March 31, 2021 (surface water quality sampling and physicochemical measurements only);
- Spring – June 15, 2021;
- Summer – September 1, 2021 (surface water quality sampling and physicochemical measurements only – aquatic field studies were not possible due to NDMNRF overland access restrictions preventing site access); and
- Fall – October 1, 2021.

3.4.1 Fish Habitat

Lake 19 (L-19) is characterized as habitat type A and is located between Birch and Springpole lakes, with an outlet flow path that ultimately reports to Dole Lake (Figure 2-1a). This waterbody is surrounded by mixed deciduous and coniferous forests with an understory comprised of shrub species. Much of the southern shoreline and surrounding forests were burned by the 2021 forest fires. The lake bottom is mostly covered by dense submerged macrophytes, including watermilfoil (*Myriophyllum*) and pondweed (*Potamogeton*) species. The emergent macrophyte community along the shoreline is dominated by water horsetail (*Equisetum fluviatile*).

3.4.2 Fish Community

Three fish species were captured at L-19 during the fall field program, including Brook Stickleback, Fathead Minnow and Northern Redbelly Dace (Table 3-2 and Appendix A, Tables A1-3 to A1-5). Baited minnow traps and gillnets were used to sample the watercourse (Figure 2-1d). A total of 1,571 individuals were captured during the September field program using minnow traps, with no catch in the gillnets. Fathead Minnow was the most abundant fish species captured, followed by Northern Redbelly Dace. The recorded water temperatures and fish community show L-19 supports a coolwater thermal regime (Hasnain et al. 2010; Coker et al. 2001).

3.4.3 Fish Tissue

A total of five Fathead Minnow composite samples were submitted from L-19. The composite samples included between 8 and 13 individuals to meet the minimum sample mass target (Table B1-1). No obvious abnormalities or external parasites were noted for these fish.

Whole body Fathead Minnow composite tissue results are displayed in Table B1-3 for the following parameters: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. Total mercury wwt concentrations ranged from 0.029 to 0.0389 mg/kg, with a mean of 0.033 mg/kg wwt. None of these composite samples exceeded the total mercury concentration Ontario consumption guidelines (1.8 mg/kg and 0.5 mg/kg), or the Health Canada guideline (0.5 mg/kg). Total metal concentrations averaged 0.0318, 0.0057, 0.018, 1.073, 0.0153, 1.824, 0.04 and 28.42 mg/kg wwt for arsenic, cadmium, chromium, copper, lead, manganese, nickel and zinc, respectively. Total averaged 1.3 mg/kg dwt and all selenium concentrations were less than the federal environmental quality guideline (6.7 mg/kg dwt). Methylmercury ranged from 0.0284 to 0.0475 mg/kg wwt, averaging 0.0351 mg/kg wwt. Three out of five of the composite samples had methylmercury concentrations less than the CCME guideline of 0.033 mg/kg.

Individual Fathead Minnow age results are displayed in Table C1-1 and age at length in Figure C1-3. Fathead Minnows showed that older fish tended to be larger (as length) in size (R^2=0.75), with the broadest range of length at age observed for individuals assessed at 1-year. Brook Stickleback are multiple spawners, meaning they usually spawn several times throughout the summer; therefore, length differences in year-one individuals are expected since some fish born early in the season may have experienced months of additional growth compared to other fish from late summer / early fall spawns.

3.4.4 Water Quality

In situ water temperatures measured during winter, spring, summer and fall were 3.4, 19.5, 19.6 and 16.9°C respectively (Table A1-1). The spring and summer data, as well as fish community results show a coolwater thermal classification. In situ DO measurements ranged from 6.64 to 11.41 mg/L which met the PWQO concentration range in all seasons except winter. These measurements also met the CWQG guidelines for the general protection of coldwater biota including early life stages in all seasons except winter. In situ pH measurements ranged from 6.97 to 8.61, which generally met the PWQO and CQWG guidelines for the general protection of aquatic biota. Conductivity measurements ranged from 59 to 121 µS/cm during the assessment period. For additional surface water quality monitoring results and data analysis please refer to the 2021 surface water quality modelling report (Wood 2022).

3.4.5 Sediment Quality

Sediment samples were collected from three locations in L-19 during the fall field investigation. Grab samples were collected within total water depths between 0.25 and 0.75 m. These samples mostly consisted of fine sand (56 to 66.9%) with some silt (25.1 to 29.1%) and trace medium sand and clay. Nutrient and total metal parameters met most PSQG and CSQG concentrations with some values greater than the PSQG LEL, as well as concentrations greater than the PSQG SEL and/or CSQG PEL as noted below:

- TKN exceeded the PSQG LEL guideline for sample L-19-SED2 and exceeded the PSQG LEL for sample L-19-SED1 and L-19-SED3; and
- TOC exceeded the PSQG LEL guideline.

3.4.6 Benthic Invertebrate Community

A total of three BIC samples were collected within L-19 during the fall field program. Samples were collected within total water depths between 0.25 and 0.70 m. A summary of the taxonomic identification results are presented in Table D2-1.

An average of 389 (105 to 674) individuals from 11 (10 to 11) taxa groups were identified in L-19 samples, with *Chironomidae* being the most abundant (more than 38% in each replicate; Figure D2-1 to D2-3). Chironomid taxa in L-19 was the highest out of all the sampled locations. Taxa richness was calculated at the family level, except for Ostracoda, which was identified to the class taxonomic level. Individuals from the Tanytarsus genus were present in all three samples, composing 21.05, 42.05 and 10.00% of the Chironomid communities. EPT taxa were present in L-19, composing 9% of the population on average (Figure D2-4). Mean TID was 5,638 (1,522 to 9,768) and mean evenness was 0.34 (0.16 to 0.48; Figure D2-5 and D2-6). Mean Simpson's Diversity was 0.70 (0.62 to 0.81; Figure D2-7). L-19 had the lowest taxa richness out of the inland waterbodies, but a similar evenness and diversity. These values indicate that the benthic community is dominated by a few species.

3.5 Lake 20 (L-20)

Lake 20 (L-20) is not anticipated to receive site drainage or direct impacts from the Project; however, an aquatic assessment was proposed due to its proximity to the site infrastructure. This site had no overland trail access to the waterbody. A helicopter was utilized during the winter surface water quality field program

(March 2021). Fire restrictions during 2021 did not allow trail cutting. Consequently, only one site visit was accomplished during the 2021 season. Ongoing studies have been scheduled to occur during the 2022 seasonal timing (spring, summer and fall); however, the lake has been classified as habitat type A and expected to contain similar fish community and fish habitat features as the surrounding inland waterbodies such as L-19.

3.5.1 Water Quality

In situ surface water temperature was 3.9°C, DO was 0.09 mg/L, pH was 6.01 and conductivity was 101 µs/cm. DO concentrations did not meet PWQO or CWQG guidelines for the general protection of coldwater fish species. The pH was also less than the acceptable PWQO and CWQG ranges.

For additional surface water quality monitoring results and data analysis please refer to the 2021 surface water quality modelling report (Wood 2022).

3.6 Springpole Lake (L-15)

A total of six locations within Springpole Lake (L-15) were sampled for water quality (samples and in situ profiles), sediment quality and benthic invertebrate community during the 2021 aquatic resources assessment (Figure 2-1). Five of these locations are positioned within the deep basins of L-15, in the northern portion of the lake that is up-gradient of the Birch River inflow (outlet of Cromarty Lake). One location (L-15-B5) is positioned within a deep basin near the eastern extent of L-15's southeast arm, between the Birch River inflow and outlet. The proposed treated effluent discharge location is positioned within the southeast arm. As such, the 2021 aquatic resources assessment collected data that builds on the existing deep basin data sets within the northern region of L-15 and also collected data within previously unsampled areas of L-15. The 2021 field studies occurred during the following seasonal periods:

- Winter – March 25 to 31, 2021;
- Spring – May 19 to 24, 2021 and June 8 to 15, 2021;
- Summer – July 28 to August 1 2021 and August 28 to September 1, 2021; and
- Fall – September 22 to October 1, 2021 and October 14 to 18, 2021.

Several sampling events occurred within each season to support the routine surface water quality monitoring program.

3.6.1 Fish Habitat

L-15 is characterized as habitat type C, which represent large lake (lentic) environments. There are two general basins within L-15. The northern basin that receives drainage from inland waterbodies and is connected to the relatively narrow southeast arm (Figure 2-1e). The nearshore substrate composition at the survey locations was comprised mostly of exposed bedrock and boulders, whereas areas near tributary inflows and sheltered embayments consist of soft fine-grained sediments. Lake bottom within the shallow embayments is dominated by submerged macrophytes, including watermilfoil and pondweed, and floating macrophytes such as water lily (Nymphaea). The emergent macrophyte community along the shorelines of surveyed areas is dominated by sedges and rushes, as well as localized areas with water horsetail, cattail and Sweet flag (*Acorus calamus*). Vegetation in the upland zones include mainly mixed forest dominated by Black Spruce (*Picea mariana*) and Tamarack (*Larix laricina*), while vegetation within the riparian zone include woody shrub species such as Alder and herbaceous species.

3.6.1.1 Lake Trout MVWHDO Assessment

Data collected at five sampling locations within the Springpole Lake northern basin (L-15-B1 to L-15-B4 and L-15-B6) and one location in the southeast arm (L-15-B5) were used to calculate the MVWHDO (Table A1-2).

MVWHDO concentrations are commonly used in evaluations of lake water quality and provide important habitat management benchmarks for many aquatic organisms, such as Lake Trout. Average MVWHDO concentrations for the five locations (B1 to B4 and B6) were calculated at 6.71, 4.78, 4.18, 0.39, and 6.41 mg/L DO, respectively. The MVWHDO values represent the average DO conditions of the entire hypolimnetic volume of the basin, allowing basins to be compared to the recommended minimum DO criterion for the protection of Lake Trout populations (7.0 mg/L; Evans 2007). In August 2021, the hypolimnion started at 13, 14 and 11 m, at locations L-15-B1, L-15-B3, and L-15-B4, respectively. Optimum habitat volume varied between the locations and was calculated at 21.4, 0 and 0% and useable habitat volume was 36.7, 31.2 and 0% for sites L-15-B1, L-15-B3 and L-15-B4, respectively. Variability seen between locations was expected given that many factors (including water quality and clarity, and habitat differences) influence these values. In September 2021, the hypolimnion moved deeper (12 to 16 m). Optimum habitat volume was 16.4% at station L-15-B1 and useable habitat volume ranged from 78 to 99% across the northern basins. Increased optimum and useable habitat volumes from August to September were expected, as by the end of September temperatures are almost always such that optimal habitat for Lake Trout has started to increase (Evans et al. 1991). Data for L-15-B6 was only available in June, as July and September data did not have a distinct hypolimnion. The hypolimnion started at 7 m, the optimum habitat volume was 15.4% and the useable habitat volume was 48.5%.

August and September data from one sampling location within the southeast arm (L-15-B5) showed the hypolimnion started at 17 and 19 m, respectively and the optimum habitat volumes were both calculated at 0%. Useable habitat in the southeast arm was up to 96.9% in September. Average MVWHDO concentration was 0.84 mg/L DO. This suggests that Lake Trout populations can inhabit locations throughout Springpole Lake during the suboptimal summertime conditions but is more likely contained within the northern basins.

3.6.1.2 Spawning Habitat Assessment

The earlier baseline studies included an extensive acoustic telemetry tracking program that collected data during the spring 2013, 2014 and 2015 Walleye spawning periods (FMG and Portt 2018). These results show most of the tagged Walleye leave Springpole Lake, travel to the Birch River inflow (southwest corner), likely travelling to fast-flowing, riverine spawning habitat commonly preferred by Walleye. Lake Trout were also tagged in 2012 and 2013, with movement patterns showing post-spawning dispersal out of the Springpole Lake north basin travelling upstream toward Cromarty Lake and also downstream in the Birch River (via the Springpole southeast arm outlet). These fish were captured in the northern portion of Springpole Lake, within the proposed area to be temporarily isolated during project development. As such, these data are valuable with respect to migratory patterns of the tagged fish; however, this sampling does not provide lake-wide data for the entire Springpole Lake population. Additional spawning habitat assessments and a desktop screening exercise were conducted during 2021 and these findings are summarized below.

The bathymetric surveys and underwater video reconnaissance conducted within shoal locations of the Springpole Lake southeast arm was completed on 28 September 2021. Fish habitat and spawning habitat surveys in the northern group of basins for Lake Trout, Walleye, Northern Pike and Lake Whitefish were described in the 2018 existing conditions report (FMG and Portt 2018). Additional spawning habitat surveys are planned to be completed in 2022.

Potential Lake Trout spawning habitat was documented at three survey locations within the southeast arm of Springpole Lake. Bathymetric surveys were conducted at four separate island locations (ISL-1, ISL-2, ISL-3, and ISL-4). ISL-1 provides shallow (<4 m total water depth) cobble substrate suitable for Lake Trout spawning habitat on the western side of the island, however there was some silt cover that may discourage spawning. ISL-2 provides similar habitat to ISL-1 with the exception of some cobble substrate in deeper water (>4 m total water depth). ISL-3 is a large area of mixed substrates ranging from silt to large boulders but may provide suitable spawning habitat within the cobble patches (<4 m total water depth) and proximity to the deep regions of the southeast basin (L-15-B5). ISL-4 was dominated by silty substrate which is unlikely to support Lake Trout spawning.

The spawning use assessment findings, substrate type, bathymetry and species-specific spawning requirements for Northern Pike, Lake Trout and Lake Whitefish were used to generate a series of figures to illustrate where spawning has been observed and locations of candidate habitats that meet species-specific needs. The acoustic telemetry data collected for Walleye within Springpole Lake indicates most of the tagged fish travelled upstream to the Birch River in early spring and nighttime spawning surveys in 2015 and 2017 did not observe spawning activity or staging within the north basin. As such, potential Project-related impacts to fish habitat would have a low impact to the resident Walleye spawning activity occurring within the Birch River. A description of the species-specific spawning habitat figures is provided below.

Northern Pike spawning habitat typically includes nearshore and even flooded riparian (terrestrial) areas accessible during the spring freshet (high water) period. As such, suitable candidate Northern Pike spawning habitat within Springpole Lake was inferred using water depths within 0 to 2 m that contain soft substrate and emergent vegetation. Figures A1-1a to A1-1e illustrate the suitable candidate spawning habitat where the above features overlap, as well as green transects where Northern Pike spawning surveys were previously conducted. The areas outlined in yellow, with brown hatch marks and light blue base colour are commonly present throughout Springpole Lake, suggesting Northern Pike have a variety of inferred ideal spawning habitats available. It is also noteworthy that some previous spawning activity was observed in habitat that meets only some of the above screening criteria, further demonstrating abundant nearshore areas with candidate Northern Pike spawning habitat are present in the lake.

Lake Trout typically spawn over hard bottom comprised of cobble / gravel / boulder, with spawning occurring within a wide range of depths with the preferred range of 1 to 18 m. Figures A1-2a to A1-2c show the approximate inferred hard substrate within total water depths between 1 and 18 m (light blue), and also illustrate the Lake Trout spawning survey locations (red and green dots). The yellow outline defines hard substrate areas that were inferred based on bathymetric data which contained a slope greater than 12%. These figures show general agreement with the confirmed Lake Trout spawning survey data and also show abundant suitable areas for spawning throughout Springpole Lake.

Lake Whitefish also typically spawn over hard bottom comprised of gravel, with spawning occurring nearshore within the preferred depth range of 1 to 8 m. Figures A1-3a to A1-3c show the approximate inferred hard substrate within total water depths between 1 and 8 m (light blue) and also illustrate the Lake Whitefish spawning survey locations (red and green dots). The yellow outline defines hard substrate areas that were inferred based on bathymetric data which contained a slope greater than 12%, and the orange dots represent the spawning survey habitat assessment locations visited in 2021. These figures show general agreement with the confirmed Lake Whitefish spawning survey data and show abundant suitable areas for Lake Whitefish spawning throughout Springpole Lake.

3.6.2 Fish Community

Seine nets and overnight baited minnow trap sets along the shoreline were used to collect fish during the spring program (June 2021; Table 3-2 and Appendix A, Tables A1-3 to A1-5). A total of 392 individuals were captured represented by six fish species: Spottail Shiner, Mimic Shiner, Rock Bass [ashigan], Yellow Perch, Blacknose Shiner and sculpin. These species had been previously detected during other baseline studies, with the comprehensive list of fish species for all area watercourses and waterbodies provided in Table 3-2. Springpole Lake contains 24 fish species, 14 of which are categorized as small bodied or forage species.

Seine nets were the most effective capture gear, with Spottail Shiners being the most frequently caught species. Additional data regarding the Springpole Lake fish community and movement patterns of large-bodied species are described in other baseline reports (FMG and Portt 2018; Wood 2021a).

Lake Sturgeon [name] have been documented historically within Birch Lake, the Birch River and Seagrave Lake by Cat Lake First Nation and Ear Falls community members, as well as some tourist operators and a small commercial fishing operation from the 1970s (personal cors, NDMNRF 2021). The *Atlas of Lake Sturgeon Waters in Ontario* (Kerr 2002) that derived Lake Sturgeon distribution data from a variety of sources including the provincial fisheries database of lake and streams surveys and other fisheries assessment projects identifies Birch Lake as one of nine lakes within the Red Lake NDMNRF district that contain Lake Sturgeon. Consequently, Springpole Lake may be utilized by Lake Sturgeon for travel to areas important to their life cycle while remaining undetected during the Springpole Project baseline fish community studies or the three cycles of BsM programs conducted by NDMNRF between 2009 and 2019 (Section 3.7.2.2). Additional studies targeting Lake Sturgeon are proposed in 2022.

3.6.3 Fish Tissue

A total of seven Spottail Shiner composite samples, five Blacknose Shiner composite samples, and five Mimic Shiner composite samples were submitted from Springpole Lake. The composite samples included between 8 and 28 individuals for Spottail Shiner, 14 and 19 Blacknose Shiner and, between 11 and 24 Mimic Shiner per composite sample to meet the minimum sample mass target (Table B1-1). No obvious abnormalities or external parasites were noted for these fish.

Whole body Blacknose Shiner, Mimic Shiner, and Spottail Shiner composite tissue results are displayed in Table B1-4 for the following parameters: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. The analytical results display total metals in mg/kg of wet weight (wwt), except for selenium which is shown in mg/kg of dry weight (dwt).

Total mercury wwt concentrations in Blacknose Shiner ranged from 0.04 to 0.102 mg/kg, with a mean of 0.0584 mg/kg wwt. In Mimic Shiner, they ranged from 0.05 to 0.0933 mg/kg wwt, averaging 0.0725 mg/kg wwt. Spottail Shiner composites had a range of 0.0401 to 0.0873 mg/kg wwt, with an average of 0.0604 mg/kg wwt.

Total selenium averaged 1.758, 2.516 and 1.9543 mg/kg dwt, respectively, for Blacknose Shiner, Mimic Shiner, and Spottail Shiner composites. All selenium concentrations were less than the federal environmental quality guideline (6.7 mg/kg dwt).

Methylmercury ranged from 0.0385 to 0.0641 mg/kg wwt, averaging 0.0459 mg/kg wwt in Blacknose Shiner composites, 0.0463 to 0.0868, averaging 0.0591 mg/kg wwt, for Mimic Shiner composites, and 0.0379 to 0.0903, averaging 0.0556 mg/kg wwt, for Spottail Shiner composites. All the composite samples for all three species had methylmercury concentrations greater than the CCME guideline of 0.033 mg/kg. The Yellow Perch composite samples submitted in 2020 during the fish community surveys showed methylmercury concentrations ranging from 0.061 to 0.109 mg/kg wwt, which is slightly higher than the ranges shown in the forage fish species composites analyzed in 2021 and also greater than the CCME guideline of 0.033 mg/kg wwt (Wood 2021a).

Individual Blacknose Shiner, Mimic Shiner, and Spottail Shiner age results are displayed in Table C1-1 and age at length in Figure C1-4. Strong trends in Spottail Shiner showed that older fish tended to be larger (R^2=0.86); however, the fish assessed to be age zero and 1-year showed a broad range of lengths. The Mimic Shiner age results also showed that older fish tended to be larger (as length) in size (R^2=0.87), with minimal length differences for fish assessed at the same age. Blacknose Shiner did not show as strong of a relationship between age and length (R^2=0.54), mostly due to the broad range of lengths observed for fish assessed to be 1 and 2 years of age.

3.6.4 Water Quality

3.6.4.1 In situ Measurements

In situ water temperatures ranged from 0.8 to 2.1°C (winter), 15.3 to 17.4°C (spring), 18 to 22°C (summer) and 14.37 to 15.47°C (fall; Table A1-1). Summer (July) temperature measurements and the fish community (Section 3.6.2) show the thermal guild classification for Springpole Lake represents cool/coldwater fish habitat (Hasnain et al. 2010). In situ DO measurements ranged from 8.31 to 11.98 mg/L which generally met or was greater than the PWQO and the CWQG guidelines for the protection of coldwater biota including early life stages in most months sampled except July and August. In situ pH measurements ranged from 6.48 to 8.92, which generally met the PWQO and CQWG guidelines for the general protection of aquatic biota. Conductivity measurements ranged from 55.6 to 92.2 µS/cm during the assessment period.

3.6.4.2 Analytical Measurements

Water quality was also assessed by laboratory analysis of water samples collected during the 2021 field program. A total of 11 sampling locations within Springpole Lake including seven stations in the northern basins, and four stations within the southeast arm, were sampled during the winter, spring, summer and fall programs. For additional surface water quality monitoring results and data analysis please refer to the 2021 surface water quality modelling report (Wood 2022).

3.6.4.3 Lake Profiles

Springpole Lake profiles were measured at six deep water stations during the 2021 field programs, shown on Figure 2-1a. The maximum water depth where profile measurements were collected was 36 m in the northern basins and 19.5 m in the southeast arm. Lake profile plots used temperature (°C) and DO (mg/L) measurements against depth collected within the six sampling months (March, June, July, August, September, and October; Figures A3-1 to A3-6). A thermocline was not present in March for any of the sampling sites, which suggests Springpole Lake was already well mixed by this time of the year. During other seasonal measurements, at all sites, both temperature and DO show a declining trend with depth. Thermoclines were below 10 m from June to August at all sampling locations, but in September and October they increased to depths greater than 10 m.

3.6.4.4 Lower Trophic and Primary Productivity

Chlorophyll a

The chlorophyll a results showed minor spatial variation reflective of natural variability associated with phytoplankton communities (Figure A2-1). All values were within the oligotrophic range (i.e., 0.3 to 4.5 µg/L; Wetzel 2001). Chlorophyll a was highest in water samples collected at the surface in July and September at station L-15-B4. Results also showed seasonal variability, with an increase in chlorophyll a concentration observed from July to September in all but two samples (L-15-B3 and L-15-B6).

Phytoplankton

Phytoplankton volume samples were collected from six Springpole Lake deep water stations in June, July and September 2021. Graphical analysis suggests that total phytoplankton biovolume (µm^3) trends are variable amongst the northern basins (L-15-B1 to L-15-B4 and L-15-B6) and the southeast arm basin (L-15-B5), where L-15-B3 showed the largest total biovolume in July (Figure A2-2). June data from station L-15-B2 had the lowest total biovolume recorded for Springpole Lake but was similar to Birch Lake station BIRCH-B1 (Section 3.6.4.4). Station L-15-B2 is located on the east side of Johnson Island, as compared to the other four stations within the northern basins, which could account for the lower phytoplankton biovolume. All stations exhibited seasonal variability from late spring (June) to early fall (September). Typically, phytoplankton are more abundant in colder waters which tend to have more nutrients, but their populations depend on available sunlight, temperature and nutrient levels. Station L-15-B3 had higher seasonal variability for biomass than the other northern basins. Total biomass amongst the stations was highest in July for stations L-15-B1, L-15-B3 and L-15-B4 and highest in September at stations L-15-B2, L-15-B5 and L-15-B6. One sample was collected in October for L-15-B6 due to an issue during analysis for the September sample. Baseline phytoplankton data are important for future analysis of any mine-related nutrient enrichment effects on the waterbody, and on the primary producers. Relative phytoplankton community composition (as density) within Springpole Lake showed similar trends amongst stations and seasonal variability (Figure A2-3). The relative community composition within the northern basins for all locations was dominated by Chrysophyceae (golden algae). The Chrysophyceae are common components of plankton in oligotrophic lakes, and the genus Dinobryon was most commonly identified in all samples. They are found in lakes during higher temperature months when zooplankton populations are elevated.

Zooplankton

Zooplankton samples were collected from six Springpole Lake deep water stations in June, July and September 2021. Total biomass (mg/m^3), total density (#/m^3) and percent relative zooplankton density were analyzed graphically to determine trends (Figures A2-4 to A2-6). Data showed variability between all Springpole stations for biomass and density, meaning that within a sampling month, the six zooplankton samples varied widely (biomass in June ranged from 141 mg/m^3 at station L-15-B1 to 38 mg/m^3 at station L-15-B5). Overall stations L-15-B5 and L-15-B6 showed a lower zooplankton biomass and density compared to L-15-B1 to L-15-B4 but were similar to results of Birch Lake. As well, seasonal variability was noted within stations between June, July and September for both biomass and density. Stations L-15-B1 to L-15-B4 had higher seasonal variability for biomass and density than L-15-B5 and L-15-B6, with station L-15-B3 having the highest variability (128, 1 and 0.67 mg/m^3 in June, July and September, respectively). Total zooplankton biomass and density was highest in June for all stations except at L-15-B6 where July had a higher density. September data from station L-15-B3 had the overall lowest biomass and density. Seven orders of zooplankton were found within Springpole lake, and Cyclopoida and Calanoida constituted nearly all zooplankton biomass. Similarly, relative zooplankton density was co-dominated by Cyclopoida and Calanoida. Baseline zooplankton data are important to monitor to determine the cause of any long-term changes to the fish community from an ecological perspective, independent of future mine-related effects.

3.6.5 Sediment Quality

Sediment samples were collected from six stations within Springpole Lake during the fall field program (Figure 2-1a). Grab samples were collected at depths between 14 and 37 m and the sediment appeared relatively similar between the northern basins and southeast arm basin. Sediment samples mostly consisted of silt (>85%) with some clay (<15%) and trace amounts of gravel and sand (<1%; Table D1-1) for all stations.

Nutrient and total metal parameters met some PSQG and CSQG concentrations with several values greater than the PSQG LEL, as well as concentrations greater than the PSQG SEL and CSQG PEL as noted below:

- TKN exceeded the PSQG SEL guideline at all stations;
- Chromium, copper and nickel exceeded the PSQG LEL guideline at all stations;
- TOC exceeded the PSQG LEL guideline at most sample stations (L-15-B1, B2 and B5), and the PSQG SEL at the remaining stations (L-15-B3, B4 and B6);
- Arsenic exceeded the PSQG LEL guideline at most stations with the exception of L-15-B5, which exceeded the CSQG PEL;
- Cadmium exceeded the PSQG LEL guideline at all stations except for L-15-B6;

- Iron exceeded the PSQG LEL guideline at stations L-15-B1, B3 and B6, while L-15-B2 and L-15-B5 station results showed a combination of PSQG LEL and SEL exceedances;
- Lead exceeded the PSQG LEL guideline at L-15-B1 and some results for L-15-B3, B4 and B5;
- Manganese exceeded the PSQG LEL guideline at L-15-B1, while L-15-B5 results showed a combination of PSQG LEL and SEL exceedances, and L-15-B2 exceeded the PSQG SEL;
- Phosphorus exceeded the PSQG SEL guideline at L-15-B1 and L-15-B2, the PSQG LEL guideline was exceeded at stations L-15-B3, B4 and B6, while station L-15-B5 results had a combination of PSQG LEL and SEL exceedances; and
- Zinc exceeded the PSQG LEL guideline at L-15-B5.

It should be noted that sediments are collected from nutrient and organic rich depositional environments, and that it is common for higher levels of some parameters to exceed guidelines due to natural baseline conditions.

3.6.6 Benthic Invertebrate Community

A total of six BIC samples were collected within Springpole Lake during the fall field program. Samples were collected within total water depths between 14 and 37 m. A summary of the taxonomic identification results are presented in Table D2-1.

Average individuals ranged from 0.40 to 87 and family taxa groups ranged from 0.4 to 5 across the six BIC samples collected from Springpole Lake (L-15-B1 to L-15-B6; Figure D2-1 and D2-2). Station L-15-B1 had the lowest abundance in Springpole Lake, with only one individual from *Uionicolidae* (mites) and one from *Chirnomidae* (Figure D2-3). Station L-15-B2 was dominated by *Pontoporeiidae* (water scud) while stations L-15-B3 to B-6 were dominated by *Chaoboridae* (phantom midges). This difference could be due to habitat differences of B2 located on the other side of Johnson Island. Abundance was significantly different between the sampling locations (p= 0.0001), where locations L-15-B1 and B2, B1 and B5, and B3 and B5 were found to be significantly different. Richness and Chironomid taxa were significantly different across the six locations (p=0.0007 and p=0.006, respectively). Stations L-15-B1 and B2, and B1 and B5 had significantly different taxa richness values, and stations L-15 B1 and B3, and B3 and B4 had significantly different Chironomid taxa (%) values. Individuals from the Tanytarsus genus and EPT taxa were not present in any of the locations within Springpole Lake (Figure D2-4). TID in Springpole Lake ranged from 6 to 1,255 with the lowest TID in L-15-B1 and the highest TID in L-15-B5 (the southeast arm). TID was significantly different between the sampling locations (p=0.0001; Figure D2-5). Similar to abundance, significant differences were found within locations L-15-B1 and B2, B1 and B5, and B3 and B5. Mean evenness was slightly different between the sampling locations, ranging from 0.39 to 0.87 (p=0.03; Figure D2-6). The evenness index value was higher than all samples at station L-15-B3, demonstrating that the proportion of taxa present is more equal than other locations. Mean Simpson's Diversity was similar between all locations (p=0.16; Figure D2-7), and had less diversity than the inland waterbodies, but similar to that of Birch Lake.

3.7 Birch Lake

A total of two locations within Birch Lake (BIRCH stations) were sampled for water quality (samples and in situ profiles), sediment quality and benthic invertebrate community during the 2021 aquatic resources assessment (Figure 2-1a). The 2021 field studies occurred during the following seasonal periods:

- Winter –March 28 to 29, 2021;
- Spring –May 23 to 24, 2021 and June 8 to 15, 2021;
- Summer –July 27 to 30, 2021 and August 28 to September 1, 2021; and
- Fall –September 22 to 24, 2021 and October 18, 2021.

Several sampling events occurred within each season to support the routine surface water quality monitoring program.

3.7.1 Fish Habitat

Birch Lake is characterized as habitat type C, which represents large lake (lentic) environments. The arms of Birch Lake extend east and west of the Springpole northern basins and have numerous islands and embayments compared to Springpole Lake. Due to the greater surface area and fetch of Birch Lake, waves tend to be larger and may provide a greater mixing environment than Springpole Lake. The southeast arm of Springpole Lake receives flow from Birch Lake (via the Birch River outlet from Cromarty Lake), meaning surface water flows from Birch Lake to the lower basin of Springpole Lake (Table A1-1). Nearshore substrate composition is comprised mostly of exposed bedrock and boulders, with some areas near tributary inflows and sheltered embayments consisting of soft fine-grained sediments. The presence of submergent and emergent macrophytes within the surveyed locations are qualitatively less than those observed within the surveyed locations in Springpole Lake. Vegetation in the upland zones include mainly mixed forest dominated by Black Spruce, Jack Pine and Tamarack, while vegetation near to the riparian zone include woody shrub species such as Alder and other herbaceous species.

3.7.2 Fish Community

A total of five fish species were captured from Birch Lake during the June field program, including forage fish Bluntnose Minnow, Brook Stickleback, Blacknose Shiner, Spottail Shiner and Yellow Perch (Table 3-2; Appendix A, Tables A1-3 to A1-5). These species had been previously detected during other baseline studies, with a comprehensive list of fish species for all area watercourses and waterbodies provided in Table 3-2. Birch Lake contains 26 fish species, 15 of which are categorized as small bodied or forage species.

Baited minnow traps were used and collected a total of 102 individuals. Yellow Perch were the most frequently caught fish species, followed by Bluntnose Minnow. Summer (July) water temperature measurements and the fish species records show the thermal guild classification for Birch Lake represents cool / coldwater fish habitat (Hasnain et al. 2010). Additional assessment of Lake Trout habitat suitability and BsM program data are provided below.

3.7.2.1 Lake Trout MVWHDO Assessment

The MVWHDO was calculated for each of the two deep water stations sampled within Birch Lake using August and September 2021 data. The profile data collected at Birch Lake locations BIRCH-B1 (August) and BIRCH-B2 (September) showed the hypolimnion started at 13 m and 18 m, respectively. The optimum habitat volume was calculated at 0% for both locations, and the useable habitat volume was calculated at 1.9% (BIRCH-B1) and 80.2% (BIRCH-B2). Average MVWHDO concentrations for locations BIRCH-B1 and BIRCH-B2 were 3.34 and 1.02 mg/L DO, respectively. This suggests that although Lake Trout populations do inhabit Birch Lake, the sampled deep water basins provide less than optimal habitats.

3.7.2.2 Broadscale Monitoring Program

The NDMNRF conducted BsM using small and large mesh gillnets to assess the fish community of Birch Lake in 2009, 2014 and 2019. For a detailed assessment of catch and community composition refer to NDMNRF (2020a,b,c). Sampling dates occurred from July 16 to 20, 2009, July 10 to 15, 2014, and July 29 to August 2, 2019. The recorded species from all three years of monitoring were: Walleye, Cisco [odoonibiins], Lake Whitefish, White Sucker [nambin], Northern Pike, Burbot [mizay], Lake Trout, Rock Bass, Moxostoma species, Shorthead Redhorse, Yellow Perch, as well as forage fish species including Blacknose Shiner, Bluntnose, Minnow, Emerald Shiner, Iowa Darter, Lake Chub, Logperch, Mottled Sculpin, Mimic Shiner, Johnny Darter, Slimy Sculpin, Spottail Shiner and Trout-perch. In 2009, three species composed the highest proportion of catches: Walleye (55%), Cisco (13%) and Lake Whitefish (8%). In 2014, Walleye represented the highest proportion of fish caught (62%) followed by Burbot (10%) and Lake Whitefish (8%). During the 2019 survey, Walleye were still the most frequently caught species (73%), followed by Northern Pike (9%) and Burbot (5%). The proportion of Walleye caught in these BsM programs have increased from 55 to 73% during the monitoring cycles, while other species such as Lake Whitefish have decreased (8 to <1%).

3.7.3 Fish Tissue

A total of seven Yellow Perch composite samples, and five Bluntnose Minnow composite samples were submitted from Birch Lake. Composite samples included 8 to 11 individuals for both Yellow Perch and Bluntnose Minnow to meet the minimum sample mass target (Table B1-1). No obvious abnormalities or external parasites were noted for these fish.

Whole body Bluntnose Minnow and Yellow Perch composite tissue results are displayed in Table B1-3 for the following parameters: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium and zinc. Total mercury wwt concentrations in Bluntnose Minnow ranged from 0.0216 to 0.0298 mg/kg wwt, with a mean of 0.0267 mg/kg wwt. In Yellow Perch they ranged from 0.029 to 0.0447 mg/kg wwt, averaging 0.0365 mg/kg wwt.

Total selenium averaged 1.4833 and 1.4086 mg/kg dwt for the Bluntnose Minnow and Yellow Perch composites, respectively. All selenium concentrations were less than the federal environmental quality guideline (6.7 mg/kg dwt).

Methylmercury ranged from 0.024 to 0.0289 mg/kg wwt, averaging 0.0266 mg/kg wwt for Bluntnose Minnow composites, and 0.0236 to 0.0333 mg/kg wwt, averaging 0.0291 mg/kg wwt for Yellow Perch composites. All the composite samples for Bluntnose Minnow had methylmercury concentrations less than the CCME guideline of 0.033 mg/kg. All but one Yellow Perch composite (0.333 mg/kg wwt) also had concentrations less than the CCME guideline.

Individual Bluntnose Minnow and Yellow Perch age results are displayed in Table C1-1 and age at length in Figure C1-5. Both Bluntnose Minnow and Yellow Perch showed length increased with increasing age but was not a strong trend (R^2=0.48 and 0.61, respectively). The variation observed in fish total length at age 1 and 2 year fish for both species contributed to the low trend values (R^2 that explains the proportion of variance within these data).

3.7.4 Water Quality

3.7.4.1 In situ Measurements

The seasonal water temperatures ranged from 1.8 to 2.4°C (winter), 9.6 to 21.3°C (spring), 17.8 to 21.5°C (summer) and 12.1 to 15.3°C (fall) (Table A1-1). In situ DO measurements ranged from 8.60 to 12.79 mg/L which generally met or were greater than the PWQO and the CWQG guidelines for the protection of coldwater deep water including early life stages in most months sampled except July and August.

In-field pH measurements ranged from 6.43 to 8.34 that generally met the PWQO and CWQG guideline values during all sampling events except for SW-03 in the spring. Conductivity measurements ranged from 57 to 157 µS/cm during the assessment period (Table A1-1).

3.7.4.2 Laboratory Measurements

Water quality was also assessed by laboratory analysis of water samples collected during the 2021 field program. A total of nine sampling locations within Birch Lake were sampled during the winter, spring, summer and fall programs. For additional surface water quality monitoring results and data analysis please refer to the 2021 surface water quality modelling report (Wood 2022).

3.7.4.3 Lake Profiles

Birch Lake profiles were measured at two deep water stations during the 2021 field programs, sampling locations of the profiles are shown on Figure 2-2. Maximum water depth was 25 m in the west basin (BIRCH-B2) and 37 m in the east basin (BIRCH-B1). Lake profile plots used temperature (°C) and DO (mg/L) measurements against depth that were collected within the six sampling months (March, June, July, August, September and October; Figures A3-7 and A3-8). A thermocline was not present in March for either of the sampling sites, in September (east basin only) and October (west basin only), which suggests the Birch Lake deep water stations were well mixed during those months without a thermocline. The other seasonal measurements, at all sites, show a declining trend with depth for temperature and DO. Thermoclines were below 10 m in June and July at both sampling locations, but from August to October, if present, the thermocline was observed deeper than 10 m.

3.7.4.4 Lower Trophic and Primary Productivity

Chlorophyll a

The chlorophyll *a* results showed minor spatial variation reflective of natural variability associated with phytoplankton communities (Figure A2-1). All values were within the oligotrophic range (i.e., 0.3 to 4.5 µg/L; Wetzel 2001). Chlorophyll *a* was highest in water samples collected at the surface in July at station BIRCH-B1 and was lowest in samples collected in September also at BIRCH-B1. Results showed seasonal variability, with a decrease in chlorophyll *a* concentration observed from July to September in BIRCH-B1, and an increase in BIRCH-B1. Values in Birch Lake were similar to those in Springpole Lake.

Phytoplankton

Phytoplankton samples were collected from two Birch Lake deep water stations in June, July and September 2021. Graphical analysis suggests that total phytoplankton biovolume (µm^3) trends are variable between the east basin (BIRCH-B1) and the west basin (BIRCH-B2), where BIRCH-B2 showed a greater total biovolume than BIRCH-B1 in all sampling months (Figure A2-2). Biovolume of BIRCH-B2 was similar to that of Springpole Lake site L-15-B2 (July and September) and L-15-B3 (June). Spatially BIRCH-B2 is closer to the shoreline of a large set of islands, which could contribute to higher nutrient loading and account for the increased phytoplankton biovolume. Both stations exhibited seasonal variability from late spring (June) to early fall (September). Station BIRCH-B1 had higher seasonal variability for biomass than BIRCH-B2, and total biomass amongst the two stations was highest in July and lowest in June.

Relative phytoplankton community composition (as density) was similar between the two Birch Lake sites, and similar to Springpole Lake (Figure A2-3). The relative community composition was dominated by Chrysophyceae (golden algae) for both sites, with Bacillariophyceae also being abundant in BIRCH-B1 in July. Birch Lake, similar to Springpole Lake, is a nutrient-poor (i.e., oligotrophic) lake. Aquatic organisms in the lake, including invertebrates, fish, and algae live with limited nutrient availability, and tend to show lower abundances compared to more productive lakes. It was expected that based on the trophic status of these lakes and the nutrient levels, phytoplankton biovolumes would be low.

Zooplankton

Zooplankton samples were collected from two Birch Lake deep water stations in June, July and September 2021. Total biomass (mg/m^3), total density (#/m^3) and percent relative zooplankton density were plotted to determine trends (Figures A2-4 to A2-6). Data show variability between Birch stations for biomass and density, meaning that within a sampling month, the two zooplankton samples varied (biomass in June was twice as high in BIRCH-B1 than BIRCH-B2). As well, seasonal variability was noted within stations between June, July, and September for both biomass and density. Station BIRCH-B1 had higher seasonal variability for biomass and density than BIRCH-B2. Total zooplankton biomass and density was highest in June for all stations except at BIRCH-B1 where July had a higher biomass (110 mg/m^3). July data from station BIRCH-B2 had the overall lowest biomass and density (23 mg/m^3 and 12,661 #/m^3). Similar to Springpole Lake, seven orders of zooplankton were found within Birch Lake, where Calanoida constituted nearly all zooplankton biomass, followed by Cyclopoida. Relative zooplankton density was dominated by Cyclopoida and Calanoida.

Similar studies in Northern oligotrophic lakes show zooplankton total biomass and taxa richness results that closely resembled those of Springpole and Birch Lakes. Snap Lake located in the Northwest Territories showed a mean zooplankton biomass of 79 mg/m^3 and three lakes within the Diavik Diamond Mines project area (also in the Northwest Territories) had a biomass range of 13 to 152 mg/m^3 (De Beers 2021; Golder 2015). Seasonal variability of total zooplankton abundance also followed the same trends, which peaked in the summer at the majority of lake stations. The 2021 Birch Lake results are the first year of baseline data and further monitoring is planned for long term monitoring and annual comparisons.

3.7.5 Sediment Quality

Sediment samples were collected from locations within Birch Lake during the fall field program. Grab samples were collected at depths between 24 and 35 m and the sediment appeared relatively similar between the stations. Samples consisted mostly of silt (>83%) with some clay (<17%) and trace amounts of gravel and sand (<1%; Table D1-1).

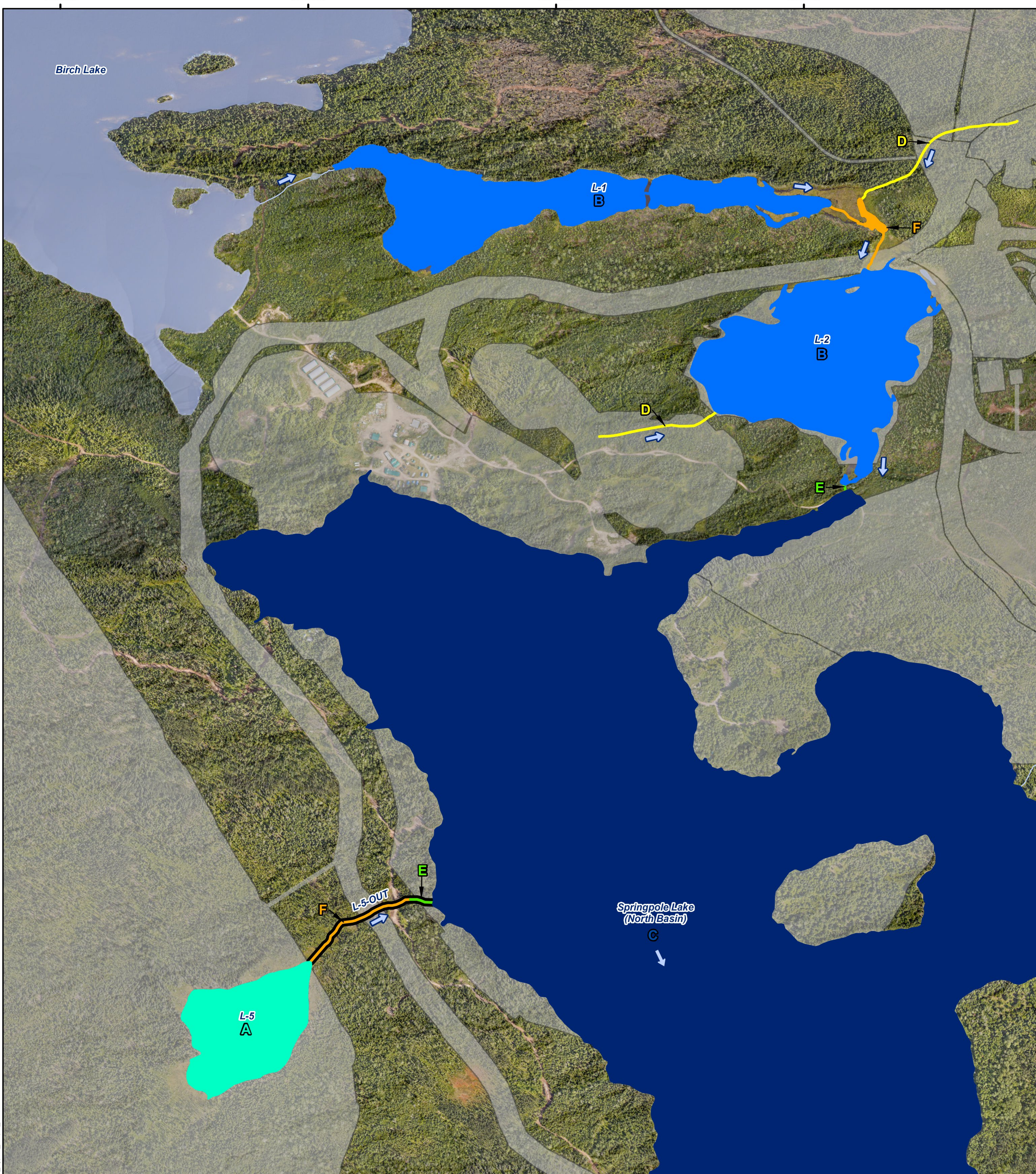
Nutrient and total metal parameters met some PSQG and CSQG concentrations with several values greater than the PSQG LEL, as well as concentrations greater than the PSQG SEL as noted below:

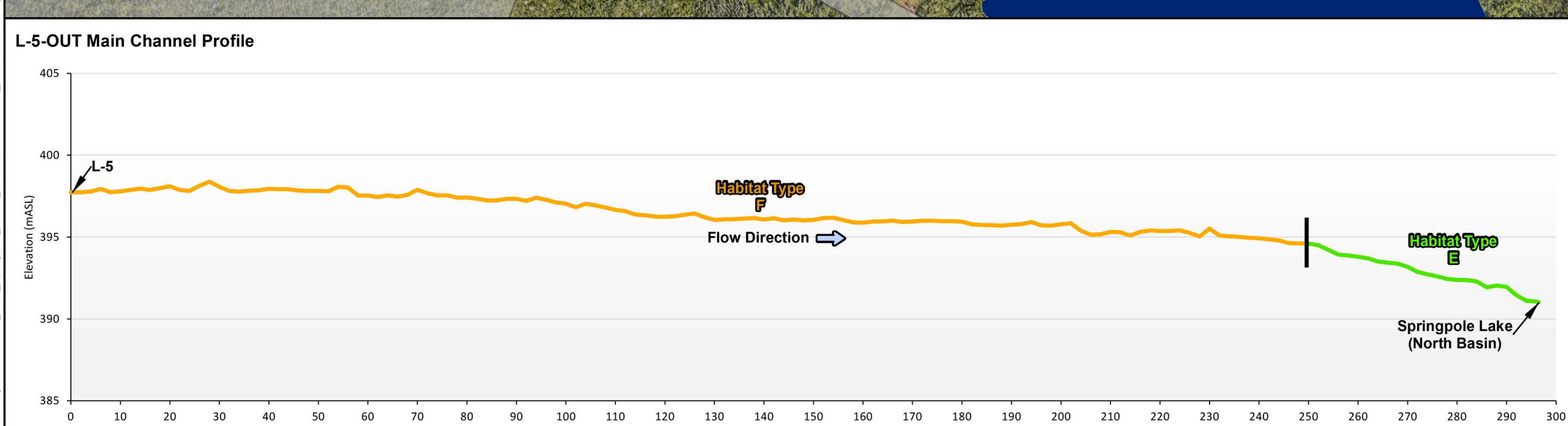
- TOC, chromium, copper and nickel exceeded the PSQG LEL at both stations;
- TKN exceeded the PSQG SEL guideline at both stations;
- Cadmium, iron and lead exceeded the PSQG LEL guideline at most replicate locations;
- Arsenic exceeded the CSQG PEL guideline at BIRCH-B1 and the PSQG LEL guideline at BIRCH-B2; and
- Phosphorus exceeded the PSQG SEL guideline at BIRCH-B1 and the PSQG LEL guideline at BIRCH-B2;

3.7.6 Benthic Invertebrate Community

A total of two BIC samples were collected within Springpole Lake during the fall field program. Samples were collected within total water depths between 24 and 35 m. A summary of the taxonomic identification results are presented in Table D2-1.

An average of 38 and 75 individuals from 6 and 5 family taxa groups were identified in Birch Lake samples (BIRCH-B1 and BIRCH-B2 respectively), with *Naddidae* (worms) being the most abundant taxa in BIRCH-B1 and *Chironomidae* and *Chaoboridae* co-dominating BIRCH-B2 (Figures D2-1 to D2-3). Abundance was not significantly different between the two sampling locations (p=0.07), but richness and Chironomid taxa were significantly different (p=0.04 and p=0.0002, respectively). Individuals from the Tanytarsus genus and EPT taxa were not present in either location of Birch Lake (Figure D2-4). TID in Birch Lake ranged from 391 to 1,957 and the mean was 557 and 1,084 in BIRCH-B1 and BIRCH-B2, respectively and was not significantly different between the two sampling locations (p=0.07; Figure D2-5). Mean evenness was significantly different between the two sampling locations (0.43 at BIRCH-B1 and 0.59 at BIRCH-B2, p=0.007; Figure D2-6). The evenness index value was higher than the inland waterbodies, demonstrating that the proportion of taxa present is relatively equal. Mean Simpson's Diversity was not similar between both locations (0.58 and 0.64, p=0.04; Figure D2-7), and had less diversity than the inland waterbodies.





LEGEND

Habitat Types

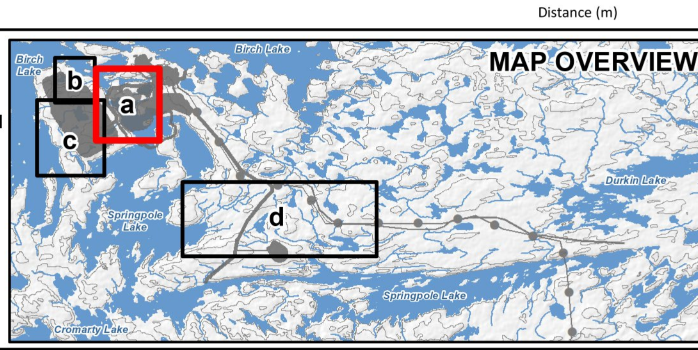
- A
- B
- C
- D
- E
- F
- G
- H
- Unclassified

Main Channel Shown in Profile

Proposed Mine Feature

Flow Direction

0 50 100 200 300 400 500 Metres



NOTES:
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

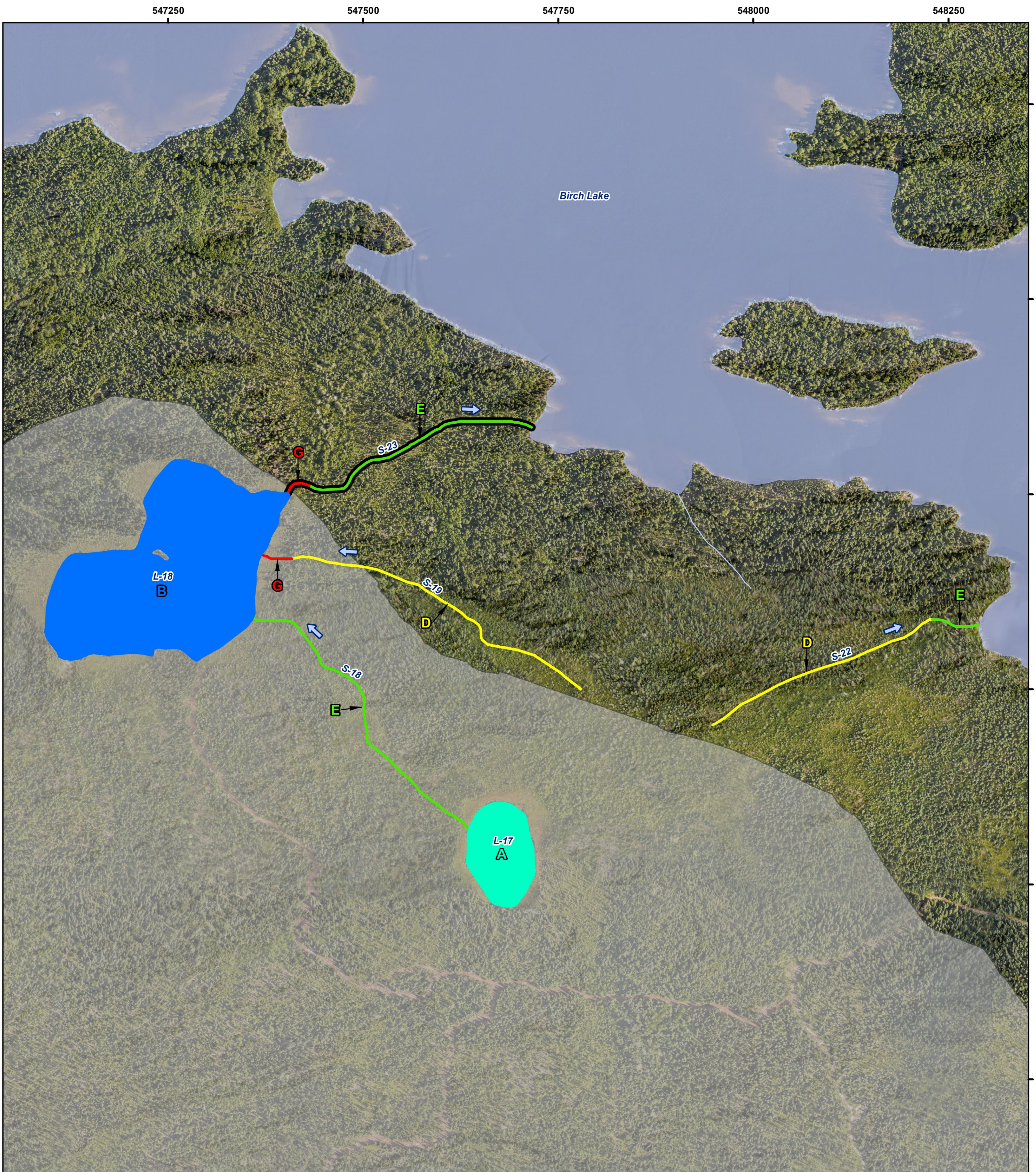
Datum: NAD83
Projection: UTM Zone 15N

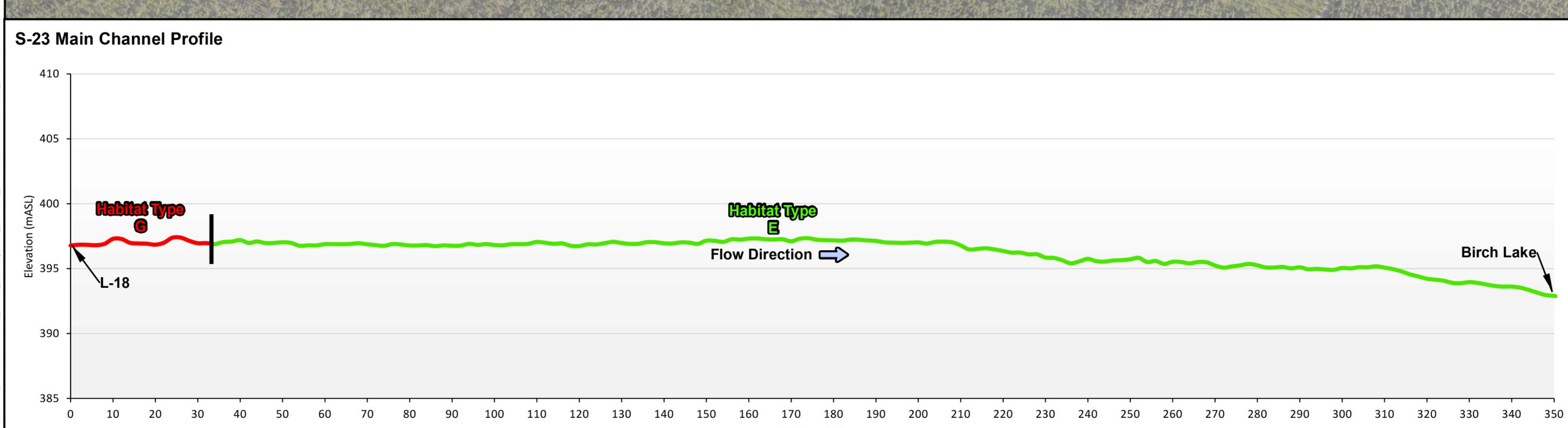
FIRST MINING GOLD | wood.

