Manitoba/Manitoba Hydro

Coordinated Aquatic Monitoring Pilot Program (CAMPP):

Three Year Summary Report (2008-2010) - Volume 13

Appendix 5: Results of CAMPP: 2010/2011

<u>VOLUME 13</u>

APPENDIX 5
RESULTS OF CAMPP: 2010/2011

Reference listing:

Coordinated Aquatic Monitoring Program (CAMP). 2014. Three Year Summary Report (2008-2010). Report prepared for the Manitoba/Manitoba Hydro MOU Working Group by North/South Consultants Inc., Winnipeg, MB.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

1.0 OVERVIEW OF COMPONENTS AND WATERBODIES FOR 2010/11 PROGRAM

In addition to pre-established climatological and hydrological monitoring in the CAMPP regions, monitoring of the following components was conducted under CAMPP in 2010/2011:

- Aquatic habitat;
- Water quality;
- Phytoplankton;
- Benthic macroinvertebrates;
- Fish communities; and
- Fish mercury.

In Year 3 of CAMPP, sampling was conducted in each of the eight regions at a total of 30 waterbodies/areas, ten of which are rotational waterbodies sampled for the first time in 2010/2011 (Table 1-1; Figure 1-1). For all components, sampling conducted in the lower Churchill River at the confluence with the Little Churchill River is hereafter referred to as the “lower Churchill River”.

Year 3 represented the first year in which fish mercury monitoring was conducted at most of the waterbodies (annual waterbodies) sampled under CAMPP for this component (exceptions included rotational waterbodies that were not sampled in 2010/2011).

In addition, 2010/2011 marked the first year in which aquatic habitat mapping surveys were undertaken under CAMPP. Specifically, surveys measuring substrate and water depth were completed at four lakes: Apussigamasi Lake; Billard Lake; Northern Indian Lake (portion of the lake); and Assean Lake.

The following sections provide a description of the results of Year 3 of CAMPP for all components excepting aquatic habitat. For presentation of results of the aquatic habitat surveys, see Section 5.0. For an overview of sampling and analysis methods see Section 4.

SECTION 1: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 1-1. Waterbodies sampled in Year 3 of CAMPP (2010/2011) by component and sampling organization.

Region	Waterbody	Water Quality [1, 2]		Benthic Macroinvertebrates[3]		Fish Community [3, 4]		Fish Mercury	
		Manitoba Hydro	Province of Manitoba	Manitoba Hydro	Province of Manitoba	Manitoba Hydro	Province of Manitoba	Manitoba Hydro	Province of Manitoba
Winnipeg River	Eaglenest Lake	O, I	-	X	-	X	-	-	-
	Pointe du Bois Forebay	O, I	-	X	-	X	-	X	-
	Lac du Bonnet	O, I	-	X	-	-	X	-	-
	Manigotagan Lake	O, I	-	X	-	A	X	X	-
Saskatchewan River	Saskatchewan River	O, I	-	X	-	-	X	-	X
	Cedar Lake-Southeast	O, I	-	X	-	A	X	-	X
	Cormorant Lake	O, I	-	X	-	A	X	-	X
Upper Churchill River	Granville Lake	I	O	X	-	A	X	-	X
	Southern Indian Lake-Area 4	I	O	X	-	A	X	-	X
	Southern Indian Lake-Area 6	I	O	X	-	A	X	-	X
Lower Churchill River	Northern Indian Lake	I	O	X	-	X	-	-	-
	Billard Lake	O, I	-	X	-	X	-	-	-
	Lower Churchill River at the Little Churchill River	O, I	-	X	-	X	-	X	-
	Gauer Lake	I	O	X	-	X	-	X	-
Churchill River Diversion	Rat Lake	O, I	-	X	-	X	-	X	-
	Threepoint Lake	O, I	-	X	-	X	-	X	-
	Footprint Lake	O, I	-	X	-	X	-	-	-
	Leftrook Lake	O, I	-	X	-	X	-	X	-

Table 1-1. – continued –

Region	Waterbody	Water Quality [1, 2]		Benthic Macroinvertebrates [3]		Fish Community [3, 4]		Fish Mercury	
		Manitoba Hydro	Province of Manitoba	Manitoba Hydro	Province of Manitoba	Manitoba Hydro	Province of Manitoba	Manitoba Hydro	Province of Manitoba
Upper Nelson River	Little Playgreen Lake	I	O	X	-	-	X		
	Playgreen Lake	-	-	-	-	-	-	-	X
	Cross Lake	I	O	X	-	X	-	X	-
	Walker Lake	I	O	X	-	X	-	-	-
	Setting Lake	I	O	X	-	-	X	-	-
Lower Nelson River	Burntwood River	O, I	-	-		-	-		
	Split Lake	-	O, I	X	-	X	-	X	-
	Limestone Forebay	O, I	-	X	-	X	-	X	-
	Lower Nelson River downstream of the Limestone GS	O, I	-	X	-	X	-	X	-
	Hayes River	O, I	-	X	-	X	-	X	-
	Assean Lake	O, I	-	X	-	X	-	X	-
Lake Winnipeg	Lake Winnipeg (north basin)	-	O, I	X	X	-	X	-	-
	Lake Winnipegosis	O, I		X	-	-	X	-	-

[1] Water quality program includes collection of phytoplankton samples for bloom monitoring and chlorophyll a.
[2] O = open-water season; I = ice-cover season.
[3] X = entire program component implementation.
[4] A = assistance provided by Manitoba Hydro.

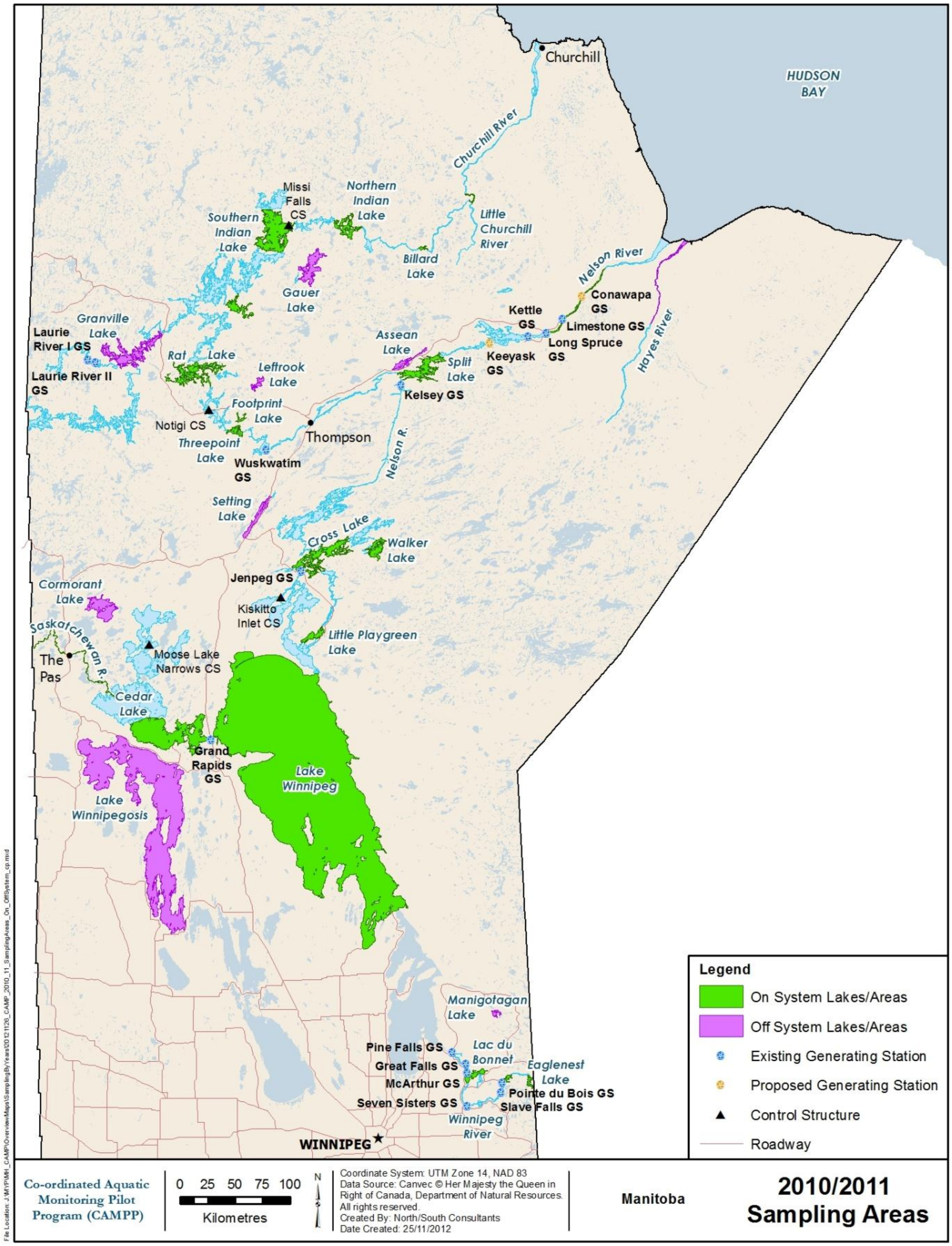


Figure 1-1. On-system and off-system waterbodies/areas sampled under CAMPP in 2010/2011.

2.0 WINNIPEG RIVER REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Winnipeg River Region, by each major component. A general description of methods is provided in Section 4 and in detail in Appendix 1.

2.1 CLIMATE

Based on comparisons to climate normals, 2010 was characterized by a relatively warm spring and late fall and an overall high amount of precipitation, most notably in August (Figure-2.1-1).

Mean monthly air temperatures measured at Pinawa in 2010 were generally similar to the 1971-2000 temperature normals over the open-water sampling period (Figure2.1-1). Notable exceptions included the month of October, where air temperature was approximately 3.3 ^{o}C above normal (approximately 60% higher than normal), and November which was 2.2 ^{o}C below normal (approximately half the normal temperature). The annual mean air temperature was approximately twice the normal annual mean, owing largely to above-average temperatures in the winter and fall periods.

Precipitation normals indicate a peak in June and relatively low levels of precipitation in winter at Pinawa (Figure 2.1-1). Precipitation was higher in ten of the twelve months of 2010 relative to the monthly normals, with an overall total precipitation nearly 50% higher than the annual normal. By far the highest precipitation occurred in August (approximately 250% of the normal for that month). Other than August, most months experienced total precipitation that was 30% or more above the normal for the respective month.

2.2 HYDROLOGY

Although river flows are primarily determined by precipitation within the river's drainage basin, a major influence on Winnipeg River flows is releases from upstream storage reservoirs in Ontario, which are regulated by the Lake of the Woods Control Board considering the interest of all users. Outflows from Lake of the Woods on the Winnipeg River and Lac Seul on the English River combine at Boundary Falls just east of the Manitoba-Ontario border.

Six Manitoba Hydro generating stations (GSs) along the Winnipeg River create upstream impoundments of fairly stable water levels under almost all flow conditions. CAMPP monitoring in 2010 occurred on Eaglenest Lake, in the Pointe du Bois GS Forebay and on Lac du Bonnet, which acts as the McArthur Falls GS Forebay. Flows for the entire region are reported based on outflows from the Slave Falls GS since it has the longest and most reliable record along the Winnipeg River. Flows also do not change significantly from Slave Falls GS to Lake Winnipeg.

Manigotagan River was monitored as a proxy for Manigotagan Lake, the off-system waterbody for this region.

There are no direct water level data for Eaglenest Lake. Relative lake levels can be inferred from Winnipeg River flows in 2010, which were between the upper and lower quartile for most of the year (Figure 2.2-1). A very low snowpack led to lower quartile flows in spring, but persistent rainfall starting in late May and continuing throughout the summer pushed flows above upper quartile in August.

The Pointe du Bois Forebay water levels are controlled within a narrow range, typically fluctuating by less than 0.1 metres. Water levels in 2010 generally remained within this range except during two wind events in early summer 2010, which caused the water level to temporarily fluctuate more than normal (Figure 2.2-2).

Lac du Bonnet water levels are controlled within a narrow range, typically fluctuating by less than 0.2 metres. Water levels in 2010 were very near the average (Figure 2.2-3).

There are no direct water level data for Manigotagan Lake. Relative lake levels can be inferred from Manigotagan River flows. Water Survey of Canada measured Manigotagan River flows from 1913 to 1996 when the gauge was discontinued. This gauge was re-established in late 2010 by Water Survey of Canada in order to provide data for CAMPP. In late fall 2010, Manigotagan River flows were the highest on record, indicating that Manigotagan Lake levels were likely the highest on record for that time of year and remained above average for the remainder of the year (Figure 2.2-4). Above average precipitation in late 2010, including a significant event during the last week of October, appear to be the cause of the above average flow.

2.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 3 of CAMPP in the Winnipeg River Region. Waterbodies sampled included the Pointe du Bois Forebay, Lac du Bonnet (approximately 86.5 km downstream) and an off-system reference lake (Manigotagan Lake), all of which were also sampled in Years 1 and 2 of CAMPP (Figure 2.3-1). Eaglenest Lake, an off-system waterbody located on the Winnipeg River approximately 24 km upstream of the Pointe du Bois GS, was also sampled (rotational waterbody) in 2010/2011. Although Eaglenest Lake is as an off-system waterbody, the results of the water quality monitoring conducted in 2010/2011 are described below collectively with the on-system sites to illustrate the change in conditions along the length of the river.

2.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Winnipeg River Region for routine water quality variables are presented in Tables 2.3-1 and 2.3-2 and Figures 2.3-2 to 2.3-12.

2.3.1.1 On-system Waterbodies

Water quality of the Winnipeg River, as measured at Eaglenest Lake, the Pointe du Bois Forebay and in Lac du Bonnet, can be generally described as moderately nutrient-rich, clear, slightly alkaline, soft, and well-oxygenated. Neither the Pointe du Bois Forebay nor Lac du Bonnet was stratified in 2010/2011 (Figure 2.3-2). Eaglenest Lake exhibited weak thermal stratification in the upper 1 m of water in spring 2010 but was isothermal for the remaining sampling periods (Figure 2.3-2).

Dissolved oxygen (DO) concentrations decreased with depth in Eaglenest Lake, the Pointe du Bois Forebay, and Lac du Bonnet in winter but DO concentrations remained above Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011; Figure 2.3-3) for the protection of aquatic life (PAL) across depth over all monitoring periods in 2010/2011.

In situ turbidity, pH, and specific conductance were relatively consistent across depth in each of the waterbodies along the length of the Winnipeg River (Figures 2.3-4 to 6). The exceptions included turbidity measured in summer at Lac du Bonnet, where it increased between approximately 3 and 7 m (Figure 2.3-4), and specific conductance which was lower in the upper 2 m in winter at Eaglenest Lake (Figure 2.3-6). The latter may reflect a sampling artifact associated with ice melt near the surface at the time of sampling. Secchi disk depths ranged between 0.9 and 1.9 m in the open-water season at sites on the Winnipeg River and were somewhat lower at Lac du Bonnet than upstream sites (Figure 2.3-7).

At least half of the samples collected in each of Eaglenest Lake, the Pointe du Bois Forebay, and Lac du Bonnet exceeded the Manitoba narrative guideline for TP of 0.025 mg/L for lakes, ponds, and reservoirs (MWS 2011; Figure 2.3-8). Other routine water quality variables for which there are MWQSOGs, including pH (6.5-9.0), ammonia (site-specific guideline), and nitrate/nitrite (2.93 mg N/L), were within PAL objectives and guidelines in 2010/2011.

On average, the majority of TP was in dissolved form (Figure 2.3-9) and the majority of TN was composed of organic nitrogen (Figure 2.3-10) at sites along the Winnipeg River. On average, nitrate/nitrite comprised a larger portion of dissolved inorganic nitrogen (DIN) than ammonia in each of the waterbodies. Concentrations of, and the relative proportion of DIN represented by, nitrate/nitrite were higher in the ice-cover season.

2.3.1.2 Off-system Waterbody

Unlike waterbodies on the Winnipeg River system, Manigotagan Lake was stratified in spring, summer and fall 2010 (Figure 2.3-2) and DO was below the long-term PAL objectives for cool and cold-water species in fall 2010 in the lower portion of the water column (below 18 m; Figure 2.3-3).

In situ turbidity, pH, and specific conductance were relatively consistent across depth in Manigotagan Lake (Figures 2.3-4 to 6). Secchi disk depths ranged between 1.5 and 1.69 m in the open-water season (Figure 2.3-7).

Half of the samples collected in Manigotagan Lake exceeded the Manitoba narrative guideline for TP of 0.025 mg/L for lakes, ponds, and reservoirs (MWS 2011; Figure 2.3-8). Other routine water quality variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011.

Like waterbodies along the Winnipeg River system, the majority of TP in Manigotagan Lake was in dissolved form (Figure 2.3-9) and the majority of TN was composed of organic nitrogen (Figure 2.3-10). On average, nitrate/nitrite comprised a larger portion of DIN than ammonia. The concentration of nitrate/nitrite, and its relative proportion of DIN, was higher in the ice-cover season.

Water samples collected at depth (1 m above the sediment-water interface) in Manigotagan Lake in summer and fall 2010, when the lake was thermally stratified, indicated higher concentrations of some water quality variables in the hypolimnion than the epilimnion. DIN, largely due to elevated concentrations of nitrate/nitrite (Figure 2.3-11), and total dissolved phosphorus and TP (Figure 2.3-12) were notably higher at depth than near the water surface. Water quality of surface and bottom samples collected in spring was similar.

2.3.2 Metals and Major Ions

Summaries of metal concentrations and detection frequencies measured in the Winnipeg River Region in 2010/2011 are presented in Tables 2.3-3 and 2.3-4.

2.3.2.1 On-system Waterbodies

Most metals were either detected in all samples in each of the waterbodies sampled along the Winnipeg River or not detected at any sites or sampling periods. Metals not detected at any site or sampling period included beryllium, bismuth, cesium, chromium, cobalt, mercury, molybdenum, nickel, selenium, silver, tellurium, thallium, tungsten, and zinc. Conversely, aluminum, arsenic, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, rubidium, sodium, strontium, titanium, and vanadium were consistently detected. The remaining metals (antimony, boron, cadmium, thorium, tin, uranium, and zirconium) were detected in some but not all samples.

Aluminum exceeded the MWQSOG PAL guideline (0.1 mg/L; MWS 2011) in all samples collected along the Winnipeg River system in 2010/2011 (Table 2.3-5, Figure 2.3-13). Iron exceeded the MWQSOG for PAL (0.3 mg/L) in Eaglenest Lake, the Pointe du Bois Forebay, and Lac du Bonnet in fall, and Lac du Bonnet in summer, and was at the guideline in Eaglenest Lake in winter (Table 2.3-5, Figure 2.3-13).No other metals measured in 2010/2011 exceeded PAL objectives or guidelines in the Winnipeg River Region. However, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods, comparisons to the guideline could not be made.

Both chloride and sulphate were consistently detected in the on-system waterbodies of the Winnipeg River Region in 2010/2011, though concentrations of both ions were low. Chloride remained less than 2 mg/L and was well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013). Sulphate concentrations at sites along the Winnipeg River averaged less than 5 mg/L (Table 2.3-2), and fell on the lower range of concentrations reported across Canada (Canadian Council of Resource and Environment Ministers [CCREM] 1987). Although there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment (BCMOE) guidelines, which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013).

2.3.2.2 Off-system Waterbody

Metals not detected in Winnipeg River waterbodies were also not detected in Manigotagan Lake; in addition, antimony, thorium, and zirconium were not detected in Manigotagan Lake (Table 2.3-5). Similarly, the same metals detected in 100% of samples collected on the Winnipeg River system were also detected in all samples collected in Manigotagan Lake. Uranium was also detected in all samples from the off-system waterbody in 2010/2011. Two samples (collected in summer and fall) contained aluminum at concentrations above the MWQSOG for PAL (0.1 mg/L; MWS 2011; Figure 2.3-13).

Concentrations of total aluminum, iron, and manganese were higher in samples collected near the sediment-water interface in summer and fall 2010 in Manigotagan Lake, when the lake was thermally stratified, relative to surface grabs (Figure 2.3-14). Aluminum and iron concentrations exceeded the MWQSOGs for PAL (0.1 and 0.3 mg/L, respectively) in these bottom samples in summer and fall (MWS 2011; Figure 2.3-14).

No other metals measured in 2010/2011 exceeded PAL objectives or guidelines in Manigotagan Lake. However, as noted in Section 2.3.2.1, comparisons could not be made to the current MWQSOG for mercury (0.000026 mg/L; MWS 2011) owing to analytical detection limits above the current guideline.

Like the on-system waterbodies, concentrations of chloride and sulphate were low in Manigotagan Lake in 2010/2011 (Table 2.3-2) and were well below the CCME PAL guideline (CCME 1999, updated to 2013) and the BCMOE guideline (Meays and Nordin 2013), respectively.

2.3.3 Trophic Status and Nutrient Ratios

2.3.3.1 On-system Waterbodies

In 2010/2011, each of the waterbodies sampled in the Winnipeg River Region were meso-eutrophic on the basis of open-water season mean TP concentrations (Table 2.3-6). Sites exhibited similar trophic categories based on chlorophyll *a* (Table 2.3-7) and TN concentrations (Table 2.3-8).

On average, sites along the Winnipeg River sampled in 2010/2011 were phosphorus limited based on TN:TP molar ratios (Figure 2.3-15). Total organic carbon to organic nitrogen (TOC:ON) molar ratios indicate that on average organic matter in the three waterbodies was a mixture of allochthonous and autochthonous sources (Figure 2.3-16). The high TOC:ON ratio for the Pointe du Bois Forebay in fall reflects a total Kjeldahl nitrogen concentration that was below the analytical DL (i.e., <0.2 mg/L).

2.3.3.2 Off-system Waterbody

Trophic status of Manigotagan Lake in 2010/2011 was consistent with on-system waterbodies. Manigotagan Lake was meso-eutrophic based on TP (Table 2.3-6), and mesotrophic based on chlorophyll *a* (Table 2.3-7) and TN (Table 2.3-8). Also like waterbodies on the Winnipeg River system, Manigotagan Lake was phosphorus limited based on TN:TP molar ratios (Figure 2.3-15), and mean TOC:ON molar ratios indicate that organic matter was a mixture of allochthonous and autochthonous sources (Figure 2.3-16).

2.3.4 *Escherichia coli*

2.3.4.1 On-system Waterbodies

E. coli was detected in 50, 75, and 100%of samples collected in Eaglenest Lake, the Pointe du Bois Forebay, and Lac du Bonnet, respectively (the maximum concentration measured along the Winnipeg River system was 5 CFU/100 mL). All measurements were well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 2.3-2; MWS 2011).

2.3.4.2 Off-system Waterbody

E. coli was not detected (i.e., <1 CFU/100 mL) in Manigotagan Lake.

2.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Winnipeg River Region in Year 3 of CAMPP. Waterbodies sampled included the Pointe du Bois Forebay, Lac du Bonnet (approximately 86.5 km downstream) and an off-system lake (Manigotagan Lake), all of which were also sampled in Years 1 and 2 of CAMPP (Figure A5.2.3-1). Eaglenest Lake, an off-system waterbody located approximately 24 km upstream of the Pointe du Bois GS, was also sampled (rotational waterbody) in 2010/2011.

2.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Winnipeg River Region were low to moderate (Figure 2.4-1), were similar between waterbodies, and were consistently lower in winter than the open-water season.

2.4.2 Community Composition and Biomass

In 2010/2011, phytoplankton community biomass (measured in Eaglenest Lake as part of the rotational analyses) was low at the site, with the highest biomass being measured in spring (Figure 2.4-2). The phytoplankton community in Eaglenest Lake was dominated by diatoms during all seasons, with cryptophytes being the next-most abundant taxa (Figure 2.4-3). Blue-green algae were also relatively common during summer and fall.

Diversity (1-G), heterogeneity (H), evenness (E_D, E_H, and $E^{H'}/S$), and species effective richness were all moderate in Eaglenest Lake during the open-water season of 2010 (Table 2.4-1). Community complexity at the site was lowest in fall but was similar between spring and summer.

2.4.3 Bloom Monitoring

Chlorophyll *a* concentrations in the region were consistently below the bloom monitoring trigger of 10 µg/L in 2010.

2.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (i.e., algal toxins), including species of *Anabaena*, *Aphanizomenon, Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to influence whether microcystins are produced. *Anabaena* and *Aphanizomenon* were present at Eaglenest Lake in 2010/2011. Taxonomic information is not available for the other waterbodies. Microcystin-LR was not measured for this Region in 2010 as the chlorophyll *a* concentration was always below the 10 µg/L trigger for microcystin-LR analysis.

2.4.5 Trophic Status

In terms of mean chlorophyll *a* concentrations measured in 2010/2011 (annual and open-water annual season), Eaglenest Lake, the Pointe du Bois Forebay, Lac du Bonnet and Manigotagan Lake were mesotrophic following the trophic classification scheme for lakes and reservoirs (OECD 1982; Table 2.3-7).

2.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Winnipeg River Region in 2010/2011; the third year of CAMPP. Areas sampled included the on-system waterbodies Pointe du Bois Forebay, and Lac du Bonnet, and the off-system waterbodies Manigotagan and Eaglenest lakes (Figures 2.5-1 to 2.5-4). Pointe du Bois Forebay, Lac du Bonnet, and Manigotagan Lake are sampled annually and Eaglenest Lake is sampled on a rotational basis (i.e., once every three years).

In 2010, grab sampling in the predominantly-wetted portion of the nearshore habitat was changed to kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize the portion of the littoral zone influenced by water level fluctuations. Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Nearshore and offshore habitat polygons were sampled in all waterbodies. Both kicknet and grab sampling consisted of five composites of three replicate samples per nearshore and offshore habitat polygon. Sampling was conducted between 14 and 21 September 2010.

2.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons at each waterbody (Table 2.5-1).

In 2010, mean water depths sampled in the nearshore intermittently wetted habitat were: 0.9 m in Eaglenest Lake and the Pointe du Bois Forebay, 0.8 m at Lac du Bonnet, and 1.0 m in Manigotagan Lake (Table 2.5-1). Mean offshore water depths were: 7.0 m in Eaglenest Lake and at Lac du Bonnet, 7.2 m in the Pointe du Bois Forebay, and 8.0 m in Manigotagan Lake (Table 2.5-1).

Sediment samples were collected and analyzed for TOC and PSA to provide a general characterization of sediment type in each nearshore and offshore polygon. The habitat polygons sampled in the Winnipeg River Region had very low mean TOC in the sediments (less than 1.0%) in both nearshore and offshore habitats with the exception of the nearshore habitat of Eaglenest Lake where the mean TOC was higher (7.3%; Table 2.5-2).

Sand comprised the majority of the sediments collected from all nearshore and offshore polygons in all waterbodies (Table 2.5-2). Sand was found to be the most dominant in the nearshore polygon of Lac du Bonnet (Table 2.5-2). Silt was generally the next most abundant sediment followed by smaller contributions from clay.

2.5.2 Species Composition, Distribution, and Relative Abundance

2.5.2.1 Eaglenest Lake

The total mean abundance for BMI collected in kicknet samples in the nearshore habitat of Eaglenest Lake was 401 individuals, with numbers ranging from 138 to 707 (Table 2.5-3). Overall, insects dominated the BMI community in abundance (55% of the mean total BMI), with non-insects comprising 45% of the overall taxa (Table 2.5-3). Insects primarily consisted of Chironomidae (23% of the mean total BMI), Ephemeroptera (15%) and Trichoptera (8%); Hemiptera and Coleoptera were also captured (Table 2.5-3). Of the non-insects, the main groups were Amphipoda (21% of the mean total invertebrates sampled) and Gastropoda (19%), with smaller numbers of Oligochaeta, Bivalvia, and Acari also present (Table 2.5-3). The overall mean density BMI collected in benthic grab samples in the offshore habitat was 721 individuals/m^2, with densities ranging from 462 to 1,356 (Table 2.5-3). Overall, insects dominated the BMI community in abundance (70% of the mean total BMI), with non-insects comprising 30% of the overall taxa (Table 2.5-3). Insects mainly consisted of Chironomidae (33% of the mean total BMI) and Ephemeroptera (30%); small numbers of Trichoptera (4%), Hemiptera, Odonata, Ceratopogonidae, and Chaoboridae were also identified (Table 2.5-3). Of the non-insects, the main group was Bivalvia (26%) followed by Amphipoda (2%) and Oligochaeta (1%).

Total EPT comprised 23% of the mean total BMI sampled in the nearshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Caenis* sp. (small square-gilled mayfly) were dominant in nearshore kicknet samples (Table 7.6). Trichoptera were also collected and Plecoptera were absent. Total EPT comprised 34% of the mean total BMI community in the offshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore grab samples (Table 2.5-3). Trichoptera were also collected and Plecoptera were again absent. The ratio of EPT:C was 0.88 in the nearshore, indicating Chironomidae were slightly dominant over EPT. The ratio was 1.87 in the offshore polygon indicating that EPT were dominant over Chironomidae.

Overall taxonomic richness in the nearshore was 30 families, with sample richness values ranging from 15 to 21 (Table 2.5-3). Hill’s Effective Richness (E^H) was 10; Chironomidae, Hyalellidae, Caenidae, and Planorbidae were most abundant. Taxonomic richness in the offshore was 13 families, with richness values ranging from four to seven (Table 2.5-3). Hill’s Effective Richness (E^H) was four with Chironomidae, Ephemeridae, and Pisidiidae most abundant.

The mean index of diversity (Simpson’s Diversity Index [D]) was 0.85 and 0.61 in the nearshore and offshore polygons, respectively (Table2.5-3). Evenness (Simpson’s Equitability [E_D]) was 0.33 in the nearshore polygon and 0.43 in the offshore polygon (Table 2.5-3).

2.5.2.2 Pointe du Bois Forebay

The total mean BMI abundance in the intermittently wetted nearshore habitat of the Pointe du Bois Forebay was 174 individuals with numbers ranging from 91 to 378 (Table 2.5-4). Overall, the BMI community was equal with respect to non-insect (50%) and insect (50%) abundance (Table 2.5-4). Of the non-insects, the main group was Amphipoda (28% of the mean total BMI); Gastropoda, Oligochaeta, Bivalvia, Acari, and Ostracoda were also present (Table 2.5-4). Insects mainly consisted of Corixidae (water boatmen; 21%) and Chironomidae (16%); smaller numbers of Ephemeroptera, Coleoptera, Trichoptera, and Ceratopogonidae were also found (Table 2.5-4). The total mean BMI density in the offshore habitat was 609 individuals/m^2 with densities ranging from 260 to 851 (Table 2.5-4). Overall, insects dominated the BMI community (74% of the mean total BMI), with non-insects comprising 26% of the overall taxa (Table 2.5-4). Insects mainly consisted of Ephemeroptera (49%) and Chironomidae (18%); a small number of Trichoptera, Ceratopogonidae, and Odonata were also collected (Table 2.5-4). Of the non-insects, the main groups were Bivalvia (16%) and Oligochaeta (9%); a small number of Gastropoda, Ostracoda, and Acari were also present (Table 2.5-4).

Total EPT comprised 8% of the mean BMI sampled in the nearshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Caenis* sp. was dominant in nearshore kicknet samples (Table 2.5-4). Trichoptera were also collected in small numbers and Plecoptera were absent. Total EPT comprised 53% of the mean total BMI sampled in the offshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore grab samples (Table 2.5-4). Trichoptera were also collected in small numbers and Plecoptera were absent. The ratio of EPT:C was 1.48 in the nearshore (Table 2.5-4), indicating EPT were more dominant than Chironomidae in this habitat The ratio of EPT:C was 4.95 in the offshore polygon (Table 2.5-4), again indicating an insect community dominated with EPT compared to Chironomidae.

Taxonomic richness in the nearshore was 32 families, with richness values ranging from eight to 25 (Table 2.5-4). Hill's Effective Richness (E^H) was seven; Hyalellidae, Corixidae, and Chironomidae were most dominant (Table 2.5-4). Taxonomic richness in the offshore was 11 families, with richness values ranging from four to seven within each sample (Table 2.5-4). Hill's Effective Richness (E^H) was four; Ephemeridae clearly dominated this habitat (Table 2.5-4).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.71 and 0.65 in the nearshore and offshore polygons, respectively (Table 2.5-4). Evenness (Simpson's Equitability [E_D]) was 0.21 in the nearshore polygon and 0.45 in the offshore polygon (Table 2.5-4).

2.5.2.3 Lac du Bonnet

The total mean BMI abundance of the intermittently wetted nearshore habitat in Lac du Bonnet was 556 individuals, with numbers ranging from 128 to 1,672 (Table 2.5-5). Overall, non-insects dominated the BMI community (86% of the mean total BMI), with insects comprising 14% of the overall taxa (Table 2.5-5). Of the non-insects, the main group was Amphipoda (78% of the mean total invertebrates sampled), though Oligochaeta, Gastropoda, Bivalvia, and Acari were also present (Table 2.5-5). Insects mainly consisted of Ephemeroptera (6%) and Chironomidae (5%); a small number of Trichoptera, Corixidae, and Empididae were also identified. The overall mean BMI density of benthic grab samples in the offshore habitat was 2,764 individuals/m^2, with densities ranging from 1,746 to 3,434 (Table 2.5-5). Overall, non-insects dominated the BMI community (91% of the mean total BMI), with insects comprising 9% of the overall taxa (Table 2.5-5). Of the non-insects, the main groups were Oligochaeta (51% of the mean total BMI) and

Bivalvia (31%), though Gastropoda, Amphipoda, and Hirudinea were also present. Insects mainly consisted of Chironomidae (4%), Ephemeroptera (3%), and Trichoptera (1%) (Table 2.5-5).

Total EPT comprised 8% of the mean total BMI in the nearshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Ephemera* sp. were most dominant in nearshore kicknet samples (Table 2.5-5). Trichoptera were also collected in small numbers and Plecoptera were absent. Total EPT comprised 4% of the mean total BMI in the offshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore grab samples (Table 2.5-5). Trichoptera were also collected in small numbers and Plecoptera were again absent. The ratio of EPT:C was 1.42 in the nearshore polygon and 1.22 in the offshore polygon (Table 2.5-5). Both ratios indicate a dominance of EPT over Chironomidae although EPT and Chironomidae were slightly more balanced within the offshore habitat.

Taxonomic richness in the nearshore was 26 families with richness values ranging from 12 to 19 within each sample (Table 2.5-5). Hill's Effective Richness (E^H) was three with Hyalellidae notably dominant. Taxonomic richness in the offshore was 14 families with sample richness values ranging from seven to ten (Table 2.5-5). Hill's Effective Richness (E^H) was four; Oligochaeta and Pisidiidae were notably dominant.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.40 and 0.62 in the nearshore and offshore polygons, respectively (Table 2.5-5). Evenness (Simpson's Equitability [E_D]) was 0.09 in the nearshore polygon and 0.28 in the offshore polygon (Table 2.5-5).

2.5.2.4 Manigotagan Lake

The total mean BMI abundance of kicknet samples in the nearshore habitat of Manigotagan Lake was 107 individuals, with numbers ranging from 14 to 226 (Table 2.5-6). Overall, non-insects dominated the BMI community in abundance (66% of the mean total BMI), with insects comprising 34% of the overall taxa (Table 2.5-6). Of the non-insects, the main group was Amphipoda (50% of the mean total BMI), though Oligochaeta (16%) and Ostracoda were also present (Table 2.5-6). Insects mainly consisted of Chironomidae (22% of the mean total BMI), and small numbers of Ephemeroptera (7%), Trichoptera (3%), and Hemiptera were also found (Table 2.5-6). The overall mean BMI density of benthic grab samples in the offshore habitat was 268 individuals/m^2, with densities ranging from 144 to 418 (Table 2.5-6). Overall, insects dominated the BMI community (57% of the mean total BMI), with non-insects comprising 43% of the overall taxa. Insects consisted of Chironomidae (32%) and small numbers of Ephemeroptera (3%) and Trichoptera (1%) (Table 2.5-6). Of the non-insects, the main group was

Oligochaeta (25%), though Bivalvia (10%), Amphipoda (5%), Gastropoda (2%), and small numbers of Ostracoda were also present.

Total EPT comprised 9% of the total BMI sampled in the nearshore polygon, with the prevalence being within the Ephemeroptera (Table 2.5-6). Genus analysis of the Ephemeroptera indicated that Leptophlebiidae (unidentified sp.) and *Procloeon* sp. were dominant in nearshore kicknet samples (Table 2.5-6). Trichoptera were also collected and Plecoptera were absent. Total EPT comprised 4% of the total BMI community in the offshore polygon, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore grab samples (Table 2.5-6). Trichoptera were also collected in small numbers and Plecoptera were again absent. The ratio of EPT:C was 0.43 in the nearshore polygon and 0.13 in the offshore polygon (Figure 2.5-4; Table 2.5-6). Both ratios indicate that Chironomidae dominated EPT in abundance in each group.

Taxonomic richness in the nearshore was 23 families with richness values ranging from 7 to 15 within each sample (Table 2.5-6). Hill's Effective Richness (E^H) was six; Hyalellidae, Chironomidae, and Oligochaeta were the most notable taxa. Taxonomic richness in the offshore was ten families with richness values ranging from four to seven within each sample (Table 2.5-6). Hill's Effective Richness (E^H) was five with Chironomidae, Oligochaeta, and Chaoboridae notably dominant.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.69 and 0.77 in the nearshore and offshore polygons, respectively (Table 2.5-6). Evenness (Simpson's Equitability [E_D]) was 0.31 in the nearshore polygon and 0.67 in the offshore polygon (Table 2.5-6).

2.6 FISH COMMUNITY

2.6.1 Gill Netting

In 2010, in the Winnipeg River Region, gill netting was conducted in the off-system waterbody, Eaglenest Lake (19 – 24 July), and the on-system waterbodies of Pointe du Bois Forebay (12 - 17 July) and Lac du Bonnet (20 – 23 September) (figures 2.6-1, 2.6-2 and 2.6-3). Gill netting was also conducted in Manigotagan Lake (7 – 9 September), another off-system waterbody (Figure 2.6-4).

A total of 12, 15, ten, and six standard gang gillnet sites were sampled in Eaglenest Lake, the Pointe du Bois Forebay, Lac du Bonnet, and Manigotagan Lake respectively (Table 2.6-1). Small mesh index gill nets were set at four of the 12 sampling sites in Eaglenest Lake, five of the 15 sampling sites in the Pointe du Bois Forebay, three of the 10 sites in Lac du Bonnet and two of the six sites in Manigotagan Lake (Table 2.6-1). In total, 20 fish species were captured in Winnipeg River Region waterbodies in 2010 (Table 2.6-2).

Surface water temperatures in July in Eaglenest Lake ranged from 19.0 to 21°C and the Pointe du Bois Forebay 16.0 to 20.5°C in 2010, while late September temperatures in Lac du Bonnet ranged from 19.3 to 21.3°C and early September temperatures in Manigotagan Lake from 18.0 to 22.7°C.

2.6.2 Species Composition

In 2010, 21 species of fish were captured in the Winnipeg River Region (Table 2.6-2).

2.6.2.1 Eaglenest Lake

A total of 494 fish representing 15 species were captured in standard gang index gill nets, and a total of 200 fish representing nine species were captured in small mesh index gill nets (Table 2.6-3).

The most common species captured in standard gang index gill nets was Yellow Perch (relative abundance = 24.7%), while the next three most common species were Walleye (20.9%), White Sucker (18.0%) and Sauger (13.4%) (Table 2.6-3, Figure 2.6-5). In the small mesh index gillnet catch, Troutperch (43.5%) was the most common species captured followed by Sauger (18.5%), Yellow Perch (13.5%) and Walleye (12.5%).

White Sucker represented 30.43% of the biomass in the standard gang index gillnet catch, followed by Northern Pike (27.09%), Walleye (20.33%) and Mooneye (4.65%) (Table 2.6-4). In the small mesh index gillnet catch, Sauger represented 44.39% of the biomass followed by Northern Pike (20.16%) and Walleye (12.64%) (Table 2.6-4).

2.6.2.2 Pointe du Bois Forebay

A total of 376 fish representing 15 species were captured in standard gang index gill nets, and a total of 99 fish representing nine species were captured in small mesh index gill nets (Table 2.6-3).

The most common species captured in standard gang index gill nets was White Sucker (relative abundance = 42.6%), while the next three most common species were Yellow Perch (14.4%), Sauger (12.8%) and Walleye (12.0%) (Table 2.6-3, Figure 2.6-5). In the small mesh index gillnet catch, Sauger (29.3%) was the most common species captured followed by Troutperch (28.3%), Walleye (15.2%) and Spottail Shiner (14.1%).

White Sucker represented 58.94% of the biomass in the standard gang index gillnet catch, followed by Walleye (14.87%), Northern Pike (9.31%) and Sauger (3.81%) (Table 2.6-4). In the small mesh index gillnet catch, Sauger represented 65.86% of the biomass followed by Mooneye (11.42%) and Yellow Perch (10.17%) (Table 2.6-4).

2.6.2.3 Lac du Bonnet

A total of 310 fish representing 14 species were captured in standard gang index gill nets set in Lac du Bonnet in 2010 (Table 2.6-3). For the small mesh index gill nets, a total of 110 fish representing 10 species were captured.

The most common species captured in standard gang index gill nets was Sauger (relative abundance = 21.0%) and the next three most common species were Walleye (16.8%), Northern Pike (12.3%) and White Sucker (11.3%) (Table 2.6-3, Figure 2.6-5). In the small mesh index gillnet catch, Yellow Perch (33.6%) was the most common species captured. Troutperch (19.1%) and Spottail Shiner (17.3%) were also abundant in 2010 small mesh index gillnet catches.

Northern Pike represented 34.89% of the biomass in the standard gang index gillnet catch, followed by Walleye (18.79%), White Sucker (17.71%) and Silver Redhorse (9.71%) (Table 2.6-4). In the small mesh index gillnet catch, Sauger represented 51.55% of the biomass followed by Yellow Perch (11.35%) and Walleye (9.58%) (Table 2.6-4).

2.6.2.4 Manigotagan Lake

A total of 354 fish representing nine species were captured in standard gang index gill nets set in Manigotagan Lake (Table 2.6-3). For the small mesh index gill nets, a total of 58 fish representing five species were captured.

The most common species captured in standard gang index gill nets were Cisco (relative abundance = 41.0%), followed by Walleye (35.3%) and Lake Whitefish (9.0%) (Table 2.6-3, Figure 2.6-5). In the small mesh index gillnet catch, Walleye made up 79.3% of the catch, Cisco 12.1% and Troutperch 5.2%.

Walleye represented 45.11% of the biomass in the standard gang index gillnet catch, followed by Lake Whitefish (17.26%), Cisco (9.59%) and Northern Pike (9.21%) (Table 2.6-4). In the small mesh index gillnet catch, Walleye represented 86.06% of the biomass followed by Cisco (13.42%), Troutperch (0.31%) and Lake Whitefish (0.21%) (Table 2.6-4).

2.6.3 Catch Per Unit Effort (CPUE) and Biomass Per Unit Effort (BPUE)

2.6.3.1 Eaglenest Lake

The overall mean CPUE value for the standard gang index gillnet catch in Eaglenest Lake in 2010 was 33.3 fish/100 m/24 h (Table 2.6-5, Figure 2.6-6). For the small mesh index gillnet catch this value was 45.3 fish/30 m/24 h.

The highest CPUE values for the standard gang index gillnet catch were recorded for Yellow Perch (8.3). Walleye (7.0), White Sucker (5.8) and Sauger (4.5) recorded the next highest CPUE values (Table 2.6-5, Figure 2.6-7). For the small mesh index gill nets the highest CPUE values were recorded for Troutperch (19.6), Sauger (8.3) and Yellow Perch (6.3) (Table 2.6-5, Figure 2.6.7).

Mean BPUE for the standard gang index gillnet catch was 21,872 g/100 m /24 h (Table 2.6-6). White Sucker had the highest BPUE (6,483) followed by Northern Pike (5,952) and Walleye (4,489). Small mesh index gill nets produced a BPUE of 216 g/30 m /24 h (Table 2.6-6) with Sauger having the highest BPUE (95).

2.6.3.2 Pointe du Bois Forebay

The overall mean CPUE value for the standard gang index gillnet catch in the Pointe du Bois Forebay in 2010 was 20.7, and for the small mesh index gillnet catch 14.0 (Table 2.6-5, Figure 2.6-6).

The highest CPUE values for the standard gang index gillnet catch were recorded for White Sucker (8.9). Yellow Perch (2.9), Sauger (2.7) and Walleye (2.4) recorded the next highest CPUE values (Table 2.6-5, Figure 2.6-7). For the small mesh index gill nets the highest CPUE values were recorded for Sauger (5.4), Troutperch (5.3) and Walleye (2.7) (Table 2.6-5, Figure 2.6.7).

Mean BPUE for the standard gang index gillnet catch was 15,410 g (Table 2.6-6). White Sucker had the highest BPUE (9,197) followed by Walleye (2,251) and Northern Pike (1,387). Small mesh index gill nets produced a BPUE of 1,227 g (Table 2.6-6) with Sauger having the highest BPUE (812).

2.6.3.3 Lac du Bonnet

The overall mean CPUE value for the standard gang index gillnet catch in Lac du Bonnet in 2010 was 32.6 (Table 2.6-5, Figure 2.6-6), and for the small mesh index gillnet catch 44.5.

The highest CPUE values for the standard gang index gillnet catch were recorded for Sauger (6.4), Walleye (5.3) and Northern Pike (3.9) (Table 2.6-5, Figure 2.6-7). For the small mesh index gill nets the highest CPUE values were recorded for Yellow Perch (15.4), Troutperch (8.5) and Spottail Shiner (7.7) (Table 2.6-5, Figure 2.6-7).

Mean BPUE for the standard gang index gillnet catch was 27,566 g (Table 2.6-6). Northern Pike had the highest BPUE (9,310) followed by Walleye (5,012) and White Sucker (4,983). Small mesh index gill nets produced a BPUE of 1,155 g (Table 2.6-6) with Sauger having the highest BPUE (570).

2.6.3.4 Manigotagan Lake

In Manigotagan Lake, the overall mean CPUE value for the standard gang index gillnet catch in 2010 was 67.0, and for the small mesh index gillnet catch 24.4 (Tables 2.6-5, Figure 2.6-6).

The highest CPUE values for the standard gang index gillnet catch were recorded for Cisco (29.6) and Walleye (21.8), followed by Lake Whitefish (6.4) a distant third (Table 2.6-5, Figure 2.6.7). For the small mesh index gill nets in 2010, Walleye (35.7) was the most frequently captured fish species, followed by Cisco (6.0), Troutperch (3.6) and Lake Whitefish (1.2) (Table 2.6-5, Figure 2.6.7).

Mean BPUE for the standard gang index gillnet catch was 27,873 g (Table 2.6-6). Walleye had the highest BPUE (12,210) followed by Lake Whitefish (5,205) and Cisco (2,967). Small mesh index gill nets produced a BPUE of 5,771 g (Table 2.6-6) with Walleye having the highest BPUE (4,918).

2.6.4 Size and Condition

2.6.4.1 Eaglenest Lake

Fish length and condition factor data were collected and analyzed for Northern Pike and Walleye collected from standard gang index gill nets set in Eaglenest Lake during 2010 (Table 2.6-7). Mean (SD) fork lengths were as follows: Northern Pike = 660 mm (167) and Walleye = 363 mm (101). Mean weights for the same species were 2263 g and 529 g respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.73 (0.10) and Walleye = 1.07 (0.11). Length frequency distributions for Northern Pike and Walleye captured in 2010 are provided in Figures 2.6-8 and 2.6-11.

2.6.4.2 Pointe du Bois Forebay

Fish length and condition factor data were collected and analyzed for Northern Pike, Lake Whitefish, Sauger and Walleye collected from standard gang index gill nets set in the Pointe du Bois Forebay during 2010 (Table 2.6-7). Mean (SD) fork lengths were as follows: Northern Pike = 522 mm (190); Lake Whitefish = 403 mm (109); Sauger = 289 mm (42) and Walleye = 354 mm (151). Mean (SD) weights for the same species were 1451 g (2354), 1096 g (883), 196 g and 706 g respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.63 (0.08); Lake Whitefish = 1.46 (0.11); Sauger = 0.88 (0.11) and Walleye = 1.03 (0.12). Length frequency distributions for Northern Pike, Lake Whitefish, Sauger and Walleye captured in 2010 are provided in Figures 2.6-8, 2.6-9, 2.6-10 and 2.6-11.

2.6.4.3 Lac du Bonnet

Fish length and condition factor data were collected and analyzed for Northern Pike, Lake Whitefish, Sauger and Walleye collected from standard gang index gill nets in Lac du Bonnet during 2010 (Table 2.6-7). Mean (SD) fork length for Northern Pike was 649±138 mm, Lake Whitefish 283±120 mm, Sauger 247 mm (29) and Walleye 343 mm (153). Mean (SD) weights for the same species were 2274 g (1435), 494 g (583), 144 g (45) and 792 g (983) respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.73 (0.07); Lake Whitefish = 1.32 (0.16); Sauger 0.92 (0.07) and Walleye = 1.09 (0.16).

Length frequency distributions for Northern Pike, Lake Whitefish, Sauger, and Walleye for 2010 are provided in Figures 2.6-8, 2.6-9, 2.6-10 and 2.6-11 respectively.

2.6.4.4 Manigotagan Lake

Fish length and condition factor data were collected and analyzed for Northern Pike and Walleye collected from standard gang index gill nets set in Manigotagan Lake during 2010 (Table 2.6-7). Mean (SD) fork lengths were as follows: Northern Pike = 583 mm (80) and Walleye = 340 mm (86). Mean (SD) weights for the same species were 1271 g (862) and 495 g (430) respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.58 (0.13) and Walleye = 1.05 (0.08).

Length frequency distributions for Northern Pike, Lake Whitefish and Walleye are provided in Figures 2.6-8 and 2.6-11 respectively.

2.6.5 Age Composition

2.6.5.1 Eaglenest Lake

Age- and year-class frequency distributions were calculated for Northern Pike and Walleye captured in standard gang index gill nets in Eaglenest Lake during 2010 (Table 2.6-8).

Age was determined for 32 Northern Pike and 92 Walleye captured in standard gang index gill nets set in the Eaglenest Lake in 2010 (Table 2.6-8). Ages ranged from 3 to 16 years for Northern Pike and 3 to 21 years for Walleye. The modal age for Northern Pike was 7 years and Walleye 5 years.

Fork length-, weight-, and condition factor-at-age data are provided for Northern Pike and Walleye in Table 2.6-9 and 2.6-12 respectively.

2.6.5.2 Pointe du Bois Forebay

Age- and year-class frequency distributions were calculated for Northern Pike, Lake Whitefish, Sauger and Walleye captured in standard gang index gill nets in the Pointe du Bois Forebay during 2010 (Table 2.6-8).

Age was determined for 16 Northern Pike, four Lake Whitefish, 47 Sauger and 42 Walleye captured in standard gang index gill nets set in the Pointe du Bois Forebay in 2010 (Table 2.6-8). Ages ranged from 3 to 10 years for Northern Pike, 3 to 15 years for Lake Whitefish, 3 to 13 years for Sauger and 2 to 27 years for Walleye. For Northern Pike, 81.25% of the aged fish were determined to be either 4 or 5 years of age. The modal age for Sauger was 4 and 7 years, and walleye 7 years.

Fork length-, weight-, and condition factor-at-age data are provided for Northern Pike, Lake Whitefish, Sauger and Walleye in Table 2.6-9, 2.6-10, 2.6-11, and 2.6-12 respectively.

2.6.5.3 Lac du Bonnet

Age- and year-class frequency distributions were calculated for Northern Pike, Lake Whitefish, Sauger and Walleye captured in standard gang index gill nets in Lac du Bonnet during 2010 (Table 2.6-8).

Age was determined for 38 Northern Pike, 13 Lake Whitefish, 64 Sauger and 52 Walleye. Ages ranged from 2 to 14 years for Northern Pike, 1 to 17 for Lake Whitefish, 1 to 9 for Sauger and one to 16 for Walleye. A majority of the aged Northern Pike were 4 to 7 years of age (78.95%), Lake Whitefish 1,2,3 or 7 years (76.91%), and Sauger 4 or 5 years (70.31%). The modal ages for Walleye were 3 and 7. No one age-class made up an exceptionally high proportion of the Walleye sample.

Fork length-, weight-, and condition factor-at-age data are provided for Northern Pike, Lake Whitefish, Sauger and Walleye in Table 2.6-9, 2.6-10, 2.6-11, and 2.6-12 respectively.

2.6.5.4 Manigotagan Lake

Age- and year-class frequency distributions were calculated for Northern Pike and Walleye captured in standard gang index gill nets in Manigotagan Lake during 2010 (Table 2.6-6).

Age was determined for 11 Northern Pike and 124 Walleye, and ranged from five to 10 years and 2 to 14 years respectively. A majority of the aged Northern Pike were 5 or 6 years of age (72.72%) and Walleye 4 or 5 years of age (76.61%).

Fork length-, weight-, and condition factor-at-age data are provided for Northern Pike, Lake Whitefish and Walleye in Table 2.6-9, Table 2.6-10, and 2.6-12 respectively.

2.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

2.6.6.1 Eaglenest Lake

A total of 11 instances (3.6%) of DELTs were recorded from 304 individuals of five species of fish examined from Eaglenest Lake in 2010 (Table 2.6-13). Incidences of DELTs were observed to occur in White Sucker (7.9%, n = 89), Northern Pike (5.9%, n = 34), Sauger (1.5%, n = 66), and Walleye (1.0%, n = 103). In total, one deformity and six lesions were found on White Sucker; one lesion and one tumour were found on Northern Pike (n = 40), one lesion was found on a sauger, and a walleye with a deformity was also identified. Lake Whitefish (n = 12) were also examined for DELTs but none were observed.

2.6.6.2 Pointe du Bois Forebay

A total of six instances (2.14%) of DELTs were recorded from 281 individuals of six species of fish examined from Pointe du Bois Forebay in 2010 (Table 2.6-13). All incidences of DELTs were observed to occur in Lake Sturgeon (16.7%, n = 6), White Sucker (2.5%, n = 160) and Sauger (2.1%, n = 48). In total, one lesion was found on a Lake Sturgeon, three lesions and one deformity were found on White Sucker and one lesion was found on a Sauger. Northern Pike (n = 18), Lake Whitefish (n = 4) and Walleye (n = 45) also were examined for DELTs but none were observed.

2.6.6.3 Lac du Bonnet

A total of three instances (1.45%) of DELTs were recorded from 207 individuals of six species of fish examined from Lac du Bonnet in 2010 (Table 2.6-13). All incidences of DELTs were observed to occur in White Sucker (2.9%, n = 35), Northern Pike (2.6%, n = 38) and Walleye (1.9%, n = 52). In total, one lesion was found on a White Sucker and a Northern Pike, and tumours were found on a Walleye. Lake Sturgeon (n = 1), Lake Whitefish (n = 16) and Sauger (n = 65) also were examined for DELTs but none were observed.

2.6.6.4 Manigotagan Lake

No DELTs were recorded from 179 individuals of four fish species examined from Manigotagan Lake in 2010 (Table 2.6-13). White Sucker (n = 11), Northern Pike (n = 11), Lake Whitefish (n = 32) and Walleye (n = 125) were all examined, but no DELTs were observed.

2.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Winnipeg River Region. Waterbodies sampled include the Pointe du Bois Forebay (14-17 July) and an off-system reference waterbody, Manigotagan Lake (8-9 September). Standard nets were set at 15 sites in the Pointe du Bois Forebay (Figure 2.7-1) and at six sites in Manigotagan Lake (Figure 2.7-2), of which 12 and 4 sites, respectively yielded fish for mercury analysis. Small mesh nets were set at five sites at Pointe du Bois and at two sites in Manigotagan Lake, of which fish from two sites and one site, respectively, were used for mercury analysis (Figures 2.7-1 to 2.7-2).

2.7.1 Species Comparisons

A total of 121 fish were analyzed for mercury. No 1-year old Yellow Perch were caught from either the Pointe du Bois Forebay or Manigotagan Lake, and Lake Whitefish were not retained from Manigotagan Lake (Table 2.7-1). With 11 and 17 fish, sample sizes of Northern Pike from Manigotagan Lake and the Pointe du Bois Forebay, respectively, were substantially lower than the target sample size of 36 fish. Conversely, a large number of Walleye muscle samples was taken from Manigotagan Lake and because no historic data are available on fish mercury levels for this lake, it was decided to analyze 17 more samples than the target size.

For all species from both waterbodies, a positive and significant relationship between mercury concentration and fish length existed (Figure 2.7-3), indicating that standardization of concentrations was necessary for comparative purposes. Standardized mercury concentrations generally were within approximately 10% of arithmetic concentrations, except for Lake

Whitefish from the Pointe du Bois Forebay, for which the arithmetic concentration was almost twice the concentration calculated for fish of a standard length. This difference was mainly a result of the small sample size and the relatively large average size of the Lake Whitefish, which was 53 mm longer than the standard length of 350 mm (Table 2.7-2).

Mean arithmetic mercury concentrations of Northern Pike and Walleye from the Pointe du Bois Forebay were at least five times higher than concentrations in Lake Whitefish and for Manigotagan Lake, Northern Pike had an almost threefold higher mean than Walleye (Table 2.7-1).

2.7.2 Comparison to Consumption Guidelines

Northern Pike from Manigotagan Lake had standardized mean mercury concentrations substantially higher than the Health Canada standard for commercial marketing of freshwater fish in Canada (0.5 parts per million [ppm] total mercury Health Canada 2007a,b), whereas means of Pike and Walleye from the Pointe du Bois Forebay only slightly exceeded the standard, and means of Walleye from Manigotagan Lake remained slightly below the standard (Figure 2.7.-4). Standardized concentrations of \Pike and Walleye from the two waterbodies in the Winnipeg River Region substantially exceeded the 0.2 ppm total mercury guideline for human consumption (see section 4.8.2.3; Figure 2.7-4). Based on individual concentrations, approximately 90% of all Northern Pike and 78% of all Walleye exceeded the 0.2 ppm guideline (Figure 2.7-3). Approximately 64% and 38%, respectively, of these individuals had mercury concentrations that also exceeded the 0.5 ppm Health Canada standard. In addition to these exceedances of guidelines and standards relating to human health, every fish analyzed for mercury from the Winnipeg River Region exceeded the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999, updated to 2013; MWS 2011).

SECTION 2: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 2.3-1. Summary statistics for *in situ* variables (near surface) measured in the Winnipeg River Region: 2010/2011.

	Temperature (°C)				*In situ* pH				DO (mg/L)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	11.16	10.75	11.09	11.38	8.44	7.83	7.73	7.88	12.29	11.62	9.70	10.69
Median	12.15	11.40	11.64	11.79	8.06	7.68	7.74	7.79	10.48	10.66	9.86	10.08
Minimum	0.05	0.01	0.00	0.52	7.75	7.50	7.33	7.66	8.23	7.98	8.08	8.73
Maximum	20.31	20.19	21.08	21.43	9.90	8.30	8.13	8.19	19.96	17.16	11.16	13.87
SD	8.51	8.57	8.76	8.58	0.99	0.42	0.40	0.28	5.30	4.04	1.55	2.36
SE	4.25	4.28	4.38	4.29	0.50	0.24	0.23	0.16	2.65	2.02	0.89	1.18
N	4	4	4	4	4	3	3	3	4	4	3	4

	DO (% Saturation)				*In situ* Specific Conductance (uS/cm)				*In situ* Turbidity (NTU)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	110	104	96	99	77.4	87.7	112.4	68.4	5	12	16	4
Median	100	100	96	101	83.2	84.7	92.9	67.7	5	8	16	5
Minimum	93	90	92	87	57.4	83.0	88.0	66.0	0	5	4	0
Maximum	149	128	101	104	86.0	98.5	176.0	72.1	9	25	29	7
SD	26	17	5	8	13.4	7.3	42.5	2.6	4	9	11	3
SE	13	9	3	4	6.7	3.7	21.3	1.3	2	5	5	1
N	4	4	3	4	4	4	4	4	4	4	4	4

Table 2.3-1. - continued -

	ORP (mV)				Secchi Disk Depth (m) [1]			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	171	170	197	177	1.59	1.54	1.18	1.62
Median	159	165	178	169	1.74	1.75	0.96	1.68
Minimum	115	109	169	133	1.10	1.05	0.90	1.50
Maximum	252	241	243	236	1.93	1.82	1.68	1.69
SD	60	55	40	43	0.43	0.43	0.43	0.11
SE	30	28	23	22	0.25	0.25	0.25	0.06
N	4	4	3	4	3	3	3	3

[1] Open-water season only.

Table 2.3-2. Summary statistics for routine laboratory variables measured in the Winnipeg River Region: 2010/2011.

	Total Alkalinity ($CaCO_3$ mg/L)				Bicarbonate Alkalinity (HCO_3 mg/L)				Carbonate Alkalinity (CO_3 mg/L)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	38.5	38.5	41.5	32.5	46.9	46.9	50.6	39.7	<0.6	<0.6	<0.6	<0.6
Median	37.7	37.8	41.2	32.2	46.0	46.1	50.3	39.3	<0.6	<0.6	<0.6	<0.6
Minimum	36.9	36.6	39.9	32.1	45.0	44.7	48.7	39.2	<0.6	<0.6	<0.6	<0.6
Maximum	41.7	41.7	43.6	33.6	50.8	50.9	53.2	41.0	<0.6	<0.6	<0.6	<0.6
SD	2.2	2.2	1.8	0.7	2.6	2.7	2.2	0.9	-	-	-	-
SE	1.1	1.1	0.9	0.4	1.3	1.4	1.1	0.4	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4

	Hydroxide Alkalinity (OH mg/L)				Ammonia (mg N/L)				Nitrate/Nitrite (mg N/L)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	<0.4	<0.4	<0.4	<0.4	0.013	0.013	0.015	0.015	0.0513	0.0581	0.0537	0.0434
Median	<0.4	<0.4	<0.4	<0.4	0.011	0.012	0.014	0.015	0.0310	0.0417	0.0331	0.0384
Minimum	<0.4	<0.4	<0.4	<0.4	<0.010	<0.010	<0.010	<0.010	0.0126	0.0192	0.0175	<0.005
Maximum	<0.4	<0.4	<0.4	<0.4	0.025	0.025	0.025	0.026	0.1307	0.1300	0.1310	0.0943
SD	-	-	-	-	0.010	0.010	0.011	0.012	0.0538	0.0509	0.0525	0.0395
SE	-	-	-	-	0.005	0.005	0.006	0.006	0.0269	0.0255	0.0262	0.0197
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-2. - continued -

	TKN (mg/L)				DIN (mg/L) [1]				Organic Nitrogen (mg/l) [1]				TN (mg/L) [1]			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.36	0.33	0.42	0.47	0.064	0.071	0.068	0.059	0.34	0.31	0.41	0.45	0.41	0.37	0.48	0.51
Median	0.34	0.37	0.42	0.50	0.046	0.057	0.048	0.053	0.33	0.36	0.41	0.49	0.41	0.40	0.49	0.56
Minimum	0.23	<0.20	0.31	0.23	0.030	0.037	0.041	0.029	0.23	<0.20	0.31	0.23	0.27	<0.20	0.35	0.29
Maximum	0.50	0.46	0.54	0.64	0.136	0.135	0.136	0.099	0.49	0.44	0.52	0.61	0.55	0.57	0.58	0.64
SD	0.13	0.17	0.10	0.17	0.048	0.044	0.045	0.030	0.13	0.16	0.09	0.16	0.15	0.21	0.11	0.16
SE	0.06	0.08	0.05	0.09	0.024	0.022	0.023	0.015	0.06	0.08	0.05	0.08	0.07	0.10	0.06	0.08
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

	TDP (mg/L)				TPP (mg/L)[1]				TP (mg/L)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.0157	0.0161	0.0194	0.0190	0.0105	0.0093	0.0091	0.0064	0.0261	0.0253	0.0285	0.0254
Median	0.0142	0.0146	0.0197	0.0193	0.0096	0.0095	0.0068	0.0062	0.0260	0.0257	0.0290	0.0249
Minimum	0.0120	0.0131	0.0141	0.0116	0.0057	0.0050	0.0040	0.0030	0.0224	0.0230	0.0231	0.0194
Maximum	0.0223	0.0220	0.0240	0.0260	0.0170	0.0131	0.0189	0.0102	0.0300	0.0270	0.0330	0.0325
SD	0.0047	0.0041	0.0050	0.0075	0.0052	0.0033	0.0067	0.0030	0.0035	0.0017	0.0041	0.0059
SE	0.0023	0.0020	0.0025	0.0038	0.0026	0.0017	0.0033	0.0015	0.0018	0.0009	0.0021	0.0030
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-2. - continued -

	TN:TP [1]				DIN:TDP [1]				DIN:TP [1]			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	35	33	37	46	8	9	8	7	5	6	5	5
Median	36	36	39	41	7	9	7	7	4	5	4	5
Minimum	20	14	26	29	6	6	4	4	3	3	3	3
Maximum	48	47	46	73	13	14	13	11	11	11	11	8
SD	13	14	8	20	3	3	3	3	4	3	4	2
SE	6	7	4	10	2	2	2	2	2	2	2	1
N	4	4	4	4	4	4	4	4	4	4	4	4

	DOC (mg/L)				TOC (mg/L)				TIC (mg/L)				TOC:ON [1]			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	11.0	10.7	11.4	14.2	11.3	11.3	11.7	14.6	8.8	8.8	9.4	7.2	44	65	35	44
Median	11.1	10.8	11.2	14.2	11.2	11.1	11.3	14.8	8.7	8.8	9.8	7.4	43	38	33	36
Minimum	10.5	9.8	10.6	13.0	10.5	10.7	10.9	13.1	7.6	7.6	8.0	6.3	25	28	25	25
Maximum	11.3	11.3	12.5	15.4	12.5	12.5	13.2	15.6	10.0	9.9	10.2	7.7	65	153	50	80
SD	0.4	0.7	0.8	1.0	0.8	0.8	1.0	1.1	1.0	1.0	1.0	0.6	19	60	11	25
SE	0.2	0.3	0.4	0.5	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.3	9	30	6	12
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-2. - continued -

	TOC:TN [1]				TDS (mg/L)				TSS (mg/L)				Laboratory Turbidity (NTU)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	37	45	30	37	62.2	62.7	75.5	47.8	2.3	3.3	3.7	<2.0	3.72	3.73	4.73	2.02
Median	34	33	28	31	67.7	72.3	77.0	52.6	2.1	3.8	3.8	<2.0	3.81	3.81	4.96	2.00
Minimum	23	22	22	24	38.0	28.0	64.0	28.0	<2.0	<2.0	2.0	<2.0	2.41	2.40	2.93	1.56
Maximum	55	92	44	64	75.3	78.0	84.0	58.0	4.0	4.7	5.2	<2.0	4.86	4.88	6.08	2.53
SD	16	32	10	18	17.1	23.7	8.7	13.5	1.5	1.6	1.3	-	1.17	1.07	1.50	0.53
SE	8	16	5	9	8.6	11.9	4.3	6.7	0.8	0.8	0.7	-	0.59	0.54	0.75	0.26
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

	True Colour (TCU)				Laboratory pH				Laboratory Conductivity (µmhos/cm)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	38.4	37.5	37.6	64.3	7.86	7.84	7.86	7.78	90.6	90.4	96.3	71.6
Median	39.6	38.8	38.6	64.6	7.86	7.84	7.88	7.76	90.0	89.9	95.9	72.0
Minimum	32.1	31.5	32.4	60.0	7.79	7.75	7.76	7.70	83.9	83.5	88.4	66.8
Maximum	42.1	41.1	40.7	68.0	7.93	7.92	7.93	7.91	98.4	98.2	105.0	75.8
SD	4.3	4.2	3.8	3.5	0.07	0.08	0.08	0.09	6.2	6.2	7.4	4.0
SE	2.2	2.1	1.9	1.7	0.03	0.04	0.04	0.05	3.1	3.1	3.7	2.0
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-2. - continued -

	E. coli (CFU/100 mL)				Chlorophyll *a* (µg/L)				Hardness as $CaCO_3$ (mg/L)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	1.0	2.0	2.3	<1	3.24	2.71	2.80	3.11	42.5	42.8	46.9	36.1
Median	<1	2.3	1.5	<1	3.33	3.29	2.65	2.40	42.5	43.4	47.4	36.1
Minimum	<1	<1	1.0	<1	<0.60	<0.60	<0.60	1.53	37.0	37.0	41.6	32.7
Maximum	2.0	3.0	5.0	<1	6.00	3.98	5.61	6.11	47.8	47.3	51.1	39.7
SD	0.7	1.1	1.9	-	2.81	1.72	2.63	2.08	5.8	5.2	4.0	4.0
SE	0.4	0.6	0.9	-	1.41	0.86	1.32	1.04	2.9	2.6	2.0	2.0
N	4	4	4	4	4	4	4	4	4	4	4	4

	Chloride (mg/L)				Sulphate (mg/L)			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	1.5	1.5	1.4	0.5	3.96	4.05	3.96	2.70
Median	1.4	1.4	1.4	0.3	3.20	3.19	3.08	1.06
Minimum	1.4	1.4	1.3	0.3	2.73	2.79	2.70	1.00
Maximum	1.6	1.6	1.8	0.9	6.70	7.03	7.00	7.70
SD	0.1	0.1	0.2	0.3	1.84	2.00	2.04	3.33
SE	0.1	0.1	0.1	0.1	0.92	1.00	1.02	1.67
N	4	4	4	4	4	4	4	4

[1] Calculated.

Table 2.3-3. Summary statistics for metals and major ions measured in the Winnipeg River Region: 2010/2011. Values are presented as mg/L.

	Aluminum				Antimony				Arsenic			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.266	0.244	0.298	0.107	<0.0002	<0.0002	<0.0002	<0.0002	0.00095	0.00094	0.00097	0.00071
Median	0.268	0.216	0.272	0.094	<0.0002	<0.0002	<0.0002	<0.0002	0.00094	0.00093	0.00102	0.00070
Minimum	0.146	0.157	0.191	0.084	<0.0002	<0.0002	<0.0002	<0.0002	0.00069	0.00074	0.00071	0.00067
Maximum	0.384	0.388	0.457	0.157	0.00020	<0.0002	<0.0002	<0.0002	0.00123	0.00115	0.00113	0.00079
SD	0.105	0.100	0.118	0.034	0.00005	-	-	-	0.00025	0.00020	0.00020	0.00006
SE	0.053	0.050	0.059	0.017	0.00003	-	-	-	0.00013	0.00010	0.00010	0.00003
N	4	4	4	4	4	4	4	4	4	4	4	4

	Barium				Beryllium				Bismuth			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.0106	0.0103	0.0113	0.0080	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Median	0.0109	0.0108	0.0115	0.0081	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Minimum	0.0088	0.0089	0.0098	0.0075	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Maximum	0.0117	0.0110	0.0123	0.0085	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SD	0.0013	0.0010	0.0010	0.0004	-	-	-	-	-	-	-	-
SE	0.0006	0.0005	0.0005	0.0002	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-3. - continued -

	Boron				Cadmium				Calcium				Cesium				Chloride				Chromium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	<0.010	<0.010	<0.010	<0.010	0.000014	0.000018	<0.00001	0.000012	11.74	11.78	12.78	9.34	<0.0001	<0.0001	<0.0001	<0.0001	1.5	1.5	1.4	0.5	<0.001	<0.001	<0.001	<0.001
Median	<0.010	<0.010	<0.010	<0.010	0.000011	0.000017	<0.00001	0.000012	11.80	12.00	13.05	9.34	<0.0001	<0.0001	<0.0001	<0.0001	1.4	1.4	1.4	0.3	<0.001	<0.001	<0.001	<0.001
Minimum	<0.010	<0.010	<0.010	<0.010	<0.00001	<0.00001	<0.00001	<0.00001	10.10	10.10	11.30	8.29	<0.0001	<0.0001	<0.0001	<0.0001	1.4	1.4	1.3	0.3	<0.001	<0.001	<0.001	<0.001
Maximum	<0.010	0.011	0.011	0.011	0.000028	0.000031	0.000011	0.000018	13.27	13.00	13.70	10.40	<0.0001	<0.0001	<0.0001	<0.0001	1.6	1.6	1.8	0.9	<0.001	<0.001	<0.001	<0.001
SD	-	-	-	-	0.000011	0.000011	-	0.000008	1.68	1.46	1.05	1.14	-	-	-	-	0.1	0.1	0.2	0.3	-	-	-	-
SE	-	-	-	-	0.000005	0.000006	-	0.000004	0.84	0.73	0.53	0.57	-	-	-	-	0.1	0.1	0.1	0.1	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-3. - continued -

	Cobalt				Copper				Iron				Lead				Lithium				Magnesium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	<0.0002	<0.0002	<0.0002	<0.0002	0.00132	0.00138	0.00139	0.00108	0.255	0.244	0.313	0.195	0.000196	0.000196	0.000243	0.000119	<0.002	<0.002	<0.002	<0.002	3.20	3.24	3.64	3.12
Median	<0.0002	<0.0002	<0.0002	<0.0002	0.00137	0.00138	0.00143	0.00104	0.265	0.235	0.286	0.191	0.000196	0.000205	0.000232	0.000126	<0.002	<0.002	<0.002	<0.002	3.21	3.25	3.61	3.13
Minimum	<0.0002	<0.0002	<0.0002	<0.0002	0.00105	0.00123	0.00114	0.00096	0.146	0.161	0.219	0.170	0.000178	0.000131	0.000159	0.000094	<0.002	<0.002	<0.002	<0.002	2.80	2.87	3.25	2.83
Maximum	<0.0002	<0.0002	<0.0002	<0.0002	0.00151	0.00155	0.00158	0.00129	0.343	0.345	0.460	0.228	0.000215	0.000245	0.000347	0.000132	0.0020	0.0023	<0.002	0.003	3.59	3.59	4.08	3.37
SD	-	-	-	-	0.00020	0.00013	0.00020	0.00015	0.086	0.077	0.110	0.024	0.000016	0.000048	0.000078	0.000017	-	-	-	-	0.42	0.37	0.35	0.29
SE	-	-	-	-	0.00010	0.00007	0.00010	0.00008	0.043	0.038	0.055	0.012	0.000008	0.000024	0.000039	0.000009	-	-	-	-	0.21	0.19	0.18	0.14
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-3. - continued -

	Manganese				Mercury				Molybdenum				Nickel				Potassium				Rubidium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.01034	0.01053	0.01332	0.00453	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.002	<0.002	<0.002	0.92	0.92	0.95	0.76	0.00169	0.00162	0.00178	0.00160
Median	0.00891	0.00964	0.01320	0.00428	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.002	<0.002	<0.002	0.91	0.88	0.91	0.76	0.00170	0.00157	0.00176	0.00161
Minimum	0.00754	0.00735	0.00888	0.00271	<0.00005	<0.00005	<0.00005	<0.00005	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.002	<0.002	<0.002	0.75	0.80	0.84	0.70	0.00134	0.00139	0.00147	0.00145
Maximum	0.01600	0.01550	0.01800	0.00686	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.002	<0.002	<0.002	1.11	1.10	1.12	0.83	0.00201	0.00194	0.00213	0.00173
SD	0.00383	0.00377	0.00429	0.00196	-	-	-	-	-	-	-	-	-	-	-	-	0.15	0.13	0.13	0.07	0.00028	0.00023	0.00030	0.00013
SE	0.00192	0.00188	0.00214	0.00098	-	-	-	-	-	-	-	-	-	-	-	-	0.08	0.07	0.06	0.04	0.00014	0.00012	0.00015	0.00006
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-3. - continued -

	Selenium				Silicon				Silver				Sodium				Strontium				Tellurium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	<0.001	<0.001	<0.001	<0.001	3.05	2.62	2.93	2.70	<0.0001	<0.0001	<0.0001	<0.0001	2.31	2.33	2.39	1.00	0.0240	0.0237	0.0251	0.0206	<0.0002	<0.0002	<0.0002	<0.0002
Median	<0.001	<0.001	<0.001	<0.001	3.25	2.85	2.96	2.84	<0.0001	<0.0001	<0.0001	<0.0001	2.35	2.29	2.32	1.00	0.0240	0.0235	0.0247	0.0202	<0.0002	<0.0002	<0.0002	<0.0002
Minimum	<0.001	<0.001	<0.001	<0.001	1.56	1.62	2.07	1.29	<0.0001	<0.0001	<0.0001	<0.0001	1.88	2.01	2.08	0.93	0.0216	0.0217	0.0236	0.0191	<0.0002	<0.0002	<0.0002	<0.0002
Maximum	<0.001	<0.001	<0.001	<0.001	4.13	3.16	3.74	3.81	<0.0001	<0.0001	<0.0001	<0.0001	2.67	2.73	2.84	1.08	0.0265	0.0264	0.0272	0.0230	<0.0002	<0.0002	<0.0002	<0.0002
SD	-	-	-	-	1.08	0.69	0.70	1.06	-	-	-	-	0.33	0.31	0.34	0.07	0.0023	0.0023	0.0016	0.0018	-	-	-	-
SE	-	-	-	-	0.542	0.343	0.349	0.528	-	-	-	-	0.17	0.15	0.17	0.04	0.0011	0.0011	0.0008	0.0009	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-3. - continued -

	Thallium				Thorium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011	<0.0001
Median	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00012	<0.0001
Minimum	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Maximum	<0.0001	<0.0001	<0.0001	<0.0001	0.00011	0.00011	0.00016	0.00011
SD	-	-	-	-	-	-	0.00005	-
SE	-	-	-	-	-	-	0.00002	-
N	4	4	4	4	4	4	4	4

	Tin				Titanium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.00032	0.00033	0.00030	0.00032	0.00883	0.00788	0.01007	0.00329
Median	<0.0002	<0.0002	<0.0002	<0.0002	0.00964	0.00676	0.00912	0.00320
Minimum	<0.0002	<0.0002	<0.0002	<0.0002	0.00393	0.00550	0.00692	0.00203
Maximum	0.00099	0.00102	0.00091	0.00099	0.01210	0.01250	0.01510	0.00471
SD	0.00045	0.00046	0.00041	0.00045	0.00352	0.00314	0.00383	0.00120
SE	0.00022	0.00023	0.00020	0.00022	0.00176	0.00157	0.00192	0.00060
N	4	4	4	4	4	4	4	4

	Tungsten				Uranium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	<0.001	<0.001	<0.001	<0.001	0.00012	0.00010	0.00014	0.00012
Median	<0.001	<0.001	<0.001	<0.001	0.00011	0.00011	0.00014	0.00012
Minimum	<0.001	<0.001	<0.001	<0.001	0.00011	<0.0001	0.00012	0.00010
Maximum	<0.001	<0.001	<0.001	<0.001	0.00012	0.00013	0.00015	0.00014
SD	-	-	-	-	0.00001	0.00003	0.00001	0.00002
SE	-	-	-	-	0.00000	0.00002	0.00001	0.00001
N	4	4	4	4	4	4	4	4

Table 2.3-3. - continued -

	Vanadium				Zinc				Zirconium			
	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG	EAGLE	PDB	LDB	MANIG
Mean	0.000923	0.00090	0.00108	0.00056	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004
Median	0.000927	0.00089	0.00106	0.00055	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004
Minimum	0.000580	0.00063	0.00077	0.00048	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004
Maximum	0.001260	0.00120	0.00145	0.00067	<0.005	<0.005	<0.005	<0.005	0.00047	0.00064	0.00047	<0.0004
SD	0.000292	0.00024	0.00031	0.00008	-	-	-	-	-	-	-	-
SE	0.000146	0.00012	0.00015	0.00004	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 2.3-4. Frequency of detections of total metals measured in the Winnipeg River Region: 2010/2011.

		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper
Eaglenest Lake	# Detections	4	1	4	4	0	0	0	2	4	0	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	25	100	100	0	0	0	50	100	0	0	0	100
Pointe du Bois	# Detections	4	0	4	4	0	0	1	3	4	0	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	25	75	100	0	0	0	100
Lac du Bonnet	# Detections	4	0	4	4	0	0	1	1	4	0	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	25	25	100	0	0	0	100
Manigotagan Lake	# Detections	4	0	4	4	0	0	1	2	4	0	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	25	50	100	0	0	0	100

Table 2.3-4. - continued -

		Iron	Lead	Magnesium	Manganese	Mercury[1]	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silver	Sodium
Eaglenest Lake	# Detections	4	4	4	4	0	0	0	4	4	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	0	0	100	100	0	0	100
Pointe du Bois	# Detections	4	4	4	4	0	0	0	4	4	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	0	0	100	100	0	0	100
Lac du Bonnet	# Detections	4	4	4	4	0	0	0	4	4	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	0	0	100	100	0	0	100
Manigotagan Lake	# Detections	4	4	4	4	0	0	0	4	4	0	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	0	0	100	100	0	0	100

Table 2.3-4. - continued -

		Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Eaglenest Lake	# Detections	4	0	0	1	1	4	0	4	4	0	1
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	25	25	100	0	100	100	0	25
Pointe du Bois	# Detections	4	0	0	1	1	4	0	3	4	0	2
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	25	25	100	0	75	100	0	50
Lac du Bonnet	# Detections	4	0	0	3	1	4	0	4	4	0	2
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	75	25	100	0	100	100	0	50
Manigotagan Lake	# Detections	4	0	0	0	1	4	0	4	4	0	0
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	0	25	100	0	100	100	0	0

[1] Mercury was analysed at a detection limit of 0.00005 mg/L and results cannot be compared to the current Manitoba PAL guideline for mercury.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 2.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Winnipeg River Region: 2010/2011. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg//L)		0.1	0.15	1.5	0.00012-0.00017	0.0345-0.0497	0.0036-0.0053	0.3	0.00077-0.00135	0.000026
Eaglenest Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	2	0	NA
	% Exceedances	100	0	0	0	0	0	50	0	NA
Pointe du Bois	N	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	1	0	NA
	% Exceedances	100	0	0	0	0	0	25	0	NA
Lac du Bonnet	N	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	2	0	NA
	% Exceedances	100	0	0	0	0	0	50	0	NA
Manigotagan Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	2	0	0	0	0	0	0	0	NA
	% Exceedances	50	0	0	0	0	0	0	0	NA

Table 2.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.020-0.030	0.001	0.0001	0.0008	0.015	0.046-0.068	120	128-429
Eaglenest Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Pointe du Bois	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lac du Bonnet	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Manigotagan Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

[1]Comparisons to the current PAL guideline could not be made; analytical detection limits varied between sampling periods and were higher than the guideline.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 2.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Winnipeg River Region and CCME (1999, updated to 2013) trophic categorization: 2010/2011.

		Trophic Status Based on Total Phosphorous (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100
Eaglenest Lake	Open-water season				0.025		
	Annual				0.026		
Pointe du Bois Forebay	Open-water season				0.025		
	Annual				0.025		
Lac du Bonnet	Open-water season				0.029		
	Annual				0.029		
Manigotagan Lake	Open-water season				0.025		
	Annual				0.025		

Table 2.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Winnipeg River Region and the OECD (1982) trophic categorization scheme for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<2.5	2.5 - 8	-	8 - 25	> 25
Eaglenest Lake	Open-water season			4.2			
	Annual			3.2			
Pointe du Bois Forebay	Open-water season			3.5			
	Annual			2.7			
Lac du Bonnet	Open-water season			3.6			
	Annual			2.8			
Manigotagan Lake	Open-water season			3.6			
	Annual			3.1			

Table 2.3-8. Total nitrogen concentrations (open-water season and annual means) measured in the Winnipeg River Region and comparison to a trophic classification scheme for lakes (Nürnberg 1982): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Eaglenest Lake	Open-water season			0.36			
	Annual			0.41			
Pointe du Bois Forebay	Open-water season			0.30			
	Annual			0.37			
Lac du Bonnet	Open-water season			0.44			
	Annual			0.48			
Manigotagan Lake	Open-water season			0.48			
	Annual			0.51			

Table 2.4-1. Community metrics for phytoplankton samples collected in the Winnipeg River Region during the open-water season of 2010.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Wiener Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H'}$)	Evenness ($E^{H'}/S$)
Eaglenest Lake	Spring	22	0.74	0.17	1.66	0.54	5.27	0.24
	Summer	22	0.70	0.15	1.69	0.55	5.44	0.25
	Fall	32	0.60	0.08	1.53	0.44	4.63	0.14

Table 2.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Winnipeg River Region for the CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples (n)	Water Depth Mean (m)	Water Depth Min (m)	Water Depth Max (m)	Mean Water Velocity (m/sec)	Mean Secchi Disk Depth (m)	Water Temperature (ºC)	Predominant Substrate	Riparian Vegetation	Canopy Cover (%)	Algae
Eaglenest Lake (2010)	Nearshore	5	0.9	0.8	1.0	0.00	0.97	15.0	bedrock, organic matter	shrubs, deciduous	0	attached, filamentous
	Offshore	5	7.0	5.6	7.9	0.14	1.08	15.0	clay, sand	--	--	--
Pointe du Bois Forebay (2010)	Nearshore	5	0.9	0.9	1.0	--	0.76	16.5	clay, silt, gravel	mixed forest	0	filamentous
	Offshore	5	7.2	5.9	9.2	0.00	1.21	15.0	clay, sand	--	--	--
Lac du Bonnet (2010)	Nearshore	5	0.8	0.6	0.9	0.00	0.65	15.0	sand, gravel, boulder	mixed forest	0	attached
	Offshore	5	7.0	6.5	7.7	0.18	0.89	15.0	clay, sand	--	--	--
Manigotagan Lake (2010)	Nearshore	5	1.0	0.8	1.0	--	>1.00	12.0	sand, woody debris, gravel	shrubs, mixed forest		--
	Offshore	5	8.0	6.3	9.7	0.00	1.61	12.0	clay, sand	--	--	--

Table 2.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Winnipeg River Region for the CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Eaglenest Lake (2010)	Nearshore	Mean	5	0.8	7.32	46.26	30.81	22.91	Loam
		SD	--	0.27	6.164	30.579	16.417	19.326	--
		SE	--	0.12	2.757	13.676	7.342	8.643	--
		Median	--	1.0	5.31	50.70	36.30	18.90	--
		Min	--	0.5	1.12	8.42	6.54	4.73	--
		Max	--	1.0	17.50	88.70	50.50	55.30	--
	Offshore	Mean	5	7.2	0.39	85.12	13.25	1.64	Loamy Sand
		SD	--	1.17	0.171	10.035	9.488	0.652	--
		SE	--	0.52	0.077	4.488	4.243	0.292	--
		Median	--	7.7	0.33	83.80	15.10	1.51	--
		Min	--	5.9	0.18	72.10	0.51	0.98	--
		Max	--	8.2	0.62	98.50	25.40	2.53	--
Pointe du Bois Forebay (2010)	Nearshore	Mean	5	0.5	0.33	49.06	36.16	14.75	Loamy Sand
		SD	--	0.07	0.142	39.278	31.550	8.092	--
		SE	--	0.03	0.063	17.566	14.110	3.619	--
		Median	--	0.5	0.26	63.40	21.80	14.80	--
		Min	--	0.3	0.20	6.91	7.12	6.73	--
		Max	--	0.5	0.52	86.10	72.00	24.70	--
	Offshore	Mean	5	7.0	0.68	84.82	13.35	1.85	Loamy Sand
		SD	--	1.43	0.124	4.632	4.013	0.822	--
		SE	--	0.64	0.055	2.071	1.795	0.368	--
		Median	--	6.3	0.66	83.20	14.80	1.67	--
		Min	--	5.8	0.53	79.90	7.04	1.00	--
		Max	--	8.9	0.87	92.00	17.30	2.77	--
Lac du Bonnet (2010)	Nearshore	Mean	5	0.4	0.35	92.80	2.44	4.74	Sand
		SD	--	0.08	0.221	3.966	1.548	2.625	--
		SE	--	0.03	0.099	1.774	0.692	1.174	--
		Median	--	0.3	0.44	92.10	2.32	4.69	--
		Min	--	0.3	0.05	87.70	0.55	1.15	--
		Max	--	0.5	0.58	98.30	4.07	8.39	--
	Offshore	Mean	5	7.3	0.33	79.80	15.08	5.13	Loamy Sand
		SD	--	0.58	0.116	5.263	5.428	1.205	--
		SE	--	0.26	0.052	2.354	2.428	0.539	--
		Median	--	7.3	0.30	82.60	13.20	4.69	--
		Min	--	6.5	0.21	70.80	10.60	3.88	--
		Max	--	7.9	0.48	83.20	24.50	6.42	--

Table 2.5-2. - continued -

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Manigotagan Lake (2010)	Nearshore	Mean	5	0.4	0.10	91.12	4.10	4.80	Sand
		SD	--	0.10	0.075	9.103	4.008	5.094	--
		SE	--	0.04	0.034	4.071	1.793	2.278	--
		Median	--	0.3	0.05	94.30	2.81	3.02	--
		Min	--	0.3	0.05	75.30	0.87	0.44	--
		Max	--	0.5	0.22	98.70	11.10	13.60	--
	Offshore	Mean	5	7.9	0.48	92.46	6.08	1.48	Sand
		SD	--	1.22	0.419	4.494	3.315	1.534	--
		SE	--	0.55	0.187	2.010	1.483	0.686	--
		Median	--	8.2	0.29	94.00	5.23	0.83	--
		Min	--	6.3	0.23	85.40	2.47	0.33	--
		Max	--	9.6	1.22	96.20	10.50	4.15	--

Table 2.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Eaglenest Lake within the Winnipeg River Region for CAMPP, 2010.

	Eaglenest Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	401	204.5	91.5	407	138	707
Oligochaeta	--	18	17.9	8.0	15	6	49
Hirudinea	--	0	0.1	0.1	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.6	0.3	0	0	1
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	84	75.5	33.8	41	17	195
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	1	0.7	0.3	1	0	1
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	1	0.6	0.3	1	0	1
Gastropoda - unid	--	6	8.2	3.7	2	0	20
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	9	11.1	5.0	2	1	27
Lymnaeidae	--	8	9.3	4.2	4	0	23
Physidae	--	5	4.9	2.2	3	1	12
Planorbidae	--	38	39.8	17.8	16	6	103
Valvatidae	--	12	13.8	6.2	6	0	32
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	182	119.1	53.3	195	57	316
Non-Insecta (%)	45	--	--	--	--	--	--
Oligochaeta	--	18	17.9	8.0	15	6	49
Oligochaeta (%)	5	--	--	--	--	--	--
Amphipoda	--	85	76.0	34.0	41	17	196
Amphipoda (%)	21	--	--	--	--	--	--
Bivalvia	--	1	0.6	0.3	1	0	1
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	77	74.6	33.4	29	20	179
Gastropoda (%)	19	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.1	0.1	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 2.5-3. - continued -

	Eaglenest Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	6	7.2	3.2	1	1	16
Elmidae (larva)	--	0	0.1	0.1	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	27	21.7	9.7	21	1	52
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	2	3.5	1.6	0	0	8
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.6	0.3	0	0	1
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	1	1.3	0.6	0	0	3
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	58	86.3	38.6	29	5	211
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.1	0.1	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.7	0.3	0	0	2
Stenomena	--	0	0.3	0.1	0	0	1
Leptophlebiidae	--	0	0.4	0.2	0	0	1
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 2.5-3. - continued -

	Eaglenest Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	2	3.2	1.4	1	0	8
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	1	1.2	0.5	0	0	3
Hydroptilidae (pupa)	--	1	2.4	1.1	0	0	5
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	25	17.7	7.9	16	7	45
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	1	1.7	0.8	0	0	4
Molannidae	--	0	0.6	0.3	0	0	1
Phryganeidae	--	0	0.6	0.3	0	0	1
Polycentropodidae	--	0	0.1	0.1	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	6	3.8	1.7	4	2	12
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	69	50.8	22.7	53	20	140
Orthocladiinae	--	5	4.3	1.9	4	0	11
Tanypodinae	--	14	5.1	2.3	14	8	22
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.3	0.1	0	0	1
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 2.5-3. - continued -

	Eaglenest Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	219	143.6	64.2	212	74	429
Insecta (%)	55	--	--	--	--	--	--
Chironomidae	--	93	52.7	23.6	76	43	156
Chironomidae (%)	23	--	--	--	--	--	--
Ephemeroptera	--	62	89.4	40.0	29	8	220
Ephemeroptera (%)	15	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	31	20.3	9.1	23	9	59
Trichoptera (%)	8	--	--	--	--	--	--
EPT	--	93	87.8	39.3	83	21	240
EPT (%)	23	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.88	0.459	0.205	0.72	0.41	1.54
Genus analysis of Ephemeroptera	Caenidae *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	30	17	2.6	1.2	17	15	21
Simpson's Diversity Index (D)	--	0.85	0.045	0.020	0.84	0.79	0.91
Evenness (Simpson's Equitability E_D)	--	0.33	0.12	0.05	0.31	0.21	0.53
Shannon-Weaver Index (H)	--	2.26	0.257	0.115	2.25	1.90	2.57
Evenness (Shannon's Equitability E_H)	--	0.74	0.086	0.039	0.73	0.60	0.84
Hill's Effective Richness ($E^{H'}$)	--	10	2.457	1.099	9.50	6.66	13.09
Evenness ($E^{H'}$/S)	--	0.46	0.122	0.054	0.45	0.29	0.62

Table 2.5-3. - continued -

	Eaglenest Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	721	366.3	163.8	563	462	1356
Oligochaeta	--	6	7.9	3.5	0	0	14
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	12	25.8	11.5	0	0	58
Hyalellidae	--	6	7.9	3.5	0	0	14
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	3	6.5	2.9	0	0	14
Pisidiidae	--	188	324.7	145.2	43	0	765
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	214	337.6	151.0	72	0	808
Non-Insecta (%)	30	--	--	--	--	--	--
Oligochaeta	--	6	7.9	3.5	0	0	14
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	17	23.7	10.6	14	0	58
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	190	331.1	148.1	43	0	779
Bivalvia (%)	26	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	3	6.5	2.9	0	0	14
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 2.5-3. - continued -

	Eaglenest Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	12	12.1	5.4	14	0	29
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	219	143.0	63.9	216	0	361
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 2.5-3. - continued -

	Eaglenest Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	26	38.7	17.3	0	0	87
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	3	6.5	2.9	0	0	14
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	3	6.5	2.9	0	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	3	6.5	2.9	0	0	14
Chironomidae (adult)	--	3	6.5	2.9	0	0	14
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	98	179.4	80.3	29	0	418
Orthocladiinae	--	3	6.5	2.9	0	0	14
Tanypodinae	--	136	68.9	30.8	87	87	231
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	508	38.7	17.3	491	462	548
Insecta (%)	70	--	--	--	--	--	--

Table 2.5-3. - continued -

	Eaglenest Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	239	169.1	75.6	216	87	519
Chironomidae (%)	33	--	--	--	--	--	--
Ephemeroptera	--	219	143.0	63.9	216	0	361
Ephemeroptera (%)	30	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	29	36.8	16.4	14	0	87
Trichoptera (%)	4	--	--	--	--	--	--
EPT	--	248	148.0	66.2	274	14	404
EPT (%)	34	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.87	1.803	0.806	1.12	0.03	4.67
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	6	1.5	0.7	6	4	7
Simpson's Diversity Index (D)	--	0.61	0.108	0.048	0.61	0.48	0.78
Evenness (Simpson's Equitability E_D)	--	0.43	0.13	0.06	0.48	0.26	0.57
Shannon-Weaver Index (H)	--	1.25	0.298	0.133	1.15	0.92	1.70
Evenness (Shannon's Equitability E_H)	--	0.67	0.104	0.046	0.67	0.52	0.82
Hill's Effective Richness ($E^{H'}$)	--	4	1.147	0.513	3.16	2.51	5.45
Evenness ($E^{H'}$/S)	--	0.55	0.131	0.059	0.61	0.35	0.68

Table 2.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Pointe du Bois within the Winnipeg River Region for CAMPP, 2010.

	Pointe du Bois Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	174	121.3	54.2	115	91	378
Oligochaeta	--	15	26.0	11.6	5	1	61
Hirudinea	--	0	0.6	0.3	0	0	1
Ostracoda	--	1	0.9	0.4	1	0	2
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	48	47.8	21.4	43	4	117
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	4	7.7	3.4	0	0	17
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	3	3.9	1.7	1	0	9
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	11	22.1	9.9	1	0	50
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.4	0.2	0	0	1
Planorbidae	--	1	2.3	1.0	0	0	5
Valvatidae	--	5	10.4	4.6	0	0	23
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	87	67.3	30.1	72	14	188
Non-Insecta (%)	50	--	--	--	--	--	--
Oligochaeta	--	15	26.0	11.6	5	1	61
Oligochaeta (%)	9	--	--	--	--	--	--
Amphipoda	--	48	47.8	21.4	43	4	117
Amphipoda (%)	28	--	--	--	--	--	--
Bivalvia	--	3	3.9	1.7	1	0	9
Bivalvia (%)	1	--	--	--	--	--	--
Gastropoda	--	17	34.9	15.6	1	0	79
Gastropoda (%)	10	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.1	0.1	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	2	1.2	0.6	1	0	3
Elmidae (larva)	--	4	7.5	3.4	1	0	17
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.6	0.3	0	0	1
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	36	25.8	11.6	44	6	71
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	1	0.9	0.4	0	0	2
Baetidae	--	1	1.5	0.7	0	0	3
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.6	0.3	0	0	1
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	5	7.0	3.2	1	0	17
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.1	0.1	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	1	1.5	0.7	1	0	4
Hexagenia	--	0	0.1	0.1	0	0	0
Heptageniidae	--	1	1.8	0.8	0	0	4
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.1	0.1	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.3	0.1	0	0	1
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.1	0.1	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	2	4.4	2.0	0	0	10
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	1	1.2	0.5	0	0	3
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.3	0.1	0	0	1
Leptoceridae (larva)	--	1	0.6	0.3	0	0	1
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	1	1.7	0.7	1	0	4
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	1	0.7	0.3	0	0	1
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.1	0.1	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	2	2.4	1.1	1	0	5
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	1	0.8	0.4	0	0	2
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	16	22.1	9.9	8	1	55
Orthocladiinae	--	8	8.7	3.9	4	2	23
Tanypodinae	--	3	2.5	1.1	2	0	7
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.1	0.1	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.4	0.2	0	0	1
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	86	62.5	28.0	75	21	190
Insecta (%)	50	--	--	--	--	--	--
Chironomidae	--	27	33.7	15.1	18	4	86

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae (%)	16	--	--	--	--	--	--
Ephemeroptera	--	9	10.9	4.9	3	0	25
Ephemeroptera (%)	5	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	5	6.3	2.8	2	0	15
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	14	17.1	7.7	4	0	40
EPT (%)	8	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.48	2.900	1.297	0.19	0.08	6.67
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	32	18	7.4	3.3	19	8	25
Simpson's Diversity Index (D)	--	0.71	0.188	0.084	0.74	0.40	0.89
Evenness (Simpson's Equitability E_D)	--	0.21	0.07	0.03	0.19	0.15	0.32
Shannon-Weaver Index (H)	--	1.80	0.651	0.291	1.96	0.85	2.58
Evenness (Shannon's Equitability E_H)	--	0.59	0.152	0.068	0.62	0.35	0.78
Hill's Effective Richness ($E^{H'}$)	--	7	4.107	1.837	7.12	2.34	13.25
Evenness ($E^{H'}/S$)	--	0.32	0.096	0.043	0.31	0.21	0.47

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	609	254.1	113.6	693	260	851
Oligochaeta	--	52	50.6	22.6	58	0	130
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	3	6.5	2.9	0	0	14
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	3	6.5	2.9	0	0	14
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	95	62.6	28.0	72	43	188
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	6.5	2.9	0	0	14
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	156	83.1	37.2	173	58	260
Non-Insecta (%)	26	--	--	--	--	--	--
Oligochaeta	--	52	50.6	22.6	58	0	130
Oligochaeta (%)	9	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	95	62.6	28.0	72	43	188
Bivalvia (%)	16	--	--	--	--	--	--
Gastropoda	--	3	6.5	2.9	0	0	14
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	3	6.5	2.9	0	0	14
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	300	92.0	41.2	303	188	404
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	3	6.5	2.9	0	0	14
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	20	24.1	10.8	14	0	58
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	17	31.3	14.0	0	0	72
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	29	27.0	12.1	29	0	72
Orthocladiinae	--	6	7.9	3.5	0	0	14
Tanypodinae	--	75	48.3	21.6	72	14	130
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	453	174.2	77.9	519	202	606
Insecta (%)	74	--	--	--	--	--	--

Table 2.5-4. - continued -

	Pointe du Bois Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	110	73.3	32.8	101	14	216
Chironomidae (%)	18	--	--	--	--	--	--
Ephemeroptera	--	300	92.0	41.2	303	188	404
Ephemeroptera (%)	49	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	23	29.9	13.4	14	0	72
Trichoptera (%)	4	--	--	--	--	--	--
EPT	--	323	102.3	45.8	375	188	433
EPT (%)	53	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	4.95	4.591	2.053	2.89	1.73	13.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	6	1.3	0.6	6	4	7
Simpson's Diversity Index (D)	--	0.65	0.125	0.056	0.67	0.45	0.79
Evenness (Simpson's Equitability E_D)	--	0.45	0.06	0.03	0.45	0.38	0.53
Shannon-Weaver Index (H)	--	1.39	0.349	0.156	1.50	0.85	1.77
Evenness (Shannon's Equitability E_H)	--	0.72	0.069	0.031	0.72	0.62	0.81
Hill's Effective Richness ($E^{H'}$)	--	4	1.323	0.592	4.47	2.35	5.87
Evenness ($E^{H'}$/S)	--	0.60	0.034	0.015	0.60	0.56	0.65

Table 2.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Lac du Bonnet within the Winnipeg River Region for CAMPP, 2010.

	Lac Du Bonnet						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	556	651.1	291.2	257	128	1672
Oligochaeta	--	34	50.4	22.5	9	2	123
Hirudinea	--	0	0.4	0.2	0	0	1
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	434	509.4	227.8	193	84	1301
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	1	2.4	1.1	0	0	5
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	2	2.1	0.9	2	0	5
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	7.2	3.2	2	0	16
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	1	1.8	0.8	0	0	4
Planorbidae	--	0	0.1	0.1	0	0	0
Valvatidae	--	0	0.9	0.4	0	0	2
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	478	565.3	252.8	226	95	1447
Non-Insecta (%)	86	--	--	--	--	--	--
Oligochaeta	--	34	50.4	22.5	9	2	123
Oligochaeta (%)	6	--	--	--	--	--	--
Amphipoda	--	434	509.4	227.8	193	84	1301
Amphipoda (%)	78	--	--	--	--	--	--
Bivalvia	--	2	2.1	0.9	2	0	5
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	7	9.4	4.2	2	0	22
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.6	0.2	0	0	1
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.6	0.3	0	0	1
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.1	0.1	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	7	6.8	3.0	5	0	17
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.3	0.1	0	0	1
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	1	2.2	1.0	1	0	5
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	9	13.2	5.9	3	1	32
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	10	15.6	7.0	5	0	37
Hexagenia	--	0	0.6	0.3	0	0	1
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.6	0.3	0	0	1
Stenomena	--	2	2.6	1.1	0	0	6
Leptophlebiidae	--	9	11.9	5.3	1	0	27
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.6	0.3	0	0	1
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.6	0.3	0	0	1
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	1	1.7	0.8	0	0	4
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	1	2.2	1.0	1	0	5
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	3	4.3	1.9	1	0	11
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	3	7.1	3.2	0	0	16
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	1	2.3	1.0	0	0	5
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.6	0.3	0	0	1
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	5	9.2	4.1	1	0	21
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	4	1.7	0.8	5	1	5
Orthocladiinae	--	11	14.9	6.7	4	3	37
Tanypodinae	--	7	9.3	4.1	1	0	21
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	2	2.1	1.0	1	0	5
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	78	86.2	38.6	33	16	225
Insecta (%)	14	--	--	--	--	--	--
Chironomidae	--	26	33.3	14.9	9	9	85
Chironomidae (%)	5	--	--	--	--	--	--
Ephemeroptera	--	31	40.8	18.3	9	1	97
Ephemeroptera (%)	6	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	11	14.9	6.7	5	1	37
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	42	54.7	24.5	15	5	134
EPT (%)	8	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.42	0.862	0.386	1.57	0.54	2.60
Genus analysis of Ephemeroptera	Ephemeridae: *Ephemera*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	26	16	3.0	1.4	16	12	19
Simpson's Diversity Index (D)	--	0.40	0.100	0.045	0.39	0.29	0.55
Evenness (Simpson's Equitability E_D)	--	0.09	0.02	0.01	0.08	0.07	0.12
Shannon-Weaver Index (H)	--	1.06	0.217	0.097	1.05	0.79	1.34
Evenness (Shannon’s Equitability E_H)	--	0.36	0.062	0.028	0.34	0.31	0.46
Hill's Effective Richness ($E^{H'}$)	--	3	0.641	0.287	2.87	2.21	3.82
Evenness ($E^{H'}$/S)	--	0.16	0.031	0.014	0.15	0.13	0.20

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2764	649.4	290.4	3030	1746	3434
Oligochaeta	--	1414	717.9	321.1	1385	375	2308
Hirudinea	--	3	6.5	2.9	0	0	14
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	20	24.1	10.8	14	0	58
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	3	6.5	2.9	0	0	14
Pisidiidae	--	863	174.7	78.1	880	635	1096
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	211	201.4	90.1	115	0	491
Lymnaeidae	--	6	12.9	5.8	0	0	29
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	2519	681.4	304.7	2813	1399	3131
Non-Insecta (%)	91	--	--	--	--	--	--
Oligochaeta	--	1414	717.9	321.1	1385	375	2308
Oligochaeta (%)	51	--	--	--	--	--	--
Amphipoda	--	20	24.1	10.8	14	0	58
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	866	170.1	76.1	880	649	1096
Bivalvia (%)	31	--	--	--	--	--	--
Gastropoda	--	216	206.6	92.4	115	0	491
Gastropoda (%)	8	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	3	6.5	2.9	0	0	14
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	9	12.9	5.8	0	0	29
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	84	57.2	25.6	72	29	173
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	14	10.2	4.6	14	0	29
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	3	6.5	2.9	0	0	14
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	14	10.2	4.6	14	0	29
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	3	6.5	2.9	0	0	14
Chironomidae (pupa)	--	3	6.5	2.9	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	78	62.6	28.0	87	14	173
Orthocladiinae	--	3	6.5	2.9	0	0	14
Tanypodinae	--	32	25.8	11.5	14	14	72
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	245	81.0	36.2	245	159	346
Insecta (%)	9	--	--	--	--	--	--
Chironomidae	--	118	65.6	29.4	101	43	216
Chironomidae (%)	4	--	--	--	--	--	--
Ephemeroptera	--	84	57.2	25.6	72	29	173

Table 2.5-5. - continued -

	Lac Du Bonnet						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	17	15.8	7.1	14	0	43
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	101	57.7	25.8	87	29	188
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.22	1.109	0.496	0.60	0.29	2.67
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	14	8	1.1	0.5	8	7	10
Simpson's Diversity Index (D)	--	0.62	0.110	0.049	0.58	0.50	0.77
Evenness (Simpson's Equitability E_D)	--	0.28	0.04	0.02	0.28	0.22	0.33
Shannon-Weaver Index (H)	--	1.26	0.313	0.140	1.12	0.99	1.75
Evenness (Shannon’s Equitability E_H)	--	0.55	0.089	0.040	0.51	0.45	0.68
Hill's Effective Richness ($E^{H'}$)	--	4	1.272	0.569	3.07	2.70	5.77
Evenness ($E^{H'}$/S)	--	0.36	0.053	0.023	0.36	0.30	0.44

Table 2.5-6. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Manigotagan Lake within the Winnipeg River Region for CAMPP, 2010.

	Manigotagan Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	107	78.3	35.0	110	14	226
Oligochaeta	--	17	7.9	3.5	17	6	26
Hirudinea	--	0	0.2	0.1	0	0	0
Ostracoda	--	1	1.5	0.7	0	0	3
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.3	0.1	0	0	1
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	53	81.4	36.4	29	3	197
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.2	0.1	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.0	0.0	0	0	0
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.1	0.1	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	71	81.0	36.2	47	9	213
Non-Insecta (%)	66	--	--	--	--	--	--
Oligochaeta	--	17	7.9	3.5	17	6	26
Oligochaeta (%)	16	--	--	--	--	--	--
Amphipoda	--	53	81.3	36.3	29	3	197
Amphipoda (%)	50	--	--	--	--	--	--
Bivalvia	--	0	0.0	0.0	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	0	0.1	0.1	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Manigotagan Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.3	0.1	0	0	1
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.1	0.1	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	1	1.4	0.6	1	0	3
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	1	0.8	0.3	0	0	2
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	1	1.8	0.8	1	0	4
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	1	1.0	0.4	0	0	2
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	1	1.0	0.5	0	0	2
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.7	0.3	0	0	2
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	1	1.9	0.9	0	0	4
Stenomena	--	1	1.1	0.5	0	0	3
Leptophlebiidae	--	2	2.7	1.2	0	0	6
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.1	0.1	0	0	0

Table 2.5-5. - continued -

	Manigotagan Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.2	0.1	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.3	0.1	0	0	1
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	3	2.9	1.3	1	0	6
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.1	0.1	0	0	0
Chironomidae (pupa)	--	2	1.4	0.6	2	0	4
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	5	6.1	2.7	2	1	16
Orthocladiinae	--	16	13.7	6.1	15	2	35
Tanypodinae	--	0	0.4	0.2	0	0	1
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.1	0.1	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.7	0.3	0	0	2
Tipulidae (larva)	--	0	0.6	0.3	0	0	1
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Manigotagan Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	36	27.0	12.1	36	4	63
Insecta (%)	34	--	--	--	--	--	--
Chironomidae	--	24	21.1	9.4	20	3	55
Chironomidae (%)	22	--	--	--	--	--	--
Ephemeroptera	--	7	8.4	3.7	6	0	21
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	2.8	1.3	2	0	6
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	10	10.6	4.7	7	1	27
EPT (%)	9	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.43	0.283	0.127	0.40	0.13	0.83
Genus analysis of Ephemeroptera	Leptophlebiidae: unidentified + Baetidae: *Procloeon*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	23	11	3.0	1.4	12	7	15
Simpson's Diversity Index (D)	--	0.69	0.254	0.113	0.79	0.24	0.85
Evenness (Simpson's Equitability E_D)	--	0.31	0.15	0.07	0.31	0.11	0.53
Shannon-Weaver Index (H)	--	1.65	0.610	0.273	1.76	0.64	2.24
Evenness (Shannon's Equitability E_H)	--	0.61	0.205	0.092	0.71	0.26	0.74
Hill's Effective Richness ($E^{H'}$)	--	6	2.755	1.232	5.81	1.89	9.35
Evenness ($E^{H'}$/S)	--	0.40	0.151	0.067	0.45	0.16	0.56

Table 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	268	108.3	48.4	274	144	418
Oligochaeta	--	66	48.5	21.7	58	14	144
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	3	6.5	2.9	0	0	14
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	6	7.9	3.5	0	0	14
Hyalellidae	--	9	12.9	5.8	0	0	29
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	26	34.4	15.4	14	0	87
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	6	7.9	3.5	0	0	14
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	115	74.3	33.2	87	43	202
Non-Insecta (%)	43	--	--	--	--	--	--
Oligochaeta	--	66	48.5	21.7	58	14	144
Oligochaeta (%)	25	--	--	--	--	--	--
Amphipoda	--	14	10.2	4.6	14	0	29
Amphipoda (%)	5	--	--	--	--	--	--
Bivalvia	--	26	34.4	15.4	14	0	87
Bivalvia (%)	10	--	--	--	--	--	--
Gastropoda	--	6	7.9	3.5	0	0	14
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera - unid	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unid	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	9	7.9	3.5	14	0	14
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	3	6.5	2.9	0	0	14
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	3	6.5	2.9	0	0	14
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	52	37.6	16.8	29	29	115
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	69	60.7	27.1	43	29	173
Orthocladiinae	--	12	15.8	7.1	0	0	29
Tanypodinae	--	6	7.9	3.5	0	0	14
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	153	102.8	46.0	130	72	332
Insecta (%)	57	--	--	--	--	--	--

Table 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	87	58.6	26.2	58	43	188
Chironomidae (%)	32	--	--	--	--	--	--
Ephemeroptera	--	9	7.9	3.5	14	0	14
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	6.5	2.9	0	0	14
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	12	12.1	5.4	14	0	29
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.13	0.126	0.056	0.15	0.00	0.25
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	6	1.2	0.5	6	4	7
Simpson's Diversity Index (D)	--	0.77	0.047	0.021	0.76	0.73	0.85
Evenness (Simpson's Equitability E_D)	--	0.67	0.20	0.09	0.69	0.46	0.95
Shannon-Weaver Index (H)	--	1.67	0.127	0.057	1.64	1.57	1.89
Evenness (Shannon's Equitability E_H)	--	0.87	0.086	0.038	0.89	0.76	0.97
Hill's Effective Richness ($E^{H'}$)	--	5	0.724	0.324	5.13	4.83	6.60
Evenness ($E^{H'}/S$)	--	0.78	0.140	0.063	0.81	0.60	0.94

Table 2.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Winnipeg River system, 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Eaglenest Lake	GN-01	15	342838	5579777	19-Jul-10	22.08	4.2	3.5	19.0
Eaglenest Lake	GN-02	15	342972	5578980	20-Jul-10	25.08	3.2	3.3	19.0
Eaglenest Lake	GN-03	15	341990	5576703	19-Jul-10	24.42	7.8	8.1	19.5
Eaglenest Lake	GN-05	15	341358	5573610	21-Jul-10	24.58	7.8	10.9	20.0
Eaglenest Lake	GN-06	15	341263	5576055	21-Jul-10	29.83	2.4	5.5	20.0
Eaglenest Lake	GN-07	15	345398	5569004	22-Jul-10	27.33	4.2	3.9	19.5
Eaglenest Lake	GN-08	15	346310	5569611	22-Jul-10	25.25	12.3	16.2	19.5
Eaglenest Lake	GN-09	15	342276	5571804	23-Jul-10	28.58	4.8	3.8	19.5
Eaglenest Lake	GN-10	15	342879	5571475	23-Jul-10	28.58	7.4	14.5	19.5
Eaglenest Lake	GN-11	15	340695	5570949	24-Jul-10	25.08	3.0	3.1	21.0
Eaglenest Lake	GN-12	15	340769	5571569	24-Jul-10	25.08	8.9	10.3	21.0
Eaglenest Lake	SN-01	15	342794	5579838	19-Jul-10	22.92	4.5	4.2	19.0
Eaglenest Lake	SN-04	15	343718	5577472	20-Jul-10	29.83	12.6	12.9	20.0
Eaglenest Lake	SN-08	15	346239	5569587	22-Jul-10	26.17	11.7	12.3	19.5
Eaglenest Lake	SN-11	15	340623	5570926	24-Jul-10	26.58	2.9	3.0	21.0
Pointe du Bois	GN-01	14	326330	5579312	13-Jul-10	25.08	7.6	6.5	19.0
Pointe du Bois	GN-03	14	324805	5580920	15-Jul-10	27.33	5.6	6.9	19.0
Pointe du Bois	GN-04	14	324032	5579877	13-Jul-10	24.42	19.6	15.8	19.0
Pointe du Bois	GN-05	14	323449	5577738	14-Jul-10	29.83	15.8	16.0	19.0
Pointe du Bois	GN-06	14	325218	5579095	15-Jul-10	25.25	8.1	24.6	19.0
Pointe du Bois	GN-07	14	322557	5578674	16-Jul-10	26.17	6.5	6.2	19.0
Pointe du Bois	GN-08	14	322795	5579936	14-Jul-10	24.58	7.9	7.1	19.5
Pointe du Bois	GN-09	14	320993	5578569	16-Jul-10	25.08	16.1	12.7	19.0
Pointe du Bois	GN-10	14	322233	5577384	16-Jul-10	26.58	12.3	13.6	19.0
Pointe du Bois	GN-11	14	320126	5578551	17-Jul-10	24.00	4.7	6.0	19.0
Pointe du Bois	GN-12	14	319643	5577488	17-Jul-10	24.08	13.0	9.7	19.0
Pointe du Bois	GN-13	14	320101	5577897	12-Jul-10	22.92	15.7	21.0	20.0
Pointe du Bois	GN-14	14	321236	5577653	12-Jul-10	22.08	6.8	5.7	20.0
Pointe du Bois	GN-15	14	319538	5575533	17-Jul-10	24.00	6.9	5.9	19.0
Pointe du Bois	GN-16	14	324027	5581109	15-Jul-10	28.58	5.4	4.9	19.0
Pointe du Bois	SN-01	14	326300	5579283	13-Jul-10	25.08	7.9	7.6	19.0
Pointe du Bois	SN-05	14	323495	5577776	14-Jul-10	29.83	12.8	15.8	19.0
Pointe du Bois	SN-09	14	320935	5578579	16-Jul-10	25.08	11.1	16.1	19.0
Pointe du Bois	SN-12	14	319610	5577472	17-Jul-10	24.08	12.1	13.0	19.0
Pointe du Bois	SN-16	14	324067	5581119	15-Jul-10	28.58	5.2	5.4	19.0

Table 2.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Lac du Bonnet	GN-01	15	300801	5586766	21-Sep-10	21.83	15.6	15.1	13.8
Lac du Bonnet	GN-02	15	301078	5588621	21-Sep-10	20.50	6.5	7.8	13.5
Lac du Bonnet	GN-03	15	297768	5586211	21-Sep-10	22.00	9.2	8.8	13.3
Lac du Bonnet	GN-04	15	298678	5583062	22-Sep-10	21.75	7.3	3.7	12.4
Lac du Bonnet	GN-05	15	294285	5584308	22-Sep-10	21.33	9.0	8.7	12.9
Lac du Bonnet	GN-06	15	293285	5587369	22-Sep-10	24.25	6.5	6.0	12.9
Lac du Bonnet	GN-07	15	291360	5583363	23-Sep-10	17.92	6.1	7.3	12.8
Lac du Bonnet	GN-08	15	288602	5586327	23-Sep-10	19.25	2.5	7.8	13.7
Lac du Bonnet	GN-09	15	288150	5582048	20-Sep-10	19.75	1.5	9.1	14.4
Lac du Bonnet	GN-10	15	286655	5579739	20-Sep-10	16.25	5.5	5.8	14.5
Lac du Bonnet	SN-01	15	300801	5686766	21-Sep-10	21.83	15.6	15.1	13.8
Lac du Bonnet	SN-04	15	298678	5583062	22-Sep-10	21.75	7.3	7.3	12.4
Lac du Bonnet	SN-08	15	288602	5586327	23-Sep-10	19.25	2.5	2.5	13.7
Manigotagan Lake	GN-01	15	318918	5640658	7-Sep-10	16.77	19.0	19.0	16.0
Manigotagan Lake	GN-02	15	320077	5639435	7-Sep-10	18.00	7.3	5.2	16.0
Manigotagan Lake	GN-03	15	317176	5639330	8-Sep-10	20.18	11.0	3.9	16.0
Manigotagan Lake	GN-04	15	317422	5636276	8-Sep-10	23.50	4.3	1.9	16.0
Manigotagan Lake	GN-05	15	315996	5637930	9-Sep-10	17.50	22.0	21.0	16.0
Manigotagan Lake	GN-06	15	314778	5640225	9-Sep-10	15.42	16.0	13.0	16.0
Manigotagan Lake	SN-01	15	318950	6540638	7-Sep-10	16.77	19.0	19.0	16.0
Manigotagan Lake	SN-03	15	317138	5639436	8-Sep-10	20.18	11.0	3.9	16.0

Table 2.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Winnipeg River Region waterbodies, 2010.

Family	Common Name	Scientific Name	ID Code	Captured in Waterbody			
				EAGLE	PDB	LDB	MANIG
Petromyzontidae	Silver Lamprey	*Ichthyomyzon unicuspis*	SLLM	+	+		
Acipenseridae	Lake Sturgeon	*Acipenser fulvescens*	LKST		+	+	
Hiodontidae	Mooneye	*Hiodon tergisus*	MOON	+	+	+	
Cyprinidae	Emerald Shiner	*Notropis atherinoides*	EMSH		+	+	
	Spottail Shiner	*Notropis hudsonius*	SPSH	+	+	+	
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC				
	White Sucker	*Catostomus commersoni*	WHSC	+	+	+	+
	Silver Redhorse	*Moxostoma anisurum*	SLRD	+	+	+	
	Golden Redhorse	*Moxostoma erythrurum*	GLRD				
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD	+	+	+	
Ictaluridae	Channel Catfish	*Ictalurus punctatus*	CHCT				
Esocidae	Northern Pike	*Esox lucius*	NRPK	+	+	+	+
Osmeridae	Rainbow Smelt	*Osmerus mordax*	RNSM	+	+		
Salmonidae	Cisco	*Coregonus artedi*	CISC	+	+	+	+
	Lake Whitefish	*Coregonus clupeaformis*	LKWH	+	+	+	+
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR	+	+	+	+
Gadidae	Burbot	*Lota lota*	BURB		+	+	+
Centrarchidae	Rock Bass	*Ambloplites rupestris*	RCBS	+	+	+	
	Smallmouth Bass	*Micropterus dolomieu*	SMBS	+	+	+	+
	Black Crappie	*Pomoxis nigromaculatus*	BLCR	+			
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+	+	+	+
	Logperch	*Percina caprodes*	LGPR	+			
	Sauger	*Sander canadensis*	SAUG	+	+	+	
	Walleye	*Sander vitreus*	WALL	+	+	+	+

Table 2.6-3. Standard gang index and small mesh index gillnet relative abundance summaries from Winnipeg River Region waterbodies, 2010.

Species	Standard Gang								Small Mesh							
	EAGLE		PDB		LDB		MANIG		EAGLE		PDB		LDB		MANIG	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Silver Lamprey	13	2.63	18	4.79	-	-	-	-	-	-		-	-	-	-	-
Lake Sturgeon	-	-	6	1.6	1	0.32	-	-	-	-		-	-	-	-	-
Mooneye	33	6.68	8	2.13	27	8.71	-	-	1	0.5	2	2.02	1	0.91	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	1	1.01	5	4.55	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	13	6.5	14	14.14	19	17.27	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
White Sucker	89	18.02	160	42.55	35	11.29	11	3.11	1	0.5	1	1.01	-	-	-	-
Silver Redhorse	7	1.42	2	0.53	19	6.13	-	-	-	-		-	-	-	-	-
Golden Redhorse	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Shorthead Redhorse	2	0.4	5	1.33	22	7.1	-	-	-	-		-	-	-	-	-
Channel Catfish	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Northern Pike	34	6.88	18	4.79	38	12.26	11	3.11	6	3		-	2	1.82	-	-
Rainbow Smelt	1	0.2	-	-	-	-	-	-	-	-	2	2.02	-	-	-	-
Cisco	1	0.2	1	0.27	9	2.9	145	40.96	-	-		-	2	1.82	7	12.07
Lake Whitefish	12	2.43	4	1.06	16	5.16	32	9.04	-	-		-	1	0.91	1	1.72
Troutperch	-	-	-	-	-	-	1	0.28	87	43.5	28	28.28	21	19.09	3	5.17
Burbot	-	-	3	0.8	2	0.65	13	3.67	-	-		-	-	-	-	-
Rock Bass	4	0.81	1	0.27	4	1.29	-	-	-	-		-	-	-	-	-
Smallmouth Bass	6	1.21	3	0.8	1	0.32	2	0.56	-	-		-	-	-	1	1.72
Black Crappie	1	0.2	-	-	-	-	-	-	-	-		-	-	-	-	-
Yellow Perch	122	24.7	54	14.36	19	6.13	14	3.95	27	13.5	7	7.07	37	33.64	-	-
Logperch	-	-	-	-	-	-	-	-	3	1.5		-	-	-	-	-
Sauger	66	13.36	48	12.77	65	20.97	-	-	37	18.5	29	29.29	12	10.91	-	-
Walleye	103	20.85	45	11.97	52	16.77	125	35.31	25	12.5	15	15.15	10	9.09	46	79.31
Total	494	100	376	100	310	100	354	100	200	100	99	100	110	100	58	100

n = number of fish caught

RA = percent relative abundance

Table 2.6-4. Standard gang and small mesh index gillnet biomass summaries from Winnipeg River Region waterbodies, 2010.

Common Name	Standard Gang												Small Mesh											
	EAGLE			PDB			LDB			MANIG			EAGLE			PDB			LDB			MANIG		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	6	8640	3.08	1	150	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	33	15215	4.65	8	3510	1.25	27	8150	3.14	-	-	-	1	650	6.79	2	770	11.42	1	212	7.23	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	0.07	5	19	0.65	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	13	50	0.52	14	54	0.80	19	95	3.24	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	89	99520	30.43	160	165450	58.94	35	46020	17.71	11	10910	7.19	1	50	0.52	1	21	0.31	-	-	-	-	-	-
Silver Redhorse	7	12220	3.74	2.00	2490.00	0.89	19	25240	9.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Golden Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	2	3110	0.95	5	6780	2.42	22	15440	5.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Channel Catfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	34	88600	27.09	18	26126.9	9.31	38	90670	34.89	11	13980	9.21	6	1930	20.16	-	-	-	2	275	9.38	-	-	-
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	19	0.27	-	-	-	-	-	-
Cisco	1	150	0.05	1.00	630.00	0.22	9	793	0.31	145	14560	9.59	-	-	-	-	-	-	2	29	0.99	6	1290	13.42
Lake Whitefish	12	11400	3.49	4	4385.2	1.56	16	8378	3.22	32	26196	17.26	-	-	-	-	-	-	1	16	0.55	1	20	0.21
Troutperch	-	-	-	-	-	-	-	-	-	1	20	0.01	86	320	3.34	28	111	1.64	21	161	5.49	3	30	0.31
Burbot	-	-	-	3	880	0.31	2	1092	0.42	13	12260	8.08	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	4	410	0.13	1	240	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth Bass	6	4300	1.31	3	1750	0.62	1	1280	0.49	2	2650	1.75	-	-	-	-	-	-	-	-	-	-	-	-
Black Crappie	1	500	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	122	14060	4.30	54	7390	2.63	19	3704	1.43	14	2750	1.81	27	1100	11.49	7	686	10.17	37	333	11.35	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	3	15	0.16	-	-	-	-	-	-	-	-	-
Sauger	66	11080	3.39	48	10685	3.81	65	9593	3.69	-	-	-	37	4250	44.39	29	4440	65.86	12	1512	51.55	-	-	-
Walleye	103	66490	20.33	45	41737.7	14.87	52	48830	18.79	125	68470	45.11	25	1210	12.64	15	638	9.46	10	281	9.58	30	8270	86.06
Total	480	327055	100	358	280695	100	310	259840	100	354	151796	100	199	9575	100	99	6742	100	110	2933	100	40	9610	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 2.6-5. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index (fish/100 m/24 h) and small mesh index (fish/30 m/24 h) gill nets set in Winnipeg River Region waterbodies, 2010.

Species	Standard Gang												Small Mesh											
	Eaglenest L (#sites=12)			Pointe du Bois (#sites=15)			Lac du Bonnet (#sites=10)			Manigotagan L (#sites=6)			Eaglenest L (#sites=4)			Pointe du Bois (#sites=5)			Lac du Bonnet (#sites=3)			Manigotagan L (#sites=2)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Silver Lamprey	13	0.8	5.15	18	1.0	4.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	6	0.3	2.39	1	0.1	1.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	33	2.2	14.72	8	0.4	3.74	27	3.0	15.43	-	-	-	1	0.2	0.90	2	0.3	1.68	1	0.4	1.25	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2	0.80	5	1.8	5.52	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	13	2.9	11.74	14	2.4	9.78	19	7.7	16.93	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	89	5.8	12.67	160	8.9	26.87	35	3.8	12.62	11	2.0	4.35	1	0.2	0.90	1	0.2	0.84	-	-	-	-	-	-
Silver Redhorse	7	0.5	2.07	2	0.1	1.17	19	2.2	11.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Golden Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	2	0.1	1.07	5	0.3	2.32	22	2.7	20.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Channel Catfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	34	2.3	5.11	18	1.0	3.53	38	3.9	6.82	11	1.8	6.17	6	1.4	5.42	-	-	-	2	0.8	2.49	-	-	-
Rainbow Smelt	1	0.1	0.86	-	-	-	-	-	-	-	-	-	-	-	-	2	0.3	1.61	-	-	-	-	-	-
Cisco	1	0.1	0.84	1	0.0	0.70	9	0.9	4.49	145	29.6	-	-	-	-	-	-	-	2	0.7	2.20	6	4.2	5.97
Lake Whitefish	12	0.8	3.46	4	0.2	1.66	16	1.7	7.76	32	6.4	20.72	-	-	-	-	-	-	1	0.4	1.10	1	0.6	1.19
Troutperch	-	-	-	-	-	-	-	-	-	1	0.2	1.04	87	19.6	52.05	28	5.3	11.94	21	8.5	17.84	3	1.8	3.57
Burbot	-	-	-	3	0.2	1.36	2	0.2	1.30	13	2.6	10.06	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	4	0.3	1.41	1	0.1	0.83	4	0.4	3.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth Bass	6	0.4	2.15	3	0.2	1.38	1	0.1	1.06	2	0.3	2.08	-	-	-	-	-	-	-	-	-	-	-	-
Black Crappie	1	0.1	0.77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	122	8.3	27.61	54	2.9	14.82	19	2.0	7.21	14	2.3	8.01	27	6.3	13.99	7	1.3	4.66	37	15.4	46.13	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	3	0.8	3.14	-	-	-	-	-	-	-	-	-
Sauger	66	4.5	11.92	48	2.7	6.16	65	6.4	12.07	-	-	-	37	8.3	8.70	29	5.4	11.73	12	4.6	3.12	-	-	-
Walleye	103	7.0	20.13	45	2.4	9.02	52	5.3	12.34	125	21.8	56.52	25	5.7	11.97	15	2.7	8.41	10	4.2	12.47	30	17.8	35.68
Total	494	33.3	49.72	376	20.7	41.83	310	32.6	60.79	354	67.0	86.47	200	45.3	91.93	99	18.0	35.08	110	44.5	91.68	40	24.4	34.47

#sites = number of sites sampled; n = number of fish caught; CPUE = mean catch per unit effort per site; SD = standard deviation

Table 2.6-6. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index (fish/100 m/24 h) and small mesh index (fish/30 m/24 h) gill nets set in Winnipeg River Region waterbodies, 2010.

Species	Standard Gang												Small Mesh											
	EAGLE			PDB			LDB			MANIG			EAGLE			PDB			LDB			MANIG		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	6	498	947	1	19	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	33	1033	1967	8	180	462	27	899	1573	-	-	-	1	15	15	2	129	289	1	88	153	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	5	7	12	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	13	1	1	14	9	15	19	39	52	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	89	6483	4168	160	9197	7281	35	4983	5481	11	1925	1770	1	1	1	1	4	8	-	-	-	-	-	-
Silver Redhorse	7	866	1181	2	141	380	19	2866	5073	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Golden Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	2	209	508	5	374	816	22	1917	4883	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Channel Catfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	34	5952	4557	18	1387	2298	38	9310	4652	11	2222	3313	6	44	44	-	-	-	2	114	198	-	-	-
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	7	-	-	-	-	-	-
Cisco	1	10	36	1	30	115	9	79	135	145	2967	4816	-	-	-	-	-	-	2	11	18	6	824	214
Lake Whitefish	12	772	1051	4	212	555	16	853	826	32	5205	6506	-	-	-	-	-	-	1	6	10	1	12	17
Troutperch	-	-	-	-	-	-	-	-	-	1	3	8	86	7	4	28	21	22	21	65	84	3	18	25
Burbot	-	-	-	3	51	125	2	105	282	13	2414	3698	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	4	29	52	1	13	52	4	56	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth Bass	6	283	619	3	96	211	1	136	430	2	460	1126	-	-	-	-	-	-	-	-	-	-	-	-
Black Crappie	1	32	111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	122	955	954	54	394	570	19	387	521	14	467	604	27	26	12	7	129	255	37	138	240	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0	-	-	-	-	-	-	-	-	-
Sauger	66	758	585	48	587	341	65	943	522	-	-	-	37	95	23	29	812	600	12	570	186	-	-	-
Walleye	103	4489	3679	45	2251	1941	52	5012	3961	125	12210	11729	25	27	11	15	119	212	10	117	202	30	4918	6955
Total	480	21872	9245	358	15410	9142	310	27566	17106	354	27873	13162	199	216	80	99	1227	1084	110	1155	757	40	5771	7211

#sites = number of sites sampled; n = number of fish measured (may not equal number of fish caught); BPUE = mean biomass per unit effort per site; SD = standard deviation

Table 2.6-7. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, Sauger and Walleye captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Species	Eaglenest L			Pointe du Bois			Lac du Bonnet			Manigotagan L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	34	660	167	18	522	190	40	649	138	11	583	80
Lake Whitefish	-	-	-	4	403	109	17	283	120	-	-	-
Sauger	-	-	-	48	289	42	77	247	29	-	-	-
Walleye	103	363	101	57	354	151	62	343	153	155	340	86
Weight (g)												
Northern Pike	40	2263	-	18	1451	2354	40	2274	1435	11	1271	862
Lake Whitefish	12	950	-	4	1096	883	17	494	583	33	794	-
Sauger	103	149	-	77	196	-	77	144	45	-	-	-
Walleye	128	529	-	60	706	-	62	792	983	155	495	430
Condition Factor (K)												
Northern Pike	34	0.73	0.1	18	0.63	0.08	40	0.73	0.07	11	0.58	0.13
Lake Whitefish	-	-	-	4	1.46	0.11	17	1.32	0.16	-	-	-
Sauger	-	-	-	48	0.88	0.11	77	0.92	0.07	-	-	-
Walleye	103	1.07	0.11	57	1.03	0.12	62	1.09	0.16	155	1.05	0.08

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 2.6-8. Age/year-class frequency distributions (%) for Northern Pike, Lake Whitefish, Sauger and Walleye captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Age	Year-Class	Northern Pike								Lake Whitefish				Sauger				Walleye							
		EAGLE		PDB		LDB		MANIG		PDB		LDB		PDB		LDB		EAGLE		PDB		LDB		MANIG	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-	-	-	4	30.77	-	-	1	1.56	-	-	-	-	6	11.54	-	-
2	2008	-	-	-	-	1	2.63	-	-	-	-	2	15.38	-	-	1	1.56	-	-	1	2.38	4	7.69	3	2.42
3	2007	1	3.13	1	6.25	2	5.26	-	-	1	25.00	2	15.38	5	10.64	3	4.69	8	8.70	-	-	8	15.38	6	4.84
4	2006	3	9.38	7	43.75	7	18.42	-	-	2	50.00	-	-	10	21.28	29	45.31	13	14.13	7	16.67	7	13.46	36	29.03
5	2005	3	9.38	6	37.50	6	15.79	4	36.36	-	-	1	7.69	3	6.38	16	25.00	23	25.00	2	4.76	4	7.69	59	47.58
6	2004	3	9.38	1	6.25	7	18.42	4	36.36	-	-	-	-	10	21.28	1	1.56	3	3.26	3	7.14	-	-	5	4.03
7	2003	5	15.63	-	-	10	26.32	1	9.09	-	-	2	15.38	7	14.89	4	6.25	15	16.30	8	19.05	8	15.38	2	1.61
8	2002	4	12.50	-	-	2	5.26	-	-	-	-	-	-	8	17.02	6	9.38	10	10.87	2	4.76	1	1.92	2	1.61
9	2001	5	15.63	-	-	-	-	1	9.09	-	-	-	-	-	-	3	4.69	3	3.26	1	2.38	4	7.69	2	1.61
10	2000	1	3.13	1	6.25	1	2.63	1	9.09	-	-	-	-	1	2.13	-	-	3	3.26	2	4.76	-	-	2	1.61
11	1999	2	6.25	-	-	1	2.63	-	-	-	-	1	7.69	2	4.26	-	-	4	4.35	3	7.14	2	3.85	3	2.42
12	1998	1	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.09	4	9.52	-	-	-	-
13	1997	2	6.25	-	-	-	-	-	-	-	-	-	-	1	2.13	-	-	-	-	1	2.38	2	3.85	2	1.61
14	1996	-	-	-	-	1	2.63	-	-	-	-	-	-	-	-	-	-	3	3.26	2	4.76	3	5.77	2	1.61
15	1995	1	3.13	-	-	-	-	-	-	1	25.00	-	-	-	-	-	-	2	2.17	1	2.38	-	-	-	-
16	1994	1	3.13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.17	1	2.38	3	5.77	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	1	7.69	-	-	-	-	1	1.09	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.38	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.38	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.09	1	2.38	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2.38	-	-	-	-
Total		32	100	16	100	38	100	11	100	4	100	13	100	47	100	64	100	92	100	42	100	52	100	124	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 2.6-9. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Age	Year-Class	Eaglenest L									Pointe du Bois								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	1	320	-	1	200	-	1	0.61	-	1	336	-	1	232	-	1	0.61	-
4	2006	3	373	34	3	337	125	3	0.63	0.05	7	459	27	7	569	115	7	0.58	0.04
5	2005	3	506	45	3	897	280	3	0.68	0.07	6	496	32	6	751	156	6	0.61	0.07
6	2004	3	581	46	3	1307	337	3	0.66	0.11	1	678	-	1	2460	-	1	0.79	-
7	2003	5	642	26	5	1996	251	5	0.76	0.09	-	-	-	-	-	-	-	-	-
8	2002	4	643	79	4	2093	972	4	0.74	0.11	-	-	-	-	-	-	-	-	-
9	2001	5	739	37	5	3268	660	5	0.8	0.04	-	-	-	-	-	-	-	-	-
10	2000	1	716	-	1	2480	-	1	0.68	-	1	897	-	1	5220	-	1	0.72	-
11	1999	2	719	45	2	2970	891	2	0.79	0.09	-	-	-	-	-	-	-	-	-
12	1998	1	870	-	1	5060	-	1	0.77	-	-	-	-	-	-	-	-	-	-
13	1997	2	914	16	2	5990	382	2	0.79	0.01	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	1	920	-	1	6040	-	1	0.78	-	-	-	-	-	-	-	-	-	-
16	1994	1	968	-	1	6520	-	1	0.72	-	-	-	-	-	-	-	-	-	-

Table 2.6-9. - continued -

Age	Year-Class	Lac du Bonnet									Manigotagan L								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	1	400	-	1	440	-	1	0.69	-	-	-	-	-	-	-	-	-	-
3	2007	2	577	55	2	1400	396	2	0.72	0	-	-	-	-	-	-	-	-	-
4	2006	7	595	58	7	1624	521	7	0.75	0.06	-	-	-	-	-	-	-	-	-
5	2005	6	634	34	6	1955	245	6	0.77	0.06	4	555	12	4	848	105	4	0.5	0.08
6	2004	7	663	55	7	2029	563	7	0.68	0.07	4	544	27	4	930	296	4	0.58	0.15
7	2003	10	702	57	10	2533	666	10	0.72	0.08	1	544	-	1	1070	-	1	0.66	-
8	2002	2	827	134	2	4760	2376	2	0.81	0.02	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	1	707	-	1	2350	-	1	0.66	-
10	2000	1	770	-	1	3740	-	1	0.82	-	1	770	-	1	3450	-	1	0.76	-
11	1999	1	830	-	1	3640	-	1	0.64	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	1	1000	-	1	7900	-	1	0.79	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 2.6-10. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Age	Year-Class	Pointe du Bois									Lac du Bonnet								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	4	193	9	4	87	11	4	1.21	0.03
2	2008	-	-	-	-	-	-	-	-	-	2	282	11	2	330	28	2	1.48	0.05
3	2007	1	341	-	1	556	-	1	1.4	-	2	325	21	2	490	127	2	1.41	0.1
4	2006	2	356	50	2	724	349	2	1.54	0.1	-	-	-	-	-	-	-	-	-
5	2005	-	-	-	-	-	-	-	-	-	1	328	-	1	330	-	1	0.94	-
6	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2003	-	-	-	-	-	-	-	-	-	2	451	16	2	1355	64	2	1.48	0.08
8	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	1	462	-	1	1300	-	1	1.32	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	1	560	-	1	2380	-	1	1.36	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	1	490	-	1	1830	-	1	1.56	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 2.6-11. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Sauger captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Age	Year-Class	Pointe du Bois									Lac du Bonnet								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	1	150	-	1	30	-	1	0.89	-
2	2008	-	-	-	-	-	-	-	-	-	1	178	-	1	49	-	1	0.87	-
3	2007	5	225	14	5	114	21	5	0.99	0.1	3	226	7	3	100	14	3	0.86	0.1
4	2006	10	247	20	10	137	35	10	0.89	0.1	29	244	11	29	135	21	29	0.92	0.1
5	2005	3	274	15	3	180	20	3	0.88	0.1	16	254	11	16	151	19	16	0.91	0
6	2004	10	291	30	10	233	79	10	0.91	0.11	1	276	-	1	189	-	1	0.9	-
7	2003	7	318	14	7	271	67	7	0.83	0.14	4	270	13	4	183	28	4	0.92	0
8	2002	8	327	16	8	305	44	8	0.87	0.07	6	274	12	6	192	33	6	0.93	0.1
9	2001	-	-	-	-	-	-	-	-	-	3	277	20	3	199	51	3	0.93	0.1
10	2000	1	316	-	1	230	-	1	0.73	-	-	-	-	-	-	-	-	-	-
11	1999	2	348	17	2	310	42	2	0.74	0.01	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	1	335	-	1	350	-	1	0.93	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 2.6-12. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Age	Year-Class	Eaglenest L									Pointe du Bois								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	1	260	-	1	190	-	1	1.08	-
3	2007	8	229	33	8	126	46	8	1.03	0.1	0	-	-	0	-	-	0	-	-
4	2006	13	256	47	13	190	123	13	1	0.08	7	286	35	7	270	116	7	1.09	0.1
5	2005	23	309	25	23	324	91	23	1.07	0.11	2	281	30	2	232	68	2	1.04	0
6	2004	3	361	11	3	503	84	3	1.07	0.08	3	312	49	3	307	173	3	0.93	0.1
7	2003	15	370	42	15	605	221	15	1.14	0.12	8	325	43	8	357	184	8	0.97	0.2
8	2002	10	402	46	10	718	280	10	1.06	0.09	2	395	69	2	699	437	2	1.05	0.2
9	2001	3	410	22	3	763	106	3	1.11	0.04	1	532	-	1	1580	-	1	1.05	-
10	2000	3	453	29	3	1053	214	3	1.12	0.04	2	459	33	2	1063	281	2	1.09	0.1
11	1999	4	473	57	4	1213	447	4	1.11	0.12	3	440	78	3	935	428	3	1.06	0.1
12	1998	1	538	-	1	1510	-	1	0.97	-	4	538	100	4	1834	813	4	1.11	0
13	1997	0	-	-	0	-	-	0	-	-	1	508	-	1	1636	-	1	1.25	-
14	1996	3	439	11	3	877	68	3	1.03	0.01	2	567	25	2	1835	212	2	1.01	0
15	1995	2	498	75	2	1605	544	2	1.29	0.13	1	522	-	1	1347	-	1	0.95	-
16	1994	2	500	110	2	1480	1032	2	1.08	0.11	1	470	-	1	1071	-	1	1.03	-
17	1993	1	520	-	1	1600	-	1	1.14	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	1	632	-	1	2710	-	1	1.07	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	1	428	-	1	776	-	1	0.99	-
21	1989	1	545	-	1	1420	-	1	0.88	-	1	658	-	1	3340	-	1	1.17	-
27	1983	-	-	-	-	-	-	-	-	-	1	710	-	1	3820	-	1	1.07	-

Table 2.6-9. - continued -

Age	Year-Class	Lac du Bonnet									Manigotagan L								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	6	223	9	6	114	16	6	1.03	0.1	-	-	-	-	-	-	-	-	-
2	2008	4	256	8	4	173	12	4	1.04	0	3	234	39	3	143	57	3	1.09	0.1
3	2007	8	282	17	8	238	43	8	1.06	0.1	6	250	19	6	160	32	6	1.02	0.1
4	2006	7	356	31	7	533	163	7	1.15	0.1	36	298	26	36	279	83	36	1.03	0.1
5	2005	4	356	42	4	553	211	4	1.17	0.1	59	355	29	59	492	131	59	1.07	0.1
6	2004	0	-	-	0	-	-	0	-	-	5	409	47	5	750	241	5	1.07	0.1
7	2003	8	413	46	8	856	319	8	1.17	0.1	2	413	25	2	755	120	2	1.08	0
8	2002	1	450	-	1	980	-	1	1.08	-	2	504	37	2	1325	191	2	1.04	0.1
9	2001	4	475	104	4	1503	978	4	1.23	0.1	2	532	33	2	1700	424	2	1.12	0.1
10	2000	0	-	-	0	-	-	0	-	-	2	551	18	2	1650	14	2	0.99	0.1
11	1999	2	515	21	2	1725	318	2	1.26	0.1	3	524	41	3	1413	423	3	0.96	0.1
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	2	523	1	2	1870	156	2	1.31	0.1	2	571	8	2	1710	339	2	0.93	0.2
14	1996	3	635	29	3	3183	445	3	1.24	0	2	613	24	2	2500	566	2	1.08	0.1
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	3	617	78	3	3010	1260	3	1.22	0.1	-	-	-	-	-	-	-	-	-
17	1993	0	-	-	0	-	-	0	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 2.6-13. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Eagle Nest Lake											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	1.1	-	-	6	6.7	-	-	89	7	7.9
Northern Pike	-	-	-	-	1	2.9	1	2.9	34	2	5.9
Lake Whitefish	-	-	-	-	-	-	-	-	12	-	-
Sauger	-	-	-	-	1	1.5	-	-	66	1	1.5
Walleye	1	1.0	-	-	-	-	-	-	103	1	1.0
Pointe du Bois											
Lake Sturgeon	1	16.7	-	-	-	-	-	-	6	1	16.7
White Sucker	1	0.6	-	-	3	1.9	-	-	160	4	2.5
Northern Pike	-	-	-	-	-	-	-	-	18	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	4	-	-
Sauger	-	-	-	-	1	2.1	-	-	48	1	2.1
Walleye	-	-	-	-	-	-	-	-	45	-	-
Lac du Bonnet											
Lake Sturgeon	-	-	-	-	-	-	-	-	1	-	-
White Sucker	-	-	-	-	1	2.9	-	-	35	1	2.9
Northern Pike	-	-	-	-	1	2.6	-	-	38	1	2.6
Lake Whitefish	-	-	-	-	-	-	-	-	16	-	-
Sauger	-	-	-	-	-	-	-	-	65	-	-
Walleye	-	-	-	-	-	-	1	1.9	52	1	1.9
Manigotagan Lake											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker			-	-	-	-	-	-	11	-	-
Northern Pike	-	-	-	-	-	-	-	-	11	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	32	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	125	-	-

n = number of inspected fish with DELTs
$n_{Inspect}$ = total number of fish inspected for DELTs
n_{DELTs} = total number of fish with DELTs
% = percentage of inspected fish with DELTs ($n/n_{Inspect} \times 100$)
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect} \times 100$)

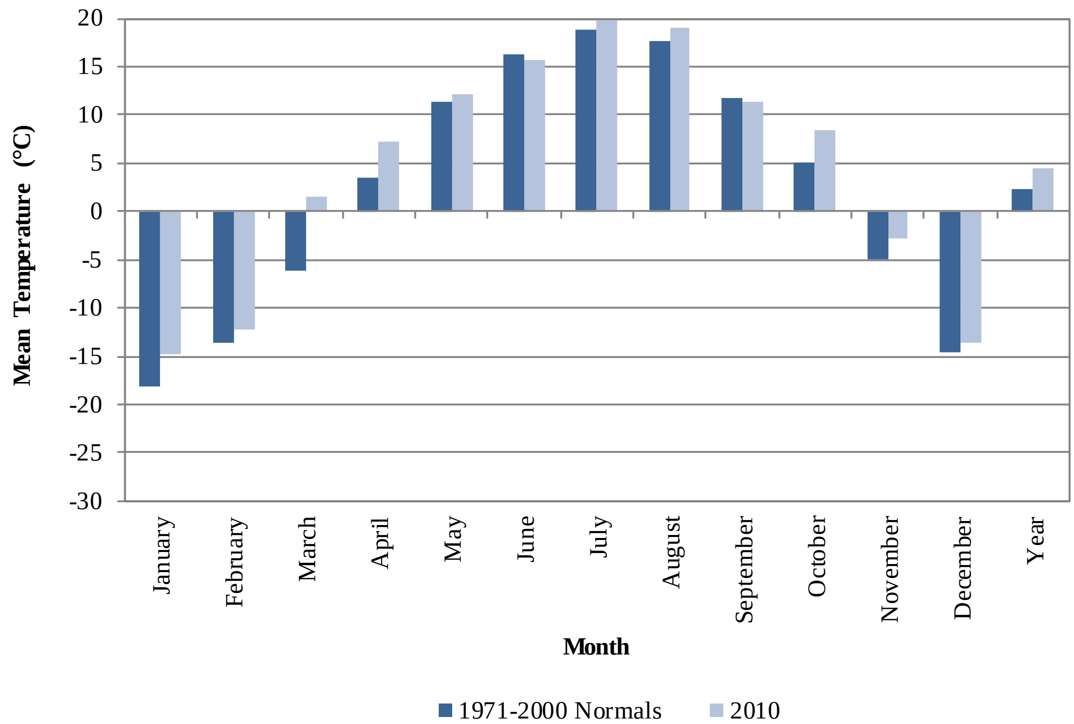
Table 2.7-1. Mean arithmetic (± standard error, SE) and standardized (95% confidence limits, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, and Walleye from the Pointe du Bois Forebay and Manigotagan Lake in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Pointe du Bois	Northern Pike	17	0.509	0.078	0.559	0.527 - 0.663
	Walleye	36	0.651	0.075	0.648	0.585 - 0.718
	Lake Whitefish	4	0.096	0.045	0.053	0.028 - 0.101
Manigotagan L	Northern Pike	11	1.178	0.121	1.012	0.799 - 1.282
	Walleye	53	0.396	0.038	0.429	0.386 - 0.477
	Lake Whitefish	0	-	-	-	-

Table 2.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from the Pointe du Bois Forebay and Manigotagan Lake in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Pointe du Bois	Lake Whitefish	4	403.0 ± 54.4	1096.3 ± 441.4	1.46 ± 0.06	6.5 ± 2.8
	Northern Pike	17	490.4 ± 33.5	969.8 ± 292.2	0.62 ± 0.02	4.7 ± 0.4
	Walleye	36	374.8 ± 27.2	891.2 ± 167.6	1.03 ± 0.02	10.7 ± 1.1
Manigotagan L	Lake Whitefish	0	-	-	-	-
	Northern Pike	11	583.3 ± 24.1	1270.9 ± 259.9	0.58 ± 0.04	6.4 ± 0.5
	Walleye	53	351.2 ± 15.5	581.5 ± 69.7	1.05 ± 0.01	5.2 ± 0.4

(A)



(B)

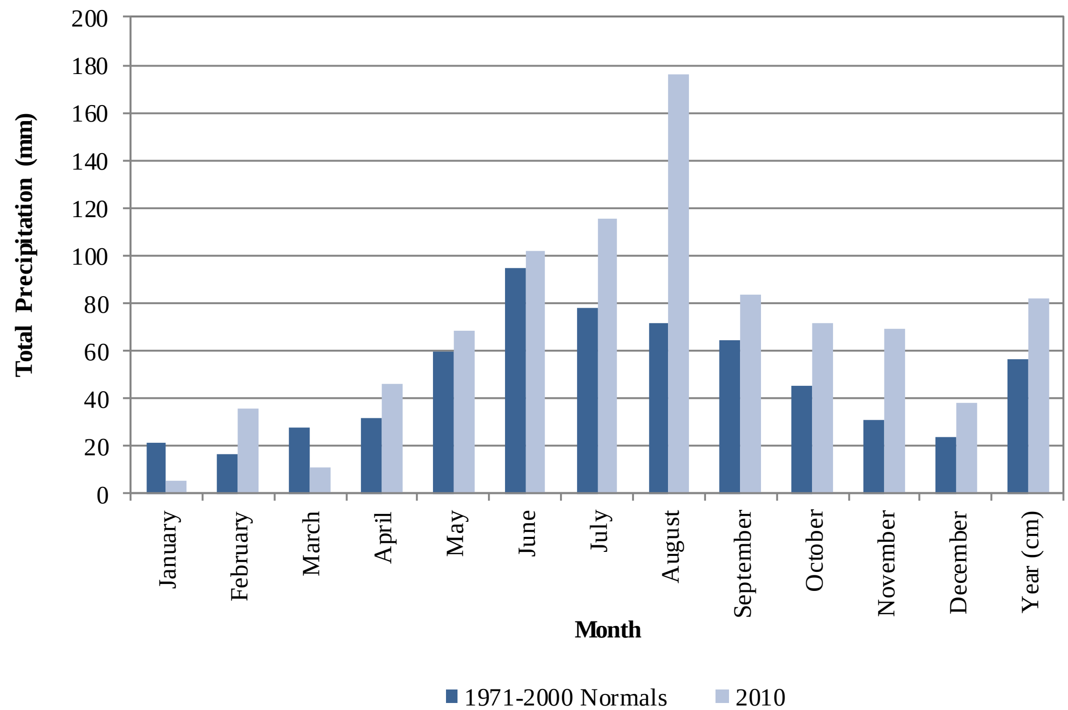


Figure 2.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Pinawa, MB.

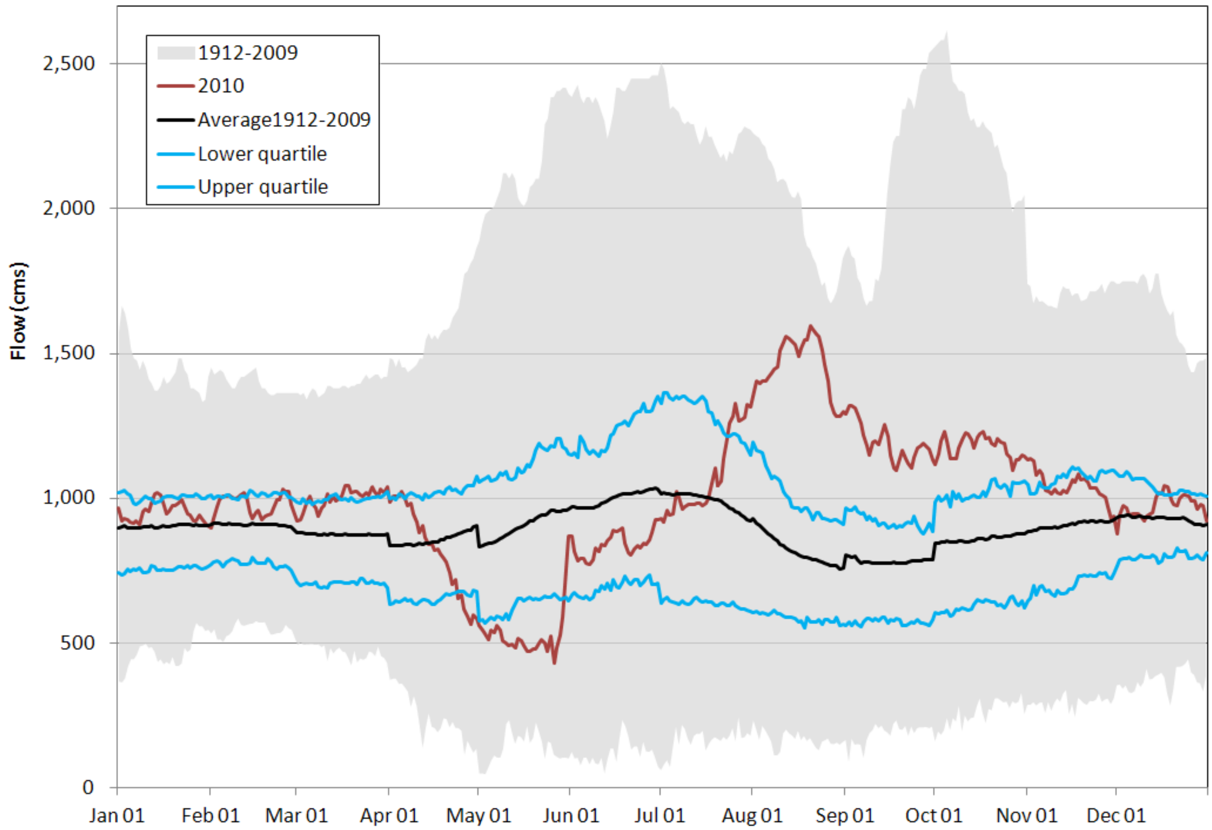


Figure 2.2-1. Flow of the Winnipeg River at Slave Falls Generating Station in 2010.

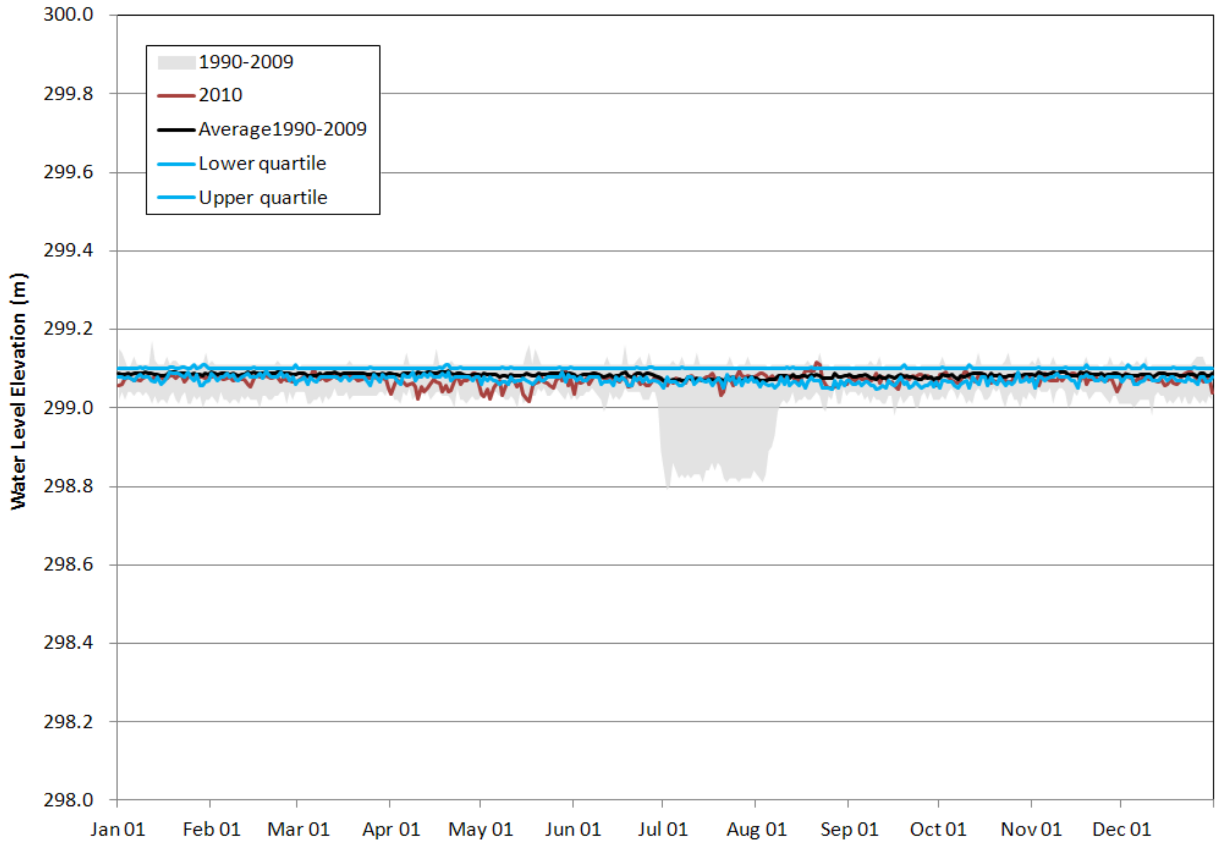


Figure 2.2-2. Water level elevation of the Pointe du Bois Outer Forebay in 2010 .

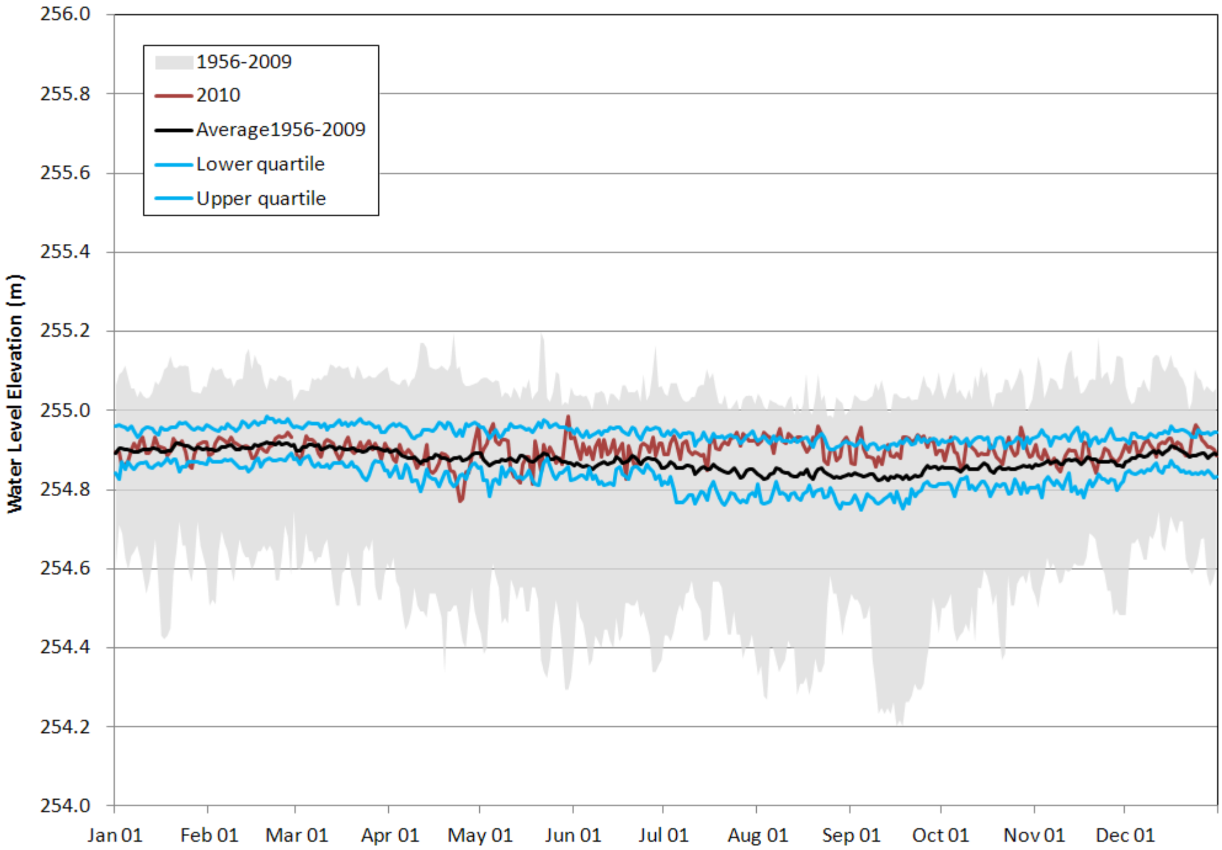


Figure 2.2-3. Water level elevation of Lac du Bonnet (06PF062) in 2010.

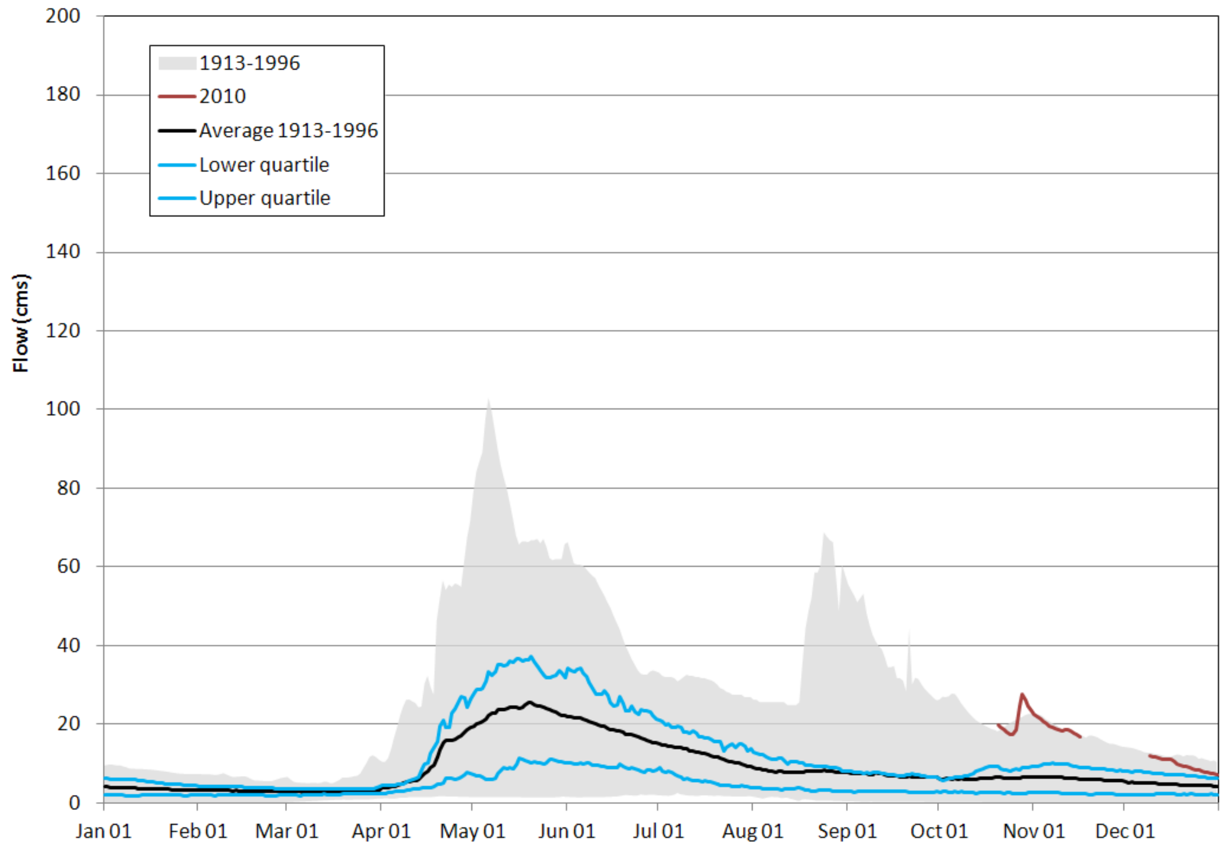


Figure 2.2-4. Flow of the Manigotagan River in 2010.

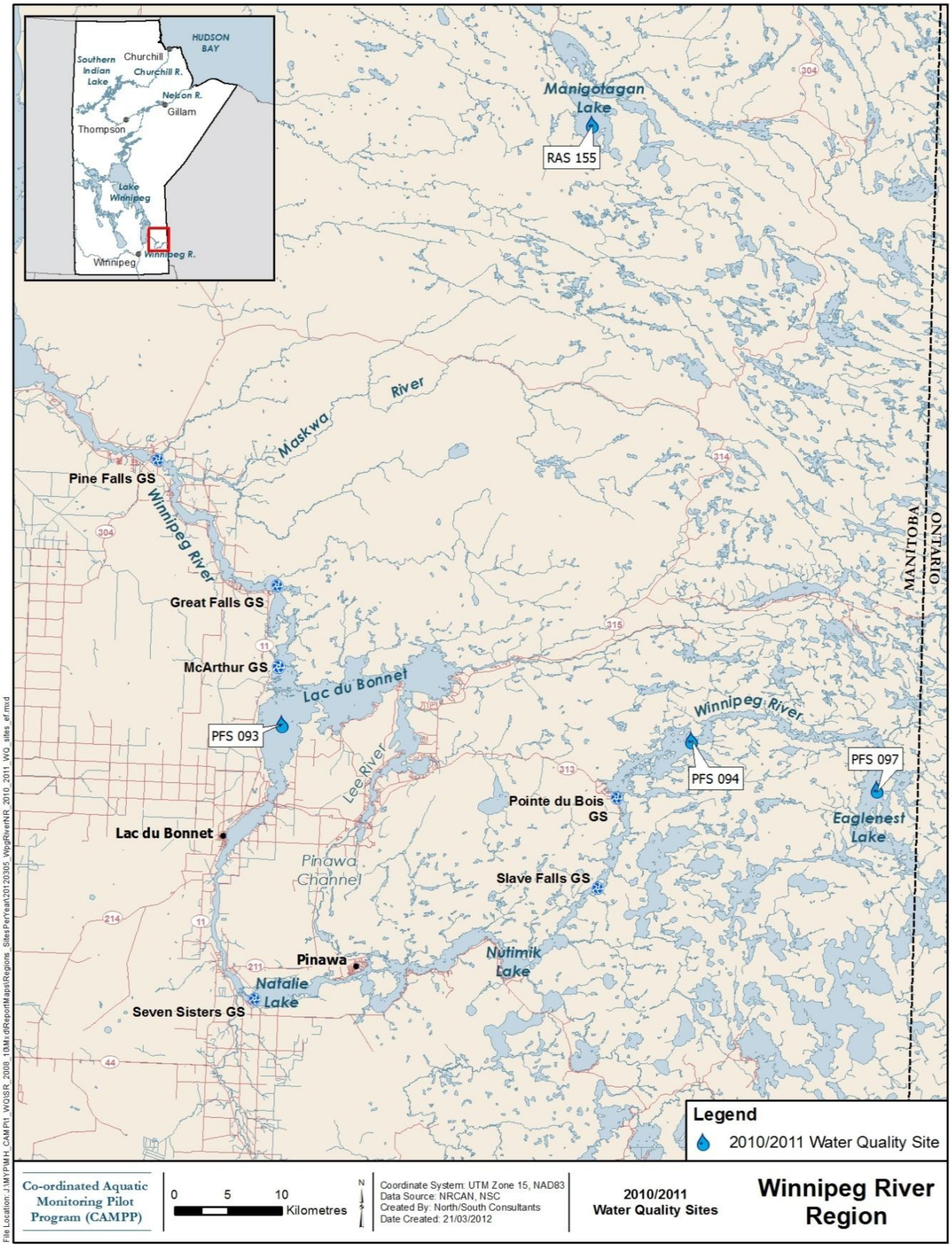


Figure 2.3-1. Water quality and phytoplankton monitoring sites in the Winnipeg River Region: 2010/2011.

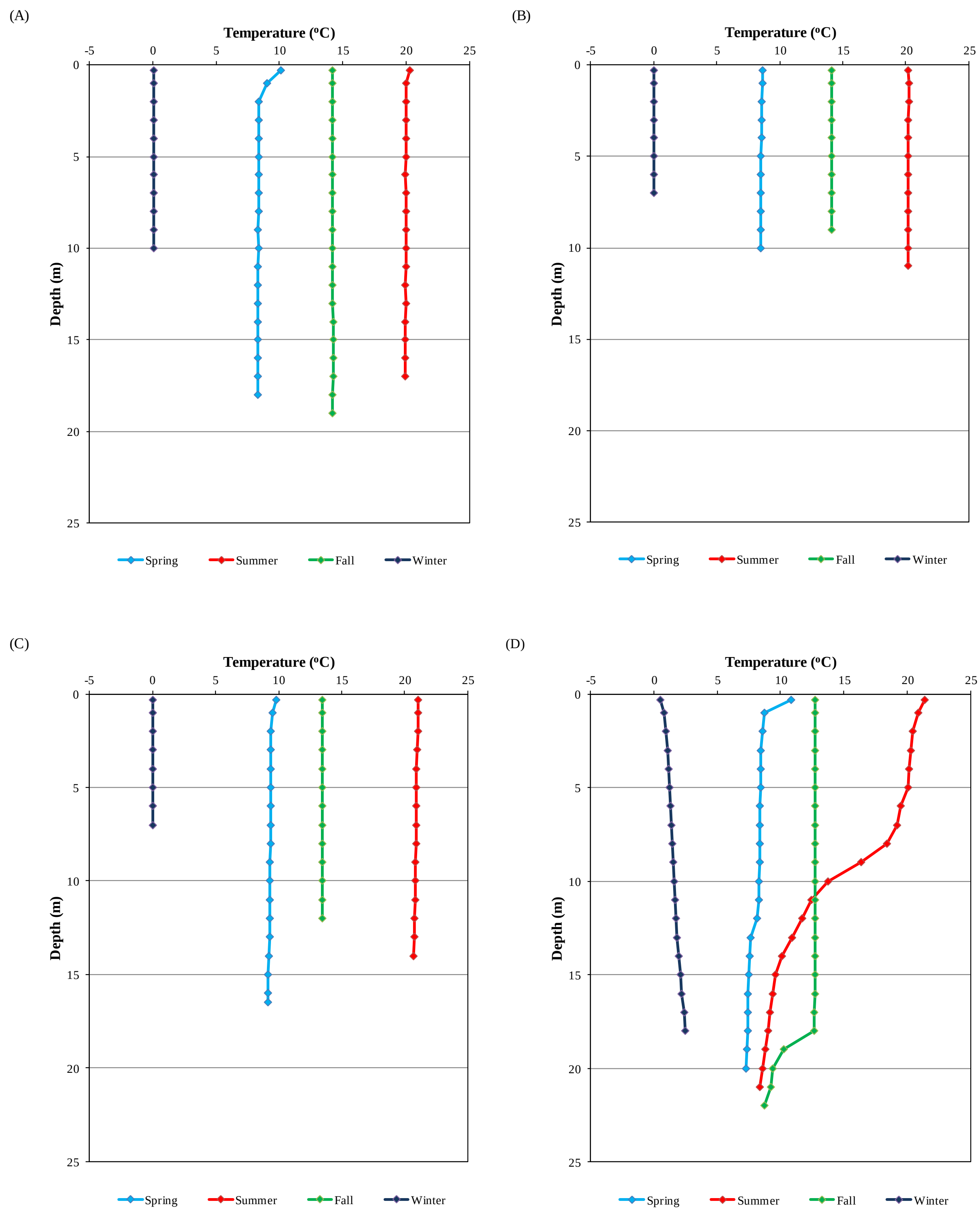


Figure 2.3-2. Water temperature profiles measured in the Winnipeg River Region in 2010/2011: (A) Eaglenest Lake; (B) Pointe du Bois Forebay; (C) Lac du Bonnet; and (D) Manigotagan Lake.

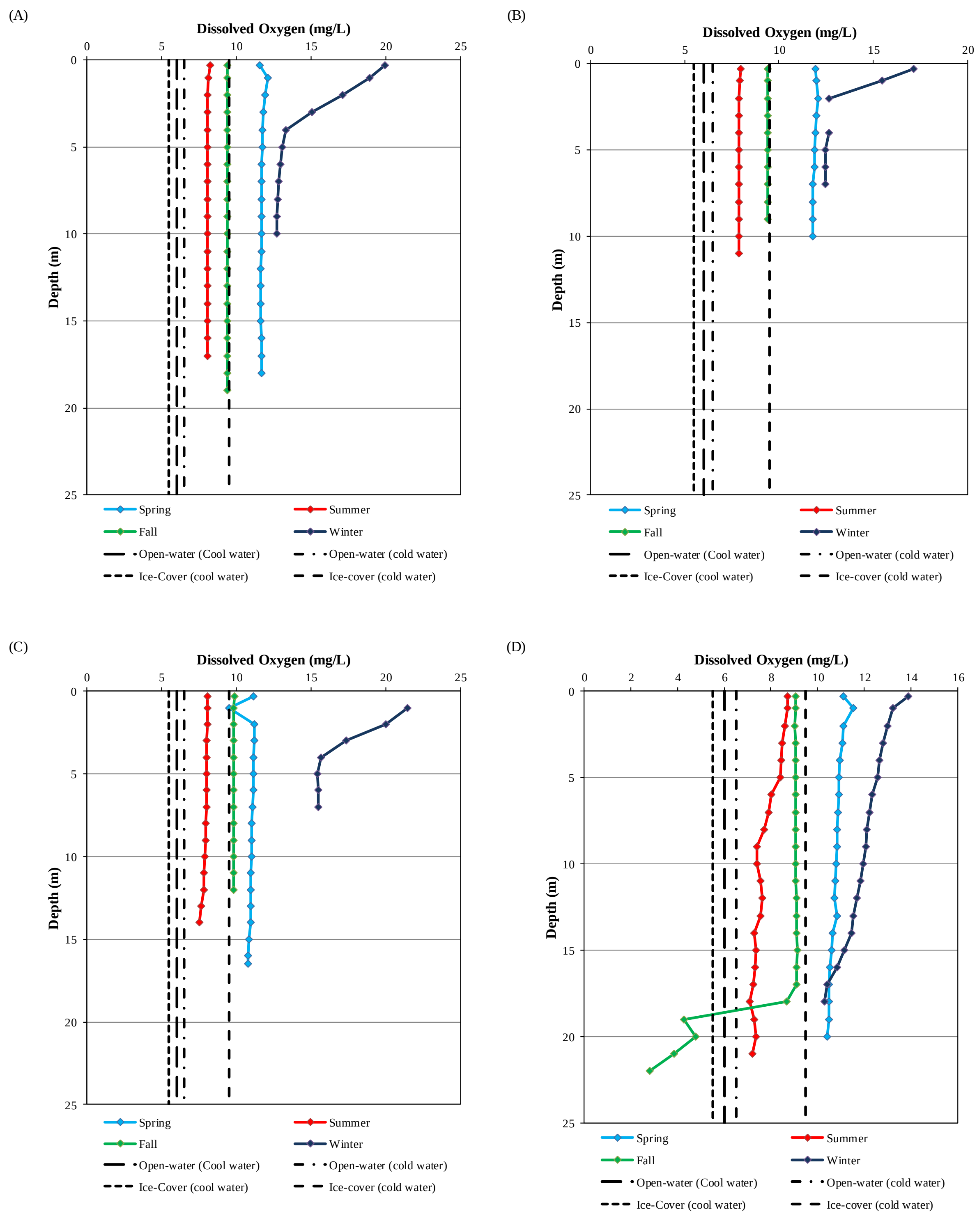


Figure 2.3-3. Dissolved oxygen depth profiles measured in the Winnipeg River Region in 2010/2011: (A) Eaglenest Lake; (B) Pointe du Bois Forebay; (C) Lac du Bonnet; and (D) Manigotagan Lake. Dashed lines represent selected MWQSOGs for PAL.

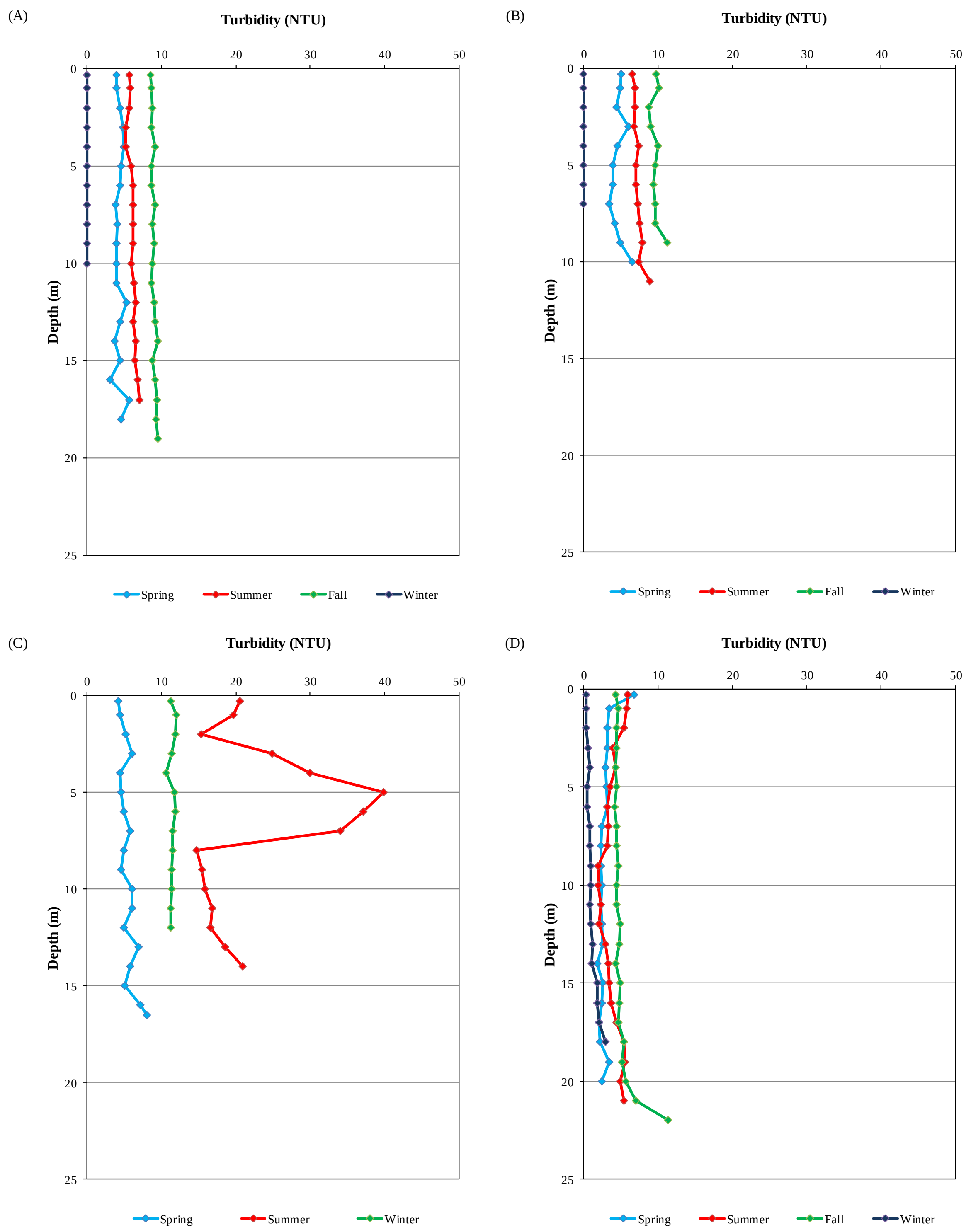


Figure 2.3-4. Turbidity profiles measured in the Winnipeg River Region in 2010/2011: (A) Eaglenest Lake; (B) Pointe du Bois Forebay; (C) Lac du Bonnet; and (D) Manigotagan Lake. The turbidity probe malfunction during winter sampling at Lac du Bonnet.

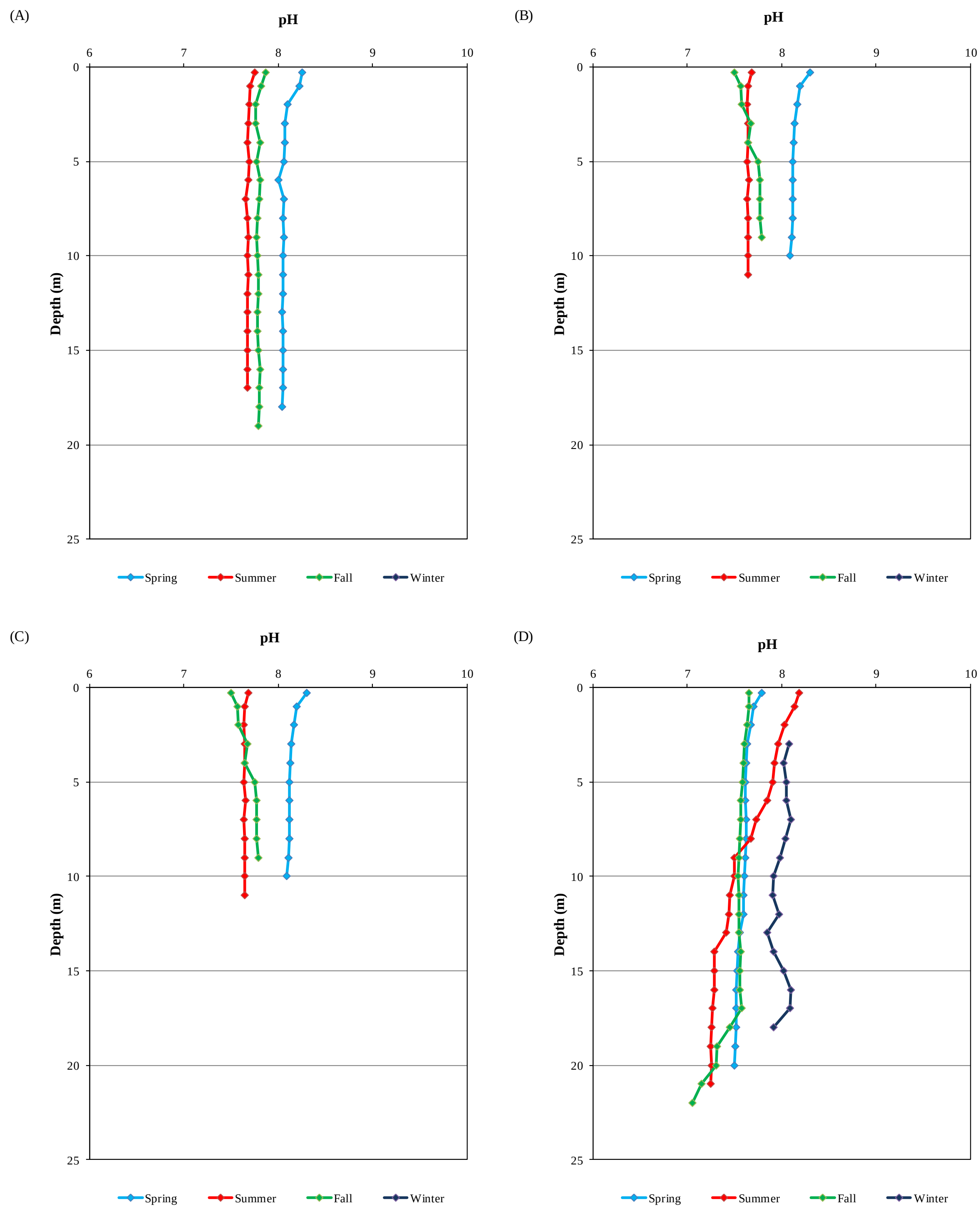


Figure 2.3-5. pH profiles measured in the Winnipeg River Region in 2010/2011: (A) Eaglenest Lake; (B) Pointe du Bois Forebay; (C) Lac du Bonnet; and (D) Manigotagan Lake. The pH probe was malfunctioning at Eaglenest Lake, Pointe du Bois, and Lac du Bonnet in winter.

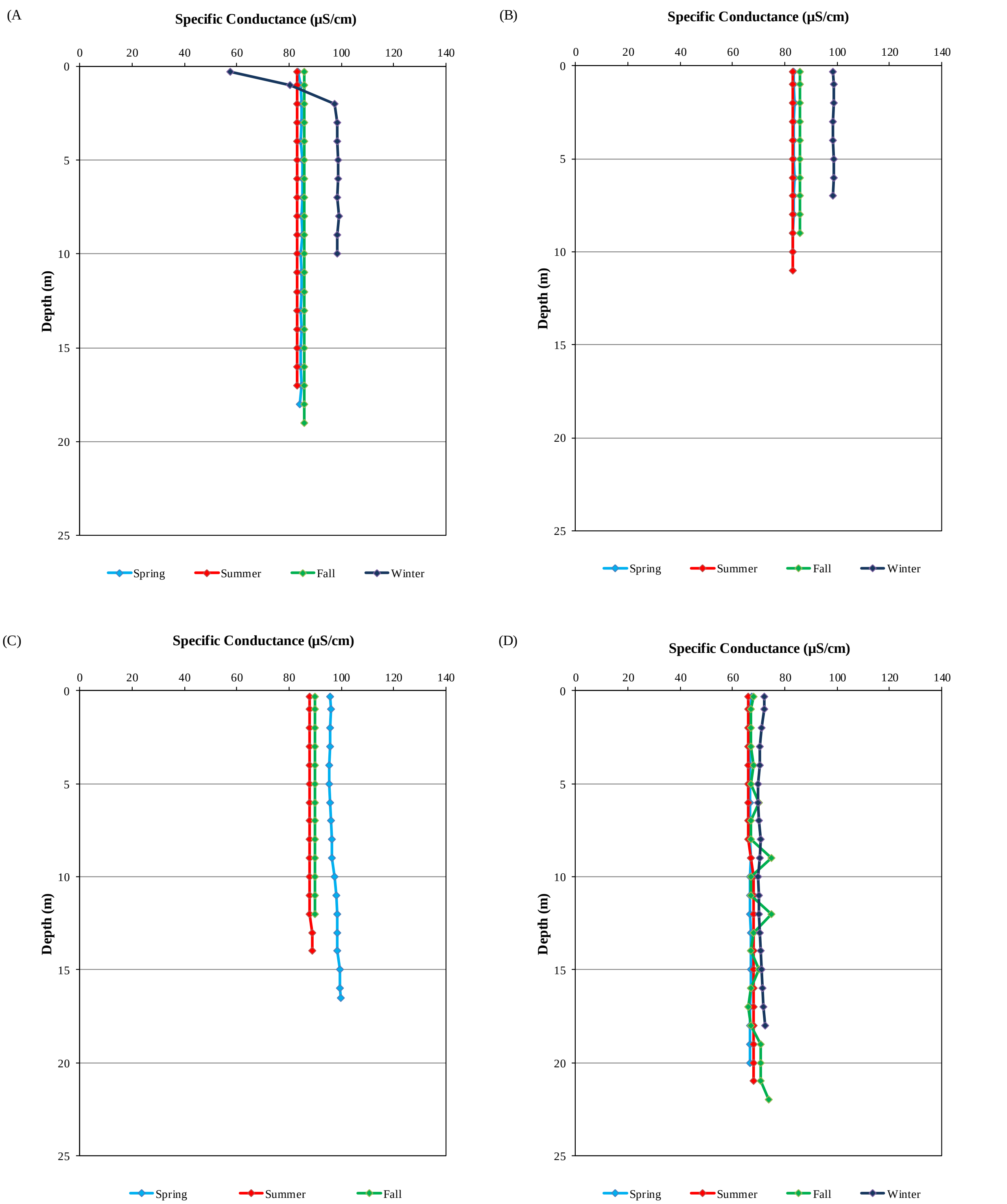


Figure 2.3-6. Specific conductance depth profiles measured in the Winnipeg River Region in 2010/2011: (A) Eaglenest Lake; (B) Pointe du Bois Forebay; (C) Lac du Bonnet; and (D) Manigotagan Lake. The probe for specific conductance malfunctioned during winter sampling at Lac du Bonnet.

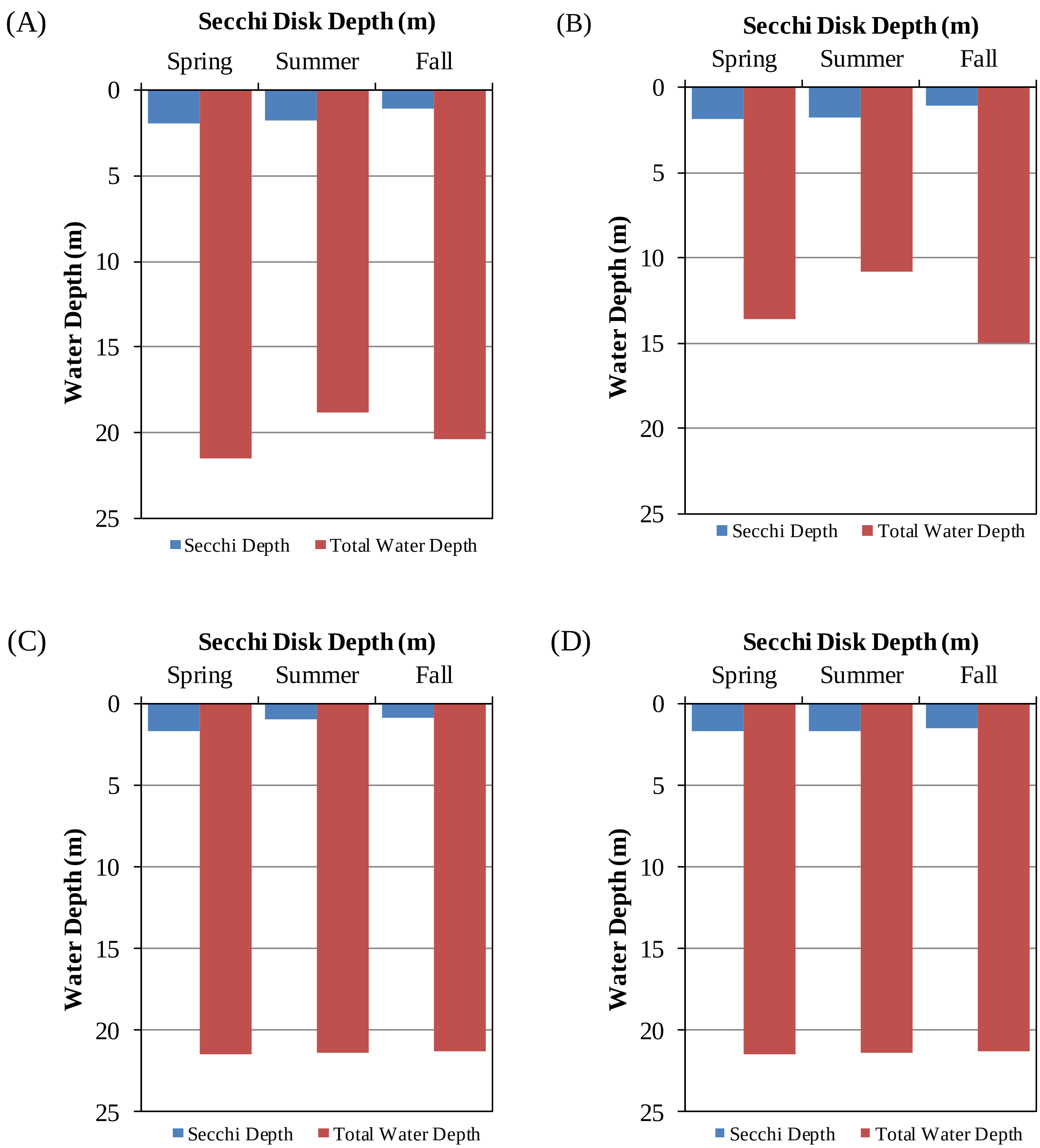


Figure 2.3-7. Secchi disk depths measured in the Winnipeg River Region in 2010/2011: (A) Eaglenest Lake; (B) Pointe du Bois Forebay; (C) Lac du Bonnet; and (D) Manigotagan Lake.

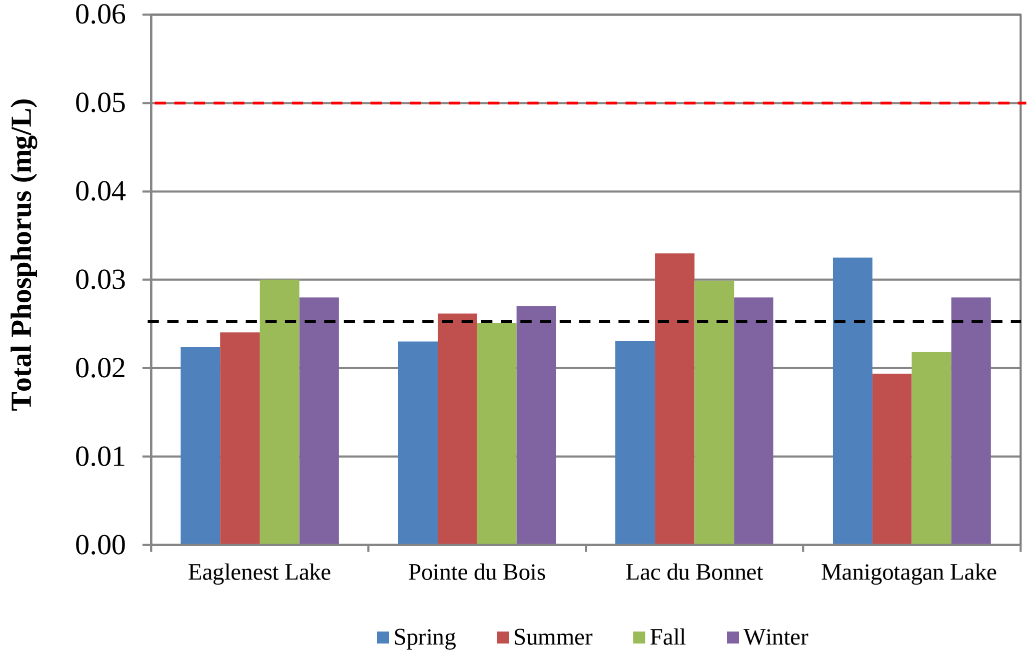


Figure 2.3-8. Total phosphorus measured in surface grabs in the Winnipeg River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

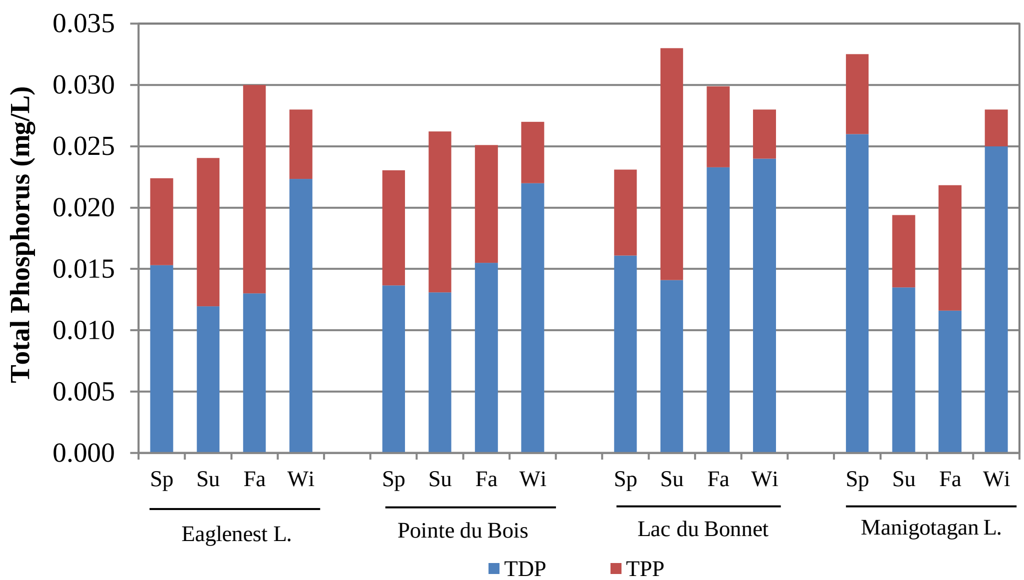


Figure 2.3-9. Particulate (TPP) and dissolved phosphorus (TDP) fractions measured in the Winnipeg River Region: 2010/2011.

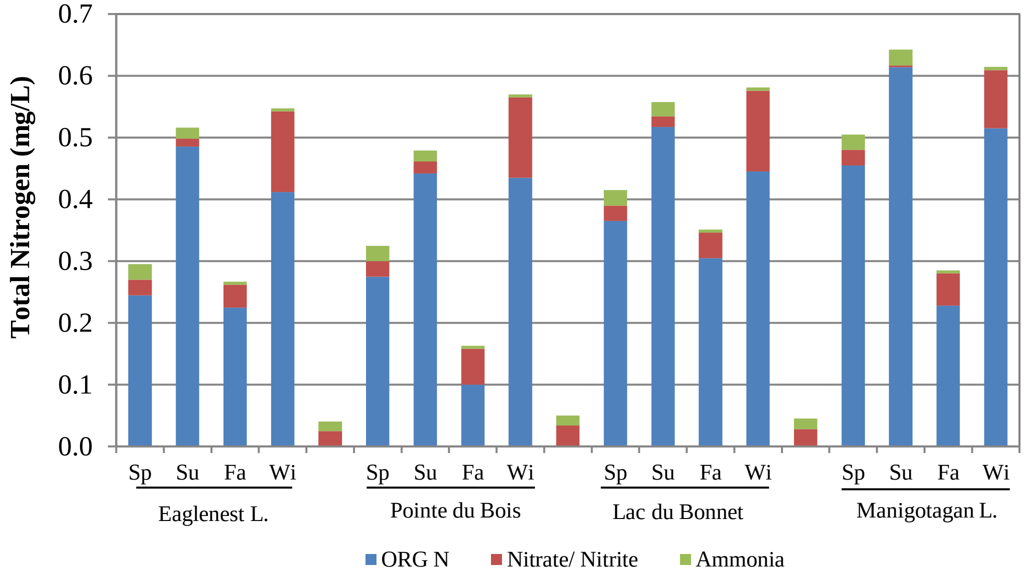


Figure 2.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Winnipeg River Region: 2010/2011.

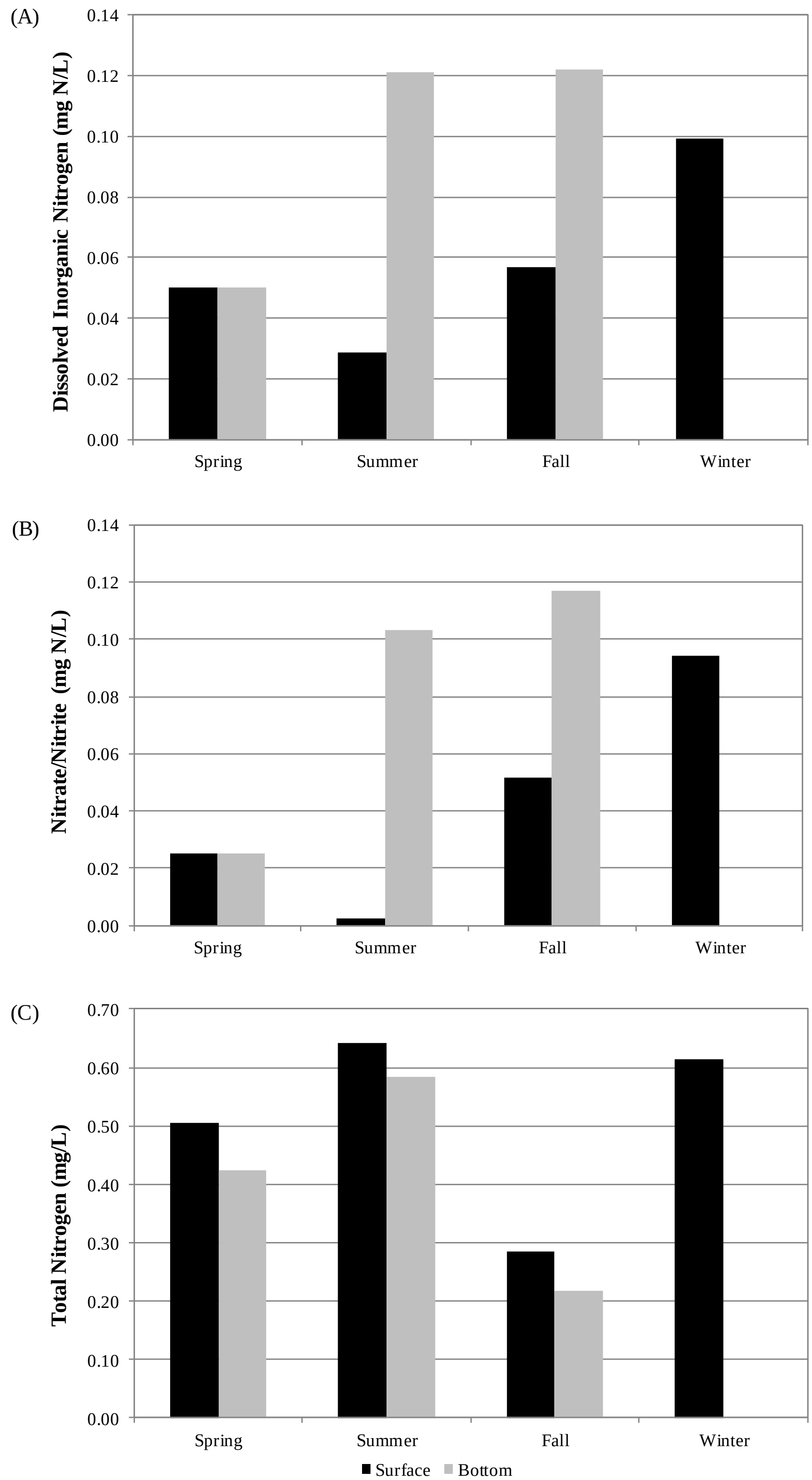


Figure 2.3-11. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Manigotagan Lake, 2010/2011.

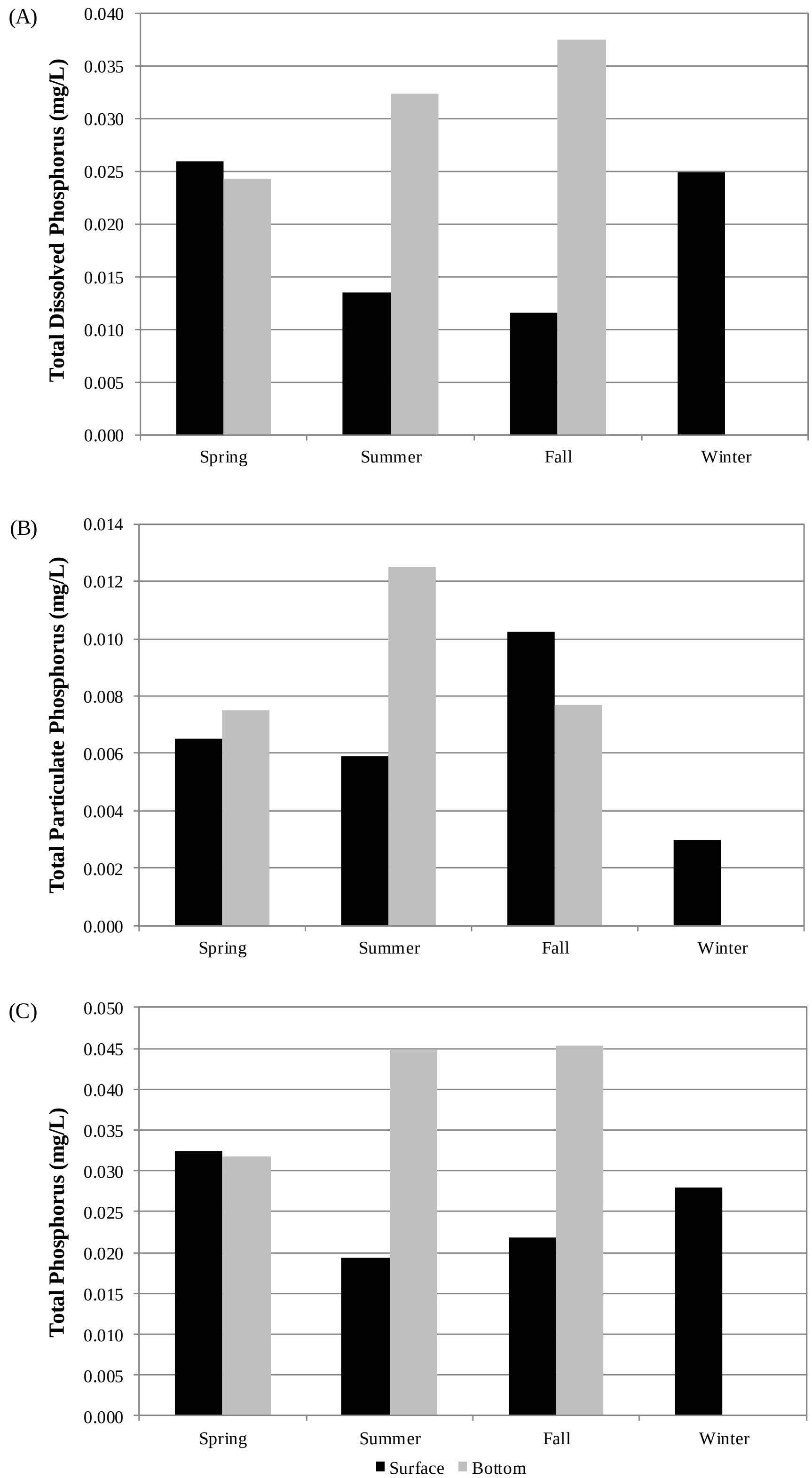


Figure 2.3-12. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Manigotagan Lake, 2010/2011.

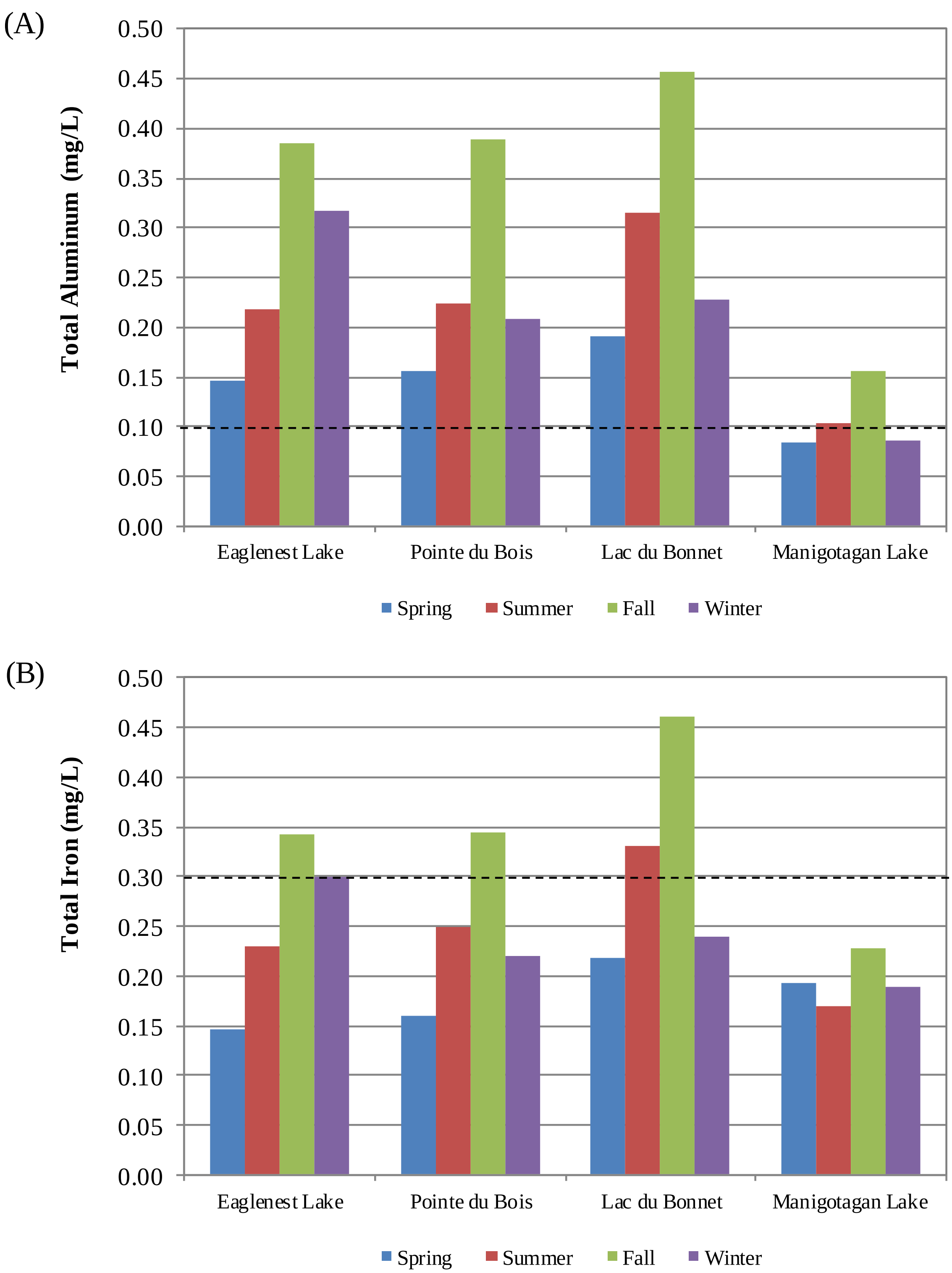


Figure 2.3-13. Total aluminum (A) and total iron (B) measured in surface grabs in the Winnipeg River Region, by sampling period and site: 2010/2011. The black dashed lines indicate the MWQSOGs for PAL for aluminum and iron.

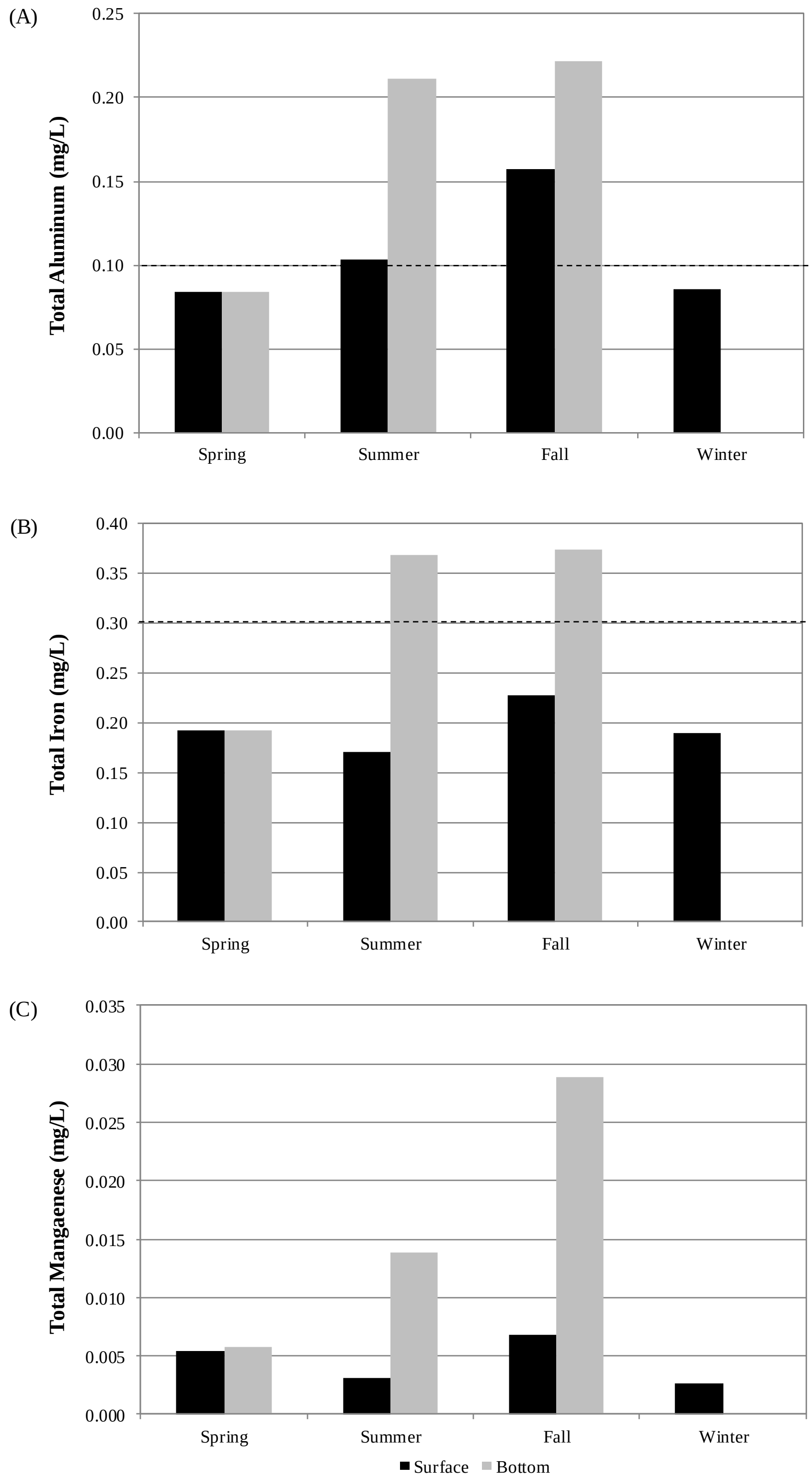


Figure 2.3-14. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Manigotagan Lake, 2010/2011. The black dashed linse indicate the MWQSOGs for PAL for aluminum and iron.

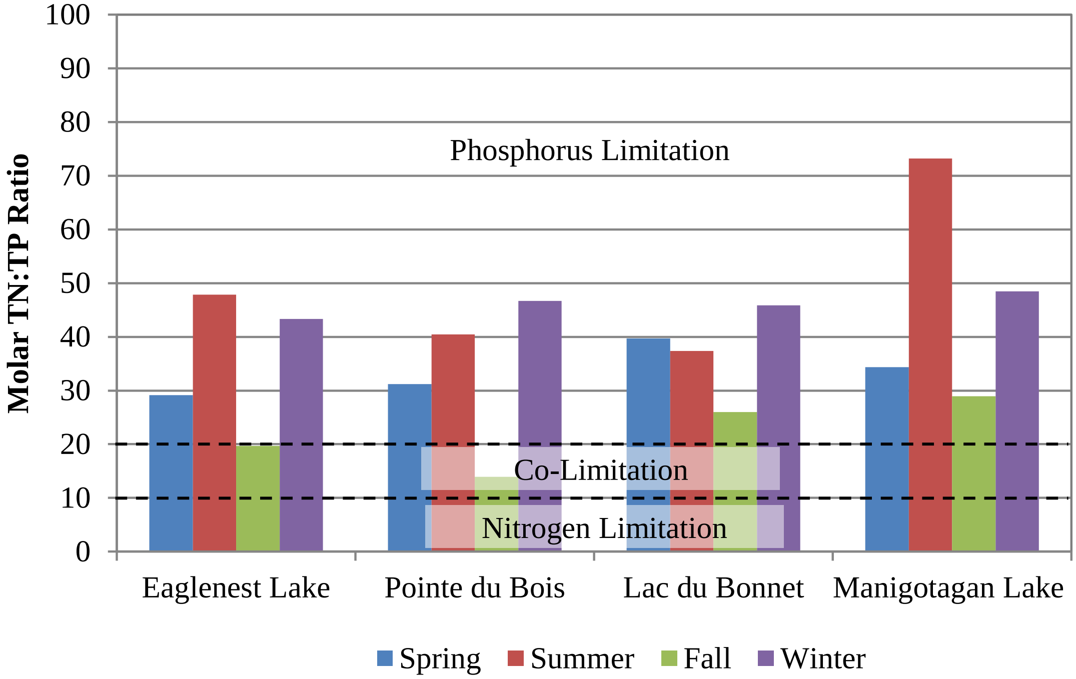


Figure 2.3-15. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Winnipeg River Region: 2010/2011.

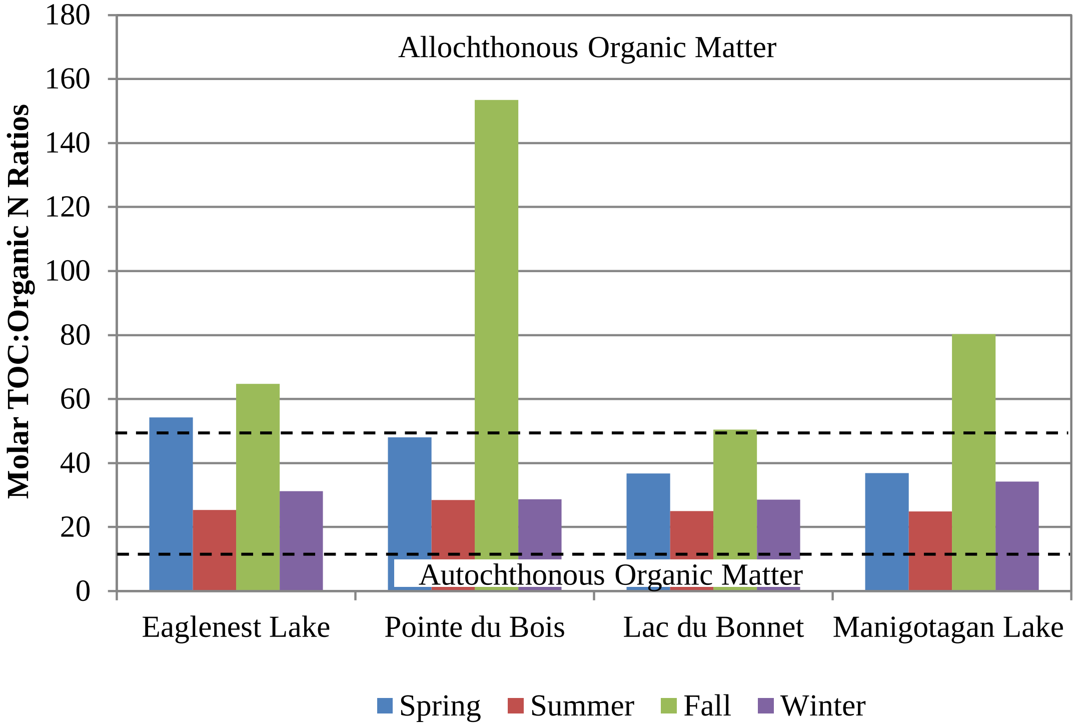


Figure 2.3-16. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Winnipeg River Region: 2010/2011.

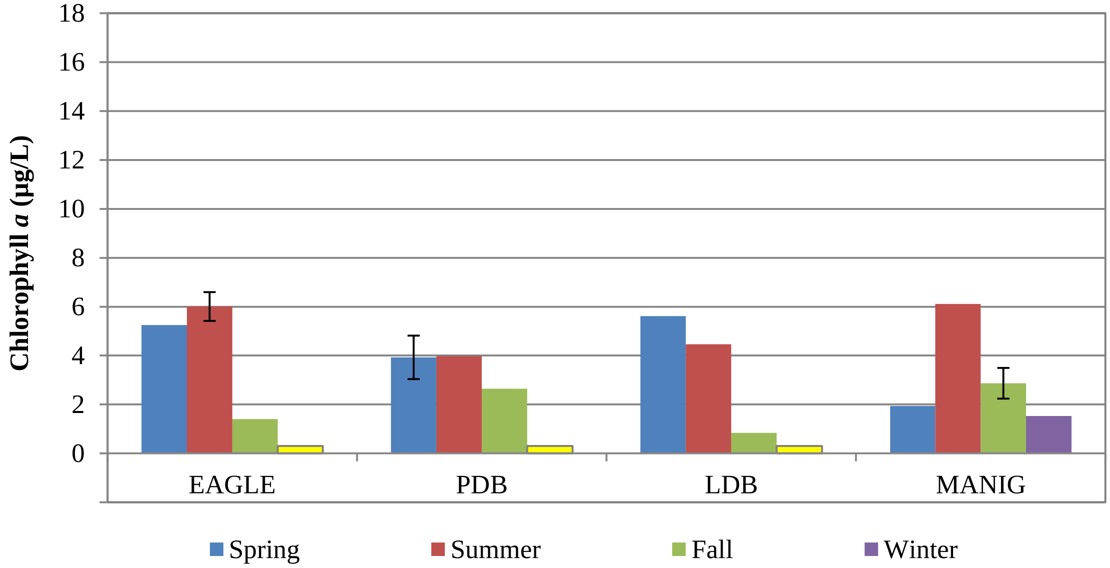


Figure 2.4-1. Chlorophyll *a* concentrations measured within the euphotic zone at sites in the Winnipeg River Region in 2010/2011. Yellow bars represent values that were below the analytical detection limit; error bars represent the standard error of triplicate samples.

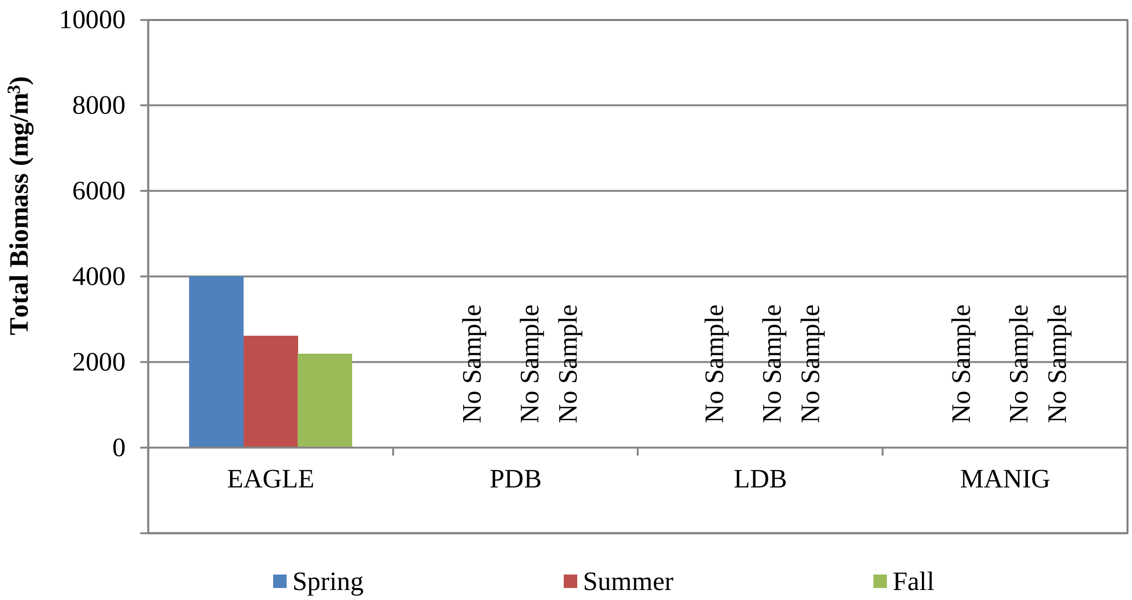


Figure 2.4-2. Phytoplankton biomass measured at sites in the Winnipeg River Region during the 2010/2011 open-water period.

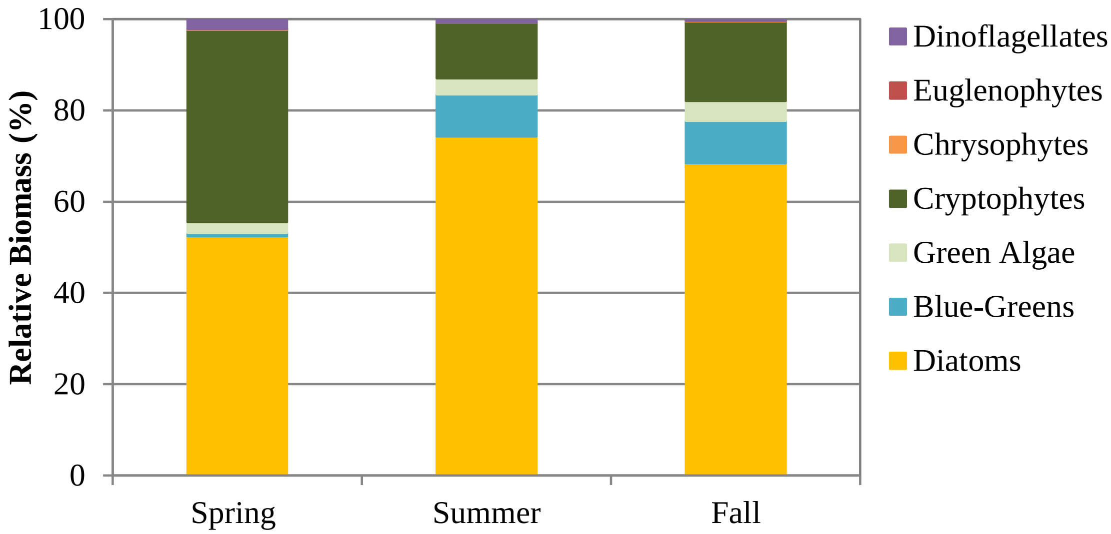


Figure 2.4-3. Phytoplankton community composition in Eaglenest Lake in 2010.

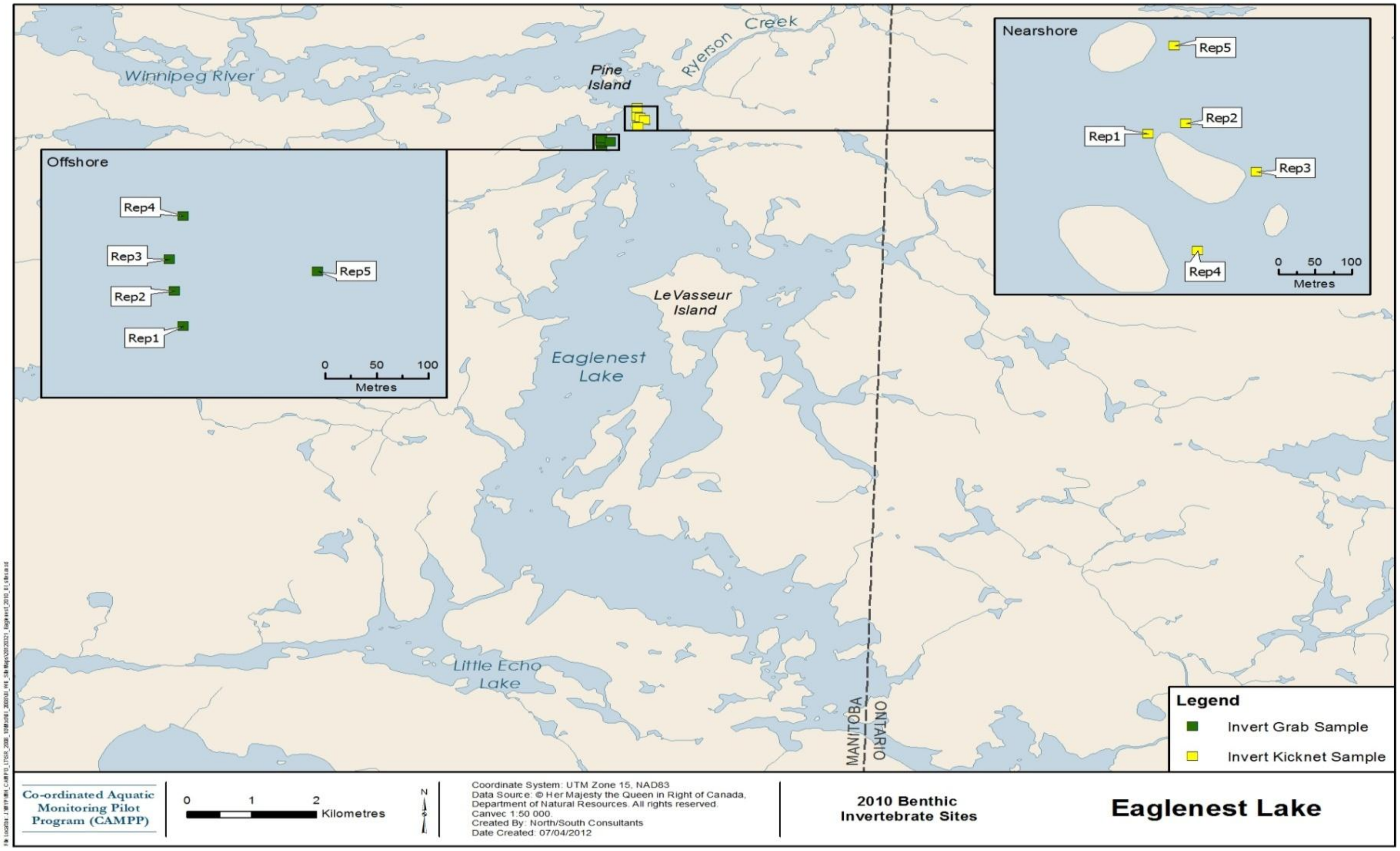


Figure 2.5-1 Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Eaglenest Lake in the Winnipeg River Region, 2010.

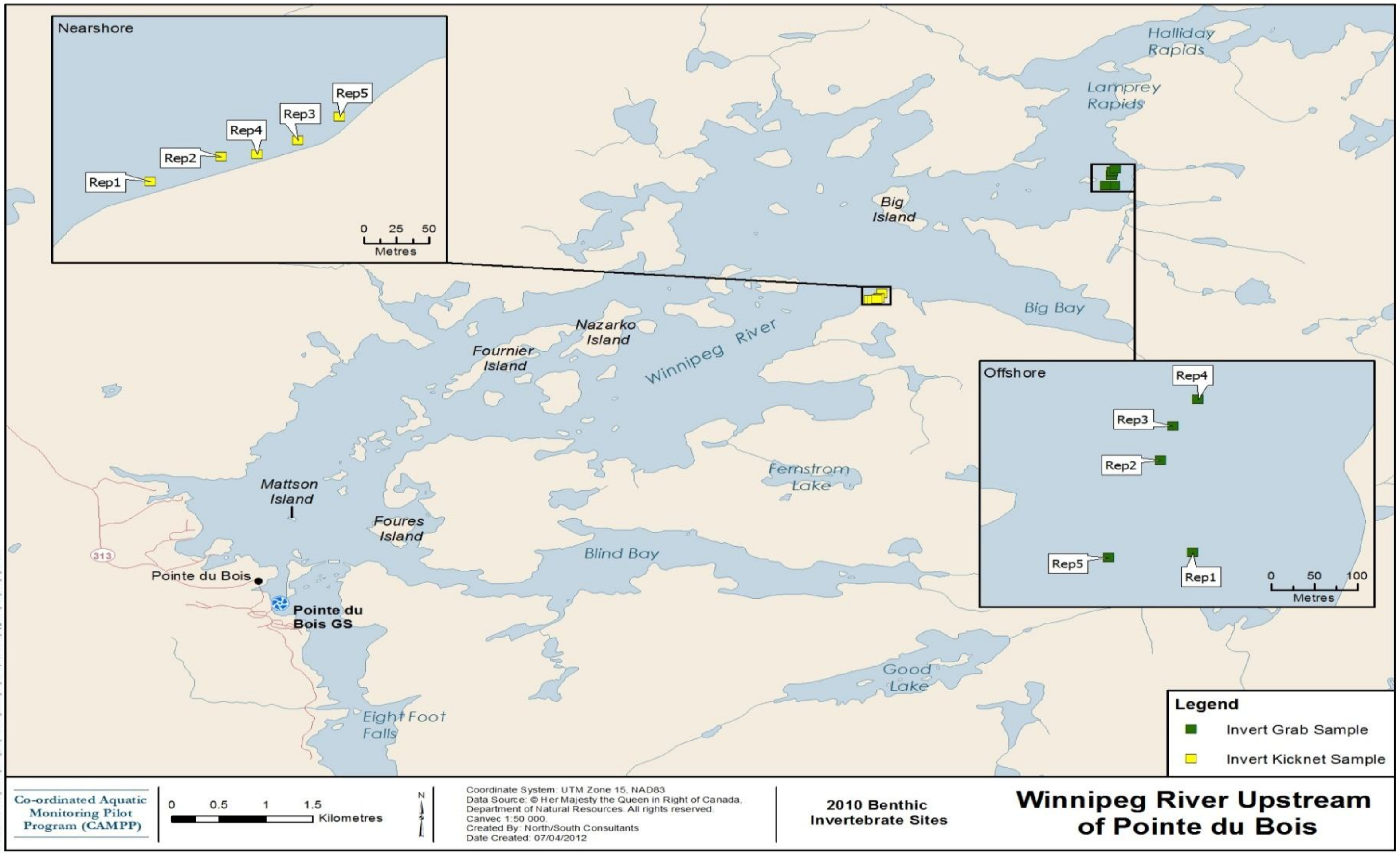


Figure 2.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Pointe du Bois Forebay in the Winnipeg River Region, 2010.

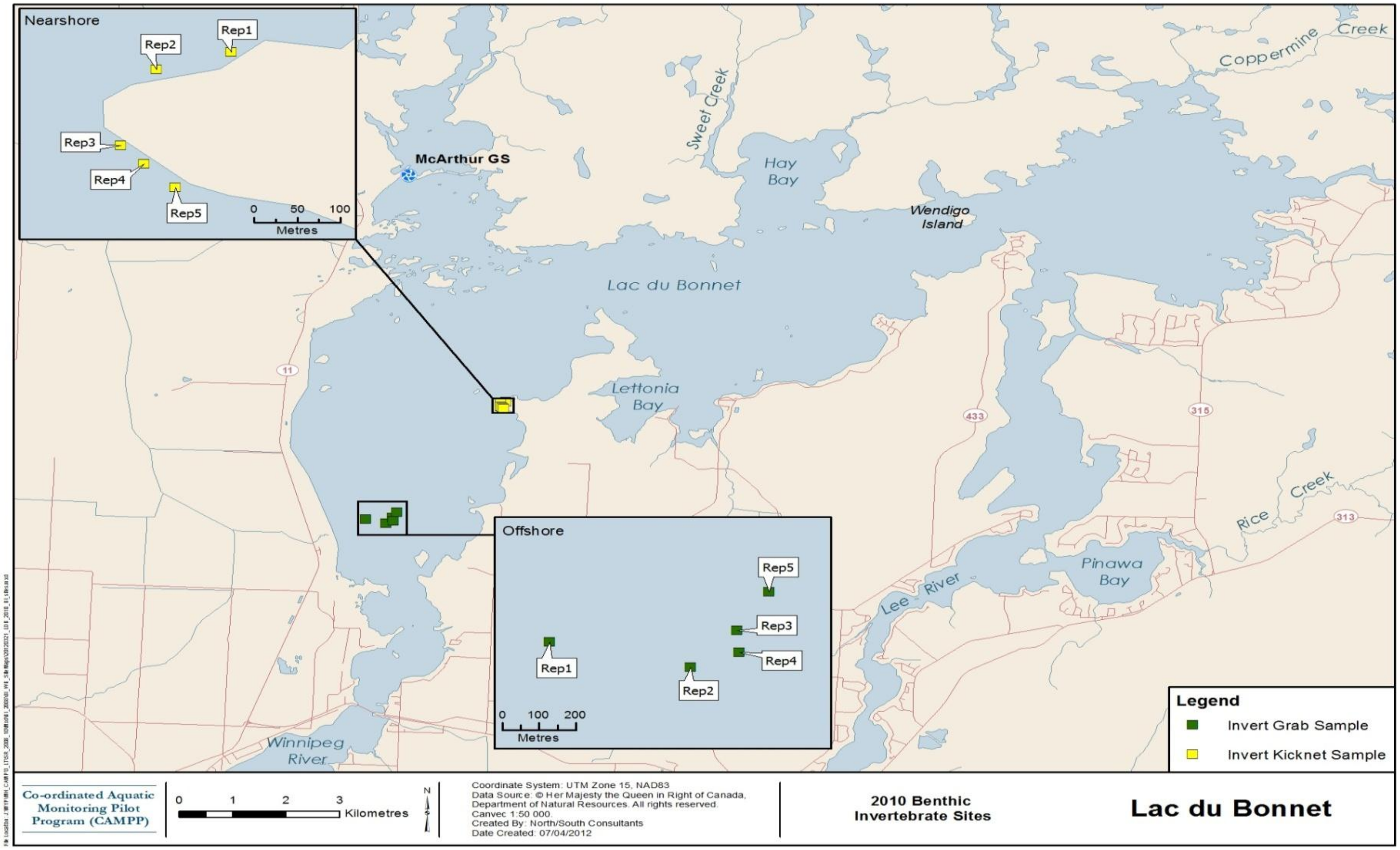


Figure 2.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Lac du Bonnet in the Winnipeg River Region, 2010.

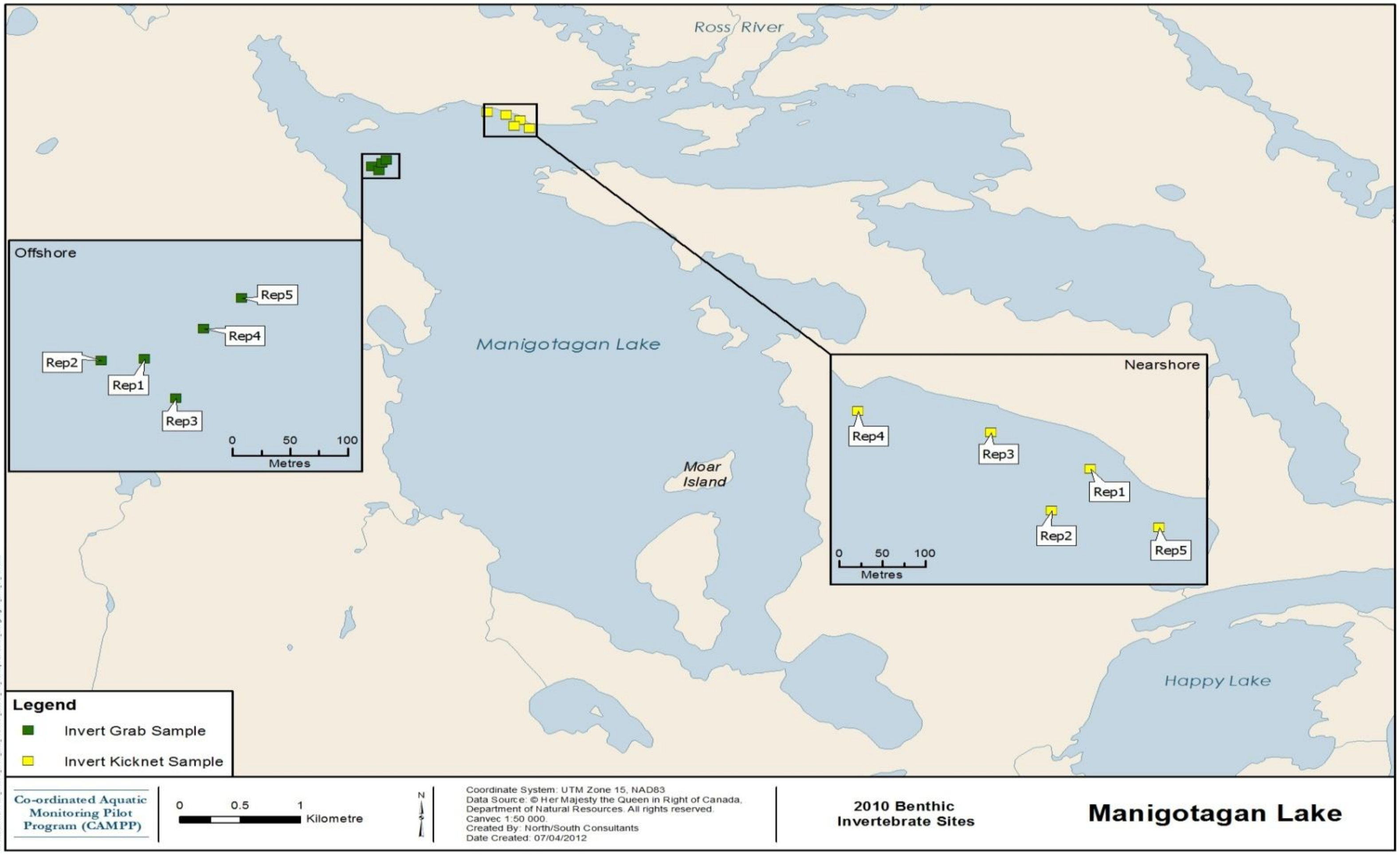


Figure 2.5-4. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Manigotagan Lake in the Winnipeg River Region, 2010.

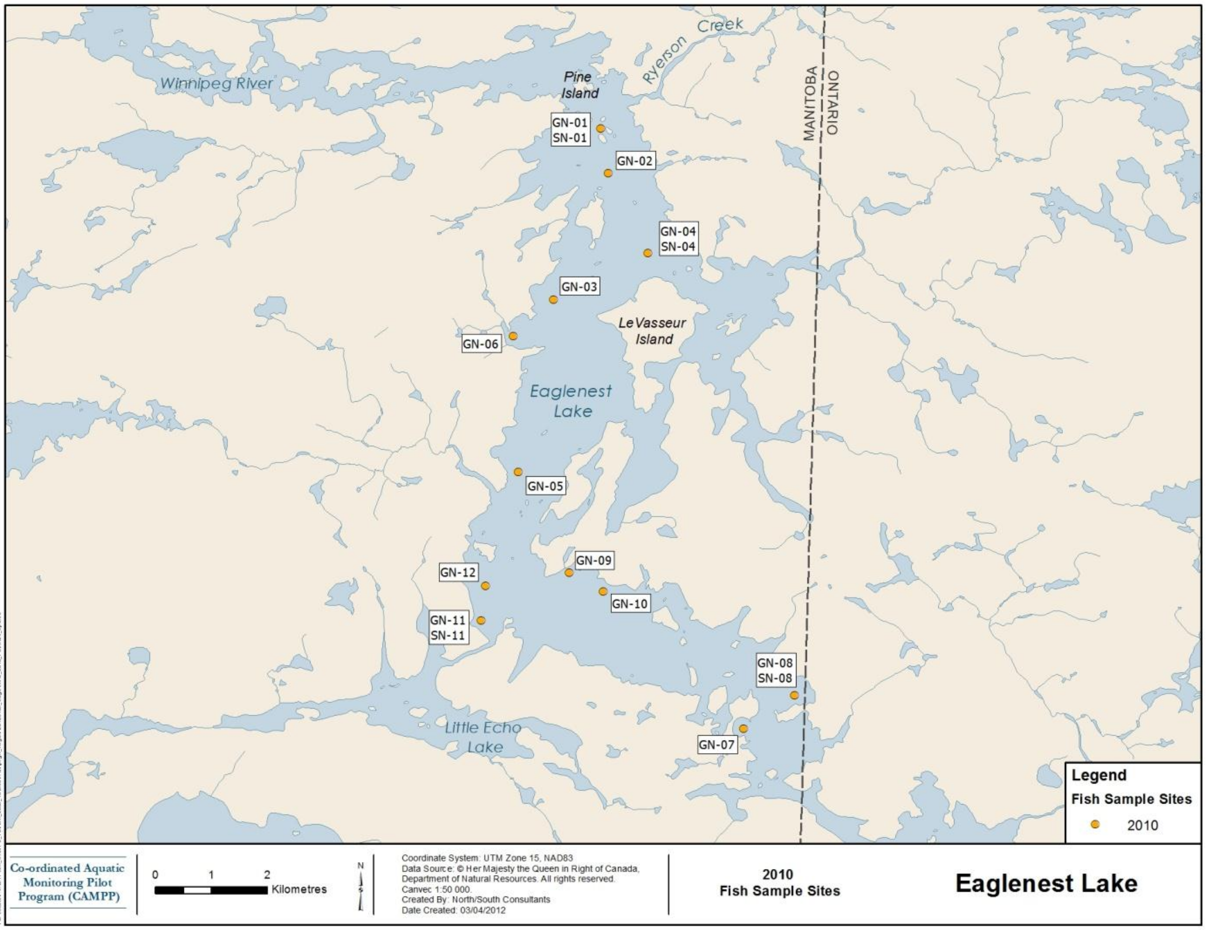


Figure 2.6-1. Map depicting standard gang (GN) and small mesh (SN) index gillnet sites sampled in Eaglenest Lake, 2010.

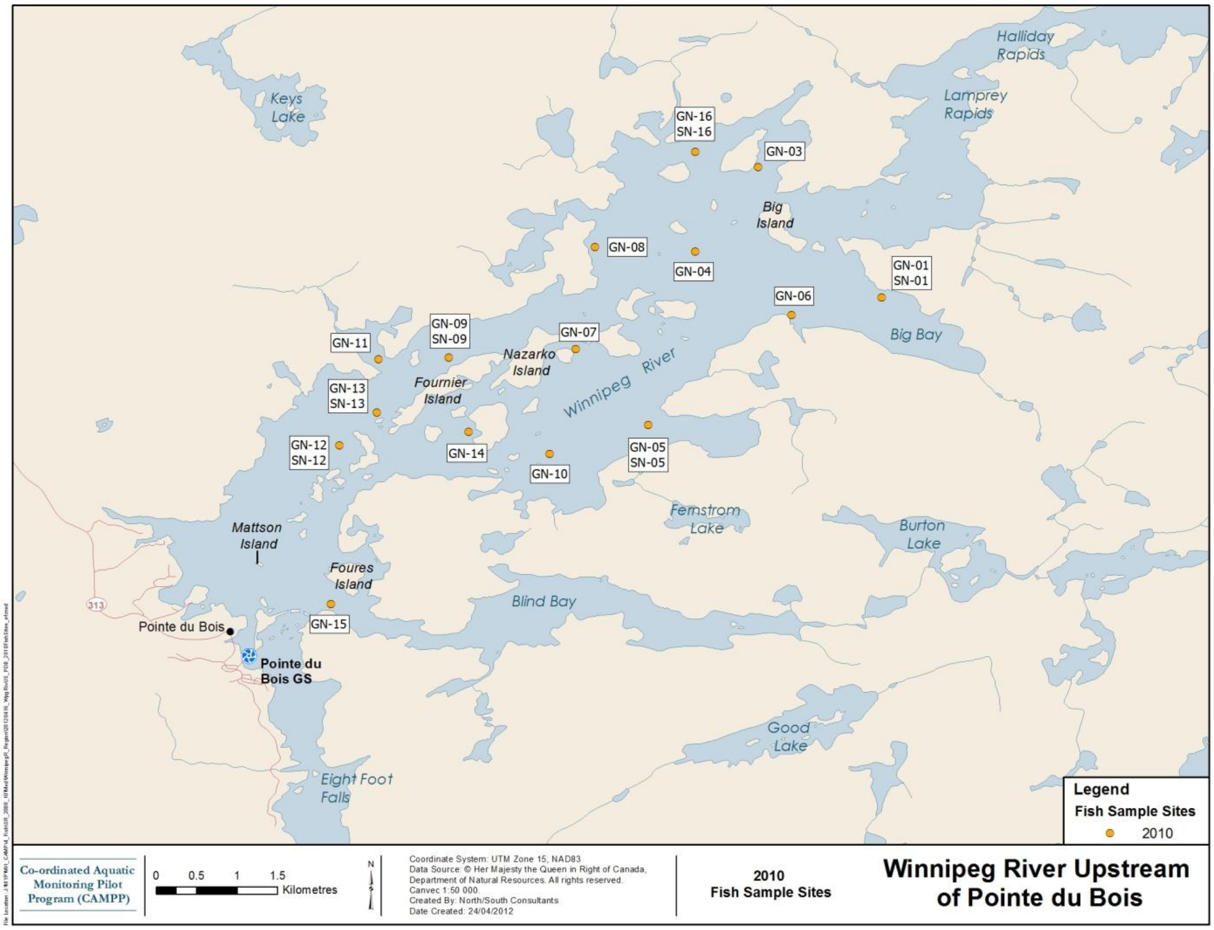


Figure 2.6-2. Map depicting standard gang (GN) and small mesh (SN) index gillnet sites sampled in Pointe du Bois Forebay, 2010.

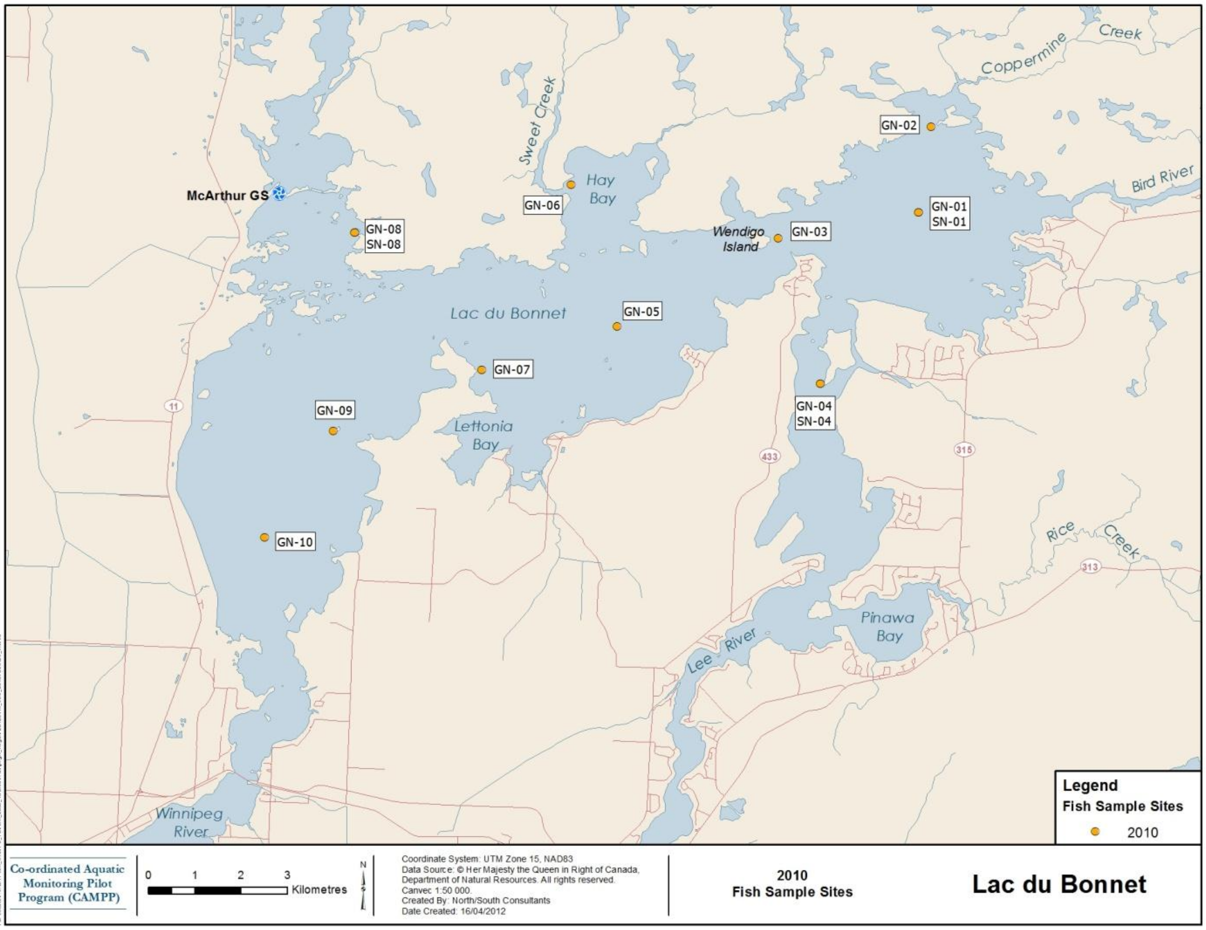


Figure 2.6-3. Map depicting standard gang (GN) and small mesh (SN) index gillnet sites sampled in Lac du Bonnet, 2010.

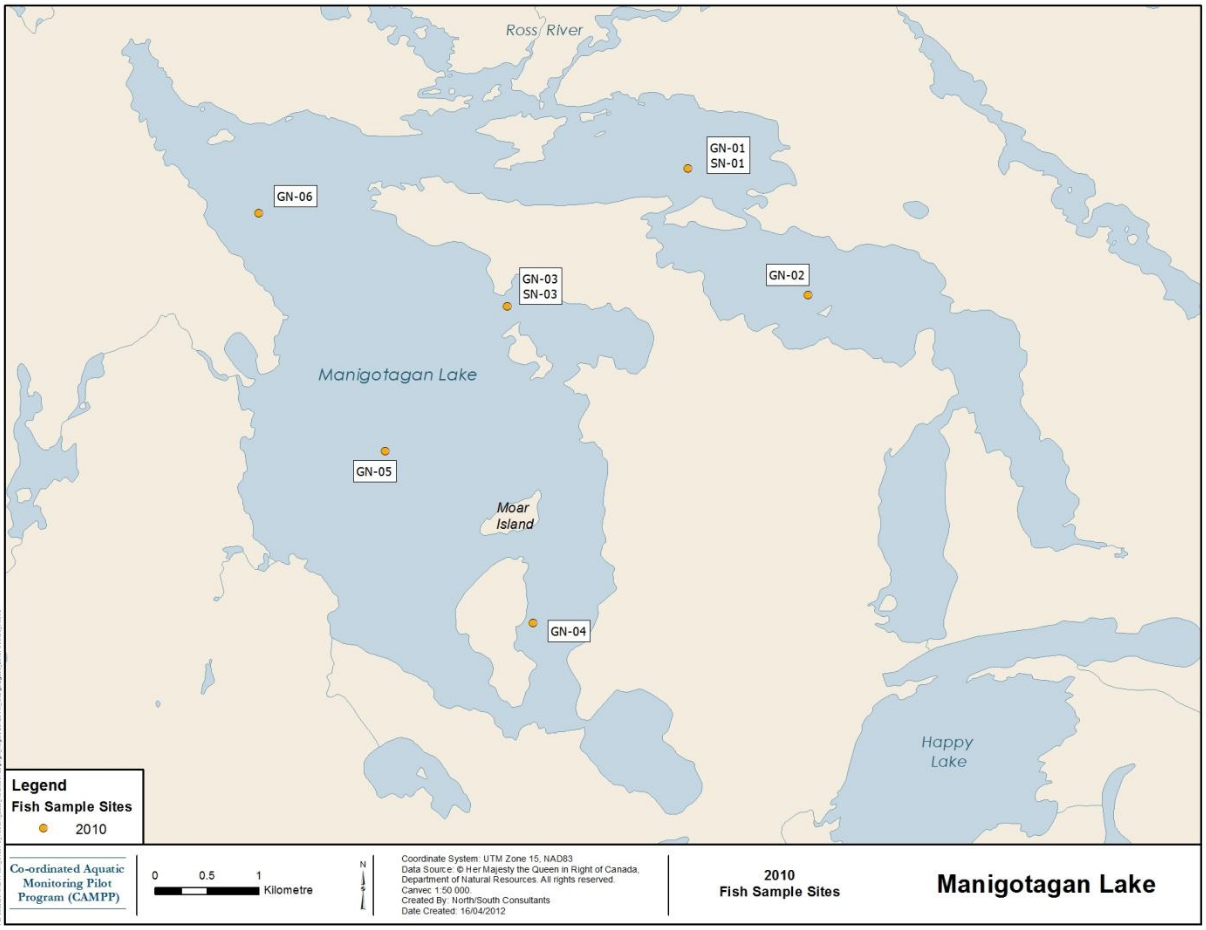


Figure 2.6-4. Map depicting standard gang (GN) and small mesh (SN) index gillnet sites sampled in Manigotagan Lake, 2010.

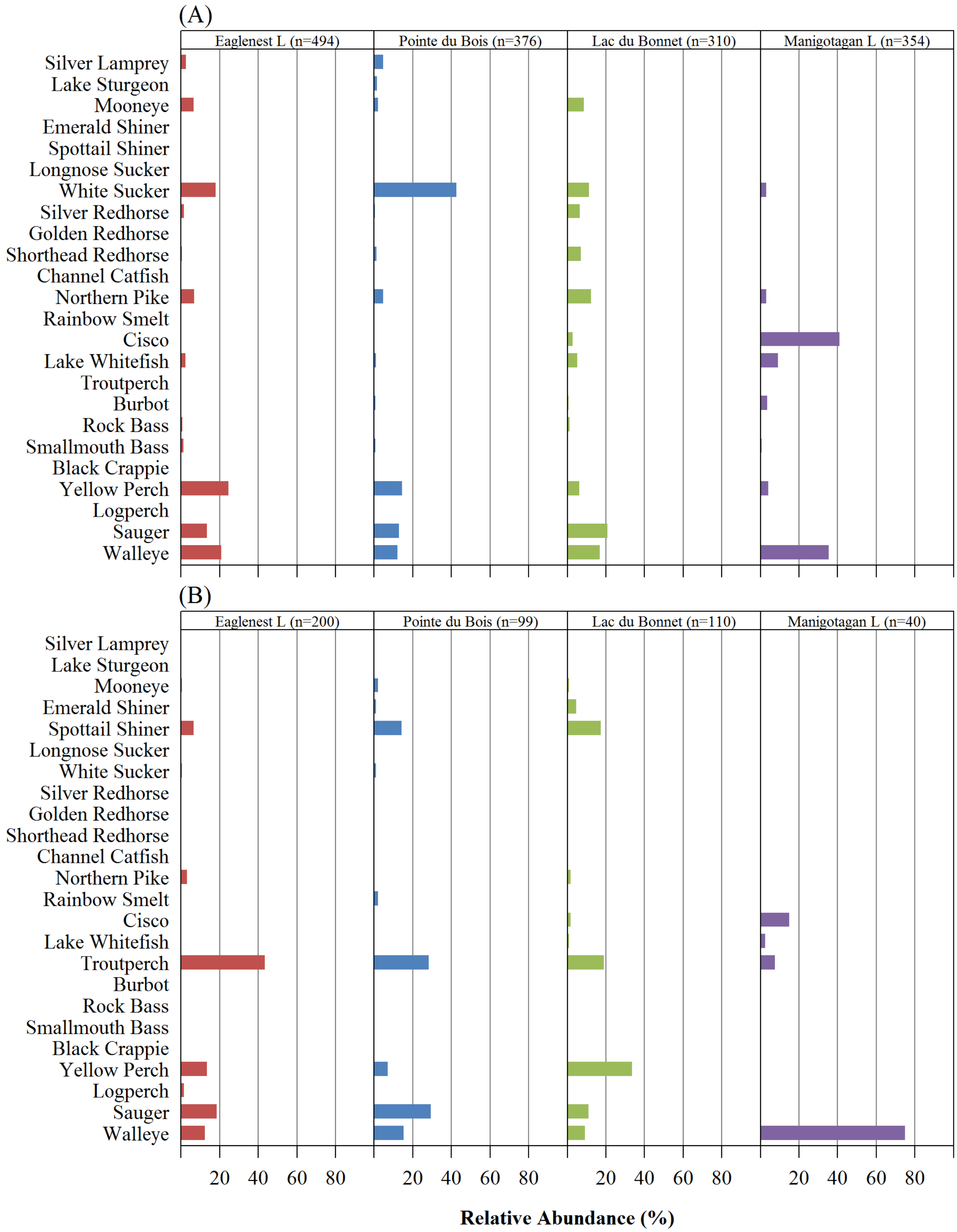


Figure 2.6-5. Relative abundance (%) distributions for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Winnipeg River Region waterbodies, 2010.

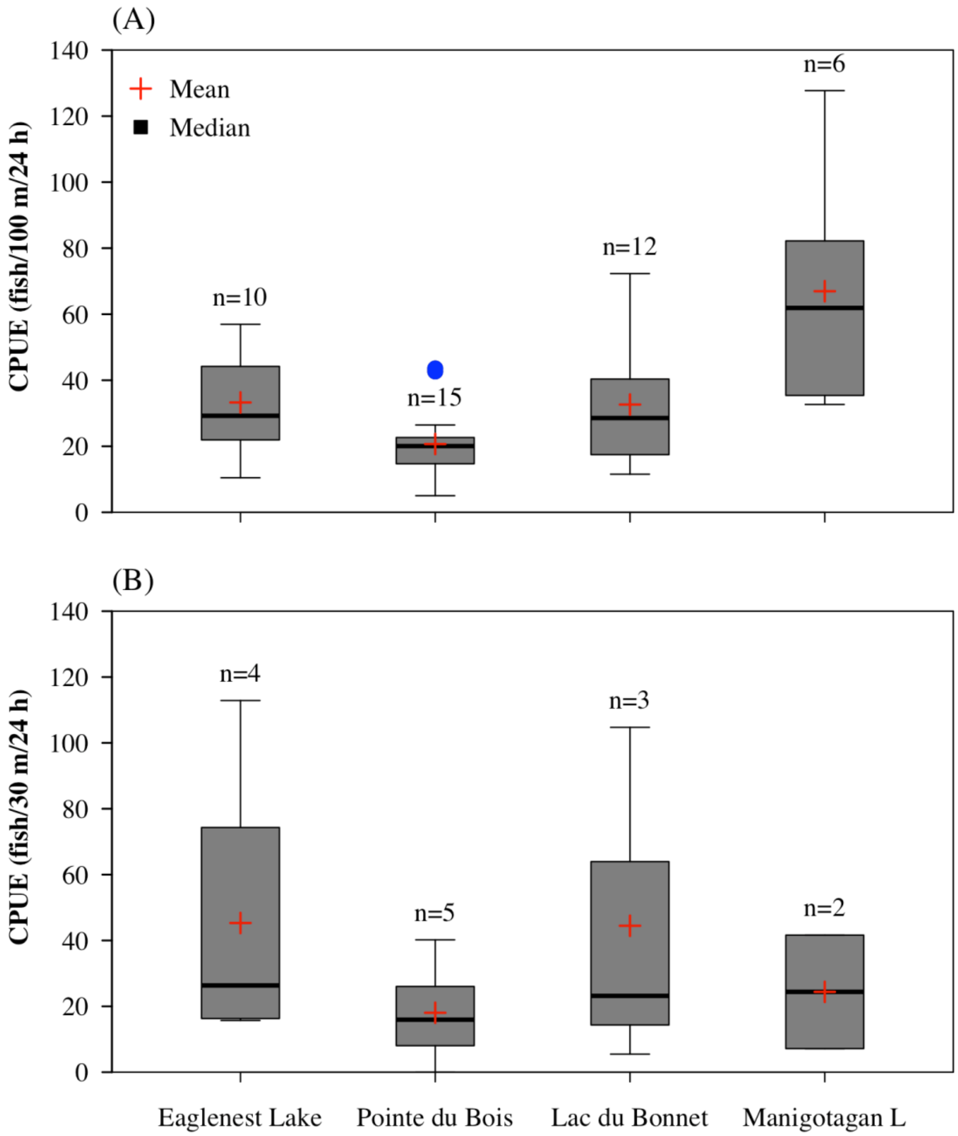


Figure 2.6-6. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Winnipeg River Region waterbodies, 2010.

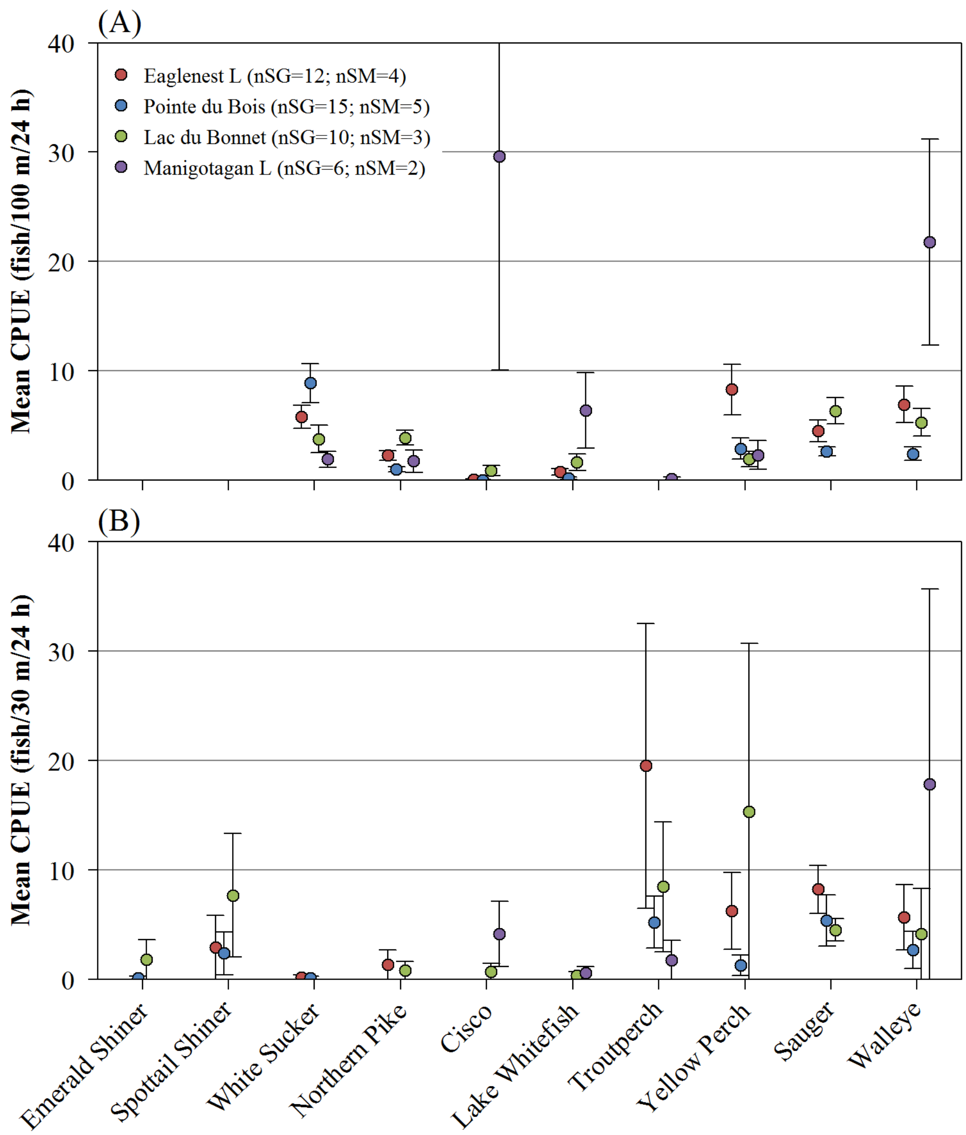


Figure 2.6-7. Mean (SE) CPUE for select species captured in (A) standard gang and (B) small mesh index gill nets set in Winnipeg River Region waterbodies, 2010.

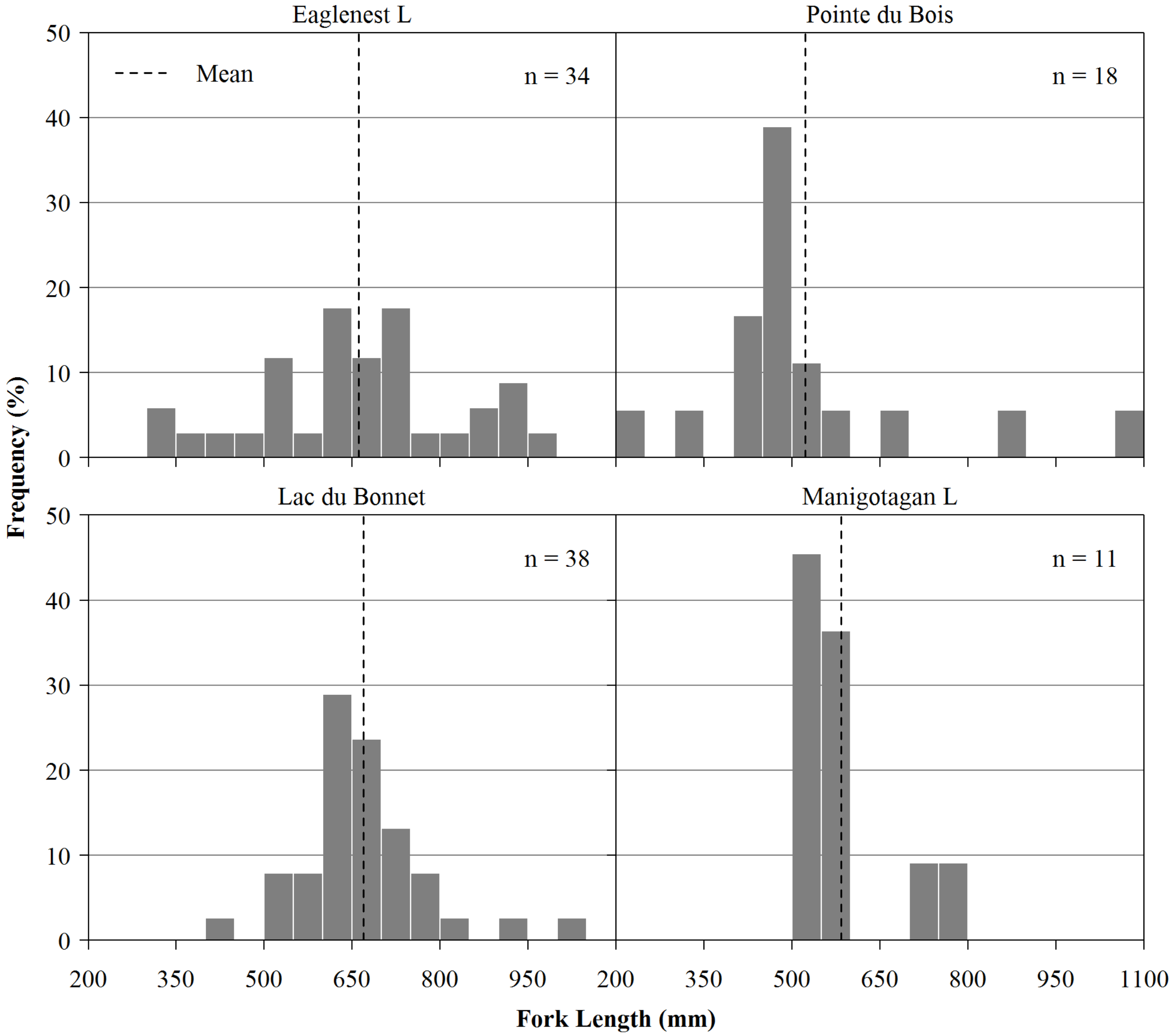


Figure 2.6-8. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

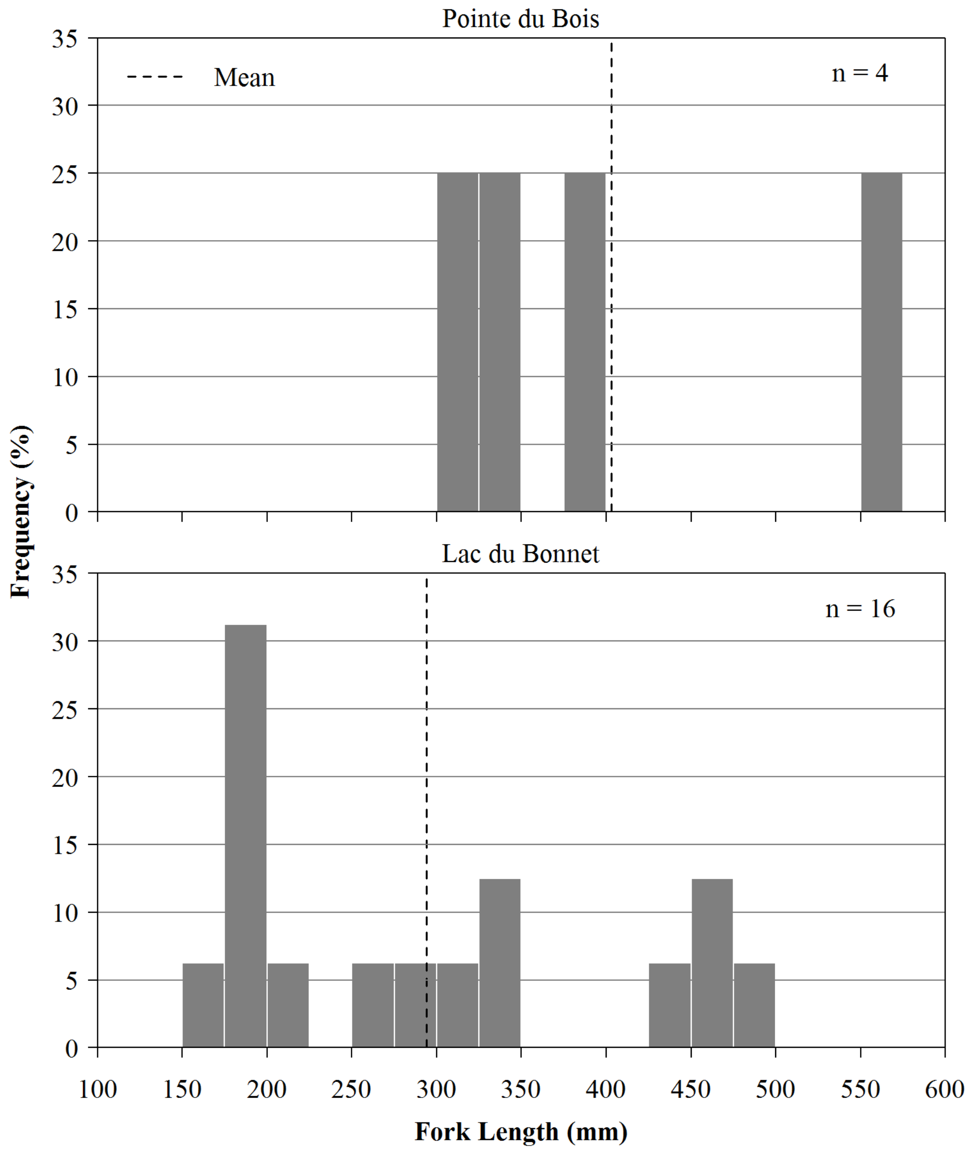


Figure 2.6-9. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

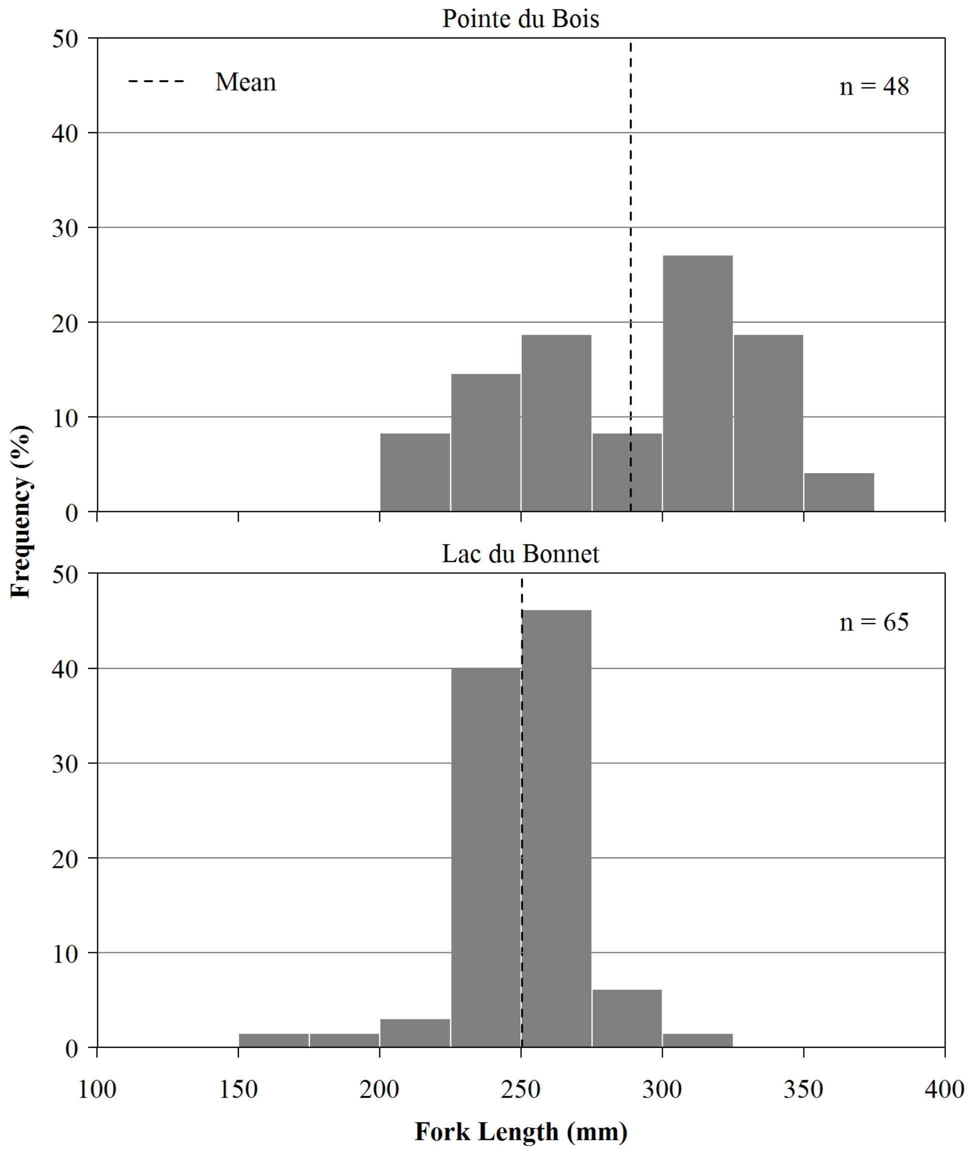


Figure 2.6-10. Fork length frequency histograms for Sauger captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

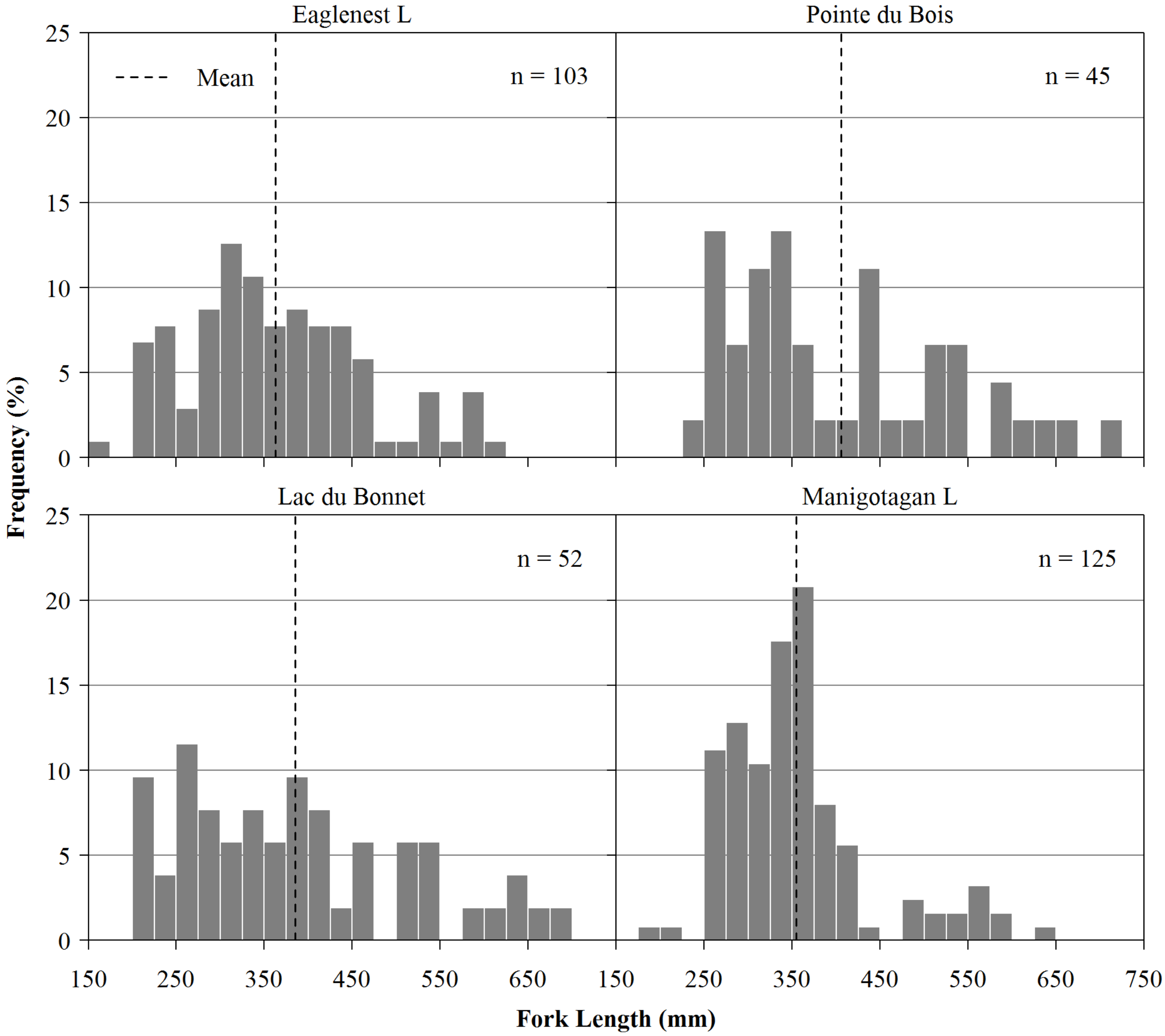


Figure 2.6-11. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2010.

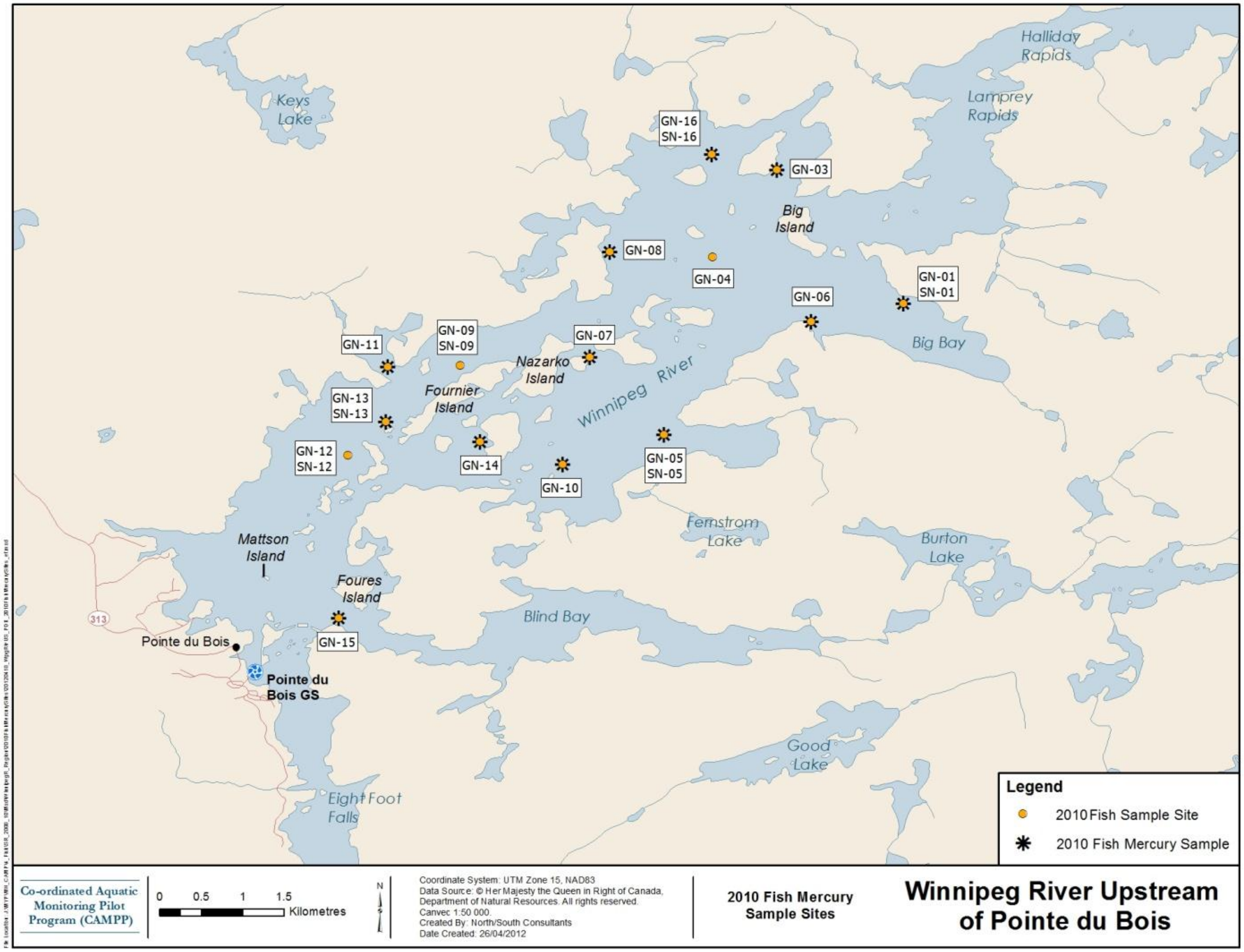


Figure 2.7-1. Fish sampling sites in the Pointe du Bois Forebay, indicating those sites where fish were collected for mercury analysis.

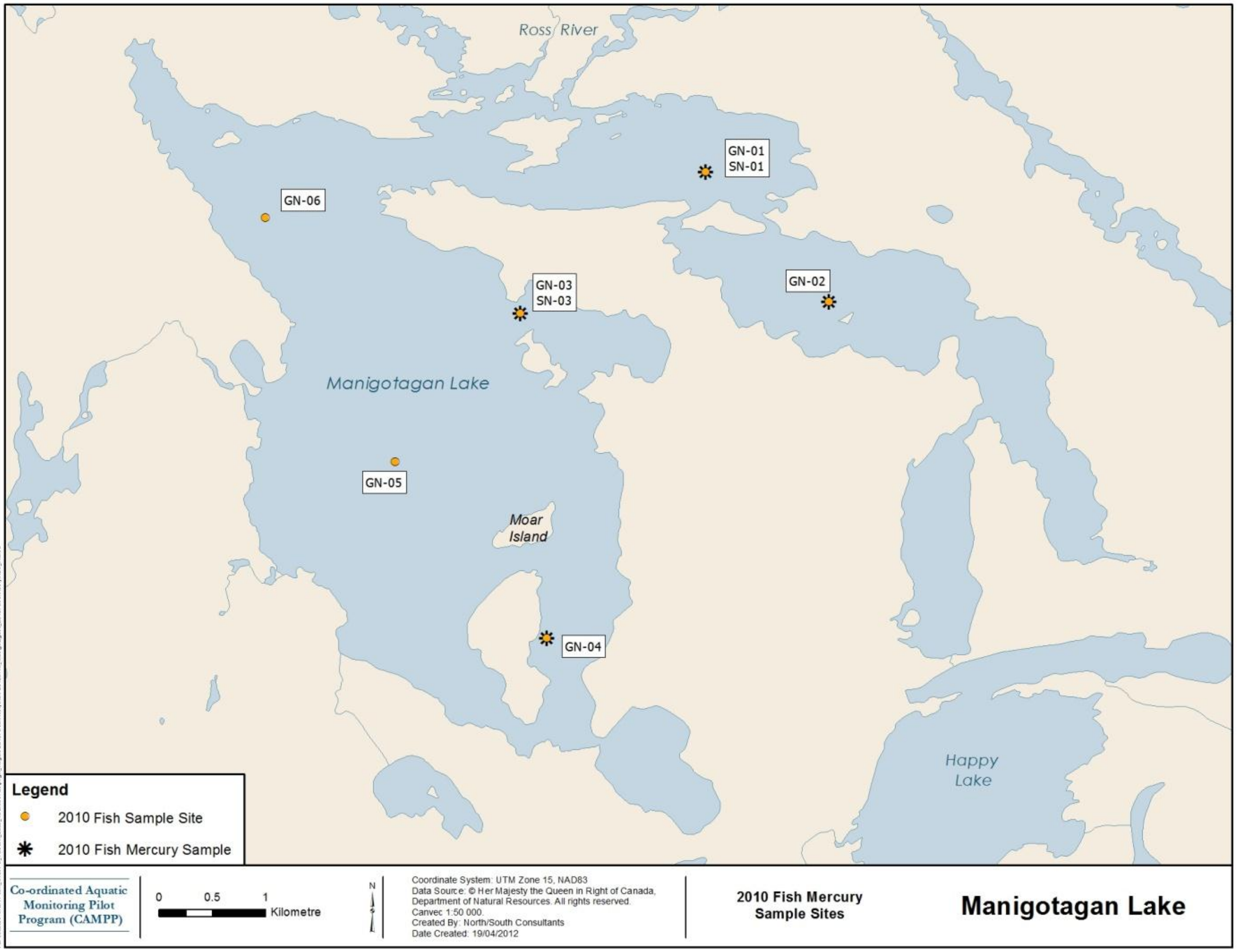


Figure 2.7-2. Fish sampling sites in Manigotagan Lake, indicating those sites where fish were collected for mercury analysis.

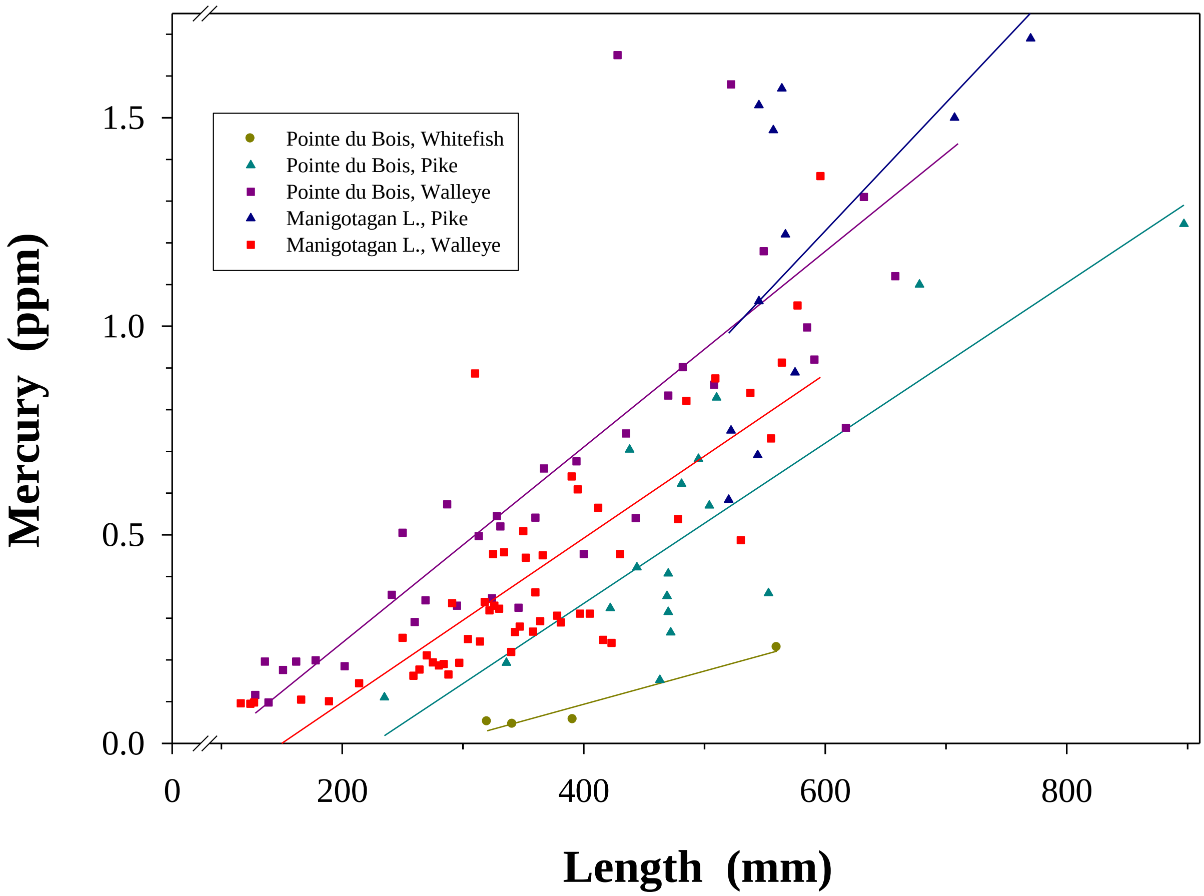


Figure 2.7-3. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from the Pointe du Bois Forebay and Manigotagan Lake in 2010. Significant linear regression lines are shown. One walleye from Pointe du Bois with a mercury concentration of 1.92 ppm and a length of 710 mm is not shown but was included in the analyses.

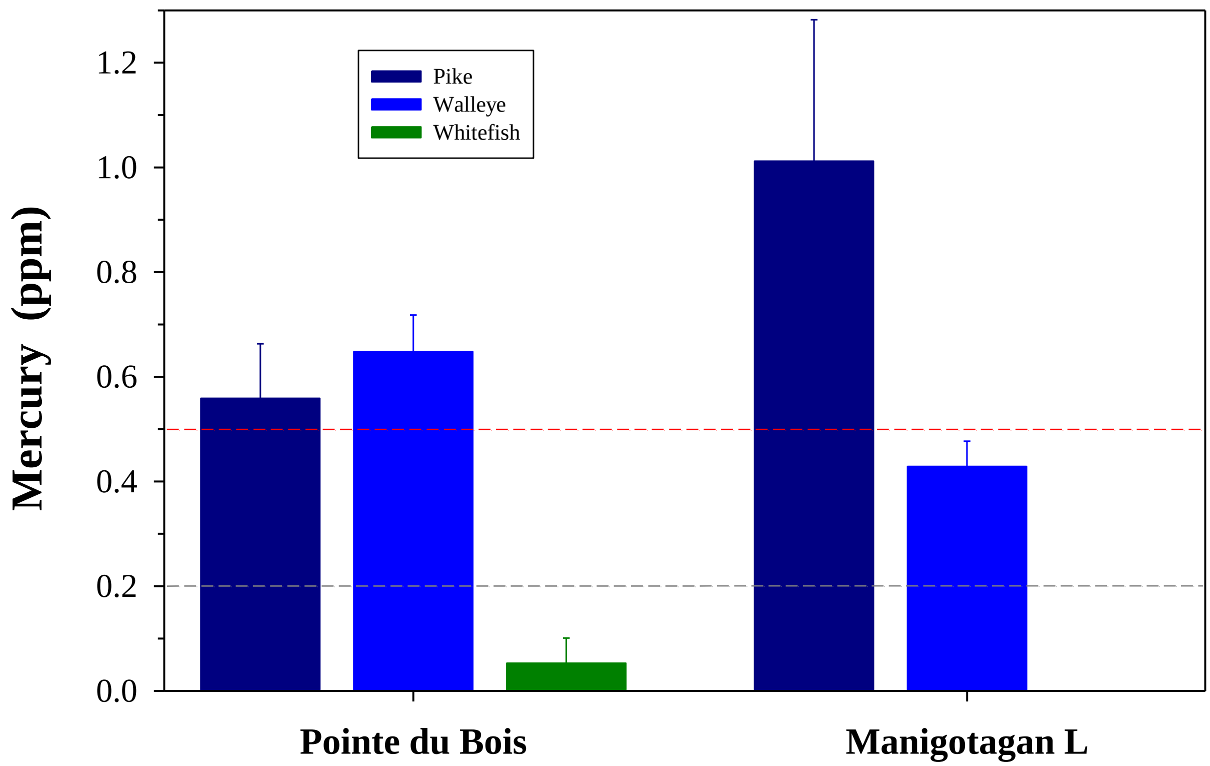


Figure 2.7-4. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye, and Lake Whitefish from the Pointe du Bois Forebay and Manigotagan Lake. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.

3.0 SASKATCHEWAN RIVER REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Saskatchewan River Region, by each major component. A description of methods is provided in Section 4 and in detail in Appendix 1.

3.1 CLIMATE

Climatological data were compiled for two stations in the Saskatchewan River Region: (1) The Pas, MB; and (2) Grand Rapids, MB.

3.1.1 The Pas

Mean monthly air temperatures measured at The Pas in 2010 were slightly warmer than the 1971-2000 temperature normals throughout the year, with the exception of May, August and September (Figure 3.1-1). Notably, the months of January, March, and April all exhibited air temperatures significantly above normal (5.4 ^{o}C, 6.0 ^{o}C, and 4.4 ^{o}C, respectively). The annual mean air temperature was also approximately 2.1 ^{o}C above the normal.

The 1971-2000 normals for precipitation for The Pas indicate a peak in June followed by a slow tapering of precipitation levels into the fall, and relatively low levels of precipitation in winter months (Figure 3.1-1). In 2010, the highest precipitation occurred in August (2.5 times the normal for that month). Precipitation in January, May, July and September were also notably above normal. Overall, 2010 experienced approximately 40% more precipitation than normal.

Overall, the comparison to climate normals showed that 2010 was characterized by overall warmer temperatures throughout the year, and atypically high levels of precipitation in January and throughout most of the open-water season (Figure 3.1-1).

3.1.2 Grand Rapids

Mean monthly air temperatures measured at Grand Rapids in 2010 were generally similar to the 1971-2000 temperature normals throughout the year (Figure 3.1-2). A notable exception was March, when the air temperature was approximately 6.6 ^{o}C above normal. The annual mean air temperature was approximately 2 ^{o}C above the normal.

The 1971-2000 normals for precipitation indicate peaks in June and July followed by a slow tapering of precipitation levels into the fall, and relatively low levels of precipitation throughout the winter months (Figure 3.1-2). In 2010, the highest precipitation occurred in August (three times the normal for that month), with secondary peaks exceeding normal amounts in June and

July. The winter months were generally drier than normal, most notably the month of January which received less than 10% of normal precipitation levels for that month. Exceptions included the months of April and November, which received more than two times the normal amount of precipitation for those months. Precipitation was almost 50% more in 2010 than the normal.

Overall, the comparison to climate normals shows that 2010 was characterized by a warmer and generally drier winter (excepting April and November), and an open water season of average air temperatures but generally higher amounts of precipitation (Figure 3.1-2).

3.2 HYDROLOGY

The Saskatchewan River flows entering Manitoba are influenced by both precipitation and water use across the Saskatchewan River watershed. Flows originate from as far west as the foot of the Rocky Mountains and are affected by various operations along the way to Manitoba including municipal and recreational use, hydroelectric generation, irrigation and flood control.

Saskatchewan River flows entering Manitoba at The Pas in 2010 were near the upper quartile from January to mid-April and fell to the lower quartile until mid-June due to a below average snowpack (Figure 3.2-1). Flows then rose to near average until September before finishing well above average for the rest of the year due to above average precipitation in the watershed.

Cedar Lake water levels were generally above average to upper quartile level for most of the year (Figures 3.2-2).

Discharge from the Grand Rapids GS varied near average to below average from January to July before climbing to well above average for the remainder of the year (Figure 3.2-4).

Cormorant Lake water levels started 2010 slightly below average and remained there before rising to upper quartile levels between September and December (Figure 3.2-4).

3.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 3 of the CAMPP program in the Saskatchewan River Region. Waterbodies sampled included the Saskatchewan River (approximately 40 km upstream of Cedar Lake), Cedar Lake (in the south-eastern area) and an off-system reference lake (Cormorant Lake; Figure 3.3-1).

3.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Saskatchewan River Region for routine water quality variables are presented in Tables 3.3-1 and 3.3-2 and Figures 3.3-2 to 3.3-14.

3.3.1.1 On-system Waterbodies

Overall, the region can generally be described as moderate to nutrient-rich, clear to turbid, alkaline, hard, and well-oxygenated. However, water quality of the Saskatchewan River Region varies by waterbody; Cedar Lake was stratified in spring but the Saskatchewan River was isothermal in all four monitoring periods of 2010/2011 (Figure 3.3-2). Dissolved oxygen (DO) decreased with depth in winter in both on-system waterbodies and concentrations in Cedar Lake were below the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011) 7-day objective for cold-water species during this period (Figure 3.3-3). DO concentrations were above MWQSOGs for the protection of aquatic life (PAL) on all other occasions (MWS 2011).

Other *in situ* variables including turbidity (Figures 3.3-4), pH (Figures 3.3-5), and specific conductance (Figures 3.3-6) were, with a few exceptions, similar across depth in each of the waterbodies. Exceptions included decreases in pH across depth at both the Saskatchewan River and Cedar Lake in winter, and an increase in specific conductance in Cedar Lake in winter.

Secchi disk depths were low in the Saskatchewan River (<0.4 m) but increased in Cedar Lake (<1.6 m; Figure 3.3-7).

Total phosphorus (TP) in Cedar Lake exceeded the Manitoba narrative guideline for lakes, reservoirs and ponds (0.025 mg/L; MWS 2011) in summer and fall 2010 and the Saskatchewan River exceeded the narrative guideline for streams and rivers (0.050 mg/L) in fall (Figure 3.3-8). With the exception of DO and TP, other routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011.

The proportion of TP in particulate form varied considerably between sampling periods in on-system waterbodies, but it dominated at both sites in fall (Figure 3.3-9). Total nitrogen (TN) was dominated by organic nitrogen and the concentration and relative proportion of nitrate/nitrite was notably higher in winter, particularly in the Saskatchewan River (Figure 3.3-10).

During stratification in spring 2010, concentrations of nitrogenous parameters were relatively similar in surface and bottom samples collected in Cedar Lake (Figure 3.3-11). Particulate phosphorus and TP were slightly higher at depth in the lake in spring 2010 (Figure 3.3-12).

3.3.1.2 Off-system Waterbody

Cormorant Lake stratified during the spring and summer sampling periods and temperature increased slightly with depth in the winter (Figure 3.3-2). DO was depleted at depth in summer, with concentrations below the MWQSOGs instantaneous minimum (4 mg/L) for cold-water aquatic life (MWS 2011). Similarly, during the ice-cover season, DO concentrations did not meet the MWQSOGs 7-day objective for cold-water species (9.5 mg/L; Figure 3.3-3). Other *in situ* parameters measured in Cormorant Lake in 2010/2011 were generally similar across depth (Figures 3.3-4 to 3.3-6). Secchi disk depth was high, ranging from 3.1 to 4.7 m.

With the exception of DO mentioned above, all other routine variables, including TP, for which there are MWQSOGs were within PAL objectives and guidelines in Cormorant Lake in 2010/2011 (MWS 2011).

TP was composed roughly equally of particulate and dissolved forms (on average; Figure 3.3-9) and TN was dominated by organic nitrogen in Cormorant Lake (Figure 3.3-10). Like Cedar Lake, concentrations of nitrogenous parameters were relatively similar in surface and bottom samples collected in Cormorant Lake in spring and summer during stratification (Figure 3.3-13). In contrast to Cedar Lake, dissolved phosphorus was slightly higher at depth in the lake in summer 2010 (Figure 3.3-14).

3.3.2 Metals and Major Ions

A summary of metal concentrations measured in the Saskatchewan River Region in 2010/2011 is presented in Table 3.3-3 and a summary of detection frequencies for metals is provided in Table 3.3-4.

3.3.2.1 On-system Waterbodies

A number of metals were not detected at either on-system sampling site including beryllium, bismuth, mercury, selenium, silver, tellurium, thallium, and tungsten. Aluminum, arsenic, barium, boron, calcium, copper, iron, lithium, magnesium, manganese, molybdenum, potassium, rubidium, silicon, sodium, strontium, titanium, uranium, and vanadium were consistently detected and the remaining metals were detected in some samples (Table 3.3-4).

Aluminum exceeded the MWQSOG for PAL (0.1 mg/L; MWS 2011) in 75% of samples collected from the Saskatchewan River and 50% of samples collected from Cedar Lake (Table 3.3-5). Iron exceeded the MWQSOG for PAL (0.3 mg/L) in 100% of samples collected from the Saskatchewan River but all samples from Cedar Lake were within in the guideline for iron (Table 3.3-5; Figure 3.3-15).

All other metals for which there are MWQSOGs for PAL were within objectives and guidelines (Table 3.3-5; MWS 2011). However, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods, comparisons to the guideline could not be made.

Both chloride and particularly sulphate were higher in the Saskatchewan River Region than observed in other CAMPP regions. Chloride ranged up to 16 mg/L but was well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations (which ranged up to 86 mg/L; Table 3.2-2) were below the British Columbia Ministry of Environment (BCMOE) guidelines (128 to 429 mg/L for soft to very hard waters; Meays and Nordin 2013).

3.3.2.2 Off-system Waterbody

Several metals were not detected in Cormorant Lake including beryllium, bismuth, cesium, chromium, cobalt, mercury, nickel, selenium, silver, tellurium, thallium, thorium, tin, tungsten, zinc and zirconium (Table 3.3-4). Aluminum, arsenic, barium, calcium, copper, lithium, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, titanium, uranium, and vanadium were consistently detected and the remaining metals were detected in some samples.

Samples collected near the sediment-water interface during spring and summer (when the lake was stratified) indicate that concentrations of aluminum, iron, and manganese were slightly higher at depth in Cormorant Lake compared to the surface (Figure 3.3-17).

With the exception of one bottom measurement in summer, aluminum concentrations were below the MWQSOGs for PAL (0.1 mg/L; MWS 2011) in Cormorant Lake and all other metals for which there are MWQSOGs for PAL were within objectives and guidelines in 2010/2011 (Table 3.3-5). However, as noted in Section 3.3.2.1, comparisons could not be made to the current MWQSOG for mercury (0.000026 mg/L) owing to analytical detection limits.

Concentrations of chloride and sulphate were low in Cormorant Lake in 2010/2011 (Table 3.3-2) and were well below the CCME PAL guideline (120 mg/L; CCME 1999 updated to 2013) and the BCMOE guideline (128 to 429 mg/L; Meays and Nordin 2013), respectively.

3.3.3 Trophic Status and Nutrient Ratios

3.3.3.1 On-system Waterbodies

Cedar Lake ranked as meso-eutrophic on the basis of TP (Table 3.3-6) and mesotrophic on the basis of chlorophyll *a* (Table 3.3-7) and TN (Table 3.3-8). Conversely, the Saskatchewan River ranked as eutrophic based on TP (Table 3.3.6) but categorization schemes for rivers indicate the site was oligotrophic on the basis of chlorophyll *a* and TN (Table 3.3.9).

On average, Cedar Lake and the Saskatchewan River were phosphorus limited, notably in spring and winter 2010/2011 (Figure 3.3-18). Mean total organic carbon to organic nitrogen molar ratios indicate that on average organic matter in these on-system waterbodies was a mixture of allochthonous and autochthonous sources (Figure 3.3-19).

3.3.3.2 Off-system Waterbody

The trophic status of Cormorant Lake was lower than for Cedar Lake. Cormorant Lake was borderline oligotrophic-mesotrophic on the basis of TP (Table 3.3-6) and oligotrophic on the basis of chlorophyll *a* (Table 3.3-7) and TN (3.3-8). Like on-system waterbodies, Cormorant Lake was phosphorus limited (Figure 3.3-18) and organic matter was a mixture of allochthonous and autochthonous sources (Figure 3.3-19). The particularly high TN:TP ratio calculated in spring for Cormorant Lake is primarily due a non-detectable concentration of TP.

3.3.4 *Escherichia coli*

3.3.4.1 On-system Waterbodies

E. coli was detected in two of the four samples collected from the Saskatchewan River but was not detected in Cedar Lake in 2010/2011 (Table 3.3-2). All measurements were well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 3.3-2; MWS 2011).

3.3.4.2 Off-system Waterbody

E. coli was not detected in any samples collected in Cormorant Lake in 2010/11 and all measurements were well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 3.3-2).

3.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Saskatchewan River Region in Year 3 of CAMPP. Waterbodies sampled included: two annual waterbodies, Cedar Lake (in the south-eastern area) and an off-system lake (Cormorant Lake); and one rotational waterbody, the Saskatchewan River (approximately 40 km upstream of Cedar Lake; Figure 3.3-1).

3.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Saskatchewan River Region were typically low to moderate, with concentrations at the on-system sites being higher than those measured at Cormorant Lake (Figure 3.4-1). Chlorophyll *a* was particularly high at Cedar Lake in summer. Winter chlorophyll *a* concentrations measured in the region were low.

3.4.2 Community Composition and Biomass

In 2010/2011, phytoplankton community composition and biomass were measured in the Saskatchewan River as part of the rotational analyses. Phytoplankton biomass was low to moderate at the site, with the highest biomass in fall (Figure 3.4-2).

Phytoplankton community composition in the Saskatchewan River was dominated by diatoms during each sampling period, particularly in fall when they formed 96% of the community (Figure 3.4-3). Cryptophytes and green algae were the next-most dominant taxa in the Saskatchewan River in spring and summer, respectively.

As would be expected, diversity, heterogeneity, evenness (E_D, E_H and $E^{H'}/S$), and species effective richness were lowest in the Saskatchewan River in fall when the community was almost completely composed of diatoms (Table 3.4-1 and Figure 3.4-3). Also, in correspondence with the composition results, metrics indicated that community complexity was highest in summer.

3.4.1 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L in Cedar Lake in summer. At this time, phytoplankton biomass was moderate (11,206 mg/m^3) and the community was co-dominated by blue-green algae and diatoms (Figure 3.4-4).

3.4.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (i.e., algal toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to affect production of microcystins. In 2010, *Anabaena* and *Aphanizomenon* were present in the Saskatchewan River and Cedar Lake. Additionally, *Planktothrix* was present in Cedar Lake during the bloom. Taxonomic information is not available for the other waterbodies in the region.

Microcystin-LR was measured on one occasion in the Saskatchewan River Region when chlorophyll *a* exceeded 10 µg/L (i.e., the trigger for microcystin-LR analysis); microcystin-LR was not detected during the bloom at Cedar Lake in summer 2010.

3.4.3 Trophic Status

In terms of mean chlorophyll *a* concentrations (open-water season and annual), Cedar and Cormorant lakes are classified as mesotrophic and oligotrophic, respectively, following the trophic categorization for lakes (OECD 1982; Table 3.3-7). The Saskatchewan River is classified as oligotrophic according to the classification scheme for rivers/streams (Table 3.3-9)

3.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Saskatchewan River Region in 2010/2011; the third year of CAMPP. Waterbodies sampled included the on-system waterbody Cedar Lake-Southeast, and the off-system waterbodies, Saskatchewan River and Cormorant Lake (Figures 3.5-1 to 3.5-3). Cedar and Cormorant lakes are sampled annually and the Saskatchewan River is sampled rotationally (i.e., once every three years).

In 2010, the nearshore grab sampling in predominantly wetted habitat was replaced with kicknet sampling in the intermittently wetted nearshore areas (i.e., areas with water depths ≤ 1 m). Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Both kicknet and grab sampling consisted of five composites of three replicate samples per nearshore and offshore habitat polygon. Sampling was conducted between 04 and 24 September 2010.

3.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons at each waterbody (Table 3.5-1).

In 2010, mean water depths in the nearshore intermittently exposed habitat sampling sites were 0.8 m, 0.5 m, and 0.9 m in the Saskatchewan River, Cedar Lake-Southeast, and Cormorant Lake, respectively; mean water depths offshore were 6.4 m, 6.2 m, and 7.4 m, respectively (Table 3.5-1).

Sediment samples were collected and analyzed for TOC and PSA to provide a general characterization of sediment type in each nearshore and offshore polygon. Mean TOC in Cedar Lake's offshore polygon was 21.4%; mean TOC was 1.3% and 0.9% in the offshore habitats of Saskatchewan River and Cormorant Lake, respectively (Table 3.5-2). Similar to its offshore polygon, sediments in the nearshore intermittently wetted sampling area of the Saskatchewan River had low TOC (1.7%).

The Saskatchewan River was silt-dominated in both the nearshore and offshore polygons, followed by clay and sand. Sand comprised the majority of the sediment from Cedar Lake in the offshore habitat, with silt and clay similarly represented. Cormorant Lake was also sand-dominated in the offshore (Table 3.5-2).

3.5.2 Species Composition, Distribution, and Relative Abundance

3.5.2.1 Saskatchewan River

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of the Saskatchewan River was 61 individuals, with numbers ranging from 43 to 82 per sample (Table 3.5-3). Insects dominated the benthic community in this habitat, comprising 66% of the total mean BMI; non-insects comprised 34% (Table 3.5-3). The insect portion only included Ephemeroptera and Chironomidae which comprised 59% and 7% of total mean BMI, respectively. Non-insect groups included Oligochaeta (17%), Bivalvia (14%), and Gastropoda (3%) (Table 3.5-3). The total mean BMI density in offshore benthic grab samples was 915 individuals/m^2, with densities ranging from 260 to 1,486 (Table 3.5-3). Insects dominated the benthic community in this habitat, comprising 62% of the total mean BMI; non-insects comprised 38% (Table 3.5-3). Insects mainly consisted of Trichoptera, Chironomidae, and Ephemeroptera (25%, 22%, and 13% of mean BMI identified, respectively); Plecoptera were also present. Oligochaeta and Bivalvia comprised most of the non-insect portion, comprising 26% and 11% of the total mean invertebrates, respectively; a few Decapoda (crayfish) were also collected (Table 3.5-3).

The total proportion of EPT in the nearshore polygon was based entirely on Ephemeroptera (59%).The mean ratio of EPT:C was 10.73, indicating a strong EPT dominance in terms of abundance relative to Chironomidae. Ephemeridae was the only Ephemeroptera family found and *Hexagenia* sp. the only genus identified (Table 3.5-3). Total EPT, in the offshore polygon was 38% and the EPT:C ratio was 2.60, indicating that the BMI community was dominated by EPT relative to Chironomidae (Table 3.5-3). Ephemeridae dominated the Ephemeroptera component, with *Hexagenia* sp. the most abundant genus of the three identified. Heptageniidae and Polymitarcyidae were the other two Ephemeroptera families represented in the grab samples. Of the Trichoptera, Hydropsychidae (net spinning caddisflies) and Polycentropodidae were present (Table 3.5-3).

Nearshore habitat was represented by eight families with richness values ranging from five to seven within each sample (Table 3.5-3). Hill's Effective Richness (E^H) was three; Ephemeridae, Oligochaeta, and Pisidiidae were most prevalent. Taxonomic richness in the offshore polygon was 14 families and ranged from three to nine within each sample (Table 3.5-3). Hill's Effective

Richness (E^H) was three; namely, Oligochaeta, Hydropsychidae, and Chironomidae (Table 3.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.60 and 0.55 in the nearshore and offshore polygons, respectively (Table 3.5-3). Mean evenness (Simpson's Equitability [E_D]) in the nearshore polygon was 0.34, and 0.40 in the offshore polygon (Table 3.5-3).

3.5.2.2 Cedar Lake-Southeast

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Cedar Lake was 356 individuals, with numbers ranging from 109 to 857 (Table 3.5-4). Non-insects dominated the BMI community in this habitat, comprising 83% of the total mean BMI; insects comprised the remaining 17% (Table 3.5-4). Of the non-insects, the main group was Amphipoda (comprising 60% of the mean total BMI), followed by Gastropoda (17%), Oligochaeta (3%), and Bivalvia (2%); Hirudinea were also found (Table 3.5-4). The insect portion was comprised of Ephemeroptera (7% of the mean total BMI), Chironomidae (5%), Hemiptera (true bugs; 3%), and Trichoptera (2%): Empididae (dance flies, balloon flies) were also present in small numbers (Table 3.5-4). Mean BMI density in offshore benthic grab samples was 5,081 individuals/m^2, with numbers ranging from 2,207 to 7,531 (Table 3.5-4). Non-insects also dominated the BMI community in this habitat of Cedar Lake, comprising 84% of the total mean BMI; insects comprised the remaining 16% (Table 3.5-4). Oligochaeta, Amphipoda, and Bivalvia made up the majority of the non-insects, comprising 33%, 26%, and 23% of the total BMI, respectively; Hirudinea and Acari were also found (Table 3.5-4). Insects were mostly comprised of Chironomidae (14%), but Ephemeroptera (2%) and Trichoptera (1%) were also represented (Table 3.5-4).

The total proportion of EPT in the nearshore was 9% of the mean BMI, and mean EPT:C was 2.04, indicating EPT were dominant in the community relative to Chironomidae (Table 3.5-4). Ephemeroptera were represented by six genera within five families; *Caenis* sp. dominated the Ephemeroptera. Corixidae was the only family of Hemiptera identified and Helicopsychidae (snail-case caddisflies) were the most common Trichoptera family collected (Table 3.5-4). Total EPT in the offshore polygon was 2% and mean EPT:C was 0.17, indicating an offshore insect community dominated by chironomids relative to EPT (Table 3.5-4). Ephemeroptera were represented by a single genus, *Hexagenia* sp. (Table 3.5-4) and Trichoptera were represented by Leptoceridae and Molannidae in equal proportions.

The nearshore habitat was represented by 31 families with taxonomic richness values ranging from 17 to 22 within each sample (Table 3.5-4). Hill's Effective Richness (E^H) was six; the most prominent family was Hyalellidae (Table 3.5-4). Taxonomic richness in the offshore polygon was 12 families and ranged from eight to ten within each sample. Hill's Effective Richness (E^H) was six in the offshore habitat; Oligochaeta, Pisidiidae, and Hyalellidae notably dominated this polygon (Table 3.5-4).

Invertebrate diversity, based on Simpson's Diversity Index (D), was 0.69 in the nearshore habitat of Cedar Lake and 0.79 in the offshore habitat. Evenness (Simpson's Equitability [E_D]) in the nearshore and offshore was 0.17 and 0.42, respectively (Table 3.5-4).

3.5.2.3 Cormorant Lake

The total mean BMI in kicknet samples in the intermittently wetted nearshore habitat of Cormorant Lake was 215 individuals, with numbers ranging from 151 to 351 (Table 3.5-5). Insects dominated the BMI community in this habitat, comprising 83% of the total mean invertebrates sampled; non-insects comprised the remaining 17% (Table 3.5-5). Chironomidae dominated the insect community, comprising 48% of total mean BMI, followed by Ephemeroptera (20%), Tipulidae (crane flies), and Trichoptera; Hemiptera, Empididae, and Dytiscidae were also found (Table 3.5-5). Of the non-insects, the main groups were Amphipoda (12% of total mean invertebrates) and Oligochaeta (5%); Acari were also present (Table 3.5-5). Mean BMI density in offshore benthic grab samples was 1,928 individuals/m^2 with densities ranging from 1,327 to 2,179 (Table 3.5-5). Non-insects comprised 58% of the total mean BMI sampled and insects comprised 42% (Table 3.5-5). Amphipoda, Gastropoda, and Bivalvia comprised 37%, 11%, and 9% of the total mean BMI, respectively; Oligochaeta were also found in small numbers (Table 3.5-5). Insects were primarily comprised of Chironomidae (20% of mean total invertebrates), Ephemeroptera (15%), and Trichoptera (4%); Ceratopogonidae and Corixidae were also present in fewer numbers (Table 3.5-5).

Total EPT comprised 25% of the mean total nearshore invertebrates sampled. The ratio of EPT:C was 0.56, indicating that chironomids dominated EPT in this habitat. Of the four Ephemeroptera families (Baetidae, Caenidae, Heptageniidae, and Leptophlebiidae) present in the samples, Caenidae was the most abundant and *Caenis* sp. was the most abundant genus. Hydropsychidae was the most common Trichoptera family (Table 3.5-5). Total EPT in the offshore polygon was 19% of the mean total invertebrates sampled and the ratio of EPT:C was 1.04, indicating a BMI community that was balanced in terms of EPT and chironomid abundance (Table 3.5-5). Ephemeridae and Caenidae were the only Ephemeroptera families represented and of these families the genus *Hexagenia* sp. was the most abundant. Molannidae was the most common Trichoptera family (Table 3.5-5).

The nearshore was represented by 28 invertebrate families, with richness values ranging from 16 to 22 within each sample (Table 3.5-5). Hill's Effective Richness (E^H) was eight. Of the eight dominant invertebrate families in this habitat; Chironomidae, Caenidae, and Hyalellidae were most notable (Table 3.5-5). Overall taxonomic richness in the offshore polygons was 16 and ranged from 12 to 14 within each sample (Table 3.5-5). Hill's Effective Richness (E^H) was nine; Hyalellidae, Chironomidae, and Ephemeridae were the most prevalent invertebrates (Table 3.5-5).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.77 and 0.82 in the nearshore and offshore polygons, respectively (Table 3.5-5). Evenness (Simpson's Equitability [E_D]) was 0.19 in the nearshore polygon and 0.41 in the offshore polygon (Table 3.5-5).

3.6 FISH COMMUNITY

3.6.1 Gill netting

Gill netting in the Saskatchewan River Region in 2010 was conducted in the Saskatchewan River (13 – 21 September), Cedar Lake-Southeast (4 – 9 August), and Cormorant Lake (17 – 23 August) (Table 3.6-1; figures 3.6-1, 3.6-2, and 3.6-3, respectively).

In the Saskatchewan River, 11 sites were sampled using standard gang index gill nets and two sites were sampled using small mesh index gill nets (Table 3.6-1; Figure 3.6-1). Water temperature was 12.0°C on 13 September.

In Cedar Lake-Southeast, 14 sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Table 3.6-1; Figure 3.6-2). Water temperature during the sampling period ranged from 19 – 23°C.

In Cormorant Lake, 17 sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Table 3.6-1; Figure 3.6-3). Water temperature during the sampling period ranged from 17.9 – 18.0°C.

3.6.2 Species Composition

In 2010, 16 species of fish were captured in the Saskatchewan River Region (Table 3.6-2).

3.6.2.1 Saskatchewan River

A total of 412 fish representing nine species were captured in standard gang index gill nets (Table 3.6-3). Only 33 fish representing seven species were captured in small mesh index gill nets. More than 50% of the total standard gang index gillnet catch was comprised of Walleye while Sauger, White Sucker and Northern Pike each represented approximately 13-14% of the catch (Table 3.6-3; Figure 3.6-4). In small mesh index gill nets, more than two thirds of the catch consisted of Logperch (n = 23 fish). No more than three individuals of any other species were captured in small mesh index gill nets.

The total biomass of fish captured in standard gang index gill nets was 354,128 g, the lowest of any other waterbody sampled in the Saskatchewan River Region in 2010 (Table 3.6-4). Walleye (47.23%), White Sucker (21.83%) and Northern Pike (19.58%) accounted for almost 90% of the total biomass. In the small mesh index gillnet catch, most of the fish were not weighed (Table 3.6-5).