SPRINGPOLE GOLD PROJECT

Habitat Types and Channel Profile

PROJECT N°: ONS2104	FIGURE: 3-1a
SCALE: 1:8,000	DATE: April 2022





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LEGEND

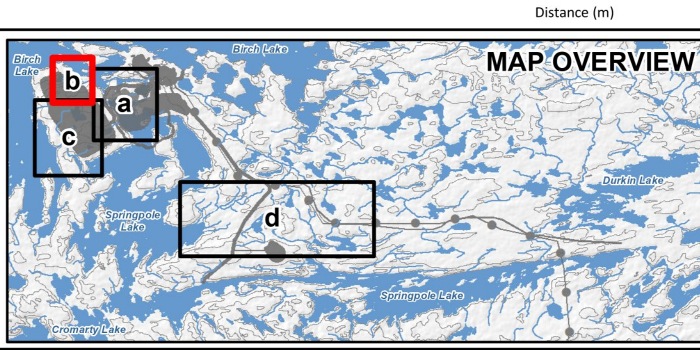
Habitat Types

- A
- B
- C
- D
- E
- F
- G
- H
- Unclassified

Main Channel Shown in Profile

Proposed Mine Feature

Flow Direction



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- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

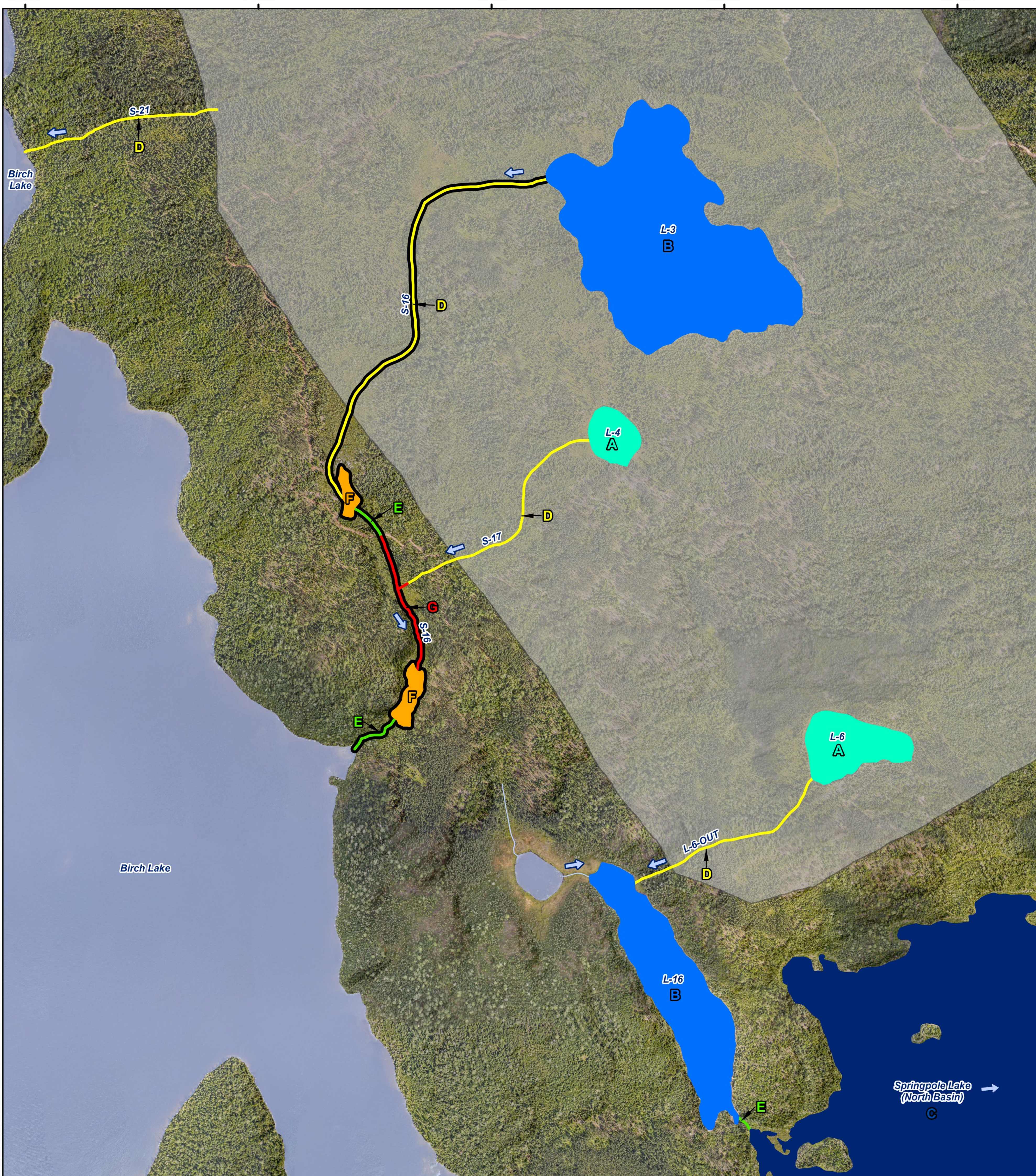
0 50 100 200 300 400 500 Metres

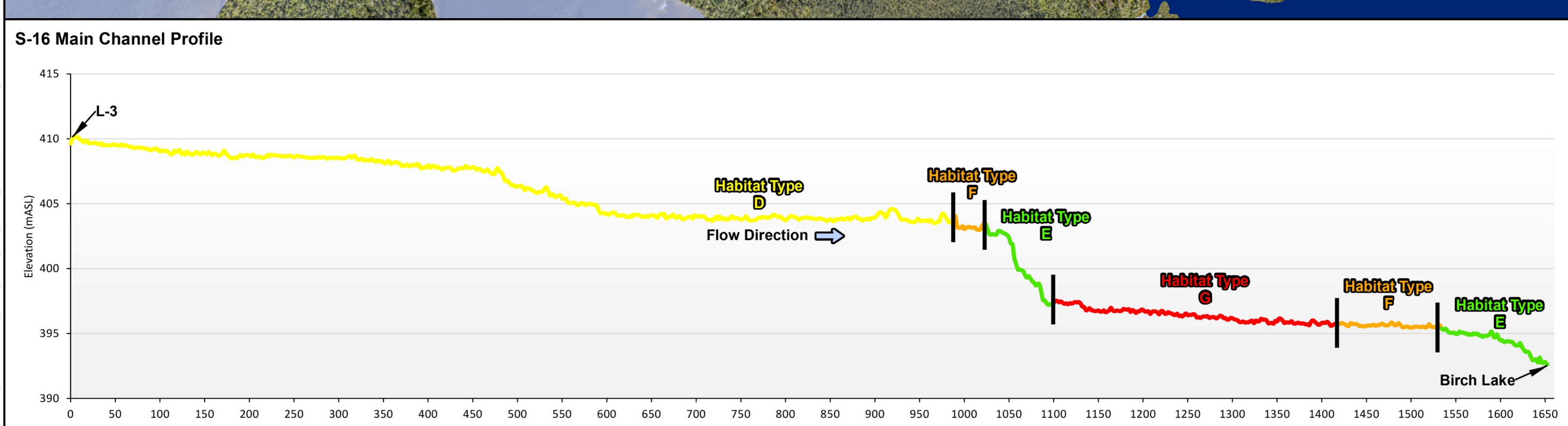
FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Habitat Types and Channel Profile

PROJECT N°: ONS2104	FIGURE: 3-1b
SCALE: 1:5,000	DATE: April 2022





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LEGEND

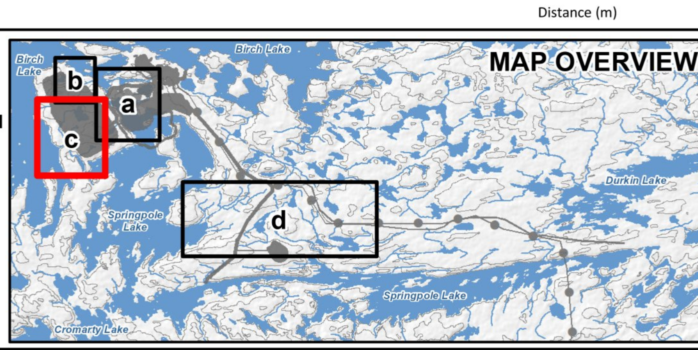
Habitat Types

- A
- B
- C
- D
- E
- F
- G
- H
- Unclassified

Main Channel Shown in Profile

Proposed Mine Feature

Flow Direction



NOTES:
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

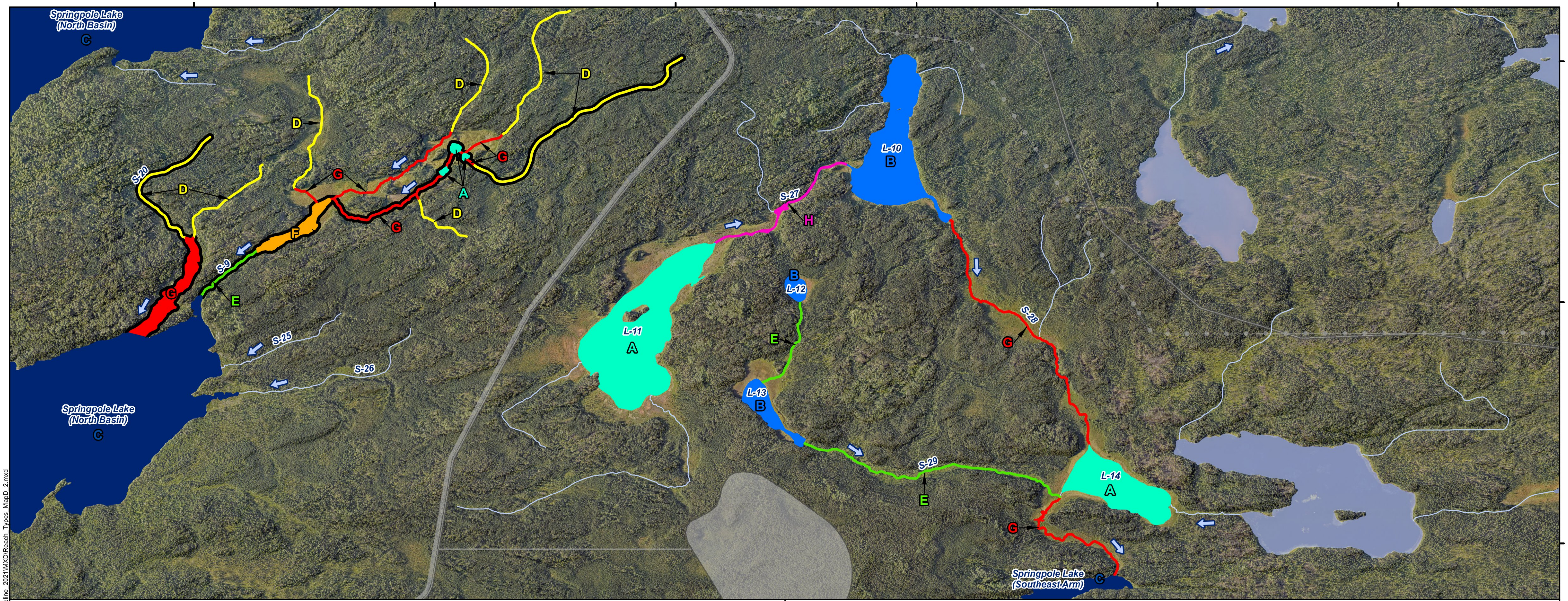
0 50 100 200 300 400 500 Metres

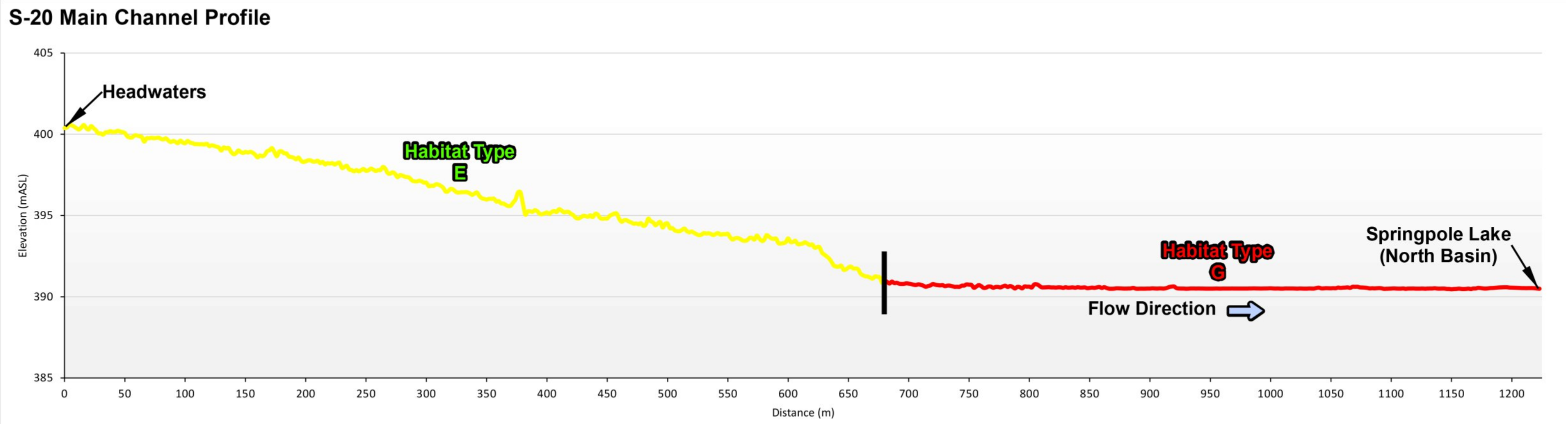
FIRST MINING GOLD wood.

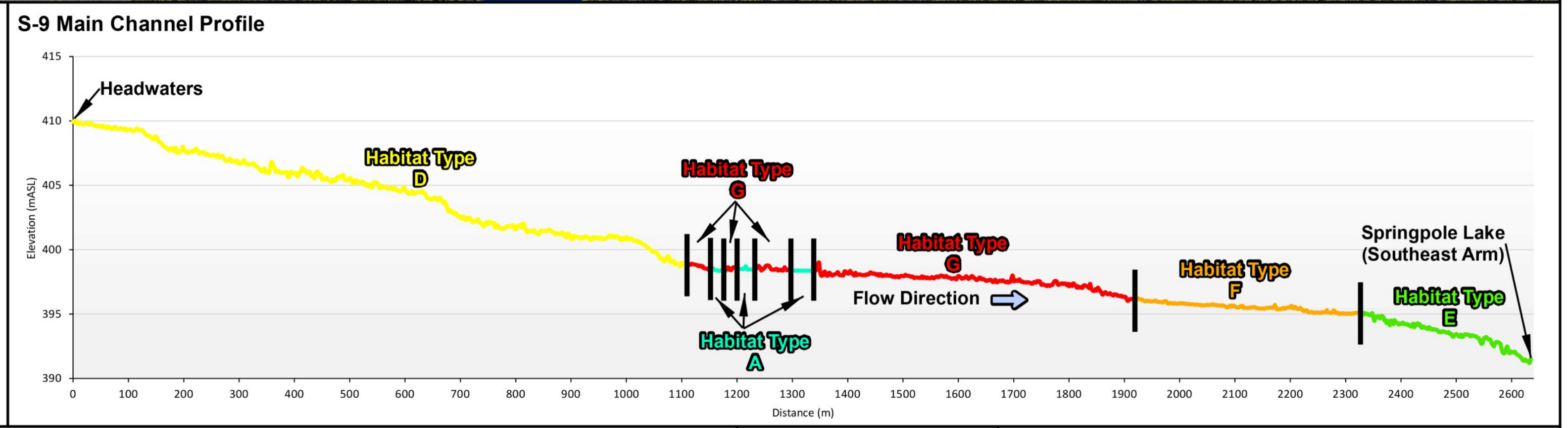
SPRINGPOLE GOLD PROJECT

Habitat Types and Channel Profile

PROJECT N°: ONS2104	FIGURE: 3-1c
SCALE: 1:8,500	DATE: April 2022



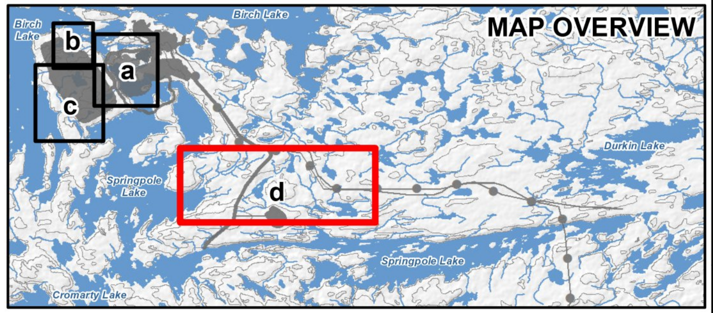




LEGEND

Habitat Types
- A
- B
- C
- D
- E
- F
- G
- H
- Unclassified
- Main Channel Shown in Profile
- Proposed Mine Feature
- Flow Direction

0 250 500 1,000 1,500 2,000 Metres



NOTES:
- Aerial imagery provided by First Mining Gold, August 2020.
- Proposed site plan provided by Ausenco, drawing number 105877-0000-G-001, Rev C. 29 July 2021.
- Co-Disposal Facility provided by Knight Piésold Ltd., 27 September 2021.

Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Habitat Types and Channel Profile

PROJECT N°: ONS2104	FIGURE: 3-1d
SCALE: 1:15,500	DATE: April 2022

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Table 3-1: Key Habitat Type Criteria

Habitat Type Classification		Lake / Pond			Riverine					
		Type A	Type B	Type C	Type D	Type E	Type F	Type G	Type H	Type I
General Habitat Attributes		• Shallow inland lake / pond habitat • Shoreline varies between extensive floating mats of herbaceous species and localized sections with boulder, cobble and/or sand	• Deep inland lake habitat • Shoreline varies between extensive floating mats of herbaceous species and localized sections with boulder, cobble and/or sand	• Large lake habitat • Shoreline mostly bedrock / boulder substrate, with some and shallow nearshore soft sediments commonly at tributary inflows	• Low lying area with diffuse pockets of standing water • Sections of complete loss of channel, can transition into muskeg drainage, overland drainage flow path or underground flow	• No floodplain with dense shrub riparian vegetation • Bedrock, boulder and cobble substrate with coarse wood debris	• Moderate beaver activity creating alternating series of pools / impoundments • Side overflow channels created during high flow and stream stage events • Abundant coarse wood debris	• Broad floodplain with extensive floating mats of herbaceous species typical of muskeg and beaver ponds / impoundments • Primarily flat morphology with occasional pools in the thalweg of meander bends and back bays of the channel	• Moderate to broad floodplain • Primarily flat morphology with occasional pools • Commonly occurring as main connecting channels between inland waterbodies	• Birch River habitat • No floodplain • Steep banks with fast flowing riffle and rapids habitat • Coarse grained substrate across channel including boulder and cobble, as well as exposed bedrock
Permanence		Permanent	Permanent	Permanent	Ephemeral	Intermittent	Permanent	Permanent	Permanent	Permanent
Characteristic Morphology Features	Bankfull Width (m)	N/A	N/A	N/A	N/A	0.50 to 4.0 m	1.0 to 10 m	>5 m	>5 m	>10 m
	Bankfull Depth (m)	Total depth <4 m	Total depth ≥4 m	Total depth ≥4 m	N/A	0.60 to 1.5 m	0.40 to 2 m	>1 m	>1 m	>0.50 m
	Channel Morphology	Pool: 100%	N/A	N/A	N/A	Slow Riffle: 5% Glide: 95%	Flat: 96% Pool: 4%	Flat: 98% Pool: 2%	Flat: 98% Pool: 2%	Fast Riffle: 80% Slow Riffle: 15% Glide: 5%
Substrate Composition (approximate %)		Boulder: 2% Cobble: 2% Fines: 96%	Boulder: 5% Cobble: 5% Fines: 90%	Bedrock: 60% Boulder: 20% Fines: 20%	Bedrock: 20% Boulder: 20% Fines: 60%	Bedrock: 20% Boulder: 60% Fines: 10%	Bedrock: 5% Boulder: 15% Fines: 80%	Bedrock: 5% Boulder: 15% Fines: 80%	Bedrock: 5% Boulder: 5% Fines: 90%	Cobble: 15% Bedrock: 45% Boulder: 40%
Instream Cover (approximate %)		Macrophytes: 80% Rock: 5% Wood: 15%	Macrophytes: 80% Rock: 10% Wood: 10%	Macrophytes: 15% Rock: 75% Wood: 10%	Rock: 60% Wood: 40%	Bank: 15% Macrophytes: 5% Rock: 40% Wood: 40%	Bank: 5% Macrophytes: 50% Rock: 10% Wood: 25%	Bank: 5% Macrophytes: 40% Rock: 10% Wood: 45%	Bank: 15% Macrophytes: 40% Rock: 10% Wood: 35%	Rock: 80% Wood: 20%
Dominant Riparian Types (approximate %)		Macrophytes: 10% Grasses and Sedges: 45% Shrubs: 35% Trees: 10%	Macrophytes: 10% Grasses and Sedges: 45% Shrubs: 35% Trees: 10%	Grasses and Sedges: 10% Shrubs: 65% Trees: 25%	Grasses and Sedges: 10% Shrubs: 60% Trees: 30%	Macrophytes: 5% Grasses and Sedges: 10% Shrubs: 40% Trees: 45%	Macrophytes: 15% Grasses and Sedges: 70% Shrubs: 10% Trees: 5%	Macrophytes: 10% Grasses and Sedges: 80% Shrubs: 5% Trees: 5%	Macrophytes: 10% Grasses and Sedges: 80% Shrubs: 5% Trees: 5%	Grasses and Sedges: 30% Shrubs: 60% Trees: 10%
Representative baseline Habitat Sampling Locations (pre-2019)		L-4, L-5, L-6, L-11, L-14, S-9 pond habitat	L-1, L-2, L-3, L-10, L-12, L-13, L-16	Birch Lake, Seagrave Lake, Springpole Lake (L-15)	S-14, S-16 (upstream reach), S-17, S-25	S-9 (upper reaches), stream between L-12 and L-13, S-16 (midstream and downstream reach), S-26 (upstream reach), S-29	S-16 (midstream reach)	S-16 (midstream reach), S-26 (downstream reach), S-28, (downstream reach)	S-27	None
Representative 2019-2020 Habitat Sampling Locations		S-9 pond habitat	None	Springpole Lake (L-15)	UNX01, UNX03, L-4-OUT, L-6-OUT, S-9 (upstream reaches), S-19, S-20 (upstream reaches), S-21, S-22 (upstream reaches)	L-5-OUT (downstream reach), S-9 (upstream reach), S-18, S-21 (downstream reach), S-22 (downstream reach)	Connecting stream between L-1 and L-2, L-5-OUT (upstream reach)	S-20 (downstream reach), S-19 (upstream reach), S-21 (downstream reach)	UNX07	Birch River (BR-KM22)
Representative 2021 Habitat Sampling Locations		L-17, L-18, L-19, L-20	None	Birch Lake, Springpole Lake (L-15)	None	None	None	None	None	None

Notes:

1 Habitat type classification based on baseline existing conditions surveyed by others (FMG and Portt 2018), results of the 2019 to 2021 field surveys conducted by Wood, as well as inferred habitat delineations using aerial photo interpretation that are subject to confirmation or change with additional field survey data if collected.

2 N/A – not applicable; calculation or measurement unable to be assessed.

Table 3-2: Fish Species Present in Local Waterbodies

Waterbody / Watercourse	Richness	Blacknose Shiner	Bluntnose minnow	Brook Stickleback	Burbot	Cisco sp.	Common Shiner	Emerald Shiner	Fathead Minnow	Finescale Dace	Golden Shiner	Iowa Darter	Johnny Darter	Lake Chub	Lake Sturgeon	Lake Trout	Lake Whitefish	Logperch	Longnose Dace	Mimic Shiner	Mottled Sculpin	Moxostoma sp.	Northern Pearl Dace	Northern Pike	Northern Redbelly Dace	Rock Bass	River Darter	Shorthead Redhorse	Slimy Sculpin	Spoonhead Sculpin	Spottail Shiner	Trout Perch	Walleye	White Sucker	Yellow Perch
Birch Lake	26	X	X	X	X	X	X	X				X	X	X	H	X	X	X		X	X	X		X		X		X	X	X	X	X	X	X	X
Springpole Lake (L-15)	24	X	X	X	X	X	X	X	X			X	X		H	X	X	X		X	X			X		X	X	X			X	X	X	X	X
Seagrave Lake	22	Xi	Xi	Xi	X	X	Xi	Xi				Xi	Xi		H	X	X	Xi		Xi	Xi			X		Xi		Xi			Xi	Xi	X	X	X
Birch River	9											X			H	Xi			X					X		X						X	Xi	Xi	X
Lake L-1	3																							X										X	X
Lake L-2	10	X						X			X												X	X				X			X	X		X	X
Lake L-3	3			X						X															X										
Lake L-4	0																																		
Lake L-5	6			X					X	X		X											X		X										
Lake L-6	0																																		
Lake L-6-OUT	0																																		
Lake L-10	2																							X											X
Lake L-11	4			X								X												X											X
Lake L-12	2			X								X																							
Lake L-13	2			X								X																							
Lake L-14	2																							X											X
Lake L-16	2																							X											X
Lake L-17	1									X																									
Lake L-18	3			X						X															X										
Lake S-19	3			X					X																X										
Stream S-7	2			X																															X
Stream S-9	13	X		X					X	X								X	X		X		X	X	X								X	X	X
Stream S-16/17	4			X								X																					X	X	
Stream S-20	1									X																									
Stream S-25	0																																		
Stream S-26	2									X																								X	
Stream S-27	2	X																																	X
Stream S-28	1																		X																
Stream S-29	1																		X																

Notes:
Fish species presence include those caught during the baseline studies and NDMNRF Broadscale Monitoring studies within Birch Lake.
Species presence includes baseline survey results from 2009 to 2021.
(H) Historic records of Lake Sturgeon presence within watershed exist (MNRF pers. Comm.) and remnant depleted population may still exist.
(Xi) Species inferred based on adjacent waterbodies and habitat type.
Waterbody/Watercourse locations are shown on Figures 3-1a to 3-1d.

4.0 SUMMARY OF FINDINGS

This report documents the existing conditions measured during the 2021 spring, summer and fall field investigations within the sampled inland waterbodies, Springpole Lake and Birch Lake. The following subsections provide the key findings by study area.

4.1 Inland Waterbodies

- Inland waterbodies were typically shallow (less than 4 m deep) lentic systems surrounded by grassy and sedge floodplains with a coniferous upland best represented by habitat type A. Lake 19 (L-19) contained a greater abundance of submergent and emergent vegetation than Lakes 17 (L-17) and 18 (L-18), but all contained macrophyte growth in nearshore areas.
- Most inland lakes were dominated by Finescale Dace and Northern Redbelly Dace with the exception of Lake 19 (L-19) which was dominated by Fathead Minnow. In all cases, minnow trapping was the most effective method of capture and the comprehensive fish species list is provided in Table 3-2.
- Lake 20 (L-20) was not accessible during the 2021 study period due to overland barriers, but is expected to have similar characteristics as other nearby inland waterbodies such as L-19.
- In-field water quality measurements show the physiochemical parameters were generally within PWQO and CWQG protection of aquatic life criteria but not for early life stages for coldwater species.
- Composite samples of Brook Stickleback, Fathead Minnow, Finescale Dace and Northern Redbelly Dace from L-17, L-18 and L-19 were submitted for laboratory analysis. Maximum composite total mercury and methylmercury concentrations were 0.095 and 0.121 mg/kg wwt, respectively for Finescale Dace at L-17. The federal consumption guideline for wildlife consumers of fish (0.033 mg/kg wwt) was exceeded by 13 of 15 composite samples collected in these waterbodies.
- Some sediment quality parameters exceeded PSQG and CSQG including TKN and TOC at L-18 and L-19, as well as total copper at L-18.
- An average of 445, 179 and 389 individuals from 15, 13 and 11 taxa groups were identified in L-17, L-18 and L-19 samples, respectively. *Chironomidae* was the most abundant taxa in all three waterbodies. Mean Simpson's Diversity was the highest at L-17 out of all locations sampled. These values indicate that the benthic community, although diverse, is dominated by a few species.

4.2 Springpole Lake

- Springpole Lake (L-15) is characterized as habitat type C, which represents large lake (lentic) environments. Springpole Lake has two distinct basins, most of the lake is represented by a series of northern basins that are connected to a narrow 18 km southeast arm (Figure 2-1a).
- Catch from seine nets and minnow traps resulted in six fish species being captured during the 2021 program in Springpole Lake. Seine nets were the most successful capture method; however, additional fish community data are contained within other study reports (FMG and Portt 2018; Wood 2021a) and the comprehensive fish species list is provided in Table 3-2.
- Composite samples of Blacknose Shiner, Mimic Shiner, and Spottail Shiner were submitted for laboratory analysis. Maximum total mercury concentrations were 0.0584, 0.0725 and 0.0873 mg/kg wwt for Blacknose Shiner, Mimic Shiner and Spottail Shiner, respectively. All of which exceeded the federal wildlife consumer guidelines.
- Lake profile data, specifically water temperature and oxygen concentrations indicate the northern basins of Springpole Lake provide optimal and useable habitat as defined by the NDMNRF assessment criteria. Lake Trout also occupy habitat with warmer water and less DO than the specified criteria; however, this method provides a general tool for resources managers to use

consistently across Ontario Lake Trout lakes. The most optimal habitat was located within the northern basins (L-15-B1 and L-15-B6), with the southeast arm showing useable habitat volume up to 96.9%. Similar trends were shown for MVWHDO, where concentrations in the north basin were up to 6.71 mg/L DO but only 0.84 mg/L DO in the southeast arm. This suggests higher quality Lake Trout habitat within Springpole Lake is mostly contained within the northern basins.

- Lake Trout potential spawning habitat was assessed in the southeastern arm of Springpole Lake near the four island locations using underwater photography and bathymetric surveys. Three of these locations contained habitat features suitable to support Lake Trout spawning, although the DO and temperature data suggest some potential limitations for use during the summer months.
- In-field water quality measurements show the physiochemical parameters were generally within PWQO and CWQG protection of aquatic life criteria for cool and coldwater species.
- Maximum depth of the profile locations was 36 m in the northern basins and 19.5 m in the southeast arm. Lake profiles showed that there was no thermocline present in March for any of the sampling sites. The thermocline was below 10 m from June to August at all sampling locations, and in September and October they increased to depths deeper than 10 m.
- L-15-B3 showed the largest total phytoplankton biovolume and L-15-B2 had the smallest. Northern basins locations were dominated by Bacillariophyceae and Cyanophyceae, but in L-15-B3 Cryptophyceae was greater.
- Total zooplankton biomass and density was highest in June for all stations except at L-15-B6 where July had a higher density. Cyclopoida and Calanoida constituted nearly all zooplankton biomass and density.
- Sediment quality laboratory results were relatively similar between the northern basins and southeast arm of Springpole Lake. Notably, PSQG and CSQG guidelines were met for many parameters, with the exception of arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and total phosphorus, which exceeded the PSQG LEL guidelines at most locations.
- Average individuals ranged from 40 to 87 and family taxa groups ranged from 0.4 to 5 across the six BIC samples collected from Springpole Lake. Station L-15-B2 was dominated by *Pontoporeiidae* while stations L-15-B3 to B-6 were dominated by *Chaoboridae*. Average abundance, richness, % Chironomid taxa, TID and evenness were significantly different between the sampling locations, and mean Simpson's Diversity was similar between all locations. Tanytarsus genus and EPT taxa were not present in any of the locations within Springpole Lake.

4.3 Birch Lake

- Birch Lake is a large lake characterized as habitat type C, which represents deep lake (lentic) environments. Birch lake extends east and west of the Springpole Lake northern basins and is connected to Springpole Lake via the Birch River.
- Nearshore substrate composition is comprised mostly of exposed bedrock and boulders, with some areas near tributary inflows and sheltered embayments consisting of soft, fine-grained sediments. Fewer submergent and emergent macrophytes were observed within the surveyed areas of Birch Lake, compared to macrophyte density observed within Springpole Lake.
- A total of five fish species were captured in Birch Lake during the June field program using minnow traps; however, the BsM program has detected a total of 23 fish species (NDMNRF 2020a,b,c) with the comprehensive fish species list provided in Table 3-2.
- Lake Trout optimal and useable habitat was calculated in Birch Lake and found zero percent optimal habitat at both locations; however, BIRCH-B2 showed 80.2% useable habitat. This may help explain the unlikelihood of Lake Trout use that is further supported by the general lack of Lake Trout in the BsM catch record.

- Composite samples of Yellow Perch and Bluntnose Minnow were submitted for laboratory analysis. Maximum total mercury concentrations were 0.0267 and 0.0365 mg/kg wwt for Bluntnose Minnow and Yellow Perch respectively. These results show some exceedance of the federal wildlife consumers of fish consumption criteria.
- In-field water quality measurements show that physiochemical parameters were generally within the PWQO and CWQG protection of aquatic life criteria.
- Maximum depth was 25 m in the west basin and 37 m in the east basin. Lake profiles showed no thermocline was present in March for any sampling location, and that both temperature and DO show a declining trend with depth.
- Total phytoplankton biovolume was greater at BIRCH-B2 compared to BIRCH-B1 and Bacillariophyceae, Chrysophyceae and Cryptophyceae were the most abundant taxonomic classes;
- Total zooplankton biomass and density was highest in June for all stations except at BIRCH-B1 where July had a higher biomass, both variables were dominated by Cyclopoida and Calanoida.
- Several sediment quality parameter concentrations were greater than the PSQG and/or CSQG guidelines, including arsenic, cadmium, chromium, copper, iron, lead, nickel, TKN, TOC and total phosphorus.
- An average of 38 and 75 individuals from 6 and 5 family taxa groups were identified in Birch Lake samples. *Naididae* was the most abundant taxa in BIRCH-B1 and *Chironomidae* and *Chaoboridae* co-dominated BIRCH-B2. Average richness, % Chironomid taxa, evenness and Simpson's Diversity were significantly between the two Birch Lake locations. Abundance and TID were not significantly different. Individuals from the Tanytarsus genus and EPT taxa were not present in either location.

5.0 CLOSING

This Aquatic Resources Assessment Report was prepared for First Mining Gold Corp. by Wood. The quality of information, conclusions and scheduling estimates contained herein is consistent with the level of effort involved in Wood's services and based on: i) information available at the time of preparation; ii) data supplied by outside sources; and iii) the assumptions, conditions and qualifications set forth in this report.

Should you have any questions, please do not hesitate to contact Mark Ruthven (416) 524-5928.

Yours truly,

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Appendix A
Fish Habitat and Catch Data

LEGEND

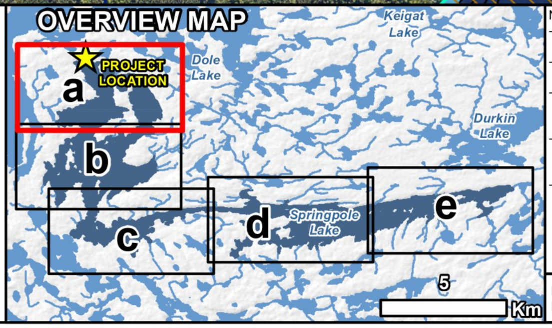
- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Northern Pike Spawning Observation Transect

Habitat Suitable for Northern Pike Spawning

- Approximate Inferred Soft Substrate
- Approximate Inferred Emergent Vegetation
- Water Depth (0 to 2 m)

0 0.25 0.5 1 1.5 2 Kilometres

OVERVIEW MAP



NOTES:
- Topographic information extracted from LIO, NDMNRF.
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- Northern Pike spawning sample locations extracted from "Existing Conditions Report - Fish Community and Habitat" by First Mining Gold Corp., and C. Portt and Associates.

Datum: NAD83
Projection: UTM Zone 15N

N S W E

FIRST MINING GOLD | wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Northern Pike

PROJECT N°: ONS2104 | **FIGURE: A1-1a**

SCALE: 1:16,000 | DATE: April 2022

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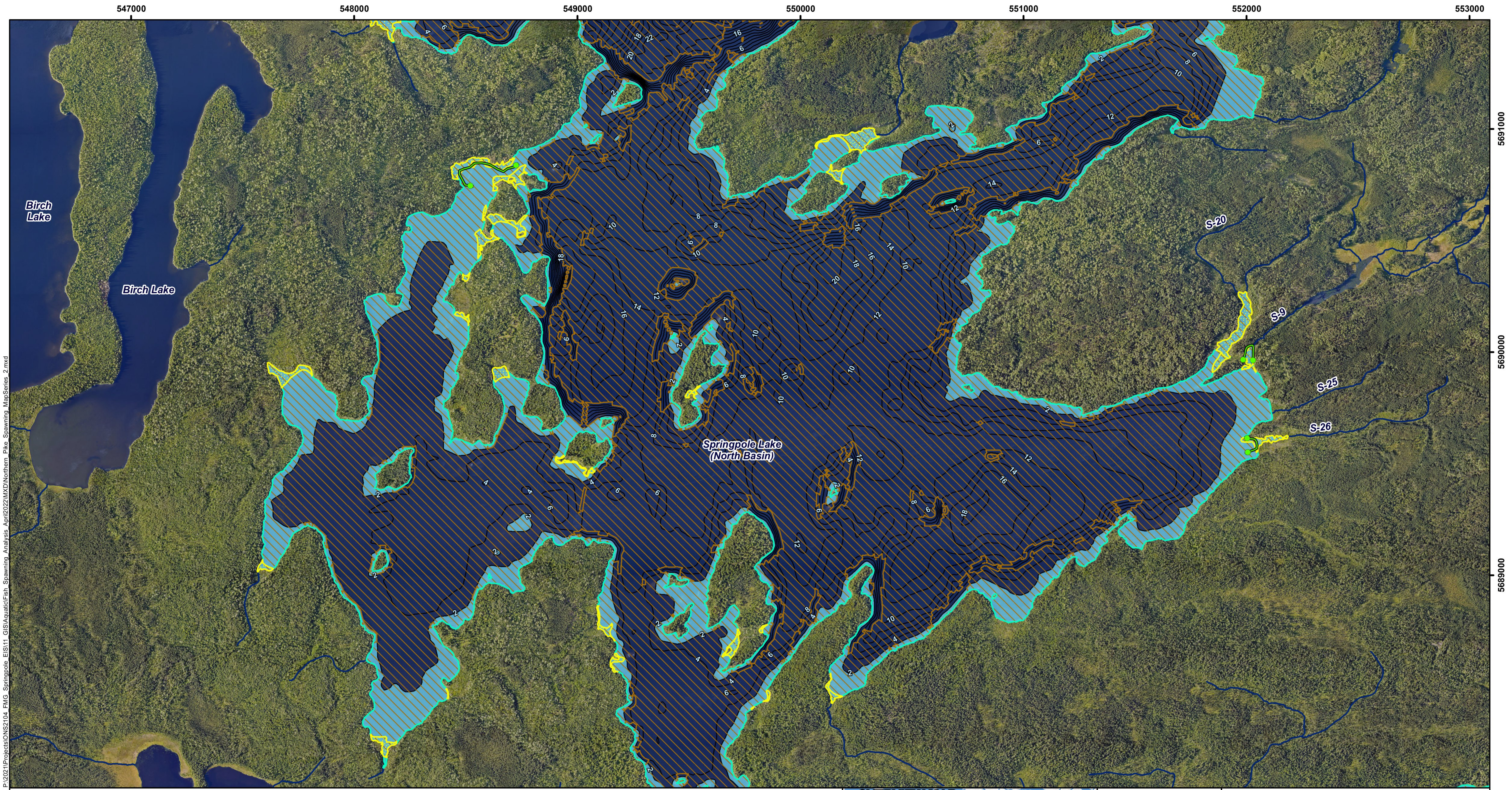


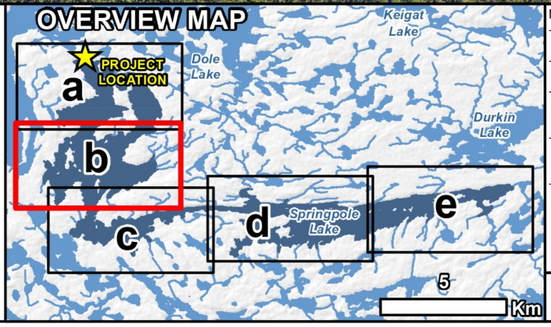
LEGEND

- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Northern Pike Spawning Observation Transect

Habitat Suitable for Northern Pike Spawning

- Approximate Inferred Soft Substrate
- Approximate Inferred Emergent Vegetation
- Water Depth (0 to 2 m)

0 0.25 0.5 1 1.5 2 Kilometres



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Datum: NAD83
Projection: UTM Zone 15N

N S E W

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Northern Pike

PROJECT Nº: ONS2104	**FIGURE: A1-1b**
SCALE: 1:16,000	DATE: April 2022

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LEGEND

- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Northern Pike Spawning Observation Transect

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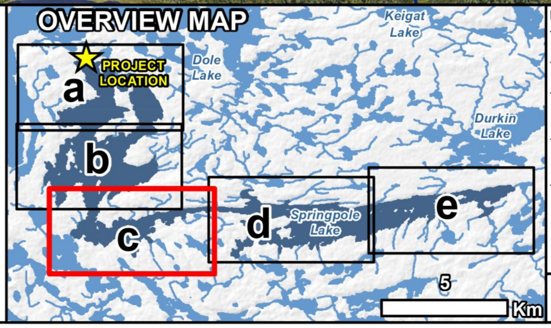
- Approximate Inferred Emergent Vegetation
- Water Depth (0 to 2 m)

0 0.25 0.5 1 1.5 2 Kilometres

OVERVIEW MAP



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Datum: NAD83
Projection: UTM Zone 15N

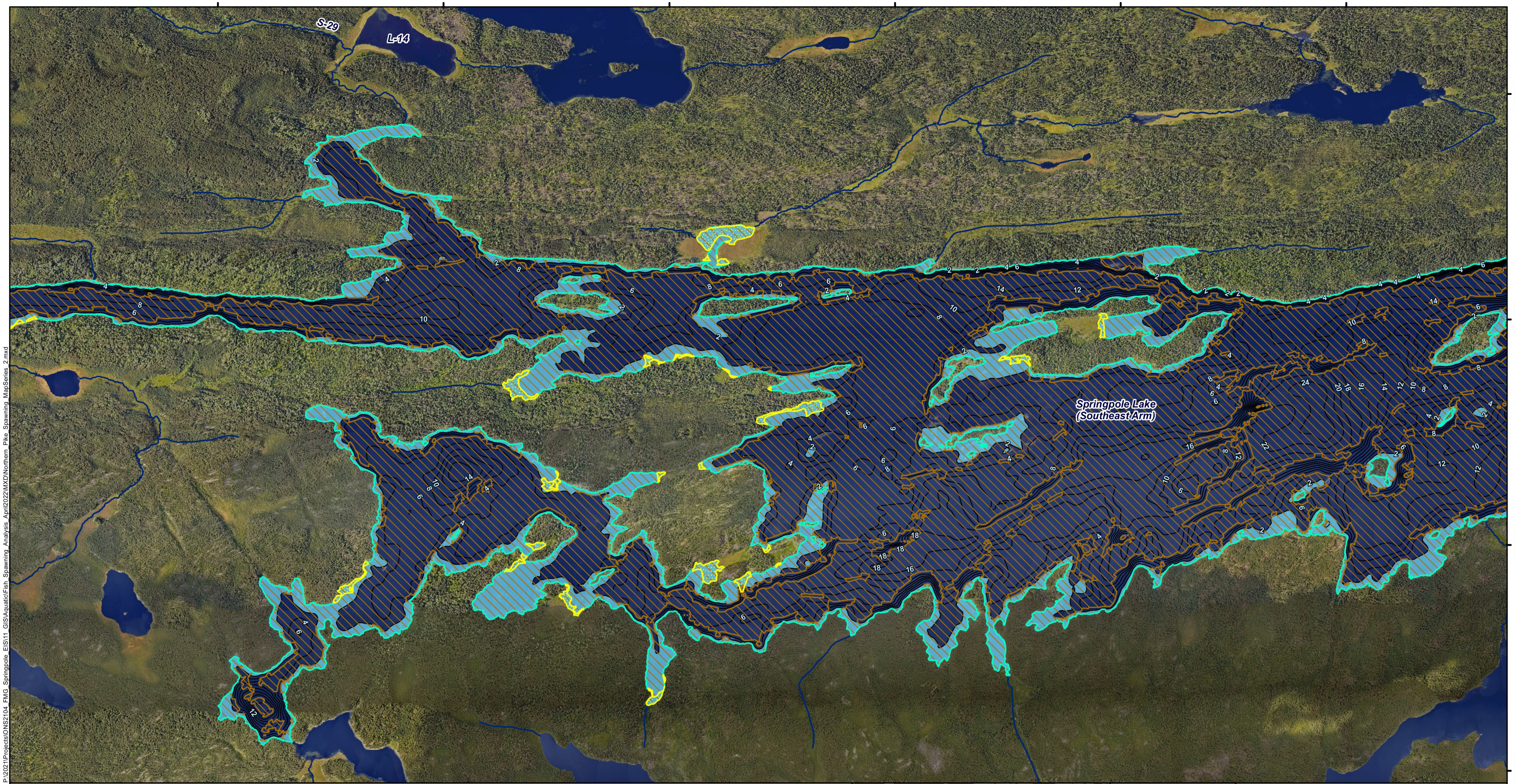
N W E S

FIRST MINING GOLD | wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Northern Pike

PROJECT N°: ONS2104	**FIGURE: A1-1c**
SCALE: 1:16,000	DATE: April 2022



LEGEND

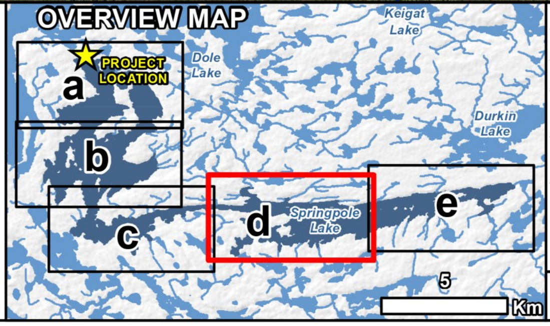
- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Northern Pike Spawning Observation Transect

Habitat Suitable for Northern Pike Spawning

- Approximate Inferred Soft Substrate
- Approximate Inferred Emergent Vegetation
- Water Depth (0 to 2 m)

0 0.25 0.5 1 1.5 2 Kilometres

OVERVIEW MAP



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Datum: NAD83
Projection: UTM Zone 15N

N W E S

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Northern Pike

PROJECT N^{o}: ONS2104	FIGURE: A1-1d
SCALE: 1:16,000	DATE: April 2022

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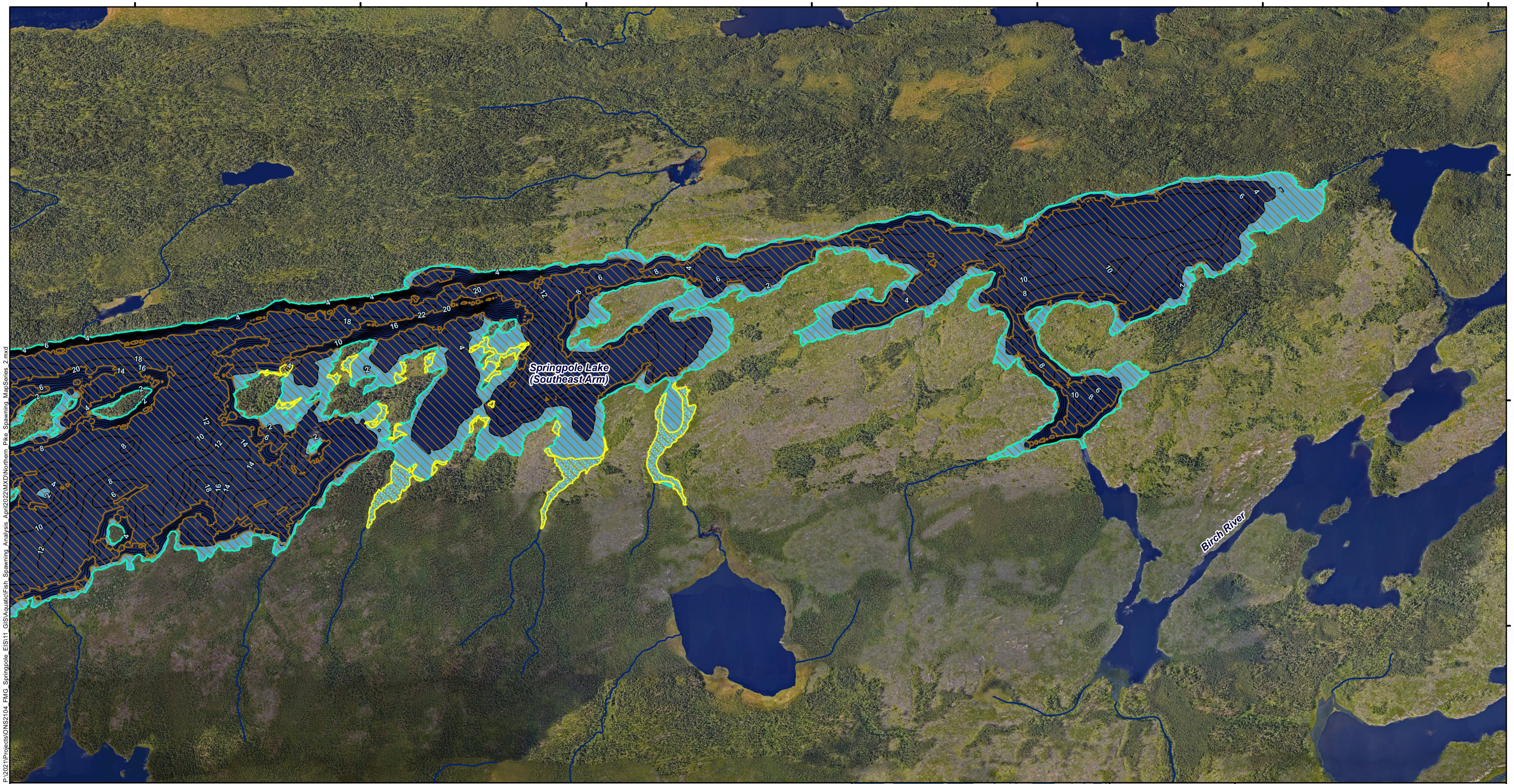

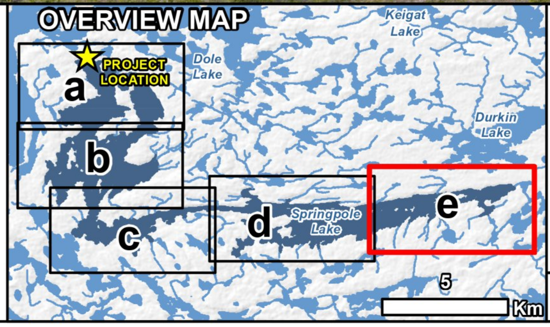

LEGEND

- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Northern Pike Spawning Observation Transect

Habitat Suitable for Northern Pike Spawning

- Approximate Inferred Soft Substrate
- Approximate Inferred Emergent Vegetation
- Water Depth (0 to 2 m)

0 0.25 0.5 1 1.5 2
Kilometres

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Datum: NAD83
Projection: UTM Zone 15N

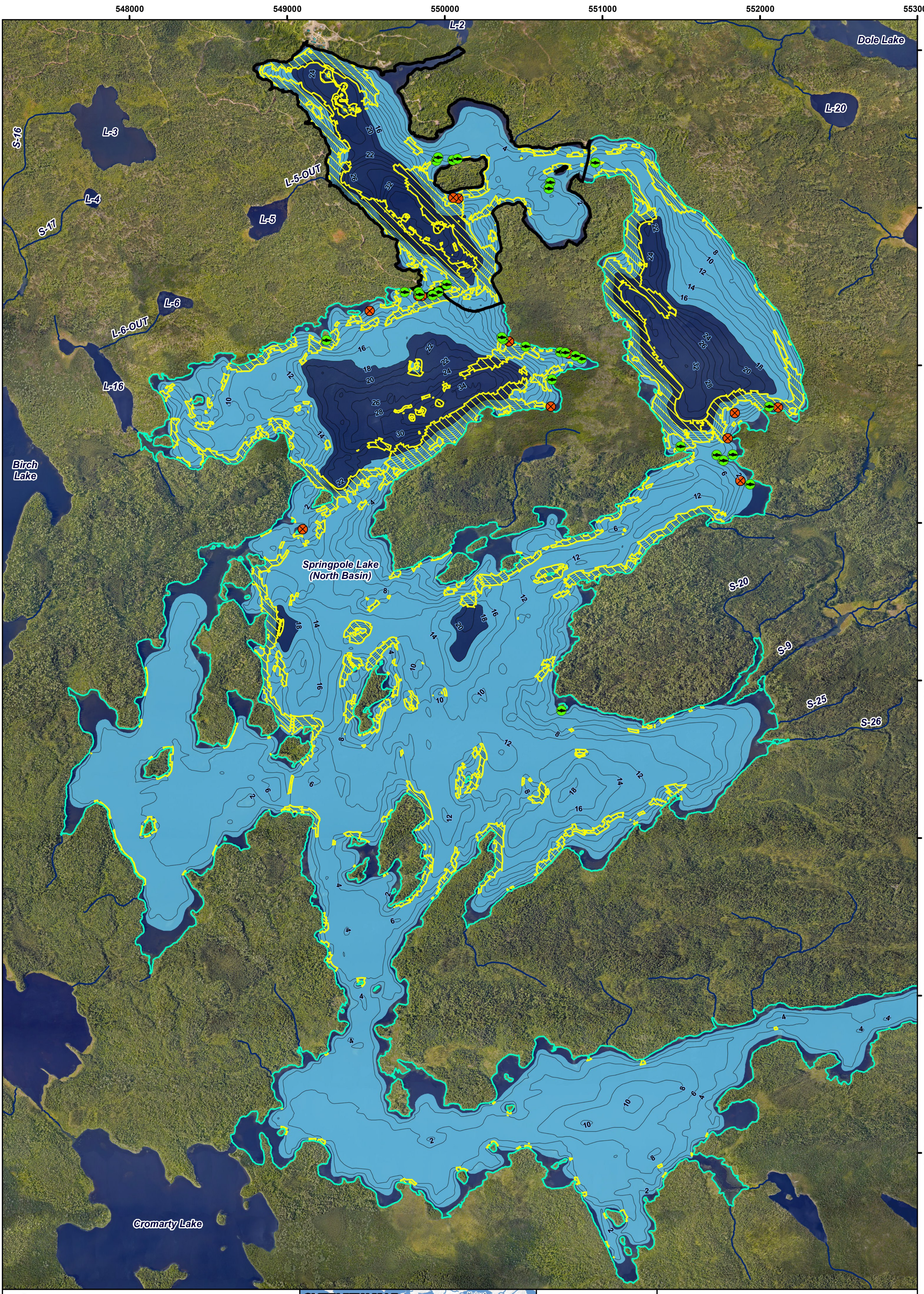
N W E S

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Northern Pike

PROJECT N°: ONS2104	FIGURE: A1-1e
SCALE: 1:16,000	DATE: April 2022



LEGEND

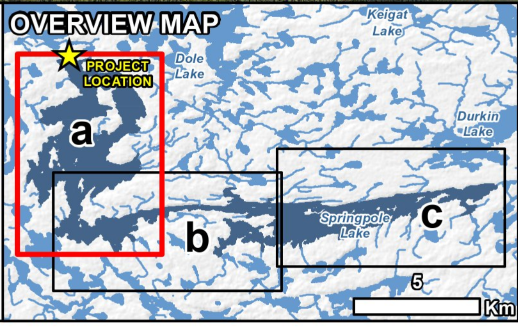
- Springpole Lake
- Candidate Lake Trout Spawning Location
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)

Habitat Suitable for Lake Trout Spawning

- Approximate Inferred Hard Substrate
- Water Depth (1 to 18 m)

Lake Trout Spawning Sample Location

- No Spawning Behaviour Observed
- Spawning Behaviour Observed



0 0.25 0.5 1 1.5 2 Kilometres

NOTES:
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- Springpole Lake bathymetry provided by Story Environmental Inc, 2017/2019.
- Approximate inferred hard substrate based on bathymetry with a slope greater than 12 percent.
- Lake Trout spawning sample locations extracted from "Existing Conditions Report - Fish Community and Habitat" by First Mining Gold Corp., and C. Portt and Associates.