3.6.2.2 Cedar Lake - SE

A total of 1,019 fish representing nine species were captured in standard gang index gill nets and 362 fish representing eight species were captured in small mesh index gill nets (Table 3.6-3). Cisco (n = 395 fish; 38.76%) was the most common species captured in standard gang index gill nets, followed by White Sucker (n = 212 fish; 20.80%), Walleye (n = 151 fish; 14.82%), and Sauger (n = 127 fish; 12.46%) (Table 3.6-3; Figure 3.6-5). Cisco (n = 97 fish; 26.80%), Spottail Shiner (n = 91 fish; 25.14%), and Sauger (n = 75 fish; 20.72%) were the most common species in the small mesh index gillnet catch (Table 3.6-3; Figure 3.6-5).

The total biomass of fish captured in standard gang index gill nets was 411,951 g (Table 3.6-4). White Sucker (32.94%) and Walleye (27.55%) represented the majority of the biomass in the standard gang index gillnet catch. In the small mesh index gillnet catch, Sauger (39.03%), Walleye (22.83%) and Cisco (21.85%) comprised most of the biomass (Table 3.6-5).

3.6.2.3 Cormorant Lake

Standard gang index gill nets set in Cormorant Lake in 2010 captured 1,060 fish from nine species while 467 fish from 11 species were captured in small mesh index gill nets (Table 3.6-3). White Sucker (n = 465 fish; 43.87%), Walleye (n = 217 fish; 20.47%), and Lake Whitefish (n = 132 fish; 12.45%) were the most abundant fish in the standard gang index gillnet catch (Table 3.6-3; Figure 3.6-6). Yellow Perch (n = 177 fish; 37.90%), Spottail Shiner (n = 174 fish; 37.26%), and Sauger (n = 57 fish; 12.21%) were most common in the small mesh index gillnet catch (Table 3.6-3; Figure 3.6-6).

The total biomass of fish captured in standard gang index gill nets was 772,649 g (Table 3.6-4), the highest of any regional waterbodies sampled in 2010. White Sucker accounted for most of the biomass (43.14%) in the standard gang index gillnet catch, followed by Walleye (23.96%) and Northern Pike (14.06%). The majority of the small mesh index gillnet biomass was represented by Sauger (22.84%), Northern Pike (20.79%), Walleye (18.98%), and Lake Whitefish (16.69%) (Table 3.6-5).

3.6.3 Catch Per Unit Effort (CPUE) and Biomass Per Unit Effort (BPUE)

3.6.3.1 Saskatchewan River

In 2010, the mean CPUE for the standard gang index gillnet catch in the Saskatchewan River was 37.8 fish/100 m of net/24 h, the lowest of any regional waterbodies sampled in 2010 (Table 3.6-6; Figure 3.6-7). Walleye had the highest CPUE (18.0), which was three times higher than the nearest species, Sauger (6.0) (Figure 3.6-8).

Mean CPUE for the small mesh index gillnet catch in the Saskatchewan River was 26.3 fish /30 m of net/24 h), approximately 4-5 times lower than either of the other surveyed regional waterbodies (Table 3.6-7; Figure 3.6-7). Logperch had the highest CPUE (18.3) in the small mesh index gillnet catch.

Mean BPUE for the standard gang index gillnet catch was 32,278 g/100m of net/24h (Table 3.6-8). Walleye had the highest BPUE (14,332) followed by White Sucker (7,340) and Northern Pike (6,635). BPUE could not be calculated for the small mesh index gillnet catch as the majority of captured fish were not weighed (Table 3.6-9).

3.6.3.2 Cedar Lake - SE

Standard gang index gill nets set in Cedar Lake-Southeast in 2010 had a mean CPUE of 62.8, the highest of the three sampled regional waterbodies (Table 3.6-6; Figure 3.6-7). Cisco (24.3) and White Sucker (13.1) had the highest CPUE values among captured species (Figure 3.6-8).

The overall CPUE for small mesh index gill nets was 116.5 (Table 3.6-7; Figure 3.6-7). Cisco (31.3), Spottail Shiner (29.3), and Sauger (24.3) comprised the majority of the CPUE for small mesh index gill nets (Figure 3.6-8).

In contrast to CPUE, mean BPUE (25,470 g) for the standard gang index gillnet catch from Cedar Lake – Southeast was the lowest of the sampled regional waterbodies (Table 3.6-8). White Sucker had the highest BPUE (8,440), followed by Walleye (6,947), and Cisco (3,912). Small mesh index gill nets produced a BPUE of 4,082 g (Table 3.6-9) with Sauger (1,592), Walleye (938) and Cisco (898) comprising the majority of the biomass.

3.6.3.3 Cormorant Lake

Standard gang index gill nets set in Cormorant Lake in 2010 produced a mean CPUE of 61.9 (Table 3.6-6; Figure 3.6-7). Small mesh index gill nets set in Cormorant Lake had the highest CPUE (130.3) among the sampled regional waterbodies (Table 3.6-7; Figure 3.6-7).

White Sucker had the highest CPUE (26.5) in the standard gang index gillnet catch, followed by Walleye (12.8) (Figure 3.6-8). Spottail Shiner (48.7) and Yellow Perch (48.1) had the highest CPUE values in the small mesh index gillnet catch.

Mean BPUE for the standard gang index gillnet catch (44,888 g) was higher than in other regional waterbodies (Table 3.6-8). White Sucker had the highest BPUE value (18,819) followed by Walleye (10,922). Mean BPUE for the small mesh index gillnet catch (5,536 g) was also the highest of the sampled regional waterbodies (Table 3.6-9). Sauger (1,410), Walleye (1,064) and Northern Pike (1,063) had the highest BPUE values in the small mesh index gillnet catch.

3.6.4 Size and Condition

Northern Pike and Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies in 2010 were measured for fork length (mm) and weight (g) (Table 3.6-10). Condition factors were calculated for each species based on these metrics. Fork length frequency histograms for these two species are illustrated in figures 3.6-9 and 3.6-10. In general, fish captured in small mesh index gill nets were not measured for fork length and were bulk weighed.

3.6.4.1 Saskatchewan River

Northern Pike captured in standard gang index gill nets set in the Saskatchewan River had a mean fork length of 536 mm, a mean weight of 1,264 g, and a mean condition factor of 0.69, the smallest values observed for any of the sampled regional waterbodies (Table 3.6-10). Most Northern Pike were 450-599 mm, with approximately 25% of the catch in the 500-549 mm size class (Figure 3.6-9).

Walleye captured in standard gang index gill nets had a mean fork length of 406 mm, a mean weight of 800 g, and a mean condition factor of 1.16 (Table 3.6-10). Approximately 35% of sampled Walleye were in the 400-424 mm size class with the 375-399 mm and 425-449 mm size classes also well-represented (Figure 3.6-10).

3.6.4.2 Cedar Lake - SE

Northern Pike captured in standard gang index gill nets set in Cedar Lake-Southeast in 2010 had a mean fork length of 549 mm, a mean weight of 1,436 g, and a mean condition factor of 0.79

(Table 3.6-10). The three size classes between 500 and 649 mm were all relatively evenly distributed, each representing approximately 20-25% of the sampled fish (Figure 3.6-9).

Walleye captured in standard gang index gill nets had a lower mean fork length (383 mm) and weight (616 g) and a higher mean condition factor (1.22) than other regional waterbodies surveyed in 2010 (Table 3.6-10). None of the size classes account for more than 20% of the sampled fish and there are few fish larger than 500 mm (Figure 3.6-10).

3.6.4.3 Cormorant Lake

Northern Pike captured in standard gang index gill nets set in Cormorant Lake in 2010 were, on average, larger and heavier than in other surveyed regional waterbodies (Table 3.6-10). Captured Northern Pike had a mean fork length of 604 mm, a mean weight of 1,683 g, and a mean condition factor of 0.73. Walleye had a mean fork length of 406 mm, a mean weight of 794 g, and a mean condition factor of 1.04.

Northern Pike were generally evenly distributed between 500 and 649 mm, with no sampled fish smaller than 450 mm (Figure 3.6-9). The fork length frequency for Walleye was also relatively evenly distributed (Figure 3.6-10). Size classes from 275 to 549 mm each represented approximately 5-10% of sampled Walleye.

3.6.5 Age Composition

Age frequency distributions were calculated for Northern Pike and Walleye (Table 3.6-11) captured in standard gang index gill nets set in Saskatchewan River Region waterbodies during 2010. Mean fork length (mm), weight (g) and condition factor are also presented, by cohort, for both species (tables 3.6-12 and 3.6-13).

3.6.5.1 Saskatchewan River

Age was determined for 55 Northern Pike captured in standard gang index gill nets set in the Saskatchewan River in 2010 (Table 3.6-11). The majority of these fish (32.73%) were 5 years of age (2005 year class), while 3, 4, and 6-year old fish were also well-represented in the catch.

Ages were determined for 209 Walleye captured in standard gang index gill nets (Table 3.6-11). The most abundant age class was 7 years (2003 year class; 34.93% of the aged fish). Walleye aged 4 – 9 were well-represented in the sample.

3.6.5.2 Cedar Lake - SE

Ages were determined for a total of 31 Northern Pike captured in standard gang index gill nets set in Cedar Lake – Southeast in 2010 (Table 3.6-11). Most of these fish were either 4 (25.81%) or 5 (32.26%) years of age.

Ages were determined for 148 Walleye (Table 3.6-11). Most (40.14%) were 7 years of age (2003 year class), however Walleye aged 5, 8, and 9 were also well-represented.

3.6.5.3 Cormorant Lake

A total of 65 Northern Pike captured in Cormorant Lake in 2010 were aged (Table 3.6-11). More than 70% of the sample was aged 4-7 years.

Of the 227 Walleye for which ages were determined, the majority were 5 years of age (Table 3.6-11). Walleye aged 3 and 14 were also well-represented in the sample.

3.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Saskatchewan River Region waterbodies in 2010 were examined externally for DELTs (Table 3.6-14).

3.6.6.1 Saskatchewan River

None of the 319 inspected fish captured in standard gang index gill nets set in the Saskatchewan River in 2010 were determined to have DELTs.

3.6.6.2 Cedar Lake - SE

One of the 418 fish examined from Cedar Lake – Southeast in 2010 was determined to have DELTs. A single Walleye, representing 0.66% of the inspected Walleye, was identified with a tumour.

3.6.6.3 Cormorant Lake

None of the 856 fish examined from Cormorant Lake in 2010 were determined to have DELTs.

3.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Saskatchewan River Region. Waterbodies sampled comprised the Saskatchewan River east of The Pas, including locations in the northwest section of Cedar Lake near the mouth of the river (13-16 September), the southeast portion of Cedar Lake (4-9 August), and an off-system reference waterbody, Cormorant Lake (17-21 August). Standard nets were set at 11 sites in the Saskatchewan River (Figure 3.7-1), at 14 sites in Cedar Lake (Figure 3.7-2), and at 17 sites in Cormorant Lake (Figure 3.7-3), of which eight, 12, and 11 sites, respectively yielded fish for mercury analysis. Small mesh nets were set at two sites in the Saskatchewan River, at three sites in Cedar Lake, and at four sites in Cormorant Lake, of which fish only from the 3 sites in Cedar Lake were used for mercury analysis (Figures 3.7-1 to 3.7-3). All fish for mercury analysis from the Saskatchewan River were actually captured at sites located in Cedar Lake (Figure 3.7-1), however, these sites are hereafter referred to as Saskatchewan River fish.

3.7.1 Species Comparisons

A total of 296 fish were analyzed for mercury. No Lake Whitefish were captured from the Saskatchewan River or Cedar Lake, and no 1-year old Yellow Perch were caught from the Saskatchewan River (Table 3.7-1). The actual mean age of the Yellow Perch from Cedar and Cormorant lakes was 1.6 and 1.8 years, respectively at mean lengths of 106 and 109 mm, respectively. With 31 fish, sample size of Northern Pike from Cedar Lake was slightly lower than the target sample size of 36 fish.

A significant relationship between mercury concentration and fish length existed for all large-bodied species from the three waterbodies (Figure 3.7-4), indicating that standardization of concentrations was necessary for comparative purposes. In contrast, Yellow Perch showed either no significant relationship between the two metrics (Cormorant Lake) or if the relationship was significant, mercury concentration was negatively correlated with length (Cedar Lake; see Section 6.6). Standardized mercury concentrations generally were within approximately 10% of arithmetic concentrations, except for Northern Pike from Cormorant Lake, for which the arithmetic concentration was approximately one third higher than the concentration calculated for fish of standard length (Table 3.7-1). This difference was mainly due to the relatively large average size of the Northern Pike analyzed for mercury, which were 59 mm longer than the standard length of 550 mm (Table 3.7-2).

Mean arithmetic mercury concentrations of Northern Pike from the Saskatchewan River and Cedar Lake -SE were similar to those of Walleye in the respective waterbodies, whereas mercury levels in these two piscivores were different in Cormorant Lake (Table 3.7-1). In fact, concentrations of all four species sampled from Cormorant Lake were different from each other with Northern Pike having the highest and Yellow Perch having the lowest concentration.

3.7.2 Comparison to Consumption Guidelines

Mean mercury concentrations of all fish species from the Saskatchewan River Region were substantially below 0.5 ppm (Figure 3.7-5), the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). However, standard concentrations in Northern Pike from the Saskatchewan River and Cormorant Lake clearly exceeded the 0.2 ppm total mercury guideline for human consumption (see section 4.8.2.3; Figure 3.7-5). In contrast, the standard means for Walleye from Cormorant Lake and the Saskatchewan River were equal to or slightly lower than the 0.2 ppm guideline, respectively, and standard means for both pike and Walleye from Cedar Lake-SE were substantially lower than the guideline (Figure 3.7-5).

Based on individual concentrations, approximately half of all Northern Pike and 30% of all Walleye exceeded the 0.2 ppm guideline (Figure 3.7-4). Approximately 25% and 2%, respectively, of the Northern Pike and Walleye had mercury levels that also were greater than 0.5 ppm, the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). In addition to these exceedances of guidelines and standard relating to human health, mercury concentrations of most fish from the Saskatchewan River Region were substantially higher than the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999 updated to 2013; MWS 2011); the exceptions were nine Lake Whitefish from Cormorant Lake and 36 Yellow Perch from Cedar and Cormorant lakes.

SECTION 3: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 3.3-1. Summary statistics for *in situ* variables (near surface) measured in the Saskatchewan River Region: 2010/2011.

	Temperature (°C)			*In situ* pH			DO (mg/L)			DO (% Saturation)			*In situ* Specific Conductance (µS/cm)			*In situ* Turbidity (NTU)		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	13.63	14.07	14.00	8.13	8.44	8.69	8.97	11.75	12.05	86	109	112	442	415	307	65.23	6.58	0.95
Median	16.40	17.29	17.57	8.19	8.43	8.66	8.71	9.02	9.21	87	96	97	426	386	300	70.90	7.60	0.85
Minimum	0.01	0.06	0.22	7.87	8.17	8.59	6.85	8.09	8.09	79	92	91	363	369	297	5.00	1.60	0.00
Maximum	21.70	21.66	20.64	8.28	8.75	8.83	11.61	20.87	21.71	92	155	162	555	520	330	114.10	9.50	2.10
SD	8.17	8.37	8.12	0.16	0.21	0.10	1.70	5.28	5.59	5	26	29	70	61	13	39.15	3.04	0.96
SE	4.72	4.83	4.69	0.09	0.12	0.06	0.98	3.05	3.23	3	15	17	41	35	8	22.61	1.76	0.55
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-1. - continued -

	ORP (mV)			Secchi Depth (m)			Calculated Euphotic Depth (m)			Estimated Euphotic Depth (m)		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	157	165	120	0.36	1.54	3.68	0.71	3.08	7.35	0.75	3.10	7.33
Median	114	163	109	0.35	1.55	3.25	0.70	3.10	6.50	0.75	3.10	6.50
Minimum	86	135	84	0.35	1.45	3.10	0.70	2.90	6.20	0.70	3.00	6.20
Maximum	314	199	177	0.37	1.62	4.68	0.74	3.24	9.36	0.80	3.20	9.30
SD	93	25	38	0.01	0.07	0.71	0.02	0.14	1.42	0.04	0.08	1.40
SE	54	15	22	0.01	0.05	0.50	0.01	0.10	1.01	0.03	0.06	0.99
N	4	4	4	3	3	3	3	3	3	3	3	3

Table 3.3-2. Summary statistics for routine laboratory variables measured in the Saskatchewan River Region: 2010/2011.

	Total Alkalinity ($CaCO_3$ mg/L)			Bicarbonate Alkalinity (HCO_3 mg/L)			Carbonate Alkalinity (CO_3 mg/L)			Hydroxide Alkalinity (OH mg/L)			Ammonia (mg N/L)			Nitrate/Nitrite (mg N/L)			TKN (mg/L)		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	152	150	165	185	176	190	<0.60	3.69	5.20	<0.40	<0.40	<0.40	<0.050	<0.050	<0.050	0.0628	<0.050	<0.050	0.50	0.43	0.28
Median	149	141	162	180	162	185	<0.60	3.73	6.02	<0.40	<0.40	<0.40	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.54	0.44	0.28
Minimum	130	136	161	158	158	183	<0.60	<0.60	2.42	<0.40	<0.40	<0.40	<0.050	<0.010	<0.010	<0.0050	<0.0050	<0.0050	0.33	0.35	0.25
Maximum	180	182	175	220	222	208	1.31	7.00	6.35	<0.40	<0.40	<0.40	<0.050	<0.050	<0.050	0.215	0.0846	<0.050	0.61	0.51	0.30
SD	18	19	6	22	27	10	0.44	2.37	1.62	-	-	-	0.012	0.009	0.008	0.0882	0.0336	0.0092	0.10	0.06	0.02
SE	10	11	3	13	15	6	0.25	1.37	0.93	-	-	-	0.007	0.005	0.005	0.0509	0.0194	0.0053	0.06	0.03	0.01
N	4	4	4	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4

Table 3.3-2. - continued -

	DIN (mg/L) [1]			Organic Nitrogen (mg/L) [1]			TN (mg/L) [1]			TDP (mg/L)			TPP (mg/L)[1]			TP (mg/L)			TN:TP[1]			DIN:DP[1]		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	0.087	<0.050	<0.050	0.47	0.41	0.27	0.57	0.46	0.29	0.0136	0.0091	0.0044	0.027	0.01325	0.0058	0.0420	0.0211	0.0101	42	70	385	20	10	5
Median	<0.050	<0.050	<0.050	0.51	0.41	0.26	0.56	0.46	0.29	0.0125	0.0085	0.0046	0.016	0.0118	0.0059	0.0304	0.0220	0.0121	44	54	56	7	11	2
Minimum	<0.050	<0.0010	<0.0010	0.28	0.33	0.25	0.53	0.38	0.25	0.0053	0.0035	<0.0010	<0.010	<0.010	<0.001	0.0180	0.0059	0.0005	15	33	36	2	1	1
Maximum	0.262	0.111	<0.050	0.60	0.51	0.30	0.61	0.54	0.32	0.0240	0.0160	0.0080	0.073	0.0270	0.0109	0.0892	0.0346	0.0157	67	141	1393	65	16	12
SD	0.102	0.0406	0.0092	0.12	0.07	0.02	0.03	0.07	0.02	0.0072	0.0045	0.0027	0.031	0.0116	0.0043	0.0283	0.0110	0.0060	21	44	582	26	6	5
SE	0.059	0.0235	0.0053	0.07	0.04	0.01	0.02	0.04	0.01	0.0041	0.0026	0.0015	0.015	0.0058	0.0021	0.0163	0.0064	0.0035	12	25	336	15	4	3
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3

Table 3.3-2. - continued -

	DIN:TP[1]			DOC (mg/L)			TOC (mg/L)			TIC (mg/L)			TOC:ON[1]			TOC:TN[1]			TDS (mg/L)			Laboratory Conductivity (µmhos/cm)		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	9	7	2	8.9	7.5	6.8	8.8	7.8	7.0	35.4	34.7	38.0	22	22	31	18	20	29	263	243	183	435	411	299
Median	2	6	1	9.9	7.1	6.7	9.7	7.1	7.1	34.1	32.1	37.3	23	21	31	20	19	28	249	232	186	423	385	297
Minimum	0	0	1	5.7	6.2	6.6	5.6	6.4	6.4	29.8	31.2	36.0	20	18	28	12	17	27	220	192	156	362	369	294
Maximum	32	15	5	10.3	9.6	7.2	10.3	10.4	7.2	43.8	43.3	41.5	23	28	33	21	22	31	334	318	206	534	505	309
SD	13	6	2	1.9	1.3	0.2	1.9	1.6	0.3	5.2	5.0	2.1	1	4	2	4	2	2	43	46	20	62	55	6
SE	8	3	1	1.1	0.8	0.1	1.1	0.9	0.2	3.0	2.9	1.2	1	2	1	2	1	1	25	27	11	36	32	3
N	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-2. - continued -

	TSS (mg/L)			Laboratory Turbidity (NTU)			True Colour (TCU)			Laboratory pH			*E. coli* (CFU/100 mL)			Chlorophyll *a* (µg/L)		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	58.2	2.2	<2.0	18.3	2.57	0.79	25.5	15.2	<5.0	8.22	8.44	8.49	6	<1	<1	2.91	4.76	1.16
Median	60.6	<2.0	<2.0	15.2	2.34	0.63	26.8	14.7	<5.0	8.24	8.46	8.54	4	<1	<1	3.32	1.69	1.15
Minimum	5.6	<2.0	<2.0	3.74	1.93	0.37	8.5	10.1	<5.0	8.07	8.23	8.34	<1	<1	<1	0.76	0.95	0.97
Maximum	106	5.6	3.6	39.0	3.69	1.52	40.0	21.1	5.6	8.32	8.62	8.56	16	<1	<1	4.25	14.7	1.36
SD	37.0	2.0	1.1	12.9	0.67	0.44	11.3	3.9	1.4	0.10	0.14	0.09	6	-	-	1.45	5.77	0.16
SE	21.3	1.2	0.7	7.42	0.39	0.26	6.5	2.3	0.8	0.06	0.08	0.05	4	-	-	0.84	3.33	0.11
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3

Table 3.3-2. - continued -

	Hardness as $CaCO_3$ (mg/L)			Chloride (mg/L)			Sulphate (mg/L)		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	187	179	169	12.5	12.2	1.04	61.2	49.2	3.54
Median	185	170	169	12.9	11.1	1.03	56.7	45.8	3.30
Minimum	163	163	160	10.1	10.5	1.00	44.8	41.1	3.18
Maximum	216	213	177	14.0	16.0	1.10	86.7	64.3	4.40
SD	19	20	7	1.5	2.2	0.04	15.6	9.0	0.50
SE	11	12	4	0.9	1.3	0.02	9.0	5.2	0.29
N	4	4	4	4	4	4	4	4	4

[1] Calculated.

Table 3.3-3. Summary statistics for metals and major ions measured in the Saskatchewan River Region: 2010/2011. Values are presented as mg/L.

	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			Boron		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	0.595	0.0834	0.0322	<0.00020	<0.00020	<0.00020	0.00141	0.00152	0.00126	0.0840	0.0814	0.0361	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.028	0.027	0.012
Median	0.620	0.0938	0.0255	<0.00020	<0.00020	<0.00020	0.00148	0.00146	0.00132	0.0845	0.0784	0.0359	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.031	0.025	0.015
Minimum	0.0817	0.0212	0.0171	<0.00020	<0.00020	<0.00020	0.00076	0.00078	0.00108	0.0730	0.0714	0.0329	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.018	0.023	<0.010
Maximum	1.06	0.125	0.0608	0.00031	0.00034	0.00021	0.00194	0.00240	0.00133	0.0939	0.0976	0.0397	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.033	0.033	0.015
SD	0.347	0.0393	0.0169	0.00009	0.00010	0.00005	0.00048	0.00060	0.00010	0.0085	0.0098	0.0024	-	-	-	-	-	-	0.006	0.004	0.004
SE	0.200	0.0227	0.0098	0.00005	0.00006	0.00003	0.00028	0.00035	0.00006	0.0049	0.0056	0.0014	-	-	-	-	-	-	0.003	0.002	0.002
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-3. - continued -

	Cadmium			Calcium			Cesium			Chromium			Cobalt			Copper			Iron		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	0.000054	0.000013	0.000019	45.6	44.8	35.6	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00044	<0.00020	<0.00020	0.00212	0.00139	0.00098	0.861	0.105	0.029
Median	0.000040	0.000013	<0.000010	44.1	42.5	36.2	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00052	<0.00020	<0.00020	0.00236	0.00130	0.00101	0.867	0.119	0.028
Minimum	<0.000010	<0.000010	<0.000010	41.4	41.8	32.1	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.00134	0.00121	0.00083	0.400	0.032	<0.020
Maximum	0.000131	0.000022	0.000053	52.6	52.5	37.8	0.00015	<0.00010	<0.00010	0.0013	<0.0010	<0.0010	0.00063	<0.00020	<0.00020	0.00243	0.00175	0.00107	1.31	0.150	0.051
SD	0.000047	0.000006	0.000020	4.2	4.5	2.3	0.00006	-	-	0.0003	-	-	0.00020	-	-	0.00045	0.00022	0.00010	0.323	0.048	0.018
SE	0.000027	0.000004	0.000012	2.4	2.6	1.3	0.00003	-	-	0.0002	-	-	0.00012	-	-	0.00026	0.00013	0.00006	0.187	0.028	0.010
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-3. - continued -

	Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	0.000679	0.000122	0.000112	0.0133	0.0110	0.0040	17.9	16.3	19.4	0.0580	0.0150	0.00264	<0.000050	<0.000050	<0.000050	0.00121	0.00127	<0.00020	<0.0020	<0.0020	<0.0020
Median	0.000831	0.000104	0.000107	0.0135	0.0099	0.0041	18.2	15.4	19.8	0.0567	0.0093	0.00225	<0.000050	<0.000050	<0.000050	0.00116	0.00120	0.00022	0.0022	<0.0020	<0.0020
Minimum	0.000093	<0.000090	<0.000090	0.0102	0.0091	0.0028	14.6	14.3	17.8	0.0540	0.00575	0.00151	<0.000050	<0.000050	<0.000050	0.00102	0.00118	<0.00020	<0.0020	<0.0020	<0.0020
Maximum	0.000960	0.000234	0.000190	0.0162	0.0152	0.0051	20.6	20.0	20.4	0.0646	0.0357	0.00454	<0.000050	<0.000050	<0.000050	0.00148	0.00150	0.00024	0.0023	<0.0020	<0.0020
SD	0.000345	0.000069	0.000068	0.0023	0.0025	0.0009	2.1	2.2	1.0	0.0040	0.0122	0.00114	-	-	-	0.00017	0.00013	0.00006	0.0005	-	-
SE	0.000199	0.000040	0.000039	0.0013	0.0014	0.0005	1.2	1.3	0.6	0.0023	0.00705	0.00066	-	-	-	0.00010	0.00008	0.00003	0.0003	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-3. - continued -

	Potassium			Rubidium			Selenium			Silicon			Silver			Sodium			Strontium		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	3.11	2.96	1.26	0.00228	0.00125	0.00109	3.07	1.86	2.91	3.07	1.86	2.91	<0.00010	<0.00010	<0.00010	20.0	17.5	2.77	0.281	0.262	0.0655
Median	3.10	2.77	1.24	0.00225	0.00123	0.00113	2.98	1.74	2.85	2.98	1.74	2.85	<0.00010	<0.00010	<0.00010	19.0	16.1	2.80	0.261	0.248	0.0650
Minimum	2.97	2.72	1.18	0.00142	0.00114	0.00096	2.67	1.38	2.73	2.67	1.38	2.73	<0.00010	<0.00010	<0.00010	13.3	14.4	2.52	0.243	0.240	0.0643
Maximum	3.26	3.60	1.36	0.00321	0.00141	0.00115	3.64	2.59	3.19	3.64	2.59	3.19	<0.00010	<0.00010	<0.00010	28.8	23.5	2.94	0.358	0.311	0.0676
SD	0.10	0.37	0.07	0.00065	0.00011	0.00008	0.37	0.45	0.18	0.37	0.45	0.18	-	-	-	5.6	3.5	0.16	0.045	0.029	0.0013
SE	0.06	0.21	0.04	0.00038	0.00006	0.00004	0.21	0.26	0.10	0.21	0.26	0.10	-	-	-	3.2	2.0	0.09	0.026	0.017	0.0007
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-3. continued.

	Tellurium			Thallium			Thorium			Tin			Titanium			Tungsten		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00018	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	0.0159	0.00290	0.00083	<0.0010	<0.0010	<0.0010
Median	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00019	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	0.0175	0.00309	0.00051	<0.0010	<0.0010	<0.0010
Minimum	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	0.00272	0.00061	0.00023	<0.0010	<0.0010	<0.0010
Maximum	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00029	<0.00010	<0.00010	0.00021	<0.00020	<0.00020	0.0259	0.00481	0.00208	<0.0010	<0.0010	<0.0010
SD	-	-	-	-	-	-	0.00009	-	-	0.00005	-	-	0.00835	0.00151	0.00074	-	-	-
SE	-	-	-	-	-	-	0.00005	-	-	0.00003	-	-	0.00482	0.00087	0.00043	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-3. - continued -

	Uranium			Vanadium			Zinc			Zirconium		
	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM	SASK	CEDAR-SE	CORM
Mean	0.00096	0.00085	0.00018	0.00204	0.00064	0.00095	0.0057	<0.0050	<0.0050	0.00062	<0.00040	<0.00040
Median	0.00088	0.00074	0.00018	0.00231	0.00062	0.00074	0.0063	<0.0050	<0.0050	0.00073	<0.00040	<0.00040
Minimum	0.00069	0.00068	0.00015	0.00051	0.00052	0.00064	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040
Maximum	0.00138	0.00124	0.00021	0.00305	0.00078	0.00169	0.0077	<0.0050	<0.0050	0.00083	<0.00040	<0.00040
SD	0.00026	0.00023	0.00003	0.00095	0.00010	0.00043	0.0020	-	-	0.00025	-	-
SE	0.00015	0.00013	0.00001	0.00055	0.00006	0.00025	0.0012	-	-	0.00014	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 3.3-4. Frequency of detections of total metals measured in the Saskatchewan River Region: 2010/2011.

		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt
Saskatchewan River	# Detections	4	1	4	4	0	0	4	3	4	1	1	3
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	25	100	100	0	0	100	75	100	25	25	75
Cedar Lake -SE	# Detections	4	2	4	4	0	0	4	3	4	0	0	0
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	50	100	100	0	0	100	75	100	0	0	0
Cormorant Lake	# Detections	4	1	4	4	0	0	3	2	4	0	0	0
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	25	100	100	0	0	75	50	100	0	0	0

Table 3.3-4. - continued -

		Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium
Saskatchewan River	# Detections	4	4	4	4	4	4	0	4	3	4	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	100	100	0	100	75	100	100	100
Cedar Lake -SE	# Detections	4	4	3	4	4	4	0	4	0	4	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	75	100	100	100	0	100	0	100	100	100
Cormorant Lake	# Detections	4	3	2	4	4	4	0	3	0	4	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	75	50	100	100	100	0	75	0	100	100	100

Table 3.3-4. - continued -

		Silicon	Silver	Sodium	Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Saskatchewan River	# Detections	4	0	4	4	0	0	3	1	4	0	4	4	3	3
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	75	25	100	0	100	100	75	75
Cedar Lake -SE	# Detections	4	0	4	4	0	0	0	0	4	0	4	4	0	0
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	0	0	100	0	100	100	0	0
Cormorant Lake	# Detections	4	0	4	4	0	0	0	0	4	0	4	4	0	0
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	0	0	100	0	100	100	0	0

Table 3.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Saskatchewan River Region: 2010/2011. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00038-0.00048	0.127-0.162	0.0139-0.0180	0.3	0.00579-0.00848	0.000026
SASK	N	**4**	4	4	4	4	4	**4**	4	0
	# Exceedances	**3**	0	0	0	0	0	**4**	0	N/A[1]
	% Exceedance	**75**	0	0	0	0	0	**100**	0	N/A[1]
CEDAR-SE	N	**4**	4	4	4	4	4	4	4	0
(Surface)	# Exceedances	**2**	0	0	0	0	0	0	0	N/A[1]
	% Exceedance	**50**	0	0	0	0	0	0	0	N/A[1]
CEDAR-SE	N	**1**	1	1	1	1	1	1	1	0
(Bottom)	# Exceedances	**1**	0	0	0	0	0	0	0	N/A[1]
	% Exceedance	**100**	0	0	0	0	0	0	0	N/A[1]
CORM	N	4	4	4	4	4	4	4	4	0
(Surface)	# Exceedances	0	0	0	0	0	0	0	0	N/A[1]
	% Exceedance	0	0	0	0	0	0	0	0	N/A[1]
CORM	N	**2**	2	2	2	2	2	2	2	0
(Bottom)	# Exceedances	**1**	0	0	0	0	0	0	0	N/A[1]
	% Exceedance	**50**	0	0	0	0	0	0	0	N/A[1]

Table 3.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.078-0.100	0.001	0.0001	0.0008	0.015	0.178-0.230	120	128-429
SASK	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedance	0	0	0	0	0	0	0	0	0
CEDAR-SE	N	4	4	4	4	4	4	4	4	4
(Surface)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedance	0	0	0	0	0	0	0	0	0
CEDAR-SE	N	1	1	1	1	1	1	1	1	1
(Bottom)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedance	0	0	0	0	0	0	0	0	0
CORM	N	4	4	4	4	4	4	4	4	4
(Surface)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedance	0	0	0	0	0	0	0	0	0
CORM	N	2	2	2	2	2	2	2	2	2
(Bottom)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedance	0	0	0	0	0	0	0	0	0

[1] Mercury was analysed at a detection limit of 0.00005 mg/L and results cannot be compared to the current Manitoba PAL guideline for mercury.

[2]Comparison to the long-term CCME PAL guideline.

[3]Comparison to the BCMOE guideline.

Table 3.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Saskatchewan River Region and CCME (1999; updated to 2013) trophic categorization: 2010/2011.

		Trophic Status Based on Total Phosphorous (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100
Saskatchewan River	Open-water season					0.050	
	Annual					0.042	
Cedar Lake-SE	Open-water season				0.023		
	Annual				0.021		
Cormorant Lake	Open-water season		0.010				
	Annual		0.010				

Table 3.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Saskatchewan River Region and the OECD (1982) trophic categorization scheme for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<2.5	2.5 - 8	-	8 - 25	> 25
Cedar Lake-SE	Open-water season			6.0			
	Annual			4.8			
Cormorant Lake	Open-water season		1.2				
	Annual		1.2				

Table 3.3-8. Total nitrogen concentrations (open-water season and annual means) measured in lakes and reservoirs in the Saskatchewan River Region and comparison to a trophic categorization scheme (Nurnberg 1996): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Cedar Lake-SE	Open-water season			0.43			
	Annual			0.46			
Cormorant Lake	Open-water season		0.29				
	Annual		0.29				

Table 3.3-9. Mean (open-water season and annual) concentrations of chlorophyll *a* and TN in the Saskatchewan River and comparison to trophic categorization schemes for rivers/streams (Dodds et al. 1998): 2010/2011.

	Trophic Categories					
	Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Chlorophyll *a* (µg/L) Trophic Categories		**<10**	**10-30**		**>30**	
Open-water season		3.6				
Annual		2.9				
TN (mg/L) Trophic Categories		**<0.7**	**0.7-1.5**		**>1.5**	
Open-water season		0.57				
Annual		0.57				

Table 3.4-1. Community metrics for phytoplankton samples collected in the Saskatchewan River Region during the open-water season of 2010.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Wiener Index (H)	Evenness (E_H)	Hill's Effective Richness ($e^{H`}$)	Evenness ($e^{H`}$/S)
Saskatchewan River	Spring	21	0.62	0.13	1.40	0.46	4.06	0.19
	Summer	39	0.90	0.26	2.35	0.64	10.52	0.27
	Fall	30	0.34	0.05	0.88	0.26	2.41	0.08

Table 3.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Saskatchewan River Region for the CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Disk Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Saskatchewan River (2010)	Nearshore	5	0.8	0.8	0.9	1.00	0.29	15.0	clay, organic matter	shrubs, coniferous	0-24	--
	Offshore	5	6.4	5.3	7.7	0.42	0.31	15.0	clay, organic matter	--	--	--
Cedar Lake -SE (2010)	Nearshore	5	0.5	0.5	0.6	--	--	14.0	boulder, cobble	shrubs, mixed forest	0-24	slime/crust
	Offshore	5	6.2	6.1	6.5	--	1.17	--	clay, organic matter	--	--	floating
Cormorant Lake (2010)	Nearshore	5	0.9	0.7	1	--*	--	15.0	boulder, cobble	mixed forest	0-24	slime/crust attached
	Offshore	5	7.4	7.1	7.6	--*	3.19	15.0	clay, organic matter	--	--	--

Note: * - water velocity not measured, but observed to be nil.

Table 3.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at offshore benthic invertebrate sites in the Saskatchewan River Region for the CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Saskatchewan River (2010)	Nearshore	Mean	5	0.8	1.73	14.11	62.04	23.88	Silt Loam
		SD	--	0.05	0.078	4.770	3.773	1.810	--
		SE	--	0.02	0.035	2.133	1.687	0.810	--
		Median	--	0.8	1.78	13.00	63.20	23.80	--
		Min	--	0.8	1.62	9.46	55.50	22.20	--
		Max	--	0.9	1.79	22.20	65.00	26.60	--
	Offshore	Mean	5	6.5	1.29	19.94	52.68	27.38	Silty Clay Loam
		SD	--	1.16	0.449	11.611	7.085	4.884	--
		SE	--	0.52	0.201	5.193	3.169	2.184	--
		Median	--	7.0	1.07	15.60	53.00	30.00	--
		Min	--	5.3	0.90	9.29	44.10	21.30	--
		Max	--	8.0	1.98	34.60	60.70	31.40	--
Cedar Lake-SE (2010)	Offshore	Mean	5	6.4	21.44	41.14	25.20	33.68	Clay Loam
		SD	--	0.19	0.439	7.068	4.230	4.621	--
		SE	--	0.09	0.196	3.161	1.892	2.066	--
		Median	--	6.3	21.40	42.50	27.40	31.80	--
		Min	--	6.1	21.00	32.90	18.60	28.70	--
		Max	--	6.6	22.10	49.60	28.90	39.70	--
Cormorant Lake (2010)	Offshore	Mean	5	7.4	0.86	57.06	24.78	18.16	Sandy Loam
		SD	--	0.19	0.136	16.770	10.007	7.285	--
		SE	--	0.09	0.061	7.500	4.475	3.258	--
		Median	--	7.4	0.81	57.20	26.00	16.80	--
		Min	--	7.1	0.72	31.60	12.40	10.60	--
		Max	--	7.6	1.08	73.00	38.40	30.00	--

Table 3.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in the Saskatchewan River within the Saskatchewan River Region for CAMPP, 2010.

	Saskatchewan River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	61	17.1	7.6	68	43	82
Oligochaeta	--	10	2.6	1.1	10	7	14
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.2	0.1	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.1	0.1	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	9	5.6	2.5	11	1	15
Gastropoda - unid	--	0	0.1	0.1	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	2	1.0	0.5	2	0	3
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	21	7.8	3.5	23	12	31
Non-Insecta (%)	34	--	--	--	--	--	--
Oligochaeta	--	10	2.6	1.1	10	7	14
Oligochaeta (%)	17	--	--	--	--	--	--
Amphipoda	--	0	0.2	0.1	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	9	5.6	2.5	11	1	15
Bivalvia (%)	14	--	--	--	--	--	--
Gastropoda	--	2	1.1	0.5	2	0	3
Gastropoda (%)	3	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 3.5-3. - continued -

	Saskatchewan River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	36	10.0	4.5	32	27	52
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 3.5-3. - continued -

	Saskatchewan River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.3	0.1	0	0	1
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	0	0.3	0.1	0	0	1
Orthocladiinae	--	2	1.0	0.5	2	1	4
Tanypodinae	--	2	2.3	1.0	1	0	6
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	41	12.1	5.4	36	28	58
Insecta (%)	66	--	--	--	--	--	--
Chironomidae	--	4	2.8	1.3	4	1	9
Chironomidae (%)	7	--	--	--	--	--	--
Ephemeroptera	--	36	10.0	4.5	32	27	52
Ephemeroptera (%)	59	--	--	--	--	--	--

Table 3.5-3. - continued -

	Saskatchewan River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	36	10	4	32	27	52
EPT (%)	59	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	10.73	5.798	2.593	9.81	4.38	20.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	6	0.8	0.4	6	5	7
Simpson's Diversity Index (D)	--	0.60	0.072	0.032	0.56	0.52	0.69
Evenness (Simpson's Equitability E_D)	--	0.34	0.088	0.039	0.33	0.23	0.46
Shannon-Weaver Index (H)	--	1.21	0.155	0.069	1.23	1.04	1.39
Evenness (Shannon’s Equitability E_H)	--	0.60	0.062	0.028	0.58	0.53	0.68
Hill's Effective Richness ($E^{H'}$)	--	3	0.5	0.2	3	3	4
Evenness ($E^{H'}$/S)	--	0.44	0.073	0.032	0.45	0.34	0.54

Table 3.5-3. - continued -

	Saskatchewan River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	915	586.6	262.4	1212	260	1486
Oligochaeta	--	242	400.0	178.9	29	0	938
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	3	6.5	2.9	0	0	14
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	98	89.8	40.1	72	14	231
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	343	380.7	170.2	231	58	1010
Non-Insecta (%)	38	--	--	--	--	--	--
Oligochaeta	--	242	400.0	178.9	29	0	938
Oligochaeta (%)	26	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	98	89.8	40.1	72	14	231
Bivalvia (%)	11	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 3.5-3. - continued -

	Saskatchewan River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	3	6.5	2.9	0	0	14
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	89	92.0	41.2	101	0	231
Heptageniidae	--	6	12.9	5.8	0	0	29
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	17	18.8	8.4	14	0	43

Table 3.5-3. - continued -

	Saskatchewan River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	9	19.4	8.7	0	0	43
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	225	316.4	141.5	0	0	664
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	3	6.5	2.9	0	0	14
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	12	25.8	11.5	0	0	58
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	3	6.5	2.9	0	0	14
Chironomidae (pupa)	--	3	6.5	2.9	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	185	206.4	92.3	115	0	476
Orthocladiinae	--	12	18.8	8.4	0	0	43
Tanypodinae	--	0	0.0	0.0	0	0	0
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	3	6.5	2.9	0	0	14
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	3	6.5	2.9	0	0	14
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	571	528.8	236.5	476	0	1154
Insecta (%)	62	--	--	--	--	--	--

Table 3.5-3. - continued -

	Saskatchewan River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	202	207.8	92.9	173	0	476
Chironomidae (%)	22	--	--	--	--	--	--
Ephemeroptera	--	115	88.4	39.5	115	0	245
Ephemeroptera (%)	13	--	--	--	--	--	--
Plecoptera	--	9	19.4	8.7	0	0	43
Plecoptera (%)	1	--	--	--	--	--	--
Trichoptera	--	228	319.1	142.7	0	0	664
Trichoptera (%)	25	--	--	--	--	--	--
EPT	--	352	335.7	150.1	245	0	794
EPT (%)	38	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.60	3.130	1.400	1.42	0.00	8.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	14	6	2.1	0.9	6	3	9
Simpson's Diversity Index (D)	--	0.55	0.201	0.090	0.63	0.20	0.71
Evenness (Simpson's Equitability E_D)	--	0.40	0.137	0.061	0.42	0.25	0.57
Shannon-Weaver Index (H)	--	1.15	0.408	0.182	1.30	0.43	1.40
Evenness (Shannon's Equitability E_H)	--	0.61	0.148	0.066	0.60	0.39	0.77
Hill's Effective Richness ($E^{H'}$)	--	3	1.0	0.5	4	2	4
Evenness ($E^{H'}$/S)	--	0.52	0.120	0.054	0.51	0.37	0.66

Table 3.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Cedar Lake-Southeast within the Saskatchewan River Region for CAMPP, 2010.

	Cedar Lake-SE						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	356	312.6	139.8	205	109	857
Oligochaeta	--	11	8.8	3.9	11	1	24
Hirudinea	--	1	1.3	0.6	0	0	3
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.3	0.1	0	0	1
Crangonyctidae	--	0	0.6	0.3	0	0	1
Gammaridae	--	39	28.7	12.9	27	8	72
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	176	139.5	62.4	100	56	341
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	7	10.0	4.5	3	0	24
Gastropoda - unid	--	0	0.3	0.1	0	0	1
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.1	0.1	0	0	0
Lymnaeidae	--	24	45.1	20.2	3	0	104
Physidae	--	6	8.8	4.0	2	1	21
Planorbidae	--	17	28.9	12.9	0	0	67
Valvatidae	--	14	27.8	12.4	3	0	64
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.1	0.1	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	294	264.5	118.3	154	95	712
Non-Insecta (%)	83	--	--	--	--	--	--
Oligochaeta	--	11	8.8	3.9	11	1	24
Oligochaeta (%)	3	--	--	--	--	--	--
Amphipoda	--	215	167.5	74.9	128	64	408
Amphipoda (%)	60	--	--	--	--	--	--
Bivalvia	--	7	10.0	4.5	3	0	24
Bivalvia (%)	2	--	--	--	--	--	--
Gastropoda	--	61	110.0	49.2	7	3	256
Gastropoda (%)	17	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.1	0.1	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	10	10.3	4.6	8	1	27
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	1	2.4	1.1	0	0	5
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.1	0.1	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	13	9.8	4.4	7	5	27
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.6	0.2	0	0	1
Hexagenia	--	0	0.1	0.1	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	1	1.2	0.5	0	0	3
Stenomena	--	0	0.1	0.1	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	3	3.8	1.7	2	0	9
Paraleptophlebia	--	7	12.8	5.7	0	0	29
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	1	0.5	0.2	0	0	1
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	2	3.1	1.4	1	1	8
Hydropsychidae	--	1	1.0	0.4	1	0	3
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.3	0.1	0	0	1
Lepidostomatidae	--	0	0.3	0.1	0	0	1
Leptoceridae (larva)	--	1	2.4	1.1	0	0	5
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	1	1.2	0.5	0	0	3
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.6	0.3	0	0	1
Polycentropodidae	--	1	1.2	0.5	0	0	3
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.1	0.1	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	12	9.5	4.2	11	1	24
Orthocladiinae	--	6	3.0	1.3	6	2	9
Tanypodinae	--	0	0.0	0.0	0	0	0
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	1	1.7	0.7	1	0	4
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.3	0.1	0	0	1
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	61	49.9	22.3	51	14	145
Insecta (%)	17	--	--	--	--	--	--

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	18	12.0	5.4	15	3	32
Chironomidae (%)	5	--	--	--	--	--	--
Ephemeroptera	--	25	22.5	10.1	18	9	64
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	7	8.3	3.7	4	2	21
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	32	30.6	13.7	23	10	85
EPT (%)	9	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.04	1.217	0.544	1.48	1.05	3.88
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	31	20	1.8	0.8	20	17	22
Simpson's Diversity Index (D)	--	0.69	0.140	0.063	0.73	0.52	0.82
Evenness (Simpson's Equitability E_D)	--	0.17	0.058	0.026	0.16	0.11	0.24
Shannon-Weaver Index (H)	--	1.79	0.473	0.212	1.94	1.22	2.25
Evenness (Shannon's Equitability E_H)	--	0.58	0.137	0.061	0.62	0.42	0.71
Hill's Effective Richness ($E^{H'}$)	--	6	2.8	1.2	7	3	10
Evenness ($E^{H'}$/S)	--	0.30	0.104	0.047	0.30	0.19	0.42

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	5081	2077.5	929.1	5165	2207	7531
Oligochaeta	--	1665	858.8	384.1	1775	462	2727
Hirudinea	--	6	7.9	3.5	0	0	14
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	35	77.4	34.6	0	0	173
Crangonyctidae	--	6	12.9	5.8	0	0	29
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	427	200.1	89.5	447	115	664
Hyalellidae	--	863	163.7	73.2	808	678	1111
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	6	12.9	5.8	0	0	29
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	1163	794.4	355.3	1096	29	2193
Gastropoda - unid	--	32	50.4	22.5	0	0	115
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	46	43.8	19.6	14	14	101
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	4247	1838.5	822.2	4328	1616	6334
Non-Insecta (%)	84	--	--	--	--	--	--
Oligochaeta	--	1665	858.8	384.1	1775	462	2727
Oligochaeta (%)	33	--	--	--	--	--	--
Amphipoda	--	1330	295.6	132.2	1298	967	1775
Amphipoda (%)	26	--	--	--	--	--	--
Bivalvia	--	1163	794.4	355.3	1096	29	2193
Bivalvia (%)	23	--	--	--	--	--	--
Gastropoda	--	78	44.0	19.7	87	14	130
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	92	41.6	18.6	72	58	144
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	14	10.2	4.6	14	0	29
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	14	14.4	6.5	14	0	29
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	401	168.1	75.2	462	188	563
Orthocladiinae	--	32	18.8	8.4	29	14	58
Tanypodinae	--	280	78.1	34.9	245	231	418
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	834	256.8	114.8	837	592	1197
Insecta (%)	16	--	--	--	--	--	--
Chironomidae	--	713	219.7	98.2	721	491	1024
Chironomidae (%)	14	--	--	--	--	--	--
Ephemeroptera	--	92	41.6	18.6	72	58	144

Table 3.5-4. - continued -

	Cedar Lake-SE						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	2	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	29	20.4	9.1	43	0	43
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	121	39.0	17.4	115	72	173
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.17	0.025	0.011	0.17	0.14	0.21
Genus analysis of Ephemeroptera				Ephemeridae: *Hexagenia*			
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	12	9	1.1	0.5	10	8	10
Simpson's Diversity Index (D)	--	0.79	0.025	0.011	0.79	0.76	0.83
Evenness (Simpson's Equitability E_D)	--	0.42	0.060	0.027	0.42	0.35	0.48
Shannon-Weaver Index (H)	--	1.81	0.153	0.068	1.75	1.70	2.08
Evenness (Shannon's Equitability E_H)	--	0.74	0.044	0.020	0.75	0.69	0.79
Hill's Effective Richness ($E^{H'}$)	--	6	1.0	0.5	6	5	8
Evenness ($E^{H'}/S$)	--	0.53	0.062	0.028	0.57	0.46	0.57

Table 3.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Cormorant Lake within the Saskatchewan River Region for CAMPP, 2010.

	Cormorant Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	215	78.2	35.0	189	151	351
Oligochaeta	--	10	6.8	3.0	6	5	21
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	4	3.5	1.5	3	0	7
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	22	20.2	9.0	13	6	57
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	1	1.1	0.5	1	0	3
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.5	0.2	0	0	1
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.1	0.1	0	0	0
Physidae	--	0	0.3	0.1	0	0	1
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	37	27.9	12.5	24	19	86
Non-Insecta (%)	17	--	--	--	--	--	--
Oligochaeta	--	10	6.8	3.0	6	5	21
Oligochaeta (%)	5	--	--	--	--	--	--
Amphipoda	--	25	21.9	9.8	16	13	64
Amphipoda (%)	12	--	--	--	--	--	--
Bivalvia	--	0	0.5	0.2	0	0	1
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	0	0.3	0.1	0	0	1
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 3.5-5. - continued -

	Cormorant Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	1	1.9	0.9	1	0	5
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	4	3.5	1.5	2	1	9
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.3	0.1	0	0	1
Baetidae	--	0	0.2	0.1	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	1	0.7	0.3	0	0	1
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	26	8.3	3.7	23	18	39
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.3	0.1	0	0	1
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.6	0.3	0	0	1
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	3	2.8	1.3	3	0	8
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.4	0.2	0	0	1
Stenomena	--	6	3.0	1.3	6	3	9
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	1	3.3	1.5	0	0	7
Paraleptophlebia	--	5	3.8	1.7	5	0	9
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0

Table 3.5-5. - continued -

	Cormorant Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.1	0.1	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.3	0.1	0	0	1
Trichoptera (pupa) - unid	--	0	0.1	0.1	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.3	0.1	0	0	1
Hydropsychidae	--	4	3.0	1.3	3	1	9
Hydroptilidae (larva)	--	2	2.5	1.1	1	1	7
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.3	0.1	0	0	1
Leptoceridae (larva)	--	1	1.4	0.6	0	0	3
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.3	0.1	0	0	1
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.3	0.1	0	0	1
Polycentropodidae	--	1	0.4	0.2	1	0	1
Psychomyiidae	--	0	0.3	0.1	0	0	1
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.1	0.1	0	0	0
Chironomidae (pupa)	--	0	0.6	0.2	0	0	1
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	6	6.3	2.8	6	0	16
Orthocladiinae	--	93	32.7	14.6	85	66	145
Tanypodinae	--	4	3.0	1.4	4	1	9
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	2	1.8	0.8	2	1	5
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	13	3.2	1.4	13	9	18
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	178	51.4	23.0	169	128	265
Insecta (%)	83	--	--	--	--	--	--

Table 3.5-5. - continued -

	Cormorant Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	104	41.0	18.3	89	67	171
Chironomidae (%)	48	--	--	--	--	--	--
Ephemeroptera	--	44	10.2	4.6	46	31	54
Ephemeroptera (%)	20	--	--	--	--	--	--
Plecoptera	--	0	0.1	0.1	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	9	4.6	2.0	9	3	15
Trichoptera (%)	4	--	--	--	--	--	--
EPT	--	53	13.0	5.8	49	39	69
EPT (%)	25	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.56	0.204	0.091	0.49	0.34	0.81
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	28	20	2.3	1.0	20	16	22
Simpson's Diversity Index (D)	--	0.77	0.056	0.025	0.78	0.68	0.83
Evenness (Simpson's Equitability E_D)	--	0.19	0.063	0.028	0.17	0.13	0.29
Shannon-Weaver Index (H)	--	2.05	0.154	0.069	2.11	1.79	2.17
Evenness (Shannon’s Equitability E_H)	--	0.64	0.058	0.026	0.65	0.56	0.73
Hill's Effective Richness ($E^{H'}$)	--	8	1.1	0.5	8	6	9
Evenness ($E^{H'}$/S)	--	0.32	0.070	0.031	0.32	0.25	0.44

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1928	341.4	152.7	2063	1327	2179
Oligochaeta	--	26	23.7	10.6	14	0	58
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	3	6.5	2.9	0	0	14
Haustoriidae	--	113	60.7	27.1	130	29	173
Hyalellidae	--	589	394.5	176.4	404	245	1241
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	164	140.8	63.0	144	0	390
Gastropoda - unid	--	32	37.3	16.7	14	0	72
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	150	143.4	64.1	130	14	361
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	38	24.1	10.8	43	14	72
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	1114	344.1	153.9	1140	635	1443
Non-Insecta (%)	58	--	--	--	--	--	--
Oligochaeta	--	26	23.7	10.6	14	0	58
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	704	380.8	170.3	563	404	1327
Amphipoda (%)	37	--	--	--	--	--	--
Bivalvia	--	164	140.8	63.0	144	0	390
Bivalvia (%)	9	--	--	--	--	--	--
Gastropoda	--	219	191.0	85.4	216	29	476
Gastropoda (%)	11	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	14	0.0	0.0	14	14	14
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	3	6.5	2.9	0	0	14
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	52	24.1	10.8	58	29	87
Hexagenia	--	234	86.8	38.8	231	130	346
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	20	7.9	3.5	14	14	29
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	35	24.1	10.8	29	14	72
Phryganeidae	--	9	12.9	5.8	0	0	29
Polycentropodidae	--	23	26.2	11.7	14	0	58
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	35	40.3	18.0	14	0	101
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	248	97.5	43.6	289	130	346
Orthocladiinae	--	9	12.9	5.8	0	0	29
Tanypodinae	--	133	52.4	23.4	115	87	202
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	814	187.2	83.7	750	620	1082
Insecta (%)	42	--	--	--	--	--	--
Chironomidae	--	390	139.5	62.4	418	245	548
Chironomidae (%)	20	--	--	--	--	--	--
Ephemeroptera	--	289	87.2	39.0	289	159	375

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	15	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	87	39.5	17.7	87	43	144
Trichoptera (%)	4	--	--	--	--	--	--
EPT	--	375	70.7	31.6	346	303	476
EPT (%)	19	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.04	0.316	0.141	0.87	0.72	1.41
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	16	13	0.8	0.4	13	12	14
Simpson's Diversity Index (D)	--	0.82	0.098	0.044	0.84	0.65	0.89
Evenness (Simpson's Equitability E_D)	--	0.41	0.160	0.072	0.42	0.17	0.61
Shannon-Weaver Index (H)	--	2.12	0.277	0.124	2.16	1.66	2.37
Evenness (Shannon’s Equitability E_H)	--	0.77	0.110	0.049	0.78	0.59	0.88
Hill's Effective Richness ($E^{H'}$)	--	9	2.1	0.9	9	5	11
Evenness ($E^{H'}$/S)	--	0.55	0.150	0.067	0.55	0.31	0.71

Table 3.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Saskatchewan River Region waterbodies, 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Saskatchewan River	GN-01	14	389619	5917392	13-Sep-10	14.95	2.4	2.4	12.0
Saskatchewan River	GN-02	14	388862	5916739	13-Sep-10	15.03	2.5	2.4	-
Saskatchewan River	GN-03	14	387767	5916424	13-Sep-10	15.08	2.5	2.3	-
Saskatchewan River	GN-04	14	381370	5923255	14-Sep-10	22.47	1.8	3.4	-
Saskatchewan River	GN-05	14	374582	5923548	14-Sep-10	23.05	2.7	2.7	-
Saskatchewan River	GN-06	14	373001	5923841	14-Sep-10	23.53	2.4	2.3	-
Saskatchewan River	GN-07	14	400582	5923226	15-Sep-10	20.03	2.4	1.8	-
Saskatchewan River	GN-08	14	402499	5922347	15-Sep-10	19.67	1.8	1.8	-
Saskatchewan River	GN-09	14	364428	5962373	20-Sep-10	21.37	1.2	4.6	-
Saskatchewan River	GN-10	14	368119	5958505	20-Sep-10	24.15	0.9	4.2	-
Saskatchewan River	GN-11	14	366449	5952015	20-Sep-10	22.13	0.9	1.8	-
Saskatchewan River	SN-03	14	387767	5916424	13-Sep-10	15.08	2.5	2.3	-
Saskatchewan River	SN-09	14	364428	5962373	20-Sep-10	21.37	1.2	4.6	-
Cedar Lake-Southeast	GN-01	14	450391	5895322	7-Aug-10	24.80	6.2	7.7	19.0
Cedar Lake-Southeast	GN-02	14	445841	5891537	7-Aug-10	24.57	10.5	10.5	19.0
Cedar Lake-Southeast	GN-03	14	441852	5887384	4-Aug-10	24.23	2.8	3.2	20.0
Cedar Lake-Southeast	GN-04	14	445257	5886828	4-Aug-10	26.03	7.9	7.5	20.0
Cedar Lake-Southeast	GN-05	14	439933	5891981	6-Aug-10	24.75	9.4	9.3	21.0
Cedar Lake-Southeast	GN-06	14	434854	5884052	4-Aug-10	22.68	6.5	6.9	20.0
Cedar Lake-Southeast	GN-07	14	431936	5891452	5-Aug-10	25.23	11.6	11.3	23.0
Cedar Lake-Southeast	GN-08	14	424069	5889128	5-Aug-10	25.07	5.6	7.0	23.0
Cedar Lake-Southeast	GN-09	14	437062	5895716	6-Aug-10	22.60	8.6	8.7	21.0
Cedar Lake-Southeast	GN-10	14	416071	5891302	5-Aug-10	24.50	7.9	7.9	23.0
Cedar Lake-Southeast	GN-11	14	452785	5889995	7-Aug-10	24.45	12.1	12.5	19.0
Cedar Lake-Southeast	GN-12	14	431258	5898598	6-Aug-10	22.42	11.9	11.8	21.0
Cedar Lake-Southeast	GN-13	14	451930	5897254	8-Aug-10	24.13	10.9	9.0	19.0
Cedar Lake-Southeast	GN-14	14	456929	5900995	8-Aug-10	23.35	4.5	4.5	19.0
Cedar Lake-Southeast	SN-04	14	445222	5886829	4-Aug-10	25.90	8.4	7.5	20.0
Cedar Lake-Southeast	SN-05	14	439906	5891987	6-Aug-10	24.58	9.7	9.3	21.0
Cedar Lake-Southeast	SN-10	14	416057	5891427	5-Aug-10	24.42	7.9	7.9	23.0

Table 3.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Cormorant Lake	GN-02	14	372017	6018009	21-Aug-10	21.60	3.7	6.7	18.0
Cormorant Lake	GN-05	14	390153	6012858	21-Aug-10	24.12	5.5	4.0	18.0
Cormorant Lake	GN-08	14	384531	6010791	17-Aug-10	17.55	11.9	11.6	18.0
Cormorant Lake	GN-09	14	381379	6009354	18-Aug-10	21.75	12.8	12.8	18.0
Cormorant Lake	GN-11	14	385101	6006950	18-Aug-10	21.55	13.4	12.8	17.9
Cormorant Lake	GN-13	14	379388	6008326	19-Aug-10	21.90	4.0	13.4	17.9
Cormorant Lake	GN-14	14	377771	6008309	19-Aug-10	22.50	6.1	13.4	17.9
Cormorant Lake	GN-15	14	369147	6010262	20-Aug-10	24.73	15.2	4.3	18.0
Cormorant Lake	GN-16	14	388234	6011052	22-Aug-10	22.42	6.1	6.1	18.0
Cormorant Lake	GN-21	14	387000	6007531	17-Aug-10	17.92	13.7	13.7	18.0
Cormorant Lake	GN-22	14	384260	6009725	17-Aug-10	17.92	12.2	7.6	18.0
Cormorant Lake	GN-24	14	380063	6010606	18-Aug-10	22.65	13.7	11.6	18.0
Cormorant Lake	GN-26	14	389351	6006697	22-Aug-10	21.50	11.6	15.9	17.9
Cormorant Lake	GN-27	14	376013	6008480	20-Aug-10	23.58	9.8	10.7	18.0
Cormorant Lake	GN-28	14	380713	6012937	22-Aug-10	22.35	14.6	12.2	17.9
Cormorant Lake	GN-31	14	370580	6008950	20-Aug-10	24.00	5.5	4.0	17.9
Cormorant Lake	GN-32	14	376484	6016649	21-Aug-10	21.95	2.4	7.0	18.0
Cormorant Lake	SN-05	14	390153	6012858	21-Aug-10	24.12	5.5	4.0	18.0
Cormorant Lake	SN-09	14	381379	6009354	18-Aug-10	21.75	12.8	12.8	18.0
Cormorant Lake	SN-21	14	387000	6007531	17-Aug-10	17.92	13.7	13.7	18.0
Cormorant Lake	SN-31	14	370580	6008950	20-Aug-10	24.00	5.5	4.0	17.9

Table 3.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Saskatchewan River Region waterbodies, 2010.

Family	Common Name	Scientific Name	ID Code	Captured in Waterbody		
				SASK	CEDAR-SE	CORM
Hiodontidae	Goldeye	*Hiodon alosoides*	GOLD	+		
Cyprinidae	Emerald Shiner	*Notropis atherinoides*	EMSH	+		
	Spottail Shiner	*Notropis hudsonius*	SPSH	+	+	+
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC	+	+	+
	White Sucker	*Catostomus commersonii*	WHSC	+	+	+
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD	+	+	
Esocidae	Northern Pike	*Esox lucius*	NRPK	+	+	+
Salmonidae	Cisco	*Coregonus artedi*	CISC	+	+	+
	Lake Whitefish	*Coregonus clupeaformis*	LKWH			+
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR		+	+
Gadidae	Burbot	*Lota lota*	BURB		+	+
Cottidae	Slimy Sculpin	*Cottus cognatus*	SLSC			+
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+	+	+
	Logperch	*Percina caprodes*	LGPR	+		+
	Sauger	*Sander canadensis*	SAUG	+	+	+
	Walleye	*Sander vitreus*	WALL	+	+	+

Table 3.6-3. Standard gang and small mesh index gillnet relative abundance summaries from Saskatchewan River Region waterbodies, 2010.

Species	Standard Gang						Small Mesh					
	Saskatchewan R.		Cedar L-SE		Cormorant L		Saskatchewan R.		Cedar L-SE		Cormorant L	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	9	2.18	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	1	3.03	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	3	9.09	91	25.14	174	37.26
Longnose Sucker	4	0.97	23	2.26	28	2.64	-	-	1	0.28	-	-
White Sucker	56	13.59	212	20.80	465	43.87	-	-	3	0.83	1	0.21
Shorthead Redhorse	7	1.70	1	0.10	-	-	-	-	-	-	-	-
Northern Pike	54	13.11	31	3.04	63	5.94	1	3.03	-	-	4	0.86
Cisco	10	2.43	395	38.76	82	7.74	-	-	97	26.80	1	0.21
Lake Whitefish	-	-	-	-	132	12.45	-	-	-	-	12	2.57
Troutperch	-	-	-	-	-	-	-	-	15	4.14	3	0.64
Burbot	-	-	1	0.10	1	0.09	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	1	0.21
Yellow Perch	5	1.21	78	7.65	48	4.53	1	3.03	42	11.60	177	37.90
Logperch	-	-	-	-	-	-	23	69.70	-	-	16	3.43
Sauger	58	14.08	127	12.46	24	2.26	3	9.09	75	20.72	57	12.21
Walleye	209	50.73	151	14.82	217	20.47	1	3.03	38	10.50	21	4.50
Total	412	100	1019	100	1060	100	33	100	362	100	467	100

n = number of fish caught and RA = percent relative abundance

Table 3.6-4. Standard gang index gillnet total biomass summaries from Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River			Cedar Lake-Southeast			Cormorant Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	9	2765	0.78	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	4	3730	1.05	23	19472	4.73	28	29240	3.78
White Sucker	56	77318	21.83	212	135709	32.94	465	333359	43.14
Shorthead Redhorse	7	3675	1.04	1	1100	0.27	-	-	-
Northern Pike	54	69338	19.58	31	44520	10.81	63	108660	14.06
Cisco	10	1180	0.33	395	63547	15.43	82	16015	2.07
Lake Whitefish	-	-	-	-	-	-	132	92195	11.93
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	1	310	0.08	1	2195	0.28
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	5	1805	0.51	78	11580	2.81	48	2725	0.35
Logperch	-	-	-	-	-	-	-	-	-
Sauger	58	27049	7.64	127	22206	5.39	24	3130	0.41
Walleye	209	167268	47.23	151	113507	27.55	217	185130	23.96
Total	412	354128	100	1019	411951	100	1060	772649	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 3.6-5. Small mesh index gillnet total biomass summaries from Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River			Cedar Lake-Southeast			Cormorant Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	91	504	4.00	174	860	4.34
Longnose Sucker	-	-	-	1	64	0.51	-	-	-
White Sucker	-	-	-	3	173	1.37	1	30	0.15
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	1	160	13.28	-	-	-	4	4120	20.79
Cisco	-	-	-	97	2755	21.85	1	570	2.88
Lake Whitefish	-	-	-	-	-	-	12	3308	16.69
Troutperch	-	-	-	15	68	0.54	3	32	0.16
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	-	-	-	42	1245	9.88	177	2535	12.79
Logperch	-	-	-	-	-	-	16	75	0.38
Sauger	3	1045	86.72	75	4920	39.03	57	4525	22.84
Walleye	-	-	-	38	2878	22.83	21	3760	18.98
Total	4	1205	100	362	12607	100	466	19815	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 3.6-6. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River (#sites=11)			Cedar Lake-Southeast (#sites=14)			Cormorant Lake (#sites=17)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Goldeye	9	0.8	0.20	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	4	0.3	0.07	23	1.4	0.13	28	1.9	0.29
White Sucker	56	5.4	0.34	212	13.1	0.91	465	26.5	0.49
Shorthead Redhorse	7	0.6	0.11	1	0.1	0.02	-	-	-
Northern Pike	54	5.1	0.54	31	2.0	0.21	63	3.7	0.12
Cisco	10	1.0	0.23	395	24.3	2.12	82	5.1	0.37
Lake Whitefish	-	-	-	-	-	-	132	7.7	0.43
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	1	0.1	0.02	1	0.1	0.02
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	5	0.6	0.08	78	4.8	0.40	48	2.7	0.37
Logperch	-	-	-	-	-	-	-	-	-
Sauger	58	6.0	0.57	127	7.8	0.52	24	1.4	0.10
Walleye	209	18.0	1.86	151	9.3	0.71	217	12.8	0.73
Total	412	37.8	2.23	1019	62.8	2.91	1060	61.9	1.60

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site
SD = standard deviation

Table 3.6-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River (#sites=2)			Cedar Lake-Southeast (#sites=3)			Cormorant Lake (#sites=4)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-
Emerald Shiner	1	0.8	0.57	-	-	-	-	-	-
Spottail Shiner	3	2.4	1.69	91	29.3	5.68	174	48.7	7.47
Longnose Sucker	-	-	-	1	0.3	0.19	-	-	-
White Sucker	-	-	-	3	0.9	0.54	1	0.3	0.14
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	1	0.8	0.57	-	-	-	4	1.0	0.21
Cisco	-	-	-	97	31.3	10.71	1	0.3	0.13
Lake Whitefish	-	-	-	-	-	-	12	3.2	0.71
Troutperch	-	-	-	15	4.9	2.06	3	0.8	0.24
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	0.3	0.13
Yellow Perch	1	0.8	0.57	42	13.2	4.23	177	48.1	3.86
Logperch	23	18.3	12.94	-	-	-	16	4.0	1.23
Sauger	3	2.4	1.69	75	24.3	4.18	57	18.0	6.16
Walleye	1	0.8	0.57	38	12.4	6.03	21	5.8	1.25
Total	33	26.3	18.57	362	116.5	21.89	467	130.3	7.52

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site
SD = standard deviation

Table 3.6-8. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River (#sites=11)			Cedar Lake-Southeast (#sites=14)			Cormorant Lake (#sites=17)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Goldeye	9	248	55	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	4	305	68	23	1206	148	28	1952	315
White Sucker	56	7340	451	212	8440	562	465	18819	393
Shorthead Redhorse	7	351	49	1	68	18	-	-	-
Northern Pike	54	6635	770	31	2803	263	63	6336	204
Cisco	10	116	27	395	3912	382	82	955	57
Lake Whitefish	-	-	-	-	-	-	132	5413	350
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	1	19	5	1	151	37
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	5	216	41	78	710	73	48	155	15
Logperch	-	-	-	-	-	-	-	-	-
Sauger	58	2733	265	127	1364	95	24	185	11
Walleye	209	14332	1586	151	6947	640	217	10922	636
Total	412	32278	1977	1019	25470	1062	1060	44888	1175

#sites = number of sites sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m/24 h) per site
SD = standard deviation

Table 3.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River (#sites=2)			Cedar Lake-Southeast (#sites=3)			Cormorant Lake (#sites=4)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-
Emerald Shiner	1	-	-	-	-	-	-	-	-
Spottail Shiner	3	-	-	91	162	32	174	241	38
Longnose Sucker	-	-	-	1	21	12	-	-	-
White Sucker	-	-	-	3	53	31	1	8	4
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	1	127	90	-	-	-	4	1063	206
Cisco	-	-	-	97	898	231	1	142	71
Lake Whitefish	-	-	-	-	-	-	12	863	212
Troutperch	-	-	-	15	22	8	3	8	3
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	0	0
Yellow Perch	1	-	-	42	396	78	177	718	87
Logperch	23	-	-	-	-	-	16	19	5
Sauger	3	832	588	75	1592	239	57	1410	447
Walleye	1	-	-	38	938	318	21	1064	163
Total	33	959	678	362	4082	707	467	5536	504

#sites = number of sites sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/30 m/24 h) per site
SD = standard deviation

Table 3.6-10. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike and Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

Species	Saskatchewan River			Cedar Lake-Southeast			Cormorant Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	51	536	107	31	549	102	63	604	80
Walleye	197	406	45	151	383	62	217	406	95
Weight (g)									
Northern Pike	55	1264	941	31	1436	740	67	1683	795
Walleye	209	800	264	189	616	456	238	794	660
Condition Factor (K)									
Northern Pike	51	0.69	0.08	31	0.79	0.07	63	0.73	0.08
Walleye	209	1.16	0.10	151	1.22	0.15	217	1.04	0.10

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 3.6-11. Age/year-class frequency distributions (%) for Northern Pike and Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

Age	Year-Class	Northern Pike						Walleye					
		Saskatchewan R		Cedar L-SE		Cormorant L		Saskatchewan R		Cedar L-SE		Cormorant L	
		n	%	n	%	n	%	n	%	n	%	n	%
0	2010	-	-	-	-	-	-	-	-	-	-	2	0.88
1	2009	2	3.64	-	-	-	-	-	-	-	-	1	0.44
2	2008	5	9.09	2	6.45	1	1.54	4	1.91	3	2.03	6	2.64
3	2007	7	12.73	-	-	3	4.62	1	0.48	2	1.35	49	21.59
4	2006	10	18.18	8	25.81	11	16.92	15	7.18	9	6.08	19	8.37
5	2005	18	32.73	10	32.26	12	18.46	41	19.62	26	17.57	66	29.07
6	2004	6	10.91	4	12.90	13	20.00	11	5.26	4	2.70	6	2.64
7	2003	4	7.27	4	12.90	11	16.92	73	34.93	45	30.41	15	6.61
8	2002	2	3.64	2	6.45	3	4.62	27	12.92	28	18.92	7	3.08
9	2001	1	1.82	1	3.23	2	3.08	17	8.13	21	14.19	13	5.73
10	2000	-	-	-	-	1	1.54	4	1.91	6	4.05	8	3.52
11	1999	-	-	-	-	3	4.62	-	-	-	-	4	1.76
12	1998	-	-	-	-	5	7.69	3	1.44	2	1.35	-	-
13	1997	-	-	-	-	-	-	7	3.35	-	-	5	2.20
14	1996	-	-	-	-	-	-	-	-	2	1.35	24	10.57
15	1995	-	-	-	-	-	-	3	1.44	-	-	-	-
16	1994	-	-	-	-	-	-	2	0.96	-	-	2	0.88
17	1993	-	-	-	-	-	-	1	0.48	-	-	-	-
Total		55	100	31	100	65	100	209	100	148	100	227	100

n = number of fish aged (may not equal number of fish caught); % = percent of total number of fish aged

Table 3.6-12. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

Age	Year-Class	Saskatchewan River									Cedar Lake-Southeast								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	2	282	3	2	153	11	2	0.68	0.03	-	-	-	-	-	-	-	-	-
2	2008	5	392	26	5	401	80	5	0.66	0.05	2	303	151	2	305	346	2	0.80	0.00
3	2007	7	474	57	7	749	303	7	0.67	0.06	-	-	-	-	-	-	-	-	-
4	2006	9	526	44	10	1005	312	9	0.68	0.06	8	495	44	8	951	232	8	0.78	0.08
5	2005	17	534	46	18	1152	421	17	0.70	0.09	10	559	52	10	1380	384	10	0.78	0.06
6	2004	5	608	61	6	1933	1051	5	0.67	0.12	4	577	27	4	1604	243	4	0.83	0.07
7	2003	4	691	119	4	2846	1622	4	0.80	0.07	4	606	41	4	1635	337	4	0.73	0.06
8	2002	2	685	78	2	2375	1082	2	0.71	0.09	2	713	46	2	3275	389	2	0.91	0.06
9	2001	1	804	-	1	3430	-	1	0.66	-	1	720	-	1	3000	-	1	0.80	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 3.6-12. - continued -

Age	Year-Class	Cormorant Lake FL (mm) n			W (g) n			K n		
		n	mean	SD	n	mean	SD	n	mean	SD
1	2009	-	-	-	-	-	-	-	-	-
2	2008	1	482	-	1	785	-	1	0.70	-
3	2007	3	481	10	3	780	54	3	0.70	0.02
4	2006	11	533	27	11	1047	207	11	0.69	0.08
5	2005	12	577	35	12	1388	308	12	0.71	0.04
6	2004	13	657	78	13	2310	858	13	0.78	0.06
7	2003	11	592	59	11	1597	550	11	0.74	0.08
8	2002	3	556	23	3	1405	70	3	0.82	0.07
9	2001	2	565	78	2	1293	788	2	0.67	0.16
10	2000	1	710	-	1	2675	-	1	0.75	-
11	1999	3	693	17	3	2517	159	3	0.76	0.01
12	1998	5	705	86	5	2636	1130	5	0.72	0.10

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 3.6-13. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

Age	Year-Class	Saskatchewan River									Cedar Lake - SE								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	3	236	12	4	146	27	3	1.03	0.03	3	222	23	3	118	28	3	1.07	0.16
3	2007	1	275	-	1	220	-	1	1.06	-	2	252	16	2	175	35	2	1.10	0.01
4	2006	14	344	30	15	447	122	14	1.12	0.10	9	293	29	9	291	85	9	1.12	0.08
5	2005	38	386	22	41	653	118	38	1.13	0.07	26	342	22	26	466	117	26	1.15	0.11
6	2004	11	395	38	11	755	229	11	1.19	0.09	4	374	31	4	678	173	4	1.28	0.10
7	2003	66	415	23	73	837	158	66	1.16	0.10	45	399	37	45	802	237	45	1.23	0.14
8	2002	27	425	29	27	899	185	27	1.15	0.06	28	405	39	28	861	257	28	1.26	0.14
9	2001	17	430	22	17	980	150	17	1.23	0.12	21	406	46	21	915	303	21	1.34	0.20
10	2000	4	411	32	4	879	163	4	1.26	0.09	6	415	60	6	939	387	6	1.22	0.21
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	3	485	70	3	1430	732	3	1.19	0.11	2	442	74	2	1195	629	2	1.31	0.07
13	1997	7	472	39	7	1227	236	7	1.16	0.08	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	2	590	91	2	2528	1163	2	1.19	0.02
15	1995	3	450	11	3	1128	122	3	1.24	0.06	-	-	-	-	-	-	-	-	-
16	1994	2	417	13	2	900	99	2	1.25	0.25	-	-	-	-	-	-	-	-	-
17	1993	1	454	-	1	1070	-	1	1.14	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 3.6-13. - continued -

Age	Year-Class	Cormorant Lake								
		FL (mm)			Weight (g)			K		
		n	mean	SD	n	mean	SD	n	mean	SD
0	2010	2	129	11	2	23	4	2	1.06	0.10
1	2009	1	184	-	1	60	-	1	0.96	-
2	2008	6	245	12	6	137	27	6	0.93	0.16
3	2007	49	292	24	49	249	88	49	0.97	0.06
4	2006	19	340	22	19	388	75	19	0.98	0.05
5	2005	66	384	32	66	587	149	66	1.01	0.06
6	2004	6	397	23	6	699	153	6	1.10	0.06
7	2003	15	462	24	15	1075	176	15	1.09	0.08
8	2002	7	483	39	7	1254	255	7	1.11	0.08
9	2001	13	501	36	13	1465	316	13	1.15	0.05
10	2000	8	518	39	8	1551	408	8	1.09	0.07
11	1999	4	477	68	4	1391	730	4	1.21	0.14
12	1998	-	-	-	-	-	-	-	-	-
13	1997	5	593	44	5	2513	663	5	1.18	0.08
14	1996	24	528	62	24	1729	728	24	1.12	0.11
15	1995	-	-	-	-	-	-	-	-	-
16	1994	2	492	25	2	1438	237	2	1.20	0.01
17	1993	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation.

Table 3.6-14. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Saskatchewan R.											
White Sucker	-	-	-	-	-	-	-	-	56	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	54	0	0.00
Walleye	-	-	-	-	-	-	-	-	209	0	0.00
Cedar L.-SE											
White Sucker	-	-	-	-	-	-	-	-	212	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	31	0	0.00
Sauger	-	-	-	-	-	-	-	-	24	0	0.00
Walleye	-	-	-	-	-	-	1	0.66	151	1	0.66
Cormorant L.											
White Sucker	-	-	-	-	-	-	-	-	444	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	63	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	132	0	0.00
Walleye	-	-	-	-	-	-	-	-	217	0	0.00

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect}\times100$);
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect}\times100$)

Table 3.7-1. Mean arithmetic (± standard error, SE) and standardized (95% confidence limit, CL) mercury concentration (ppm) for Lake Whitefish, Northern Pike, Walleye, and Yellow Perch from the Saskatchewan River east of The Pas, the southeast area of Cedar Lake, and Cormorant Lake in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Saskatchewan R	Northern Pike	36	0.230	0.025	0.227	0.197 - 0.262
	Walleye	36	0.202	0.019	0.180	0.157 - 0.205
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	0	-	-	-	-
Cedar L - SE	Northern Pike	31	0.116	0.011	0.105	0.090 - 0.121
	Walleye	36	0.106	0.010	0.107	0.095 - 0.120
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	25	0.016	0.001	0.016	0.014 - 0.017
Cormorant L	Northern Pike	36	0.407	0.029	0.304	0.256 - 0.360
	Walleye	36	0.224	0.019	0.202	0.185 - 0.221
	Lake Whitefish	35	0.058	0.007	0.047	0.041 - 0.055
	Yellow Perch	25	0.033	0.001	-*	0.030 - 0.036

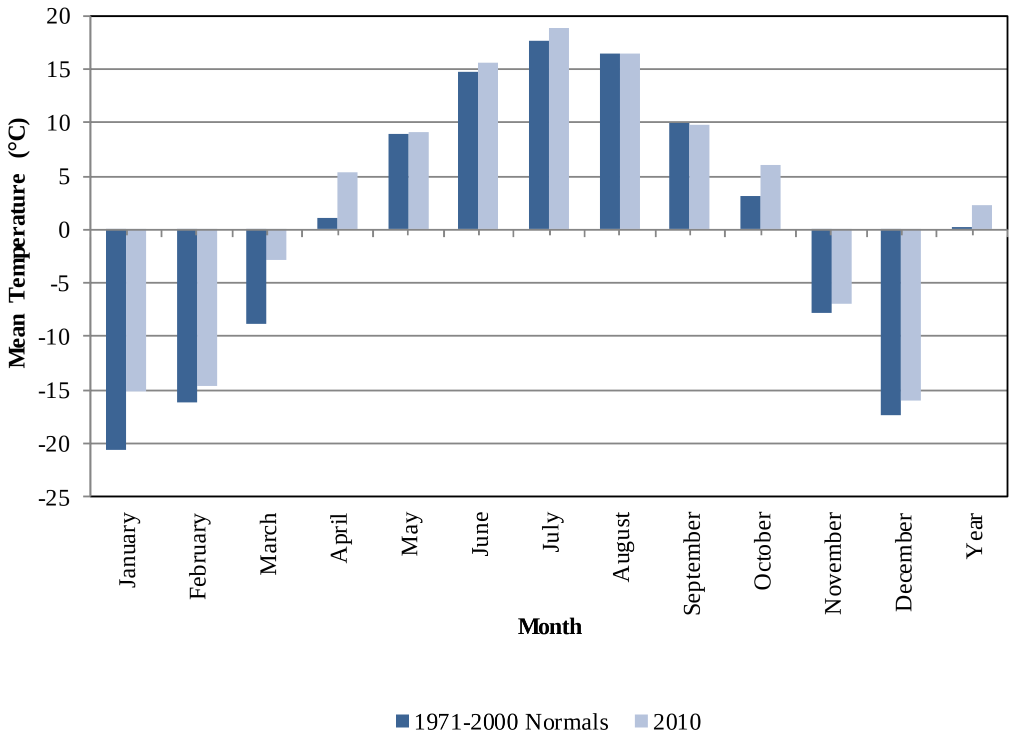
* The relationship between mercury concentration and fish length was not significant; the CL is for the arithmetic mean.

Table 3.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from the Saskatchewan River east of The Pas, the southeast area of Cedar Lake, and Cormorant Lake in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Saskatchewan R	Northern Pike	36	517.6 ± 20.6	1147.2 ± 168.8	0.68 ± 0.01	4.5 ± 0.3
	Walleye	36	399.9 ± 7.8	774.3 ± 40.4	1.16 ± 0.02	7.6 ± 0.6
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	0	-	-	-	-
Cedar L - SE	Northern Pike	31	549.2 ± 18.4	1436.1 ± 133.0	0.79 ± 0.01	5.3 ± 0.3
	Walleye [a]	36	377.3 ± 15.6	798.8 ± 107.7	1.20 ± 0.02	7.0 ± 0.4
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	25	106.3 ± 4.0	19.5 ± 2.1	1.44 ± 0.03	1.6 ± 0.1
Cormorant L	Northern Pike [b]	36	608.5 ± 11.0	1776.3 ± 115.8	0.75 ± 0.01	6.5 ± 0.4
	Walleye [c]	36	415.3 ± 16.7	925.7 ± 116.3	1.05 ± 0.02	6.1 ± 0.5
	Lake Whitefish [b]	35	360.8 ± 12.0	690.9 ± 63.2	1.29 ± 0.02	11.5 ± 1.0
	Yellow Perch [d]	25	108.8 ± 2.4	16.7 ± 1.1	1.26 ± 0.02	1.8 ± 0.2

[a] n = 32 for age
[b] n = 34 for age
[c] n = 35 for age
[d] n = 12 for age

(A)



(B)

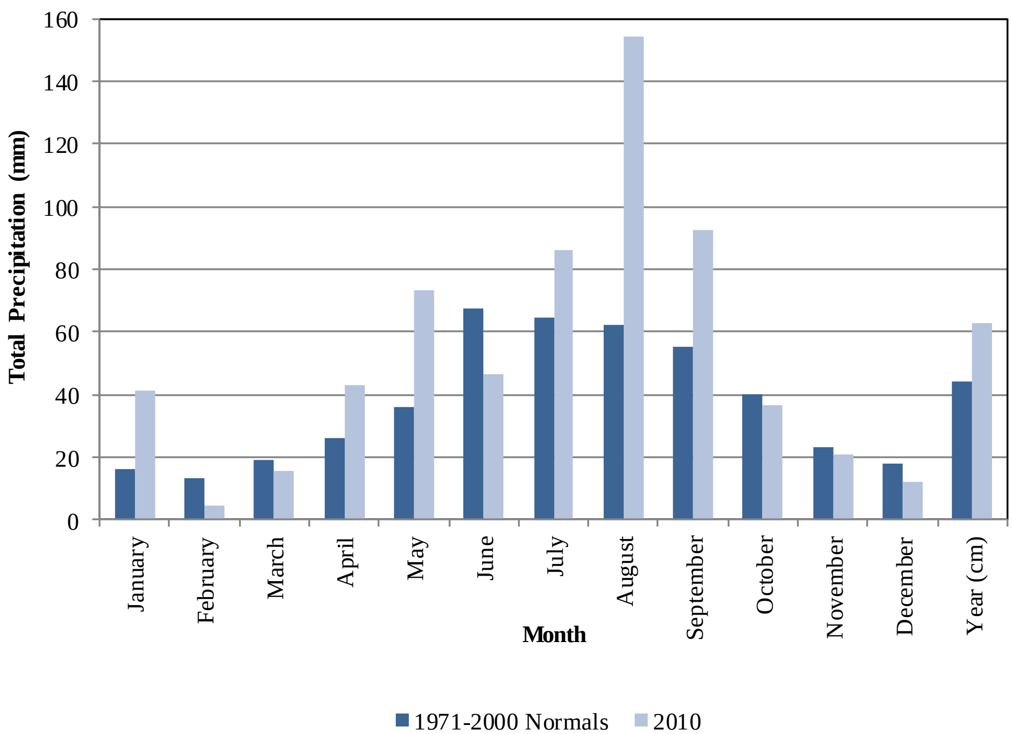


Figure 3.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), The Pas, MB.

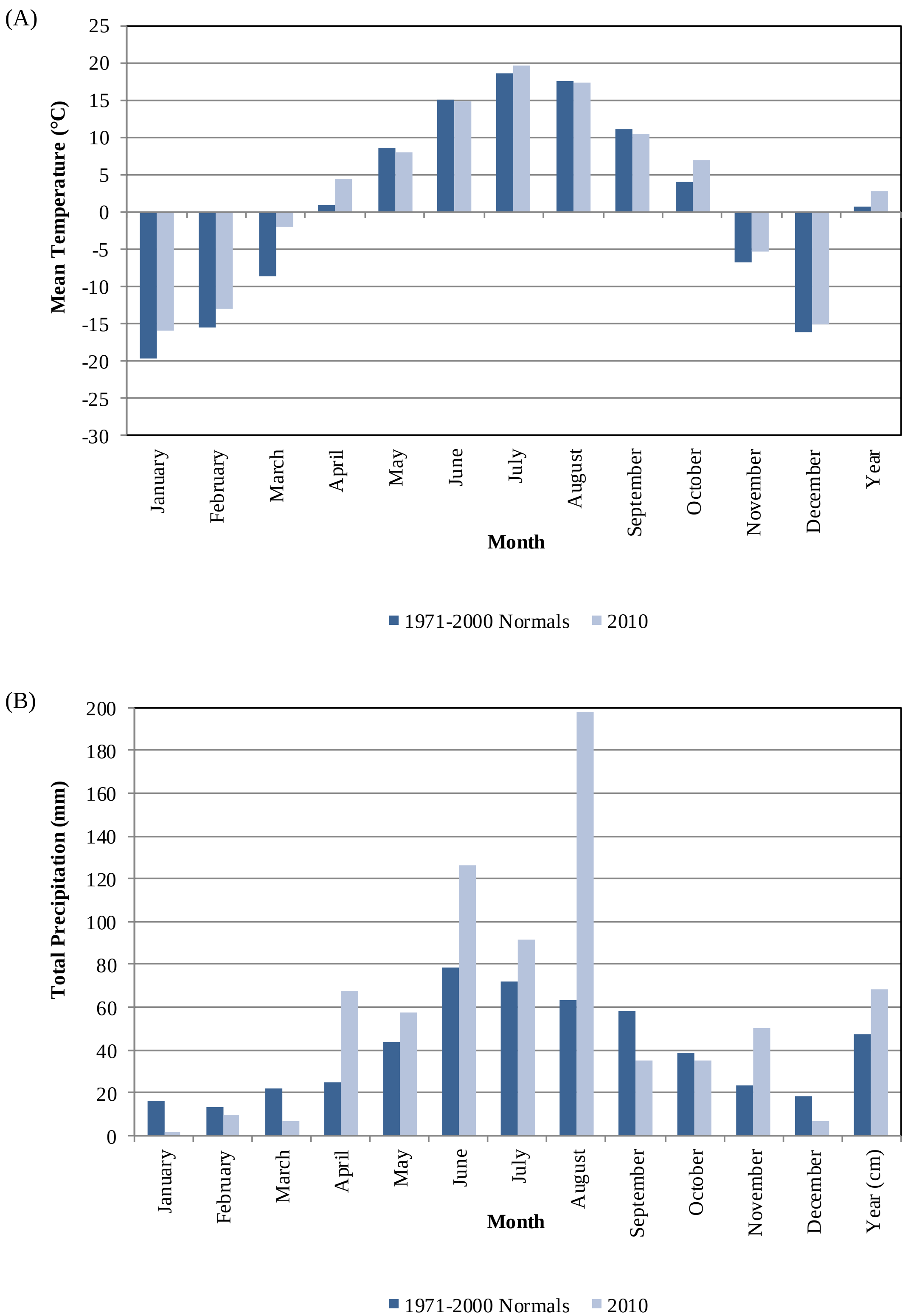


Figure 3.1-2. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Grand Rapids, MB.

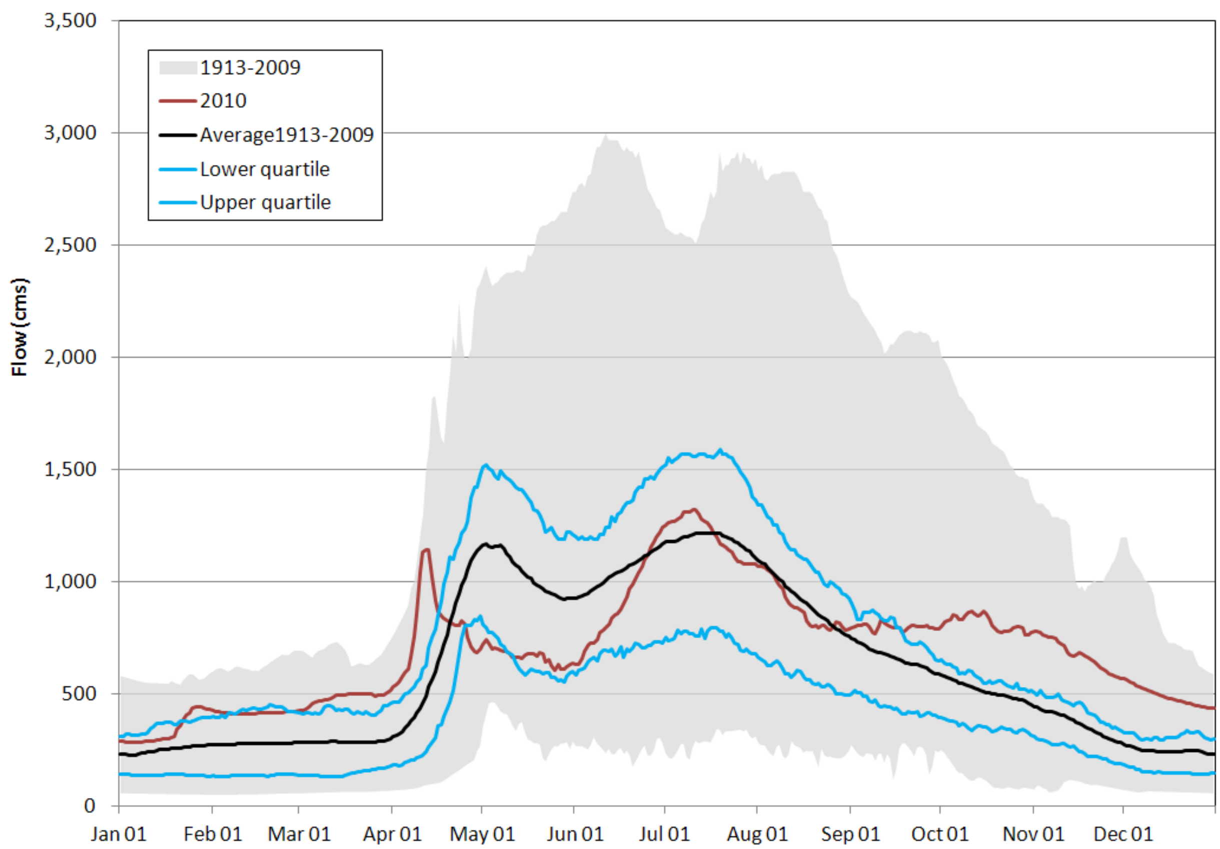


Figure 3.2-1. Flow of the Saskatchewan River Flow at The Pas (05KJ001) in 2010.

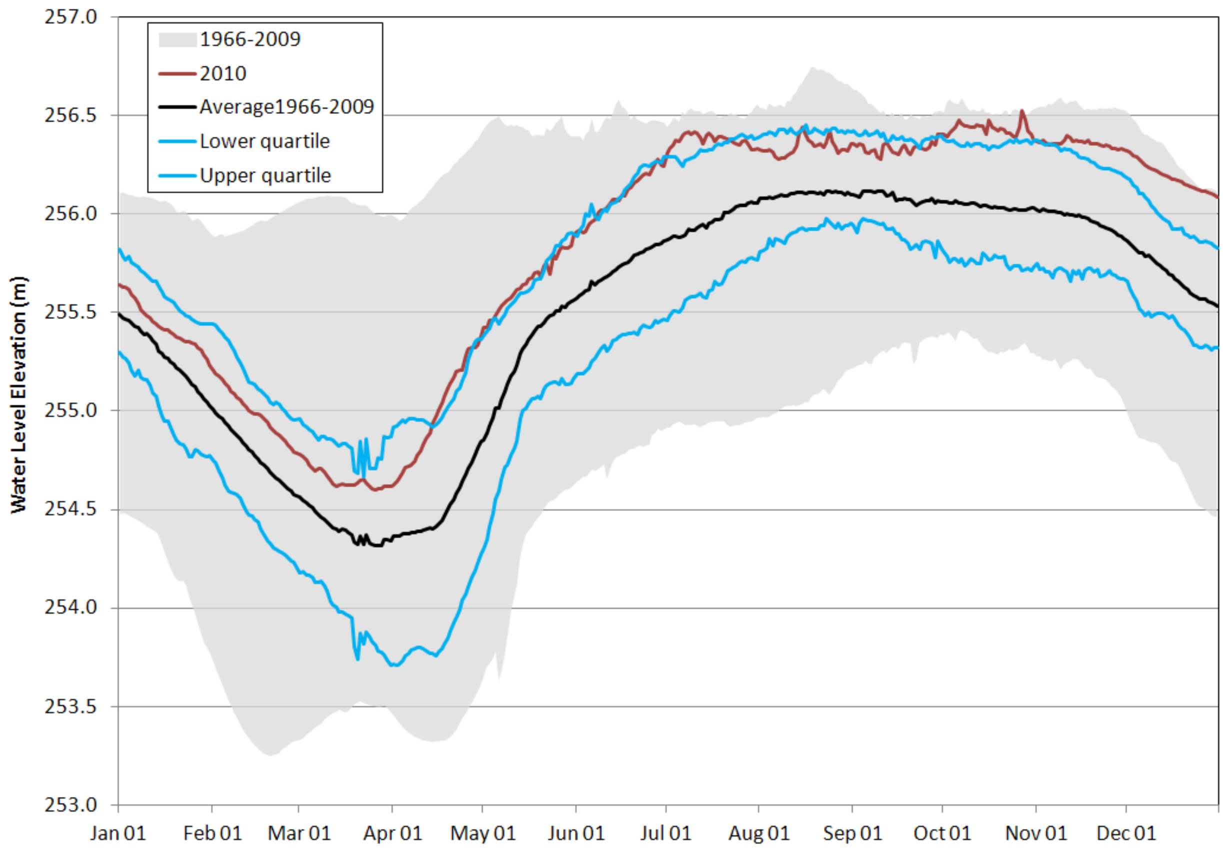


Figure 3.2-2. Water level elevation of Cedar Lake (05KL005) in 2010.

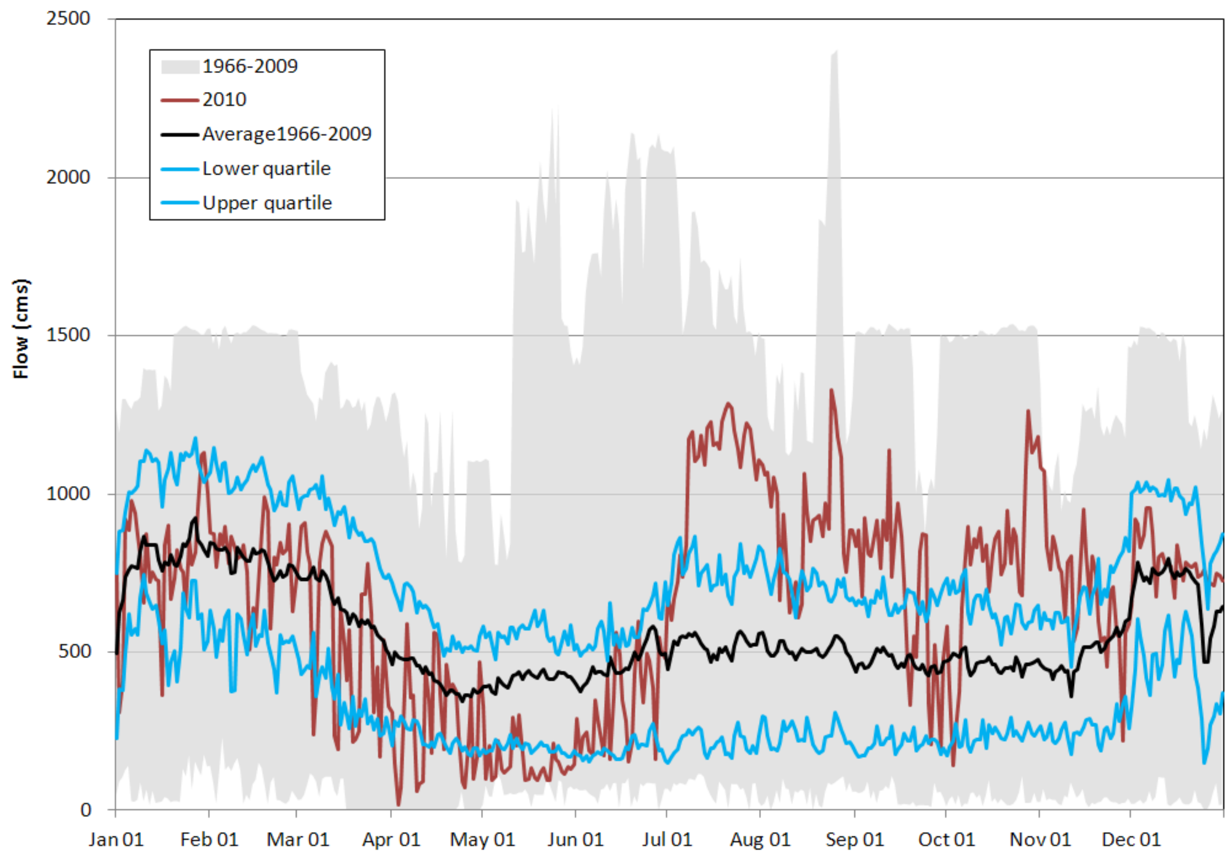


Figure 3.2-3. Outflow of the Grand Rapids Generating Station in 2010.

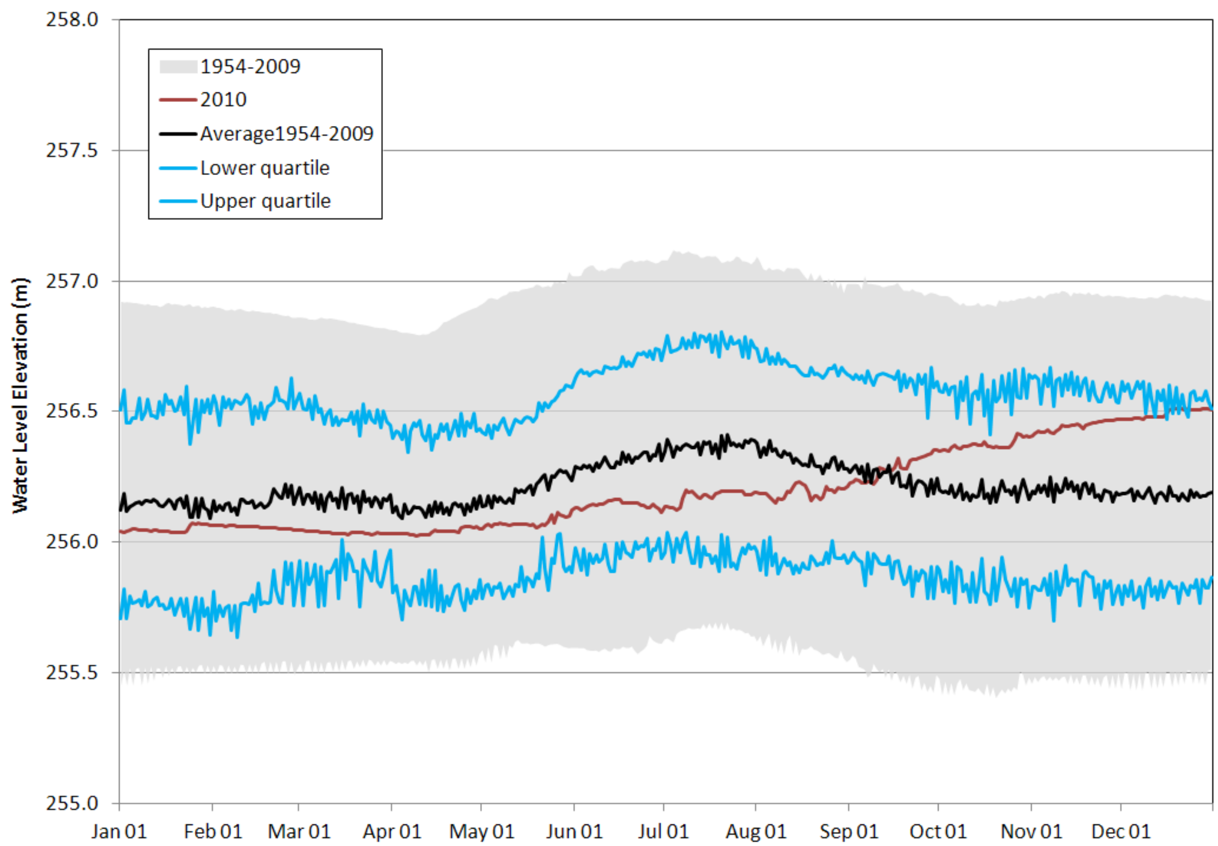


Figure 3.2-4. Water level elevation of Cormorant Lake(05KK002) in 2010.

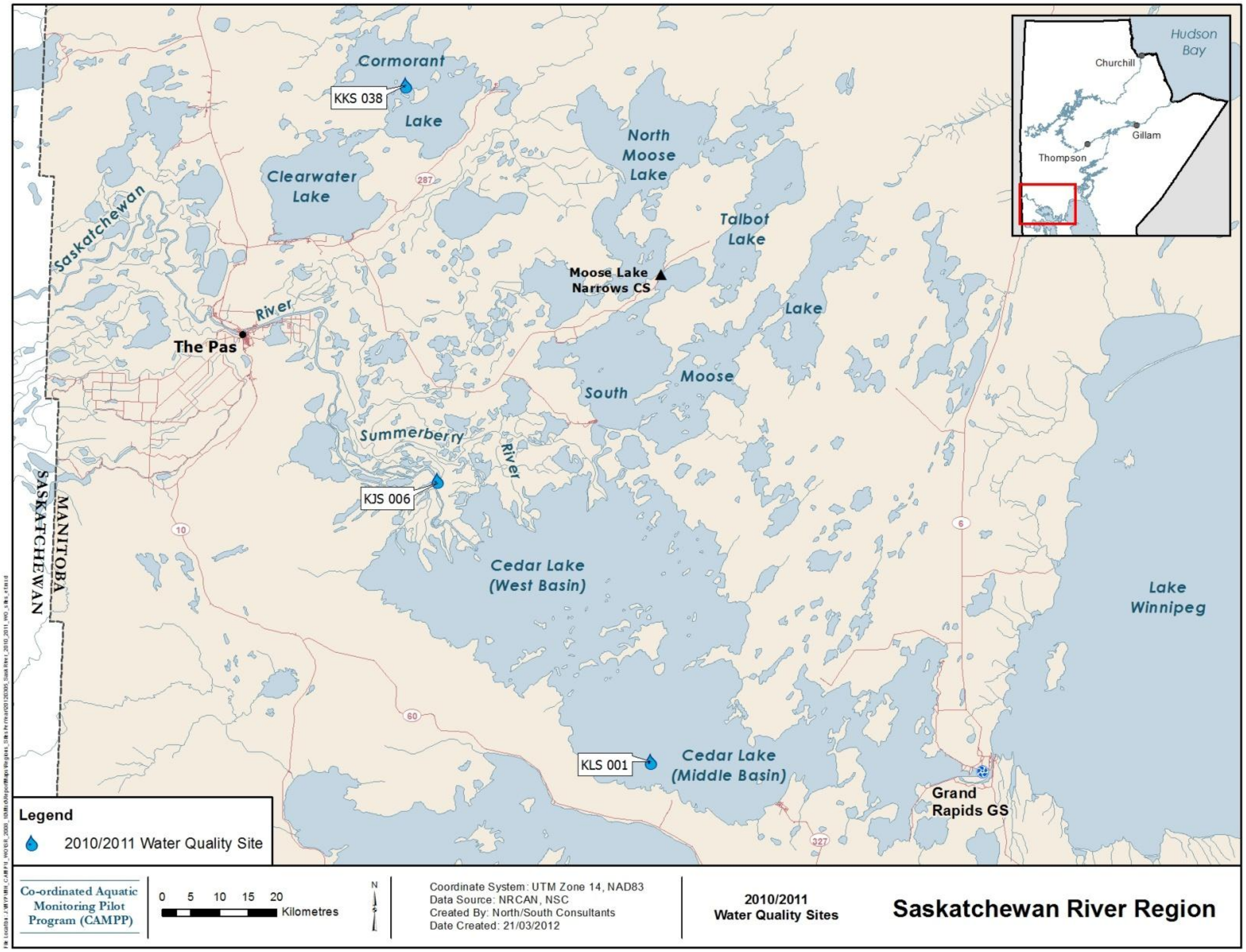


Figure 3.3-1. Water quality and phytoplankton monitoring sites in the Saskatchewan River Region: 2010/2011.

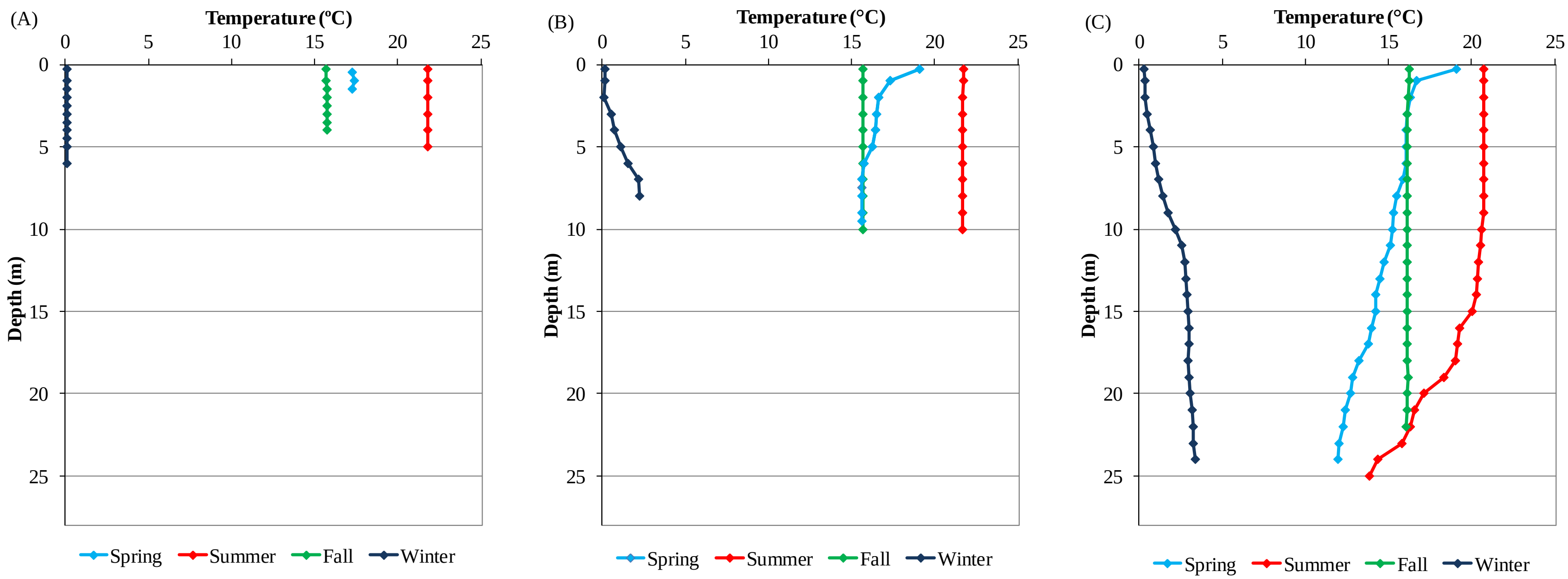


Figure 3.3-2. Water temperature profiles measured in the Saskatchewan River Region in 2010/2011: (A) Saskatchewan River; (B) Cedar Lake-SE; and (C) Cormorant Lake.

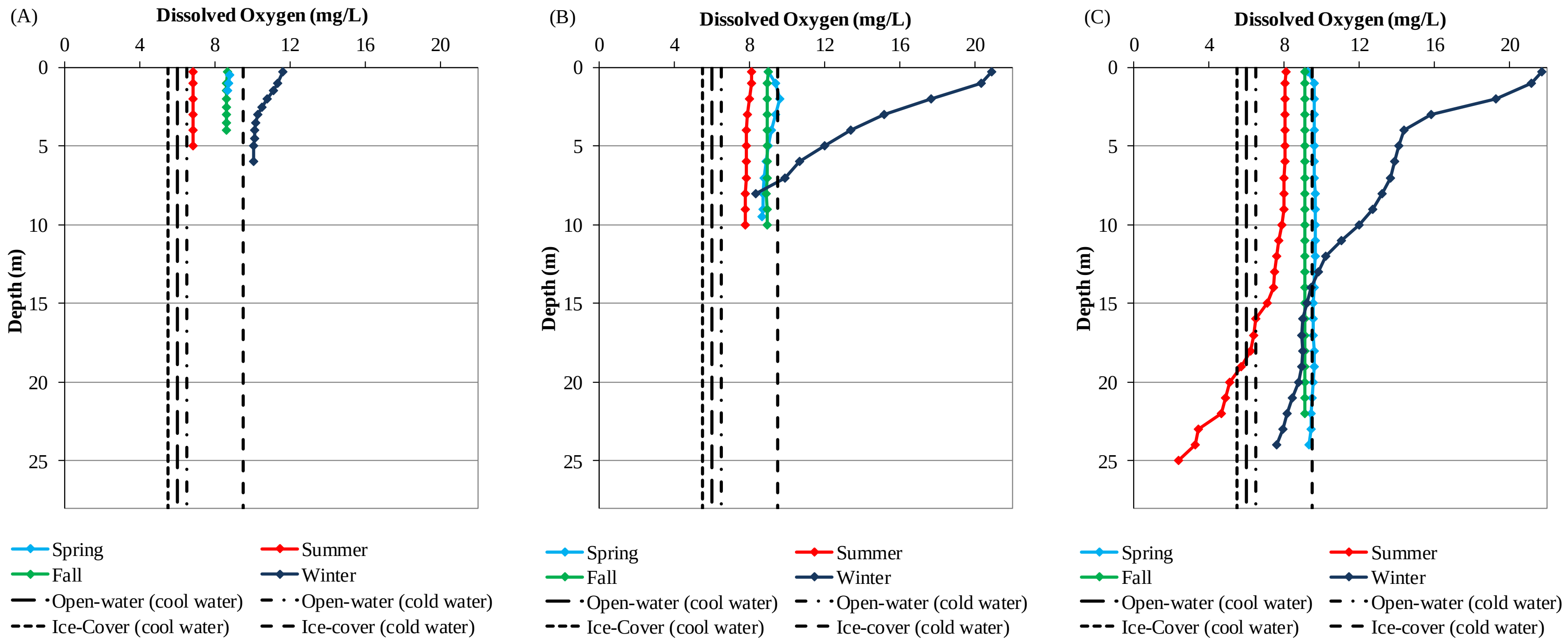


Figure 3.3-3. Dissolved oxygen depth profiles measured in the Saskatchewan River Region in 2010/2011: (A) Saskatchewan River; (B) Cedar Lake-SE; and (C) Cormorant Lake. Dashed lines represent selected MWQSOGs for PAL.

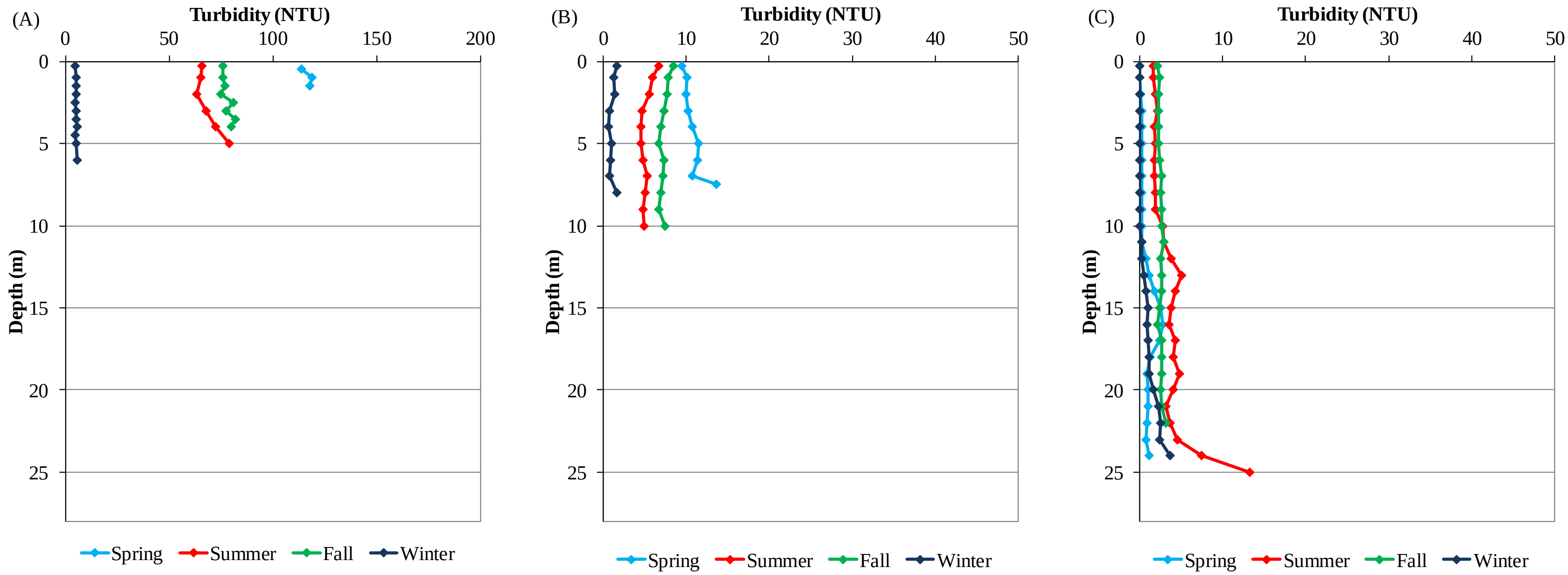


Figure 3.3-4. Turbidity depth profiles measured in the Saskatchewan River Region in 2010/2011: (A) Saskatchewan River; (B) Cedar Lake-SE; and (C) Cormorant Lake. Note that the x-axis scale is greater for the Saskatchewan River.

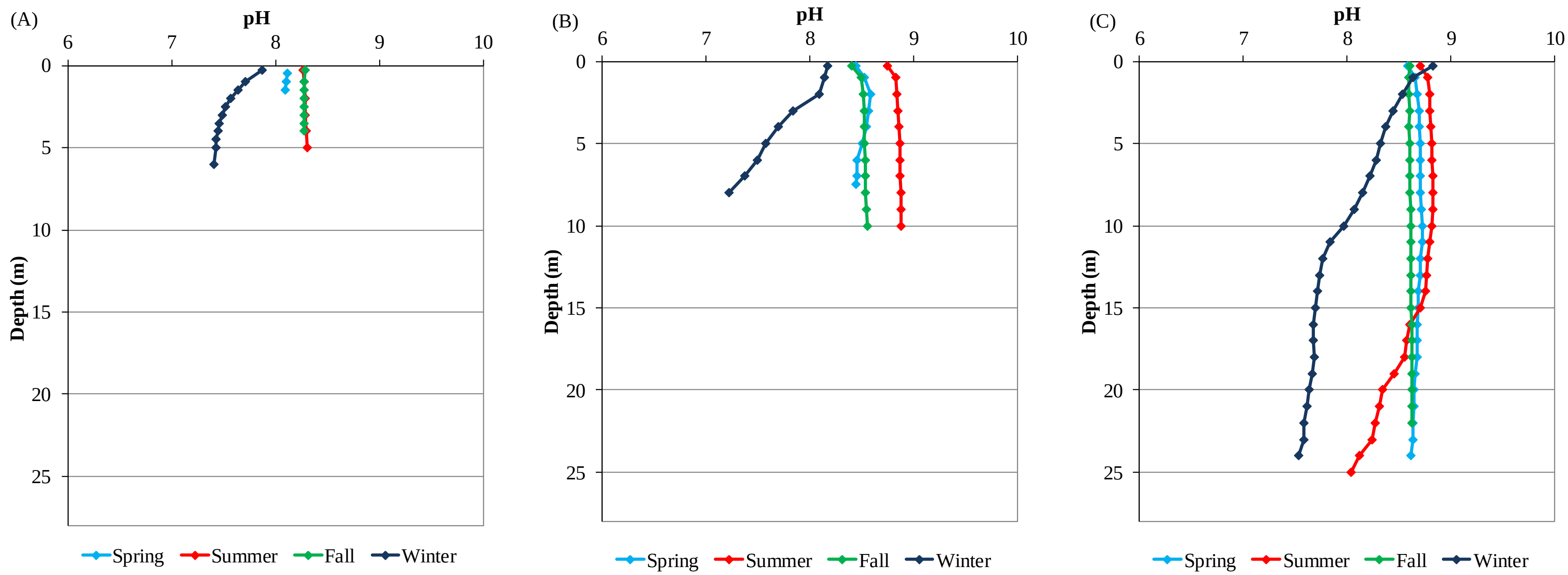


Figure 3.3-5. pH depth profiles measured in the Saskatchewan River Region in 2010/2011: (A) Saskatchewan River; (B) Cedar Lake-SE; and (C) Cormorant Lake.

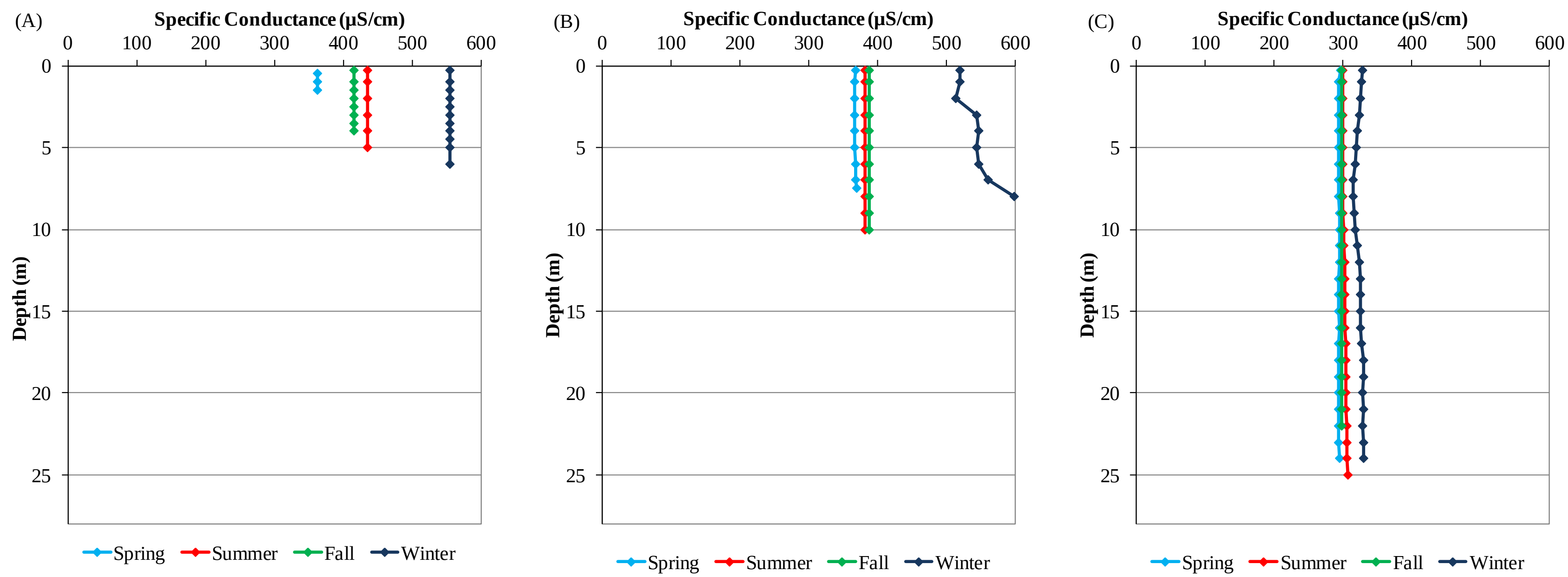


Figure 3.3-6. Specific conductance depth profiles measured in the Saskatchewan River Region in 2010/2011: (A) Saskatchewan River; (B) Cedar Lake-SE; and (C) Cormorant Lake.

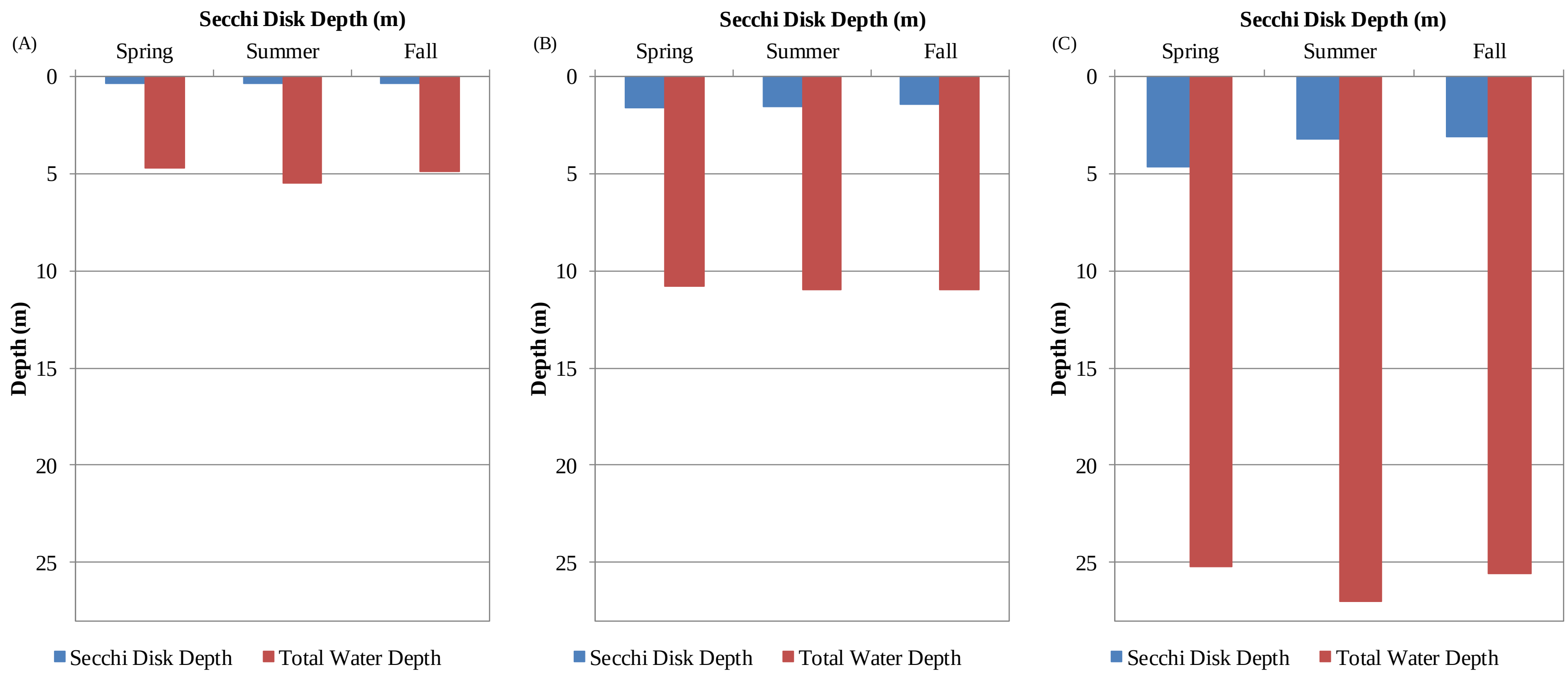


Figure 3.3-7. Secchi disk depths measured in the Saskatchewan River Region in 2010/2011: (A) Saskatchewan River; (B) Cedar Lake-SE; and (C) Cormorant Lake.

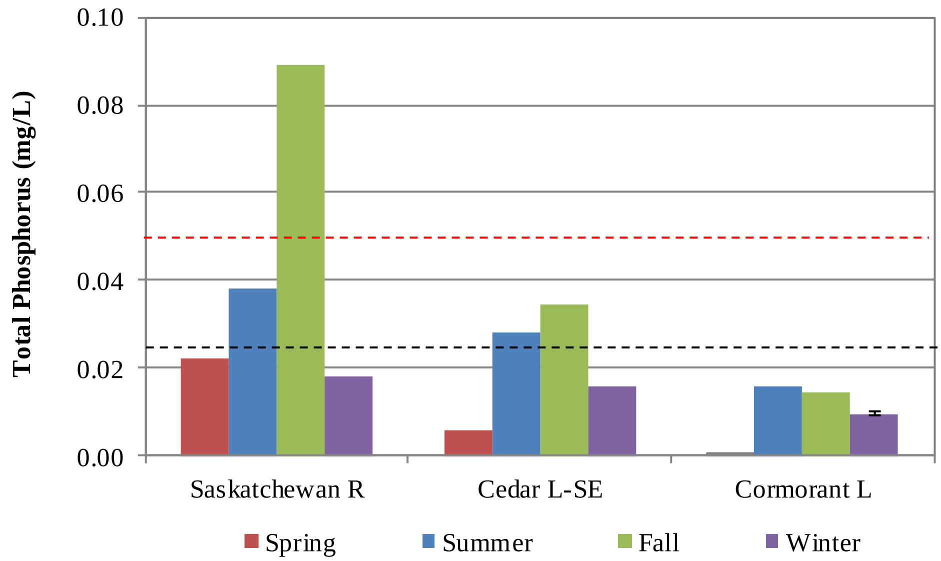


Figure 3.3-8. Total phosphorus measured in surface grabs in the Saskatchewan River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

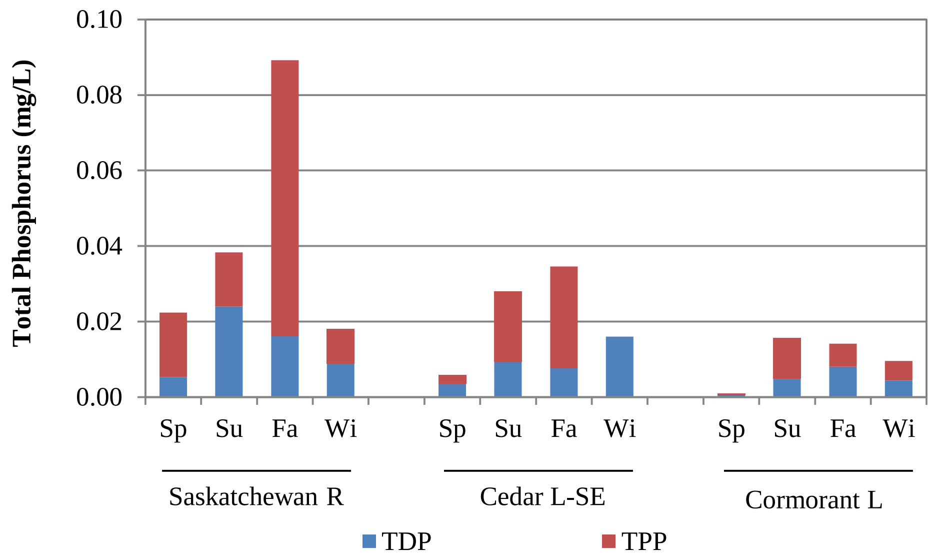


Figure 3.3-9. Particulate (TPP) and dissolved phosphorus (TDP) fractions measured in the Saskatchewan River Region: 2010/2011.

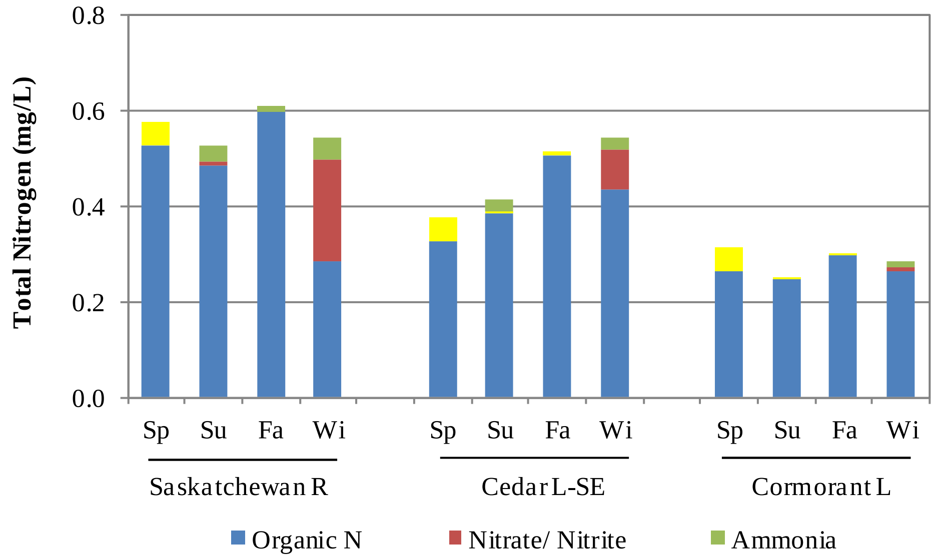


Figure 3.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Saskatchewan River Region: 2010/2011. Yellow bars represent values that were below the analytical detection limit.

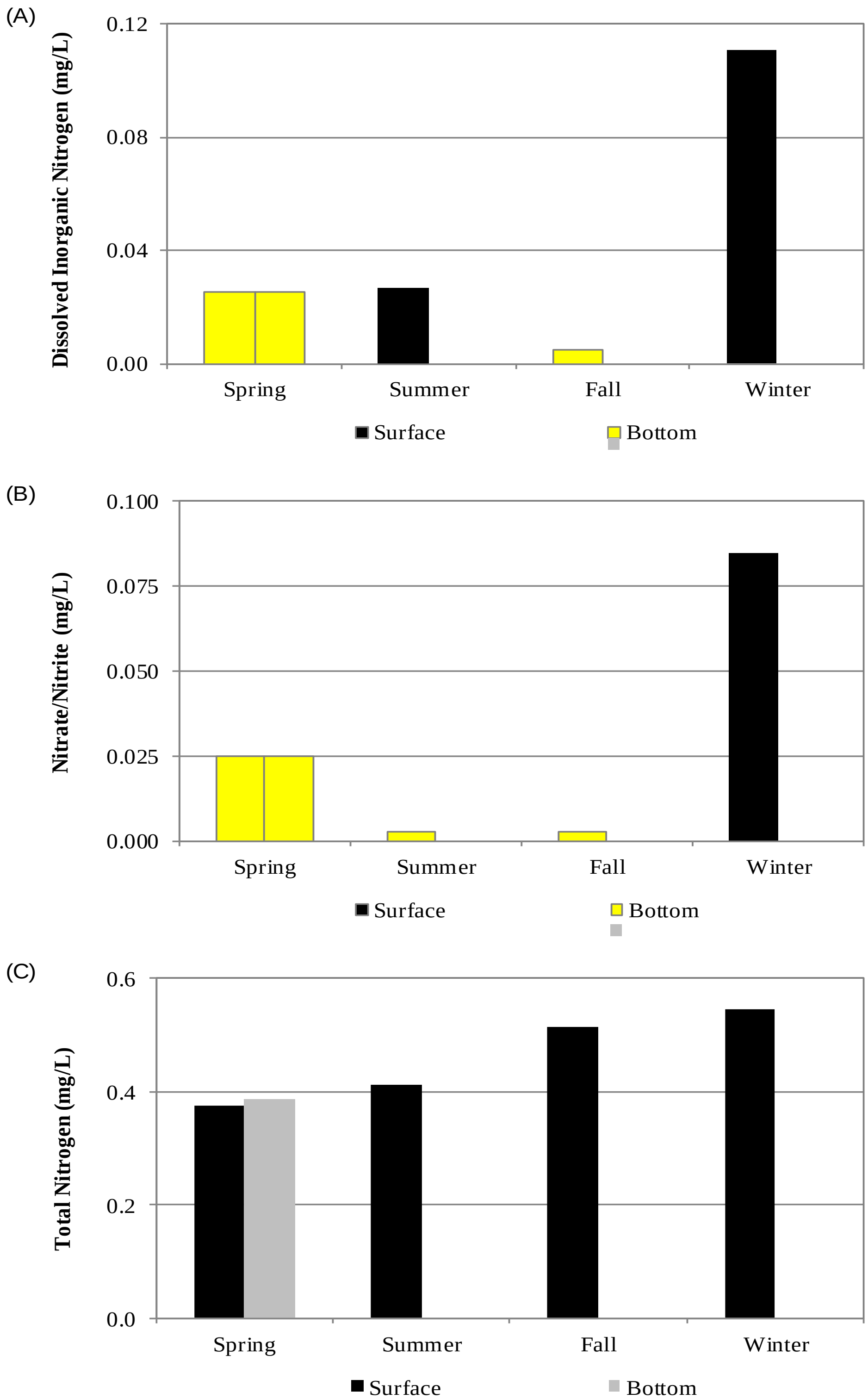


Figure 3.3-11. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Cedar Lake-SE, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

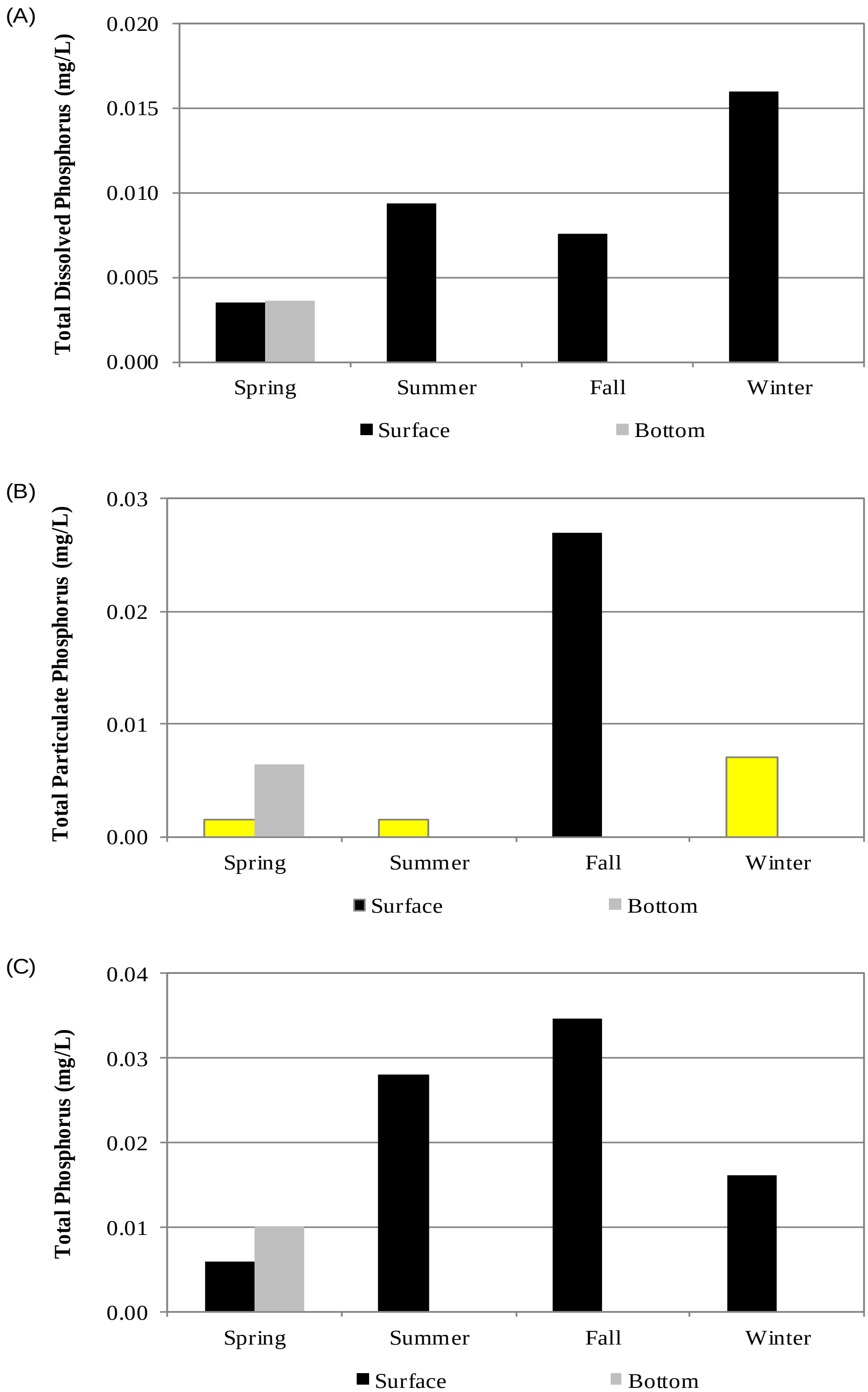


Figure 3.3-12. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Cedar Lake-SE, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

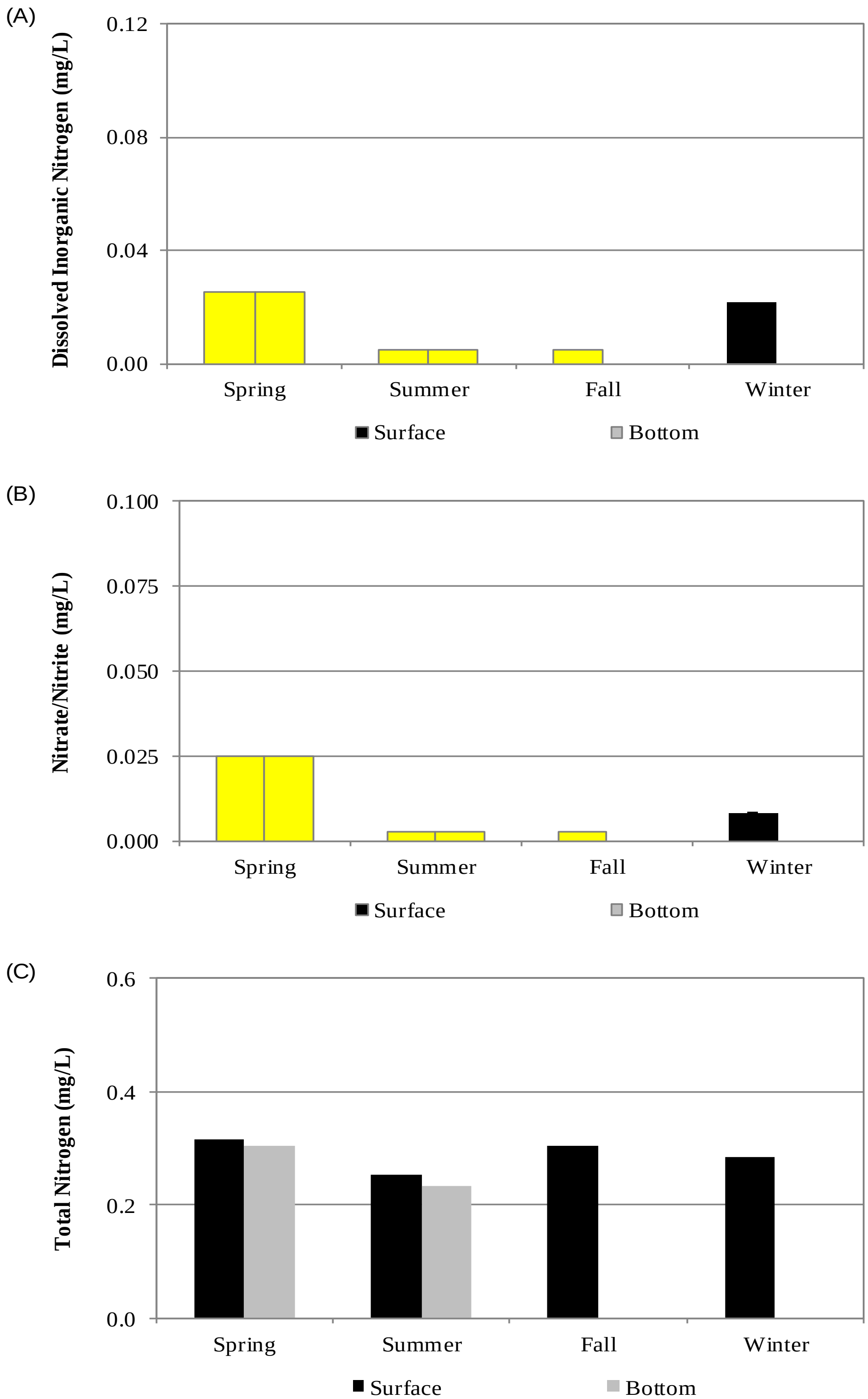


Figure 3.3-13. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Cormorant Lake, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

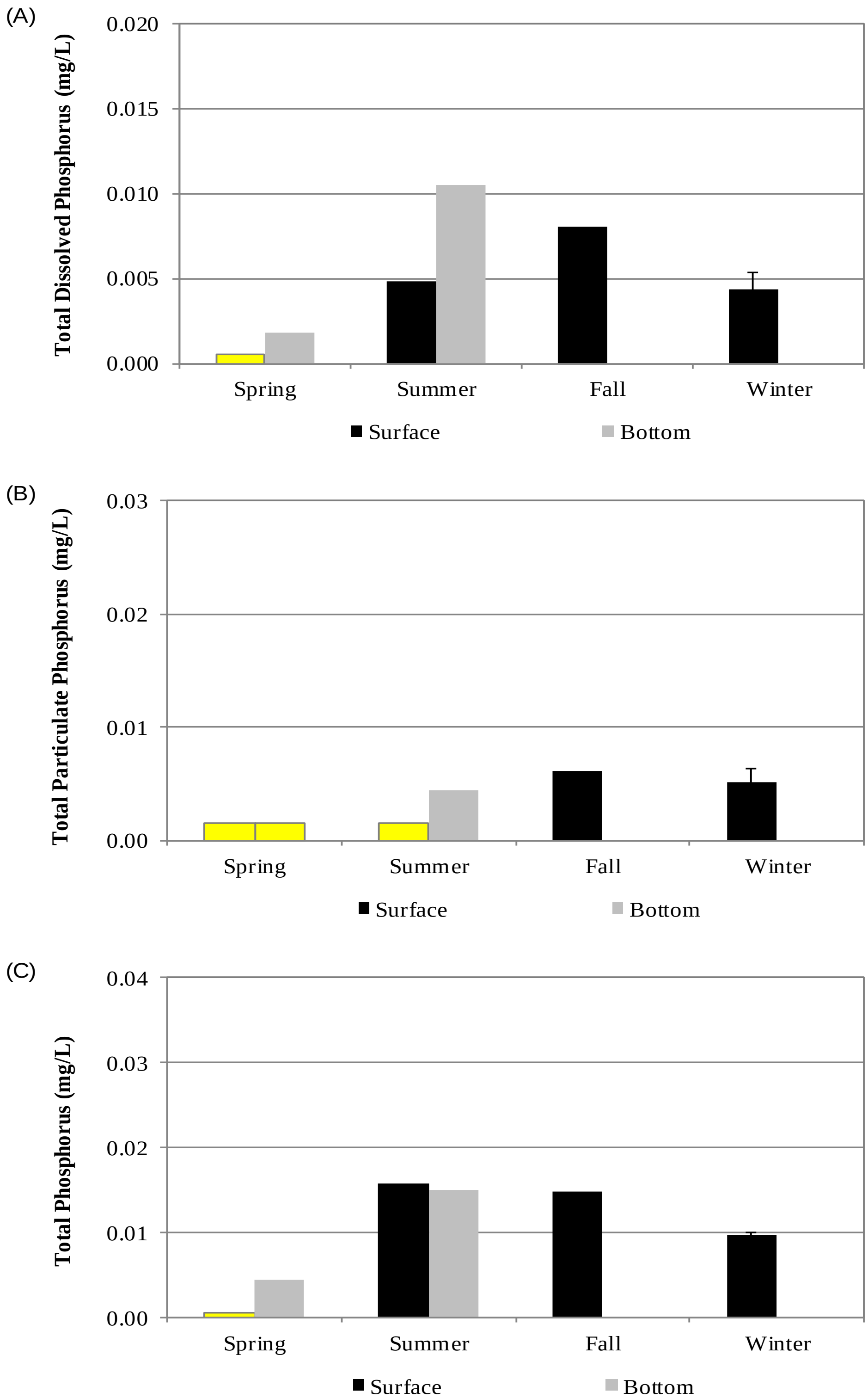
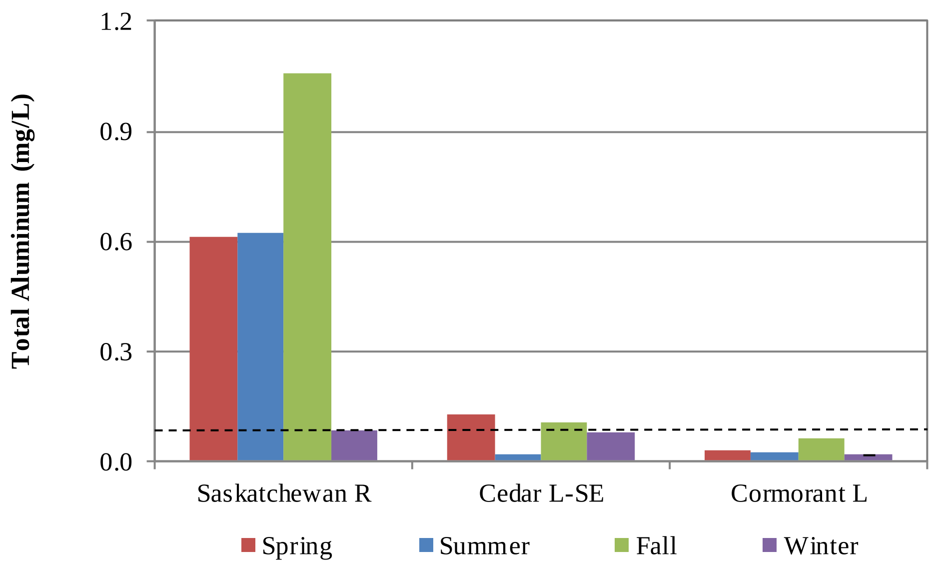


Figure 3.3-14. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Cormorant Lake, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

(A)



(B)

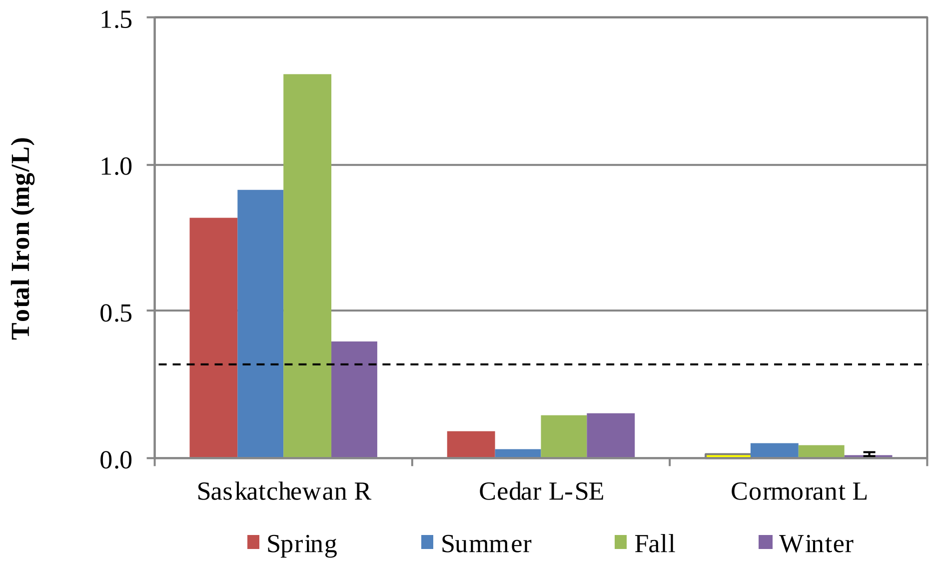


Figure 3.3-15. Total aluminum (A) and total iron (B) measured in surface grabs in the Saskatchewan River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

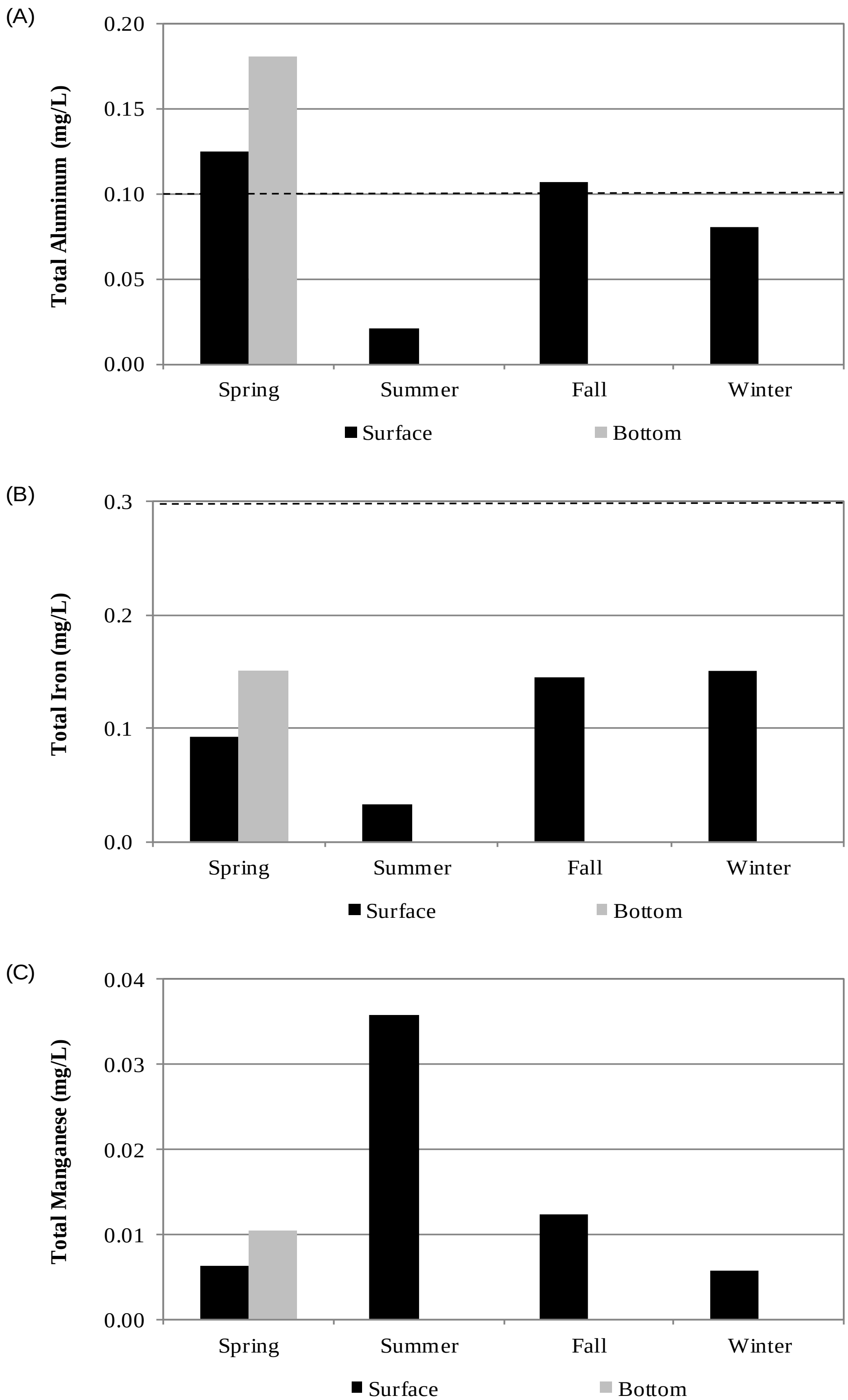


Figure 3.3-16. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Cedar Lake-SE, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

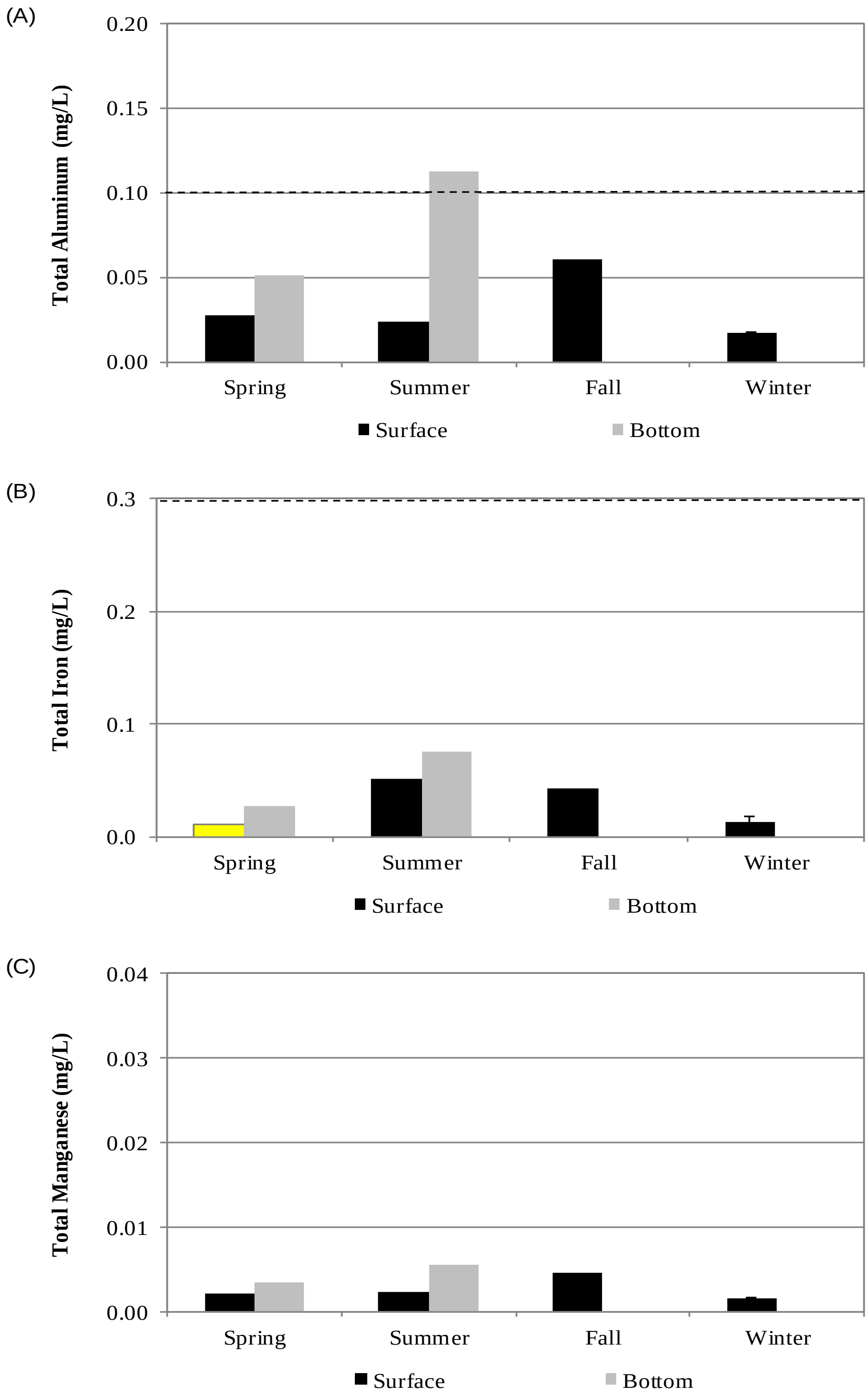


Figure 3.3-17. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Cormorant Lake, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron. Yellow bars represent values that were below the analytical detection limit.

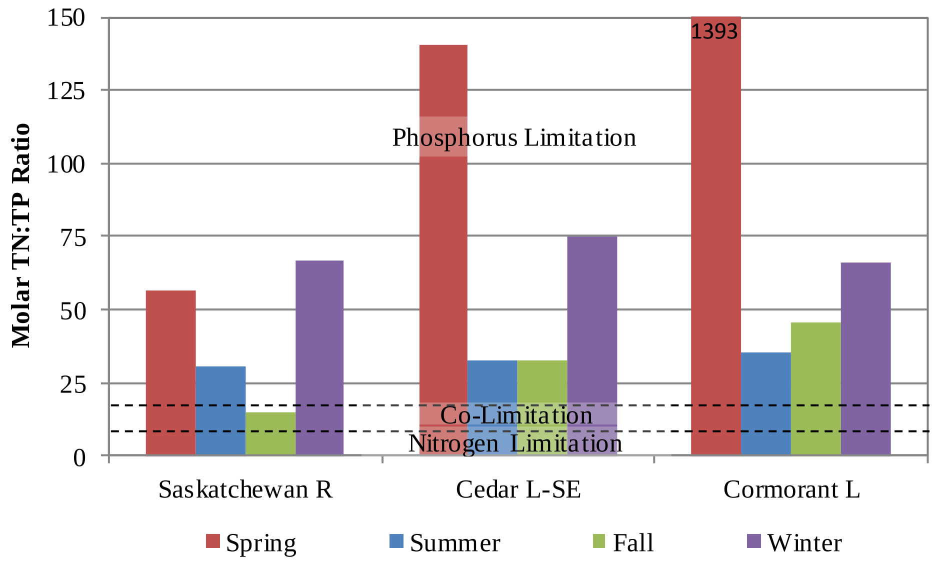


Figure 3.3-18. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Saskatchewan River Region: 2010/2011.

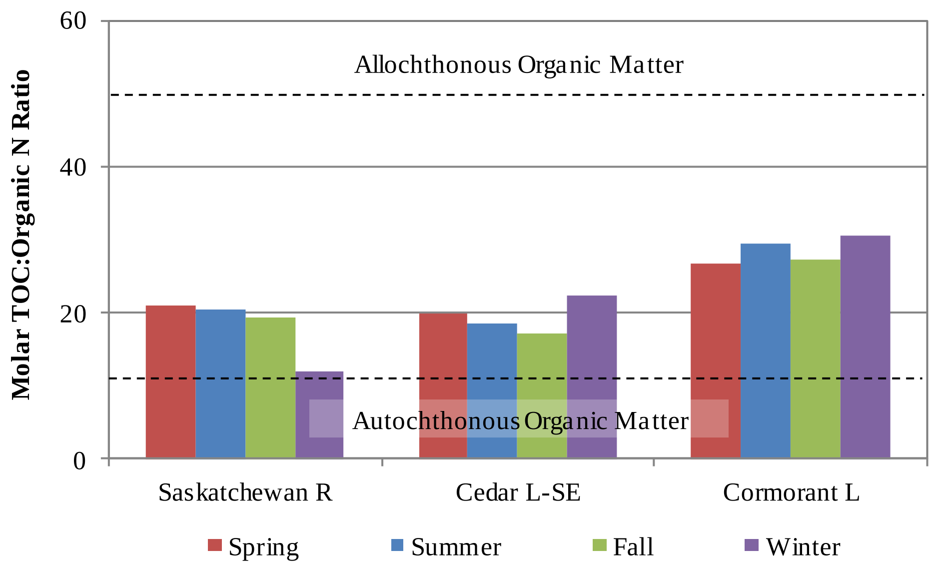


Figure 3.3-19. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Saskatchewan River Region: 2010/2011.

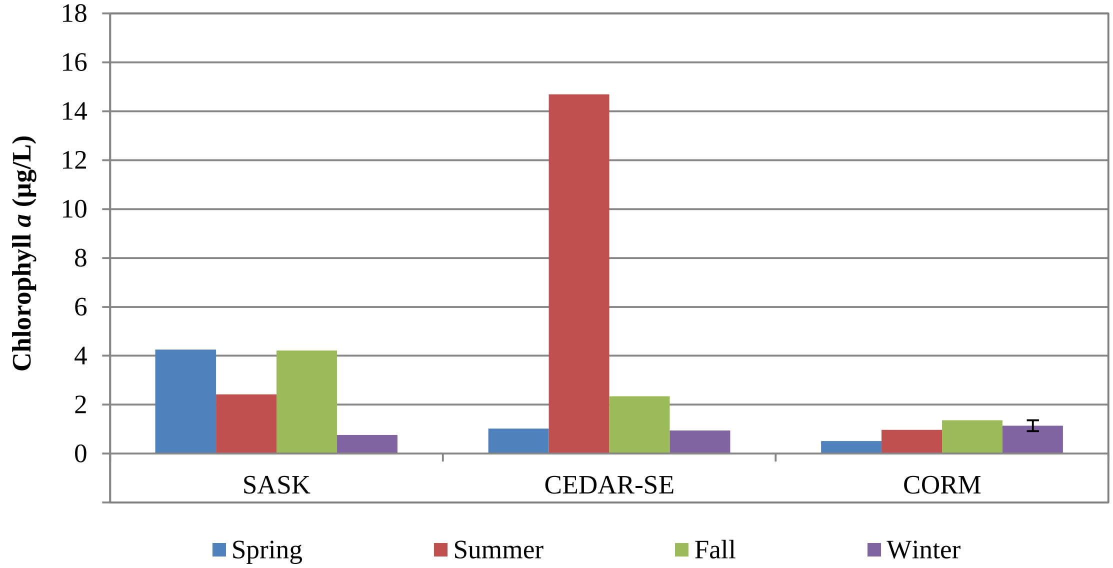


Figure 3.4-1. Chlorophyll *a* concentrations measured within the euphotic zone at sites in the Saskatchewan River Region in 2010/2011. Error bars represent the standard error of triplicate samples.

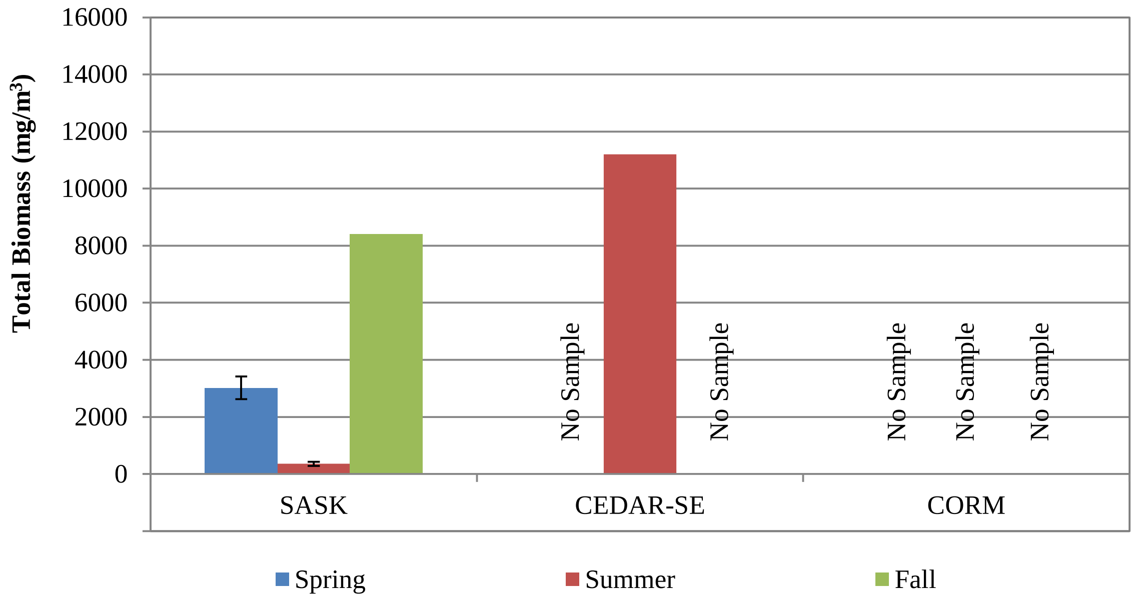


Figure 3.4-2. Phytoplankton biomass measured at sites in the Saskatchewan River Region in 2010. Error bars represent the standard error of samples analysed in duplicate for quality assurance.

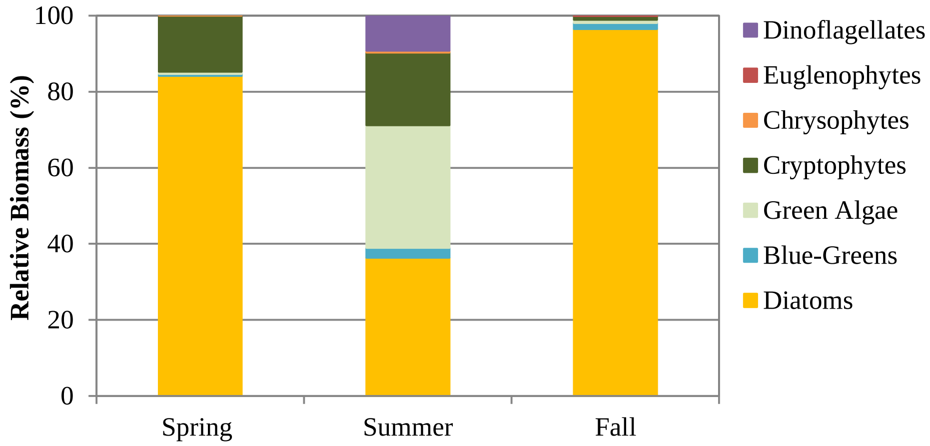


Figure 3.4-3. Phytoplankton community composition measured at the Saskatchewan River in 2010.

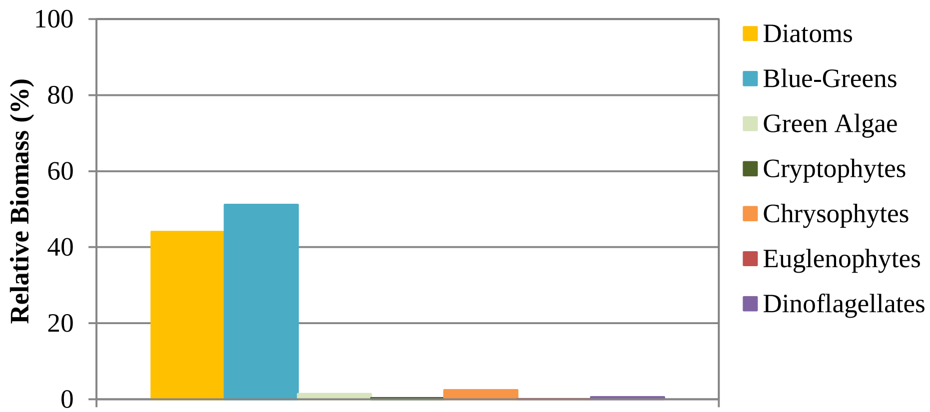


Figure 3.4-4. Phytoplankton community composition measured during the phytoplankton bloom in Cedar Lake in summer 2010.

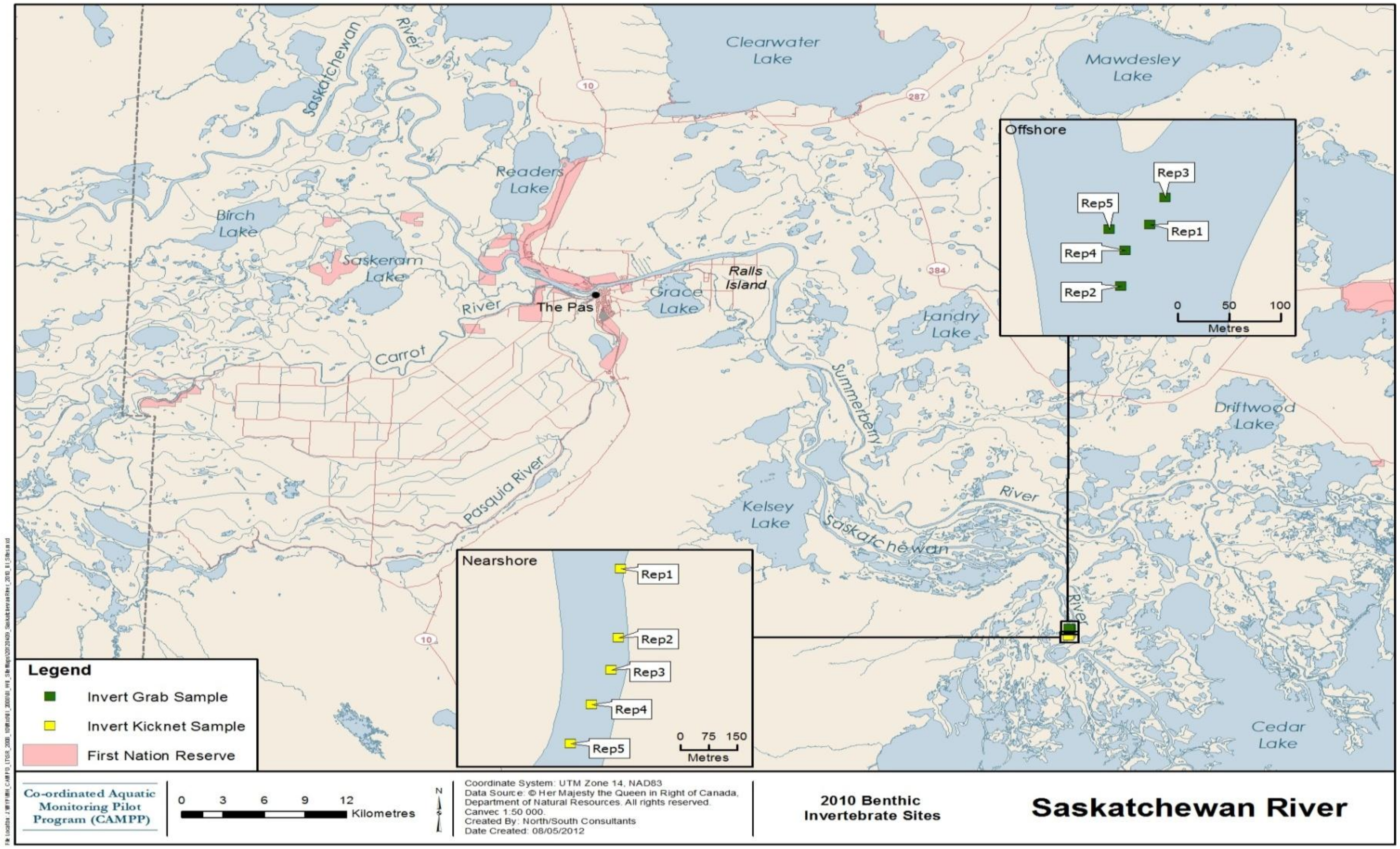


Figure 3.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Saskatchewan River in the Saskatchewan River Region, 2010.

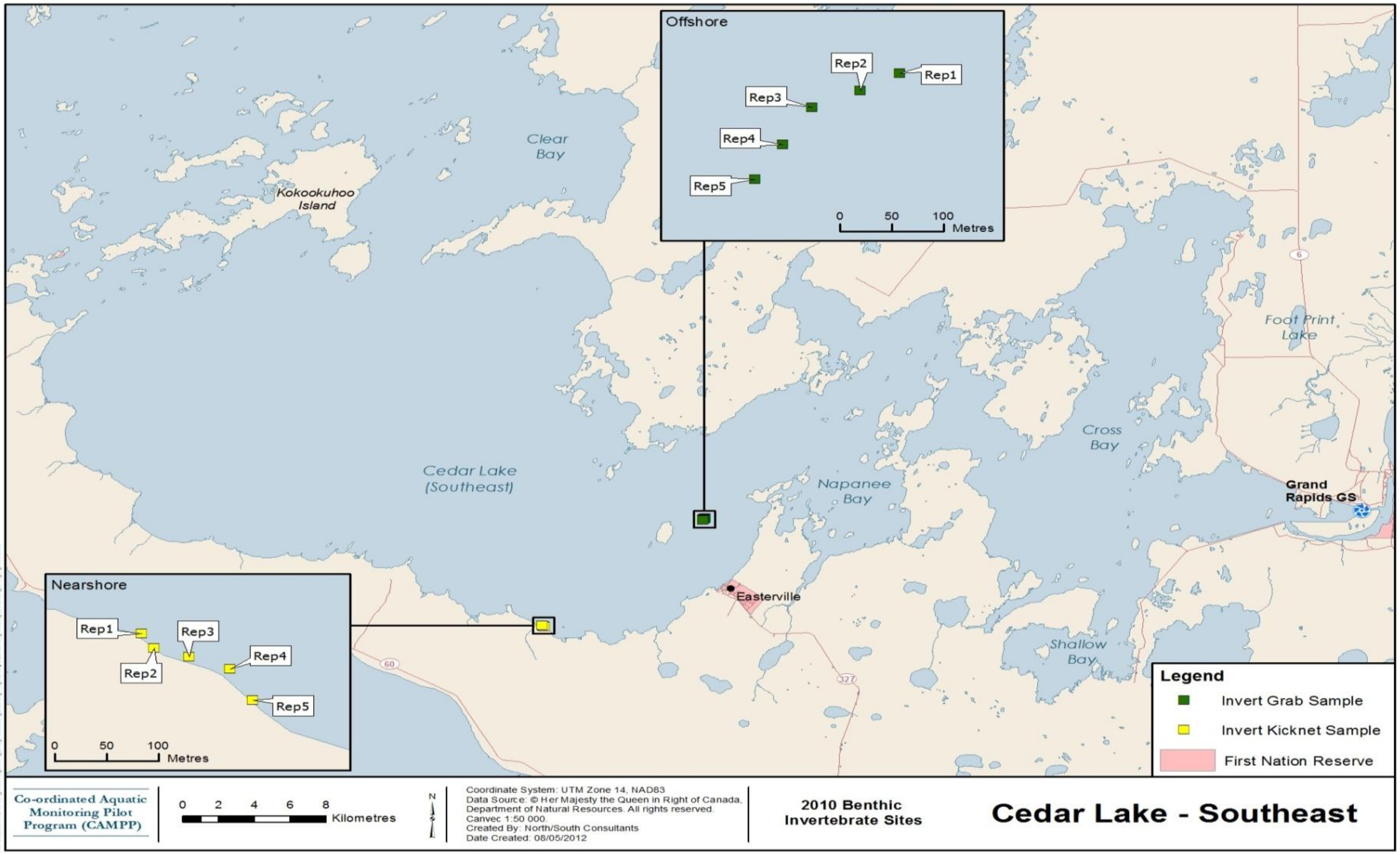


Figure 3.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Cedar Lake - Southeast in the Saskatchewan River Region, 2010.

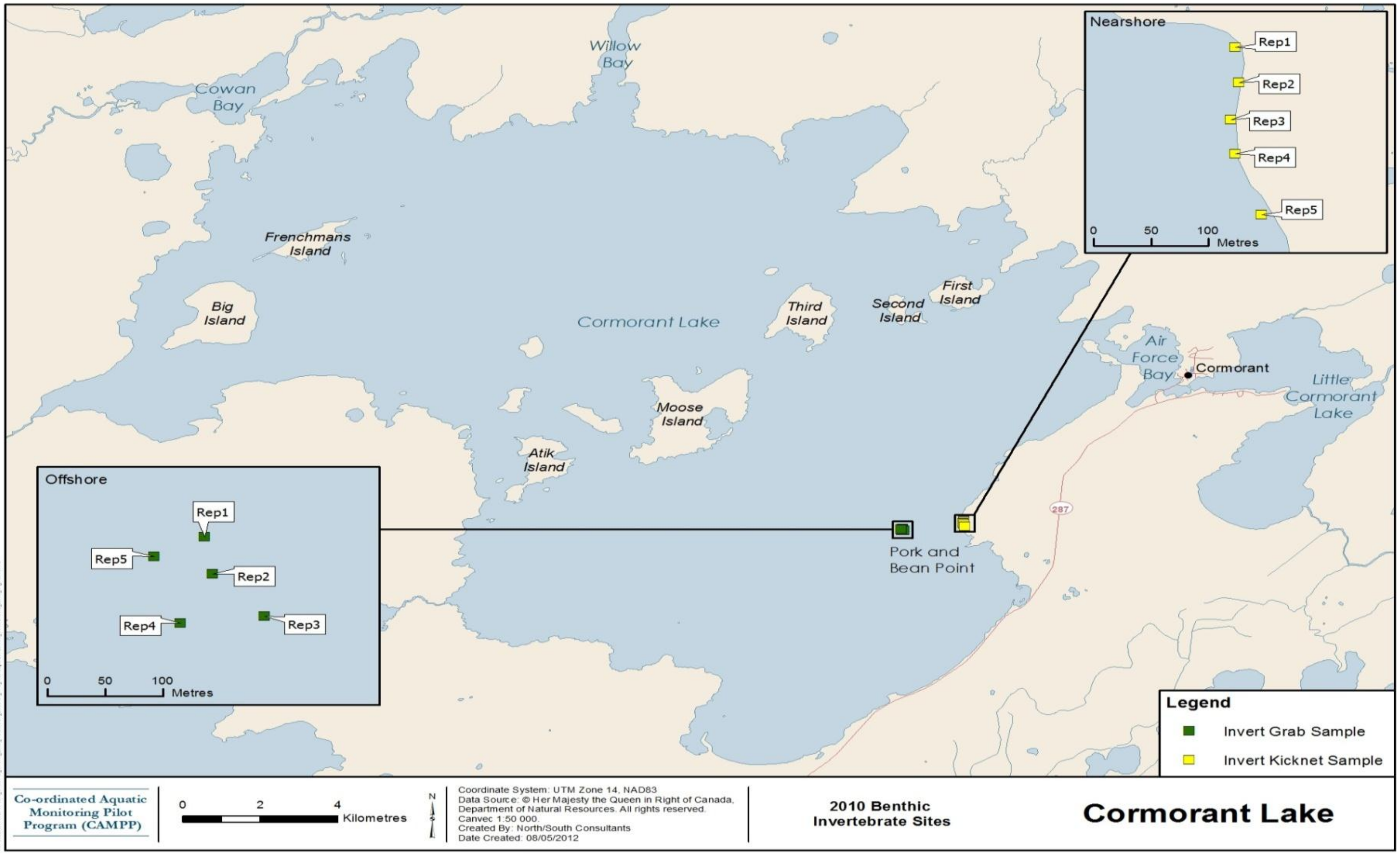


Figure 3.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Cormorant Lake in the Saskatchewan River Region, 2010.

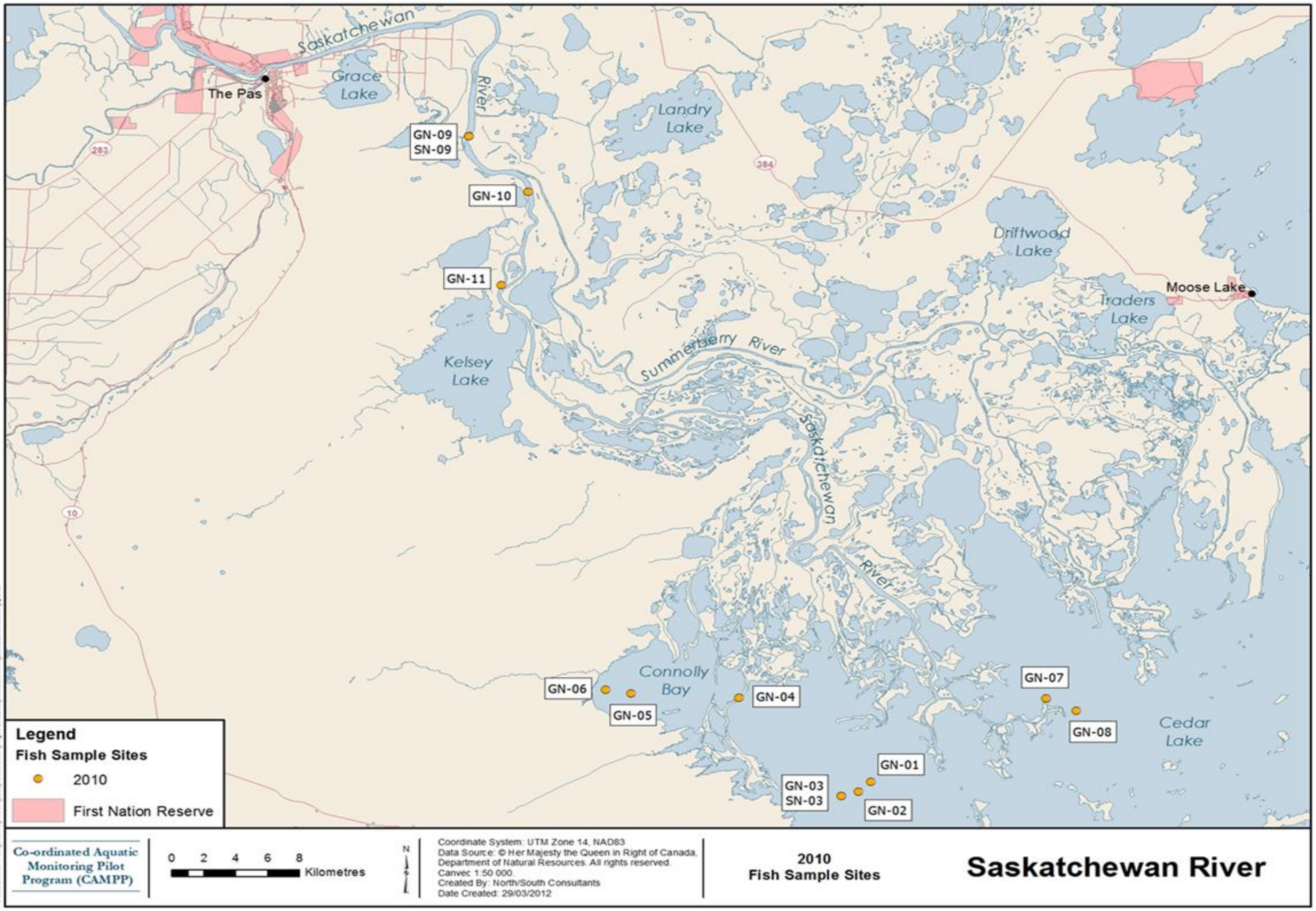


Figure 3.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Saskatchewan River, 2010.

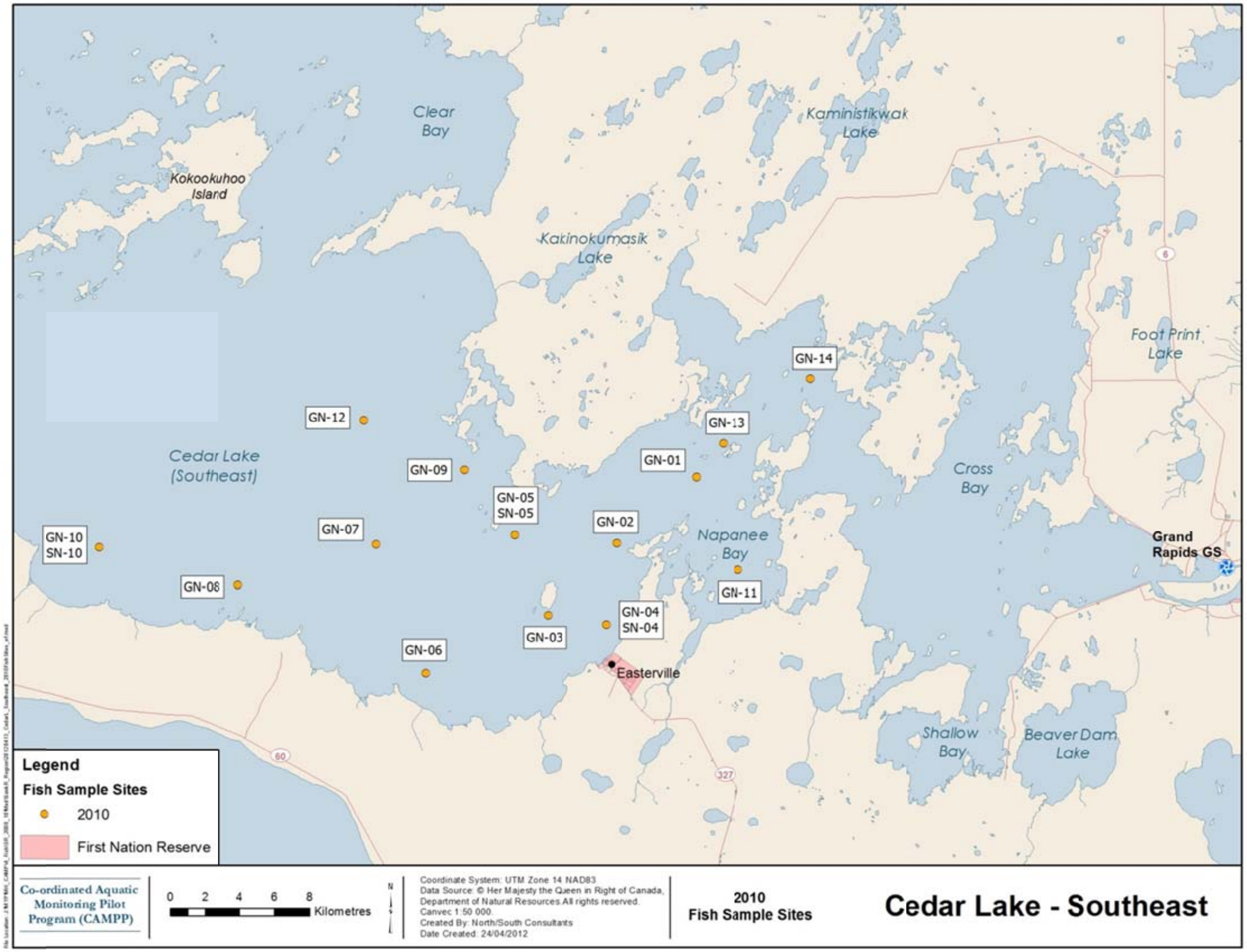


Figure 3.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Cedar Lake-Southeast, 2010.

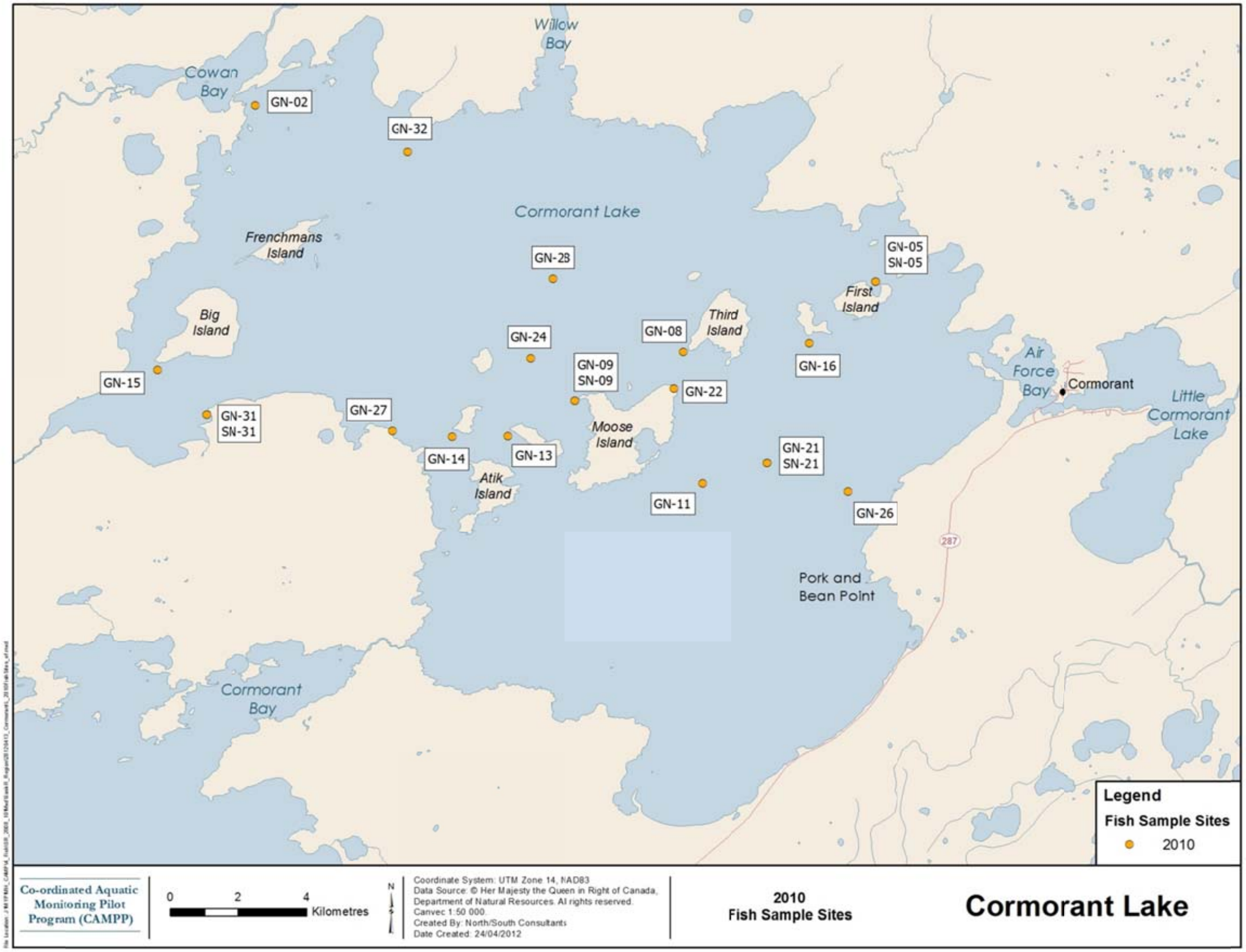


Figure 3.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Cormorant Lake, 2010.

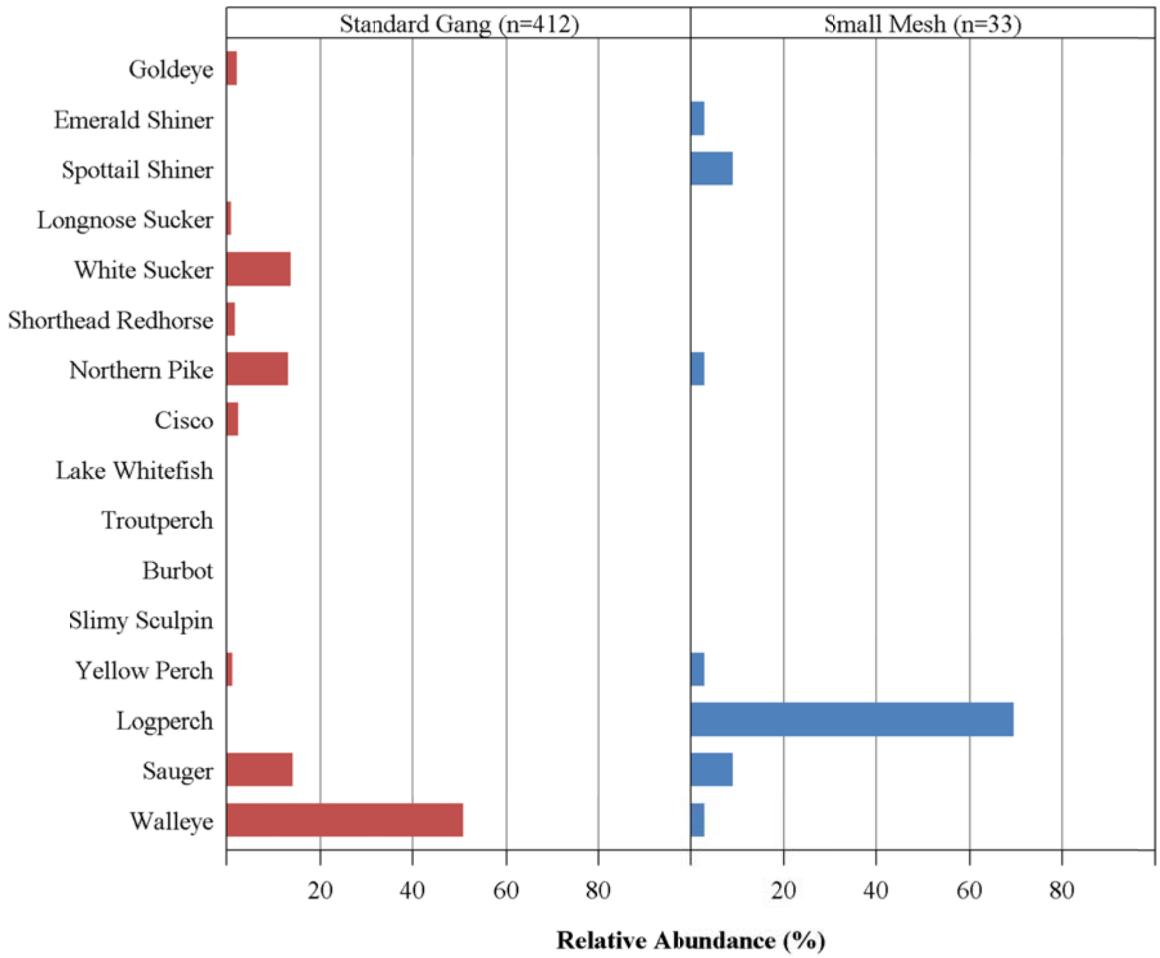


Figure 3.6-4. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in the Saskatchewan River, 2010.

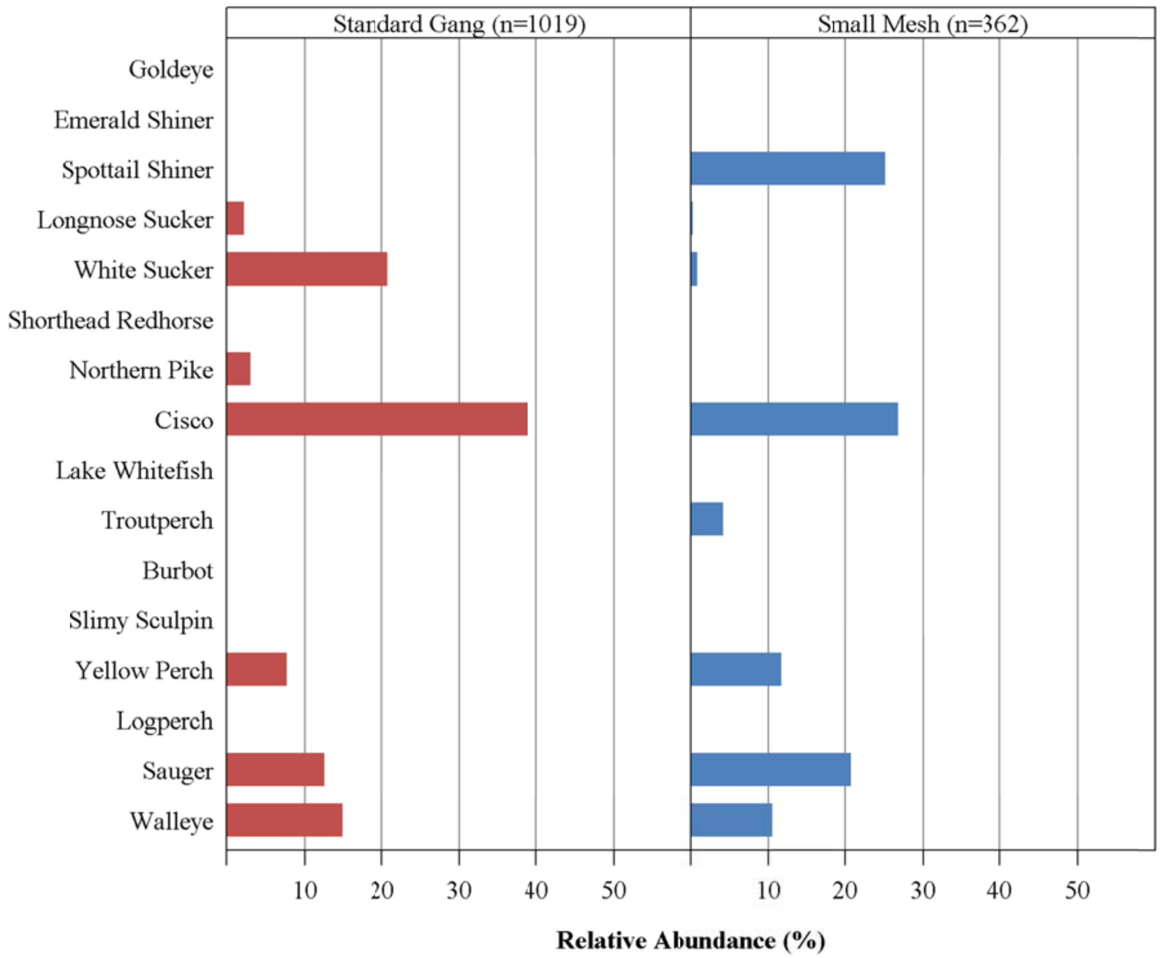


Figure 3.6-5. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Cedar Lake-Southeast, 2010.

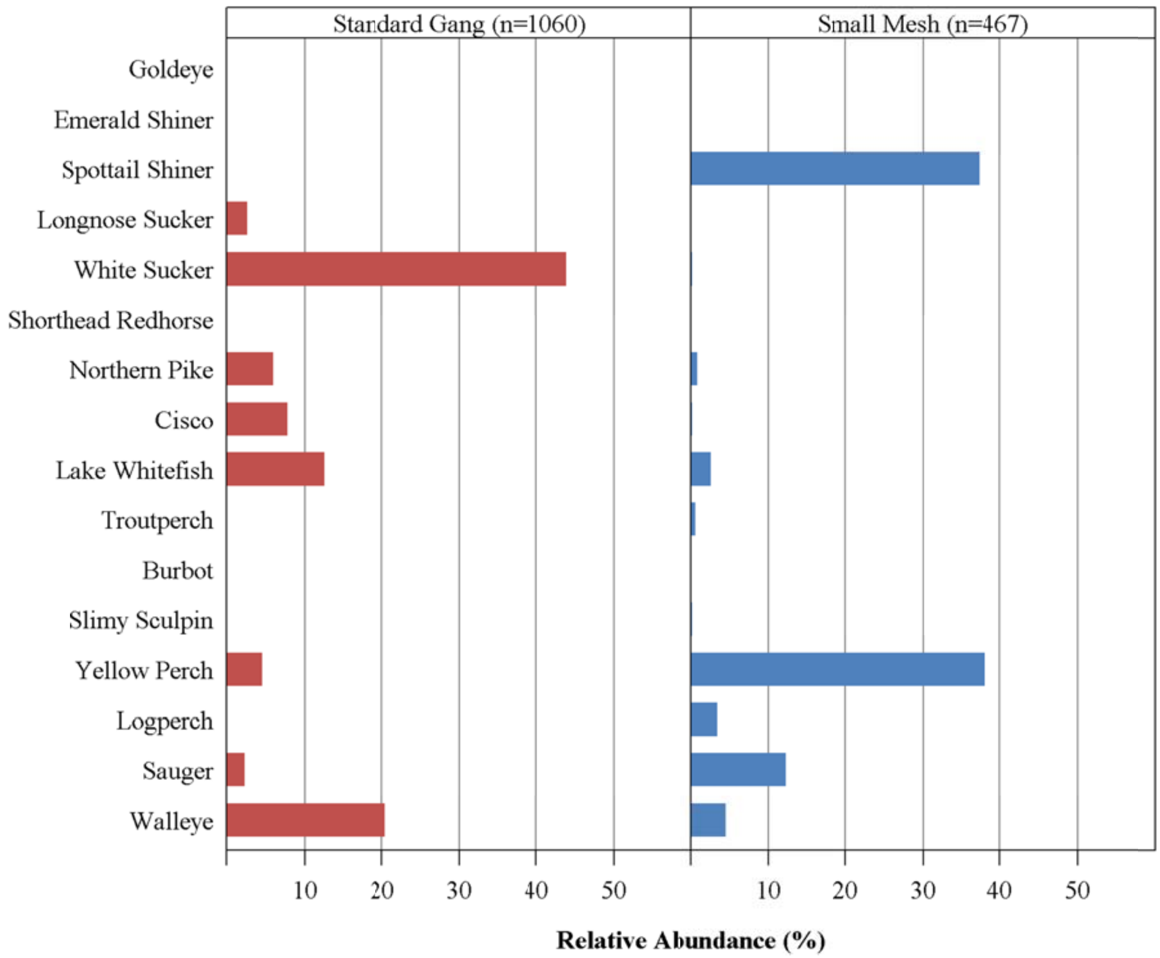


Figure 3.6-6. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Cormorant Lake, 2010.

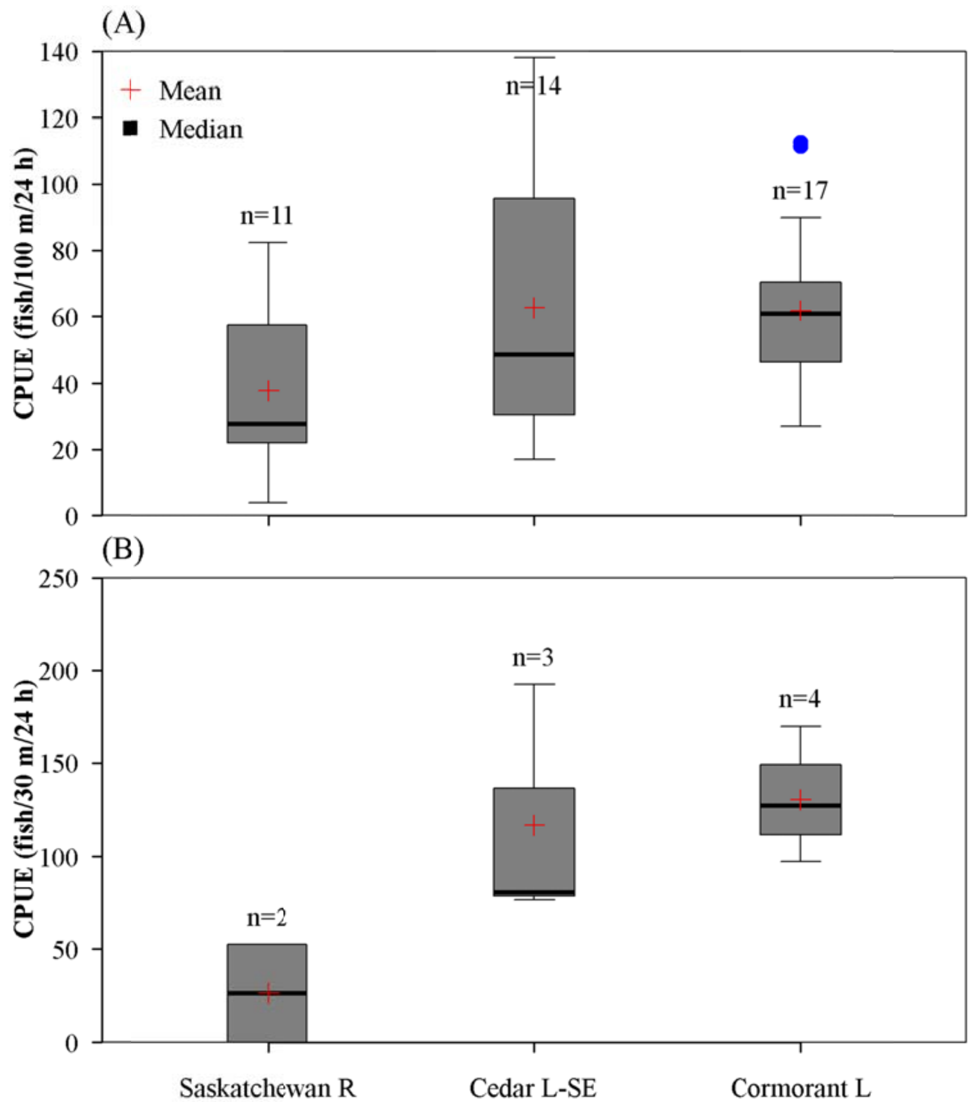


Figure 3.6-7. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang (fish/100 m/24 h) and (B) small mesh (fish/30 m/24 h) index gill nets set in Saskatchewan River Region waterbodies, 2010.

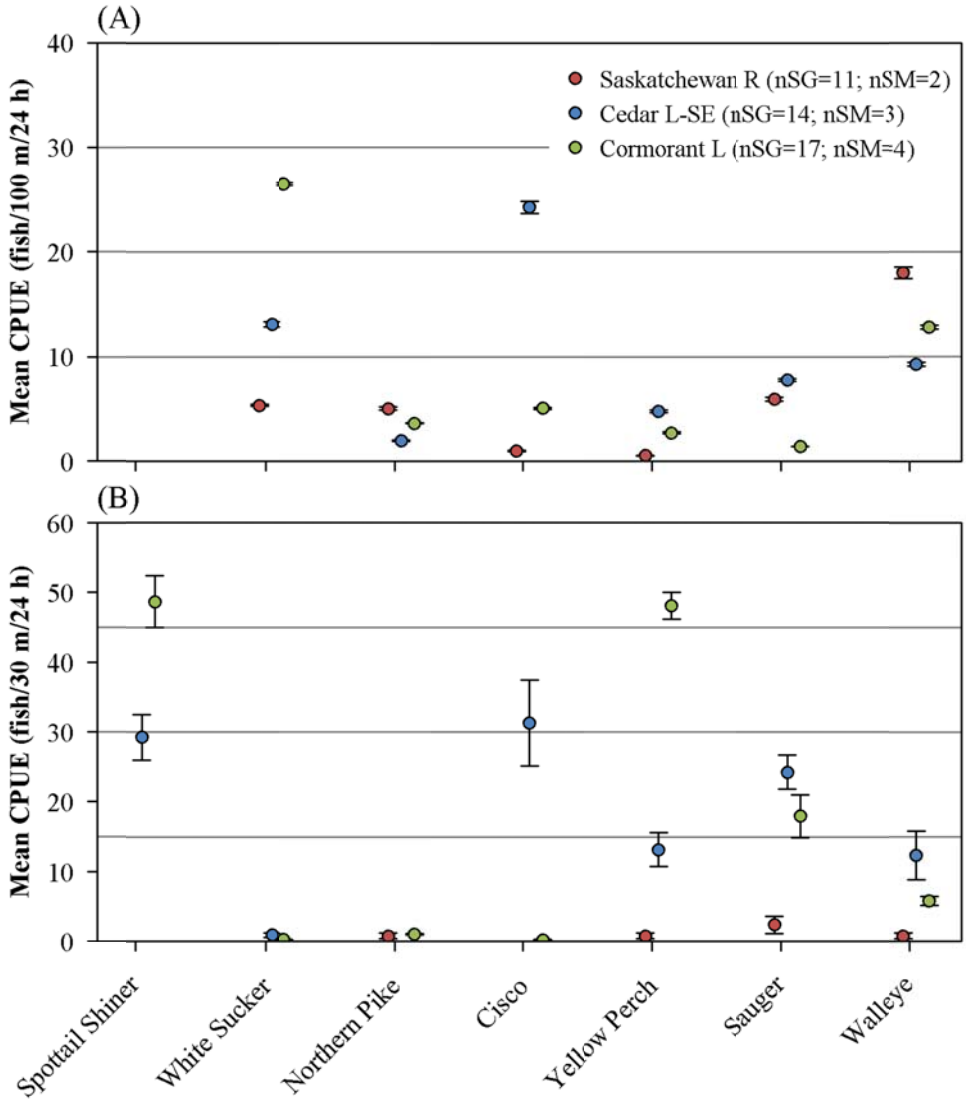


Figure 3.6-8. Mean (SE) Spottail Shiner, White Sucker, Northern Pike, Cisco, Yellow Perch, Sauger and Walleye CPUE calculated from (A) standard gang and (B) small mesh index gill nets set in Saskatchewan River Region waterbodies, 2010.

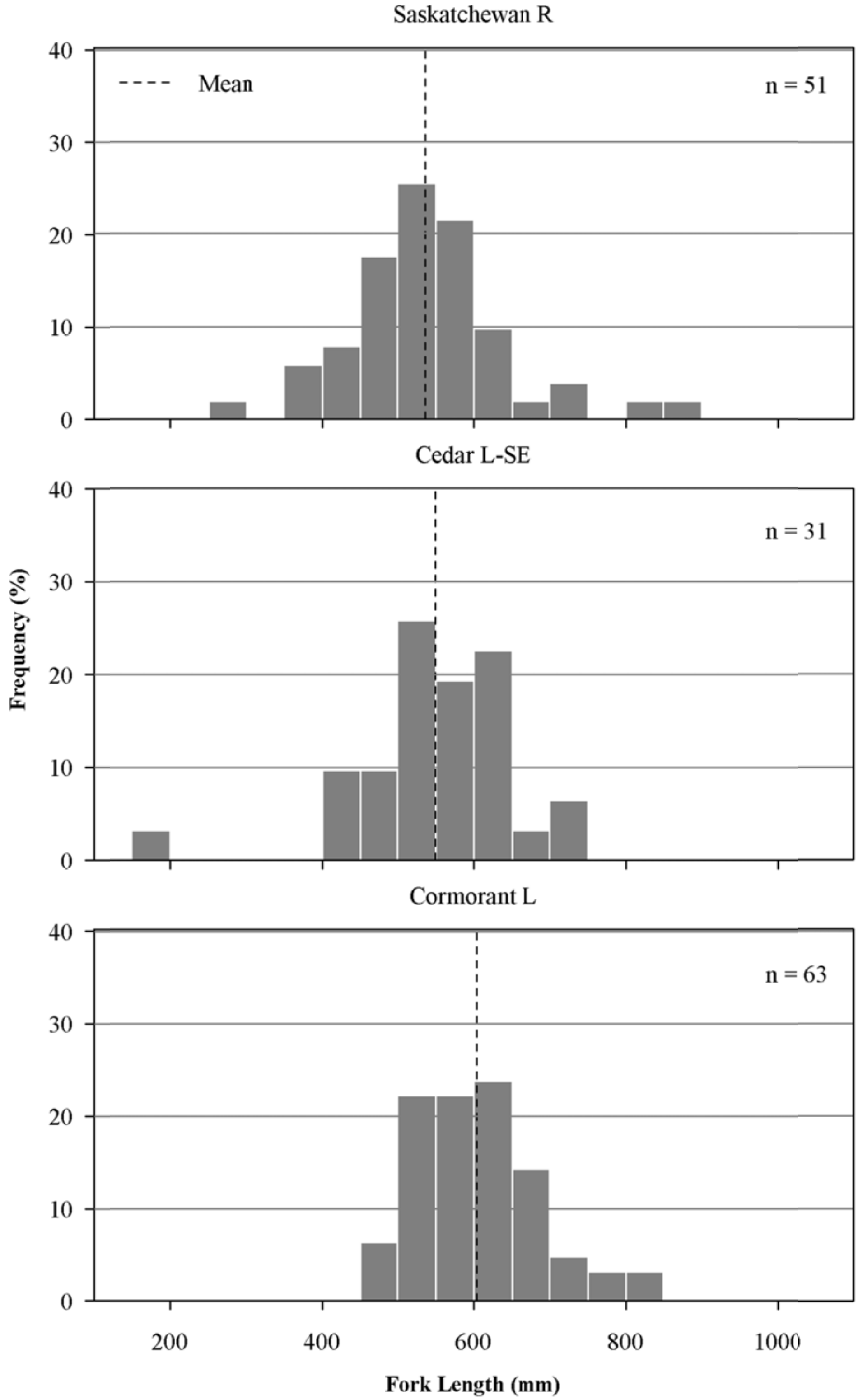


Figure 3.6-9. Fork length frequency histogram for Northern Pike captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

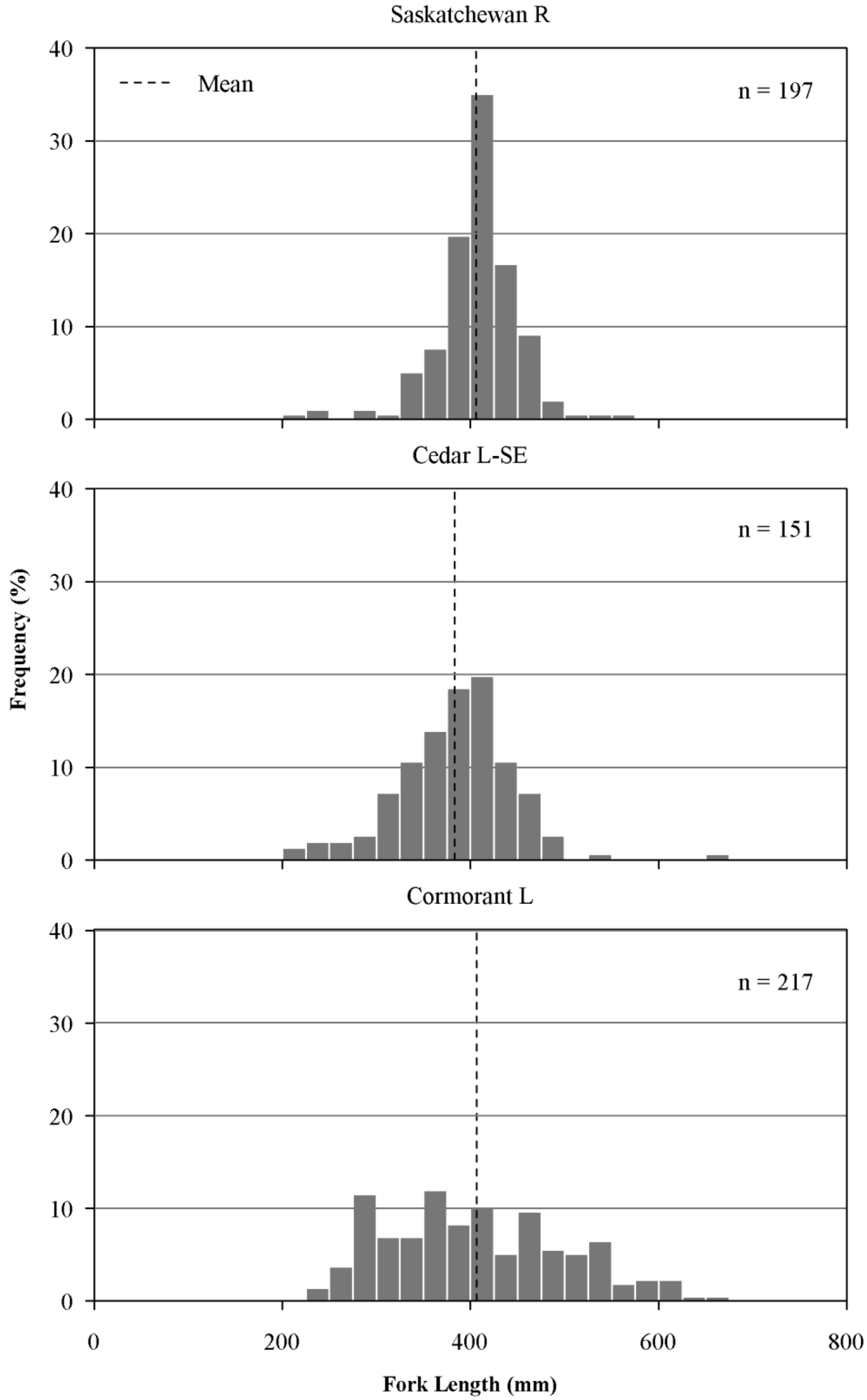


Figure 3.6-10. Fork length frequency histogram for Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2010.

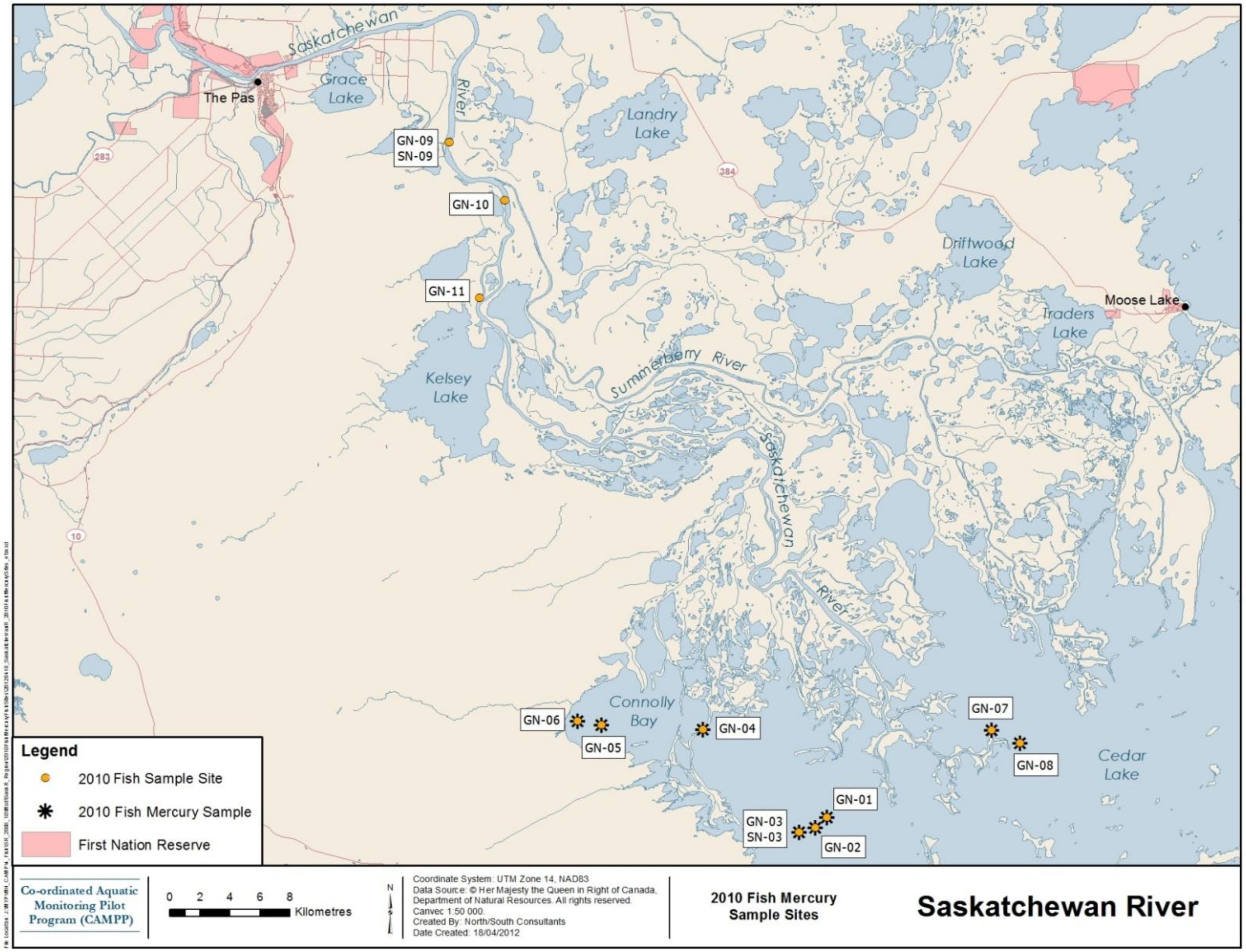


Figure 3.7-1. Fish sampling sites in the Saskatchewan River, indicating those sites where fish were collected for mercury analysis.

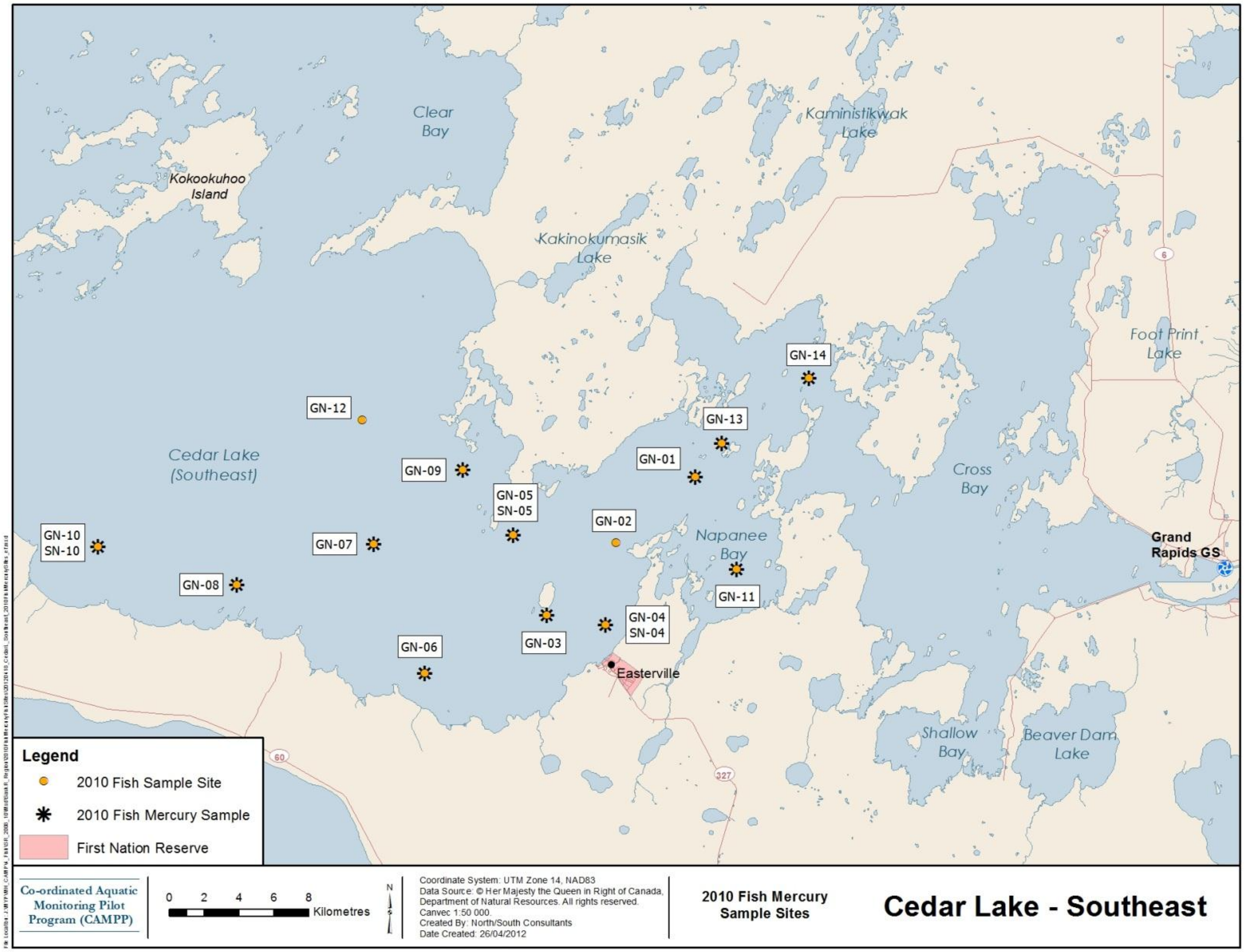


Figure 3.7-2. Fish sampling sites in Cedar Lake-Southeast, indicating those sites where fish were collected for mercury analysis.

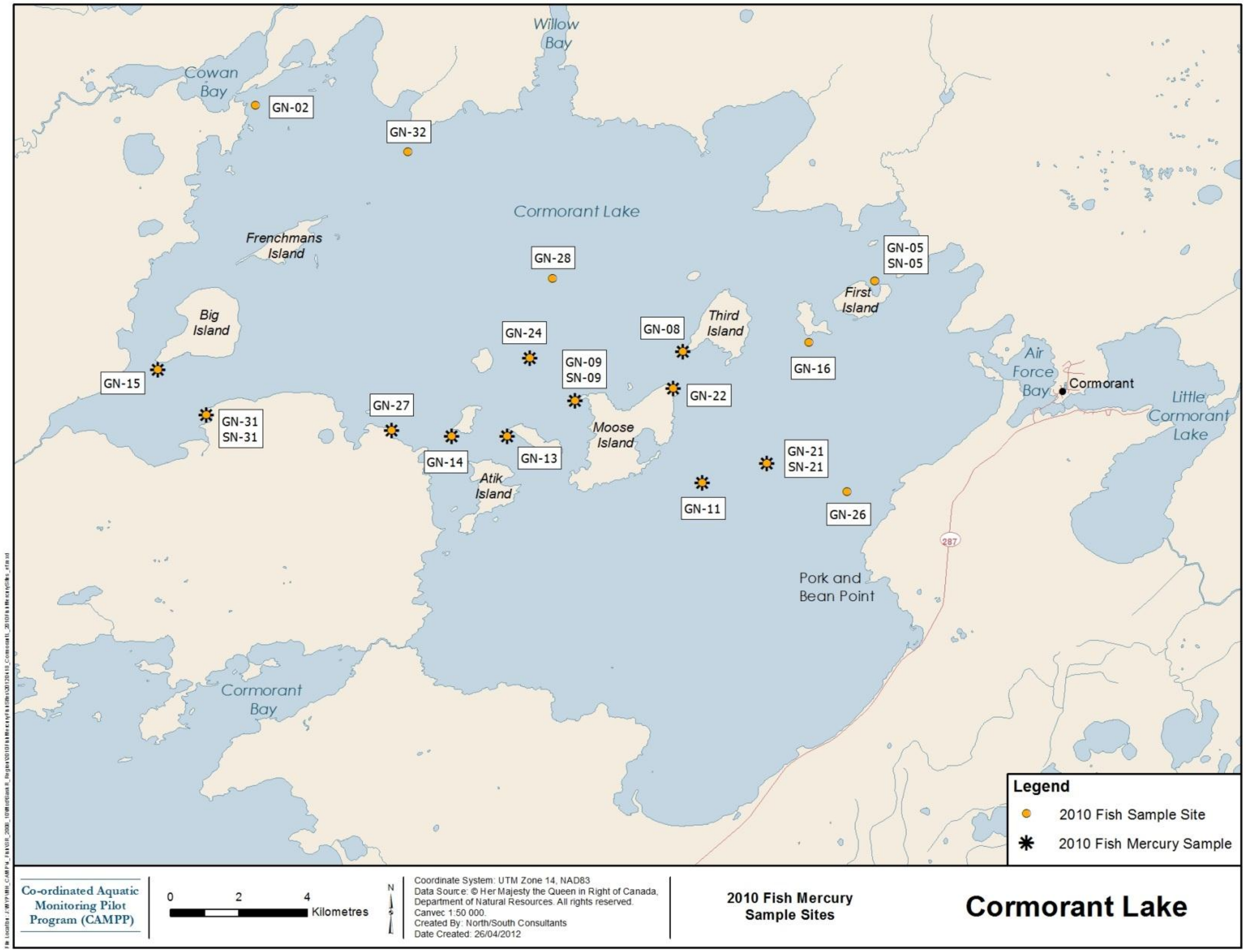


Figure 3.7-3. Fish sampling sites in Cormorant Lake, indicating those sites where fish were collected for mercury analysis.

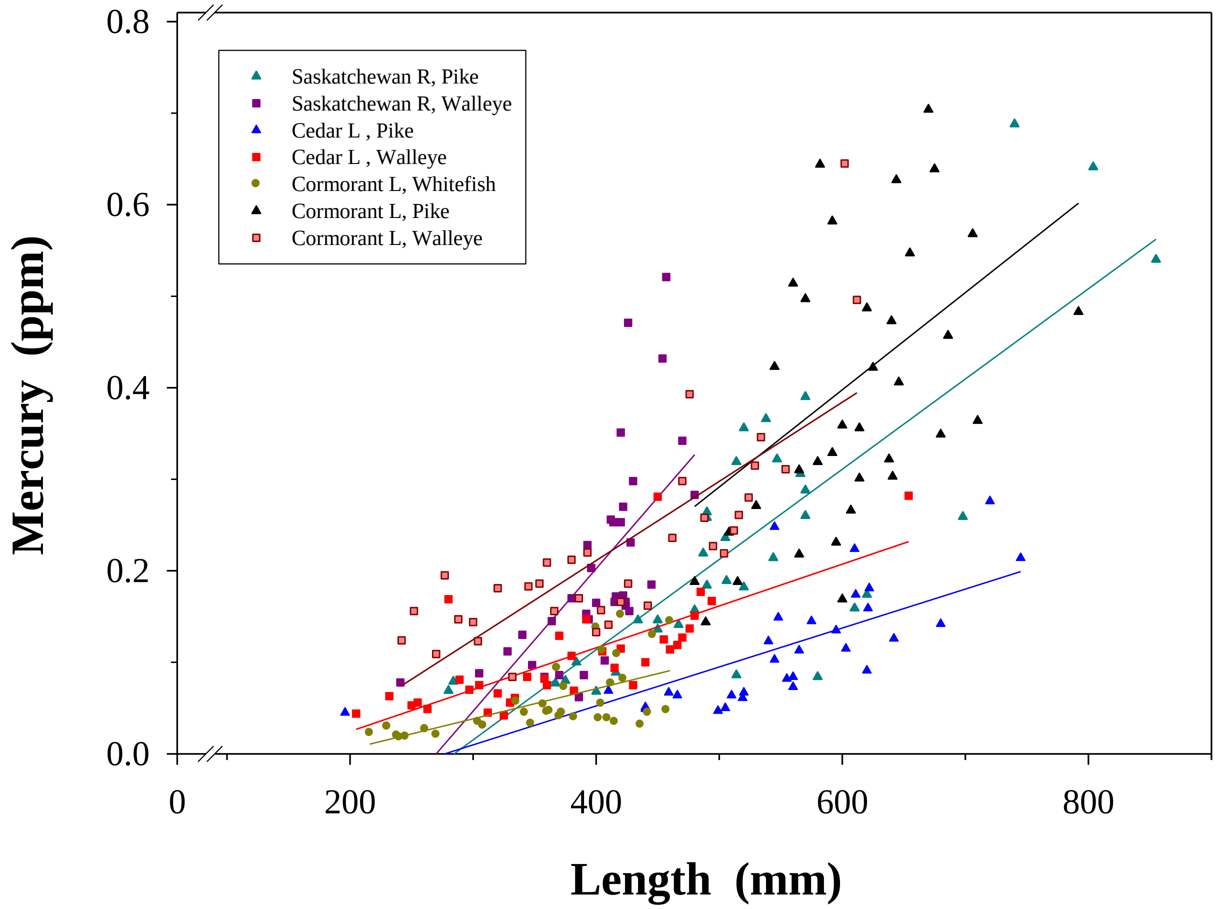


Figure 3.7-4. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from the Saskatchewan River, Cedar Lake- Southeast, and Cormorant Lake in 2010. Significant linear regression lines are shown.

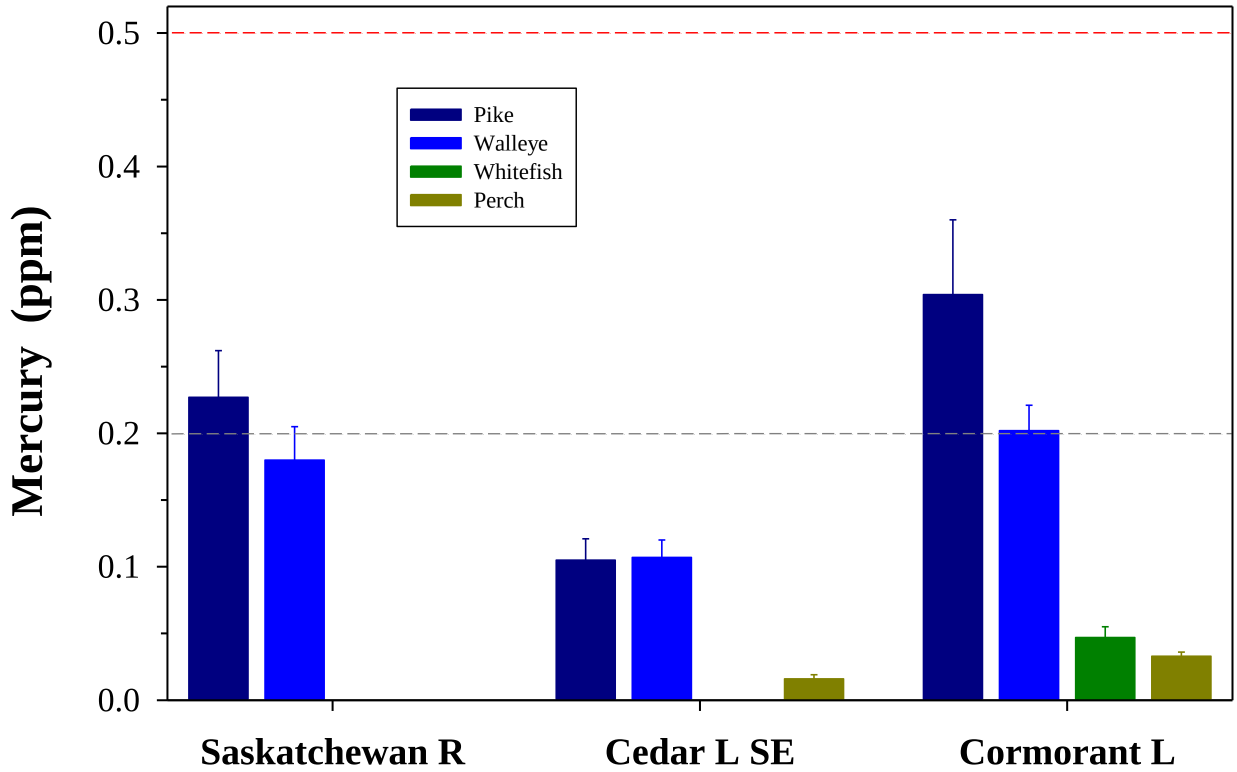


Figure 3.7-5. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye, and Lake Whitefish, and arithmetic mean (+95% CL) concentrations of Yellow Perch from the Saskatchewan River, Cedar Lake-Southeast, and Cormorant Lake. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.

4.0 UPPER CHURCHILL RIVER REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Upper Churchill River Region, by each major component. A description of methods is provided in Section 4 and in detail in Appendix 1.

4.1 CLIMATE

Mean monthly air temperatures measured at Lynn Lake in 2010 were generally higher than the 1971-2000 temperature normals throughout the year (Figure 4.1-1). January and March were both notably warmer than normal (6.6 ^{o}C and 7.9 ^{o}C above normal, respectively). Overall, the annual mean air temperature was 3.2 ^{o}C above the normal.

The 1971-2000 normals for precipitation measured at Lynn Lake indicate a peak in July followed by secondary peaks in June and August, and relatively low levels of precipitation in winter (Figure 4.1-1). In 2010, the highest precipitation occurred in August, when it was slightly higher than the normal. The months of April and May were exceptional in that precipitation levels were 1.7 times the normal. Notably dry months included June, November and December, having received 20%, 30% and 12 % of the normal precipitation levels, respectively.

Overall, the comparison to climate normals indicates that 2010 was characterized by a warmer winter with average precipitation from January to March but drier conditions in November and December, and the open-water sampling season was drier with average air temperatures (Figure 4.1-1).

4.2 HYDROLOGY

Upper Churchill River flows entering Manitoba are influenced by run-off from snow-melt and precipitation across the Churchill River drainage basin, which begins in Alberta and covers a large portion of northwestern Saskatchewan. The drainage basin includes several large lakes which act as reservoirs, the largest being Reindeer Lake along the Manitoba-Saskatchewan border. In 2010, CAMPP monitoring occurred on Southern Indian Lake, which acts as a hydroelectric reservoir for Manitoba Hydro as part of the Churchill River Diversion. Monitoring also occurred on Granville Lak - the off-system waterbody for this region.

Upper Churchill River flow started out the year above the upper quartile in 2010 as a carryover from the above average precipitation in 2009. A very low snowpack then led to flows dropping below average in mid-May. Close to average precipitation then kept flows between the lower quartile and average for the rest of the year (Figure 4.2-1).

Southern Indian Lake water levels in 2010 did not follow the typical pattern but remained at or above the upper quartile for most of the year, reaching record highs from early-February until late-May (Figure 4.2-2). The non-typical pattern was driven by very high upper Churchill River flows through the winter of 2009-2010.

Granville Lake water levels were well above the upper quartile for the first few months of 2010 before declining to the lower quartile by August and returning to near average levels from October through the end of the year (Figure 4.2-3).

4.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 3 of CAMPP in the Upper Churchill River Region. Waterbodies sampled included Southern Indian Lake (two areas; Southern Indian Lake-Area 6 and Southern Indian Lake-Area 4) and Granville Lake (an off-system waterbody located approximately 200 km upstream of the Missi Falls Control Structure; Figure 4.3-1). Although Granville Lake is as an off-system waterbody, the results of the water quality monitoring conducted in 2010/2011 are described below collectively with the on-system sites to illustrate the change in conditions along the length of the river.

4.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Upper Churchill River Region for routine water quality variables are presented in Tables 4.3-1 and 4.3-2 and Figures 4.3-2 to 4.3-10.

4.3.1.1 On-system Waterbodies

Water quality of Southern Indian Lake can be generally described as moderately nutrient-rich, slightly alkaline, soft, and well-oxygenated. SIL-Area 4 was not stratified over the monitoring period in 2010/2011 but SIL-Area 6 was weakly stratified in spring (Figure 4.3-2). Dissolved oxygen (DO) was relatively constant across depth at both sites and was consistently above the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL; Manitoba Water Stewardship [MWS] 2011; Figure 4.3-3). Other *in situ* variables, including turbidity, pH, and specific conductance, were relatively consistent across depth (Figures 4.3-4 to 4.3-6). The exception was that pH increased slightly with depth at SIL-Area 6 and SIL-Area 4 in fall 2010. Secchi disk depths in Southern Indian Lake were low to moderate (0.5-0.8 m; Figure 4.3-7).

Most routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011 (MWS 2011). Two of the four samples collected in SIL-Area 6 exceeded the Manitoba narrative guideline for total phosphorus (TP) of 0.025 mg/L for lakes, ponds, and reservoirs, but no samples from SIL-Area 4 had elevated concentrations (Figure 4.3-8). *In situ* pH was also above the upper limit for PAL in SIL-Area 4 in summer 2010 (6.5-9.0; Figure 4.3-5); conversely, pH measured at the laboratory was consistently within the guidelines (Table 4.3-2).

Dissolved and particulate phosphorus generally formed equivalent portions of the TP pool in SIL-Area 6 but the majority of TP in SIL-Area 4 was in the dissolved form (Figure 4.3-9). During most sampling periods, organic nitrogen comprised the majority of total nitrogen (TN), although ammonia dominated the dissolved inorganic nitrogen (DIN) pool in spring and summer and nitrate/nitrite comprised the majority of the pool in fall and winter (Figure 4.3-10).

4.3.1.2 Off-system Waterbody

Granville Lake was isothermal and well-oxygenated during all sampling periods in 2010/2011 (Figures 4.3-2 and 4.3-3). Turbidity, pH, and specific conductance were relatively consistent across depth and Secchi disk depth was consistently higher than in Southern Indian Lake (1.2 to 1.8 m; Figures 4.3-4 to 4.3-7).

As in SIL-Area 6, 50 % of samples from Granville Lake exceeded the guideline for TP (0.025 mg/L (MWS 2011; Figure 4.3-8). *In situ* pH measured in the upper 3 m of water in summer 2010 also exceeded the upper PAL limit (6.5-9.0). All other measures for routine parameters were within the MWQSOGs for PAL, where they exist.

Dissolved and particulate phosphorus generally formed equivalent portions of the TP pool in Granville Lake (Figure 4.3-9) and TN was composed mainly of organic nitrogen during all periods except spring (Figure 4.3-10). Ammonia comprised the majority of the DIN pool in Granville Lake in the open-water season whereas nitrate/nitrite was higher in winter.

4.3.2 Metals and Major Ions

A summary of metal concentrations measured in the Upper Churchill River Region in 2010/2011 is presented in Table 4.3-3 and a summary of detection frequencies for metals is provided in Table 4.3-4.

4.3.2.1 On-system Waterbodies

A number of metals were not detected in SIL-Area 6 or SIL-Area 4 during any sampling period including antimony, beryllium, bismuth, mercury, molybdenum, nickel, selenium, silver, tellurium, thallium, tungsten, and zinc. Aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, thorium, titanium, and vanadium were consistently detected; the remaining metals were detected in some samples (Table 4.3-4).

Aluminum exceeded the MWQSOG for PAL in 100% of samples at both SIL-Area 6 and SIL-Area 4 (Figure 4.3-11). Iron concentrations were also in excess of the PAL guideline (0.3 mg/L) in 75 and 25% of the samples from these sites, respectively (Figure 4.3-11). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines at each of the sampling sites in 2010/2011 (MWS 2011; Table 4.3-5). However, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods, comparisons to the guideline could not be made.

Both chloride and sulphate were consistently detected in Southern Indian Lake in 2010/2011, though both were present at low concentrations. Chloride averaged less than 2 mg/L and was well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013). Sulphate averaged less than 3 mg/L at each site (Table 4.3-2), and fell on the lower range of concentrations reported across Canada (Canadian Council of Resource and Environment Ministers [CCREM] 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, the concentrations in Southern Indian Lake were below the British Columbia Ministry of Environment (BCMOE) guidelines, which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013).

4.3.2.2 Off-system Waterbody

With a few exceptions, metals consistently detected or not detected in Granville Lake were generally similar to those found in Southern Indian Lake (Table 4.3-4). The exceptions were that cadmium, cesium, chromium, cobalt, thorium, and zirconium were also never detected in the lake. The metals detected in all samples from Granville Lake were similar to those found in SIL-Areas 6 and 4 with the exception that lead was only detected in 50% of samples.

A slightly lower frequency of exceedance (75%) of the aluminum PAL guideline (0.1 mg/L; MWS 2011) occurred in Granville Lake than in Southern Indian Lake, and no samples from Granville Lake had iron concentrations in excess of the PAL guideline (0.3 mg/L). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines (Table 4.3-5).

As in Southern Indian Lake, concentrations of chloride and sulphate were low, averaging 1 and 3 mg/L, respectively, in Granville Lake and were below the CCME PAL (120 mg/L; CCME 1999; updated to 2013) and BCMOE guidelines (128 to 429 mg/L; Meays and Nordin 2013).

4.3.3 Trophic Status and Nutrient Ratios

4.3.3.1 On-system Waterbodies

Areas 4 and 6 of Southern Indian Lake were meso-eutrophic based on TP (Table 4.3-6) but varied between oligotrophic and mesotrophic based on TN (Table 4.3-8) and chlorophyll *a* (Table 4.3-7). On the basis of molar TN:TP ratios, both areas of Southern Indian Lake were phosphorus limited during each sampling period in 2010/2011 (Figure 4.3-12). Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter in the lake was a mixture of allochthonous and autochthonous sources (Figure 4.3-13).

4.3.3.2 Off-system Waterbody

Similar to Southern Indian Lake, Granville Lake was meso-eutrophic based on TP (Table 4.3-6) and mesotrophic based on chlorophyll *a* and TN (Tables 4.3-7 and 4.3-8). As with SIL-Areas 4 and 6, molar TN:TP ratios indicated that Granville Lake was phosphorous limited during all sampling periods in 2010/2011 (Figure 4.3-12). TOC:ON ratios also indicated that organic matter was a mixture of allochthonous and autochthonous sources (Figure 4.3-13).

4.3.4 *Escherichia coli*

4.3.4.1 On-system Waterbodies

E. coli was detected in one of four samples (1 CFU/100 mL) collected in SIL-Area 6 but was not detected in SIL-Area 4 in 2010/2011 (Table 4.3-2). All measurements were well below the MWQSOG recreational guideline of 200 CFU/100 mL (MWS 2011).

4.3.4.2 Off-system Waterbody

E. coli was not detected in Granville Lake during the 2010/2011 sampling period in 2010/2011 and all measurements were well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 4.3-2).

4.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 3 of CAMPP in the Upper Churchill River Region. Waterbodies sampled included Southern Indian

Lake-Area 6 (SIL-Area 6; in South Bay), Southern Indian Lake-Area 4 (near Missi Falls), and Granville Lake (Figure 4.3-1).

4.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Upper Churchill River Region were low to moderate and were generally similar between waterbodies (Figure 4.4-1). Winter chlorophyll *a* concentrations were typically lower than those of the open-water season.

4.4.2 Community Composition and Biomass

In 2010/2011, phytoplankton community composition and biomass were measured at SIL-Area 6 as part of the rotational waterbody analyses. Phytoplankton biomass was low throughout the open-water season, with the highest biomass in fall (Figure 4.4-2).

During all seasons, the phytoplankton community of SIL-Area 6 was dominated by cryptophytes (Figure 4.4-3). In spring, chrysophytes, green algae, and diatoms formed equivalent proportions of the community and were collectively the next most common groups. In summer, blue greens were the second-most abundant group but by fall, the phytoplankton community was more similar to that of spring, with green algae being the second-most abundant taxon. *Cryptomonas* sp. was the most common cryptophyte at the site.

Phytoplankton species richness ranged from 13 to 16 in SIL-Area 6 in 2010/11 (Table 4.4-1). Based on diversity, evenness, and effective richness, community complexity was highest in spring and lowest in fall.

4.4.1 Bloom Monitoring

Chlorophyll *a* concentrations in the region were consistently below the bloom monitoring trigger of 10 µg/L in 2010.

4.4.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (algal toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to affect production of microcystins. *Anabaena* and *Aphanizomenon* were present SIL-Area 6 in 2010/2011; taxonomic information is not available for the other waterbodies in the region.

Microcystin-LR was not measured in this region in 2010 as the chlorophyll *a* concentration was consistently below the 10 µg/L trigger for microcystin-LR analysis.

4.4.3 Trophic Status

SIL-Area 6 was oligotrophic while SIL-Area 4 and Granville Lake were mesotrophic based on mean chlorophyll *a* concentrations (Table 4.3-7).

4.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Upper Churchill River Region in 2010/2011; the third year of CAMPP. Waterbodies sampled included the on-system lakes Southern Indian Lake-Area 4, and Southern Indian Lake-Area 6, and the off-system waterbody Granville Lake. Gauer Lake is the annual, off-system lake site for both the Upper Churchill River Region and the Lower Churchill River Region and is presented and discussed in the Lower Churchill River Region section of this annual report. (Figures 4.5-1 to 4.5-3).

In 2010, grab sampling in the predominantly-wetted portion of the nearshore habitat was changed to kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize the portion of the littoral zone influenced by water level fluctuations. Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Nearshore and offshore habitat polygons were sampled in all waterbodies. Both kicknet and grab sampling consisted of five composites of three replicate samples per nearshore and offshore habitat polygon. Sampling was conducted between 13 and 25 August 2010.

4.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons at each waterbody (Table 4.5-1).

In 2010, mean water depths sampled in the nearshore were: 0.6 m in Granville Lake, 0.5 m in Southern Indian Lake-Area 6, and 1.0 m in Southern Indian Lake-Area 4. Mean water depths sampled in the offshore were: 9.1 m in Granville Lake, 9.2 m in Southern Indian Lake-Area 6, and 8.9 m in Southern Indian Lake-Area 4 (Table 4.5-1).

Sediment samples were collected and analyzed for TOC and PSA to provide a general characterization of sediment type in each offshore polygon. The habitat polygons sampled in the Upper Churchill River Region generally had low mean TOC in the sediments (less than 3%;

Table 4.5-2). Mean TOC was highest at Granville Lake (2.7%) followed by Southern Indian Lake-Area 6 (1.2%) and Southern Indian Lake-Area 4 (0.7%) (Table 4.5-2).

Silt comprised the majority of the sediments collected from the offshore polygon in Granville Lake followed by clay and sand. In Southern Indian Lake-Area 6, clay dominated the sediment followed by silt; sand was a very small part of the overall composition. Southern Indian Lake-Area 4 was dominated by sand followed by similar percentages of silt and clay (Table 4.5-2).

4.5.2 Species Composition, Distribution, and Relative Abundance

4.5.2.1 Granville Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Granville Lake was 323 individuals, with numbers ranging from 248 to 424 (Table 4.5-3). Overall, insects dominated the BMI community in abundance (88% of the mean total BMI), with non-insects comprising 12% of the overall taxa (Table 4.5-3). Of the insects, the main groups were Corixidae (water boatman; 78% of the mean total BMI) and Chironomidae (9%) (Table 4.5-3). Non-insects were represented by Gastropoda (5%), Oligochaeta (4%), and Amphipoda (3%). Mean BMI density in offshore benthic grab samples was 1,766 individuals/m^2, with densities ranging from 1,197 to 2,655 (Table 4.5-3). Overall, insects and non-insects were similarly represented, with insects slightly dominating the BMI community at 55% of the mean total BMI; non-insects comprised 45% of the overall taxa (Table 4.5-3). Insects mainly consisted of Chironomidae (26% of the mean total BMI) and Ephemeroptera (23%); small numbers of Ceratopogonidae, Sialidae, Leptoceridae (long-horn caddisflies), Corixidae, and Chaoboridae (phantom midges) were also collected (Table 4.5-3). Of the non-insects, the main groups were Amphipoda (33%) and Bivalvia (11%); a small number of Acari, Hirudinea, and Oligochaeta were also present (Table 4.5-3).

Total EPT comprised 1% of the mean total nearshore BMI. Ephemeroptera and Trichoptera were equally present in very small numbers (4.5-3). Genus analysis of the Ephemeroptera in the nearshore habitat indicated that *Procloeon* sp. was dominant within the mayflies. In the offshore polygon, total EPT comprised 24% of the BMI community, with the prevalence within Ephemeroptera (23%; 4.5-3). Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore samples. *Hexagenia* sp. is a ubiquitous group with general habitat requirements, commonly found in depositional substrate consisting of sand-silt in both lentic and lotic environments (Merritt and Cummins 1996). Trichoptera were also collected in small numbers and were comprised solely of Leptoceridae. The ratio of EPT:C was 0.26 in the nearshore indicating Chironomidae were dominant in abundance over EPT. The ratio of EPT:C was 0.93 in the offshore polygon indicating a fairly balanced community with respect the numbers of EPT and Chironomidae (4.5-3).

Taxonomic richness in the nearshore was 19 families, with richness values ranging from seven to 14 within each sample (Table 4.5-3). Hill's Effective Richness (E^H) was three, with Corixidae notably dominating the BMI community (Table 4.5-3). Taxonomic richness in the offshore polygon was 12 families, with richness values ranging from four to 10 within each sample (Table 4.5-3). Hill's Effective Richness (E^H) was five in the offshore; Haustoriidae, Chironomidae, Ephemeridae, and Pisidiidae were the most dominant families in this habitat (Table 4.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.38 and 0.72 in the nearshore and offshore polygons, respectively (Table 4.5-3). Evenness (Simpson's Equitability [E_D]) was 0.12 in the nearshore polygon and 0.45 in the offshore polygon (Table 4.5-3).

4.5.2.2 Southern Indian Lake-Area 6

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Southern Indian Lake-Area 6 was 100 individuals, with numbers ranging from 37 to 211 (Table 4.5-4). Overall, insects dominated the BMI community in abundance (65% of the mean total BMI), with non-insects comprising 35% of the overall taxa. Insects mainly consisted of Corixidae (57% of the mean total BMI), and small numbers of Ephemeroptera (4%), Trichoptera (3%), Chironomidae (1%) and Coleoptera. Of the non-insects, the main groups were Gastropoda (16%), Amphipoda (13%), and Oligochaeta (6%). The mean BMI density in the offshore habitat was 643 individuals/m^2, with densities ranging from 274 to 1,414 (Table 4.5-4). Overall, non-insects dominated the BMI community (66% of the mean total BMI), with insects comprising 34% of the overall taxa. Of the non-insects, the main group was Amphipoda (54% of the mean total BMI) followed by Bivalvia (5%), Gastropoda (3%), and small number of Acari and Oligochaeta. Insects mainly consisted of Chironomidae (23%), Ephemeroptera (9%), and a small number of Ceratopogonidae.

Total EPT comprised 6% and 9% of the mean total BMI sampled in the nearshore and offshore polygons, respectively. Genus analysis of the Ephemeroptera indicated the dominance of *Procloeon* sp. within the mayflies; unidentified Baetidae were also found. Trichoptera were collected in small numbers in nearshore habitat and consisted of Lepidostomatidae and Limnephilidae. In the offshore habitat, prevalence was solely with the mayflies (Table 4.5-4). Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was singly dominant. The ratio of EPT:C in the nearshore was 8.73 indicating that EPT were much more prevalent than Chironomidae in this habitat. The offshore EPT:C ratio was 0.73 indicating Chironomidae dominated in abundance over EPT (Table 4.5-4).

Taxonomic richness in the nearshore was 20, with richness values ranging from 10 to 16 within each sample (Table 4.5-4). Hill's Effective Richness (E^H) was four; Corixidae notably dominated the BMI community in this habitat (Table 4.5-4). Taxonomic richness in the offshore polygon was eight families, with richness values ranging from five to seven within each sample (Table 4.5-4). Hill's Effective Richness (E^H) was four; Haustoriidae, Chironomidae, Ephemeridae, and Pisidiidae comprised the majority of the BMI sampled in this habitat.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.59 and 0.67 in the nearshore and offshore polygons, respectively (Table 4.5-4). Evenness (Simpson's Equitability [E_D]) was 0.19 in the nearshore polygon and 0.46 in the offshore polygon (Table 4.5-4).

4.5.2.3 Southern Indian Lake-Area 4

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Southern Indian Lake-Area 4 was 110 individuals, with numbers ranging from 26 to 196 (Table 4.5-5). Overall, insects dominated the BMI community in abundance (77% of the mean total BMI), with non-insects comprising 23% of the overall taxa. Of the insects, the main group was Chironomidae (61% of the mean total BMI); Ceratopogonidae, Caenidae, Sialidae, Limnephilidae, and Tabanidae were present in smaller numbers (Table 4.5-5). The total mean BMI density collected in the offshore habitat was 785 individuals/m^2, with densities ranging from 505 to 1,111 (Table 4.5-5). Overall, insects and non-insects were similarly represented, with insects slightly dominating the BMI community (56% of the total mean BMI), and non-insects comprising 44% of the overall taxa. Of the insects, the main group was Chironomidae (54% of the mean total BMI), with a small number of Diptera (true flies). Of the non-insects, the main groups were Amphipoda (27%), Oligochaeta (8%), and Bivalvia (5%); Ostracoda, Gastropoda, and Acari were also present in smaller abundances (Table 4.5-5).

Total EPT comprised 4% of the mean BMI sampled in the nearshore polygon, with the prevalence being within the mayflies (4.5-5). Genus analysis of the Ephemeroptera indicated that *Caenis* sp. was singly dominant. Trichoptera were identified as Limnephilidae. The ratio of EPT:C was 0.15 in the nearshore, indicating Chironomidae dominated EPT in abundance in this habitat. Ephemeroptera, Plecoptera, nor Trichoptera were present in the offshore samples (Table 4.5-5).

Taxonomic richness in the nearshore polygon was 28 families, with richness values ranging from 12 to 17 within each sample (4.5-5). Taxonomic richness in the offshore habitat was seven families, with richness values ranging from four to six within each sample (Table 4.5-5). Hill's Effective Richness (E^H) was six and four in the nearshore and offshore habitats, respectively.

The nearshore was mainly dominated by Chironomidae and Oligochaeta; the offshore was mainly dominated by Chironomidae, Haustoriidae, and Oligochaeta (Table 4.5-5).

Mean diversity (Simpson's Diversity Index [D]) was 0.69 and 0.66 in the nearshore and offshore polygons, respectively (Table 4.5-5). Evenness (Simpson's Equitability [E_D]) was 0.23 in the nearshore polygon and 0.45 in the offshore polygon (Table 4.5-5).

4.6 FISH COMMUNITY

4.6.1 Gill Netting

In 2010, in the Upper Churchill River Region, gill netting was conducted in Granville Lake (22 – 25 July and 3 – 5 September), in Area 6 of Southern Indian Lake (6 – 10 August), and in Area 4 of Southern Indian Lake (19 – 23 September) (figures 4.6-1 to 4.6-3, respectively).

In Granville Lake, twelve sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Table 4.6-1; Figure 4.6-1). Water temperature during the sampling period ranged from 19.6 – 21.7°C in July and from 14.6 – 15.8°C in September.

In Area 6 of Southern Indian Lake, twelve sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Table 4.6-1; Figure 4.6-2). Water temperature ranged from 18.1 – 18.6°C during the sampling period. In Area 4 of Southern Indian Lake, 21 sites were sampled with standard gang index gill nets and five sites were sampled with small mesh index gill nets (Table 4.6-1; Figure 4.6-3). Water temperature ranged from 5.0 – 9.9°C during the sampling period.

4.6.2 Species Composition

In 2010, 15 species of fish were captured in the Upper Churchill River Region (Table 4.6-2).

4.6.2.1 Granville Lake

A total of 934 fish representing ten species were captured in standard gang index gill nets (Table 4.6-3) and a total of 290 fish representing twelve species were captured in small mesh index gill nets (Table 4.6-4). White Sucker represented 60.71% (n = 567 fish) of the standard gang index gillnet catch. In small mesh index gill nets, Cisco was the most common species captured (n = 91 fish; 31.38%) followed by Spottail Shiner (n = 63 fish; 21.72%) and Yellow Perch (n = 61 fish; 21.03%) (Table 4.6-4; Figure 4.6-4).

White Sucker represented 69.10% of the biomass in the standard gang index gillnet catch (Table 4.6-5). In the small mesh index gillnet catch, Sauger represented 26.24% of the overall biomass, followed by Northern Pike (20.60%) and Walleye (18.83%) (Table 4.6-6).

4.6.2.2 Southern Indian Lake (Area 6)

A total of 423 fish representing nine species were captured in standard gang index gill nets and 179 fish representing eight species were captured in small mesh index gill nets (Tables 4.6-3 and 4.6-4, respectively).

The most common species captured in standard gang index gill nets were Sauger (n = 154 fish; 36.41%) and Cisco (n = 132 fish; 31.21%) (Table 4.6-3; Figure 4.6-5). In the small mesh index gillnet catch, Sauger were most abundant (n = 86 fish; 48.04%) followed by Cisco (n = 40 fish; 22.35%) and Troutperch (n = 36 fish; 20.11%) (Table 4.6-4; Figure 4.6-5).

In terms of biomass, Cisco represented 22.81% of the standard gang index gillnet catch, followed by White Sucker (20.07%) and Longnose Sucker (17.55%) (Table 4.6-5). In the small mesh index gillnet catch, Sauger represented 61.45% of the biomass followed by Northern Pike (14.53%) and Cisco (11.61%) (Table 4.6-6).

4.6.2.3 Southern Indian Lake (Area 4)

A total of 766 fish representing eight species were captured in standard gang index gill nets and 42 fish representing seven species were captured in small mesh index gill nets (Tables 4.6-3 and 4.6-4, respectively).

The most common species captured in standard gang index gill nets were Longnose Sucker (n = 267 fish; 34.86%), Lake Whitefish (n = 174 fish; 22.72%), and Cisco (n = 161 fish; 21.02%) (Table 4.6-3; Figure 4.6-6). In the small mesh index gillnet catch, Cisco were most abundant (n = 28 fish; 66.67%) followed by Spottail Shiner (n = 6 fish; 14.29%) (Table 4.6-4; Figure 4.6-6).

In terms of biomass, Longnose Sucker represented 46.43% of the standard gang index gillnet catch, followed by Lake Whitefish (16.42%), Northern Pike (14.76%), and Burbot (12.97%) (Table 4.6-5). In the small mesh index gillnet catch, Cisco represented 71.86% of the biomass followed by Walleye (13.97%) and Burbot (9.25%) (Table 4.6-6).

4.6.3 Catch Per Unit Effort (CPUE) and Biomass Per Unit Effort (BPUE)

4.6.3.1 Granville Lake

In 2010, the mean CPUE for the standard gang index gillnet catch in Granville Lake was 76.6 fish/100 m of net/24 h (Table 4.6-7; Figure 4.6-7). White Sucker had the highest CPUE (46.4) followed by Walleye (11.9) (Figure 4.6-8).

Mean CPUE for the small mesh index gillnet catch was 108.3 fish /30 m of net/24 h (Table 4.6-8; Figure 4.6-7). Cisco had the highest CPUE (32.2) followed by Spottail Shiner (25.3) and Yellow Perch (22.0) (Figure 4.6-8).

Mean BPUE for the standard gang index gillnet catch was 63,815 g/100 m of net/24 h (Table 4.6-9). White Sucker had the highest BPUE (44,099). Small mesh index gill nets produced a mean BPUE of 4,270 g/30 m of net/24 h (Table 4.6-10) with Sauger (1,082) having the highest value.

4.6.3.2 Southern Indian Lake (Area 6)

Standard gang index gill nets set in Area 6 of Southern Indian Lake in 2010 had a mean CPUE of 35.6 (Table 4.6-7; Figure 4.6-7). Sauger had the highest CPUE (12.8) followed by Cisco (11.4) (Table 4.6-7; Figure 4.6-8).

The overall mean CPUE for small mesh index gill nets was 52.7 (Table 4.6-8; Figure 4.6-7). Sauger had the highest CPUE of 10.5 followed by Cisco (11.5) and Troutperch (10.6) (Figure 4.6-8).

Mean BPUE for the standard gang index gillnet catch was 16,834 g (Table 4.6-9). Cisco had the highest BPUE (3,962) followed by White Sucker (3,286) and Longnose Sucker (2,889). Small mesh index gill nets produced a mean BPUE of 4,717 g with Sauger (2,903), Northern Pike (703) and Cisco (544) having the highest mean BPUE values (Table 4.6-10).

4.6.3.3 Southern Indian Lake (Area 4)

Standard gang index gill nets set in Area 4 of Southern Indian Lake in 2010 had a mean CPUE of 35.1 (Table 4.6-7; Figure 4.6-7). Longnose Sucker had the highest CPUE (12.3) followed by Lake Whitefish (7.9) and Cisco (7.3) (Table 4.6-7; Figure 4.6-8).

The overall mean CPUE for small mesh index gill nets was 9.1 (Table 4.6-8; Figure 4.6-7). Cisco had the highest mean CPUE of 6.1.

Mean BPUE for the standard gang index gillnet catch was 22,418 g (Table 4.6-9). Longnose Sucker had the highest mean BPUE (10,373) followed by Lake Whitefish (3,641) and Northern Pike (3,452). Small mesh index gill nets produced a mean BPUE of 1,100 g (Table 4.6-10) with Cisco (794) having the highest mean BPUE value.

4.6.4 Size and Condition

Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies in 2010 were measured for fork length (mm) and weight (g) (Table 4.6-11). Condition factors were calculated for each species based on these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, and Walleye are illustrated in figure 4.6-9, 4.6-10, and 4.6-11, respectively.

Limited data exists for fish captured in small mesh index gill nets (Table 4.6-12).

4.6.4.1 Granville Lake

Northern Pike captured in standard gang index gill nets set in Granville Lake in 2010 had a mean fork length of 607 mm, a mean weight of 1,686 g, and a mean condition factor of 0.68 (Table 4.6-11). Only two Northern Pike were captured in small mesh index gill nets (Table 4.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 319 mm, a mean weight of 581 g, and a mean condition factor of 1.40 (Table 4.6-11). Lake Whitefish were not captured in small mesh index gill nets (Table 4.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 358 mm, a mean weight of 571 g, and a mean condition factor of 1.10 (Table 4.6-11). Seven Walleye captured in small mesh index gill nets were bulk weighed (Table 4.6-12).

4.6.4.2 Southern Indian Lake (Area 6)

Northern Pike captured in Southern Indian Lake (Area 6) in 2010 had a mean fork length of 516 mm, a mean weight of 973 g, and a mean condition factor of 0.65 (Table 4.6-11). Only two Northern Pike were captured in small mesh index gill nets (Table 4.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 322 mm, a mean weight of 571 g, and a mean condition factor of 1.55 (Table 4.6-11). Only one Lake Whitefish was captured in a small mesh index gill net (Table 4.6-12).

Five Walleye were captured in Area 6 of Southern Indian Lake in 2010. These fish had a mean fork length of 326 mm, a mean weight of 484 g, and a mean condition factor of 1.05 (Table 4.6-11). Only two Walleye were captured in small mesh index gill nets (Table 4.6-12).

4.6.4.3 Southern Indian Lake (Area 4)

Northern Pike captured in Southern Indian Lake (Area 4) in 2010 had a mean fork length of 560 mm, a mean weight of 1,326 g, and a mean condition factor of 0.71 (Table 4.6-11). Northern Pike were not captured in small mesh index gill nets (Table 4.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 322 mm, a mean weight of 460 g, and a mean condition factor of 1.25 (Table 4.6-11). No Lake Whitefish were captured in small mesh index gill nets (Table 4.6-12).

A total of twelve Walleye were captured in standard gang index gill nets. These fish had a mean fork length of 343 mm, a mean weight of 549 g, and a mean condition factor of 1.20 (Table 4.6-11). Only one Walleye was captured in a small mesh index gill net (Table 4.6-12).

4.6.5 Age Composition

Age frequency distributions were calculated for Northern Pike (Table 4.6-13), Lake Whitefish (Table 4.6-14), and Walleye (Table 4.6-15) captured in standard gang index gill nets set in Upper Churchill River Region waterbodies during 2010.

Mean fork length (mm), weight (g) and condition factor are also presented, by cohort, for Northern Pike (Table 4.6-16), Lake Whitefish (Table 4.6-17) and Walleye (Table 4.6-18).

4.6.5.1 Granville Lake

Ages were determined for 44 Northern Pike captured in Granville Lake in 2010 (Table 4.6-13). Northern Pike ranged in age from 3 – 10 years, with fish aged 13 years and 8 years most abundant in the sample.

A total of 49 Lake Whitefish captured in standard gang index gill nets were aged. Sampled Lake Whitefish ranged in age from 2 – 10 years as well as one 12-year old and one 18-year old fish (Table 4.6-14).

Ages were determined for 149 Walleye captured in standard gang index gill nets. Walleye ranged in age from 3 – 14 years, with the majority ranging from 4 – 9 years of age. However fish aged 6 years and 13 years were absent from the sample (Table 4.6-15).

4.6.5.2 Southern Indian Lake (Area 6)

Ages were determined for a total of 26 Northern Pike captured in Area 6 of Southern Indian Lake in 2010 (Table 4.6-13). Sampled Northern Pike ranged in age from 2 – 13 years, however 11-year old fish were absent from the sample.

A total of 27 Lake Whitefish were aged (Table 4.6-14). Lake Whitefish ranged from 2 – 9 years of age, with 4-year old fish most abundant in the sample. Eight-year old fish were absent from the sample.

Only five Walleye were captured in Area 6 of Southern Indian Lake in 2010, of which all fish were aged. Three of the five fish were determined to be four years of age (Table 4.6-15).

4.6.5.3 Southern Indian Lake (Area 4)

A total of 55 Northern Pike captured in Area 4 of Southern Indian Lake in 2010 were aged (Table 4.6-13). Northern Pike aged 3 – 14 years were represented in the sample, with no dominant age class being evident.

A total of 174 Lake Whitefish captured in standard gang index gill nets were aged. Lake Whitefish ranged from 4 – 19 years of age, with the exception of 18-year old fish which were absent from the sample. Approximately 40% of aged Lake Whitefish were determined to be 11 years of age (Table 4.6-14).

Twelve Walleye captured in Area 4 of Southern Indian Lake in 2010 were aged (Table 4.6-15). Walleye ranged in age from 4 – 8 years.

4.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies in 2010 were examined externally for DELTs (Table 4.6-19).

4.6.6.1 Granville Lake

A total of 567 White Sucker, 44 Northern Pike, 54 Sauger, and 151 Walleye captured in standard gang index gill nets were examined externally for DELTs. DELTs were documented on two White Suckers and one Walleye.

4.6.6.2 Southern Indian Lake (Area 6)

A total of 42 White Sucker, 26 Northern Pike, 28 Lake Whitefish, 154 Sauger, and five Walleye captured in standard gang index gill nets were examined externally for DELTs. Only one White Sucker was determined to have a DELT.

4.6.6.3 Southern Indian Lake (Area 4)

Seven White Sucker, 55 Northern Pike, 174 Lake Whitefish, two Sauger, and 12 Walleye captured in standard gang index gill nets were examined externally for DELTs. Among these fish, only one Lake Whitefish and one Walleye were determined to have a DELT.

4.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Upper Churchill River Region. Waterbodies sampled included Area 4 (20-22 September) and Area 6 (7-10 August) of Southern Indian Lake (SIL), and an off-system waterbody, Granville Lake (23-26 July and 4-5 September). All fish for mercury analysis were captured in standard nets: at 9 out of 21 set sites in Area 4 of SIL (Figure 4.7-1), and at all 12 set sites in both Area 6 of SIL (Figure 4.7-2) and Granville Lake (Figure 4.7-3).

4.7.1 Species Comparisons

A total of 257 fish were analyzed for mercury. No 1-year old Yellow Perch were caught from any of the three locations (Table 4.7-1). The targeted sample size of 36 fish was not obtained for the three large-bodied species from SIL-Area 6, particularly for Walleye, nor for Walleye from SIL-Area 4.

Except for Walleye from SIL-Area 4, a significant positive relationship between mercury concentration and fish length existed for the three species captured from all four locations (Figure 4.7-4), indicating that standardization of concentrations is necessary for comparative purposes. Standardized mercury concentrations were within 15% of arithmetic concentrations (Table 4.7-1), partially reflecting the fact that the mean lengths of fish analyzed for mercury were within 86% and 107% of the standard length of each species (Table 4.7-2).

Mean arithmetic mercury concentrations of Northern Pike and Walleye from Granville Lake and SIL-Area 6 were similar, whereas concentrations of the two piscivorous species differed significantly in SIL-Area 4 (Table 4.7-1). In all three sampling locations, concentrations of the two predatory species were significantly higher than those of Lake Whitefish. However, whereas the difference between means ranged from 5.5 to almost 20 times in Northern Pike from all locations and in Walleye from SIL-Area 6 and Granville Lake, mercury levels in Walleye from SIL-Area 4 were only three times higher, than in Lake Whitefish. This supports the hypothesis that the small number of Walleye from SIL-Area 4 analyzed for mercury resulted in a sample that does not adequately reflect the average mercury concentration in the population and also contributed to the non-significant relationship between fish length and mercury concentration for that location (Table 4.7-1)

4.7.2 Comparison to Consumption Guidelines

With a range of 0.44 to 0.52 ppm (Table 4.7-1), standard concentrations of Northern Pike and Walleye from Granville Lake and SIL-Area 6 were close to the Health Canada 0.5 ppm standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). In contrast, the arithmetic mean for Walleye from SIL-Area 4 just exceeded the 0.2 ppm guideline for human consumption (see section 4.8.2.3; Table 4.7-1). Standardized mean concentrations of Lake Whitefish from all three locations were several times lower than the 0.2 ppm guideline (Figure 4.7-5).

Based on individual concentrations, approximately 90% of all Northern Pike and Walleye from the Lower Churchill River Region exceeded the 0.2 ppm guideline, but none of the Lake Whitefish did (Figure 4.7-4). Approximately 39% of the Pike and 16% of the Walleye had mercury levels that were also higher than the 0.5 ppm Health Canada standard (Figure 4.7-4). In addition to these exceedances of guidelines and standard relating to human health, total mercury concentrations of most fish were substantially higher than the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999 updated to 2013; MWS 2011); exceptions were 31 Lake Whitefish mainly from SIL-Area 6.

SECTION 4: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 4.3-1. Summary statistics for *in situ* variables (near surface) measured in the Upper Churchill River Region: 2010/2011.

	Temperature (°C)			*In situ* pH			DO (mg/L)			DO (% Saturation)			*In situ* Specific Conductance (µS/cm)			*In situ* Turbidity (NTU)		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	11.68	10.83	9.30	8.10	7.86	8.12	11.25	11.14	11.66	104	101	103	86	93	103	6.83	26.6	18.8
Median	14.59	13.70	11.44	7.87	8.02	8.14	10.03	10.03	10.95	101	101	104	86	87	104	7.65	25.1	20.9
Minimum	-0.04	0.02	-0.09	7.49	6.89	6.98	9.23	9.80	9.91	97	95	96	68	81	98	1.90	6.80	9.10
Maximum	17.57	15.88	14.41	9.17	8.52	9.21	15.72	14.68	14.82	117	109	110	105	117	107	10.1	49.3	24.1
SD	7.04	6.46	5.56	0.64	0.60	0.79	2.60	2.05	1.94	8	5	6	13	14	4	3.41	15.2	5.75
SE	4.06	3.73	3.21	0.37	0.35	0.46	1.50	1.18	1.12	5	3	3	8	8	2	1.97	8.75	3.32
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-1. - continued -

	ORP (mV)			Secchi Disk Depth- Open-Water Season (m)			Calculated Euphotic Depth (m)			Estimated Euphotic Depth (m)		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	189	169	209	1.53	0.58	0.75	3.07	1.16	1.50	3.05	1.11	1.53
Median	201	166	210	1.61	0.57	0.71	3.22	1.14	1.41	3.22	1.10	1.50
Minimum	129	117	134	1.22	0.47	0.70	2.44	0.93	1.40	2.44	0.80	1.40
Maximum	225	227	280	1.77	0.71	0.84	3.54	1.42	1.68	3.50	1.42	1.68
SD	36	45	52	0.28	0.12	0.08	0.46	0.20	0.13	0.45	0.25	0.12
SE	21	26	30	0.16	0.07	0.05	0.33	0.14	0.09	0.32	0.18	0.08
N	4	4	4	3	3	3	3	3	3	3	3	3

Table 4.3-2. Summary statistics for routine laboratory variables measured in the Upper Churchill River Region: 2010/2011.

	Total Alkalinity ($CaCO_3$ mg/L)			Bicarbonate Alkalinity (HCO_3 mg/L)			Carbonate Alkalinity (CO_3 mg/L)			Ammonia (mg N/L)			Nitrate/Nitrite (mg N/L)			TKN (mg/L)			DIN (mg/L) [1]			Organic Nitrogen (mg/L) [1]			TN (mg/L) [1]		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	39.4	43.2	54.1	48.1	52.6	65.9	<0.60	<0.60	<0.60	0.067	<0.050	0.057	<0.050	<0.050	<0.050	0.38	0.32	0.31	0.084	<0.050	0.083	0.31	0.31	0.25	0.40	0.34	0.33
Median	39.4	40.6	52.3	48.1	49.5	63.7	<0.60	<0.60	<0.60	0.013	<0.050	0.043	<0.050	<0.050	<0.050	0.38	0.31	0.30	0.035	<0.050	0.072	0.37	0.30	0.26	0.40	0.33	0.32
Minimum	31.6	38.5	50.3	38.6	46.9	61.3	<0.60	<0.60	<0.60	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.050	0.34	0.31	0.24	<0.010	<0.050	0.025	0.10	0.29	0.10	0.37	0.31	0.27
Maximum	47.3	53.1	61.5	57.7	64.7	75.0	<0.60	<0.60	<0.60	0.236	<0.050	0.137	<0.050	<0.050	<0.050	0.41	0.36	0.38	0.261	<0.050	0.162	0.41	0.36	0.38	0.41	0.39	0.43
SD	5.6	5.9	4.4	6.8	7.2	5.3	-	-	-	0.098	0.008	0.056	0.017	0.0111	0.012	0.03	0.02	0.05	0.103	0.007	0.052	0.12	0.03	0.10	0.02	0.03	0.06
SE	3.2	3.4	2.5	3.9	4.1	3.1	-	-	-	0.057	0.005	0.032	0.0097	0.0064	0.0067	0.02	0.01	0.03	0.060	0.004	0.030	0.07	0.02	0.06	0.01	0.02	0.03
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-2. - continued -

	TDP (mg/L)			TPP (mg/L)			TP (mg/L)			TN:TP [1]			DIN:DP [1]			DIN:TP [1]			DOC (mg/L)			TOC (mg/L)			TIC (mg/L)		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	0.0104	0.0128	0.0138	0.010	0.011	<0.010	0.0196	0.0241	0.0223	55	37	34	41	5	17	18	3	8	7.7	7.2	7.6	7.7	7.4	7.8	8.9	9.9	11.7
Median	0.0119	0.0140	0.0152	<0.010	0.011	<0.010	0.0191	0.0247	0.0227	52	36	29	6	5	10	5	3	7	7.4	7.2	7.5	7.6	7.2	7.8	8.8	9.5	11.8
Minimum	0.0038	0.0064	0.0081	<0.010	<0.010	<0.010	0.0094	0.0132	0.0190	30	20	26	1	3	3	0	1	2	6.7	6.5	7.0	6.8	6.5	7.0	6.5	8.2	9.5
Maximum	0.0141	0.0167	0.0167	0.019	0.018	0.013	0.0306	0.0340	0.0247	86	56	49	152	9	44	61	5	17	9.2	8.2	8.5	8.9	8.7	8.6	11.6	12.7	13.8
SD	0.0039	0.0040	0.0034	0.006	0.006	0.0031	0.0087	0.0089	0.0025	24	16	9	64	2	16	25	1	6	0.9	0.6	0.6	0.8	0.8	0.6	1.9	1.8	1.7
SE	0.0023	0.0023	0.0019	0.003	0.003	0.0016	0.0050	0.0051	0.0014	14	9	5	37	1	9	15	1	3	0.5	0.4	0.4	0.4	0.5	0.3	1.1	1.0	1.0
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-2. - continued -

	TOC:ON [1]			TOC:TN [1]			TDS (mg/L)			Laboratory Conductivity (µmhos/cm)			TSS (mg/L)			Laboratory Turbidity (NTU)			True Colour (TCU)			Laboratory pH		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	37	28	48	23	25	28	46.4	56.0	69.5	86.8	93.2	113	5.0	5.5	4.4	3.31	12.0	8.95	13.7	13.0	17.4	7.84	7.92	8.09
Median	25	28	35	22	25	28	49.0	58.0	73.0	86.9	87.7	109	4.8	6.2	4.8	3.54	10.7	9.36	14.5	12.7	13.7	7.88	7.95	8.08
Minimum	24	26	23	21	24	21	28.0	46.0	46.0	70.4	83.3	105	4.0	<2.0	<2.0	1.85	4.99	6.30	10.9	11.5	12.1	7.61	7.81	8.05
Maximum	76	29	97	25	26	38	59.5	62.0	86.0	103	114	128	6.4	8.4	6.8	4.32	21.5	10.8	15.0	15.0	30.0	7.98	7.98	8.15
SD	22	1	29	2	1	6	11.5	6.6	15.9	11.6	12.5	9.1	0.9	2.8	2.1	0.91	6.00	1.83	1.7	1.4	7.4	0.14	0.07	0.04
SE	13	1	17	1	0	4	6.6	3.8	9.2	6.7	7.2	5.3	0.5	1.6	1.2	0.52	3.46	1.06	1.0	0.8	4.3	0.08	0.04	0.02
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-2. - continued -

	E. coli (CFU/100 mL)			Chlorophyll *a* (µg/L)			Hardness as $CaCO_3$ (mg/L)			Chloride (mg/L)			Sulphate (mg/L)		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	<1	<1	<1	3.37	1.31	2.68	39.1	43.7	56.1	1.01	0.92	0.78	2.76	2.66	2.76
Median	<1	<1	<1	3.35	0.99	2.54	39.6	41.9	54.5	1.00	0.85	0.75	2.37	2.22	2.00
Minimum	<1	<1	<1	0.95	<0.60	0.99	31.7	37.4	51.5	0.87	0.75	0.73	2.09	2.11	1.95
Maximum	<1	1	<1	5.83	2.98	4.65	45.4	53.4	63.8	1.17	1.22	0.89	4.20	4.10	5.10
SD	-	0	-	2.03	1.05	1.63	5.1	6.1	4.8	0.11	0.19	0.07	0.84	0.83	1.35
SE	-	0	-	1.17	0.60	0.94	3.0	3.5	2.8	0.06	0.11	0.04	0.49	0.48	0.78
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

[1] Calculated.

Table 4.3-3. Summary statistics for metals and major ions measured in the Upper Churchill River Region: 2010/2011. Values are presented as mg/L.

	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			Boron		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	0.169	0.643	0.408	<0.00020	<0.00020	<0.00020	0.00029	0.00030	0.00029	0.0140	0.0165	0.0130	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010
Median	0.174	0.583	0.489	<0.00020	<0.00020	<0.00020	0.00033	0.00034	0.00033	0.0136	0.0167	0.0131	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010
Minimum	0.049	0.165	0.146	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0128	0.0139	0.0122	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010
Maximum	0.279	1.24	0.508	<0.00020	<0.00020	<0.00020	0.00039	0.00041	0.00038	0.0158	0.0189	0.0138	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.013	0.012	<0.010
SD	0.087	0.409	0.152	-	-	-	0.00011	0.00012	0.00011	0.0011	0.0019	0.0006	-	-	-	-	-	-	0.004	0.003	-
SE	0.050	0.236	0.088	-	-	-	0.00007	0.00007	0.00006	0.0006	0.0011	0.0003	-	-	-	-	-	-	0.002	0.002	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-3. - continued -

	Cadmium			Calcium			Cesium			Chromium			Cobalt			Copper			Iron		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	<0.000010	<0.000010	0.000014	9.73	11.2	15.2	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	0.00020	<0.00020	0.00082	0.00122	0.00161	0.142	0.527	0.245
Median	<0.000010	<0.000010	<0.000010	9.73	11.0	14.8	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.00080	0.00120	0.00116	0.144	0.453	0.240
Minimum	<0.000010	<0.000010	<0.000010	8.17	9.43	14.1	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.00065	0.00088	0.00102	0.055	0.246	0.180
Maximum	<0.000010	<0.000010	0.000041	11.3	13.3	17.1	<0.00010	0.00012	<0.00010	<0.0010	0.0017	<0.0010	<0.00020	0.00036	<0.00020	0.00101	0.00159	0.00312	0.226	0.955	0.320
SD	-	-	0.000016	1.16	1.44	1.2	-	0.00003	-	-	0.0005	-	-	0.00011	-	0.00013	0.00026	0.00087	0.061	0.280	0.064
SE	-	-	0.000009	0.67	0.83	0.7	-	0.00002	-	-	0.0003	-	-	0.00006	-	0.00008	0.00015	0.00050	0.035	0.162	0.037
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-3. - continued -

	Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel			Potassium		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	0.000105	0.000263	0.000208	0.0032	0.0032	0.0023	3.58	3.84	4.40	0.0131	0.00970	0.00451	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	1.21	1.30	1.22
Median	<0.000090	0.000234	0.000191	0.0037	0.0035	0.0026	3.71	3.58	4.28	0.0133	0.00961	0.00485	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	1.24	1.29	1.22
Minimum	<0.000090	0.000145	0.000149	<0.0020	<0.0020	<0.0020	2.74	3.31	3.96	0.00694	0.00546	0.00256	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	1.04	1.12	1.12
Maximum	0.000214	0.000439	0.000302	0.0042	0.0048	0.0031	4.17	4.89	5.10	0.0190	0.0141	0.00578	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	1.34	1.48	1.31
SD	0.000069	0.000119	0.000057	0.0013	0.0014	0.0008	0.55	0.63	0.44	0.00459	0.00349	0.00135	-	-	-	-	-	-	-	-	-	0.11	0.15	0.07
SE	0.000040	0.000069	0.000033	0.0007	0.0008	0.0005	0.32	0.37	0.25	0.00265	0.00202	0.00078	-	-	-	-	-	-	-	-	-	0.06	0.09	0.04
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-3. - continued -

	Rubidium			Selenium			Silicon			Silver			Sodium			Strontium			Tellurium			Thallium		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	0.00181	0.00256	0.00160	<0.0010	<0.0010	<0.0010	2.30	2.80	2.85	<0.00010	<0.00010	<0.00010	2.67	2.89	2.62	0.0341	0.0332	0.0309	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Median	0.00194	0.00251	0.00164	<0.0010	<0.0010	<0.0010	2.24	2.84	2.99	<0.00010	<0.00010	<0.00010	3.20	2.60	2.59	0.0360	0.0314	0.0320	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Minimum	0.00118	0.00152	0.00112	<0.0010	<0.0010	<0.0010	1.81	1.57	2.26	<0.00010	<0.00010	<0.00010	0.736	2.46	2.46	0.0216	0.0235	0.0240	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
Maximum	0.00217	0.00371	0.00198	<0.0010	<0.0010	<0.0010	2.91	3.97	3.17	<0.00010	<0.00010	<0.00010	3.54	3.91	2.85	0.0427	0.0463	0.0354	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010
SD	0.00038	0.00079	0.00032	-	-	-	0.47	0.91	0.36	-	-	-	1.13	0.59	0.15	0.0077	0.0084	0.0042	-	-	-	-	-	-
SE	0.00022	0.00046	0.00019	-	-	-	0.27	0.53	0.21	-	-	-	0.653	0.34	0.09	0.0045	0.0048	0.0024	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-3. - continued -

	Thorium			Tin			Titanium			Tungsten			Uranium			Vanadium			Zinc			Zirconium		
	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4	GRAN	SIL-6	SIL-4
Mean	<0.00010	0.00026	0.00014	0.00040	0.00023	0.00041	0.0073	0.0252	0.0115	<0.0010	<0.0010	<0.0010	<0.00010	0.00013	0.00011	0.00042	0.00116	0.00072	<0.0050	<0.0050	<0.0050	<0.00040	0.00070	<0.00040
Median	<0.00010	0.00022	0.00013	<0.00020	<0.00020	<0.00020	0.0071	0.0213	0.0118	<0.0010	<0.0010	<0.0010	<0.00010	0.00014	0.00011	0.00046	0.00106	0.00078	<0.0050	<0.0050	<0.0050	<0.00040	0.00064	0.00043
Minimum	<0.00010	0.00014	0.00011	<0.00020	<0.00020	<0.00020	0.0026	0.0100	0.0076	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	0.00010	<0.00020	0.00048	0.00044	<0.0050	<0.0050	<0.0050	<0.00040	0.00052	<0.00040
Maximum	<0.00010	0.00045	0.00017	0.00129	0.00062	0.00134	0.0127	0.0480	0.0149	<0.0010	<0.0010	<0.0010	0.00012	0.00019	0.00012	0.00065	0.00204	0.00087	<0.0050	<0.0050	<0.0050	<0.00040	0.00102	0.00046
SD	-	0.00013	0.00003	0.00052	0.00023	0.00054	0.0037	0.0151	0.0034	-	-	-	0.00003	0.00005	0.00001	0.00021	0.00060	0.00017	-	-	-	-	0.00021	0.00010
SE	-	0.00007	0.00002	0.00030	0.00013	0.00031	0.0021	0.0087	0.0020	-	-	-	0.00002	0.00003	0.00000	0.00012	0.00035	0.00010	-	-	-	-	0.00012	0.00006
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-4. Frequency of detections of total metals measured in the Churchill River Diversion Region: 2010/2011.

Waterbody		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury
Granville Lake	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	# Detections	4	0	3	4	0	0	2	0	4	0	0	0	4	4	2	3	4	4	0
	% Detection	100	0	75	100	0	0	50	0	100	0	0	0	100	100	50	75	100	100	0
Southern Indian Lake-Area 6	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	# Detections	4	0	3	4	0	0	1	0	4	1	2	2	4	4	4	3	4	4	0
	% Detection	100	0	75	100	0	0	25	0	100	25	50	50	100	100	100	75	100	100	0
Southern Indian Lake-Area 4	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	# Detections	4	0	3	4	0	0	0	1	4	0	0	0	4	4	4	3	4	4	0
	% Detection	100	0	75	100	0	0	0	25	100	0	0	0	100	100	100	75	100	100	0
Gauer Lake	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	12	12	12
	# Detections	12	0	3	12	0	0	0	6	12	0	1	1	6	10	1	0	12	12	0
	% Detection	100	0	25	100	0	0	0	50	100	0	8	8	50	83	8	0	100	100	0

Table 4.3-4. - continued -

Waterbody		Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Granville Lake	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	# Detections	0	0	4	4	0	4	0	4	4	0	0	0	1	4	0	2	3	0	0
	% Detection	0	0	100	100	0	100	0	100	100	0	0	0	25	100	0	50	75	0	0
Southern Indian Lake-Area 6	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	# Detections	0	0	4	4	0	4	0	4	4	0	0	4	1	4	0	3	4	0	4
	% Detection	0	0	100	100	0	100	0	100	100	0	0	100	25	100	0	75	100	0	100
Southern Indian Lake-Area 4	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	# Detections	0	0	4	4	0	4	0	4	4	0	0	4	1	4	0	4	4	0	3
	% Detection	0	0	100	100	0	100	0	100	100	0	0	100	25	100	0	100	100	0	75
Gauer Lake	n	12	12	12	12	12	4	12	12	12	12	12	4	12	12	12	12	12	12	12
	# Detections	3	2	12	12	0	4	0	12	12	0	0	0	5	7	1	12	4	0	0
	% Detection	25	17	100	100	0	100	0	100	100	0	0	0	42	58	8	100	33	0	0

Table 4.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Upper Churchill River Region. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury[1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00012-0.00019	0.0336-0.0596	0.0035-0.0064	0.3	0.00074-0.00180	0.000026
Granville Lake	N	**4**	4	4	4	4	4	4	4	4
	# Exceedances	**3**	0	0	0	0	0	0	0	0
	% Exceedances	**75**	0	0	0	0	0	0	0	0
Southern Indian Lake-Area 6	N	**4**	4	4	4	4	4	**4**	4	4
	# Exceedances	**4**	0	0	0	0	0	**3**	0	0
	% Exceedances	**100**	0	0	0	0	0	**75**	0	0
Southern Indian Lake-Area 4	N	**4**	4	4	4	4	4	**4**	4	4
	# Exceedances	**4**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**25**	0	0
Gauer Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

Table 4.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.0197-0.0357	0.001	0.0001	0.0008	0.015	0.0453-0.0819	120	128-429
Granville Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Southern Indian Lake-Area 6	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Southern Indian Lake-Area 4	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Gauer Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

[1] Mercury was analysed at a detection limit of 0.0005 mg/L and results cannot be compared to the current Manitoba PAL guideline for mercury.

[2]Comparison to the long-term CCME PAL guideline.

[3]Comparison to the BCMOE guideline.

Table 4.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Upper Churchill River Region and CCME (1999; updated to 2013) trophic categorization: 2010/2011.

		Lake Trophic Status Based on Total Phosphorous (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100
Granville Lake	Open-water season				0.022		
	Annual			0.020			
Southern Indian Lake-Area 6	Open-water season				0.026		
	Annual				0.024		
Southern Indian Lake-Area 4	Open-water season				0.024		
	Annual				0.022		

Table 4.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in lakes of the Upper Churchill River Region and the OECD (1982) trophic categorization scheme for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	< 2.5	2.5 - 8	-	8 - 25	> 25
Granville Lake	Open-water season			4.2			
	Annual			3.4			
Southern Indian Lake-Area 6	Open-water season		1.7				
	Annual		1.3				
Southern Indian Lake-Area 4	Open-water season			3.2			
	Annual			2.7			

Table 4.3-8. Total nitrogen concentrations (open-water season and annual means) measured in the Upper Churchill River Region and comparison to a trophic categorization scheme for lakes (Nürnberg 1996): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Granville Lake	Open-water season			0.39			
	Annual			0.40			
Southern Indian Lake-Area 6	Open-water season		0.33				
	Annual		0.34				
Southern Indian Lake-Area 4	Open-water season		0.30				
	Annual		0.33				

Table 4.4-1. Community metrics for phytoplankton samples collected in the Upper Churchill River Region during the open-water season of 2010.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Heterogeneity (H)	Evenness (E_H)	Hill's Effective Richness ($e^{H`}$)	Evenness ($e^{H`}/S$)
South Indian Lake -Area 6	Spring	16	0.80	0.31	2.08	0.75	8.03	0.50
	Summer	13	0.60	0.19	1.29	0.50	3.65	0.28
	Fall	15	0.53	0.14	1.24	0.46	3.47	0.23

Table 4.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Upper Churchill River Region for the CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Disk Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Granville Lake (2010)	Nearshore	5	0.6	0.4	0.8	0.00	0.63	15.5	bedrock, boulder	coniferous	0-24	attached
	Offshore	5	9.1	8.8	9.3	0.02*	1.19	15.0	clay, organic matter	--	--	0
Southern Indian Lake-Area 6 (2010)	Nearshore	5	0.5	0.4	0.6	0.01	0.61	15.0	boulder, gravel	shrubs, mixed forest	0-24	attached
	Offshore	5	9.2	9.1	9.3	0.00	0.52	14.0	clay	--	--	0
Southern Indian Lake-Area 4 (2010)	Nearshore	5	1.0	0.8	1.2	0.02	1.23	17.0	boulder	mixed forest	0-24	periphyton, attached
	Offshore	5	8.9	8.6	9.2	0.17	1.43	16.0	silt, gravel	--	--	0

Table 4.5-2. Sediment analysis (particle size and total organic carbon) results from samples collected at offshore benthic invertebrate sites in the Upper Churchill River Region for the CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Granville L (2010)	Offshore	Mean	5	9.2	2.66	5.13	76.36	18.54	Silt Loam
		SD	--	0.22	0.475	6.297	3.038	4.408	--
		SE	--	0.11	0.213	2.816	1.359	1.971	--
		Median	--	9.3	2.86	1.73	76.60	18.70	--
		Min	--	8.9	1.81	0.35	73.00	11.60	--
		Max	--	9.4	2.91	15.40	81.00	22.90	--
SIL-Area 6 (2010)	Offshore	Mean	5	9.1	1.23	0.47	43.68	55.82	Silty Clay
		SD	--	0.05	0.530	0.470	8.132	7.796	--
		SE	--	0.02	0.237	0.210	3.637	3.486	--
		Median	--	9.1	1.02	0.34	43.30	56.40	--
		Min	--	9.1	0.94	0.12	32.90	44.10	--
		Max	--	9.2	2.17	1.30	55.60	65.80	--
SIL-Area 4 (2010)	Offshore	Mean	5	9.0	0.70	76.84	12.49	10.68	Sandy Loam
		SD	--	0.20	0.245	5.784	2.472	3.455	--
		SE	--	0.09	0.110	2.587	1.105	1.545	--
		Median	--	8.9	0.62	78.10	12.10	9.88	--
		Min	--	8.8	0.39	69.10	9.57	6.73	--
		Max	--	9.2	1.01	83.70	16.30	14.70	--

Table 4.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected in nearshore and offshore sites at Granville Lake in the Upper Churchill River Region for CAMPP, 2010.

	Granville Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	323	84.0	37.6	294	248	424
Oligochaeta	--	14	8.9	4.0	17	3	24
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	9	7.0	3.1	6	4	21
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.3	0.1	0	0	1
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.0	0.0	0	0	0
Gastropoda - unid	--	0	0.6	0.3	0	0	1
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.3	0.1	0	0	1
Lymnaeidae	--	2	1.4	0.6	2	0	4
Physidae	--	0	0.6	0.3	0	0	1
Planorbidae	--	8	7.0	3.2	5	2	17
Valvatidae	--	5	4.3	1.9	5	0	11
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	39	15.0	6.7	41	21	60
Non-Insecta (%)	12	--	--	--	--	--	--
Oligochaeta	--	14	8.9	4.0	17	3	24
Oligochaeta (%)	4	--	--	--	--	--	--
Amphipoda	--	9	7.0	3.1	6	4	21
Amphipoda (%)	3	--	--	--	--	--	--
Bivalvia	--	0	0.0	0.0	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	16	12.8	5.7	12	3	32
Gastropoda (%)	5	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 4.5-3. - continued -

	Granville Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.4	0.2	0	0	1
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.3	0.1	0	0	1
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	252	66.4	29.7	259	183	318
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	1	1.1	0.5	1	0	3
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.4	0.2	0	0	1
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	1	0.9	0.4	0	0	2
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.6	0.3	0	0	1
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 4.5-3. - continued -

	Granville Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.3	0.1	0	0	1
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	1	1.6	0.7	1	0	4
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.6	0.3	0	0	1
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	3	3.5	1.6	1	0	8
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	6	4.7	2.1	5	1	12
Orthocladiinae	--	17	12.4	5.5	13	5	34
Tanypodinae	--	2	1.3	0.6	2	0	3
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 4.5-3. - continued -

	Granville Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	284	81.4	36.4	273	205	372
Insecta (%)	88	--	--	--	--	--	--
Chironomidae	--	27	20.1	9.0	15	9	54
Chironomidae (%)	9	--	--	--	--	--	--
Ephemeroptera	--	2	2.4	1.1	1	0	5
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	2	1.6	0.7	1	0	4
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	4	2	1	4	0	6
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.26	0.199	0.089	0.39	0.00	0.43
Genus analysis of Ephemeroptera	Baetidae: *Procloeon*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta+/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	19	11	3.1	1.4	12	7	14
Simpson's Diversity Index (D)	--	0.38	0.093	0.041	0.43	0.23	0.45
Evenness (Simpson's Equitability E_D)	--	0.12	0.031	0.014	0.13	0.08	0.16
Shannon-Weaver Index (H)	--	0.96	0.203	0.091	0.99	0.66	1.18
Evenness (Shannon's Equitability E_H)	--	0.37	0.078	0.035	0.39	0.23	0.43
Hill's Effective Richness ($E^{H'}$)	--	3	0.514	0.230	2.69	1.94	3.24
Evenness ($E^{H'}$/S)	--	0.20	0.049	0.022	0.21	0.11	0.24

Table 4.5-3. - continued -

	Granville Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1766	659.5	294.9	1500	1197	2655
Oligochaeta	--	3	6.5	2.9	0	0	14
Hirudinea	--	6	7.9	3.5	0	0	14
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	592	394.7	176.5	592	188	1111
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	9	12.9	5.8	0	0	29
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	188	99.4	44.5	202	43	317
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	796	430.7	192.6	822	390	1457
Non-Insecta (%)	45	--	--	--	--	--	--
Oligochaeta	--	3	6.5	2.9	0	0	14
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	592	394.7	176.5	592	188	1111
Amphipoda (%)	33	--	--	--	--	--	--
Bivalvia	--	188	99.4	44.5	202	43	317
Bivalvia (%)	11	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	23	21.9	9.8	29	0	43
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 4.5-3. - continued -

	Granville Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	12	12.1	5.4	14	0	29
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	413	269.1	120.3	346	159	750
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 4.5-3. - continued -

	Granville Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	12	12.1	5.4	14	0	29
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	49	49.6	22.2	29	0	115
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	9	12.9	5.8	0	0	29
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	3	6.5	2.9	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	55	49.3	22.1	29	14	115
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	395	144.5	64.6	462	159	519
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	970	423.8	189.5	1068	332	1443
Insecta (%)	55	--	--	--	--	--	--
Chironomidae	--	453	161.5	72.2	491	173	563
Chironomidae (%)	26	--	--	--	--	--	--
Ephemeroptera	--	413	269.1	120.3	346	159	750

Table 4.5-3. - continued -

	Granville Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	23	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	12.1	5.4	14	0	29
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	424	277	124	346	159	765
EPT (%)	24	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.93	0.433	0.194	0.92	0.39	1.36
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	12	8	2.5	1.1	9	4	10
Simpson's Diversity Index (D)	--	0.72	0.132	0.059	0.77	0.49	0.82
Evenness (Simpson's Equitability E_D)	--	0.45	0.139	0.062	0.40	0.36	0.69
Shannon-Weaver Index (H)	--	1.55	0.360	0.161	1.70	0.96	1.82
Evenness (Shannon’s Equitability E_H)	--	0.71	0.106	0.047	0.71	0.60	0.88
Hill's Effective Richness ($E^{H'}$)	--	5	1.493	0.668	5.48	2.61	6.17
Evenness ($E^{H'}$/S)	--	0.55	0.129	0.058	0.51	0.44	0.77

Table 4.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Southern Indian Lake-Area 6 within the Upper Churchill River Region for CAMPP, 2010.

	Southern Indian Lake-Area 6						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	100	67.0	30.0	90	37	211
Oligochaeta	--	6	6.8	3.0	3	1	17
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.1	0.1	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	13	14.9	6.7	5	3	38
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.2	0.1	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.1	0.1	0	0	0
Gastropoda - unid	--	0	0.6	0.3	0	0	1
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	13	7.1	3.2	12	5	21
Physidae	--	1	0.7	0.3	1	0	2
Planorbidae	--	2	1.6	0.7	1	0	3
Valvatidae	--	0	0.1	0.1	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	35	23.3	10.4	31	12	60
Non-Insecta (%)	35	--	--	--	--	--	--
Oligochaeta	--	6	6.8	3.0	3	1	17
Oligochaeta (%)	6	--	--	--	--	--	--
Amphipoda	--	13	14.9	6.7	5	3	38
Amphipoda (%)	13	--	--	--	--	--	--
Bivalvia	--	0	0.1	0.1	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	16	9.5	4.3	14	6	27
Gastropoda (%)	16	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.3	0.1	0	0	1
Dytiscidae (adult)	--	1	1.4	0.6	1	0	3
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	57	49.5	22.2	44	15	139
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.3	0.1	0	0	1
Baetidae	--	1	1.0	0.5	1	0	3
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	2	1.8	0.8	2	0	4
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.3	0.1	0	0	1
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.3	0.1	0	0	1
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.1	0.1	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	1	1.1	0.5	0	0	3
Leptoceridae (larva)	--	0	0.1	0.1	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	2	1.9	0.9	1	0	5
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.2	0.1	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.3	0.1	0	0	1
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	0	0.2	0.1	0	0	0
Orthocladiinae	--	1	1.4	0.6	1	0	3
Tanypodinae	--	0	0.0	0.0	0	0	0
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	65	51.0	22.8	47	25	151
Insecta (%)	65	--	--	--	--	--	--
Chironomidae	--	1	1.6	0.7	1	0	4
Chironomidae (%)	1	--	--	--	--	--	--
Ephemeroptera	--	4	3.1	1.4	3	1	7
Ephemeroptera (%)	4	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	3.1	1.4	1	1	8
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	6	5.5	2.5	4	1	15
EPT (%)	6	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	8.73	10.825	4.841	3.00	0.00	25.00
Genus analysis of Ephemeroptera	Baetidae: *Procloeon*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	20	12	2.5	1.1	12	10	16
Simpson's Diversity Index (D)	--	0.59	0.118	0.053	0.57	0.45	0.78
Evenness (Simpson's Equitability E_D)	--	0.19	0.045	0.020	0.18	0.15	0.25
Shannon-Weaver Index (H)	--	1.37	0.334	0.149	1.30	1.06	1.93
Evenness (Shannon’s Equitability E_H)	--	0.52	0.087	0.039	0.51	0.43	0.67
Hill's Effective Richness ($E^{H'}$)	--	4	1.584	0.709	3.68	2.90	6.87
Evenness ($E^{H'}$/S)	--	0.30	0.055	0.025	0.28	0.24	0.38

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	643	461.1	206.2	476	274	1414
Oligochaeta	--	3	6.5	2.9	0	0	14
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	346	300.7	134.5	231	115	866
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	20	19.4	8.7	29	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	35	7.9	3.5	29	29	43
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	20	24.1	10.8	14	0	58
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	424	332.9	148.9	332	159	995
Non-Insecta (%)	66	--	--	--	--	--	--
Oligochaeta	--	3	6.5	2.9	0	0	14
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	346	300.7	134.5	231	115	866
Amphipoda (%)	54	--	--	--	--	--	--
Bivalvia	--	35	7.9	3.5	29	29	43
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	20	24.1	10.8	14	0	58
Gastropoda (%)	3	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	61	25.8	11.5	58	29	87
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	12	6.5	2.9	14	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	12	12.1	5.4	14	0	29
Orthocladiinae	--	3	6.5	2.9	0	0	14
Tanypodinae	--	133	111.0	49.6	72	43	274
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	219	135.9	60.8	144	115	418
Insecta (%)	34	--	--	--	--	--	--
Chironomidae	--	147	125.5	56.1	72	43	317
Chironomidae (%)	23	--	--	--	--	--	--
Ephemeroptera	--	61	25.8	11.5	58	29	87

Table 4.5-4. - continued -

	Southern Indian Lake-Area 6						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	9	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	61	25.8	11.5	58	29	87
EPT (%)	9	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.73	0.738	0.330	0.40	0.24	2.00
Genus analysis of Ephemeroptera		Ephemeridae: *Hexagenia*					
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	6	0.8	0.4	6	5	7
Simpson's Diversity Index (D)	--	0.67	0.054	0.024	0.67	0.58	0.72
Evenness (Simpson's Equitability E_D)	--	0.46	0.163	0.073	0.43	0.26	0.71
Shannon-Weaver Index (H)	--	1.40	0.101	0.045	1.40	1.28	1.54
Evenness (Shannon's Equitability E_H)	--	0.74	0.108	0.048	0.75	0.58	0.87
Hill's Effective Richness ($E^{H'}$)	--	4	0.417	0.187	4.05	3.59	4.68
Evenness ($E^{H'}$/S)	--	0.61	0.151	0.068	0.61	0.40	0.81

Table 4.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Southern Indian Lake-Area 4 within the Upper Churchill River Region for CAMPP, 2010.

	Southern Indian Lake-Area 4						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	110	60.6	27.1	112	26	196
Oligochaeta	--	17	23.9	10.7	6	5	60
Hirudinea	--	0	0.2	0.1	0	0	0
Ostracoda	--	0	0.1	0.1	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.1	0.1	0	0	0
Hyalellidae	--	2	2.8	1.3	0	0	7
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.1	0.1	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	4	2.3	1.0	3	1	7
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.1	0.1	0	0	0
Lymnaeidae	--	0	0.1	0.1	0	0	0
Physidae	--	0	0.1	0.1	0	0	0
Planorbidae	--	1	2.4	1.1	0	0	6
Valvatidae	--	1	1.1	0.5	0	0	3
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	25	29.7	13.3	14	8	78
Non-Insecta (%)	23	--	--	--	--	--	--
Oligochaeta	--	17	23.9	10.7	6	5	60
Oligochaeta (%)	15	--	--	--	--	--	--
Amphipoda	--	2	2.8	1.2	0	0	7
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	4	2.3	1.0	3	1	7
Bivalvia (%)	3	--	--	--	--	--	--
Gastropoda	--	2	3.6	1.6	1	0	9
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	1	1.5	0.7	0	0	4
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.1	0.1	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.1	0.1	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	2	1.6	0.7	2	1	5
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.4	0.2	0	0	1
Hexagenia	--	0	0.2	0.1	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.3	0.1	0	0	1
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.1	0.1	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.1	0.1	0	0	0
Leptoceridae (larva)	--	0	0.3	0.1	0	0	1
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	1	1.0	0.4	1	0	2
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.1	0.1	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.2	0.1	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	11	14.1	6.3	6	2	35
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	4	3.9	1.8	4	1	10
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	53	46.9	21.0	54	7	124
Orthocladiinae	--	6	3.9	1.7	5	1	11
Tanypodinae	--	4	3.2	1.4	3	1	9
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.1	0.1	0	0	0
Empididae	--	0	0.6	0.3	0	0	1
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tabanidae	--	1	1.6	0.7	1	0	4
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	85	66.4	29.7	83	18	185
Insecta (%)	77	--	--	--	--	--	--
Chironomidae	--	67	53.8	24.1	76	10	142
Chironomidae (%)	61	--	--	--	--	--	--
Ephemeroptera	--	3	1.5	0.7	2	2	5
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	1	0.8	0.4	1	0	2
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	4	1.9	0.8	4	2	7
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.15	0.162	0.072	0.08	0.02	0.42
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	28	14	2.1	0.9	14	12	17
Simpson's Diversity Index (D)	--	0.69	0.114	0.051	0.67	0.56	0.88
Evenness (Simpson's Equitability E_D)	--	0.23	0.163	0.073	0.18	0.13	0.52
Shannon-Weaver Index (H)	--	1.73	0.327	0.146	1.71	1.33	2.23
Evenness (Shannon's Equitability E_H)	--	0.61	0.125	0.056	0.59	0.46	0.81
Hill's Effective Richness ($E^{H'}$)	--	6	2.069	0.925	5.55	3.77	9.33
Evenness ($E^{H'}/S$)	--	0.34	0.142	0.064	0.32	0.21	0.58

Table 4.5-5. - continued -

	Southern Indian Lake Area 4						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	785	303.6	135.8	664	505	1111
Oligochaeta	--	61	42.6	19.0	72	0	115
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	20	16.4	7.4	14	0	43
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	214	192.1	85.9	101	58	476
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	6	7.9	3.5	0	0	14
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	38	24.1	10.8	43	0	58
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	9	12.9	5.8	0	0	29
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	346	218.3	97.6	216	159	592
Non-Insecta (%)	44	--	--	--	--	--	--
Oligochaeta	--	61	42.6	19.0	72	0	115
Oligochaeta (%)	8	--	--	--	--	--	--
Amphipoda	--	214	192.1	85.9	101	58	476
Amphipoda (%)	27	--	--	--	--	--	--
Bivalvia	--	38	24.1	10.8	43	0	58
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	9	12.9	5.8	0	0	29
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0

Table 4.5-5. - continued -

	Southern Indian Lake Area 4						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0

Table 4.5-5. - continued -

	Southern Indian Lake Area 4						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	12	12.1	5.4	14	0	29
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	58	75.0	33.5	43	0	188
Orthocladiinae	--	3	6.5	2.9	0	0	14
Tanypodinae	--	366	121.4	54.3	332	245	534
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	439	100.3	44.8	476	317	534
Insecta (%)	56	--	--	--	--	--	--
Chironomidae	--	427	98.2	43.9	462	303	534
Chironomidae (%)	54	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	0	0	0
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--

Table 4.5-5. - continued -

	Southern Indian Lake Area 4						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	0	0.0	0.0	0	0	0
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.00	0.000	0.000	0.00	0.00	0.00
Genus analysis of Ephemeroptera	--	--	--	--	--	--	--
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	7	5	0.8	0.4	5	4	6
Simpson's Diversity Index (D)	--	0.66	0.098	0.044	0.72	0.52	0.74
Evenness (Simpson's Equitability E_D)	--	0.45	0.046	0.021	0.45	0.40	0.51
Shannon-Weaver Index (H)	--	1.35	0.300	0.134	1.51	1.01	1.67
Evenness (Shannon's Equitability E_H)	--	0.70	0.093	0.042	0.73	0.59	0.80
Hill's Effective Richness ($E^{H'}$)	--	4	1.134	0.507	4.52	2.75	5.29
Evenness ($E^{H'}/S$)	--	0.58	0.075	0.034	0.57	0.48	0.66

Table 4.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Upper Churchill River Region waterbodies, 2010.

Waterbody	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Granville Lake	GN-01	14	428152	6253598	22-Jul-10	18.93	15.3	4.1	20.8
Granville Lake	GN-02	14	427209	6250881	22-Jul-10	19.60	10.4	8.9	21.7
Granville Lake	GN-03	14	421905	6248787	23-Jul-10	22.55	5.2	19.2	19.6
Granville Lake	GN-04	14	421021	6247986	23-Jul-10	23.25	20.2	2.9	19.9
Granville Lake	GN-05	14	413498	6243271	24-Jul-10	21.60	7.2	6.7	20.7
Granville Lake	GN-06	14	415572	6239186	24-Jul-10	22.17	8.5	3.8	20.8
Granville Lake	GN-07	14	411095	6238205	24-Jul-10	24.57	8.2	7.6	21.1
Granville Lake	GN-08	14	405280	6238958	03-Sep-10	18.93	12.3	13.2	15.8
Granville Lake	GN-09	14	399817	6239030	03-Sep-10	19.50	7.0	3.6	15.5
Granville Lake	GN-10	14	401588	6234567	03-Sep-10	20.53	-	-	-
Granville Lake	GN-11	14	396066	6235566	04-Sep-10	22.28	10.8	10.8	14.6
Granville Lake	GN-12	14	394404	6237833	04-Sep-10	23.08	-	-	-
Granville Lake	SN-06	14	415572	6239186	24-Jul-10	22.17	8.5	3.8	20.8
Granville Lake	SN-09	14	399817	6239030	03-Sep-10	19.50	7.0	3.6	15.5
Granville Lake	SN-12	14	394404	6237833	04-Sep-10	23.08	-	-	-
Southern Indian Lake-Area 6	GN-01	14	499199	6286626	06-Aug-10	18.83	12.0	12.5	18.4
Southern Indian Lake-Area 6	GN-02	14	496668	6286380	06-Aug-10	19.10	12.2	11.2	18.3
Southern Indian Lake-Area 6	GN-03	14	498522	6283199	06-Aug-10	20.35	10.0	10.0	18.6
Southern Indian Lake-Area 6	GN-04	14	499762	6281322	07-Aug-10	23.33	3.7	10.0	18.4
Southern Indian Lake-Area 6	GN-05	14	501803	6282683	07-Aug-10	21.58	9.6	9.5	18.2
Southern Indian Lake-Area 6	GN-06	14	503191	6286060	07-Aug-10	20.70	8.2	9.9	18.5
Southern Indian Lake-Area 6	GN-07	14	502633	6281522	08-Aug-10	22.90	8.7	8.6	18.1
Southern Indian Lake-Area 6	GN-08	14	504727	6283947	08-Aug-10	24.80	8.3	6.2	18.6
Southern Indian Lake-Area 6	GN-09	14	500746	6285383	08-Aug-10	21.40	11.4	11.4	18.5
Southern Indian Lake-Area 6	GN-10	14	505687	6281881	09-Aug-10	20.73	5.5	5.4	18.6
Southern Indian Lake-Area 6	GN-11	14	504698	6280375	09-Aug-10	20.27	4.7	4.6	18.4
Southern Indian Lake-Area 6	GN-12	14	506880	6283330	09-Aug-10	19.28	7.0	7.2	18.5
Southern Indian Lake-Area 6	SN-03	14	498522	6283199	06-Aug-10	20.35	10.0	10.0	18.6
Southern Indian Lake-Area 6	SN-06	14	503191	6286060	07-Aug-10	20.70	8.2	9.9	18.5
Southern Indian Lake-Area 6	SN-09	14	500746	6285383	08-Aug-10	21.40	11.4	11.4	18.5
Southern Indian Lake-Area 6	SN-12	14	506880	6283330	09-Aug-10	19.28	7.0	7.2	18.5

Table 4.6-1. - continued -

Waterbody	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Southern Indian Lake-Area 4	GN-01	14	548098	6357076	19-Sep-10	20.72	13.7	6.6	6.4
Southern Indian Lake-Area 4	GN-02	14	542837	6358657	19-Sep-10	22.17	12.3	17.0	6.9
Southern Indian Lake-Area 4	GN-03	14	543452	6360862	19-Sep-10	23.40	12.7	16.2	7.1
Southern Indian Lake-Area 4	GN-04	14	542546	6360352	22-Sep-10	19.43	22.6	21.5	9.9
Southern Indian Lake-Area 4	GN-05	14	537511	6362781	21-Sep-10	24.42	28.4	25.2	6.0
Southern Indian Lake-Area 4	GN-07	14	531297	6366069	21-Sep-10	21.98	6.7	6.8	6.0
Southern Indian Lake-Area 4	GN-09	14	533673	6371159	20-Sep-10	22.25	15.3	16.0	5.0
Southern Indian Lake-Area 4	GN-11	14	538238	6366562	20-Sep-10	21.88	2.7	4.5	5.0
Southern Indian Lake-Area 4	GN-12	14	542057	6363950	20-Sep-10	21.67	20.0	21.4	5.0
Southern Indian Lake-Area 4	GN-13	14	531213	6359406	21-Sep-10	21.10	20.1	21.9	6.0
Southern Indian Lake-Area 4	GN-14	14	534563	6356038	21-Sep-10	22.50	17.2	17.1	9.9
Southern Indian Lake-Area 4	GN-15	14	534479	6350515	21-Sep-10	22.18	19.4	18.9	9.7
Southern Indian Lake-Area 4	GN-16	14	526121	6345049	20-Sep-10	22.40	17.2	17.1	9.8
Southern Indian Lake-Area 4	GN-18	14	529785	6338701	20-Sep-10	22.25	11.0	20.7	9.7
Southern Indian Lake-Area 4	GN-19	14	533072	6338372	20-Sep-10	22.00	20.2	20.2	9.6
Southern Indian Lake-Area 4	GN-21	14	537315	6343724	19-Sep-10	22.92	21.9	22.0	9.7
Southern Indian Lake-Area 4	GN-23	14	540311	6347912	19-Sep-10	22.67	16.3	16.3	9.8
Southern Indian Lake-Area 4	GN-24	14	541122	6353116	21-Sep-10	22.70	9.8	4.7	9.9
Southern Indian Lake-Area 4	GN-25	14	538076	6338650	19-Sep-10	23.20	19.1	19.1	9.7
Southern Indian Lake-Area 4	GN-26	14	543413	6360848	22-Sep-10	18.55	13.3	16.8	9.3
Southern Indian Lake-Area 4	GN-27	14	542293	6361361	22-Sep-10	19.12	19.5	18.5	9.7
Southern Indian Lake-Area 4	SN-01	14	548098	6357076	19-Sep-10	20.72	13.7	6.6	6.4
Southern Indian Lake-Area 4	SN-07	14	531297	6366069	21-Sep-10	21.98	6.7	6.8	6.0
Southern Indian Lake-Area 4	SN-09	14	533673	6371159	20-Sep-10	22.25	15.3	16.0	5.0
Southern Indian Lake-Area 4	SN-24	14	541122	6353116	21-Sep-10	22.70	9.8	4.7	9.9
Southern Indian Lake-Area 4	SN-25	14	538076	6338650	19-Sep-10	23.20	19.1	19.1	9.7

Table 4.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Upper Churchill River Region waterbodies, 2010.

Family	Common Name	Scientific Name	ID Code
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH
	Emerald Shiner	*Notropis atherinoides*	EMSH
	Spottail Shiner	*Notropis hudsonius*	SPSH
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC
	White Sucker	*Catostomus commersoni*	WHSC
	Shorthead Redhorse	*Moxostoma anisurum*	SHRD
Esocidae	Northern Pike	*Esox lucius*	NRPK
Salmonidae	Cisco	*Coregonus artedi*	CISC
	Lake Whitefish	*Coregonus clupeaformis*	LKWH
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR
Gadidae	Burbot	*Lota lota*	BURB
Cottidae	Slimy Sculpin	*Cottus bairdi*	SLSC
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Sauger	*Sander canadensis*	SAUG
	Walleye	*Sander vitreus*	WALL

Table 4.6-3. Standard gang index gillnet relative abundance summaries from Upper Churchill River Region waterbodies, 2010.

Species	Granville L		SIL-Area 6		SIL-Area 4	
	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-
Longnose Sucker	15	1.61	25	5.91	267	34.86
White Sucker	567	60.71	42	9.93	7	0.91
Shorthead Redhorse	4	0.43	-	-	-	-
Northern Pike	44	4.71	26	6.15	55	7.18
Cisco	29	3.10	132	31.21	161	21.02
Lake Whitefish	49	5.25	28	6.62	174	22.72
Troutperch	-	-	-	-	-	-
Burbot	9	0.96	9	2.13	88	11.49
Slimy Sculpin	-	-	-	-	-	-
Yellow Perch	12	1.28	2	0.47	-	-
Sauger	54	5.78	154	36.41	2	0.26
Walleye	151	16.17	5	1.18	12	1.57
Total	934	100	423	100	766	100

n = number of fish caught

RA = percent relative abundance

Table 4.6-4. Small mesh index gillnet relative abundance summaries from Upper Churchill River Region waterbodies, 2010.

Species	Granville L		SIL-Area 6		SIL-Area 4	
	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-
Emerald Shiner	32	11.03	11	6.15	-	-
Spottail Shiner	63	21.72	1	0.56	6	14.29
Longnose Sucker	1	0.34	-	-	1	2.38
White Sucker	1	0.34	-	-	-	-
Shorthead Redhorse	1	0.34	-	-	-	-
Northern Pike	2	0.69	2	1.12	-	-
Cisco	91	31.38	40	22.35	28	66.67
Lake Whitefish	-	-	1	0.56	-	-
Troutperch	6	2.07	36	20.11	1	2.38
Burbot	-	-	-	-	1	2.38
Slimy Sculpin	1	0.34	-	-	-	-
Yellow Perch	61	21.03	-	-	-	-
Sauger	24	8.28	86	48.04	4	9.52
Walleye	7	2.41	2	1.12	1	2.38
Total	290	100	179	100	42	100

n = number of fish caught
RA = percent relative abundance

Table 4.6-5. Standard gang index gillnet biomass summaries from Upper Churchill River Region waterbodies, 2010.

Species	Granville L			SIL-Area 6			SIL-Area 4		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	15	20010	2.58	25	35310	17.55	267	225260	46.43
White Sucker	567	535700	69.10	42	40370	20.07	7	8630	1.78
Shorthead Redhorse	4	2400	0.31	-	-	-	-	-	-
Northern Pike	44	74200	9.57	26	25300	12.58	55	71600	14.76
Cisco	29	9530	1.23	132	45870	22.81	161	29870	6.16
Lake Whitefish	49	28470	3.67	28	16000	7.95	174	79660	16.42
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	9	8410	1.08	9	8300	4.13	88	62910	12.97
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	12	1140	0.15	2	190	0.09	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	54	10300	1.33	154	27380	13.61	2	600	0.12
Walleye	151	85090	10.98	5	2420	1.20	12	6590	1.36
Total	934	775250	100	423	201140	100	766	485120	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = percent of total biomass

Table 4.6-6. Small mesh index gillnet biomass summaries from Upper Churchill River Region waterbodies, 2010.