Datum: NAD83
Projection: UTM Zone 15N

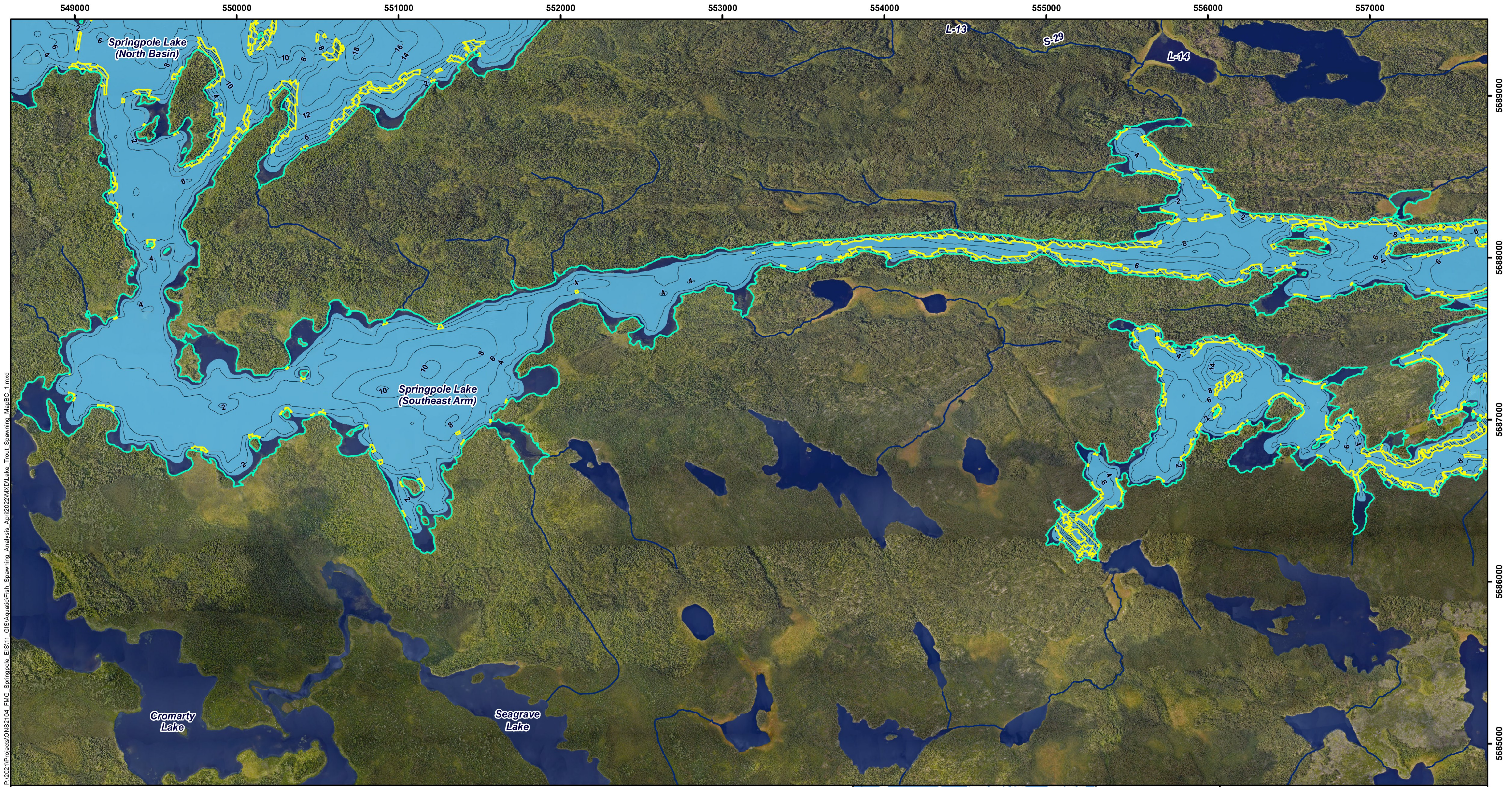
N W E S

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Lake Trout

PROJECT N°: ONS2104	**FIGURE: A1-2a**
SCALE: 1:22,000	DATE: April 2022



LEGEND

- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)

Habitat Suitable for Lake Trout Spawning

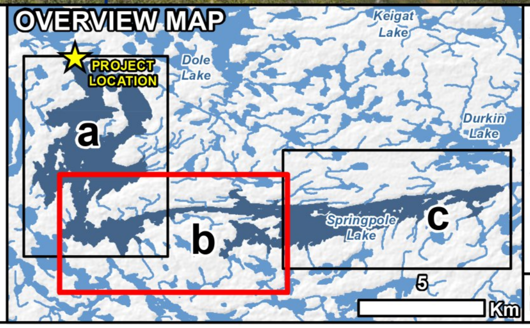
- Approximate Inferred Hard Substrate
- Water Depth (1 to 18 m)

Lake Trout Spawning Sample Location

- No Spawning Behaviour Observed
- Spawning Behaviour Observed
- Candidate Lake Trout Spawning Location

0 0.5 1 2 3 4 5 Kilometres

OVERVIEW MAP



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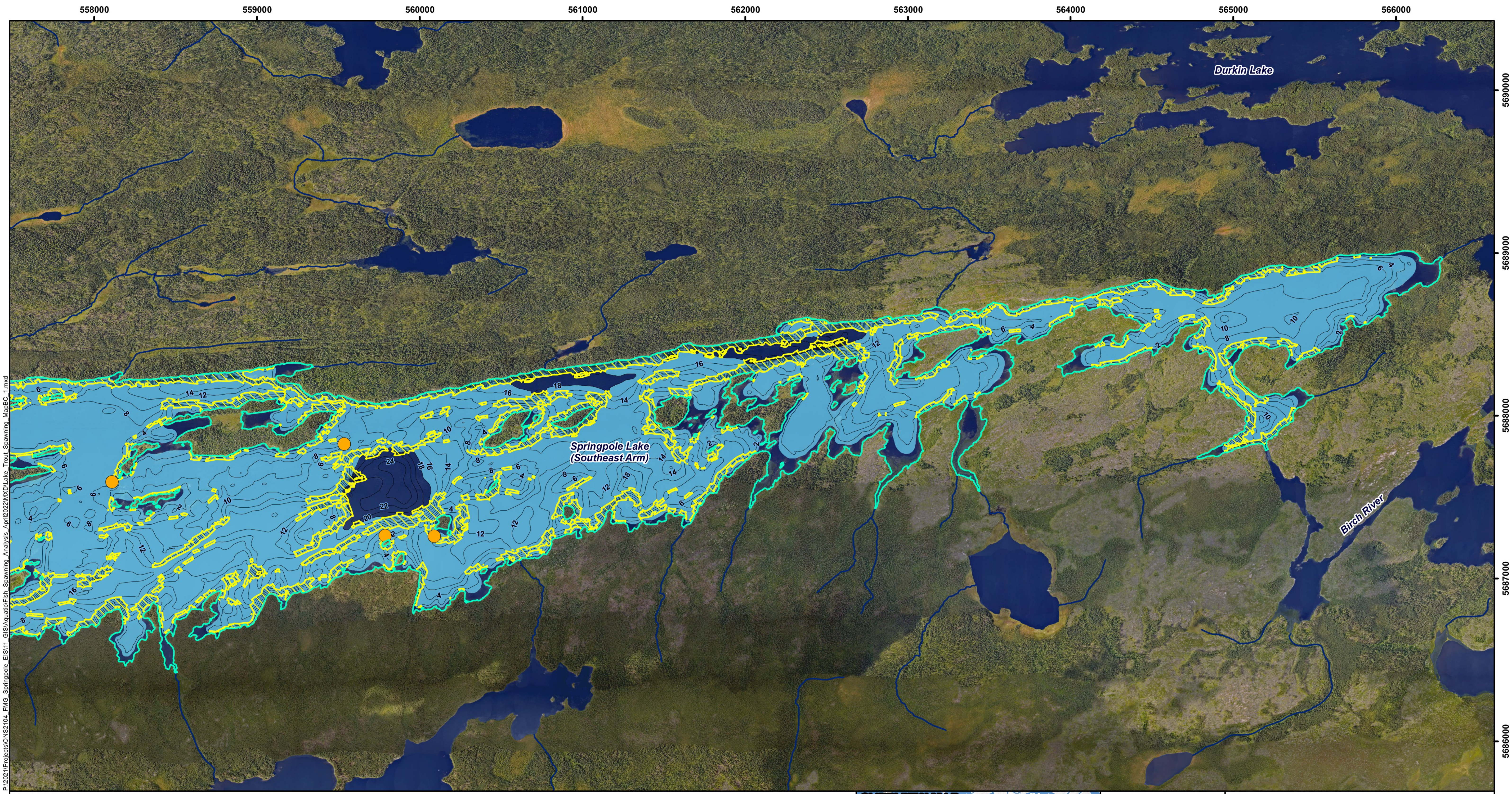
Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD | wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Lake Trout

PROJECT N°: ONS2104	FIGURE: A1-2b
SCALE: 1:22,000	DATE: April 2022



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LEGEND

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- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Candidate Lake Trout Spawning Location

Habitat Suitable for Lake Trout Spawning

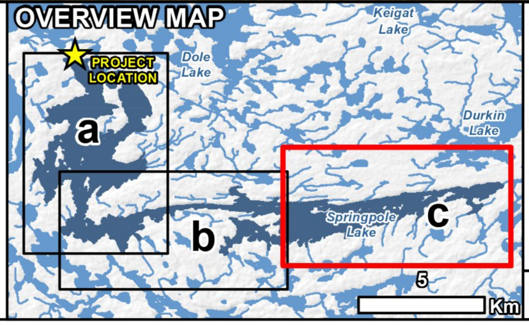
- Approximate Inferred Hard Substrate
- Water Depth (1 to 18 m)

Lake Trout Spawning Sample Location

- No Spawning Behaviour Observed
- Spawning Behaviour Observed

0 0.5 1 2 3 4 5 Kilometres

OVERVIEW MAP



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Datum: NAD83
Projection: UTM Zone 15N

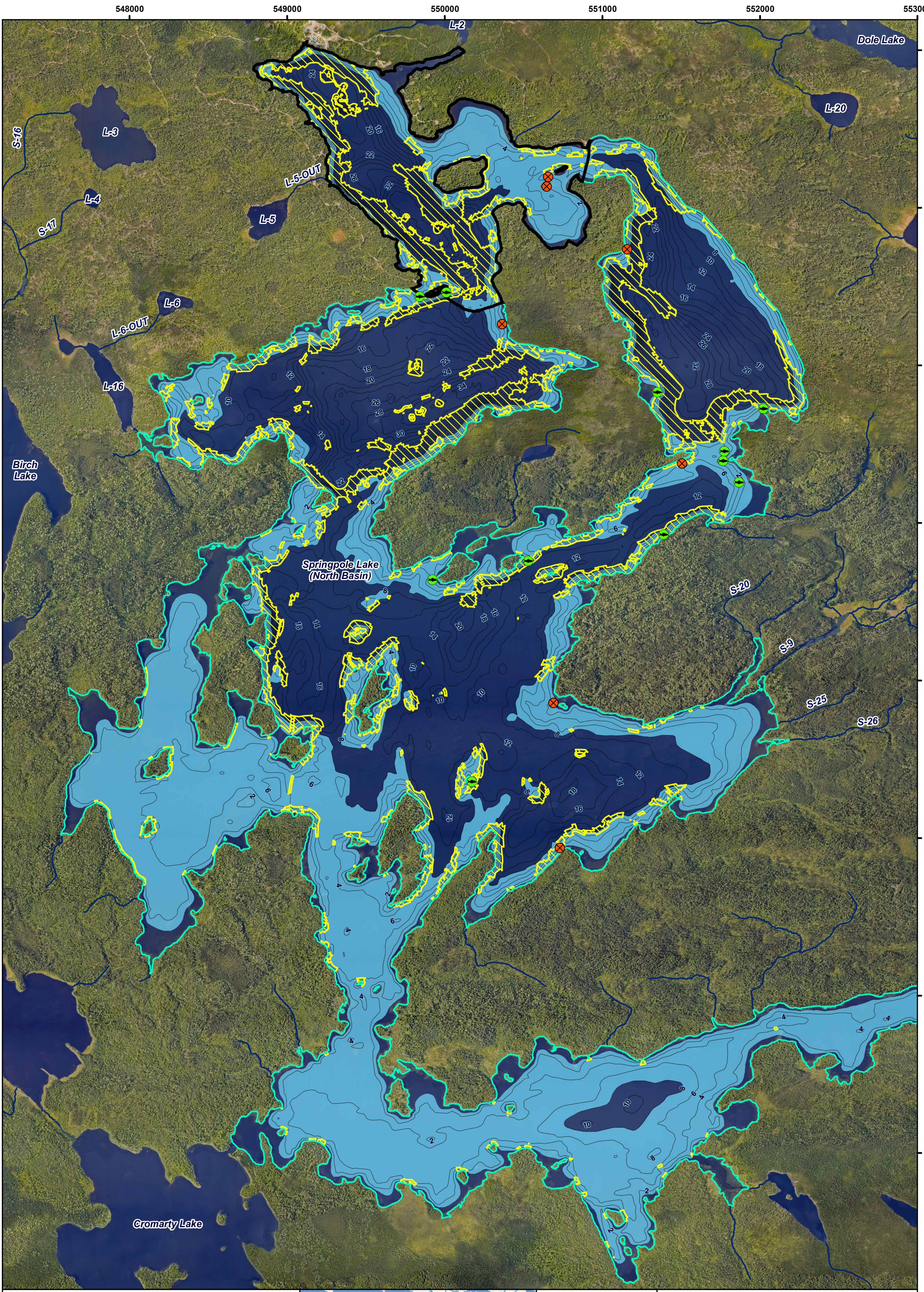
N W E S

FIRST MINING GOLD | wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Lake Trout

PROJECT N°: ONS2104	**FIGURE: A1-2c**
SCALE: 1:22,000	DATE: April 2022



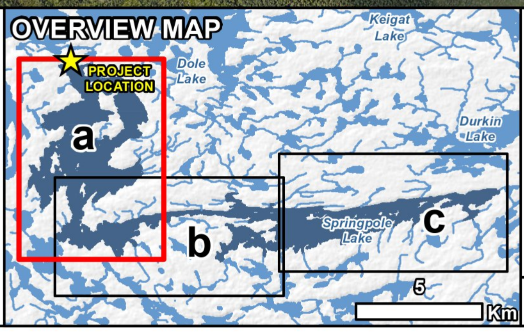
LEGEND

- Springpole Lake
- Candidate Lake Whitefish Spawning Location
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)

Habitat Suitable for Lake Whitefish Spawning
- Approximate Inferred Hard Substrate
- Water Depth (1 to 8 m)

Lake Whitefish Spawning Sample Location
- No Spawning Behaviour Observed
- Spawning Behaviour Observed

0 0.25 0.5 1 1.5 2 Kilometres



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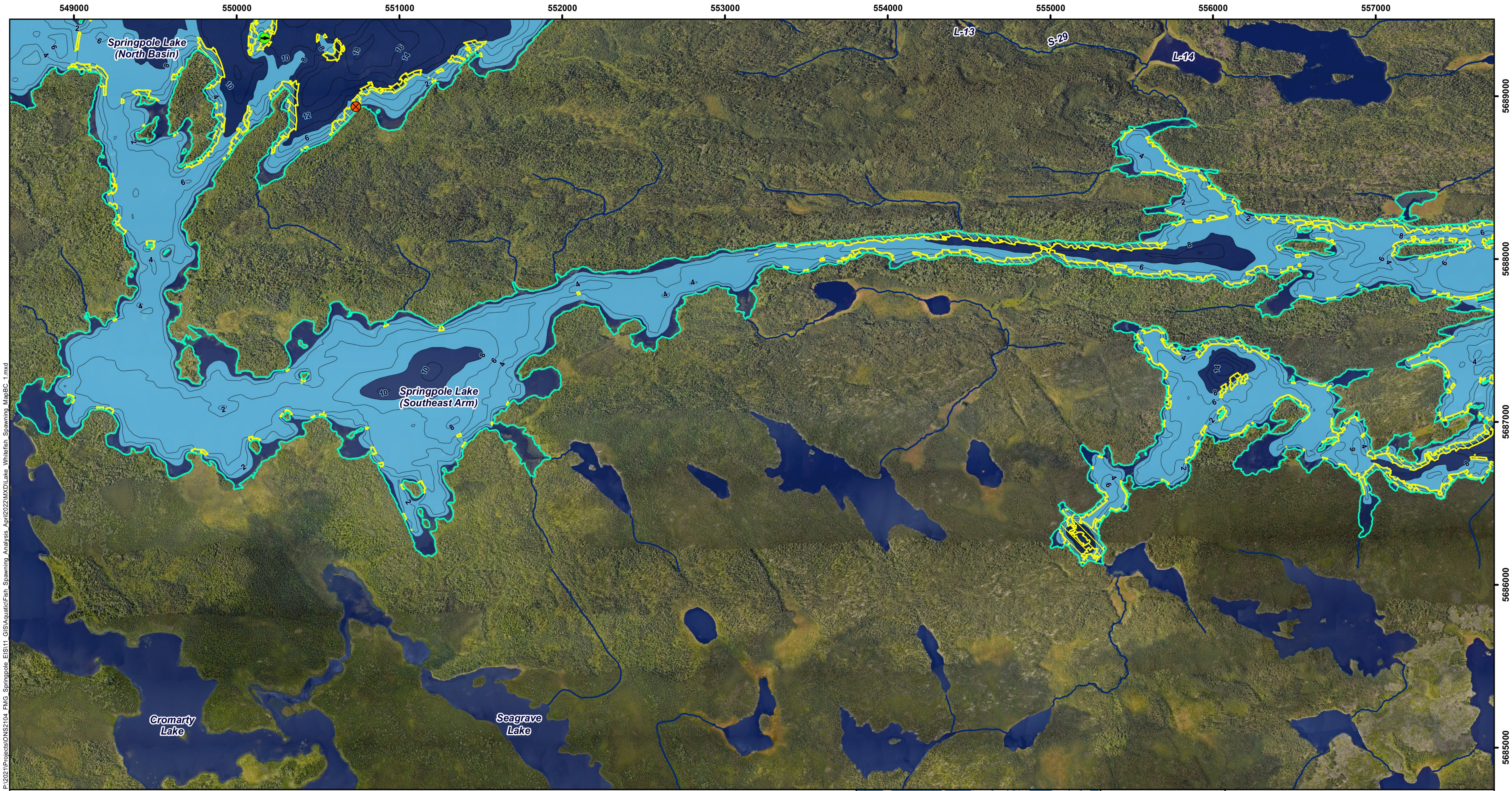
Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Lake Whitefish

PROJECT N°: ONS2104	**FIGURE: A1-3a**
SCALE: 1:22,000	DATE: April 2022



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LEGEND

- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)
- Candidate Lake Whitefish Spawning Location

Habitat Suitable for Lake Whitefish Spawning

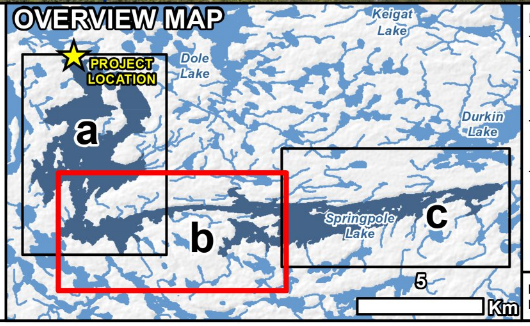
- Approximate Inferred Hard Substrate
- Water Depth (1 to 8 m)

Lake Whitefish Spawning Sample Location

- No Spawning Behaviour Observed
- Spawning Behaviour Observed

0 0.5 1 2 3 4 5 Kilometres

OVERVIEW MAP



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Datum: NAD83
Projection: UTM Zone 15N

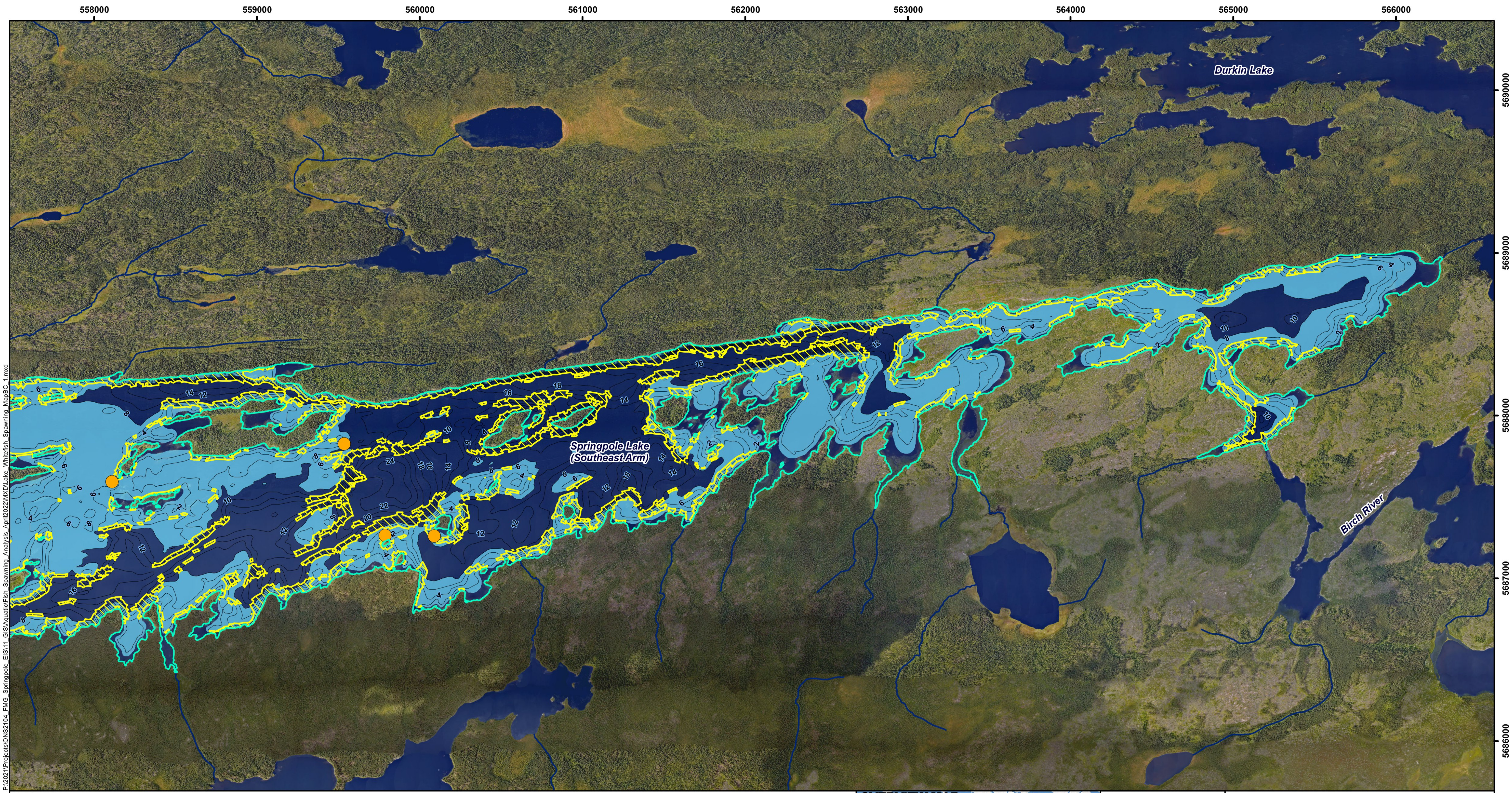
N W E S

FIRST MINING GOLD | wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Lake Whitefish

PROJECT N°: ONS2104	**FIGURE: A1-3b**
SCALE: 1:22,000	DATE: April 2022



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LEGEND

- Springpole Lake
- Proposed Springpole Lake Dewatered Area
- Bathymetry Contours (2 m interval)

Habitat Suitable for Lake Whitefish Spawning

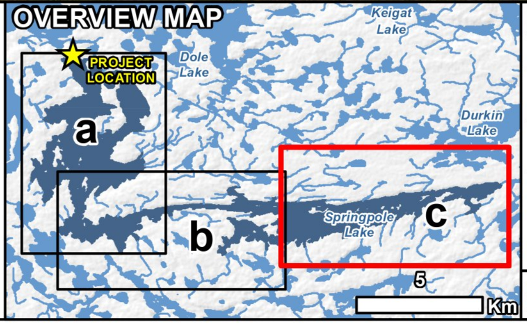
- Approximate Inferred Hard Substrate
- Water Depth (1 to 8 m)

Lake Whitefish Spawning Sample Location

- No Spawning Behaviour Observed
- Spawning Behaviour Observed
- Candidate Lake Whitefish Spawning Location

0 0.5 1 2 3 4 5 Kilometres

OVERVIEW MAP



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Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD wood.

SPRINGPOLE GOLD PROJECT

Potential Spawning Habitat for Lake Whitefish

PROJECT N°: ONS2104	**FIGURE: A1-3c**
SCALE: 1:22,000	DATE: April 2022

Table A1-1a: In-field Physicochemical Measurements – Inland Lakes

Parameter	Month	Lake 17 L-17	Lake 18 L-18	Lake 19 L-19	Lake 20 L-20
Surface Water Temperature (°C)	March	2.7	2.9	3.4	3.9
	May	20.6	20.2	18.2	
	June	14.5	23.2	19.5	
	July				
	August		19.3	-	
	September	13.72	16.21	19.6	
	October	10.4	9.9	16.91, 9.4	
pH (pH units)	March	7.21	6.88	6.97	6.01
	May	8.1	7.84	7.83	
	June	7.42	7.8	7.87	
	July				
	August		7.81	-	
	September	6.98	6.84	8.61	
	October	7.11	7.7	8, 8.03	
Conductivity (µS/cm)	March	99	111	121	101
	May	81.6	78.6	59	
	June	72.8	64.6	59.3	
	July				
	August		77	-	
	September	101	76	71	
	October	105.9	80.2	72, 74.2	
Turbidity (NTU)	March				
	May				
	June	-0.03	-0.58	0.66	
	July				
	August		6.84	-	
	September			1.45	
	October				
Dissolved Oxygen (%)	March	55	33.3	49.9	0.07
	May	96.1	99.9	105.2	
	June	68.2	98.6	104.4	
	July	-			
	August		92.8	-	
	September	89.1	103.5	112.1	
	October	60	81.3	113.2, 99.7	
Dissolved Oxygen (mg/L)	March	7.45	4.25	6.64	0.09
	May	8.62	9.02	9.93	
	June	6.94	8.45	9.58	
	July				
	August		8.55	-	
	September	9.26	10.17	10.27	
	October	6.7	9.18	10.95, 11.41	
TDS (NTU)	March				
	May	53	51	2.59	
	June	47	43	39	
	July				
	August		50	-	
	September	64	0.05	46	
	October	69	52	47, 48	
ORP	March	166.6	17.9	57.2	-7.3
	May	107.2	77.7	112.5	
	June	79.5	133.4	158.9	
	July				
	August		70.6	-	
	September	176	122.4	105.1	
	October	133	106.6	153.2, 116.2	

Table A1-1b: In-field Physicochemical Measurements – Springpole Lake

Parameter	Month	L-15-B1	L-15-B2	L-15-B3	L-15-B4	L-15-B5	L-15-B6	SW-07A	SW-15	SW-16	SW-25	SW-27
Surface Water Temperature (°C)	March	1.7	1.9	1.7	1.6	1.9	2.1	2	0.8	0.8	2	1.8
	May	11.3		10.3	10	11.5		14.5	9.2	13.5	18.6	12.3
	June	16.4	16.4	16.5	17.2	16.6	17	17.4	16.2	17.3	16.7	15.3
	July	21.5	-	22	20.8	20.5	20.7	20.9	21.3	20.7	21.6	20.7
	August	18.5	20.3	18.4	18.1	18.9		18.8	18	18.9	18.2	18.5
	September	14.82	14.49	15.03	14.59	14.66	14.44	13.79	14.37	15.47	14.71	15.36
	October	13.4	13.9	13.6	13.8	13.3	13.6	11.7	13.6	12.4	13.6	12.9
pH (pH units)	March	7.11	7.13	7.25	7.3	7.23	7.27	7.35	7.5	6.94	7.27	6.9
	May	7.05		6.54	7.2	7.03		7.21	7.31	7.12	7.52	6.98
	June	6.48	7.59	7.85	7.75	7.92	8	9.94	7.87	6.6	7.7	7.62
	July	8.26		8.29	7.91	7.6	7.9	7.77	8.18	7.77	8.43	7.68
	August	7.87	7.79	7.84	7.76	7.7		8	7.81	7.91	7.66	7.97
	September	7.37	7.27	7.35	7.11	7.32	6.92	7.44	7.34	7.26	7.26	7.28
	October	7.71	7.91	7.51	7.51	7.41	7.59	7.59	7.72	7.4	7.66	7.41
Conductivity (µS/cm)	March	69	66	67	66	62	66	62	70	65	65	82
	May	62.4		92.2	62.3	58.3		57	62.2	54.8	64.8	1.4
	June	66.3	62.7	62.5	62.5	55.6	63	57.6	61.2	55.8	62.6	53.3
	July	62		62	62	57	62	58	61	58	62	57
	August	62	62	62	62	57		59	61	58	62	57
	September	62	62	62	62	57	62	57	62	58	62	57
	October	63.7	63.8	63.7	63.6	57.8	63.5	59.3	63.4	59.2	63.6	58.5
Turbidity (NTU)	March											
	May											
	June	-1.18	-1.1	-1.27	-1.1	-1.22	-1.26	-1.04	-1.14	-1.13	-1.27	-1.25
	July	-2.13		-2.17	-2.03	-2.25	-2.16	-2.05	-2.14	-2.08	-2.21	-2.15
	August	-2.1	-2.18	-2.07	-2.11	-1.69		-1.13	-2.08	-1.54	-2.11	-1.7
	September											
	October	-1.99	-1.97	-2.01	-1.84	-1.72	-1.87	-1.64	-1.86	-1.57	-1.96	-1.74
Dissolved Oxygen (%)	March	85.8	83.3	86.1	85	82.4	85.7	87.9	81.5	71.8	82.9	81
	May	102.1		98	98.6	99.5	-	99.8	93.7	98.6	98.3	97.3
	June	97	98.7	97.1	94.9	95.5	94.4	92.2	98.6	91	97.4	91.8
	July	100.5		101.3	97.5	92.2	97.1	94.7	100.8	94.6	100.8	92.2
	August	95.2	96.4	94.4	93.7	95.2		100.3	93.8	97.7	92.9	94.1
	September	102.1	96.4	116.7	110.6	95.4	105.4	108.5	106.1	103.4	94.1	99.6
	October	93.2	93.3	90.7	87.8	86.2	90.2	91.4	91.9	87.6	91.8	87.3
Dissolved Oxygen (mg/L)	March	11.96	11.5	11.98	11.88	11.41	11.83	12.06	11.58	10.3	11.5	11.28
	May	11.18		11.04	11.15	10.38		10.16	11.2	10.26	10.99	10.39
	June	9.49	9.66	9.45	9.2	9.27	9.14	8.87	9.69	8.75	9.48	9.19
	July	8.89		8.85	8.73	8.31	8.71	8.46	8.94	8.48	8.88	8.26
	August	8.92	8.67	8.86	8.86	8.62		9.33	8.89	9.09	8.76	8.82
	September	10.36	9,82	11.77	11.24	9.54	10.75	11.2	10.7	10.31	9.54	9.96
	October	9.67	9.69	9.43	9.09	9.02	9.39	9.91	9.55	9.36	9.55	9.21
TDS (NTU)	March											
	May			-	-	0.49	-	0.43	1.83	-0.75	0.4	2.47
	June	41	41	41	41	36	41	37	40	36	41	33
	July	41		40	40	37	40	38	39	38	40	37
	August	40	40	40	40	37		38	40	38	40	37
	September		40	40	40	37	40	37	40	37		37
	October	41	41	41	41	38	41	39	41	38	41	38
ORP	March	262.2	144.2	185	198.6	108	194.2	131.9	178.3	173.8	100.7	135.5
	May	240.6		226.6	217.4	233.4	-	217.7	237.6	233.9	231.4	188.6
	June	158.4	190.5	225.7	147.7	131.1	182.8	152.5	114.7	235.6	190.7	163.9
	July	59.3		100	150.4	109	154.1	77.3	154.7	89.9	30.8	84.6
	August	96.9	167.9	149.7	156.5	145.6		125.1	147.5	103.9	118.2	116.8
	September	166.5	142.6	205.1	143.6	145.6	202.2	239.1	140.1	224.4	120.4	236.5
	October	195.7	174.8	166.5	210.4	174.1	151.5	182.2	184.1	148.1	180.3	163.1

Table A1-1c: In-field Physicochemical Measurements – Birch Lake

Parameter	Month	BIRCH-B1	BIRCH-B2	SW-03	SW-04	SW-18	SW-19B	SW-20	SW-23	SW-24	SW-28
Surface Water Temperature (°C)	March	1.8	2.2	1.8	1.9	2.2		2.4	1.4	2	1.8
	May		11.5	9.6	11.2	9.9		9.6	9.7	12.6	9.7
	June	17.3	16	15.4	16.8	16.1	18.3	19.9	16.9	16.2	21.3
	July	20.3	20.8	21	21.2	21.4		20.6	19.9	21.5	20.8
	August			18	18.1	17.8				18	
	September	18.5	14.98	15.28	15.26	15.01		18.8, 14.9	18.9, 15.1	15.27	18.2, 15.3
	October	15.63, 13.2	12.9	12.9	12.4	12.1		12.8	13.1	12.6	13
pH (pH units)	March	7.1	7.24	7.36	7.44	7.4		8.05	7.21	7.46	7.26
	May		7.25	6.31	7.29	7.04		7.26	7.63	7.12	7.01
	June	7.74	7.93	8.12	7.6	7.81	6.43	7.9	7.55	7.82	7.93
	July	7.8	7.92	7.99	8.02	8.09		7.93	8.34	8.02	7.86
	August			7.71	7.74	7.66				7.71	-
	September	7.97	7.17	7.49	7.48	7.4		8.29, 7.38	8.84, 7.34	7.35	8.2, 7.24
	October	7.11, 7.24	7.53	7.65	7.44	7.32		7.45	7.38	7.34	7.54
Conductivity (µS/cm)	March	62	61	63	60	62		149	60	157	61
	May		61.9	57.3	58.2	56.6		57.3	57.9	59.6	58.6
	June	59.1	57.4	57.8	57.5	57.7	59.7	59.2	58.3	57.9	60.3
	July	58	58	58	58	58		58	58	58	58
	August			58	58	58				58	-
	September	58	58	58	58	58		58, 58	58, 58	58	59, 59
	October	58, 59.9	59.3	59.6	59.4	59.3		59.6	59.8	59.5	60.3
Turbidity (NTU)	March										
	May										
	June	-1.36	-1.08	-1.2	-1.45	-1.29	-1.26	-1.25	-1.21	-1.21	-1.27
	July	-2.08	-2.16	-2.13	-2.13	-2.12		-2.13	-2.07	-2.17	-2.1
	August			-2.07	-2.01	-2.01				-2.01	
	September	-1.67						-1.6	-1.75	-	-1.58
	October	-1.96	-1.86	-1.93	-1.85	-1.78		-1.99	-1.91	-1.88	-1.86
Dissolved Oxygen (%)	March	88.9	85.6	91.6	88.1	88.6		81.1	85.8	88.2	89.6
	May		100.8	99.1	100.8	100.1		99.3	98.5	102.1	98.2
	June	102.8	97.7	96.8	97.7	98	105.8	107.4	101.5	97.8	106.7
	July	96.3	97.3	97.8	99.6	100.6		96.7	95.4	99.9	96.4
	August			92.3	93.8	91.9				91.6	
	September	94.2	120.2	128.1	127.3	126		99.1, 95.4	95.1, 101.2	127.5	94.4, 69.1
	October	102.7, 87.5	88.5	93.5	92.2	91.1		87.7	87.9	90.9	92.2
Dissolved Oxygen (mg/L)	March	12.37	11.83	12.73	12.21	12.21		11.13	11.69	12.19	12.45
	May		10.94	11.29	11.07	11.32		11.32	11.2	10.86	11.72
	June	9.88	9.67	9.69	9.44	9.66	9.98	9.76	9.84	9.62	9.45
	July	8.7	8.7	8.72	8.85	8.9		8.69	8.66	8.82	8.63
	August			8.75	8.6	8.73				8.67	
	September	8.82	12.14	12.84	12.77	12.7		9.23, 9.67	8.85, 10.2	12.79	8.89, 6.82
	October	10.21, 9.18	9.35	9.87	9.85	9.79		9.28	9.23	9.66	9.7
TDS (NTU)	March										
	May		-	-1.18	3.4	-1.16		-1.07	-1.36	1.61	-1.06
	June	38	38	38	38	38	39	39	38	38	39
	July	38	37	38	38	38		38	38	38	38
	August			38	38	38				38	
	September	38						38, 38	38, 58	-	38, 38
	October	38, 39	39	39	39	39		39	39	39	39
ORP	March	208.4	156.5	134.5	142.5	132.4		151.9	156.5	153.5	137.8
	May		102.2	241.1	160.1	224.6		242.2	162.8	209.1	262.3
	June	165.9	181.4	95.1	154.1	107.4	98.3	113	194.1	112.3	95.2
	July	178.3	82.1	156.4	101.7	128		155.1	158.1	101.8	150.5
	August			183.8	159.9	173.9				170.1	
	September	113.5	181.4	199.3	188.2	176.2		86.8, 156.7	88.7, 151.5	153.1	110.9, 179.4
	October	223.1, 184.8	156.1	195.9	184.2	170.5		166.7	188	128.6	172.9

Table A1-2: Springpole Lake Mean Volume Weighted Hypolimnetic Dissolved Oxygen Concentration

Site	Month	MVWHDO (mg/L)	Optimum Habitat Volume (%)	Useable Habitat Volume (%)
L-15-B1	August	6.84	21.4	36.7
L-15-B1	September	6.57	16.4	99.0
L-15-B2	August	No sample		
L-15-B2	September	4.78	0.0	97.7
L-15-B3	August	4.17	0.0	31.2
L-15-B3	September	4.19	0.0	78.0
L-15-B4	August	0.69	0.0	0.0
L-15-B4	September	0.10	0.0	80.7
L-15-B5	August	1.47	0.0	0.0
L-15-B5	September	0.21	0.0	96.9
L-15-B6	June	6.41	15.4	48.5
L-15-B6	July	No hypolimnion		
L-15-B6	August	No sample		
L-15-B6	September	No hypolimnion		
BIRCH B1	August	3.34	0.0	1.9
BIRCH B1	September	No hypolimnion		
BIRCH B2	August	No sample		
BIRCH B2	September	1.02	0.0	80.2

Table A1-3: Minnow Trap Catch and CPUE Summary (2021)

Waterbody Name	Season	Effort ID	Lift Date (dd/mm/yy)	Minnow Traps (#)	Effort (hours)	Overnight Sets (#)	Total Trap Hours Effort (# traps*hours)	Fish Species											Total Catch	Total CPUE
								Blacknose Shiner	Bluntnose Minnow	Brook Stickleback	Cottus Sp.	Fathead Minnow	Finescale Dace	Mimic Shiner	Northern Redbelly Dace	Rock Bass	Spottail Shiner	Yellow Perch		
Species Catch by Location																				
Springpole Lake	Spring	L15-MT1	6/14/2021	27	48.3	2	1314.9	1	0	0	1	0	0	9	0	2	0	35	**48**	-
Birch Lake	Spring	BIRCH-MT1	6/10/2021	27	20.5	1	553.5	10	32	2	0	0	0	0	0	0	1	57	**102**	-
Lake 17	Fall	L17-MT1	9/29/2021	21	2.0	0	42.0	0	0	0	0	0	930	0	0	0	0	0	**930**	-
Lake 18	Fall	L18-MT1	9/30/2021	23	23.5	1	540.5	0	0	586	0	0	100	0	490	0	0	0	**1176**	-
Lake 19	Fall	L19-MT1	1/10/2021	24	32.0	1	768.0	0	0	150	0	971	0	0	450	0	0	0	**1571**	-
Species Catch Total								**11**	**32**	**738**	**1**	**971**	**1030**	**9**	**940**	**2**	**1**	**92**	**3827**	**-**
CPUE Catch by Location																				
Springpole Lake	Spring	L15-MT1	6/14/2021	27	48.3	2	1314.9	0.001	0.00	0.00	0.001	0.00	0.00	0.01	0.00	0.002	0.00	0.03	**-**	**0.04**
Birch Lake	Spring	BIRCH-MT1	6/10/2021	27	20.5	1	553.5	0.018	0.06	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.002	0.10	**-**	**0.18**
Lake 17	Fall	L17-MT1	9/29/2021	21	2.0	0	42.0	0.00	0.00	0.00	0.00	0.00	22.14	0.00	0.00	0.00	0.00	0.00	**-**	**22.14**
Lake 18	Fall	L18-MT1	9/30/2021	23	23.5	1	540.5	0.00	0.00	1.08	0.00	0.00	0.19	0.00	0.91	0.00	0.00	0.00	**-**	**2.18**
Lake 19	Fall	L19-MT1	1/10/2021	24	32.0	1	768.0	0.00	0.00	0.20	0.00	1.26	0.00	0.00	0.59	0.00	0.00	0.00	**-**	**2.05**
Species CPUE Total								**0.019**	**0.06**	**1.28**	**0.001**	**1.26**	**22.33**	**0.01**	**1.49**	**0.002**	**0.002**	**0.13**	**-**	**26.58**

Table A1-4: Gillnet Catch and CPUE Summary (2021)

Waterbody Name	Season	Effort ID	Lift Date (dd/mm/yy)	Net Length (m)	Total Net Effort (hours)	Fish Species	Total Catch	Total CPUE
						Finescale Dace		
Species Catch by Location								
Lake 17	Fall	L-17-GN1	9/30/2021	15.24	20.3	16	**16**	-
Lake 17	Fall	L-17-GN2	9/30/2021	15.24	20.5	30	**30**	-
Lake 17	Fall	L-17-GN3	9/30/2021	15.24	20.2	0	**0**	-
Lake 18	Fall	L-18-GN1	9/30/2021	15.24	23.5	0	**0**	-
Lake 18	Fall	L-18-GN2	9/30/2021	15.24	23.5	0	**0**	-
Lake 18	Fall	L-18-GN3	9/30/2021	15.24	23.5	0	**0**	-
Lake 19	Fall	L-19-GN1	10/1/2021	15.24	32.0	0	**0**	-
Lake 19	Fall	L-19-GN2	10/1/2021	15.24	32.0	0	**0**	-
Lake 19	Fall	L-19-GN3	10/1/2021	15.24	32.0	0	**0**	-
Species Catch Total						**46**	-	-
CPUE Catch by Location								
Lake 17	Fall	L-17-GN1	9/30/2021	15.24	20.3	0.79	-	**0.79**
Lake 17	Fall	L-17-GN2	9/30/2021	15.24	20.5	1.46	-	**1.46**
Lake 17	Fall	L-17-GN3	9/30/2021	15.24	20.2	0.00	-	**0**
Lake 18	Fall	L-18-GN1	9/30/2021	15.24	23.5	0.00	-	**0**
Lake 18	Fall	L-18-GN2	9/30/2021	15.24	23.5	0.00	-	**0**
Lake 18	Fall	L-18-GN3	9/30/2021	15.24	23.5	0.00	-	**0**
Lake 19	Fall	L-19-GN1	10/1/2021	15.24	32.0	0.00	-	**0**
Lake 19	Fall	L-19-GN2	10/1/2021	15.24	32.0	0.00	-	**0**
Lake 19	Fall	L-19-GN3	10/1/2021	15.24	32.0	0.00	-	**0**
Species CPUE Total						**2.25**	-	**2.25**

Table A1-5: Seine Net Catch and CPUE Summary (2021)

Waterbody Name	Season	Effort ID	Haul Date (dd/mm/yy)	Hauls (#)	Fish Species			Total Catch	Total CPUE
					Blacknose Shiner	Mimic Shiner	Spottail Shiner		
Species Catch by Location									
Springpole Lake	Spring	L15-SN1	6/15/2021	1	0	91	51	**142**	-
Springpole Lake	Spring	L15-SN2	6/15/2021	1	100	0	102	**202**	-
Species Catch Total					**100**	**91**	**153**	**344**	-
CPUE Catch by Location									
Springpole Lake	Spring	L15-SN1	6/15/2021	1	0.00	91.00	51.00	-	**142.00**
Springpole Lake	Spring	L15-SN2	6/15/2021	1	100.00	0.00	102.00	-	**202.00**
Species CPUE Total					**100.00**	**91.00**	**153.00**	-	**344.00**

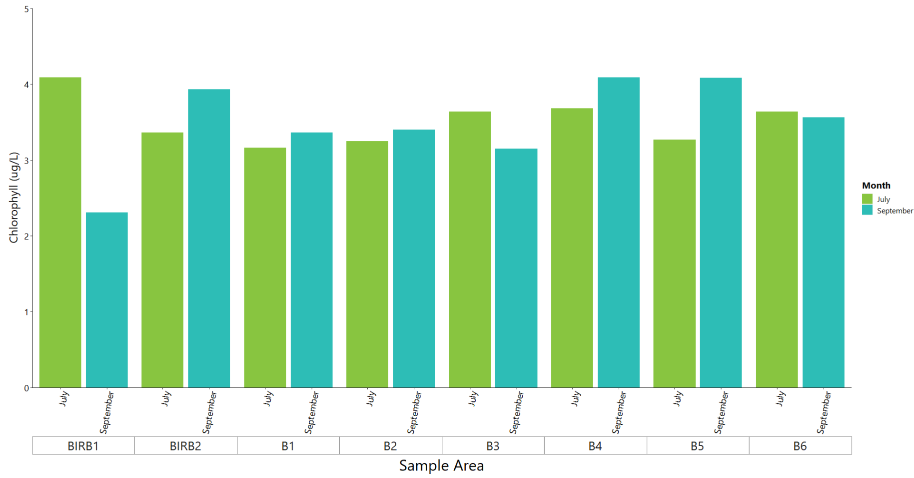


Figure A2-1: Total chlorophyll a (ug/L) for Springpole and Birch Lake, 2021

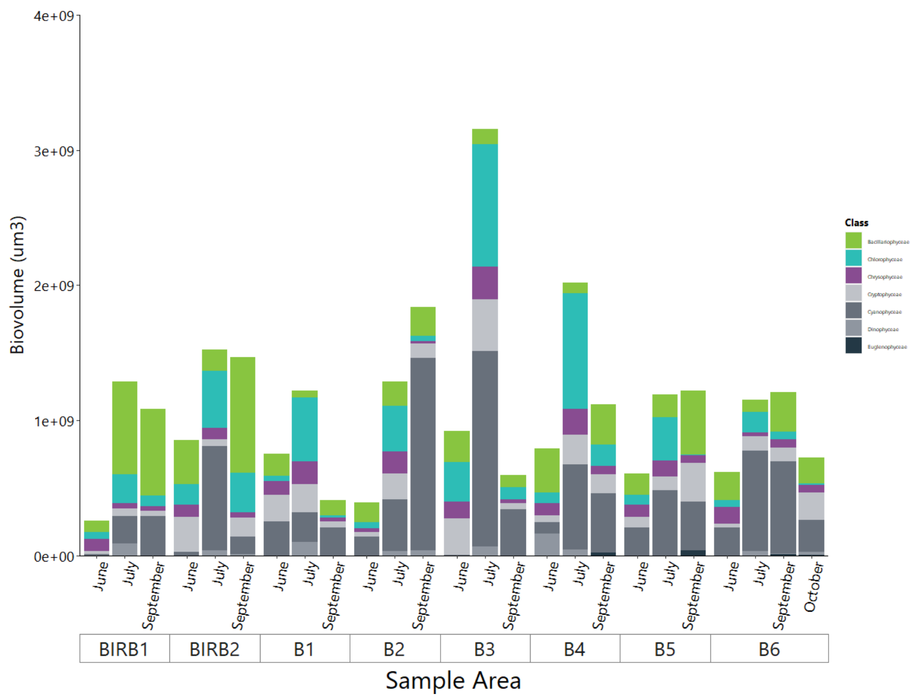


Figure A2-2: Total phytoplankton biovolume (um^3) by taxonomic group for Springpole and Birch Lake, 2021

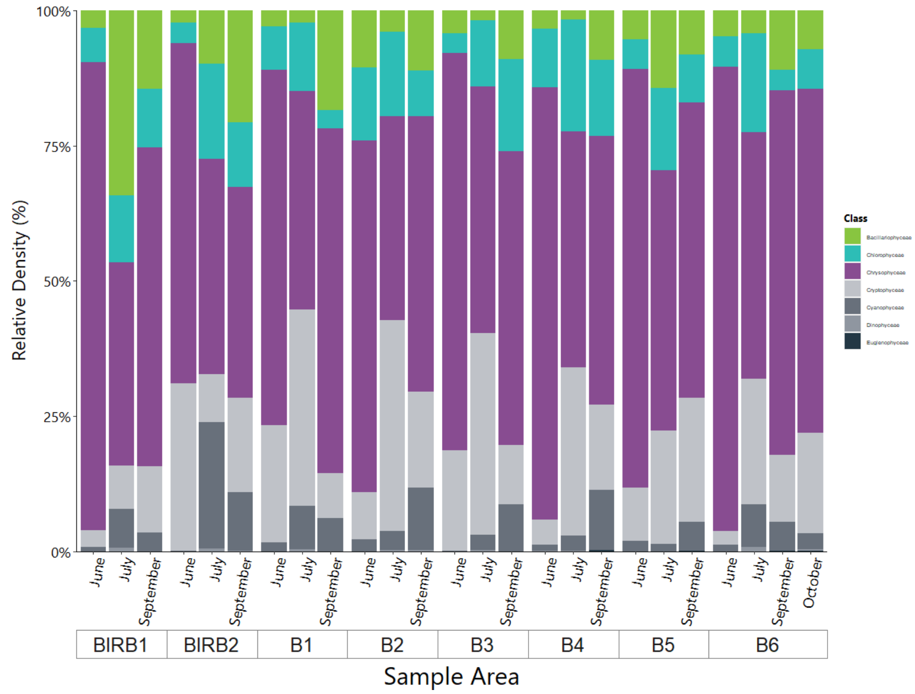


Figure A2-3: Relative phytoplankton density (%) by taxonomic group for Springpole and Birch Lake, 2021

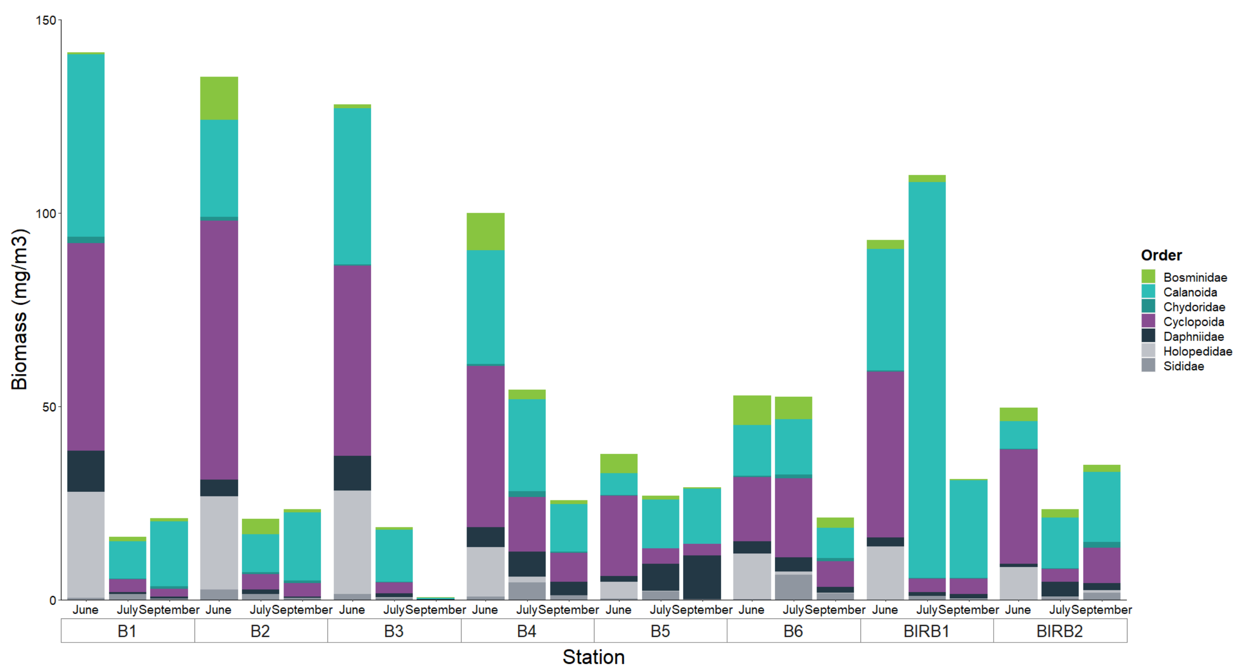


Figure A2-4: Total zooplankton biomass (mg/m^3) by taxonomic group for Springpole and Birch Lake, 2021

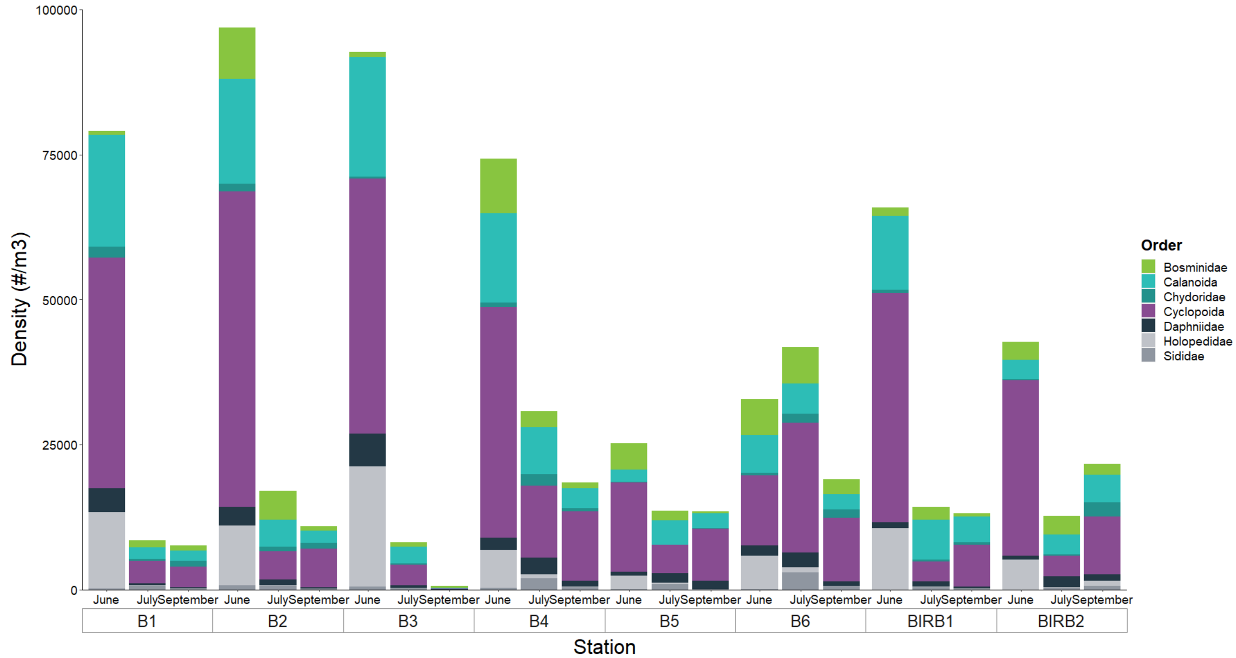


Figure A2-5: Total zooplankton density (#/m^3) by taxonomic group for Springpole and Birch Lake, 2021

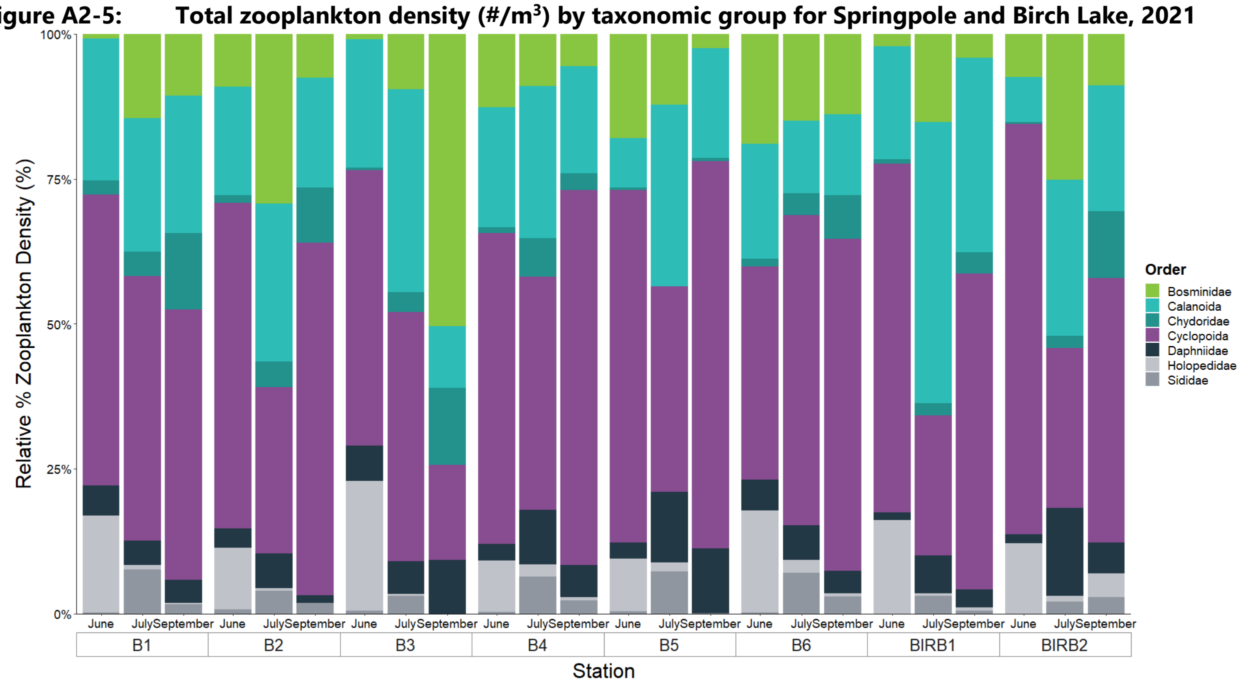


Figure A2-6: Relative zooplankton density (%) by taxonomic group for Springpole and Birch Lake, 2021

Table A2-1: Springpole and Birch Lake Phytoplankton Sample Results, June 2021

Area	Site	Month	Class	Genus	Species	Unit	Units/L	Biovolume Unit (μm^3)	Biovolume (Total μm^3)
Birch	BIRCH-B2	June	Bacillariophyceae	Asterionella	formosa	Single Cell	10000	810	8100000
Birch	BIRCH-B2	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	3000	4000	12000000
Birch	BIRCH-B2	June	Bacillariophyceae	Melosira	sp.	Filament	3000	72000	2.16E+08
Birch	BIRCH-B2	June	Bacillariophyceae	Synedra	sp.	Single Cell	15000	540	8100000
Birch	BIRCH-B2	June	Bacillariophyceae	Synedra	ulna	Single Cell	10000	6000	60000000
Birch	BIRCH-B2	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	8000	2560	20480000
Birch	BIRCH-B2	June	Chlorophyceae	Botryococcus	sp.	Colony	1000	64000	64000000
Birch	BIRCH-B2	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	20000	180	3600000
Birch	BIRCH-B2	June	Chlorophyceae	Kirchneriella	sp.	Colony	5000	3375	16875000
Birch	BIRCH-B2	June	Chlorophyceae	Monoraphidium	sp.	Single Cell	10000	120	1200000
Birch	BIRCH-B2	June	Chlorophyceae	Oocystis	sp.	Colony	1000	8000	8000000
Birch	BIRCH-B2	June	Chlorophyceae	Pediastrum	Boryanum	Colony	1000	10000	10000000
Birch	BIRCH-B2	June	Chlorophyceae	Pediastrum	privum	Colony	5000	900	4500000
Birch	BIRCH-B2	June	Chlorophyceae	Pediastrum	tetras	Colony	5000	1600	8000000
Birch	BIRCH-B2	June	Chlorophyceae	Scenedesmus	sp.	Single Cell	20000	24	480000
Birch	BIRCH-B2	June	Chlorophyceae	Unidentified		Single Cell	10000	1000	10000000
Birch	BIRCH-B2	June	Chlorophyceae	Unidentified		Colony	1000	27000	27000000
Birch	BIRCH-B2	June	Chrysophyceae	Dinobryon	sp.	Single Cell	5000	540	2700000
Birch	BIRCH-B2	June	Chrysophyceae	small chrysophytes		Single Cell	1330000	64	85120000
Birch	BIRCH-B2	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	29000	2000	58000000
Birch	BIRCH-B2	June	Cryptophyceae	Unidentified		Single Cell	626000	324	2.03E+08
Birch	BIRCH-B2	June	Cyanophyceae	Anabaena	sp.	Filament	1000	6480	6480000
Birch	BIRCH-B2	June	Cyanophyceae	Aphanizomenon	sp.	Filament	1000	2880	2880000
Birch	BIRCH-B2	June	Cyanophyceae	Aphanocapsa	sp.	Colony	1000	15625	15625000
Springpole	B5	June	Bacillariophyceae	Asterionella	formosa	Single Cell	50000	810	40500000
Springpole	B5	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	10000	4000	40000000
Springpole	B5	June	Bacillariophyceae	Gomphonema	sp.	Single Cell	1000	9000	9000000
Springpole	B5	June	Bacillariophyceae	Rhizosolenia	sp.	Single Cell	10000	1125	11250000
Springpole	B5	June	Bacillariophyceae	Synedra	sp.	Single Cell	2000	540	1080000
Springpole	B5	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	20000	2800	56000000
Springpole	B5	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	34000	180	6120000
Springpole	B5	June	Chlorophyceae	Pediastrum	tetras	Colony	1000	2500	2500000
Springpole	B5	June	Chlorophyceae	Scenedesmus	sp.	Single Cell	10000	24	240000
Springpole	B5	June	Chlorophyceae	Unidentified		Colony	2000	27000	54000000
Springpole	B5	June	Chlorophyceae	Unidentified		Single Cell	49000	216	10584000
Springpole	B5	June	Chrysophyceae	Bitrichia	sp.	Single Cell	5000	240	1200000
Springpole	B5	June	Chrysophyceae	Dinobryon	sp.	Single Cell	5000	540	2700000
Springpole	B5	June	Chrysophyceae	small chrysophytes		Single Cell	1330000	64	85120000
Springpole	B5	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	15000	2000	30000000

Table A2-1: Springpole and Birch Lake Phytoplankton Sample Results, June 2021

Area	Site	Month	Class	Genus	Species	Unit	Units/L	Biovolume Unit (µm^3)	Biovolume (Total µm^3)
Springpole	B5	June	Cryptophyceae	Unidentified		Single Cell	156000	324	50544000
Springpole	B5	June	Cyanophyceae	Aphanizomenon	sp.	Filament	3000	1600	4800000
Springpole	B5	June	Cyanophyceae	Aphanocapsa	sp.	Colony	25000	8000	2E+08
Springpole	B5	June	Cyanophyceae	Pseudanabaena	sp.	Filament	5000	80	400000
Springpole	B2	June	Bacillariophyceae	Asterionella	formosa	Single Cell	22000	810	17820000
Springpole	B2	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	15000	4000	60000000
Springpole	B2	June	Bacillariophyceae	Synedra	sp.	Single Cell	1000	540	540000
Springpole	B2	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	27000	2560	69120000
Springpole	B2	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	29000	180	5220000
Springpole	B2	June	Chlorophyceae	Unidentified		Colony	1000	27000	27000000
Springpole	B2	June	Chlorophyceae	Unidentified		Single Cell	54000	216	11664000
Springpole	B2	June	Chrysophyceae	Dinobryon	sp.	Single Cell	10000	540	5400000
Springpole	B2	June	Chrysophyceae	small chrysophytes		Single Cell	391000	64	25024000
Springpole	B2	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	10000	2000	20000000
Springpole	B2	June	Cryptophyceae	Unidentified		Single Cell	44000	324	14256000
Springpole	B2	June	Cyanophyceae	Anabaena	sp.	Filament	1000	3240	3240000
Springpole	B2	June	Cyanophyceae	Aphanizomenon	sp.	Filament	1000	1440	1440000
Springpole	B2	June	Cyanophyceae	Aphanocapsa	sp.	Colony	10000	8000	80000000
Springpole	B2	June	Cyanophyceae	Gomphosphaeria	sp.	Colony	2000	27000	54000000
Springpole	B6	June	Bacillariophyceae	Asterionella	formosa	Single Cell	69000	810	55890000
Springpole	B6	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	15000	4000	60000000
Springpole	B6	June	Bacillariophyceae	Melosira	sp.	Filament	1000	42000	42000000
Springpole	B6	June	Bacillariophyceae	Rhizosolenia	sp.	Single Cell	5000	1125	5625000
Springpole	B6	June	Bacillariophyceae	Synedra	sp.	Single Cell	10000	810	8100000
Springpole	B6	June	Bacillariophyceae	Synedra	ulna	Single Cell	2000	9000	18000000
Springpole	B6	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	7000	2800	19600000
Springpole	B6	June	Chlorophyceae	Crucigenia	quadrata	Single Cell	20000	12	240000
Springpole	B6	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	20000	180	3600000
Springpole	B6	June	Chlorophyceae	Quadrigula	sp.	Single Cell	4000	180	720000
Springpole	B6	June	Chlorophyceae	Scenedesmus	quadricauda	Single Cell	20000	160	3200000
Springpole	B6	June	Chlorophyceae	Scenedesmus	sp.	Single Cell	10000	24	240000
Springpole	B6	June	Chlorophyceae	Unidentified		Colony	1000	27000	27000000
Springpole	B6	June	Chlorophyceae	Unidentified		Single Cell	54000	216	11664000
Springpole	B6	June	Chrysophyceae	Dinobryon	bavaricum	Single Cell	5000	540	2700000
Springpole	B6	June	Chrysophyceae	small chrysophytes		Single Cell	1960000	64	1.25E+08
Springpole	B6	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	5000	2000	10000000
Springpole	B6	June	Cryptophyceae	Unidentified		Single Cell	54000	324	17496000
Springpole	B6	June	Cyanophyceae	Anabaena	sp.	Filament	2000	3240	6480000
Springpole	B6	June	Cyanophyceae	Aphanocapsa	sp.	Colony	25000	8000	2E+08
Springpole	B4	June	Bacillariophyceae	Asterionella	formosa	Single Cell	21000	810	17010000

Table A2-1: Springpole and Birch Lake Phytoplankton Sample Results, June 2021

Area	Site	Month	Class	Genus	Species	Unit	Units/L	Biovolume Unit (µm^3)	Biovolume (Total µm^3)
Springpole	B4	June	Bacillariophyceae	Attheya	sp.	Single Cell	5000	2250	11250000
Springpole	B4	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	10000	4000	40000000
Springpole	B4	June	Bacillariophyceae	Melosira	sp.	Filament	4000	25500	1.02E+08
Springpole	B4	June	Bacillariophyceae	Stephanodiscus	sp.	Single Cell	3000	32000	96000000
Springpole	B4	June	Bacillariophyceae	Synedra	sp.	Single Cell	2000	900	1800000
Springpole	B4	June	Bacillariophyceae	Synedra	ulna	Single Cell	1000	12500	12500000
Springpole	B4	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	13000	3200	41600000
Springpole	B4	June	Chlorophyceae	Crucigenia	quadrata	Single Cell	59000	12	708000
Springpole	B4	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	39000	180	7020000
Springpole	B4	June	Chlorophyceae	Pediastrum	Boryanum	Colony	1000	57600	57600000
Springpole	B4	June	Chlorophyceae	Scenedesmus	sp.	Single Cell	49000	24	1176000
Springpole	B4	June	Chlorophyceae	Spondylosium	sp.	Filament	1000	4500	4500000
Springpole	B4	June	Chlorophyceae	Unidentified		Single Cell	44000	216	9504000
Springpole	B4	June	Chrysophyceae	small chrysophytes		Single Cell	1410000	64	90240000
Springpole	B4	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	2000	12000	24000000
Springpole	B4	June	Cryptophyceae	Unidentified		Single Cell	78000	324	25272000
Springpole	B4	June	Cyanophyceae	Anabaena	sp.	Filament	1000	3600	3600000
Springpole	B4	June	Cyanophyceae	Aphanocapsa	sp.	Colony	10000	8000	80000000
Springpole	B4	June	Cyanophyceae	Pseudanabaena	sp.	Filament	10000	480	4800000
Springpole	B4	June	Dinophyceae	Ceratium	hirundinella	Single Cell	2000	80000	1.6E+08
Springpole	B1	June	Bacillariophyceae	Asterionella	formosa	Single Cell	27000	810	21870000
Springpole	B1	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	25000	4000	1E+08
Springpole	B1	June	Bacillariophyceae	Melosira	sp.	Filament	1000	6000	6000000
Springpole	B1	June	Bacillariophyceae	Synedra	sp.	Single Cell	3000	540	1620000
Springpole	B1	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	13000	2560	33280000
Springpole	B1	June	Chlorophyceae	Botryococcus	sp.	Colony	1000	15625	15625000
Springpole	B1	June	Chlorophyceae	Crucigenia	quadrata	Single Cell	78000	12	936000
Springpole	B1	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	49000	180	8820000
Springpole	B1	June	Chlorophyceae	Kirchneriella	sp.	Colony	5000	800	4000000
Springpole	B1	June	Chlorophyceae	Unidentified		Single Cell	49000	216	10584000
Springpole	B1	June	Chrysophyceae	Bitrichia	sp.	Single Cell	5000	240	1200000
Springpole	B1	June	Chrysophyceae	Dinobryon	sp.	Single Cell	5000	540	2700000
Springpole	B1	June	Chrysophyceae	small chrysophytes		Single Cell	1490000	64	95360000
Springpole	B1	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	25000	2000	50000000
Springpole	B1	June	Cryptophyceae	Unidentified		Single Cell	469000	324	1.52E+08
Springpole	B1	June	Cyanophyceae	Anabaena	sp.	Filament	2000	3240	6480000
Springpole	B1	June	Cyanophyceae	Aphanizomenon	sp.	Filament	1000	960	960000
Springpole	B1	June	Cyanophyceae	Aphanocapsa	sp.	Colony	29000	8000	2.32E+08
Springpole	B1	June	Cyanophyceae	Gomphosphaeria	sp.	Colony	1000	8000	8000000
Springpole	B1	June	Cyanophyceae	Pseudanabaena	sp.	Filament	5000	480	2400000

Table A2-1: Springpole and Birch Lake Phytoplankton Sample Results, June 2021

Area	Site	Month	Class	Genus	Species	Unit	Units/L	Biovolume Unit (µm^3)	Biovolume (Total µm^3)
Birch	BIRCH-B1	June	Bacillariophyceae	Asterionella	formosa	Single Cell	27000	810	21870000
Birch	BIRCH-B1	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	2000	4000	8000000
Birch	BIRCH-B1	June	Bacillariophyceae	Synedra	sp.	Single Cell	15000	720	10800000
Birch	BIRCH-B1	June	Bacillariophyceae	Synedra	ulna	Single Cell	5000	6500	32500000
Birch	BIRCH-B1	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	4000	2560	10240000
Birch	BIRCH-B1	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	5000	180	900000
Birch	BIRCH-B1	June	Chlorophyceae	Oocystis	sp.	Colony	1000	27000	27000000
Birch	BIRCH-B1	June	Chlorophyceae	Unidentified		Single Cell	98000	216	21168000
Birch	BIRCH-B1	June	Chrysophyceae	Dinobryon	sp.	Single Cell	1000	540	540000
Birch	BIRCH-B1	June	Chrysophyceae	small chrysophytes		Single Cell	1410000	64	90240000
Birch	BIRCH-B1	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	2000	2000	4000000
Birch	BIRCH-B1	June	Cryptophyceae	Unidentified		Single Cell	49000	324	15876000
Birch	BIRCH-B1	June	Cyanophyceae	Anabaena	sp.	Filament	4000	2160	8640000
Birch	BIRCH-B1	June	Cyanophyceae	Aphanizomenon	sp.	Filament	4000	640	2560000
Birch	BIRCH-B1	June	Cyanophyceae	Pseudanabaena	sp.	Filament	5000	240	1200000
Springpole	B3	June	Bacillariophyceae	Asterionella	formosa	Single Cell	31000	810	25110000
Springpole	B3	June	Bacillariophyceae	Cyclotella	sp.	Single Cell	10000	4000	40000000
Springpole	B3	June	Bacillariophyceae	Fragilaria	crotonensis	Single Cell	16000	1760	28160000
Springpole	B3	June	Bacillariophyceae	Melosira	sp.	Filament	1000	9000	9000000
Springpole	B3	June	Bacillariophyceae	Synedra	sp.	Single Cell	2000	810	1620000
Springpole	B3	June	Bacillariophyceae	Tabellaria	sp.	Single Cell	49000	2560	1.25E+08
Springpole	B3	June	Chlorophyceae	Botryococcus	sp.	Colony	1000	144000	1.44E+08
Springpole	B3	June	Chlorophyceae	Crucigenia	quadrata	Single Cell	20000	12	240000
Springpole	B3	June	Chlorophyceae	Elakatothrix	sp.	Single Cell	25000	180	4500000
Springpole	B3	June	Chlorophyceae	Oocystis	sp.	Colony	5000	27000	1.35E+08
Springpole	B3	June	Chlorophyceae	Unidentified		Single Cell	44000	216	9504000
Springpole	B3	June	Chrysophyceae	Dinobryon	sp.	Single Cell	5000	540	2700000
Springpole	B3	June	Chrysophyceae	small chrysophytes		Single Cell	1880000	64	1.2E+08
Springpole	B3	June	Cryptophyceae	Cryptomonas	sp.	Single Cell	10000	12000	1.2E+08
Springpole	B3	June	Cryptophyceae	Unidentified		Single Cell	469000	324	1.52E+08
Springpole	B3	June	Cyanophyceae	Anabaena	sp.	Filament	1000	3240	3240000
Springpole	B3	June	Cyanophyceae	Aphanizomenon	sp.	Filament	1000	1760	1760000

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B1	June	Spring	118	Chydoridae	Chydorus sphaericus	70	0.28	14	50	1883.239	0.248501	0.921505	1.735414
Springpole	B1	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	70	0.28	28	100	3766.478	0.761878	2.650219	9.981992
Springpole	B1	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	70	0.28	3	10.71429	403.5513	0.666787	1.599376	0.64543
Springpole	B1	June	Spring	135	Holopedidae	Holopedium gibberum	35	0.14	49	350	13182.67	0.539014	2.084403	27.47801
Springpole	B1	June	Spring	152	Sididae	Diaphanosoma birgei	70	0.28	1	3.571429	134.5171	0.576207	2.841944	0.38229
Springpole	B1	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	70	0.28	5	17.85714	672.5854	0.228553	0.665532	0.447627
Springpole	B1	June	Spring	201	Calanoida	Calanoid copepodid	20	0.08	17	212.5	8003.766	0.804657	3.297957	26.39608
Springpole	B1	June	Spring	204	Calanoida	Leptodiaptomus minutus	70	0.28	22	78.57143	2959.376	0.8657	3.896466	11.53111
Springpole	B1	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	70	0.28	6	21.42857	807.1025	1.042746	6.111385	4.932514
Springpole	B1	June	Spring	211	Calanoida	Epischura lacustris copepodid	70	0.28	34	121.4286	4573.581	0.438796	0.767592	3.510644
Springpole	B1	June	Spring	215	Calanoida	Calanoid nauplius	70	0.28	22	78.57143	2959.376	0.248488	0.287584	0.85107
Springpole	B1	June	Spring	301	Cyclopoida	Cyclopoid copepodid	5	0.02	19	950	35781.54	0.475731	0.928267	33.21483
Springpole	B1	June	Spring	302	Cyclopoida	Diacyclops thomasi	70	0.28	13	46.42857	1748.722	0.83969	4.140797	7.241103
Springpole	B1	June	Spring	309	Cyclopoida	Mesocyclops edax	70	0.28	11	39.28571	1479.688	1.176935	8.569226	12.67978
Springpole	B1	June	Spring	313	Cyclopoida	Cyclopoid nauplius	70	0.28	4	14.28571	538.0683	0.206946	0.198498	0.106805
Springpole	B1	June	Spring	320	Cyclopoida	Acanthocyclops sp.	70	0.28	1	3.571429	134.5171	0.756771	2.770861	0.372728
Springpole	B2	June	Spring	118	Chydoridae	Chydorus sphaericus	50	0.2	7	35	1318.267	0.229147	0.802258	1.057591
Springpole	B2	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	50	0.2	13	65	2448.211	0.622221	1.498451	3.668524
Springpole	B2	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	50	0.2	4	20	753.2957	0.548997	1.011502	0.76196
Springpole	B2	June	Spring	135	Holopedidae	Holopedium gibberum	45	0.18	49	272.2222	10253.19	0.553677	2.350302	24.0981
Springpole	B2	June	Spring	152	Sididae	Diaphanosoma birgei	50	0.2	4	20	753.2957	0.676125	3.363571	2.533764
Springpole	B2	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	50	0.2	47	235	8851.224	0.289124	1.268562	11.22833
Springpole	B2	June	Spring	201	Calanoida	Calanoid copepodid	25	0.1	17	170	6403.013	0.574116	1.460092	9.34899
Springpole	B2	June	Spring	204	Calanoida	Leptodiaptomus minutus	50	0.2	12	60	2259.887	0.81127	3.316396	7.494679
Springpole	B2	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	50	0.2	2	10	376.6478	1.116083	7.228518	2.722606
Springpole	B2	June	Spring	209	Calanoida	Leptodiaptomus siciloides	50	0.2	1	5	188.3239	0.961934	4.99919	0.941467
Springpole	B2	June	Spring	211	Calanoida	Epischura lacustris copepodid	25	0.1	19	190	7156.309	0.396596	0.583161	4.173283
Springpole	B2	June	Spring	215	Calanoida	Calanoid nauplius	50	0.2	9	45	1694.915	0.191458	0.181596	0.307791
Springpole	B2	June	Spring	301	Cyclopoida	Cyclopoid copepodid	5	0.02	25	1250	47080.98	0.460157	0.921027	43.36284
Springpole	B2	June	Spring	302	Cyclopoida	Diacyclops thomasi	50	0.2	31	155	5838.041	0.751253	3.341491	19.50776
Springpole	B2	June	Spring	309	Cyclopoida	Mesocyclops edax	50	0.2	3	15	564.9718	1.089389	6.820719	3.853513
Springpole	B2	June	Spring	313	Cyclopoida	Cyclopoid nauplius	50	0.2	5	25	941.6196	0.191253	0.17281	0.162721
Springpole	B3	June	Spring	118	Chydoridae	Chydorus sphaericus	55	0.22	2	9.090909	342.4071	0.269642	1.051773	0.360134
Springpole	B3	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	55	0.22	27	122.7273	4622.496	0.655942	1.738883	8.037978
Springpole	B3	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	55	0.22	6	27.27273	1027.221	0.540592	0.904426	0.929046
Springpole	B3	June	Spring	135	Holopedidae	Holopedium gibberum	25	0.1	55	550	20715.63	0.441768	1.28888	26.69996

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B3	June	Spring	152	Sididae	Diaphanosoma birgei	55	0.22	3	13.63636	513.6107	0.594347	2.93963	1.509825
Springpole	B3	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	55	0.22	5	22.72727	856.0178	0.274949	1.093893	0.936392
Springpole	B3	June	Spring	201	Calanoida	Calanoid copepodid	20	0.08	20	250	9416.196	0.681599	2.289809	21.56129
Springpole	B3	June	Spring	204	Calanoida	Leptodiaptomus minutus	55	0.22	20	90.90909	3424.071	0.840475	3.630499	12.43109
Springpole	B3	June	Spring	209	Calanoida	Leptodiaptomus siciloides	55	0.22	4	18.18182	684.8142	0.829157	3.507745	2.402154
Springpole	B3	June	Spring	211	Calanoida	Epischura lacustris copepodid	55	0.22	28	127.2727	4793.7	0.427346	0.726995	3.484996
Springpole	B3	June	Spring	215	Calanoida	Calanoid nauplius	55	0.22	13	59.09091	2225.646	0.209997	0.214954	0.478411
Springpole	B3	June	Spring	301	Cyclopoida	Cyclopoid copepodid	5	0.02	20	1000	37664.78	0.420569	0.746913	28.13232
Springpole	B3	June	Spring	302	Cyclopoida	Diacyclops thomasi	55	0.22	20	90.90909	3424.071	0.767425	3.485268	11.9338
Springpole	B3	June	Spring	309	Cyclopoida	Mesocyclops edax	55	0.22	10	45.45455	1712.036	0.94589	5.171846	8.854385
Springpole	B3	June	Spring	313	Cyclopoida	Cyclopoid nauplius	55	0.22	7	31.81818	1198.425	0.191196	0.175283	0.210064
Springpole	B4	June	Spring	118	Chydoridae	Chydorus sphaericus	75	0.3	6	20	753.2957	0.209598	0.649278	0.489099
Springpole	B4	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	75	0.3	10	33.33333	1255.493	0.822213	3.274352	4.110926
Springpole	B4	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	75	0.3	7	23.33333	878.8449	0.591633	1.263116	1.110084
Springpole	B4	June	Spring	135	Holopedidae	Holopedium gibberum	75	0.3	52	173.3333	6528.562	0.515416	1.945979	12.70445
Springpole	B4	June	Spring	152	Sididae	Diaphanosoma birgei	75	0.3	2	6.666667	251.0986	0.623118	3.087379	0.775236
Springpole	B4	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	45	0.18	45	250	9416.196	0.266564	1.02323	9.634934
Springpole	B4	June	Spring	201	Calanoida	Calanoid copepodid	35	0.14	21	150	5649.718	0.622694	2.044604	11.55143
Springpole	B4	June	Spring	204	Calanoida	Leptodiaptomus minutus	75	0.3	15	50	1883.239	0.854793	3.812781	7.180379
Springpole	B4	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	75	0.3	8	26.66667	1004.394	0.98953	5.438794	5.462693
Springpole	B4	June	Spring	209	Calanoida	Leptodiaptomus siciloides	75	0.3	3	10	376.6478	0.910613	4.399855	1.657196
Springpole	B4	June	Spring	211	Calanoida	Epischura lacustris copepodid	35	0.14	16	114.2857	4304.547	0.430098	0.70135	3.018996
Springpole	B4	June	Spring	215	Calanoida	Calanoid nauplius	75	0.3	17	56.66667	2134.338	0.234434	0.259358	0.553558
Springpole	B4	June	Spring	301	Cyclopoida	Cyclopoid copepodid	5	0.02	19	950	35781.54	0.446913	0.813603	29.11196
Springpole	B4	June	Spring	302	Cyclopoida	Diacyclops thomasi	75	0.3	12	40	1506.591	0.751467	3.328286	5.014367
Springpole	B4	June	Spring	309	Cyclopoida	Mesocyclops edax	75	0.3	7	23.33333	878.8449	1.015676	6.343211	5.574699
Springpole	B4	June	Spring	313	Cyclopoida	Cyclopoid nauplius	75	0.3	10	33.33333	1255.493	0.192855	0.175876	0.220811
Springpole	B4	June	Spring	320	Cyclopoida	Acanthocyclops sp.	75	0.3	3	10	376.6478	0.939646	4.7655	1.794915
Springpole	B5	June	Spring	118	Chydoridae	Chydorus sphaericus	200	0.8	2	2.5	94.16196	0.267926	1.114689	0.104961
Springpole	B5	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	200	0.8	14	17.5	659.1337	0.712665	2.271414	1.497165
Springpole	B5	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	200	0.8	1	1.25	47.08098	0.544099	0.887759	0.041797
Springpole	B5	June	Spring	135	Holopedidae	Holopedium gibberum	200	0.8	49	61.25	2306.968	0.520359	1.894083	4.369588
Springpole	B5	June	Spring	152	Sididae	Diaphanosoma birgei	200	0.8	2	2.5	94.16196	0.480526	2.350456	0.221324
Springpole	B5	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	110	0.44	53	120.4545	4536.894	0.275532	1.09412	4.963907
Springpole	B5	June	Spring	201	Calanoida	Calanoid copepodid	200	0.8	19	23.75	894.5386	0.716059	2.527237	2.260711
Springpole	B5	June	Spring	204	Calanoida	Leptodiaptomus minutus	200	0.8	8	10	376.6478	0.836808	3.586362	1.350796
Springpole	B5	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	200	0.8	2	2.5	94.16196	1.119803	7.362959	0.693311

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B5	June	Spring	209	Calanoida	Leptodiaptomus siciloides	200	0.8	1	1.25	47.08098	0.849019	3.677049	0.173119
Springpole	B5	June	Spring	210	Calanoida	Epischura lacustris	200	0.8	1	1.25	47.08098	1.522775	15.47556	0.728604
Springpole	B5	June	Spring	211	Calanoida	Epischura lacustris copepodid	200	0.8	10	12.5	470.8098	0.467562	0.993717	0.467852
Springpole	B5	June	Spring	215	Calanoida	Calanoid nauplius	200	0.8	5	6.25	235.4049	0.244457	0.273693	0.064429
Springpole	B5	June	Spring	301	Cyclopoida	Cyclopoid copepodid	20	0.08	25	312.5	11770.24	0.457397	0.905722	10.66057
Springpole	B5	June	Spring	302	Cyclopoida	Diacyclops thomasi	200	0.8	43	53.75	2024.482	0.731999	3.197667	6.473619
Springpole	B5	June	Spring	309	Cyclopoida	Mesocyclops edax	200	0.8	7	8.75	329.5669	0.998833	5.864998	1.932909
Springpole	B5	June	Spring	313	Cyclopoida	Cyclopoid nauplius	200	0.8	14	17.5	659.1337	0.179688	0.158769	0.10465
Springpole	B5	June	Spring	320	Cyclopoida	Acanthocyclops sp.	200	0.8	12	15	564.9718	0.746968	2.791485	1.57711
Springpole	B6	June	Spring	118	Chydoridae	Chydorus sphaericus	140	0.56	6	10.71429	403.5513	0.23937	0.834229	0.336654
Springpole	B6	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	140	0.56	21	37.5	1412.429	0.692582	2.068321	2.921357
Springpole	B6	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	140	0.56	5	8.928571	336.2927	0.527194	0.905909	0.30465
Springpole	B6	June	Spring	135	Holopedidae	Holopedium gibberum	80	0.32	49	153.125	5767.42	0.513321	2.031183	11.71468
Springpole	B6	June	Spring	152	Sididae	Diaphanosoma birgei	140	0.56	1	1.785714	67.25854	0.431899	2.099711	0.141224
Springpole	B6	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	80	0.32	53	165.625	6238.23	0.283834	1.229978	7.672886
Springpole	B6	June	Spring	201	Calanoida	Calanoid copepodid	60	0.24	18	75	2824.859	0.663088	2.180866	6.160639
Springpole	B6	June	Spring	204	Calanoida	Leptodiaptomus minutus	140	0.56	20	35.71429	1345.171	0.815114	3.377843	4.543777
Springpole	B6	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	140	0.56	3	5.357143	201.7756	1.066893	6.462842	1.304044
Springpole	B6	June	Spring	211	Calanoida	Epischura lacustris copepodid	140	0.56	22	39.28571	1479.688	0.415982	0.669329	0.990398
Springpole	B6	June	Spring	215	Calanoida	Calanoid nauplius	140	0.56	10	17.85714	672.5854	0.188035	0.176807	0.118918
Springpole	B6	June	Spring	301	Cyclopoida	Cyclopoid copepodid	20	0.08	21	262.5	9887.006	0.465615	0.899998	8.898284
Springpole	B6	June	Spring	302	Cyclopoida	Diacyclops thomasi	140	0.56	14	25	941.6196	0.715268	3.063871	2.885001
Springpole	B6	June	Spring	309	Cyclopoida	Mesocyclops edax	140	0.56	10	17.85714	672.5854	0.968008	5.380643	3.618942
Springpole	B6	June	Spring	313	Cyclopoida	Cyclopoid nauplius	140	0.56	1	1.785714	67.25854	0.143856	0.108137	0.007273
Springpole	B6	June	Spring	320	Cyclopoida	Acanthocyclops sp.	140	0.56	8	14.28571	538.0683	0.67164	2.147145	1.155311
Birch	BIRCH-B1	June	Spring	115	Daphniidae	Ceriodaphnia sp.	100	0.4	1	2.5	94.16196	0.234459	0.081276	0.007653
Birch	BIRCH-B1	June	Spring	118	Chydoridae	Chydorus sphaericus	100	0.4	6	15	564.9718	0.206606	0.654855	0.369974
Birch	BIRCH-B1	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	100	0.4	5	12.5	470.8098	0.913417	4.196533	1.975769
Birch	BIRCH-B1	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	100	0.4	4	10	376.6478	0.587541	1.239575	0.466883
Birch	BIRCH-B1	June	Spring	135	Holopedidae	Holopedium gibberum	40	0.16	45	281.25	10593.22	0.464834	1.28891	13.65371
Birch	BIRCH-B1	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	100	0.4	15	37.5	1412.429	0.320307	1.621306	2.289981
Birch	BIRCH-B1	June	Spring	201	Calanoida	Calanoid copepodid	40	0.16	42	262.5	9887.006	0.72768	2.586417	25.57192
Birch	BIRCH-B1	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	100	0.4	3	7.5	282.4859	0.910732	4.375587	1.236042
Birch	BIRCH-B1	June	Spring	209	Calanoida	Leptodiaptomus siciloides	100	0.4	1	2.5	94.16196	0.91202	4.385033	0.412903
Birch	BIRCH-B1	June	Spring	210	Calanoida	Epischura lacustris	100	0.4	2	5	188.3239	1.452308	13.80016	2.598899
Birch	BIRCH-B1	June	Spring	211	Calanoida	Epischura lacustris copepodid	100	0.4	20	50	1883.239	0.431055	0.782346	1.473345
Birch	BIRCH-B1	June	Spring	215	Calanoida	Calanoid nauplius	100	0.4	5	12.5	470.8098	0.226121	0.237152	0.111654

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Birch	BIRCH-B1	June	Spring	301	Cyclopoida	Cyclopoid copepodid	5	0.02	17	850	32015.07	0.434591	0.767331	24.56615
Birch	BIRCH-B1	June	Spring	302	Cyclopoida	Diacyclops thomasi	100	0.4	55	137.5	5178.908	0.708022	2.953515	15.29598
Birch	BIRCH-B1	June	Spring	309	Cyclopoida	Mesocyclops edax	100	0.4	4	10	376.6478	0.965144	5.570676	2.098183
Birch	BIRCH-B1	June	Spring	313	Cyclopoida	Cyclopoid nauplius	100	0.4	18	45	1694.915	0.171371	0.145219	0.246134
Birch	BIRCH-B1	June	Spring	320	Cyclopoida	Acanthocyclops sp.	100	0.4	3	7.5	282.4859	0.699205	2.297661	0.649057
Birch	BIRCH-B2	June	Spring	115	Daphniidae	Ceriodaphnia sp.	140	0.56	1	1.785714	67.25854	0.263493	0.113228	0.007616
Birch	BIRCH-B2	June	Spring	118	Chydoridae	Chydorus sphaericus	140	0.56	2	3.571429	134.5171	0.228238	0.78294	0.105319
Birch	BIRCH-B2	June	Spring	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	140	0.56	6	10.71429	403.5513	0.54013	0.948699	0.382849
Birch	BIRCH-B2	June	Spring	127	Daphniidae	Daphnia (Daphnia) retrocurva	140	0.56	3	5.357143	201.7756	0.683711	1.965157	0.396521
Birch	BIRCH-B2	June	Spring	135	Holopedidae	Holopedium gibberum	100	0.4	55	137.5	5178.908	0.486636	1.624545	8.413369
Birch	BIRCH-B2	June	Spring	188	Bosminidae	Bosmina (Bosmina) longirostris	140	0.56	47	83.92857	3161.151	0.274552	1.073668	3.394027
Birch	BIRCH-B2	June	Spring	201	Calanoida	Calanoid copepodid	100	0.4	21	52.5	1977.401	0.736584	2.662264	5.264364
Birch	BIRCH-B2	June	Spring	204	Calanoida	Leptodiaptomus minutus	140	0.56	3	5.357143	201.7756	0.803896	3.221542	0.650029
Birch	BIRCH-B2	June	Spring	205	Calanoida	Skistodiaptomus oregonensis	140	0.56	1	1.785714	67.25854	0.922174	4.506115	0.303075
Birch	BIRCH-B2	June	Spring	209	Calanoida	Leptodiaptomus siciloides	140	0.56	2	3.571429	134.5171	0.809795	3.273168	0.440297
Birch	BIRCH-B2	June	Spring	211	Calanoida	Epischura lacustris copepodid	140	0.56	13	23.21429	874.361	0.390187	0.570219	0.498577
Birch	BIRCH-B2	June	Spring	215	Calanoida	Calanoid nauplius	140	0.56	1	1.785714	67.25854	0.224233	0.233488	0.015704
Birch	BIRCH-B2	June	Spring	301	Cyclopoida	Cyclopoid copepodid	10	0.04	28	700	26365.35	0.428709	0.754681	19.89742
Birch	BIRCH-B2	June	Spring	302	Cyclopoida	Diacyclops thomasi	140	0.56	39	69.64286	2623.083	0.680513	2.730256	7.161688
Birch	BIRCH-B2	June	Spring	309	Cyclopoida	Mesocyclops edax	140	0.56	5	8.928571	336.2927	0.932307	4.961138	1.668394
Birch	BIRCH-B2	June	Spring	313	Cyclopoida	Cyclopoid nauplius	140	0.56	10	17.85714	672.5854	0.179139	0.157522	0.105947
Birch	BIRCH-B2	June	Spring	320	Cyclopoida	Acanthocyclops sp.	140	0.56	4	7.142857	269.0342	0.789129	3.196962	0.860092
Springpole	B1	July	Summer	115	Daphniidae	Ceriodaphnia sp.	25	0.1	3	30	62.78252	0.258296	0.137445	0.008629
Springpole	B1	July	Summer	118	Chydoridae	Chydorus sphaericus	25	0.1	17	170	355.7676	0.2211	0.734257	0.261225
Springpole	B1	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	25	0.1	8	80	167.4201	0.703075	2.121881	0.355245
Springpole	B1	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	25	0.1	6	60	125.565	0.523742	0.935936	0.117521
Springpole	B1	July	Summer	135	Holopedidae	Holopedium gibberum	25	0.1	3	30	62.78252	0.375788	0.676397	0.042466
Springpole	B1	July	Summer	152	Sididae	Diaphanosoma birgei	25	0.1	31	310	648.7527	0.444672	2.165988	1.40519
Springpole	B1	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	25	0.1	59	590	1234.723	0.264302	0.958601	1.183606
Springpole	B1	July	Summer	201	Calanoida	Calanoid copepodid	10	0.04	26	650	1360.288	0.7471	2.738111	3.72462
Springpole	B1	July	Summer	204	Calanoida	Leptodiaptomus minutus	25	0.1	4	40	83.71003	0.794635	3.185953	0.266696
Springpole	B1	July	Summer	211	Calanoida	Epischura lacustris copepodid	25	0.1	10	100	209.2751	0.3512	0.436829	0.091417
Springpole	B1	July	Summer	212	Calanoida	Limnocalanus macrurus	25	0.1	7	70	146.4925	2.062607	32.67082	4.786032
Springpole	B1	July	Summer	215	Calanoida	Calanoid nauplius	25	0.1	6	60	125.565	0.208859	0.20962	0.026321
Springpole	B1	July	Summer	218	Calanoida	Limnocalanus macrurus copepodid	25	0.1	1	10	20.92751	2.141675	35.81099	0.749435
Springpole	B1	July	Summer	301	Cyclopoida	Cyclopoid copepodid	5	0.02	31	1550	3243.764	0.415147	0.694092	2.25147
Springpole	B1	July	Summer	302	Cyclopoida	Diacyclops thomasi	25	0.1	4	40	83.71003	0.638922	2.39481	0.20047

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B1	July	Summer	309	Cyclopoida	Mesocyclops edax	25	0.1	13	130	272.0576	0.725675	2.614626	0.711329
Springpole	B1	July	Summer	313	Cyclopoida	Cyclopoid nauplius	25	0.1	10	100	209.2751	0.177294	0.15405	0.032239
Springpole	B1	July	Summer	320	Cyclopoida	Acanthocyclops sp.	25	0.1	3	30	62.78252	0.541525	1.224597	0.076883
Springpole	B2	July	Summer	115	Daphniidae	Ceriodaphnia sp.	26	0.104	7	67.30769	195.0382	0.321385	0.241781	0.047157
Springpole	B2	July	Summer	118	Chydoridae	Chydorus sphaericus	26	0.104	27	259.6154	752.2903	0.193341	0.556321	0.418515
Springpole	B2	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	26	0.104	19	182.6923	529.3895	0.651681	1.743813	0.923156
Springpole	B2	July	Summer	123	Daphniidae	Daphnia (Hyalodaphnia) longiremis	26	0.104	1	9.615385	27.8626	0.602594	1.186428	0.033057
Springpole	B2	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	26	0.104	9	86.53846	250.7634	0.50708	0.77551	0.194469
Springpole	B2	July	Summer	135	Holopedidae	Holopedium gibberum	26	0.104	3	28.84615	83.58781	0.390185	0.832847	0.069616
Springpole	B2	July	Summer	152	Sididae	Diaphanosoma birgei	26	0.104	24	230.7692	668.7025	0.431771	2.101149	1.405044
Springpole	B2	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	7	0.028	48	1714.286	4967.504	0.246208	0.803125	3.989525
Springpole	B2	July	Summer	201	Calanoida	Calanoid copepodid	5	0.02	24	1200	3477.253	0.649443	2.032887	7.068863
Springpole	B2	July	Summer	204	Calanoida	Leptodiaptomus minutus	26	0.104	7	67.30769	195.0382	0.732702	2.678056	0.522323
Springpole	B2	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	26	0.104	5	48.07692	139.313	0.856309	3.777381	0.526238
Springpole	B2	July	Summer	209	Calanoida	Leptodiaptomus siciloides	26	0.104	6	57.69231	167.1756	0.715387	2.464881	0.412068
Springpole	B2	July	Summer	211	Calanoida	Epischura lacustris copepodid	26	0.104	16	153.8462	445.8017	0.444815	1.021721	0.455485
Springpole	B2	July	Summer	212	Calanoida	Limnocalanus macrurus	26	0.104	1	9.615385	27.8626	1.945022	28.25639	0.787297
Springpole	B2	July	Summer	215	Calanoida	Calanoid nauplius	26	0.104	7	67.30769	195.0382	0.183135	0.172632	0.03367
Springpole	B2	July	Summer	301	Cyclopoida	Cyclopoid copepodid	4	0.016	24	1500	4346.566	0.420166	0.74207	3.225457
Springpole	B2	July	Summer	302	Cyclopoida	Diacyclops thomasi	26	0.104	3	28.84615	83.58781	0.577685	1.987936	0.166167
Springpole	B2	July	Summer	309	Cyclopoida	Mesocyclops edax	26	0.104	6	57.69231	167.1756	0.653024	1.981519	0.331262
Springpole	B2	July	Summer	313	Cyclopoida	Cyclopoid nauplius	26	0.104	7	67.30769	195.0382	0.173768	0.14769	0.028805
Springpole	B2	July	Summer	320	Cyclopoida	Acanthocyclops sp.	26	0.104	3	28.84615	83.58781	0.741134	2.640317	0.220698
Springpole	B3	July	Summer	115	Daphniidae	Ceriodaphnia sp.	45	0.18	7	38.88889	97.6617	0.333144	0.244924	0.02392
Springpole	B3	July	Summer	118	Chydoridae	Chydorus sphaericus	45	0.18	20	111.1111	279.0334	0.206331	0.648728	0.181017
Springpole	B3	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	45	0.18	18	100	251.1301	0.802365	3.273079	0.821969
Springpole	B3	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	45	0.18	8	44.44444	111.6134	0.57416	1.195859	0.133474
Springpole	B3	July	Summer	135	Holopedidae	Holopedium gibberum	45	0.18	2	11.11111	27.90334	0.448633	1.002229	0.027966
Springpole	B3	July	Summer	152	Sididae	Diaphanosoma birgei	45	0.18	18	100	251.1301	0.418022	2.032752	0.510485
Springpole	B3	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	40	0.16	50	312.5	784.7815	0.235708	0.758343	0.595133
Springpole	B3	July	Summer	201	Calanoida	Calanoid copepodid	10	0.04	35	875	2197.388	0.754125	2.858865	6.282036
Springpole	B3	July	Summer	204	Calanoida	Leptodiaptomus minutus	45	0.18	13	72.22222	181.3717	0.649456	1.93787	0.351475
Springpole	B3	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	45	0.18	9	50	125.565	0.784223	3.054377	0.383523
Springpole	B3	July	Summer	209	Calanoida	Leptodiaptomus siciloides	45	0.18	1	5.555556	13.95167	0.718584	2.439482	0.034035
Springpole	B3	July	Summer	210	Calanoida	Epischura lacustris	45	0.18	1	5.555556	13.95167	1.249777	9.518546	0.1328
Springpole	B3	July	Summer	211	Calanoida	Epischura lacustris copepodid	45	0.18	6	33.33333	83.71003	0.489906	1.378289	0.115377
Springpole	B3	July	Summer	212	Calanoida	Limnocalanus macrurus	45	0.18	15	83.33333	209.2751	1.978882	29.58917	6.192275