Species	Granville L			SIL-Area 6			SIL-Area 4		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	32	124	1.12	11	43	0.27	-	-	-
Spottail Shiner	63	344	3.09	1	9	0.06	6	40	0.79
Longnose Sucker	1	19	0.17	-	-	-	1	10	0.20
White Sucker	1	31	0.28	-	-	-	-	-	-
Shorthead Redhorse	1	410	3.69	-	-	-	-	-	-
Northern Pike	2	2290	20.60	2	2340	14.53	-	-	-
Cisco	91	1770	15.92	40	1870	11.61	28	3651	71.86
Lake Whitefish	-	-	-	1	370	2.30	-	-	-
Troutperch	6	29	0.26	36	218.1	1.35	1	10	0.20
Burbot	-	-	-	-	-	-	1	470	9.25
Slimy Sculpin	1	2	0.02	-	-	-	-	-	-
Yellow Perch	61	1088	9.79	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	24	2917	26.24	86	9900	61.45	4	190	3.74
Walleye	7	2094	18.83	2	1360	8.44	1	710	13.97
Total	290	11118	100	179	16110	100	42	5081	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = percent of total biomass

Table 4.6-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Upper Churchill River Region waterbodies, 2010.

Species	Granville L (# sites = 12)			SIL-Area 6 (# sites = 12)			SIL-Area 4 (# sites = 21)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	15	1.3	2.28	25	2.1	2.27	267	12.3	6.35
White Sucker	567	46.4	22.66	42	3.4	1.99	7	0.3	1.26
Shorthead Redhorse	4	0.3	0.66	-	-	-	-	-	-
Northern Pike	44	3.6	1.52	26	2.1	2.48	55	2.6	5.29
Cisco	29	2.4	3.40	132	11.4	11.25	161	7.3	12.91
Lake Whitefish	49	4.2	5.28	28	2.4	1.45	174	7.9	5.04
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	9	0.8	1.10	9	0.8	1.39	88	4.0	3.38
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	12	1.0	1.06	2	0.2	0.41	-	-	-
Sauger	54	4.7	4.86	154	12.8	9.81	2	0.1	0.28
Walleye	151	11.9	15.63	5	0.4	0.89	12	0.6	1.73
Total	934	76.6	21.67	423	35.6	18.05	766	35.1	19.28

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site
SD = standard deviation

Table 4.6-8. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Upper Churchill River Region waterbodies, 2010.

Species	Granville L (# sites = 3)			SIL-Area 6 (# sites = 4)			SIL-Area 4 (# sites = 5)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	32	12.7	13.83	11	3.4	6.05	-	-	-
Spottail Shiner	63	25.3	36.92	1	0.3	0.58	6	1.3	2.93
Longnose Sucker	1	0.4	0.63	-	-	-	1	0.2	0.47
White Sucker	1	0.4	0.71	-	-	-	-	-	-
Shorthead Redhorse	1	0.4	0.71	-	-	-	-	-	-
Northern Pike	2	0.8	1.42	2	0.6	0.70	-	-	-
Cisco	91	32.2	29.98	40	11.5	8.26	28	6.1	3.76
Lake Whitefish	-	-	-	1	0.3	0.56	-	-	-
Troutperch	6	2.2	1.04	36	10.6	2.86	1	0.2	0.49
Burbot	-	-	-	-	-	-	1	0.2	0.46
Slimy Sculpin	1	0.4	0.63	-	-	-	-	-	-
Yellow Perch	61	22.0	23.14	-	-	-	-	-	-
Sauger	24	8.8	5.57	86	25.4	4.39	4	0.9	1.18
Walleye	7	2.8	4.00	2	0.6	0.66	1	0.2	0.49
Total	290	108.3	45.12	179	52.7	8.15	42	9.1	6.03

#sites = number of sites sampled

n = number of fish caught

CPUE = mean catch per unit effort (fish/30 m/24 h) per site

SD = standard deviation

Table 4.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Upper Churchill River Region waterbodies, 2010.

Species	Granville L (# sites = 12)			SIL-Area 6 (# sites = 12)			SIL-Area 4 (# sites = 21)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-		-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	15	1655	3215	25	2889	3361	267	10373	6083
White Sucker	567	44099	25345	42	3286	2200	7	394	1442
Shorthead Redhorse	4	199	362	-	-	-	-	-	-
Northern Pike	44	6130	3452	26	2123	2415	55	3452	7177
Cisco	29	773	1330	132	3962	4195	161	1355	2392
Lake Whitefish	49	2462	3422	28	1332	827	174	3641	2474
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	9	688	1061	9	730	1235	88	2873	2519
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	12	97	108	2	17	39	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	54	880	1081	154	2291	1927	2	27	89
Walleye	151	6832	7093	5	202	437	12	304	845
Total	934	63815	23946	423	16834	6036	766	22418	12623

#sites = number of sites sampled

n = number of fish measured (may not equal number of fish caught)

BPUE = mean biomass per unit effort per site

SD = standard deviation

Table 4.6-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m/24 h) set in Upper Churchill River Region waterbodies, 2010.

Species	Granville L (# sites = 3)			SIL-Area 6 (# sites = 4)			SIL-Area 4 (# sites = 5)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	32	49	54	11	13	23	-	-	-
Spottail Shiner	63	138	202	1	2	5	6	9	20
Longnose Sucker	1	7	12	-	-	-	1	2	5
White Sucker	1	13	22	-	-	-	-	-	-
Shorthead Redhorse	1	168	291	-	-	-	-	-	-
Northern Pike	2	939	1627	2	703	882	-	-	-
Cisco	91	643	404	40	544	161	28	794	781
Lake Whitefish	-	-	-	1	104	207	-	-	-
Troutperch	6	11	1	36	64	26	1	2	5
Burbot	-	-	-	-	-	-	1	97	217
Slimy Sculpin	1	1	1	-	-	-	-	-	-
Yellow Perch	61	387	345	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	24	1082	523	86	2903	488	4	41	57
Walleye	7	831	1068	2	383	661	1	155	347
Total	290	4270	2785	179	4717	1492	42	1100	1064

#sites = number of sites sampled

n = number of fish measured (may not equal number of fish caught)

BPUE = mean biomass per unit effort per site

SD = standard deviation

Table 4.6-11. Summary of mean fork length (mm), weight (g) and condition factor (K) calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang and small mesh index gill nets set in Upper Churchill River Region waterbodies, 2010.

Species	Granville L			SIL-Area 6			SIL-Area 4		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	44	607	95	26	516	86	55	560	85
Lake Whitefish	49	319	97	28	322	61	174	322	57
Walleye	151	358	68	5	326	119	12	343	61
Weight (g)									
Northern Pike	44	1686	962	26	973	511	54	1326	631
Lake Whitefish	49	581	496	28	571	310	173	460	232
Walleye	149	571	296	5	484	464	12	549	335
Condition Factor (K)									
Northern Pike	44	0.68	0.08	26	0.65	0.06	54	0.71	0.07
Lake Whitefish	49	1.40	0.20	28	1.55	0.11	173	1.25	0.12
Walleye	149	1.10	0.10	5	1.05	0.02	12	1.20	0.11

Table 4.6-12. Summary of mean fork length (mm), weight (g) and condition factor (K) calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang and small mesh index gill nets set in Upper Churchill River Region waterbodies, 2010.

Species	Granville L			SIL-Area 6			SIL-Area 4		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	2	542	85	2	548	59	-	-	-
Lake Whitefish	-	-	-	1	286	-	-	-	-
Walleye	-	-	-	2	365	202	1	350	-
Weight (g)									
Northern Pike	2	1145	516	2	1170	537	-	-	-
Lake Whitefish	-	-	-	1	370	-	-	-	-
Walleye	7	299	-	2	680	764	1	710	-
Condition Factor (K)									
Northern Pike	2	0.70	0.01	2	0.68	0.10	-	-	-
Lake Whitefish	-	-	-	1	1.58	-	-	-	-
Walleye	-	-	-	2	1.11	0.25	1	1.66	-

Table 4.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard index gill nets set in Upper Churchill River Region waterbodies, 2010.

Age	Year-Class	Granville L		SIL-Area 6		SIL-Area 4	
		n	%	n	%	n	%
1	2009	-	-	-	-	-	-
2	2008	-	-	1	3.85	-	-
3	2007	1	2.27	1	3.85	3	5.45
4	2006	3	6.82	2	7.69	1	1.82
5	2005	13	29.55	5	19.23	7	12.73
6	2004	6	13.64	3	11.54	5	9.09
7	2003	3	6.82	4	15.38	5	9.09
8	2002	10	22.73	1	3.85	8	14.55
9	2001	5	11.36	4	15.38	7	12.73
10	2000	3	6.82	2	7.69	6	10.91
11	1999	-	-	-	-	6	10.91
12	1998	-	-	2	7.69	5	9.09
13	1997	-	-	1	3.85	1	1.82
14	1996	-	-	-	-	1	1.82
15	1995	-	-	-	-	-	-
16	1994	-	-	-	-	-	-
Total		44	100	26	100	55	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 4.6-14. Year-class frequency distributions (%) for Lake Whitefish captured in standard index gill nets set in Upper Churchill River Region waterbodies, 2010.

Age	Year-Class	Granville L		SIL-Area 6		SIL-Area 4	
		n	%	n	%	n	%
1	2009	-	-	-	-	-	-
2	2008	2	4.08	1	3.70	-	-
3	2007	11	22.45	6	22.22	-	-
4	2006	8	16.33	10	37.04	1	0.57
5	2005	8	16.33	6	22.22	2	1.15
6	2004	4	8.16	2	7.41	4	2.30
7	2003	2	4.08	1	3.70	13	7.47
8	2002	8	16.33	-	-	9	5.17
9	2001	1	2.04	1	3.70	12	6.90
10	2000	3	6.12	-	-	17	9.77
11	1999	-	-	-	-	71	40.80
12	1998	1	2.04	-	-	11	6.32
13	1997	-	-	-	-	10	5.75
14	1996	-	-	-	-	6	3.45
15	1995	-	-	-	-	11	6.32
16	1994	-	-	-	-	4	2.30
17	1993	-	-	-	-	2	1.15
18	1992	1	2.04	-	-	-	-
19	1991	-	-	-	-	1	0.57
20	1990	-	-	-	-	-	-
21	1989	-	-	-	-	-	-
22	1988	-	-	-	-	-	-
23	1987	-	-	-	-	-	-
24	1986	-	-	-	-	-	-
25	1985	-	-	-	-	-	-
26	1984	-	-	-	-	-	-
27	1983	-	-	-	-	-	-
28	1982	-	-	-	-	-	-
29	1981	-	-	-	-	-	-
30	1980	-	-	-	-	-	-
Total		49	100	27	100	174	100

n = number of fish aged (may not equal number of fish caught)

% = percent of total number of fish aged

Table 4.6-15. Year-class frequency distributions (%) for Walleye captured in standard index gill nets set in Upper Churchill River Region waterbodies, 2010.

Age	Year-Class	Granville L		SIL-Area 6		SIL-Area 4	
		n	%	n	%	n	%
1	2009	-	-	-	-	-	-
2	2008	-	-	-	-	-	-
3	2007	4	2.68	-	-	-	-
4	2006	25	16.78	3	60.00	4	33.33
5	2005	21	14.09	-	-	3	25.00
6	2004	-	-	-	-	1	8.33
7	2003	29	19.46	-	-	3	25.00
8	2002	32	21.48	1	20.00	1	8.33
9	2001	22	14.77	-	-	-	-
10	2000	3	2.01	1	20.00	-	-
11	1999	2	1.34	-	-	-	-
12	1998	4	2.68	-	-	-	-
13	1997	-	-	-	-	-	-
14	1996	7	4.70	-	-	-	-
15	1995	-	-	-	-	-	-
16	1994	-	-	-	-	-	-
Total		149	100	5	100	12	100

n = number of fish aged (may not equal number of fish caught)

% = percent of total number of fish aged

Table 4.6-16. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2010.

		Granville L									SIL-Area 6								
Age	Year-Class	FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	1	324	-	1	240	-	1	0.70	-
3	2007	1	442	-	1	620	-	1	0.70	-	1	364	-	1	310	-	1	0.60	-
4	2006	3	471	39	3	663	155	3	0.60	0.02	2	422	57	2	500	184	2	0.70	0.01
5	2005	13	555	71	13	1217	476	13	0.70	0.04	5	475	13	5	714	92	5	0.70	0.04
6	2004	6	599	78	6	1540	694	6	0.70	0.05	3	512	45	3	947	291	3	0.70	0.05
7	2003	3	649	53	3	2153	652	3	0.80	0.07	4	509	6	4	775	31	4	0.60	0.02
8	2002	10	658	53	10	1946	516	10	0.70	0.06	1	570	-	1	1080	-	1	0.60	-
9	2001	5	685	110	5	2632	1746	5	0.70	0.16	4	559	61	4	1105	466	4	0.60	0.04
10	2000	3	695	81	3	2483	1451	3	0.70	0.14	2	607	66	2	1645	587	2	0.70	0.03
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	2	649	24	2	1820	495	2	0.70	0.11
13	1997	-	-	-	-	-	-	-	-	-	1	620	-	1	1810	-	1	0.80	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4.6-16. - continued -

Age	Year Class	SIL-Area 4 FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-
3	2007	3	397	26	3	477	80	3	0.80	0.02
4	2006	1	460	-	1	620	-	1	0.60	-
5	2005	7	467	27	7	743	113	7	0.70	0.05
6	2004	5	519	54	5	1032	347	5	0.70	0.09
7	2003	5	535	32	5	1040	201	5	0.70	0.04
8	2002	8	532	41	8	1039	254	8	0.70	0.03
9	2001	7	617	34	6	1670	133	6	0.80	0.05
10	2000	6	604	52	6	1472	391	6	0.70	0.05
11	1999	6	630	48	6	1977	550	6	0.80	0.10
12	1998	5	645	50	5	1938	508	5	0.70	0.04
13	1997	1	635	-	1	1840	-	1	0.70	-
14	1996	1	774	-	1	3440	-	1	0.70	-
15	1995	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 4.6-17. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2010.

Age	Year-Class	Granville L									SIL-Area 6								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	2	173	1	2	70	14	2	1.40	0.24	1	206	-	1	140	-	1	1.60	-
3	2007	11	214	21	11	139	49	11	1.40	0.13	6	249	17	6	242	59	6	1.50	0.07
4	2006	8	294	36	8	385	153	8	1.40	0.20	10	318	27	10	506	115	10	1.60	0.16
5	2005	8	307	45	8	439	231	8	1.40	0.11	6	368	20	6	773	144	6	1.50	0.12
6	2004	4	343	56	4	465	58	4	1.20	0.42	2	373	30	2	825	276	2	1.60	0.17
7	2003	2	440	198	2	955	785	2	1.10	0.51	1	430	-	1	1260	-	1	1.60	-
8	2002	8	410	19	8	1055	162	8	1.50	0.08	-	-	-	-	-	-	-	-	-
9	2001	1	432	-	1	1280	-	1	1.60	-	1	446	-	1	1310	-	1	1.50	-
10	2000	3	406	79	3	1047	690	3	1.40	0.09	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	1	464	-	1	1500	-	1	1.50	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	1	504	-	1	2080	-	1	1.60	-	-	-	-	-	-	-	-	-	-

Table 4.6-17. - continued -

Age	Year-Class	SIL-Area 4								
		FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-
4	2006	1	215	-	1	110	-	1	1.1	-
5	2005	2	208	4	2	95	7	2	1.1	0.03
6	2004	4	235	38	4	155	81	4	1.1	0.08
7	2003	13	239	25	13	165	75	13	1.1	0.14
8	2002	9	248	18	8	176	37	8	1.2	0.08
9	2001	12	264	26	12	228	90	12	1.2	0.14
10	2000	17	312	35	17	385	128	17	1.2	0.12
11	1999	71	327	26	71	463	117	71	1.3	0.08
12	1998	11	361	18	11	602	86	11	1.3	0.07
13	1997	10	377	31	10	709	152	10	1.3	0.09
14	1996	6	386	19	6	707	116	6	1.2	0.05
15	1995	11	406	26	11	820	154	11	1.2	0.07
16	1994	4	413	23	4	948	183	4	1.3	0.1
17	1993	2	402	6	2	730	71	2	1.1	0.16
18	1992	-	-	-	-	-	-	-	-	-
19	1991	1	410	-	1	820	-	1	1.2	-
27	1983	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-
29	1981	-	-	-	-	-	-	-	-	-
30	1980	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 4.6-18. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2010.

Age	Year-Class	Granville L									SIL-Area 6								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	4	260	16	4	180	38	4	1.00	0.04	-	-	-	-	-	-	-	-	-
4	2006	25	259	31	24	189	80	24	1.00	0.10	3	240	11	3	147	21	3	1.10	0.02
5	2005	21	302	33	21	314	123	21	1.10	0.09	-	-	-	-	-	-	-	-	-
6	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2003	29	381	28	29	636	186	29	1.10	0.11	-	-	-	-	-	-	-	-	-
8	2002	32	397	29	31	723	186	31	1.10	0.11	1	468	-	1	1050	-	1	1.00	-
9	2001	22	407	28	22	751	164	22	1.10	0.09	-	-	-	-	-	-	-	-	-
10	2000	3	430	18	3	890	161	3	1.10	0.12	1	444	-	1	930	-	1	1.10	-
11	1999	2	456	37	2	1120	212	2	1.20	0.07	-	-	-	-	-	-	-	-	-
12	1998	4	418	36	4	863	218	4	1.20	0.04	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	7	431	32	7	903	249	7	1.10	0.11	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 4.6-18. - continued -

Age	Year-Class	SIL-Area 4 FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-
4	2006	4	291	34	4	288	94	4	1.10	0.06
5	2005	3	325	25	3	393	93	3	1.10	0.02
6	2004	1	310	-	1	350	-	1	1.20	-
7	2003	3	413	27	3	950	174	3	1.30	0.03
8	2002	1	430	-	1	1060	-	1	1.30	-
9	2001	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 4.6-19. Deformities, erosion, lesions, and tumours (DELTs) on select fish species captured in standard gang index gill nets set on Upper Churchill River Region waterbodies, 2010.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Granville Lake											
White Sucker	-	-	1	0.20	1	0.20	-	-	567	2	0.40
Northern Pike	-	-	-	-	-	-	-	-	44	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	54	0	0
Walleye	-	-	-	-	1		-	-	151	1	0.7
SIL-Area 6											
White Sucker	-	-	1	2.40	-	-	-	-	42	1	2.40
Northern Pike	-	-	-	-	-	-	-	-	26	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	28	0	0
Sauger	-	-	-	-	-	-	-	-	154	0	0
Walleye	-	-	-	-	-	-	-	-	5	0	0
SIL-Area 4											
White Sucker	-	-	-	-	-	-	-	-	7	0	0
Northern Pike	-	-	-	-	-	-	-	-	55	0	0
Lake Whitefish	-	-	1	0.60	-	-	-	-	174	1	0.60
Sauger	-	-	-	-	-	-	-	-	2	0	0
Walleye	1	8.30	-	-	-	-	-	-	12	1	8.30

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect} \times 100$);
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect} \times 100$)

Table 4.7-1. Mean arithmetic (± standard error, SE) and standardized (± 95% confidence limit, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, Walleye, and Yellow Perch from Granville Lake, and Southern Indian Lake Areas 6 and 4 in 2010.

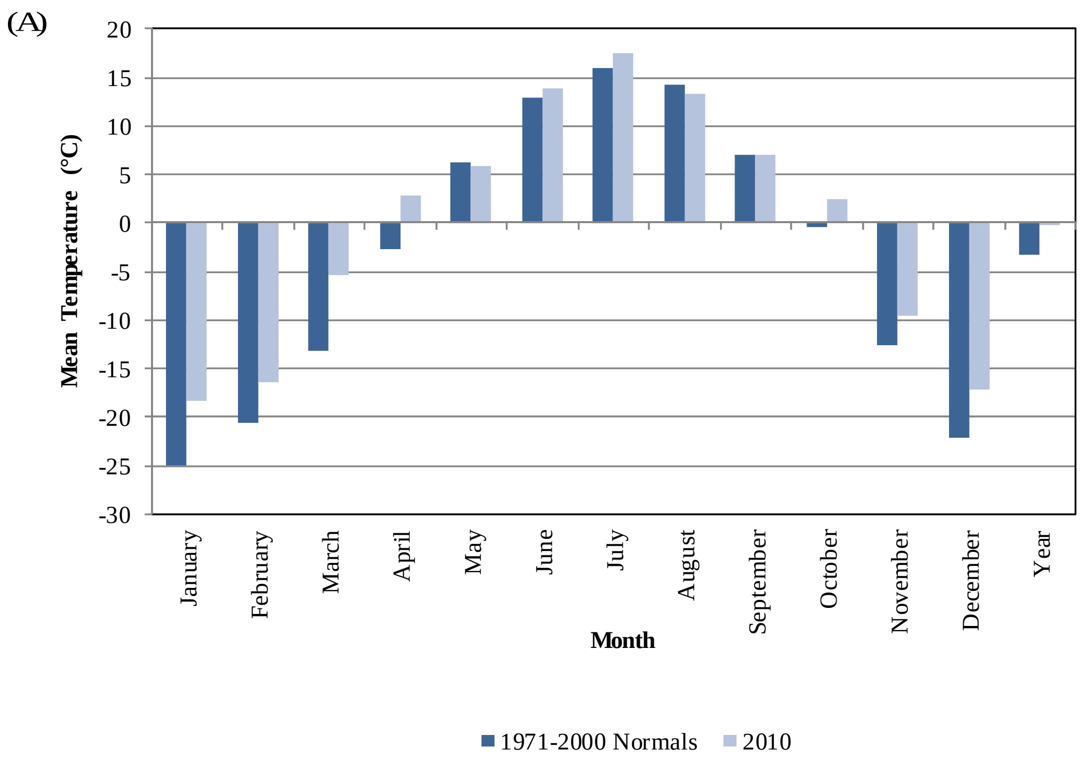
Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Granville L	Northern Pike	37	0.513	0.038	0.441	0.392 - 0.497
	Walleye	35	0.416	0.026	0.441	0.401 - 0.485
	Lake Whitefish	36	0.047	0.003	0.052	0.048 - 0.056
SIL-Area 6	Northern Pike	28	0.499	0.053	0.520	0.443 - 0.610
	Walleye	7	0.421	0.137	0.457	0.271 - 0.771
	Lake Whitefish	29	0.026	0.002	0.028	0.025 - 0.030
SIL-Area 4	Northern Pike	36	0.408	0.026	0.371	0.330 - 0.417
	Walleye	12	0.217	0.011	-*	0.194 - 0.240
	Lake Whitefish	37	0.070	0.003	0.072	0.066 - 0.079

* The relationship between mercury concentration and fish length was not significant, the CL is for the arithmetic mean.

Table 4.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from Granville Lake, and Southern Indian Lake areas 6 and 4 in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (yrs)
Granville L	Northern Pike [a]	37	588.9 ± 16.6	1577.3 ± 169.1	0.69 ± 0.01	7.0 ± 0.4
	Walleye [b]	35	376.4 ± 11.0	623.7 ± 49.7	1.07 ± 0.01	8.7 ± 0.5
	Lake Whitefish [c]	36	308.3 ± 15.7	563.6 ± 86.5	1.42 ± 0.03	5.7 ± 0.6
SIL-Area 6	Northern Pike	28	517.9 ± 15.8	987.1 ± 95.4	0.65 ± 0.01	7.2 ± 0.5
	Walleye	7	337.4 ± 48.7	540.0 ± 189.0	1.07 ± 0.04	5.7 ± 1.1
	Lake Whitefish [d]	29	324.1 ± 11.5	568.6 ± 58.9	1.55 ± 0.02	4.3 ± 0.3
SIL-Area 4	Northern Pike	36	562.2 ± 14.9	1352.5 ± 110.2	0.71 ± 0.01	8.1 ± 0.5
	Walleye	12	343.3 ± 17.7	549.2 ± 96.7	1.20 ± 0.03	5.5 ± 0.4
	Lake Whitefish	37	325.0 ± 10.1	480.8 ± 40.5	1.25 ± 0.02	11.1 ± 0.5

[a] n = 25 for age;
[b] n = 34 for age
[c] n = 29 for age
[d] n = 28 for weight, K, and age



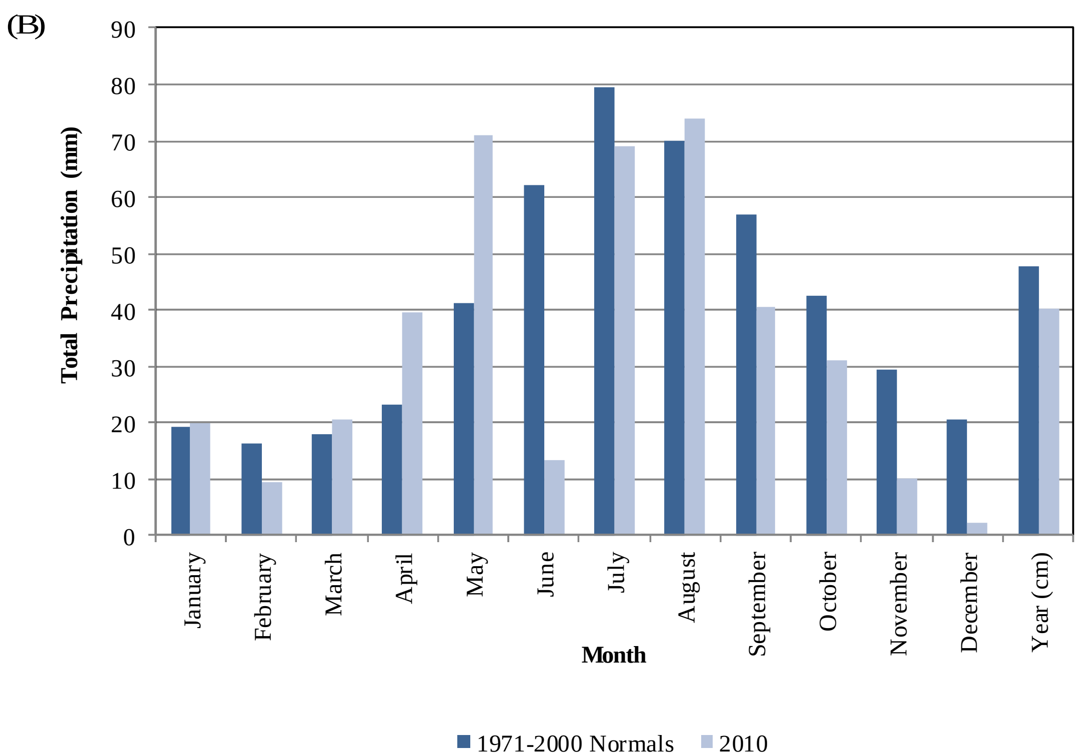


Figure 4.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Lynn Lake, MB.

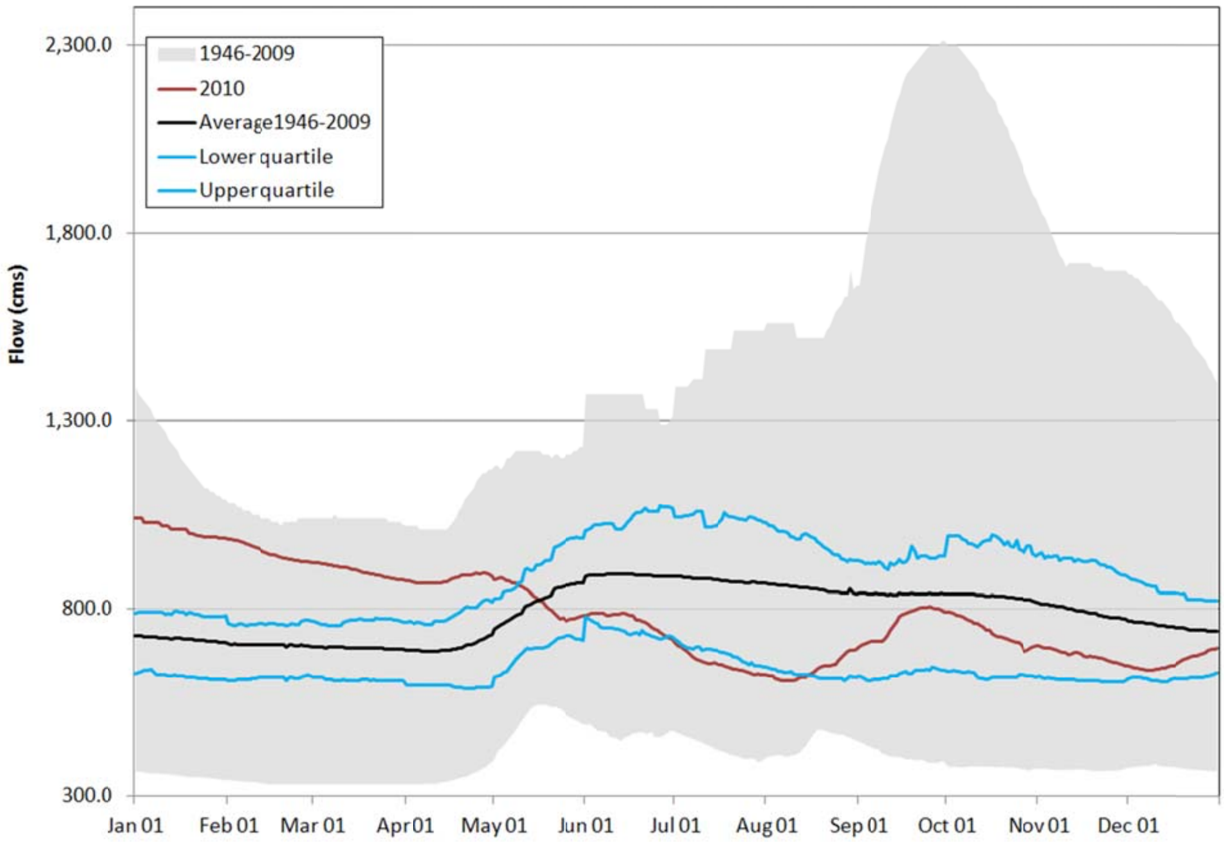


Figure 4.2-1. Flows of the Upper Churchill River Flow at Granville Falls (06EC006) in 2010.

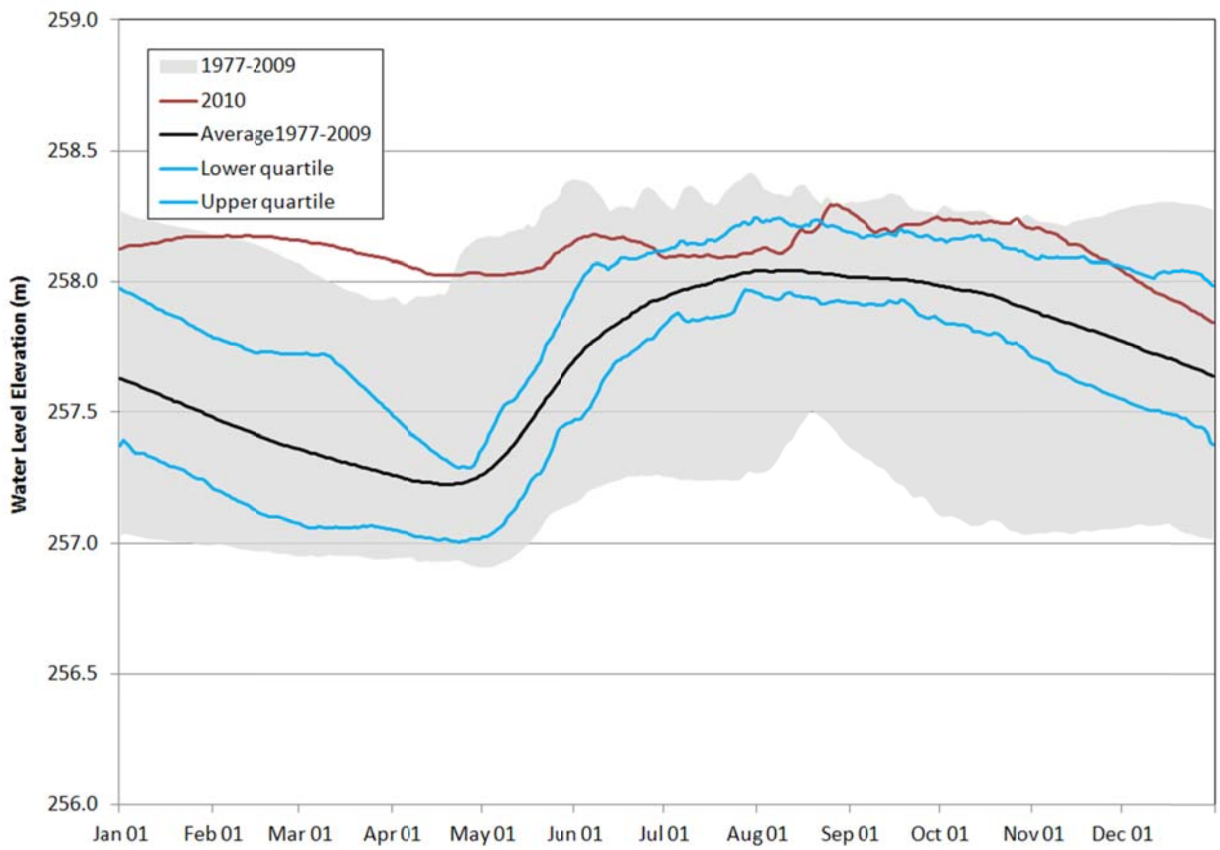


Figure 4.2-2. Average water level elevation of Southern Indian Lake in 2010.

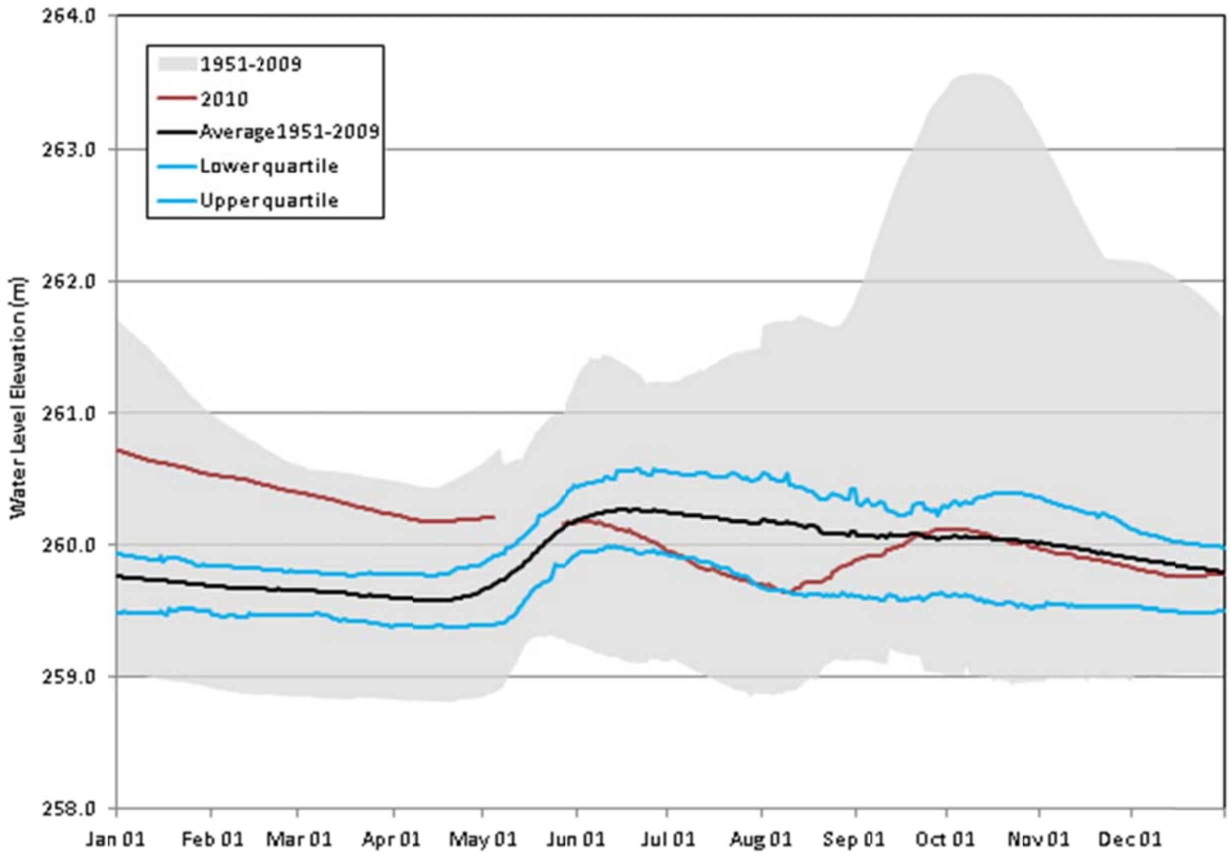


Figure 4.2-3. Water level elevation of Granville Lake (06EB002) in 2010.

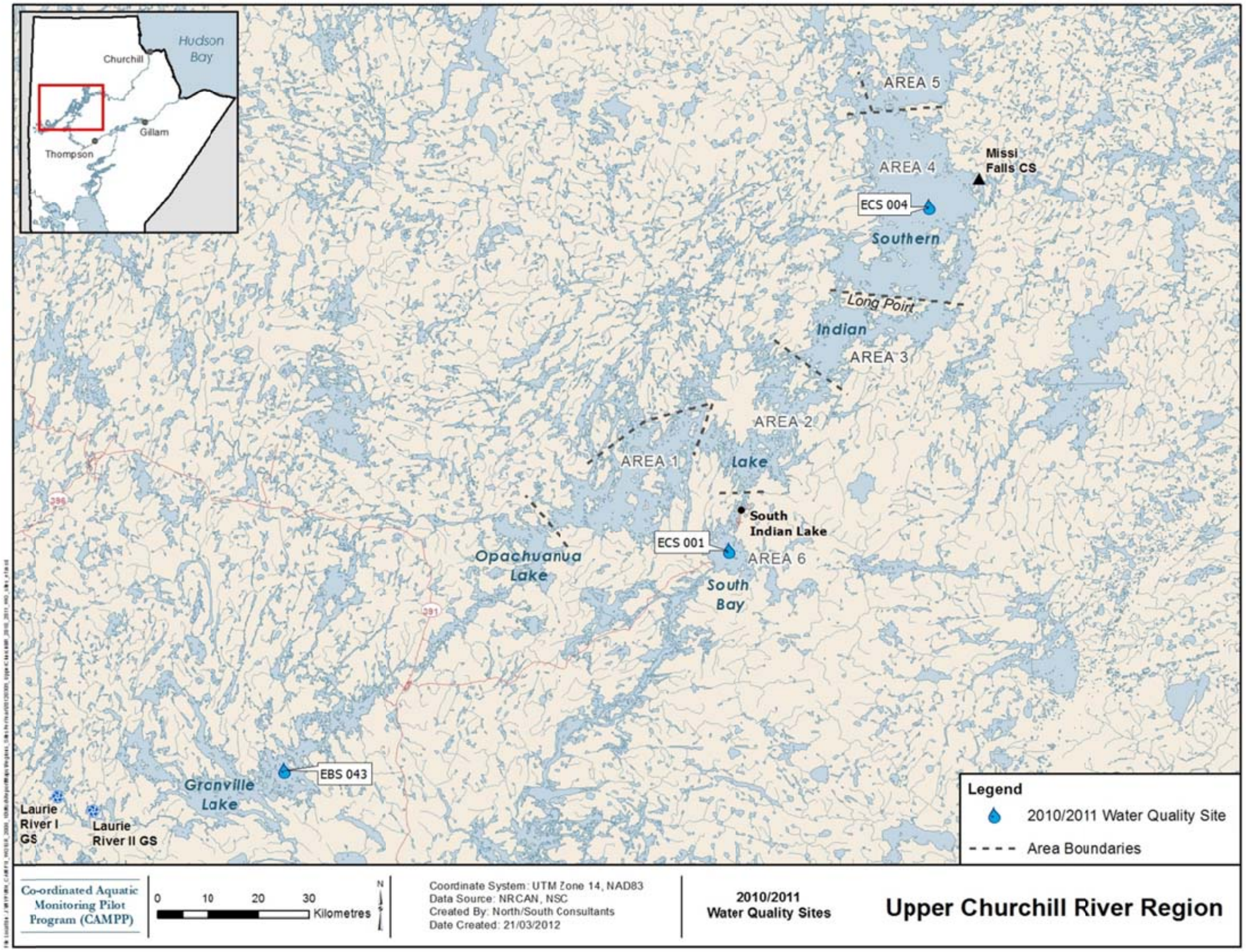


Figure 4.3-1. Water quality and phytoplankton monitoring sites in the Upper Churchill River Region: 2010/2011.

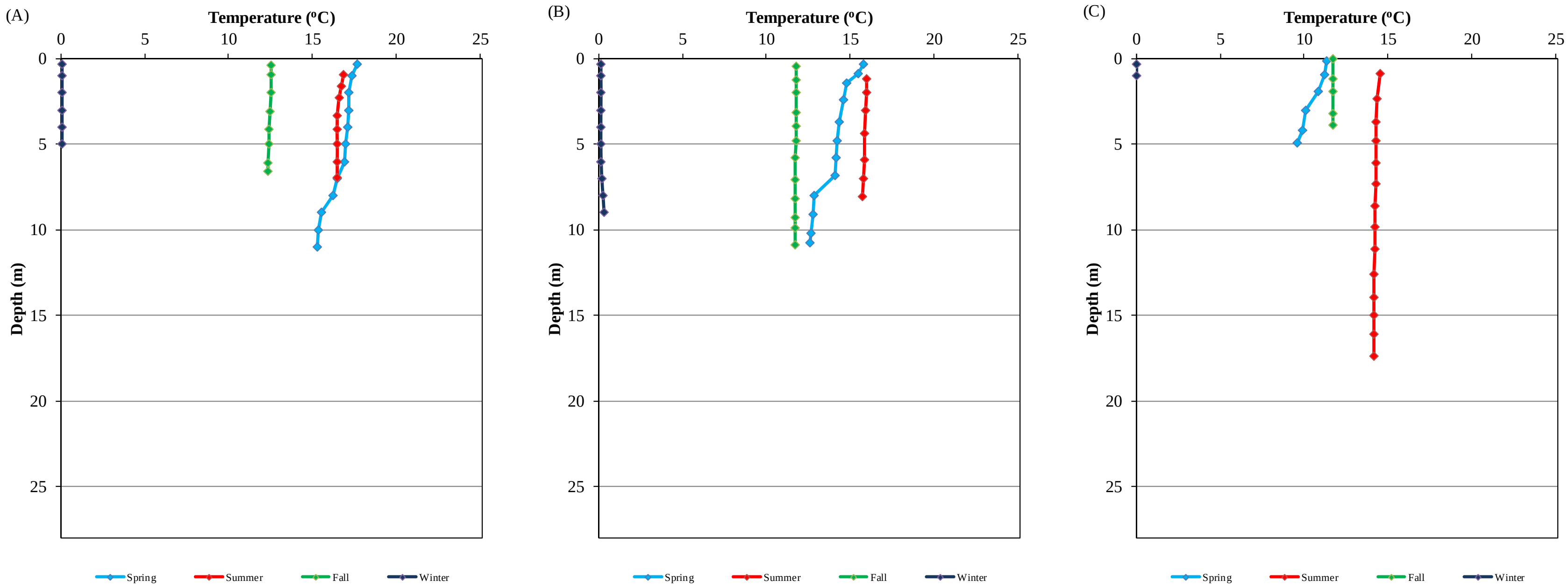


Figure 4.3-2. Water temperature profiles measured in the Upper Churchill River Region in 2010/2011: (A) Granville Lake; (B) Southern Indian Lake-Area 6 and (C) Southern Indian Lake-Area 4.

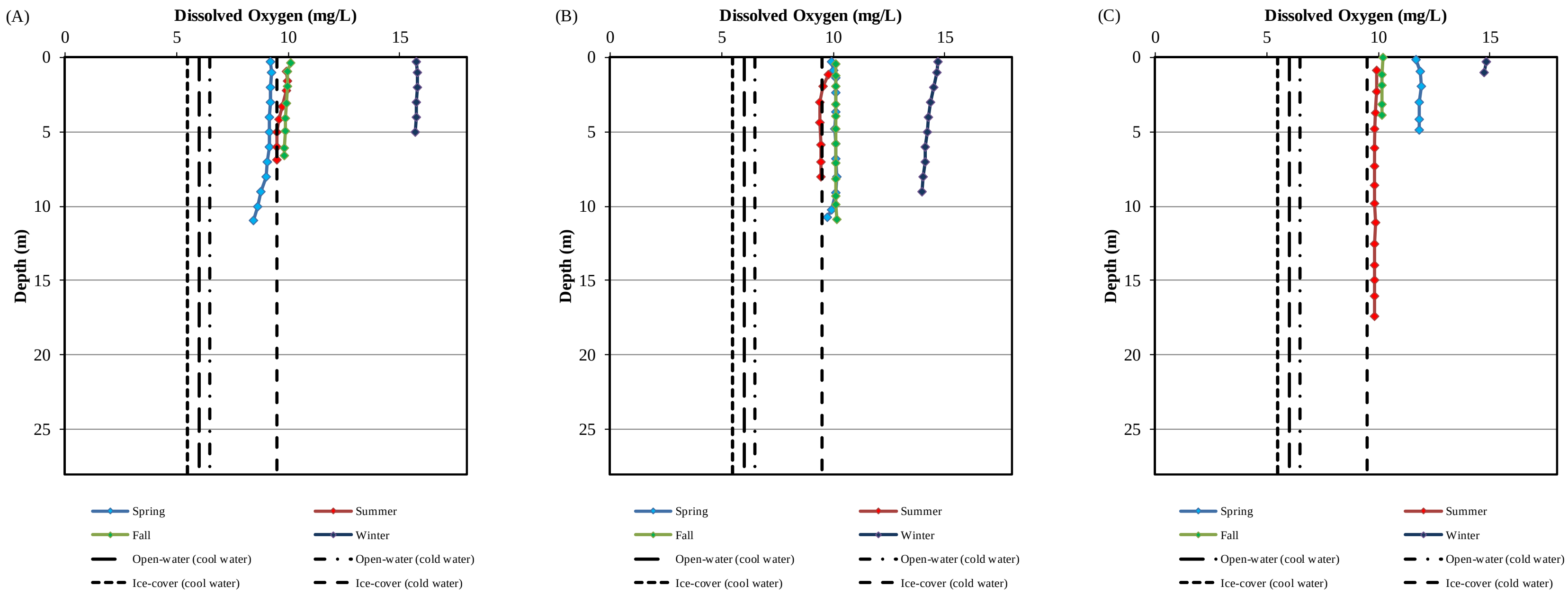


Figure 4.3-3. Dissolved oxygen depth profiles measured in the Upper Churchill River Region in 2010/2011: (A) Granville Lake; (B) Southern Indian Lake-Area 6 and (C) Southern Indian Lake-Area 4. Dashed lines represent selected MWQSOGs for PAL.

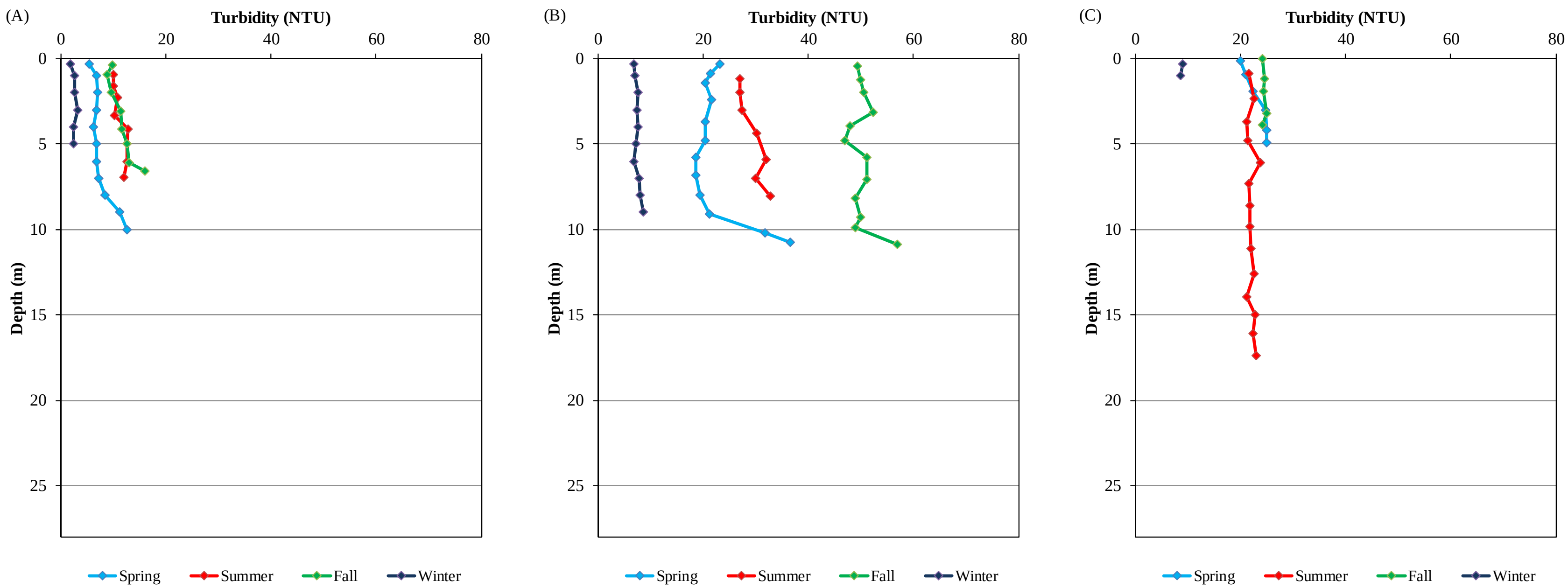


Figure 4.3-4. Turbidity depth profiles measured in the Upper Churchill River Region in 2010/2011: (A) Granville Lake; (B) Southern Indian Lake-Area 6 and (C) Southern Indian Lake-Area 4.

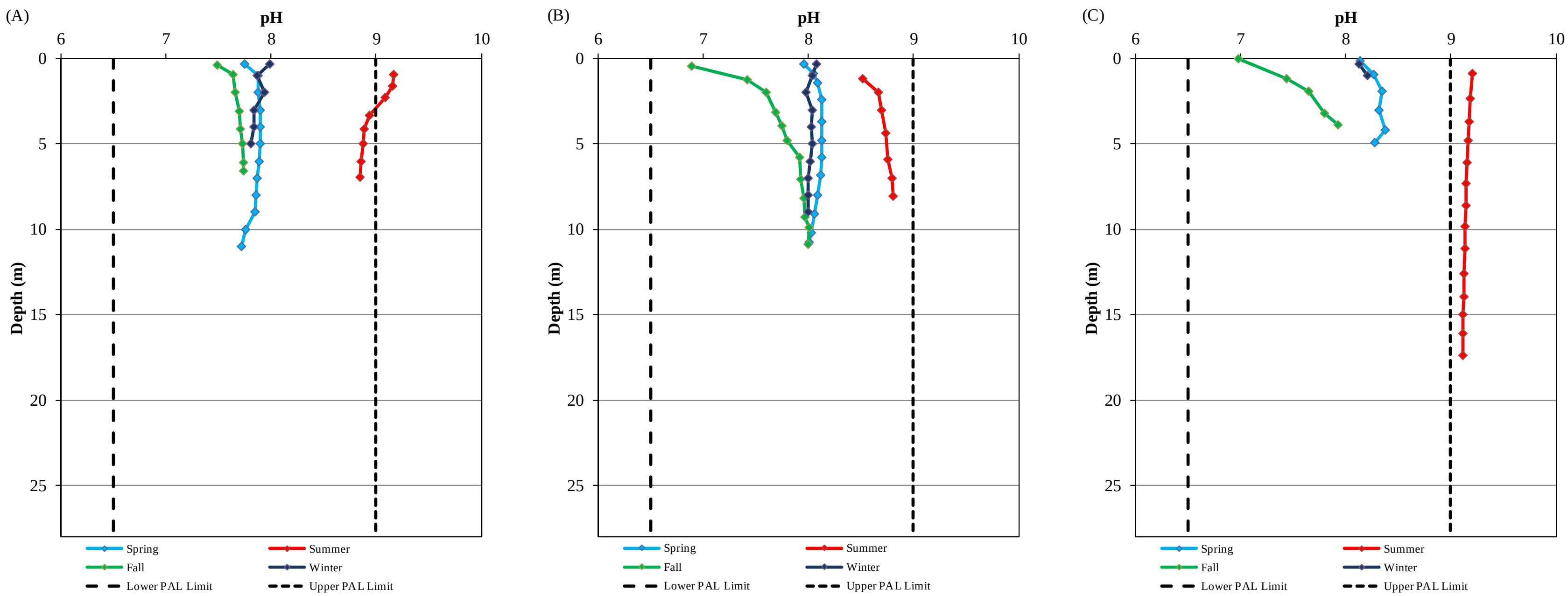


Figure 4.3-5. pH depth profiles measured in the Upper Churchill River Region in 2010/2011: (A) Granville Lake; (B) Southern Indian Lake-Area 6 and (C) Southern Indian Lake-Area 4. Dashed lines represent selected MWQSOGs for PAL.

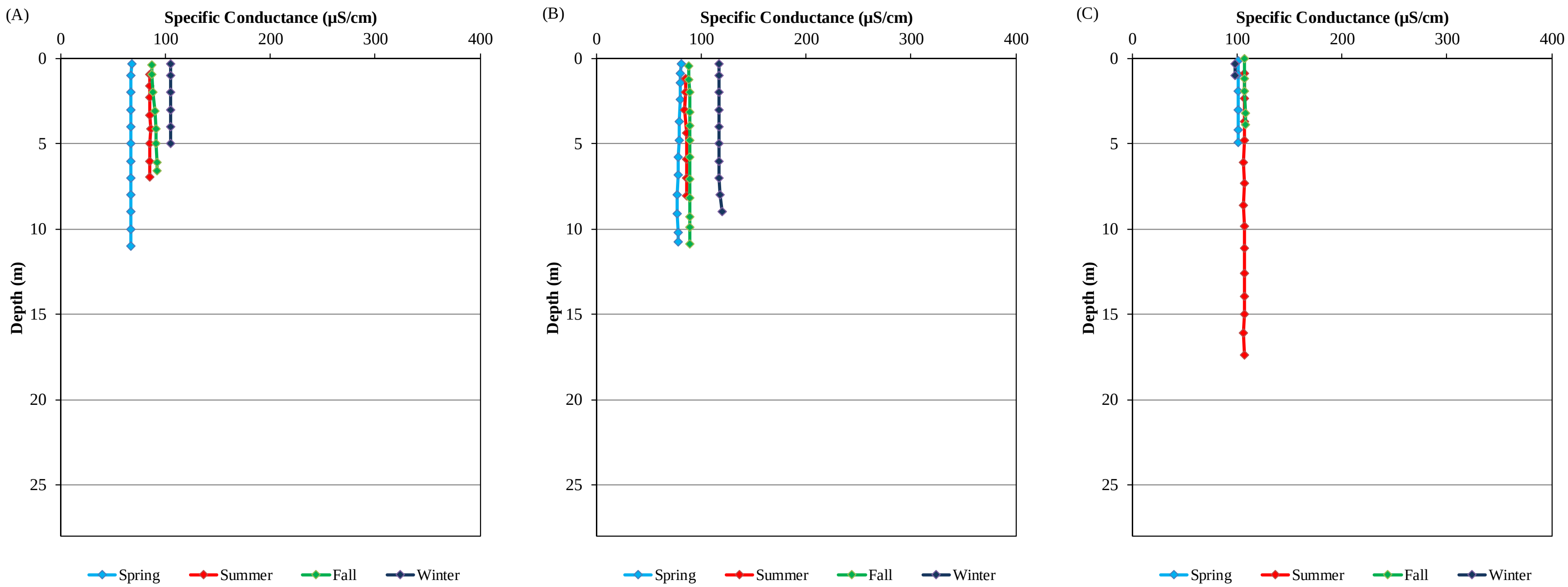


Figure 4.3-6. Specific conductance depth profiles measured in the Upper Churchill River Region in 2010/2011: (A) Granville Lake; (B) Southern Indian Lake-Area 6 and (C) Southern Indian Lake-Area 4.

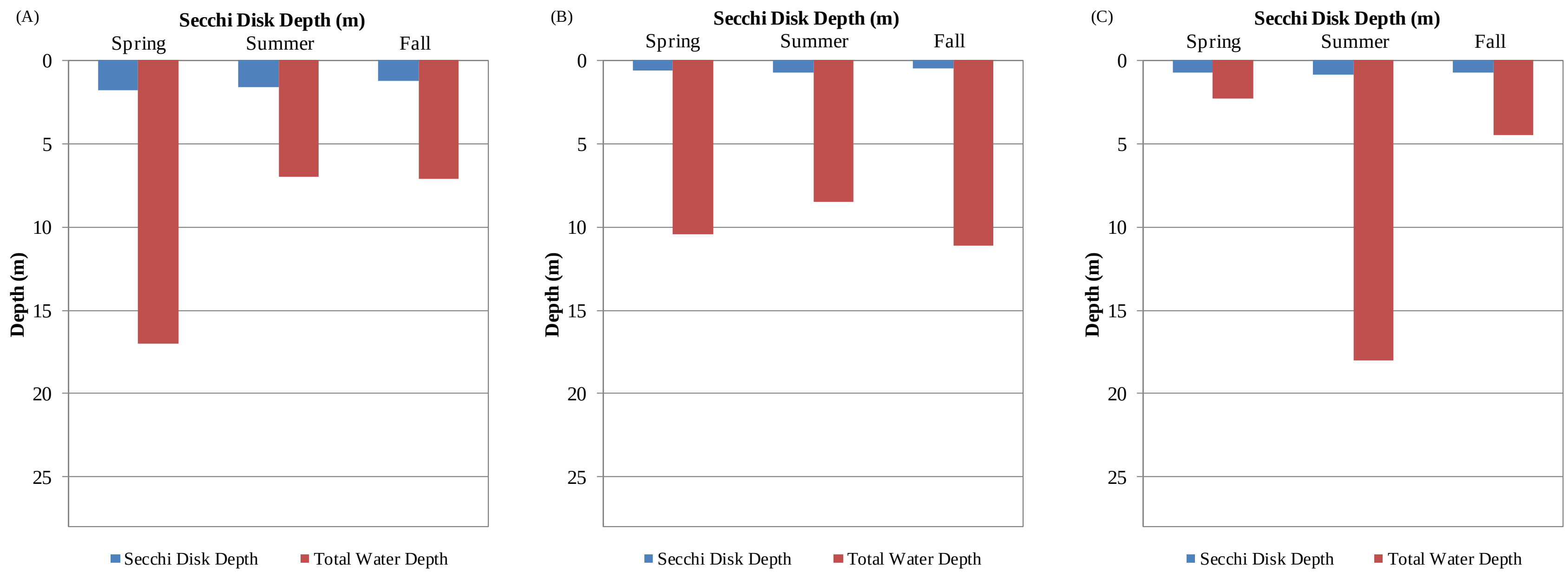


Figure 4.3-7. Secchi disk depths measured in the Upper Churchill River Region in 2010/2011: (A) Granville Lake; (B) Southern Indian Lake-Area 6 and (C) Southern Indian Lake-Area 4.

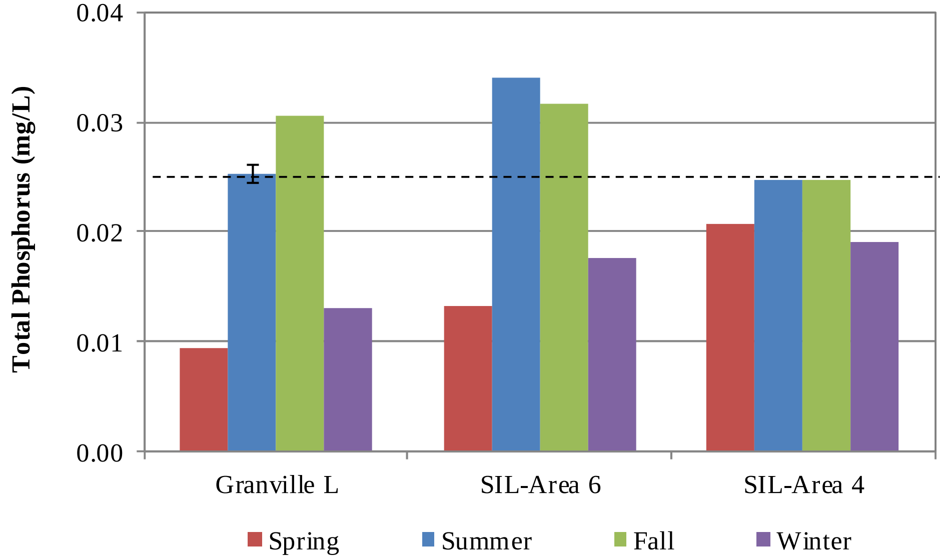


Figure 4.3-8. Total phosphorus measured in surface grabs in the Upper Churchill River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

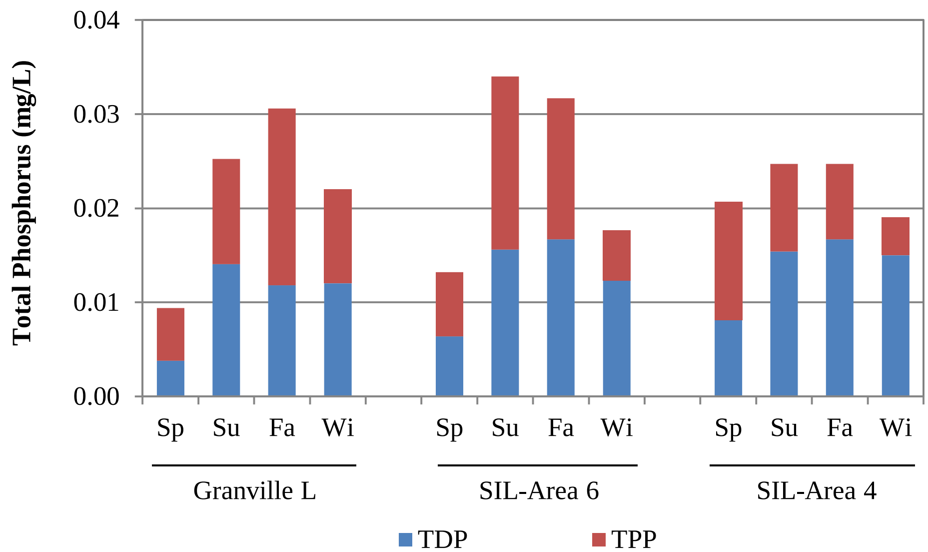


Figure 4.3-9. Particulate (TPP) and dissolved phosphorus (TDP) fractions measured in the Upper Churchill River Region: 2010/2011.

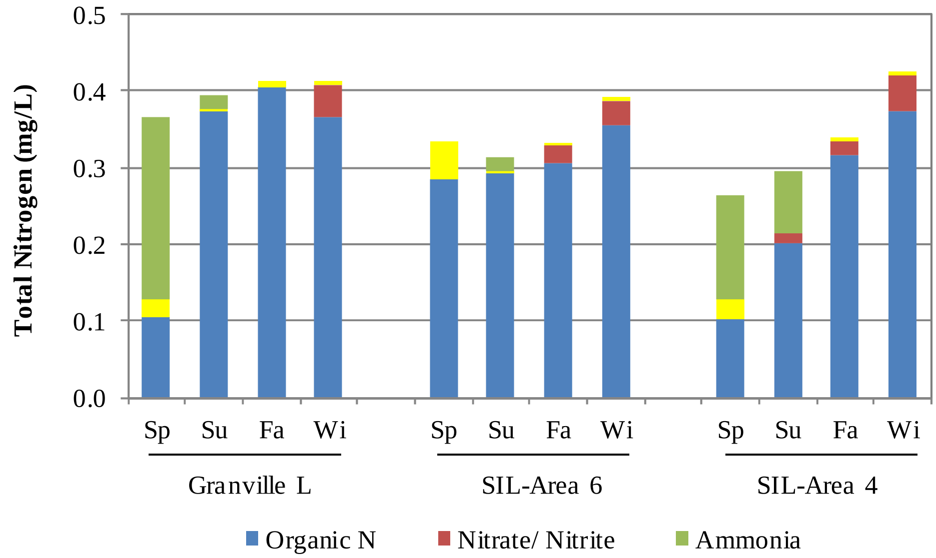


Figure 4.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Upper Churchill River Region: 2010/2011. Yellow bars represent values that were below the analytical detection limit.

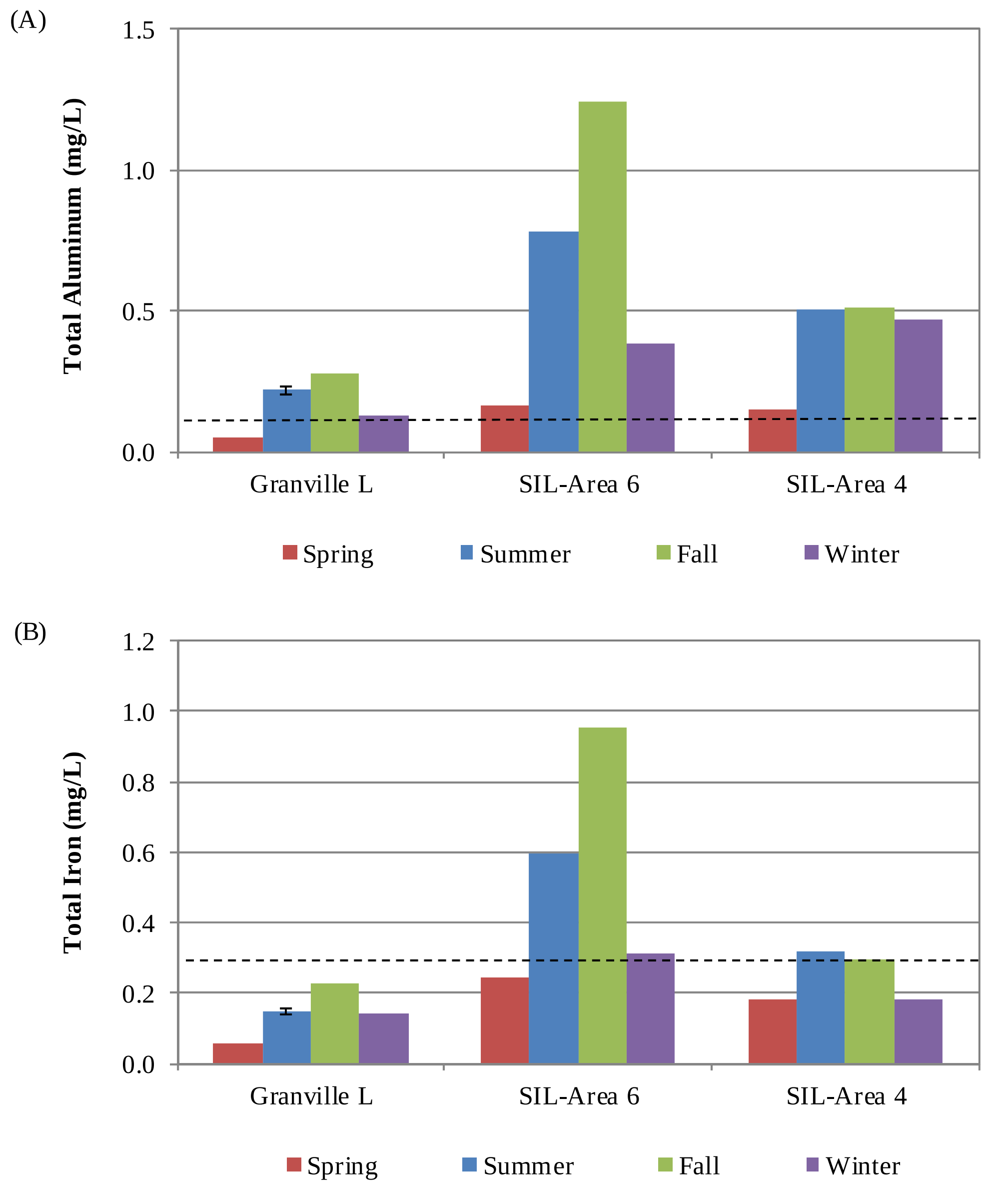


Figure 4.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Upper Churchill River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

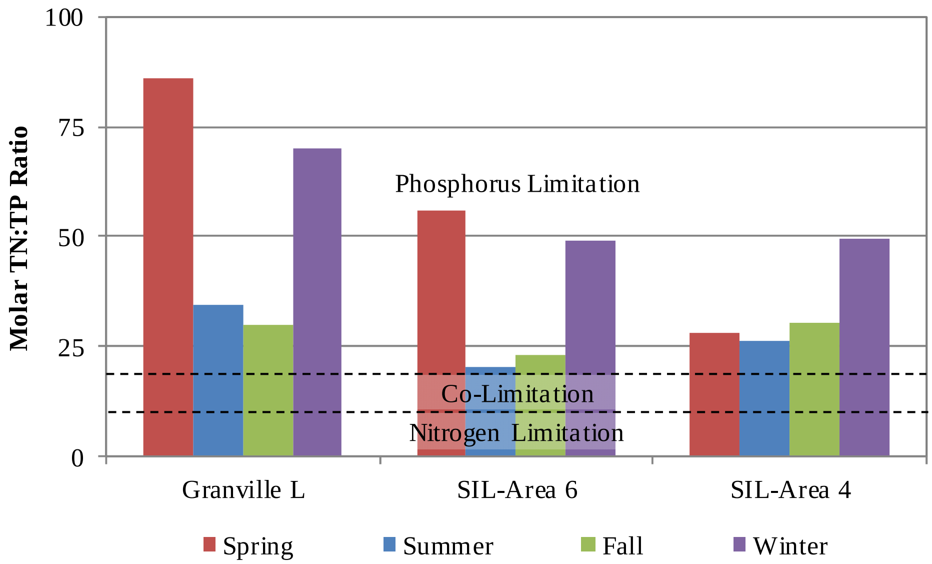


Figure 4.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Upper Churchill River Region: 2010/2011.

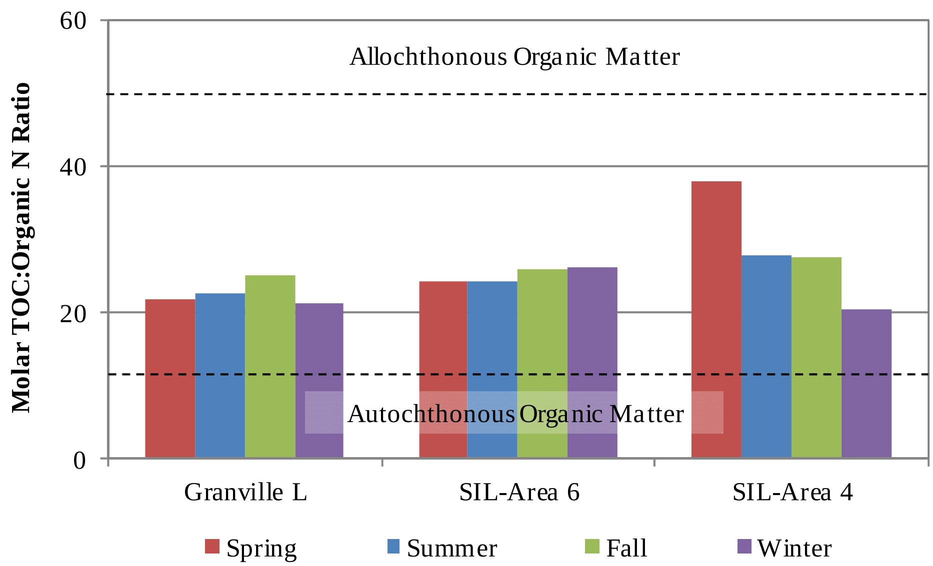


Figure 4.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Upper Churchill River Region: 2010/2011.

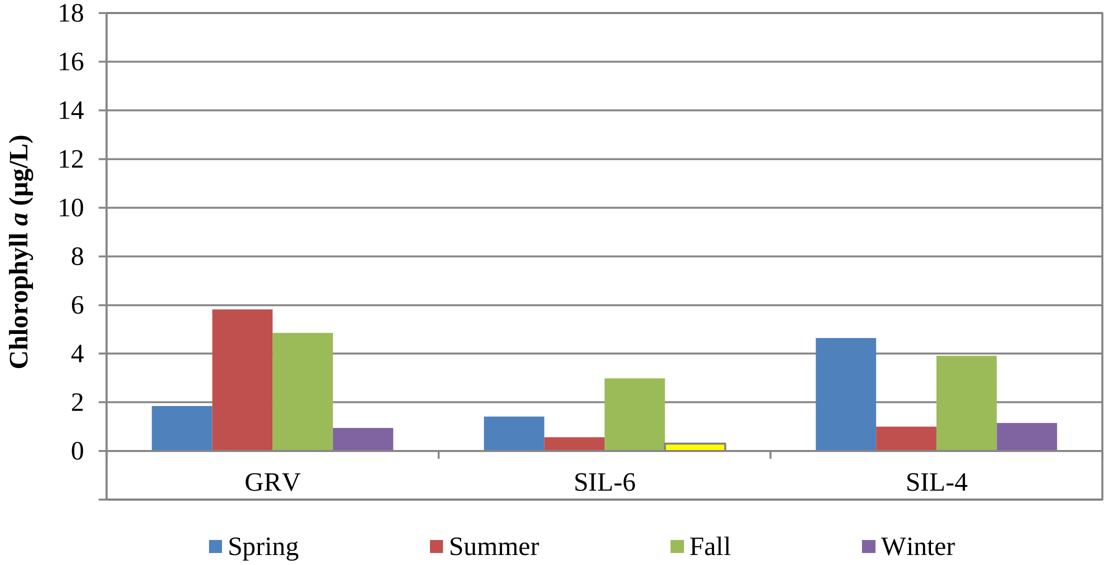


Figure 4.4-1. Chlorophyll *a* concentrations measured within the euphotic zone at sites in the Upper Churchill River Region in 2010/2011. Yellow bars represent values that were below the analytical detection limit.

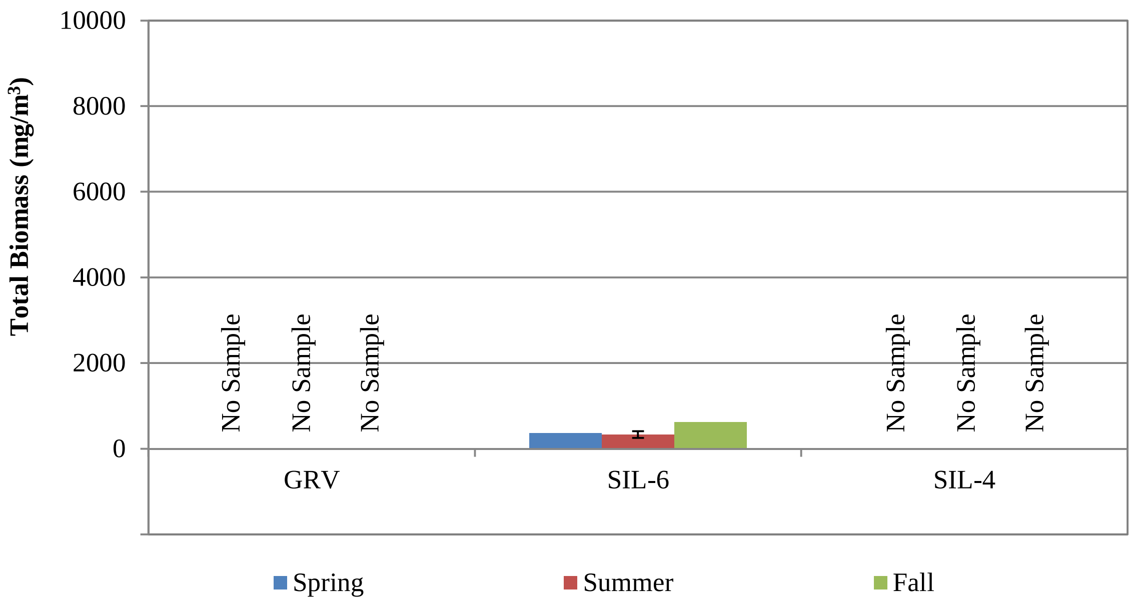


Figure 4.4-2. Phytoplankton biomass measured at sites in the Upper Churchill River Region during the 2010/2011 open-water period. Standard error of two analytical counts is shown for SIL-6 in summer.

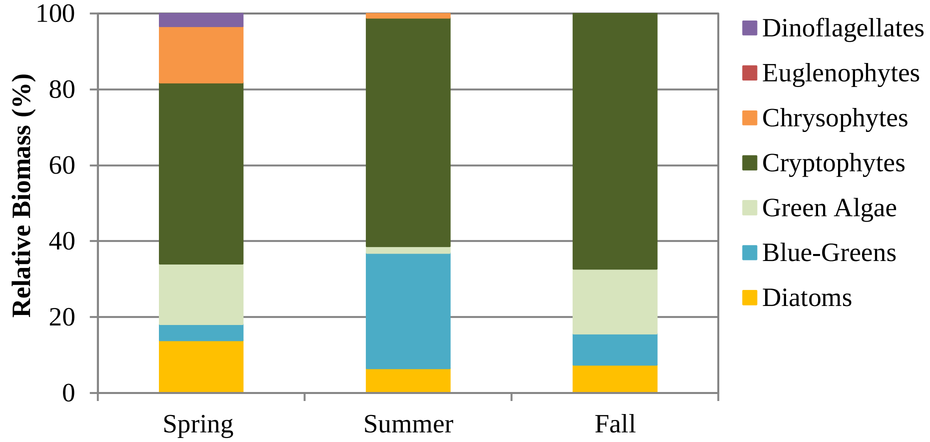


Figure 4.4-3. Phytoplankton community composition at Southern Indian Lake-Area 6 in 2010/2011.

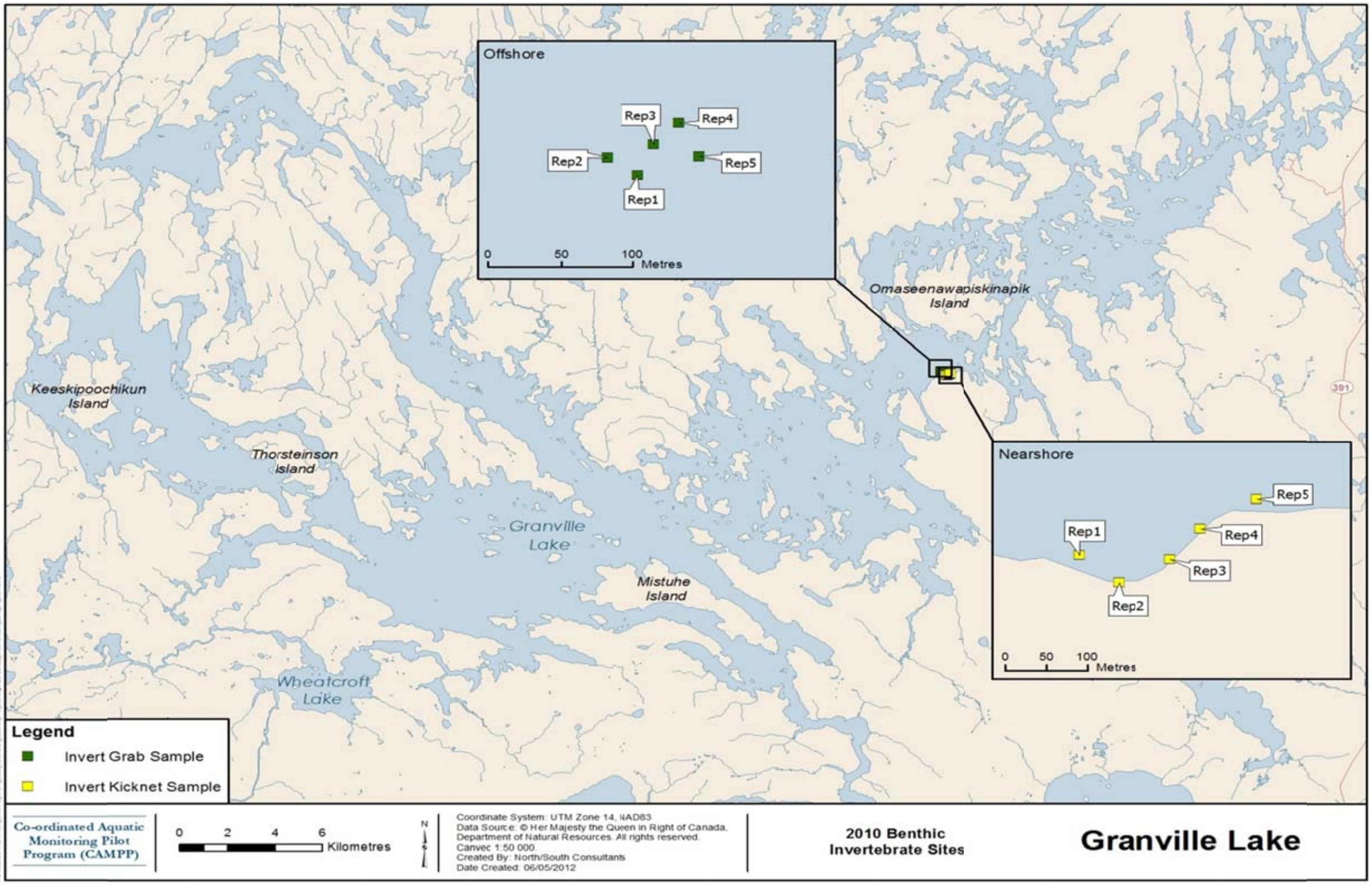


Figure 4.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Granville Lake in the Upper Churchill River Region, 2010.

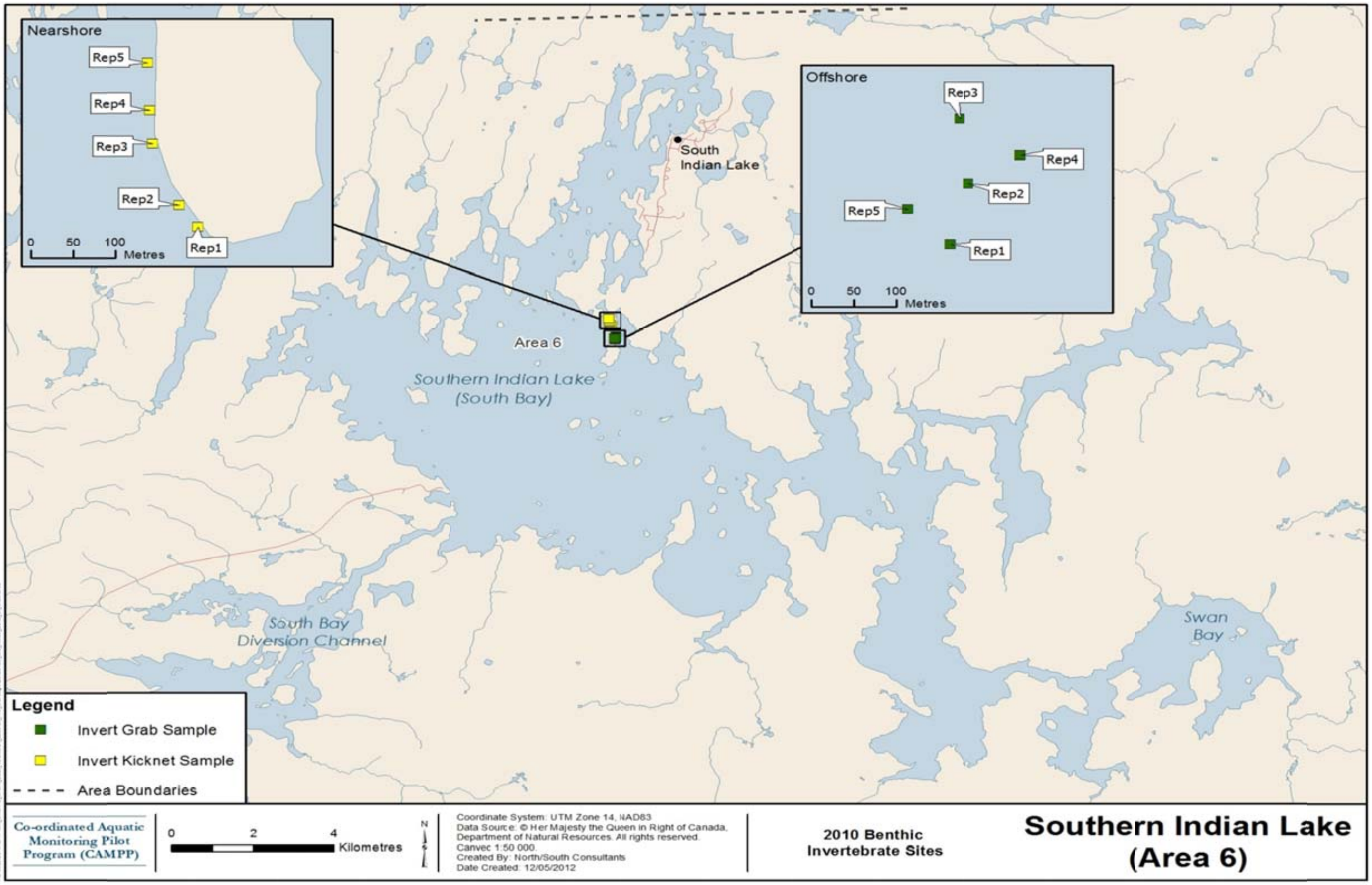


Figure 4.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Southern Indian Lake-Area 6 in the Upper Churchill River Region, 2010.

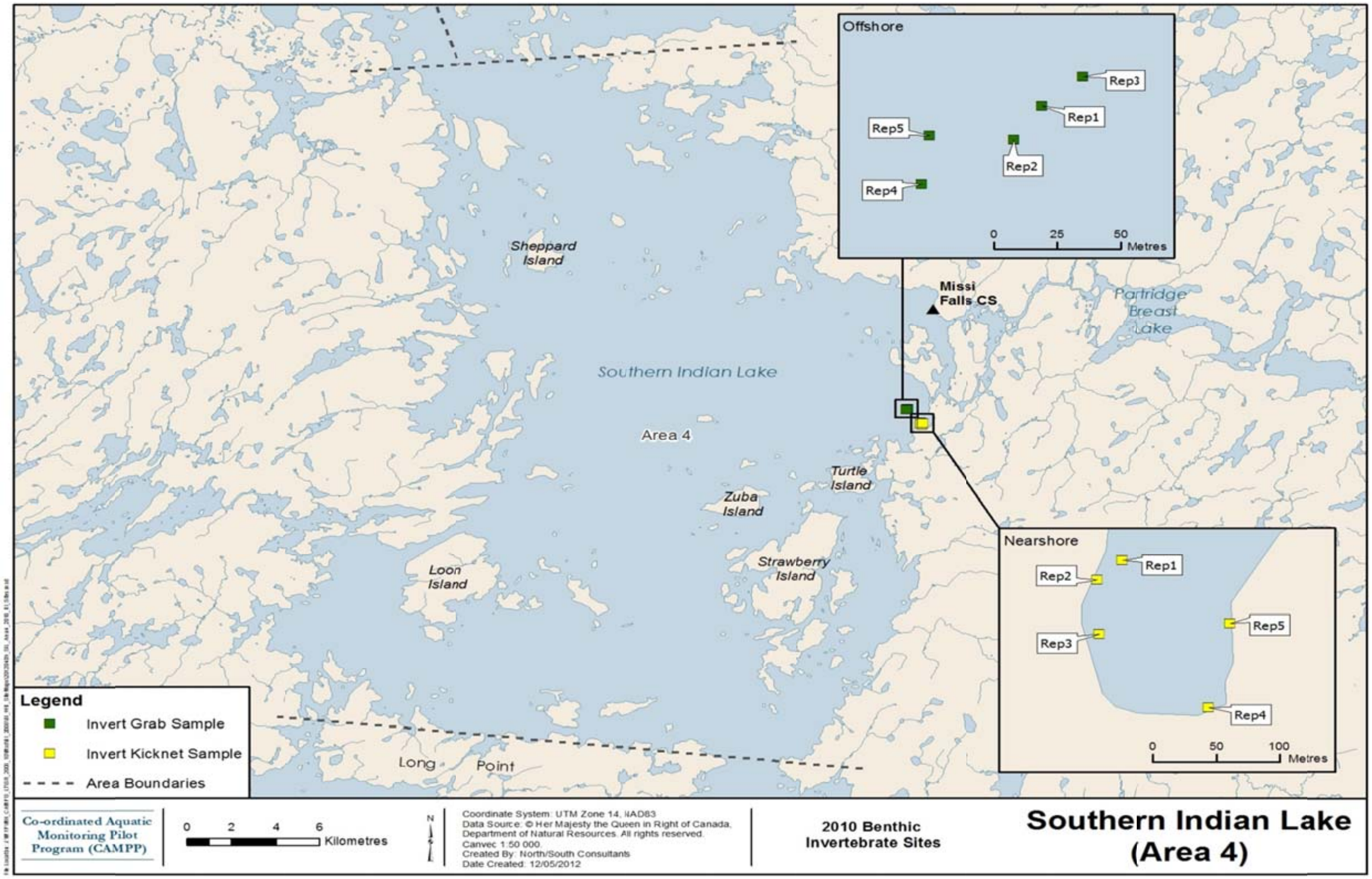


Figure 4.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Southern Indian Lake-Area 4 in the Upper Churchill River Region, 2010.

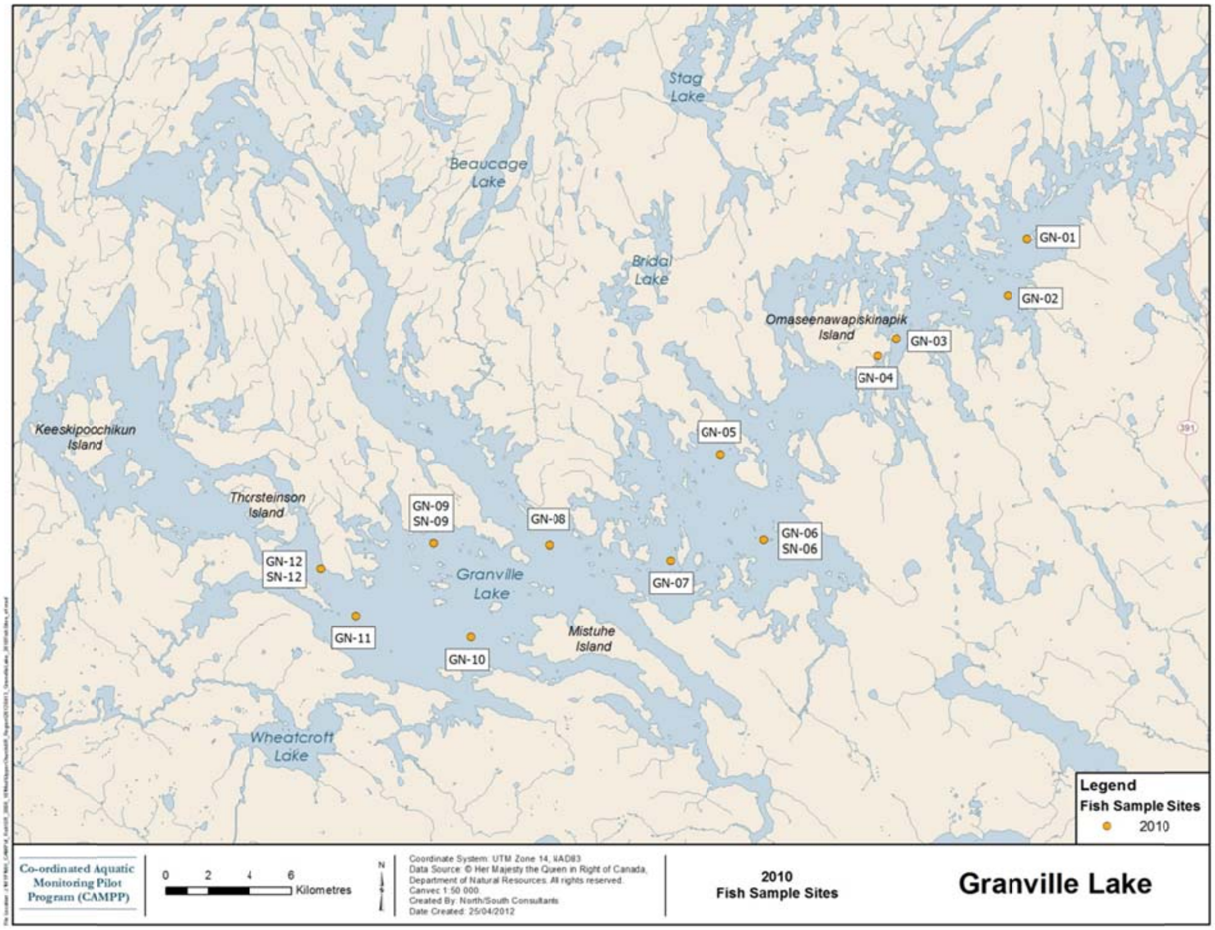


Figure 4.6-1. Map depicting standard gang (GN) and small mesh (SN) index gillnet sites sampled in Granville Lake, 2010.

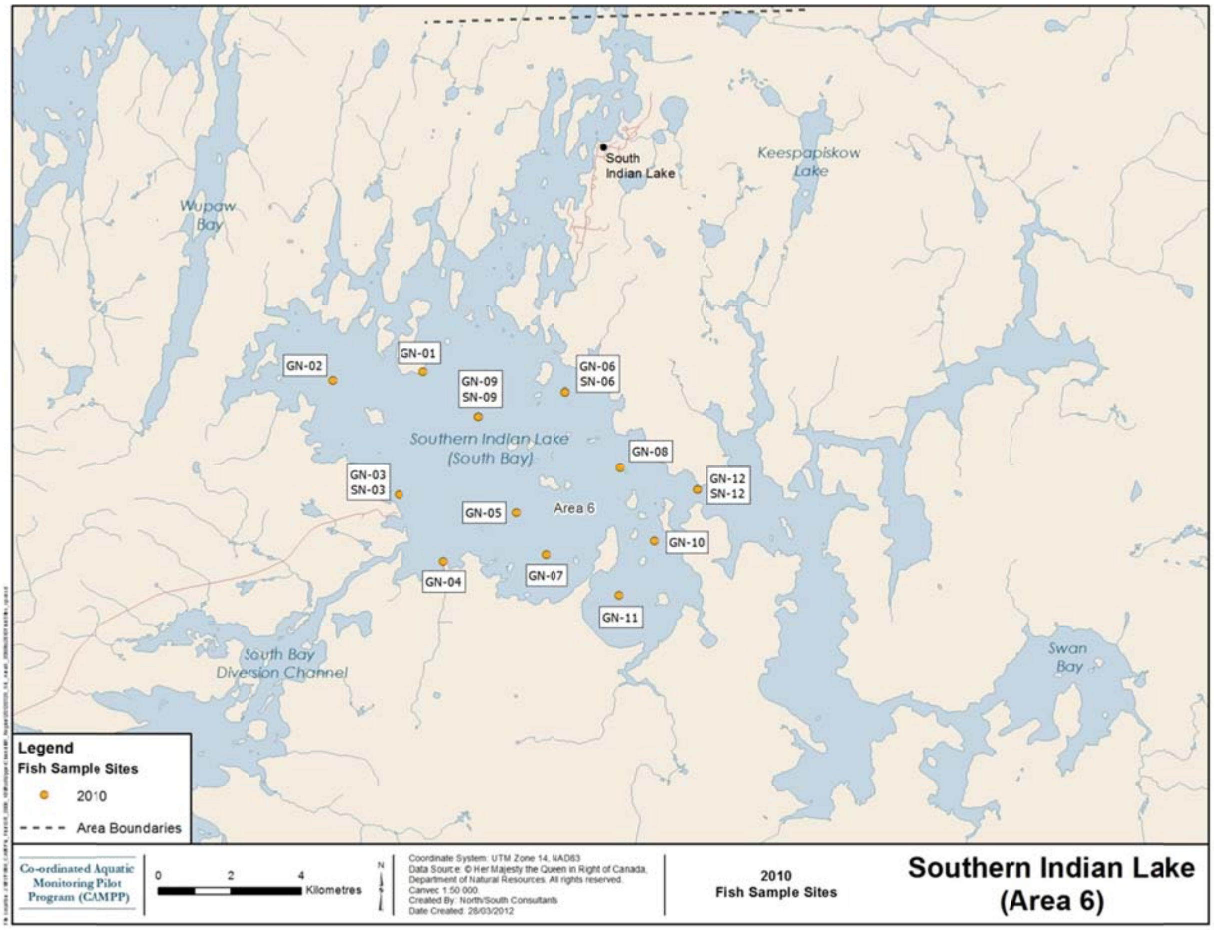


Figure 4.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Southern Indian Lake – Area 6, 2010.

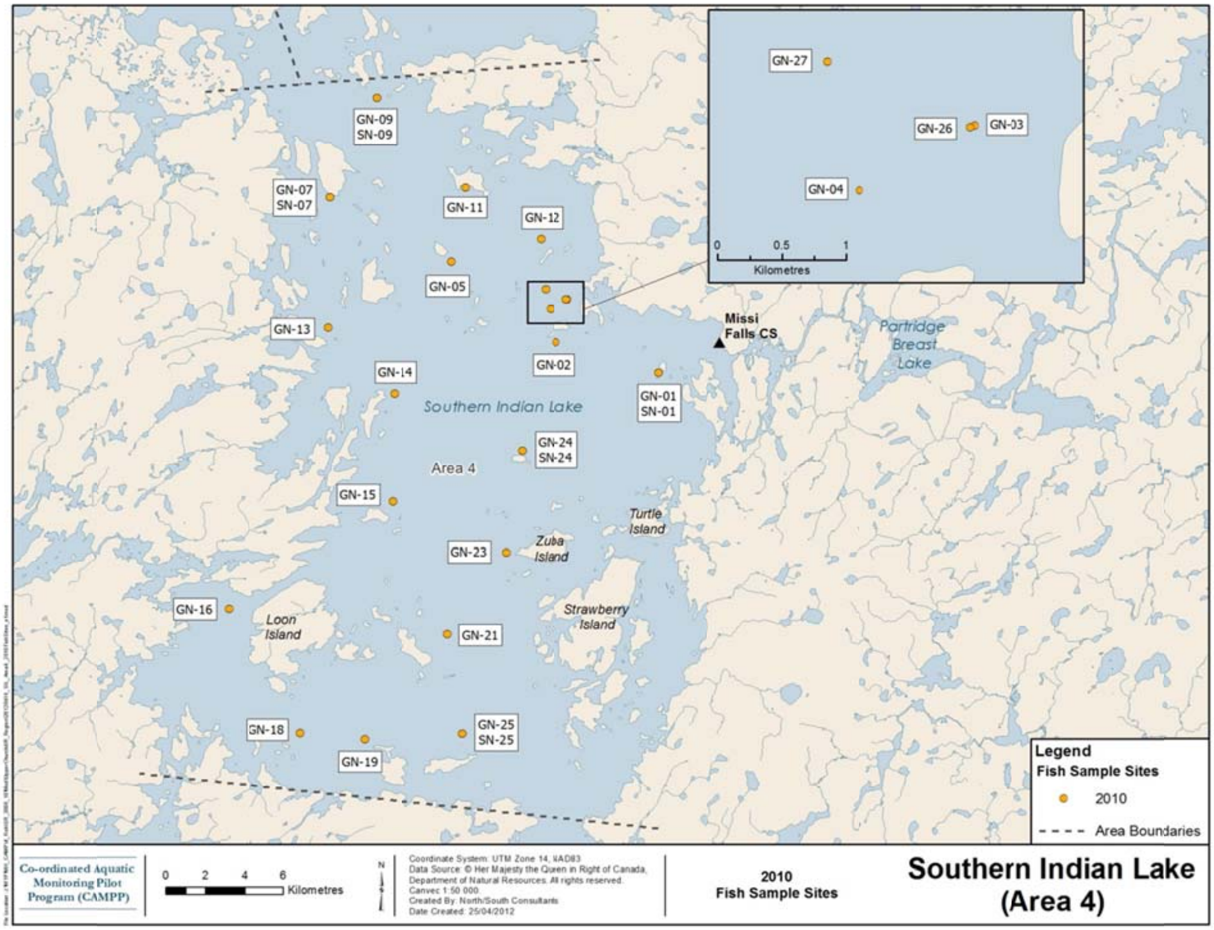


Figure 4.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Southern Indian Lake – Area 4, 2010.

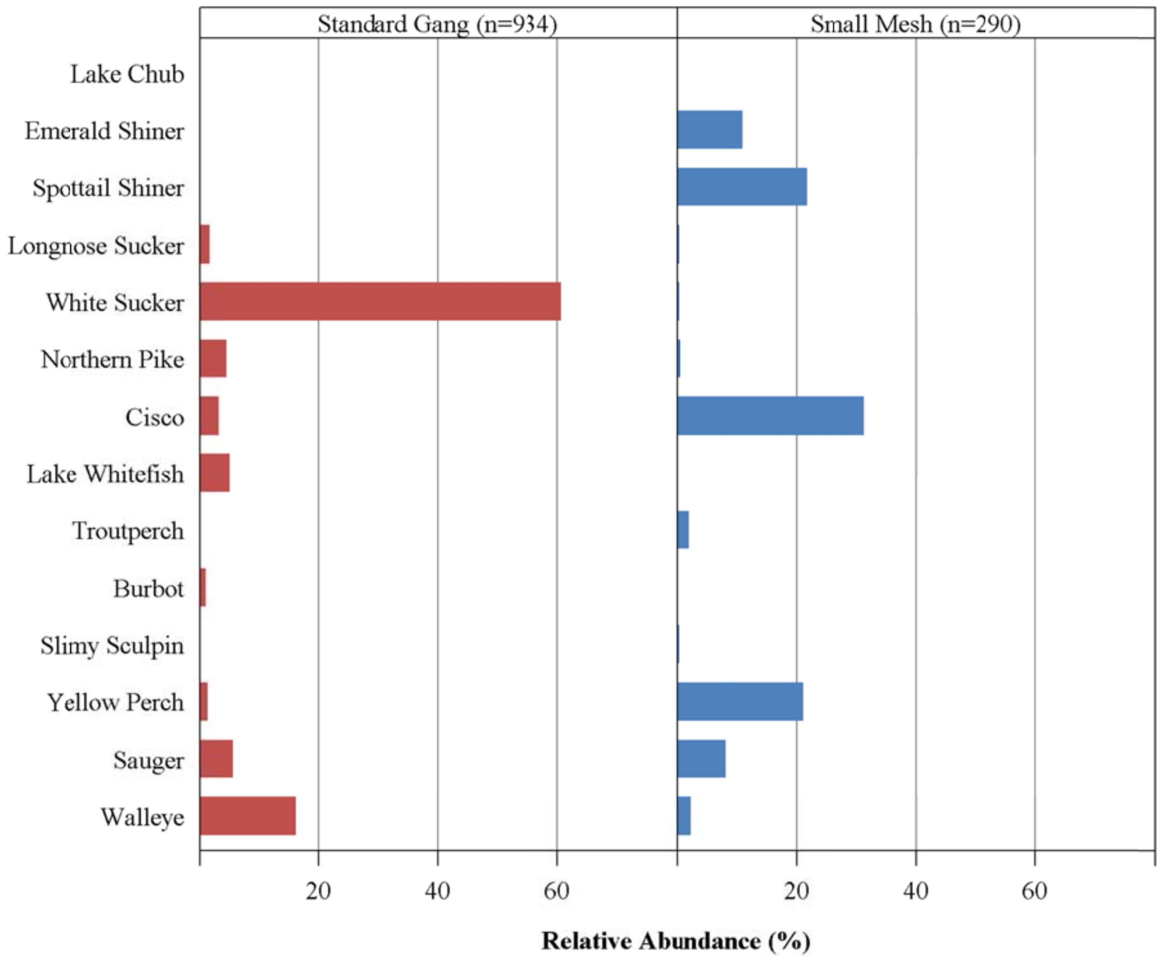


Figure 4.6-4. Relative abundance (%) distributions for fish captured in (A) standard gang and (B) small mesh index gill nets set in Granville Lake, 2010.

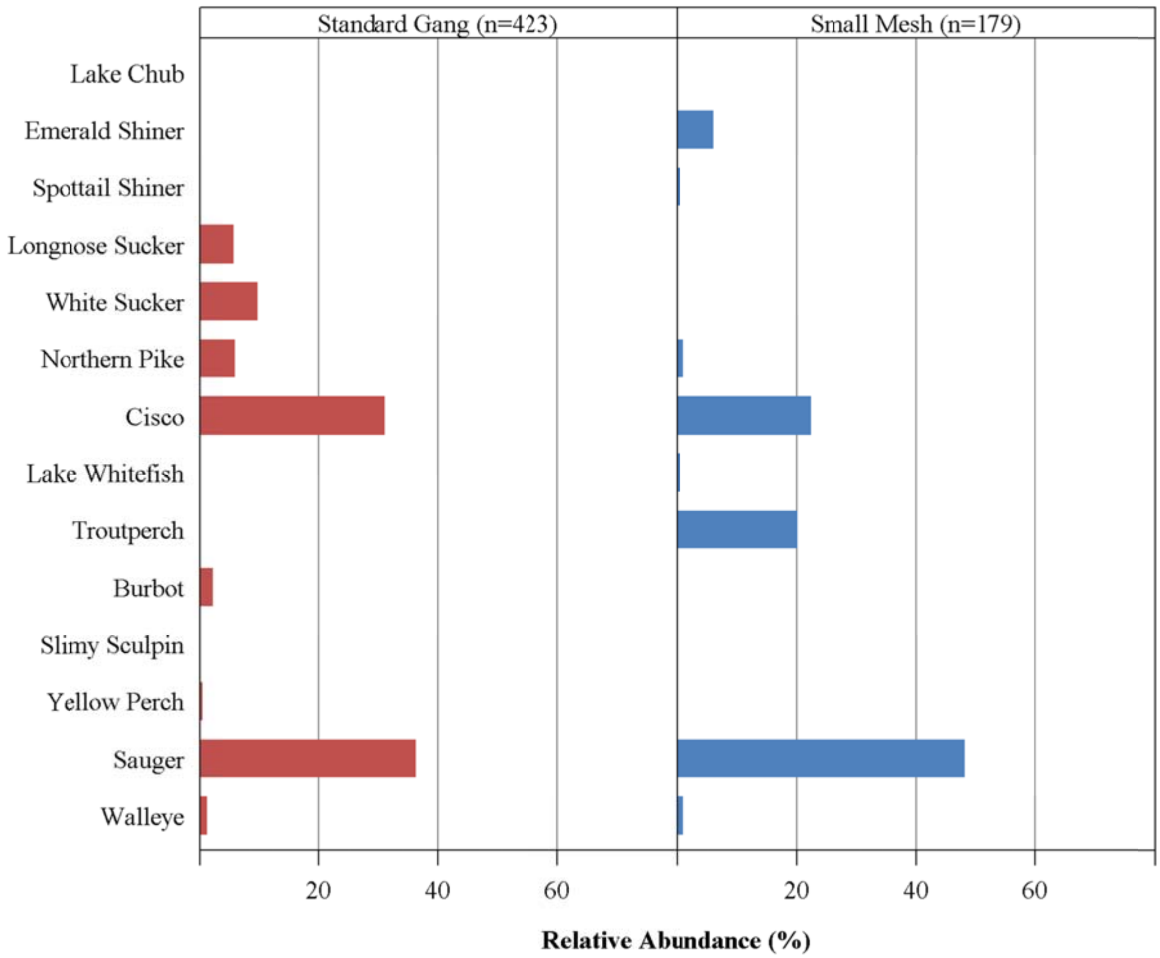


Figure 4.6-5. Relative abundance (%) distributions for fish captured in (A) standard gang and (B) small mesh index gill nets set in Southern Indian Lake – Area 6, 2010.

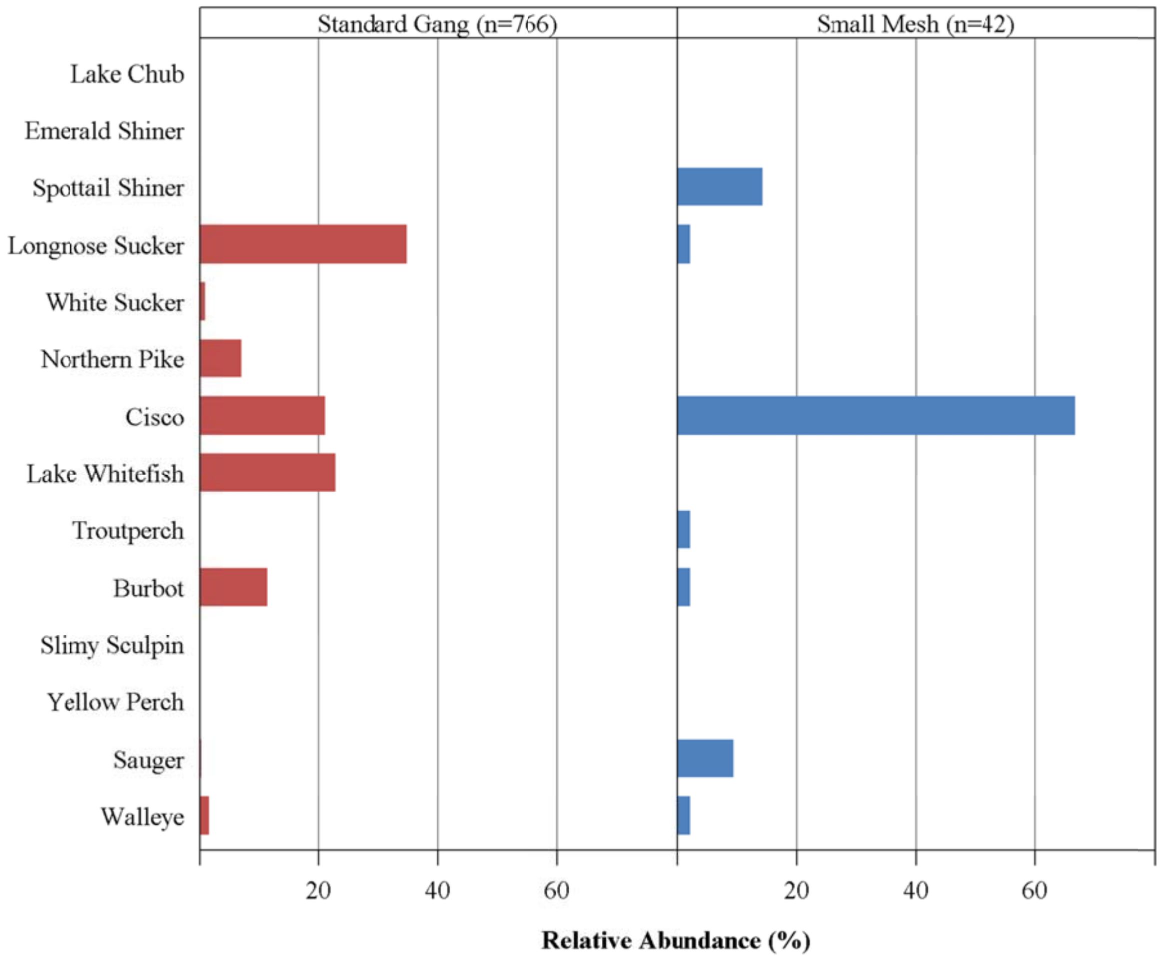


Figure 4.6-6. Relative abundance (%) distributions for fish captured in (A) standard gang and (B) small mesh index gill nets set in Southern Indian Lake – Area 4, 2010.

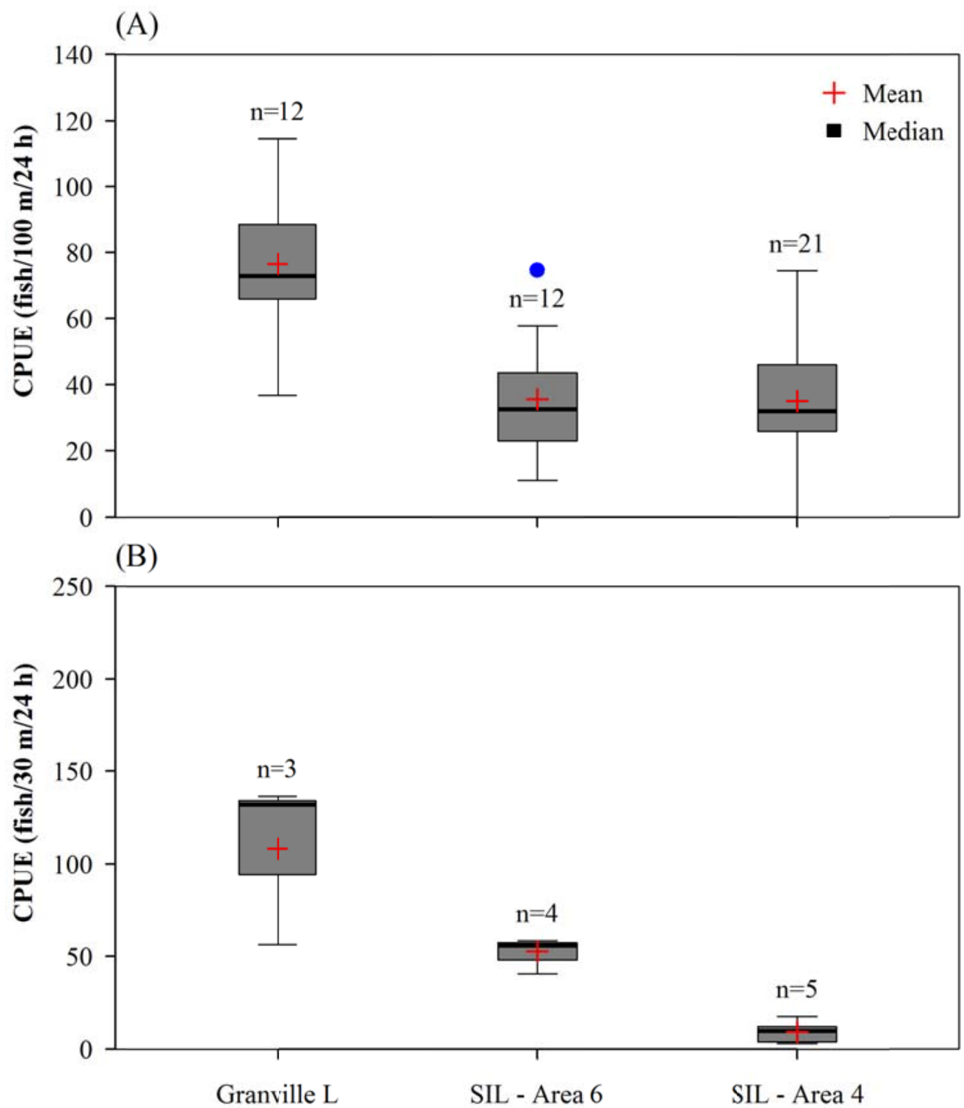


Figure 4.6-7. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Upper Churchill River Region waterbodies, 2010.

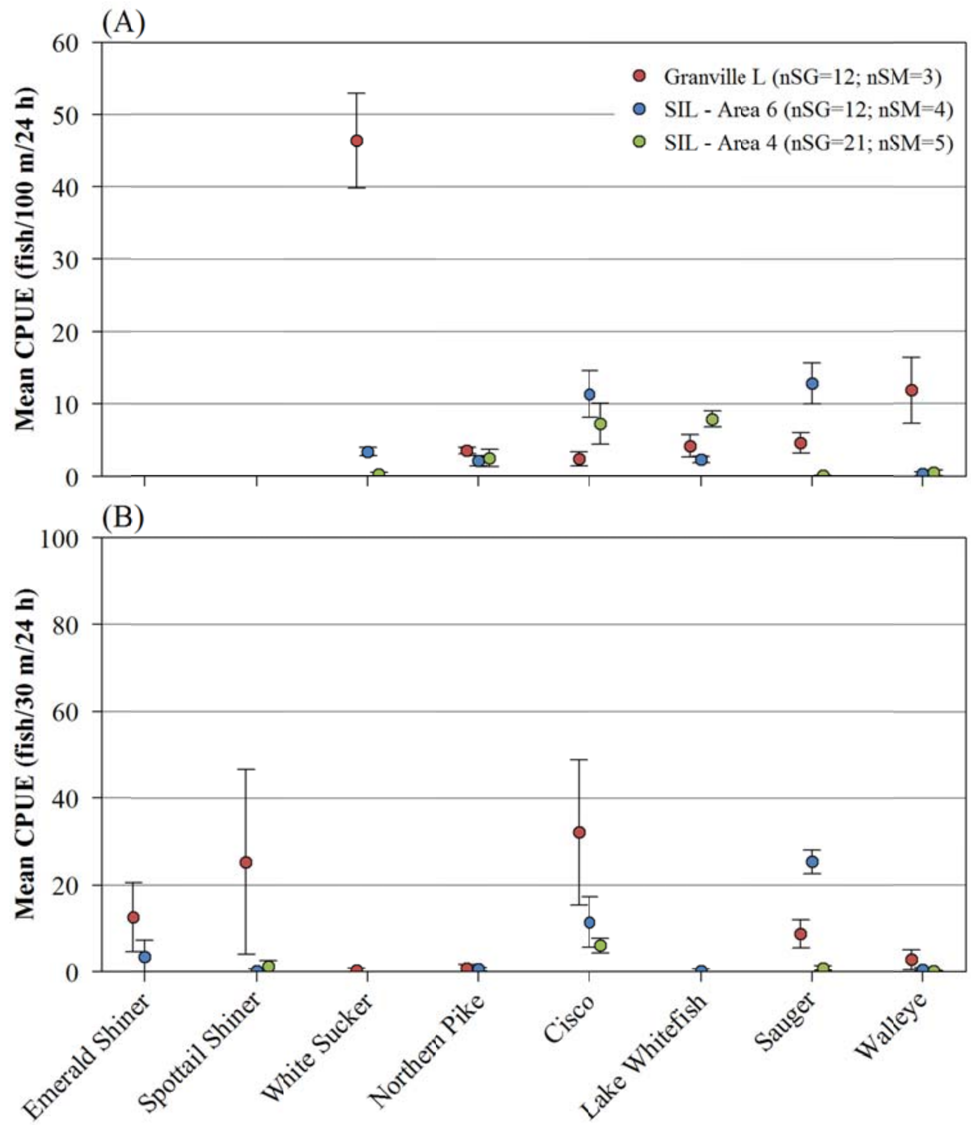


Figure 4.6-8. Mean (SE) CPUE calculated for a subset of fish species captured in (A) standard gang (B) small mesh index fill nets set in Upper Churchill River waterbodies 2010.

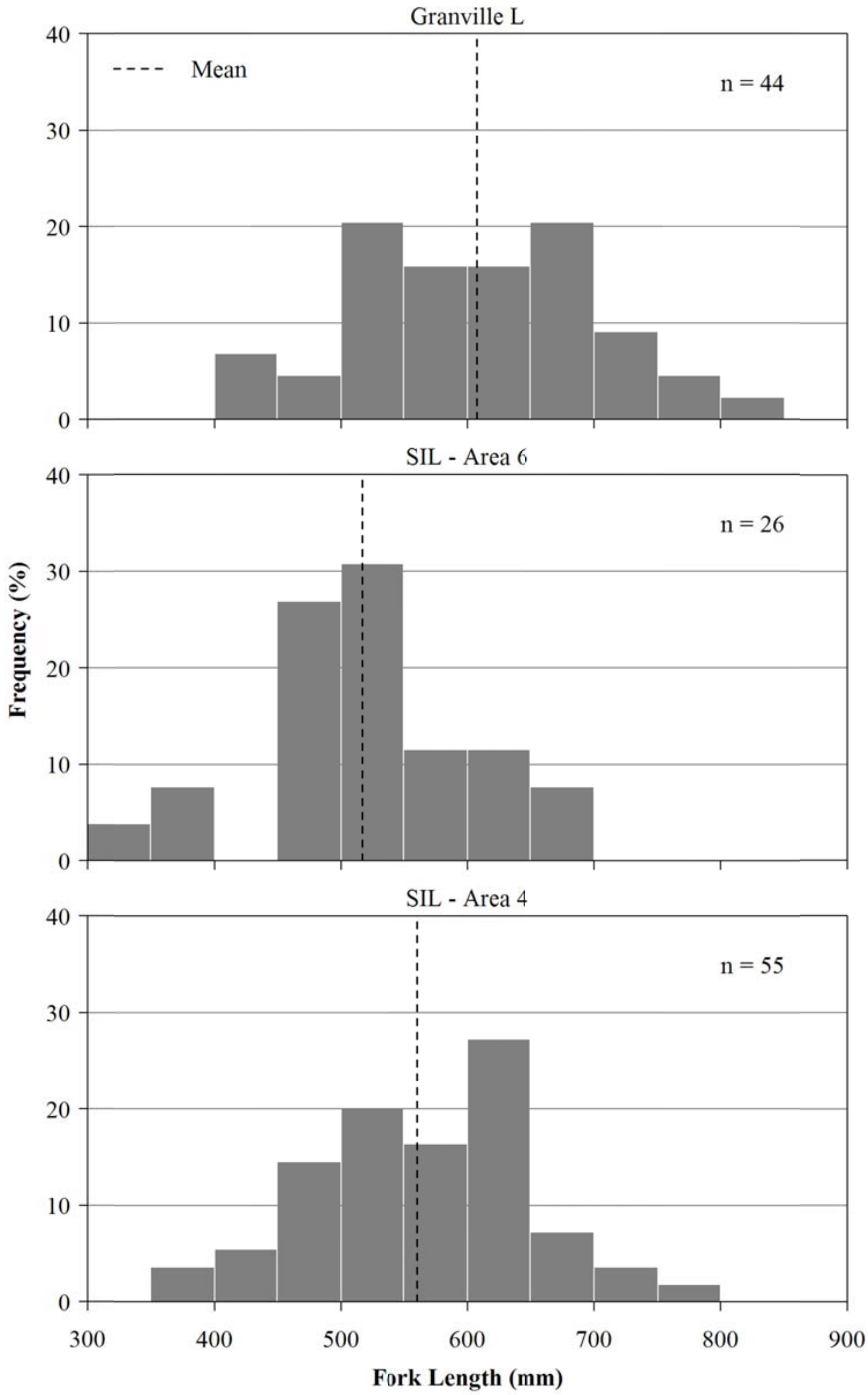


Figure 4.6-9. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2010.

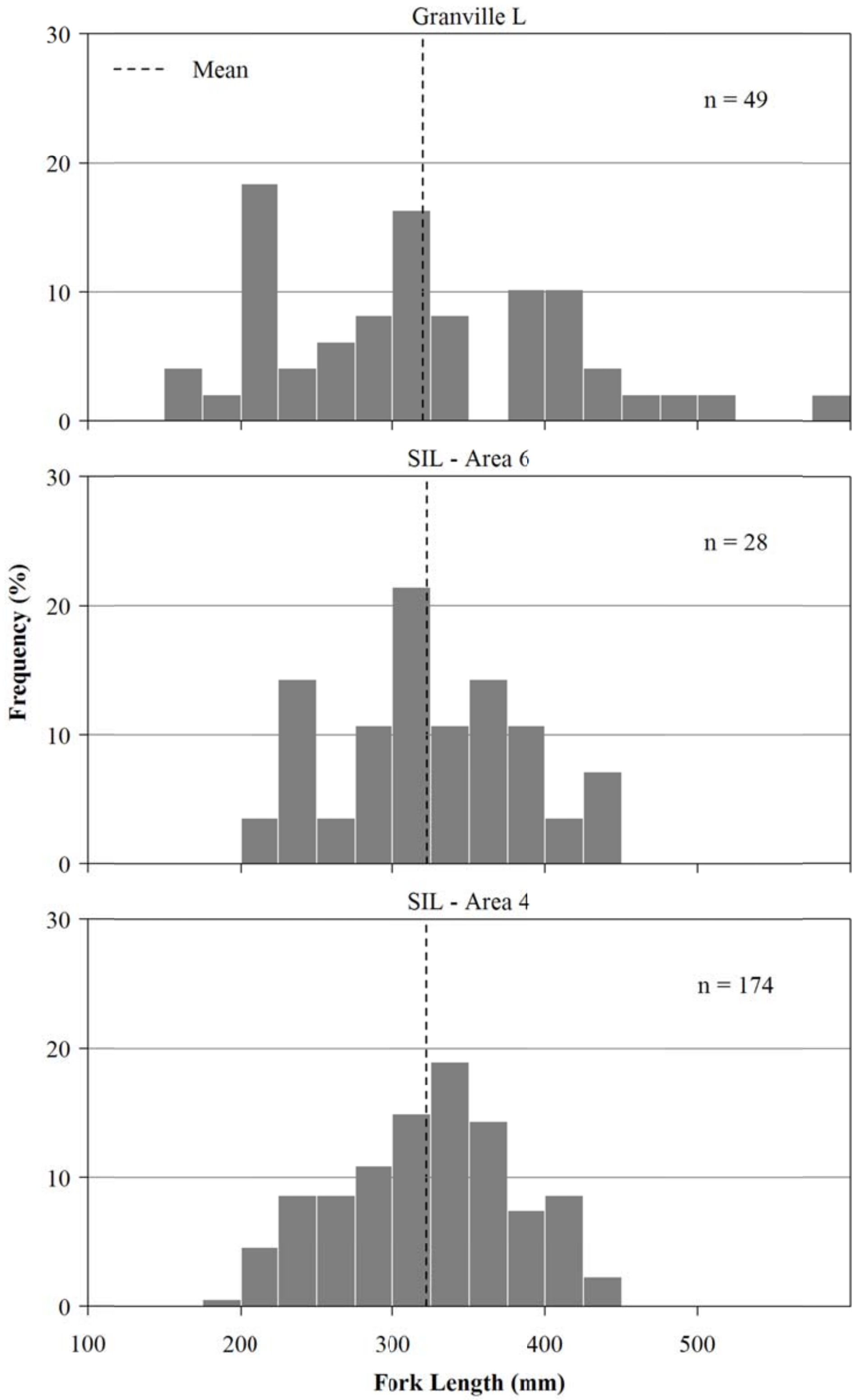


Figure 4.6-10. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2010.

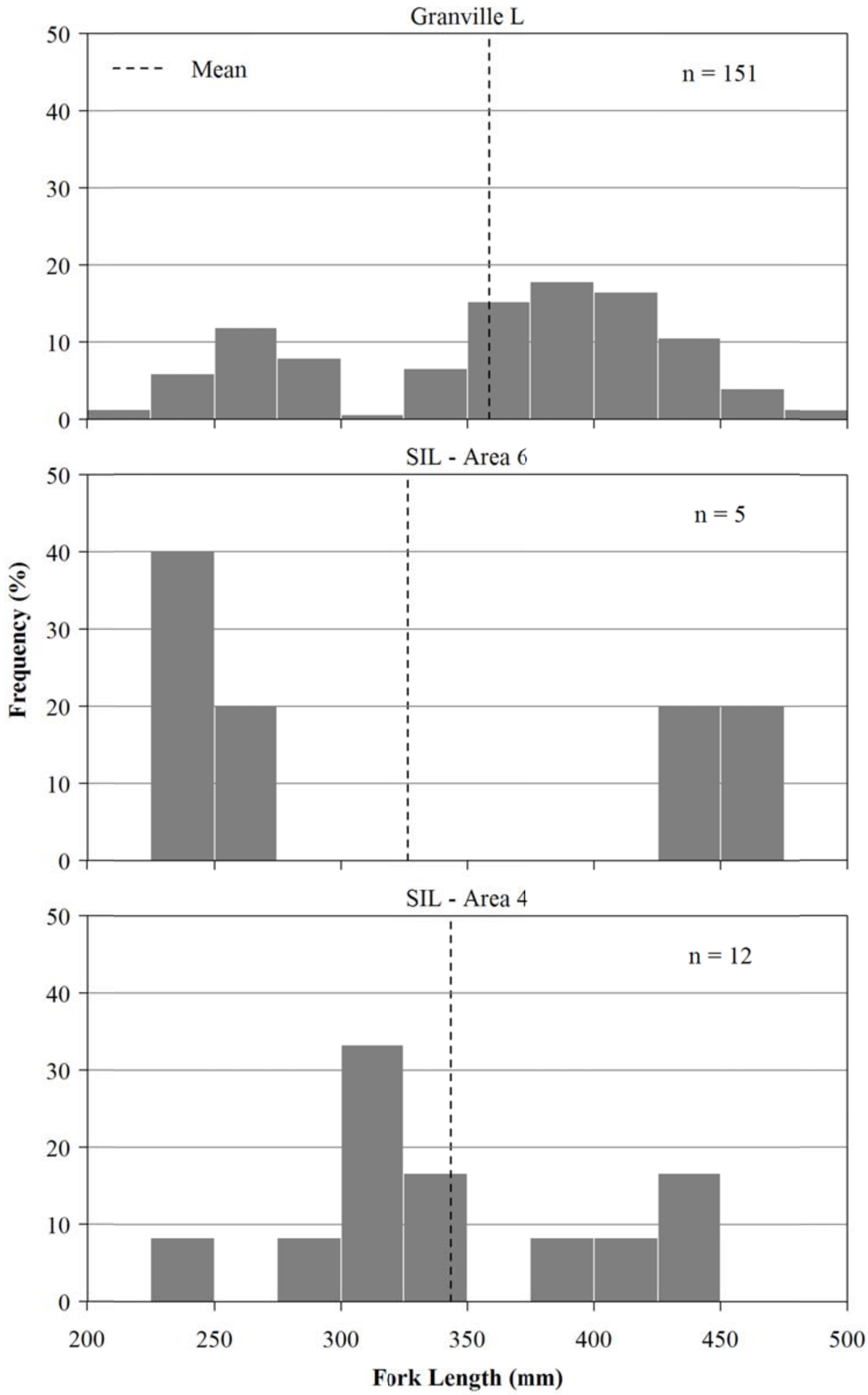


Figure 4.6-11. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2010.

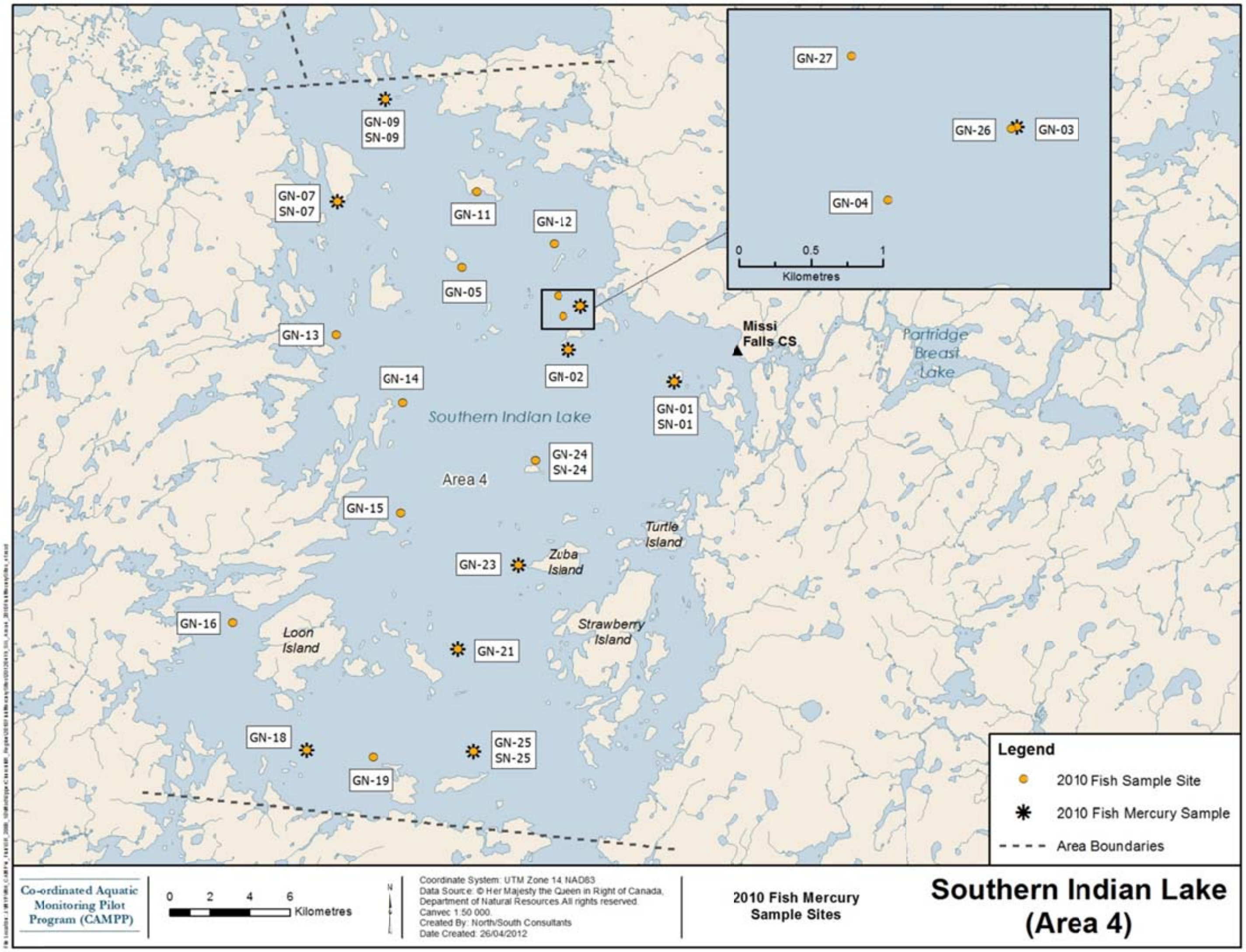


Figure 4.7-1. Fish sampling sites in Southern Indian Lake - Area 4, indicating those sites where fish were collected for mercury analysis.

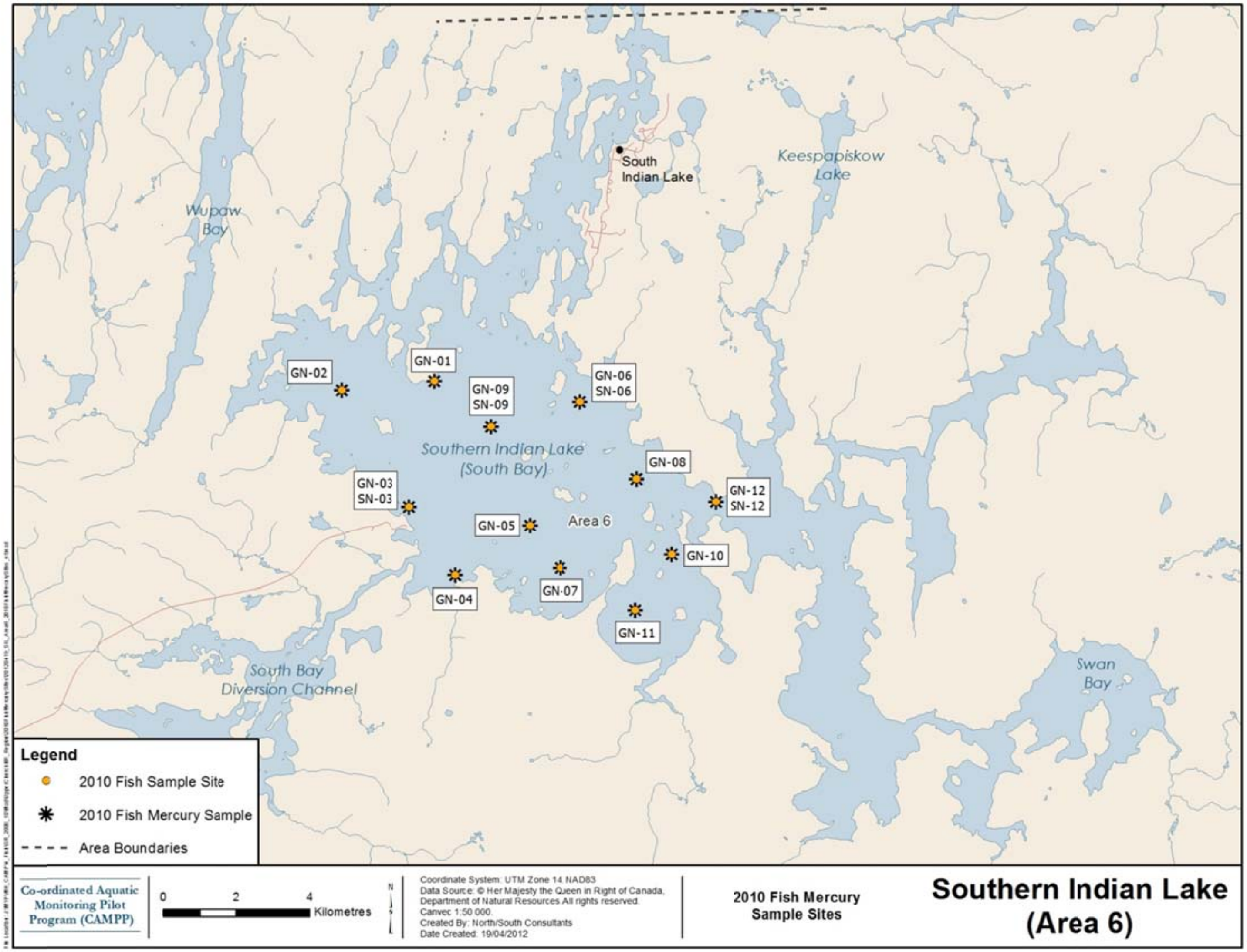


Figure 4.7-2. Fish sampling sites in Southern Indian Lake - Area 6, indicating those sites where fish were collected for mercury analysis.

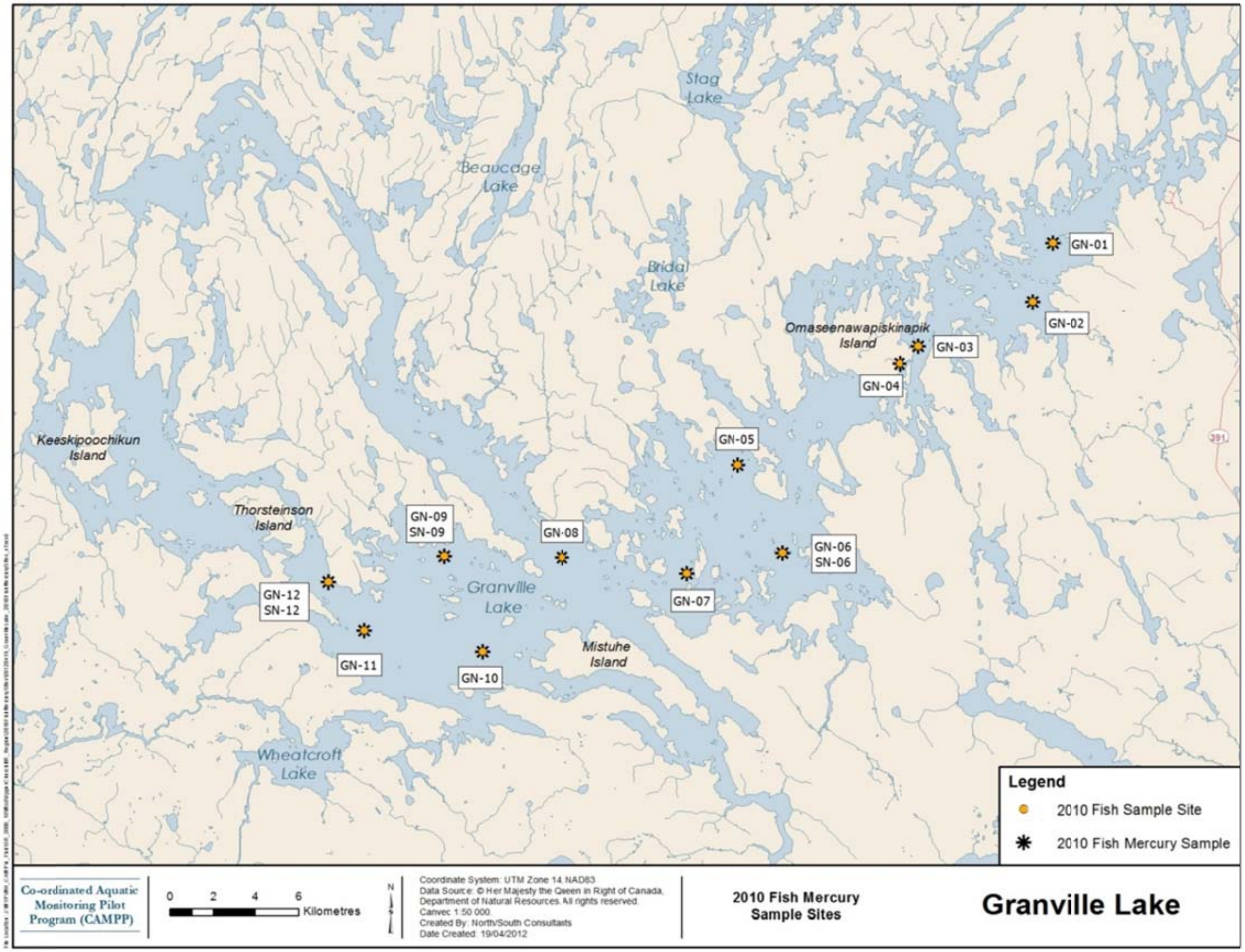


Figure 4.7-3. Fish sampling sites in Granville Lake, indicating those sites where fish were collected for mercury analysis.

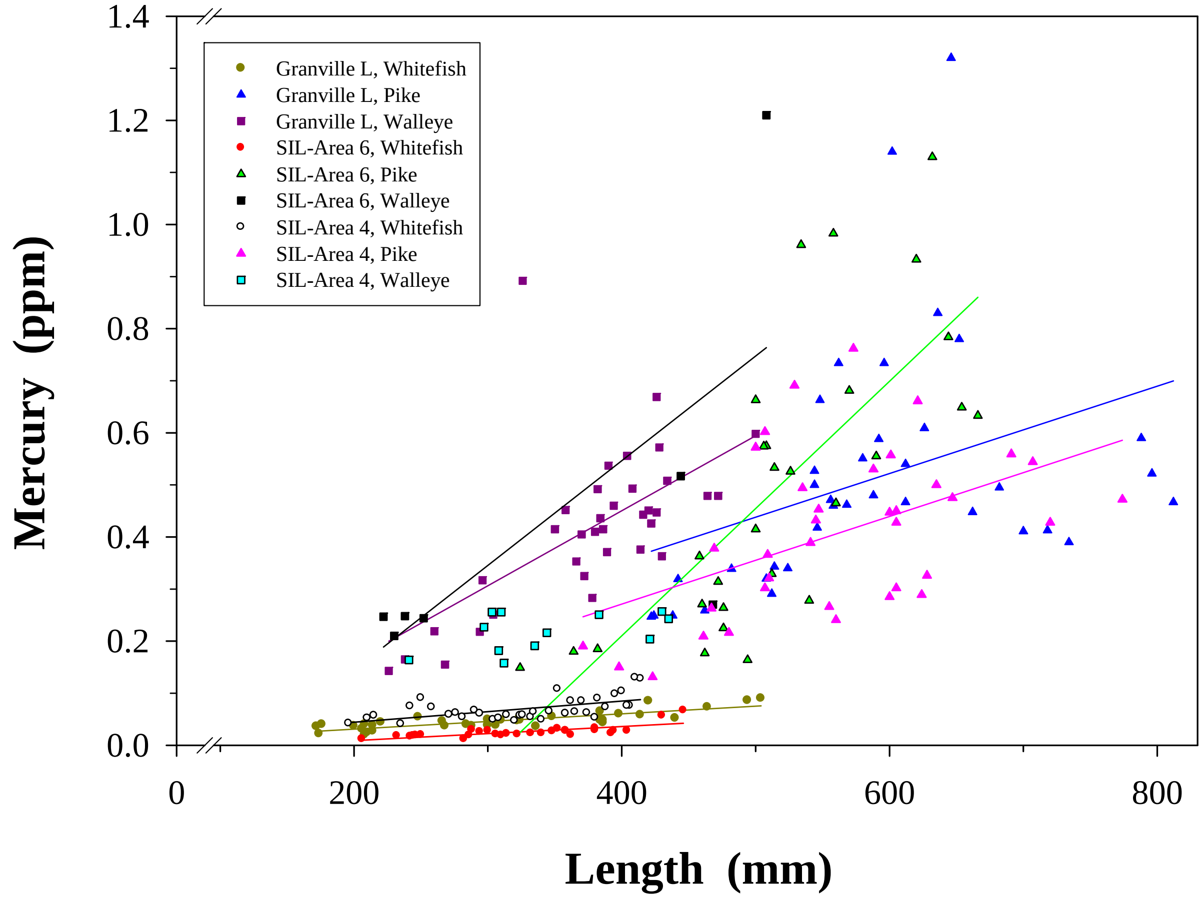


Figure 4.7-4. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Granville Lake and Areas 6 and 4 of Southern Indian Lake in 2010. Significant linear regression lines are shown.

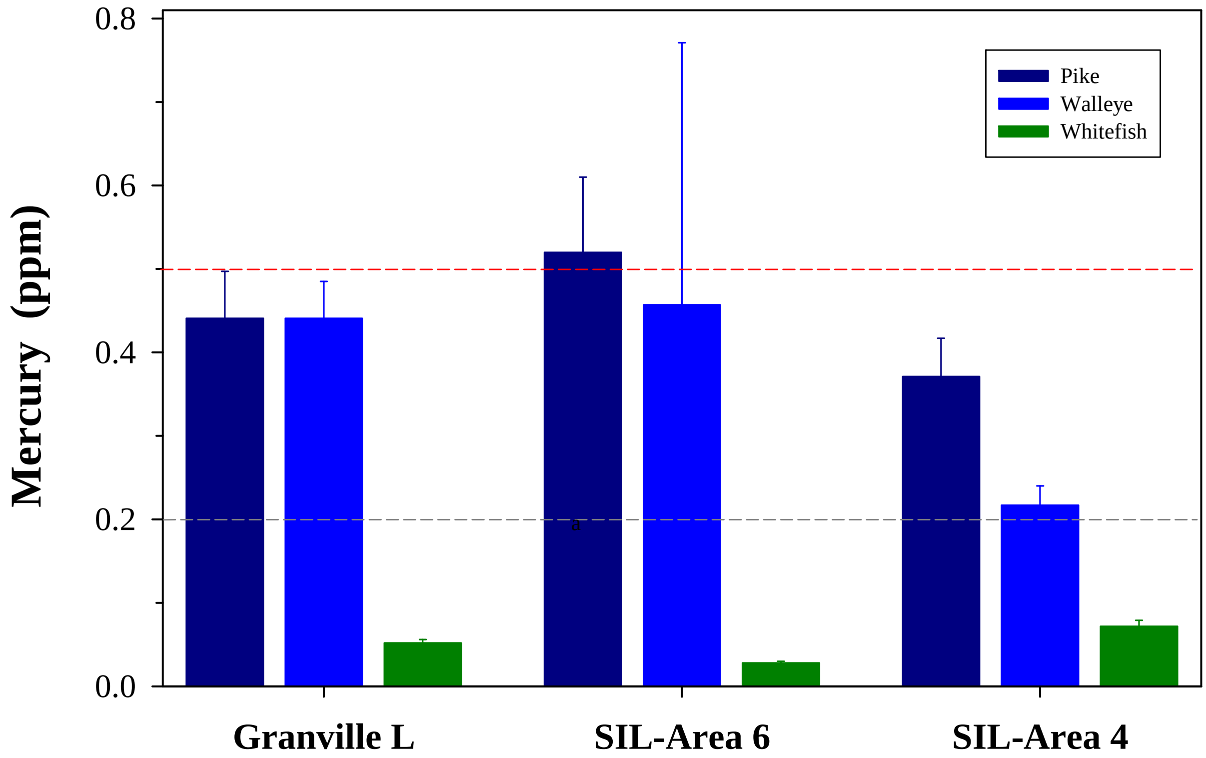


Figure 4.7-5. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye (arithmetic mean for SIL-Area 4), and Lake Whitefish from Granville Lake and Areas 6 and 4 of Southern Indian Lake in 2010. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.

5.0 LOWER CHURCHILL RIVER REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Lower Churchill River Region, by each major component. A general description of methods is provided in Section 4 and in detail in Appendix 1.

5.1 CLIMATE

Mean monthly air temperatures measured at Churchill in 2010 were warmer than the 1971-2000 temperature normals with the exception of May and August (Figure 5.1-1). The winter months in particular exhibited the greatest degree of difference, ranging from 4 ^{o}C to 8.6 ^{o}C. The annual mean air temperature was approximately 4.1 ^{o}C above the normal.

The 1971-2000 precipitation normals at Churchill indicate a peak in August with a gradual increase and decrease thereafter, as well as relatively lower levels of precipitation during the winter months (Figure 5.1-1). In 2010, the highest precipitation levels occurred in August (approximately 2.5 times the normal for that month. Autumn and winter were generally drier than normal, most notably the month of February when precipitation was approximately 3% of the normal. June was also particularly dry, receiving 34 % of the normal for that month.

Overall the comparison to climate normals shows that 2010 was characterized by generally warmer and drier conditions throughout the year with an atypically wet August (Figure 5.1-1).

5.2 HYDROLOGY

Flows along the lower Churchill River have been modified as a result of the Churchill River Diversion which diverts the majority of the upper Churchill River flow through the Rat-Burntwood River system to the Nelson River for power production. The Missi Falls Control Structure (CS) releases the remaining portion of the upper Churchill River flow from Southern Indian Lake into the lower Churchill River. The lower Churchill River flows through a number of lakes where discharge is augmented by local inflows and inflows from tributaries along the way to the Churchill River Estuary at Hudson Bay.

Lower Churchill River inflows from the Missi Falls CS were close to average for most of 2010 but increased above average from August to mid-October (Figure 5.2-1). Higher Missi Falls flows in 2010 were driven mainly by high precipitation in 2009, which resulted in high Southern Indian Lake water levels and above average flows on the Nelson River, which allowed flow out of the Notigi CS to be reduced.

Further downstream on the lower Churchill River above Red Head Rapids, flows dropped from the 2009 high in January 2010 and remained near average until May. Flows then dropped further to near record lows until mid-August due to a very low snowpack in the lower Churchill River basin. Above average precipitation and the flow increases at Missi Falls then led to flows near the upper quartile for September and October before flow returned to near average for the end of 2010 (Figure 5.2-2).

Water levels on Northern Indian Lake, Billard Lake, and on the Churchill River above Swallow Rapids, near the confluence with the Little Churchill River, followed a similar trend to flows above Red Head Rapids (Figure 5.2-3 to 5.2-5). The only difference was that levels were above average from January through April, while flows above Red Head Rapids were closer to average.

Gauer River flows also followed a similar trend to lower Churchill River flows above Red Head Rapids being near average to start the year, falling to record lows mid-year, before climbing above the upper quartile to complete 2010 (Figure 5.2-6).

5.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 3 of CAMPP in the Lower Churchill River Region. Waterbodies sampled included Northern Indian Lake, Billard Lake, the lower Churchill River (at the confluence with the Little Churchill River) and an off-system reference lake (Gauer Lake; Figure 5.3-1). The lower Churchill River at the confluence with the Little Churchill River site is hereafter referred to as the "lower Churchill River" site.

5.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Lower Churchill River Region for routine water quality variables are presented in Tables 5.3-2 and 5.2-3 and Figures 5.3-2 to 5.3-10.

5.3.1.1 On-system Waterbodies

Water quality of the Lower Churchill River Region can be generally described as relatively clear, slightly alkaline, moderately soft, and well-oxygenated, with moderate concentrations of nutrients. None of the waterbodies in the region stratified during the 2010/2011 monitoring periods (Figure 5.3-2) and all sites exhibited dissolved oxygen (DO) concentrations above Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL; Manitoba Water Stewardship [MWS] 2011) across depth (Figure 5.3-3). Other *in situ* variables, including turbidity, pH, and specific conductance, were relatively consistent across depth (Figures 5.3-4 to 5.3-6). Secchi disk depths ranged between 0.95 and 1.8 m in the open-water season (Figure 5.3-7).

Ammonia and nitrate concentrations measured in the Lower Churchill River Region were all within PAL objectives and guidelines in 2010/2011 (MWS 2011). One of the four samples collected in Northern Indian Lake exceeded the Manitoba narrative guideline for total phosphorus (TP) of 0.025 mg/L for lakes, ponds, and reservoirs (Figure 5.3-8). Additionally, field and laboratory measurements of pH were within the PAL guidelines (6.5-9.0) at all on-system sites.

During the open-water season, TP in Northern Indian Lake was generally composed of equivalent proportions of dissolved and particulate forms but the relative proportions of each form varied between seasons in Billard Lake and the lower Churchill River (Figure 5.3-9). The majority of total nitrogen (TN) was composed of organic nitrogen at all sites and sampling periods and dissolved inorganic nitrogen (DIN) concentrations were generally low (below the detection limit) during the open-water season (Figure 5.3-10). The relative proportion of TN as nitrate/nitrite were higher in the ice-cover season compared to the open-water season.

5.3.1.2 Off-system Waterbody

Gauer Lake was not stratified during the open-water season and all DO concentrations met the most stringent MWQSOGs for PAL in 2010/11 (MWS 2011; Figures 5.3-2 and 5.3-3). All other field measurements in Gauer Lake were similar across depth (Figures 5.3-4 to 5.3-6). Secchi disk depths at Gauer Lake were relatively high, ranging from 1.0 to 1.8 m during the open-water season, and similar to on-system sites (Figure 5.3-7).

One quarter of the samples collected in Gauer Lake exceeded the Manitoba narrative guideline for TP (0.025 mg/L) for lakes, ponds, and reservoirs (Figure 5.3-8). With the exception of on pH measurement from Gauer Lake exceeded the upper guideline range, all other field and laboratory measurements were within the MWQSOGs for PAL (MWS 2011).

Similar to Northern Indian Lake, dissolved and particulate phosphorus generally comprised equal proportions of TP (Figure 5.3-9). Organic nitrogen was the dominant form of nitrogen and concentrations of nitrate/nitrite and ammonia were low (i.e., non-detectable) during the open-water season of 2010. Nitrate/nitrite was higher in winter.

5.3.2 Metals and Major Ions

A summary of metal concentrations measured in the Lower Churchill River Region in 2010/2011 is presented in Table 5.3-3 and a summary of detection frequencies for metals is provided in Table 5.3-4.

5.3.2.1 On-system Waterbodies

A number of metals were not detected at any site or sampling period including antimony, beryllium, bismuth, boron, cesium, chromium, cobalt, mercury, nickel, selenium, silver, tellurium, thallium, tungsten, and zinc. Aluminum, barium, calcium, copper, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, titanium, and uranium were consistently detected; the remaining metals were detected in some samples (Table 5.3-4).

Aluminum exceeded the MWQSOG for PAL (0.1 mg/L; MWS 2011) in 75-100 % of samples collected in Northern Indian Lake, Billard Lake, and the lower Churchill River (Figure 5.3-11; Table 5.3-5). One sample collected in the lower Churchill River also contained iron in excess of the PAL guideline (0.3 mg/L; Figure 5.3-11). As the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods (0.000050 mg/L), comparisons to the guideline could not be made. All other metals for which there are MWQSOGs for PAL were within objectives and guidelines at each of the sampling sites in 2010/2011 (Table 5.3-5).

Both chloride and sulphate were consistently detected, though at low concentrations, in the on-system waterbodies of the Lower Churchill River Region in 2010/2011. Chloride was less than 1 mg/L and well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013). Sulphate averaged less than 3 mg/L at each site (Table 5.3-2), and fell on the lower range of concentrations reported across Canada (Canadian Council of Resource and Environment Ministers [CCREM] 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment (BCMOE) guidelines, which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013).

5.3.2.2 Off-system Waterbody

Many metals were not detected in Gauer Lake including antimony, beryllium, bismuth, boron, cesium, chromium, cobalt, lithium, mercury, nickel, selenium, silver, tellurium, thallium, thorium, tungsten, zinc, and zirconium. Aluminum, barium, calcium, copper, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, titanium, and uranium were consistently detected; the remaining metals were detected in some samples (Table 5.3-4).

All metals for which there are MWQSOGs for PAL (MWS 2011) were within objectives and guidelines for the off-system reference lake during all sampling periods in 2010/2011 (Table 5.3-5). However, as noted in Section 5.3.2.1, comparisons could not be made to the current MWQSOG for mercury (0.000026 mg/L) owing to analytical detection limits. Also like on-system waterbodies, chloride and sulphate concentrations were very low in Gauer Lake and well below the CCME (120 mg/L; CCME 1999, updated to 2013) and BCMOE PAL guidelines (128-429 mg/L; BCMOE 2000), respectively.

5.3.3 Trophic Status and Nutrient Ratios

5.3.3.1 On-system Waterbodies

The two on-system lakes on the lower Churchill River (Northern Indian Lake and Billard Lake) are classified as mesotrophic to borderline meso-eutrophic on the basis of TP concentrations measured in 2010/2011 (Table 5.3-6). Based on TN, Northern Indian Lake ranks as mesotrophic and Billard Lake as oligotrophic (Table 5.3-7). Conversely the trophic status of these lakes is reversed based on chlorophyll *a* (Table 5.3-8). The lower Churchill River was mesotrophic based on TP (Table 5.3-6), but oligotrophic based on TN (Table 5.3-9) and chlorophyll *a* (Table 5.3-10).

On the basis of molar TN:TP ratios, all waterbodies sampled in the Lower Churchill River Region in 2010/2011 were phosphorus limited during each sampling period (Figure 5.3-12). Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter in the three waterbodies is generally a mixture of allochthonous and autochthonous sources (Figure 5.3-13).

5.3.3.2 Off-system Waterbody

The trophic status of Gauer Lake was similar to Northern Indian Lake: meso-eutrophic based on TP (Table 5.3-6); mesotrophic based on TN (Table 5.3-7); and oligotrophic based on chlorophyll *a* concentrations (Table 5.3-8). Like on-system waterbodies, Gauer Lake was phosphorus-limited (Figure 5.3-12) and organic matter was from a mixture of allochthonous and autochthonous sources (Figure 5.3-13).

5.3.4 *Escherichia coli*

5.3.4.1 On-system Waterbodies

E. coli was detected in one or two samples (1 to 4 CFU/100 mL) collected in each of the on-system waterbodies in the Lower Churchill River Region in 2010/2011 (Table 5.3-2). All measurements were well below the MWQSOG for recreation of 200 CFU/100 mL (MWS 2011).

5.3.4.2 Off-system Waterbody

E. coli was not detected in any samples collected in Gauer Lake and all measurements were well below the MWQSOG for recreation of 200 CFU/100 mL in 2010/11 (Table 5.3-2).

5.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Lower Churchill River Region in Year 3 of CAMPP. Waterbodies sampled included Northern Indian Lake, Billard Lake, the lower Churchill River and an off-system lake (Gauer Lake; Figure 5.3-1).

5.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Lower Churchill River Region were low to moderate and were highest in Billard Lake (Figure 5.4-1). Chlorophyll *a* concentrations were not detected in the on-system waterbodies during winter.

5.4.2 Community Composition and Biomass

In 2010/2011, phytoplankton community composition and biomass was measured at Billard Lake as part of the rotational waterbody analyses. Phytoplankton biomass was relatively low at the site, with the highest biomass in fall (Figure 5.4-2).

The phytoplankton community at Billard Lake was dominated by diatoms in spring, blue-greens in summer, and co-dominated by diatoms and cryptophytes in fall 2010 (Figure 5.4-3). In spring, chrysophytes and blue-greens were the next most common groups, whereas green algae, and green and blue-green algae were the next most common group(s) in summer and fall, respectively.

Phytoplankton species richness ranged from 23 to 26 in Billard Lake in 2010 and was similar between seasons (Table 5.4-1). Simpson's diversity and evenness (E_D) indicated that the community had the greatest diversity in spring and lowest in fall; however, Shannon's diversity (H), Hill's effective richness ($E^{H'}$), and evenness (E_H, $E^{H'}/S$) were highest in summer and lowest in spring.

5.4.3 Bloom Monitoring

Chlorophyll *a* concentrations in the region were consistently below the bloom monitoring trigger of 10 µg/L in 2010.

5.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (algal toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to affect production of microcystins. *Anabaena*, *Aphanizomenon* and *Oscillatoria*/*Planktothrix* were present in Billard Lake in 2010/2011. Taxonomic information is not available for the other waterbodies in the region.

Microcystin-LR was not measured in this region in 2010 as chlorophyll *a* concentrations were always below the 10 µg/L trigger.

5.4.5 Trophic Status

Based on the trophic classification scheme for lakes that uses chlorophyll *a* concentrations as the indicator (OECD 1982), Northern Indian and Gauer lakes were oligotrophic while Billard Lake was mesotrophic (Table 5.3-8). According to chlorophyll *a* trophic categories for rivers (Dodds et al. 1998), the lower Churchill River was oligotrophic in 2010/2011 (Table 5.3-10).

5.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Lower Churchill River region in 2010/2011, the third year of CAMPP. Waterbodies sampled included the on-system lakes Northern Indian and Billard, and the off-system lake Gauer. Northern Indian and Gauer lakes are sampled annually and Billard Lake is sampled on a rotational basis (i.e., once every three years). Also sampled annually was the on-system river site, lower Churchill River. The Hayes River is an annual, off-system river site for both the Lower Churchill River Region and the Lower Nelson River Region (Figures 5.5-1 to 5.5-4); refer to the Lower Nelson River Region section of this annual report for discussion of the Hayes River (Section 8.5).

In 2010, grab sampling in the predominantly-wetted portion of the nearshore habitat was changed to kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize the portion of the littoral zone influenced by water level fluctuations. Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Nearshore and offshore habitat polygons were sampled in all waterbodies. Both kicknet and grab sampling consisted of five composites of three replicate samples per near and offshore habitat polygon, for a total of 10 samples per waterbody. Sampling was conducted between 16 and 29 August 2010.

5.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons (where applicable) at each waterbody (Table 5.5-1).

In 2010, mean water depths sampled in the nearshore were: 0.3 m in Northern Indian Lake, 0.5 m in Billard Lake, 1.0 m in the Churchill River, and 0.5 m in Gauer Lake. Mean water depths sampled in the offshore were: 3.5 m in Northern Indian Lake, 8.2 m in Billard Lake, 6.4 m in the Churchill River, and 6.2 m in Gauer Lake (Table 5.5-1).