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B3	July	Summer	215	Calanoida	Calanoid nauplius	45	0.18	3	16.66667	41.85501	0.185904	0.173224	0.00725
Springpole	B3	July	Summer	301	Cyclopoida	Cyclopoid copepodid	5	0.02	26	1300	3264.691	0.430054	0.74454	2.430692
Springpole	B3	July	Summer	302	Cyclopoida	Diacyclops thomasi	45	0.18	4	22.22222	55.80669	0.587935	2.053159	0.11458
Springpole	B3	July	Summer	309	Cyclopoida	Mesocyclops edax	45	0.18	5	27.77778	69.75836	0.809903	3.595354	0.250806
Springpole	B3	July	Summer	313	Cyclopoida	Cyclopoid nauplius	45	0.18	5	27.77778	69.75836	0.146101	0.111339	0.007767
Springpole	B3	July	Summer	320	Cyclopoida	Acanthocyclops sp.	45	0.18	5	27.77778	69.75836	0.505669	1.052423	0.073415
Springpole	B4	July	Summer	115	Daphniidae	Ceriodaphnia sp.	14	0.056	4	71.42857	269.0747	0.392694	0.360823	0.097088
Springpole	B4	July	Summer	118	Chydoridae	Chydorus sphaericus	14	0.056	30	535.7143	2018.06	0.217314	0.716295	1.445527
Springpole	B4	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	14	0.056	28	500	1883.523	0.762278	2.723683	5.130119
Springpole	B4	July	Summer	123	Daphniidae	Daphnia (Hyalodaphnia) longiremis	14	0.056	1	17.85714	67.26868	0.600092	1.172486	0.078872
Springpole	B4	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	14	0.056	10	178.5714	672.6868	0.657543	1.6624	1.118275
Springpole	B4	July	Summer	135	Holopedidae	Holopedium gibberum	14	0.056	10	178.5714	672.6868	0.551465	2.113385	1.421646
Springpole	B4	July	Summer	152	Sididae	Diaphanosoma birgei	14	0.056	29	517.8571	1950.792	0.470655	2.300688	4.488163
Springpole	B4	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	14	0.056	41	732.1429	2758.016	0.256732	0.895004	2.468436
Springpole	B4	July	Summer	201	Calanoida	Calanoid copepodid	6	0.024	34	1416.667	5336.648	0.703346	2.388678	12.74754
Springpole	B4	July	Summer	204	Calanoida	Leptodiaptomus minutus	14	0.056	10	178.5714	672.6868	0.656899	2.015789	1.355994
Springpole	B4	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	14	0.056	8	142.8571	538.1494	0.862078	3.860709	2.077638
Springpole	B4	July	Summer	209	Calanoida	Leptodiaptomus siciloides	14	0.056	11	196.4286	739.9554	0.72138	2.49434	1.8457
Springpole	B4	July	Summer	210	Calanoida	Epischura lacustris	14	0.056	1	17.85714	67.26868	1.400292	12.591	0.84698
Springpole	B4	July	Summer	211	Calanoida	Epischura lacustris copepodid	14	0.056	5	89.28571	336.3434	0.480426	1.136545	0.382269
Springpole	B4	July	Summer	212	Calanoida	Limnocalanus macrurus	14	0.056	2	35.71429	134.5374	2.092601	33.84065	4.552831
Springpole	B4	July	Summer	215	Calanoida	Calanoid nauplius	14	0.056	4	71.42857	269.0747	0.198776	0.191655	0.051569
Springpole	B4	July	Summer	301	Cyclopoida	Cyclopoid copepodid	2	0.008	21	2625	9888.495	0.412592	0.696447	6.886812
Springpole	B4	July	Summer	302	Cyclopoida	Diacyclops thomasi	14	0.056	19	339.2857	1278.105	0.804714	3.875266	4.952996
Springpole	B4	July	Summer	309	Cyclopoida	Mesocyclops edax	14	0.056	9	160.7143	605.4181	0.821501	3.589637	2.173231
Springpole	B4	July	Summer	313	Cyclopoida	Cyclopoid nauplius	14	0.056	8	142.8571	538.1494	0.173068	0.148297	0.079806
Springpole	B4	July	Summer	320	Cyclopoida	Acanthocyclops sp.	14	0.056	1	17.85714	67.26868	0.61232	1.645619	0.110699
Springpole	B5	July	Summer	115	Daphniidae	Ceriodaphnia sp.	24	0.096	2	20.83333	82.60967	0.305612	0.20514	0.016947
Springpole	B5	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	24	0.096	36	375	1486.974	0.882366	4.54714	6.76148
Springpole	B5	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	24	0.096	2	20.83333	82.60967	0.589723	1.181654	0.097616
Springpole	B5	July	Summer	135	Holopedidae	Holopedium gibberum	24	0.096	5	52.08333	206.5242	0.408887	0.940046	0.194142
Springpole	B5	July	Summer	152	Sididae	Diaphanosoma birgei	24	0.096	24	250	991.3161	0.433682	2.112713	2.094366
Springpole	B5	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	24	0.096	40	416.6667	1652.193	0.222295	0.66036	1.091042
Springpole	B5	July	Summer	201	Calanoida	Calanoid copepodid	20	0.08	33	412.5	1635.672	0.753782	2.883294	4.716122
Springpole	B5	July	Summer	204	Calanoida	Leptodiaptomus minutus	24	0.096	2	20.83333	82.60967	0.698025	2.275247	0.187957
Springpole	B5	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	24	0.096	4	41.66667	165.2193	0.898969	4.241965	0.700855
Springpole	B5	July	Summer	211	Calanoida	Epischura lacustris copepodid	20	0.08	17	212.5	842.6187	0.425013	0.778745	0.656185

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B5	July	Summer	212	Calanoida	Limnocalanus macrurus	24	0.096	5	52.08333	206.5242	1.966982	29.15081	6.020347
Springpole	B5	July	Summer	215	Calanoida	Calanoid nauplius	20	0.08	27	337.5	1338.277	0.204417	0.201582	0.269772
Springpole	B5	July	Summer	301	Cyclopoida	Cyclopoid copepodid	5	0.02	17	850	3370.475	0.425459	0.715622	2.411987
Springpole	B5	July	Summer	302	Cyclopoida	Diacyclops thomasi	24	0.096	10	104.1667	413.0484	0.645771	2.478383	1.023692
Springpole	B5	July	Summer	309	Cyclopoida	Mesocyclops edax	24	0.096	3	31.25	123.9145	0.715986	2.445069	0.302979
Springpole	B5	July	Summer	313	Cyclopoida	Cyclopoid nauplius	20	0.08	16	200	793.0529	0.165559	0.138843	0.11011
Springpole	B5	July	Summer	320	Cyclopoida	Acanthocyclops sp.	24	0.096	2	20.83333	82.60967	0.736569	2.694238	0.22257
Springpole	B5	July	Summer	338	Cyclopoida	Tropocyclops extensus	24	0.096	1	10.41667	41.30484	0.381628	0.514276	0.021242
Springpole	B6	July	Summer	115	Daphniidae	Ceriodaphnia sp.	16	0.064	10	156.25	840.8223	0.331191	0.269788	0.226844
Springpole	B6	July	Summer	118	Chydoridae	Chydorus sphaericus	16	0.064	19	296.875	1597.562	0.199355	0.597052	0.953828
Springpole	B6	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	16	0.064	15	234.375	1261.233	0.691854	2.160968	2.725485
Springpole	B6	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	16	0.064	5	78.125	420.4111	0.616267	1.58351	0.665725
Springpole	B6	July	Summer	135	Holopedidae	Holopedium gibberum	16	0.064	11	171.875	924.9045	0.399057	0.924247	0.85484
Springpole	B6	July	Summer	152	Sididae	Diaphanosoma birgei	16	0.064	35	546.875	2942.878	0.442959	2.159514	6.355187
Springpole	B6	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	12	0.048	56	1166.667	6278.14	0.258626	0.915411	5.74708
Springpole	B6	July	Summer	201	Calanoida	Calanoid copepodid	7	0.028	21	750	4035.947	0.690722	2.384583	9.624049
Springpole	B6	July	Summer	204	Calanoida	Leptodiaptomus minutus	16	0.064	1	15.625	84.08223	0.63363	1.790105	0.150516
Springpole	B6	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	16	0.064	3	46.875	252.2467	0.926207	4.555286	1.149056
Springpole	B6	July	Summer	211	Calanoida	Epischura lacustris copepodid	16	0.064	5	78.125	420.4111	0.371945	0.498576	0.209607
Springpole	B6	July	Summer	212	Calanoida	Limnocalanus macrurus	16	0.064	1	15.625	84.08223	2.18762	37.73059	3.172472
Springpole	B6	July	Summer	215	Calanoida	Calanoid nauplius	16	0.064	4	62.5	336.3289	0.220676	0.228418	0.076824
Springpole	B6	July	Summer	301	Cyclopoida	Cyclopoid copepodid	2	0.008	30	3750	20179.73	0.43888	0.797536	16.09407
Springpole	B6	July	Summer	302	Cyclopoida	Diacyclops thomasi	16	0.064	9	140.625	756.74	0.62957	2.355926	1.782824
Springpole	B6	July	Summer	309	Cyclopoida	Mesocyclops edax	16	0.064	8	125	672.6578	0.812046	3.548867	2.387173
Springpole	B6	July	Summer	313	Cyclopoida	Cyclopoid nauplius	16	0.064	8	125	672.6578	0.145089	0.113241	0.076173
Springpole	B6	July	Summer	320	Cyclopoida	Acanthocyclops sp.	16	0.064	1	15.625	84.08223	0.640709	1.839708	0.154687
Birch	BIRCH-B1	July	Summer	115	Daphniidae	Ceriodaphnia sp.	16	0.064	8	125	392.3908	0.349761	0.3129	0.122779
Birch	BIRCH-B1	July	Summer	118	Chydoridae	Chydorus sphaericus	16	0.064	6	93.75	294.2931	0.204044	0.616411	0.181405
Birch	BIRCH-B1	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	16	0.064	5	78.125	245.2442	0.691882	1.991014	0.488285
Birch	BIRCH-B1	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	16	0.064	6	93.75	294.2931	0.578269	1.219967	0.359028
Birch	BIRCH-B1	July	Summer	135	Holopedidae	Holopedium gibberum	16	0.064	1	15.625	49.04884	0.336004	0.407092	0.019967
Birch	BIRCH-B1	July	Summer	152	Sididae	Diaphanosoma birgei	16	0.064	9	140.625	441.4396	0.404185	1.960124	0.865276
Birch	BIRCH-B1	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	16	0.064	44	687.5	2158.149	0.24299	0.807423	1.742539
Birch	BIRCH-B1	July	Summer	201	Calanoida	Calanoid copepodid	16	0.064	14	218.75	686.6838	0.693637	2.524373	1.733446
Birch	BIRCH-B1	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	16	0.064	4	62.5	196.1954	1.754335	23.99989	4.708667
Birch	BIRCH-B1	July	Summer	211	Calanoida	Epischura lacustris copepodid	16	0.064	4	62.5	196.1954	0.381342	0.522974	0.102605
Birch	BIRCH-B1	July	Summer	212	Calanoida	Limnocalanus macrurus	16	0.064	59	921.875	2893.882	1.996663	30.21165	87.42894

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Birch	BIRCH-B1	July	Summer	215	Calanoida	Calanoid nauplius	16	0.064	13	203.125	637.635	0.180321	0.162561	0.103654
Birch	BIRCH-B1	July	Summer	218	Calanoida	Limnocalanus macrurus copepodid	11	0.044	32	727.2727	2283.001	0.836983	3.596514	8.210845
Birch	BIRCH-B1	July	Summer	301	Cyclopoida	Cyclopoid copepodid	5	0.02	15	750	2354.345	0.484989	1.04475	2.4597
Birch	BIRCH-B1	July	Summer	302	Cyclopoida	Diacyclops thomasi	16	0.064	5	78.125	245.2442	0.774205	3.775116	0.925825
Birch	BIRCH-B1	July	Summer	309	Cyclopoida	Mesocyclops edax	16	0.064	1	15.625	49.04884	0.697489	2.267065	0.111197
Birch	BIRCH-B1	July	Summer	313	Cyclopoida	Cyclopoid nauplius	16	0.064	16	250	784.7815	0.178386	0.155903	0.12235
Birch	BIRCH-B2	July	Summer	115	Daphniidae	Ceriodaphnia sp.	20	0.08	6	75	156.9563	0.336755	0.277077	0.043489
Birch	BIRCH-B2	July	Summer	118	Chydoridae	Chydorus sphaericus	20	0.08	10	125	261.5938	0.243291	0.893605	0.233762
Birch	BIRCH-B2	July	Summer	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	20	0.08	37	462.5	967.8972	0.725092	2.305737	2.231716
Birch	BIRCH-B2	July	Summer	123	Daphniidae	Daphnia (Hyalodaphnia) longiremis	20	0.08	5	62.5	130.7969	0.758244	2.334934	0.305402
Birch	BIRCH-B2	July	Summer	127	Daphniidae	Daphnia (Daphnia) retrocurva	20	0.08	25	312.5	653.9846	0.659694	1.777603	1.162525
Birch	BIRCH-B2	July	Summer	135	Holopedidae	Holopedium gibberum	20	0.08	5	62.5	130.7969	0.481914	1.601559	0.209479
Birch	BIRCH-B2	July	Summer	152	Sididae	Diaphanosoma birgei	20	0.08	10	125	261.5938	0.475735	2.328629	0.609155
Birch	BIRCH-B2	July	Summer	188	Bosminidae	Bosmina (Bosmina) longirostris	10	0.04	61	1525	3191.445	0.227381	0.691945	2.208304
Birch	BIRCH-B2	July	Summer	201	Calanoida	Calanoid copepodid	5	0.02	25	1250	2615.938	0.737489	2.638115	6.901146
Birch	BIRCH-B2	July	Summer	204	Calanoida	Leptodiaptomus minutus	20	0.08	3	37.5	78.47815	0.741873	2.647721	0.207788
Birch	BIRCH-B2	July	Summer	205	Calanoida	Skistodiaptomus oregonensis	20	0.08	1	12.5	26.15938	0.908033	4.338029	0.11348
Birch	BIRCH-B2	July	Summer	211	Calanoida	Epischura lacustris copepodid	20	0.08	10	125	261.5938	0.34274	0.399987	0.104634
Birch	BIRCH-B2	July	Summer	212	Calanoida	Limnocalanus macrurus	20	0.08	7	87.5	183.1157	2.018141	30.96058	5.669368
Birch	BIRCH-B2	July	Summer	215	Calanoida	Calanoid nauplius	20	0.08	9	112.5	235.4345	0.176822	0.160212	0.037719
Birch	BIRCH-B2	July	Summer	301	Cyclopoida	Cyclopoid copepodid	5	0.02	25	1250	2615.938	0.383693	0.572604	1.497897
Birch	BIRCH-B2	July	Summer	302	Cyclopoida	Diacyclops thomasi	20	0.08	13	162.5	340.072	0.668689	2.74744	0.934327
Birch	BIRCH-B2	July	Summer	309	Cyclopoida	Mesocyclops edax	20	0.08	9	112.5	235.4345	0.80968	3.536763	0.832676
Birch	BIRCH-B2	July	Summer	313	Cyclopoida	Cyclopoid nauplius	20	0.08	11	137.5	287.7532	0.163144	0.135217	0.038909
Birch	BIRCH-B2	July	Summer	320	Cyclopoida	Acanthocyclops sp.	20	0.08	1	12.5	26.15938	0.432042	0.697842	0.018255
Springpole	B1	September	Fall	115	Daphniidae	Ceriodaphnia sp.	30	0.12	6	50	104.6375	0.421638	0.480178	0.050245
Springpole	B1	September	Fall	118	Chydoridae	Chydorus sphaericus	30	0.12	57	475	994.0566	0.198933	0.594013	0.590483
Springpole	B1	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	30	0.12	10	83.33333	174.3959	0.758523	2.457509	0.428579
Springpole	B1	September	Fall	127	Daphniidae	Daphnia (Daphnia) retrocurva	30	0.12	1	8.333333	17.43959	0.762348	2.313587	0.040348
Springpole	B1	September	Fall	135	Holopedidae	Holopedium gibberum	30	0.12	1	8.333333	17.43959	0.475807	1.17218	0.020442
Springpole	B1	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	30	0.12	12	100	209.2751	0.251485	0.839418	0.175669
Springpole	B1	September	Fall	152	Sididae	Diaphanosoma birgei	30	0.12	7	58.33333	122.0771	0.459073	2.241592	0.273647
Springpole	B1	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	30	0.12	34	283.3333	592.946	0.269666	0.982504	0.582572
Springpole	B1	September	Fall	201	Calanoida	Calanoid copepodid	10	0.04	22	550	1151.013	0.778532	3.058287	3.520128
Springpole	B1	September	Fall	204	Calanoida	Leptodiaptomus minutus	30	0.12	2	16.66667	34.87918	0.772682	2.933706	0.102325
Springpole	B1	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	30	0.12	2	16.66667	34.87918	0.953638	4.903946	0.171046
Springpole	B1	September	Fall	209	Calanoida	Leptodiaptomus siciloides	30	0.12	1	8.333333	17.43959	0.785661	3.038372	0.052988

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B1	September	Fall	211	Calanoida	Epischura lacustris copepodid	30	0.12	2	16.66667	34.87918	0.450993	0.839324	0.029275
Springpole	B1	September	Fall	212	Calanoida	Limnocalanus macrurus	30	0.12	24	200	418.5501	2.012524	30.83571	12.90629
Springpole	B1	September	Fall	215	Calanoida	Calanoid nauplius	30	0.12	6	50	104.6375	0.17134	0.151194	0.015821
Springpole	B1	September	Fall	301	Cyclopoida	Cyclopoid copepodid	5	0.02	18	900	1883.476	0.36468	0.516394	0.972616
Springpole	B1	September	Fall	302	Cyclopoida	Diacyclops thomasi	30	0.12	17	141.6667	296.473	0.676565	2.734724	0.810772
Springpole	B1	September	Fall	309	Cyclopoida	Mesocyclops edax	30	0.12	2	16.66667	34.87918	0.813121	3.893983	0.135819
Springpole	B1	September	Fall	313	Cyclopoida	Cyclopoid nauplius	10	0.04	25	625	1307.969	0.113043	0.076872	0.100546
Springpole	B2	September	Fall	115	Daphniidae	Ceriodaphnia sp.	38	0.152	2	13.15789	36.71492	0.329783	0.223629	0.008211
Springpole	B2	September	Fall	118	Chydoridae	Chydorus sphaericus	30	0.12	45	375	1046.375	0.204887	0.628663	0.657818
Springpole	B2	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	38	0.152	6	39.47368	110.1448	0.746616	2.549247	0.280786
Springpole	B2	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	38	0.152	6	39.47368	110.1448	0.27441	0.99973	0.110115
Springpole	B2	September	Fall	152	Sididae	Diaphanosoma birgei	38	0.152	11	72.36842	201.9321	0.497195	2.437463	0.492202
Springpole	B2	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	38	0.152	39	256.5789	715.941	0.270722	1.029111	0.736782
Springpole	B2	September	Fall	201	Calanoida	Calanoid copepodid	15	0.06	30	500	1395.167	0.778636	3.044511	4.247602
Springpole	B2	September	Fall	204	Calanoida	Leptodiaptomus minutus	38	0.152	1	6.578947	18.35746	0.71744	2.429937	0.044607
Springpole	B2	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	38	0.152	2	13.15789	36.71492	0.976772	5.192197	0.190631
Springpole	B2	September	Fall	209	Calanoida	Leptodiaptomus siciloides	38	0.152	2	13.15789	36.71492	0.798175	3.176373	0.11662
Springpole	B2	September	Fall	211	Calanoida	Epischura lacustris copepodid	38	0.152	3	19.73684	55.07239	0.424939	0.708019	0.038992
Springpole	B2	September	Fall	212	Calanoida	Limnocalanus macrurus	38	0.152	20	131.5789	367.1492	2.121732	35.18792	12.91922
Springpole	B2	September	Fall	215	Calanoida	Calanoid nauplius	38	0.152	9	59.21053	165.2172	0.13657	0.105019	0.017351
Springpole	B2	September	Fall	301	Cyclopoida	Cyclopoid copepodid	5	0.02	15	750	2092.751	0.469447	0.924964	1.935719
Springpole	B2	September	Fall	302	Cyclopoida	Diacyclops thomasi	38	0.152	26	171.0526	477.294	0.632483	2.368342	1.130396
Springpole	B2	September	Fall	309	Cyclopoida	Mesocyclops edax	38	0.152	3	19.73684	55.07239	0.763993	2.879457	0.158579
Springpole	B2	September	Fall	313	Cyclopoida	Cyclopoid nauplius	5	0.02	29	1450	4045.985	0.11865	0.082186	0.332523
Springpole	B3	September	Fall	115	Daphniidae	Ceriodaphnia sp.	250	1	1	1	2.511301	0.377909	0.315319	0.000792
Springpole	B3	September	Fall	118	Chydoridae	Chydorus sphaericus	250	1	30	30	75.33903	0.191751	0.559669	0.042165
Springpole	B3	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	250	1	10	10	25.11301	0.624448	1.577019	0.039604
Springpole	B3	September	Fall	127	Daphniidae	Daphnia (Daphnia) retrocurva	250	1	10	10	25.11301	0.532471	1.067768	0.026815
Springpole	B3	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	250	1	14	14	35.15821	0.260862	0.900064	0.031645
Springpole	B3	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	125	0.5	50	100	251.1301	0.267184	1.005617	0.252541
Springpole	B3	September	Fall	201	Calanoida	Calanoid copepodid	250	1	19	19	47.71472	0.710948	2.397366	0.11439
Springpole	B3	September	Fall	204	Calanoida	Leptodiaptomus minutus	250	1	1	1	2.511301	0.545744	1.23981	0.003114
Springpole	B3	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	250	1	1	1	2.511301	0.812191	3.297023	0.00828
Springpole	B3	September	Fall	211	Calanoida	Epischura lacustris copepodid	250	1	1	1	2.511301	0.377409	0.500402	0.001257
Springpole	B3	September	Fall	212	Calanoida	Limnocalanus macrurus	250	1	1	1	2.511301	1.992933	29.99956	0.075338
Springpole	B3	September	Fall	215	Calanoida	Calanoid nauplius	250	1	1	1	2.511301	0.163164	0.135566	0.00034
Springpole	B3	September	Fall	301	Cyclopoida	Cyclopoid copepodid	250	1	19	19	47.71472	0.402064	0.696816	0.033248

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

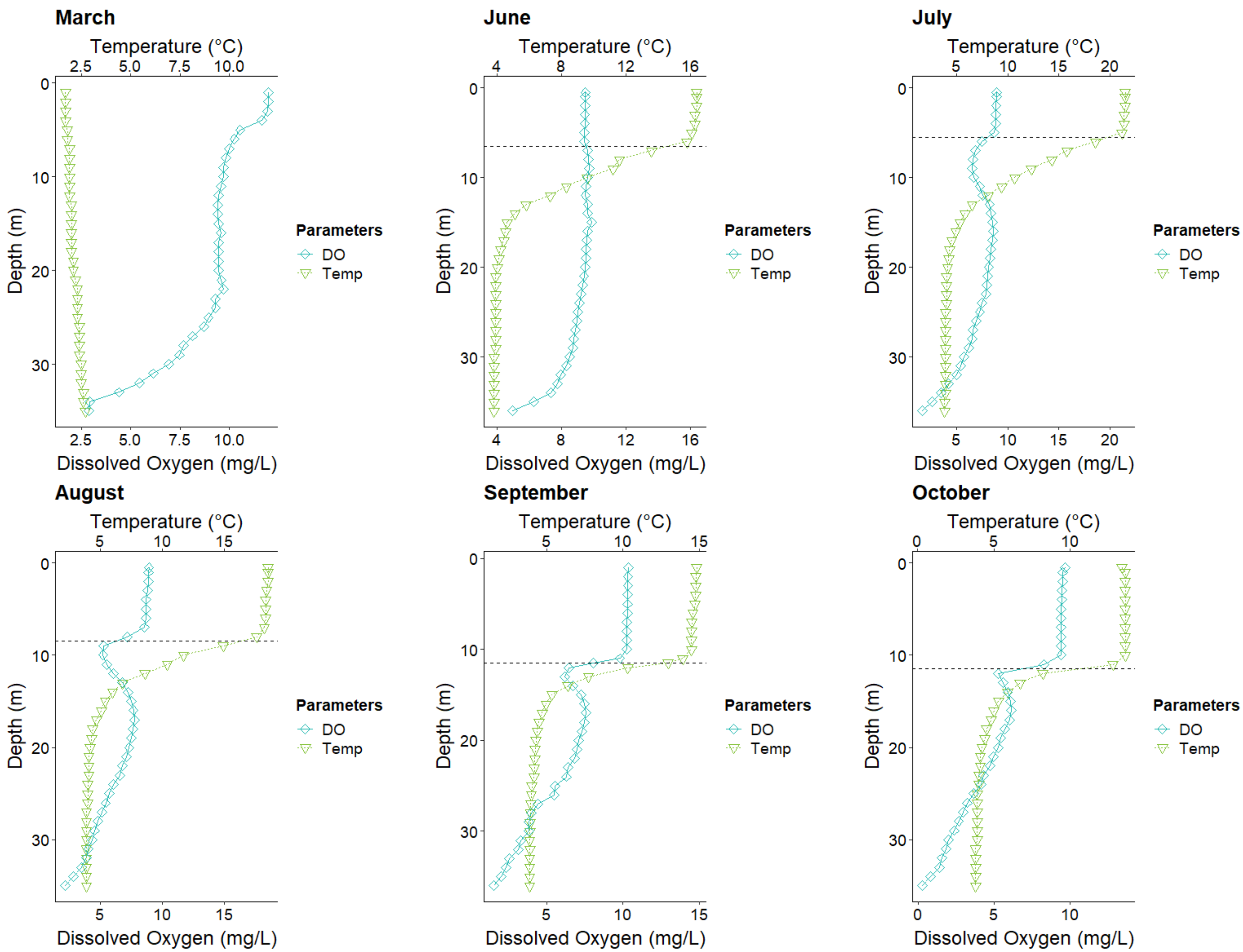
Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m³)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m³)
Springpole	B3	September	Fall	302	Cyclopoida	Diacyclops thomasi	250	1	3	3	7.533903	0.623094	2.285607	0.01722
Springpole	B3	September	Fall	309	Cyclopoida	Mesocyclops edax	250	1	1	1	2.511301	1.033372	5.962585	0.014974
Springpole	B3	September	Fall	313	Cyclopoida	Cyclopoid nauplius	250	1	12	12	30.13561	0.144779	0.113747	0.003428
Springpole	B3	September	Fall	338	Cyclopoida	Tropocyclops extensus	250	1	2	2	5.022602	0.377909	0.504981	0.002536
Springpole	B4	September	Fall	118	Chydoridae	Chydorus sphaericus	45	0.18	20	111.1111	523.1959	0.20272	0.615516	0.322035
Springpole	B4	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	45	0.18	36	200	941.7526	0.819936	3.312932	3.119962
Springpole	B4	September	Fall	127	Daphniidae	Daphnia (Daphnia) retrocurva	45	0.18	3	16.66667	78.47938	0.896782	3.750131	0.294308
Springpole	B4	September	Fall	135	Holopedidae	Holopedium gibberum	45	0.18	4	22.22222	104.6392	0.360411	0.515409	0.053932
Springpole	B4	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	45	0.18	6	33.33333	156.9588	0.252051	0.847593	0.133037
Springpole	B4	September	Fall	152	Sididae	Diaphanosoma birgei	45	0.18	16	88.88889	418.5567	0.532751	2.620525	1.096838
Springpole	B4	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	45	0.18	33	183.3333	863.2732	0.273599	1.014233	0.875561
Springpole	B4	September	Fall	201	Calanoida	Calanoid copepodid	10	0.04	23	575	2707.539	0.871464	4.023425	10.89358
Springpole	B4	September	Fall	204	Calanoida	Leptodiaptomus minutus	45	0.18	2	11.11111	52.31959	0.764816	2.852007	0.149216
Springpole	B4	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	45	0.18	8	44.44444	209.2784	0.969469	5.125377	1.07263
Springpole	B4	September	Fall	209	Calanoida	Leptodiaptomus siciloides	45	0.18	1	5.555556	26.15979	0.799605	3.172757	0.082999
Springpole	B4	September	Fall	211	Calanoida	Epischura lacustris copepodid	45	0.18	4	22.22222	104.6392	0.404216	0.604387	0.063243
Springpole	B4	September	Fall	215	Calanoida	Calanoid nauplius	45	0.18	13	72.22222	340.0773	0.155248	0.132583	0.045088
Springpole	B4	September	Fall	301	Cyclopoida	Cyclopoid copepodid	5	0.02	18	900	4237.887	0.462601	0.945747	4.007968
Springpole	B4	September	Fall	302	Cyclopoida	Diacyclops thomasi	45	0.18	24	133.3333	627.8351	0.682472	2.719644	1.707488
Springpole	B4	September	Fall	309	Cyclopoida	Mesocyclops edax	45	0.18	9	50	235.4382	0.880462	4.295581	1.011344
Springpole	B4	September	Fall	313	Cyclopoida	Cyclopoid nauplius	5	0.02	29	1450	6827.706	0.131312	0.095994	0.655421
Springpole	B4	September	Fall	320	Cyclopoida	Acanthocyclops sp.	45	0.18	1	5.555556	26.15979	0.854883	3.739838	0.097833
Springpole	B4	September	Fall	338	Cyclopoida	Tropocyclops extensus	45	0.18	1	5.555556	26.15979	0.433973	0.705539	0.018457
Springpole	B5	September	Fall	118	Chydoridae	Chydorus sphaericus	65	0.26	5	19.23077	76.25508	0.17472	0.44749	0.034123
Springpole	B5	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	35	0.14	53	378.5714	1501.136	1.117155	7.564312	11.35506
Springpole	B5	September	Fall	152	Sididae	Diaphanosoma birgei	65	0.26	1	3.846154	15.25102	0.449062	2.187406	0.03336
Springpole	B5	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	65	0.26	22	84.61538	335.5224	0.2606	0.923718	0.309928
Springpole	B5	September	Fall	201	Calanoida	Calanoid copepodid	10	0.04	16	400	1586.106	0.785969	3.084663	4.892601
Springpole	B5	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	65	0.26	25	96.15385	381.2754	0.950462	4.907736	1.871199
Springpole	B5	September	Fall	209	Calanoida	Leptodiaptomus siciloides	65	0.26	7	26.92308	106.7571	0.719309	2.496025	0.266468
Springpole	B5	September	Fall	211	Calanoida	Epischura lacustris copepodid	65	0.26	5	19.23077	76.25508	0.373518	0.49852	0.038015
Springpole	B5	September	Fall	212	Calanoida	Limnocalanus macrurus	65	0.26	15	57.69231	228.7652	2.027056	31.41642	7.186986
Springpole	B5	September	Fall	215	Calanoida	Calanoid nauplius	65	0.26	11	42.30769	167.7612	0.168325	0.1461	0.02451
Springpole	B5	September	Fall	301	Cyclopoida	Cyclopoid copepodid	10	0.04	30	750	2973.948	0.354368	0.561335	1.669382
Springpole	B5	September	Fall	302	Cyclopoida	Diacyclops thomasi	65	0.26	12	46.15385	183.0122	0.704392	3.013092	0.551433
Springpole	B5	September	Fall	309	Cyclopoida	Mesocyclops edax	65	0.26	2	7.692308	30.50203	0.854632	3.847747	0.117364
Springpole	B5	September	Fall	313	Cyclopoida	Cyclopoid nauplius	5	0.02	28	1400	5551.37	0.103961	0.066996	0.371919

Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Springpole	B5	September	Fall	320	Cyclopoida	Acanthocyclops sp.	65	0.26	5	19.23077	76.25508	0.655727	2.035315	0.155203
Springpole	B5	September	Fall	338	Cyclopoida	Tropocyclops extensus	65	0.26	13	50	198.2632	0.4078	0.62723	0.124357
Springpole	B6	September	Fall	115	Daphniidae	Ceriodaphnia sp.	40	0.16	3	18.75	100.8987	0.334502	0.225781	0.022781
Springpole	B6	September	Fall	118	Chydoridae	Chydorus sphaericus	40	0.16	43	268.75	1446.214	0.195358	0.581599	0.841116
Springpole	B6	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	40	0.16	13	81.25	437.2276	0.763163	2.849907	1.246058
Springpole	B6	September	Fall	127	Daphniidae	Daphnia (Daphnia) retrocurva	40	0.16	6	37.5	201.7973	0.586028	1.357547	0.273949
Springpole	B6	September	Fall	135	Holopedidae	Holopedium gibberum	40	0.16	3	18.75	100.8987	0.421602	0.883068	0.0891
Springpole	B6	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	40	0.16	9	56.25	302.696	0.256731	0.870665	0.263547
Springpole	B6	September	Fall	152	Sididae	Diaphanosoma birgei	40	0.16	17	106.25	571.7591	0.566894	2.797937	1.599746
Springpole	B6	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	30	0.12	52	433.3333	2331.88	0.26756	1.006727	2.347567
Springpole	B6	September	Fall	201	Calanoida	Calanoid copepodid	10	0.04	15	375	2017.973	0.806021	3.324961	6.709683
Springpole	B6	September	Fall	204	Calanoida	Leptodiaptomus minutus	40	0.16	3	18.75	100.8987	0.66867	2.048067	0.206647
Springpole	B6	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	40	0.16	3	18.75	100.8987	1.06405	6.412322	0.646995
Springpole	B6	September	Fall	209	Calanoida	Leptodiaptomus siciloides	40	0.16	2	12.5	67.26578	0.802323	3.221646	0.216707
Springpole	B6	September	Fall	211	Calanoida	Epischura lacustris copepodid	40	0.16	3	18.75	100.8987	0.377504	0.504774	0.050931
Springpole	B6	September	Fall	215	Calanoida	Calanoid nauplius	40	0.16	8	50	269.0631	0.169886	0.151556	0.040778
Springpole	B6	September	Fall	301	Cyclopoida	Cyclopoid copepodid	10	0.04	24	600	3228.757	0.519282	1.313977	4.242514
Springpole	B6	September	Fall	302	Cyclopoida	Diacyclops thomasi	40	0.16	12	75	403.5947	0.646698	2.45621	0.991313
Springpole	B6	September	Fall	309	Cyclopoida	Mesocyclops edax	40	0.16	4	25	134.5316	0.949348	5.057933	0.680452
Springpole	B6	September	Fall	313	Cyclopoida	Cyclopoid nauplius	5	0.02	26	1300	6995.641	0.126743	0.090551	0.633461
Springpole	B6	September	Fall	320	Cyclopoida	Acanthocyclops sp.	40	0.16	1	6.25	33.63289	0.644142	1.864049	0.062693
Springpole	B6	September	Fall	338	Cyclopoida	Tropocyclops extensus	40	0.16	3	18.75	100.8987	0.384536	0.525239	0.052996
Birch	BIRCH-B1	September	Fall	118	Chydoridae	Chydorus sphaericus	35	0.14	30	214.2857	474.8293	0.198924	0.592545	0.281358
Birch	BIRCH-B1	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	35	0.14	18	128.5714	284.8976	0.82748	3.557009	1.013383
Birch	BIRCH-B1	September	Fall	127	Daphniidae	Daphnia (Daphnia) retrocurva	35	0.14	8	57.14286	126.6211	0.557194	1.333181	0.168809
Birch	BIRCH-B1	September	Fall	135	Holopedidae	Holopedium gibberum	35	0.14	5	35.71429	79.13822	0.364365	0.796617	0.063043
Birch	BIRCH-B1	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	35	0.14	9	64.28571	142.4488	0.219736	0.640297	0.09121
Birch	BIRCH-B1	September	Fall	152	Sididae	Diaphanosoma birgei	35	0.14	4	28.57143	63.31057	0.447667	2.181035	0.138083
Birch	BIRCH-B1	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	35	0.14	25	178.5714	395.6911	0.240112	0.788143	0.311861
Birch	BIRCH-B1	September	Fall	201	Calanoida	Calanoid copepodid	5	0.02	32	1600	3545.392	0.760058	2.823895	10.01182
Birch	BIRCH-B1	September	Fall	205	Calanoida	Skistodiaptomus oregonensis	35	0.14	2	14.28571	31.65529	0.981456	5.262989	0.166601
Birch	BIRCH-B1	September	Fall	209	Calanoida	Leptodiaptomus siciloides	35	0.14	14	100	221.587	0.772503	2.928367	0.648888
Birch	BIRCH-B1	September	Fall	212	Calanoida	Limnocalanus macrurus	35	0.14	31	221.4286	490.6569	1.970667	29.28922	14.37096
Birch	BIRCH-B1	September	Fall	215	Calanoida	Calanoid nauplius	35	0.14	8	57.14286	126.6211	0.146341	0.115379	0.014609
Birch	BIRCH-B1	September	Fall	301	Cyclopoida	Cyclopoid copepodid	5	0.02	18	900	1994.283	0.46444	0.98976	1.973861
Birch	BIRCH-B1	September	Fall	302	Cyclopoida	Diacyclops thomasi	35	0.14	20	142.8571	316.5529	0.71425	3.157204	0.999422
Birch	BIRCH-B1	September	Fall	309	Cyclopoida	Mesocyclops edax	35	0.14	5	35.71429	79.13822	0.88973	4.385056	0.347026

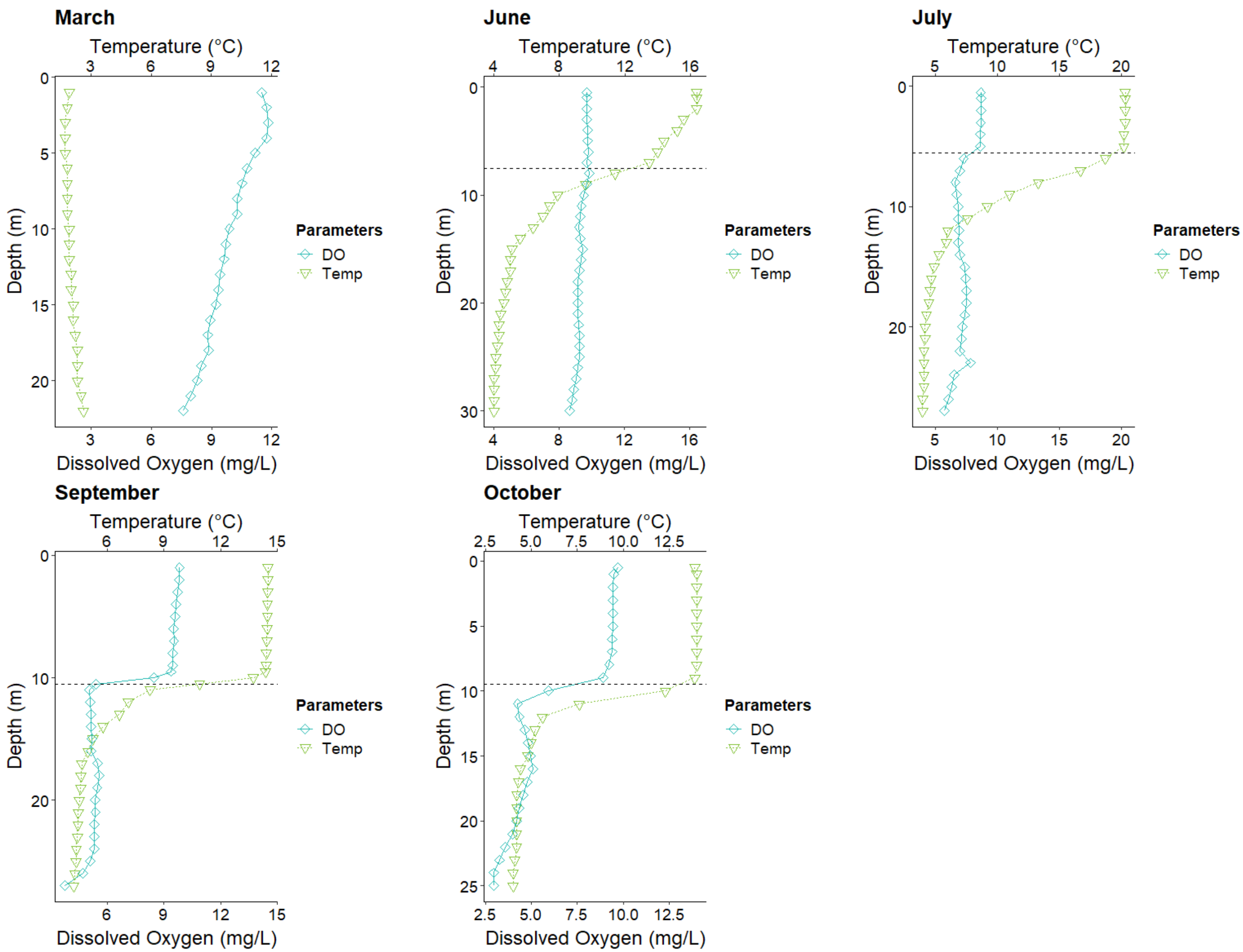
Table A2-2: Springpole and Birch Lake Zooplankton Sample Results, 2021

Area	Site	Month	Season	Species Code	Order	Taxa	Total aliquot volume (mL)	Fract. Anal.	#/Fract.	Total # in sample	Density (#/m^3)	Mean Length (mm)	*Mean Weight (µg)	Biomass (mg/m^3)
Birch	BIRCH-B1	September	Fall	313	Cyclopoida	Cyclopoid nauplius	2	0.008	16	2000	4431.74	0.122112	0.085562	0.379188
Birch	BIRCH-B1	September	Fall	320	Cyclopoida	Acanthocyclops sp.	35	0.14	2	14.28571	31.65529	0.699884	2.346183	0.074269
Birch	BIRCH-B1	September	Fall	338	Cyclopoida	Tropocyclops extensus	35	0.14	19	135.7143	300.7252	0.413788	0.637954	0.191849
Birch	BIRCH-B2	September	Fall	115	Daphniidae	Ceriodaphnia sp.	15	0.06	10	166.6667	523.1877	0.372789	0.367901	0.192481
Birch	BIRCH-B2	September	Fall	118	Chydoridae	Chydorus sphaericus	15	0.06	48	800	2511.301	0.205593	0.636903	1.599454
Birch	BIRCH-B2	September	Fall	122	Daphniidae	Daphnia (Hyalodaphnia) mendotae	15	0.06	5	83.33333	261.5938	0.860767	3.571918	0.934392
Birch	BIRCH-B2	September	Fall	127	Daphniidae	Daphnia (Daphnia) retrocurva	15	0.06	7	116.6667	366.2314	0.642109	1.633107	0.598095
Birch	BIRCH-B2	September	Fall	135	Holopedidae	Holopedium gibberum	15	0.06	17	283.3333	889.4191	0.391761	0.805142	0.716109
Birch	BIRCH-B2	September	Fall	150	Bosminidae	Eubosmina (Eubosmina) longispina	15	0.06	1	16.66667	52.31877	0.245401	0.77335	0.040461
Birch	BIRCH-B2	September	Fall	152	Sididae	Diaphanosoma birgei	15	0.06	12	200	627.8252	0.569843	2.81018	1.764302
Birch	BIRCH-B2	September	Fall	188	Bosminidae	Bosmina (Bosmina) longirostris	15	0.06	36	600	1883.476	0.259275	0.932817	1.756939
Birch	BIRCH-B2	September	Fall	201	Calanoida	Calanoid copepodid	7	0.028	34	1214.286	3811.796	0.72692	2.612107	9.956817
Birch	BIRCH-B2	September	Fall	209	Calanoida	Leptodiaptomus siciloides	15	0.06	4	66.66667	209.2751	0.783069	3.0159	0.631153
Birch	BIRCH-B2	September	Fall	211	Calanoida	Epischura lacustris copepodid	15	0.06	2	33.33333	104.6375	0.393856	0.558042	0.058392
Birch	BIRCH-B2	September	Fall	212	Calanoida	Limnocalanus macrurus	15	0.06	5	83.33333	261.5938	1.930791	27.91606	7.302669
Birch	BIRCH-B2	September	Fall	215	Calanoida	Calanoid nauplius	15	0.06	6	100	313.9126	0.171638	0.155943	0.048953
Birch	BIRCH-B2	September	Fall	301	Cyclopoida	Cyclopoid copepodid	2	0.008	15	1875	5885.861	0.483496	1.001869	5.896862
Birch	BIRCH-B2	September	Fall	302	Cyclopoida	Diacyclops thomasi	15	0.06	18	300	941.7378	0.584625	2.034792	1.916241
Birch	BIRCH-B2	September	Fall	309	Cyclopoida	Mesocyclops edax	15	0.06	2	33.33333	104.6375	1.111211	7.131156	0.746187
Birch	BIRCH-B2	September	Fall	313	Cyclopoida	Cyclopoid nauplius	7	0.028	24	857.1429	2690.679	0.123419	0.088083	0.237003
Birch	BIRCH-B2	September	Fall	320	Cyclopoida	Acanthocyclops sp.	15	0.06	3	50	156.9563	0.643045	1.927228	0.302491
Birch	BIRCH-B2	September	Fall	338	Cyclopoida	Tropocyclops extensus	15	0.06	2	33.33333	104.6375	0.362284	0.452545	0.047353



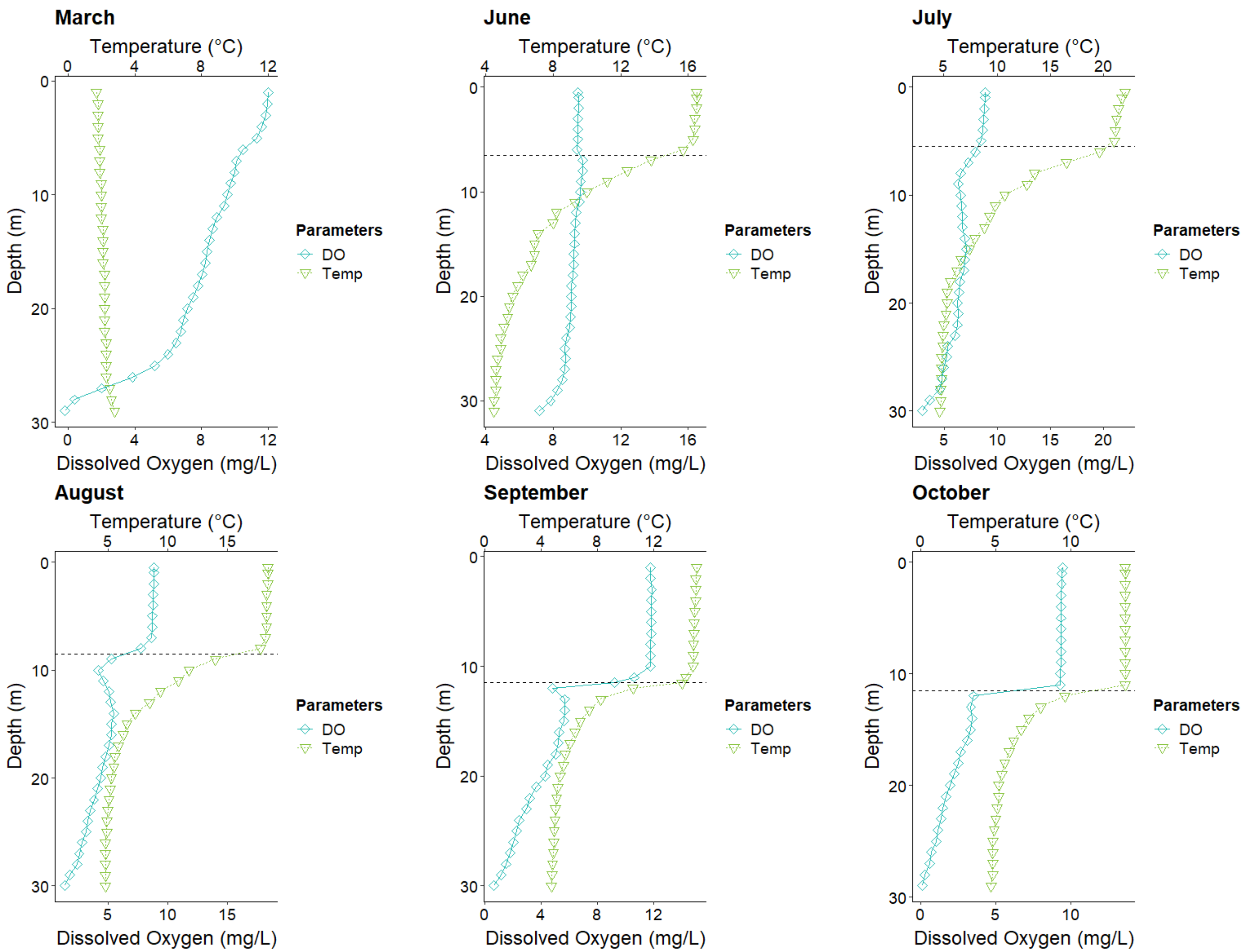
Note: dashed line represents the thermocline

Figure A3-1: Temperature-DO profiles for Springpole Lake station L-15-B1



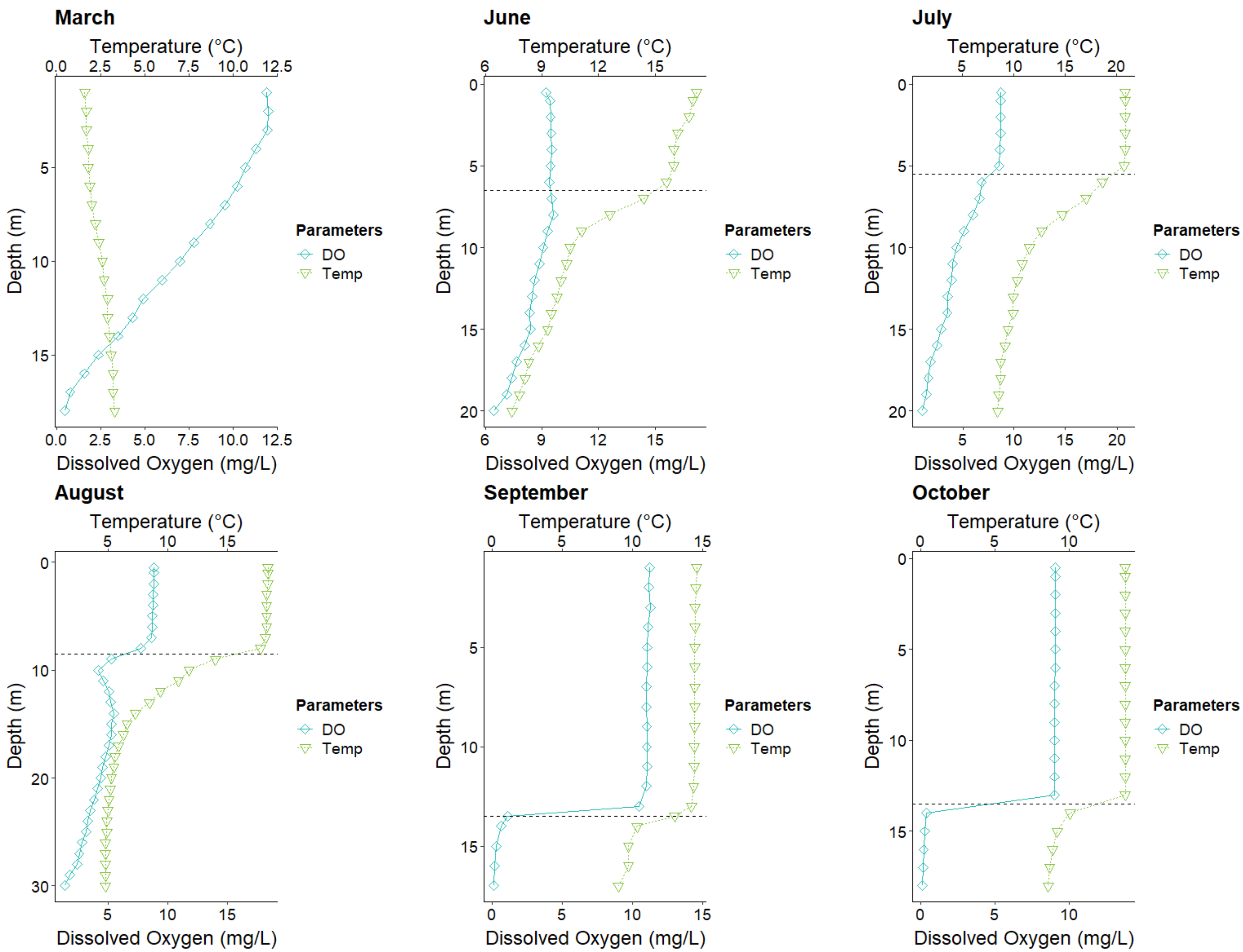
Note: dashed line represents the thermocline

Figure A3-2: Temperature-DO profiles for Springpole Lake station L-15-B2



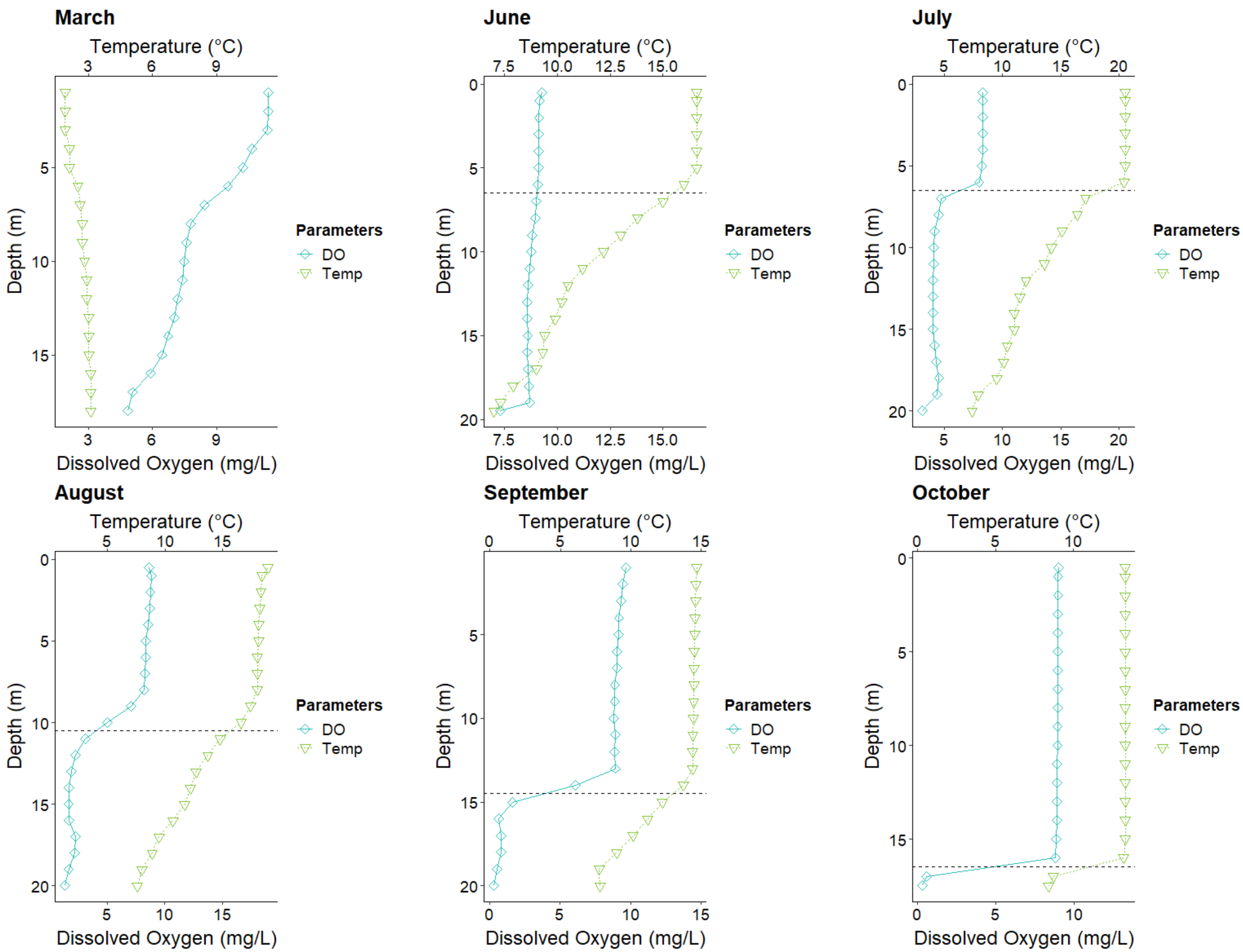
Note: dashed line represents the thermocline

Figure A3-3: Temperature-DO profiles for Springpole Lake station L-15-B3



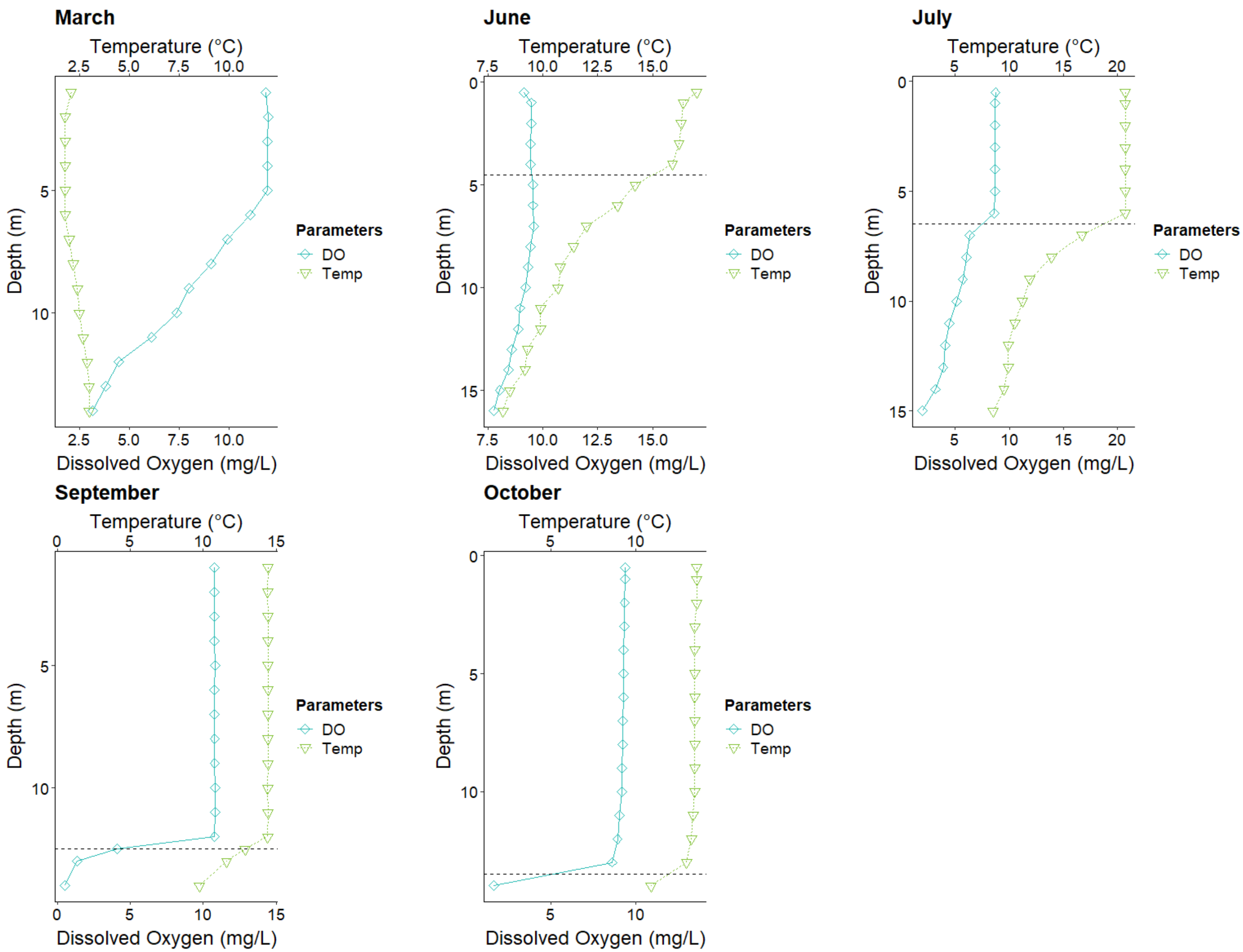
Note: dashed line represents the thermocline

Figure A3-4: Temperature-DO profiles for Springpole Lake station L-15-B4



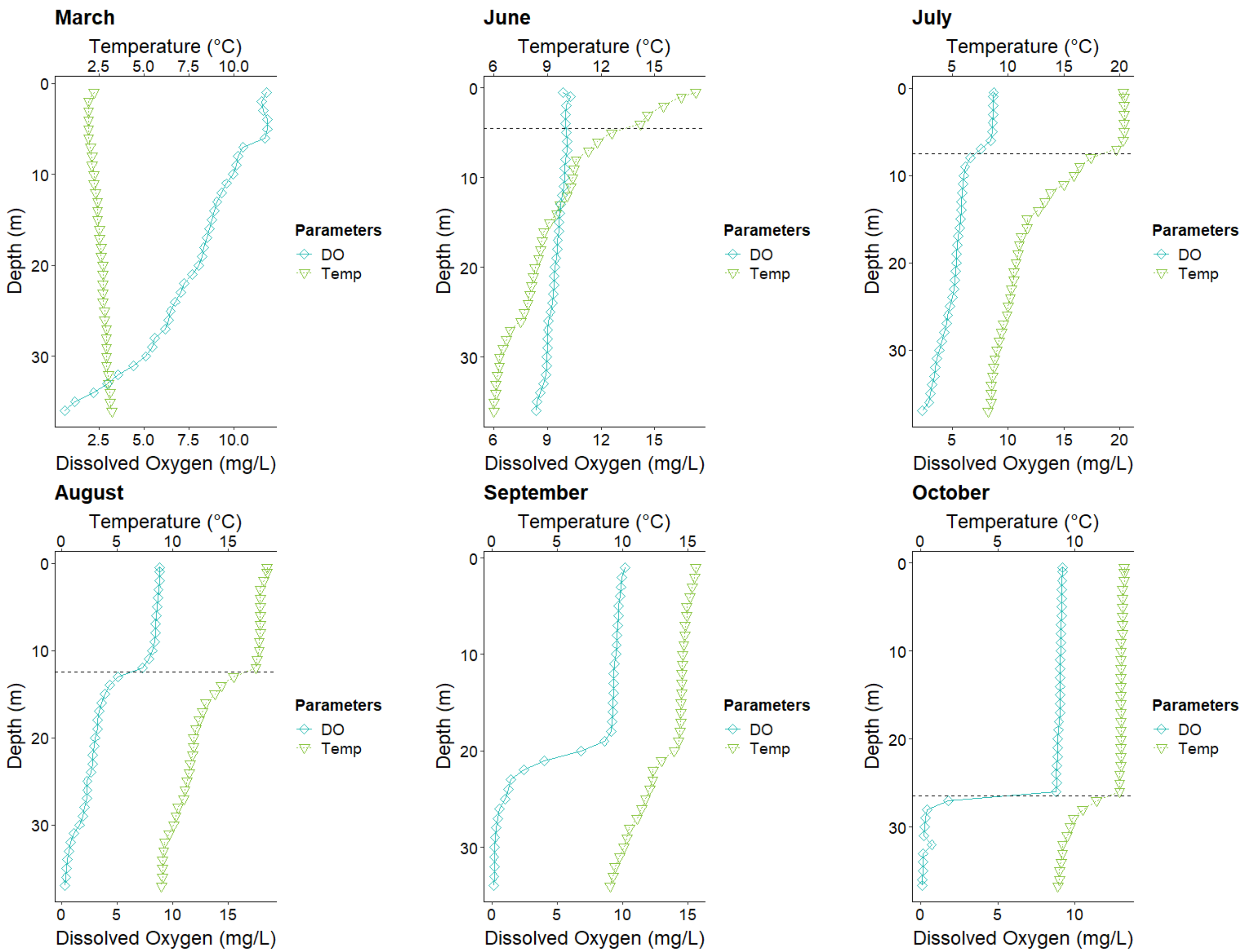
Note: dashed line represents the thermocline

Figure A3-5: Temperature-DO profiles for Springpole Lake station L-15-B5



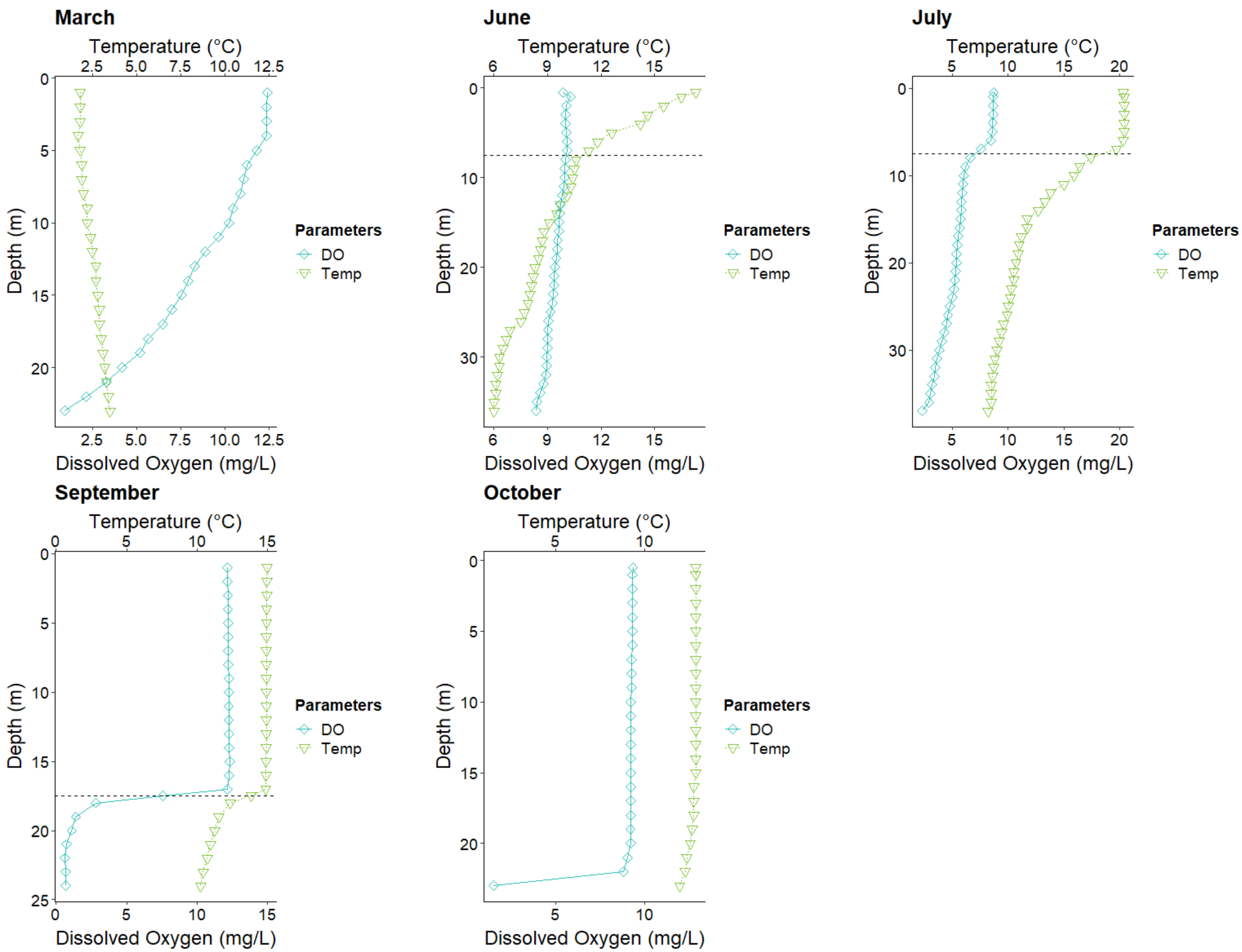
Note: dashed line represents the thermocline

Figure A3-6: Temperature-DO profiles for Springpole Lake station L-15-B6



Note: dashed line represents the thermocline

Figure A3-7: Temperature-DO profiles for Birch Lake station BIRCH-B1



Note: dashed line represents the thermocline

Figure A3-8: Temperature-DO profiles for Birch Lake station BIRCH-B2

Appendix B
Fish Tissue Data

Table B1-1: Composite Fish Sample Summary

Year	Station	Composite ID	Species	No. Individuals per Sample	Total Length Range (mm)	Mean Total Length (mm)	Individual Weight Range (g)	Mean Individual Weight (g)	Hg (µg/g wwt)	MeHg (µg/g wwt)	Moisture (%)
2019	S-9	S-9-MT1-COMP1	Finescale Dace	24	55-72	63.71	1.63-3.22	2.39	0.155	0.152	74.3
2019	S-9	S-9-MT1-COMP2	Northern Redbelly Dace	31	52-63	59.32	1.06-2.35	1.79	0.087	0.112	75.2
2019	S-9	S-9-MT1-COMP3	Finescale Dace	16	66-86	72.43	2.68-6.84	3.47	0.166	0.221	76.6
2019	S-9-US02	S-9-US02-MT1-COMP1	Northern Pearl Dace	10	83-95	89.7	4.98-7.57	6.14	0.127	0.189	75.3
2019	S-9-US02	S-9-US02-MT1-COMP2	Northern Pearl Dace	10	86-96	90.3	4.71-7.26	6.07	0.116	0.109	73.9
2019	S-9-US02	S-9-US02-MT1-COMP3	Northern Pearl Dace	5	110-121	115.8	10.83-15.21	12.86	0.197	0.267	73.7
2019	S-9-US02	S-9-US02-MT1-COMP4	Northern Redbelly Dace	37	50-61	56.14	0.86-1.83	1.48	0.081	0.099	76.7
2019	S-9-US02	S-9-US02-MT1-COMP5	Northern Pearl Dace	11	84-91	86.82	4.43-6.81	5.38	0.112	0.157	79.2
2019	L-5-OUT	L-5-OUT-MT1-COMP1	Finescale Dace	16	62-75	68.75	2.72-4.56	3.35	0.203	0.264	79
2019	L-5-OUT	L-5-OUT-MT1-COMP2	Finescale Dace	13	68-80	74.77	3.30-5.24	4.37	0.184	0.229	77.2
2019	L-5-OUT	L-5-OUT-MT1-COMP3	Finescale Dace	20	60-69	64.15	2.19-2.99	2.68	0.143	0.176	76.6
2019	L-15	SPL-SN1-COMP1	Yellow Perch	60	41-54	47.2	0.58-1.36	0.9	0.085	0.102	81.8
2019	L-15	SPL-SN1-COMP2	Yellow Perch	52	42-56	49.12	0.67-1.45	0.02	0.086	0.072	83.4
2019	L-15	SPL-SN2-COMP1	Yellow Perch	46	45-60	52.28	0.80-1.98	1.21	0.092	0.09	78.7
2019	L-15	SPL-SN3-COMP1	Yellow Perch	43	46-60	52.81	0.75-1.82	1.27	0.095	0.085	79.6
2019	L-15	SPL-SN3-COMP2	Yellow Perch	58	43-57	48.88	0.56-1.35	0.94	0.095	0.109	80.4
2019	L-15	SPL-SN3-COMP3	Yellow Perch	42	49-62	53.02	0.99-2.09	1.26	0.087	0.061	79.2
2019	L-15	SPL-SN4-COMP1	Yellow Perch	52	42-57	48.96	0.59-1.56	1	0.086	0.103	83.3
2019	L-15	SPL-SN4-COMP2	Yellow Perch	53	42-61	48.81	0.67-1.93	1.02	0.084	0.109	83.2
2019	L-15	SPL-SN4-COMP3	Yellow Perch	53	42-53	47.58	0.59-1.84	1.03	0.091	0.085	83.9
2021	L-15	L-15-COMP-1-BNS	Blacknose Shiner	19	40-51	48.053	0.583-1.345	1.074	0.0538	0.0458	75.6
2021	L-15	L-15-COMP-2-BNS	Blacknose Shiner	15	51-53	51.867	0.583-1.557	1.268	0.04	0.0385	76.4
2021	L-15	L-15-COMP-3-BNS	Blacknose Shiner	15	53-54	53.667	1.265-1.6	1.422	0.0473	0.0444	75
2021	L-15	L-15-COMP-4-BNS	Blacknose Shiner	14	54-56	54.929	1.372-1.744	1.561	0.049	0.0365	76.2
2021	L-15	L-15-COMP-5-BNS	Blacknose Shiner	15	57-64	59.867	1.189-2.443	1.92	0.102	0.0641	75.5
2021	L-15	L-15-COMP-1-MS	Mimic Shiner	24	44-50	47.125	0.622-1.046	0.855	0.05	0.0463	74.1
2021	L-15	L-15-COMP-2-MS	Mimic Shiner	17	50-53	51.941	0.812-1.31	1.183	0.0616	0.052	75.3
2021	L-15	L-15-COMP-3-MS	Mimic Shiner	14	54-55	54.286	1.247-1.613	1.433	0.0701	0.0492	74.2
2021	L-15	L-15-COMP-4-MS	Mimic Shiner	13	55-59	56.769	1.476-1.789	1.661	0.0874	0.0613	72.2
2021	L-15	L-15-COMP-5-MS	Mimic Shiner	11	59-63	60.182	1.501-2.209	1.92	0.0933	0.0868	73.8
2021	L-15	L-15-COMP-1-STS	Spottail Shiner	28	39-46	43.393	0.495-1.011	0.729		0.0379	74.9
2021	L-15	L-15-COMP-2-STS	Spottail Shiner	20	46-49	47.1	0.747-1.413	1.031		0.0464	75.6
2021	L-15	L-15-COMP-3-STS	Spottail Shiner	20	49-50	49.789	1.041-1.364	1.188		0.0466	73.8
2021	L-15	L-15-COMP-4-STS	Spottail Shiner	20	50-53	51.35	1.170-1.6	1.361		0.0509	76.3
2021	L-15	L-15-COMP-5-STS	Spottail Shiner	19	53-57	54.4	1.399-1.904	1.581		0.0597	75.3

Table B1-1: Composite Fish Sample Summary

Year	Station	Composite ID	Species	No. Individuals per Sample	Total Length Range (mm)	Mean Total Length (mm)	Individual Weight Range (g)	Mean Individual Weight (g)	Hg (µg/g wwt)	MeHg (µg/g wwt)	Moisture (%)
2021	L-15	L-15-COMP-6-STS	Spottail Shiner	8	62-77	71.75	1.279-3.744	3.137		0.0577	73.1
2021	L-15	L-15-COMP-7-STS	Spottail Shiner	8	77-94	85.625	3.301-7.829	5.554		0.0903	74.6
2021	Birch Lake	BIRCH-COMP-1-BNM	Bluntnose Minnow	11	56-66	61.909	1.488-2.77	1.993	0.0216	0.0268	71.1
2021	Birch Lake	BIRCH-COMP-2-BNM	Bluntnose Minnow	8	66-76	72.25	2.497-4.002	3.419	0.0298	0.0289	74.3
2021	Birch Lake	BIRCH-COMP-3-BNM	Bluntnose Minnow	8	81-90	86	4.646-6.889	5.766	0.0286	0.024	74.3
2021	Birch Lake	BIRCH-COMP-1-YLP	Yellow Perch	11	57-63	59.833	1.595-2.224	1.917	0.033	0.0285	75.8
2021	Birch Lake	BIRCH-COMP-2-YLP	Yellow Perch	8	63-71	65.625	1.946-3.005	2.462	0.029	0.0299	76.8
2021	Birch Lake	BIRCH-COMP-3-YLP	Yellow Perch	8	77-80	78.375	2.685-4.97	4.336	0.0447	0.0288	75.6
2021	Birch Lake	BIRCH-COMP-4-YLP	Yellow Perch	8	80-83	81.875	4.445-5.551	5.035	0.0365	0.0317	75
2021	Birch Lake	BIRCH-COMP-5-YLP	Yellow Perch	8	84-85	84.375	4.856-6.405	5.613	0.035	0.0333	76.8
2021	Birch Lake	BIRCH-COMP-6-YLP	Yellow Perch	8	86-89	87.625	4.532-6.353	5.794	0.037	0.0236	78.9
2021	Birch Lake	BIRCH-COMP-7-YLP	Yellow Perch	8	89-95	92.125	5.183-8.46	6.82	0.0404	0.028	76.9
2021	L-17	L-17-COMP-1-FSD	Finescale Dace	16	65-75	70.563	2.55-4.51	3.343		0.0523	75.9
2021	L-17	L-17-COMP-2-FSD	Finescale Dace	18	64-73	68.167	2.4-3.88	3.031		0.0662	73.6
2021	L-17	L-17-COMP-3-FSD	Finescale Dace	12	75-85	79.417	3.68-5.49	4.487		0.0382	78
2021	L-17	L-17-COMP-4-FSD	Finescale Dace	13	75-80	75.308	2.56-5.42	3.892		0.0626	76.2
2021	L-17	L-17-COMP-5-FSD	Finescale Dace	11	74-85	81.636	3.41-6.13	4.929		0.121	76.7
2021	L-18	L-18-COMP-1-BSB	Brook Stickleback	22	63-72	66.545	1.85-2.9	2.291	0.0465	0.0528	79.1
2021	L-18	L-18-COMP-2-BSB	Brook Stickleback	30	59-66	62.533	1.44-2.27	1.806	0.0514	0.0506	79.4
2021	L-18	L-18-COMP-3-BSB	Brook Stickleback	34	52-63	57.706	1.06-1.88	1.495	0.0542	0.0582	79.2
2021	L-18	L-18-COMP-4-BSB	Brook Stickleback	29	58-67	62.621	1.41-2.51	1.772	0.0577	0.0498	78.2
2021	L-18	L-18-COMP-5-NRD	Northern Redbelly Dace	19	61-66	63.895	2.23-3	2.635	0.0599	0.0723	78.2
2021	L-19	L-19-COMP-1-FHM	Fathead Minnow	8	80-88	83.5	5.75-7.79	6.446	0.0389	0.0475	73.2
2021	L-19	L-19-COMP-2-FHM	Fathead Minnow	10	75-79	77	4.53-5.51	5.065	0.029	0.0312	79.1
2021	L-19	L-19-COMP-3-FHM	Fathead Minnow	8	80-88	83.5	4.68-8.03	6.378	0.0376	0.0331	72.8
2021	L-19	L-19-COMP-4-FHM	Fathead Minnow	13	69-78	74	3.53-4.68	4.089	0.0302	0.0352	80
2021	L-19	L-19-COMP-5-FHM	Fathead Minnow	12	70-80	74.5	3.5-5.18	4.278	0.0292	0.0284	79.6

Notes:
1. Total mercury (Hg) and methymercury (MeHg) values expressed as µg/g wet weight (wwt).
2. Composite samples were composed of fish with a size difference (largest to smallest) not greater than 75%.
3. Laboratory certificates of analysis indicate sample ID of WB05-OUT-MT1-COMP1 to -COMP3 for the above samples.
4. YOY – young-of-the-year fish were sampled that represent a small-bodied forage (prey) species for upper trophic level predators.

Table B1-2: Springpole Lake Northern Pike Epaxial Muscle Tissue Sample Summary (2019)

Sample ID	Total Length (mm)	Total Weight (g)	Age (Years)	Hg (µg/g wwt)	MeHg (µg/g wwt)	Moisture (%)
SPL-AN1-F1	530	490	4	2.02	2.19	79.2
SPL-AN1-F2	590	980	4	1.67	1.1	78.5
SPL-AN1-F3	601	1000	3	1.02	0.61	78.3
SPL-AN1-F4	501	520	2	0.53	0.504	77.9
SPL-AN1-F5	501	510	2	0.865	0.391	77
SPL-AN1-F6	556	750	4	1.49	1.41	78.5
SPL-AN2-F1	534	530	3	0.981	0.97	77.9
SPL-AN2-F2	514	480	2	3.49	3.88	81.6
SPL-AN2-F3	599	850	6	2.04	2.11	79.8
SPL-AN2-F4	682	1800	6	1.88	1.13	78.4
SPL-AN3-F1	625	1000	4	2.15	2.1	79.4
SPL-AN3-F2	525	600	3	1.65	1.34	79.5
SPL-AN3-F3	542	700	3	0.645	0.344	79.4
SPL-AN4-F1	445	320	2	0.389	0.333	78.6
SPL-AN4-F2	491	500	4	0.625	0.653	79.3
SPL-AN4-F3	596	740	5	1.97	1.64	79.4
SPL-AN4-F4	610	750	3	3.83	4.47	80.9
SPL-AN5-F1	491	520	2	0.646	0.611	77.5
SPL-AN5-F2	525	500	2	1.52	1.29	80.1
SPL-AN5-F3	670	1200	5	3.6	3.91	80.4

Notes:
1. Total mercury (Hg) and methymercury (MeHg) values expressed as µg/g wet weight (wwt).

Table B1-3: Contaminants of Concern in Inland Waterbody Fish Tissue

Year	Fish Species	Sample Area	Descriptive Statistics	Total Length (mm)	Fresh Weight (g)	Arsenic (mg/kg wwt)	Cadmium (mg/kg wwt)	Chromium (mg/kg wwt)	Copper (mg/kg wwt)	Lead (mg/kg wwt)	Manganese (mg/kg wwt)	Mercury (mg/kg wwt)	Nickel (mg/kg wwt)	Selenium (mg/kg dwt)	Zinc (mg/kg wwt)
2019	Finescale Dace	S-9	Sample Size (n)	40	40	2	2	1	2	2	2	2	1	2	2
			No. MDL (n)	-	-	0	0	1	0	0	0	0	1	0	0
			Minimum	55	1.63	0.018	0.0028	-	0.874	6.733	6.733	0.0388	-	0.6	43.29
			Maximum	86	6.84	0.02	0.0044	-	1.088	7.067	7.067	0.0398	-	0.69	49.09
			Mean	67.2	2.82	0.019	0.0036	-	0.981	6.9	6.9	0.0393	-	0.64	46.19
			Median	69.5	2.78	0.019	0.0036	-	0.981	6.9	6.9	0.0393	-	0.64	46.19
			Standard deviation	6.6	0.89	0.001	0.0011	-	0.152	0.236	0.236	0.0007	-	0.07	4.1
			Standard error	1.04	0.14	0.001	0.0008	-	0.107	0.167	0.167	0.0005	-	0.05	2.9
2019	Finescale Dace	L-5-OUT	Sample Size (n)	49	49	3	3	3	3	3	3	3	3	3	3
			No. MDL (n)	-	-	0	0	2	0	0	0	0	3	0	0
			Minimum	60	2.19	0.036	0.003	0.0158	1.409	0.006	5.381	0.0335	-	0.12	36.25
			Maximum	80	5.24	0.045	0.0053	1.4868	1.487	0.01	6.552	0.0426	-	0.17	44.52
			Mean	68.47	3.35	0.039	0.004	-	1.441	0.008	6.107	0.0393	-	0.14	41.51
			Median	67	2.99	0.036	0.0036	-	1.427	0.009	6.388	0.042	-	0.14	43.76
			Standard deviation	5.28	0.79	0.005	0.0012	-	0.041	0.002	0.634	0.0051	-	0.03	4.57
			Standard error	0.75	0.11	0.003	0.0007	-	0.023	0.001	0.366	0.0029	-	0.02	2.64
2019	Northern Redbelly Dace	S-9	Sample Size (n)	31	31	1	1	1	1	1	1	1	1	1	1
			No. MDL (n)	-	-	0	0	1	0	0	0	0	1	0	0
			Minimum	52	1.06	0.024	0.0027	-	0.702	0.0154	5.3	0.0217	-	5.848	41.2
			Maximum	63	2.35	0.024	0.0027	-	0.702	0.0154	5.3	0.0217	-	5.848	41.2
			Mean	59.32	1.79	-	-	-	-	-	-	-	-	-	-
			Median	59	1.76	-	-	-	-	-	-	-	-	-	-
			Standard deviation	2.64	0.31	-	-	-	-	-	-	-	-	-	-
			Standard error	0.47	0.05	-	-	-	-	-	-	-	-	-	-
2019	Northern Redbelly Dace	S-9-US02	Sample Size (n)	37	37	1	1	1	1	1	1	1	1	1	1
			No. MDL (n)	-	-	0	0	0	0	0	0	0	1	0	0
			Minimum	50	0.86	0.031	0.0034	0.0158	0.79	0.0224	12.9	0.0187	-	0.515	52.4
			Maximum	61	1.83	0.031	0.0034	0.0158	0.79	0.0224	12.9	0.0187	-	0.515	52.4
			Mean	56.14	1.48	-	-	-	-	-	-	-	-	-	-
			Median	56	1.53	-	-	-	-	-	-	-	-	-	-
			Standard deviation	2.16	0.2	-	-	-	-	-	-	-	-	-	-
			Standard error	0.36	0.03	-	-	-	-	-	-	-	-	-	-
2019	Pearl Dace	S-9-US02	Sample Size (n)	36	36	4	4	4	4	4	4	4	4	4	4
			No. MDL (n)	-	-	0	0	4	0	0	0	0	4	0	0
			Minimum	83	4.43	0.017	0.0018	0.05	1.67	0.009	3.367	0.0273	0.2	0.15	31.3
			Maximum	121	15.21	0.032	0.0042	0.05	2.401	0.056	5.148	0.0518	0.2	0.18	42.94
			Mean	92.61	6.82	0.025	0.0027	-	1.954	0.024	4.005	0.0352	-	0.16	36.88
			Median	89	5.92	0.025	0.0024	-	1.872	0.015	3.753	0.0308	-	0.15	36.64
			Standard deviation	10.15	2.64	0.006	0.0011	-	0.328	0.022	0.809	0.0112	-	0.02	4.9
			Standard error	1.69	0.44	0.003	0.0006	-	0.164	0.011	0.404	0.0056	-	0.01	2.45

Table B1-3: Contaminants of Concern in Inland Waterbody Fish Tissue

Year	Fish Species	Sample Area	Descriptive Statistics	Total Length (mm)	Fresh Weight (g)	Arsenic (mg/kg wwt)	Cadmium (mg/kg wwt)	Chromium (mg/kg wwt)	Copper (mg/kg wwt)	Lead (mg/kg wwt)	Manganese (mg/kg wwt)	Mercury (mg/kg wwt)	Nickel (mg/kg wwt)	Selenium (mg/kg dwt)	Zinc (mg/kg wwt)
2021	Finescale Dace	L-17	Sample Size (n)	70	70	5	5	5	5	5	5	5	5	5	5
			No. MDL (n)	-	-	0	0	0	0	0	0	0	4	0	0
			Minimum	64	2.4	0.0146	0.0021	0.013	0.497	0.0117	4.73	0.0518	0.04	0.512	34.8
			Maximum	85	6.13	0.0194	0.0044	0.03	0.683	0.0154	7.59	0.0948	0.047	0.763	45.4
			Mean	74.0857	3.81	0.0177	0.0037	0.0188	0.6046	0.0134	5.992	0.07686	-	0.6156	41.22
			Median	73.5	3.655	0.0179	0.0042	0.018	0.653	0.0135	5.93	0.0787	-	0.559	43.9
			Standard deviation	5.9044	0.9284	0.0019	0.0009	0.0066	0.0832	0.0016	1.0264	0.0175	-	0.1067	4.9489
			Standard error	0.7057	0.111	0.0009	0.0004	0.003	0.0372	0.0007	0.459	0.0078	-	0.0477	2.2132
2021	Brook Stickleback	L-18	Sample Size (n)	115	115	4	4	4	4	4	4	4	4	4	4
			No. MDL (n)	-	-	0	0	0	0	0	0	0	4	0	0
			Minimum	52	1.06	0.0261	0.0053	0.014	2.02	0.0093	7.03	0.0465	0.04	1.04	35.1
			Maximum	72	2.9	0.0304	0.0083	0.018	2.32	0.0255	12.9	0.0577	0.04	1.11	41.3
			Mean	61.8957	1.7986	0.0292	0.0071	0.0153	2.16	0.0167	9.56	0.0525	-	1.085	38.075
			Median	62	1.77	0.0301	0.0074	0.0145	2.15	0.01605	9.155	0.0528	-	1.095	37.95
			Standard deviation	4.0074	0.3672	0.0021	0.0013	0.0019	0.1273	0.0067	2.7867	0.0047	-	0.0311	3.2806
			Standard error	0.3737	0.0342	0.001	0.0006	0.0009	0.0636	0.0033	1.3933	0.0024	-	0.0155	1.6403
2021	Northern Redbelly Dace	L-18	Sample Size (n)	19	19	1	1	1	1	1	1	1	1	1	1
			No. MDL (n)	-	-	0	0	0	0	0	0	0	1	0	0
			Minimum	61	2.23	0.0361	0.0067	0.03	1.94	0.0139	5.4	0.0599	0.04	0.719	66.1
			Maximum	66	3	0.0361	0.0067	0.03	1.94	0.0139	5.4	0.0599	0.04	0.719	66.1
			Mean	63.8947	2.6353	-	-	-	-	-	-	-	-	-	-
			Median	64	2.66	-	-	-	-	-	-	-	-	-	-
			Standard deviation	1.7605	0.2086	-	-	-	-	-	-	-	-	-	-
			Standard error	0.4039	0.0479	-	-	-	-	-	-	-	-	-	-
2021	Fathead Minnow	L-19	Sample Size (n)	51	51	5	5	5	5	5	5	5	5	5	5
			No. MDL (n)	-	-	0	0	1	0	0	0	0	5	0	0
			Minimum	69	3.5	0.025	0.0046	0.01	0.965	0.0128	1.51	0.029	0.04	1.06	25.7
			Maximum	88	8.03	0.0392	0.0065	0.021	1.17	0.02	2.62	0.0389	0.04	1.55	32.8
			Mean	77.6863	5.0535	0.0318	0.0057	0.018	1.073	0.0153	1.824	0.033	-	1.3	28.42
			Median	77	4.91	0.0313	0.0057	0.018	1.08	0.0137	1.7	0.0302	-	1.37	27.3
			Standard deviation	4.8145	1.1565	0.0052	0.0007	0.0035	0.0768	0.0031	0.4577	0.0049	-	0.2012	2.7472
			Standard error	0.6742	0.1619	0.0023	0.0003	0.0017	0.0343	0.0014	0.2047	0.0022	-	0.09	1.2286

Notes:
1. Concentrations less than the reportable detection limit were given the lowest reportable value for calculation of summary statistics (e.g., a concentration of <0.0010 was considered 0.0010)
2. No. MDL indicates the number of sample results reported less than the detection limit.
3. All results represent wet weight results, unless otherwise noted; "dwt" represents concentration for dry weight

Table B1-4: Contaminants of Concern in Springpole Lake (L-15) Fish Tissue

Year	Fish Species	Descriptive Statistics	Total Length (mm)	Fresh Weight (g)	Arsenic (mg/kg wwt)	Cadmium (mg/kg wwt)	Chromium (mg/kg wwt)	Copper (mg/kg wwt)	Lead (mg/kg wwt)	Manganese (mg/kg wwt)	Mercury (mg/kg wwt)	Nickel (mg/kg wwt)	Selenium (mg/kg dwt)	Zinc (mg/kg wwt)
2019	Northern Pike	Sample Size (n)	20	20	20	20	20	20	20	20	20	20	20	20
		No. MDL (n)	-	-	0	14	10	0	18	0	0	20	11	0
		Minimum	445	320	0.013	0.0012	0.012	0.099	0.004	0.158	0.0832	0.2	0.02	4.71
		Maximum	682	1800	0.152	0.005	0.05	0.211	0.02	0.58	0.7315	0.2	0.08	8.69
		Mean	556.4	737	0.054	0.0041	0.033	0.152	0.018	0.331	0.3366	-	0.04	6.38
		Median	538	650	0.041	0.005	0.037	0.151	0.02	0.299	0.3293	-	0.02	6.13
		Standard deviation	62.8	338.48	0.038	0.0015	0.018	0.025	0.005	0.132	0.1921	-	0.03	1.35
		Standard error	14.1	75.69	0.008	0.0003	0.004	0.006	0.001	0.03	0.043	-	0.01	0.3
2019	Yellow Perch	Sample Size (n)	459	459	9	9	6	9	9	9	9	9	9	9
		No. MDL (n)	-	-	0	0	3	0	1	0	0	9	9	0
		Minimum	41	0.56	0.038	0.0149	0.014	0.374	0.004	2.789	0.0142	0.2	0.2	23.38
		Maximum	62	2.09	0.075	0.0327	0.044	0.697	0.02	6.204	0.0241	0.2	0.2	46.53
		Mean	49.63	1.06	0.052	0.0201	0.023	0.449	0.007	3.712	0.0175	-	-	27.06
		Median	49	1.03	0.05	0.0181	0.02	0.43	0.007	3.569	0.0182	-	-	24.89
		Standard deviation	3.88	0.25	0.012	0.0054	0.011	0.1	0.005	1.031	0.0034	-	-	7.34
		Standard error	0.18	0.01	0.004	0.0018	0.005	0.033	0.002	0.344	0.0011	-	-	2.45
2021	Blacknose Shiner	Sample Size (n)	49	49	5	5	5	5	5	5	5	5	5	5
		No. MDL (n)	-	-	0	0	0	0	0	0	0	5	0	0
		Minimum	40	0.583	0.075	0.0147	0.021	0.571	0.0067	2.83	0.04	0.04	1.65	76.9
		Maximum	64	2.443	0.0952	0.0218	0.061	0.658	0.0091	4	0.102	0.04	1.82	89.9
		Mean	53.3718	1.4283	0.0847	0.018	0.0348	0.6278	0.0085	3.44	0.0584	-	1.758	85.94
		Median	53.5	1.4025	0.0836	0.0166	0.029	0.648	0.0088	3.37	0.049	-	1.77	87.1
		Standard deviation	4.4725	0.3627	0.0084	0.0034	0.0164	0.0364	0.001	0.4653	0.0249	-	0.0646	5.2065
		Standard error	0.5064	0.0411	0.0038	0.0015	0.0073	0.0163	0.0005	0.2081	0.0111	-	0.0289	2.3284
2021	Mimic Shiner	Sample Size (n)	79	79	5	5	5	5	5	5	5	5	5	5
		No. MDL (n)	-	-	0	0	0	0	0	0	0	5	0	0
		Minimum	44	0.622	0.0898	0.0243	0.018	0.612	0.0057	1.8	0.05	0.04	2.43	115
		Maximum	63	2.209	0.101	0.0377	0.03	0.787	0.0099	2.85	0.0933	0.04	2.66	138
		Mean	52.8354	1.3087	0.0977	0.0287	0.0238	0.6736	0.0071	2.334	0.0725	-	2.516	121.8
		Median	53	1.287	0.0989	0.0279	0.025	0.648	0.0064	2.22	0.0701	-	2.49	116
		Standard deviation	4.8157	0.4055	0.0045	0.0053	0.0048	0.0696	0.0017	0.4811	0.0179	-	0.0989	9.985
		Standard error	0.5418	0.0456	0.002	0.0024	0.0022	0.0311	0.0008	0.2152	0.008	-	0.0442	4.4654
2021	Spottail Shiner	Sample Size (n)	123	123	7	7	7	7	7	7	7	7	7	7
		No. MDL (n)	-	-	0	0	1	0	1	0	0	7	0	0
		Minimum	39	0.178	0.102	0.0169	0.01	0.468	0.004	2.68	0.0401	0.04	1.57	60.4
		Maximum	94	7.829	0.133	0.0262	0.035	0.782	0.0197	3.62	0.0873	0.04	2.45	77.8
		Mean	52.6585	1.5608	0.1159	0.0212	0.0193	0.5819	0.0143	3.1543	0.0604	-	1.9543	69.5571
		Median	50	1.214	0.117	0.0203	0.0165	0.573	0.01585	3.28	0.0579	-	2.02	70.4
		Standard deviation	11.3005	1.3008	0.0111	0.0037	0.0089	0.1076	0.0051	0.3551	0.0144	-	0.3078	6.3979
		Standard error	1.0189	0.1173	0.0042	0.0014	0.0036	0.0407	0.0021	0.1342	0.0054	-	0.1164	2.4182

Notes:

1. Concentrations less than the reportable detection limit were given the lowest reportable value for calculation of summary statistics (e.g., a concentration of <0.0010 was considered 0.0010)
2. No. MDL indicates the number of sample results reported less than the detection limit.
3. All results represent wet weight results, unless otherwise noted; "dwt" represents concentration for dry weight
4. All individual fish tissue results (Northern Pike and Yellow Perch) represent Wood 2019 data and do not include other sources.
5. All composite fish tissue results (Blacknose Shiner, Mimic Shiner, and Spottail Shiner) represent Wood 2021 data and do not include other sources.

Table B1-5: Contaminants of Concern in Springpole Lake (L-15) Fish Tissue

Year	Fish Species	Sample Area	Descriptive Statistics	Total Length (mm)	Fresh Weight (g)	Arsenic (mg/kg wwt)	Cadmium (mg/kg wwt)	Chromium (mg/kg wwt)	Copper (mg/kg wwt)	Lead (mg/kg wwt)	Manganese (mg/kg wwt)	Mercury (mg/kg wwt)	Nickel (mg/kg wwt)	Selenium (mg/kg dwt)	Zinc (mg/kg wwt)
2021	Bluntnose Minnow	Birch Lake	Sample Size (n)	27	27	3	3	3	3	3	3	3	3	3	3
			No. MDL (n)	-	-	0	0	0	0	0	0	0	2	0	0
			Minimum	56	1.488	0.106	0.0158	0.032	0.69	0.0236	3.28	0.0216	0.04	1.28	53.1
			Maximum	90	6.889	0.165	0.0288	0.067	0.754	0.0555	3.36	0.0298	0.049	1.65	81.2
			Mean	72.1111	3.5335	0.1417	0.0225	0.0477	0.7213	0.039	3.3267	0.0267	-	1.4833	70.4
			Median	72	3.245	0.154	0.0229	0.044	0.72	0.0379	3.34	0.0286	-	1.52	76.9
			Standard deviation	10.6458	1.6734	0.0314	0.0065	0.0178	0.032	0.016	0.0416	0.0044	-	0.1877	15.1357
			Standard error	2.0488	0.322	0.0181	0.0038	0.0103	0.0185	0.0092	0.024	0.0026	-	0.1084	8.7386
2021	Yellow Perch	Birch Lake	Sample Size (n)	59	59	7	7	7	7	7	7	7	7	7	7
			No. MDL (n)	-	-	0	0	0	0	0	0	0	3	0	0
			Minimum	57	1.595	0.0642	0.0133	0.023	0.377	0.0098	2.61	0.029	0.04	1.28	24.9
			Maximum	95	8.46	0.154	0.0213	0.055	0.52	0.0174	4.51	0.0447	0.074	1.52	33.5
			Mean	77.3	4.3914	0.1114	0.0166	0.0359	0.4494	0.0138	3.4657	0.0365	0.0623	1.4086	29.8714
			Median	80.5	4.8355	0.119	0.0155	0.032	0.452	0.0156	3.39	0.0365	0.0655	1.42	29.8
			Standard deviation	11.7218	1.8607	0.0321	0.0028	0.0117	0.0507	0.003	0.5978	0.0051	0.0136	0.0871	2.9882
			Standard error	1.5133	0.2402	0.0121	0.0011	0.0044	0.0191	0.0011	0.226	0.0019	0.0068	0.0329	1.1294

Notes:
1. Concentrations less than the reportable detection limit were given the lowest reportable value for calculation of summary statistics (e.g., a concentration of <0.0010 was considered 0.0010)
2. No. MDL indicates the number of sample results reported less than the detection limit.
3. All results represent wet weight results, unless otherwise noted; "dwt" represents concentration for dry weight
4. All individual fish tissue results (Northern Pike and Yellow Perch) represent Wood 2019 data and do not include other sources.
5. All composite fish tissue results (Bluntnose Minnow and Yellow Perch) represent Wood 2021 data and do not include other sources.

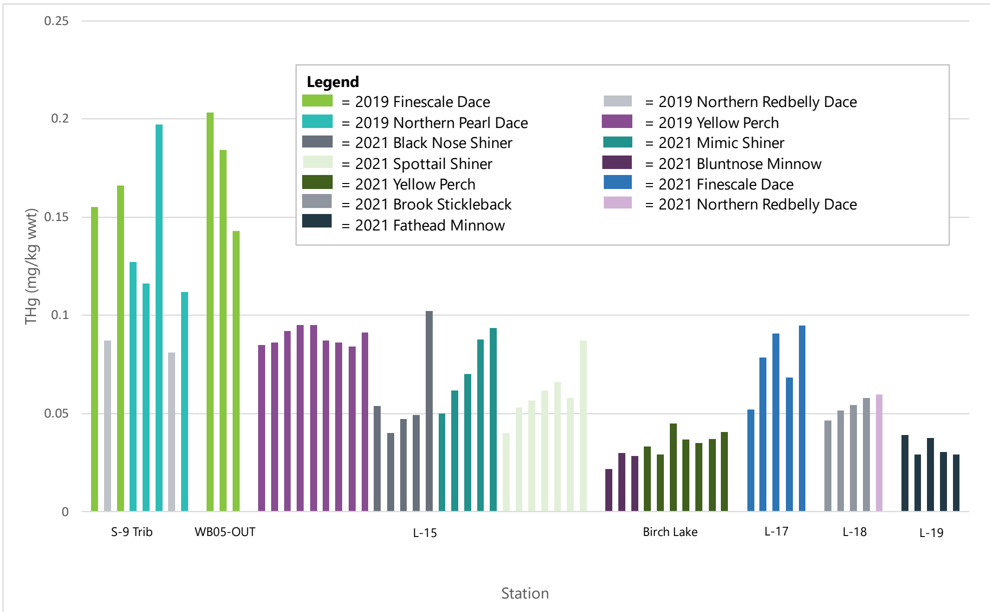


Figure B1-1 Total Mercury in Forage Fish Species Composites

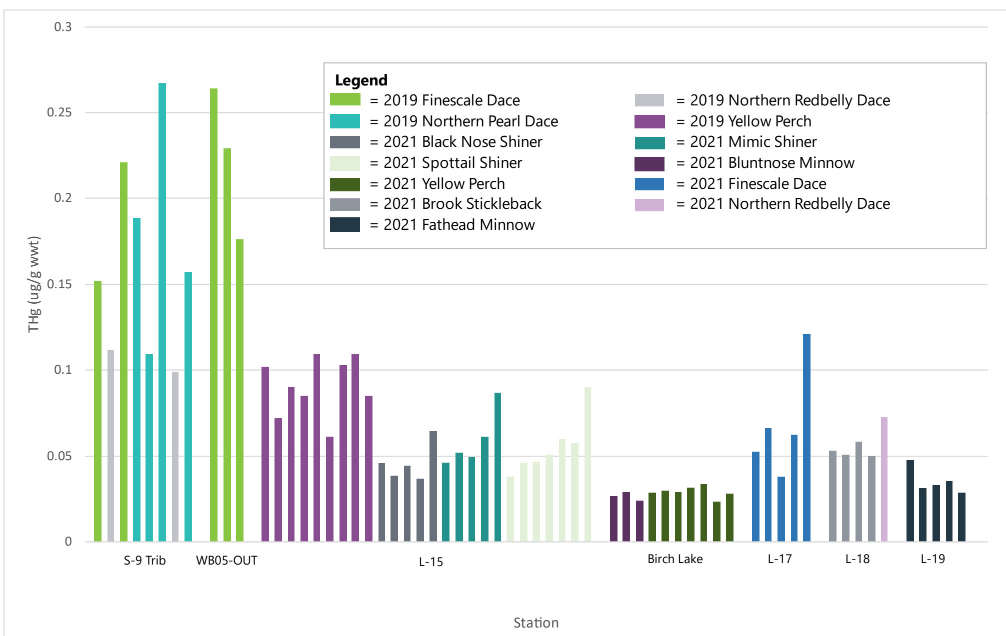
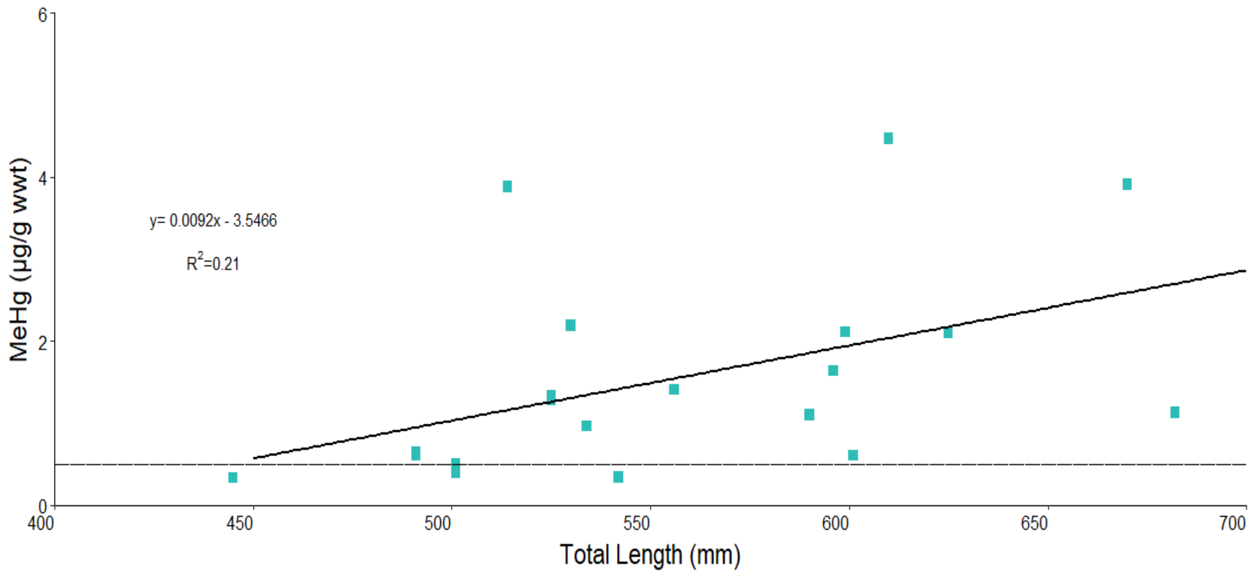


Figure B1-2 Methymercury in Forage Fish Species Composites



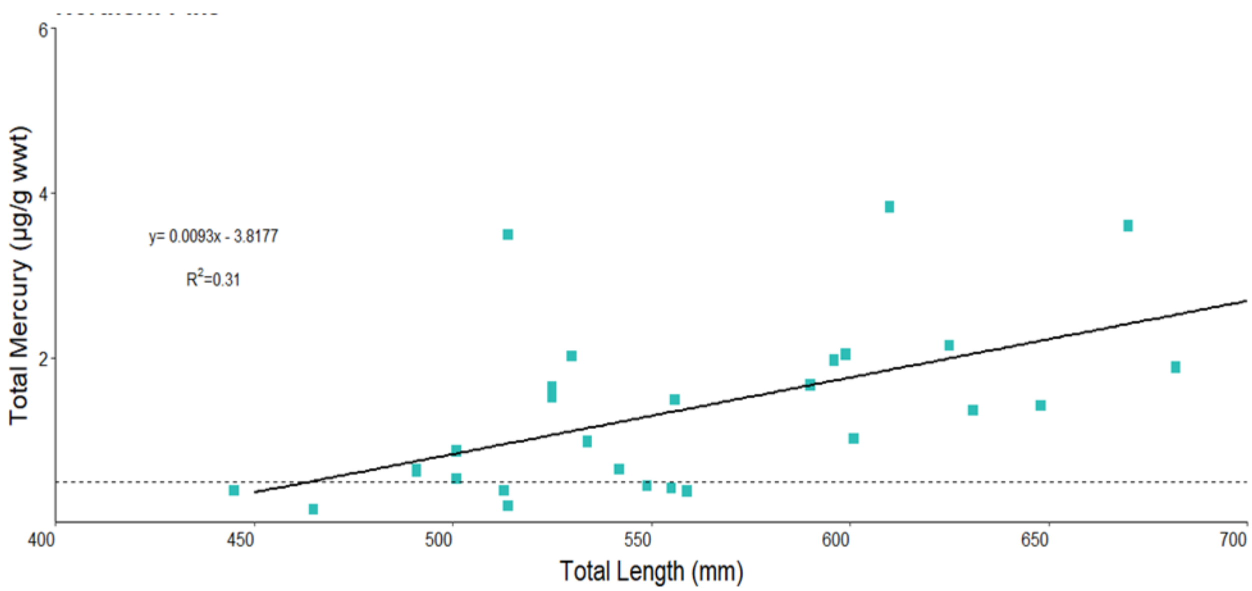


Figure B1-3 Methymercury and Total Mercury in Northern Pike at Length from Springpole Lake

Note: Dashed line represents the consumption guideline for general population (0.5µg/g wwt). Methylmercury plot shows Wood 2019 values only, whereas the total mercury plot shows Wood and Story Environmental Inc. concentrations measured in 2019.