Sediment samples were collected and analyzed for TOC and PSA to provide a general characterization of sediment type in each nearshore and offshore polygon (Table 5.5-2). Due to the hard, rocky substrate, sediment samples were not collected from nearshore polygons in the Churchill River and Gauer Lake.

The nearshore habitat polygons sampled in the Lower Churchill River Region had low mean TOC (less than 1.0% (Table 5.5-2). TOC was generally higher in the offshore with mean values of 2.6% and 2.9% at Northern Indian and Billard lakes, respectively; in the offshore habitat of the Churchill River, however, the mean TOC was low (0.8%). Mean TOC was highest at Gauer Lake (8.0%) (Table 5.5-2).

Sand dominated the sediments from the nearshore polygon of Billard Lake and the offshore polygon in the Churchill River. Silt dominated the sediments from the Northern Indian Lake nearshore and offshore polygons and from the offshore polygons of Billard and Gauer lakes. Although clay did not dominate the sediments in any of the waterbodies, it was present in all samples (Table 5.5-2).

5.5.2 Species Composition, Distribution, and Relative Abundance

5.5.2.1 Northern Indian Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Northern Indian Lake was 120 individuals, with numbers ranging from 28 to 249 (Table 5.5-3). Overall, abundance of insects and non-insects in the BMI community was similar (56% and 44%, respectively) (Table 5.5-3). Of the non-insects, the main groups were Oligochaeta (29% of mean total BMI) and Bivalvia (12%); Amphipoda and Gastropoda were also present (Table 5.5-3). Insects were comprised mainly of Tipulidae (crane flies: 40%); a small number of Dolichopodidae, Corixidae, Chironomidae, Dytiscidae (predacious diving beetles), and Ephydridae (shore flies) were also found (Table 5.5-3). Mean BMI density in offshore benthic grab samples was 2,196 individuals/m^2, with densities ranging from 1,082 to 2,900 (Table 5.5-3). Half (50%) of the BMI community in the offshore polygon consisted of insects, the other half non-insects (Table 5.5-3). Insects mainly consisted of Chironomidae (36%) and Ephemeroptera (13%); Heptageniidae (flat-headed/stream mayflies), Leptoceridae, and Ceratopogonidae were also collected (Table 5.5-3). Of the non-insects, the dominant group was Amphipoda (42%); Bivalvia, Gastropoda, Oligochaeta, and Ostracoda were also present (Table 5.5-3).

Total EPT comprised less than 0.1% of the mean total nearshore BMI sampled from Northern Indian Lake. In the offshore polygon, total EPT comprised 13% of the BMI community, and was comprised mainly of Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant (Table 5.5-3). The EPT:C ratio was 0.1 in the nearshore polygon and 0.38 in the offshore polygon indicating that both insect communities had greater abundances of chironomids than EPT (5.5-3).

Taxonomic richness in the nearshore was 23 families, with richness values ranging from 12 to 14 within each sample (Table 5.5-3). Hill's Effective Richness (E^H) was six with Tipulidae and Oligochaeta notably dominating the BMI community (Table 5.5-3). In the offshore habitat, taxonomic richness was 11 families, with richness values ranging from six to eight within each sample (Table 5.5-3). Hill's Effective Richness (E^H) was five. Haustoriidae, Chironomidae, and Ephemeridae were most notable in this habitat (Table 5.5-3).

Mean diversity (Simpson's Diversity Index [D]) was 0.71 and 0.74 in the nearshore and offshore polygons, respectively (Table 5.5-3). Evenness (Simpson's Equitability [E_D]) was 0.27 in the nearshore polygon and 0.42 in the offshore polygon (Table 5.5-3).

5.5.2.2 Billard Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Billard Lake was 241 individuals, with numbers ranging from 142 to 359 (Table 5.5-4). Non-insects dominated the BMI community in abundance (61% of the mean total BMI), with insects comprising 39% of the overall taxa. Of the non-insects, the main group was Oligochaeta (50% of total mean BMI); Bivalvia, Amphipoda, and Gastropoda were also present (Table 5.5-4). Insects mainly consisted of Ephemeroptera (14%) and Chironomidae (11%). Several taxa of Coleoptera (beetles), and a small number of Corixidae, Ceratopogonidae, Tipulidae, and Leptoceridae were also found (Table 5.5-4). The mean BMI density in the offshore habitat was 2,438 individuals/m^2, with densities ranging from 678 to 3,621 (Table 5.5-4). Non-insects dominated the BMI community (76% of the mean total BMI), with insects comprising 24% of the overall taxa. Of the non-insects, the main group was Bivalvia (64% of the mean total BMI); Oligochaeta, Gastropoda, and Amphipoda were also present. Insects mainly consisted of Chironomidae (22%); a small number of Ceratopogonidae, Ephemeroptera, and Trichoptera were also collected (Table 5.5-4).

Total EPT comprised 15% of the overall BMI community in the nearshore polygon of Billard Lake. Ephemeroptera was the dominant group (14% of the mean total invertebrate community) and was comprised of four families, most notably Caenidae (Table 5.5-4). Trichoptera (Leptoceridae) were also found in small numbers (Table 5.5-4). In the offshore polygon, total EPT comprised less than one percent of the total BMI community and consisted of Ephemeridae (Ephemeroptera) and Molannidae (Trichoptera) (Table 5.5-4). The EPT:C ratio was 1.36 in the nearshore and 0.02 in the offshore indicating EPT were dominant over Chironomidae in the nearshore, while the offshore ratio indicated an insect community dominated by chironomids versus EPT.

Taxonomic richness in the nearshore was 30 families, with richness values ranging from 17 to 21 within each sample (Table 5.5-4). Hill's Effective Richness (E^H) was seven with Oligochaeta notably dominating the BMI community (Table 5.5-4). Taxonomic richness in the offshore polygon was 11 families, with richness values ranging from two to nine within each sample (Table 5.5-4). Hill's Effective Richness (E^H) was three; Pisidiidae and Chironomidae were most dominant in this habitat (Table 5.5-4).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.70 in the nearshore and 0.48 in the offshore polygon (Table 5.5-4). Evenness values (Simpson's Equitability [E_D]) were 0.16 in the nearshore polygon and 0.30 in the offshore polygon (Table 5.5-4).

5.5.2.3 Lower Churchill River

The total mean BMI abundance in kicknet samples in the nearshore polygon of the lower Churchill River was 666 individuals, with numbers ranging from 351 to 987 (Table 5.5-5). Insects dominated the BMI community in abundance (97% of the mean total BMI), with non-insects comprising 3% of the overall taxa. Insects mainly consisted of Corixidae (67% of the mean total BMI) and three families of Coleoptera (22%); several families of Ephemeroptera and Brachycera were also present. Of the non-insects, the main group was Oligochaeta (2%); Gastropoda and Bivalvia were also present in small numbers (Table 5.5-5). The mean BMI densityin the offshore habitat was 1,737 individuals/m^2, with densities ranging from 693 to 2,770 (Table 5.5-5). Insects dominated the BMI community (92% of the mean total BMI), with non-insects comprising 8% of the overall taxa. Insects mainly consisted of Chironomidae (83% of the mean BMI) and Ephemeroptera (7%); a small number of Trichoptera and Ceratopogonidae were also collected (Table 5.5-5). Of the non-insects, the main group was Bivalvia (5%) followed by Oligochaeta (2%); Gastropoda and Amphipoda were also present (Table 5.5-5).

Total EPT comprised 4% of the mean total BMI community in the nearshore habitat and 8% in the offshore polygon. Ephemeroptera dominated the EPT community in both habitats. Genus analysis of the mayflies indicated that *Parameletus* sp. (Siphlonuridae) was dominant in nearshore samples and *Hexagenia* sp (Ephemeridae) was dominant in offshore samples (Table 5.5-5). Other families within Ephemeroptera were also present in the samples from nearshore and offshore habitats and included Ephemeridae, Baetiscidae, and Ephemerellidae; Leptophlebiidae and Siphlonuridae were found only in the nearshore habitat (Table 5.5-5). Trichoptera were collected only in the offshore polygon and consisted solely of Leptoceridae (Table 5.5-5). The EPT:C ratio was 5.75 in the nearshore polygon and 0.12 in the offshore polygon indicating EPT were dominant over chironomids in the nearshore habitat and that chironomids dominated EPT in the offshore habitat (Table 5.5-5).

Taxonomic richness in the nearshore was 22 families, with richness values ranging from eight to 18 within each sample. Hill's Effective Richness (E^H) was three with Corixidae and Dytiscidae notably dominating the nearshore BMI community (Table 5.5-5). In the offshore polygon taxonomic richness was 11 families, with richness values ranging from three to 10 within each sample. Hill's Effective Richness (E^H) was three with Chironomidae dominating, followed by Ephemeridae and Pisidiidae (Table 5.5-5).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.52 in the nearshore polygon and 0.49 in the offshore polygon. Evenness (Simpson's Equitability [E_D]) was 0.15 in the nearshore and 0.28 in the offshore (Table 5.5-5).

5.5.2.4 Gauer Lake

The total mean BMI abundance in kicknet samples in the nearshore habitat of Gauer Lake was 180 individuals, with numbers ranging from 51 to 330 (Table 5.5-6). Insects dominated the BMI community in abundance (94% of the mean BMI), with non-insects comprising 6% of the overall taxa. Insects were dominated by Corixidae (89% of the mean total BMI), with small numbers of Ephemeroptera, Chironomidae, and Dytiscidae also present. Of the non-insects, the main group was Amphipoda (3%). Gastropoda and Bivalvia were minimally represented in addition to trace numbers of other taxa (Table 5.5-6). Mean BMI density in the offshore habitat was 3,930 individuals/m^2, with densities ranging from 2,424 to 4,415 (Table 5.5-6). Overall, insects and non-insects were equally abundant (49% and 51%, respectively) in this habitat. Insects mainly consisted of Chironomidae (46% of the mean total BMI) with small numbers of Ceratopogonidae, Ephemeroptera, and Trichoptera also present. Of the non-insects, the main groups were Oligochaeta (27%) and Bivalvia (22%); Gastropoda, Acari, and Diplostraca were also identified (Table 5.5-6).

Total EPT comprised 2% and 1% of the mean total BMI in the nearshore and offshore habitats, respectively. In both habitats Ephemeroptera were most abundant of the EPT; *Hexagenia* sp. was dominant in the offshore polygon and *Stenomena* sp. was dominant in the nearshore polygon (Table 5.5-6). Trichoptera were also collected in both areas in very small densities (Table 5.5-6). The EPT:C ratio was 2.89 in the nearshore indicating EPT were dominant over Chironomidae. In the offshore, the ratio was 0.03 indicating Chironomidae dominated EPT.

Taxonomic richness in the nearshore polygon was 25 families with richness values ranging from nine to 18 within each sample. Hill's Effective Richness (E^H) was three in the nearshore and was notably dominated by Corixidae (Table 5.5-6). In the offshore polygon, taxonomic richness was 10 families, with richness values ranging from seven to 10 within each sample. Hill's Effective Richness (E^H) was five; Chironomidae dominated, followed by Oligochaeta and Pisidiidae (Table 5.5-6).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.29 in the nearshore habitat and 0.75 in the offshore habitat. Evenness (Simpson's Equitability [E_D]) was 0.11 and 0.42 in the nearshore and offshore habitats, respectively (Table 5.5-6).

5.6 FISH COMMUNITY

5.6.1 Gill Netting

In 2010, in the Lower Churchill River Region, gill netting was conducted in Northern Indian Lake (6 - 10 August), Billard Lake (23 – 27 July), and the lower Churchill River mainstem at the confluence of the Little Churchill River (11 – 16 August) (Table 5.6-1; figures 5.6-1 – 5.6-3). In addition, results from gill netting conducted in Gauer Lake in 2010 are also included in this report. Gill netting was conducted in Gauer Lake from 14 – 18 July (Table 5.6-1; Figure 5.6-4).

In Northern Indian Lake, twelve sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Table 5.6-1; Figure 5.6-1). Water temperature during the sampling period ranged from 19.0 – 21.0°C.

In Billard Lake, the lower Churchill River, and Gauer Lake, nine sites were sampled with standard gang index gill nets and three sites with small mesh index gill nets (Table 5.6-1; figures

5.6-2 – 5.6-4). During sampling, water temperature ranged from 18.5 – 23.0°C in Billard Lake, 15.0 – 20.0°C in the lower Churchill River, and from 17.5 – 18.5°C in Gauer Lake.

5.6.2 Species Composition

In 2010, 14 species of fish were captured in the Lower Churchill River Region (Table 5.6-2).

5.6.2.1 Northern Indian Lake

A total of 671 fish representing eight species were captured in standard gang index gill nets (Table 5.6-3), 558 fish representing eleven species were captured in small mesh index gill nets (Table 5.6-4). White Sucker represented 25.48% (n = 171) of the standard gang index gillnet catch, followed by Lake Whitefish (n = 170; 25.34%) and Walleye (n = 140; 20.86%) (Table 5.6-3; Figure 5.6-5). In the small mesh index gillnet catch, Spottail Shiner was the most common species captured (n = 186; 33.33%), followed by Cisco (n = 88; 15.77%) and Emerald Shiner (n = 68; 12.19%) (Table 5.6-4; Figure 5.6-5).

Total biomass captured in standard gang index gill nets was 499,311g (Table 5.6-5) with White Sucker comprising 30.29% of the total, followed by Northern Pike (24.71%), Lake Whitefish (21.17%) and Walleye (17.81%). In small mesh index gill nets, total biomass was 36,267 g (Table 5.6-6) with Walleye representing 57.61% of the total, followed by Northern Pike (17.32%) and Lake Whitefish (12.48%).

5.6.2.2 Billard Lake

A total of 508 fish representing five species were captured in standard gang index gill nets set in Billard Lake in 2010 (Table 5.6-3; Figure 5.6-6). Lake Whitefish represented 47.44% of the catch (n = 241) followed by Walleye (n = 112; 22.05%) and Northern Pike (n = 104; 20.47%). Included in the catch was one Lake Sturgeon, captured near the outlet of Billard Lake.

Eight species (n = 231) were captured in small mesh index gill nets (Table 5.6-4; Figure 5.6-6). Troutperch (n = 88; 38.10%) and Lake Whitefish (n = 85; 36.80%) represented the majority of the catch.

Total biomass for the standard gang index gillnet catch was 574,189 g (Table 5.6-5) with Lake Whitefish representing 40.07% of the total, followed by Northern Pike (28.50%) and Walleye (24.31%). Total biomass for the small mesh index gillnet catch was 23,739 g, with Lake Whitefish, Walleye, and Northern Pike once again contributing the majority (Table 5.6-6).

5.6.2.3 Lower Churchill River

A total of 603 fish representing seven species were captured in standard gang index gill nets and 580 fish representing 12 species were captured in small mesh index gill nets (Table 5.6-3 and 5.6-4).

The two most common species captured in standard gang index gill nets were Lake Sturgeon (n = 254; 42.12%) and Walleye (n = 137; 22.72%) (Table 5.6-3; Figure 5.6-7). In the small mesh index gillnet catch, Walleye was the most common species captured (n = 346; 59.66%), followed by Spottail Shiner (n = 86; 14.83%) (Table 5.6-4; Figure 5.6-7).

Total biomass for the standard gang index gillnet catch was 952,134 g (Table 5.6-5) with Lake Sturgeon making up 53.54% of the total. Small mesh index gill nets produced a total of 10,935 g of biomass, with Walleye comprising 82.57% of the total (Table 5.6-6).

5.6.2.4 Gauer Lake

In 2010, eight species (n = 716) were captured in standard gang index gill nets (Table 5.6-3). The majority of the catch was comprised of four species, including: Walleye (n = 187; 26.12%), White Sucker (n = 178; 24.86%), Lake Whitefish (n = 172; 24.02%) and Northern Pike (n = 122; 17.04%) (Table 5.6-3; Figure 5.6-8). In small mesh index gill nets, a total of 297 fish, comprising nine species were captured. The majority of the catch consisted of Emerald Shiner (n = 126; 42.42%), Troutperch (n = 59; 19.87%), and Spottail Shiner (n = 52; 17.51%) (Table 5.6-4; Figure 5.6-8).

Standard gang index gill nets produced a total of 661,813g of biomass (Table 5.6-5), with White Sucker contributing 35.70% of the total, followed by Northern Pike (23.71%), Walleye (19.29%) and Lake Whitefish (17.35%). Small mesh index gill nets produced 23,099 g of biomass (Table 5.6-6), with Northern Pike representing 48.52% of the total, followed by Walleye (30.74%).

5.6.3 Catch Per Unit of Effort (CPUE) and Biomass Per Unit Effort (BPUE)

5.6.3.1 Northern Indian Lake

In 2010, the mean CPUE for the standard gang index gillnet catch in Northern Indian Lake was 75.9 fish/100 m of net/24 h (Table 5.6-7; Figure 5.6-9). Lake Whitefish had the highest CPUE (19.5), followed by White Sucker (19.1) and Walleye (15.8) (Figure 5.6-10).

Mean CPUE for the small mesh index gillnet catch was 211.2 fish/30 m of net/24 h (Table 5.6-8; Figure 5.6-9). Spottail Shiner had the highest CPUE (71.1) followed by Cisco (33.1) (Figure 5.6-10).

Mean BPUE per site for standard gang index gill nets was 56,342 g/100 m of net/24 h (Table 5.6-9). White Sucker had the highest mean BPUE per site at 16,871, followed by Northern Pike (13,800) and Lake Whitefish (12,136). Small mesh index gill nets had a mean BPUE per site of 13,545g/30 m of net/24 h (Table 5.6-10) with Walleye having the highest value of 7,719 g/30 m/24 h.

5.6.3.2 Billard Lake

Mean CPUE from nine standard gang index gillnet sites fished in Billard Lake in 2010 was 56.2 (Table 5.6-7; Figure 5.6-9). Lake Whitefish had the highest CPUE (26.4) followed by Walleye (12.7) and Northern Pike (11.5) (Figure 5.6-10).

Small mesh index gill nets (n = 3 sites) had a mean CPUE of 88.5 (Table 5.6-8; Figure 5.6-9). Lake Whitefish and Troutperch had the highest CPUE, with respective values of 33.4 and 33.2 (Figure 5.6-10).

Mean BPUE per site for standard gang index gill nets was 63,390 (Table 5.6-9). White Sucker, Northern Pike, Lake Whitefish, and Walleye had the highest BPUE values. For small mesh index gillnet sets, mean BPUE was 8,731 (Table 5.6-10). Walleye had the highest mean BPUE value of 3,009, followed by Lake Whitefish (3,501).

5.6.3.3 Lower Churchill River

Standard gang index gill nets set at nine sites in the lower Churchill River in 2010 had a CPUE of 59.3 (Table 5.6-7; Figure 5.6-9). Lake Sturgeon had the highest CPUE (25.3) followed by Walleye (13.5) and Lake Whitefish (7.5) (Figure 5.6-10).

The overall CPUE for small mesh index gill nets set at three sites was 190.1 (Table 5.6-8; Figure 5.6-9). Species having the highest CPUE were Walleye (113.3), Spottail Shiner (28.2), and Longnose Dace (15.3) (Figure 5.6-10).

Standard gang index gill nets had a mean BPUE per site of 93,949 (Table 5.6-9). Lake Sturgeon had the highest BPUE value of 50,703, followed by Walleye (15,526) and Northern Pike (14,659). Mean BPUE per site for small mesh index gill nets was 3,600 with Walleye having the highest value of 2,975 (Table 5.6-10).

5.6.3.4 Gauer Lake

In Gauer Lake in 2010, standard gang index gill nets set at nine sites had an overall CPUE of 61.1 (Table 5.6-7; Figure 5.6-9) and small mesh index gill nets 112.8 (Table 5.6-8; Figure 5.6-9).

Walleye had the highest CPUE (15.3) in the standard gang index gillnet catch, followed by Lake Whitefish (15.1) and White Sucker (14.9). Emerald Shiner were most abundant in the small mesh index gillnet catch (CPUE = 47.7) followed by Troutperch (22.7) and Spottail Shiner (19.6) (Figure 5.6-10).

Mean BPUE for standard index gill nets was 54,715 (Table 5.6-9) with White Sucker having the highest BPUE (19,350) followed by Northern Pike (12,671), Lake Whitefish (10,301) and Walleye (10,209). Mean BPUE for small mesh index gillnet sets was 8,717 (Table 5.6-10) with Northern Pike having the highest BPUE value (4,187) followed by Walleye (2,685) and Lake Whitefish (1,352).

5.6.4 Size and Condition

Northern Pike, Lake Whitefish, and Walleye captured in standard gang (Table 5.6-11) and small mesh (Table 5.6-12) index gill nets set in Lower Churchill River Region waterbodies in 2010 were measured for fork length (mm) and weight (g). Condition factor also calculated for each species using these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, and Walleye are illustrated in figures 5.6-11, 5.6-12, and 5.6-13.

5.6.4.1 Northern Indian Lake

Northern Pike captured in standard gang index gill nets set in Northern Indian Lake in 2010 had a mean fork length of 575 mm, a mean weight of 1,418 g, and a mean condition factor of 0.63 (Table 5.6-11). In small mesh index gill nets, Northern Pike had a mean fork length of 485 mm, a mean weight of 897 g, and a mean condition factor of 0.65 (Table 5.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 341 mm, a mean weight of 622 g, and a mean condition factor of 1.34 (Table 5.6-11). In small mesh index gill nets, Lake Whitefish had a mean fork length of 282 mm, a mean weight of 283 g, and a mean condition factor of 1.35 (Table 5.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 376 mm, a mean weight of 635 g, and a mean condition factor of 1.06 (Table 5.6-11). In small mesh index gill nets, Walleye had a mean fork length of 331 mm, a mean weight of 435 g, and a mean condition factor of 1.06 (Table 5.6-12).

5.6.4.2 Billard Lake

Northern Pike captured in standard gang index gill nets set in Billard Lake in 2010 had a mean fork length of 606 mm, a mean weight of 1,574 g, and a mean condition factor of 0.65 (Table

5.6-11). In small mesh index gill nets, Northern Pike had a mean fork length of 550 mm, a mean weight of 1,096 g, and a mean condition factor of 0.64 (Table 5.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 398 mm, a mean weight of 955 g, and a mean condition factor of 1.37 (Table 5.6-11). In small mesh index gill nets, the majority of captured Lake Whitefish were measured for weight only (Table 5.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 478 mm, a mean weight of 1,247 g, and a mean condition factor of 1.05 (Table 5.6-11). In small mesh index gill nets, Walleye had a mean fork length of 377 mm, a mean weight of 632 g, and a mean condition factor of 1.01 (Table 5.6-12).

5.6.4.3 Lower Churchill River

Northern Pike captured in standard gang index gill nets set in the lower Churchill River in 2010 had a mean fork length of 704 mm, a mean weight of 2,452 g, and a mean condition factor of 0.74 (Table 5.6-11). Lake Whitefish had a mean fork length of 403 mm, a mean weight of 966 g, and a mean condition factor of 1.42. The walleye catch had a mean fork length of 443 mm, a mean weight of 1,153 g, and a mean condition factor of 1.18. There were an insufficient number of fish captured and/or measured in small mesh index gill nets to warrant the analysis of size and condition metrics.

5.6.4.4 Gauer Lake

In standard gang index gill nets set in Gauer Lake in 2010, captured Northern Pike had a mean fork length of 557 mm, a mean weight of 1,286 g, and a mean condition factor of 0.66 (Table 5.6-11). Lake Whitefish had a mean fork length of 348 mm, a mean weight of 667 g, and a mean condition factor of 1.39. Walleye had a mean fork length of 387 mm, a mean weight of 683 g, and a mean condition factor of 1.11 (Table 5.6-11). An insufficient number of fish captured in small mesh gill nets were measured for length and weight, therefore analysis based on these metrics were not possible (Table 5.6-12).

5.6.5 Age Composition

Age frequency distributions were calculated for Northern Pike (Table 5.6-13), Lake Whitefish (Table 5.6-14) and Walleye (Table 5.6-15) captured in standard gang index gill nets set in the Lower Churchill River Region waterbodies during 2010.

Mean fork length (mm), weight (g) and condition factor are also presented, by cohort, for Northern Pike (Table 5.6-16), Lake Whitefish (Table 5.6-17) and Walleye (Table 5.6-18).

5.6.5.1 Northern Indian Lake

Ages were determined for 87 Northern Pike captured in Northern Indian Lake in 2010 (Table 5.6-13). The majority of aged fish ranged from five to nine years of age, with 5-year old fish being most abundant in the catch.

A total of 164 Lake Whitefish were aged (Table 5.6-14). Age classes two through seventeen were represented in the sample along with two fish determined to be 24 years of age. The majority of captured Lake Whitefish ranged in age from four to ten years.

Ages were determined for 139 captured Walleye (Table 5.6-15). The majority of Walleye ranged in age from seven to fourteen, with the oldest fish being 26 years of age.

5.6.5.2 Billard Lake

A total of 102 Northern Pike captured in Billard Lake in 2010 were aged (Table 5.6-13). The majority of aged pike ranged from five to eight years of age. Ages were determined for 225 Lake Whitefish, with the majority ranging in age from four to ten years (Table 5.6-14). A total of 109 captured Walleye were aged (Table 5.6-15). With the exception of 23-year old Walleye, the sample contained fish ranging in age from four to twenty-four.

5.6.5.3 Lower Churchill River

A total of 49 Northern Pike captured in the lower Churchill River in 2010 were aged (Table 5.6-13). Most Northern Pike ranged in age from seven to ten years, with 8-year old fish most abundant in the sample.

Of the 77 Lake Whitefish for which ages were determined, the majority ranged in age from six to ten years (Table 5.6-14).

Ages were determined for 136 captured Walleye, and with the exception of 9-year old fish of which only three were captured, fish aged seven to fourteen were most abundant (Table 5.6-15). The oldest Walleye in the catch was 28 years of age.

5.6.5.4 Gauer Lake

A total of 79 Northern Pike captured in Gauer Lake in 2010 were aged (Table 5.6-13). The majority of captured pike ranged in age from four to seven years.

Ages were determined for 105 captured Lake Whitefish (Table 5.6-14). Although whitefish aged four to eleven years were most abundant, the six and nine year old age classes were poorly represented.

A total of 107 Walleye were aged (Table 5.6-15), with fish aged seven through fourteen being well represented.

5.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Lower Churchill River Region waterbodies in 2010 were examined externally for DELTs (Table 5.6-19).

5.6.6.1 Northern Indian Lake

A total of 568 fish captured in standard gang index gill nets set in Northern Indian Lake in 2010 were examined externally for DELTs. Among these, DELTs were documented on 20 fish. Captured Lake Whitefish had the highest proportion of DELTs (4.29%), with three fish having lesions, two fish having tumours, and one fish having erosion. Deformities and lesions were the most prevalent form of DELT encountered.

5.6.6.2 Billard Lake

DELTs were documented on seven of 508 fish examined externally. Lesions were the most prevalent form of DELT encountered.

5.6.6.3 Lower Churchill River

In the lower Churchill River, a total of seven of the 588 captured fish were determined to have DELTs. Deformities were most prevalent, documented for two Lake Sturgeon, two Lake Whitefish, and two Walleye.

5.6.6.4 Gauer Lake

Five of the 659 fish captured in Gauer Lake in 2010 had DELTs. White Sucker accounted for all five occurrences, with all five fish having deformities.

5.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Lower Churchill River Region. Waterbodies sampled included Northern Indian Lake (8-10 August), the Churchill River at the mouth of the Little Churchill River (12-16 August), and an off-system waterbody, Gauer Lake (15-17 August). Standard nets were set at 12 sites in Northern Indian Lake (Figure 5.7-1), at 9 sites in the Churchill River (Figure 5.7-2), and at 9 sites in Gauer Lake (Figure 5.7-3), of which eight, eight, and three sites, respectively yielded fish for mercury analysis. Small mesh nets were set at four sites in Northern Indian Lake, three sites in the Churchill River, and three sites in Gauer Lake, of which fish from two sites at Northern Indian Lake and one site in the Churchill River were used for mercury analysis (Figures 5.7-1 to 5.7-3). Accidental mortalities of Lake Sturgeon captured during fish community sampling at the Churchill River provided 24 samples for mercury analysis. Eight additional Lake Sturgeon muscle samples were obtained from local resource users (TCN 2010) on 22 August and analyzed for mercury.

5.7.1 Species Comparisons

A total of 368 fish were analyzed for mercury. One-year old Yellow Perch were only captured from Northern Indian Lake and with less than target numbers. The actual mean age of the Yellow Perch was 2.1 years at a mean length of 102 mm (Table 5.7-1). Sample sizes for the other species were close to or equal to the target sample size of 36 fish (Table 5.7-1).

A significant positive relationship between mercury concentration and fish length existed for all large-bodied species from the three waterbodies (Figure 5.7-4), indicating that standardization of concentrations was necessary for comparative purposes. Standardized mercury concentrations were generally within approximately 10% of arithmetic concentrations, except for all species sampled from the Churchill River, for which standard concentrations differed by up to 60% from arithmetic concentrations (Table 5.7-2). This difference was mainly due to the relative large average size of Northern Pike, Walleye, and Lake Whitefish and the relative small mean size of Lake Sturgeon compared to the standard length of each species (Table 5.7-1).

Within each waterbody, mean arithmetic mercury concentrations of Northern Pike and Walleye were quite similar to each other and approximately four to seven times higher than of Lake Whitefish (Table 5.7-2). Yellow Perch had the lowest mercury content among the four species from Northern Indian Lake. Northern Pike and Walleye from the Churchill River had arithmetic mercury concentrations that were approximately three times higher than those in Lake Sturgeon caught at the same location.

5.7.2 Comparison to Consumption Guidelines

At 0.53 ppm, standard concentrations of Northern Pike and Walleye from Northern Indian Lake slightly exceeded the 0.5 ppm Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). The same two species from the lower Churchill River and Gauer Lake had mean concentrations considerably below 0.5 ppm but above the 0.2 ppm guideline for human consumption (see section 4.8.2.3; Figure 5.7-5). Standardized mean concentrations in Lake Sturgeon from the lower Churchill River were just below the 0.2 ppm guideline, whereas mean concentrations in Lake Whitefish and Yellow Perch from all sampling locations were well below the guideline (Figure 5.7-5; Table 5.7-2).

Based on individual concentrations, 85% of all Northern Pike and 78% of all Walleye from the Lower Churchill River Region exceeded the 0.2 ppm guideline (Figure 5.7-4). The percentage of piscivorous fish exceeding 0.5 ppm differed markedly between waterbodies, with 28-56% in Northern Indian Lake and the Churchill River, and 3-6% in Gauer Lake. None of the Yellow Perch and only nine Lake Whitefish from the on-system waterbodies had mercury concentrations higher than 0.2 ppm. Six and two of the 32 Sturgeon from the lower Churchill River exceeded concentrations of 0.2 ppm and 0.5 ppm, respectively (Figure 5.7-4). In addition to the exceedances of guidelines and standard relating to human health, mercury concentrations of most fish from the Lower Churchill River Region were substantially higher than the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; updated to 2013; MWS 2011); exceptions were17 Lake Whitefish and one Lake Sturgeon.

SECTION 5: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 5.3-1. Summary statistics for *in situ* variables (near surface) measured in the Lower Churchill River Region: 2010/11.

	Temperature (°C)				*In situ* pH				DO (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	10.23	12.19	11.89	10.19	7.95	7.99	7.93	8.36	11.05	10.87	10.67	11.10
Median	12.27	14.94	14.53	11.42	8.05	8.14	8.20	8.19	10.33	10.29	10.04	10.58
Minimum	0.01	-0.07	-0.09	0.23	6.99	6.89	6.77	7.88	9.44	9.16	8.81	9.16
Maximum	16.36	18.93	18.58	17.69	8.72	8.81	8.54	9.19	14.11	13.73	13.80	14.07
SD	6.36	7.63	7.44	6.45	0.64	0.70	0.69	0.50	1.82	1.75	1.94	1.83
SE	3.67	4.41	4.29	3.73	0.37	0.40	0.40	0.29	1.05	1.01	1.12	1.06
N	4	4	4	4	4	4	4	4	4	4	4	4

	DO (% Saturation)				*In situ* Specific Conductance (µS/cm)				*In situ* Turbidity (NTU)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	99	101	98	100	135	135	135	135	7.23	8.88	9.43	3.47
Median	98	101	98	99	135	135	135	135	5.30	6.70	6.10	3.20
Minimum	97	98	94	97	126	126	126	126	4.00	4.40	5.50	0.60
Maximum	104	106	101	105	145	145	145	145	14.3	17.7	16.7	6.60
SD	3	3	2	3	7	7	7	7	4.19	5.19	5.14	2.46
SE	2	2	1	2	4	4	4	4	2.42	3.00	3.64	1.74
N	4	4	4	4	4	4	4	4	4	4	3	3

Table 5.3-1. - continued -

	ORP (mV)				Secchi Disk Depth- Open-Water Season (m)				Calculated Euphotic Depth (m)				Estimated Euphotic Depth (m)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	163	188	185	175	1.53	1.25	1.30	1.45	3.07	2.50	2.60	2.90	3.01	2.43	2.60	2.87
Median	164	190	174	179	1.58	1.40	1.30	1.56	3.16	2.80	2.60	3.11	3.00	2.50	2.60	3.00
Minimum	142	163	159	136	1.22	0.95	1.30	1.00	2.44	1.90	2.60	2.00	2.44	2.00	2.60	2.00
Maximum	182	210	232	207	1.80	1.40	1.30	1.80	3.60	2.80	2.60	3.60	3.60	2.80	2.60	3.60
SD	15	21	29	25	0.29	0.26	-	0.41	0.48	0.42	-	0.67	0.47	0.33	-	0.66
SE	8	12	17	15	0.17	0.15	-	0.24	0.34	0.30	-	0.47	0.33	0.23	-	0.47
N	4	4	4	4	3	3	1	3	3	3	1	3	3	3	1	3

Table 5.3-2. Summary statistics for routine laboratory variables measured in the Lower Churchill River Region: 2010/11.

	Total Alkalinity ($CaCO_3$ mg/L)				Bicarbonate Alkalinity (HCO_3 mg/L)				Carbonate Alkalinity (CO_3 mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	67.3	65.4	67.1	80.5	82.1	76.8	81.1	98.1	<0.60	1.68	<0.60	<0.60
Median	67.2	63.7	66.5	78.0	82.0	72.5	79.7	95.2	<0.60	<0.60	<0.60	<0.60
Minimum	63.3	59.2	60.6	73.0	77.3	70.8	74.0	89.1	<0.60	<0.60	<0.60	<0.60
Maximum	71.4	75.1	74.7	93.0	87.2	91.6	91.2	113	<0.60	5.82	1.44	<0.60
SD	2.9	6.5	6.4	7.5	3.5	8.6	7.3	9.0	-	2.39	0.49	-
SE	1.7	3.8	3.7	4.3	2.0	4.9	4.2	5.2	-	1.38	0.29	-
N	4	4	4	4	4	4	4	4	4	4	4	4

	Ammonia (mg N/L)				Nitrate/Nitrite (mg N/L)				TKN (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	<0.050	<0.050	0.023	<0.050	<0.050	<0.050	<0.050	<0.050	0.37	0.30	0.33	0.48
Median	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	0.34	0.31	0.32	0.49
Minimum	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	0.32	0.24	0.25	0.34
Maximum	<0.050	<0.050	0.068	<0.050	0.0640	0.0697	0.0760	<0.050	0.48	0.36	0.42	0.59
SD	0.007	0.008	0.026	-	0.0245	0.0274	0.0300	0.0093	0.07	0.04	0.07	0.09
SE	0.004	0.005	0.015	-	0.0142	0.0158	0.0173	0.0054	0.04	0.02	0.04	0.05
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-2. - continued -

	DIN (mg/L) [1]				Organic Nitrogen (mg/L) [1]				TN (mg/L) [1]			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	<0.050	<0.050	<0.050	<0.050	0.35	0.29	0.30	0.47	0.39	0.33	0.35	0.49
Median	<0.050	<0.050	<0.050	<0.050	0.32	0.30	0.29	0.49	0.37	0.32	0.36	0.50
Minimum	<0.010	<0.010	<0.010	<0.010	0.30	0.23	0.21	0.32	0.35	0.24	0.25	0.37
Maximum	0.075	0.077	0.093	<0.050	0.48	0.35	0.42	0.59	0.48	0.43	0.43	0.59
SD	0.026	0.028	0.039	0.009	0.07	0.04	0.08	0.10	0.05	0.07	0.08	0.08
SE	0.015	0.016	0.023	0.005	0.04	0.03	0.05	0.06	0.03	0.04	0.04	0.05
N >DL	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4

	TDP (mg/L)				TPP (mg/L)				TP (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	0.0108	0.0068	0.0083	0.0103	<0.010	0.0105	<0.010	0.011575	0.0197	0.0169	0.0177	0.0208
Median	0.0119	0.0048	0.0085	0.0107	<0.010	0.0104	<0.010	0.01025	0.0201	0.0184	0.0183	0.0177
Minimum	0.0055	0.0034	0.0029	0.0045	<0.010	<0.010	<0.010	<0.010	0.0102	0.0079	0.0115	0.0120
Maximum	0.0140	0.0140	0.0134	0.0152	0.015	0.0182	0.0136	0.0208	0.0286	0.0228	0.0228	0.0360
SD	0.0034	0.0042	0.0049	0.0038	0.005	0.0076	0.0036	0.0069	0.0066	0.0055	0.0042	0.0098
SE	0.0020	0.0024	0.0028	0.0022	0.002	0.0038	0.0018	0.0034	0.0038	0.0032	0.0024	0.0056
N >DL	4	4	4	4	3	3	3	3	4	4	4	4
% Detected	100	100	100	100	75	75	75	75	100	100	100	100
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-2. - continued -

	TN:TP [1]				DIN:DP[1]				DIN:TP [1]				DOC (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	49	52	45	61	7	9	20	4	4	5	7	2	8.7	8.1	8.8	10.0
Median	48	41	44	61	7	11	12	2	4	4	5	2	7.9	7.9	8.5	10.1
Minimum	27	28	34	31	1	2	1	1	1	0	0	0	7.5	6.8	7.5	8.8
Maximum	75	97	59	89	12	12	53	12	9	10	18	4	11.4	9.9	10.6	11.2
SD	17	28	9	21	4	4	20	5	3	4	7	2	1.6	1.2	1.1	0.9
SE	10	16	5	12	3	2	11	3	2	2	4	1	0.9	0.7	0.7	0.5
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

	TOC (mg/L)				TIC (mg/L)				TOC:ON			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	8.9	10.4	9.0	10.2	15.0	27.0	16.1	17.9	30	42	36	26
Median	8.3	7.9	8.9	10.2	15.2	15.8	15.7	17.0	30	33	36	26
Minimum	7.6	6.7	7.8	8.5	12.9	14.0	14.9	16.4	27	26	29	21
Maximum	11.4	19.1	10.3	11.8	16.7	62.5	18.1	21.0	32	76	43	31
SD	1.5	5.1	1.0	1.2	1.6	20.5	1.2	1.9	2	20	6	4
SE	0.9	2.9	0.6	0.7	0.9	11.9	0.7	1.1	1	11	3	3
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-2. - continued -

	TDS (mg/L)				Laboratory Conductivity (µmhos/cm)				TSS (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	83.5	85.2	88.0	91.5	137	131	135	158	3.6	4.4	4.5	3.8
Median	89.0	91.3	87.0	93.0	137	127	134	153	3.2	3.4	3.4	3.8
Minimum	60.0	60.0	70.0	66.0	129	120	123	144	<2.0	<2.0	<2.0	<2.0
Maximum	96.0	98.0	108	114	146	152	151	181	6.8	9.6	10.0	6.4
SD	13.9	14.8	13.5	18.7	6	13	12	14	2.2	3.3	3.4	1.9
SE	8.0	8.5	7.8	10.8	3	8	7	8	1.2	1.9	2.0	1.1
N	4	4	4	4	4	4	4	4	4	4	4	4

	Laboratory Turbidity (NTU)				True Colour (TCU)				Laboratory pH			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	4.04	5.02	4.71	1.49	19.4	18.2	22.8	21.3	8.12	8.28	8.11	8.20
Median	4.09	4.60	3.65	1.52	15.0	18.3	20.2	20.2	8.12	8.15	8.14	8.21
Minimum	2.85	2.71	2.78	0.56	10.0	12.0	19.5	14.3	8.10	8.07	7.83	8.17
Maximum	5.13	8.18	8.78	2.35	37.4	24.4	31.2	30.4	8.14	8.73	8.34	8.23
SD	1.08	1.99	2.43	0.73	10.7	4.6	4.9	6.9	0.02	0.27	0.19	0.03
SE	0.63	1.15	1.40	0.42	6.2	2.6	2.8	4.0	0.01	0.15	0.11	0.02
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-2. - continued -

	E. coli (CFU/100 mL)				Chlorophyll *a* (µg/L)				Hardness as $CaCO_3$ (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	2	1	2	<1	1.17	2.88	1.50	1.61	67.3	64.2	70.3	83.6
Median	<1	<1	<1	<1	1.37	2.88	1.35	1.58	67.0	65.7	70.0	81.1
Minimum	<1	<1	<1	<1	<0.60	<0.60	<0.60	1.24	64.4	55.3	61.7	75.5
Maximum	4	4	4	<1	1.63	5.46	2.99	2.03	71.0	69.9	79.4	96.8
SD	1	2	1	-	0.52	1.83	0.97	0.33	2.4	5.9	7.7	8.1
SE	1	1	1	-	0.30	1.06	0.56	0.19	1.4	3.4	4.4	4.7
N >DL	2	1	2	0	3	3	3	4	4	4	4	4
% Detected	50	25	50	0	75	75	75	100	100	100	100	100
N	4	4	4	4	4	4	4	4	4	4	4	4

	Chloride (mg/L)				Sulphate (mg/L)			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	0.90	0.86	0.93	0.51	2.24	2.46	2.88	1.31
Median	0.92	0.85	0.91	0.58	1.71	1.77	1.88	0.84
Minimum	0.74	0.76	0.77	<0.20	1.55	1.59	1.76	<0.50
Maximum	1.04	0.96	1.11	0.80	4.00	4.70	6.00	3.30
SD	0.12	0.08	0.12	0.26	1.02	1.30	1.80	1.18
SE	0.07	0.05	0.07	0.15	0.59	0.75	1.04	0.68
N >DL	4	4	4	3	4	4	4	3
% Detected	100	100	100	75	100	100	100	75
N	4	4	4	4	4	4	4	4

[1] Calculated.

Table 5.3-3. Summary statistics for metals and major ions measured in the Lower Churchill River Region: 2010/11. Values are presented as mg/L.

	Aluminum				Antimony				Arsenic			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	0.198	0.299	0.268	0.0342	<0.00020	<0.00020	<0.00020	<0.00020	0.00029	0.00036	0.00036	0.00031
Median	0.188	0.301	0.239	0.0359	<0.00020	<0.00020	<0.00020	<0.00020	0.00035	0.00035	0.00035	0.00037
Minimum	0.0627	0.122	0.110	0.0061	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00030	0.00029	<0.00020
Maximum	0.355	0.473	0.485	0.0590	<0.00020	<0.00020	<0.00020	<0.00020	0.00038	0.00043	0.00046	0.00039
SD	0.112	0.139	0.149	0.0248	-	-	-	-	0.00011	0.00005	0.00006	0.00012
SE	0.0649	0.081	0.086	0.0143	-	-	-	-	0.00006	0.00003	0.00004	0.00007
N	4	4	4	4	4	4	4	4	4	4	4	4

	Barium				Beryllium			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	0.0110	0.0112	0.0114	0.00976	<0.00020	<0.00020	<0.00020	<0.00020
Median	0.0112	0.0112	0.0119	0.00965	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	0.00963	0.00877	0.00873	0.00933	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.0120	0.0135	0.0132	0.0104	<0.00020	<0.00020	<0.00020	<0.00020
SD	0.00086	0.00203	0.00186	0.00040	-	-	-	-
SE	0.00049	0.00117	0.00108	0.00023	-	-	-	-
N	4	4	4	4	4	4	4	4

Table 5.3-3. - continued -

	Bismuth				Boron				Cadmium				Calcium				Cesium				Chromium			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010	<0.010	<0.000010	<0.000010	<0.000010	0.000012	19.3	18.3	20.0	24.0	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010
Median	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010	<0.010	<0.000010	<0.000010	<0.000010	<0.000010	19.2	18.4	19.7	23.5	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010	<0.010	<0.000010	<0.000010	<0.000010	<0.000010	18.6	15.6	17.7	21.6	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	<0.010	<0.010	<0.010	<0.000010	0.000010	0.000020	0.000032	20.2	20.8	22.7	27.6	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010
SD	-	-	-	-	-	-	-	-	-	0.000002	0.000006	0.000012	0.6	1.9	2.2	2.3	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-	0.000001	0.000004	0.000007	0.3	1.1	1.3	1.3	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-3. - continued -

	Cobalt				Copper				Iron				Lead				Lithium				Magnesium			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	<0.00020	<0.00020	<0.00020	<0.00020	0.00101	0.00125	0.00146	0.00068	0.119	0.157	0.159	0.045	<0.000090	0.000172	0.000219	0.000129	<0.0020	0.0023	0.0024	<0.0020	4.66	4.51	4.98	5.73
Median	<0.00020	<0.00020	<0.00020	<0.00020	0.00095	0.00121	0.00116	0.00064	0.123	0.152	0.135	0.049	<0.000090	0.000204	0.000235	<0.000090	<0.0020	0.0025	0.0027	<0.0020	4.76	4.48	5.07	5.46
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	0.00078	0.00110	0.00100	0.00055	0.058	0.068	0.055	<0.020	<0.000090	<0.000090	0.000094	<0.000090	<0.0020	<0.0020	<0.0020	<0.0020	4.11	3.99	4.24	5.23
Maximum	<0.00020	<0.00020	<0.00020	<0.00020	0.00137	0.00148	0.00253	0.00088	0.170	0.254	0.310	0.073	0.000141	0.000235	0.000311	0.000380	0.0030	0.0033	0.0030	<0.0020	5.01	5.08	5.53	6.78
SD	-	-	-	-	0.00022	0.00014	0.00062	0.00013	0.042	0.070	0.099	0.026	0.000044	0.000075	0.000079	0.000145	0.0008	0.0008	0.0008	-	0.34	0.39	0.56	0.62
SE	-	-	-	-	0.00013	0.00008	0.00036	0.00007	0.024	0.041	0.057	0.015	0.000025	0.000043	0.000046	0.000084	0.0005	0.0005	0.0005	-	0.20	0.23	0.32	0.36
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-3. - continued -

	Manganese				Mercury				Molybdenum				Nickel				Potassium				Rubidium			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	0.00900	0.0139	0.0149	0.0127	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	0.953	0.997	0.971	0.769	0.00118	0.00138	0.00134	0.00078
Median	0.00871	0.0123	0.0141	0.0121	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	0.967	1.00	0.962	0.759	0.00123	0.00129	0.00135	0.00081
Minimum	0.00536	0.00580	0.00439	0.00384	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	0.770	0.842	0.829	0.720	0.00090	0.00113	0.00093	0.00056
Maximum	0.0132	0.0250	0.0272	0.0230	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	0.00022	<0.0020	<0.0020	<0.0020	<0.0020	1.11	1.14	1.13	0.837	0.00138	0.00179	0.00175	0.00093
SD	0.00330	0.00712	0.00909	0.00714	-	-	-	-	-	-	-	0.00005	-	-	-	-	0.121	0.127	0.112	0.045	0.00018	0.00026	0.00029	0.00014
SE	0.00190	0.00411	0.00525	0.00412	-	-	-	-	-	-	-	0.00003	-	-	-	-	0.070	0.073	0.065	0.026	0.00010	0.00015	0.00017	0.00008
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-3. - continued -

	Selenium				Silicon				Silver				Sodium				Strontium				Tellurium			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	<0.0010	<0.0010	<0.0010	<0.0010	1.87	2.61	2.48	1.89	<0.00010	<0.00010	<0.00010	<0.00010	2.07	2.25	2.23	1.57	0.0316	0.0349	0.0364	0.0309	<0.00020	<0.00020	<0.00020	<0.00020
Median	<0.0010	<0.0010	<0.0010	<0.0010	2.08	2.73	1.93	1.92	<0.00010	<0.00010	<0.00010	<0.00010	2.03	2.18	2.21	1.48	0.0323	0.0345	0.0360	0.0309	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	<0.0010	<0.0010	<0.0010	<0.0010	0.873	1.70	1.34	1.19	<0.00010	<0.00010	<0.00010	<0.00010	1.65	1.95	2.08	1.43	0.0255	0.0318	0.0324	0.0242	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	<0.0010	<0.0010	<0.0010	<0.0010	2.43	3.30	4.73	2.52	<0.00010	<0.00010	<0.00010	<0.00010	2.59	2.70	2.43	1.89	0.0362	0.0389	0.0412	0.0377	<0.00020	<0.00020	<0.00020	<0.00020
SD	-	-	-	-	0.600	0.60	1.37	0.53	-	-	-	-	0.36	0.28	0.15	0.19	0.0039	0.0027	0.0040	0.0048	-	-	-	-
SE	-	-	-	-	0.346	0.35	0.79	0.30	-	-	-	-	0.21	0.16	0.09	0.11	0.0022	0.0015	0.0023	0.0028	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-3. - continued -

	Thallium				Thorium				Tin				Titanium				Tungsten			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	0.00029	<0.00020	0.00602	0.00521	0.00686	0.00683	0.00122	<0.0010	<0.0010	<0.0010	<0.0010
Median	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	0.00095	0.00550	0.00663	0.00559	0.00124	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	0.00264	0.00267	0.00305	0.00023	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	0.00015	<0.00010	0.00041	0.00087	0.00038	0.0221	0.00721	0.0115	0.0131	0.00218	<0.0010	<0.0010	<0.0010	<0.0010
SD	-	-	-	-	-	0.00004	0.00004	-	0.00013	0.00033	0.00012	0.00931	0.00194	0.00329	0.00395	0.00096	-	-	-	-
SE	-	-	-	-	-	0.00002	0.00003	-	0.00008	0.00019	0.00007	0.00537	0.00112	0.00190	0.00228	0.00055	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-3. - continued -

	Uranium				Vanadium				Zinc				Zirconium			
	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU	NIL	BILL	LCR-LiCR	GAU
Mean	0.00020	0.00019	0.00019	0.00023	0.00046	0.00060	0.00056	0.00034	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040	<0.00040
Median	0.00019	0.00020	0.00021	0.00022	0.00051	0.00058	0.00054	0.00039	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040	<0.00040
Minimum	0.00017	0.00012	0.00012	0.00021	0.00020	0.00049	0.00037	<0.00020	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040	<0.00040
Maximum	0.00024	0.00023	0.00022	0.00025	0.00063	0.00074	0.00079	0.00049	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	0.00048	0.00047	<0.00040
SD	0.00003	0.00004	0.00004	0.00002	0.00017	0.00009	0.00015	0.00015	-	-	-	-	-	0.00012	0.00012	-
SE	0.00002	0.00002	0.00002	0.00001	0.00010	0.00005	0.00009	0.00009	-	-	-	-	-	0.00007	0.00007	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 5.3-4. Frequency of detections of total metals measured in the Lower Churchill Region: 2010/2011.

Waterbody		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium
Northern Indian Lake	# Detections	4	0	3	4	0	0	0	0	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	75	100	0	0	0	0	100	0
Billard Lake	# Detections	4	0	4	4	0	0	0	1	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	100	100	0	0	0	25	100	0
Lower Churchill River	# Detections	4	0	4	4	0	0	0	1	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	100	100	0	0	0	25	100	0
Gauer Lake	# Detections	4	0	3	4	0	0	0	1	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	75	100	0	0	0	25	100	0

Table 5.3-4. - continued -

Waterbody		Chloride	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury
Northern Indian Lake	# Detections	4	0	0	4	4	2	2	4	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	0	100	100	50	50	100	100	0
Billard Lake	# Detections	4	0	0	4	4	3	3	4	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	0	100	100	75	75	100	100	0
Lower Churchill River	# Detections	4	0	0	4	4	4	3	4	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	100	0	0	100	100	100	75	100	100	0
Gauer Lake	# Detections	3	0	0	4	3	1	0	4	4	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	75	0	0	100	75	25	0	100	100	0

Table 5.3-4. - continued -

Waterbody		Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Sulphate
Northern Indian Lake	# Detections	0	0	4	4	0	4	0	4	4	4
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	100	100	0	100	0	100	100	100
Billard Lake	# Detections	0	0	4	4	0	4	0	4	4	4
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	100	100	0	100	0	100	100	100
Lower Churchill River	# Detections	0	0	4	4	0	4	0	4	4	4
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	100	100	0	100	0	100	100	100
Gauer Lake	# Detections	1	0	4	4	0	4	0	4	4	3
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	25	0	100	100	0	100	0	100	100	75

Table 5.3-4. - continued -

Waterbody		Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Northern Indian Lake	# Detections	0	0	0	1	4	0	4	4	0	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	0	25	100	0	100	100	0	0
Billard Lake	# Detections	0	0	1	1	4	0	4	4	0	1
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	25	25	100	0	100	100	0	25
Lower Churchill River	# Detections	0	0	1	1	4	0	4	4	0	1
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	25	25	100	0	100	100	0	25
Gauer Lake	# Detections	0	0	0	2	4	0	4	3	0	0
	n	4	4	4	4	4	4	4	4	4	4
	% Detection	0	0	0	50	100	0	100	75	0	0

Table 5.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Lower Churchill River Region: 2010/2011. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00017-0.00026	0.0531-0.0839	0.0056-0.0091	0.3	0.00150-0.00305	0.000026
Northern Indian Lake	N	**4**	4	4	4	4	4	4	4	4
	# Exceedances	**3**	0	0	0	0	0	0	0	0
	% Exceedances	**75**	0	0	0	0	0	0	0	0
Billard Lake	N	**4**	4	4	4	4	4	4	4	4
	# Exceedances	**4**	0	0	0	0	0	0	0	0
	% Exceedances	**100**	0	0	0	0	0	0	0	0
Lower Churchill River	N	**4**	4	4	4	4	4	**4**	4	4
	# Exceedances	**4**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**25**	0	0
Gauer Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

Table 5.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.0316-0.0507	0.001	0.0001	0.0008	0.015	0.0725-0.1166	120	128-429
Northern Indian Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Billard Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lower Churchill River	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Gauer Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

[1] Mercury was analysed at a detection limit of 0.0005 mg/L and results cannot be compared to the current Manitoba PAL guideline for mercury.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 5.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Lower Churchill River Region and the CCME (1999; updated to 2013) trophic categorization: 2010/2011.

		Trophic Status Based on Total Phosphorus (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100
Northern Indian Lake	Open-water season				0.020		
	Annual				0.020		
Billard Lake	Open-water season			0.017			
	Annual			0.010			
Lower Churchill River	Open-water season			0.017			
	Annual			0.018			
Gauer Lake	Open-water season				0.024		
	Annual				0.021		

Table 5.3-7. Total nitrogen concentrations (open-water season and annual means) measured in lakes and reservoirs in the Lower Churchill River Region and comparison to a trophic categorization scheme Nürnberg (1996): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Northern Indian Lake	Open-water season			0.39			
	Annual			0.39			
Billard Lake	Open-water season		0.30				
	Annual		0.33				
Gauer Lake	Open-water season			0.49			
	Annual			0.49			

Table 5.3-8. Chlorophyll *a* concentrations (open-water season and annual means) measured in lakes in the Lower Churchill River Region and the OECD (1982) trophic categorization schemes for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	< 2.5	2.5 - 8	-	8 - 25	> 25
Northern Indian Lake	Open-water season		1.5				
	Annual		1.2				
Billard Lake	Open-water season			3.7			
	Annual			2.9			
Gauer Lake	Open-water season		1.7				
	Annual		1.6				

Table 5.3-9. Mean (open-water season and annual) concentrations of TN in the Lower Churchill River and comparison to a trophic categorization scheme for rivers/streams (Dodds et al. 1998): 2010/2011.

		River Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-Oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<0.7	0.7-1.5	-	>1.5	-
Lower Churchill River	Open-water season		0.33[a]				
	Annual		0.35				

Table 5.3-10. Mean (open-water season and annual) concentrations of chlorophyll *a* in the Lower Churchill River and comparison to a trophic categorization scheme for rivers/streams (Dodds et al. 1998): 2010/2011.

		River Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<10	10-30	-	>30	-
Lower Churchill River	Open-water season		1.9				
	Annual		1.5				

Table 5.4-1. Community metrics for phytoplankton samples collected in the Lower Churchill River Region during the open-water season of 2010.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Heterogeneity (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H`}$)	Evenness ($E^{H`}/S$)
Billard Lake	Spring	23	0.95	0.90	2.08	0.66	8.03	0.35
	Summer	26	0.88	0.37	2.44	0.78	11.44	0.50
	Fall	23	0.84	0.27	2.28	0.73	9.75	0.42

Table 5.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Lower Churchill River Region for the CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Disk Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Northern Indian Lake (2010)	Nearshore	5	0.3	0.3	0.4	0.00	0.34	14.0	silt, organic matter	grass, shrubs, deciduous	0-24	0
	Offshore	5	3.5	3.4	3.6	0.00	0.87 [a]	14.0	clay	--	--	0
Billard Lake (2010)	Nearshore	5	0.5	0.4	0.6	0.02	0.53	9.0	cobble, gravel, sand	mixed forest	0-24	0
	Offshore	5	8.2	7.6	9.1	0.07 [b]	1.23	13.0	clay, organic matter	--	--	0
Churchill River (2010)	Nearshore	5	1.0	1.0	1.0	0.00	0.72	--	boulder	grass, shrubs, mixed forest	0	algal balls
	Offshore	5	6.4	5.2	7.4	0.49	0.65	12.0	sand	--	--	0
Gauer Lake (2010)	Nearshore	5	0.5	0.4	0.7	0.00	0.60	14.0	boulder	shrubs, coniferous	0-24	attached, floating at one site
	Offshore	5	6.2	6.0	6.6	0.01	1.97 [a]	13.5	clay, silt	--	--	0

[a] based on two measurements

[b] based on a single measurement

Table 5.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Lower Churchill River Region for the CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Northern Indian Lake (2010)	Nearshore	Mean	5	0.2*	0.95	16.42	51.16	32.40	Silty Clay Loam
		SD	--	0.03	0.740	8.146	1.759	8.225	--
		SE	--	0.01	0.331	3.643	0.787	3.678	--
		Median	--	0.2	0.53	17.80	51.30	32.30	--
		Min	--	0.2	0.29	3.32	49.00	23.40	--
		Max	--	0.3	1.91	23.20	53.40	45.40	--
	Offshore	Mean	5	3.5	2.56	28.46	50.82	20.72	Silt Loam
		SD	--	0.07	1.827	1.720	2.298	3.101	--
		SE	--	0.03	0.817	0.769	1.028	1.387	--
		Median	--	3.5	1.73	28.20	50.40	20.80	--
		Min	--	3.4	1.72	26.30	48.20	17.30	--
		Max	--	3.6	5.83	30.80	54.40	25.50	--
Billard Lake (2010)	Nearshore	Mean	5	0.2	0.26	96.90	2.73	0.38	Sand
		SD	--	0.04	0.132	1.977	1.861	0.244	--
		SE	--	0.02	0.059	0.884	0.832	0.109	--
		Median	--	0.2	0.27	97.60	1.98	0.24	--
		Min	--	0.2	0.05	93.40	1.64	0.15	--
		Max	--	0.3	0.41	98.10	6.04	0.67	--
	Offshore	Mean	5	8.0*	2.90	2.72	58.44	38.82	Silty Clay Loam
		SD	--	0.98	0.327	0.904	8.288	8.227	--
		SE	--	0.49	0.146	0.404	3.706	3.679	--
		Median	--	7.6	2.75	2.32	58.30	37.40	--
		Min	--	7.2	2.73	1.91	49.60	27.20	--
		Max	--	9.4	3.48	4.23	70.90	48.10	--
Churchill River (2010)	Offshore	Mean	5	6.2	0.82	87.40	7.69	4.90	Sand
		SD	--	0.57	1.031	11.517	6.343	5.381	--
		SE	--	0.26	0.461	5.150	2.837	2.407	--
		Median	--	6.5	0.34	92.80	6.56	2.29	--
		Min	--	5.3	0.10	68.80	1.25	0.63	--
		Max	--	6.7	2.60	97.70	17.90	13.30	--
Gauer Lake (2010)	Offshore	Mean	5	6.3*	7.96	0.55	62.44	37.00	Silty Clay Loam
		SD	--	0.29	0.184	0.257	5.596	5.540	--
		SE	--	0.15	0.082	0.115	2.503	2.478	--
		Median	--	6.3	7.89	0.47	63.30	36.20	--
		Min	--	6.0	7.77	0.22	53.20	32.50	--
		Max	--	6.7	8.21	0.82	67.00	46.00	--

Table 5.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Northern Indian Lake within the Lower Churchill River Region for CAMPP, 2010.

	Northern Indian Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	120	92.1	41.2	81	28	249
Oligochaeta	--	35	61.5	27.5	10	2	145
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.3	0.1	0	0	1
Hyalellidae	--	0	0.4	0.2	0	0	1
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.3	0.1	0	0	1
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	15	9.0	4.0	14	3	27
Gastropoda - unid	--	0	0.3	0.1	0	0	1
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	1	0.6	0.3	1	0	1
Lymnaeidae	--	1	1.3	0.6	1	0	3
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.3	0.1	0	0	1
Valvatidae	--	0	0.3	0.1	0	0	1
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.1	0.1	0	0	0
Non-Insecta	--	53	60.8	27.2	33	8	160
Non-Insecta (%)	44	--	--	--	--	--	--
Oligochaeta	--	35	61.5	27.5	10	2	145
Oligochaeta (%)	29	--	--	--	--	--	--
Amphipoda	--	1	0.5	0.2	0	0	1
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	15	9.0	4.0	14	3	27
Bivalvia (%)	12	--	--	--	--	--	--
Gastropoda	--	2	1.4	0.6	2	0	4
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 5.5-3. - continued -

	Northern Indian Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.2	0.1	0	0	0
Dytiscidae (larva)	--	0	0.3	0.1	0	0	1
Dytiscidae (adult)	--	2	1.2	0.5	1	0	3
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.1	0.1	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.3	0.1	0	0	1
Haliplidae (larva)	--	0	0.6	0.2	0	0	1
Haliplidae (adult)	--	0	0.4	0.2	0	0	1
Heliophoridae	--	0	0.2	0.1	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.1	0.1	0	0	0
Corixidae (larva + adult)	--	5	3.4	1.5	6	0	8
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.1	0.1	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 5.5-3. - continued -

	Northern Indian Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.4	0.2	0	0	1
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.3	0.1	0	0	1
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1	0.8	0.4	1	0	2
Orthocladiinae	--	2	1.2	0.5	3	0	3
Tanypodinae	--	0	0.3	0.1	0	0	1
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	7	5.2	2.3	8	0	13
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	1	1.5	0.7	0	0	4
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	45	49.5	22.1	33	0	123
Tipulidae (pupa)	--	3	4.4	1.9	1	0	10

Table 5.5-3. - continued -

	Northern Indian Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	67	53.5	23.9	52	20	150
Insecta (%)	56	--	--	--	--	--	--
Chironomidae	--	4	1.9	0.8	4	1	5
Chironomidae (%)	3	--	--	--	--	--	--
Ephemeroptera	--	0	0.1	0.1	0	0	0
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	0	0.1	0.1	0	0	0
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.10	0.22	0.10	0.00	0.00	0.50
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	23	13	0.9	0.4	14	12	14
Simpson's Diversity Index (D)	--	0.71	0.141	0.063	0.76	0.52	0.84
Evenness (Simpson's Equitability E_D)	--	0.27	0.135	0.060	0.30	0.12	0.39
Shannon-Weaver Index (H)	--	1.68	0.366	0.164	1.74	1.27	2.06
Evenness (Shannon's Equitability E_H)	--	0.61	0.150	0.067	0.66	0.44	0.74
Hill's Effective Richness ($E^{H'}$)	--	6	2.0	0.9	6	4	8
Evenness ($E^{H'}$/S)	--	0.36	0.148	0.066	0.41	0.20	0.49

Table 5.5-3. - continued -

	Northern Indian Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2196	780.0	348.8	2496	1082	2900
Oligochaeta	--	55	59.0	26.4	14	14	144
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	6	7.9	3.5	0	0	14
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	918	465.2	208.1	1024	390	1414
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	118	90.3	40.4	58	43	231
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	6.5	2.9	0	0	14
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	3	6.5	2.9	0	0	14
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	1102	562.0	251.3	1313	462	1688
Non-Insecta (%)	50	--	--	--	--	--	--
Oligochaeta	--	55	59.0	26.4	14	14	144
Oligochaeta (%)	2	--	--	--	--	--	--
Amphipoda	--	918	465.2	208.1	1024	390	1414
Amphipoda (%)	42	--	--	--	--	--	--
Bivalvia	--	118	90.3	40.4	58	43	231
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	6	7.9	3.5	0	0	14
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0

Table 5.5-3. - continued -

	Northern Indian Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	280	78.8	35.2	317	188	346
Heptageniidae	--	3	6.5	2.9	0	0	14
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 5.5-3. - continued -

	Northern Indian Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	3	6.5	2.9	0	0	14
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	20	21.9	9.8	14	0	43
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	23	21.9	9.8	14	0	58
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	390	127.0	56.8	390	188	505
Orthocladiinae	--	14	10.2	4.6	14	0	29
Tanypodinae	--	361	117.2	52.4	375	202	491
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 5.5-3. - continued -

	Northern Indian Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1094	270.0	120.7	1183	620	1298
Insecta (%)	50	--	--	--	--	--	--
Chironomidae	--	788	215.6	96.4	866	418	967
Chironomidae (%)	36	--	--	--	--	--	--
Ephemeroptera	--	283	74.7	33.4	317	202	346
Ephemeroptera (%)	13	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	6.5	2.9	0	0	14
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	286	78.0	34.9	317	202	361
EPT (%)	13	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.38	0.10	0.05	0.40	0.21	0.48
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	7	0.8	0.4	7	6	8
Simpson's Diversity Index (D)	--	0.74	0.034	0.015	0.75	0.70	0.78
Evenness (Simpson's Equitability E_D)	--	0.42	0.076	0.034	0.44	0.33	0.51
Shannon-Weaver Index (H)	--	1.61	0.059	0.026	1.62	1.52	1.67
Evenness (Shannon's Equitability E_H)	--	0.72	0.043	0.019	0.74	0.66	0.76
Hill's Effective Richness ($E^{H'}$)	--	5	0.3	0.1	5	5	5
Evenness ($E^{H'}/S$)	--	0.54	0.059	0.026	0.56	0.46	0.59

Table 5.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Billard Lake within the Lower Churchill River Region for CAMPP, 2010.

	Billard Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	241	93.1	41.6	198	142	359
Oligochaeta	--	120	75.4	33.7	96	65	249
Hirudinea	--	0	0.1	0.1	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.1	0.1	0	0	0
Haustoriidae	--	1	1.2	0.5	0	0	3
Hyalellidae	--	1	0.9	0.4	0	0	2
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	23	21.5	9.6	14	6	57
Gastropoda - unid	--	0	0.1	0.1	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	2	1.9	0.8	1	0	5
Lymnaeidae	--	0	0.3	0.1	0	0	1
Physidae	--	0	0.4	0.2	0	0	1
Planorbidae	--	0	0.3	0.1	0	0	1
Valvatidae	--	1	0.6	0.3	0	0	1
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	147	72.9	32.6	130	79	266
Non-Insecta (%)	61	--	--	--	--	--	--
Oligochaeta	--	120	75.4	33.7	96	65	249
Oligochaeta (%)	50	--	--	--	--	--	--
Amphipoda	--	1	1.7	0.8	1	0	4
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	23	21.5	9.6	14	6	57
Bivalvia (%)	9	--	--	--	--	--	--
Gastropoda	--	3	1.6	0.7	2	1	5
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0

Table 5.5-4. - continued -

	Billard Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.3	0.1	0	0	1
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	1	0.9	0.4	0	0	2
Dytiscidae (adult)	--	18	11.7	5.3	17	4	34
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.3	0.1	0	0	1
Gyrinidae (adult)	--	2	1.4	0.6	1	0	3
Haliplidae (larva)	--	0	0.3	0.1	0	0	1
Haliplidae (adult)	--	0	0.5	0.2	0	0	1
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.6	0.3	0	0	1
Hydrophilidae (adult)	--	0	0.1	0.1	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	4	3.4	1.5	4	1	10
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.3	0.1	0	0	1
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.6	0.3	0	0	1
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	25	20.8	9.3	17	10	61
Ephemerellidae	--	0	0.1	0.1	0	0	0
Eurylophella	--	4	3.3	1.5	2	1	7
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	3	5.0	2.2	2	0	12
Hexagenia	--	0	0.1	0.1	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.1	0.1	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	1	0.9	0.4	1	0	2
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0

Table 5.5-4. - continued -

	Billard Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.1	0.1	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.4	0.2	0	0	1
Leptoceridae (larva)	--	1	0.8	0.3	1	0	2
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	4	3.1	1.4	5	0	8
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.6	0.3	0	0	1
Chironomidae (pupa)	--	2	1.0	0.5	2	1	3
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	13	9.4	4.2	12	2	27
Orthocladiinae	--	9	2.3	1.0	9	6	11
Tanypodinae	--	1	1.1	0.5	1	0	3
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.1	0.1	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0

Table 5.5-4. - continued -

	Billard Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tabanidae	--	0	0.1	0.1	0	0	0
Tipulidae (larva)	--	4	2.0	0.9	3	2	7
Tipulidae (pupa)	--	0	0.5	0.2	0	0	1
Insecta	--	94	39.4	17.6	87	63	161
Insecta (%)	39	--	--	--	--	--	--
Chironomidae	--	26	11.1	5.0	26	14	41
Chironomidae (%)	11	--	--	--	--	--	--
Ephemeroptera	--	34	28.5	12.7	24	12	83
Ephemeroptera (%)	14	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	1	0.9	0.4	1	0	2
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	35	28.9	12.9	24	14	85
EPT (%)	15	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.36	0.73	0.33	1.00	0.58	2.21
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	30	18	1.5	0.7	18	17	21
Simpson's Diversity Index (D)	--	0.70	0.140	0.063	0.71	0.50	0.83
Evenness (Simpson's Equitability E_D)	--	0.16	0.063	0.028	0.16	0.08	0.25
Shannon-Weaver Index (H)	--	1.84	0.396	0.177	1.79	1.27	2.26
Evenness (Shannon's Equitability E_H)	--	0.58	0.113	0.051	0.58	0.40	0.68
Hill's Effective Richness ($E^{H'}$)	--	7	2.5	1.1	6	4	10
Evenness ($E^{H'}$/S)	--	0.28	0.082	0.037	0.27	0.15	0.36

Table 5.5-4. - continued -

	Billard Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2438	1179.2	527.4	2337	678	3621
Oligochaeta	--	173	180.5	80.7	130	0	433
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	17	31.3	14.0	0	0	72
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	6	7.9	3.5	0	0	14
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	1573	742.3	332.0	1515	606	2655
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	6.5	2.9	0	0	14
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	3	6.5	2.9	0	0	14
Valvatidae	--	81	60.0	26.8	87	0	144
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	1855	860.4	384.8	1760	606	2943
Non-Insecta (%)	76	--	--	--	--	--	--
Oligochaeta	--	173	180.5	80.7	130	0	433
Oligochaeta (%)	7	--	--	--	--	--	--
Amphipoda	--	17	31.3	14.0	0	0	72
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	1573	742.3	332.0	1515	606	2655
Bivalvia (%)	64	--	--	--	--	--	--
Gastropoda	--	87	61.2	27.4	87	0	144
Gastropoda (%)	4	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0

Table 5.5-4. - continued -

	Billard Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	3	6.5	2.9	0	0	14
Hexagenia	--	6	7.9	3.5	0	0	14
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 5.5-4. - continued -

	Billard Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	3	6.5	2.9	0	0	14
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	29	30.6	13.7	29	0	72
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	3	6.5	2.9	0	0	14
Chironomidae (pupa)	--	3	6.5	2.9	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	407	339.8	152.0	404	14	923
Orthocladiinae	--	9	19.4	8.7	0	0	43
Tanypodinae	--	121	41.6	18.6	144	58	159
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 5.5-4. - continued -

	Billard Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	583	396.1	177.1	649	72	1140
Insecta (%)	24	--	--	--	--	--	--
Chironomidae	--	542	381.1	170.4	577	72	1111
Chironomidae (%)	22	--	--	--	--	--	--
Ephemeroptera	--	9	7.9	3.5	14	0	14
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	6.5	2.9	0	0	14
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	12	12.1	5.4	14	0	29
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.02	0.02	0.01	0.02	0.00	0.05
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	6	2.8	1.2	7	2	9
Simpson's Diversity Index (D)	--	0.48	0.175	0.078	0.53	0.19	0.64
Evenness (Simpson's Equitability E_D)	--	0.30	0.108	0.049	0.30	0.18	0.41
Shannon-Weaver Index (H)	--	1.02	0.366	0.164	1.18	0.39	1.28
Evenness (Shannon's Equitability E_H)	--	0.51	0.120	0.054	0.49	0.36	0.66
Hill's Effective Richness ($E^{H'}$)	--	3	0.9	0.4	3	1	4
Evenness ($E^{H'}$/S)	--	0.40	0.110	0.049	0.43	0.28	0.51

Table 5.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in the Churchill River within the Lower Churchill River Region for CAMPP, 2010.

	Churchill River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	666	253.0	113.1	571	351	987
Oligochaeta	--	13	2.4	1.1	13	9	15
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.3	0.1	0	0	1
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	2	4.7	2.1	0	0	11
Gastropoda - unid	--	0	0.6	0.3	0	0	1
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.3	0.1	0	0	1
Lymnaeidae	--	3	3.3	1.5	2	0	8
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	18	8.3	3.7	16	11	32
Non-Insecta (%)	3	--	--	--	--	--	--
Oligochaeta	--	13	2.4	1.1	13	9	15
Oligochaeta (%)	2	--	--	--	--	--	--
Amphipoda	--	0	0.3	0.1	0	0	1
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	2	4.7	2.1	0	0	11
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	3	3.0	1.4	3	0	8
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 5.5-5. - continued -

	Churchill River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	2	2.2	1.0	1	0	5
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	112	53.3	23.8	99	64	197
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	34	55.0	24.6	5	2	131
Haliplidae (larva)	--	1	0.7	0.3	0	0	1
Haliplidae (adult)	--	0	0.3	0.1	0	0	1
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	443	168.2	75.2	385	226	637
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	3	3.1	1.4	3	0	8
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.6	0.3	0	0	1
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	1	1.2	0.5	0	0	3
Hexagenia	--	1	1.2	0.5	0	0	3
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.9	0.4	0	0	2
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0

Table 5.5-5. - continued -

	Churchill River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	15	19.7	8.8	11	0	48
Siphlonurus	--	9	17.4	7.8	0	0	40
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.3	0.1	0	0	1
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	1	2.4	1.1	0	0	5
Diptera (pupa) - unid	--	1	3.0	1.3	0	0	7
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.9	0.4	0	0	2
Ceratopogonidae (larva)	--	1	1.2	0.5	0	0	3
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	7	12.5	5.6	1	0	29
Orthocladiinae	--	2	2.6	1.2	0	0	5
Tanypodinae	--	1	1.2	0.5	0	0	3
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	1	0.7	0.3	1	0	1
Empididae	--	1	1.5	0.7	0	0	3
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.6	0.3	0	0	1
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	7	5.9	2.6	7	0	16
Tipulidae (pupa)	--	5	6.4	2.8	0	0	13
Insecta	--	648	248.8	111.3	557	332	955
Insecta (%)	97	--	--	--	--	--	--

Table 5.5-5. - continued -

	Churchill River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	10	12.6	5.6	5	1	32
Chironomidae (%)	1	--	--	--	--	--	--
Ephemeroptera	--	29	22.0	9.9	19	11	61
Ephemeroptera (%)	4	--	--	--	--	--	--
Plecoptera	--	0	0.3	0.1	0	0	1
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	29	21.9	9.8	19	11	61
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	5.75	5.25	2.35	2.86	1.92	14.00
Genus analysis of Ephemeroptera	Siphlonuridae: *Parameletus*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	22	13	3.7	1.7	13	8	18
Simpson's Diversity Index (D)	--	0.52	0.035	0.015	0.51	0.47	0.56
Evenness (Simpson's Equitability E_D)	--	0.15	0.033	0.015	0.15	0.10	0.19
Shannon-Weaver Index (H)	--	1.16	0.170	0.076	1.10	0.94	1.33
Evenness (Shannon's Equitability E_H)	--	0.43	0.026	0.011	0.43	0.41	0.47
Hill's Effective Richness ($E^{H'}$)	--	3	0.5	0.2	3	3	4
Evenness ($E^{H'}$/S)	--	0.22	0.034	0.015	0.22	0.17	0.25

Table 5.5-5. - continued -

	Churchill River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1737	884.8	395.7	1645	693	2770
Oligochaeta	--	32	21.4	9.6	29	0	58
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	3	6.5	2.9	0	0	14
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	6	7.9	3.5	0	0	14
Pisidiidae	--	89	37.3	16.7	87	43	144
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	12.9	5.8	0	0	29
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	136	60.0	26.8	159	43	202
Non-Insecta (%)	8	--	--	--	--	--	--
Oligochaeta	--	32	21.4	9.6	29	0	58
Oligochaeta (%)	2	--	--	--	--	--	--
Amphipoda	--	3	6.5	2.9	0	0	14
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	95	41.6	18.6	87	43	159
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	6	12.9	5.8	0	0	29
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 5.5-5. - continued -

	Churchill River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	3	6.5	2.9	0	0	14
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	3	6.5	2.9	0	0	14
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	14	10.2	4.6	14	0	29
Hexagenia	--	101	42.1	18.8	115	43	144
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 5.5-5. - continued -

	Churchill River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	12	18.8	8.4	0	0	43
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	32	23.7	10.6	43	0	58
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1232	755.0	337.6	1111	476	2323
Orthocladiinae	--	12	15.8	7.1	0	0	29
Tanypodinae	--	193	191.0	85.4	144	43	519
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1601	869.5	388.9	1486	649	2611
Insecta (%)	92	--	--	--	--	--	--
Chironomidae	--	1437	826.6	369.7	1327	519	2395
Chironomidae (%)	83	--	--	--	--	--	--
Ephemeroptera	--	121	39.0	17.4	130	58	159

Table 5.5-5. - continued -

	Churchill River						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	18.8	8.4	0	0	43
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	133	35.9	16.1	144	72	159
EPT (%)	8	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.12	0.08	0.03	0.09	0.07	0.25
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	6	2.6	1.2	6	3	10
Simpson's Diversity Index (D)	--	0.49	0.122	0.054	0.52	0.29	0.63
Evenness (Simpson's Equitability E_D)	--	0.28	0.136	0.061	0.27	0.12	0.49
Shannon-Weaver Index (H)	--	1.08	0.234	0.105	1.09	0.80	1.40
Evenness (Shannon's Equitability E_H)	--	0.54	0.134	0.060	0.54	0.32	0.66
Hill's Effective Richness ($E^{H'}$)	--	3	0.7	0.3	3	2	4
Evenness ($E^{H'}$/S)	--	0.40	0.159	0.071	0.37	0.19	0.63

Table 5.5-6. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Gauer Lake within the Lower Churchill River Region for CAMPP, 2010.

	Gauer Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	180	115	51.2	132.3	51	330
Oligochaeta	--	0	0	0.1	0.3	0	1
Hirudinea	--	0	0	0.1	0.0	0	0
Ostracoda	--	0	0	0.0	0.0	0	0
Amphipoda - unid	--	0	0	0.0	0.0	0	0
Crangonyctidae	--	0	0	0.0	0.0	0	0
Gammaridae	--	1	1	0.6	0.7	0	3
Haustoriidae	--	0	0	0.0	0.0	0	0
Hyalellidae	--	4	4	1.7	2.7	1	9
Diplostraca	--	0	0	0.0	0.0	0	0
Mysidae	--	0	0	0.1	0.0	0	0
Decapoda	--	0	0	0.0	0.0	0	0
Arachnida - unid	--	0	0	0.0	0.0	0	0
Acari	--	0	0	0.2	0.7	0	1
Bivalvia - unid	--	0	0	0.0	0.0	0	0
Unionidae	--	0	0	0.0	0.0	0	0
Pisidiidae	--	1	1	0.4	0.7	0	2
Gastropoda - unid	--	0	0	0.1	0.0	0	1
Ancylidae	--	0	0	0.0	0.0	0	0
Hydrobiidae	--	0	0	0.1	0.0	0	1
Lymnaeidae	--	2	2	0.8	1.3	0	5
Physidae	--	2	1	0.7	1.3	0	4
Planorbidae	--	0	0	0.1	0.0	0	1
Valvatidae	--	1	1	0.2	0.3	0	1
Platyhelminthes	--	0	0	0.0	0.0	0	0
Hydrozoa	--	0	0	0.0	0.0	0	0
Collembola	--	0	0	0.0	0.0	0	0
Non-Insecta	--	11	6	2.7	11.3	4	19
Non-Insecta (%)	6	--	--	--	--	--	--
Oligochaeta	--	0	0	0.1	0.3	0	1
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	5	5	2.1	2.7	1	10
Amphipoda (%)	3	--	--	--	--	--	--
Bivalvia	--	1	1	0.4	0.7	0	2
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	4	3	1.3	2.7	2	9
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0	0.0	0.0	0	0
Sialidae	--	0	0	0.0	0.0	0	0
Neuroptera	--	0	0	0.0	0.0	0	0
Sisyridae	--	0	0	0.0	0.0	0	0
Odonata	--	0	0	0.0	0.0	0	0
Anisoptera	--	0	0	0.0	0.0	0	0
Aeshnidae	--	0	0	0.0	0.0	0	0
Corduliidae	--	0	0	0.0	0.0	0	0
Gomphidae	--	0	0	0.0	0.0	0	0
Libellulidae	--	0	0	0.0	0.0	0	0

Table 5.5-6. - continued -

	Gauer Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Zygoptera	--	0	0	0.0	0.0	0	0
Coenagrionidae	--	0	0	0.0	0.0	0	0
Lepidoptera	--	0	0	0.0	0.0	0	0
Pyralidae	--	0	0	0.0	0.0	0	0
Coleoptera (larva) - unid	--	0	0	0.0	0.0	0	0
Coleoptera (adult) - unid	--	0	0	0.0	0.0	0	0
Curculionidae	--	0	0	0.0	0.0	0	0
Dytiscidae (larva)	--	0	0	0.0	0.0	0	0
Dytiscidae (adult)	--	2	2	0.7	0.7	1	4
Elmidae (larva)	--	0	0	0.0	0.0	0	0
Elmidae (adult)	--	0	0	0.0	0.0	0	0
Gerridae	--	0	0	0.1	0.0	0	0
Gyrinidae (larva)	--	0	0	0.0	0.0	0	0
Gyrinidae (adult)	--	0	1	0.3	0.0	0	1
Haliplidae (larva)	--	0	0	0.0	0.0	0	0
Haliplidae (adult)	--	0	0	0.0	0.0	0	0
Heliophoridae	--	0	0	0.0	0.0	0	0
Helodidae (adult)	--	0	0	0.0	0.0	0	0
Hydrophilidae (larva)	--	0	0	0.0	0.0	0	0
Hydrophilidae (adult)	--	0	0	0.0	0.0	0	0
Hemiptera - unidentified	--	0	0	0.0	0.0	0	0
Corixidae (larva + adult)	--	161	118	52.9	113.3	26	313
Corixidae	--	0	0	0.0	0.0	0	0
Ephemeroptera - unid	--	0	0	0.0	0.0	0	0
Baetidae	--	0	0	0.0	0.0	0	0
Acentrella	--	0	0	0.0	0.0	0	0
Baetis	--	0	0	0.0	0.0	0	0
Callibaetis	--	0	0	0.0	0.0	0	0
Centroptilum	--	0	0	0.0	0.0	0	0
Paracloeodes	--	0	0	0.0	0.0	0	0
Plauditus	--	0	0	0.0	0.0	0	0
Procloeon	--	0	0	0.2	0.3	0	1
Pseudocloeon	--	0	0	0.0	0.0	0	0
Baetiscidae	--	0	0	0.0	0.0	0	0
Baetisca	--	0	0	0.0	0.0	0	0
Caenidae	--	0	0	0.0	0.0	0	0
Caenis	--	1	2	0.8	0.3	0	4
Ephemerellidae	--	0	0	0.0	0.0	0	0
Eurylophella	--	0	0	0.0	0.0	0	0
Ephemeridae	--	0	0	0.0	0.0	0	0
Ephemera	--	0	0	0.0	0.0	0	0
Hexagenia	--	0	0	0.0	0.0	0	0
Heptageniidae	--	0	0	0.0	0.0	0	0
Heptagenia	--	0	0	0.0	0.0	0	0
Stenacron	--	0	0	0.2	0.0	0	1
Stenomena	--	2	3	1.4	0.0	0	7
Leptophlebiidae	--	0	0	0.1	0.0	0	1
Leptophlebia	--	0	0	0.0	0.0	0	0
Paraleptophlebia	--	0	0	0.0	0.0	0	0
Metretopodidae	--	0	0	0.0	0.0	0	0

Table 5.5-6. - continued -

	Gauer Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphloplecton	--	0	0	0.0	0.0	0	0
Leptohyphidae	--	0	0	0.0	0.0	0	0
Tricorythodes	--	0	0	0.0	0.0	0	0
Polymitarcyidae	--	0	0	0.0	0.0	0	0
Ephoron	--	0	0	0.0	0.0	0	0
Siphlonuridae	--	0	0	0.0	0.0	0	0
Parameletus	--	0	0	0.0	0.0	0	0
Siphlonurus	--	0	0	0.0	0.0	0	0
Plecoptera - unid	--	0	0	0.0	0.0	0	0
Chloroperlidae	--	0	0	0.0	0.0	0	0
Perlidae	--	0	0	0.0	0.0	0	0
Perlodidae	--	0	0	0.0	0.0	0	0
Pteronarcyidae	--	0	0	0.0	0.0	0	0
Trichoptera (larva) - unid	--	0	0	0.0	0.0	0	0
Trichoptera (pupa) - unid	--	0	0	0.1	0.0	0	0
Brachycentridae	--	0	0	0.0	0.0	0	0
Dipseudopsidae	--	0	0	0.0	0.0	0	0
Helicopsychidae	--	0	0	0.1	0.0	0	0
Hydropsychidae	--	0	0	0.0	0.0	0	0
Hydroptilidae (larva)	--	0	0	0.0	0.0	0	0
Hydroptilidae (pupa)	--	0	0	0.0	0.0	0	0
Lepidostomatidae	--	0	0	0.1	0.0	0	1
Leptoceridae (larva)	--	0	0	0.1	0.0	0	1
Leptoceridae (pupa)	--	0	0	0.0	0.0	0	0
Limnephilidae	--	0	1	0.3	0.0	0	2
Molannidae	--	0	0	0.0	0.0	0	0
Phryganeidae	--	0	0	0.0	0.0	0	0
Polycentropodidae	--	0	0	0.0	0.0	0	0
Psychomyiidae	--	0	0	0.0	0.0	0	0
Diptera (larva) - unid	--	0	0	0.0	0.0	0	0
Diptera (pupa) - unid	--	0	0	0.0	0.0	0	0
Diptera (adult) - unid	--	0	0	0.0	0.0	0	0
Brachycera (pupa)	--	0	0	0.0	0.0	0	0
Ceratopogonidae (larva)	--	0	0	0.0	0.0	0	0
Ceratopogonidae (adult)	--	0	0	0.0	0.0	0	0
Chaoboridae	--	0	0	0.0	0.0	0	0
Chironomidae (adult)	--	0	0	0.1	0.0	0	1
Chironomidae (pupa)	--	0	0	0.1	0.0	0	1
Chironomidae (larva)	--	0	0	0.0	0.0	0	0
Chironominae	--	0	0	0.1	0.0	0	1
Orthocladiinae	--	1	1	0.4	0.7	0	2
Tanypodinae	--	0	0	0.1	0.0	0	1
Culicidae	--	0	0	0.0	0.0	0	0
Dixidae	--	0	0	0.0	0.0	0	0
Dolichopodidae (pupa)	--	0	0	0.0	0.0	0	0
Empididae	--	0	0	0.0	0.0	0	0
Ephydridae	--	0	0	0.0	0.0	0	0
Muscidae	--	0	0	0.0	0.0	0	0
Sciomyzidae	--	0	0	0.0	0.0	0	0
Simuliidae	--	0	0	0.0	0.0	0	0

Table 5.5-6. - continued -

	Gauer Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Stratiomyidae	--	0	0	0.0	0.0	0	0
Tabanidae	--	0	0	0.0	0.0	0	0
Tipulidae (larva)	--	0	0	0.0	0.0	0	0
Tipulidae (pupa)	--	0	0	0.0	0.0	0	0
Insecta	--	169	117	52.4	117.3	32	319
Insecta (%)	94	--	--	--	--	--	--
Chironomidae	--	1	1	0.5	1.7	0	3
Chironomidae (%)	1	--	--	--	--	--	--
Ephemeroptera	--	4	3	1.5	2.7	1	9
Ephemeroptera (%)	2	--	--	--	--	--	--
Plecoptera	--	0	0	0.0	0.0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	1	1	0.4	0.7	0	2
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	4	3	1.5	4.7	1	10
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.89	2.92	1.30	2.33	0.00	7.50
Genus analysis of Ephemeroptera	Heptageniidae: *Stenomena*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	25	13	4.0	1.8	11	9	18
Simpson's Diversity Index (D)	--	0.29	0.277	0.124	0.13	0.10	0.73
Evenness (Simpson's Equitability E_D)	--	0.11	0.047	0.021	0.09	0.09	0.19
Shannon-Weaver Index (H)	--	0.80	0.699	0.312	0.40	0.30	1.90
Evenness (Shannon's Equitability E_H)	--	0.28	0.226	0.101	0.16	0.12	0.65
Hill's Effective Richness ($E^{H'}$)	--	3	2.3	1.0	1	1	7
Evenness ($E^{H'}$/S)	--	0.17	0.103	0.046	0.13	0.11	0.35

Table 5.5-6. - continued -

	Gauer Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3930	844.8	377.8	4256	2424	4415
Oligochaeta	--	1056	419.6	187.6	1068	548	1688
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	3	6.5	2.9	0	0	14
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	26	34.4	15.4	14	0	87
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	857	216.1	96.6	822	592	1183
Gastropoda - unid	--	6	12.9	5.8	0	0	29
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	12	12.1	5.4	14	0	29
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	63	47.4	21.2	72	14	115
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	2023	585.6	261.9	2020	1154	2684
Non-Insecta (%)	51	--	--	--	--	--	--
Oligochaeta	--	1056	419.6	187.6	1068	548	1688
Oligochaeta (%)	27	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	857	216.1	96.6	822	592	1183
Bivalvia (%)	22	--	--	--	--	--	--
Gastropoda	--	81	48.5	21.7	87	14	144
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 5.5-6. - continued -

	Gauer Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	32	18.8	8.4	43	0	43
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 5.5-6. - continued -

	Gauer Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	3	6.5	2.9	0	0	14
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	14	25.0	11.2	0	0	58
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	61	29.6	13.2	72	29	87
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	14	17.7	7.9	14	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1293	449.8	201.1	1197	707	1861
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	491	64.5	28.9	476	418	577
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1907	462.0	206.6	1847	1270	2467
Insecta (%)	49	--	--	--	--	--	--
Chironomidae	--	1798	464.7	207.8	1717	1140	2337
Chironomidae (%)	46	--	--	--	--	--	--
Ephemeroptera	--	32	18.8	8.4	43	0	43

Table 5.5-6. - continued -

	Gauer Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	17	23.7	10.6	14	0	58
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	49	31.6	14.1	43	14	101
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.03	0.03	0.01	0.03	0.01	0.09
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	8	1.2	0.5	8	7	10
Simpson's Diversity Index (D)	--	0.75	0.024	0.011	0.74	0.73	0.77
Evenness (Simpson's Equitability E_D)	--	0.42	0.081	0.036	0.43	0.28	0.48
Shannon-Weaver Index (H)	--	1.56	0.073	0.033	1.53	1.49	1.65
Evenness (Shannon’s Equitability E_H)	--	0.69	0.062	0.028	0.72	0.58	0.74
Hill's Effective Richness ($E^{H'}$)	--	5	0.4	0.2	5	4	5
Evenness ($E^{H'}$/S)	--	0.50	0.090	0.040	0.52	0.34	0.56

Table 5.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Lower Churchill River Region, 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Northern Indian Lake	GN-01	14	599033	6350500	7-Aug-10	15.83	2.5	3.0	19.0
Northern Indian Lake	GN-02	14	604258	6349713	7-Aug-10	14.58	15.2	21.0	19.0
Northern Indian Lake	GN-03	14	606790	6350687	8-Aug-10	17.25	7.0	10.0	20.0
Northern Indian Lake	GN-04	14	600354	6350843	7-Aug-10	15.92	2.5	2.5	19.0
Northern Indian Lake	GN-05	14	605333	6356405	8-Aug-10	17.50	3.8	4.1	20.0
Northern Indian Lake	GN-06	14	608420	6352936	8-Aug-10	17.33	9.1	8.2	20.0
Northern Indian Lake	GN-07	14	606154	6359037	9-Aug-10	14.75	5.9	6.0	21.0
Northern Indian Lake	GN-08	14	606325	6359927	9-Aug-10	15.00	4.0	4.0	19.0
Northern Indian Lake	GN-09	14	605405	6366506	9-Aug-10	14.83	3.0	6.0	19.0
Northern Indian Lake	GN-10	14	606417	6363839	6-Aug-10	14.25	5.5	4.0	19.0
Northern Indian Lake	GN-11	14	607544	6361982	6-Aug-10	14.83	9.7	9.0	19.0
Northern Indian Lake	GN-12	14	607611	6363297	6-Aug-10	15.67	2.5	9.0	19.0
Northern Indian Lake	SN-03	14	606769	6350705	8-Aug-10	17.25	7.0	-	20.0
Northern Indian Lake	SN-05	14	605353	6356379	8-Aug-10	17.50	3.8	-	20.0
Northern Indian Lake	SN-09	14	605412	6366555	9-Aug-10	14.83	3.0	-	19.0
Northern Indian Lake	SN-12	14	607597	6363321	6-Aug-10	15.67	2.5	-	19.0
Billard Lake	GN-01	14	671175	6336533	23-Jul-10	20.00	9.0	7.8	18.5
Billard Lake	GN-02	14	671650	6336560	23-Jul-10	20.00	2.2	3.3	18.5
Billard Lake	GN-03	14	673959	6337121	24-Jul-10	18.50	5.0	3.0	20.0
Billard Lake	GN-04	14	672390	6337817	24-Jul-10	20.83	8.5	7.8	20.0
Billard Lake	GN-05	14	671572	6337385	25-Jul-10	19.33	2.5	5.2	22.0
Billard Lake	GN-06	14	673130	6337293	25-Jul-10	24.50	6.7	8.0	20.0
Billard Lake	GN-07	14	670542	6337415	26-Jul-10	23.75	3.2	3.0	23.0
Billard Lake	GN-08	14	675310	6337324	26-Jul-10	23.25	3.0	3.8	23.0
Billard Lake	GN-09	14	676095	6337262	26-Jul-10	21.00	1.0	3.4	22.0
Billard Lake	SN-03	14	673905	6337135	24-Jul-10	18.50	5.0	3.0	20.0
Billard Lake	SN-06	14	673159	6337269	25-Jul-10	24.50	6.7	8.0	20.0
Billard Lake	SN-09	14	676134	6337261	26-Jul-10	21.00	1.0	3.4	22.0
Lower Churchill River	GN-01	15	357387	6376685	11-Aug-10	22:13	3.1	0.2	19.0
Lower Churchill River	GN-02	15	360445	6379491	12-Aug-10	26:00	0.8	3.0	19.0
Lower Churchill River	GN-03	15	358464	6376582	11-Aug-10	22:47	2.9	3.3	19.0
Lower Churchill River	GN-04	15	360673	6381916	12-Aug-10	23:36	3.5	1.0	19.0
Lower Churchill River	GN-05	15	359608	6383044	13-Aug-10	24:11	3.7	4.0	20.0
Lower Churchill River	GN-06	15	360876	6380553	13-Aug-10	26:28	1.9	1.5	20.0
Lower Churchill River	GN-07	15	360947	6381612	15-Aug-10	20:55	2.3	2.6	15.0
Lower Churchill River	GN-08	15	355372	6383711	14-Aug-10	24:36	4.3	0.5	19.0
Lower Churchill River	GN-09	15	359343	6377258	15-Aug-10	25:11	3.6	3.0	15.0
Lower Churchill River	SN-05	15	359564	6383007	13-Aug-10	24:14	2.3	3.7	20.0
Lower Churchill River	SN-06	15	360876	6380553	11-Aug-10	22:57	0.9	2.9	19.0
Lower Churchill River	SN-08	15	355407	6383707	14-Aug-10	24:36	3.0	4.3	19.0

Table 5.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Gauer Lake	GN-01	14	570828	6307756	14-Jul-10	45.07	1.0	6.5	18.5
Gauer Lake	GN-02	14	567206	6308669	14-Jul-10	24.20	6.0	7.0	18.0
Gauer Lake	GN-03	14	564469	6312317	17-Jul-10	22.25	2.0	1.0	18.0
Gauer Lake	GN-04	14	567874	6310483	14-Jul-10	46.23	2.0	6.0	17.5
Gauer Lake	GN-05	14	571226	6314682	16-Jul-10	20.27	25.0	24.0	18.0
Gauer Lake	GN-06	14	568189	6314213	16-Jul-10	22.88	5.5	4.5	18.0
Gauer Lake	GN-07	14	568537	6311638	14-Jul-10	45.47	3.5	13.5	18.0
Gauer Lake	GN-08	14	566594	6317087	16-Jul-10	20.33	3.0	1.0	18.0
Gauer Lake	GN-09	14	562378	6309862	17-Jul-10	21.02	1.0	3.5	18.0
Gauer Lake	SN-03	14	564469	6312317	17-Jul-10	22.25	2.0	1.0	18.0
Gauer Lake	SN-05	14	571226	6314682	16-Jul-10	20.27	25.0	24.0	18.0
Gauer Lake	SN-09	14	562378	6309862	17-Jul-10	21.02	1.0	1.0	18.0

Table 5.6-2. Fish species (common and scientific names) list compiled from CAMPP standard gang index and small mesh index gillnetting investigations conducted in the Lower Churchill River Region, 2010.

Family	Common Name	Scientific Name	ID Code
Acipenseridae	Lake Sturgeon	*Acipenser fulvescens*	LKST
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH
	Emerald Shiner	*Notropis atherinoides*	EMSH
	Spottail Shiner	*Notropis hudsonius*	SPSH
	Longnose Dace	*Rhinichthys cataractae*	LNDC
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC
	White Sucker	*Catostomus commersoni*	WHSC
Esocidae	Northern Pike	*Esox lucius*	NRPK
Salmonidae	Cisco	*Coregonus artedi*	CISC
	Lake Whitefish	*Coregonus clupeaformis*	LKWH
	Arctic Grayling	*Thymallus articus*	ARGR
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR
Gadidae	Burbot	*Lota lota*	BURB
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Logperch	*Percina caprodes*	LGPR
	Walleye	*Sander vitreus*	WALL

Table 5.6-3. Summary of Lower Churchill River CAMPP standard gang index gillnet catches, 2010.

Species	Northern Indian Lake		Billard Lake		Lower Churchill River		Gauer Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Sturgeon	-	-	1	0.20	254	42.12	-	-
Lake Chub	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-
Longnose Sucker	9	1.34	-	-	7	1.16	16	2.23
White Sucker	171	25.48	50	9.84	68	11.28	178	24.86
Shorthead Redhorse	-	-	-	-	-	-	-	-
Northern Pike	87	12.97	104	20.47	51	8.46	122	17.04
Cisco	86	12.82	-	-	8	1.33	12	1.68
Lake Whitefish	170	25.34	241	47.44	78	12.94	172	24.02
Arctic Grayling	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-
Burbot	3	0.45	-	-	-	-	3	0.42
Yellow Perch	5	0.75	-	-	-	-	26	3.63
Logperch	-	-	-	-	-	-	-	-
Walleye	140	20.86	112	22.05	137	22.72	187	26.12
Total	671	100	508	100	603	100	716	100

n = number of fish caught

RA = percent relative abundance

Table 5.6-4. Summary of Lower Churchill River CAMPP small mesh index gillnet catches, 2010.

Species	Northern Indian Lake		Billard Lake		Lower Churchill River		Gauer Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Sturgeon	-	-	-	-	-	-	-	-
Lake Chub	6	1.08	1	0.43	32	5.52	7	2.36
Emerald Shiner	68	12.19	-	-	6	1.03	126	42.42
Spottail Shiner	186	33.33	25	10.82	86	14.83	52	17.51
Longnose Dace	-	-	-	-	47	8.10	-	-
Longnose Sucker	1	0.18	2	0.87	2	0.34	1	0.34
White Sucker	22	3.94	13	5.63	8	1.38	-	-
Shorthead Redhorse	-	-	-	-				
Northern Pike	7	1.25	5	2.16	-	-	8	2.69
Cisco	88	15.77	-	-	16	2.76	-	-
Lake Whitefish	16	2.87	85	36.80	18	3.10	11	3.70
Arctic Grayling	-	-	-	-	1	0.17	-	-
Brook Trout	-	-	-	-	-	-	-	-
Troutperch	62	11.11	88	38.10	15	2.59	59	19.87
Burbot	-	-	-	-	-	-	-	-
Yellow Perch	53	9.50	-	-	-	-	6	2.02
Logperch	-	-	-	-	3	0.52	-	-
Walleye	49	8.78	12	5.19	346	59.66	27	9.09
Total	558	100	231	100	580	100	297	100

n = number of fish caught

RA = percent relative abundance

Table 5.6-5. Standard gang index gillnet biomass summaries from Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake			Billard Lake			Lower Churchill River			Gauer Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	1	9074	1.58	254	509747	53.54	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	9	4620	0.93	-	-	-	7	3080	0.32	16	14345	2.17
White Sucker	171	151231	30.29	50	31750	5.53	68	51520	5.41	178	236237	35.70
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	87	123377	24.71	104	163670	28.50	51	150343	15.79	122	156893	23.71
Cisco	86	20668	4.14	-	-	-	8	4160	0.44	12	2526	0.38
Lake Whitefish	170	105716	21.17	241	230085	40.07	78	75380	7.92	172	114795	17.35
Arctic Grayling	-	-	-	-	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	4190	0.84	-	-	-	-	-	-	3	4797	0.72
Yellow Perch	5	592	0.12	-	-	-	-	-	-	26	4578	0.69
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	140	88917	17.81	112	139610	24.31	137	157904	16.58	187	127642	19.29
Total	671	499311	100	508	574189	100	603	952134	100	716	661813	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = proportion of total biomass (%)

Table 5.6-6. Small mesh index gillnet biomass summaries from Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake			Billard Lake			Lower Churchill River			Gauer Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	6	61	0.17	1	14	0.06	32	348	3.18	7	44	0.19
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	68	440	1.21	-	-	-	6	47	0.43	126	388	1.68
Spottail Shiner	186	1137	3.14	25	140	0.59	86	446	4.08	52	196	0.85
Longnose Dace	-	-	-	-	-	-	47	228	2.09	-	-	-
Longnose Sucker	1	100	0.28	2	35	0.15	2	18	0.16	1	205	0.89
White Sucker	22	796	2.19	13	370	1.56	8	62	0.57	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	6280	17.32	5	5480	23.08	-	-	-	8	11207	48.52
Cisco	88	1164	3.21	-	-	-	16	89	0.81	-	-	-
Lake Whitefish	16	4526	12.48	85	9650	40.65	18	88	0.80	11	3497	15.14
Arctic Grayling	-	-	-	-	-	-	1	450	4.12	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	62	300	0.83	88	470	1.98	15	113	1.03	59	245	1.06
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	53	570	1.57	-	-	-	-	-	-	6	216	0.94
Logperch	-	-	-	-	-	-	3	17	0.16	-	-	-
Walleye	49	20893	57.61	12	7580	31.93	346	9029	82.57	27	7101	30.74
Total	558	36267	100	231	23739	100	580	10935	100	297	23099	100

n = number of fish measured (may not equal number of fish caught

B = biomass (g)

% = proportion of total biomass (%)

Table 5.6-7. Mean catch-per-unit-effort (CPUE) (fish/100 m of net/24 h) calculated for fish species captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake (#sites=12)			Billard Lake (#sites=9)			Lower Churchill River (#sites=9)			Gauer Lake (#sites=9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Sturgeon	-	-	-	1	0.1	0.33	254	25.3	20.43	-	-	-
Lake Chub	-	-	-	-	-		-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-		-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-		-	-	-	-	-	-
Longnose Dace	-	-	-	-	-		-	-	-	-	-	-
Longnose Sucker	9	0.9	2.15	-	-		7	0.7	1.11	16	1.4	3.06
White Sucker	171	19.1	12.78	50	5.6	4.23	68	6.7	4.95	178	14.9	9.33
Shorthead Redhorse	-	-	-	-	-		-	-	-	-	-	-
Northern Pike	87	9.6	6.44	104	11.5	4.11	51	4.9	2.79	122	10.2	7.68
Cisco	86	10.0	7.55	-	-		8	0.8	0.99	12	1.0	1.02
Lake Whitefish	170	19.5	23.87	241	26.4	11.64	78	7.5	8.10	172	15.1	8.85
Arctic Grayling	-	-	-	-	-		-	-	-	-	-	-
Brook Trout	-	-	-	-	-		-	-	-	-	-	-
Troutperch	-	-	-	-	-		-	-	-	-	-	-
Burbot	3	0.4	1.25	-	-		-	-	-	3	0.3	0.69
Yellow Perch	5	0.6	0.69	-	-		-	-	-	26	2.8	4.41
Logperch	-	-	-	-	-		-	-	-	-	-	-
Walleye	140	15.8	11.92	112	12.7	10.98	137	13.5	6.99	187	15.3	4.17
Total	671	75.9	24.60	508	56.2	16.74	603	59.3	26.25	716	61.1	16.50

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort per site
SD = standard deviation

Table 5.6-8. Mean catch-per-unit-effort (CPUE) (fish/30 m of net/24 h) calculated for fish species captured in small mesh index gill nets set in Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake (#sites=4)			Billard Lake (#sites=3)			Lower Churchill River (#sites=3)			Gauer Lake (#sites=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	6	2.3	3.06	1	0.4	0.74	32	10.6	18.31	7	2.6	2.36
Emerald Shiner	68	26.1	18.46	-	-	-	6	2.0	3.43	126	47.7	69.89
Spottail Shiner	186	71.1	66.26	25	9.5	16.49	86	28.2	25.48	52	19.6	26.86
Longnose Dace	-	-	-	-	-	-	47	15.3	26.47	-	-	-
Longnose Sucker	1	0.4	0.70	2	0.7	1.13	2	0.7	1.13	1	0.4	0.68
White Sucker	22	8.2	6.32	13	5.0	5.63	8	2.6	4.57	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	2.6	1.82	5	1.7	2.01	-	-	-	8	3.0	3.50
Cisco	88	33.1	23.54	-	-	-	16	5.3	8.31	-	-	-
Lake Whitefish	16	6.1	3.56	85	33.4	32.68	18	5.9	10.29	11	4.2	1.84
Arctic Grayling	-	-	-	-	-	-	1	0.3	0.57	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	62	23.9	27.66	88	33.2	15.80	15	5.0	7.74	59	22.7	20.75
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	53	19.3	20.42	-	-	-	-	-	-	6	2.3	3.95
Logperch	-	-	-	-	-	-	3	1.0	0.99	-	-	-
Walleye	49	18.3	5.96	12	4.6	4.97	346	113.3	99.02	27	10.3	7.19
Total	558	211.2	128.80	231	88.5	23.42	580	190.1	164.03	297	112.8	86.55

#sites = number of sites sampled; n = number of fish caught

CPUE = mean catch per unit effort per site

SD = standard deviation

Table 5.6-9. Mean biomass-per-unit-effort (BPUE) (g/100 m of net/24 h)calculated for fish species captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake (#sites=12)			Billard Lake (#sites=9)			Lower Churchill River (#sites=9)			Gauer Lake (#sites=9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	1	1008	3024	254	50703	44432	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	9	472	1099	-	-	-	7	293	560	16	1104	1966
White Sucker	171	16871	13289	50	3496	3306	68	5108	4154	178	19350	11888
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	87	13800	10756	104	17968	7175	51	14659	9343	122	12671	9105
Cisco	86	2407	2677	-	-	-	8	390	544	12	189	242
Lake Whitefish	170	12136	16011	241	25098	13221	78	7271	7529	172	10301	7093
Arctic Grayling	-	-	-	-	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	503	1742	-	-	-	-	-	-	3	414	930
Yellow Perch	5	65	85	-	-	-	-	-	-	26	475	704
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	140	10087	7316	112	15820	12683	137	15526	7058	187	10209	3624
Total	671	56342	19754	508	63390	19773	603	93949	46257	716	54715	16665

#sites = number of sites sampled

n = number of fish measured (may not equal number of fish caught)

BPUE = mean biomass per unit effort per site

SD = standard deviation

Table 5.6-10. Mean biomass-per-unit-effort (BPUE) (g/30 m of net/24 h) calculated for fish species captured in small mesh index gill nets set in Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake (#sites=4)			Billard Lake (#sites=3)			Lower Churchill River (#sites=3)			Gauer Lake (#sites=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	6	24	34	1	6	10	32	115	199	7	16	17
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	68	169	131	-	-	-	6	16	27	126	146	205
Spottail Shiner	186	436	445	25	53	92	86	147	171	52	74	86
Longnose Dace	-	-	-	-	-	-	47	74	128	-	-	-
Longnose Sucker	1	35	70	2	11	20	2	6	10	1	81	140
White Sucker	22	286	357	13	147	117	8	20	35	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	2379	2456	5	1827	2513	-	-	-	8	4187	4261
Cisco	88	433	275	-	-	-	16	29	48	-	-	-
Lake Whitefish	16	1741	1378	85	3501	2964	18	29	50	11	1352	973
Arctic Grayling	-	-	-	-	-	-	1	146	253	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	62	115	127	88	177	84	15	37	55	59	94	78
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	53	208	226	-	-	-	-	-	-	6	82	142
Logperch	-	-	-	-	-	-	3	6	5	-	-	-
Walleye	49	7719	3851	12	3009	1911	346	2975	1838	27	2685	101
Total	558	13545	6410	231	8731	2994	580	3600	2318	297	8717	4227

#sites = number of sites sampled
n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort per site
SD = standard deviation

Table 5.6-11. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake			Billard Lake			Lower Churchill River			Gauer Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	87	575	126	104	606	103	51	704	164	122	557	108
Lake Whitefish	170	341	78	241	398	75	78	403	48	172	348	68
Walleye	140	376	74	112	478	83	137	443	88	187	387	57
Weight (g)												
Northern Pike	87	1418	1147	104	1574	1067	41	2452	1556	122	1286	954
Lake Whitefish	170	622	379	241	955	457	78	966	337	172	667	404
Walleye	140	635	374	112	1247	563	137	1153	604	187	683	267
Condition Factor (K)												
Northern Pike	87	0.63	0.07	104	0.65	0.08	41	0.74	0.08	122	0.66	0.07
Lake Whitefish	170	1.34	0.12	241	1.37	0.11	78	1.42	0.13	172	1.39	0.13
Walleye	140	1.06	0.10	112	1.05	0.09	137	1.18	0.10	187	1.11	0.09

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation

Table 5.6-12. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, and Walleye captured in small mesh index gill nets set in Lower Churchill River Region waterbodies, 2010.

Species	Northern Indian Lake			Billard Lake			Lower Churchill River			Gauer Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	7	485	121	5	550	81	-	-	-	8	567	86
Lake Whitefish	12	282	64	14	350	62	-	-	-			
Walleye	47	331	69	12	377	87	1	436	-	3	398	121
Weight (g)												
Northern Pike	7	897	835	5	1096	408	-	-	-	8	1401	635
Lake Whitefish	16	283	283	85	114	268	18	5	0	11	318	131
Walleye	48	435	302	12	632	488	346	26	107	27	263	250
Condition Factor (K)												
Northern Pike	7	0.65	0.06	5	0.64	0.08	-	-	-	8	0.72	0.09
Lake Whitefish	12	1.35	0.12	14	1.29	0.19	-	-	-			
Walleye	47	1.06	0.10	12	1.01	0.07	1	1.15	-	3	1.01	0.07

n = number of fish measured (may not equal number of fish caught)
SD = standard deviation

Table 5.6-13. Year-class frequency distributions (%) for Northern Pike captured in standard index gill nets set in Lower Churchill River Region waterbodies, 2010.

Age	Year-Class	Northern Indian L.		Billard L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-
2	2008	1	1.15	-	-	-	-	1	1.27
3	2007	2	2.30	1	0.98	-	-	6	7.59
4	2006	4	4.60	8	7.84	1	2.04	9	11.39
5	2005	19	21.84	13	12.75	4	8.16	13	16.46
6	2004	13	14.94	27	26.47	5	10.20	24	30.38
7	2003	14	16.09	27	26.47	7	14.29	14	17.72
8	2002	12	13.79	10	9.80	8	16.33	4	5.06
9	2001	11	12.64	5	4.90	6	12.24	5	6.33
10	2000	4	4.60	7	6.86	6	12.24	2	2.53
11	1999	2	2.30	1	0.98	4	8.16	-	-
12	1998	1	1.15	1	0.98	1	2.04	-	-
13	1997	-	-	1	0.98	2	4.08	-	-
14	1996	1	1.15	-	-	4	8.16	-	-
15	1995	1	1.15	-	-	1	2.04	-	-
16	1994	-	-	-	-	-	-	1	1.27
17	1993	2	2.30	1	0.98	-	-	-	-
Total		87	100	102	100	49	100	79	100

n = number of fish aged

% = relative abundance

Table 5.6-14. Year-class frequency distributions (%) for Lake Whitefish captured in standard index gill nets set in Lower Churchill River Region waterbodies, 2010.

Age	Year-Class	Northern Indian L.		Billard L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-
2	2008	3	1.83	6	2.67	-	-	-	-
3	2007	6	3.66	2	0.89	-	-	1	0.95
4	2006	11	6.71	24	10.67	2	2.60	15	14.29
5	2005	13	7.93	29	12.89	1	1.30	12	11.43
6	2004	27	16.46	31	13.78	10	12.99	4	3.81
7	2003	29	17.68	41	18.22	16	20.78	10	9.52
8	2002	26	15.85	32	14.22	15	19.48	16	15.24
9	2001	16	9.76	23	10.22	11	14.29	6	5.71
10	2000	10	6.10	11	4.89	10	12.99	11	10.48
11	1999	2	1.22	3	1.33	3	3.90	9	8.57
12	1998	7	4.27	6	2.67	7	9.09	3	2.86
13	1997	2	1.22	3	1.33	-	-	2	1.90
14	1996	3	1.83	2	0.89	-	-	1	0.95
15	1995	1	0.61	3	1.33	-	-	1	0.95
16	1994	4	2.44	1	0.44	-	-	1	0.95
17	1993	2	1.22	3	1.33	-	-	5	4.76
18	1992	-	-	2	0.89	1	1.30	2	1.90
19	1991	-	-	-	-	-	-	4	3.81
20	1990	-	-	2	0.89	-	-	-	-
21	1989	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-
23	1987	-	-	1	0.44	1	1.30	-	-
24	1986	2	1.22	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	1	0.95
28	1982	-	-	-	-	-	-	-	-
29	1981	-	-	-	-	-	-	-	-
30	1980	-	-	-	-	-	-	1	0.95
Total		164	100	225	100	77	100	105	100

n = number of fish aged; % = relative abundance

Table 5.6-15. Year-class frequency distributions (%) for Walleye captured in standard index gill nets set in Lower Churchill River Region waterbodies, 2010.

Age	Year-Class	Northern Indian L.		Billard L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-
3	2007	1	0.72	-	-	1	0.74	-	-
4	2006	2	1.44	3	2.75	3	2.21	1	0.93
5	2005	6	4.32	2	1.83	2	1.47	4	3.74
6	2004	3	2.16	1	0.92	3	2.21	2	1.87
7	2003	9	6.47	11	10.09	14	10.29	11	10.28
8	2002	11	7.91	4	3.67	16	11.76	13	12.15
9	2001	26	18.71	9	8.26	3	2.21	11	10.28
10	2000	28	20.14	13	11.93	10	7.35	20	18.69
11	1999	13	9.35	4	3.67	10	7.35	11	10.28
12	1998	8	5.76	11	10.09	14	10.29	11	10.28
13	1997	10	7.19	8	7.34	10	7.35	8	7.48
14	1996	13	9.35	8	7.34	21	15.44	9	8.41
15	1995	2	1.44	3	2.75	7	5.15	5	4.67
16	1994	1	0.72	1	0.92	6	4.41	1	0.93
17	1993	-	-	4	3.67	-	-	-	-
18	1992	-	-	2	1.83	-	-	-	-
19	1991	1	0.72	8	7.34	2	1.47	-	-
20	1990	2	1.44	9	8.26	1	0.74	-	-
21	1989	-	-	6	5.50	3	2.21	-	-
22	1988	1	0.72	1	0.92	-	-	-	-
23	1987	-	-	-	-	3	2.21	-	-
24	1986	-	-	1	0.92	3	2.21	-	-
25	1985	1	0.72	-	-	1	0.74	-	-
26	1984	1	0.72	-	-	1	0.74	-	-
27	1983	-	-	-	-	1	0.74	-	-
28	1982	-	-	-	-	1	0.74	-	-
Total		139	100	109	100	136	100	107	100

n = number of fish aged; % = relative abundance

Table 5.6-16. Mean fork length- (mm), weight- (g), and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

Age	Year-Class	Northern Indian Lake									Billard Lake								
		FL			W			K			FL			W			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	1	288	-	1	167	-	1	0.70	-	-	-	-	-	-	-	-	-	-
3	2007	2	383	68	2	370	212	2	0.62	0.05	1	401	-	1	450	-	1	0.70	-
4	2006	4	406	36	4	423	133	4	0.62	0.06	8	470	58	8	733	226	8	0.69	0.06
5	2005	19	459	58	19	643	258	19	0.63	0.05	13	529	42	13	999	245	13	0.67	0.04
6	2004	13	544	44	13	1018	255	13	0.62	0.07	27	570	47	27	1190	259	27	0.64	0.07
7	2003	14	586	26	14	1226	233	14	0.61	0.08	27	611	44	27	1464	344	27	0.64	0.09
8	2002	12	637	33	12	1643	243	12	0.63	0.07	10	672	36	10	1905	353	10	0.62	0.07
9	2001	11	671	72	11	2035	734	11	0.65	0.09	5	682	47	5	1920	595	5	0.59	0.08
10	2000	4	678	54	4	2050	887	4	0.63	0.11	7	738	52	7	2644	807	7	0.64	0.10
11	1999	2	679	16	2	2055	318	2	0.66	0.15	1	830	-	1	4800	-	1	0.84	-
12	1998	1	705	-	1	2380	-	1	0.68	-	1	875	-	1	4400	-	1	0.66	-
13	1997	-	-	-	-	-	-	-	-	-	1	835	-	1	4260	-	1	0.73	-
14	1996	1	705	-	1	2640	-	1	0.75	-	-	-	-	-	-	-			-
15	1995	1	927	-	1	5760	-	1	0.72	-	-	-	-	-	-	-			-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
17	1993	2	949	30	2	6490	368	2	0.76	0.03	1	1084	-	1	8920	-	1	0.70	-

Table 5.6-16. - continued -

Age	Year-Class	Lower Churchill River									Gauer Lake								
		FL			W			K			FL			W			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	1	353	-	1	284	-	1	0.65	-
3	2007	-	-	-	-	-	-	-	-	-	6	383	42	6	398	113	6	0.69	0.05
4	2006	1	465	-	1	700	-	1	0.70	-	9	456	35	9	647	147	9	0.68	0.06
5	2005	4	499	87	4	1028	710	4	0.74	0.07	13	516	41	13	893	194	13	0.64	0.05
6	2004	5	490	52	5	842	330	5	0.69	0.05	24	573	40	24	1239	305	24	0.65	0.07
7	2003	7	627	138	7	2093	1571	7	0.72	0.07	14	609	32	14	1483	416	14	0.64	0.11
8	2002	8	691	93	7	2244	1132	7	0.70	0.11	4	668	32	4	1835	358	4	0.61	0.06
9	2001	6	749	65	5	3118	771	5	0.77	0.05	5	694	46	5	2568	447	5	0.77	0.06
10	2000	6	782	44	5	3686	254	5	0.81	0.08	2	739	54	2	2525	601	2	0.62	0.01
11	1999	4	863	73	2	4860	1867	2	0.86	0.09	-	-	-	-	-	-	-	-	-
12	1998	1	774	-	1	3170	-	1	0.68	-	-	-	-	-	-	-	-	-	-
13	1997	2	925	156	1	4240	-	1	0.79	-	-	-	-	-	-	-	-	-	-
14	1996	4	890	51	2	4690	1570	2	0.69	0.11	-	-	-	-	-	-	-	-	-
15	1995	1	949	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	1	1024	-	1	8700	-	1	0.81	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length (mm); W = weight (g); K = condition factor (K)

n = number of fish; SD = standard deviation.

Table 5.6-17. Mean fork length- (mm), weight- (g), and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

Age	Year-Class	Northern Indian Lake									Billard Lake								
		FL			W			K			FL			W			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	3	251	86	3	270	303	3	1.26	0.18	6	211	19	6	118	31	6	1.23	0.13
3	2007	6	251	79	6	258	272	6	1.22	0.10	2	268	2	2	240	28	2	1.25	0.12
4	2006	11	246	58	11	227	187	11	1.28	0.08	24	320	38	24	463	155	24	1.35	0.11
5	2005	13	261	35	13	244	96	13	1.31	0.12	29	341	29	29	569	165	29	1.40	0.11
6	2004	27	306	47	27	408	187	27	1.31	0.11	31	398	42	31	897	279	31	1.37	0.07
7	2003	29	356	55	29	647	275	29	1.33	0.11	41	413	36	41	1015	313	41	1.40	0.12
8	2002	26	358	44	26	668	251	26	1.38	0.10	32	434	25	32	1131	198	32	1.37	0.09
9	2001	16	400	37	16	912	212	16	1.40	0.10	23	457	21	23	1343	214	23	1.39	0.10
10	2000	10	399	38	10	931	291	10	1.41	0.12	11	465	29	11	1397	308	11	1.37	0.08
11	1999	2	377	4	2	815	49	2	1.52	0.04	3	475	12	3	1303	176	3	1.22	0.13
12	1998	7	419	61	7	1059	339	7	1.38	0.12	6	494	31	6	1713	505	6	1.39	0.12
13	1997	2	453	32	2	1240	198	2	1.34	0.07	3	467	11	3	1347	163	3	1.32	0.09
14	1996	3	454	39	3	1147	218	3	1.22	0.12	2	477	12	2	1365	21	2	1.26	0.08
15	1995	1	470	-	1	1340	-	1	1.29	-	3	486	6	3	1570	40	3	1.37	0.07
16	1994	4	413	83	4	1055	641	4	1.34	0.09	1	485	-	1	1680	-	1	1.47	-
17	1993	2	389	118	2	860	594	2	1.38	0.24	3	510	22	3	1703	315	3	1.27	0.09
18	1992	-	-	-	-	-	-	-	-	-	2	471	7	2	1270	156	2	1.21	0.09
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	2	487	35	2	1400	354	2	1.20	0.04
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length (mm); W = weight (g); K = condition factor (K); n = number of fish; SD = standard deviation

Table 5.6-17. - continued -

Age	Year Class	Northern Indian Lake									Billard Lake								
		FL			W			K			FL			W			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
23	1987	-	-	-	-	-	-	-	-	-	1	542	-	1	2120	-	1	1.33	-
24	1986	2	458	20	2	1255	219	2	1.30	0.06	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.6-17. - continued -

Age	Year-Class	Lower Churchill River									Gauer Lake								
		FL			W			K			FL			W			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	1	283	-	1	284	-	1	1.25	-
4	2006	2	265	57	2	275	177	2	1.36	0.07	15	278	28	15	291	89	15	1.31	0.05
5	2005	1	346	-	1	460	-	1	1.11	-	12	299	29	12	385	142	12	1.39	0.11
6	2004	10	377	23	10	798	132	10	1.49	0.10	4	304	16	4	395	85	4	1.39	0.16
7	2003	16	382	27	16	824	199	16	1.46	0.13	10	368	35	10	739	242	10	1.43	0.11
8	2002	15	404	42	15	999	290	15	1.47	0.09	16	363	30	16	692	193	16	1.41	0.13
9	2001	11	404	31	11	925	219	11	1.38	0.14	6	401	38	6	965	292	6	1.46	0.11
10	2000	10	432	40	10	1124	332	10	1.36	0.16	11	416	28	11	1115	255	11	1.52	0.11
11	1999	3	423	2	3	1073	38	3	1.42	0.04	9	417	37	9	1129	399	9	1.49	0.17
12	1998	7	452	24	7	1281	259	7	1.37	0.12	3	400	10	3	915	88	3	1.43	0.09
13	1997	-	-	-	-	-	-	-	-	-	2	453	40	2	1408	522	2	1.48	0.17
14	1996	-	-	-	-	-	-	-	-	-	1	430	-	1	1128	-	1	1.42	-
15	1995	-	-	-	-	-	-	-	-	-	1	435	-	1	1016	-	1	1.23	-
16	1994	-	-	-	-	-	-	-	-	-	1	434	-	1	1193	-	1	1.46	-
17	1993	-	-	-	-	-	-	-	-	-	5	456	27	5	1342	331	5	1.40	0.10
18	1992	1	519	-	1	2150	-	1	1.54	-	2	399	11	2	896	35	2	1.42	0.06
19	1991	-	-	-	-	-	-	-	-	-	4	460	17	4	1418	143	4	1.47	0.20
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.6-17. - continued -

		Lower Churchill River									Gauer Lake								
		FL			W			K			FL			W			K		
Age	Year Class	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
23	1987	1	515	-	1	1740	-	1	1.27	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	1	461	-	1	1327	-	1	1.35	-
28	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	1980	-	-	-	-	-	-	-	-	-	1	480	-	1	1498	-	1	1.35	-

FL = fork length (mm); W = weight (g); K = condition factor (K)
n = number of fish; SD = standard deviation.

Table 5.6-18. Mean fork length- (mm), weight- (g), and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

		Northern Indian Lake									Billard Lake								
		FL			W			K			FL			W			K		
Age	Year Class	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	1	227	-	1	112	-	1	0.96	-	-	-	-	-	-	-	-	-	-
4	2006	2	221	9	2	105	7	2	0.98	0.06	3	278	21	3	220	61	3	1.01	0.14
5	2005	6	239	12	6	127	11	6	0.94	0.12	2	312	13	2	330	71	2	1.08	0.10
6	2004	3	276	37	3	242	138	3	1.06	0.15	1	401	-	1	610	-	1	0.95	-
7	2003	10	316	33	10	341	127	10	1.04	0.08	11	373	14	11	528	62	11	1.01	0.07
8	2002	12	311	34	12	321	109	12	1.03	0.08	4	379	13	4	575	85	4	1.05	0.07
9	2001	27	371	56	27	597	296	27	1.07	0.08	9	432	33	9	870	225	9	1.06	0.08
10	2000	28	378	37	28	605	209	28	1.08	0.08	13	465	26	13	1075	203	13	1.06	0.08
11	1999	14	396	44	14	671	229	14	1.05	0.07	4	488	27	4	1295	157	4	1.11	0.05
12	1998	8	416	38	8	814	249	8	1.10	0.11	11	497	19	11	1381	126	11	1.13	0.06
13	1997	10	415	46	10	797	234	10	1.10	0.08	8	502	39	8	1344	385	8	1.03	0.10
14	1996	13	441	26	13	922	237	13	1.06	0.15	8	516	30	8	1411	269	8	1.02	0.10
15	1995	2	463	33	2	960	127	2	0.97	0.08	3	534	19	3	1633	184	3	1.07	0.04
16	1994	1	452	-	1	900	-	1	0.97	-	1	496	-	1	1360	-	1	1.11	-
17	1993	-	-	-	-	-	-	-	-	-	4	558	31	4	1845	371	4	1.05	0.08
18	1992	-	-	-	-	-	-	-	-	-	2	507	19	2	1480	71	2	1.14	0.07
19	1991	1	410	-	1	620	-	1	0.90	-	8	548	42	8	1753	364	8	1.06	0.11
20	1990	2	559	62	2	1780	382	2	1.03	0.12	9	565	34	9	1904	365	9	1.05	0.07
21	1989	-	-	-	-	-	-	-	-	-	6	588	25	6	1928	217	6	0.95	0.05
22	1988	1	568	-	1	2080	-	1	1.14	-	1	572	-	1	2100	-	1	1.12	-

Table 5.6-18. - continued -

		Northern Indian Lake									Billard Lake								
		FL			W			K			FL			W			K		
Age	Year Class	n		SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	1	624	-	1	2380	-	1	0.98	-
25	1985	1	520	-	1	1500	-	1	1.07	-	-	-	-	-	-	-	-	-	-
26	1984	1	524	-	1	1670	-	1	1.16	-	-	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.6-18. - continued -

		Lower Churchill River									Gauer Lake								
		FL			W			K			FL			W			K		
Age	Year Class	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	1	209	-	1	100	-	1	1.10	-	-	-	-	-	-	-	-	-	-
4	2006	3	267	51	3	227	151	3	1.07	0.10	1	224	-	1	123	-	1	1.09	-
5	2005	2	285	28	2	265	120	2	1.11	0.20	4	276	29	4	227	69	4	1.06	0.12
6	2004	3	305	24	3	320	66	3	1.12	0.04	2	329	69	2	406	267	2	1.04	0.08
7	2003	14	400	60	14	771	378	14	1.14	0.07	11	347	16	11	453	57	11	1.08	0.08
8	2002	16	375	27	16	621	155	16	1.16	0.07	13	372	24	13	553	107	13	1.06	0.05
9	2001	3	371	12	3	600	46	3	1.18	0.07	11	382	22	11	622	108	11	1.10	0.07
10	2000	10	411	38	10	847	203	10	1.21	0.11	20	399	31	20	702	172	20	1.08	0.07
11	1999	10	424	58	10	967	387	10	1.21	0.07	11	411	26	11	793	156	11	1.13	0.07
12	1998	14	461	53	14	1204	373	14	1.20	0.13	11	422	30	11	827	184	11	1.09	0.09
13	1997	11	467	38	11	1231	285	11	1.19	0.08	8	444	39	8	1000	267	8	1.12	0.09
14	1996	21	498	46	21	1548	439	21	1.22	0.09	9	438	52	9	967	303	9	1.14	0.17
15	1995	7	499	34	7	1484	198	7	1.20	0.12	5	434	28	5	952	273	5	1.14	0.11
16	1994	6	525	52	6	1888	562	6	1.27	0.06	1	452	-	1	961	-	1	1.04	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	2	533	50	2	1875	318	2	1.25	0.14	-	-	-	-	-	-	-	-	-
20	1990	1	561	-	1	2140	-	1	1.21	-	-	-	-	-	-	-	-	-	-
21	1989	3	548	56	3	1800	303	3	1.10	0.15	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.6-18. - continued -

		Lower Churchill River									Gauer Lake								
		FL			W			K			FL			W			K		
Age	Year Class	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
23	1987	3	554	51	3	1990	567	3	1.15	0.08	-	-	-	-	-	-	-	-	-
24	1986	3	533	28	3	1627	122	3	1.08	0.18	-	-	-	-	-	-	-	-	-
25	1985	1	601	-	1	2150	-	1	0.99	-	-	-	-	-	-	-	-	-	-
26	1984	1	596	-	1	2780	-	1	1.31	-	-	-	-	-	-	-	-	-	-
27	1983	1	570	-	1	2360	-	1	1.27	-	-	-	-	-	-	-	-	-	-
28	1982	1	520	-	1	1850	-	1	1.32	-	-	-	-	-	-	-	-	-	-

FL = fork length (mm); W = weight (g); K = condition factor (K)
n = number of fish; SD = standard deviation

Table 5.6-19. Deformities, erosions, lesions, and tumours (DELTs) on select fish species captured in standard gang index gill nets set on Lower Churchill River Region waterbodies, 2010.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Northern Indian L.											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	3	1.75	-	-	3	1.75	-	-	171	6	3.51
Northern Pike	1	1.15	2	2.30	-	-	-	-	87	3	3.45
Lake Whitefish	3	1.76	-	-	2	1.18	-	-	170	5	2.94
Walleye	-	-	1	0.71	3	2.14	2	1.43	140	6	4.29
Billard L.											
Lake Sturgeon	-	-	-	-	-	-	-	-	1	0	0.00
White Sucker	-	-	-	-	1	2.00	-	-	50	1	2.00
Northern Pike	1	0.96	-	-	-	-	-	-	104	1	0.96
Lake Whitefish	-	-	-	-	3	1.24	-	-	241	3	1.24
Walleye	-	-	-	-	1	0.89	1	0.89	112	2	1.79
Lower Churchill R.											
Lake Sturgeon	2	0.79	-	-	-	-	-	-	254	2	0.79
White Sucker	-	-	-	-	-	-	-	-	68	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	51	0	0.00
Lake Whitefish	2	2.56	-	-	-	-	-	-	78	2	2.56
Walleye	2	1.46	-	-	1	0.73	-	-	137	3	2.19
Gauer L.											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	5	2.81	-	-	-	-	-	-	178	5	2.81
Northern Pike	-	-	-	-	-	-	-	-	122	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	172	0	0.00
Walleye	-	-	-	-	-	-	-	-	187	0	0.00

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect}\times100$);
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect}\times100$)

Table 5.7-1. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from Northern Indian Lake, the lower Churchill River, and Gauer Lake in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Northern Indian L	Northern Pike	36	571.9 ± 24.5	1490.6 ± 228.3	0.64 ± 0.01	7.0 ± 0.5
	Walleye	36	379.8 ± 13.7	667.9 ± 74.8	1.06 ± 0.02	11.2 ± 0.8
	Lake Whitefish	32	352.6 ± 14.8	672.1 ± 72.6	1.32 ± 0.02	8.9 ± 0.8
	Yellow Perch	19	101.8 ± 1.8	14.3 ± 0.7	1.33 ± 0.03	2.1 ± 0.1
Lower Churchill R	Northern Pike [a]	36	668.2 ± 27.3	2324.2 ± 277.4	0.74 ± 0.02	8.7 ± 0.5
	Walleye	36	442.2 ± 17.8	1194.7 ± 121.2	1.18 ± 0.02	13.1 ± 1.1
	Lake Whitefish [b]	36	399.7 ± 9.8	975.3 ± 69.4	1.44 ± 0.02	8.7 ± 0.6
	Yellow Perch	0	-	-	-	-
	Lake Sturgeon [c]	32	797.6 ± 44.5	2179.8 ± 171.1	0.68 ± 0.02	12.1± 0.7
Gauer L	Northern Pike	36	572.8 ± 20.9	1492.8 ± 234.5	0.68 ± 0.01	6.2 ± 0.4
	Walleye [d]	36	390.2 ± 10.2	682.9 ± 49.4	1.08 ± 0.02	10.4 ± 0.6
	Lake Whitefish [e]	36	372.7 ± 11.8	824.9 ± 79.6	1.41 ± 0.02	10.1 ± 1.1
	Yellow Perch	0	-	-	-	-

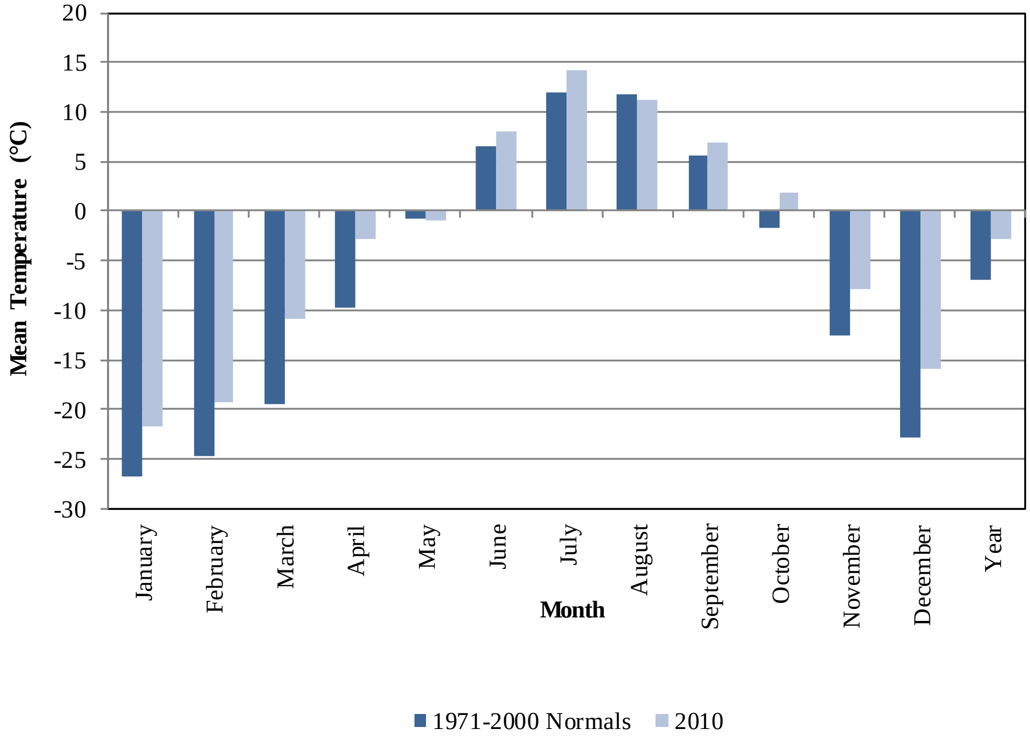
[a] n = 33 for weight and K
[b] n = 35 for age
[c] n = 23 for weight and K, n = 21 for age
[d] n = 32 for age
[e] n = 33 for age

Table 5.7-2. Mean arithmetic (± standard error, SE) and standardized (± 95% confidence limit, CL) mercury concentration (ppm) for Lake Whitefish, Northern Pike, Walleye, Yellow Perch, and Lake Sturgeon from Northern Indian Lake, the Lower Churchill River, and Gauer Lake in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Northern Indian L	Northern Pike	36	0.592	0.050	0.530	0.483 - 0.582
	Walleye	36	0.520	0.042	0.526	0.469 - 0.590
	Lake Whitefish	32	0.126	0.013	0.112	0.100 - 0.125
	Yellow Perch	19	0.075	0.004	-*	0.067 - 0.083
Lower Churchill R	Northern Pike	36	0.472	0.041	0.330	0.292 - 0.371
	Walleye	36	0.481	0.056	0.304	0.227- 0.333
	Lake Whitefish	36	0.117	0.011	0.073	0.062 - 0.085
	Yellow Perch	0	-	-	-	-
	Lake Sturgeon	32	0.156	0.023	0.192	0.165 - 0.223
Gauer L	Northern Pike	36	0.238	0.022	0.202	0.182 - 0.224
	Walleye	33	0.249	0.017	0.246	0.222 - 0.272
	Lake Whitefish	36	0.041	0.003	0.036	0.032 - 0.040
	Yellow Perch	0	-	-	-	-

* The relationship between mercury concentration and fish length was not significant; the CL is for the arithmetic mean.

(A)



(B)

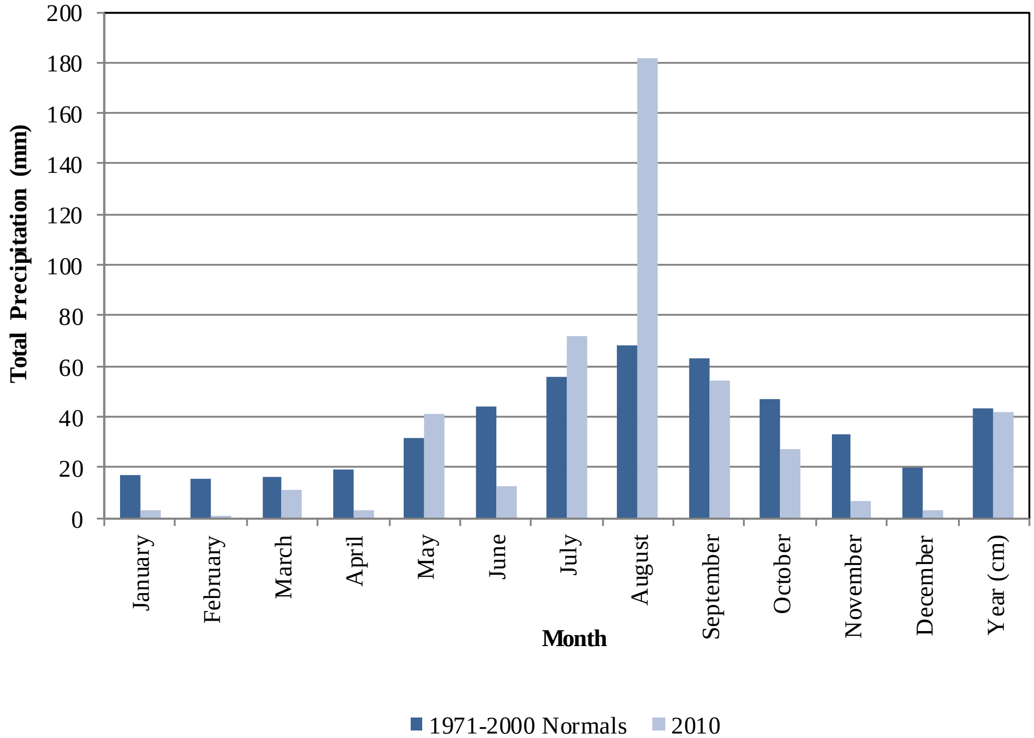


Figure 5.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Churchill, MB.

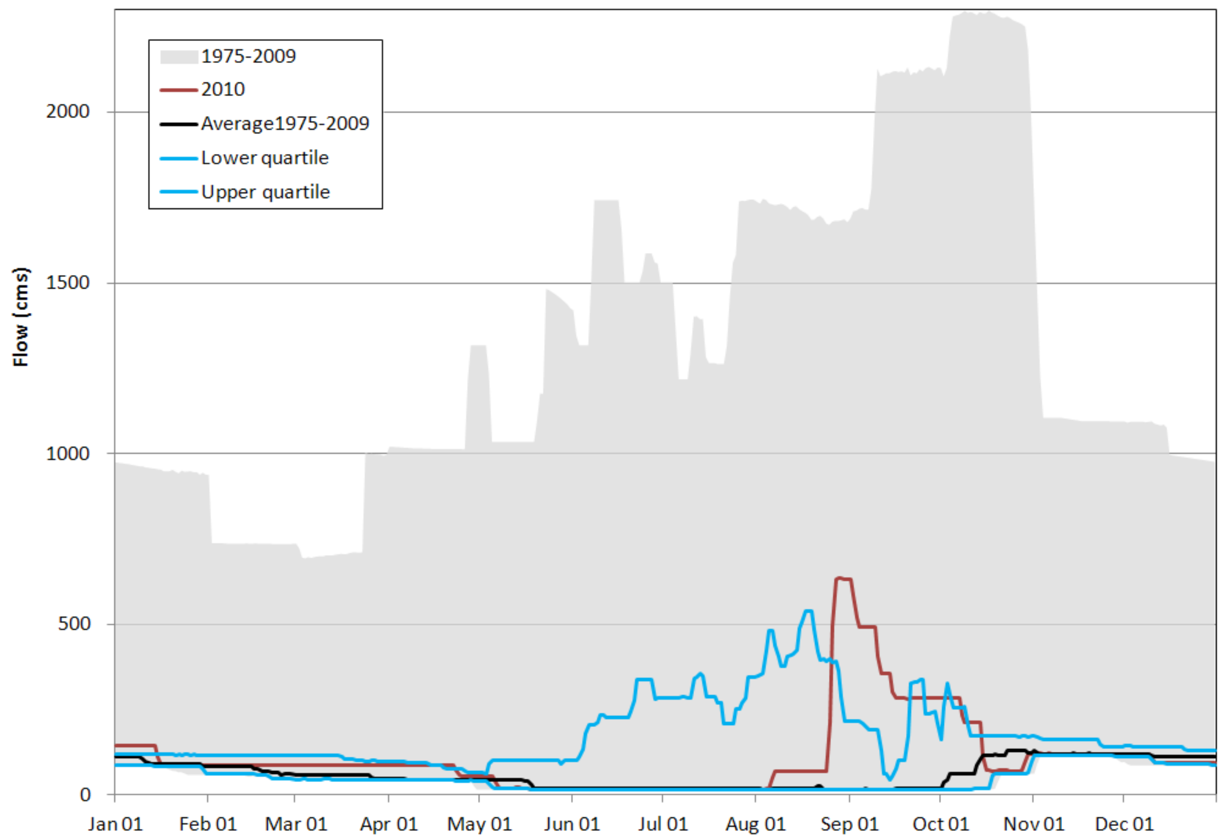


Figure 5.2-1. Flow at the Missi Falls Control Structure (06EC702) in 2010.

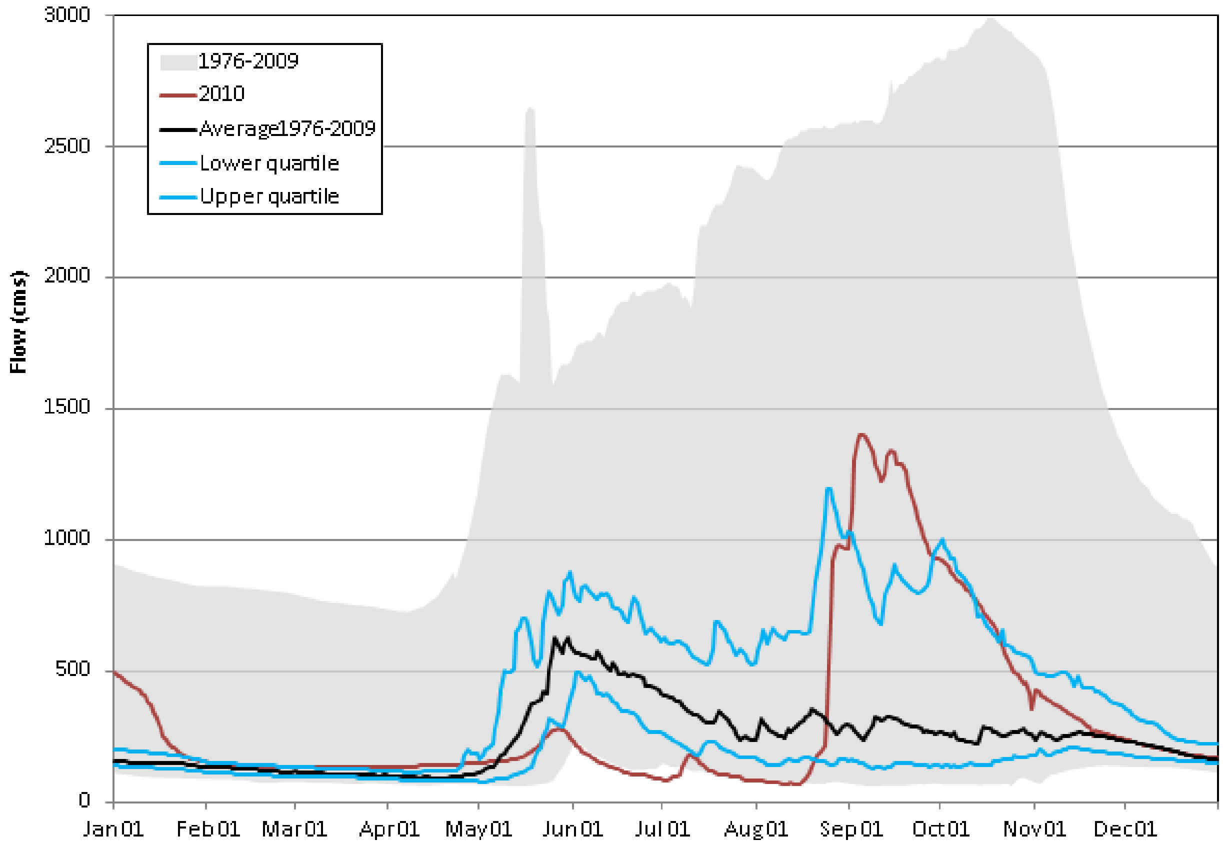


Figure 5.2-2. Flow of the Churchill River above Red Head Rapids (06FD001) in 2010.

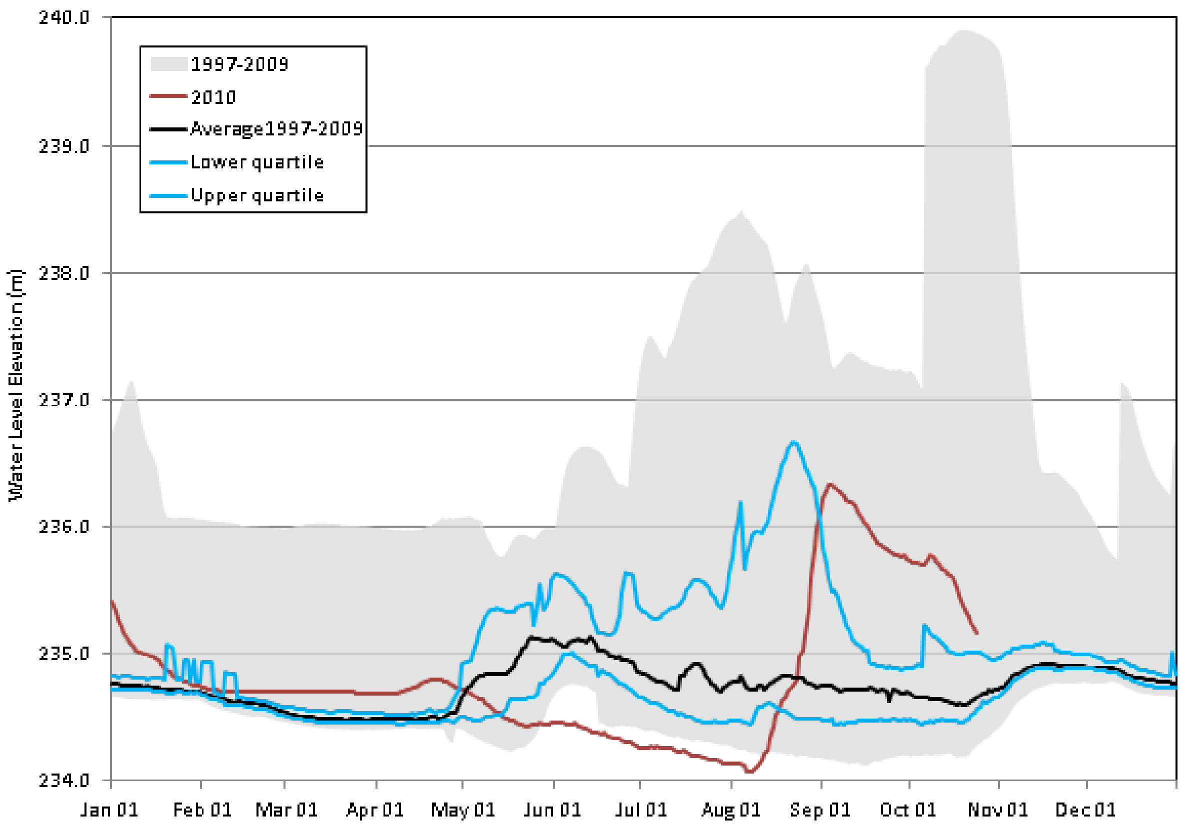


Figure 5.2-3. Water level elevation of Northern Indian Lake (06FA701) in 2010.

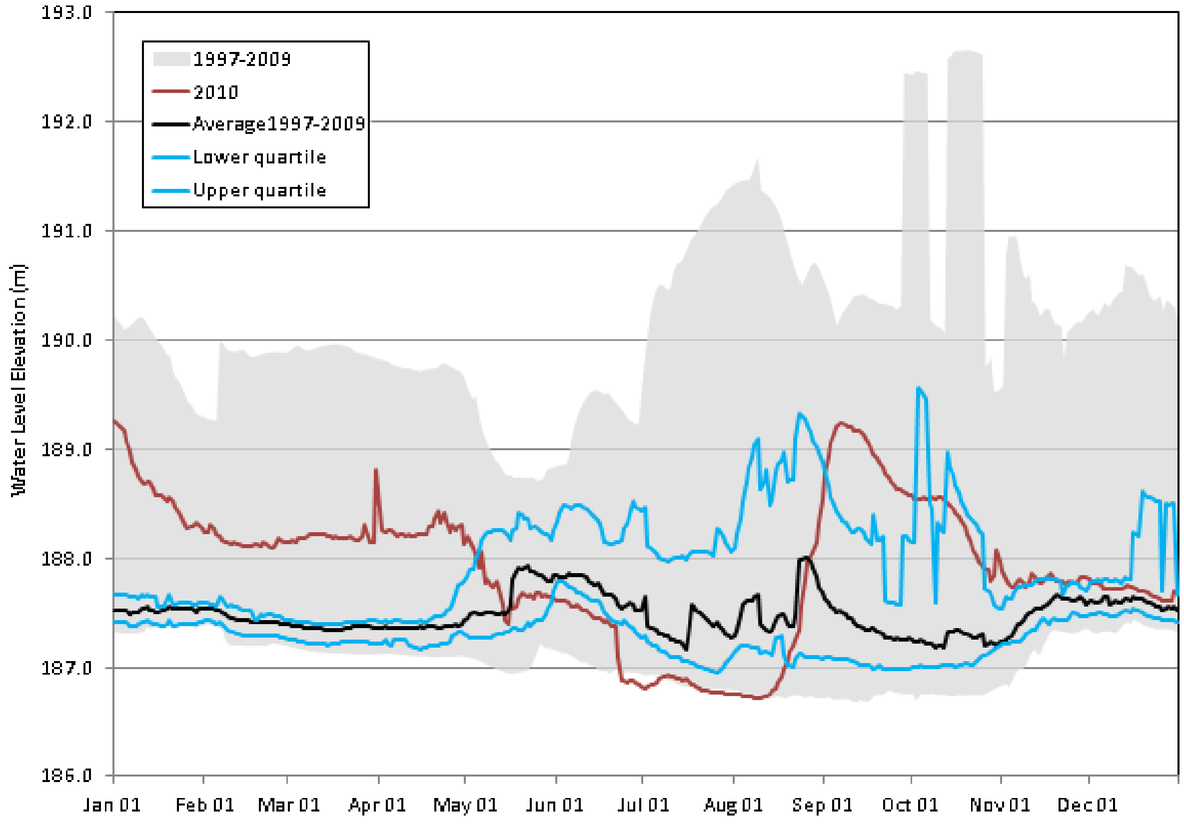


Figure 5.2-4. Water level elevation of Billard Lake (06FB702) in 2010.

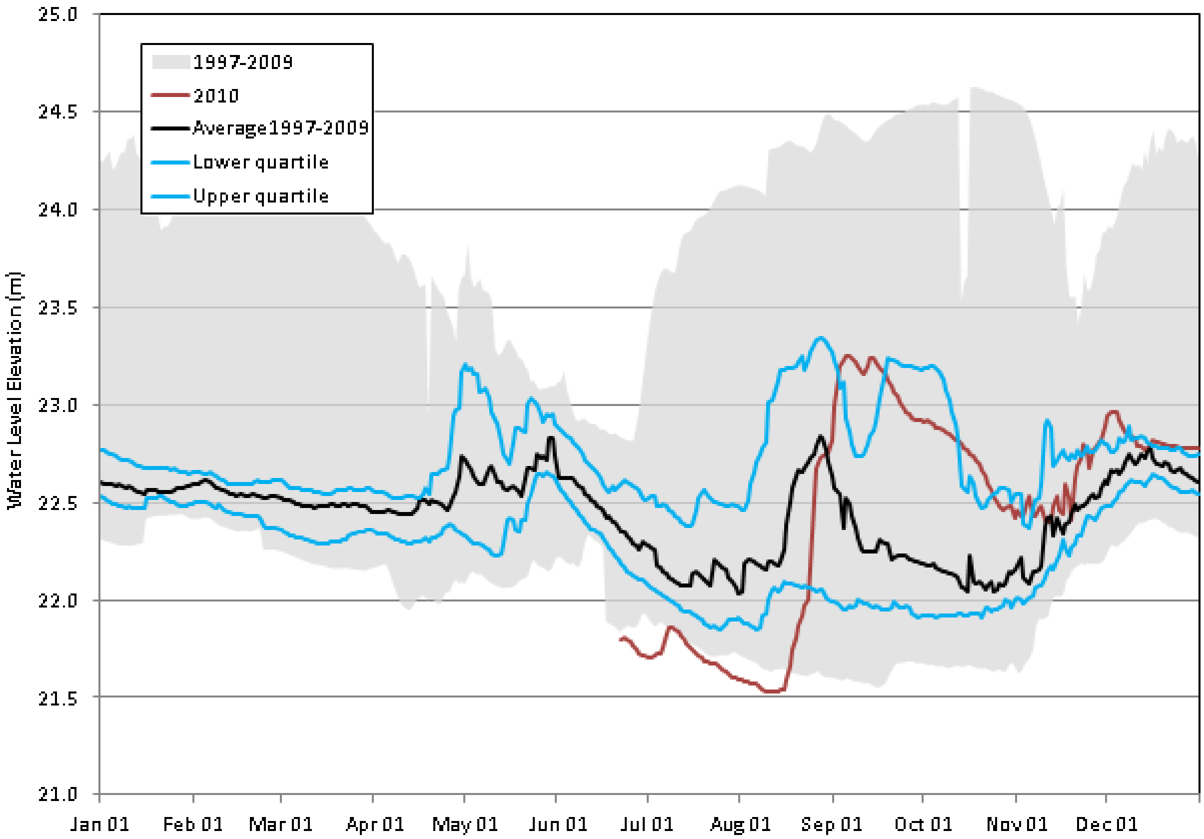


Figure 5.2-5. Water level elevation of the Churchill River above Swallow Rapids (06FD702) in 2010.

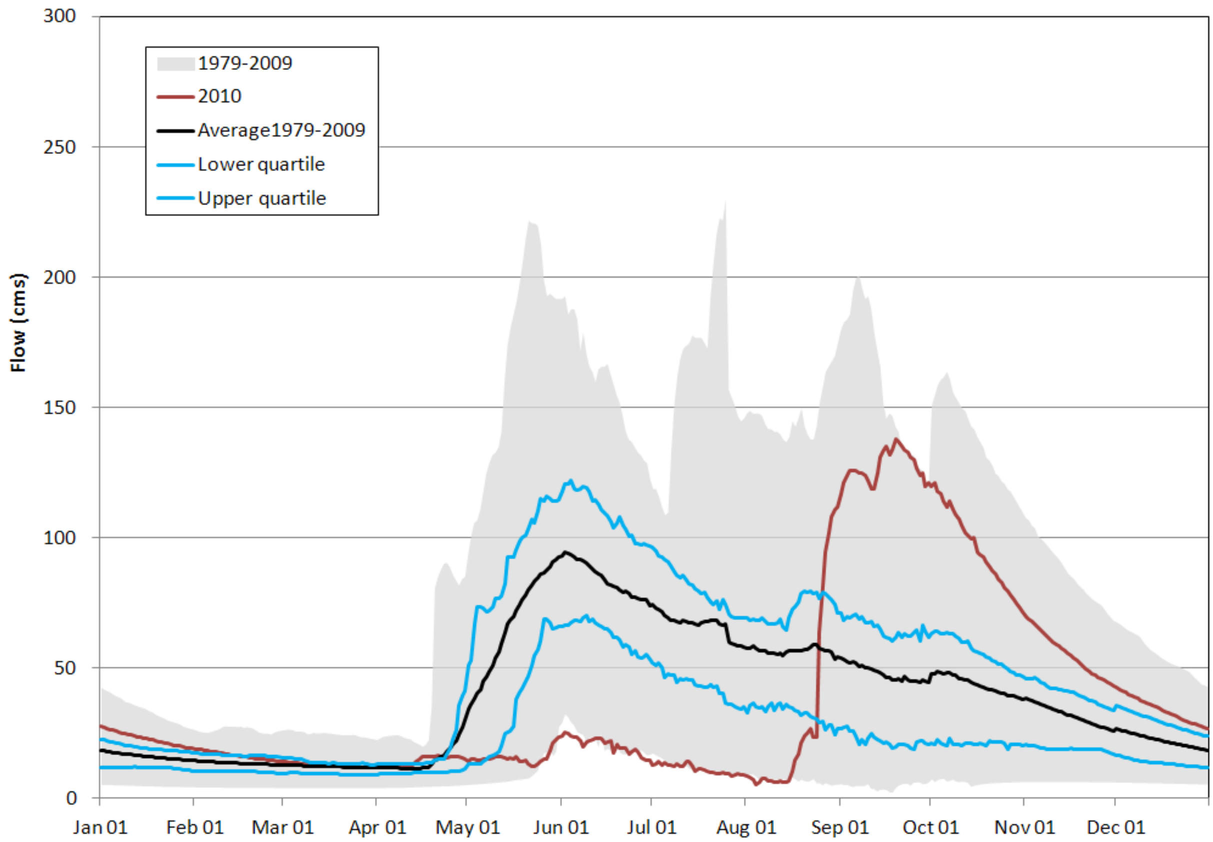


Figure 5.2-6. Flow of the Gauer River (06FA001) in 2010.

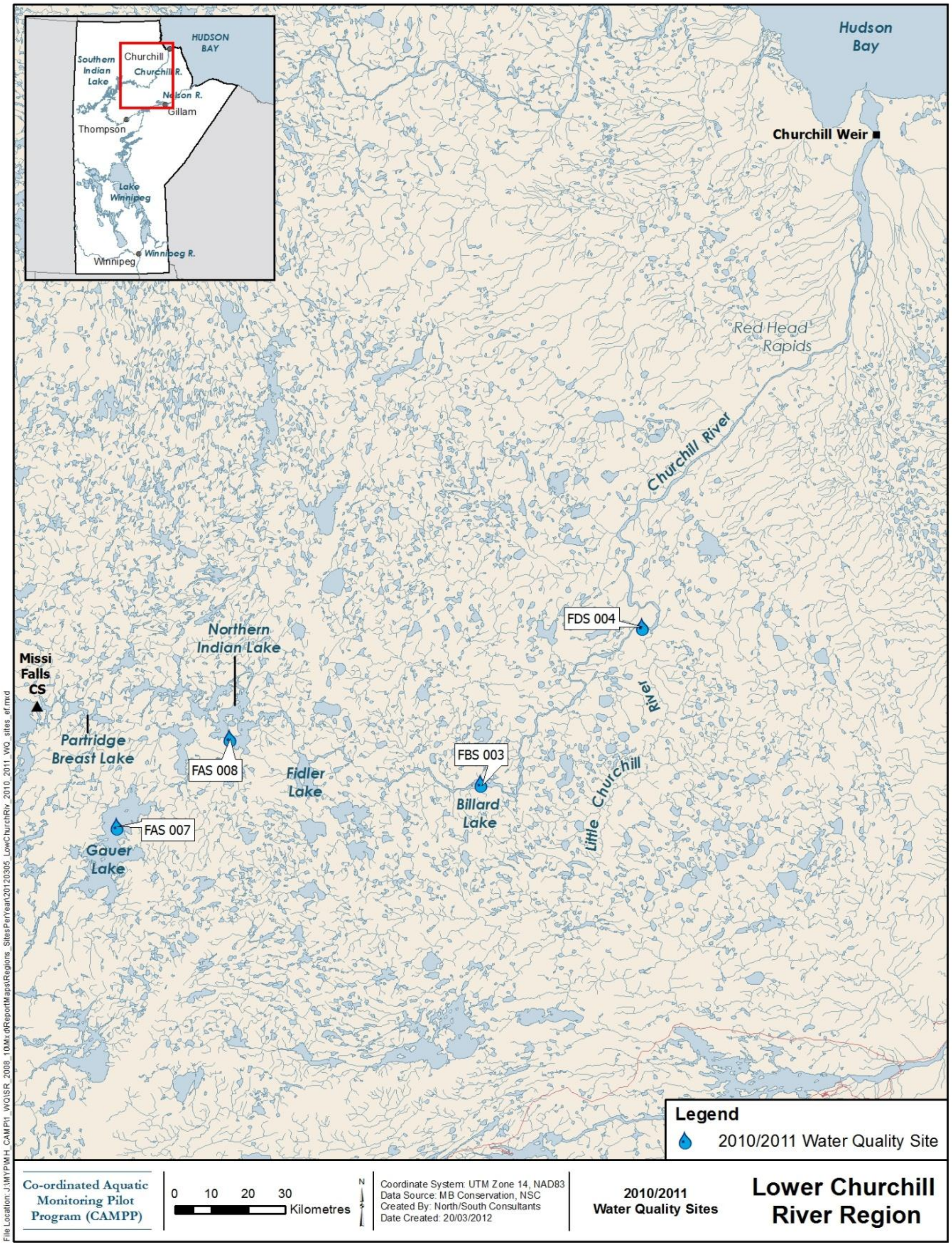


Figure 5.3-1. Water quality and phytoplankton monitoring sites in the Lower Churchill River Region: 2010/2011.

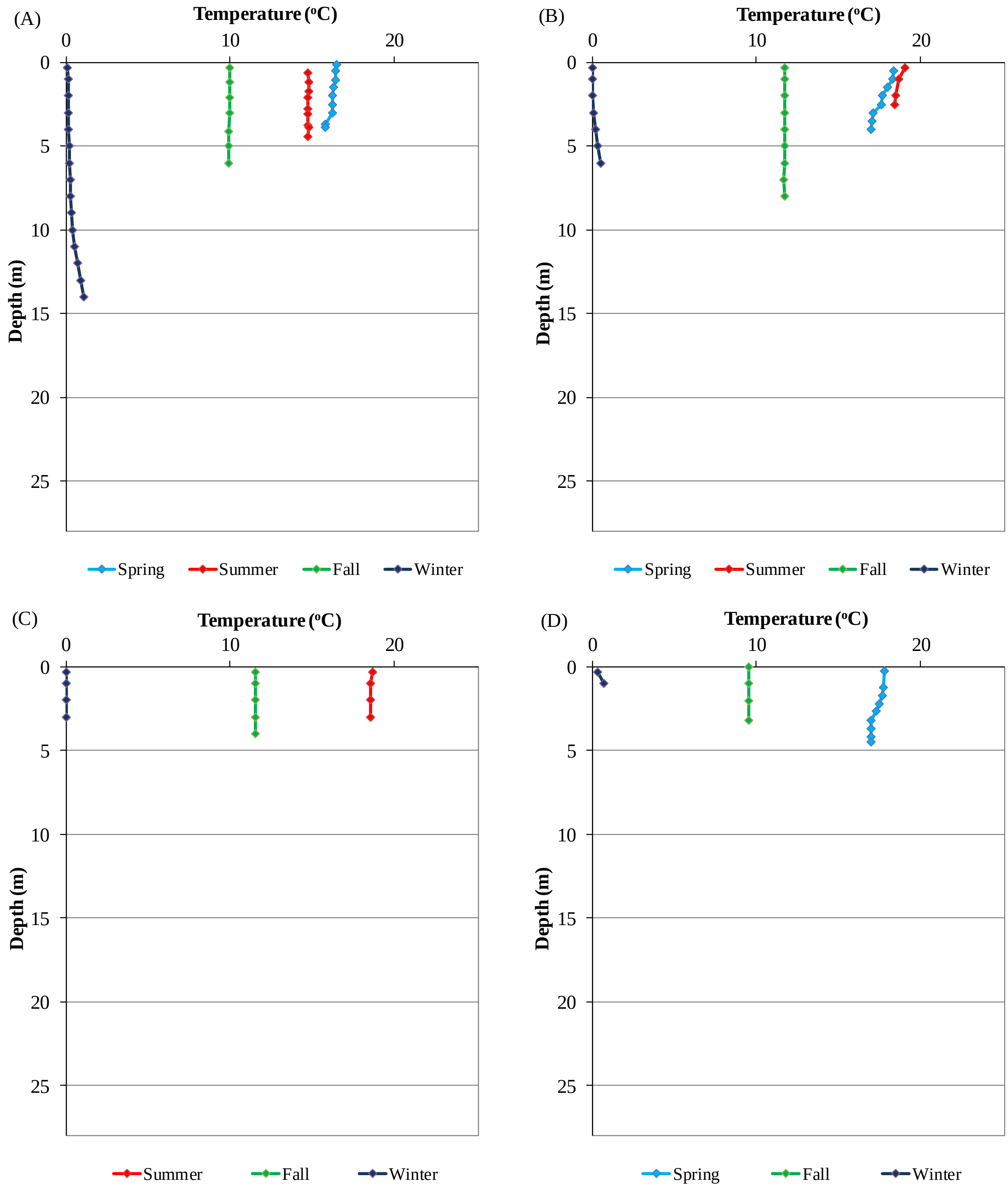


Figure 5.3-2. Water temperature profiles measured in the Lower Churchill River Region in 2010/2011: (A) Northern Indian Lake; (B) Billard Lake; (C) Lower Churchill River Region at Little Churchill River; and (D) Gauer Lake.

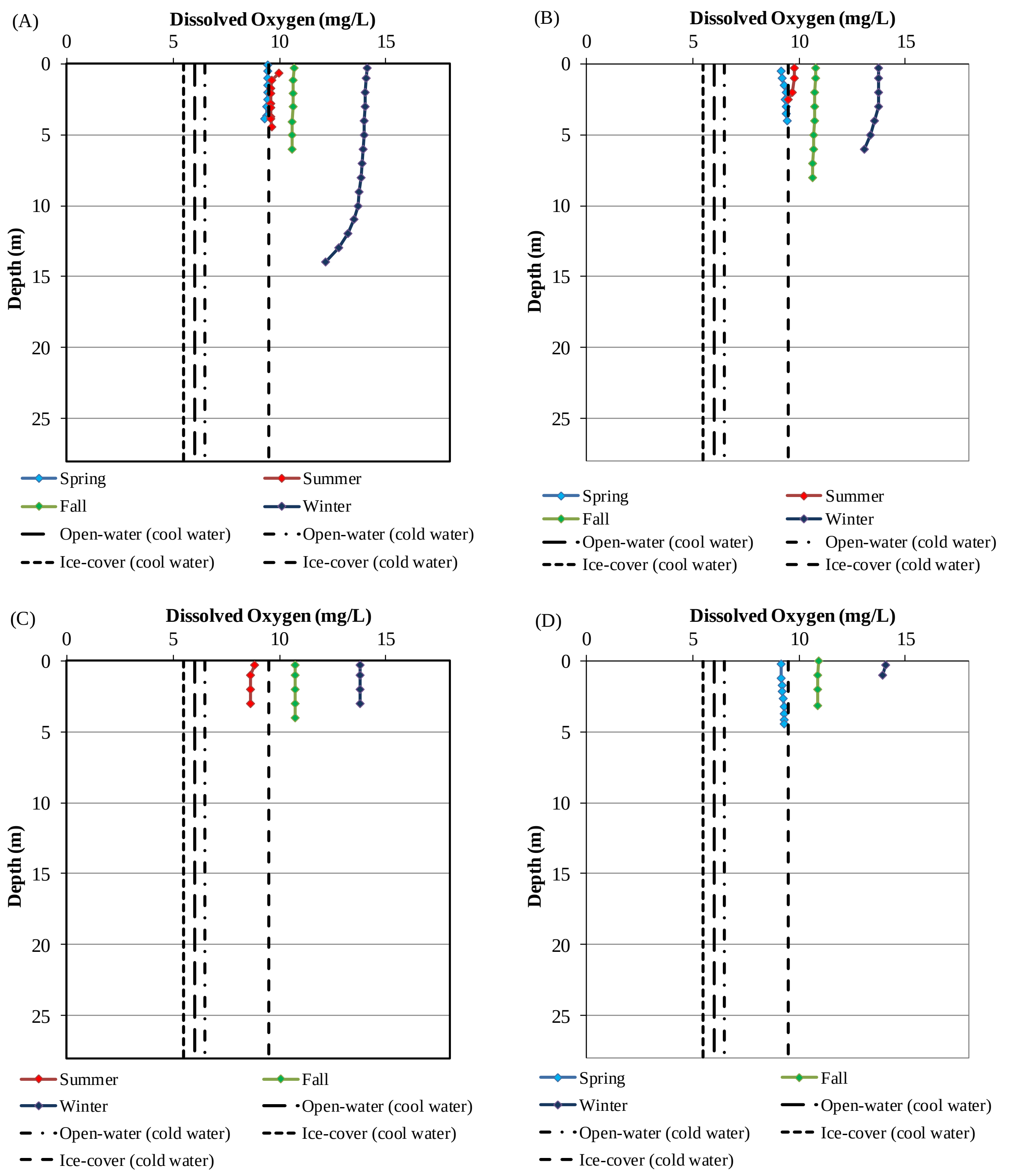


Figure 5.3-3. Dissolved oxygen depth profiles measured in the Lower Churchill River Region in 2010/2011: (A) Northern Indian Lake; (B) Billard Lake; (C) Lower Churchill River Region at Little Churchill River; and (D) Gauer Lake. Dashed lines represent selected MWQSOGs for PAL.

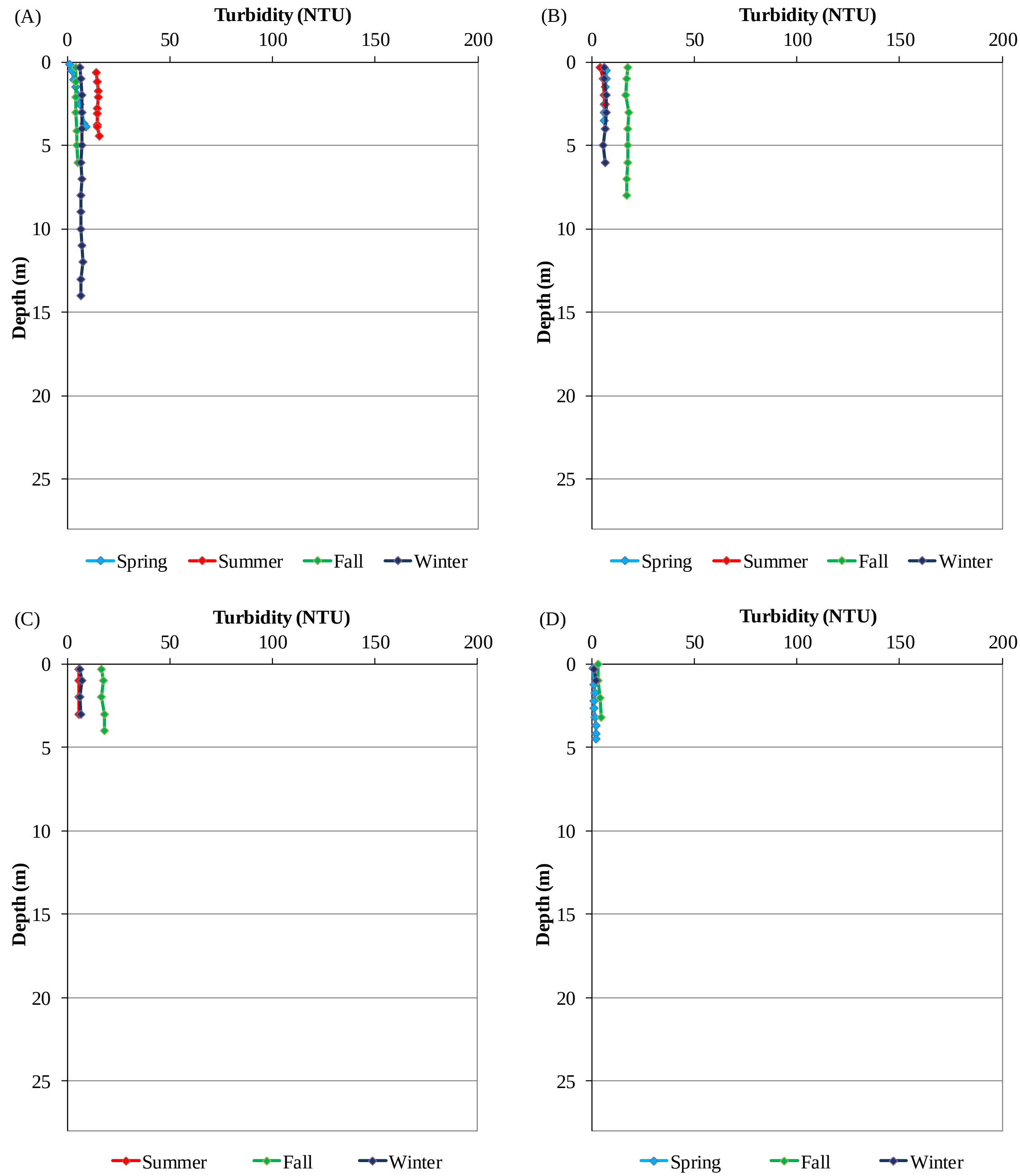


Figure 5.3-4. Turbidity depth profiles measured in the Lower Churchill River Region in 2010/2011: (A) Northern Indian Lake; (B) Billard Lake; (C) Lower Churchill River Region at Little Churchill River; and (D) Gauer Lake.

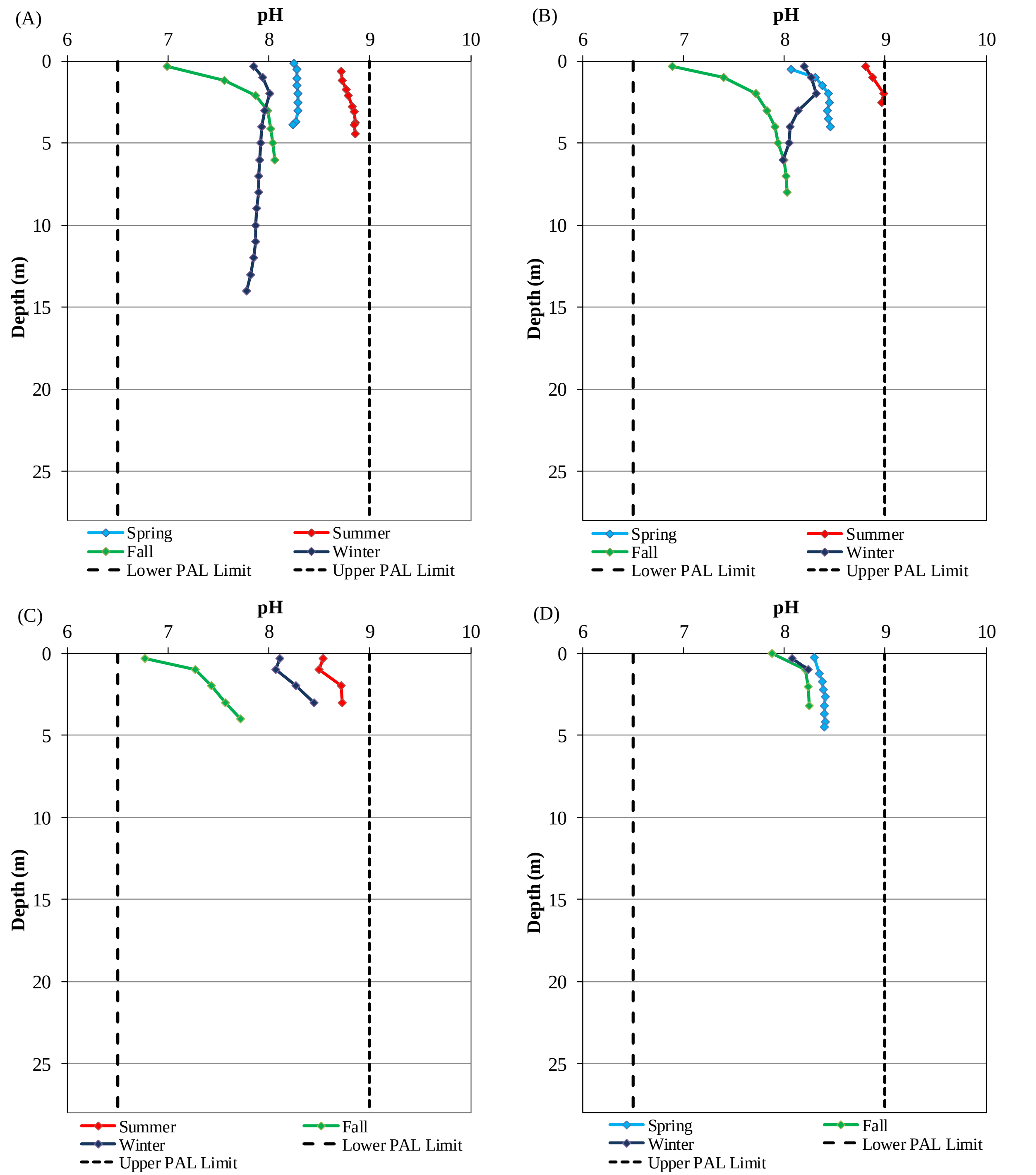


Figure 5.3-5. pH depth profiles measured in the Lower Churchill River Region in 2010/2011: (A) Northern Indian Lake; (B) Billard Lake; (C) Lower Churchill River Region at Little Churchill River; and (D) Gauer Lake. Dashed lines represent selected MWQSOGs for PAL.

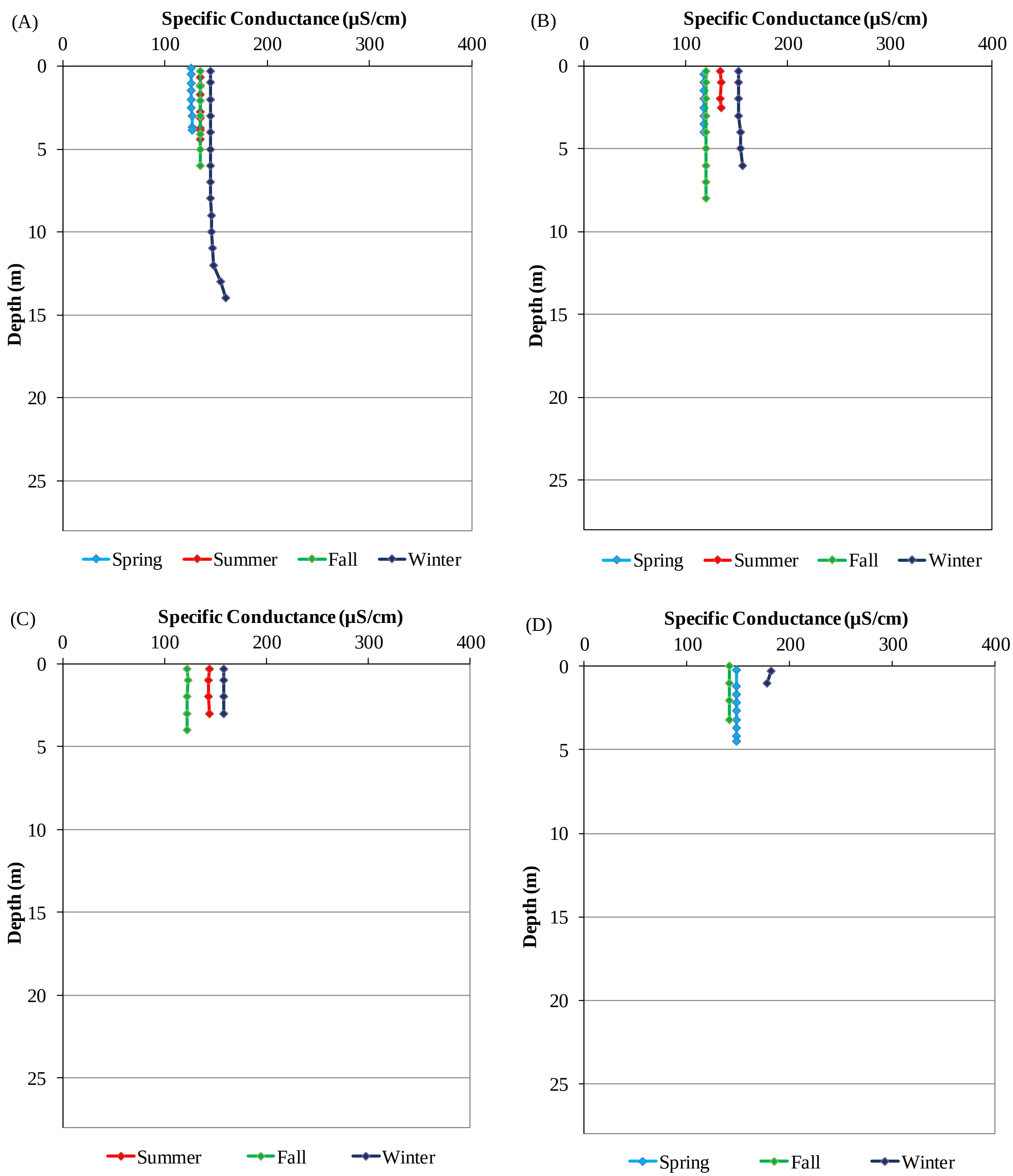


Figure 5.3-6. Specific conductance depth profiles measured in the Lower Churchill River Region in 2010/2011: (A) Northern Indian Lake; (B) Billard Lake; (C) Lower Churchill River Region at Little Churchill River; and (D) Gauer Lake.

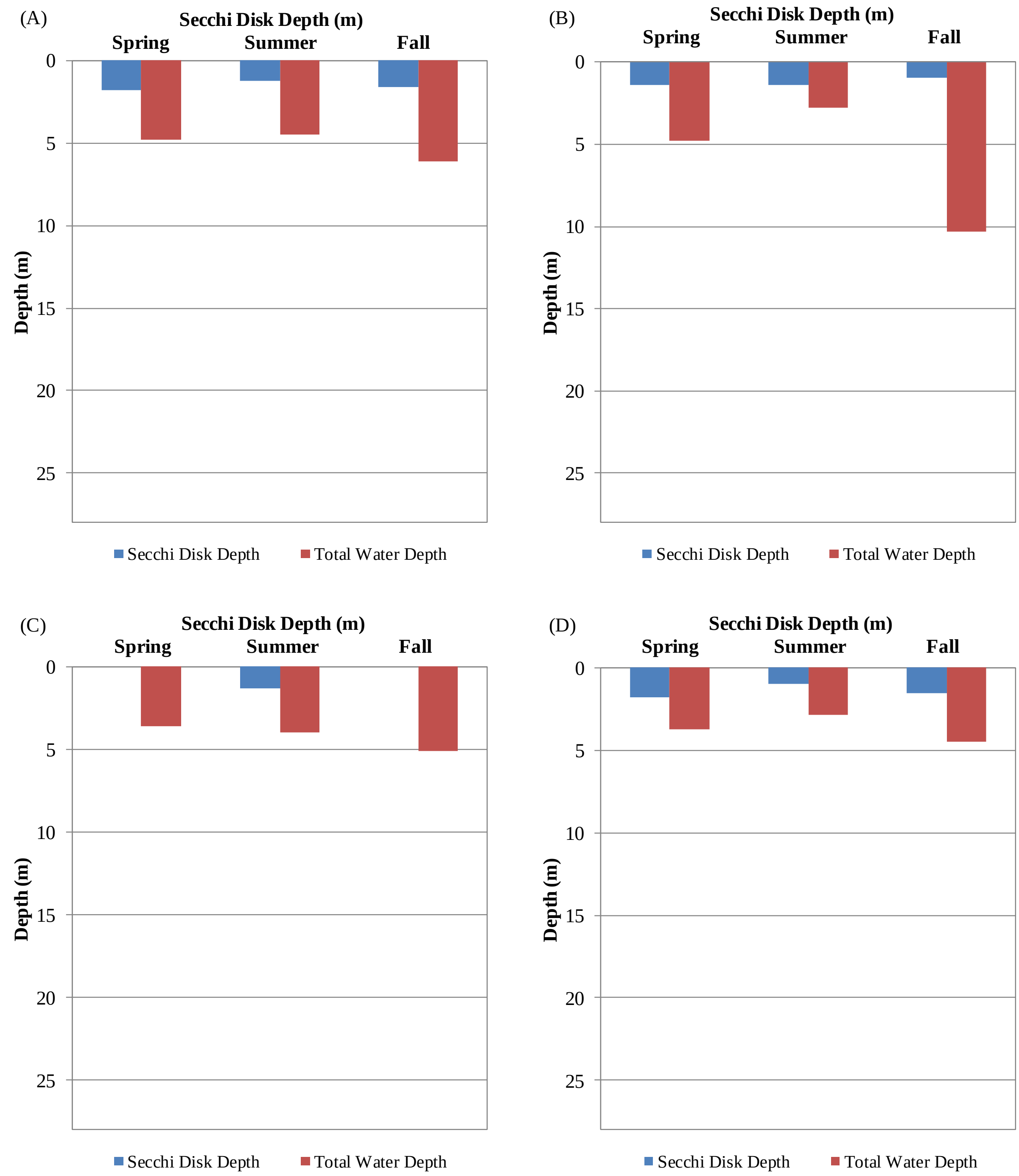


Figure 5.3-7. Secchi disk depths measured in the Lower Churchill River Region in 2010/2011: (A) Northern Indian Lake; (B) Billard Lake; (C) Lower Churchill River Region at Little Churchill River; and (D) Gauer Lake.

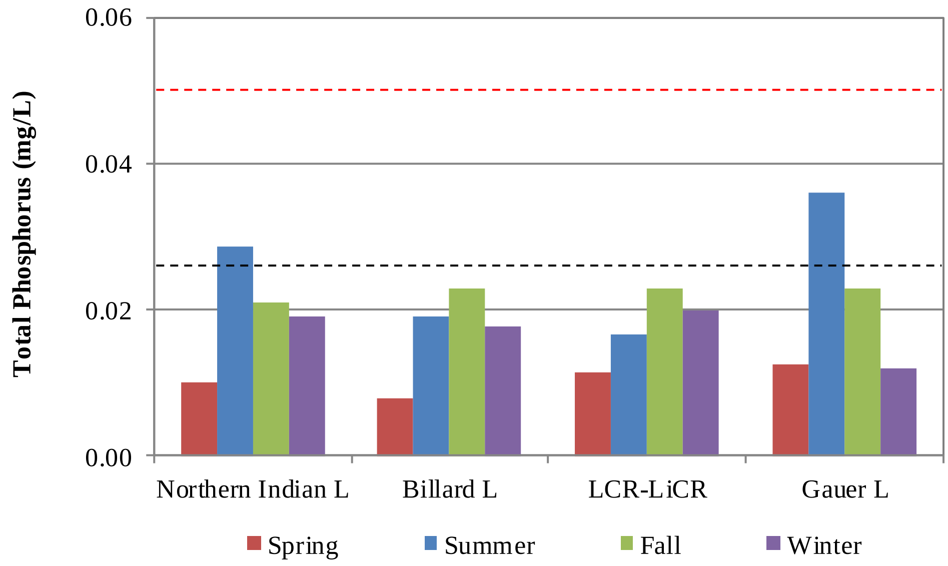


Figure 5.3-8. Total phosphorus measured in surface grabs in the Lower Churchill River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

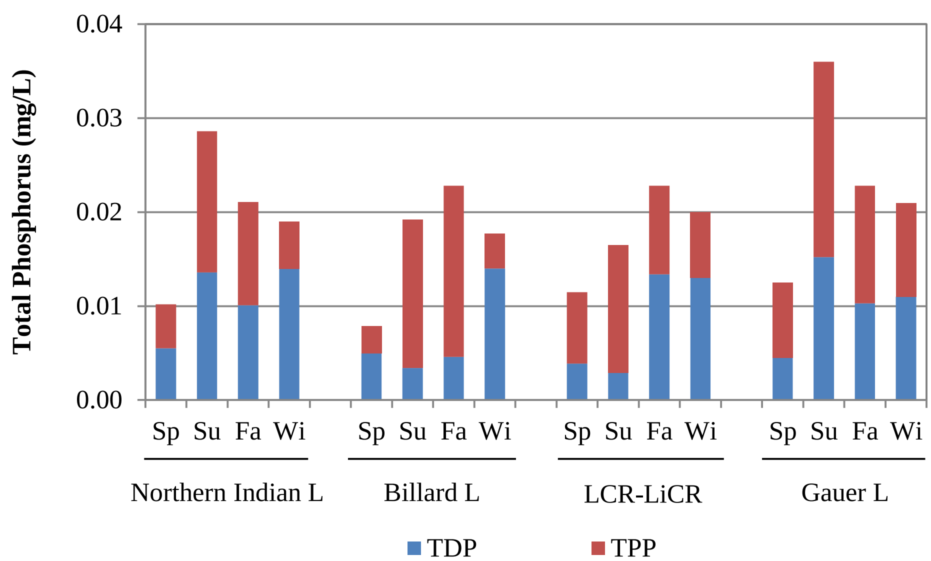


Figure 5.3-9. Particulate (TPP) and dissolved phosphorus (TDP) fractions measured in the Lower Churchill River Region: 2010/2011.

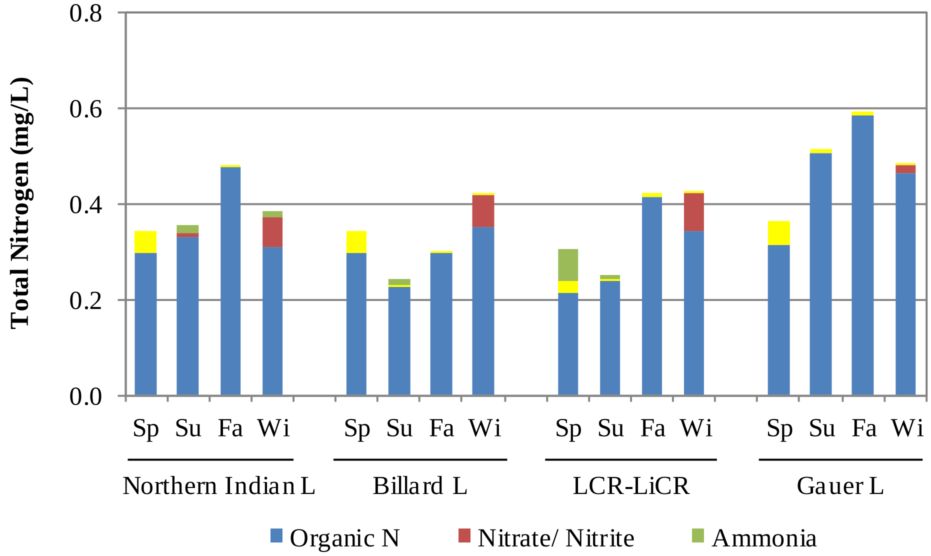


Figure 5.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Lower Churchill River Region: 2010/2011. Yellow bars represent values that were below the analytical detection limit.

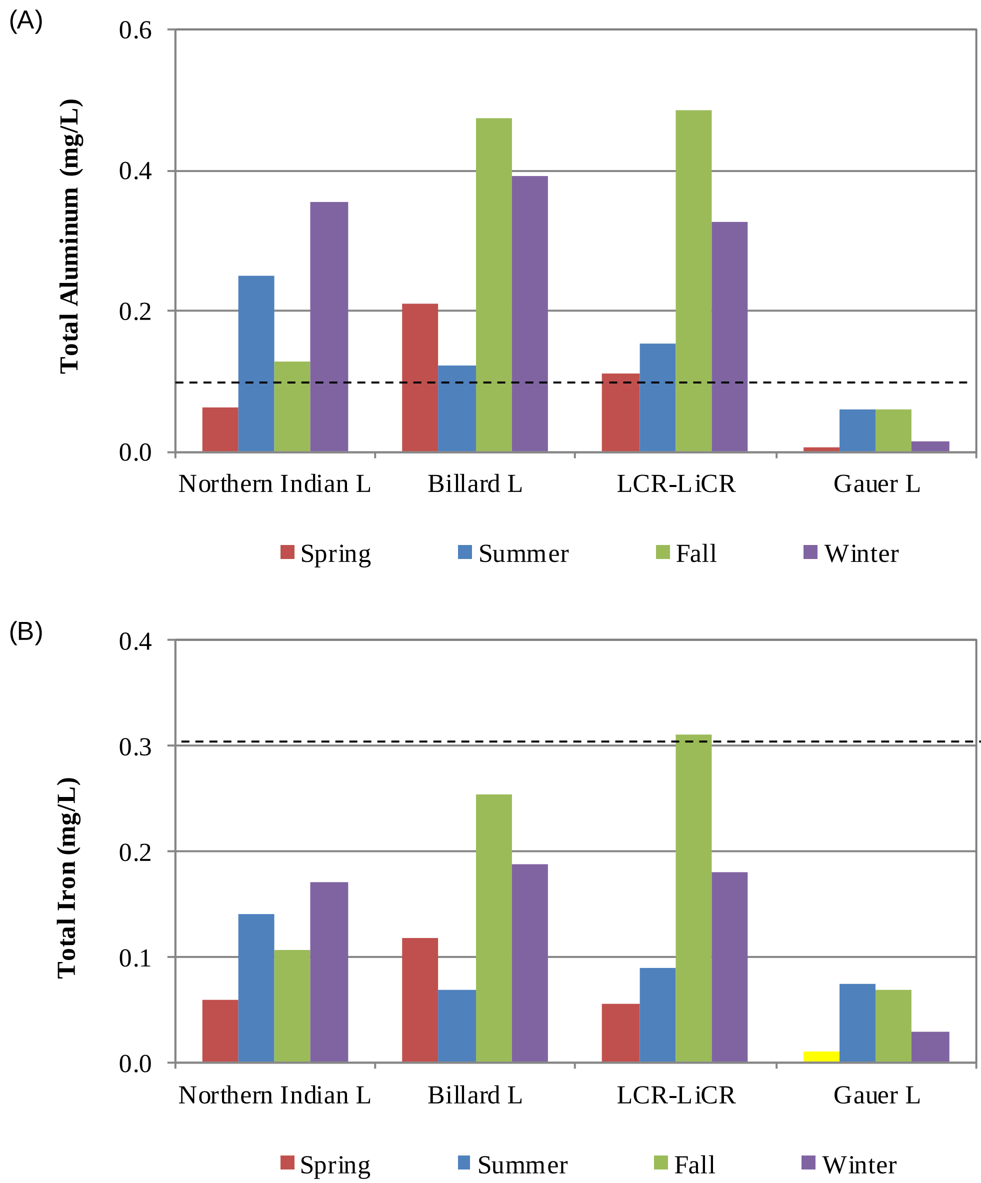


Figure 5.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Lower Churchill River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron. Yellow bars represent values that were below the analytical detection limit.

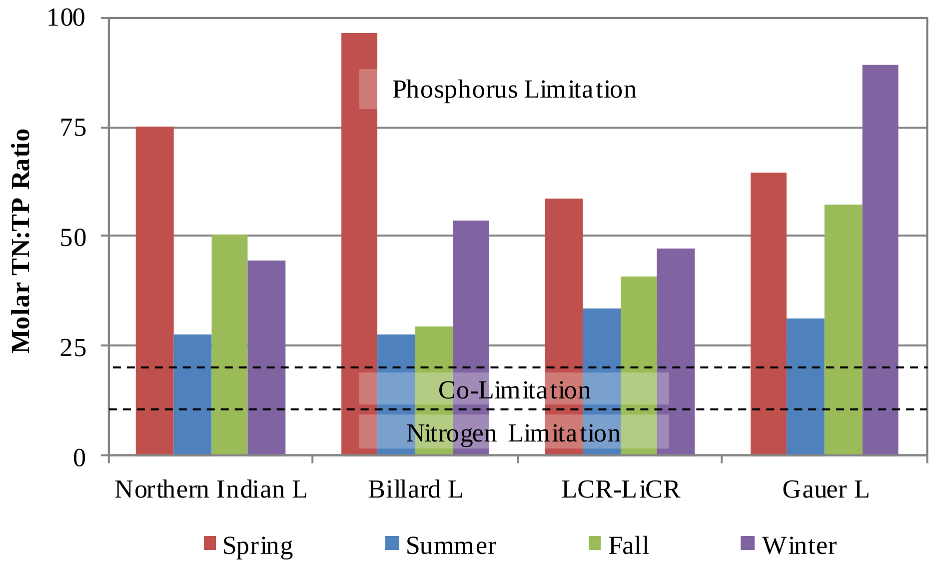


Figure 5.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Lower Churchill River Region: 2010/2011.

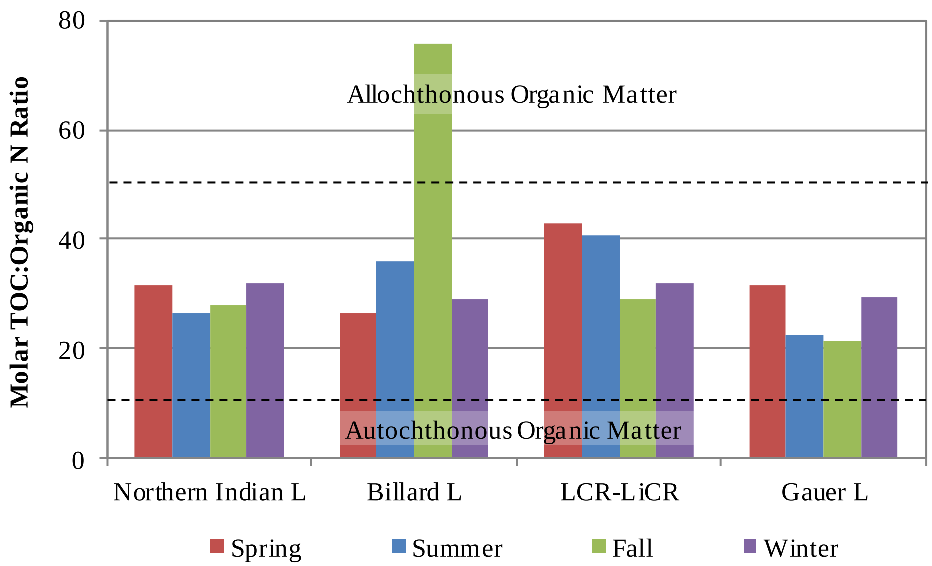


Figure 5.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Lower Churchill River Region: 2010/2011.

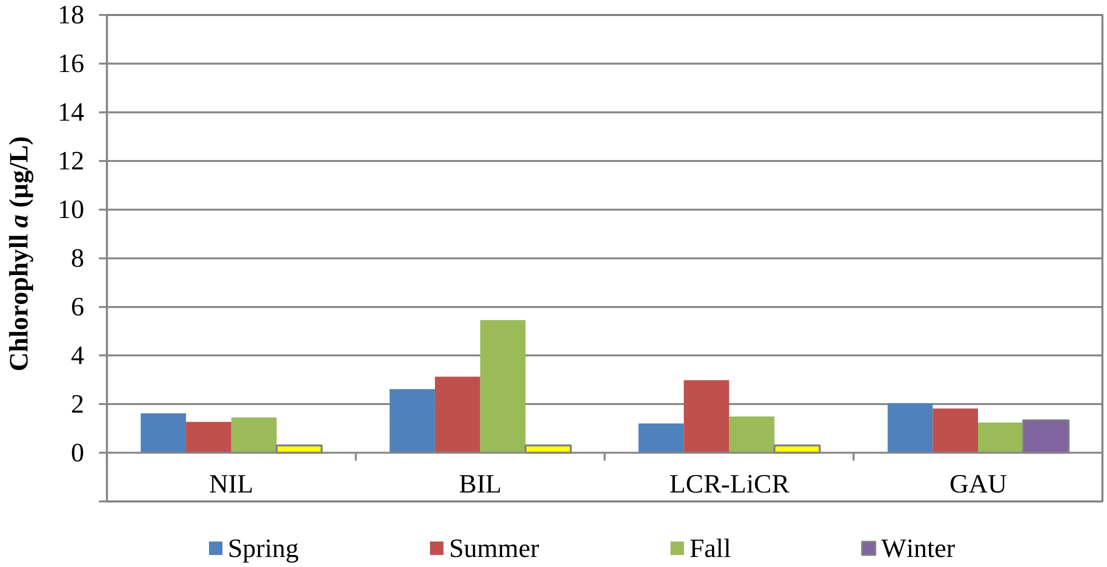


Figure 5.4-1. Chlorophyll *a* concentrations measured within the euphotic zone at sites in the Lower Churchill River Region in 2010/2011. Yellow bars represent values that were below the analytical detection limit.

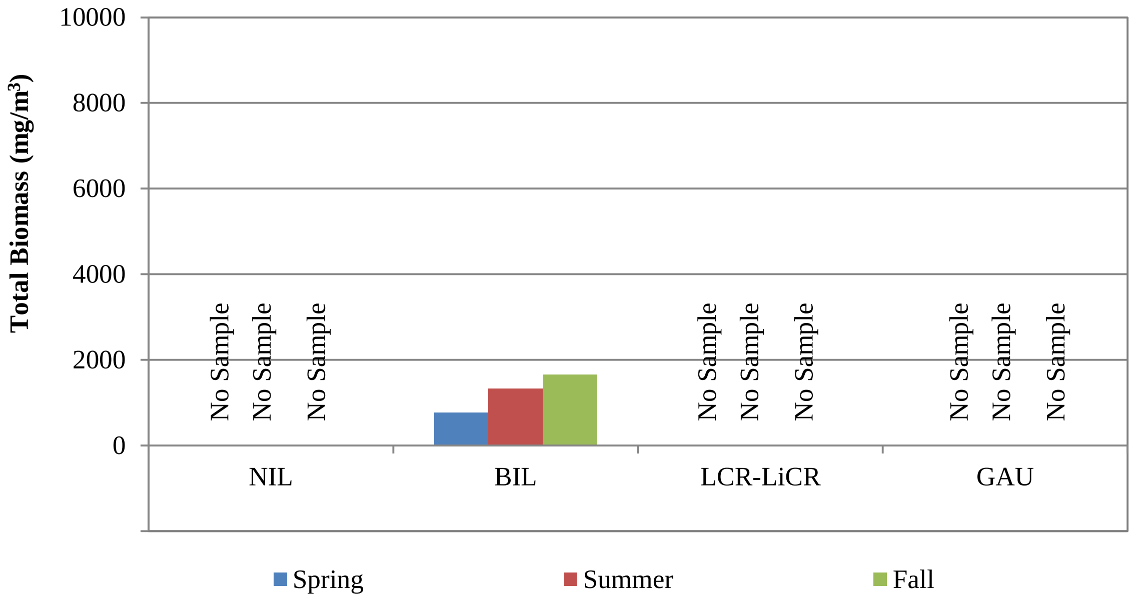


Figure 5.4-2. Phytoplankton biomass measured at sites in the Lower Churchill River Region during the 2010/2011 open-water period.

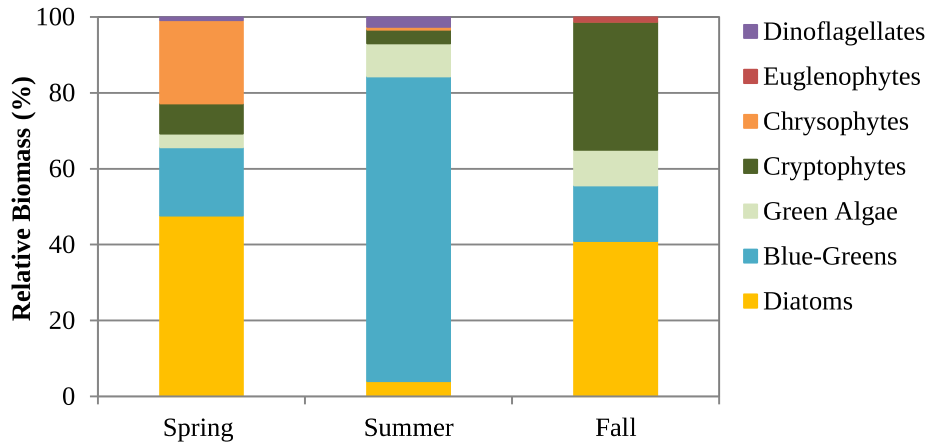


Figure 5.4-3. Phytoplankton community composition at Billard Lake in 2010/2011.

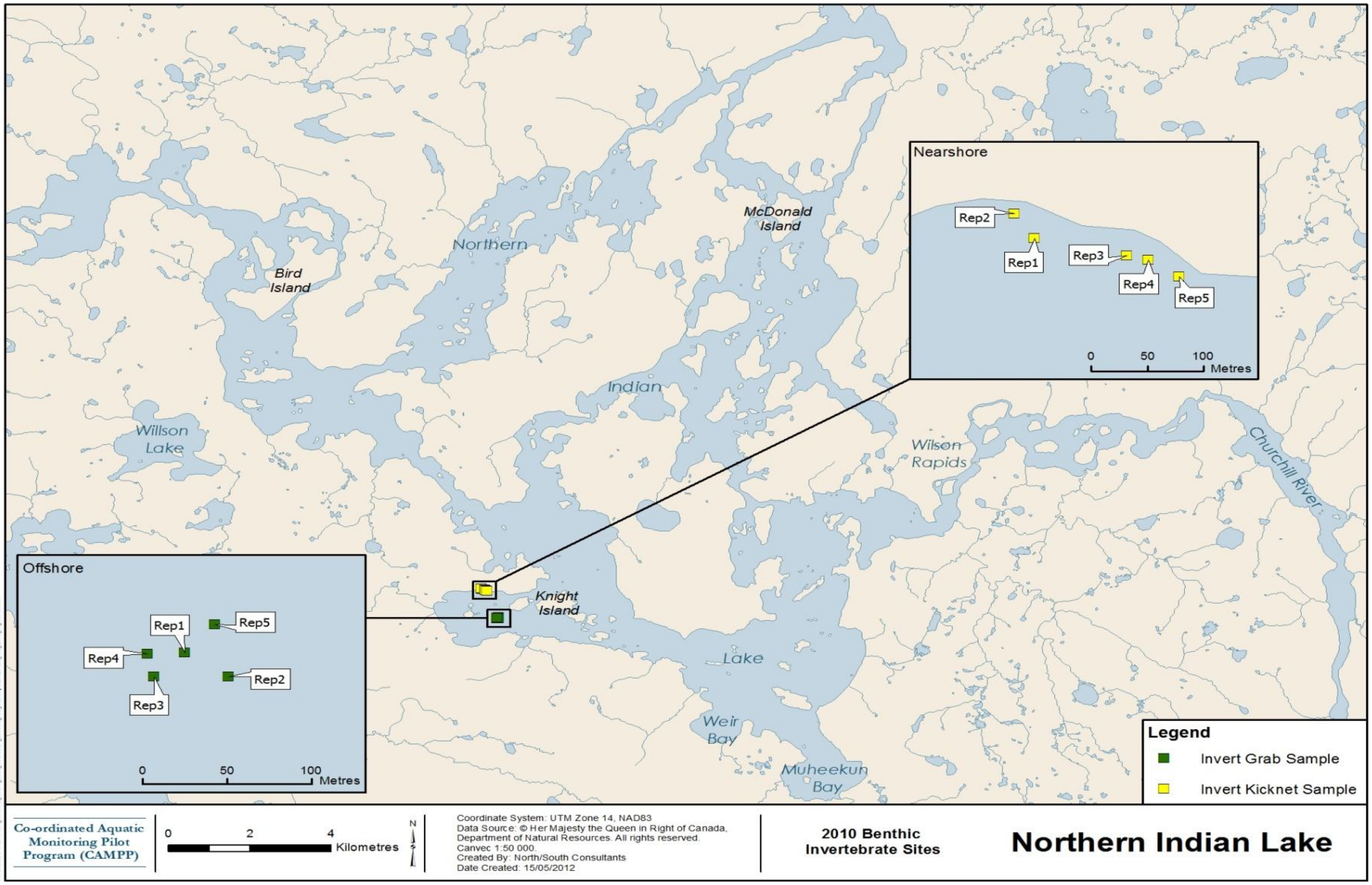


Figure 5.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Northern Indian Lake within the Lower Churchill River Region, 2010.

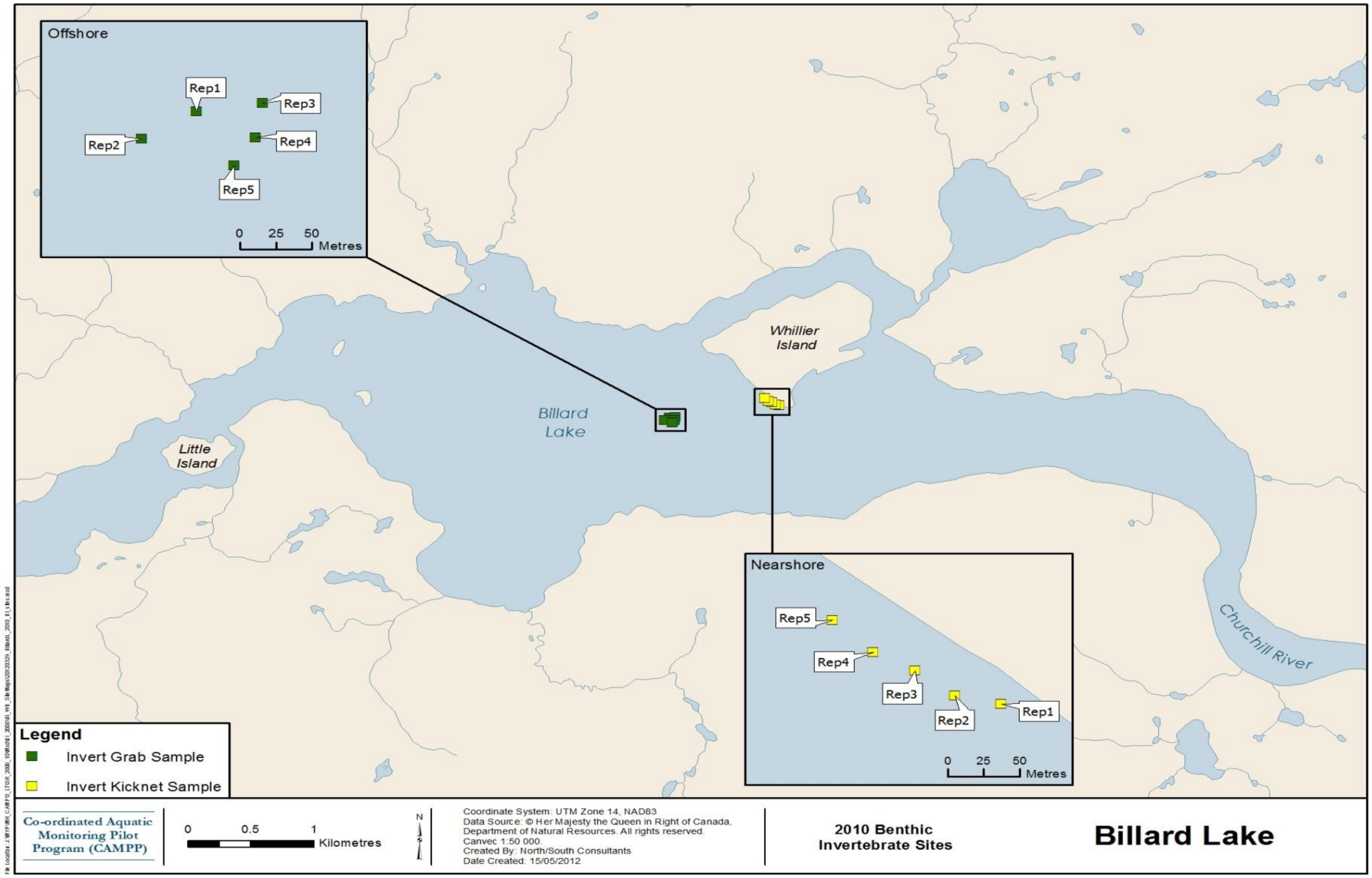


Figure 5.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Billard Lake within the Lower Churchill River Region, 2010.

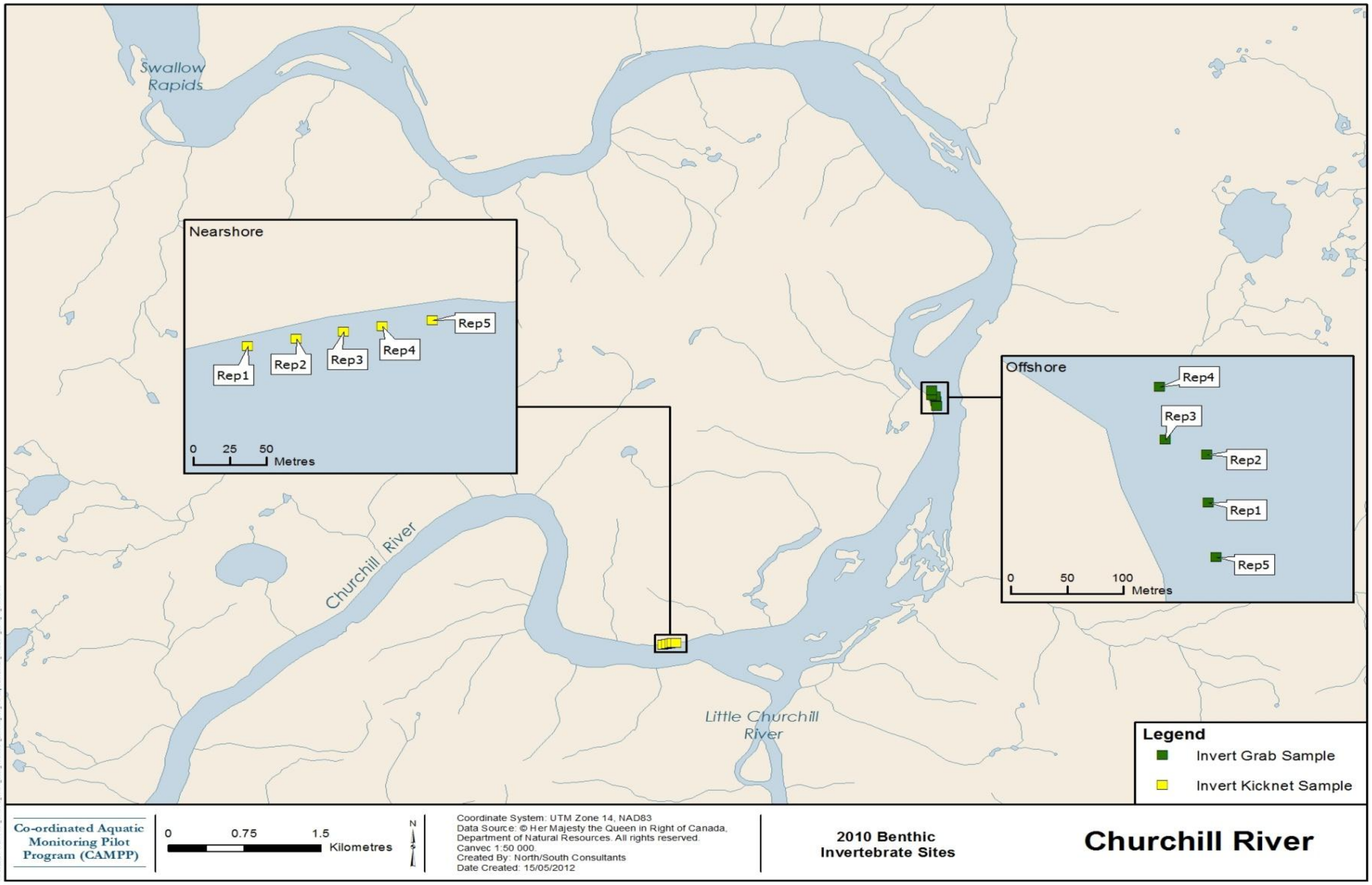


Figure 5.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in the Churchill River within the Lower Churchill River Region, 2010.

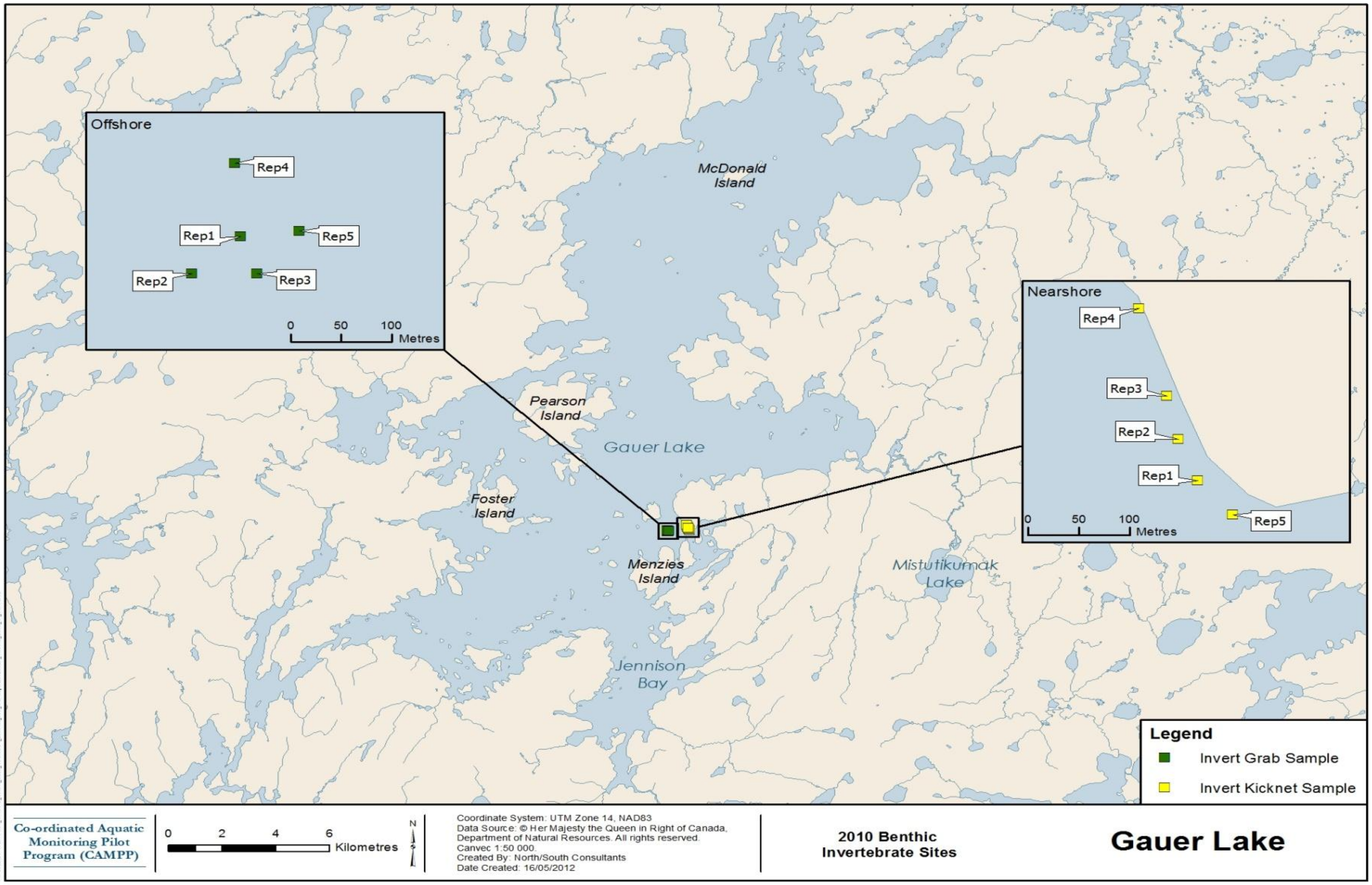


Figure 5.5-4. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Gauer Lake within the Lower Churchill River Region, 2010.

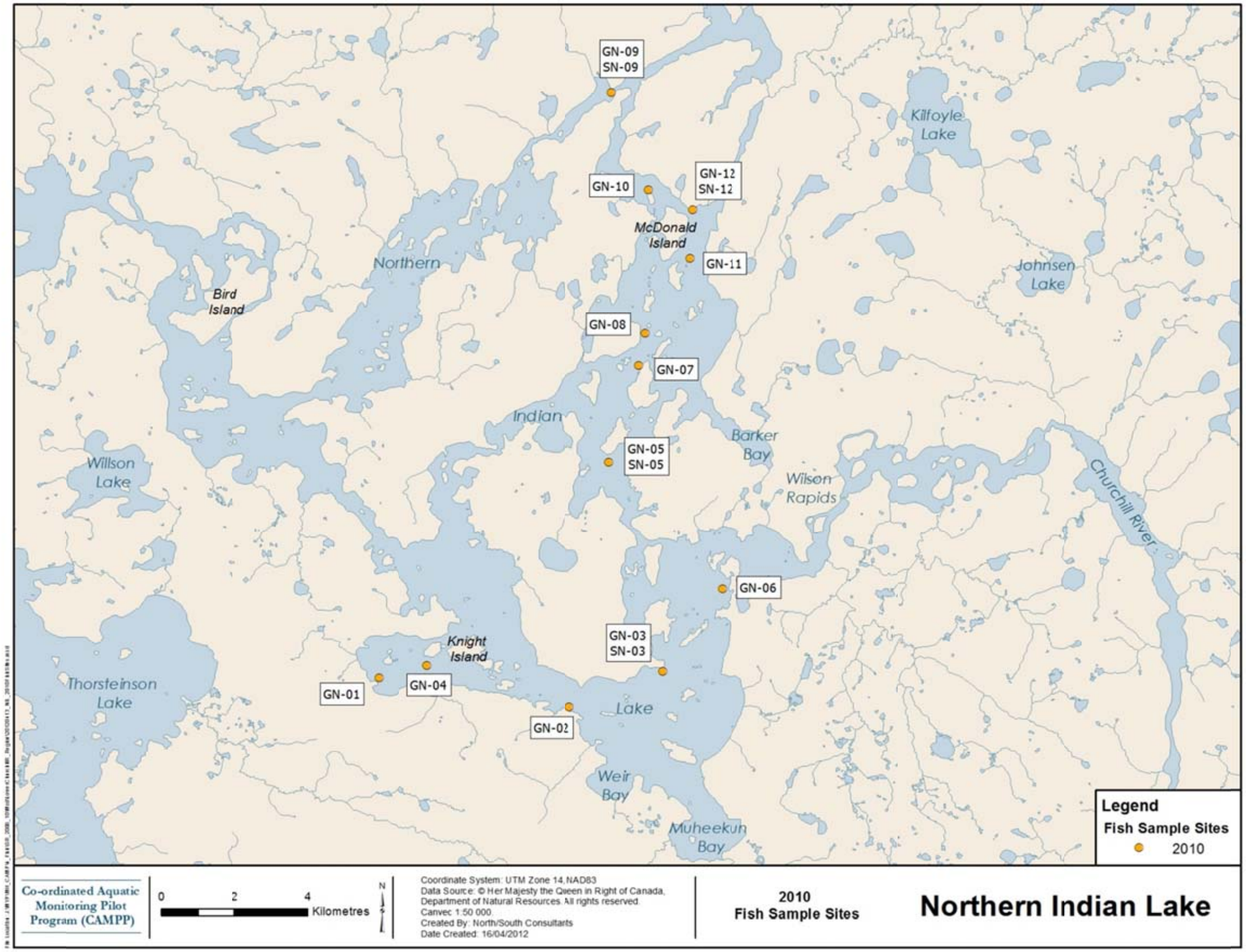


Figure 5.6-1. Map of standard gang and small mesh index gillnet sites sampled in Northern Indian Lake, 2010.

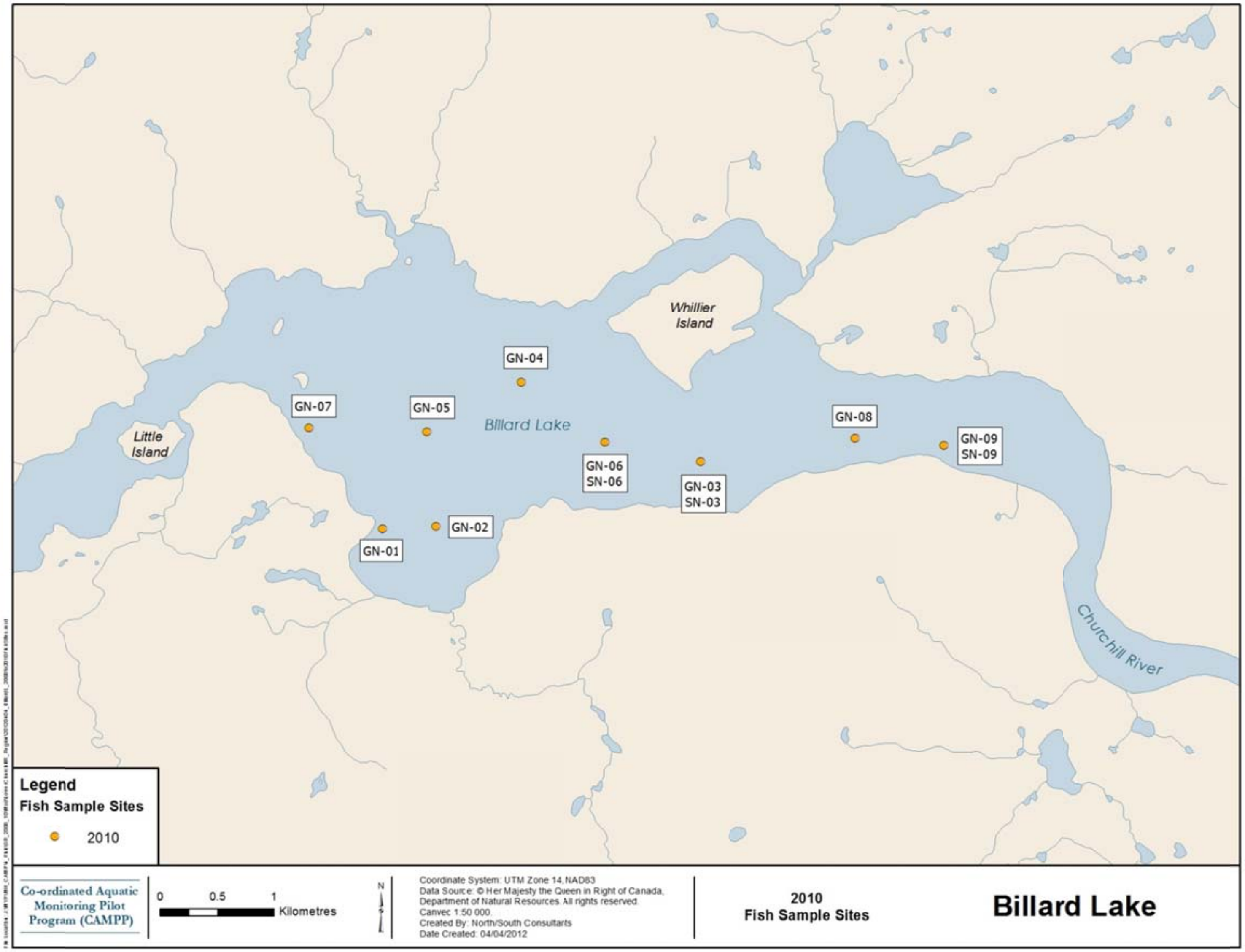


Figure 5.6-2. Map of standard gang and small mesh index gillnet sites sampled in Billard Lake, 2010.

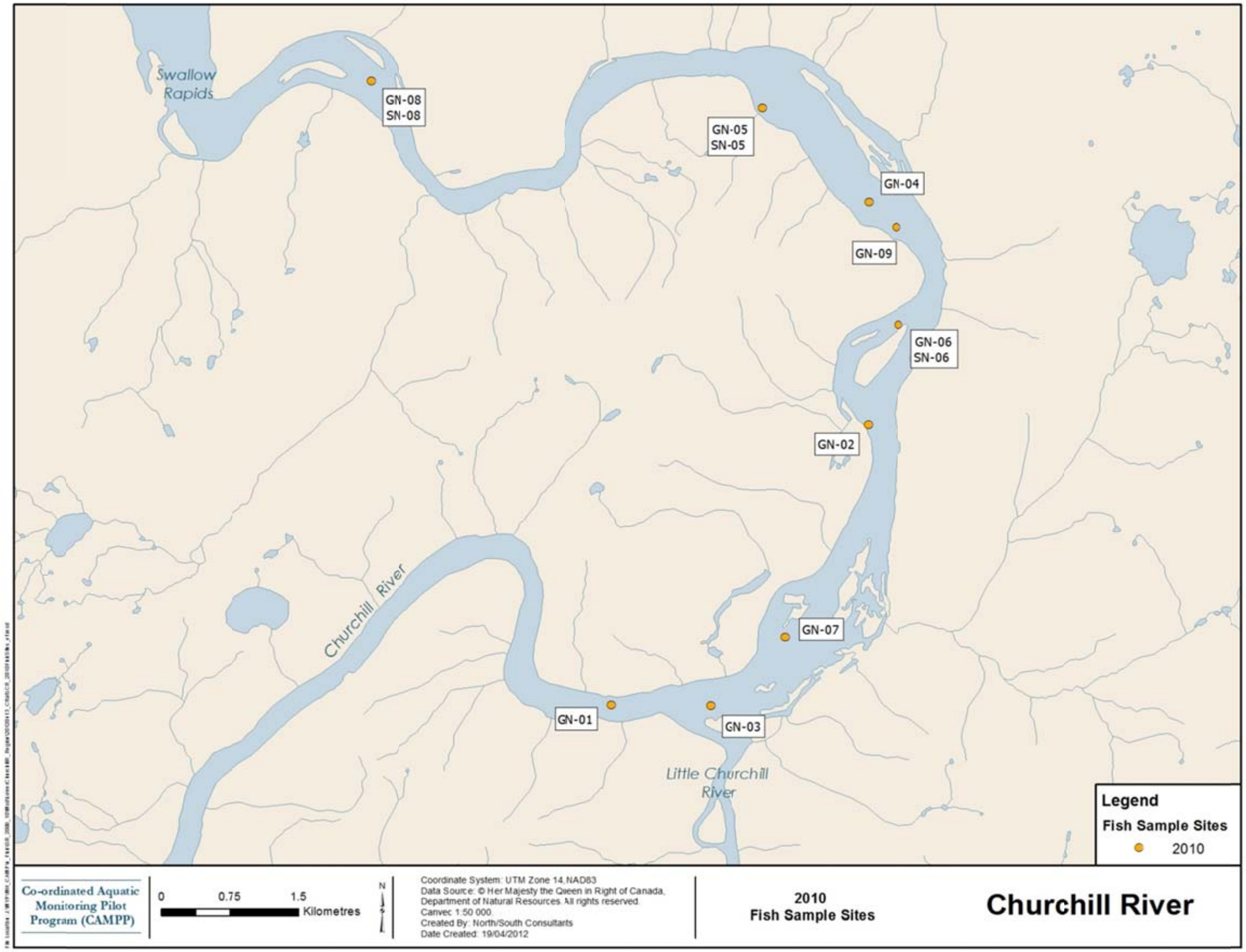


Figure 5.6-3. Map of standard gang and small mesh index gillnet sites sampled in the Lower Churchill River, 2010.

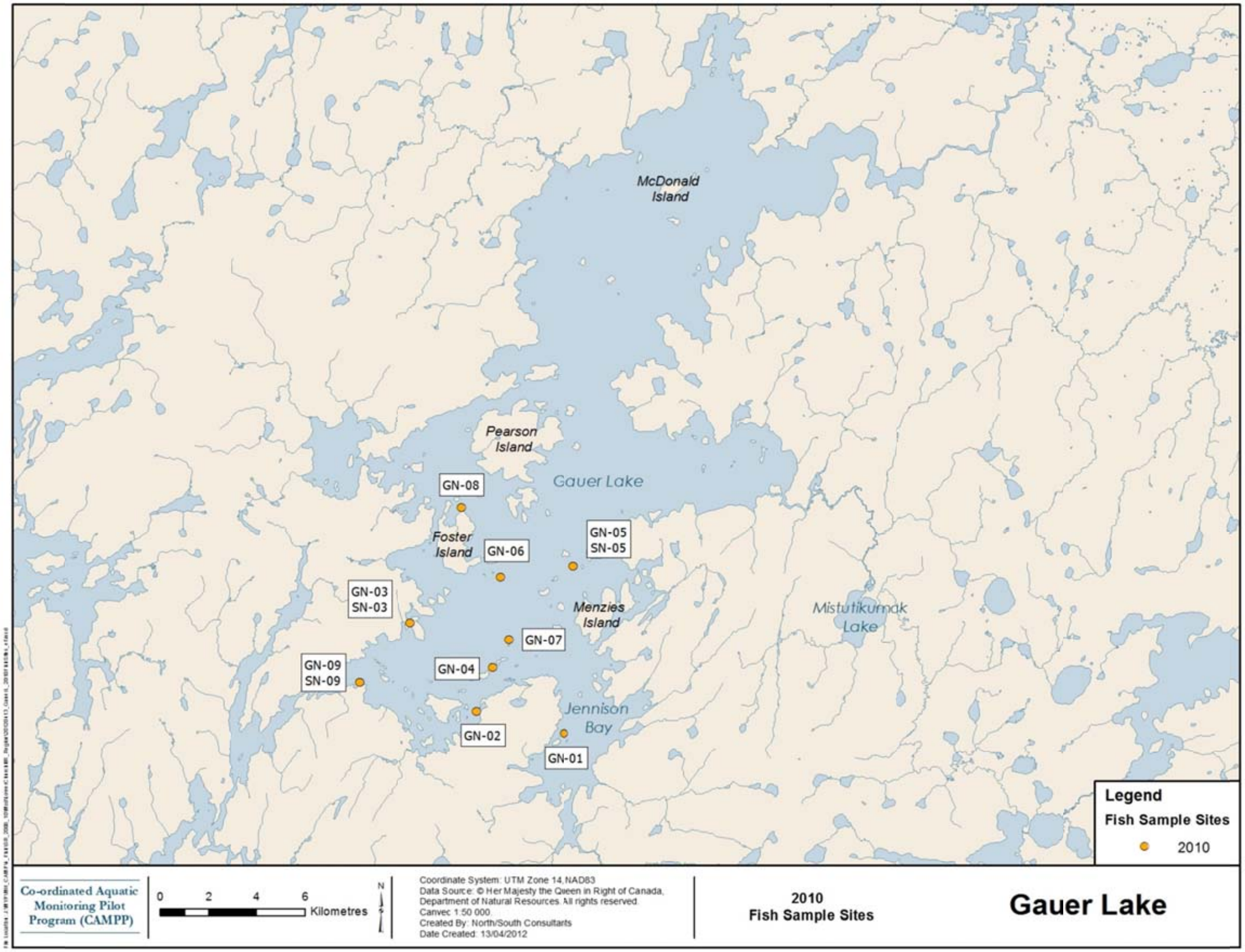


Figure 5.6-4. Map of standard gang and small mesh index gillnet sites sampled in Gauer Lake, 2010.

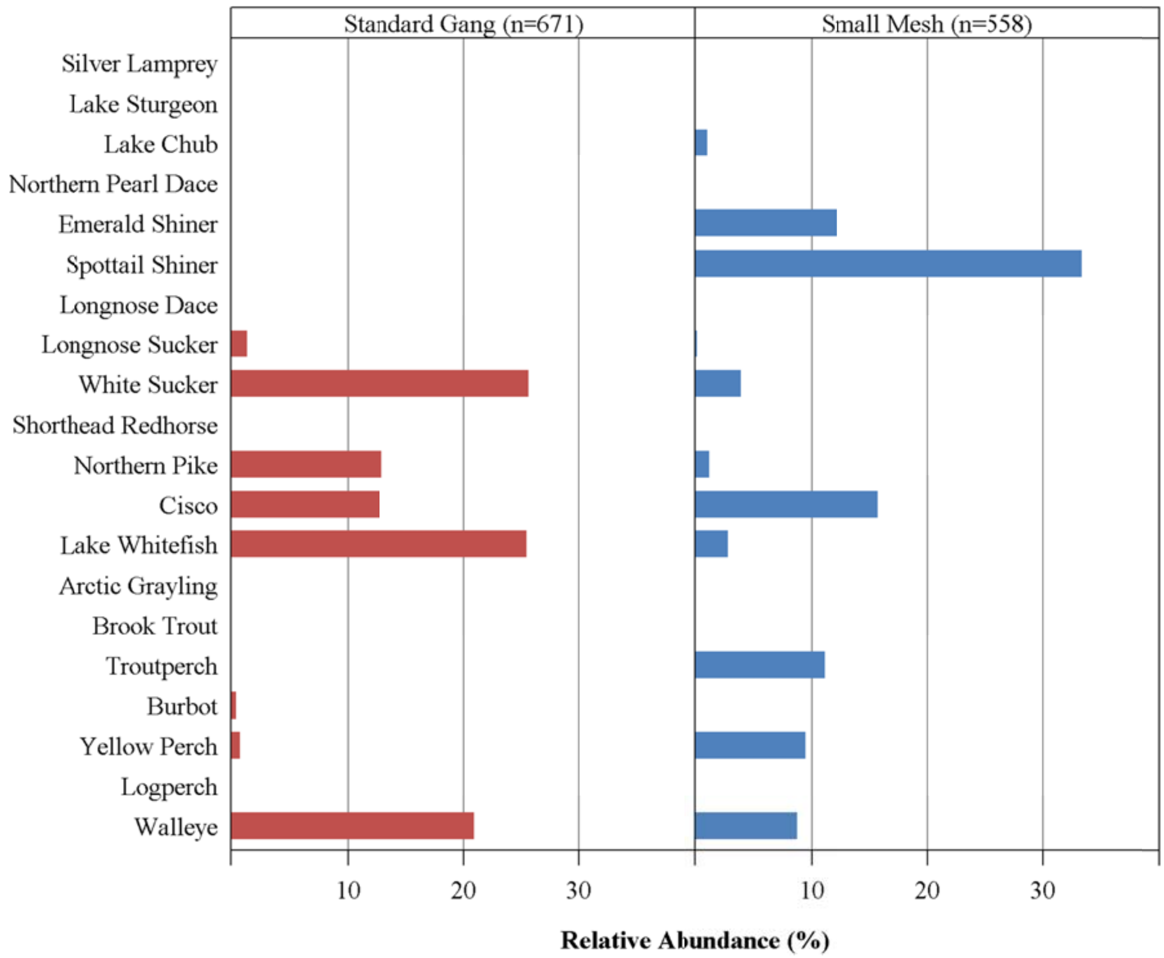


Figure 5.6-5. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set in Northern Indian Lake, 2010.

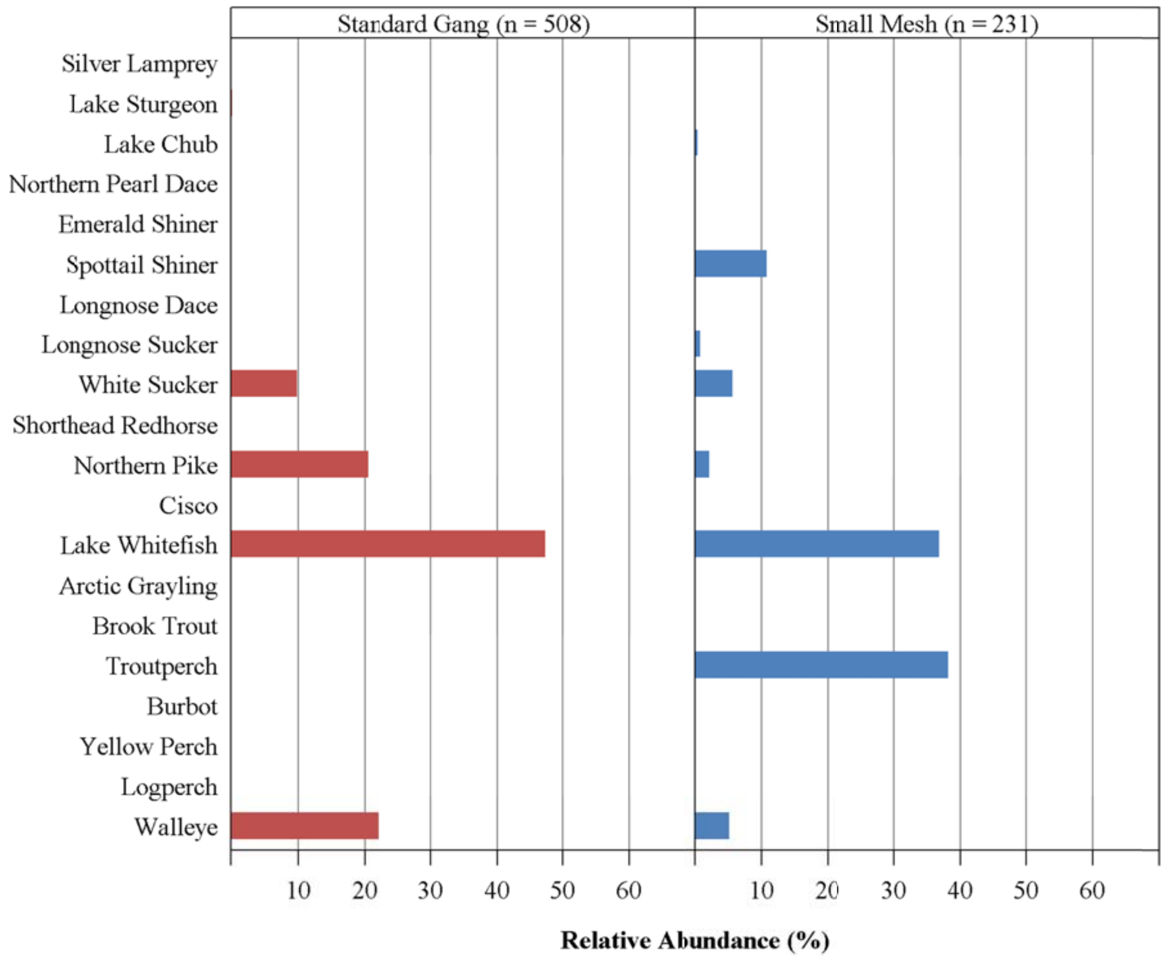


Figure 5.6-6. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set in Billard Lake, 2010.

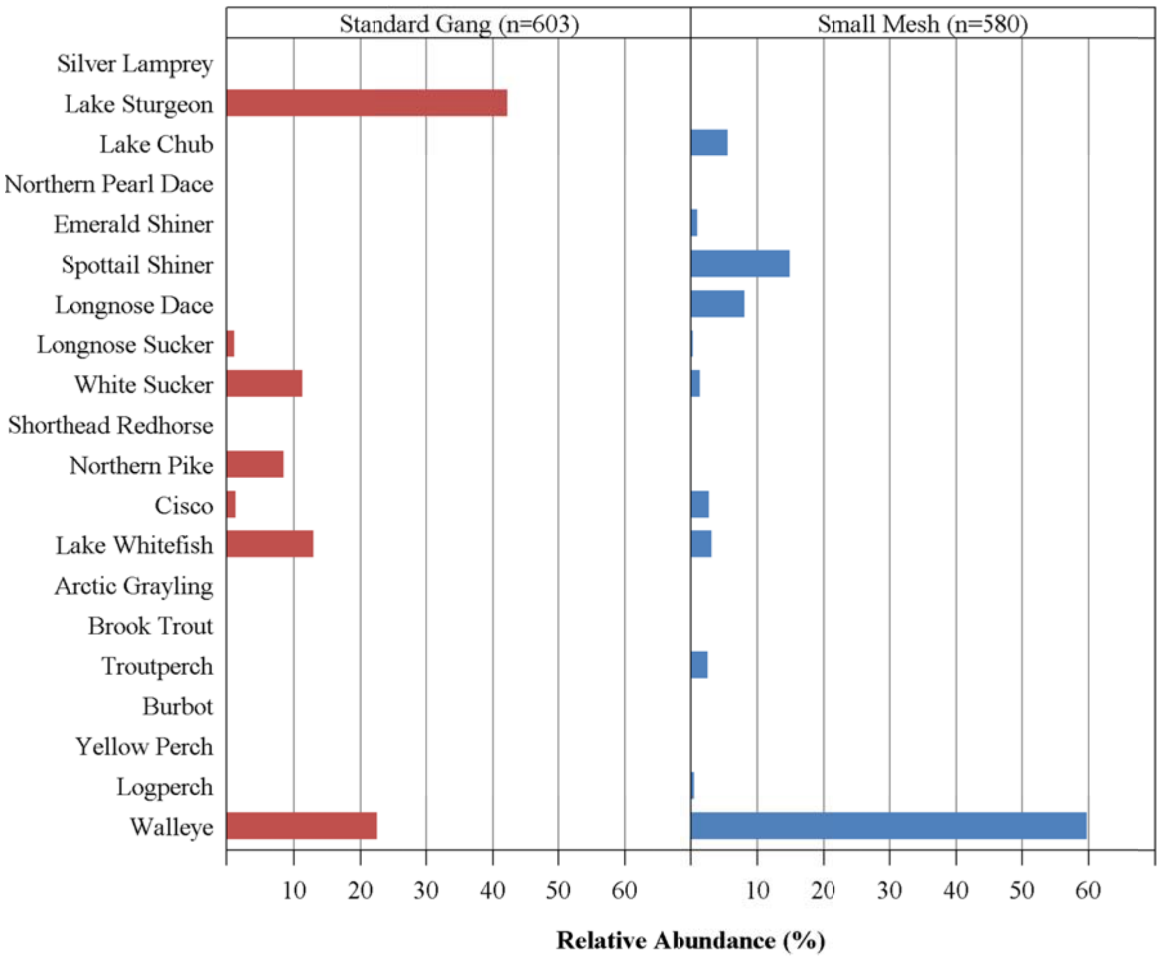


Figure 5.6-7. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set in the Lower Churchill River, 2010.

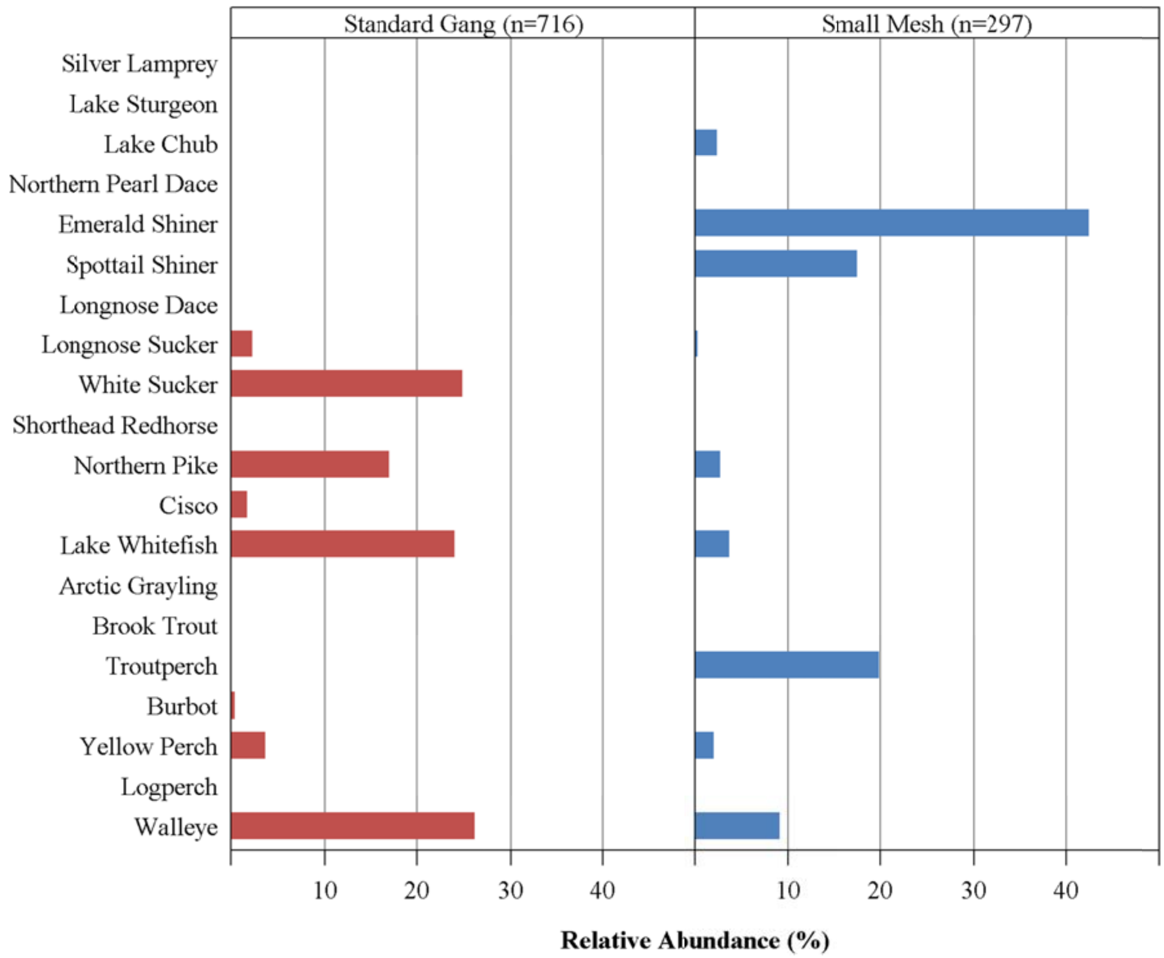


Figure 5.6-8. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set in Gauer Lake, 2010.

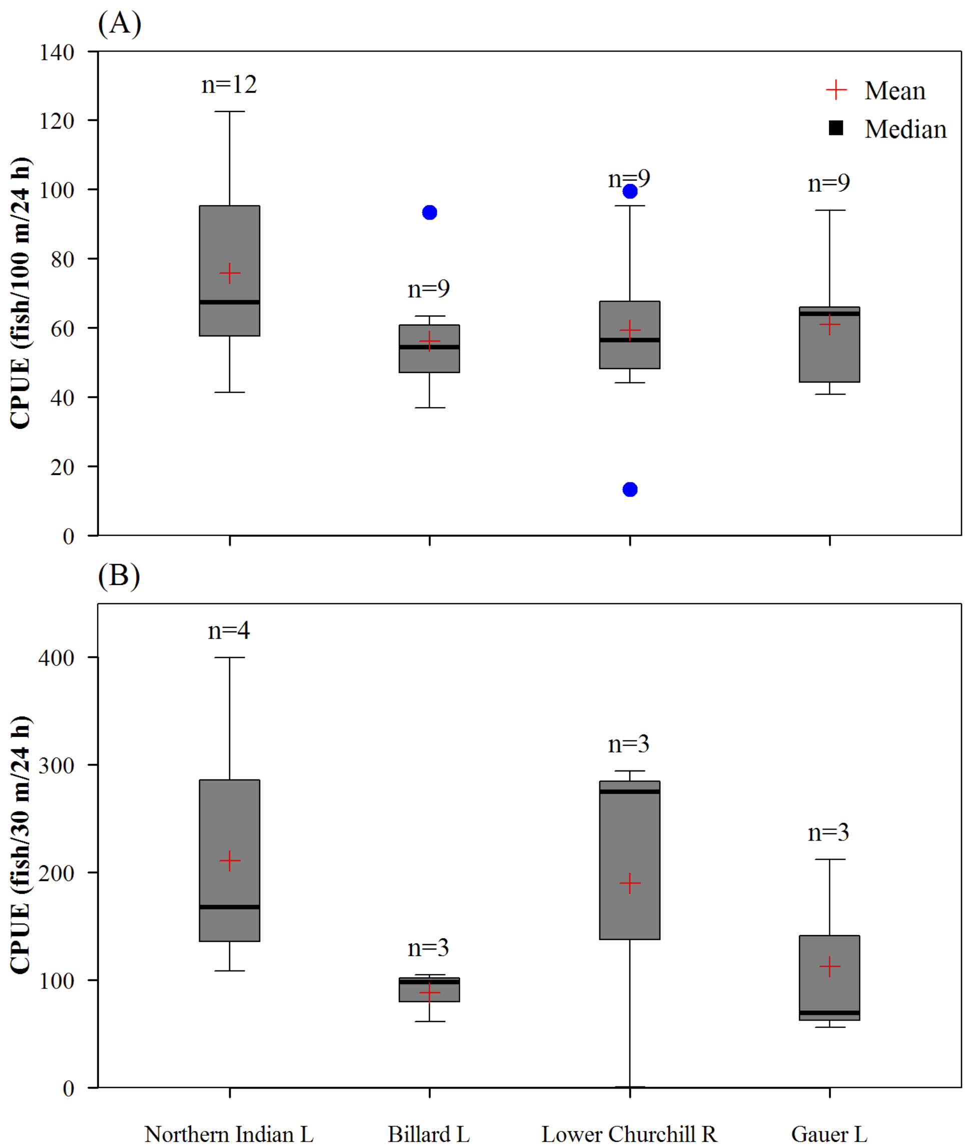


Figure 5.6-9. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang (fish/100 m/24 h) and (B) small mesh (fish/30 m/24 h) index gill nets set in Lower Churchill River Region waterbodies, 2010.

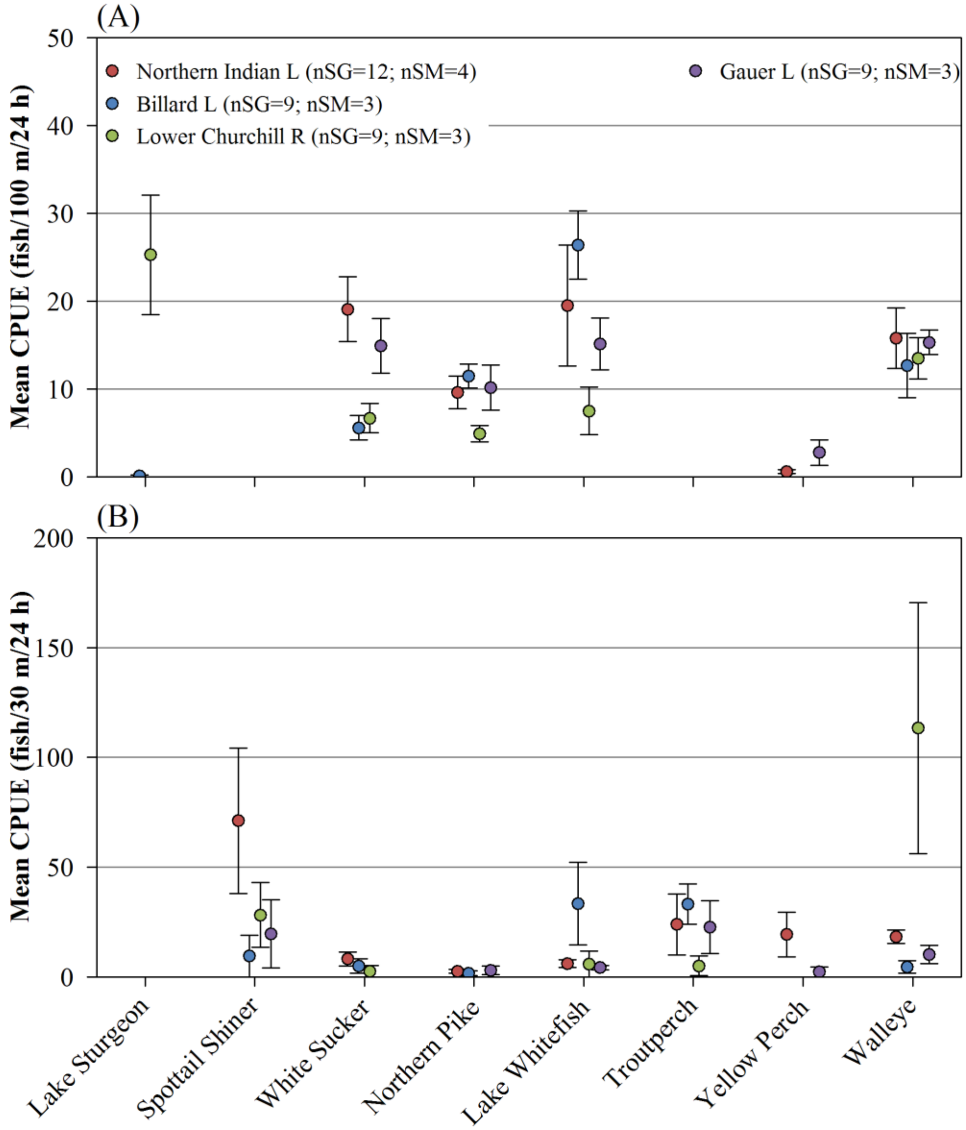


Figure 5.6-10. Mean (SE) Lake Sturgeon, Spottail Shiner, White Sucker, Northern Pike, Lake Whitefish, Troutperch,Yellow Perch, and Walleye CPUE calculated from (A) standard gang and (B) small mesh index gill nets set in Lower Churchill River Region waterbodies, 2010.

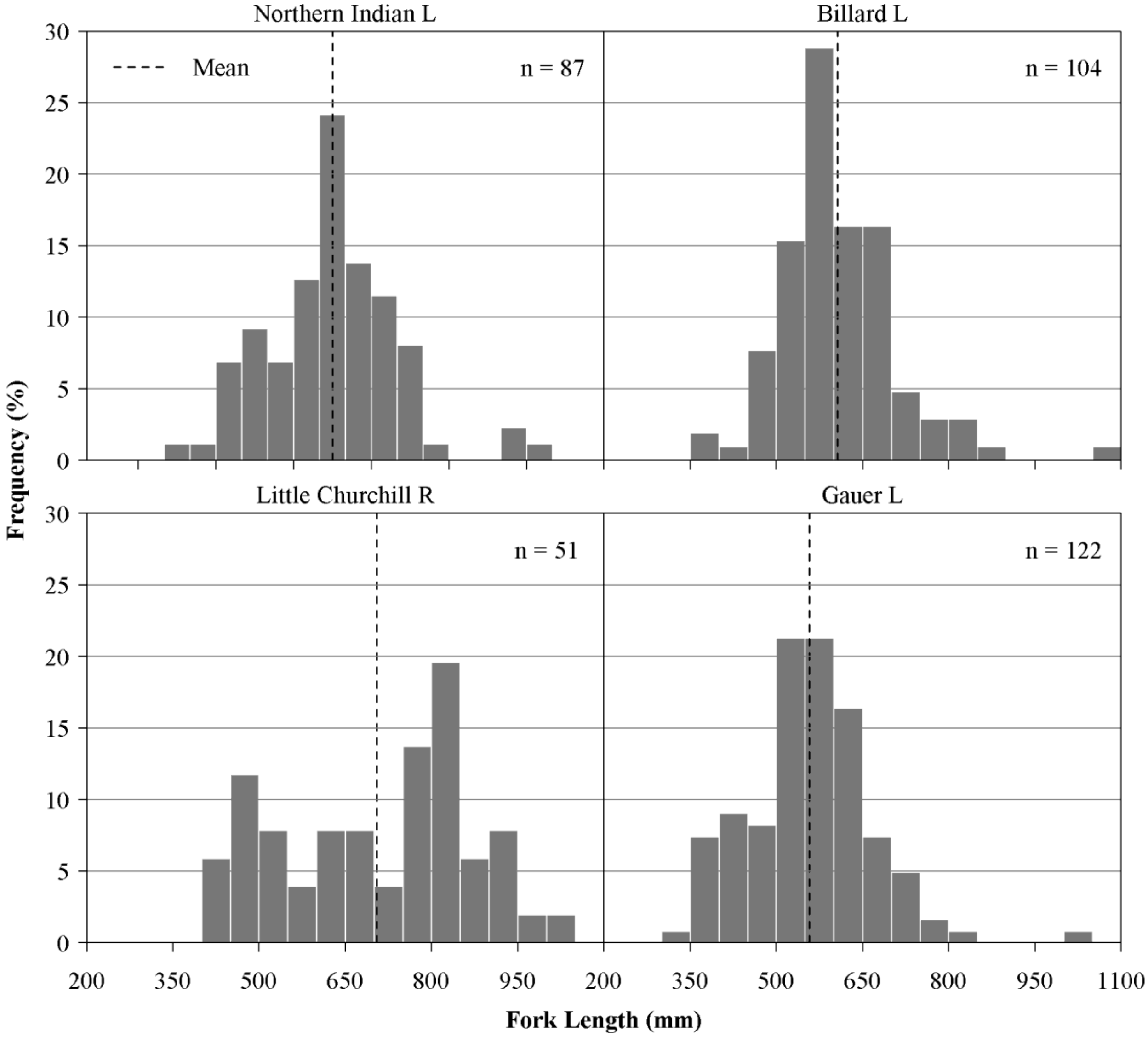


Figure 5.6-11. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

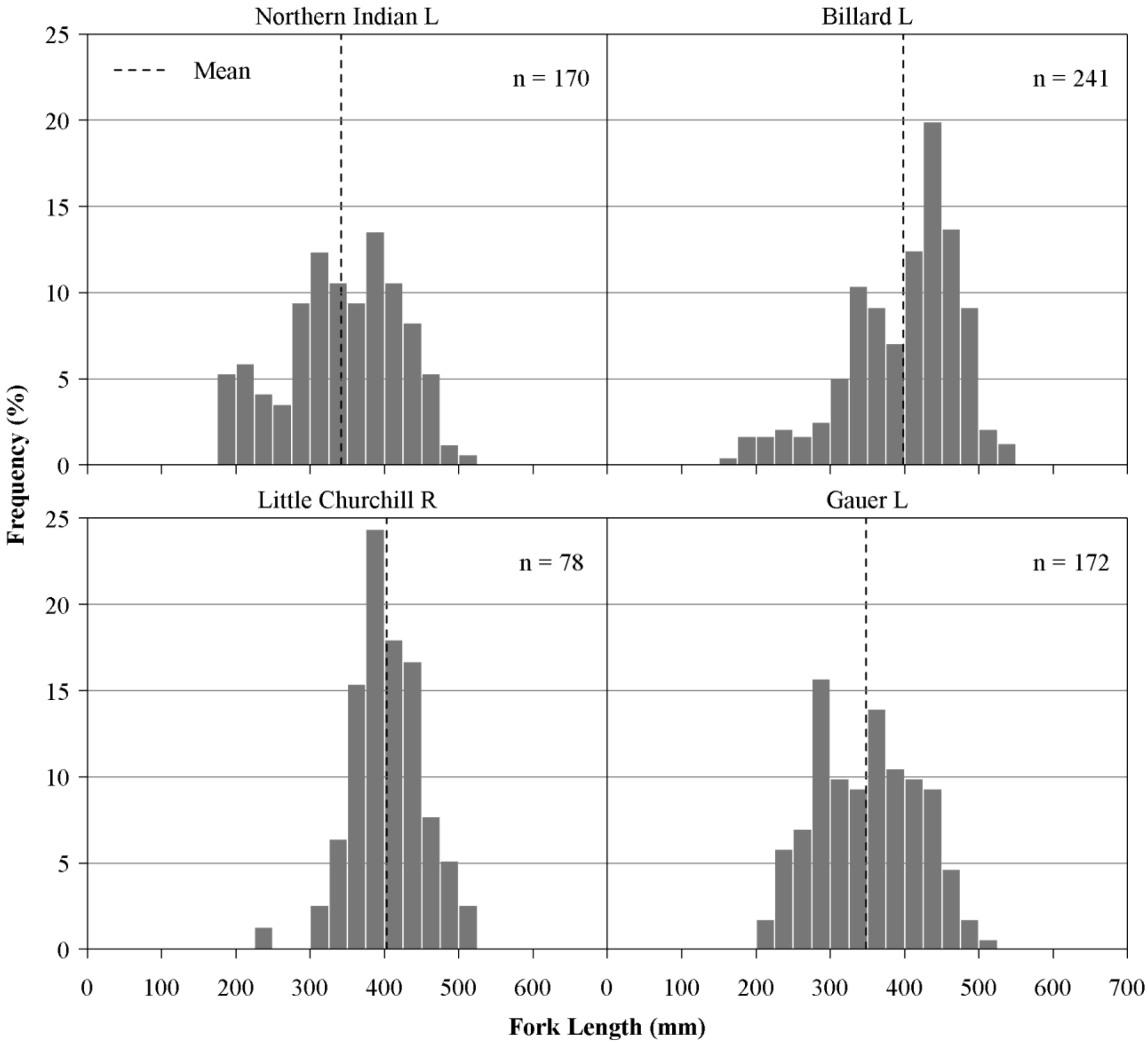


Figure 5.6-12. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

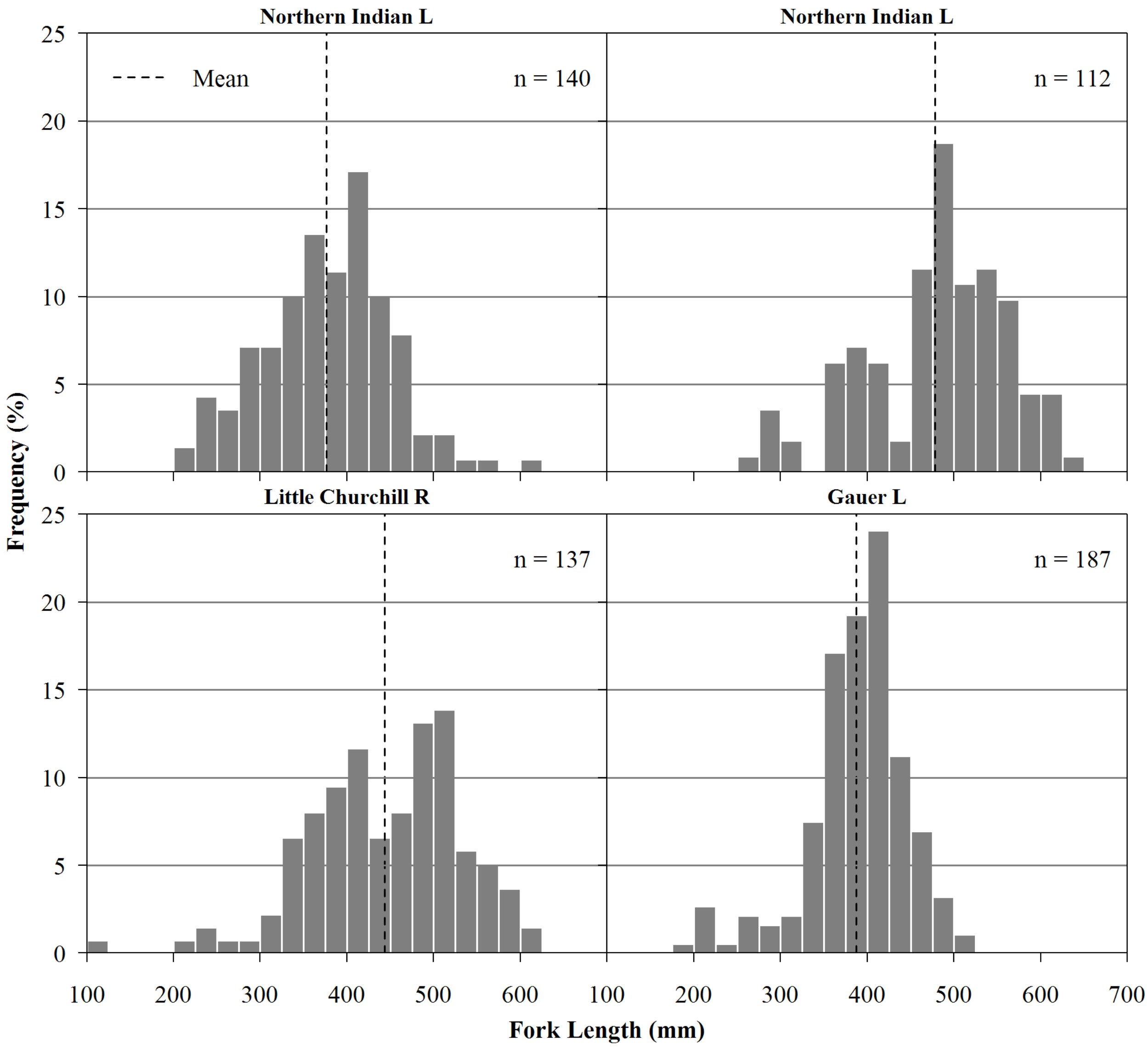


Figure 5.6-13. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2010.

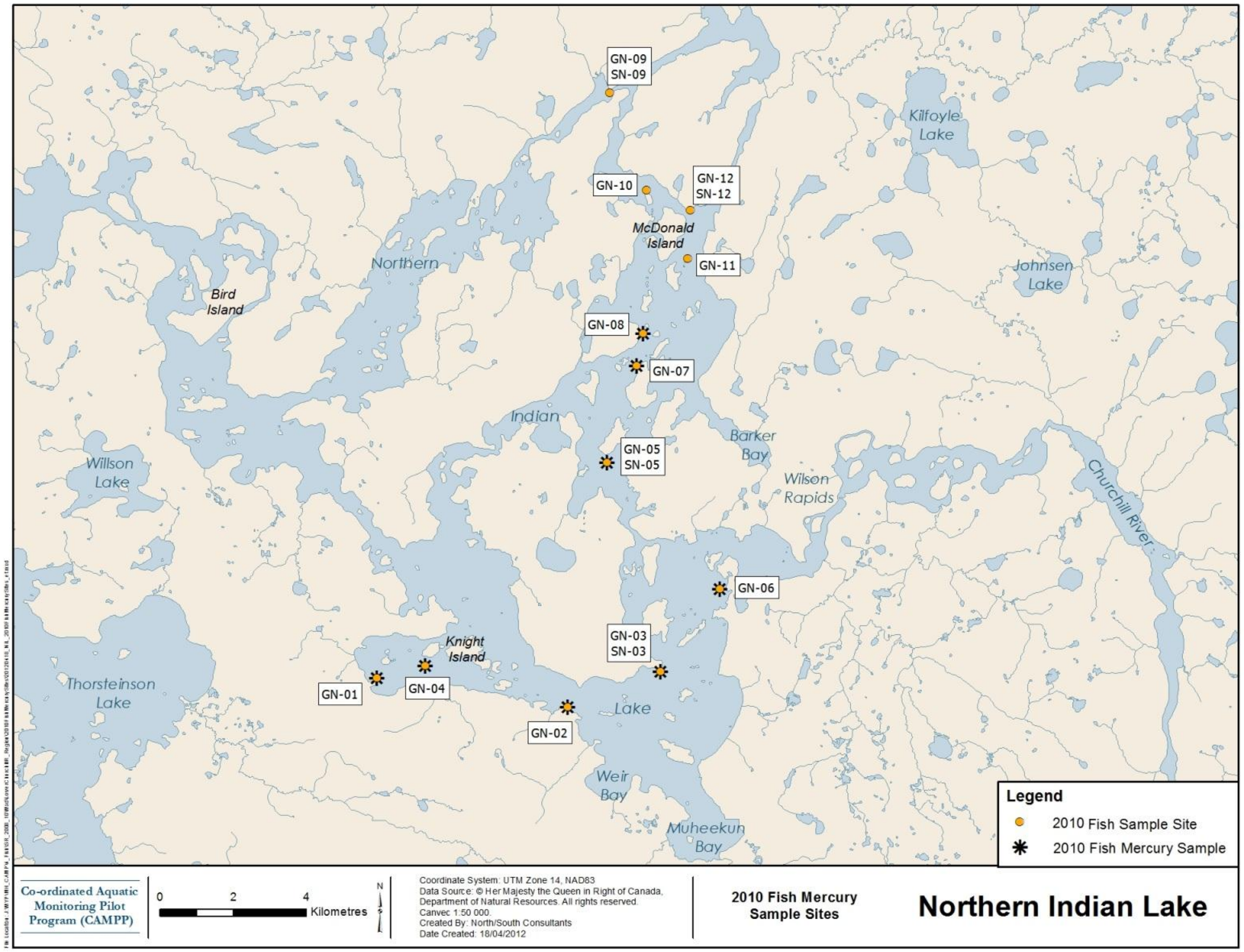


Figure 5.7-1. Fish sampling sites in Northern Indian Lake, indicating those sites where fish were collected for mercury analysis.

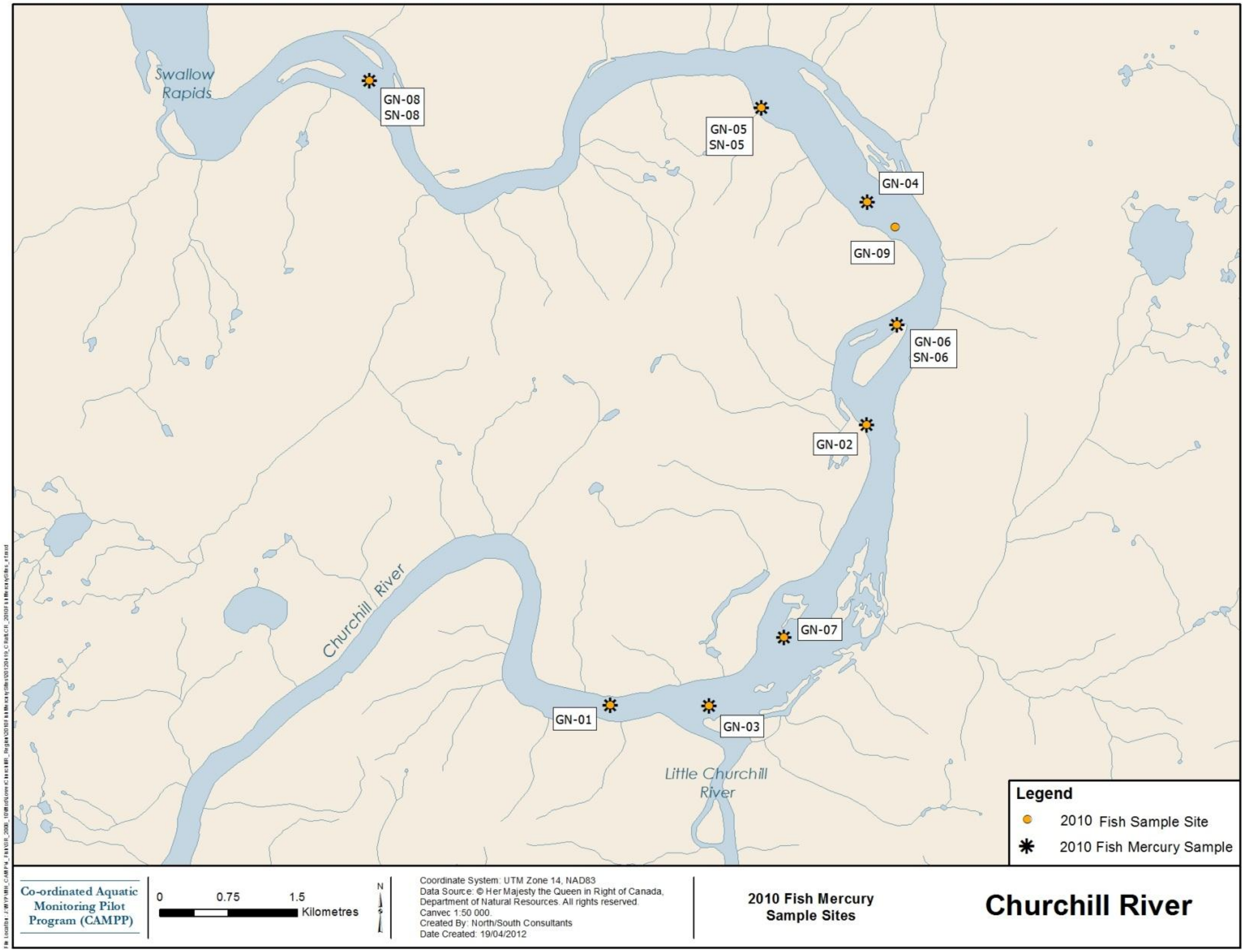


Figure 5.7-2. Fish sampling sites in the Churchill River at Little Churchill River, indicating those sites where fish were collected for mercury analysis.

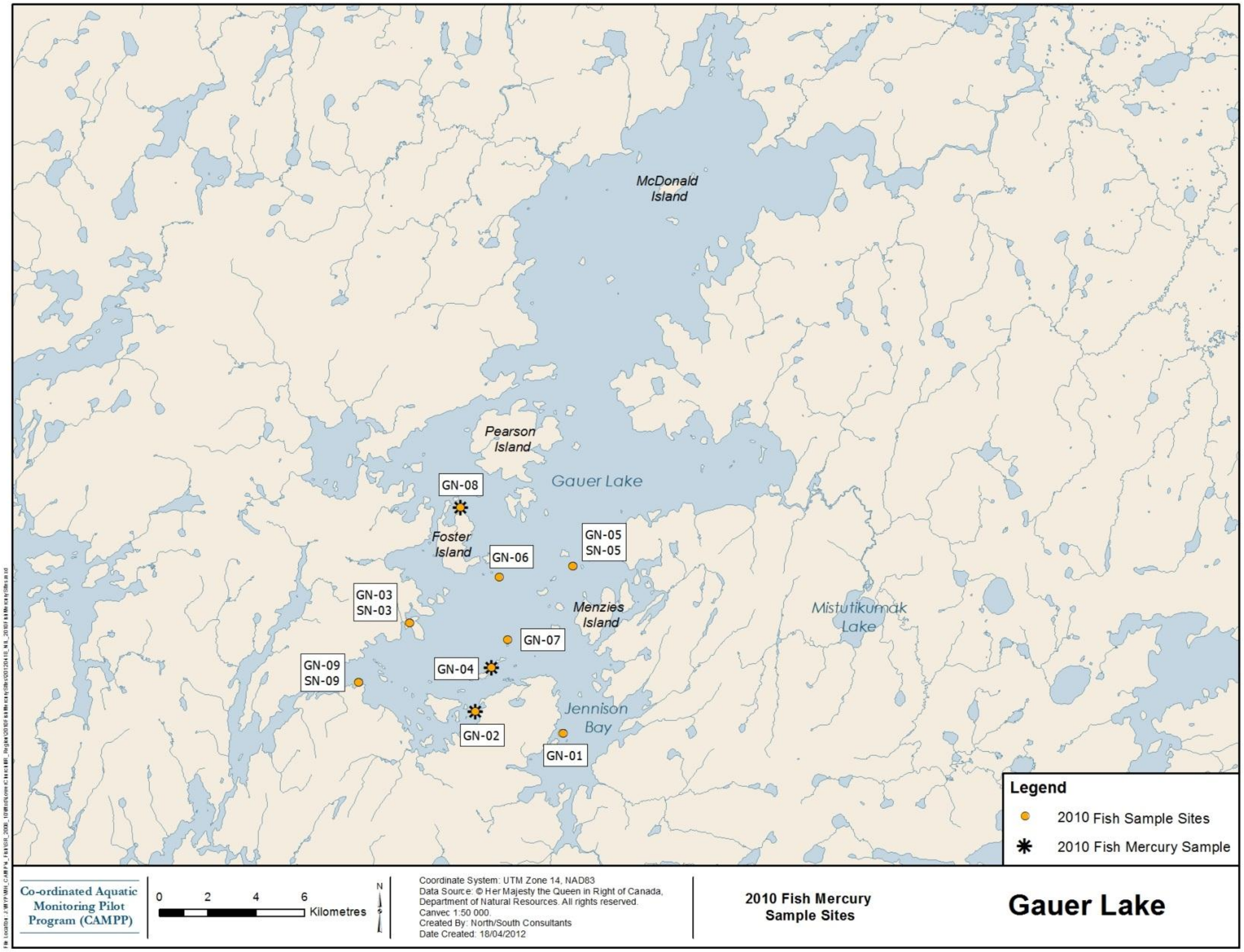


Figure 5.7-3. Fish sampling sites in Gauer Lake, indicating those sites where fish were collected for mercury analysis.

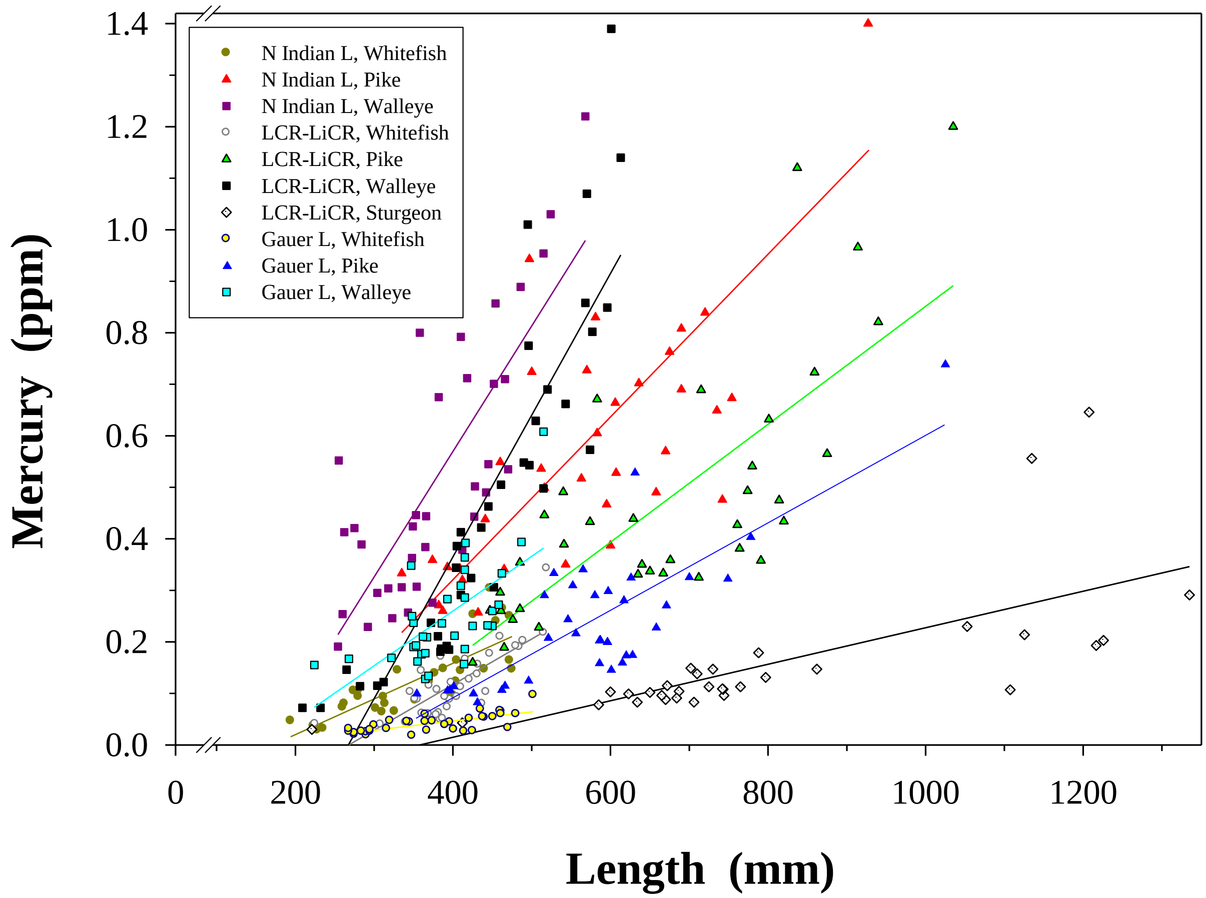


Figure 5.7-4. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, Walleye, and Lake Sturgeon from Northern Indian Lake, the Lower Churchill River at Little Churchill River, and Gauer Lake in 2010. Significant linear regression lines are shown. One Northern Pike from Northern Indian Lake with a mercury concentration of 1.67 ppm and a length of 928 mm is not shown but was used in the analyses.

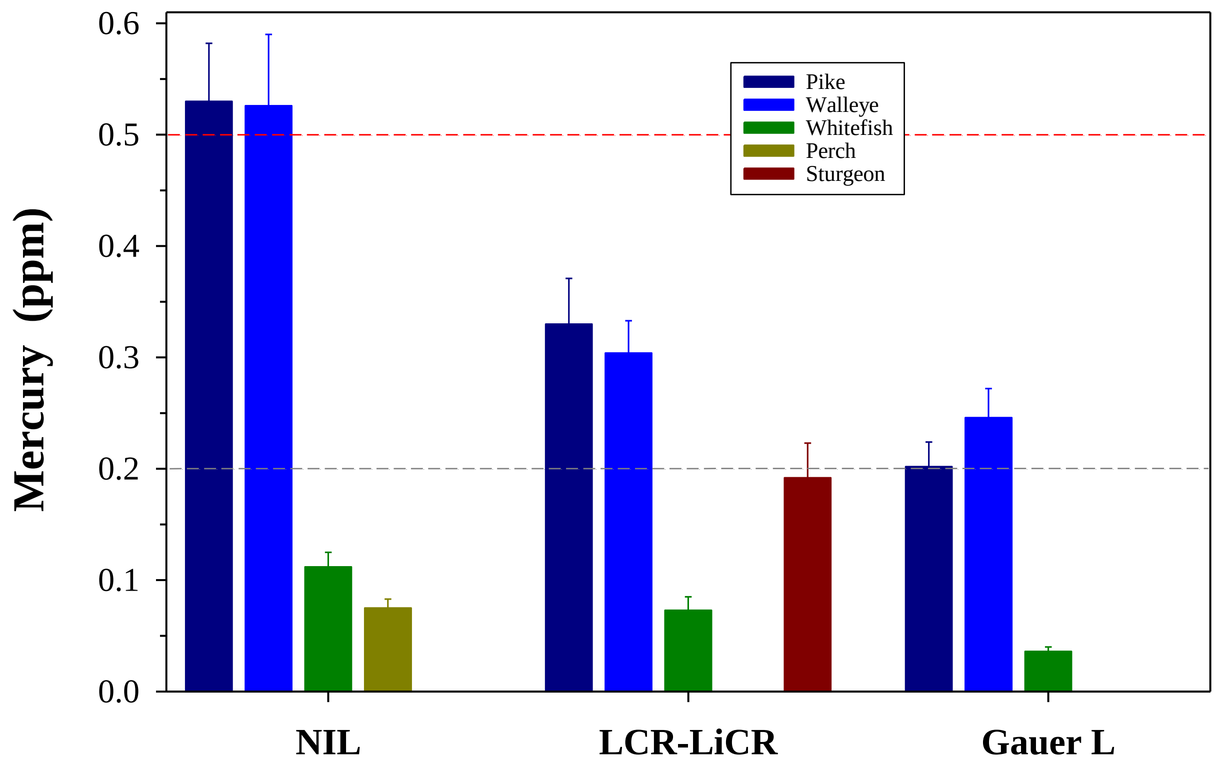


Figure 5.7-5. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye, Lake Whitefish, Yellow Perch (arithmetic mean for NIL) and Lake Sturgeon from Northern Indian Lake, the Churchill River at Little Churchill River, and Gauer Lake in 2010. Means with different letters indicate a significant difference between waterbodies within species. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.

6.0 CHURCHILL RIVER DIVERSION REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Churchill River Diversion Region by each major component. A general description of methods is provided in Section 4 and in detail in Appendix 1.

6.1 CLIMATE

Mean monthly air temperatures measured at Thompson in 2010 followed the same trend as the 1971-2000 temperature normals, however, all months except for May and September were slightly warmer than normal (Figure 6.1-1). Notably, January and March exhibited air temperatures 6.8 ^{o}C and 8.0 ^{o}C, respectively, above normal. The annual mean air temperature was approximately 3.1 ^{o}C above normal.

The 1971-2000 precipitation normals at Thompson indicate peaks in July with relatively low levels of precipitation during the winter months (Figure 6.1-1). In 2010, the highest precipitation occurred in August when it was approximately three times the normal levels for that month. The majority of months exhibited below normal precipitation levels, notably the month of June in which the precipitation levels were 12 % of the normal. Nevertheless, total precipitation in 2010 was approximately 20% higher than normal.

Overall, the comparison to climate normals indicates that 2010 was characterized by a warmer than average winter and an average spring, summer and autumn, which was atypically wet in August and atypically dry in June (Figure 6.1-1).

6.2 HYDROLOGY

The Churchill River Diversion improves downstream hydropower generation by transferring the majority of the water flow from the Churchill River to the Nelson River via the Rat and Burntwood rivers. The amount of water diverted to the Nelson River is regulated by the Notigi Control Structure (CS) while Southern Indian Lake is used as a reservoir. Local inflows also contribute to the total water flowing from the Burntwood River into the Nelson River.

Notigi CS flows in 2010 were at the Water Power Act licence maximum from January to early-May and again for part of June. Flows then varied between the upper and lower quartile until November when flows returned to the licence maximum to complete the year (Figure 6.2-1). Above average precipitation in 2009 allowed Southern Indian Lake to remain near its upper limit throughout the 2009/2010 winter. As a result, Rat Lake, which is located just downstream from Southern Indian Lake along the diversion route, reached record high water levels from February to late-May 2010 (Figure 6.2-2). Water levels on Rat Lake also remained near or above the upper quartile for the rest of 2010. High flows on the Nelson River resulted in reduced flows at the Notigi Control Structure in the summer of 2010.

Water levels on Footprint Lake and Threepoint Lake generally followed a similar pattern to Notigi flows, peaking in the winter and reaching lowest levels during the summer (Figures 6.2-3 and 6.2-4).

Leftrook Lake water levels were monitored for June and part of July 2010 although there are no previous data available for comparison (Figure 6.2-5).

6.3 WATER QUALITY

The following provides an overview of water quality conditions measured in the Churchill River Diversion Region in Year 3 of CAMPP. Waterbodies sampled included Rat Lake (approximately 60 km upstream of Threepoint Lake), Threepoint Lake (near the outlet), Footprint Lake (north of Threepoint Lake; connected by Footprint River), and an off-system reference lake (Leftrook Lake; Figure 6.3-1).

6.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Churchill River Diversion Region for routine water quality variables are presented in Tables 6.3-2 and 6.3-3 and Figures 6.3-2 to 6.3-14.

6.3.1.1 On-system Waterbodies

Water quality of the study lakes in the Churchill River Diversion Region can be generally described as moderately nutrient-rich, clear to moderately turbid, slightly alkaline, soft to moderately hard, and well-oxygenated during the open-water season. Neither Rat nor Threepoint lakes were stratified or showed vertical variation in dissolved oxygen (DO) concentrations; however, Footprint Lake was stratified in the spring of 2010 (Figures 6.3-2 and 6.3-3). Although the site was not stratified in winter, DO decreased with depth in Footprint Lake resulting in concentrations dropping below the long-term Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011) for the protection of aquatic life (PAL) for cold-water species (9.5 mg/L).

Other *in situ* variables, including turbidity, pH, and specific conductance, were similar across depth (Figures 6.3-4 to 6.3-6). Exceptions were that pH increased with depth in spring and specific conductivity increased with depth in winter 2011 at Footprint Lake. *In situ* pH measured at Footprint Lake in summer 2010 exceeded the upper PAL limit (6.5-9.0) through most of the water column. Secchi disk depths in the on-system lakes were generally low, ranging from 0.5 to 1.1 m (Figure 6.3-7).

Lakes studied in the Churchill River Diversion Region in 2010/11 had total phosphorous (TP) concentrations exceeding the Manitoba narrative guideline for lakes, ponds, and reservoirs (0.025 mg/L) in 50-75% of surface samples (Figure 6.3-8). All other routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011 (MWS 2011).

TP in on-system waterbodies was generally composed primarily of particulate phosphorus in the open-water season but dissolved phosphorus dominated in winter (Figure 6.3-9). The majority of total nitrogen (TN) was composed of organic nitrogen at all sites and sampling periods (Figure 6.3-10). Nitrate/nitrite and ammonia were frequently below detection in samples from Rat, Threepoint, and Footprint lakes; however, ammonia comprised a larger portion of dissolved inorganic nitrogen (DIN) than nitrate/nitrite in spring in Threepoint and Footprint lakes and in summer in Rat and Footprint Lakes. In all cases, the concentrations and the relative proportion of total nitrogen represented by nitrate/nitrite was higher in the ice-cover season.

Water samples collected at depth (1 m above the sediment-water interface) in Footprint Lake in spring 2010, when the lake was thermally stratified, indicated similar or lower concentrations of most water quality variables in the hypolimnion compared to the epilimnion. For example, DIN was notably lower at depth, largely due to reduced concentrations of ammonia, whereas nitrate/nitrite concentrations were similar in the surface and bottom samples (Figure 6.3-11). Conversely, TP was slightly higher at depth due to higher concentrations of dissolved phosphorus (Figure 6.3-12).

6.3.1.2 Off-system Waterbody

Leftrook Lake was stratified in spring 2010 (Figure 6.3-2) and during that sampling event, DO was below the long-term PAL objectives for cool and cold-water species at depth (6.0 and 6.5 mg/L, respectively; MWS 2011; Figure 6.3-3). Although Leftrook Lake did not stratify in winter, declining DO with depth resulted in concentrations that were also below the guidelines for both cool and cold-water species (5.5 and 9.5 mg/L, respectively). During the open-water season, the remainder of the *in situ* variables (i.e., turbidity, pH, and specific conductance) were relatively consistent across depth. Exceptions were that specific conductivity increased and pH decreased with depth in winter 2011. *In situ* pH in Leftrook Lake in summer 2010 was also above the upper limit of the PAL guideline (6.5-9.0) throughout most of the water column. Secchi disk depths, which ranged from 0.8 to 2.66 m, were higher in Leftrook Lake as compared to on-system lakes (Figure 6.3-7).

Similar to on-system lakes, Leftrook Lake had TP concentrations exceeding the Manitoba narrative guideline (0.025 mg/L' MWS 2011) in 50% of surface samples (Figure 6.3-8).With the exceptions of DO, pH, and TP, as noted above, other routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011.

Nutrient compositions (e.g., TP, TN, and DIN) were similar between on- and off-system sites.TP in Leftrook Lake was generally composed a greater proportion of the particulate form (Figure 6.3-9), and TN was predominantly present as organic nitrogen (Figure 6.3-10). Ammonia formed most of the DIN pool in spring and summer but nitrate/nitrite dominated in winter.

Similar to Footprint Lake, the water sample collected at depth during a period of stratification in Leftrook Lake (spring 2010; Figure 6.3-2) indicated lower concentrations of DIN and ammonia at depth but similar or higher concentrations of TN, TDP, particulate phosphorous, and TP (Figures 6.3-13 and 6.3-14).

6.3.2 Metals and Major Ions

A summary of metal concentrations measured in the Churchill River Diversion Region in 2010/2011 is presented in Table 6.3-3 and a summary of detection frequencies for metals is provided in Table 6.3-4.

6.3.2.1 On-system Waterbodies

A number of metals were not detected in Rat, Threepoint, or Footprint lakes during any sampling period, including beryllium, bismuth, mercury, nickel, selenium, silver, tellurium, thallium, tungsten, and zinc. Aluminum, arsenic, barium, calcium, copper, iron, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, titanium, and vanadium were consistently detected; the remaining metals were detected in some samples (Table 6.3-4).

Aluminum and iron exceeded the MWQSOGs for PAL (0.1 and 0.3 mg/L, respectively; MWS 2011) in 100% and 25-100% of samples, respectively, at Rat, Threepoint, and Footprint lakes (Figure 6.3-15 and Table 6.3-5).

During stratification of Footprint Lake in spring 2010, the concentrations of aluminum and iron were lower in samples collected near the sediment-water interface, but concentrations of manganese were similar between the deep sample and the surface grab (Figures 6.3-16 and 6.3-17). However, aluminum exceeded the MWQSOG for PAL (0.1 mg/L; MWS 2011) in the bottom sample from Footprint Lake (Table 6.3-5).

All other metals for which there are MWQSOGs for PAL were within objectives and guidelines at each of the sampling sites in 2010/2011 (MWS 2011; Table 6.3-5). However, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods, comparisons to the guideline could not be made.

Both chloride and sulphate were consistently detected at low concentrations in Rat, Threepoint, and Footprint lakes in 2010/2011. Chloride averaged less than 2 mg/L at each site (Table 6.3-2) and was well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013; Table 6.3-5). Sulphate (mean of 3 mg/L at each site) also fell on the lower range of concentrations reported across Canada (Canadian Council of Resource and Environment Ministers [CCREM] 1987).While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment (BCMOE) guidelines which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013).

6.3.2.2 Off-system Waterbody

With a few exceptions, the metals consistently detected or not detected in Leftrook Lake were similar to those found in the on-system lakes (Table 6.3-4). The exceptions were that antimony, boron, cesium, chromium, cobalt, thorium, and zirconium were also never detected during any period in Leftrook Lake. The sample collected from Leftrook Lake near the sediment-water interface (during spring stratification) contained similar concentrations of aluminum, iron, and manganese as the surface grab (Figure 6.3-17).

In contrast to the on-system waterbodies, no exceedances of the MWQSOGs for PAL for metals occurred in Leftrook Lake in 2010/2011 (MWS 2011; Table 6.3-5). As noted in Section 6.3.2.1, however, comparisons could not be made to the current MWQSOGs for mercury (0.000026 mg/L) owing to analytical detection limits. Chloride and sulphate were also low and well below the CCME (120 mg/L; CCME 1999, updated to 2013) and BCMOE (128-429 mg/L; BCMOE 2000) PAL guidelines, respectively, in Leftrook Lake.

6.3.3 Trophic Status and Nutrient Ratios

6.3.3.1 On-system Waterbodies

Rat, Threepoint, and Footprint lakes were meso-eutrophic on the basis of TP in 2010/2011 (Table 6.3-6). In contrast, Rat and Threepoint lakes were categorized as oligotrophic based on chlorophyll *a* and TN concentrations while Footprint Lake was mesotrophic in both cases (Tables 6.3-7 and 6.3-8).

On the basis of molar TN:TP ratios, all waterbodies sampled in the Churchill River Diversion Region in 2010/2011 were phosphorus limited during each sampling period (Figure 6.3-18). Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter in the three waterbodies was generally a mixture of allochthonous and autochthonous sources, with higher proportions of allochthonous contributions occurring in spring (Figure 6.3-19).

6.3.3.2 Off-system Waterbody

On the basis of mean open-water TP (Table 6.3-6) and chlorophyll *a* concentrations (Table 6.3-7), Leftrook Lake was eutrophic, whereas this off-system waterbody was mesotrophic on the basis of TN (Table 6.3-8). Similar to the on-system lakes, Leftrook Lake was phosphorus limited during all sampling periods and organic matter was derived from a mixture of allochthonous and autochthonous sources.

6.3.4 *Escherichia coli*

6.3.4.1 On-system Waterbodies

E. coli was detected in one sample collected from each Threepoint and Footprint lakes (2 and 1 CFU/100 mL, respectively) but was not detected in any samples from Rat Lake (Table 6.3-2). All measurements were well below the MWQSOG for recreation of 200 CFU/100 mL (MWS 2011).

6.3.4.2 Off-system Waterbody

E. coli was not detected in any samples collected in Leftrook Lake and was well below the MWQSOG for recreation of 200 CFU/100 mL (MWS 2011) during the 2010/11 sampling season.

6.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Churchill River Diversion Region in Year 3 of CAMPP. Waterbodies sampled included Rat Lake, Threepoint Lake (near the outlet), Footprint Lake, and an off-system lake (Leftrook Lake; Figure 6.3-1).

6.4.1 Chlorophyll *a*

Chlorophyll *a* concentrations were lowest at Rat and Threepoint lakes and highest at the off-system lake (Leftrook Lake). Peak concentrations occurred in summer or fall in each lake (Figure 6.4-1). Chlorophyll *a* was not detected at any sampling site during winter.

6.4.2 Community Composition and Biomass

Phytoplankton community composition and biomass was measured in Rat and Footprint lakes in 2010/2011 as part of the rotational waterbody analyses and in summer and fall in Leftrook Lake as part of bloom monitoring (see Section 6.4.3 for discussion of bloom monitoring results). Like chlorophyll *a*, peak biomass occurred in summer or fall; however, biomass was notably higher in fall at Footprint Lake which was not reflected in the chlorophyll *a* concentration (Figure 6.4-2).

Phytoplankton community composition varied between the two rotational waterbodies sampled in the Churchill River Diversion Region in 2010 (Figure 6.4-3). Rat Lake was dominated by cryptophytes during all seasons, with the next most common groups being diatoms in spring and blue-green algae in summer and fall. Diatoms dominated at Footprint Lake in spring and fall and co-dominated with blue-green algae in summer. During spring and fall, the second-most abundant taxa at Footprint Lake were either cryptophytes and/or blue-green algae.

Species richness, diversity, and evenness were generally higher in Footprint Lake than Rat Lake (Table 6.4-1). In Rat Lake, the community was least complex in summer but metrics showed diversity and evenness were similar between spring and fall. In Footprint Lake, the community metrics were similar between spring and summer and indicated that the lowest complexity occurred in fall.

6.4.1 Bloom Monitoring

Chlorophyll *a* concentrations exceeded the bloom monitoring trigger of 10 µg/L in Leftrook Lake in summer and fall 2010. Total phytoplankton biomass during these periods was high during both bloom periods (15,238 mg/m^3 and 12,989 mg/m^3, respectively; Figure 6.4-2). The phytoplankton community was dominated by blue-green algae during both bloom periods (Figure 6.4-4).

6.4.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (algal toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to influence whether microcystins are produced. *Anabaena* and *Aphanizomenon* were present in Rat, Footprint and Leftrook lakes, and *Microcystis* and *Oscillatoria* were present in Leftrook Lake in 2009/2010. Taxonomic information is not available for Threepoint Lake.

Microcystin-LR was analysed on two occasions in 2010 when the chlorophyll *a* concentrations in the Churchill River Diversion Region exceeded 10 µg/L (i.e., the trigger for microcystin-LR analysis). Microcystin-LR was not detected (i.e., < 0.2 µg/L) during either bloom event in Leftrook Lake in summer and fall 2010.

6.4.3 Trophic Status

Based on mean chlorophyll *a* concentrations measured during the open-water season of 2010, Rat and Threepoint lakes were oligotrophic, Footprint Lake was mesotrophic, and Leftrook Lake was eutrophic in 2010/2011 (Table 6.3-7).

6.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Churchill River Diversion in 2010/2011, the third year of CAMPP. Waterbodies sampled included the on-system lakes Rat, Threepoint, and Footprint, and the off-system lake, Leftrook (Figures 6.5-1 to 6.5-4). Threepoint and Leftrook lakes are sampled annually, and Rat and Footprint lakes are sampled on a rotational basis (i.e., once every three years).

In 2010, grab sampling in the predominantly-wetted portion of the nearshore habitat was changed to kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize the portion of the littoral zone influenced by water level fluctuations. Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Nearshore and offshore habitat polygons were sampled in all waterbodies. Both kicknet and grab sampling consisted of five composites of three replicate samples per nearshore and offshore habitat polygon, for a total of 10 samples per waterbody. Sampling was conducted between 17 and 22 August 2010.

6.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons (where applicable) at each waterbody (Table 6.5-1).

In 2010, mean water depths sampled in the nearshore- intermittently wetted habitat were: 0.8 m in Rat Lake, 0.7 m in Threepoint Lake, 0.6 m in Footprint Lake, and 0.5 m in Leftrook Lake.

Mean water depths sampled in the offshore were: 7.6 m in Rat Lake, 4.8 m in Threepoint Lake, 6.4 m in Footprint Lake, and 7.9 m in Leftrook Lake (Table 6.5-1).

Sediment samples were also collected from benthic invertebrate sampling areas with depositional substrates and analyzed for TOC and PSA (Table 6.5-2). Mean TOC in nearshore habitats was greatest at Rat Lake (7.8%) and lowest at Threepoint Lake (0.7%). No depositional sediments were available from the intermittently wetted nearshore areas of Leftrook Lake; the substrate was boulder/gravel. In the offshore habitats, mean TOC was lowest at Footprint Lake (0.9%) and greatest at Leftrook Lake (5.1%).

Clay comprised the majority of the sediments collected from both nearshore and offshore habitats in Rat Lake, and from the offshore habitat in Leftrook Lake (Table 6.5-2). Both silt and clay dominated sediment samples within the nearshore and offshore habitat in Threepoint Lake (Table 6.5-2). At Footprint Lake, sand, silt, and clay were similarly represented in sediments collected nearshore, while silt and clay dominated offshore sediments (Table 6.5-2).

6.5.2 Species Composition, Distribution, and Relative Abundance

6.5.2.1 Rat Lake

The total mean BMI abundance in kicknet samples from the intermittently wetted nearshore habitat of Rat Lake was 243 individuals, with numbers ranging from 139 to 395 (Table 6.5-3). Overall, non-insects (51% of the mean total invertebrates sampled) and insects (49%) were similarly represented within the BMI community (Table 6.5-3). Of the non-insects, the main group was Amphipoda (27% of the mean total BMI), followed by Oligochaeta (15%) and Bivalvia (8%) (Table 6.5-3). Insects mainly consisted of Hemiptera (26% of the mean total BMI) and Chironomidae (13%) (Table 6.5-3). Mean BMI density in offshore benthic grab samples was 124 individuals/m^2, with densities ranging from zero to 534 (Table 6.5-3). Overall, insects dominated the BMI community in abundance (88% of mean total BMI; Table 6.5-3). Insects consisted of Chironomidae (58% of mean total BMI) and Ephemeroptera (30%; Table 6.5-3). Non-insects consisted of Oligochaeta (5% of the mean total BMI), Bivalvia (5%), and Amphipoda (2%; Table 6.5-3).

Total EPT comprised 7% of the mean total nearshore BMI, with the prevalence being mayflies. Genus analysis of the mayflies indicated that *Callibaetis* sp. were dominant in nearshore kicknet samples. *Callibaetis* sp. is a ubiquitous group associated with vascular plants, commonly found in lentic environments (Merritt and Cummins 1996). The most common Trichoptera families were Limnephilidae, Phryganeidae, and Dipseudopsidae (Table 6.5-3). Plecoptera were not collected in nearshore samples. In offshore habitat, total EPT comprised 30% of the invertebrate community, consisting solely of Ephemeroptera. Of the Ephemeroptera, *Hexagenia* was the only genus represented (Table 6.5-3). Neither Plecoptera nor Trichoptera were collected in offshore samples (Table 6.5-3). The ratio of EPT:C was balanced in the nearshore habitat and chironomids dominated EPT in the offshore habitat (1.04 and 0.13, respectively; Table 6.5-3).

Overall taxonomic richness in the nearshore was 30, with values ranging from 15 to 24 within each sample (Table 6.5-3). Hill's Effective Richness (E^H) was eight in the nearshore. Four taxa were most dominant in the BMI community: Corixidae (water boatman), Hyalellidae, Chironomidae, and Oligochaeta (Table 6.5-3). Taxonomic richness in the offshore polygon was five, with values ranging from zero to five within each sample (Table 6.5-3). Hill's Effective Richness (E^H) was two in the offshore. Chironomidae and Ephemeridae dominated the invertebrate community (Table 6.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.80 in nearshore habitat and 0.33 in offshore habitat (Table 6.5-3). Evenness (Simpson's Equitability [E_D]) was 0.23 in the nearshore and 0.69 offshore (Table 6.5-3).

6.5.2.2 Threepoint Lake

The total mean BMI abundance in kicknet samples from the intermittently wetted nearshore habitat of Threepoint Lake was 46 individuals, with numbers ranging from 11 to 80 (Table 6.5-4). Overall, insects dominated the BMI community in abundance comprising 79% of the mean total BMI, with non-insects comprising 21%. Insects mainly consisted of Corixidae (54% of mean total BMI) and Chironomidae (16%; Table 6.5-4). Of the non-insects, the main group was Gastropoda (10% of the mean total BMI; Table 6.5-4). The mean BMI density collected in the offshore habitat was 1,065 individuals/m^2, with densities ranging from 303 to 2,092 (Table 6.5-4). Overall, non-insects dominated the BMI community comprising 85% of the mean total BMI, with insects comprising the remaining 15%. Non-insects mainly consisted of Bivalvia (52% of mean total BMI) and Amphipoda (29%; Table 6.5-4). Of the insects, Chironomidae (7%), Ephemeroptera (4%), Trichoptera (4%), and small numbers of Ceratopogonidae were collected (Table 6.5-4).

Total EPT comprised 6% and 8% of the total BMI community in the nearshore and offshore polygons, respectively (Table 6.5-4). *Hexagenia* was the dominant Ephemeroptera genus within both habitats. Trichoptera were represented minimally in the nearshore and by Leptoceridae, Polycentropodidae, and Phryganeidae in the offshore (Table 6.5-4). Plecoptera were not collected in either habitat type (Table 6.5-4). The nearshore EPT:C ratio (0.58) indicated a chironomid-dominated EPT:C community, although overall abundance was generally low. The offshore ratio (1.20) indicated a generally balanced EPT:C insect community (Table 6.5-4).

Overall taxonomic richness in the nearshore-intermittently exposed polygon was 20, ranging from nine to 15 within this habitat (Table 6.5-4). Hill's Effective Richness (E^H) was six and overall, Corixidae dominated the invertebrate community. Taxonomic richness in the offshore habitat was 12, ranging from five to 11 within each sample (Table 6.5-4). Hill's Effective Richness (E^H) was four and was primarily dominated by Pisidiidae and Haustoriidae (Table 6.5-4).

Simpson's Diversity Index values (D) were similar in both nearshore (0.66) and offshore (0.67) polygons (Table 6.5-4). Evenness values (E_D) were the same in both habitat types (0.38; (Table 6.5-4).

6.5.2.3 Footprint Lake

The total mean BMI abundance in kicknet samples from the intermittently wetted nearshore habitat of Footprint Lake was 35 individuals, with numbers ranging from seven to 103 (Table 6.5-5). Overall, insects comprised the majority of the BMI community in this habitat (65% of the mean total BMI). Insects mainly consisted of Corixidae (approximately half of the mean total invertebrates sampled). Chironomidae, Ephemeroptera, Dytiscidae (diving beetles), and Trichoptera were also represented, but to a much lesser extent (Table 6.5-5). Amphipoda was the main non-insect group comprising 23% of mean total invertebrates, followed by Oligochaeta (8%), Gastropoda (2%), and Bivalvia (1%) (Table 6.5-5). The mean BMI density in the offshore habitat was 678 individuals/m^2, with densities ranging from 505 to 1,082 (Table 6.5-5). Overall, insects dominated the BMI comprising 83% of the mean total BMI sampled. Insects were dominated by Chaoboridae (phantom midges; 54% of the mean total BMI) and Chironomidae (20%) (Table 6.5-5). Of the non-insects, the main group was Amphipoda (15%), followed by Bivalvia (2%).

Total EPT comprised 5% of the total BMI in both nearshore and offshore polygons. In both habitat types, mayflies comprised the majority of this total (Table 6.5-5). Genus analysis of Ephemeroptera indicated that *Hexageni*a sp. were the dominant mayfly in both the nearshore and offshore habitats. Trichoptera were collected in very small numbers in the nearshore habitat and were not present offshore. Plecoptera were not collected in either nearshore or offshore polygons. The ratio of EPT:C was similar in both nearshore (0.42) and offshore (0.41) polygons, indicating Chironomidae dominated EPT in the insect communities in each habitat (Table 6.5-5).

Although mean abundance of BMI was relatively low in Footprint Lake, overall taxonomic richness in the nearshore habitat was relatively high at 19, ranging from seven to 15 within each sample. Hill's Effective Richness (E^H) was four and Corixidae and Hyalellidae dominated the invertebrate community in this habitat (Table 6.5-5). In the offshore habitat, overall taxonomic richness was seven, ranging from five to six within each sample. Hill's Effective Richness (E^H) was four and three families dominated the offshore BMI community: Chaoboridae, Chironomidae, and Haustoriidae (Table 6.5-5).

Simpson's Diversity Index (D) was 0.68 in the nearshore and 0.65 in the offshore polygon (Table 6.5-5). Evenness values (E_D) were 0.49 and 0.46 for nearshore and offshore, respectively (Table 6.5-5).

6.5.2.4 Leftrook Lake

The total mean BMI abundance in kicknet samples from the intermittently wetted nearshore habitat of Leftrook Lake was 151 individuals, with numbers ranging from 36 to 226 (Table 6.5-6). Overall, non-insects dominated the BMI community in abundance comprising 80% of the mean total BMI, with insects comprising the remaining amount. Amphipoda dominated the non-insects (comprised 55% of mean total BMI), followed by Oligochaeta (12%), Bivalvia (6%), and Gastropoda (3%) (Table 6.5-6). Insects mainly consisted of Trichoptera (8% of the mean total BMI), followed by Chironomidae (5%), Ephemeroptera (4%), and small numbers of Corixidae. Mean BMI density in the offshore habitat was 2,911 individuals/m^2, with densities ranging from 1,169 to 4,083 (Table 6.5-6). Overall, non-insects dominated the BMI community at 79% of total mean invertebrates sampled, with insects comprising the remaining 21%. Bivalvia dominated the non-insects comprising 71% of mean total BMI. Oligochaeta, Gastropoda, Acari, and Amphipoda were also present. Insects mainly consisted of Chironomidae (20% of mean total BMI); small numbers of Ephemeroptera and Ceratopogonidae were also collected (Table 6.5-6).

Total EPT comprised 11% of the total nearshore BMI community. Trichopteran families included Helicopsychidae, Lepidostomatidae, Limnephilidae, and Leptoceridae (Table 6.5-6). *Stenomena* was the most common mayfly genus identified in nearshore kicknet samples (Table 6.5-6). *Stenomena* is a ubiquitous group with general habitat requirements, commonly found in depositional substrate in both lentic and lotic environments (Merritt and Cummins 1996). No Plecoptera were collected in the nearshore samples. In the offshore polygon, total EPT comprised 1% of the total BMI community, consisting solely of the Ephemeroptera genus *Hexagenia*.

Mean EPT:C was 2.79 in the nearshore habitat and 0.04 in the offshore habitat (Table 6.5-6). The nearshore ratio indicated an EPT-dominated community with respect to these groups and the offshore ratio indicated chironomids dominated EPT.

Overall taxonomic richness within the nearshore-intermittently exposed habitat polygon was 22, with richness values ranging from 14 to 18 within each sample. Hill's Effective Richness (E^H)

was seven and Hyalellidae dominated the BMI community in this habitat (Table 6.5-6). In the offshore polygon, taxonomic richness was ten, ranging from four to eight within each sample (Table 6.5-6). Hill's Effective Richness (E^H) was three and Pisidiidae primarily dominated the BMI community in this habitat type (Table 6.5-6).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.71 and 0.49 in the nearshore and offshore polygons, respectively (Table 6.5-6). Evenness (Simpson's Equitability [E_D]) was 0.27 in the nearshore polygon and 0.29 offshore (Table 6.5-6).

6.6 FISH COMMUNITY

6.6.1 Gill Netting

In 2010, in the Churchill River Diversion Region, gill netting was conducted in Rat Lake (20 –22 July), Threepoint Lake (23 – 26 August), Footprint Lake (17 – 21 August), and Leftrook Lake (25 – 27 July) (Table 6.6-1; Figures 6.6-1 – 6.6-4).

In Rat, Threepoint, Footprint, and Leftrook Lakes, nine standard gang index gill net sites and three small mesh index gill net sites were sampled (Table 6.6-1; figures 6.6-1 – 6.6-4). During sampling, water temperature ranged from 18.5 – 19.5°C in Rat Lake, from 14.0 – 15.0 °C in Threepoint Lake, from 14.0 – 15.0°C in Footprint Lake, and from 20.0 – 21.0°C in Leftrook Lake.

6.6.2 Species Composition

In 2010, 14 species of fish were captured in the Churchill River Diversion Region (Table 6.6-2).

6.6.2.1 Rat Lake

In 2010, a total of 195 fish representing nine species were captured in standard gang index gill nets (Table 6.6-3) and a total of 59 fish representing eight species were captured in small mesh index gill nets (Table 6.6-4). Cisco represented 29.23% (n = 57) of the standard gang index gillnet catch, followed by White Sucker (n = 46; 23.59%) (Table 6.6-3; Figure 6.6-5). In the small mesh index gillnet catch, Emerald Shiner was the most common species captured (n = 34; 57.63%) (Table 6.6-4; Figure 6.6-5).

In the standard gang index gillnet catch, White Sucker represented 39.46% of the biomass followed by Cisco (25.54%) (Table 6.6-5). Cisco (43.77%) and Walleye (36.94%) comprised the bulk of the biomass in the small mesh index gillnet catch (Table 6.6-6).

6.6.2.2 Threepoint Lake

A total of 263 fish representing ten species were captured in standard gang index gill nets (Table 6.6-3) and a total of 120 fish representing seven species were captured in small mesh index gill nets (Table 6.6-4). Walleye represented 34.60% (n = 91) of the standard index gill net catch followed by White Sucker (n = 87; 33.08%) (Table 6.6-3; Figure 6.6-5). In the small mesh index gillnet catch, Spottail Shiner (n = 46; 38.33%) and Sauger (n = 28; 23.33%) were the most common species captured (Table 6.6-4; Figure 6.6-5).

In terms of biomass, White Sucker represented 48.27% of the standard gang index gillnet catch, followed by Walleye (23.89%) and Northern Pike (17.84%) (Table 6.6-5). In the small mesh index gillnet catch, Sauger (59.18%) and Walleye (25.64%) represented the bulk of the biomass (Table 6.6-6).

6.6.2.3 Footprint Lake

In 2010, 480 fish representing nine species were captured in standard gang index gill nets and 72 fish representing eight species were captured in small mesh index gill nets (Table 6.6-s 3 and 4).

Species commonly captured in standard gang index gill nets were Walleye (n = 182; 37.92%) and White Sucker (n = 155; 32.29%) (Table 6.6-3; Figure 6.6-5). In small mesh index gill nets Walleye (n = 28; 38.89%) and Spottail Shiner (n = 20; 27.78%) were the most abundant species (Table 6.6-4; Figure 6.6-5).

White Sucker (51.32%) represented the bulk of the biomass in the standard gang index gillnet catch (Table 6.6-5). In the small mesh index gillnet catch, Walleye composed 74.32% of the biomass (Table 6.6-6).

6.6.2.4 Leftrook Lake

A total of 544 fish, comprising of six species were captured in standard gang index gill nets and 406 fish comprising nine species were captured in small mesh index gill nets (Table 6.6-s 3 and 4).

White Sucker (n = 191; 35.11%) was the most common species captured in standard gang index gill nets (Table 6.6-3; Figure 6.6-5). In the small mesh index gillnet catch, Emerald Shiner represented 35.71% (n = 145) of the total catch followed by Spottail Shiner (n = 121; 29.80%) (Table 6.6-4; Figure 6.6-5).

In terms of biomass, White Sucker represented 42.48% of the standard gang index gillnet catch, followed by Lake Whitefish (24.57%), (Table 6.6-5). In the small mesh index gillnet catch, Walleye composed the bulk of the biomass (57.81%) (Table 6.6-6).

6.6.3 Catch Per Unit Effort (CPUE) and Biomass Per Unit Effort (BPUE)

6.6.3.1 Rat Lake

In 2010, the mean CPUE for the standard gang index gillnet catch in Rat Lake was 22.9 fish/100 m of net/24 h (Table 6.6-7; Figure 6.6-6). Cisco had the highest CPUE (7.8) (Figure 6.6-7).

The total CPUE for small mesh index gill nets was 27.7 fish/30 m of net/24 h (Table 6.6-8; Figure 6.6-6). Emerald Shiner had the highest CPUE (16.3) (Figure 6.6-7).

Mean BPUE for the standard gang index gillnet catch was 14,628 g/100 m of net/24 h (Table 6.6-9). White Sucker had the highest BPUE (5,131) followed by Cisco (4,381). Small mesh index gill nets produced a BPUE of 2,111 g/30 m of net/24 h (Table 6.6-10) with Cisco having the highest BPUE (944) followed by Walleye (799).

6.6.3.2 Threepoint Lake

In Threepoint Lake in 2010, standard gang index gill nets had a total CPUE of 19.2 (Table 6.6-7; Figure 6.6-6) and small mesh index gill nets had a total CPUE of 43.4 (Table 6.6-8; Figure 6.6-6).

In the standard gang index gill nets, White Sucker had the highest CPUE value (7.1) followed by Walleye (5.7) (Table 6.6-7; Figure 6.6-7). In the small mesh index gill nets Spottail Shiner (15.7) and Sauger (10.7) had the highest CPUE (Table 6.6-8; Figure 6.6-7).

Mean BPUE for the standard gang index gillnet catch was 13,753 (Table 6.6-9); White Sucker had the highest BPUE (7,351). Mean BPUE for the small mesh index gillnet catch was 1,143 (Table 6.6-10) with Sauger having the highest BPUE (686).

6.6.3.3 Footprint Lake

Standard gang index gill nets set in Footprint Lake in 2010 had a CPUE of 42.1 (Table 6.6-7; Figure 6.6-6). Species with the highest CPUE were Walleye (15.0) and White Sucker (14.6) (Figure 6.6-7).

Mean CPUE for small mesh index gillnet catch was 24.8 (Table 6.6-8; Figure 6.6-6). Walleye had the highest CPUE (9.6) followed by Spottail Shiner (6.9) (Figure 6.6-7).