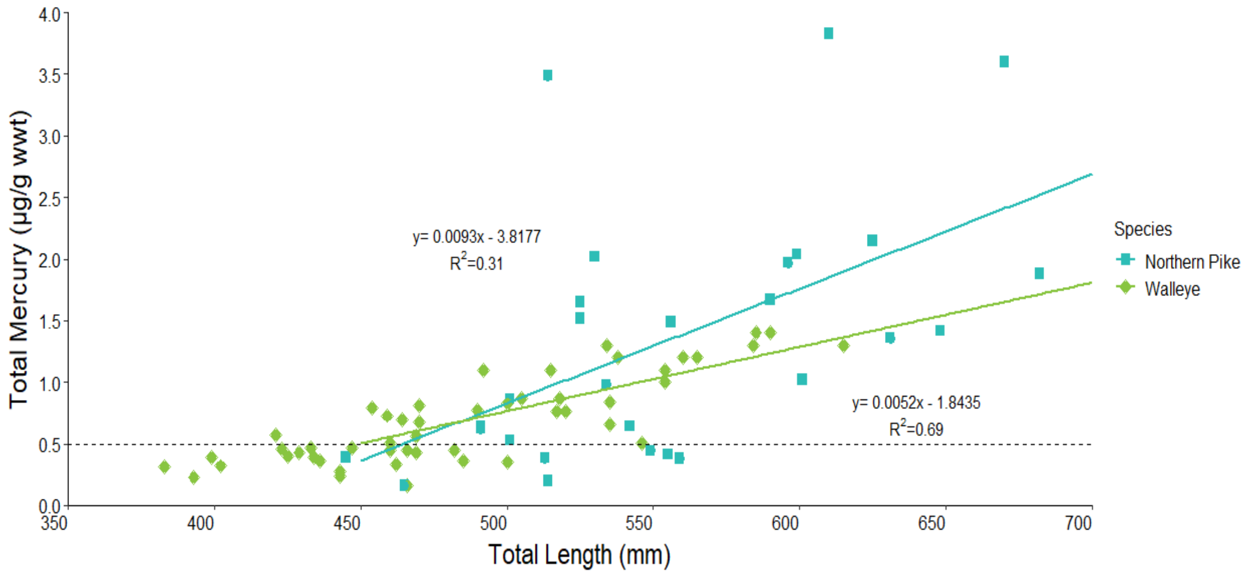


Figure B1-4 Total Mercury in Northern Pike and Walleye at Length from Springpole Lake

Note: Dashed line represents the consumption guideline for general population (0.5µg/g wwt). This plot shows all total mercury concentrations from the 2019 Wood and Story Environmental Inc. investigations, as well as historic sampling (FMG and C. Portt 2018).

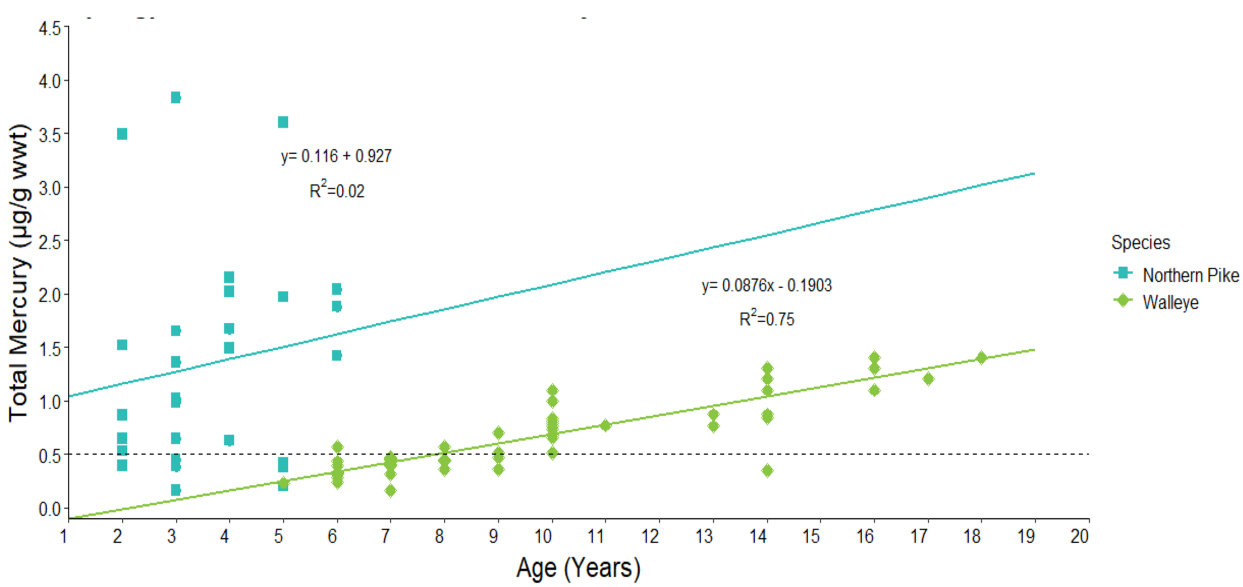


Figure B1-5 Total Mercury in Northern Pike and Walleye at Age from Springpole Lake

Note: Dashed line represents the consumption guideline for general population (0.5µg/g wwt). This plot shows data from the 2019 Wood and Story Environmental Inc. investigations, as well as historic sampling (FMG and C. Portt 2018).

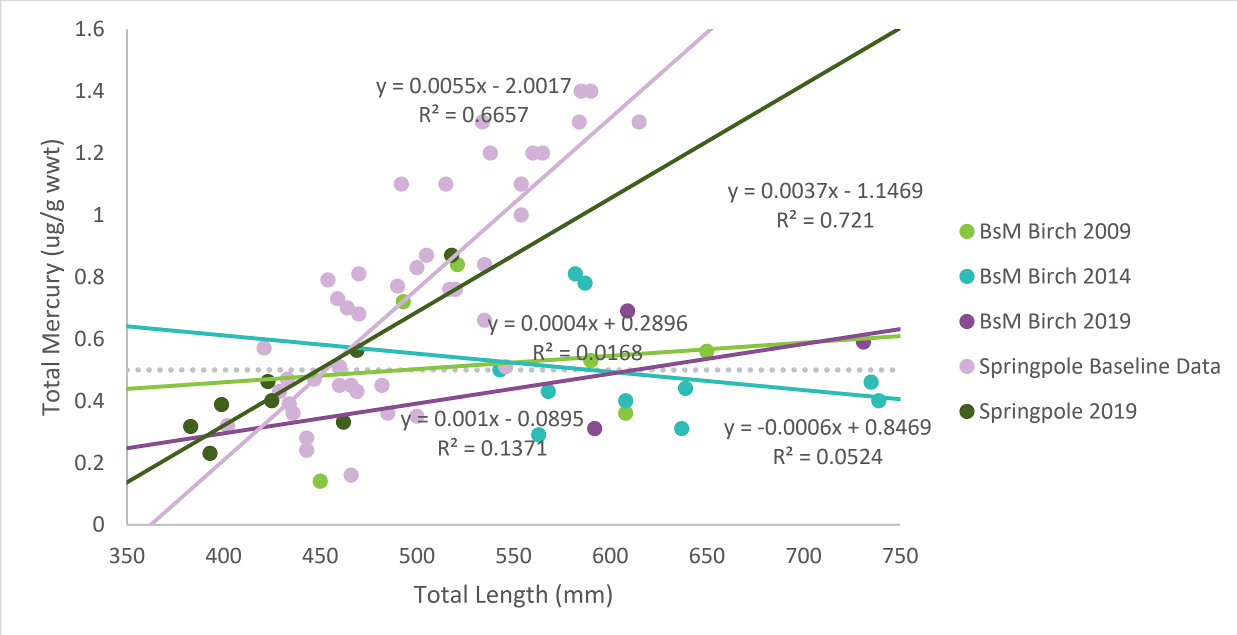


Figure B1-6 Total Mercury in Walleye at Length from Birch and Springpole Lakes

Note: Dashed line represents the consumption guideline for general population (0.5µg/g wwt). This plot shows data from the 2019 Wood and Story Environmental Inc. investigations, as well as historic sampling (FMG and C. Portt 2018).

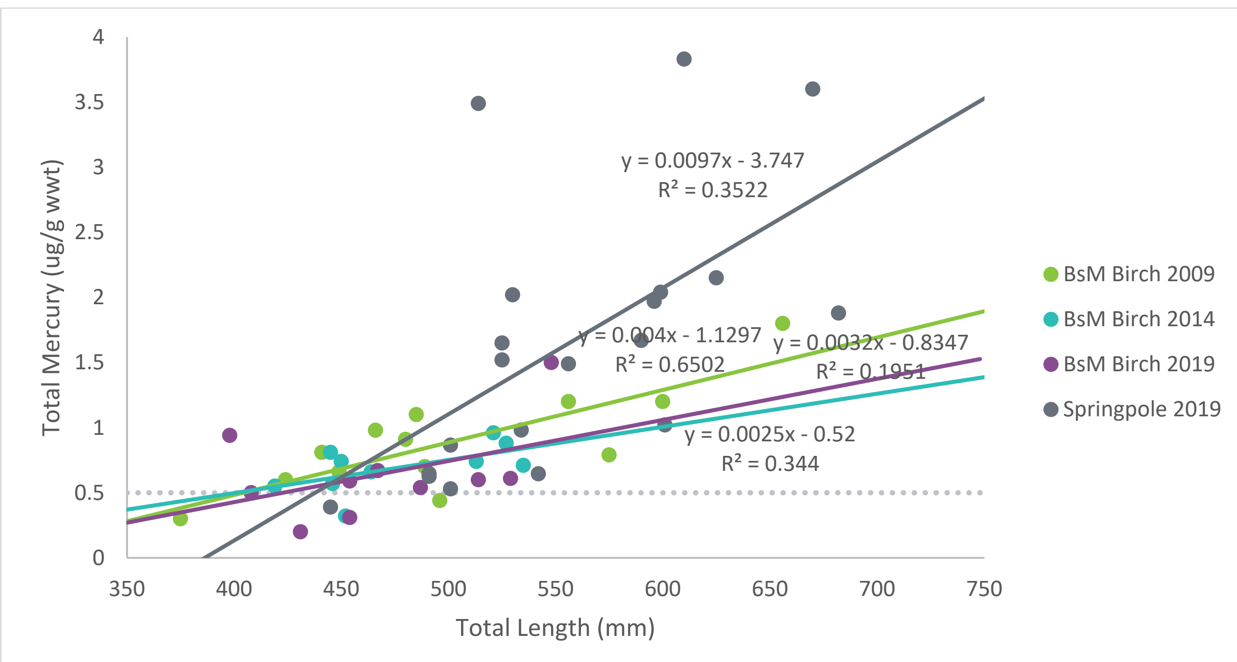


Figure B1-7 Total Mercury in Northern Pike at Length from Birch and Springpole Lakes

Note: Dashed line represents the consumption guideline for general population (0.5µg/g wwt). This plot shows data from the 2019 Wood and Story Environmental Inc. investigations, as well as historic sampling (FMG and C. Portt 2018).

Appendix C
Fish Age Data

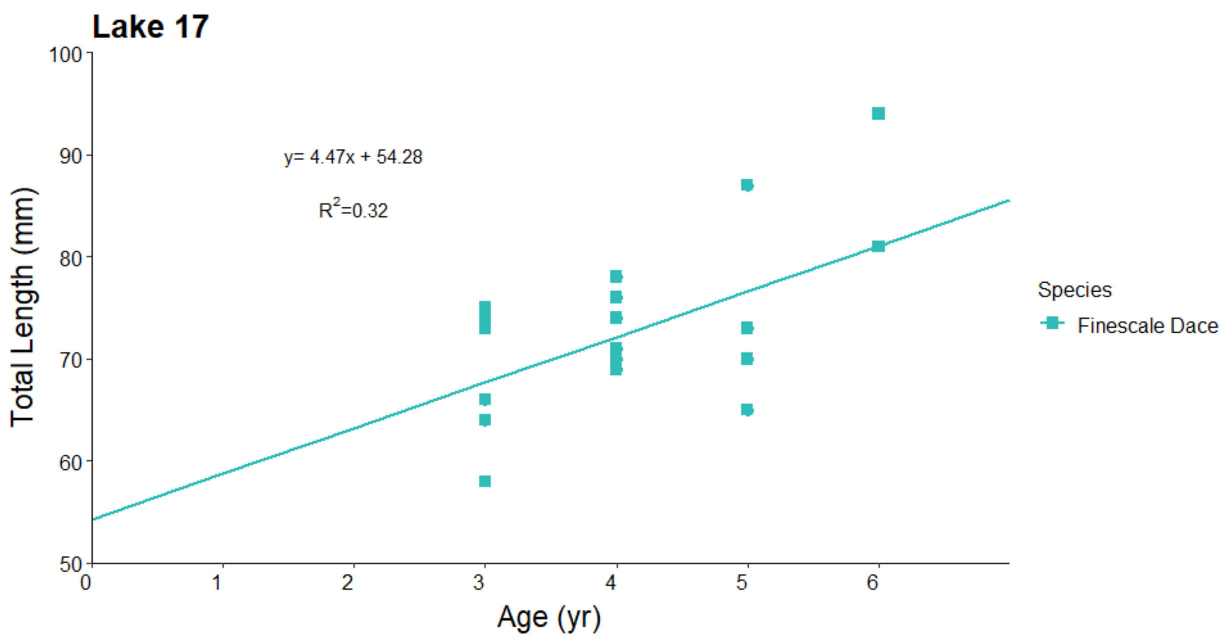


Figure C1-1: Age in Forage Fish Species at Length from Lake 17, 2021

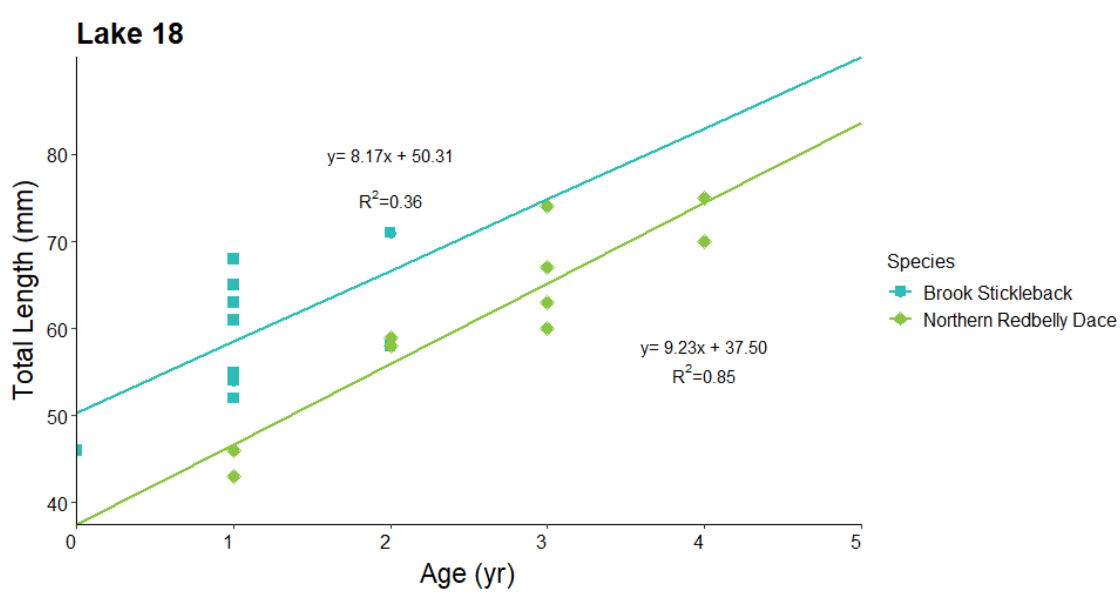


Figure C1-2: Age in Forage Fish Species at Length from Lake 18, 2021

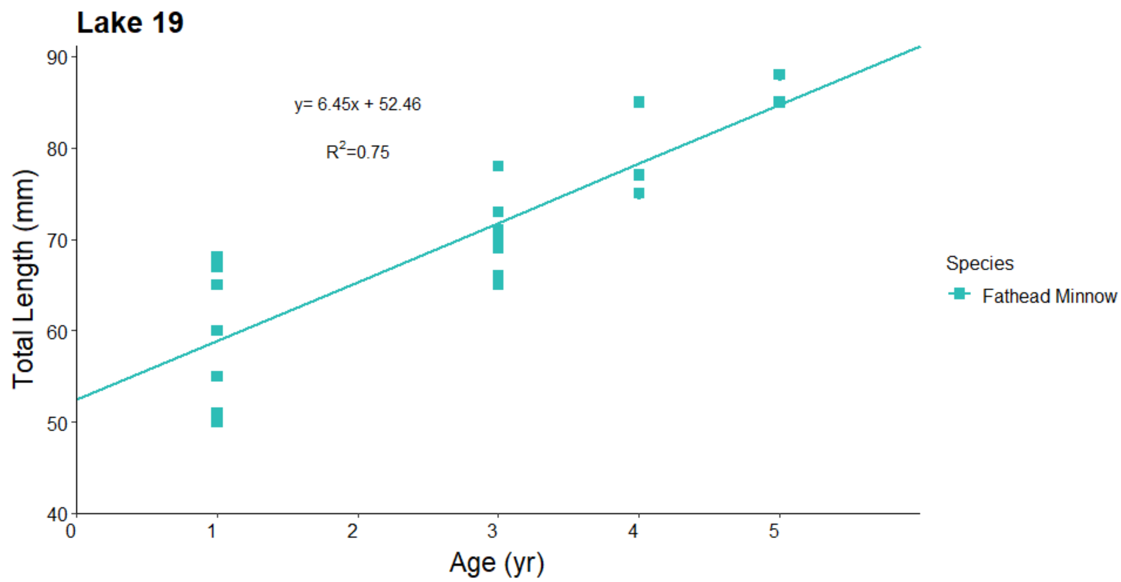


Figure C1-3: Age in Forage Fish Species at Length from Lake 19, 2021

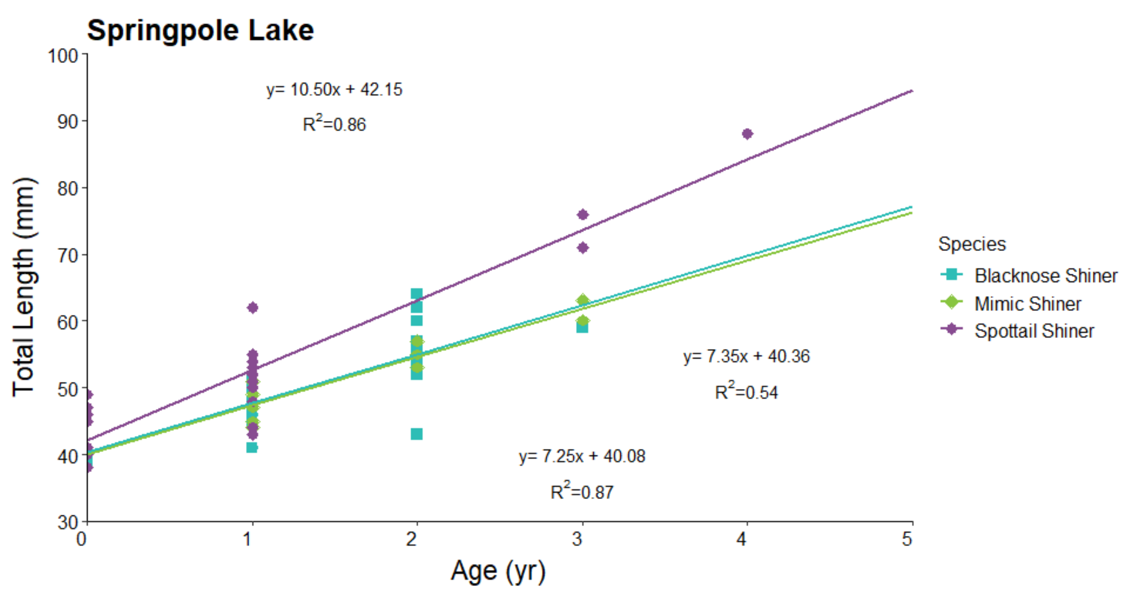


Figure C1-4: Age in Forage Fish Species at Length from Springpole Lake, 2021

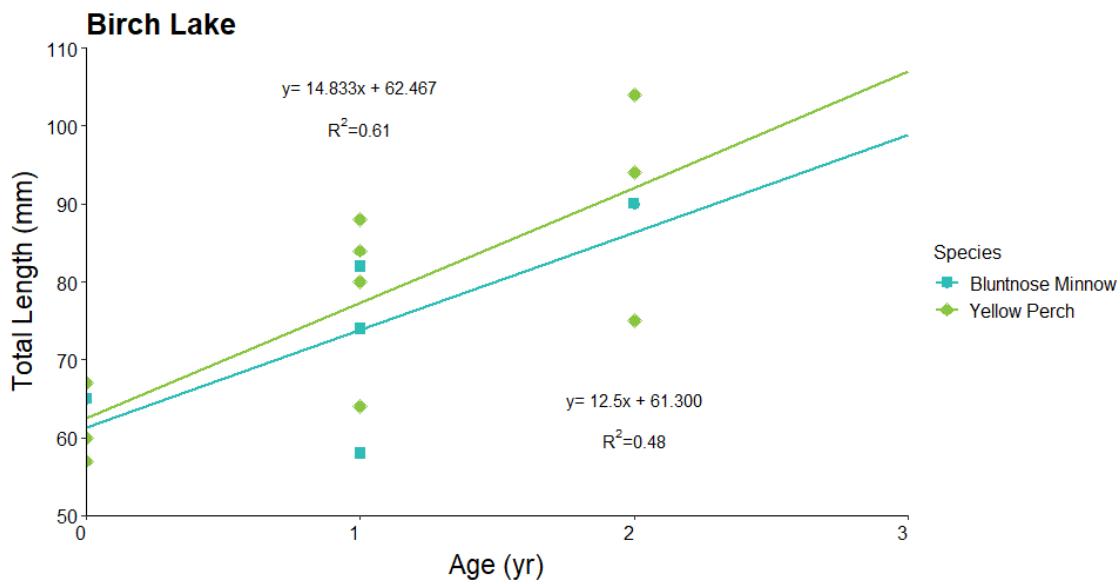


Figure C1-5: Age in Forage Fish Species at Length from Birch Lake, 2021

Table C1-1: Forage Fish Species Age Results

Waterbody	Effort ID	Species	Fork Length (mm)	Total Length (mm)	Total Weight (g)	Ageing Structure	Ageing Method	Final Age Estimate
Birch Lake	BIRCH-MT1-F14-BNM	Bluntnose Minnow	75	82	5.534	Otolith	Whole	1
Birch Lake	BIRCH-MT1-F16-BNM	Bluntnose Minnow	60	65	2.530	Otolith	Whole	0
Birch Lake	BIRCH-MT1-F18-BNM	Bluntnose Minnow	67	74	3.841	Otolith	Whole	1
Birch Lake	BIRCH-MT1-F20-BNM	Bluntnose Minnow	53	58	1.470	Otolith	Whole	1
Birch Lake	BIRCH-MT1-F26-BNM	Bluntnose Minnow	82	90	6.189	Otolith	Whole	2
Birch Lake	BIRCH-MT1-F55-YLP	Yellow Perch	53	57	1.807	Otolith	Section	0
Birch Lake	BIRCH-MT1-F91-YLP	Yellow Perch	57	60	1.831	Otolith	Section	0
Birch Lake	BIRCH-MT1-F92-YLP	Yellow Perch	61	64	2.458	Otolith	Section	1
Birch Lake	BIRCH-MT1-F72-YLP	Yellow Perch	63	67	2.968	Otolith	Section	0
Birch Lake	BIRCH-MT1-F99-YLP	Yellow Perch	73	75	4.103	Otolith	Section	2
Birch Lake	BIRCH-MT1-F47-YLP	Yellow Perch	77	80	4.119	Otolith	Section	1
Birch Lake	BIRCH-MT1-F49-YLP	Yellow Perch	79	84	5.894	Otolith	Section	1
Birch Lake	BIRCH-MT1-F44-YLP	Yellow Perch	84	88	5.780	Otolith	Section	1
Birch Lake	BIRCH-MT1-F102-YLP	Yellow Perch	90	94	7.692	Otolith	Section	2
Birch Lake	BIRCH-MT1-F105-YLP	Yellow Perch	100	104	12.315	Otolith	Section	2
Springpole Lake	L-15-SN2-F230-BNS	Blacknose Shiner	40	43	0.714	Otolith	Whole	2
Springpole Lake	L-15-SN2-F232-BNS	Blacknose Shiner	43	46	0.944	Otolith	Whole	1
Springpole Lake	L-15-SN2-F246-BNS	Blacknose Shiner	45	50	1.159	Otolith	Whole	1
Springpole Lake	L-15-SN2-F252-BNS	Blacknose Shiner	60	64	2.646	Otolith	Whole	2
Springpole Lake	L-15-SN2-F254-BNS	Blacknose Shiner	52	56	1.497	Otolith	Whole	2
Springpole Lake	L-15-SN2-F262-BNS	Blacknose Shiner	47	52	1.281	Otolith	Whole	2
Springpole Lake	L-15-SN2-F263-BNS	Blacknose Shiner	37	39	0.543	Otolith	Whole	0
Springpole Lake	L-15-SN2-F265-BNS	Blacknose Shiner	43	45	1.008	Otolith	Whole	1
Springpole Lake	L-15-SN2-F269-BNS	Blacknose Shiner	38	41	0.748	Otolith	Whole	1
Springpole Lake	L-15-SN2-F270-BNS	Blacknose Shiner	47	50	1.379	Otolith	Whole	1
Springpole Lake	L-15-SN2-F272-BNS	Blacknose Shiner	50	54	1.594	Otolith	Whole	2
Springpole Lake	L-15-SN2-F275-BNS	Blacknose Shiner	55	60	1.954	Otolith	Whole	2
Springpole Lake	L-15-SN2-F281-BNS	Blacknose Shiner	48	53	1.540	Otolith	Whole	2
Springpole Lake	L-15-SN2-F286-BNS	Blacknose Shiner	55	59	1.948	Otolith	Whole	3
Springpole Lake	L-15-SN2-F287-BNS	Blacknose Shiner	56	62	2.258	Otolith	Whole	2
Springpole Lake	L-15-SN2-F289-BNS	Blacknose Shiner	52	57	1.808	Otolith	Whole	2
Springpole Lake	L-15-SN2-F297-BNS	Blacknose Shiner	46	50	1.325	Otolith	Whole	1
Springpole Lake	L-15-SN2-F299-BNS	Blacknose Shiner	47	51	1.231	Otolith	Whole	1
Springpole Lake	L-15-SN2-F300-BNS	Blacknose Shiner	43	48	0.977	Otolith	Whole	1
Springpole Lake	L-15-SN2-F321-BNS	Blacknose Shiner	50	55	1.627	Otolith	Whole	2
Springpole Lake	L-15-SN1-F40-MS	Mimic Shiner	42	45	0.710	Otolith	Whole	1
Springpole Lake	L-15-SN1-F42-MS	Mimic Shiner	57	63	2.043	Otolith	Whole	3

Table C1-1: Forage Fish Species Age Results

Waterbody	Effort ID	Species	Fork Length (mm)	Total Length (mm)	Total Weight (g)	Ageing Structure	Ageing Method	Final Age Estimate
Springpole Lake	L-15-SN1-F44-MS	Mimic Shiner	40	44	0.669	Otolith	Whole	1
Springpole Lake	L-15-SN1-F46-MS	Mimic Shiner	49	53	1.216	Otolith	Whole	2
Springpole Lake	L-15-SN1-F54-MS	Mimic Shiner	51	55	1.365	Otolith	Whole	2
Springpole Lake	L-15-SN1-F55-MS	Mimic Shiner	47	51	0.913	Otolith	Whole	1
Springpole Lake	L-15-SN1-F69-MS	Mimic Shiner	42	47	0.798	Otolith	Whole	1
Springpole Lake	L-15-SN1-F78-MS	Mimic Shiner	54	60	2.105	Otolith	Whole	3
Springpole Lake	L-15-SN1-F106-MS	Mimic Shiner	52	57	1.558	Otolith	Whole	2
Springpole Lake	L-15-SN1-F107-MS	Mimic Shiner	45	49	1.000	Otolith	Whole	1
Springpole Lake	L-15-SN1-F130-STS	Spottail Shiner	64	71	2.832	Otolith	Whole	3
Springpole Lake	L-15-SN1-F137-STS	Spottail Shiner	39	43	0.688	Otolith	Whole	1
Springpole Lake	L-15-SN1-F145-STS	Spottail Shiner	67	76	3.230	Otolith	Whole	3
Springpole Lake	L-15-SN1-F155-STS	Spottail Shiner	79	88	5.370	Otolith	Whole	4
Springpole Lake	L-15-SN1-F162-STS	Spottail Shiner	40	46	0.772	Otolith	Whole	0
Springpole Lake	L-15-SN1-F168-STS	Spottail Shiner	35	40	0.649	Otolith	Whole	0
Springpole Lake	L-15-SN1-F175-STS	Spottail Shiner	40	44	0.685	Otolith	Whole	1
Springpole Lake	L-15-SN2-F214-STS	Spottail Shiner	44	50	1.247	Otolith	Whole	1
Springpole Lake	L-15-SN2-F219-STS	Spottail Shiner	35	38	0.517	Otolith	Whole	0
Springpole Lake	L-15-SN2-F220-STS	Spottail Shiner	41	45	0.917	Otolith	Whole	0
Springpole Lake	L-15-SN2-F222-STS	Spottail Shiner	45	49	1.102	Otolith	Whole	0
Springpole Lake	L-15-SN2-F226-STS	Spottail Shiner	37	41	0.689	Otolith	Whole	0
Springpole Lake	L-15-SN2-F339-STS	Spottail Shiner	45	51	1.544	Otolith	Whole	1
Springpole Lake	L-15-SN2-F340-STS	Spottail Shiner	50	54	1.533	Otolith	Whole	1
Springpole Lake	L-15-SN2-F341-STS	Spottail Shiner	47	52	1.551	Otolith	Whole	1
Springpole Lake	L-15-SN2-F343-STS	Spottail Shiner	55	62	2.245	Otolith	Whole	1
Springpole Lake	L-15-SN2-F353-STS	Spottail Shiner	44	48	1.159	Otolith	Whole	1
Springpole Lake	L-15-SN2-F354-STS	Spottail Shiner	50	55	1.723	Otolith	Whole	1
Springpole Lake	L-15-SN2-F356-STS	Spottail Shiner	43	47	1.137	Otolith	Whole	0
Springpole Lake	L-15-SN2-F361-STS	Spottail Shiner	47	53	1.628	Otolith	Whole	1
Lake 17	L-17-MT1-F71-FSD	Finescale Dace	82	87	6.030	Otolith	Whole	5
Lake 17	L-17-MT1-F72-FSD	Finescale Dace	88	94	8.400	Otolith	Whole	6
Lake 17	L-17-MT1-F73-FSD	Finescale Dace	73	78	4.770	Otolith	Whole	4
Lake 17	L-17-MT1-F74-FSD	Finescale Dace	65	70	3.180	Otolith	Whole	5
Lake 17	L-17-MT1-F75-FSD	Finescale Dace	61	65	2.480	Otolith	Whole	5
Lake 17	L-17-MT1-F76-FSD	Finescale Dace	60	64	2.010	Otolith	Whole	3
Lake 17	L-17-MT1-F77-FSD	Finescale Dace	65	70	2.810	Otolith	Whole	5
Lake 17	L-17-MT1-F78-FSD	Finescale Dace	62	66	2.970	Otolith	Whole	3
Lake 17	L-17-MT1-F79-FSD	Finescale Dace	69	73	3.300	Otolith	Whole	3

Table C1-1: Forage Fish Species Age Results

Waterbody	Effort ID	Species	Fork Length (mm)	Total Length (mm)	Total Weight (g)	Ageing Structure	Ageing Method	Final Age Estimate
Lake 17	L-17-MT1-F80-FSD	Finescale Dace	70	75	3.760	Otolith	Whole	3
Lake 17	L-17-MT1-F81-FSD	Finescale Dace	69	74	3.010	Otolith	Whole	3
Lake 17	L-17-MT1-F82-FSD	Finescale Dace	54	58	1.730	Otolith	Whole	3
Lake 17	L-17-MT1-F83-FSD	Finescale Dace	70	74	4.480	Otolith	Whole	4
Lake 17	L-17-MT1-F84-FSD	Finescale Dace	67	71	3.510	Otolith	Whole	4
Lake 17	L-17-MT1-F85FSD	Finescale Dace	76	81	4.670	Otolith	Whole	6
Lake 17	L-17-MT1-F86-FSD	Finescale Dace	68	73	3.280	Otolith	Whole	5
Lake 17	L-17-MT1-F87-FSD	Finescale Dace	71	76	4.580	Otolith	Whole	4
Lake 17	L-17-MT1-F88-FSD	Finescale Dace	66	70	3.420	Otolith	Whole	4
Lake 17	L-17-MT1-F89-FSD	Finescale Dace	65	69	3.360	Otolith	Whole	4
Lake 17	L-17-MT1-F90-FSD	Finescale Dace	68	73	4.560	Otolith	Whole	5
Lake 17	L-17-MT1-F91-FSD	Finescale Dace				Otolith	Whole	5
Lake 18	L-18-MT1-F136-BSB	Brook Stickleback	-	58	1.580	Otolith	Whole	2
Lake 18	L-18-MT1-F137-BSB	Brook Stickleback	-	71	2.690	Otolith	Whole	2
Lake 18	L-18-MT1-F139-BSB	Brook Stickleback	-	63	1.780	Otolith	Whole	1
Lake 18	L-18-MT1-F141-BSB	Brook Stickleback	-	68	2.230	Otolith	Whole	1
Lake 18	L-18-MT1-F143-BSB	Brook Stickleback	-	65	2.240	Otolith	Whole	1
Lake 18	L-18-MT1-F144-BSB	Brook Stickleback	-	61	1.800	Otolith	Whole	1
Lake 18	L-18-MT1-F148-BSB	Brook Stickleback	-	52	1.040	Otolith	Whole	1
Lake 18	L-18-MT1-F152-BSB	Brook Stickleback	-	55	1.260	Otolith	Whole	1
Lake 18	L-18-MT1-F153-BSB	Brook Stickleback	-	54	1.420	Otolith	Whole	1
Lake 18	L-18-MT1-F155-BSB	Brook Stickleback	-	46	0.730	Otolith	Whole	0
Lake 18	L-18-MT1-F156-NRD	Northern Redbelly Dace	70	75	3.490	Otolith	Whole	4
Lake 18	L-18-MT1-F157-NRD	Northern Redbelly Dace	69	74	3.300	Otolith	Whole	3
Lake 18	L-18-MT1-F158-NRD	Northern Redbelly Dace	64	67	3.730	Otolith	Whole	3
Lake 18	L-18-MT1-F160-NRD	Northern Redbelly Dace	66	70	3.230	Otolith	Whole	4
Lake 18	L-18-MT1-F165-NRD	Northern Redbelly Dace	57	60	2.390	Otolith	Whole	3
Lake 18	L-18-MT1-F166-NRD	Northern Redbelly Dace	59	63	2.380	Otolith	Whole	3
Lake 18	L-18-MT1-F167-NRD	Northern Redbelly Dace	55	59	1.950	Otolith	Whole	2
Lake 18	L-18-MT1-F171-NRD	Northern Redbelly Dace	55	58	1.630	Otolith	Whole	2
Lake 18	L-18-MT1-F173-NRD	Northern Redbelly Dace	40	43	0.840	Otolith	Whole	1
Lake 18	L-18-MT1-F174-NRD	Northern Redbelly Dace	43	46	0.930	Otolith	Whole	1
Lake 19	L-19-MT1-F52-FHM	Fathead Minnow	47	50	1.070	Otolith	Whole	1
Lake 19	L-19-MT1-F53-FHM	Fathead Minnow	47	51	1.220	Otolith	Whole	1
Lake 19	L-19-MT1-F54-FHM	Fathead Minnow	55	60	2.080	Otolith	Whole	1
Lake 19	L-19-MT1-F55-FHM	Fathead Minnow	50	55	1.620	Otolith	Whole	1
Lake 19	L-19-MT1-F56-FHM	Fathead Minnow	55	60	2.010	Otolith	Whole	1

Table C1-1: Forage Fish Species Age Results

Waterbody	Effort ID	Species	Fork Length (mm)	Total Length (mm)	Total Weight (g)	Ageing Structure	Ageing Method	Final Age Estimate
Lake 19	L-19-MT1-F57-FHM	Fathead Minnow	60	65	2.510	Otolith	Whole	1
Lake 19	L-19-MT1-F58-FHM	Fathead Minnow	60	65	2.890	Otolith	Whole	3
Lake 19	L-19-MT1-F59-FHM	Fathead Minnow	64	70	3.160	Otolith	Whole	3
Lake 19	L-19-MT1-F60-FHM	Fathead Minnow	68	73	4.010	Otolith	Whole	3
Lake 19	L-19-MT1-F61-FHM	Fathead Minnow	62	66	2.950	Otolith	Whole	3
Lake 19	L-19-MT1-F62-FHM	Fathead Minnow	64	69	3.210	Otolith	Whole	3
Lake 19	L-19-MT1-F63-FHM	Fathead Minnow	70	75	4.570	Otolith	Whole	4
Lake 19	L-19-MT1-F64-FHM	Fathead Minnow	62	68	2.790	Otolith	Whole	1
Lake 19	L-19-MT1-F65-FHM	Fathead Minnow	66	71	3.470	Otolith	Whole	3
Lake 19	L-19-MT1-F66-FHM	Fathead Minnow	62	67	3.010	Otolith	Whole	1
Lake 19	L-19-MT1-F67-FHM	Fathead Minnow	78	85	6.380	Otolith	Whole	5
Lake 19	L-19-MT1-F68-FHM	Fathead Minnow	78	85	5.850	Otolith	Whole	4
Lake 19	L-19-MT1-F69-FHM	Fathead Minnow	71	77	4.680	Otolith	Whole	4
Lake 19	L-19-MT1-F70-FHM	Fathead Minnow	73	78	5..25	Otolith	Whole	3
Lake 19	L-19-MT1-F71-FHM	Fathead Minnow	82	88	8.270	Otolith	Whole	5

Appendix D
Sediment Quality and Benthic Invertebrate Community Data

Table D1-1a: Inland Lakes (L-18 and L-19)

					Sample Area	L-18-SED1	L-18-SED2	L-18-SED3	L-19-SED1	L-19-SED2	L-19-SED3
					Sample Date (dd-mmm-yy)	30-Sep-21	30-Sep-21	30-Sep-21	30-Sep-21	30-Sep-21	30-Sep-21
Parameter	Unit	MDL	PSQG		CSQG						
			LEL	SEL	PEL						
Sample Depth (range as relevant)	m	0.05	-	-	-	1.30 – 1.35	1.20 – 1.25	1.30 – 1.40	0.60 – 0.75	0.50 – 0.55	0.25 – 0.30
Physical Tests											
Moisture	%	1.0									
Physical Tests	pH	N/A				5.69	5.65	5.71	5.53	6.03	5.78
Organic Content											
Leachable Anions & Nutrients											
Nitrate (N)	ug/g	2									
Nitrite (N)	ug/g	0.5									
Nitrate + Nitrite (N)	ug/g	3									
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		1.26	1.74	1.8	0.67	0.32	0.63
Organic / Inorganic Carbon											
Fraction Organic Carbon	g/g	0.001				0.146	0.315	0.277	0.0318	0.0186	0.0374
Total Organic Carbon	%	0.05	1	10		14.6	31.5	27.7	3.18	1.86	3.74
Metals											
Aluminum	ug/g	50				4520	4340	4860	2280	2970	3450
Antimony	ug/g	0.20 or 0.10				0.13	0.25	0.22	<0.10	<0.10	0.12
Arsenic	ug/g	1.0 or 0.1	6	33	17	1.91	4.4	2.73	1.55	0.95	2.03
Barium	ug/g	0.50				24.2	35.3	44	20.5	17.3	24.6
Beryllium	ug/g	0.20 or 0.10				<0.10	0.11	0.11	<0.10	<0.10	<0.10
Bismuth	ug/g	1.0 or 0.2				<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron	ug/g	5.0				<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	0.202	0.355	0.285	0.112	0.049	0.16
Calcium	ug/g	50				10300	15300	16000	4890	2370	4700
Chromium	ug/g	1.0 or 0.5	26	110	90	12.2	8.02	8.94	5.53	7.23	8.54
Cobalt	ug/g	0.10				3.52	3.71	4.03	1.29	1.62	2.38
Copper	ug/g	0.50	16	110	197	16.1	40.6	29.9	3.18	3	4.55
Iron	ug/g	50	20000	40000		5350	6550	6690	3890	3970	5770
Lead	ug/g	1.0 or 0.5	31	250	91.3	4.12	7.79	4.18	3.13	1.88	4.56
Lithium	ug/g	2				2.5	<2.0	<2.0	<2.0	3.9	3.9
Magnesium	ug/g	50 or 20				2110	1340	1300	1080	1200	1570
Manganese	ug/g	1.0	460	1100		127	336	173	76.3	49	82.1
Mercury	ug/g	0.05	0.2	2	0.486	0.0541	0.139	0.116	0.0237	0.0084	0.0223
Molybdenum	ug/g	0.50 or 0.1				0.31	0.41	0.44	0.14	0.12	0.28
Nickel	ug/g	0.50	16	75		11.4	9.61	10.7	3.31	4.64	5.79
Phosphorus	ug/g	50	600	2000		290	438	335	243	267	181
Potassium	ug/g	200 or 100				250	220	160	<100	150	140
Selenium	ug/g	0.50 or 0.2				0.53	1.16	1.27	0.29	<0.20	0.28
Silver	ug/g	0.20 or 0.10				<0.10	0.14	<0.10	<0.10	<0.10	<0.10
Sodium	ug/g	50				52	<50	64	<50	61	61
Strontium	ug/g	1.0 or 0.5				19.2	22.2	33.1	13	6.96	11
Sulfur	ug/g	1000				2000	4500	4700	<1000	<1000	<1000
Thallium	ug/g	0.050				<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				144	62	90.5	254	331	301
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				0.231	0.256	0.301	0.31	0.297	0.259
Vanadium	ug/g	5.0 or 0.2				8.24	7.81	9.47	6.63	7.45	9.67
Zinc	ug/g	5.0 or 2.0	120	820	315	28.4	34.8	30.8	15.8	9.8	23.5
Zirconium	ug/g	1				1.2	1.9	2.5	1.8	1.9	2
Particle Size (Soil)											
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					9	<1.0	<1.0	7.4	6	9.8
Fine Sand (0.075mm - 0.425mm)	%					21.7	<1.0	2.3	62.6	66.9	56
Silt (0.002mm - 0.075mm)	%					62.2	92.7	92.9	25.4	25.1	29.1
Clay (<0.002mm)	%					6.3	6.6	4	3	2	4

Notes:
1. PSQG; Provincial Sediment Quality Guidelines for the protection and management of aquatic sediment quality in Ontario
2. CSQG; Canadian Council of Ministers of the Environment Canadian Sediment Quality Guidelines for the protection of aquatic life
3. MDL; Method Detection Limit provided by Bureau Veritas, Mississauga, ON
4. '<' indicates that the reported concentration was less than the MDL
5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1b: Springpole Lake Station L15-B1

						L15-B1-SED1	L15-B1-SED2	L15-B1-SED3	L15-B1-SED4	L15-B1-SED5
Sample Area										
Sample Date (dd-mmm-yy)						26-Sep-21	26-Sep-21	27-Sep-21	27-Sep-21	27-Sep-21
Parameter	Unit	MDL	PSQG		CSQG					
			LEL	SEL	PEL					
Sample Depth	m	0.1	-	-	-	37.0	37.0	37.0	37.0	37.0
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				4.79	4.78	4.81	4.76	5.02
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		0.98	0.91	0.84	0.8	0.91
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.0858	0.0864	0.0846	0.0852	0.0878
Total Organic Carbon	%	0.05	1	10		8.58	8.64	8.46	8.52	8.78
Metals										
Aluminum	ug/g	50				18700	16500	17200	18000	16200
Antimony	ug/g	0.20 or 0.10				0.61	0.56	0.55	0.56	0.55
Arsenic	ug/g	1.0 or 0.1	6	33	17	16.2	16.7	15.1	16.3	19.4
Barium	ug/g	0.50				172	152	149	162	172
Beryllium	ug/g	0.20 or 0.10				0.55	0.49	0.51	0.52	0.5
Bismuth	ug/g	1.0 or 0.2				0.52	0.46	0.47	0.48	0.44
Boron	ug/g	5.0				9.8	8.7	8.6	9.1	8.4
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	1.08	1.03	0.975	1	1.01
Calcium	ug/g	50				6630	5830	6090	6390	5920
Chromium	ug/g	1.0 or 0.5	26	110	90	43.7	36.5	37.2	39	34.8
Cobalt	ug/g	0.10				12.2	10.4	10.8	11	10.2
Copper	ug/g	0.50	16	110	197	50.1	44.9	44.8	46.8	44.4
Iron	ug/g	50	20000	40000		34300	30600	30600	32900	31900
Lead	ug/g	1.0 or 0.5	31	250	91.3	37.1	37.1	33.3	33.9	41.2
Lithium	ug/g	2				17.1	14.6	15.6	16.1	14.5
Magnesium	ug/g	50 or 20				7470	6550	6770	7060	6220
Manganese	ug/g	1.0	460	1100		821	720	688	796	819
Mercury	ug/g	0.05	0.2	2	0.486	0.114	0.124	0.0926	0.115	0.127
Molybdenum	ug/g	0.50 or 0.1				1.54	1.44	1.44	1.47	1.55
Nickel	ug/g	0.50	16	75		34.4	29.1	29.9	31	28.4
Phosphorus	ug/g	50	600	2000		2640	2470	2380	3070	3060
Potassium	ug/g	200 or 100				2010	1790	1790	1850	1720
Selenium	ug/g	0.50 or 0.2				1.84	1.69	1.54	1.72	1.68
Silver	ug/g	0.20 or 0.10				0.27	0.26	0.27	0.26	0.27
Sodium	ug/g	50				194	176	170	182	172
Strontium	ug/g	1.0 or 0.5				25.8	23.5	24.4	25.2	23.3
Sulfur	ug/g	1000				2800	2500	2500	2700	2700
Thallium	ug/g	0.050				0.303	0.273	0.274	0.274	0.26
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				501	420	414	451	385
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				1.89	1.68	1.76	1.75	1.63
Vanadium	ug/g	5.0 or 0.2				54.5	47.4	46.9	49.3	45.6
Zinc	ug/g	5.0 or 2.0	120	820	315	99.8	93.1	91	97	90.5
Zirconium	ug/g	1				3.4	3	3.4	3.5	3
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					82.4	82.9	81.4	83.3	79.3
Clay (<0.002mm)	%					17.4	17.1	18.5	16.6	20.6

Notes:

1. PSQG; Provincial Sediment Quality Guidelines for the protection and management of aquatic sediment quality in Ontario
2. CSQG; Canadian Council of Ministers of the Environment Canadian Sediment Quality Guidelines for the protection of aquatic life
3. MDL; Method Detection Limit provided by Bureau Veritas, Mississauga, ON
4. '<' indicates that the reported concentration was less than the MDL
5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1c: Springpole Lake Station L15-B2

					Sample Area	L-15-B2-SED1	L-15-B2-SED2	L-15-B2-SED3	L-15-B2-SED4	L-15-B2-SED5
					Sample Date (dd-mmm-yy)	26-Sep-21	26-Sep-21	26-Sep-21	26-Sep-21	26-Sep-21
Parameter	Unit	MDL	PSQG		CSQG					
			LEL	SEL	PEL					
Sample Depth	m	0.1	-	-	-	28.0	28.0	28.5	27.5	27.0
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				5.73	5.74	5.75	5.76	5.77
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		0.89	0.91	0.9	0.89	0.92
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.0788	0.0827	0.0745	0.0758	0.0759
Total Organic Carbon	%	0.05	1	10		7.88	8.27	7.45	7.58	7.59
Metals										
Aluminum	ug/g	50				16100	15800	14800	15300	16300
Antimony	ug/g	0.20 or 0.10				0.38	0.5	0.33	0.48	0.34
Arsenic	ug/g	1.0 or 0.1	6	33	17	12.8	14.3	15.1	11.8	11.5
Barium	ug/g	0.50				260	237	243	243	242
Beryllium	ug/g	0.20 or 0.10				0.56	0.57	0.58	0.59	0.61
Bismuth	ug/g	1.0 or 0.2				0.34	0.42	0.3	0.41	0.32
Boron	ug/g	5.0				10.1	10.3	9.1	9.7	9
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	0.862	0.969	0.755	0.982	0.843
Calcium	ug/g	50				5680	5770	5790	5590	5740
Chromium	ug/g	1.0 or 0.5	26	110	90	38.1	39.4	38.1	36.4	40
Cobalt	ug/g	0.10				17	17.5	17	16.9	19.7
Copper	ug/g	0.50	16	110	197	43.2	44.9	42.7	41.8	46.9
Iron	ug/g	50	20000	40000		44800	43300	37400	41400	43600
Lead	ug/g	1.0 or 0.5	31	250	91.3	18.2	24.6	16.5	24.2	16.2
Lithium	ug/g	2				15.1	15.7	15	14.9	14.8
Magnesium	ug/g	50 or 20				6940	6940	6850	6600	7050
Manganese	ug/g	1.0	460	1100		3400	3010	2770	3110	2850
Mercury	ug/g	0.05	0.2	2	0.486	0.0888	0.0991	0.0784	0.1	0.0753
Molybdenum	ug/g	0.50 or 0.1				2.14	2.23	1.97	2.08	2.09
Nickel	ug/g	0.50	16	75		36.4	36.2	36.1	34.6	39.4
Phosphorus	ug/g	50	600	2000		2350	2380	2060	2160	2350
Potassium	ug/g	200 or 100				2030	2120	2030	1910	1980
Selenium	ug/g	0.50 or 0.2				1.39	1.53	1.36	1.49	1.4
Silver	ug/g	0.20 or 0.10				0.16	0.18	0.16	0.17	0.18
Sodium	ug/g	50				164	166	160	154	162
Strontium	ug/g	1.0 or 0.5				23.6	25.1	24.7	24.1	23.9
Sulfur	ug/g	1000				1200	1400	1200	1200	1200
Thallium	ug/g	0.050				0.411	0.405	0.459	0.425	0.467
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				547	552	504	471	484
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				1.94	1.98	1.88	1.96	2.06
Vanadium	ug/g	5.0 or 0.2				61.8	62.4	61.3	57.8	64.5
Zinc	ug/g	5.0 or 2.0	120	820	315	95.8	97.3	93.6	94.2	98.9
Zirconium	ug/g	1				1.7	1.9	1.8	2.1	2.2
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	1.2	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					85.7	82.5	84.9	88	87.4
Clay (<0.002mm)	%					13.9	17.2	13.8	11.7	11.9

Notes:
1. PSQG; Provincial Sediment Quality Guidelines for the protection and management of aquatic sediment quality in Ontario
2. CSQG; Canadian Council of Ministers of the Environment Canadian Sediment Quality Guidelines for the protection of aquatic life
3. MDL; Method Detection Limit provided by Bureau Veritas, Mississauga, ON
4. '<' indicates that the reported concentration was less than the MDL
5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1d: Springpole Lake Station L15-B3

Parameter	Unit	MDL	PSQG LEL	PSQG SEL	CSQG PEL	L-15-B3-SED1	L-15-B3-SED2	L-15-B3-SED3	L-15-B3-SED4	L-15-B3-SED5
Sample Date (dd-mmm-yy)						23-Sep-21	23-Sep-21	23-Sep-21	23-Sep-21	23-Sep-21
Sample Depth	m	0.1	-	-	-	30.0	30.0	30.0	30.0	30.0
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				5.77	5.16	5.26	5.7	5.27
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		1.36	1.05	1	1.04	1.01
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.108	0.104	0.0994	0.101	0.1
Total Organic Carbon	%	0.05	1	10		10.8	10.4	9.94	10.1	10
Metals										
Aluminum	ug/g	50				15400	15500	15800	16700	16200
Antimony	ug/g	0.20 or 0.10				0.44	0.46	0.48	0.45	0.46
Arsenic	ug/g	1.0 or 0.1	6	33	17	9.16	10.4	11.8	10.2	12.9
Barium	ug/g	0.50				109	112	127	118	134
Beryllium	ug/g	0.20 or 0.10				0.46	0.48	0.47	0.46	0.45
Bismuth	ug/g	1.0 or 0.2				0.44	0.45	0.45	0.45	0.45
Boron	ug/g	5.0				7.9	7.7	7.5	7.8	7.3
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	1	1.01	0.97	1.06	0.952
Calcium	ug/g	50				6530	6500	6050	6330	5930
Chromium	ug/g	1.0 or 0.5	26	110	90	37.2	38.1	36.8	38.4	37.5
Cobalt	ug/g	0.10				9.97	10.8	11	10.7	10.8
Copper	ug/g	0.50	16	110	197	49.5	49.5	49.4	51.1	49.1
Iron	ug/g	50	20000	40000		26000	26000	28200	26600	29300
Lead	ug/g	1.0 or 0.5	31	250	91.3	32.6	32.7	31.9	33.6	30.9
Lithium	ug/g	2				13.1	13.5	12.6	13.5	12.6
Magnesium	ug/g	50 or 20				6680	6870	6930	6730	6860
Manganese	ug/g	1.0	460	1100		472	429	471	467	463
Mercury	ug/g	0.05	0.2	2	0.486	0.169	0.12	0.14	0.17	0.13
Molybdenum	ug/g	0.50 or 0.1				1.07	1.12	1.06	1.09	1.09
Nickel	ug/g	0.50	16	75		28.5	30.4	29.9	30	29.6
Phosphorus	ug/g	50	600	2000		1160	1080	1670	1350	1690
Potassium	ug/g	200 or 100				1840	1820	1880	1930	1890
Selenium	ug/g	0.50 or 0.2				1.84	1.8	1.63	1.82	1.82
Silver	ug/g	0.20 or 0.10				0.26	0.25	0.26	0.27	0.25
Sodium	ug/g	50				151	146	149	159	147
Strontium	ug/g	1.0 or 0.5				22.6	22.4	22.3	23.6	22.6
Sulfur	ug/g	1000				2000	2300	2200	2000	2400
Thallium	ug/g	0.050				0.272	0.269	0.264	0.272	0.261
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				406	417	429	442	431
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				1.67	1.69	1.63	1.65	1.64
Vanadium	ug/g	5.0 or 0.2				47.6	47.9	47.2	48.7	47.4
Zinc	ug/g	5.0 or 2.0	120	820	315	92.8	95	96.7	97.4	93.7
Zirconium	ug/g	1				3.2	3.4	3.2	3.3	3.3
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					89.7	87.8	85.6	88.1	88.1
Clay (<0.002mm)	%					10.2	12	14.4	11.9	11.8

Notes:
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3. MDL; Method Detection Limit provided by Bureau Veritas, Mississauga, ON
4. '<' indicates that the reported concentration was less than the MDL
5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1e: Springpole Lake Station L15-B4

					Sample Area	L-15-B4-SED1	L-15-B4-SED2	L-15-B4-SED3	L-15-B4-SED4	L-15-B4-SED5
					Sample Date (dd-mmm-yy)	25-Sep-21	25-Sep-21	25-Sep-21	25-Sep-21	25-Sep-21
Parameter	Unit	MDL	PSQG		CSQG					
			LEL	SEL	PEL					
Sample Depth	m	0.1	-	-	-	17.0	17.0	17.0	17.0	17.0
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				5.44	5.49	5.5	5.49	5.74
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		1.32	1.37	1.42	1.36	1.34
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.0989	0.105	0.104	0.104	0.105
Total Organic Carbon	%	0.05	1	10		9.89	10.5	10.4	10.4	10.5
Metals										
Aluminum	ug/g	50				14600	15800	15900	15300	16200
Antimony	ug/g	0.20 or 0.10				0.39	0.48	0.43	0.46	0.49
Arsenic	ug/g	1.0 or 0.1	6	33	17	6.08	8.03	7.23	7.67	8.54
Barium	ug/g	0.50				86.6	91	89.3	86	97.3
Beryllium	ug/g	0.20 or 0.10				0.41	0.41	0.38	0.39	0.42
Bismuth	ug/g	1.0 or 0.2				0.33	0.37	0.35	0.37	0.4
Boron	ug/g	5.0				7.2	7.4	6.8	6.8	7.4
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	0.642	0.854	0.786	0.766	0.873
Calcium	ug/g	50				6900	7050	6800	6990	7070
Chromium	ug/g	1.0 or 0.5	26	110	90	37.8	38.2	39.7	37.2	41.2
Cobalt	ug/g	0.10				9.12	9.34	9.53	9.19	10
Copper	ug/g	0.50	16	110	197	42.4	44.1	45.3	43.1	46.9
Iron	ug/g	50	20000	40000		18700	19200	19500	19000	20900
Lead	ug/g	1.0 or 0.5	31	250	91.3	21.4	31.5	24.7	26.3	27.9
Lithium	ug/g	2				13.4	13.1	12.7	13	13.5
Magnesium	ug/g	50 or 20				6120	6560	6670	6330	6750
Manganese	ug/g	1.0	460	1100		224	230	234	224	249
Mercury	ug/g	0.05	0.2	2	0.486	0.105	0.131	0.111	0.101	0.118
Molybdenum	ug/g	0.50 or 0.1				0.96	0.92	0.92	0.97	0.99
Nickel	ug/g	0.50	16	75		27	28.1	28.5	27.1	29.3
Phosphorus	ug/g	50	600	2000		945	991	1010	930	1010
Potassium	ug/g	200 or 100				1560	1690	1700	1590	1740
Selenium	ug/g	0.50 or 0.2				1.36	1.53	1.49	1.47	1.52
Silver	ug/g	0.20 or 0.10				0.19	0.2	0.19	0.19	0.2
Sodium	ug/g	50				145	153	144	139	159
Strontium	ug/g	1.0 or 0.5				24.2	23.8	23.8	23.5	23.9
Sulfur	ug/g	1000				2300	2500	2200	2500	2500
Thallium	ug/g	0.050				0.2	0.2	0.196	0.201	0.215
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				502	511	494	460	535
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				1.47	1.45	1.47	1.45	1.56
Vanadium	ug/g	5.0 or 0.2				41.4	43.7	42.9	41.5	45.8
Zinc	ug/g	5.0 or 2.0	120	820	315	75.7	83	82.5	79.3	86.7
Zirconium	ug/g	1				3	3.2	3.2	3.3	3.1
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					82.3	85.8	87.3	84.5	85.5
Clay (<0.002mm)	%					17.6	14.1	12.6	15.5	14.4

Notes:
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3. MDL; Method Detection Limit provided by Bureau Veritas, Mississauga, ON
4. '<' indicates that the reported concentration was less than the MDL
5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1f: Springpole Lake Station L15-B5

						L-15-B5-SED1	L-15-B5-SED2	L-15-B5-SED3	L-15-B5-SED4	L-15-B5-SED5
Sample Area						L-15-B5-SED1	L-15-B5-SED2	L-15-B5-SED3	L-15-B5-SED4	L-15-B5-SED5
Sample Date (dd-mmm-yy)						28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21
Parameter	Unit	MDL	PSQG		CSQG					
			LEL	SEL	PEL					
Sample Depth	m	0.1	-	-	-	20.0	20.0	20.0	20.0	20.0
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				4.72	4.34	4.53	4.29	4.75
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		0.95	1.07	1.04	1.02	1.15
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.0975	0.0994	0.098	0.0928	0.0988
Total Organic Carbon	%	0.05	1	10		9.75	9.94	9.8	9.28	9.88
Metals										
Aluminum	ug/g	50				23700	18400	23300	24700	24800
Antimony	ug/g	0.20 or 0.10				0.57	0.44	0.51	0.49	0.57
Arsenic	ug/g	1.0 or 0.1	6	33	17	18.3	17	32.3	23.7	21.4
Barium	ug/g	0.50				206	155	221	245	201
Beryllium	ug/g	0.20 or 0.10				0.83	0.59	0.78	0.95	0.71
Bismuth	ug/g	1.0 or 0.2				0.58	0.51	0.57	0.57	0.63
Boron	ug/g	5.0				9.3	7.3	8.9	8.8	9.3
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	1.29	0.921	1.21	1.26	1.28
Calcium	ug/g	50				8500	6690	8280	8390	8730
Chromium	ug/g	1.0 or 0.5	26	110	90	51.5	38.3	48.7	52.2	52.2
Cobalt	ug/g	0.10				21.9	16.5	21.7	27.9	19
Copper	ug/g	0.50	16	110	197	53.6	39.9	49.7	53.5	53.8
Iron	ug/g	50	20000	40000		46500	39000	59900	64500	46200
Lead	ug/g	1.0 or 0.5	31	250	91.3	32.6	30.5	35.6	32.4	36.2
Lithium	ug/g	2				18.8	13.9	17.8	18.1	19.3
Magnesium	ug/g	50 or 20				5820	4650	5640	5740	6350
Manganese	ug/g	1.0	460	1100		1140	1040	1840	1770	1020
Mercury	ug/g	0.05	0.2	2	0.486	0.134	0.14	0.142	0.122	0.137
Molybdenum	ug/g	0.50 or 0.1				1.77	1.14	1.25	1.78	1.4
Nickel	ug/g	0.50	16	75		37.8	28.8	35.6	39.4	37.7
Phosphorus	ug/g	50	600	2000		2600	1960	3210	3310	2600
Potassium	ug/g	200 or 100				1760	1470	1690	1720	1880
Selenium	ug/g	0.50 or 0.2				2.09	1.85	2.19	2.25	2.35
Silver	ug/g	0.20 or 0.10				0.19	0.14	0.18	0.18	0.2
Sodium	ug/g	50				215	172	208	221	228
Strontium	ug/g	1.0 or 0.5				31.9	22.4	29.6	31.3	32.2
Sulfur	ug/g	1000				3700	2800	3100	3600	4100
Thallium	ug/g	0.050				0.368	0.293	0.333	0.414	0.334
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				503	344	433	483	470
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				2.82	2.08	2.6	2.93	2.74
Vanadium	ug/g	5.0 or 0.2				69.9	50.1	65.4	77.3	61.7
Zinc	ug/g	5.0 or 2.0	120	820	315	136	103	131	146	133
Zirconium	ug/g	1				3	2.3	3.1	3.2	3.4
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					89	89.2	87	88.1	88.7
Clay (<0.002mm)	%					10.9	10.6	12.7	11.6	11.1

Notes:
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4. '<' indicates that the reported concentration was less than the MDL
5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1g: Springpole Lake Station L15-B6

					Sample Area	L-15-B6-SED1	L-15-B6-SED2	L-15-B6-SED3	L-15-B6-SED4	L-15-B6-SED5
					Sample Date (dd-mmm-yy)	25-Sep-21	25-Sep-21	25-Sep-21	25-Sep-21	25-Sep-21
Parameter	Unit	MDL	PSQG		CSQG					
			LEL	SEL	PEL					
Sample Depth	m	0.1	-	-	-	14.0	14.0	14.0	14.5	14.5
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				5.79	5.72	5.66	5.68	5.66
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		1.25	1.25	1.32	1.33	1.25
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.105	0.1	0.103	0.101	0.0987
Total Organic Carbon	%	0.05	1	10		10.5	10	10.3	10.1	9.87
Metals										
Aluminum	ug/g	50				16200	16700	16300	18000	18400
Antimony	ug/g	0.20 or 0.10				0.18	0.2	0.44	0.33	0.18
Arsenic	ug/g	1.0 or 0.1	6	33	17	4.63	5.06	6.03	6.37	4.67
Barium	ug/g	0.50				94.6	95.1	91.7	102	101
Beryllium	ug/g	0.20 or 0.10				0.41	0.42	0.47	0.45	0.42
Bismuth	ug/g	1.0 or 0.2				<0.20	<0.20	0.37	0.28	<0.20
Boron	ug/g	5.0				6.9	6.4	8.1	8.3	7.8
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	0.314	0.346	0.621	0.52	0.305
Calcium	ug/g	50				7300	7470	8780	8250	7830
Chromium	ug/g	1.0 or 0.5	26	110	90	42.8	41.4	39.7	45.9	48.4
Cobalt	ug/g	0.10				10.4	10.4	9.98	10.8	11.1
Copper	ug/g	0.50	16	110	197	49.5	50.3	46.8	52.6	52.3
Iron	ug/g	50	20000	40000		22000	22700	21300	22800	23900
Lead	ug/g	1.0 or 0.5	31	250	91.3	8.24	9.03	23.8	15	7.51
Lithium	ug/g	2				15.3	15.1	17.1	16.5	16.5
Magnesium	ug/g	50 or 20				7470	7560	7310	7790	8130
Manganese	ug/g	1.0	460	1100		259	266	242	268	279
Mercury	ug/g	0.05	0.2	2	0.486	0.0707	0.0691	0.109	0.0996	0.0584
Molybdenum	ug/g	0.50 or 0.1				1.04	1.03	1.06	1.13	1.14
Nickel	ug/g	0.50	16	75		31.6	31.8	31.1	33.4	33.6
Phosphorus	ug/g	50	600	2000		1000	1060	1030	1130	1120
Potassium	ug/g	200 or 100				1750	1760	1720	1900	1940
Selenium	ug/g	0.50 or 0.2				1.42	1.31	1.44	1.57	1.56
Silver	ug/g	0.20 or 0.10				0.17	0.17	0.22	0.2	0.18
Sodium	ug/g	50				135	141	140	164	159
Strontium	ug/g	1.0 or 0.5				25.1	24.4	29.2	27.4	27.8
Sulfur	ug/g	1000				2000	1900	2300	2500	2100
Thallium	ug/g	0.050				0.216	0.227	0.253	0.232	0.236
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				507	486	465	607	660
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				1.63	1.61	1.88	1.7	1.75
Vanadium	ug/g	5.0 or 0.2				44.6	44.5	42.5	48.1	50
Zinc	ug/g	5.0 or 2.0	120	820	315	81.6	84.4	85.9	90.8	87.5
Zirconium	ug/g	1				3.3	3.4	4.1	3.3	3.1
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					85	89.3	85.6	85.9	84.3
Clay (<0.002mm)	%					14.6	10.2	14.1	13.9	15.4

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7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1h: Birch Lake Station BIRCH-B1

					Sample Area	BIRCH-B1-SED1	BIRCH-B1-SED2	BIRCH-B1-SED3	BIRCH-B1-SED4	BIRCH-B1-SED5
					Sample Date (dd-mmm-yy)	1-Oct-21	1-Oct-21	1-Oct-21	1-Oct-21	1-Oct-21
Parameter	Unit	MDL	PSQG		CSQG					
			LEL	SEL	PEL					
Sample Depth	m	0.1	-	-	-	35.0	35.0	35.0	35.0	35.0
Physical Tests										
Moisture	%	1.0								
Physical Tests	pH	N/A				4.94	4.76	4.69	4.74	4.64
Organic Content										
Leachable Anions & Nutrients										
Nitrate (N)	ug/g	2								
Nitrite (N)	ug/g	0.5								
Nitrate + Nitrite (N)	ug/g	3								
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48		0.76	0.71	0.62	0.72	0.56
Organic / Inorganic Carbon										
Fraction Organic Carbon	g/g	0.001				0.0807	0.0754	0.0752	0.0752	0.0762
Total Organic Carbon	%	0.05	1	10		8.07	7.54	7.52	7.52	7.62
Metals										
Aluminum	ug/g	50				17900	15400	17600	19500	17200
Antimony	ug/g	0.20 or 0.10				0.54	0.43	0.5	0.57	0.5
Arsenic	ug/g	1.0 or 0.1	6	33	17	24.3	19.3	22.9	29.7	24.6
Barium	ug/g	0.50				140	117	136	160	147
Beryllium	ug/g	0.20 or 0.10				0.56	0.55	0.62	0.63	0.6
Bismuth	ug/g	1.0 or 0.2				0.42	0.39	0.41	0.44	0.41
Boron	ug/g	5.0				9.3	7.8	9.1	10.3	9.2
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5	0.885	0.629	0.964	0.918	0.815
Calcium	ug/g	50				6240	5290	6090	6540	5820
Chromium	ug/g	1.0 or 0.5	26	110	90	42	35.2	43.3	45.5	40.9
Cobalt	ug/g	0.10				9.96	8.37	9.81	10.7	9.53
Copper	ug/g	0.50	16	110	197	39.5	33.6	40.5	42.9	38.5
Iron	ug/g	50	20000	40000		30100	26700	31200	33500	31100
Lead	ug/g	1.0 or 0.5	31	250	91.3	35	28.8	34	36.4	32.2
Lithium	ug/g	2				15.2	13	15.1	16.5	14.8
Magnesium	ug/g	50 or 20				6190	5370	6330	6490	6180
Manganese	ug/g	1.0	460	1100		740	673	762	771	739
Mercury	ug/g	0.05	0.2	2	0.486	0.106	0.106	0.108	0.108	0.109
Molybdenum	ug/g	0.50 or 0.1				0.9	0.76	0.76	1.03	0.86
Nickel	ug/g	0.50	16	75		26.3	22.2	27	29.7	25.9
Phosphorus	ug/g	50	600	2000		1810	1800	2070	2400	2260
Potassium	ug/g	200 or 100				2010	1870	2070	2190	1940
Selenium	ug/g	0.50 or 0.2				1.76	1.49	1.77	1.83	1.71
Silver	ug/g	0.20 or 0.10				0.14	0.13	0.15	0.16	0.14
Sodium	ug/g	50				256	220	258	285	246
Strontium	ug/g	1.0 or 0.5				25.5	20.2	24.4	26.8	23.6
Sulfur	ug/g	1000				2100	1800	2000	2300	2000
Thallium	ug/g	0.050				0.25	0.225	0.252	0.258	0.235
Tin	ug/g	1.0 or 2.0				<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0				529	400	521	570	480
Tungsten	ug/g	0.5				<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05				2.5	2.13	2.58	2.72	2.47
Vanadium	ug/g	5.0 or 0.2				48.4	40.4	48.5	52.4	46.4
Zinc	ug/g	5.0 or 2.0	120	820	315	96.1	81.1	99	105	93.3
Zirconium	ug/g	1				2.7	2.4	2.9	2.9	2.7
Particle Size (Soil)										
Gravel (4.75mm - 3in.)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%					<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%					85.2	85.6	82.9	87.5	80.2
Clay (<0.002mm)	%					14.6	14.2	16.9	12.5	19.7

Notes:
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3. MDL; Method Detection Limit provided by Bureau Veritas, Mississauga, ON
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7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

Table D1-1i: Birch Lake Station BIRCH-B2

						Sample Area	BIRCH-B2-SED1	BIRCH-B2-SED2	BIRCH-B2-SED3	BIRCH-B2-SED4	BIRCH-B2-SED5
						Sample Date (dd-mmm-yy)	24-Sep-21	24-Sep-21	24-Sep-21	24-Sep-21	24-Sep-21
Parameter	Unit	MDL	PSQG		CSQG						
			LEL	SEL	PEL						
Sample Depth	m	0.1	-	-	-		24.0	24.0	24.0	24.0	24.0
Physical Tests											
Moisture	%	1.0									
Physical Tests	pH	N/A					5.5	5.55	5.38	5.43	5.4
Organic Content											
Leachable Anions & Nutrients											
Nitrate (N)	ug/g	2									
Nitrite (N)	ug/g	0.5									
Nitrate + Nitrite (N)	ug/g	3									
Total Kjeldahl Nitrogen	ug/g	100	0.055	0.48			1.12	1.1	1.05	0.51	0.82
Organic / Inorganic Carbon											
Fraction Organic Carbon	g/g	0.001					0.0858	0.0872	0.0884	0.0906	0.09
Total Organic Carbon	%	0.05	1	10			8.58	8.72	8.84	9.06	9
Metals											
Aluminum	ug/g	50					15200	14100	14400	15100	15600
Antimony	ug/g	0.20 or 0.10					0.51	0.46	0.49	0.42	0.48
Arsenic	ug/g	1.0 or 0.1	6	33	17		14.3	12.3	13.3	13.2	15.5
Barium	ug/g	0.50					89.1	84.3	86.4	93.2	93
Beryllium	ug/g	0.20 or 0.10					0.49	0.47	0.45	0.43	0.45
Bismuth	ug/g	1.0 or 0.2					0.36	0.34	0.36	0.33	0.35
Boron	ug/g	5.0					8.4	8.3	7.9	7.5	7.6
Cadmium	ug/g	0.10 or 0.02	0.6	10	3.5		0.668	0.569	0.61	0.646	0.687
Calcium	ug/g	50					6370	6370	6200	6270	6280
Chromium	ug/g	1.0 or 0.5	26	110	90		38.2	36.2	36.4	37.8	39.7
Cobalt	ug/g	0.10					6.91	6.42	6.36	6.84	7.1
Copper	ug/g	0.50	16	110	197		35.7	33.6	33.7	36	38.3
Iron	ug/g	50	20000	40000			20400	18400	18600	20500	20800
Lead	ug/g	1.0 or 0.5	31	250	91.3		30.6	26.3	30	27.8	31
Lithium	ug/g	2					13.3	13.1	12.6	11.9	12.6
Magnesium	ug/g	50 or 20					5310	5050	5030	5460	5590
Manganese	ug/g	1.0	460	1100			292	261	261	296	295
Mercury	ug/g	0.05	0.2	2	0.486		0.114	0.113	0.112	0.121	0.119
Molybdenum	ug/g	0.50 or 0.1					0.89	0.81	0.83	0.79	0.82
Nickel	ug/g	0.50	16	75			23.3	21.5	21.5	23	24.3
Phosphorus	ug/g	50	600	2000			1080	1010	1000	1220	1190
Potassium	ug/g	200 or 100					1850	1790	1820	1900	1950
Selenium	ug/g	0.50 or 0.2					1.7	1.58	1.54	1.57	1.62
Silver	ug/g	0.20 or 0.10					0.15	0.14	0.16	0.14	0.15
Sodium	ug/g	50					188	181	178	201	190
Strontium	ug/g	1.0 or 0.5					24.3	24.5	24	24	22.3
Sulfur	ug/g	1000					1800	1800	1800	1600	1800
Thallium	ug/g	0.050					0.203	0.196	0.206	0.187	0.198
Tin	ug/g	1.0 or 2.0					<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	ug/g	5.0 or 1.0					474	462	430	434	453
Tungsten	ug/g	0.5					<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	ug/g	0.05					2.12	2.09	2.1	2.04	2.05
Vanadium	ug/g	5.0 or 0.2					38.4	36.3	35.8	37.7	39
Zinc	ug/g	5.0 or 2.0	120	820	315		79.4	73.4	76.6	81.2	85.7
Zirconium	ug/g	1					2.5	2.6	2.7	2.7	2.7
Particle Size (Soil)											
Gravel (4.75mm - 3in.)	%						<1.0	<1.0	<1.0	<1.0	<1.0
Coarse Sand (2.0mm - 4.75mm)	%						<1.0	<1.0	<1.0	<1.0	<1.0
Medium Sand (0.425mm - 2.0mm)	%						<1.0	<1.0	<1.0	<1.0	<1.0
Fine Sand (0.075mm - 0.425mm)	%						<1.0	<1.0	<1.0	<1.0	<1.0
Silt (0.002mm - 0.075mm)	%						84.1	83.9	84.5	83.6	83.8
Clay (<0.002mm)	%						15.8	16	15.4	16.3	16.1

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5. '-' indicates that the parameter was not analyzed
6. Green shaded values indicate concentrations that exceed the PSQG LEL
7. Blue shaded values indicate concentrations that exceed the PSQG SEL and LEL

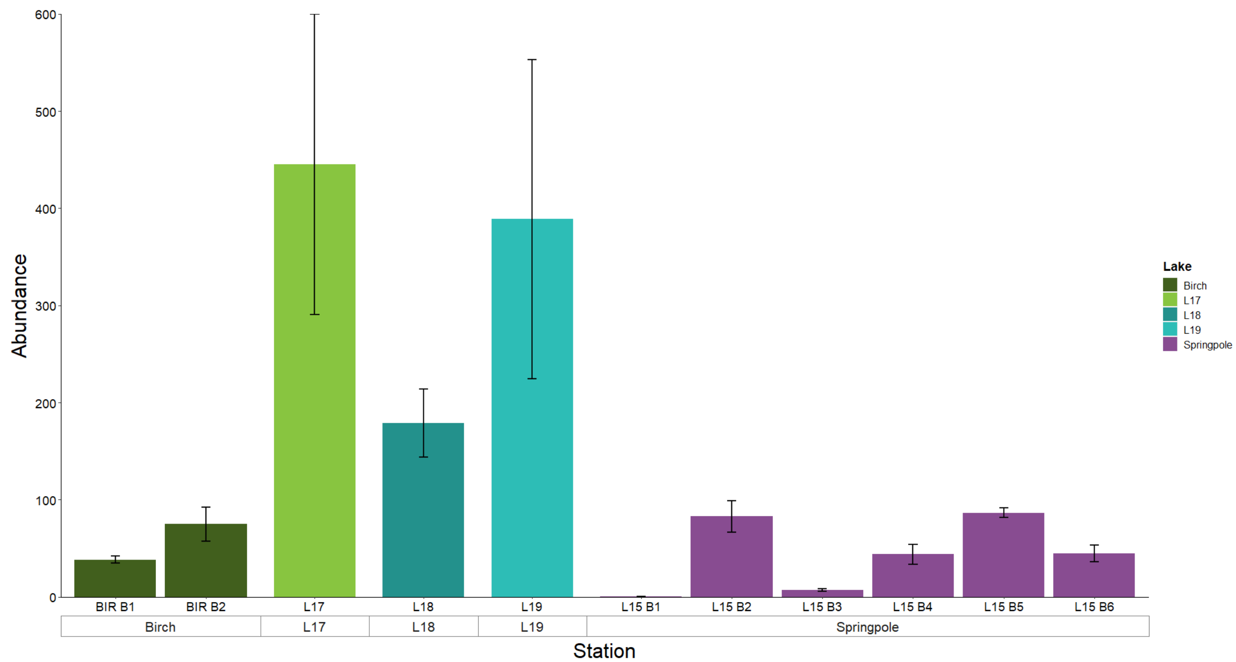


Figure D2-1: Benthic Invertebrate Community Abundance for Springpole, Birch Lake and the inland waterbodies, September 2021

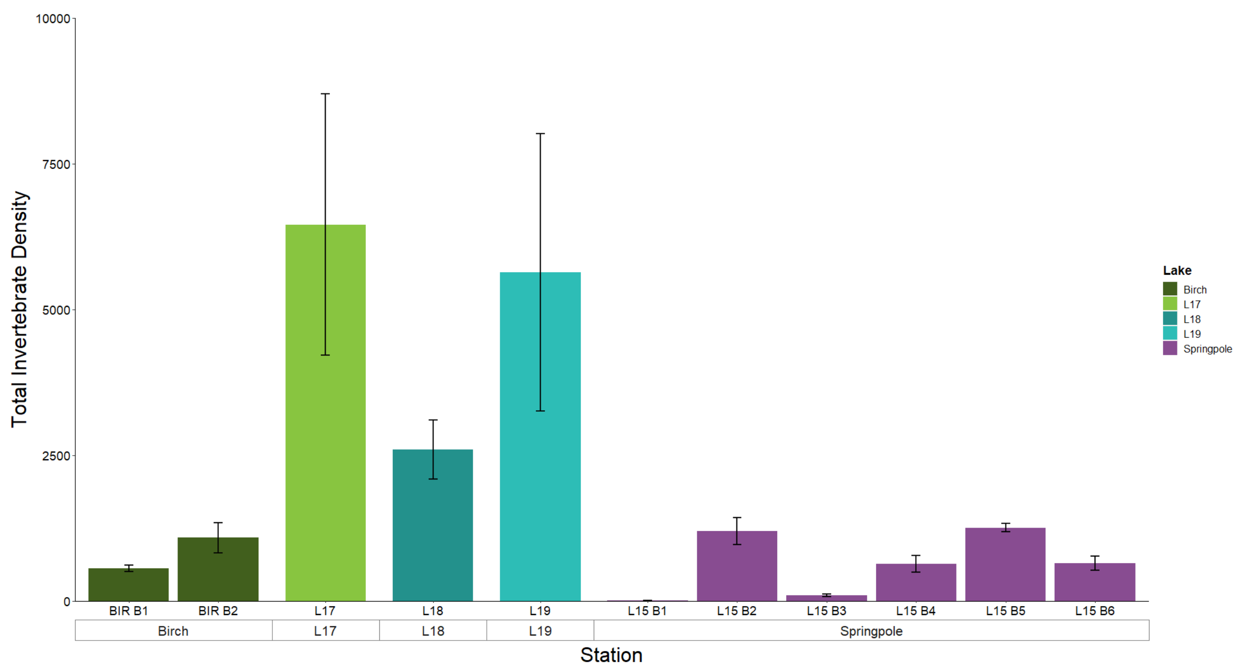


Figure D2-2: Benthic Invertebrate Community Density (TID) for Springpole, Birch Lake and the inland waterbodies, September 2021

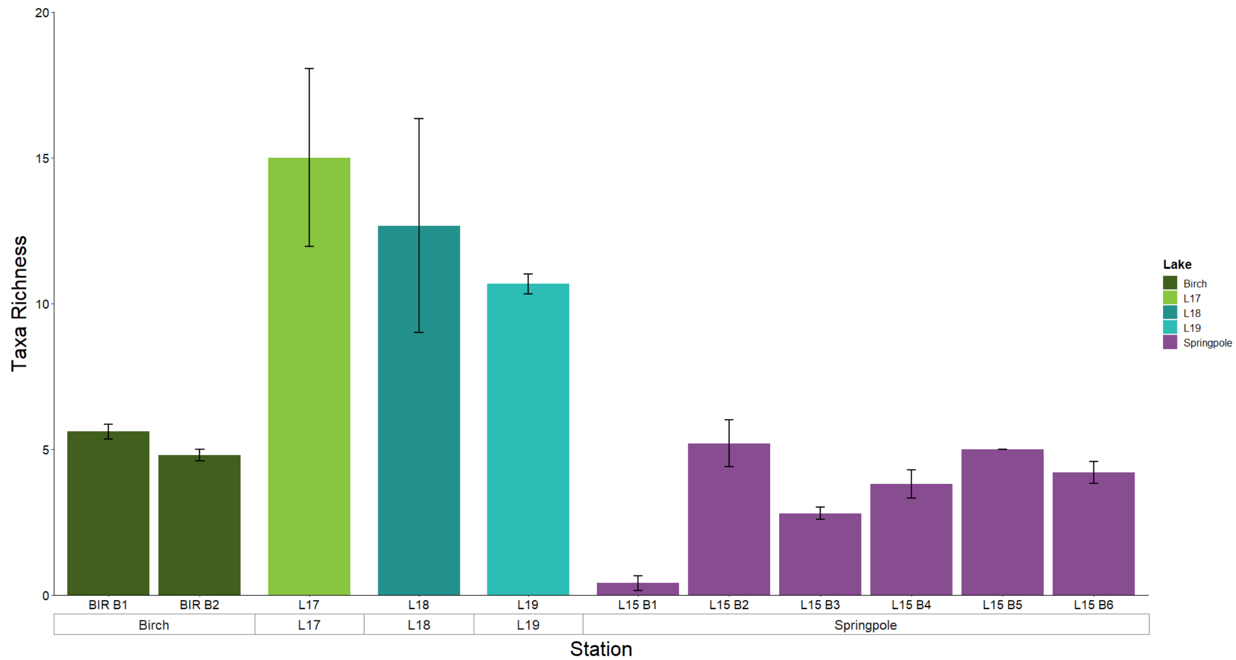


Figure D2-3: Benthic Invertebrate Community Taxa Richness for Springpole, Birch Lake and the inland waterbodies, September 2021

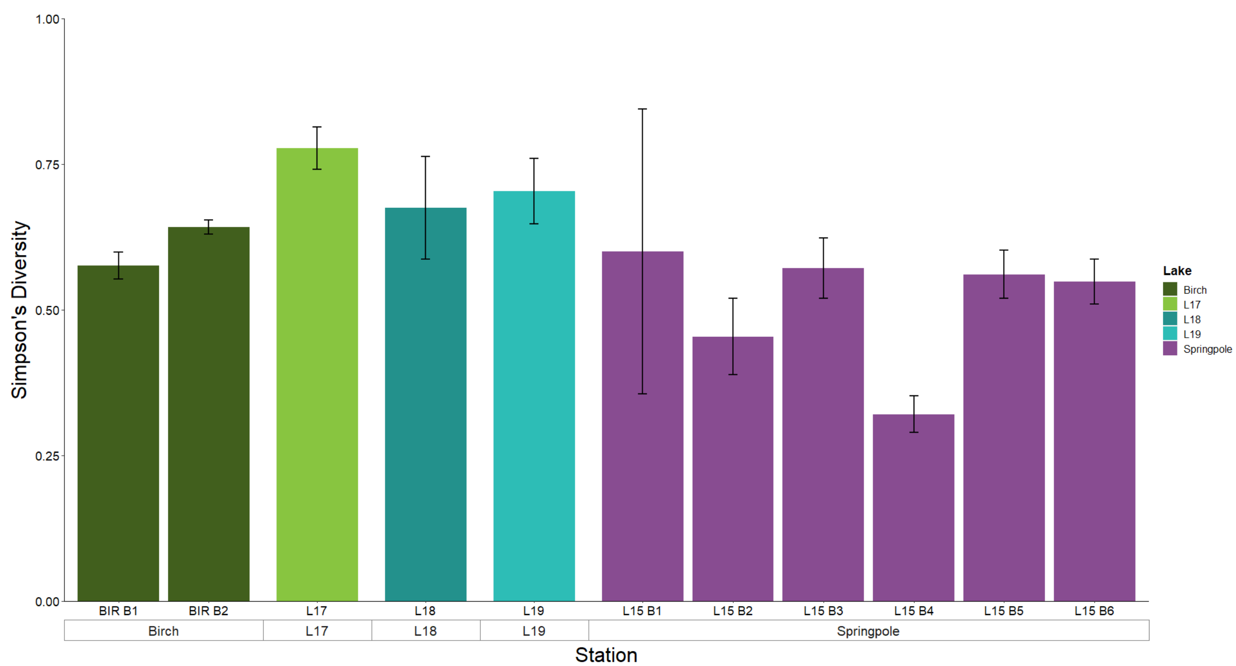


Figure D2-4: Benthic Invertebrate Community Simpson's Diversity for Springpole, Birch Lake and the inland waterbodies, September 2021

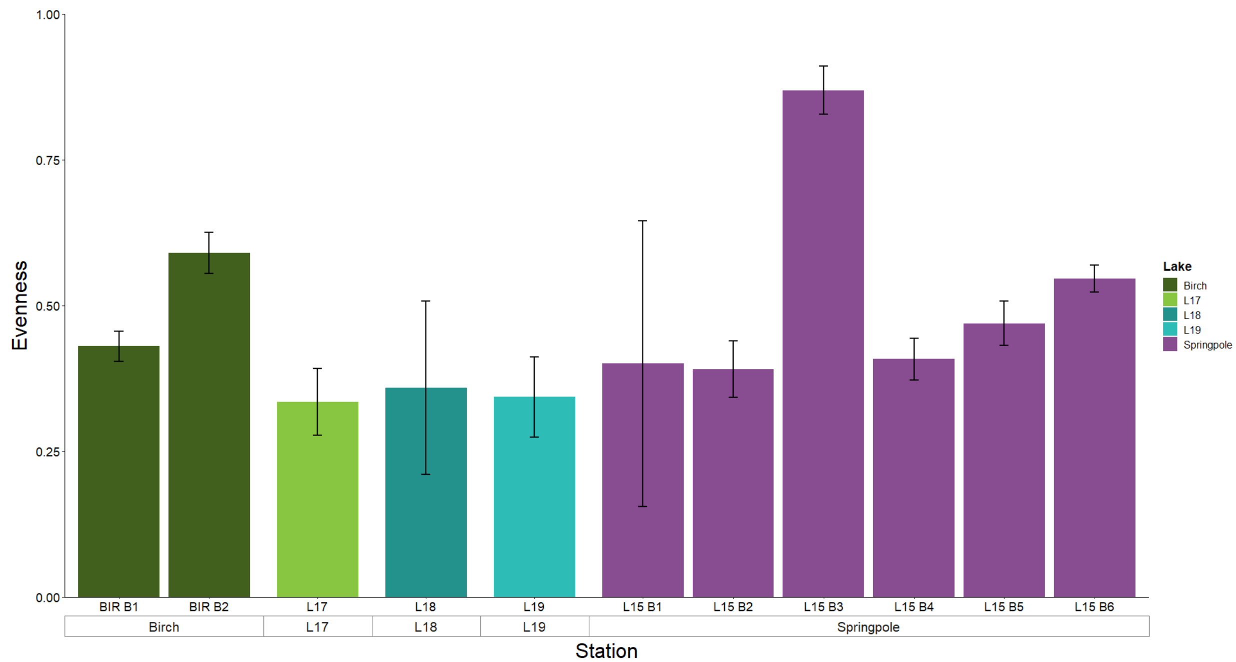


Figure A2-5: Benthic Invertebrate Community Evenness for Springpole, Birch Lake and the inland waterbodies, September 2021

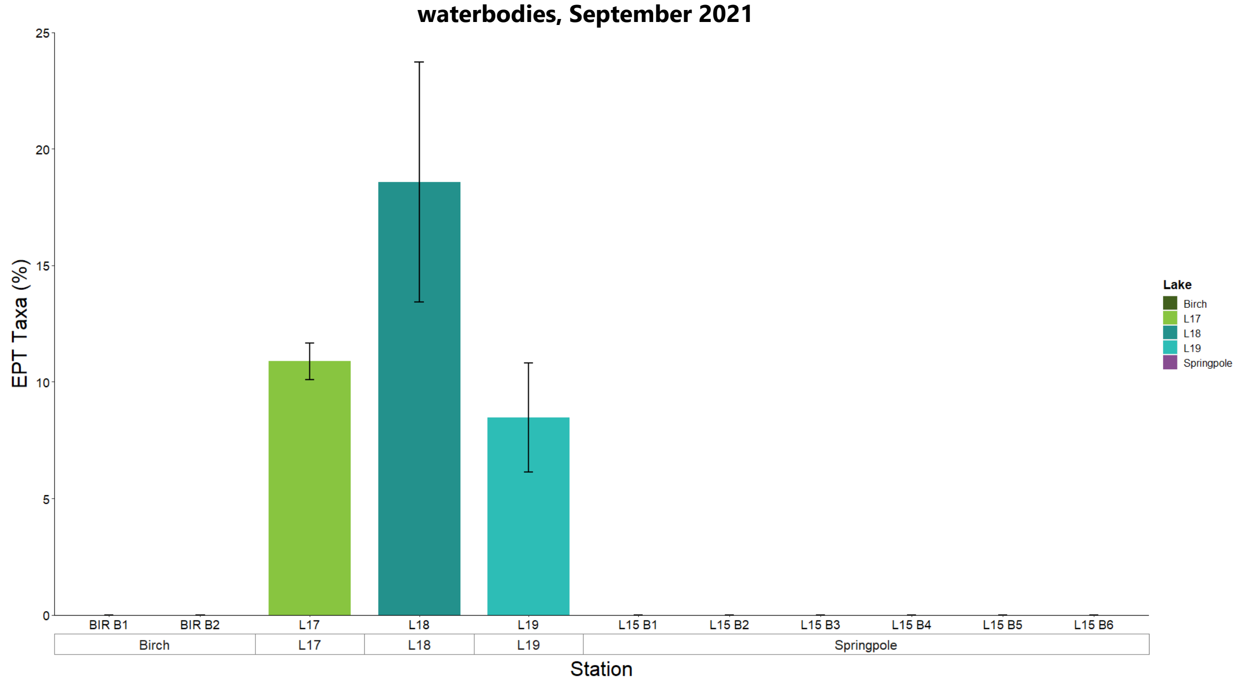


Figure D2-6: Benthic Invertebrate Community percent EPT Taxa for Springpole, Birch Lake and the inland waterbodies, September 2021

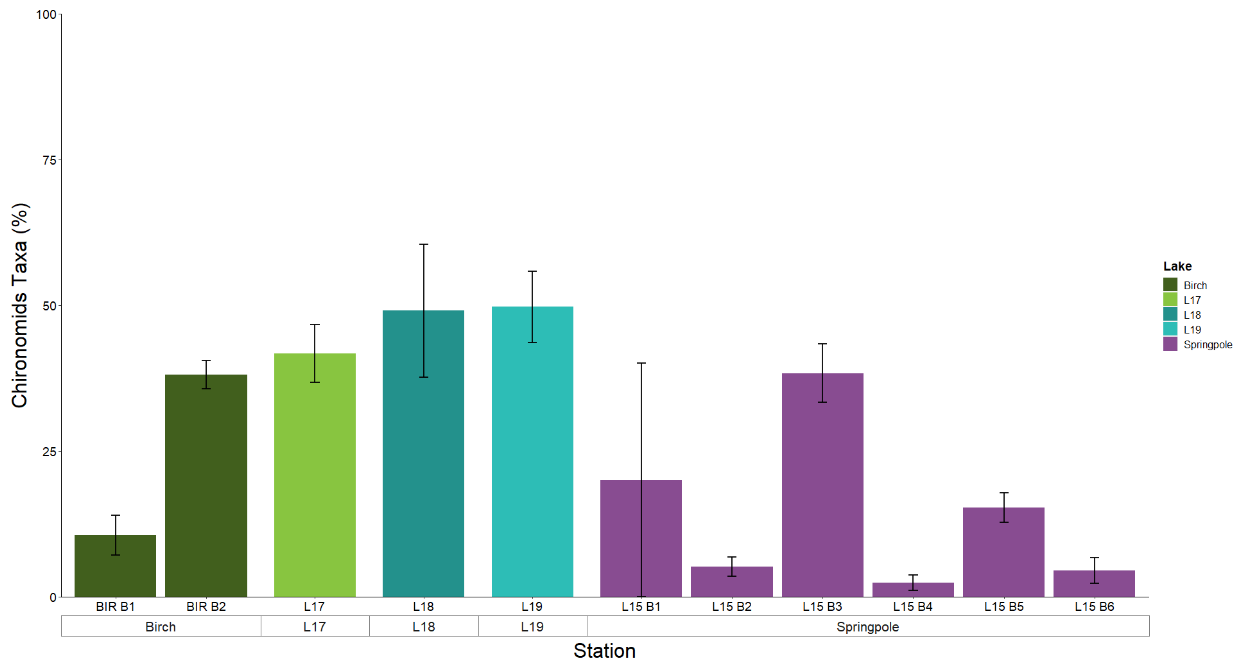


Figure D2-7: Benthic Invertebrate Community percent Chironomid Taxa for Springpole, Birch Lake and the inland waterbodies, September 2021

Table D2-1a: Springpole Waterbodies Benthic Invertebrate Community Metrics (2021)

Taxa Level	Birch Lake (BIR)													
	Birch-B1							Birch-B2						
	1	2	3	4	5	AVG	SD	1	2	3	4	5	AVG	SD
Total Abundance	44	27	34	40	47	38	4	81	30	50	78	135	75	18
TID (abundance/(0.023*3))	638	391	493	580	681	557	52	1174	435	725	1130	1957	1084	257
Total Taxa Richness	5	6	6	6	5	6	0.24	5	4	5	5	5	5	0.20
Sum of pi^2	0.48	0.48	0.37	0.40	0.39			0.37	0.35	0.33	0.34	0.40		
Simpsons D (1-D)	0.52	0.52	0.63	0.60	0.61	0.58	0.02	0.63	0.65	0.67	0.66	0.60	0.64	0.01
Simpsons E	0.42	0.35	0.45	0.42	0.51	0.43	0.03	0.54	0.71	0.60	0.60	0.50	0.59	0.04
# EPT Taxa	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		
% EPT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomids	6.82	11.11	14.71	20.00	0.00	10.53	3.41	43.21	33.33	44.00	32.05	37.78	38.07	2.45
Tanytarsus Count	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		
% Chironomids that are Metal Sens	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		

Table D2-1b: Springpole Waterbodies Benthic Invertebrate Community Metrics (2021)

Taxa Level	Springpole Lake (L15)																				
	L15-B1							L15-B2							L15-B3						
	1	2	3	4	5	AVG	SD	1	2	3	4	5	AVG	SD	1	2	3	4	5	AVG	SD
Total Abundance	1	0	1	0	0	0.40	0.24	77	56	145	61	75	83	16	9	10	3	8	4	7	1
TID (abundance/(0.023*3))	14	0	14	0	0	6	4	1116	812	2101	884	1087	1200	233	130	145	43	116	58	99	20
Total Taxa Richness	1	0	1	0	0	0.40	0.24	6	4	8	4	4	5	0.80	3	3	3	3	2	3	0.20
Sum of pi^2	1.00	0.00	1.00	0.00	0.00			0.37	0.48	0.51	0.76	0.61			0.36	0.42	0.33	0.41	0.63		
Simpsons D (1-D)	0.00	1.00	0.00	1.00	1.00	0.60	0.24	0.63	0.52	0.49	0.24	0.39	0.45	0.07	0.64	0.58	0.67	0.59	0.38	0.57	0.05
Simpsons E	1.00	0.00	1.00	0.00	0.00	0.40	0.24	0.45	0.53	0.25	0.33	0.41	0.39	0.05	0.93	0.79	1.00	0.82	0.80	0.87	0.04
# EPT Taxa	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		
% EPT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomids	0.00	0.00	100.00	0.00	0.00	20.00	20.00	6.49	10.71	2.76	1.64	4.00	5.12	1.61	33.33	50.00	33.33	50.00	25.00	38.33	5.00
Tanytarsus Count	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		
% Chironomids that are Metal Sens	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		

Table D2-1c: Springpole Waterbodies Benthic Invertebrate Community Metrics (2021)

Taxa Level	Springpole Lake (L15)																				
	L15-B4							L15-B5							L15-B6						
	1	2	3	4	5	AVG	SD	1	2	3	4	5	AVG	SD	1	2	3	4	5	AVG	SD
Total Abundance	37	69	10	60	43	44	10	84	77	105	81	86	87	5	68	46	23	58	29	45	8
TID (abundance/(0.023*3))	536	1000	145	870	623	635	148	1217	1116	1522	1174	1246	1255	70	986	667	333	841	420	649	123
Total Taxa Richness	3	5	3	5	3	4	0.49	5	5	5	5	5	5	0.00	4	3	5	5	4	4	0.37
Sum of pi^2	0.76	0.63	0.66	0.60	0.75			0.38	0.38	0.46	0.39	0.59			0.53	0.55	0.35	0.38	0.45		
Simpsons D (1-D)	0.24	0.37	0.34	0.40	0.25	0.32	0.03	0.62	0.62	0.54	0.61	0.41	0.56	0.04	0.47	0.45	0.65	0.62	0.55	0.55	0.04
Simpsons E	0.44	0.32	0.51	0.33	0.44	0.41	0.04	0.53	0.53	0.43	0.52	0.34	0.47	0.04	0.47	0.61	0.57	0.52	0.56	0.55	0.02
# EPT Taxa	0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		
% EPT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomids	0.00	1.45	0.00	3.33	6.98	2.35	1.31	20.24	15.58	16.19	18.52	5.81	15.27	2.51	5.88	0.00	4.35	12.07	0.00	4.46	2.23
Tanytarsus Count	0.00	0.00	0.00	0.00	0.00			1.00	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		
% Chironomids that are Metal Sens	0.00	0.00	0.00	0.00	0.00			5.88	0.00	0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00		

Table D2-1d: Springpole Waterbodies Benthic Invertebrate Community Metrics (2021)

Taxa Level	Lake 17					Lake 18					Lake 19				
	L17					L18					L19				
	1	2	3	AVG	SD	1	2	3	AVG	SD	1	2	3	AVG	SD
Total Abundance	640	140	556	445	155	244	124	169	179	35	388	674	105	389	164
TID (abundance/(0.023*3))	9275	2029	8058	6454	2240	3536	1797	2449	2594	507	5623	9768	1522	5638	2381
Total Taxa Richness	19	9	17	15	3.06	20	9	9	13	3.67	10	11	11	11	0.33
Sum of pi^2	0.15	0.26	0.26			0.48	0.18	0.31			0.38	0.32	0.19		
Simpsons D (1-D)	0.85	0.74	0.74	0.78	0.04	0.52	0.82	0.69	0.67	0.09	0.62	0.68	0.81	0.70	0.06
Simpsons E	0.35	0.43	0.23	0.33	0.06	0.10	0.62	0.36	0.36	0.15	0.26	0.29	0.48	0.34	0.07
# EPT Taxa	76.00	16.00	52.00			21.00	32.00	36.00			40.00	76.00	4.00		
% EPT	11.88	11.43	9.35	10.89	0.78	8.61	25.81	21.30	18.57	5.15	10.31	11.28	3.81	8.46	2.34
% Chironomids	31.88	45.71	47.48	41.69	4.93	68.44	29.03	49.70	49.06	11.38	58.76	52.23	38.10	49.69	6.10
Tanytarsus Count	60.00	20.00	24.00			17.00	8.00	40.00			48.00	148.00	4.00		
% Chironomids that are Metal Sens	29.41	31.25	9.09			10.18	22.22	47.62			21.05	42.05	10.00		

Appendix E
Photographic Record

L-1 site overview facing north (March 2021)


L-1 site overview facing northeast (August 2021)

L-5 site overview facing east (March 2021)

L-16 site overview facing south (May 2021)

Plate E-1: Inland Lakes Sample Areas

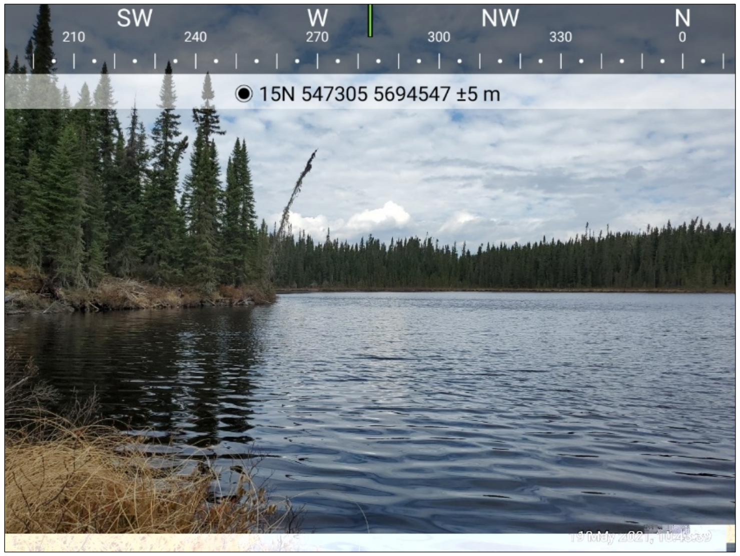
SW-09 site overview facing north (May 2021)

SW-09 site overview facing northeast (August 2021)

L-17 site overview facing west (May 2021)

L-17 site overview facing northeast (September 2021)

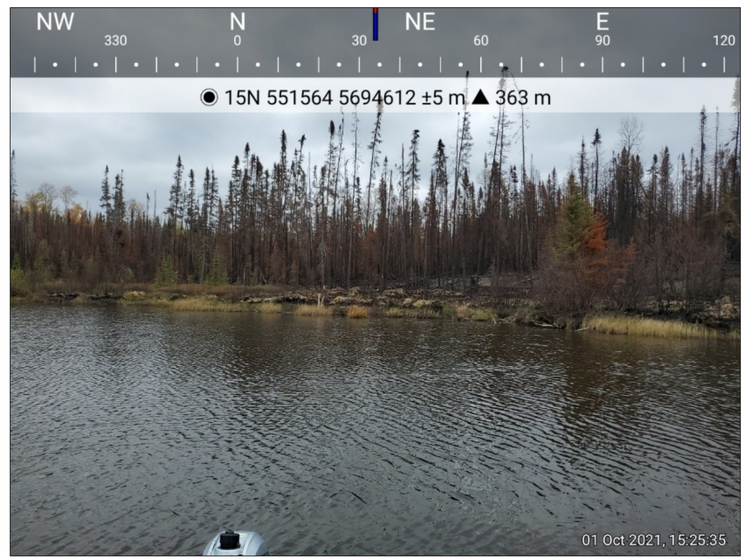
Plate E-2: Inland Lakes Sample Areas



L-18 site overview facing northwest (May 2021)

L-18 site overview facing northeast (August 2021)

L-19 site overview facing west (August 2021)



L-19 site overview facing southwest (September 2021)

Plate E-3: Inland Lakes Sample Areas

Benthics composite sample from L-19 (September 2021)

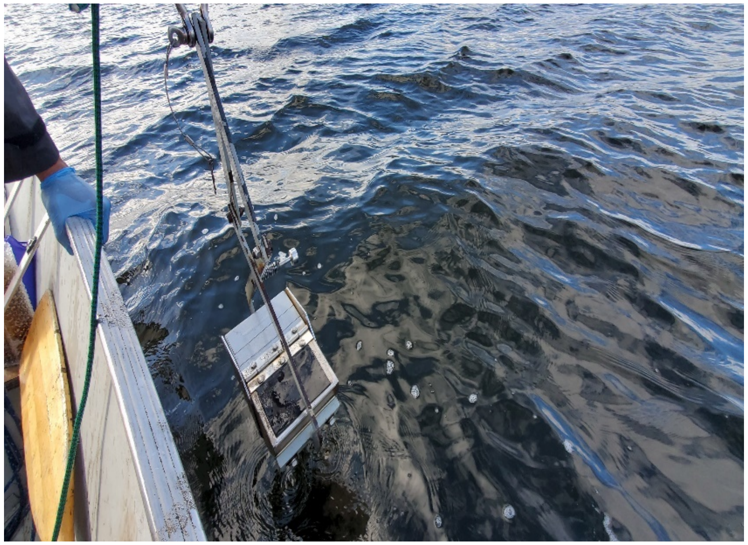

Benthics composite sample in sieve bucket from L-19 (September 2021)

Benthics composite sample from L-17 (September 2021)


Benthics composite sample from L-19 (September 2021)

Plate E-4: Benthics and sediment sampling


Gillnet full of fish (September 2021)


Petite ponar sediment sample grab (September 2021)


Van Doorn water sample grab (September 2021)

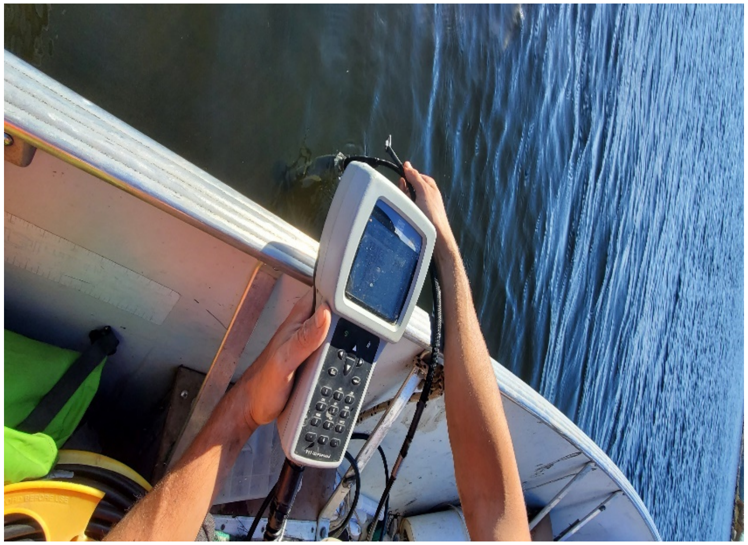

In situ surface water reading with YSI (September 2021)

Plate E-5: Various methods used to complete the fisheries resource assessment