In terms of BPUE, standard gang index gill nets produced 26,529 (Table 6.6-9). White Sucker had the highest BPUE (14,230) followed by Walleye (6,992). Mean BPUE for the small mesh index gillnet catch was 2,626 (Table 6.6-10). Walleye had the highest BPUE (1,952).

6.6.3.4 Leftrook Lake

In 2010, the mean CPUE for the standard gang index gillnet catch in Leftrook Lake was 67.1(Table 6.6-7; Figure 6.6-6). The species with the highest CPUE was White Sucker (24.9) (Figure 6.6-7).

Mean CPUE for the small mesh index gillnet catch was 169.9 (Table 6.6-8; Figure 6.6-6). Emerald Shiner had the highest CPUE (74.9), followed by Spottail Shiner (40.3) (Figure 6.6-7).

Mean BPUE for the standard gang index gillnet catch was 47,352 (Table 6.6-9). White Sucker had the highest BPUE (21,898). Small mesh index gill nets produced a BPUE of 7,709 (Table 6.6-10) with Walleye having the highest BPUE (4,332).

6.6.4 Size and Condition

Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies in 2010 were measured for fork length (mm) and weight (g) (Table 6.6-11). Condition factor was then calculated for each species using these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, and Walleye are illustrated in figures 6.6-8, 6.6-9, and 6.6-10.

In general, fish captured in small mesh index gill nets were not measured for fork length and were bulk weighed (Table 6.6-12).

6.6.4.1 Rat Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 426 mm, a mean weight of 1,832 g, and a mean condition factor of 0.64 (Table 6.6-11). In small mesh index gill nets, three Northern Pike were captured - one was measured individually and two were bulk weighed (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 339 mm, a mean weight of 1,224 g, and a mean condition factor of 1.68 (Table 6.6-11). No Lake Whitefish were captured in small mesh index gill nets (Table 6.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 341 mm, a mean weight of 582 g, and a mean condition factor of 1.04 (Table 6.6-11). Three of six Walleye captured in small mesh index gill nets were individually measured for length. The three fish measured for length had a mean fork length of 351 mm and condition factor of 1.08; all six walleye captured in small mesh index nets had a mean weight of 260 g (Table 6.6-12).

6.6.4.2 Threepoint Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 484 mm, a mean weight of 1,647 g, and a mean condition factor of 0.70 (Table 6.6-11). Only one Northern Pike (mean weight = 20 g) was captured in small mesh index gill nets (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 389 mm, a mean weight of 890 g, and a mean condition factor of 1.40 (Table 6.6-11). No Lake Whitefish were captured in small mesh index gill nets (Table 6.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 351 mm, a mean weight of 545 g, and a mean condition factor of 1.05 (Table 6.6-11). In small mesh index gill nets, 15 Walleye were captured and bulk weighed (Table 6.6-12).

6.6.4.3 Footprint Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 435 mm, a mean weight of 1,580 g, and a mean condition factor of 0.67 (Table 6.6-11). Three Northern Pike were captured in small mesh index gill nets; and had a mean weight of 308 g (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean weight of 1,108 g; individual fork lengths were not recorded (Table 6.6-11). No Lake Whitefish were captured in small mesh index gill nets (Table 6.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 346 mm, a mean weight of 531 g, and a mean condition factor of 1.10 (Table 6.6-11). In small mesh index gill nets, 28 Walleye were bulk weighed, averaging 203 g (Table 6.6-12).

6.6.4.4 Leftrook Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 467 mm, a mean weight of 672 g, and a mean condition factor of 0.60 (Table 6.6-11). Eight Northern Pike (seven of which were bulk weighed and one of which was weighed individually) had a mean weight of 579 g (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 421 mm, a mean weight of 1,084 g, and a mean condition factor of 1.40 (Table 6.6-11). No Lake Whitefish were captured in small mesh index gill nets (Table 6.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 367 mm, a mean weight of 546 g, and a mean condition factor of 1.02 (Table 6.6-11). In small mesh index gill nets, 53 Walleye were bulk weighed and averaged 227 g (Table 6.6-12).

6.6.5 Age Composition

Age frequency distributions were calculated for Northern Pike (Table 6.6-13), Lake Whitefish (Table 6.6-14) and Walleye (Table 6.6-15) captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies during 2010.

Mean fork length (mm), weight (g) and condition factor are also presented, by cohort, for Northern Pike (Table 6.6-16), Lake Whitefish (Table 6.6-17) and Walleye (Table 6.6-18).

6.6.5.1 Rat Lake

Relatively few fish were captured in standard gang index gill nets in Rat Lake in 2010. Age was determined for 21 Northern Pike (Table 6.6-13), one Lake Whitefish (Table 6.6-14), and 16 Walleye (Table 6.6-15).

6.6.5.2 Threepoint Lake

A total of 32 Northern Pike captured in standard gang index gill nets were aged. Northern Pike ranged from 2 to 10-years old, with ages 3 to 6 composing the majority of the catch (78.13%) (Table 6.6-13).

Ages were determined for two Lake Whitefish captured in standard gang index gill nets (Table 6.6-14).

Of the 88 Walleye for which ages were determined, 8 and 14-year old fish had the strongest representation in the catch (Table 6.6-15).

6.6.5.3 Footprint Lake

Ages were determined for 41 Northern Pike (Table 6.6-14). Three and 4-year old fish represented over half of the total catch (53.55%).

Two Lake Whitefish captured in standard gang index gill nets were aged (Table 6.6-14).

Ages were determined for 157 Walleye captured in standard gang index gill nets. The majority of Walleye were 8 and 9-years of age, at 20.38% and 21.02% of the catch, respectively (Table 6.6-15).

6.6.5.4 Leftrook Lake

Ages were determined for 70 Northern Pike captured in standard gang index gill nets set in Leftrook Lake in 2010. The majority of Northern Pike (42.86%) were 5 years of age with strong representation by 4 and 6-year old fish (Table 6.6-13).

A total of 77 Lake Whitefish captured in standard gang index gill nets were aged. Lake Whitefish ages ranged from 3 through 28, with 5-year old fish representing the highest percentage of the catch (12.99%) (Table 6.6-14).

Ages were determined for a total of 108 Walleye captured in standard gang index gill nets. Walleye ranged in age from 3 through 23, with strong representation by ages 10, 11, and 12-year old fish (Table 6.6-15).

6.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies in 2010 were examined externally for DELTs (Table 6.6-19).

6.6.6.1 Rat Lake

One White Sucker out of the 92 fish captured in standard gang index gill nets set in Rat Lake was documented as having a deformity.

6.6.6.2 Threepoint Lake

In Threepoint Lake, three out of the 518 fish captured in 2010 had DELTs. Deformities were present on one White Sucker and one Walleye; lesions were found on one White Sucker.

6.6.6.3 Footprint Lake

Lesions were found on one White Sucker out of the 381 fish captured in Footprint Lake in 2010.

6.6.6.4 Leftrook Lake

Eight of the 458 fish captured in Leftrook Lake were determined to have DELTs. Deformities were found on seven White Sucker and on one Lake Whitefish.

6.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Churchill River Diversion (CRD) Region. Waterbodies sampled included Rat Lake (21-23 July), Threepoint Lake (24-26 August), and an off-system waterbody, Leftrook Lake (26-29 July). Standard nets set at nine sites each lake yielded fish for mercury analysis from nine sites in Rat Lake (Figure 6.7-1), eight sites in Threepoint Lake (Figure 6.7-2), and seven sites in Leftrook Lake (Figure 6.7-3).

6.7.1 Species Comparisons

A total of 231 fish were analyzed for mercury (Table 6.7-1). Three 1-year old Yellow Perch were caught only from Leftrook Lake and Lake Whitefish captures from Rat and Threepoint lakes were similarly low. All 3 Yellow Perch were aged 1+ and had a mean length of 78 mm (Table 6.7-2). Numbers of Northern Pike and Walleye were close to or at the target sample size of 36 fish, except for Rat Lake (Table 6.7-1).

A significant positive relationship between mercury concentration and fish length existed for all species with more than three samples (Figure 6.7-4), indicating that standardization of concentrations was necessary for comparative purposes. Standardized mercury concentrations often differed substantially from arithmetic concentrations as, with the exception of Lake Whitefish from Leftrook Lake, mean fish sizes were much lower than the standard length of each species (Table 6.7-2).

Within each waterbody, mean arithmetic mercury concentrations of Northern Pike and Walleye in the region were similar and several times higher than in Lake Whitefish from the respective lake (Table 6.7-1). For Leftrook Lake, Northern Pike and Walleye, but not Lake Whitefish, had significantly higher mean arithmetic mercury concentrations than Yellow Perch.

6.7.2 Comparison to Consumption Guidelines

Standard concentrations of Northern Pike and Walleye from Rat and Threepoint lakes exceeded 0.5 ppm (Figure 6.7-5), the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). With 0.39 ppm mercury, Northern Pike from Leftrook Lake had an intermediate concentration, whereas mercury levels in Walleye from this off-system lake were just above 0.2 ppm, the guideline for human consumption (see section 4.8.2.3). Mean concentrations in Lake Whitefish from Leftrook Lake were clearly below 0.2 ppm (Figure 6.7-5).

Based on individual concentrations, 92-100% of all Northern Pike and Walleye from Rat and Threepoint lakes exceeded the 0.2 ppm guideline and approximately 40% of individuals of these species also had mercury levels in excess of 0.5 ppm (Figure 6.7-4). In contrast, none of the Northern Pike or Walleye from Leftrook Lake had concentrations exceeding 0.5 ppm, although most (58-67%) exceeded 0.2 ppm. None of the Lake Whitefish or Yellow Perch from the CRD Region had mercury levels above 0.2 ppm. In addition to the above exceedances of guidelines and standards relating to human health, mercury concentrations of most fish from the CRD Region were substantially higher than the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999 updated to 2013; MWS 2011); exceptions were for 13 Lake Whitefish, almost exclusively from Leftrook Lake, and one Yellow Perch.

SECTION 6: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 6.3-1. Summary statistics for *in situ* variables (near surface) measured in the Churchill River Diversion Region: 2010/11.

	Temperature (°C)				*In situ* pH				DO (mg/L)				DO (% Saturation)			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	12.06	12.25	11.89	13.03	7.57	7.74	8.09	8.34	10.20	10.91	11.22	9.31	95	101	103	90
Median	14.67	14.85	14.91	15.98	7.58	7.75	7.83	8.25	9.39	9.76	9.66	9.33	94	98	97	94
Minimum	-0.07	-0.01	0.36	0.53	7.08	7.27	7.72	7.89	8.20	8.66	9.13	8.65	89	95	95	74
Maximum	18.98	19.30	17.36	19.61	8.02	8.20	8.98	8.97	13.81	15.44	16.42	9.95	102	114	122	97
SD	7.22	7.31	6.85	7.53	0.36	0.33	0.52	0.39	2.15	2.66	3.03	0.58	5	8	11	9
SE	4.17	4.22	3.96	4.35	0.21	0.19	0.30	0.23	1.24	1.54	1.75	0.34	3	5	7	5
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-1. - continued -

	In situ Specific Conductance (μS/cm)				*In situ Turbidity (NTU)*				ORP (mV)				Secchi Disk Depth- Open-Water Season (m)			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	97	103	165	206	18.8	31.1	18.2	5.77	150	164	190	132	0.83	0.51	0.98	1.67
Median	94	101	170	196	15.2	30.3	19.2	5.4	151	155	183	112	0.9	0.48	0.92	1.55
Minimum	84	93	129	185	11.7	20.9	13	1	105	100	112	83	0.65	0.45	0.91	0.8
Maximum	115	116	192	246	33	42.8	21.5	10.9	193	248	282	201	0.95	0.59	1.1	2.66
SD	12	9	23	24	8.3	8.2	3.4	4.05	37	57	77	50	0.13	0.06	0.09	0.76
SE	7	5	13	14	4.8	4.7	1.9	2.86	21	33	44	36	0.09	0.04	0.06	0.54
N	4	4	4	4	4	4	4	3	4	4	4	3	3	3	3	3

Table 6.3-1. - continued -

	Calculated Euphotic Depth (m)				Estimated Euphotic Depth (m)			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	1.67	1.01	1.95	3.34	1.68	1.03	2.00	3.28
Median	1.80	0.95	1.84	3.10	1.80	1.00	2.00	3.00
Minimum	1.30	0.90	1.81	1.60	1.25	1.00	1.80	1.60
Maximum	1.90	1.18	2.20	5.32	2.00	1.10	2.20	5.25
SD	0.26	0.12	0.18	1.53	0.32	0.05	0.16	1.50
SE	0.19	0.09	0.13	1.08	0.22	0.03	0.12	1.06
N	3	3	3	3	3	3	3	3

Table 6.3-2. Summary statistics for routine laboratory variables measured in the Churchill River Diversion Region: 2010/11.

	Total Alkalinity ($CaCO_3$ mg/L)				Bicarbonate Alkalinity (HCO_3 mg/L)				Carbonate Alkalinity (CO_3 mg/L)				Ammonia (mg N/L)				Nitrate/Nitrite (mg N/L)				TKN (mg/L)				DIN (mg/L) [1]			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	47.7	50.1	83.7	107	56.0	60.3	101	122	1.28	0.64	0.91	4.52	<0.050	0.030	0.046	0.051	<0.050	<0.050	<0.050	<0.050	0.30	0.30	0.52	0.56	0.032	0.052	0.067	0.086
Median	47.6	50.0	85.4	107	54.9	59.5	101	115	<0.60	<0.60	0.91	3.44	<0.050	<0.10	0.017	0.016	<0.050	<0.050	<0.050	<0.050	0.31	0.30	0.41	0.54	0.035	0.036	0.047	0.073
Minimum	42.6	47.0	66.6	95.0	49.6	56.8	81.2	111	<0.60	<0.60	<0.60	<0.60	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	0.24	0.27	0.28	0.33	<0.010	<0.010	<0.010	<0.010
Maximum	52.9	53.5	97.3	120	64.6	65.3	119	146	4.21	1.64	1.51	10.9	<0.050	0.105	0.144	0.167	<0.050	0.0556	0.0582	0.113	0.35	0.34	0.97	0.82	0.055	0.130	0.169	0.192
SD	3.6	2.3	11.0	9.8	5.8	3.5	13.4	14	1.69	0.58	0.61	3.99	0.009	0.043	0.058	0.068	0.0175	0.0208	0.0228	0.0455	0.04	0.03	0.27	0.20	0.020	0.050	0.062	0.074
SE	2.1	1.4	6.4	5.7	3.3	2.0	7.7	8	0.98	0.34	0.35	2.31	0.005	0.025	0.033	0.039	0.0101	0.0120	0.0132	0.0263	0.02	0.02	0.15	0.11	0.012	0.029	0.036	0.043
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-2. - continued -

	Organic Nitrogen (mg/L) [1]				TN (mg/L) [1]				TDP (mg/L)				TPP (mg/L)				TP (mg/L)				TN:TP [1]				DIN:DP [1]			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	0.28	0.27	0.47	0.50	0.32	0.33	0.54	0.59	0.0108	0.0115	0.0112	0.0103	<0.014	<0.014	<0.014	0.022	0.0223	0.0283	0.0265	0.0308	37	26	76	52	14	15	42	40
Median	0.30	0.29	0.39	0.53	0.31	0.32	0.41	0.59	0.0128	0.0129	0.0126	0.0116	<0.014	<0.014	<0.014	0.018	0.0234	0.0290	0.0304	0.0260	35	25	27	46	6	6	6	12
Minimum	0.19	0.18	0.28	0.16	0.27	0.31	0.34	0.36	0.0027	0.0063	0.0024	0.0031	<0.014	<0.014	<0.014	<0.014	0.0106	0.0196	0.0099	0.0140	20	22	26	32	1	1	1	1
Maximum	0.35	0.34	0.83	0.79	0.39	0.35	1.00	0.82	0.0147	0.0140	0.0173	0.0150	0.019	0.023	0.023	0.047	0.0318	0.0356	0.0352	0.0570	58	34	222	83	43	46	156	137
SD	0.06	0.06	0.21	0.24	0.05	0.02	0.27	0.17	0.0047	0.0031	0.0060	0.0045	0.005	0.008	0.007	0.015	0.0078	0.0057	0.0098	0.0178	14	5	85	19	17	18	65	56
SE	0.03	0.04	0.12	0.14	0.03	0.01	0.15	0.10	0.0027	0.0018	0.0034	0.0026	0.003	0.005	0.004	0.009	0.0045	0.0033	0.0057	0.0103	8	3	49	11	10	11	38	32
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-2. - continued -

	DIN:TP [1]				DOC (mg/L)				TOC (mg/L)				TIC (mg/L)				TOC:ON [1]				TOC:TN [1]				TDS (mg/L)				Laboratory Conductivity (μmhos/cm)			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	4	5	11	12	7.0	8.2	9.1	9.1	7.2	8.2	9.0	9.5	10.4	10.9	17.7	24.1	32	37	26	31	27	29	23	20	59.2	132	112	161	101	105	168	205
Median	3	3	3	10	6.8	7.5	9.1	8.9	6.9	7.8	9.2	9.4	10.2	10.5	16.9	23.0	28	37	27	23	26	29	26	19	58.3	83.0	113	129	100	105	172	205
Minimum	0	0	0	0	6.5	7.2	7.6	8.7	6.7	6.7	8.2	8.8	9.1	9.9	15.3	21.0	25	25	13	14	23	24	11	14	46.0	58.0	104	92.0	91	99	134	186
Maximum	11	15	38	29	8.0	10.6	10.6	9.7	8.3	10.7	9.3	10.5	12.2	12.5	21.6	29.2	47	49	35	63	32	36	28	29	74.0	303	118	294	111	112	192	225
SD	4	6	15	12	0.6	1.4	1.1	0.4	0.7	1.5	0.4	0.6	1.2	1.0	2.6	3.2	9	8	8	19	3	4	7	6	10.7	99.5	5	78.4	7	5	21	16
SE	2	3	9	7	0.3	0.8	0.6	0.2	0.4	0.9	0.3	0.4	0.7	0.6	1.5	1.8	5	5	5	11	2	2	4	3	6.2	57.5	3	45.3	4	3	12	9
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-2. - continued -

	TSS (mg/L)				Laboratory Turbidity (NTU)				True Colour (TCU)				Laboratory pH				*E. coli* (CFU/100 mL)				Chlorophyll *a* (μg/L)			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	2.3	5.4	5.5	<2.0	8.98	14.1	9.13	2.22	13.5	23.2	15.5	13.5	8.12	8.07	8.26	8.46	<1	<1	<1	<1	1.27	1.10	2.57	6.87
Median	2.2	5.2	6.2	<2.0	7.81	13.6	7.86	1.80	13.8	22.3	15.5	13.7	7.99	8.00	8.33	8.48	<1	<1	<1	<1	1.31	1.15	2.69	5.54
Minimum	<2.0	3.2	2.4	<2.0	6.31	9.70	5.70	0.77	10.0	10.6	13.3	10.0	7.89	7.90	8.00	8.09	<1	<1	<1	<1	<0.60	<0.60	<0.60	<0.60
Maximum	3.6	8.0	7.0	2.0	14.0	19.4	15.1	4.51	16.2	37.7	17.8	16.8	8.62	8.38	8.37	8.78	<1	2	1	<1	2.16	1.80	4.60	16.10
SD	1.3	1.8	1.8	0.4	2.98	3.49	3.56	1.50	2.4	11.1	1.6	3.1	0.29	0.19	0.15	0.25	-	1	0	-	0.83	0.56	1.72	6.66
SE	0.7	1.0	1.1	0.3	1.72	2.01	2.06	0.86	1.4	6.4	0.9	1.8	0.17	0.11	0.09	0.15	-	0	0	-	0.48	0.32	1.00	3.84
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-2. - continued -

	Hardness as $CaCO_3$ (mg/L)				Chloride (mg/L)				Sulphate (mg/L)			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	46.9	49.4	84.9	107	0.89	0.89	0.96	0.67	3.00	3.07	2.78	3.34
Median	48.0	49.7	87.6	102	0.84	0.89	0.94	0.66	2.20	2.18	2.15	2.80
Minimum	38.4	44.2	62.6	98.3	0.78	0.78	0.87	0.58	2.05	1.91	2.00	2.17
Maximum	53.1	54.0	102	124	1.12	0.99	1.10	0.79	5.57	6.00	4.80	5.60
SD	6.2	4.1	14.4	10.2	0.14	0.08	0.09	0.08	1.48	1.70	1.17	1.37
SE	3.6	2.4	8.3	5.9	0.08	0.04	0.05	0.05	0.86	0.98	0.68	0.79
N	4	4	4	4	4	4	4	4	4	4	4	4

[1] Calculated.

Table 6.3-3. Summary statistics for metals and major ions measured in the Churchill River Diversion Region: 2010/11. Values are presented as mg/L.

	Aluminum- Total				Antimony-Total				Arsenic-Total				Barium-Total				Beryllium-Total				Bismuth-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	0.556	0.709	0.589	0.0282	<0.00020	<0.00020	<0.00020	<0.00020	0.00039	0.00043	0.00051	0.00058	0.0145	0.0162	0.0159	0.0125	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Median	0.581	0.711	0.390	0.0297	<0.00020	<0.00020	<0.00020	<0.00020	0.00039	0.00042	0.00052	0.00051	0.0148	0.0154	0.0145	0.0115	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	0.266	0.479	0.305	0.0123	<0.00020	<0.00020	<0.00020	<0.00020	0.00025	0.00030	0.00039	0.00034	0.0111	0.0135	0.0125	0.0107	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.794	0.935	1.27	0.0411	<0.00020	0.00020	<0.00020	<0.00020	0.00054	0.00058	0.00062	0.00095	0.0174	0.0207	0.0222	0.0164	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
SD	0.189	0.170	0.396	0.0105	-	0.00004	-	-	0.00010	0.00010	0.00010	0.00024	0.0023	0.0027	0.0037	0.0023	-	-	-	-	-	-	-	-
SE	0.109	0.098	0.229	0.0061	-	0.00003	-	-	0.00006	0.00006	0.00006	0.00014	0.0013	0.0016	0.0022	0.0013	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-3. - continued -

	Cadmium-Total				Calcium-Total				Cesium-Total				Chromium-Total				Cobalt-Total				Copper-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	<0.000010	0.000013	<0.000010	<0.000010	12.2	12.9	24.4	30.5	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	0.00023	<0.00020	<0.00020	0.00114	0.00141	0.00156	0.00079
Median	<0.000010	0.000015	<0.000010	<0.000010	12.4	12.8	25.4	29.6	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	0.00026	<0.00020	<0.00020	0.00117	0.00146	0.00152	0.00071
Minimum	<0.000010	<0.000010	<0.000010	<0.000010	10.4	12.1	16.7	26.8	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	0.00088	0.00116	0.00141	0.00061
Maximum	0.000012	0.000017	0.000011	0.000013	13.7	13.8	29.9	36.0	<0.00010	<0.00010	0.00012	<0.00010	<0.0010	0.0013	0.0017	<0.0010	0.00022	0.00031	0.00036	<0.00020	0.00134	0.00155	0.00179	0.00115
SD	0.000003	0.000005	0.000003	0.000003	1.4	0.7	4.8	3.4	-	-	0.00003	-	-	0.0003	0.0005	-	0.00006	0.00008	0.00011	-	0.00017	0.00015	0.00014	0.00022
SE	0.000002	0.000003	0.000002	0.000002	0.8	0.4	2.8	2.0	-	-	0.00002	-	-	0.0002	0.0003	-	0.00003	0.00005	0.00007	-	0.00010	0.00008	0.00008	0.00013
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-3. - continued -

	Iron- Total				Lead-Total				Lithium-Total				Magnesium-Total				Manganese-Total				Mercury-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	0.430	0.555	0.401	0.056	0.000220	0.000330	0.000213	<0.000090	0.0030	0.0039	0.0030	0.0020	3.98	4.19	5.85	7.42	0.00868	0.0123	0.0129	0.0514	<0.000050	<0.000050	<0.000050	<0.000050
Median	0.492	0.569	0.271	0.062	0.000222	0.000336	0.000168	<0.000090	0.0035	0.0037	0.0033	<0.0020	4.15	4.30	5.84	7.45	0.00939	0.0122	0.0125	0.0367	<0.000050	<0.000050	<0.000050	<0.000050
Minimum	0.192	0.374	0.142	0.024	0.000156	0.000189	0.000138	<0.000090	<0.0020	0.0034	<0.0020	<0.0020	3.05	3.41	5.10	6.49	0.00505	0.00874	0.00479	0.0202	<0.000050	<0.000050	<0.000050	<0.000050
Maximum	0.544	0.710	0.920	0.075	0.000282	0.000459	0.000379	0.000154	0.0039	0.0048	0.0045	0.0039	4.60	4.76	6.61	8.29	0.0109	0.0159	0.0221	0.1120	<0.000050	<0.000050	<0.000050	<0.000050
SD	0.139	0.123	0.304	0.019	0.000047	0.000096	0.000096	0.000045	0.0012	0.0006	0.0013	0.0012	0.66	0.56	0.59	0.65	0.00220	0.00255	0.00615	0.0373	-	-	-	-
SE	0.080	0.071	0.176	0.011	0.000027	0.000055	0.000056	0.000026	0.0007	0.0003	0.0007	0.0007	0.38	0.32	0.34	0.38	0.00127	0.00147	0.00355	0.0215	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-3. - continued -

	Molybdenum-Total				Nickel-Total				Potassium- Total				Rubidium-Total				Selenium-Total				Silicon-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	1.26	1.25	1.32	1.24	0.00231	0.00264	0.00205	0.00098	<0.0010	<0.0010	<0.0010	<0.0010	2.43	3.24	3.23	3.36
Median	<0.00020	<0.00020	0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	1.25	1.19	1.23	1.21	0.00246	0.00252	0.00157	0.00099	<0.0010	<0.0010	<0.0010	<0.0010	2.44	2.99	2.68	3.69
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	1.03	1.13	1.20	1.14	0.00166	0.00212	0.00118	0.00083	<0.0010	<0.0010	<0.0010	<0.0010	1.97	2.55	2.25	1.81
Maximum	0.00020	<0.00020	0.00021	0.00023	<0.0020	<0.0020	<0.0020	<0.0020	1.51	1.50	1.62	1.41	0.00266	0.00339	0.00389	0.00111	<0.0010	<0.0010	<0.0010	<0.0010	2.85	4.41	5.33	4.26
SD	0.00004	-	0.00004	0.00006	-	-	-	-	0.17	0.15	0.18	0.10	0.00038	0.00047	0.00107	0.00010	-	-	-	-	0.31	0.70	1.24	0.93
SE	0.00003	-	0.00003	0.00004	-	-	-	-	0.10	0.09	0.10	0.06	0.00022	0.00027	0.00062	0.00006	-	-	-	-	0.18	0.41	0.71	0.54
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-3. - continued -

	Silver- Total				Sodium-Total				Strontium-Total				Tellurium-Total				Thallium-Total				Thorium-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	<0.00010	<0.00010	<0.00010	<0.00010	2.98	2.92	2.98	2.85	0.0353	0.0357	0.0447	0.0517	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00019	0.00026	0.00021	<0.00010
Median	<0.00010	<0.00010	<0.00010	<0.00010	2.94	2.83	2.96	2.89	0.0330	0.0339	0.0437	0.0507	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00023	0.00027	0.00012	<0.00010
Minimum	<0.00010	<0.00010	<0.00010	<0.00010	2.46	2.63	2.74	2.52	0.0305	0.0333	0.0430	0.0480	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	0.00011	<0.00010
Maximum	<0.00010	<0.00010	<0.00010	<0.00010	3.58	3.37	3.28	3.12	0.0448	0.0419	0.0483	0.0575	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00025	0.00037	0.00048	<0.00010
SD	-	-	-	-	0.43	0.29	0.19	0.24	0.0056	0.0036	0.0021	0.0036	-	-	-	-	-	-	-	-	0.00008	0.00008	0.00016	-
SE	-	-	-	-	0.25	0.17	0.11	0.14	0.0032	0.0021	0.0012	0.0021	-	-	-	-	-	-	-	-	0.00005	0.00005	0.00009	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-3. - continued -

	Tin- Total				Titanium-Total				Tungsten-Total				Uranium-Total				Vanadium-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	<0.00020	0.00021	0.00027	<0.00020	0.0190	0.0260	0.0208	0.00098	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	0.00011	0.00025	0.00034	0.00097	0.00132	0.00130	0.00041
Median	<0.00020	<0.00020	<0.00020	<0.00020	0.0211	0.0252	0.0138	0.00105	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	0.00025	0.00030	0.00106	0.00134	0.00122	0.00042
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	0.0103	0.0198	0.00911	0.00041	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	0.00023	0.00025	0.00056	0.00099	0.00065	0.00027
Maximum	0.00038	0.00054	0.00076	0.00047	0.0236	0.0338	0.0464	0.00141	<0.0010	<0.0010	<0.0010	<0.0010	0.00021	0.00022	0.00028	0.00052	0.00123	0.00160	0.00212	0.00055
SD	0.00012	0.00019	0.00029	0.00016	0.0051	0.0051	0.0150	0.00036	-	-	-	-	0.00007	0.00007	0.00002	0.00010	0.00025	0.00023	0.00053	0.00012
SE	0.00007	0.00011	0.00017	0.00009	0.0030	0.0030	0.00866	0.00021	-	-	-	-	0.00004	0.00004	0.00001	0.00006	0.00015	0.00013	0.00030	0.00007
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 6.3-3. - continued -

	Zinc- Total				Zirconium-Total			
	RAT	3PT	FOOT	LEFT	RAT	3PT	FOOT	LEFT
Mean	<0.0050	<0.0050	<0.0050	<0.0050	0.00077	0.00101	0.00080	<0.00040
Median	<0.0050	<0.0050	<0.0050	<0.0050	0.00073	0.00095	0.00052	<0.00040
Minimum	<0.0050	<0.0050	<0.0050	<0.0050	0.00059	0.00073	0.00045	<0.00040
Maximum	<0.0050	<0.0050	<0.0050	<0.0050	0.00101	0.00140	0.00171	<0.00040
SD	-	-	-	-	0.00016	0.00025	0.00053	-
SE	-	-	-	-	0.00009	0.00014	0.00031	-
N	4	4	4	4	4	4	4	4

Table 6.3-4. Frequency of detections of total metals measured in the Churchill River Diversion Region: 2010/2011.

			Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chloride	Chromium	Cobalt
Rat Lake	Surface	# Detections	4	0	4	4	0	0	1	1	4	0	4	0	2
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	0	100	100	0	0	25	25	100	0	100	0	50
Threepoint Lake	Surface	# Detections	4	1	4	4	0	0	1	3	4	0	4	2	3
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	25	100	100	0	0	25	75	100	0	100	50	75
Footprint Lake	Surface	# Detections	4	0	4	4	0	0	2	1	4	1	4	1	1
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	0	100	100	0	0	50	25	100	25	100	25	25
Footprint Lake	Bottom	# Detections	1	0	1	1	0	0	0	0	1	0	1	0	0
		n	1	1	1	1	1	1	1	1	1	1	1	1	1
		% Detection	100	0	100	100	0	0	0	0	100	0	100	0	0
Leftrook Lake	Surface	# Detections	4	0	4	4	0	0	0	1	4	0	4	0	0
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	0	100	100	0	0	0	25	100	0	100	0	0
Leftrook Lake	Bottom	# Detections	1	0	1	1	0	0	0	0	1	0	1	0	0
		n	1	1	1	1	1	1	1	1	1	1	1	1	1
		% Detection	100	0	100	100	0	0	0	0	100	0	100	0	0

Table 6.3-4. - continued -

			Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silicon
Rat Lake	Surface	# Detections	4	4	4	3	4	4	0	1	0	4	4	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	100	100	75	100	100	0	25	0	100	100	0	100
Threepoint Lake	Surface	# Detections	4	4	4	4	4	4	0	0	0	4	4	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	100	100	100	100	100	0	0	0	100	100	0	100
Footprint Lake	Surface	# Detections	4	4	4	3	4	4	0	3	0	4	4	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	100	100	75	100	100	0	75	0	100	100	0	100
Footprint Lake	Bottom	# Detections	1	1	1	0	1	1	0	0	0	1	1	0	1
		n	1	1	1	1	1	1	1	1	1	1	1	1	1
		% Detection	100	100	100	0	100	100	0	0	0	100	100	0	100
Leftrook Lake	Surface	# Detections	4	4	2	2	4	4	0	2	0	4	4	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	100	100	50	50	100	100	0	50	0	100	100	0	100
Leftrook Lake	Bottom	# Detections	1	1	1	1	1	1	0	0	0	1	1	0	1
		n	1	1	1	1	1	1	1	1	1	1	1	1	1
		% Detection	100	100	100	100	100	100	0	0	0	100	100	0	100

Table 6.3-4. - continued -

			Silver	Sodium	Strontium	Sulphate	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Zinc	Zirconium
Rat Lake	Surface	# Detections	0	4	4	4	0	0	3	1	4	0	1	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	0	100	100	100	0	0	75	25	100	0	25	0	100
Threepoint Lake	Surface	# Detections	0	4	4	4	0	0	4	1	4	0	2	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	0	100	100	100	0	0	100	25	100	0	50	0	100
Footprint Lake	Surface	# Detections	0	4	4	4	0	0	4	1	4	0	4	0	4
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	0	100	100	100	0	0	100	25	100	0	100	0	100
Footprint Lake	Bottom	# Detections	0	1	1	1	0	0	0	0	1	0	1	0	0
		n	1	1	1	1	1	1	1	1	1	1	1	1	1
		% Detection	0	100	100	100	0	0	0	0	100	0	100	0	0
Leftrook Lake	Surface	# Detections	0	4	4	4	0	0	0	1	4	0	4	0	0
		n	4	4	4	4	4	4	4	4	4	4	4	4	4
		% Detection	0	100	100	100	0	0	0	25	100	0	100	0	0
Leftrook Lake	Bottom	# Detections	0	1	1	1	0	0	0	1	1	0	1	0	0
		n	1	1	1	1	1	1	1	1	1	1	1	1	1
		% Detection	0	100	100	100	0	0	0	100	100	0	100	0	0

Table 6.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Churchill River Diversion Region: 2010/11. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00013-0.00032	0.0394-0.1028	0.0041-0.0112	0.3	0.00094-0.00418	0.000026
Rat Lake	N	**4**	4	4	4	4	4	**4**	4	4
	# Exceedances	**4**	0	0	0	0	0	**3**	0	0
	% Exceedances	**100**	0	0	0	0	0	**75**	0	0
Threepoint Lake	N	**4**	4	4	4	4	4	**4**	4	4
	# Exceedances	**4**	0	0	0	0	0	**4**	0	0
	% Exceedances	**100**	0	0	0	0	0	**100**	0	0
Footprint Lake (Surface)	N	**4**	4	4	4	4	4	**4**	4	4
	# Exceedances	**4**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**25**	0	0
Footprint Lake (Bottom)	N	**1**	1	1	1	1	1	1	1	1
	# Exceedances	**1**	0	0	0	0	0	0	0	0
	% Exceedances	**100**	0	0	0	0	0	0	0	0
Leftrook Lake (Surface)	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Leftrook Lake (Bottom)	N	1	1	1	1	1	1	1	1	1
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

Table 6.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.0232-0.0626	0.001	0.0001	0.0008	0.015	0.0533-0.1438	120	128-429
Rat Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Threepoint Lake	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Footprint Lake (Surface)	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Footprint Lake (Bottom)	N	1	1	1	1	1	1	1	1	1
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Leftrook Lake (Surface)	N	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Leftrook Lake (Bottom)	N	1	1	1	1	1	1	1	1	1
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

[1] Mercury was analysed at a detection limit of 0.0005 mg/L and results can not be compared to the current Manitoba PAL guideline for mercury.

[2]Comparison to the long-term CCME PAL guideline.

[3]Comparison to the BCMOE guideline.

Table 6.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Churchill River Diversion Region and CCME (1999; updated to 2013) trophic categorization: 2010/2011.

		Trophic Status Based on Total Phosphorous (mg/L)					
Trophic Categories		Ultra-oligotrophic < 0.004	Oligotrophic 0.004 - 0.010	Mesotrophic 0.010 - 0.020	Meso-eutrophic 0.020 - 0.035	Eutrophic 0.035 - 0.100	Hyper-eutrophic > 0.100
Rat Lake	Open-water season				0.022		
	Annual				0.022		
Threepoint Lake	Open-water season				0.028		
	Annual				0.028		
Footprint Lake	Open-water season				0.026		
	Annual				0.026		
Leftrook Lake	Open-water season					0.036	
	Annual				0.031		

Table 6.3-7. Chlorophyll a concentrations (open-water season and annual means) measured in the Churchill River Diversion Region and the OECD (1982) trophic categorization scheme for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
Trophic Categories		Ultra-oligotrophic -	Oligotrophic < 2.5	Mesotrophic 2.5 - 8	Meso-eutrophic -	Eutrophic 8 - 25	Hyper-eutrophic > 25
Rat Lake	Open-water season		1.6				
	Annual		1.3				
Threepoint Lake	Open-water season		1.4				
	Annual		1.1				
Footprint Lake	Open-water season			3.3			
	Annual			2.6			
Leftrook Lake	Open-water season					9.1	
	Annual			6.9			

Table 6.3-8. Total nitrogen concentrations (open-water season and annual means) measured in the Churchill River Diversion Region and comparison to a trophic categorization scheme for lakes (Nürnberg 1996): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
Trophic Categories		Ultra-oligotrophic -	Oligotrophic <0.350	Mesotrophic 0.350-0.650	Meso-eutrophic -	Eutrophic 0.651-1.2	Hyper-eutrophic >1.2
Rat Lake	Open-water season		0.30				
	Annual		0.32				
Threepoint Lake	Open-water season		0.32				
	Annual		0.32				
Footprint Lake	Open-water season			0.61			
	Annual			0.54			
Leftrook Lake	Open-water season			0.61			
	Annual			0.59			

Table 6.4-1. Community metrics for phytoplankton samples collected in the Churchill River Diversion Region during the open-water season of 2010.

Waterbody	Season	Species Richnes (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Heterogeneity (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H'}$)	Evennes ($E^{H'}/S$)
Rat Lake	Spring	14	0.47	0.13	1.10	0.42	3.00	0.21
	Summer	12	0.22	0.11	0.58	0.23	1.79	0.15
	Fall	16	0.51	0.13	1.08	0.39	2.94	0.18
Footprint Lake	Spring	25	0.82	0.22	2.03	0.63	7.63	0.31
	Summer	33	0.86	0.21	2.39	0.68	10.96	0.33
	Fall	23	0.56	0.10	1.37	0.44	3.92	0.17

Table 6.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Churchill River Diversion Region for CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Disk Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Rat Lake (2010)	Nearshore	5	0.8	0.7	0.9	0.02	0.29	16.0	woody debris	grass, coniferous	0-24	attached
	Offshore	5	7.6	6.8	8.6	0.02	0.42	16.0	clay, organic matter	--	--	--
Threepoint Lake (2010)	Nearshore	5	0.7	0.6	0.7	0.00	0.34	13.0	clay, organic matter	grass, mixed forest	0-24	--
	Offshore	5	4.8	4.5	5.2	0.00	0.25	13.0	clay, sand	--	--	--
Footprint Lake (2010)	Nearshore	5	0.6	0.5	0.8	0.00	0.29	16.0	clay, organic matter	grass, coniferous	0-24	--
	Offshore	5	6.4	6.1	6.7	0.00	0.86	16.0	clay, silt	--	--	--
Leftrook Lake (2010)	Nearshore	5	0.5	0.4	0.6	0.01	0.53	14.0	boulder, gravel	shrub, coniferous	0-24	attached
	Offshore	5	7.9	7.7	8.1	0.02	1.07	15.0	clay	--	--	--

Table 6.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Churchill River Diversion Region for CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Rat Lake (2010)	Nearshore	Mean	*5*	*0.8*	*7.76*	*1.56*	*27.78*	*70.64*	*clay*
		SD	--	0.17	4.394	1.335	13.409	14.164	--
		SE	--	0.08	1.965	0.597	5.997	6.335	--
		Median	--	0.9	8.16	1.63	21.60	76.70	--
		Min	--	0.6	1.89	0.36	15.30	50.20	--
		Max	--	0.9	12.80	3.68	48.10	84.20	--
	Offshore	Mean	5	7.6	3.91	0.19	35.36	64.46	clay
		SD	--	0.85	1.863	0.065	5.851	5.843	--
		SE	--	0.38	0.833	0.029	2.617	2.613	--
		Median	--	7.7	4.31	0.22	37.30	62.60	--
		Min	--	6.2	1.24	0.11	28.30	56.80	--
		Max	--	8.4	5.84	0.25	43.00	71.50	--
Threepoint Lake (2010)	Nearshore	Mean	5	0.4	0.73	7.95	45.56	46.50	silty clay
		SD	--	0.06	0.497	5.611	15.275	12.407	--
		SE	--	0.03	0.222	2.509	6.831	5.549	--
		Median	--	0.5	0.57	7.94	43.40	47.50	--
		Min	--	0.4	0.40	1.53	29.10	28.30	--
		Max	--	0.5	1.60	16.50	67.00	63.00	--
	Offshore	Mean	5	4.6	1.63	9.24	55.86	34.92	silty clay loam
		SD	--	0.25	0.052	2.364	2.369	1.743	--
		SE	--	0.11	0.023	1.057	1.060	0.779	--
		Median	--	4.5	1.66	7.96	55.25	34.35	--
		Min	--	0.9	1.54	3.68	48.10	33.90	--
		Max	--	5.0	12.80	13.20	58.70	84.20	--
Footprint Lake (2010)	Nearshore	Mean	5	0.5	1.17	40.12	29.01	30.84	silty clay
		SD	--	0.11	0.439	23.276	14.745	17.015	--
		SE	--	0.07	0.196	10.410	6.594	7.609	--
		Median	--	0.5	1.35	35.10	27.80	27.10	--
		Min	--	0.4	0.50	16.80	8.05	14.60	--
		Max	--	0.8	1.61	77.30	45.30	59.70	--
	Offshore	Mean	5	6.3	0.93	11.14	44.92	43.94	clay loam
		SD	--	0.30	0.312	12.122	6.436	10.876	--
		SE	--	0.13	0.140	5.421	2.878	4.864	--
		Median	--	6.2	1.04	6.03	42.40	45.00	--
		Min	--	6.0	0.57	1.16	38.30	27.80	--
		Max	--	6.7	1.27	29.80	52.70	58.40	--
Leftrook Lake (2010)	Nearshore	Mean	0	--	--	--	--	--	--
		SD	--	--	--	--	--	--	--
		SE	--	--	--	--	--	--	--
		Median	--	--	--	--	--	--	--
		Min	--	--	--	--	--	--	--
		Max	--	--	--	--	--	--	--
									--
	Offshore	Mean	5	7.9	5.12	0.16	26.18	73.66	clay
		SD	--	0.22	0.066	0.038	1.062	1.069	--
		SE	--	0.10	0.029	0.017	0.475	0.478	--
		Median	--	8.1	5.13	0.17	25.60	74.20	--
		Min	--	7.7	5.01	0.11	25.30	71.90	--
		Max	--	8.1	5.18	0.21	27.90	74.50	--

Table 6.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Rat Lake within the Churchill River Diversion Region for CAMPP, 2010.

	Rat Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	243	101.4	45.3	243	139	395
Oligochaeta	--	37	28.0	12.5	23	15	82
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.3	0.1	0	0	1
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	9	4.9	2.2	9	3	16
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	57	15.3	6.9	53	37	76
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.3	0.1	0	0	1
Arachnida - unid	--	0	0.3	0.1	0	0	1
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	18	24.8	11.1	13	1	61
Gastropoda - unid	--	1	2.0	0.9	0	0	5
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.1	0.1	0	0	0
Physidae	--	1	0.5	0.2	1	0	1
Planorbidae	--	0	0.4	0.2	0	0	1
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.3	0.1	0	0	1
Non-Insecta	--	124	42.1	18.8	126	79	190
Non-Insecta (%)	51	--	--	--	--	--	--
Oligochaeta	--	37	28.0	12.5	23	15	82
Oligochaeta (%)	15	--	--	--	--	--	--
Amphipoda	--	66	19.6	8.8	62	44	92
Amphipoda (%)	27	--	--	--	--	--	--
Bivalvia	--	18	24.8	11.1	13	1	61
Bivalvia (%)	8	--	--	--	--	--	--
Gastropoda	--	2	2.7	1.2	1	0	7
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.1	0.1	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	3	2.3	1.0	2	1	7
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0

Table 6.5-3. - continued -

	Rat Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.4	0.2	0	0	1
Dytiscidae (adult)	--	0	0.3	0.1	0	0	1
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.1	0.1	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	1	1.7	0.8	0	0	4
Haliplidae (adult)	--	0	0.9	0.4	0	0	2
Heliophoridae	--	0	0.3	0.1	0	0	1
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	1	1.7	0.8	0	0	4
Corixidae (larva + adult)	--	61	30.0	13.4	61	17	99
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	6	4.9	2.2	6	0	12
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	5	3.8	1.7	5	0	11
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.1	0.1	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.4	0.2	1	0	1
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0

Table 6.5-3. - continued -

	Rat Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	1	0.2	0.1	1	0	1
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.6	0.3	0	0	1
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.6	0.3	0	0	1
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	2	0.8	0.4	3	1	3
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	1	1.3	0.6	0	0	3
Polycentropodidae	--	0	0.1	0.1	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	3	1.7	0.7	3	0	5
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.3	0.1	0	0	1
Chironomidae (pupa)	--	1	1.0	0.5	1	0	3
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	18	19.4	8.7	17	1	49
Orthocladiinae	--	12	6.5	2.9	14	4	18
Tanypodinae	--	2	2.5	1.1	0	0	6
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.6	0.3	0	0	1
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 6.5-3. - continued -

	Rat Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	119	61.8	27.6	117	42	205
Insecta (%)	49	--	--	--	--	--	--
Chironomidae	--	32	26.1	11.7	34	6	69
Chironomidae (%)	13	--	--	--	--	--	--
Ephemeroptera	--	12	3.5	1.5	13	6	15
Ephemeroptera (%)	5	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	5	1.9	0.8	6	2	7
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	17	5.2	2.3	18	8	22
EPT (%)	7	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.04	1.121	0.501	0.64	0.28	3.00
Genus analysis of Ephemeroptera	Baetidae: unidentified + *Callibaetis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	30	18	3.6	1.6	17	15	24
Simpson's Diversity Index (D)	--	0.80	0.058	0.026	0.83	0.73	0.85
Evenness (Simpson's Equitability E_D)	--	0.23	0.039	0.018	0.21	0.19	0.28
Shannon-Weaver Index (H)	--	2.04	0.252	0.113	2.13	1.77	2.36
Evenness (Shannon's Equitability E_H)	--	0.65	0.048	0.022	0.68	0.58	0.69
Hill's Effective Richness ($E^{H'}$)	--	8	2.0	0.9	8	6	11
Evenness ($E^{H'}$/S)	--	0.34	0.041	0.019	0.33	0.28	0.39

Table 6.5-3. - continued -

	Rat Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	124	229.6	102.7	29	0	534
Oligochaeta	--	6	12.9	5.8	0	0	29
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	3	6.5	2.9	0	0	14
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	6	7.9	3.5	0	0	14
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	14	25.0	11.2	0	0	58
Non-Insecta (%)	12	--	--	--	--	--	--
Oligochaeta	--	6	12.9	5.8	0	0	29
Oligochaeta (%)	5	--	--	--	--	--	--
Amphipoda	--	3	6.5	2.9	0	0	14
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	6	7.9	3.5	0	0	14
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 6.5-3. - continued -

	Rat Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	38	83.9	37.5	0	0	188
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 6.5-3. - continued -

	Rat Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	17	18.8	8.4	14	0	43
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	55	106.7	47.7	14	0	245
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	110	205.5	91.9	14	0	476
Insecta (%)	88	--	--	--	--	--	--

Table 6.5-3. - continued -

	Rat Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	72	122.0	54.6	14	0	289
Chironomidae (%)	58	--	--	--	--	--	--
Ephemeroptera	--	38	83.9	37.5	0	0	188
Ephemeroptera (%)	30	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	38	83.9	37.5	0	0	188
EPT (%)	30	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.13	0.291	0.130	0.00	0.00	0.65
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	1	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	2	--	--	--	--	--	--
Taxonomic Richness (Family-level)	5	2	1.9	0.9	1	0	5
Simpson's Diversity Index (D)	--	0.33	0.306	0.137	0.45	0.00	0.66
Evenness (Simpson's Equitability E_D)	--	0.69	0.443	0.198	0.91	0.00	1.04
Shannon-Weaver Index (H)	--	0.52	0.539	0.241	0.64	0.00	1.28
Evenness (Shannon’s Equitability E_H)	--	0.53	0.492	0.220	0.72	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	2	1.1	0.5	2	1	4
Evenness ($E^{H'}$/S)	--	0.71	0.430	0.192	0.94	0.00	1.00

Table 6.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Threepoint Lake within the Churchill River Diversion Region for CAMPP, 2010.

	Threepoint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	46	29.2	13.1	45	11	80
Oligochaeta	--	2	1.2	0.5	1	1	4
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.1	0.1	0	0	0
Hyalellidae	--	2	2.6	1.2	1	0	7
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	1	0.9	0.4	2	0	2
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.4	0.2	0	0	1
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	4	3.6	1.6	5	0	9
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	10	7.7	3.4	9	4	23
Non-Insecta (%)	21	--	--	--	--	--	--
Oligochaeta	--	2	1.2	0.5	1	1	4
Oligochaeta (%)	3	--	--	--	--	--	--
Amphipoda	--	2	2.6	1.2	1	0	7
Amphipoda (%)	5	--	--	--	--	--	--
Bivalvia	--	1	0.9	0.4	2	0	2
Bivalvia (%)	3	--	--	--	--	--	--
Gastropoda	--	5	3.7	1.7	5	1	10
Gastropoda (%)	10	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.1	0.1	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.1	0.1	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0

Table 6.5-4. - continued -

	Threepoint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.1	0.1	0	0	0
Dytiscidae (adult)	--	1	0.6	0.3	0	0	2
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	25	23.4	10.5	17	4	63
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.1	0.1	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.7	0.3	0	0	2
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	2	3.0	1.3	0	0	7
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.3	0.1	0	0	1
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0

Table 6.5-4. - continued -

	Threepoint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.1	0.1	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.4	0.2	0	0	1
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.1	0.1	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.1	0.1	0	0	0
Ceratopogonidae (adult)	--	0	0.1	0.1	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.1	0.1	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	3	4.7	2.1	1	0	11
Orthocladiinae	--	3	4.3	1.9	2	0	11
Tanypodinae	--	1	2.7	1.2	0	0	6
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.1	0.1	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.2	0.1	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 6.5-4. - continued -

	Threepoint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	36	25.6	11.4	35	7	66
Insecta (%)	79	--	--	--	--	--	--
Chironomidae	--	8	11.7	5.2	3	1	28
Chironomidae (%)	16	--	--	--	--	--	--
Ephemeroptera	--	2	4.1	1.8	1	0	10
Ephemeroptera (%)	5	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.4	0.2	0	0	1
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	3	4	2	1	0	11
EPT (%)	6	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.58	0.802	0.359	0.33	0.08	2.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	20	12	2.4	1.1	11	9	15
Simpson's Diversity Index (D)	--	0.66	0.300	0.134	0.83	0.19	0.89
Evenness (Simpson's Equitability E_D)	--	0.38	0.241	0.108	0.48	0.11	0.65
Shannon-Weaver Index (H)	--	1.58	0.711	0.318	1.89	0.53	2.35
Evenness (Shannon's Equitability E_H)	--	0.61	0.261	0.117	0.79	0.22	0.80
Hill's Effective Richness ($E^{H'}$)	--	6	3.4	1.5	7	2	10
Evenness ($E^{H'}/S$)	--	0.43	0.217	0.097	0.55	0.15	0.61

Table 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1065	860.2	384.7	577	303	2092
Oligochaeta	--	23	21.9	9.8	29	0	43
Hirudinea	--	3	6.5	2.9	0	0	14
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	312	233.0	104.2	202	87	577
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	3	6.5	2.9	0	0	14
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	554	521.6	233.3	231	144	1226
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	12	12.1	5.4	14	0	29
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	906	766.7	342.9	462	245	1832
Non-Insecta (%)	85	--	--	--	--	--	--
Oligochaeta	--	23	21.9	9.8	29	0	43
Oligochaeta (%)	2	--	--	--	--	--	--
Amphipoda	--	312	233.0	104.2	202	87	577
Amphipoda (%)	29	--	--	--	--	--	--
Bivalvia	--	554	521.6	233.3	231	144	1226
Bivalvia (%)	52	--	--	--	--	--	--
Gastropoda	--	12	12.1	5.4	14	0	29
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	43	40.8	18.2	14	14	101
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	23	21.9	9.8	14	0	58
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	3	6.5	2.9	0	0	14
Polycentropodidae	--	14	25.0	11.2	0	0	58
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	6	7.9	3.5	0	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	3	6.5	2.9	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	3	6.5	2.9	0	0	14
Orthocladiinae	--	32	25.8	11.5	29	0	58
Tanypodinae	--	32	12.1	5.4	29	14	43
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	159	94.6	42.3	115	58	260
Insecta (%)	15	--	--	--	--	--	--

Table 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	69	23.7	10.6	58	43	101
Chironomidae (%)	7	--	--	--	--	--	--
Ephemeroptera	--	43	40.8	18.2	14	14	101
Ephemeroptera (%)	4	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	40	42.6	19.0	14	0	87
Trichoptera (%)	4	--	--	--	--	--	--
EPT	--	84	82.5	36.9	29	14	188
EPT (%)	8	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.20	1.258	0.563	0.50	0.33	3.25
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	12	7	2.3	1.0	7	5	11
Simpson's Diversity Index (D)	--	0.67	0.066	0.029	0.68	0.58	0.75
Evenness (Simpson's Equitability E_D)	--	0.38	0.131	0.059	0.45	0.20	0.50
Shannon-Weaver Index (H)	--	1.42	0.151	0.068	1.44	1.25	1.64
Evenness (Shannon’s Equitability E_H)	--	0.67	0.120	0.054	0.74	0.50	0.79
Hill's Effective Richness ($E^{H'}$)	--	4	0.7	0.3	4	4	5
Evenness ($E^{H'}$/S)	--	0.51	0.153	0.069	0.60	0.29	0.65

Table 6.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Footprint Lake within the Churchill River Diversion Region for CAMPP, 2010.

	Footprint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	35	38.6	17.3	21	7	103
Oligochaeta	--	3	2.6	1.2	2	0	7
Hirudinea	--	0	0.3	0.1	0	0	1
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	8	4.4	2.0	10	3	13
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.1	0.1	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.5	0.2	0	0	1
Gastropoda - unid	--	0	0.1	0.1	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.1	0.1	0	0	0
Lymnaeidae	--	0	0.1	0.1	0	0	0
Physidae	--	0	0.3	0.1	0	0	1
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.3	0.1	0	0	1
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	12	5.9	2.6	14	4	18
Non-Insecta (%)	35	--	--	--	--	--	--
Oligochaeta	--	3	2.6	1.2	2	0	7
Oligochaeta (%)	8	--	--	--	--	--	--
Amphipoda	--	8	4.4	2.0	10	3	13
Amphipoda (%)	23	--	--	--	--	--	--
Bivalvia	--	0	0.5	0.2	0	0	1
Bivalvia (%)	1	--	--	--	--	--	--
Gastropoda	--	1	0.8	0.4	0	0	2
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0

Table 6.5-5. - continued -

	Footprint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	1	0.8	0.3	1	0	2
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.1	0.1	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	17	34.5	15.4	3	0	79
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.4	0.2	0	0	1
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.9	0.4	0	0	2
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	1	2.2	1.0	0	0	5
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0

Table 6.5-5. - continued -

	Footprint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.3	0.1	0	0	1
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.1	0.1	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.1	0.1	0	0	0
Ceratopogonidae (larva)	--	0	0.3	0.1	0	0	1
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.3	0.1	0	0	1
Chironomidae (pupa)	--	0	0.1	0.1	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1	0.8	0.4	1	0	2
Orthocladiinae	--	1	0.5	0.2	1	0	2
Tanypodinae	--	1	0.8	0.4	0	0	2
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 6.5-5. - continued -

	Footprint Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	23	40.4	18.1	4	2	95
Insecta (%)	65	--	--	--	--	--	--
Chironomidae	--	3	1.7	0.7	3	1	5
Chironomidae (%)	7	--	--	--	--	--	--
Ephemeroptera	--	2	3.6	1.6	0	0	8
Ephemeroptera (%)	5	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.3	0.1	0	0	1
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	2	4	2	0	0	9
EPT (%)	5	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.42	0.742	0.332	0.11	0.00	1.73
Genus analysis of Ephemeroptera				Ephemeridae: *Hexagenia*			
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	19	9	3.3	1.5	8	7	15
Simpson's Diversity Index (D)	--	0.68	0.182	0.081	0.71	0.41	0.91
Evenness (Simpson's Equitability E_D)	--	0.49	0.512	0.229	0.32	0.09	1.39
Shannon-Weaver Index (H)	--	1.46	0.260	0.116	1.51	1.12	1.77
Evenness (Shannon's Equitability E_H)	--	0.63	0.165	0.074	0.63	0.39	0.85
Hill's Effective Richness ($E^{H'}$)	--	4	1.1	0.5	5	3	6
Evenness ($E^{H'}$/S)	--	0.45	0.199	0.089	0.45	0.17	0.73

Table 6.5-5. - continued -

	Footprint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	678	230.6	103.1	592	505	1082
Oligochaeta	--	3	6.5	2.9	0	0	14
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	101	57.7	25.8	87	29	173
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	14	14.4	6.5	14	0	29
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	118	63.2	28.3	115	29	202
Non-Insecta (%)	17	--	--	--	--	--	--
Oligochaeta	--	3	6.5	2.9	0	0	14
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	101	57.7	25.8	87	29	173
Amphipoda (%)	15	--	--	--	--	--	--
Bivalvia	--	14	14.4	6.5	14	0	29
Bivalvia (%)	2	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 6.5-5. - continued -

	Footprint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	32	15.8	7.1	29	14	58
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 6.5-5. - continued -

	Footprint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	26	21.4	9.6	29	0	58
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	366	232.1	103.8	361	101	736
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	6	7.9	3.5	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	55	31.3	14.0	43	14	87
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	75	47.2	21.1	58	29	144
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	560	186.3	83.3	491	404	880
Insecta (%)	83	--	--	--	--	--	--

Table 6.5-5. - continued -

	Footprint Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	136	67.4	30.1	144	43	231
Chironomidae (%)	20	--	--	--	--	--	--
Ephemeroptera	--	32	15.8	7.1	29	14	58
Ephemeroptera (%)	5	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	32	15.8	7.1	29	14	58
EPT (%)	5	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.41	0.521	0.233	0.20	0.06	1.33
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	7	6	0.5	0.2	6	5	6
Simpson's Diversity Index (D)	--	0.65	0.124	0.055	0.61	0.51	0.81
Evenness (Simpson's Equitability E_D)	--	0.46	0.183	0.082	0.43	0.26	0.75
Shannon-Weaver Index (H)	--	1.39	0.297	0.133	1.24	1.11	1.77
Evenness (Shannon’s Equitability E_H)	--	0.72	0.142	0.063	0.69	0.53	0.91
Hill's Effective Richness ($E^{H'}$)	--	4	1.3	0.6	3	3	6
Evenness ($E^{H'}$/S)	--	0.60	0.168	0.075	0.58	0.38	0.84

Table 6.5-6. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Leftrook Lake within the Churchill River Diversion Region for CAMPP, 2010.

	Leftrook Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	151	78.1	34.9	167	36	226
Oligochaeta	--	18	10.4	4.6	17	8	33
Hirudinea	--	5	2.5	1.1	6	1	7
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	83	63.3	28.3	80	4	151
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	1	0.6	0.3	0	0	2
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	9	7.9	3.5	6	3	23
Gastropoda - unid	--	0	0.6	0.3	0	0	1
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	3	3.0	1.3	1	0	6
Physidae	--	1	0.8	0.3	1	0	2
Planorbidae	--	1	0.8	0.4	1	0	2
Valvatidae	--	0	0.1	0.1	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	1	1.2	0.5	1	0	3
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	122	67.8	30.3	128	24	192
Non-Insecta (%)	80	--	--	--	--	--	--
Oligochaeta	--	18	10.4	4.6	17	8	33
Oligochaeta (%)	12	--	--	--	--	--	--
Amphipoda	--	83	63.3	28.3	80	4	151
Amphipoda (%)	55	--	--	--	--	--	--
Bivalvia	--	9	7.9	3.5	6	3	23
Bivalvia (%)	6	--	--	--	--	--	--
Gastropoda	--	5	3.8	1.7	3	1	10
Gastropoda (%)	3	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0

Table 6.5-6. - continued -

	Leftrook Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	1	1.3	0.6	1	0	3
Elmidae (larva)	--	0	0.1	0.1	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.7	0.3	0	0	2
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	4	2.0	0.9	3	1	6
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	1	1.0	0.5	1	0	3
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.4	0.2	1	0	1
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	4	5.9	2.6	0	0	13
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0

Table 6.5-6. - continued -

	Leftrook Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	4	3.7	1.7	2	1	9
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	4	1.4	0.6	4	2	5
Leptoceridae (larva)	--	2	2.2	1.0	1	0	5
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	2	1.5	0.7	2	0	4
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.9	0.4	0	0	2
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.1	0.1	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	5	3.8	1.7	4	1	11
Orthocladiinae	--	1	0.9	0.4	1	0	2
Tanypodinae	--	1	0.9	0.4	1	0	2
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 6.5-6. - continued -

	Leftrook Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	29	11.5	5.1	34	12	39
Insecta (%)	20	--	--	--	--	--	--
Chironomidae	--	7	4.0	1.8	6	3	13
Chironomidae (%)	5	--	--	--	--	--	--
Ephemeroptera	--	6	6.1	2.7	2	1	13
Ephemeroptera (%)	4	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	5.6	2.5	11	4	19
Trichoptera (%)	8	--	--	--	--	--	--
EPT	--	17	9	4	20	6	27
EPT (%)	11	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.79	1.744	0.780	2.13	1.58	5.86
Genus analysis of Ephemeroptera	Heptageniidae: *Stenomena*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	22	17	1.5	0.7	17	14	18
Simpson's Diversity Index (D)	--	0.71	0.160	0.072	0.74	0.54	0.92
Evenness (Simpson's Equitability E_D)	--	0.27	0.223	0.100	0.20	0.11	0.66
Shannon-Weaver Index (H)	--	1.86	0.451	0.202	1.94	1.37	2.52
Evenness (Shannon's Equitability E_H)	--	0.64	0.148	0.066	0.66	0.49	0.85
Hill's Effective Richness ($E^{H'}$)	--	7	3.3	1.5	7	4	12
Evenness ($E^{H'}$/S)	--	0.37	0.170	0.076	0.37	0.23	0.65

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2911	1185.1	530.0	3261	1169	4083
Oligochaeta	--	193	111.1	49.7	202	72	346
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	6	12.9	5.8	0	0	29
Hyalellidae	--	6	12.9	5.8	0	0	29
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	17	18.8	8.4	14	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	2060	941.6	421.1	2453	649	2986
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	12.9	5.8	0	0	29
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	17	12.1	5.4	14	0	29
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	2306	1036.3	463.4	2727	822	3304
Non-Insecta (%)	79	--	--	--	--	--	--
Oligochaeta	--	193	111.1	49.7	202	72	346
Oligochaeta (%)	7	--	--	--	--	--	--
Amphipoda	--	12	15.8	7.1	0	0	29
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	2060	941.6	421.1	2453	649	2986
Bivalvia (%)	71	--	--	--	--	--	--
Gastropoda	--	23	16.4	7.4	29	0	43
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (larva) – unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	23	12.9	5.8	14	14	43
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	3	6.5	2.9	0	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	6	12.9	5.8	0	0	29
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	280	74.0	33.1	289	159	361
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	294	92.2	41.2	317	173	404
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	606	173.4	77.6	635	346	779
Insecta (%)	21	--	--	--	--	--	--

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	580	161.1	72.1	620	332	736
Chironomidae (%)	20	--	--	--	--	--	--
Ephemeroptera	--	23	12.9	5.8	14	14	43
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	23	13	6	14	14	43
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.04	0.015	0.007	0.04	0.02	0.06
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	6	1.5	0.7	6	4	8
Simpson's Diversity Index (D)	--	0.49	0.087	0.039	0.48	0.42	0.64
Evenness (Simpson's Equitability E_D)	--	0.29	0.081	0.036	0.27	0.18	0.38
Shannon-Weaver Index (H)	--	1.05	0.191	0.086	1.00	0.91	1.38
Evenness (Shannon's Equitability E_H)	--	0.53	0.092	0.041	0.52	0.43	0.67
Hill's Effective Richness ($E^{H'}$)	--	3	0.6	0.3	3	2	4
Evenness ($E^{H'}$/S)	--	0.41	0.100	0.045	0.40	0.27	0.51

Table 6.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Churchill River Diversion Region waterbodies, 2010.

Waterbody	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Rat Lake	GN-01	14	457611	6224524	20-Jul-10	15.58	20.5	10.0	19.5
Rat Lake	GN-02	14	462567	6225347	20-Jul-10	16.27	14.5	11.5	19.5
Rat Lake	GN-03	14	461628	6224305	20-Jul-10	15.62	4.0	1.5	19.5
Rat Lake	GN-04	14	463681	6222542	21-Jul-10	23.30	8.0	6.0	18.5
Rat Lake	GN-05	14	465283	6221935	21-Jul-10	23.02	12.0	7.0	18.5
Rat Lake	GN-06	14	464403	6221796	21-Jul-10	22.42	7.0	2.5	18.5
Rat Lake	GN-07	14	463711	6225919	21-Jul-10	23.93	3.5	1.0	18.5
Rat Lake	GN-08	14	465472	6224538	22-Jul-10	22.70	6.5	1.5	18.5
Rat Lake	GN-09	14	464648	6225178	22-Jul-10	22.87	5.5	1.0	18.5
Rat Lake	SN-01	14	457611	6224524	20-Jul-10	15.58	20.5	-	19.5
Rat Lake	SN-03	14	461628	6224305	20-Jul-10	15.62	4.0	-	19.5
Rat Lake	SN-06	14	464403	6221796	21-Jul-10	22.42	7.0	-	18.5
Threepoint Lake	GN-02	14	502095	6174452	23-Aug-10	46.88	5.8	6.3	15.0
Threepoint Lake	GN-04	14	500133	6174917	23-Aug-10	47.25	2.4	4.3	15.0
Threepoint Lake	GN-05	14	501259	6174416	23-Aug-10	46.25	5.9	5.7	15.0
Threepoint Lake	GN-06	14	503201	6169924	25-Aug-10	23.48	3.9	3.4	14.0
Threepoint Lake	GN-09	14	503842	6172984	25-Aug-10	24.45	4.4	4.5	14.0
Threepoint Lake	GN-13	14	505986	6174705	25-Aug-10	24.03	4.2	1	14.0
Threepoint Lake	GN-15	14	507251	6169354	26-Aug-10	21.10	4.7	4.7	14.0
Threepoint Lake	GN-16	14	507527	6169574	26-Aug-10	20.92	5.9	5	14.0
Threepoint Lake	GN-17	14	508559	6170496	26-Aug-10	20.97	4.3	0.7	14.0
Threepoint Lake	SN-09	14	503334	6169955	25-Aug-10	23.48	3.9	3.4	14.0
Threepoint Lake	SN-15	14	507121	6169444	26-Aug-10	21.10	4.7	4.7	14.0
Threepoint Lake	SN-16	14	507527	6169574	26-Aug-10	20.92	5.9	5	14.0

Table 6.6-1. - continued -

Waterbody	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Footprint Lake	GN-02	14	511178	6187513	21-Aug-10	44.58	3.8	4.6	15.0
Footprint Lake	GN-03	14	509817	6186051	21-Aug-10	43.58	4.8	-	15.0
Footprint Lake	GN-05	14	508121	6182721	18-Aug-10	23.90	11.2	12.0	15.0
Footprint Lake	GN-06	14	509547	6181358	19-Aug-10	23.50	4.8	3.7	14.5
Footprint Lake	GN-09	14	506107	6180601	18-Aug-10	22.95	6.2	6.2	15.0
Footprint Lake	GN-11	14	504994	6179901	18-Aug-10	21.83	7.7	7.5	15.0
Footprint Lake	GN-12	14	509639	6183391	19-Aug-10	23.67	11.2	6.7	15.0
Footprint Lake	GN-13	14	505945	6189559	17-Aug-10	22.70	2.9	2.0	14.0
Footprint Lake	GN-14	14	504360	6186324	17-Aug-10	23.72	3.7	5.4	14.0
Footprint Lake	SN-06	14	509547	6181358	19-Aug-10	23.50	4.8	4.8	14.5
Footprint Lake	SN-09	14	506107	6180601	18-Aug-10	22.95	6.2	6.2	15.0
Footprint Lake	SN-14	14	504360	6186324	17-Aug-10	23.72	3.7	5	14.0
Leftrook Lake	GN-01	14	525927	6216983	25-Jul-10	14.13	4.5	5.5	21.0
Leftrook Lake	GN-02	14	525506	6216031	25-Jul-10	14.68	2.5	2.0	21.0
Leftrook Lake	GN-05	14	523396	6217408	25-Jul-10	15.10	4.5	1.0	21.0
Leftrook Lake	GN-08	14	523809	6213799	26-Jul-10	27.48	5.0	7.0	21.0
Leftrook Lake	GN-09	14	521700	6213666	27-Jul-10	19.97	3.0	-	20.0
Leftrook Lake	GN-10	14	518468	6209942	27-Jul-10	20.83	5.5	5.5	20.0
Leftrook Lake	GN-11	14	519766	6209122	26-Jul-10	23.67	10.0	1.5	21.0
Leftrook Lake	GN-12	14	517109	6213471	27-Jul-10	20.82	2.0	4.0	20.0
Leftrook Lake	GN-13	14	517899	6213124	26-Jul-10	25.02	7.0	2.0	21.0
Leftrook Lake	SN-05	14	523396	6217408	25-Jul-10	15.10	4.5	-	21.0
Leftrook Lake	SN-08	14	523809	6213799	26-Jul-10	27.48	5.0	-	21.0
Leftrook Lake	SN-12	14	517109	6213471	27-Jul-10	20.82	2.0	-	20.0

Table 6.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Churchill River Diversion Region waterbodies, 2010.

Family	Species	Scientific Name	ID Code
Cyprinidae	Emerald Shiner	*Notropis atherinoides*	EMSH
	Spottail Shiner	*Notropis hudsonius*	SPSH
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC
	White Sucker	*Catostomus commersoni*	WHSC
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD
Esocidae	Northern Pike	*Esox lucius*	NRPK
Salmonidae	Cisco	*Coregonus artedi*	CISC
	Lake Whitefish	*Coregonus clupeaformis*	LKWH
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR
Gadidae	Burbot	*Lota lota*	BURB
Cottidae	Sculpin	*Cottus sp.*	COTT
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Sauger	*Sander canadensis*	SAUG
	Walleye	*Sander vitreus*	WALL

Table 6.6-3. Standard gang index gillnet relative abundance summaries from Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake		Threepoint Lake		Footprint Lake		Leftrook Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Emerald Shiner	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-
Longnose Sucker	10	5.13	3	1.14	-	-	-	-
White Sucker	46	23.59	87	33.08	155	32.29	191	35.11
Shorthead Redhorse	-	-	1	0.38	1	0.21	-	-
Northern Pike	21	10.77	32	12.17	42	8.75	71	13.05
Cisco	57	29.23	12	4.56	56	11.67	73	13.42
Lake Whitefish	3	1.54	2	0.76	2	0.42	88	16.18
Troutperch	-	-	-	-	-	-	-	-
Burbot	3	1.54	1	0.38	1	0.21	-	-
Sculpin	-	-	-	-	-	-	-	-
Yellow Perch	5	2.56	3	1.14	21	4.38	13	2.39
Sauger	28	14.36	31	11.79	20	4.17	-	-
Walleye	22	11.28	91	34.60	182	37.92	108	19.85
Total	195	100	263	100	480	100	544	100

n = number of fish caught
RA = percent relative abundance

Table 6.6-4. Small mesh index gillnet relative abundance summaries from Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake		Threepoint Lake		Footprint Lake		Leftrook Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Emerald Shiner	34	57.63	17	14.17	3	4.17	145	35.71
Spottail Shiner	4	6.78	46	38.33	20	27.78	121	29.80
Longnose Sucker	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	1	1.39	2	0.49
Shorthead Redhorse	-	-	-	-	-	-	-	-
Northern Pike	3	5.08	1	0.83	3	4.17	8	1.97
Cisco	6	10.17	5	4.17	4	5.56	5	1.23
Lake Whitefish	-	-	-	-	-	-	-	-
Troutperch	2	3.39	8	6.67	2	2.78	56	13.79
Sculpin	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	7	1.72
Yellow Perch	2	3.39	-	-	-	-	9	2.22
Sauger	2	3.39	28	23.33	11	15.28	-	-
Walleye	6	10.17	15	12.50	28	38.89	53	13.05
Total	59	100	120	100	72	100	406	100

n = number of fish caught
RA = percent relative abundance

Table 6.6-5. Standard gang index gillnet biomass summaries from Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake			Threepoint Lake			Footprint Lake			Leftrook Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	8476	6.62	3	2773	1.48	-	-	-	-	-	-
White Sucker	46	50525	39.46	87	90585	48.27	155	151643	51.32	191	169387	42.48
Shorthead Redhorse	-	-	-	1	1937	1.03	1	394	0.13	-	-	-
Northern Pike	21	13679	10.68	32	33481	17.84	42	28659	9.70	71	45710	11.46
Cisco	57	32700	25.54	12	5306	2.83	56	19529	6.61	73	27956	7.01
Lake Whitefish	3	3672	2.87	2	1779	0.95	2	2216	0.75	88	97981	24.57
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	2699	2.11	1	468	0.25	1	1378	0.47	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	502	0.39	3	725	0.39	21	3787	1.28	13	2009	0.50
Sauger	28	4894	3.82	31	5793	3.09	20	3882	1.31	-	-	-
Walleye	22	10906	8.52	91	44827	23.89	182	83993	28.43	108	55736	13.98
Total	195	128053	100	263	187674	100	480	295481	100	544	398779	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g);
% = percent of total biomass

Table 6.6-6. Small mesh index gillnet biomass summaries from Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake			Threepoint Lake			Footprint Lake			Leftrook Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Emerald Shiner	34	125	2.96	17	77	2.51	3	17	0.22	145	501	2.41
Spottail Shiner	4	15	0.36	46	302	9.91	20	120	1.57	121	598	2.88
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	1	53	0.69	2	123	0.59
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	298	7.06	1	20	0.64	3	923	12.07	8	4630	22.27
Cisco	5	1847	43.77	5	20	0.67	4	74	0.97	5	2175	10.46
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	2	10	0.23	8	44	1.44	2	13	0.16	56	354	1.70
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	7	16	0.08
Yellow Perch	2	20	0.48	-	-	-	-	-	-	9	372	1.79
Sauger	2	346	8.20	28	1803	59.18	11	764	9.99	-	-	-
Walleye	6	1559	36.94	15	781	25.64	28	5683	74.32	53	12018	57.81
Total	58	4221	100	120	3046	100	72	7647	100	406	20787	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g);
% = percent of total biomass

Table 6.6-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m of net/24 h) set in Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake (#sites=9)			Threepoint Lake (#sites=9)			Footprint Lake (#sites=9)			Leftrook Lake (#sites=9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	1.1	2.04	3	0.2	0.39	-	-	-	-	-	-
White Sucker	46	4.7	4.65	87	7.1	3.57	155	14.6	8.67	191	24.9	19.35
Shorthead Redhorse	-	-	-	1	0.1	0.15	1	0.1	0.30	-	-	-
Northern Pike	21	2.3	1.47	32	2.4	1.89	42	4.0	3.06	71	7.6	4.56
Cisco	57	7.8	12.93	12	1.0	1.74	56	4.7	2.97	73	10.3	17.07
Lake Whitefish	3	0.4	0.60	2	0.1	0.30	2	0.2	0.39	88	8.8	15.03
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	0.4	0.66	1	0.1	0.15	1	0.1	0.15	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	0.5	0.93	3	0.2	0.30	21	1.7	2.28	13	1.8	2.76
Sauger	28	3.3	5.22	31	2.5	1.95	20	1.9	1.95	-	-	-
Walleye	22	2.5	2.34	91	5.7	3.99	182	15.0	8.52	108	13.8	7.62
Total	195	22.9	11.46	263	19.2	7.08	480	42.1	17.58	544	67.1	33.42

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m of net/24 h) per site
SD = standard deviation

Table 6.6-8. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m of net/24 h) set in Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake (#sites=3)			Threepoint Lake (#sites=3)			Footprint Lake (#sites=3)			Leftrook Lake (#sites=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Emerald Shiner	34	16.3	22.10	17	6.3	2.04	3	1.0	1.75	145	74.9	122.39
Spottail Shiner	4	1.6	1.61	46	15.7	15.67	20	6.9	3.71	121	40.3	33.29
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	1	0.3	0.59	2	0.8	1.33
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	1.2	1.11	1	0.3	0.34	3	1.0	0.02	8	2.8	1.44
Cisco	6	2.9	2.81	5	1.9	1.90	4	1.4	1.59	5	2.4	3.45
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	2	0.7	1.23	8	3.0	1.65	2	0.7	0.59	56	21.1	18.26
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	7	2.0	3.53
Yellow Perch	2	1.0	1.77	-	-	-	-	-	-	9	3.4	3.03
Sauger	2	0.9	0.78	28	10.7	5.37	11	3.8	3.67	-	-	-
Walleye	6	3.1	5.32	15	5.5	0.68	28	9.6	5.46	53	22.3	11.47
Total	59	27.7	26.95	120	43.4	9.26	72	24.8	12.57	406	169.9	132.29

#sites = number of sites sampled
CPUE = mean catch per unit effort (fish/30 m of net/24 h) per site
SD = standard deviation

Table 6.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m of net/24 h) set in Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake (#sites=9)			Threepoint Lake (#sites=9)			Footprint Lake (#sites=9)			Leftrook Lake (#sites=9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	887	1904	3	172	348	-	-	-	-	-	-
White Sucker	46	5131	5456	87	7351	3279	155	14230	7933	191	21898	15289
Shorthead Redhorse	-	-	-	1	96	287	1	39	116	-	-	-
Northern Pike	21	1462	1358	32	2327	2497	42	2649	1806	71	4865	2798
Cisco	57	4381	7121	12	401	689	56	1681	1604	73	3855	6221
Lake Whitefish	3	537	1454	2	110	222	2	225	501	88	9433	17582
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	398	631	1	23	70	1	72	216	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	51	89	3	36	73	21	284	359	13	278	407
Sauger	28	571	930	31	465	338	20	357	324	-	-	-
Walleye	22	1210	902	91	2773	2091	182	6992	4074	108	7023	3676
Total	195	14628	7142	263	13753	5430	480	26529	12452	544	47352	23126

#sites = number of sites sampled
n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m of net/24 h) per site
SD = standard deviation

Table 6.6-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m of net/24 h) set in Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake (#sites=3)			Threepoint Lake (#sites=3)			Footprint Lake (#sites=3)			Leftrook Lake (#sites=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Emerald Shiner	34	60	82	17	28	14	3	6	10	145	258	421
Spottail Shiner	4	6	7	46	103	178	20	41	12	121	198	176
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	1	18	31	2	47	82
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	142	185	1	7	12	3	315	28	8	1576	917
Cisco	5	944	1608	5	8	13	4	26	35	5	1047	1491
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	2	3	6	8	17	16	2	4	4	56	126	115
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	7	5	8
Yellow Perch	2	10	18	-	-	-	-	-	-	9	120	109
Sauger	2	147	128	28	686	597	11	263	231	-	-	-
Walleye	6	799	1383	15	295	340	28	1952	781	53	4332	1201
Total	58	2111	1521	120	1143	734	72	2626	931	406	7709	2107

#sites = number of sites sampled
n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m of net/24 h) per site
SD = standard deviation

Table 6.6-11. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake			Threepoint Lake			Footprint Lake			Leftrook Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	21	426	127	32	484	124	42	435	110	71	467	47
Lake Whitefish	3	339	176	2	389	76	-	-	-	88	421	55
Walleye	22	341	86	91	351	58	182	346	52	108	367	37
Weight (g)												
Northern Pike	21	1832	282	32	1647	856	42	1580	337	71	672	154
Lake Whitefish	3	1224	1772	2	890	564	2	1108	679	88	1084	353
Walleye	22	582	298	91	545	166	182	531	148	108	546	146
Condition Factor (K)												
Northern Pike	21	0.64	0.05	32	0.70	0.13	42	0.67	0.07	71	0.60	0.07
Lake Whitefish	3	1.68	0.64	2	1.40	0.13	-	-	-	88	1.40	0.16
Walleye	22	1.04	0.09	91	1.05	0.08	182	1.10	0.09	108	1.02	0.07

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 6.6-12. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, and Walleye captured in small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Species	Rat Lake			Threepoint Lake			Footprint Lake			Leftrook Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	1	325	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	3	351	63	-	-	-	-	-	-	-	-	-
Weight (g)												
Northern Pike	3	99	-	1	20	-	3	308	32	8	579	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	6	260	-	-	-	-	28	203	-	53	227	-
Condition Factor (K)												
Northern Pike	1	0.66	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	3	1.08	0.04	-	-	-	-	-	-	-	-	-

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 6.6-13. Year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Age	Year-Class	Rat L		Threepoint L		Footprint L		Leftrook L	
		n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-
2	2008	1	4.76	1	3.13	-	-	3	4.29
3	2007	6	28.57	6	18.75	11	26.83	2	2.86
4	2006	3	14.29	5	15.63	11	26.83	15	21.43
5	2005	6	28.57	7	21.88	5	12.20	30	42.86
6	2004	3	14.29	7	21.88	4	9.76	18	25.71
7	2003	-	-	2	6.25	5	12.20	2	2.86
8	2002	1	4.76	1	3.13	1	2.44	-	-
9	2001	-	-	2	6.25	2	4.88	-	-
10	2000	1	4.76	1	3.13	2	4.88	-	-
Total		21	100	32	100	41	100	70	100

n = number of fish aged (may not equal number of fish caught)

% = percent of total number of fish aged

Table 6.6-14. Year-class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Age	Year-Class	Rat L		Threepoint L		Footprint L		Leftrook L	
		n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-
3	2007	1	100.00	-	-	-	-	1	1.30
4	2006	-	-	-	-	-	-	2	2.60
5	2005	-	-	1	50.00	-	-	10	12.99
6	2004	-	-	-	-	1	50.00	6	7.79
7	2003	-	-	-	-	1	50.00	3	3.90
8	2002	-	-	-	-	-	-	1	1.30
9	2001	-	-	-	-	-	-	4	5.19
10	2000	-	-	-	-	-	-	2	2.60
11	1999	-	-	1	50.00	-	-	3	3.90
12	1998	-	-	-	-	-	-	4	5.19
13	1997	-	-	-	-	-	-	4	5.19
14	1996	-	-	-	-	-	-	2	2.60
15	1995	-	-	-	-	-	-	3	3.90
16	1994	-	-	-	-	-	-	4	5.19
17	1993	-	-	-	-	-	-	7	9.09
18	1992	-	-	-	-	-	-	5	6.49
19	1991	-	-	-	-	-	-	2	2.60
20	1990	-	-	-	-	-	-	4	5.19
21	1989	-	-	-	-	-	-	1	1.30
22	1988	-	-	-	-	-	-	2	2.60
23	1987	-	-	-	-	-	-	1	1.30
24	1986	-	-	-	-	-	-	3	3.90
25	1985	-	-	-	-	-	-	1	1.30
26	1984	-	-	-	-	-	-	1	1.30
27	1983	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	1	1.30
Total		1	100	2	100	2	100	77	100

n = number of fish aged (may not equal number of fish caught)

% = percent of total number of fish aged

Table 6.6-15. Year-class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Age	Year-Class	Rat L		Threepoint L		Footprint L		Leftrook L	
		n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-
2	2008	-	-	1	1.14	-	-	-	-
3	2007	1	6.25	2	2.27	2	1.27	-	-
4	2006	3	18.75	6	6.82	10	6.37	2	1.85
5	2005	2	12.50	6	6.82	9	5.73	2	1.85
6	2004	-	-	3	3.41	5	3.18	3	2.78
7	2003	-	-	7	7.95	14	8.92	2	1.85
8	2002	2	12.50	16	18.18	32	20.38	9	8.33
9	2001	1	6.25	9	10.23	33	21.02	9	8.33
10	2000	2	12.50	2	2.27	13	8.28	13	12.04
11	1999	3	18.75	2	2.27	5	3.18	18	16.67
12	1998	1	6.25	2	2.27	2	1.27	12	11.11
13	1997	1	6.25	2	2.27	3	1.91	7	6.48
14	1996	-	-	15	17.05	18	11.46	6	5.56
15	1995	-	-	6	6.82	7	4.46	9	8.33
16	1994	-	-	1	1.14	2	1.27	6	5.56
17	1993	-	-	-	-	1	0.64	1	0.93
18	1992	-	-	1	1.14	1	0.64	1	0.93
19	1991	-	-	3	3.41	-	-		0.00
20	1990	-	-	3	3.41	-	-	1	0.93
21	1989	-	-	1	1.14	-	-	3	2.78
22	1988	-	-	-	-	-	-	3	2.78
23	1987	-	-	-	-	-	-	1	0.93
Total		16	100	88	100	157	100	108	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 6.6-16. Mean fork length- (mm), weight- (g) and condition factor- (K), at-age for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Age	Year-Class	Rat Lake									Threepoint Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	1	300	-	1	171	-	1	0.63	-	1	325	-	1	204	-	1	0.59	-
3	2006	6	324	22	6	224	47	6	0.65	0.03	6	353	22	6	266	43	6	0.60	0.06
4	2005	3	407	48	3	435	126	3	0.64	0.04	5	411	18	5	438	75	5	0.63	0.05
5	2004	6	424	22	6	492	95	6	0.64	0.05	7	454	41	7	609	135	7	0.65	0.09
6	2003	3	511	28	3	772	208	3	0.57	0.08	7	529	36	7	1038	282	7	0.69	0.08
7	2002	-	-	-	-	-	-	-	-	-	2	588	61	2	1657	740	2	0.79	0.12
8	2001	1	532	-	1	1086	-	1	0.72	-	1	680	-	1	2150	-	1	0.68	-
9	2000	-	-	-	-	-	-	-	-	-	2	745	18	2	4000	495	2	0.97	0.05
10	1999	1	871	-	1	4500	-	1	0.68	-	1	760	-	1	4500	-	1	1.03	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

.

Table 6.6-16. - continued -

Age	Year-Class	Footprint Lake									Leftrook Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	3	343	24	3	269	65	3	0.66	0.04
3	2006	11	338	21	11	252	53	11	0.65	0.04	2	387	59	2	405	165	2	0.68	0.03
4	2005	11	370	42	11	336	91	11	0.66	0.06	15	436	32	15	536	129	15	0.64	0.07
5	2004	5	445	31	5	552	94	5	0.63	0.05	30	475	22	30	652	103	30	0.61	0.08
6	2003	4	507	34	4	878	187	4	0.67	0.04	18	499	30	18	772	146	18	0.61	0.04
7	2002	5	537	36	5	1065	291	5	0.67	0.08	2	543	3	2	927	202	2	0.58	0.11
8	2001	1	505	-	1	871	-	1	0.68	-	-	-	-	-	-	-	-	-	-
9	2000	2	666	39	2	2310	28	2	0.80	0.15	-	-	-	-	-	-	-	-	-
10	1999	2	679	30	2	2400	283	2	0.77	0.01	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation
.

Table 6.6-17. Mean fork length- (mm), weight- (g) and condition factor- (K), at-age for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Age	Year-Class	Rat Lake									Threepoint Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	1	250	-	1	236	-	1	1.51	-	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2005	-	-	-	-	-	-	-	-	-	1	335	-	1	491	-	1	1.31	-
6	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	1	442		1	1288		1	1.49	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

.

Table 6.6-17. - continued -

Age	Year-Class	Footprint Lake FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Leftrook Lake FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	1	341	-	1	529	-	1	1.33	-
4	2006	-	-	-	-	-	-	-	-	-	2	297	114	2	377	392	2	1.11	0.16
5	2005	-	-	-	-	-	-	-	-	-	10	349	38	10	623	227	10	1.42	0.09
6	2004	-	-	-	1	628	-	-	-	-	6	381	41	6	823	288	6	1.43	0.15
7	2003	-	-	-	1	1588	-	-	-	-	3	417	15	3	1030	105	3	1.42	0.06
8	2002	-	-	-	-	-	-	-	-	-	1	415	-	1	1129	-	1	1.58	-
9	2001	-	-	-	-	-	-	-	-	-	4	439	12	4	1147	98	4	1.36	0.06
10	2000	-	-	-	-	-	-	-	-	-	2	419	12	2	1003	132	2	1.37	0.06
11	1999	-	-	-	-	-	-	-	-	-	3	442	15	3	1291	121	3	1.50	0.10
12	1998	-	-	-	-	-	-	-	-	-	4	437	20	4	1161	83	4	1.40	0.12
13	1997	-	-	-	-	-	-	-	-	-	4	435	7	4	1086	114	4	1.32	0.12
14	1996	-	-	-	-	-	-	-	-	-	2	474	4	2	1684	62	2	1.58	0.01
15	1995	-	-	-	-	-	-	-	-	-	3	453	34	3	1499	355	3	1.61	0.38
16	1994	-	-	-	-	-	-	-	-	-	4	457	36	4	1313	280	4	1.37	0.08
17	1993	-	-	-	-	-	-	-	-	-	7	445	14	7	1354	188	7	1.54	0.22
18	1992	-	-	-	-	-	-	-	-	-	5	476	15	5	1638	121	5	1.52	0.08
19	1991	-	-	-	-	-	-	-	-	-	2	484	52	2	1531	380	2	1.35	0.09
20	1990	-	-	-	-	-	-	-	-	-	4	456	19	4	1380	415	4	1.43	0.24
21	1989	-	-	-	-	-	-	-	-	-	1	450	-	1	1362	-	1	1.49	-
22	1988	-	-	-	-	-	-	-	-	-	2	470	36	2	1443	239	2	1.40	0.09
23	1987	-	-	-	-	-	-	-	-	-	1	480	-	1	1408	-	1	1.27	-
24	1986	-	-	-	-	-	-	-	-	-	3	452	9	3	1196	176	3	1.29	0.16
25	1985	-	-	-	-	-	-	-	-	-	1	435	-	1	1109	-	1	1.35	-
26	1984	-	-	-	-	-	-	-	-	-	1	465	-	1	1218	-	1	1.21	-
27	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-	1	452	-	1	967	-	1	1.05	-
29	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation
.

Table 6.6-18. Mean fork length- (mm), weight- (g) and condition factor- (K), at-age for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Age	Year-Class	Rat Lake									Threepoint Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	1	210	-	1	93	-	1	1.0	-
3	2007	1	219	-	1	98	-	1	0.93	-	2	224	23	2	113	27	2	1.0	0.06
4	2006	3	231	11	3	117	10	3	0.95	0.06	6	245	23	6	154	46	6	1.02	0.07
5	2005	2	316	13	2	340	38	2	1.08	0.01	6	288	59	6	269	202	6	1.01	0.04
6	2004	-	-	-	-	-	-	-	-	-	3	335	18	3	384	40	3	1.02	0.06
7	2003	-	-	-	-	-	-	-	-	-	7	354	21	7	448	82	7	1.00	0.04
8	2002	2	346	6	2	460	29	2	1.11	0.01	16	357	30	16	474	121	16	1.02	0.05
9	2001	1	464	-	1	960	-	1	0.96	-	9	377	33	9	569	146	9	1.04	0.04
10	2000	2	365	21	2	520	134	2	1.06	0.09	2	370	14	2	491	34	2	0.97	0.04
11	1999	3	409	8	3	778	107	3	1.13	0.10	2	369	10	2	503	11	2	1.00	0.06
12	1998	1	405	-	1	695	-	1	1.05	-	2	372	14	2	561	58	2	1.09	0.01
13	1997	1	501	-	1	1400	-	1	1.11	-	2	399	1	2	787	37	2	1.24	0.04
14	1996	-	-	-	-	-	-	-	-	-	15	393	32	15	684	169	15	1.10	0.09
15	1995	-	-	-	-	-	-	-	-	-	6	365	26	6	546	141	6	1.11	0.07
16	1994	-	-	-	-	-	-	-	-	-	1	481	-	1	1256	-	1	1.13	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	1	388	-	1	610	-	1	1.04	-
19	1991	-	-	-	-	-	-	-	-	-	3	364	39	3	542	222	3	1.08	0.08
20	1990	-	-	-	-	-	-	-	-	-	3	359	28	3	517	105	3	1.11	0.06
21	1989	-	-	-	-	-	-	-	-	-	1	390	-	1	617	-	1	1.04	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

.

Table 6.6-18. - continued -

Age	Year-Class	Footprint Lake									Leftrook Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	2	217	1	2	106	2	2	1.04	0.01	-	-	-	-	-	-	-	-	-
4	2006	10	243	31	10	154	55	10	1.03	0.08	2	216	8	2	101	6	2	1.01	0.06
5	2005	9	287	27	9	249	63	9	1.04	0.10	2	308	11	2	299	31	2	1.03	0.00
6	2004	5	324	18	5	368	76	5	1.07	0.07	3	289	21	3	247	57	3	1.02	0.03
7	2003	14	341	20	14	422	65	14	1.07	0.09	2	329	1	2	352	37	2	0.99	0.09
8	2002	32	356	22	32	484	94	32	1.06	0.08	9	360	24	9	484	103	9	1.03	0.08
9	2001	33	365	30	33	526	121	33	1.07	0.09	9	350	13	9	454	57	9	1.06	0.07
10	2000	13	368	22	13	522	93	13	1.04	0.06	13	356	17	13	461	90	13	1.01	0.10
11	1999	5	382	18	5	589	85	5	1.05	0.08	18	361	17	18	489	67	18	1.03	0.04
12	1998	2	408	46	2	774	245	2	1.13	0.02	12	384	24	12	603	118	12	1.06	0.09
13	1997	3	384	31	3	651	190	3	1.13	0.10	7	386	32	7	578	138	7	1.00	0.06
14	1996	18	402	20	18	702	112	18	1.07	0.08	6	386	25	6	588	95	6	1.02	0.09
15	1995	7	396	19	7	607	125	7	0.97	0.14	9	394	26	9	641	135	9	1.04	0.06
16	1994	2	383	38	2	583	117	2	1.04	0.10	6	384	25	6	567	106	6	0.99	0.06
17	1993	1	350	-	1	396	-	1	0.92	-	1	386	-	1	637	-	1	1.11	-
18	1992	1	350	-	1	400	-	1	0.93	-	1	424	-	1	777	-	1	1.02	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	1	415	-	1	621	-	1	0.87	-
21	1989	-	-	-	-	-	-	-	-	-	3	394	9	3	551	81	3	0.90	0.07
22	1988	-	-	-	-	-	-	-	-	-	3	400	21	3	645	94	3	1.01	0.03
23	1987	-	-	-	-	-	-	-	-	-	1	410	-	1	646	-	1	0.94	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

.

Table 6.6-19. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n[1]	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Rat Lake											
White Sucker	1	2.17	-	-	-	-	-	-	46	1	2.17
Northern Pike	-	-	-	-	-	-	-	-	21	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	3	0	0.00
Walleye	-	-	-	-	-	-	-	-	22	0	0.00
Threepoint Lake											
White Sucker	1	0.45	-	-	1	0.45	-	-	221	2	0.90
Northern Pike	-	-	-	-	-	-	-	-	90	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	11	0	0.00
Walleye	1	0.51	-	-	-	-	-	-	196	1	0.51
Footprint Lake											
White Sucker	-	-	-	-	1	0.65	-	-	155	1	0.65
Northern Pike	-	-	-	-	-	-	-	-	42	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	2	0	0.00
Walleye	-	-	-	-	-	-	-	-	182	0	0.00
Leftrook Lake											
White Sucker	7	3.66	-	-	-	-	-	-	191	1	3.66
Northern Pike	-	-	-	-	-	-	-	-	71	0	0.00
Lake Whitefish	1	1.14	-	-	-	-	-	-	88	1	1.14
Walleye	-	-	-	-	-	-	-	-	108	0	0.00

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect} \times 100$);
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect} \times 100$)

Table 6.7-1. Mean arithmetic (± standard error, SE) and standardized (± 95% confidence limit, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, Walleye, and Yellow Perch from Rat, Threepoint, and Leftrook lakes in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Rat L	Northern Pike	22	0.450	0.065	0.655	0.539 - 0.796
	Walleye	25	0.492	0.030	0.566	0.517 - 0.621
	Lake Whitefish	3	0.063	0.037	-*	0.000 - 0.174
	Yellow Perch	0	-	-	-	-
Threepoint L	Northern Pike	32	0.502	0.039	0.591	0.527 - 0.663
	Walleye	36	0.510	0.036	0.577	0.495 - 0.673
	Lake Whitefish	2	0.082	0.040	-*	0.000 - 0.202
	Yellow Perch	0	-	-	-	-
Leftrook L	Northern Pike	36	0.247	0.017	0.392	0.317 - 0.484
	Walleye	36	0.220	0.017	0.255	0.216 - 0.301
	Lake Whitefish	36	0.044	0.004	0.026	0.022 - 0.031
	Yellow Perch	3	0.029	0.007	-*	0.008 - 0.050

* The relationship between mercury concentration and fish length was not significant; the CL is for the arithmetic mean.

Table 6.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from Rat, Threepoint, and Leftrook lakes in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Rat L	Northern Pike	22	421.2 ± 26.8	632.1 ± 191.9	0.64 ± 0.01	4.6 ± 0.4
	Walleye [a]	25	342.6 ± 16.5	495.4 ± 65.4	1.04 ± 0.02	8.0 ± 0.8
	Lake Whitefish	3	338.7 ± 101.4	1224.0 ± 102.3	1.68 ± 0.19	-
	Yellow Perch	0	-	-	-	-
Threepoint L	Northern Pike	32	483.9 ± 21.8	1046.3 ± 201.6	0.69 ± 0.02	5.2 ± 0.3
	Walleye	36	358.3 ± 8.7	511.5 ± 34.3	1.04 ± 0.01	11.0 ± 0.8
	Lake Whitefish	2	388.5 ± 53.5	889.5 ± 398.5	1.40 ± 0.09	8.0 ± 3.0
	Yellow Perch	0	-	-	-	-
Leftrook L	Northern Pike	36	469.8 ± 7.4	645.1 ± 28.3	0.61 ± 0.01	5.1 ± 0.2
	Walleye	36	352.9 ± 0.6	462.6 ± 18.6	1.02 ± 0.01	11.1 ± 0.6
	Lake Whitefish [b]	36	418.2 ± 10.5	1099.1 ± 74.2	1.41 ± 0.02	13.8 ± 1.2
	Yellow Perch	3	78.3 ± 4.4	6.9 ± 1.1	1.42 ± 0.13	1.0 ± 0.0

[a] n = 16 for age
[b] n = 30 for age

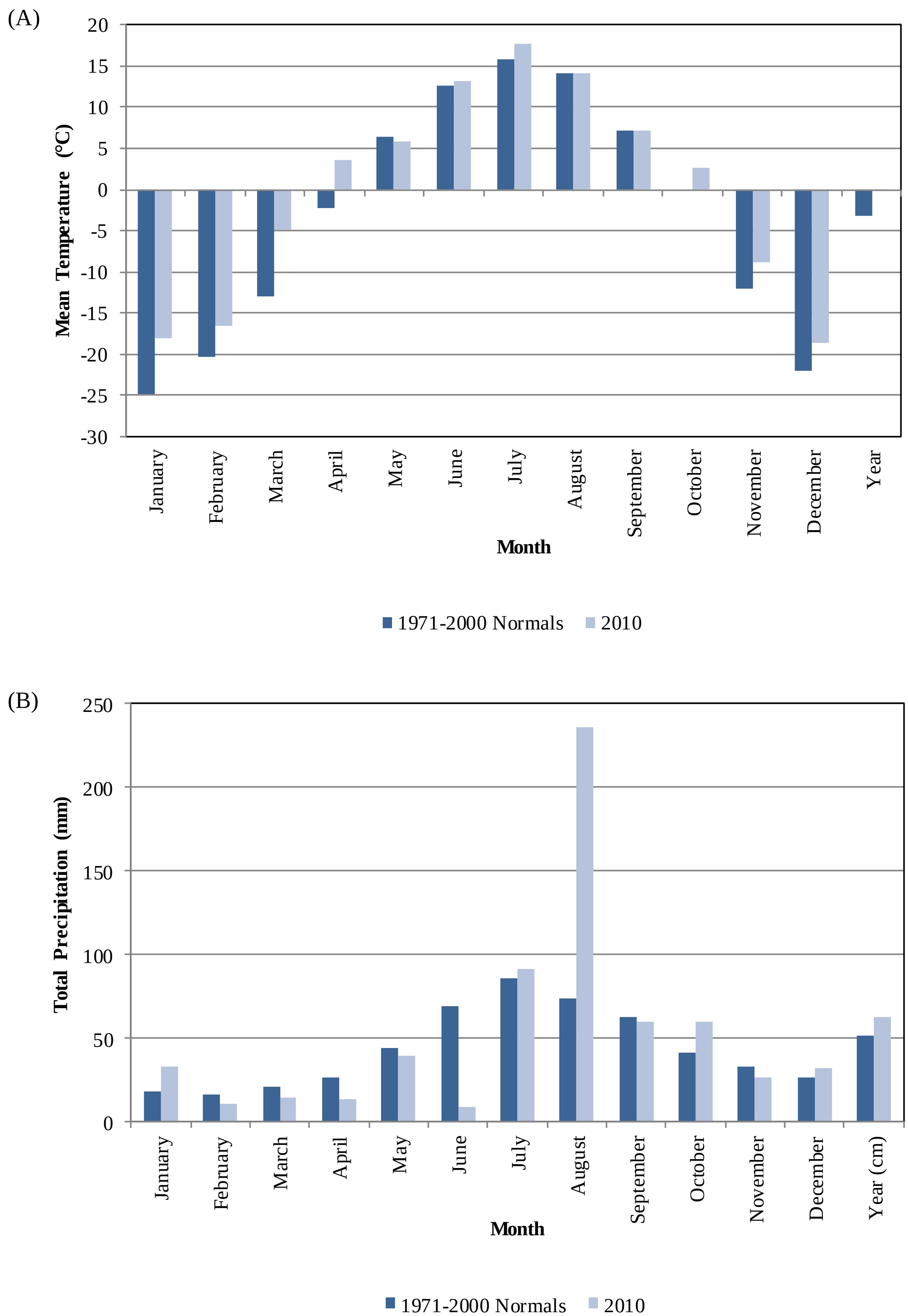


Figure 6.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Thompson, MB.

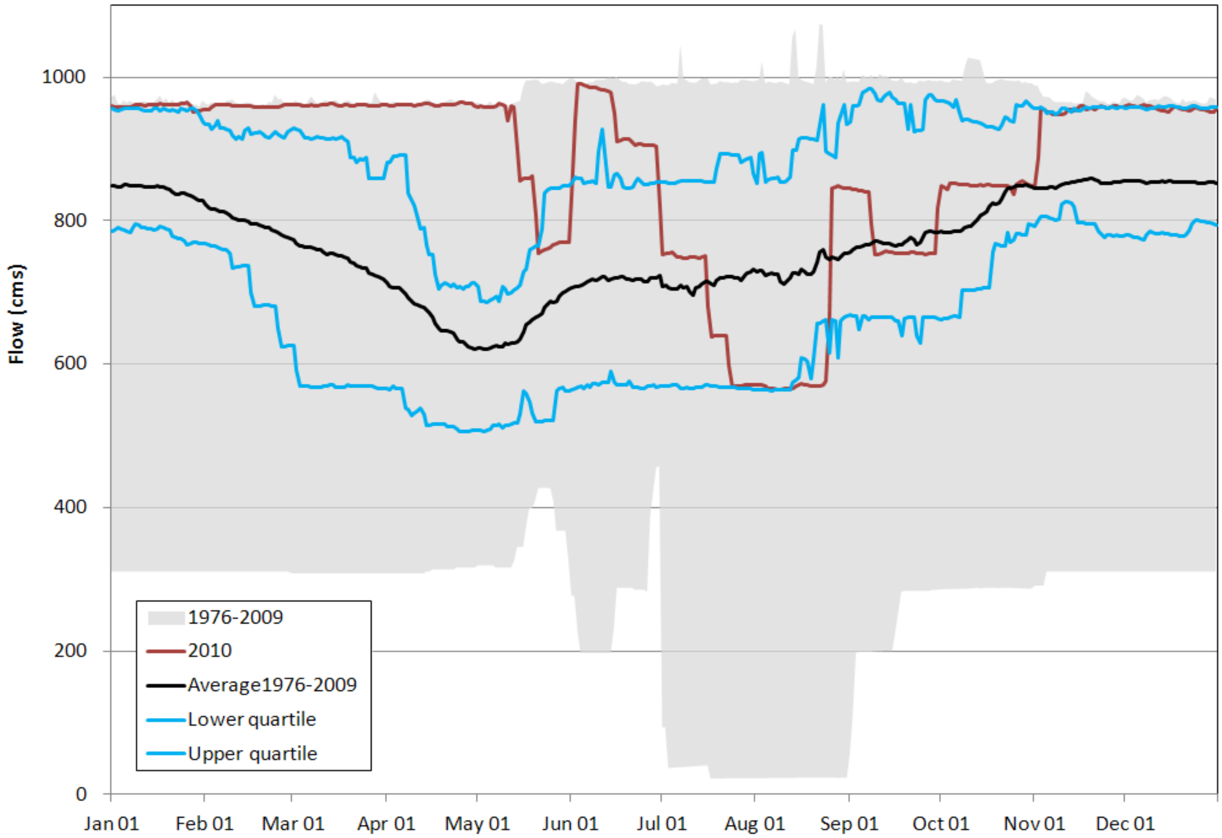


Figure 6.2-1. Flow of the Churchill River Diversion at the Notigi Control Structure in 2010.

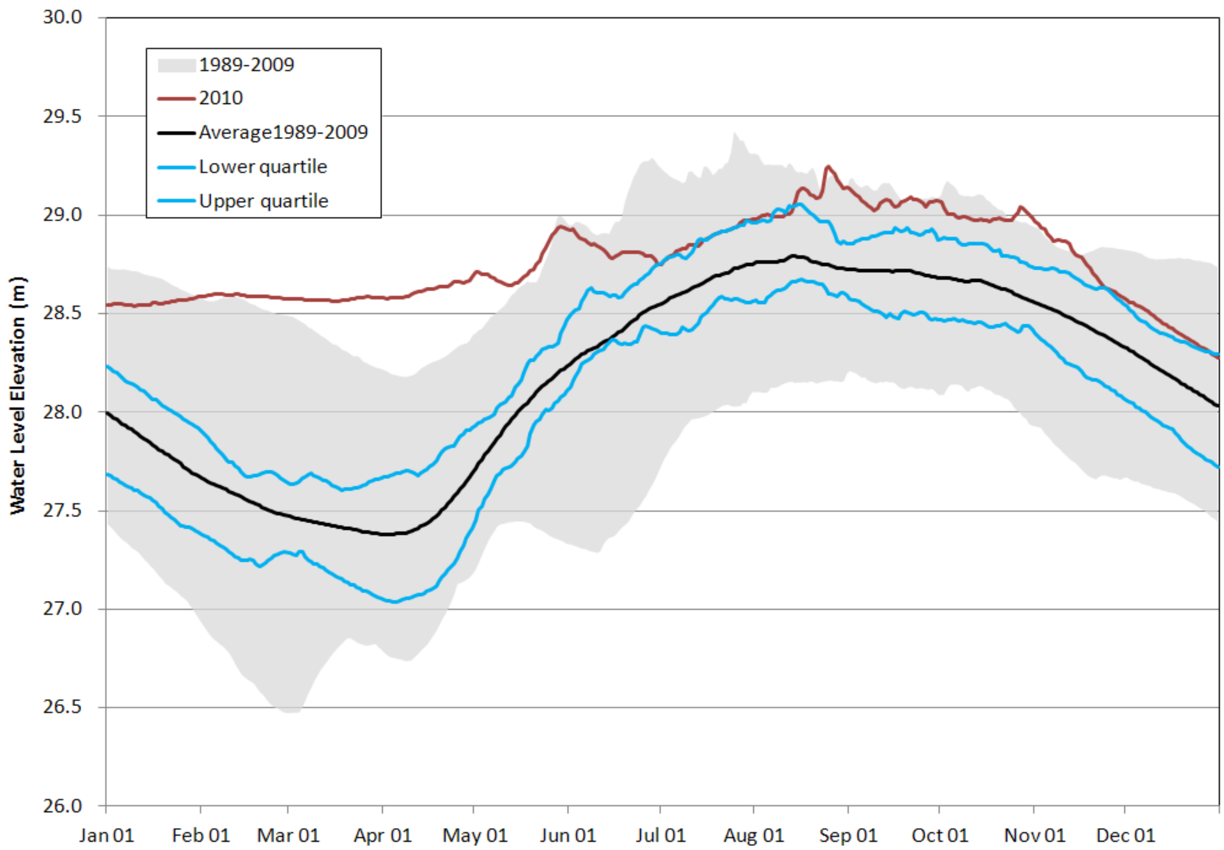


Figure 6.2-2. Water level elevation of Rat Lake (05TF004) in 2010.

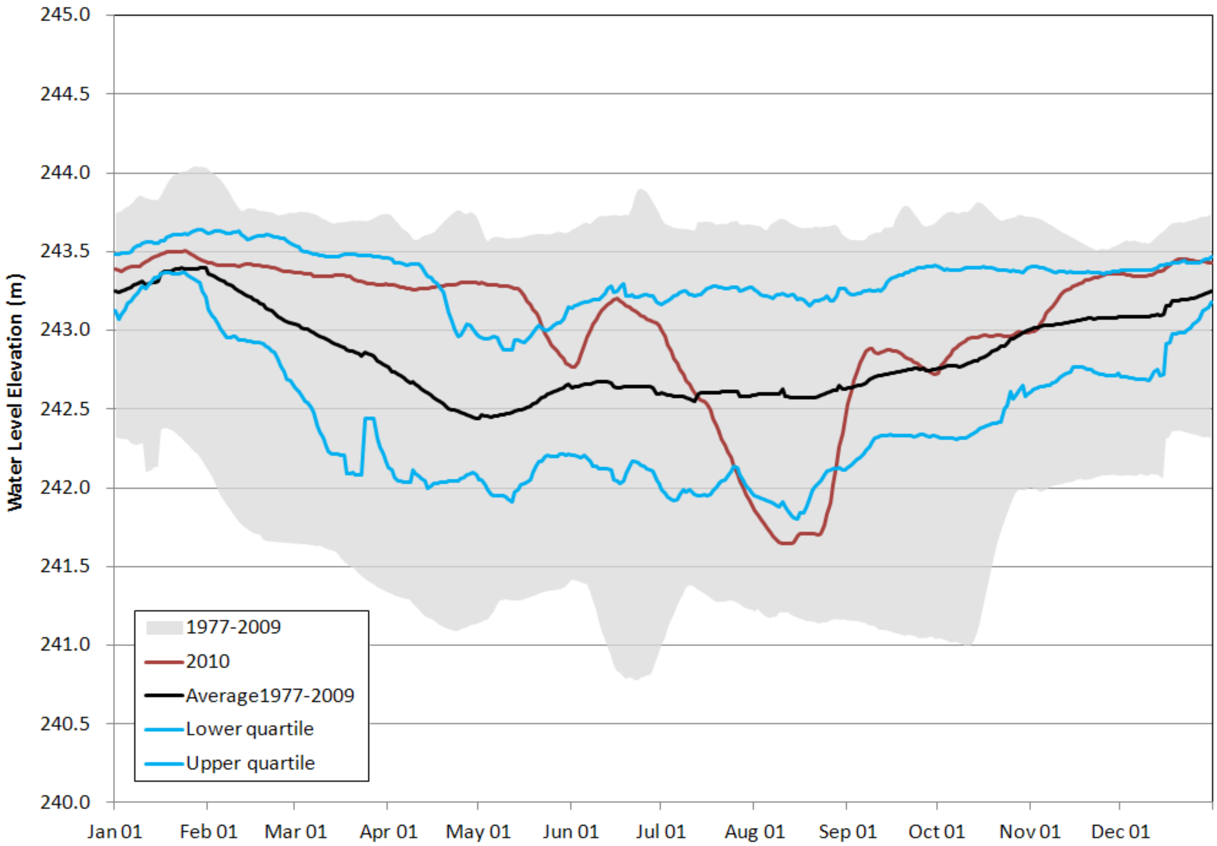


Figure 6.2-3. Water level elevation of Footprint Lake (05TF001) in 2010.

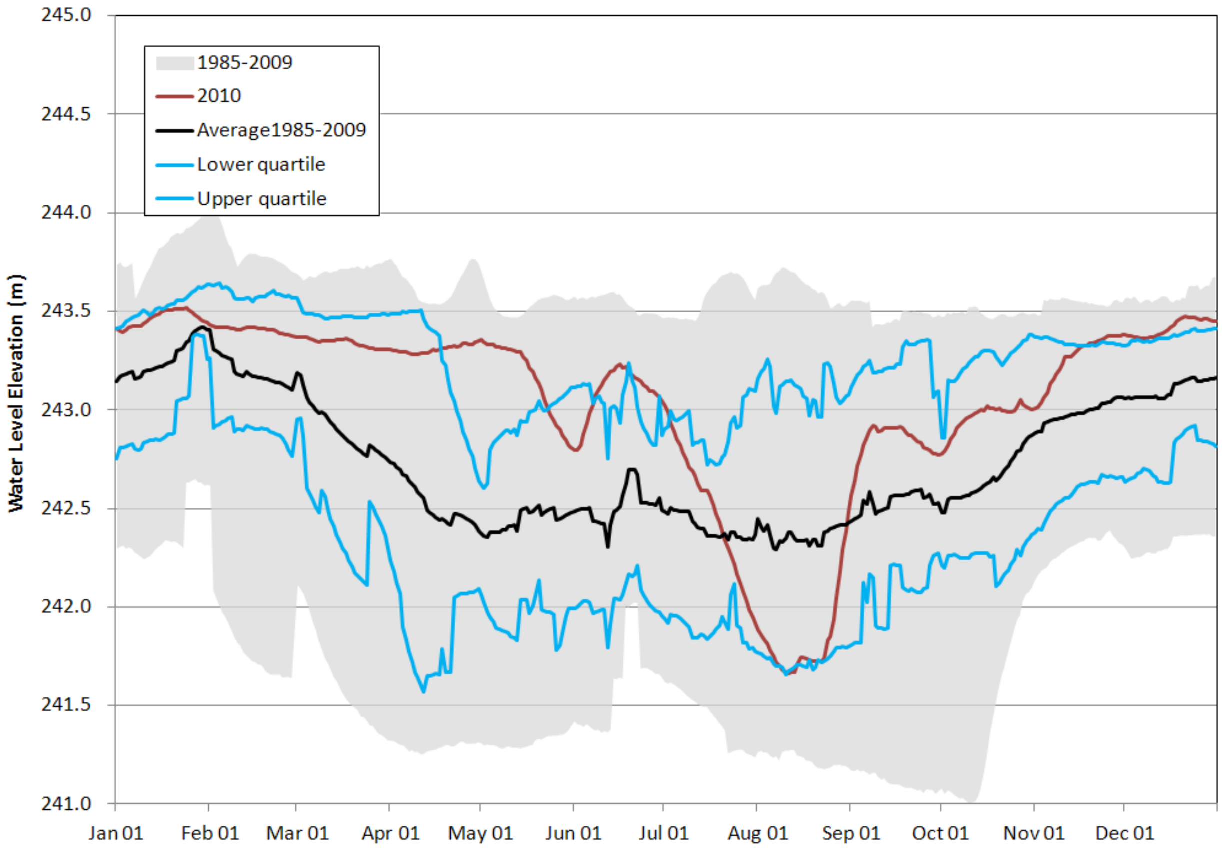


Figure 6.2-4. Water level elevation of Threepoint Lake (05TF003) in 2010.

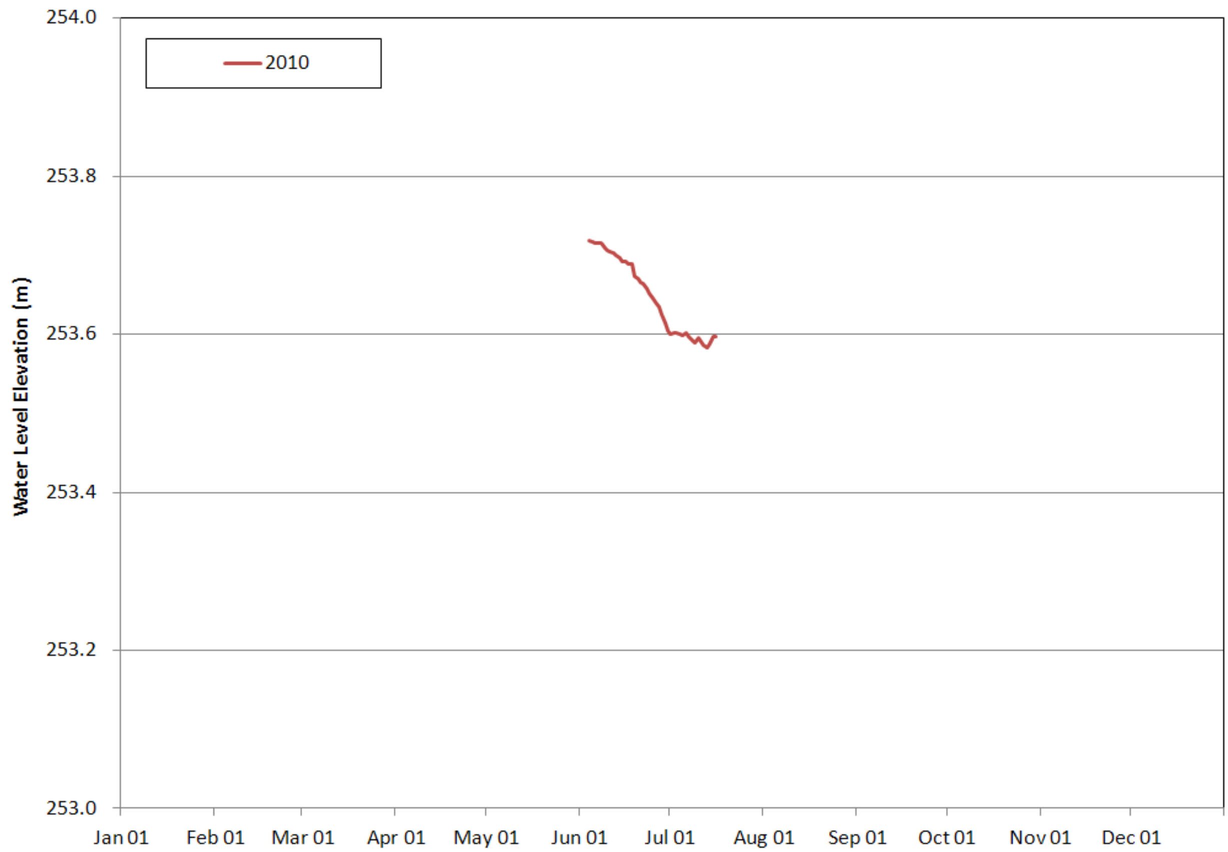


Figure 6.2-5. Water level elevation of Leftrook Lake (05TF784) in 2010.

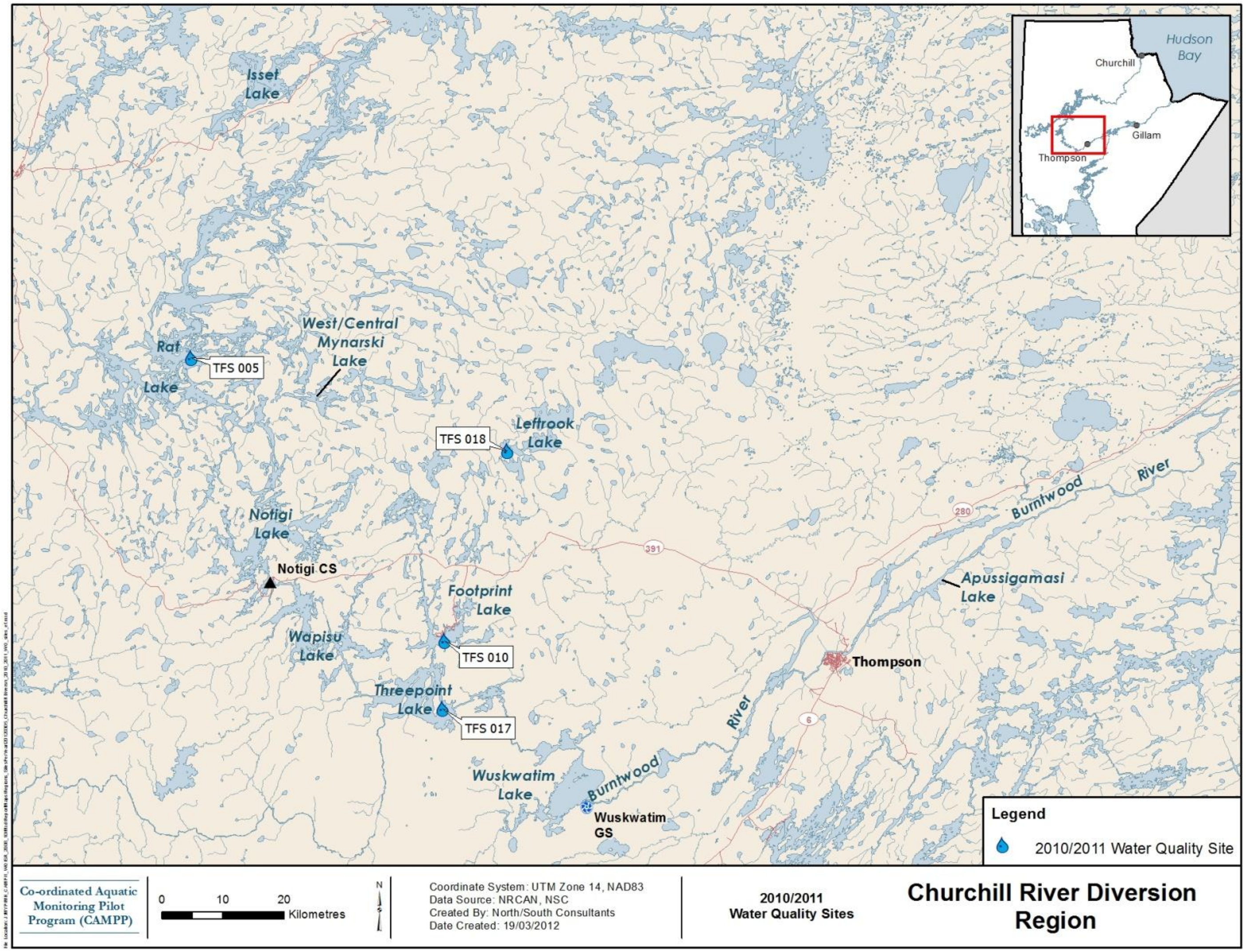


Figure 6.3-1. Water quality and phytoplankton monitoring sites in the Churchill River Diversion Region: 2010/2011.

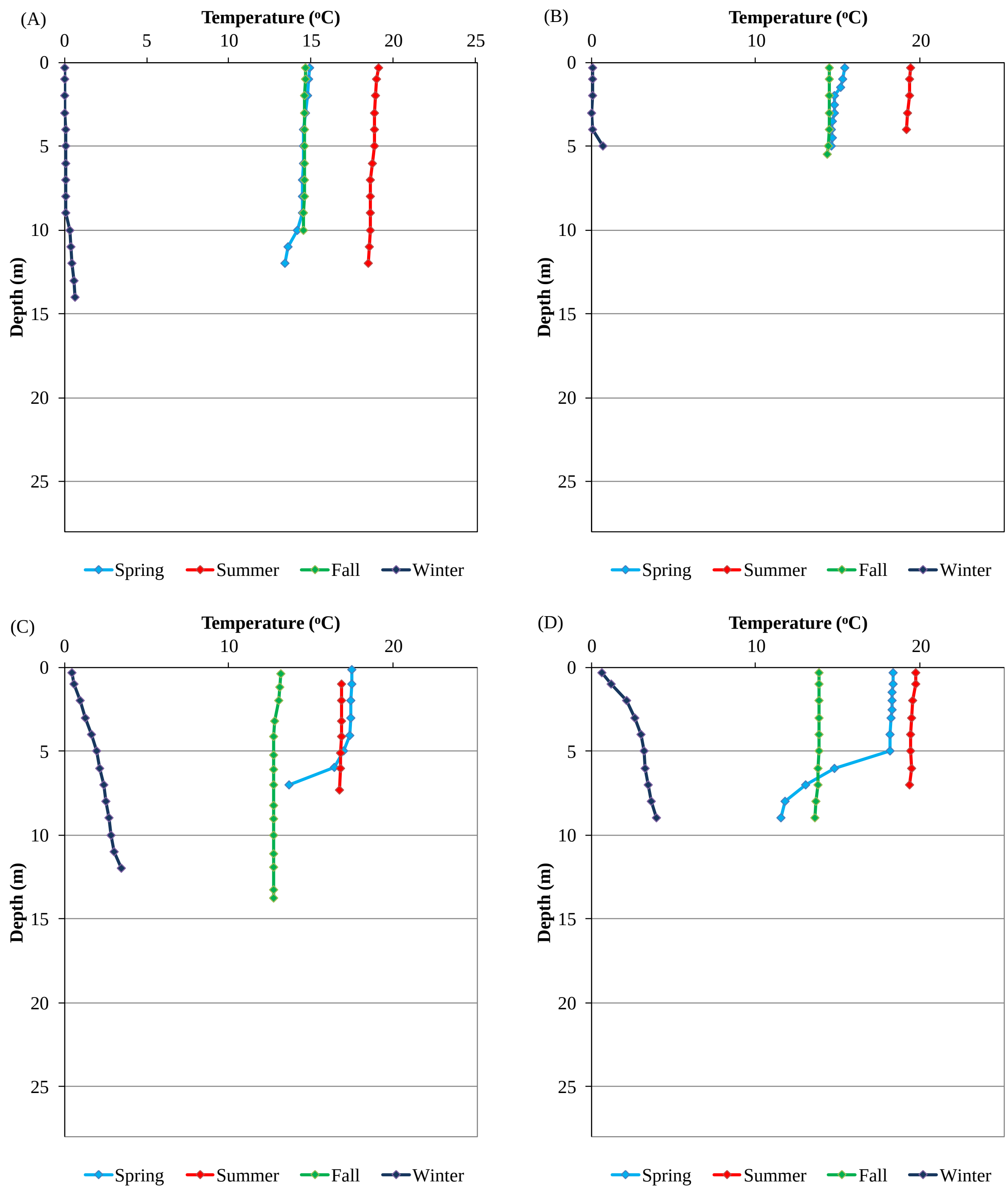


Figure 6.3-2. Water temperature profiles measured in the Churchill River Diversion Region in 2010/2011: (A) Rat Lake; (B) Threepoint Lake; (C) Footprint Lake; and (D) Leftrook Lake.

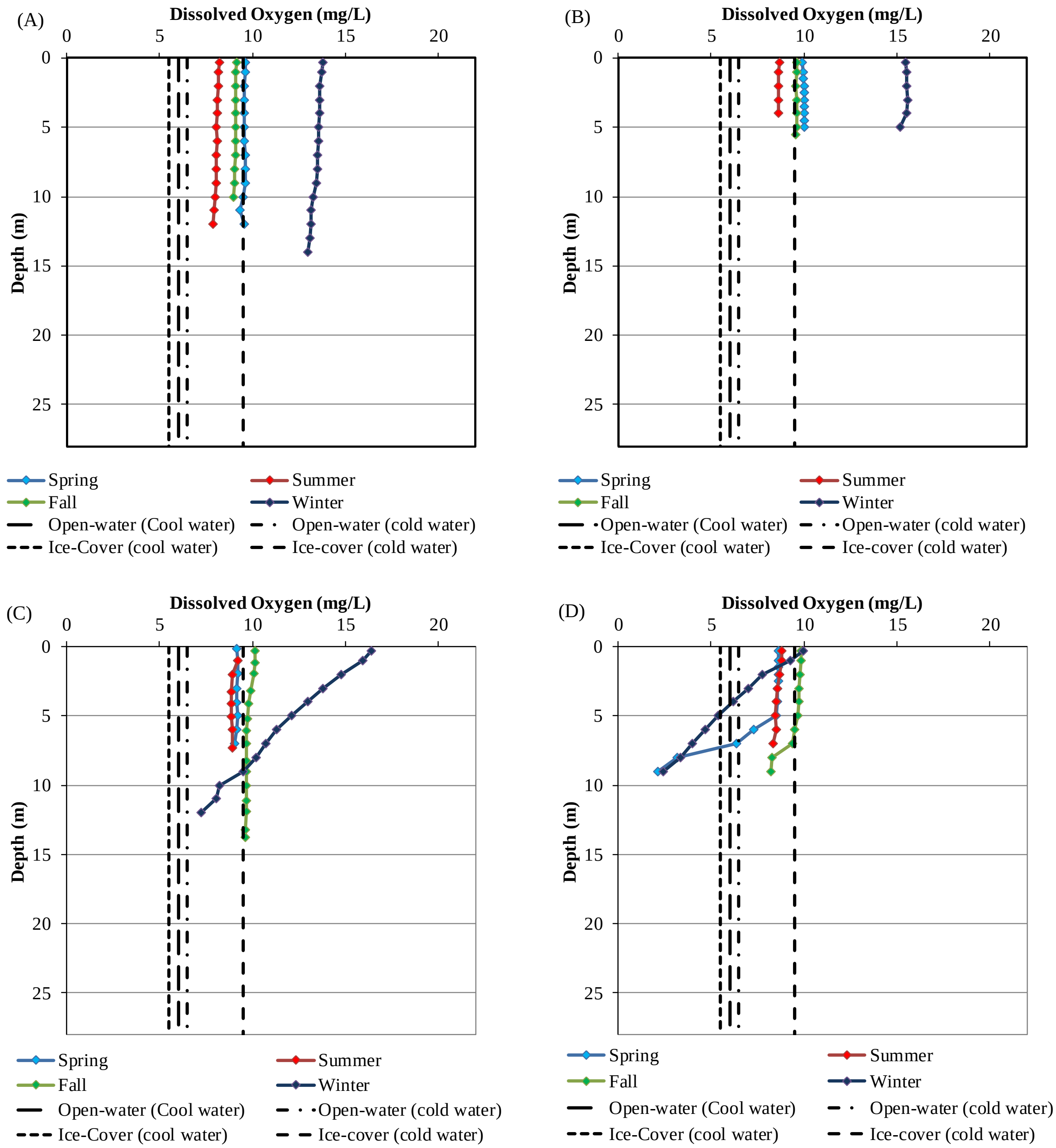


Figure 6.3-3. Dissolved oxygen depth profiles measured in the Churchill River Diversion Region in 2010/2011: (A) Rat Lake; (B) Threepoint Lake; (C) Footprint Lake; and (D) Leftrook Lake. Dashed lines represent selected MWQSOGs for PAL.

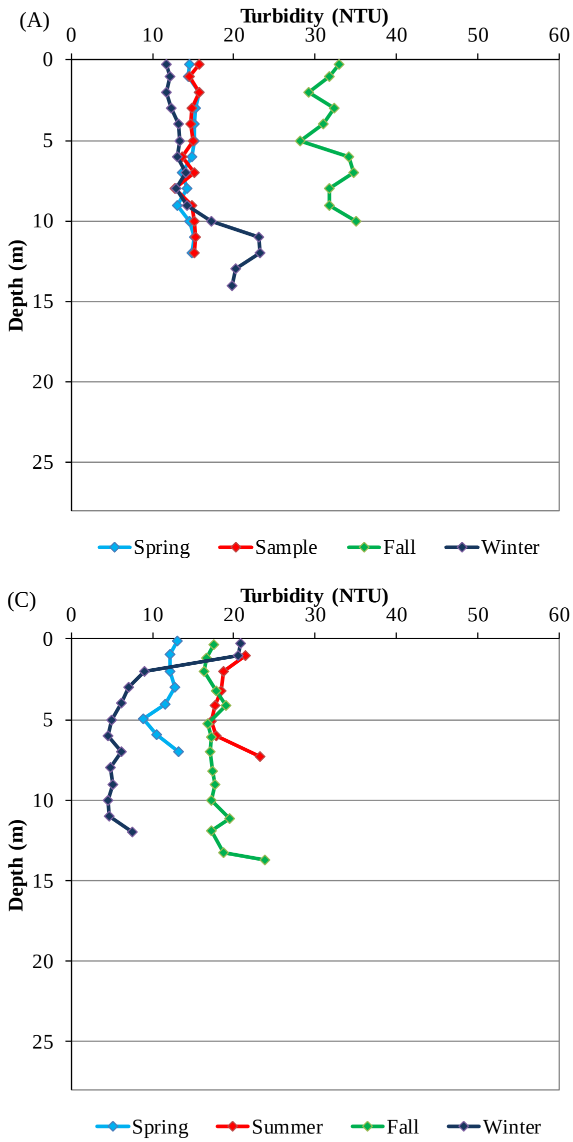


Figure 6.3-4. Turbidity depth profiles measured in the Churchill River Diversion Region in 2010/2011: (A) Rat Lake; (B) Threepoint Lake; (C) Footprint Lake; and (D) Leftrook Lake.

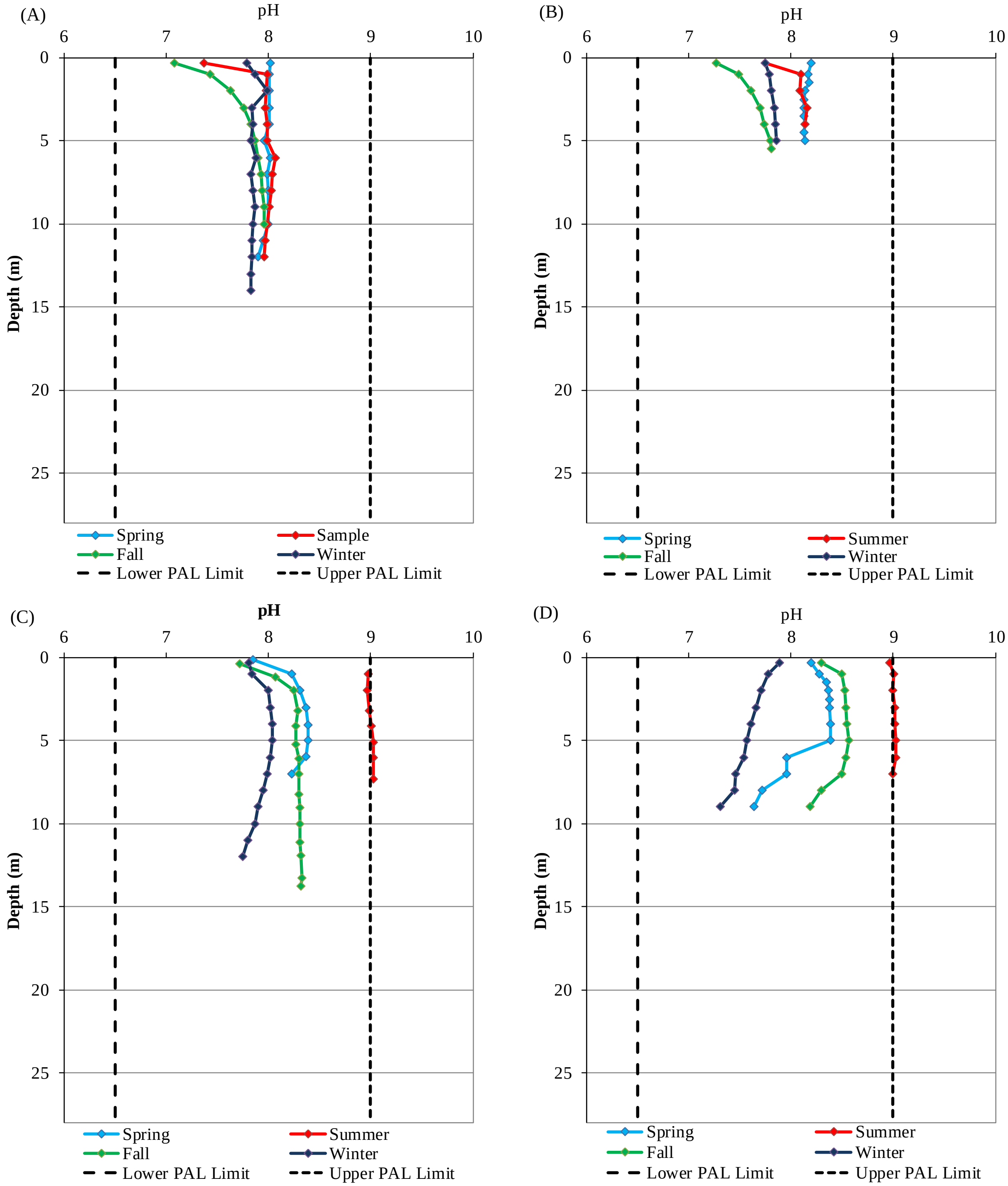


Figure 6.3-5. pH depth profiles measured in the Churchill River Diversion Region in 2010/2011: (A) Rat Lake; (B) Threepoint Lake; (C) Footprint Lake; and (D) Leftrook Lake. Dashed lines represent selected MWQSOGs for PAL.

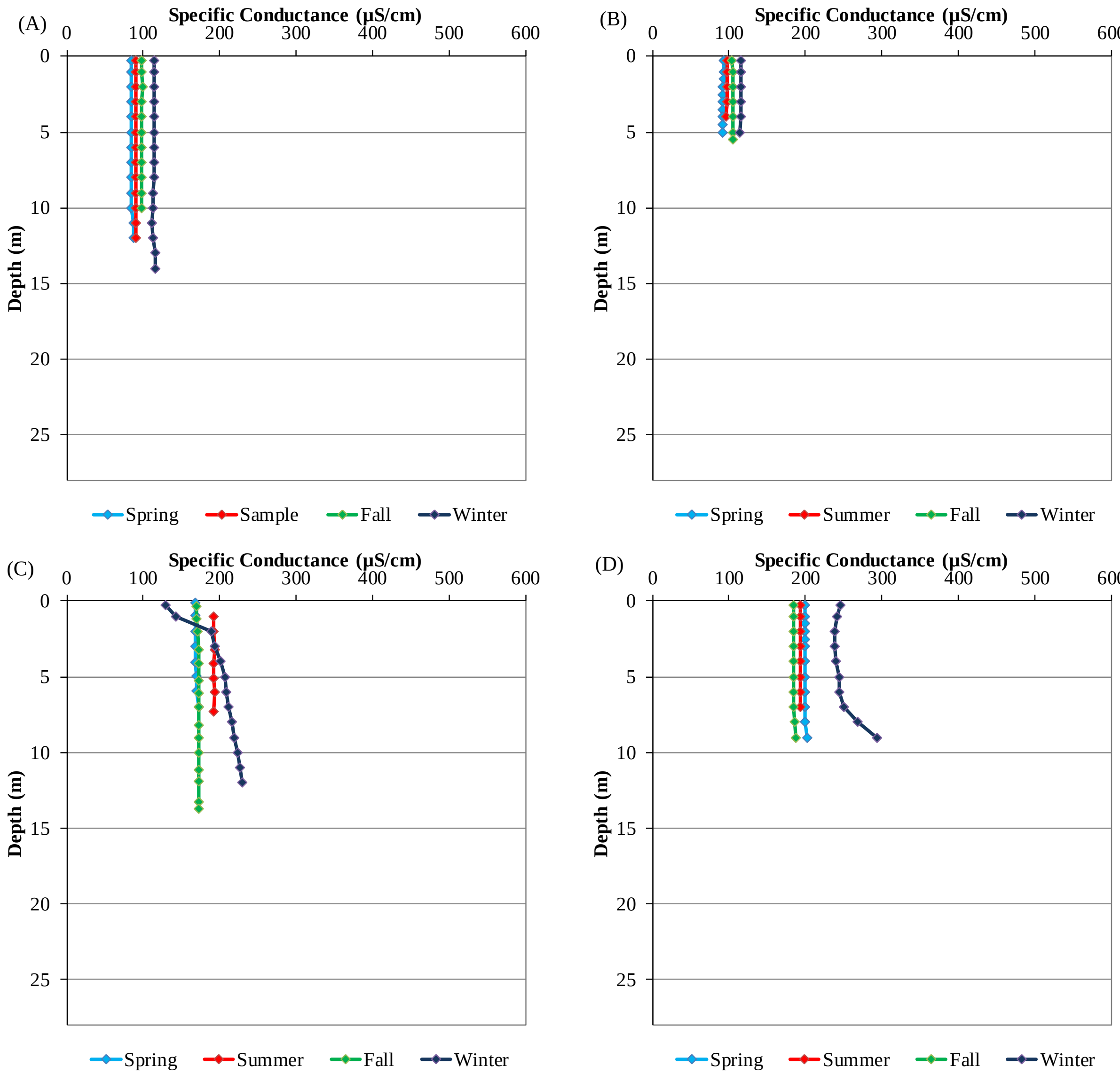


Figure 6.3-6. Specific conductance depth profiles measured in the Churchill River Diversion Region in 2010/2011: (A) Rat Lake; (B) Threepoint Lake; (C) Footprint Lake; and (D) Leftrook Lake.

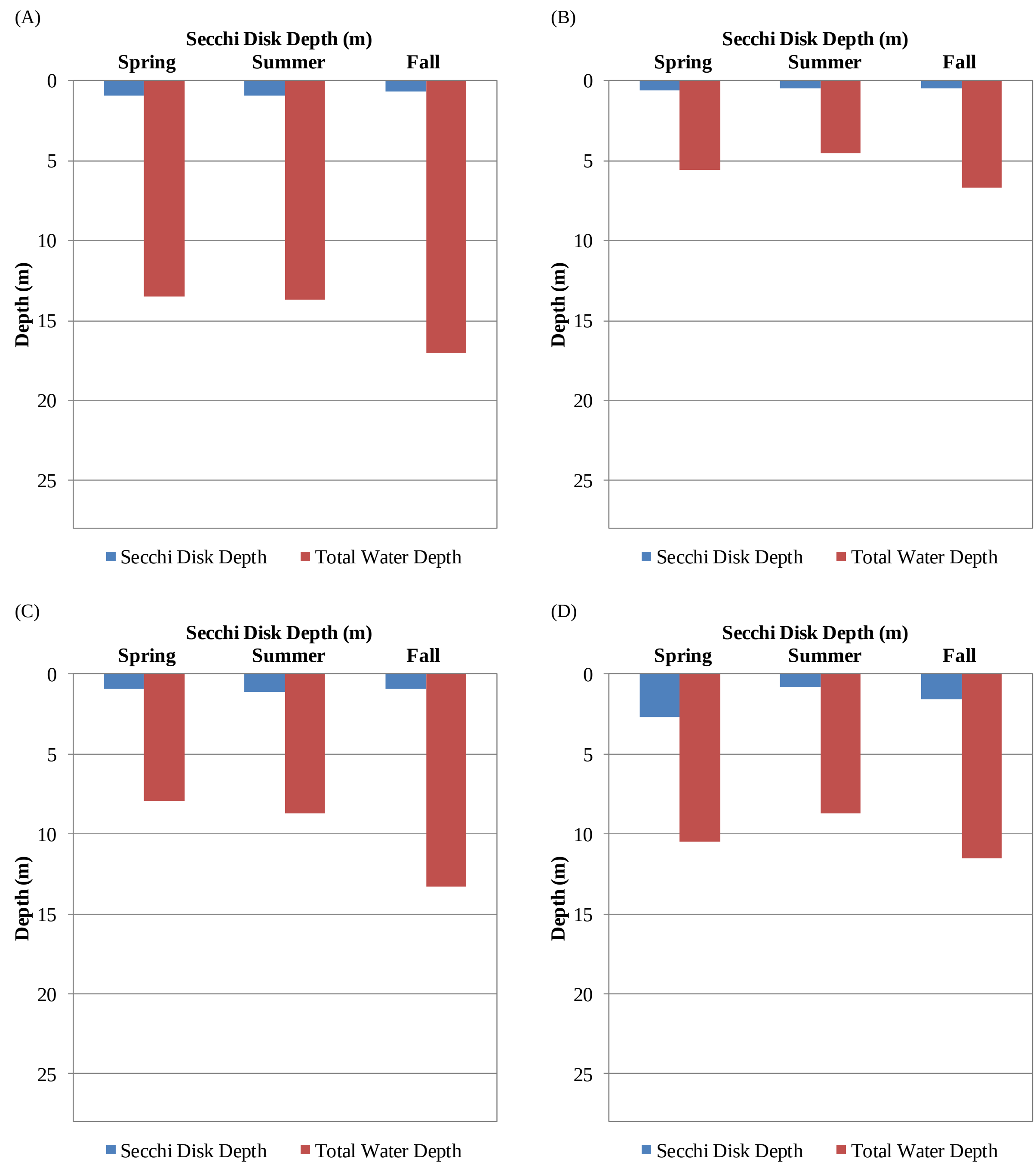


Figure 6.3-7. Secchi disk depths measured in the Churchill River Diversion Region in 2010/2011: (A) Rat River; (B) Threepoint Lake; (C) Footprint Lake; and (D) Leftrook Lake.

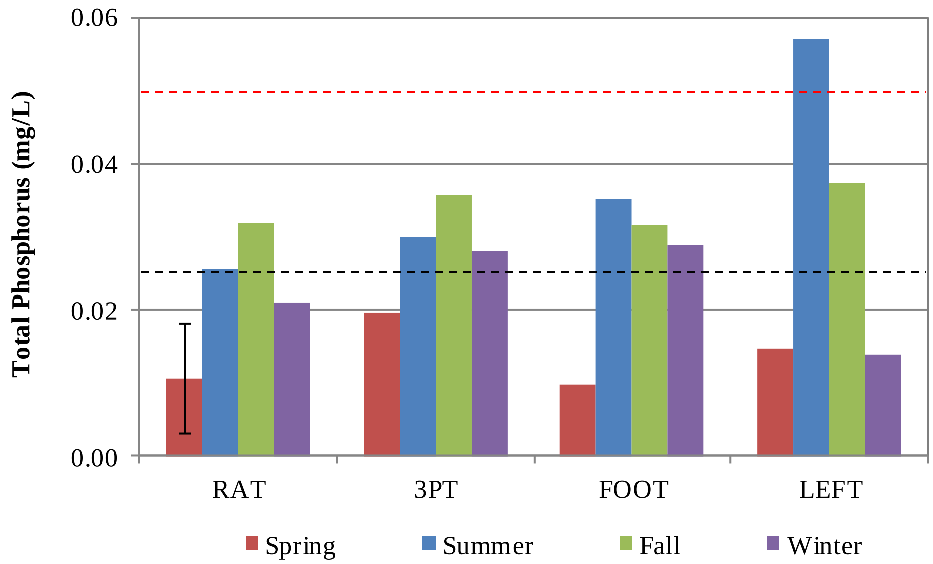


Figure 6.3-8. Total phosphorus measured in surface grabs in the Churchill River Diversion Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

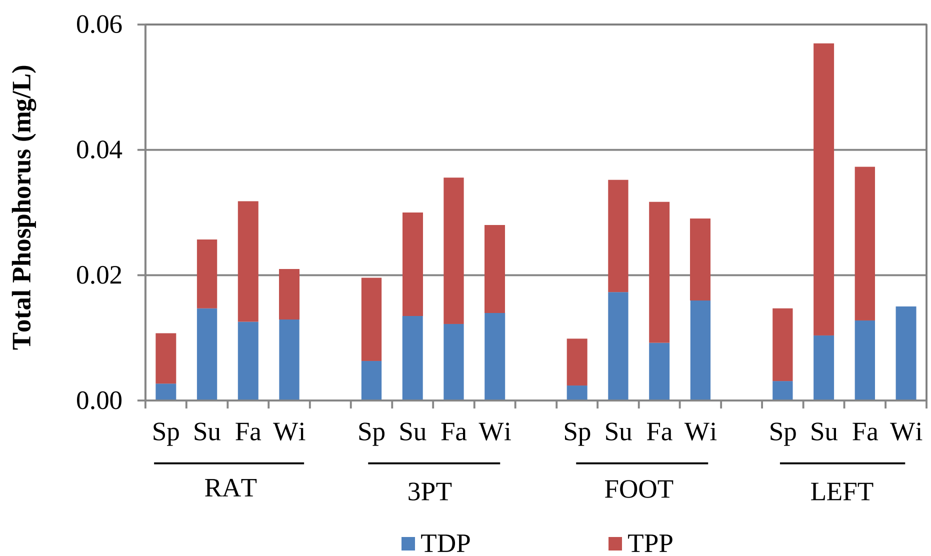


Figure 6.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Churchill River Diversion Region: 2010/2011.

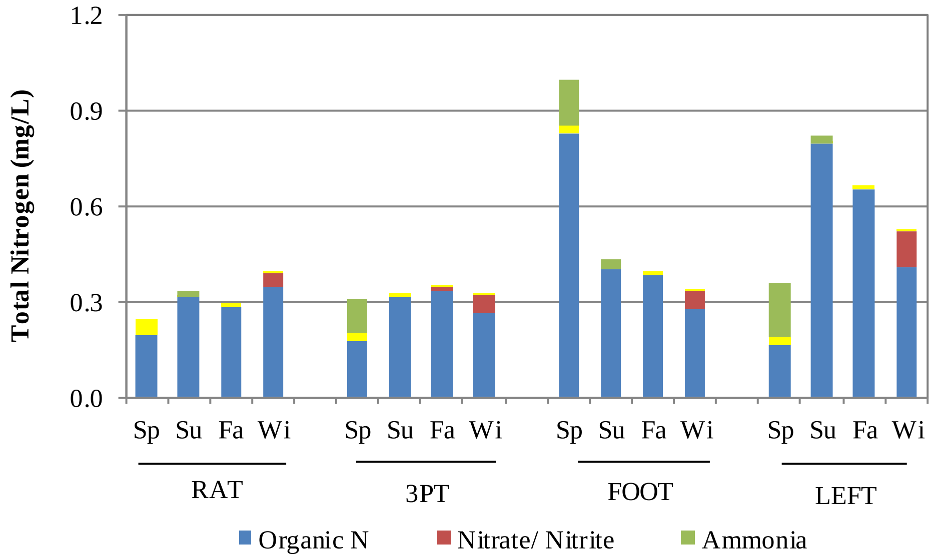


Figure 6.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Churchill River Diversion Region: 2010/2011. Yellow bars represent values that were below the analytical detection limit.

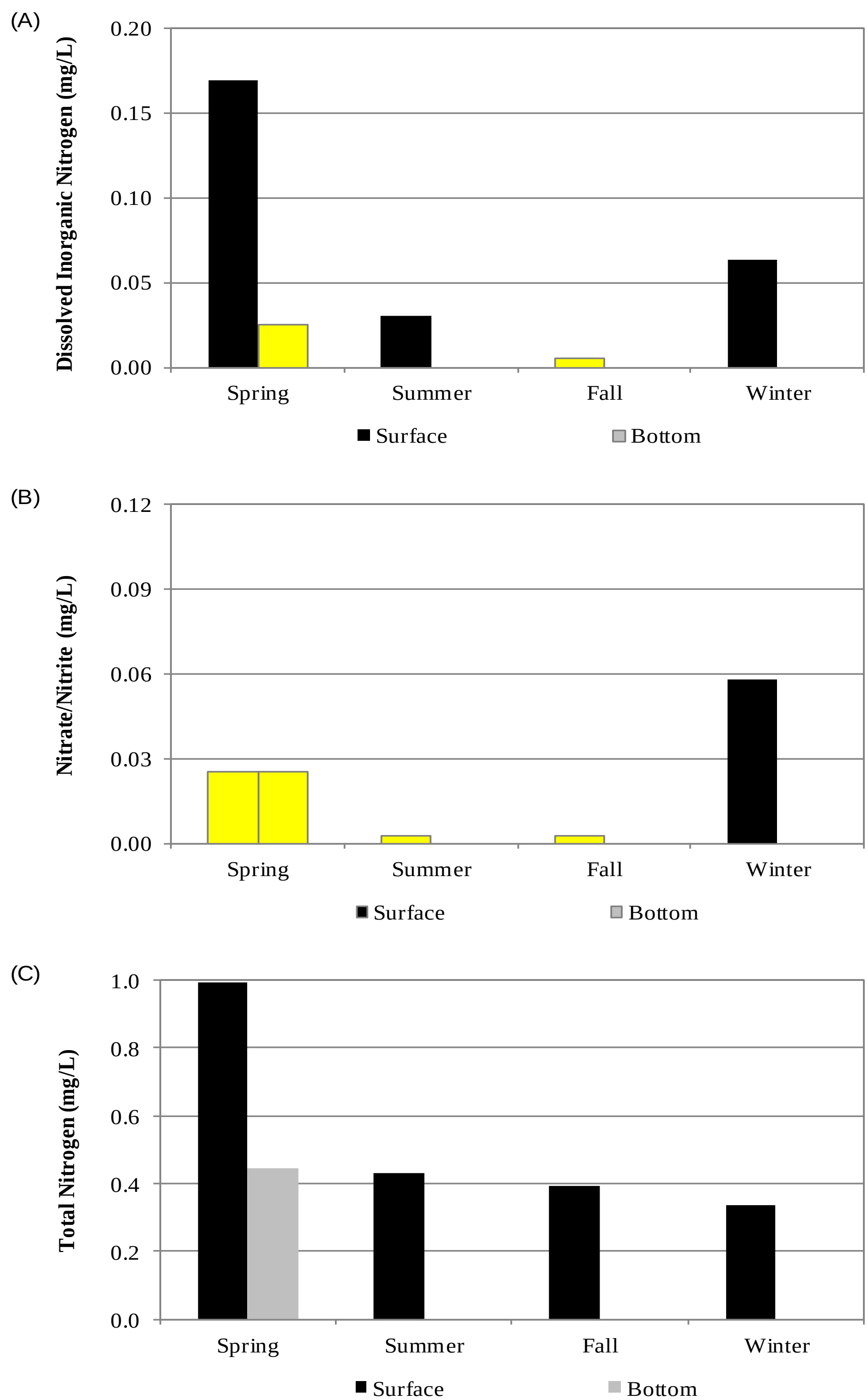


Figure 6.3-11. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Footprint Lake, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

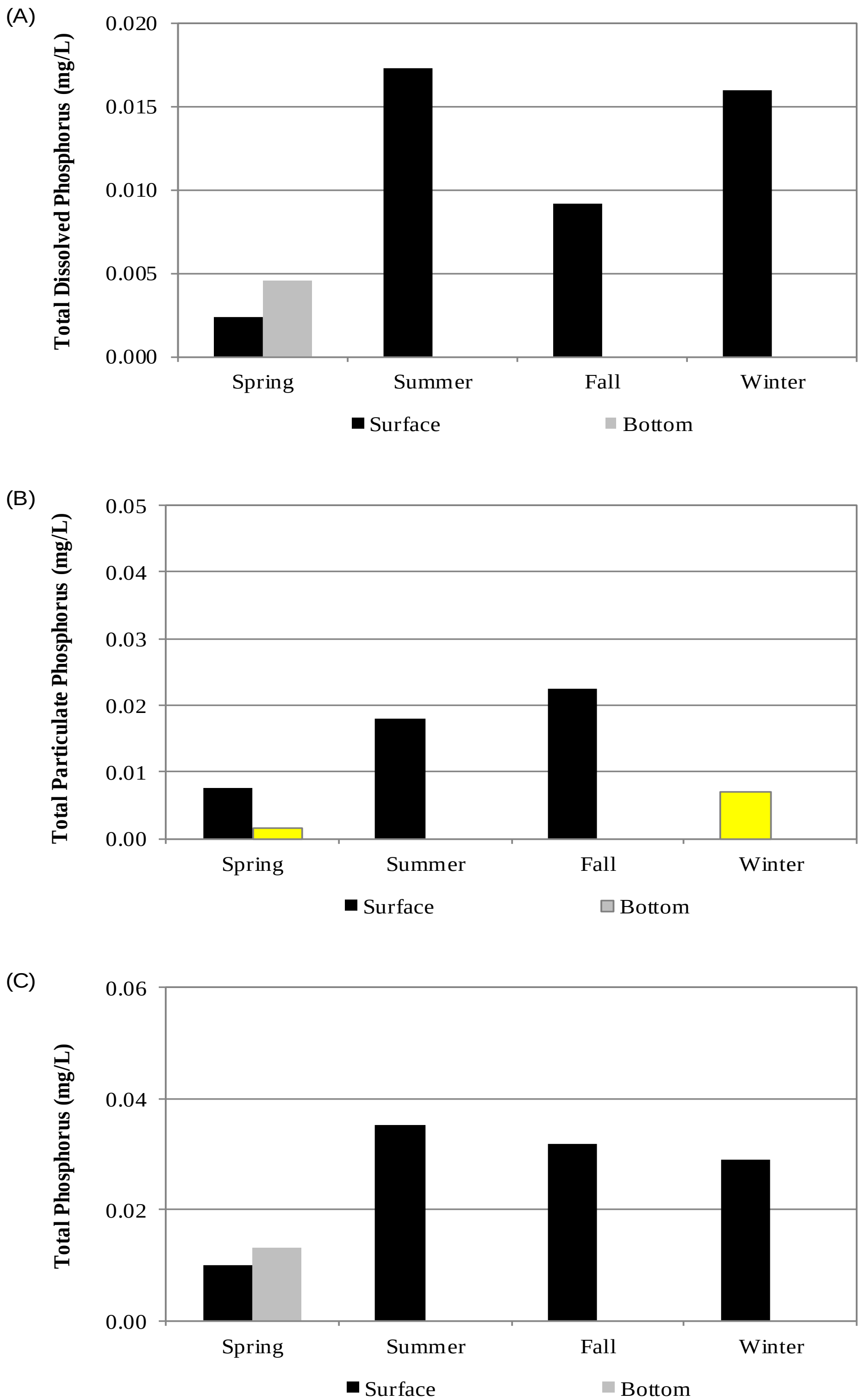


Figure 6.3-12. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Footprint Lake, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

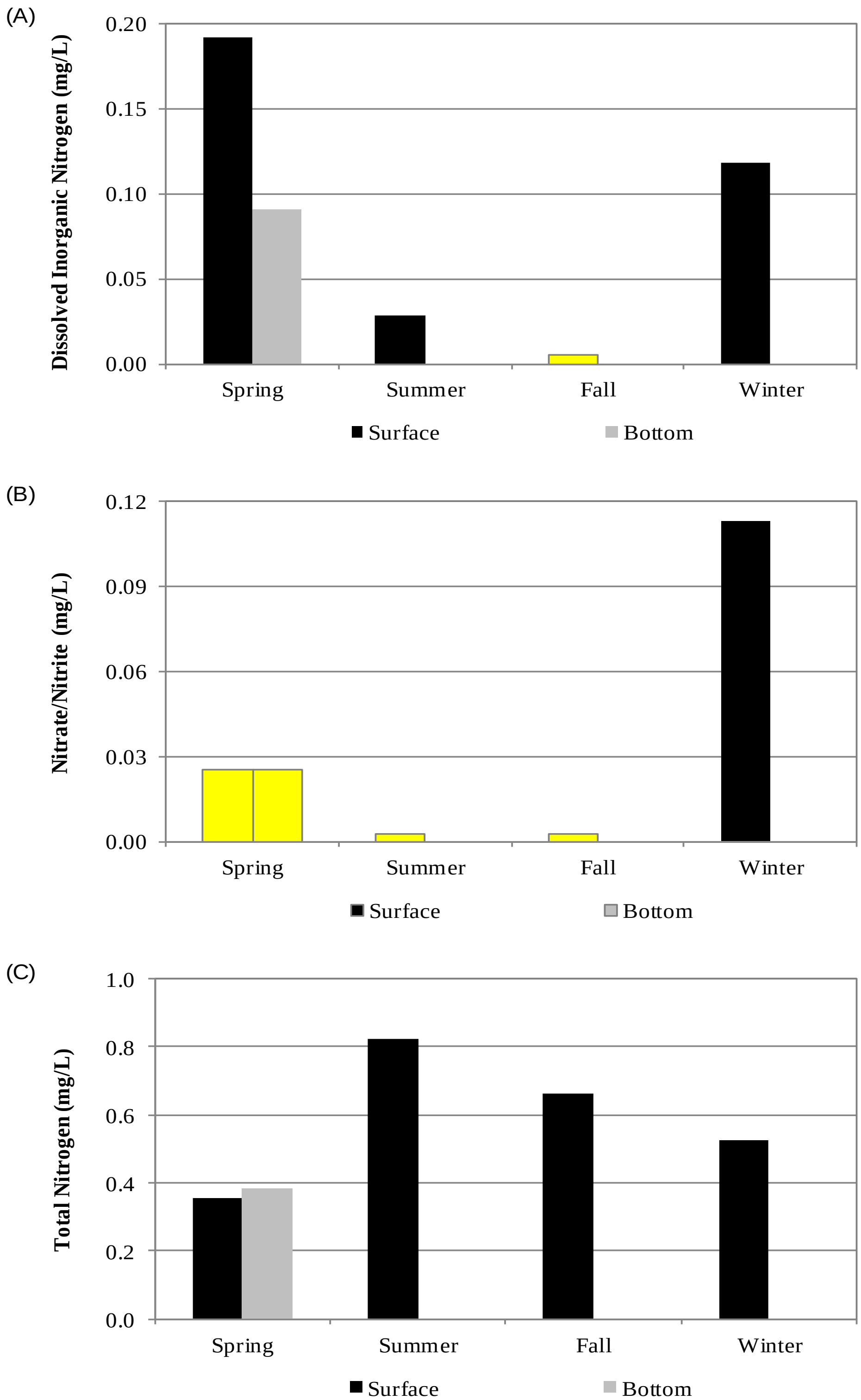


Figure 6.3-13. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Leftrook Lake, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

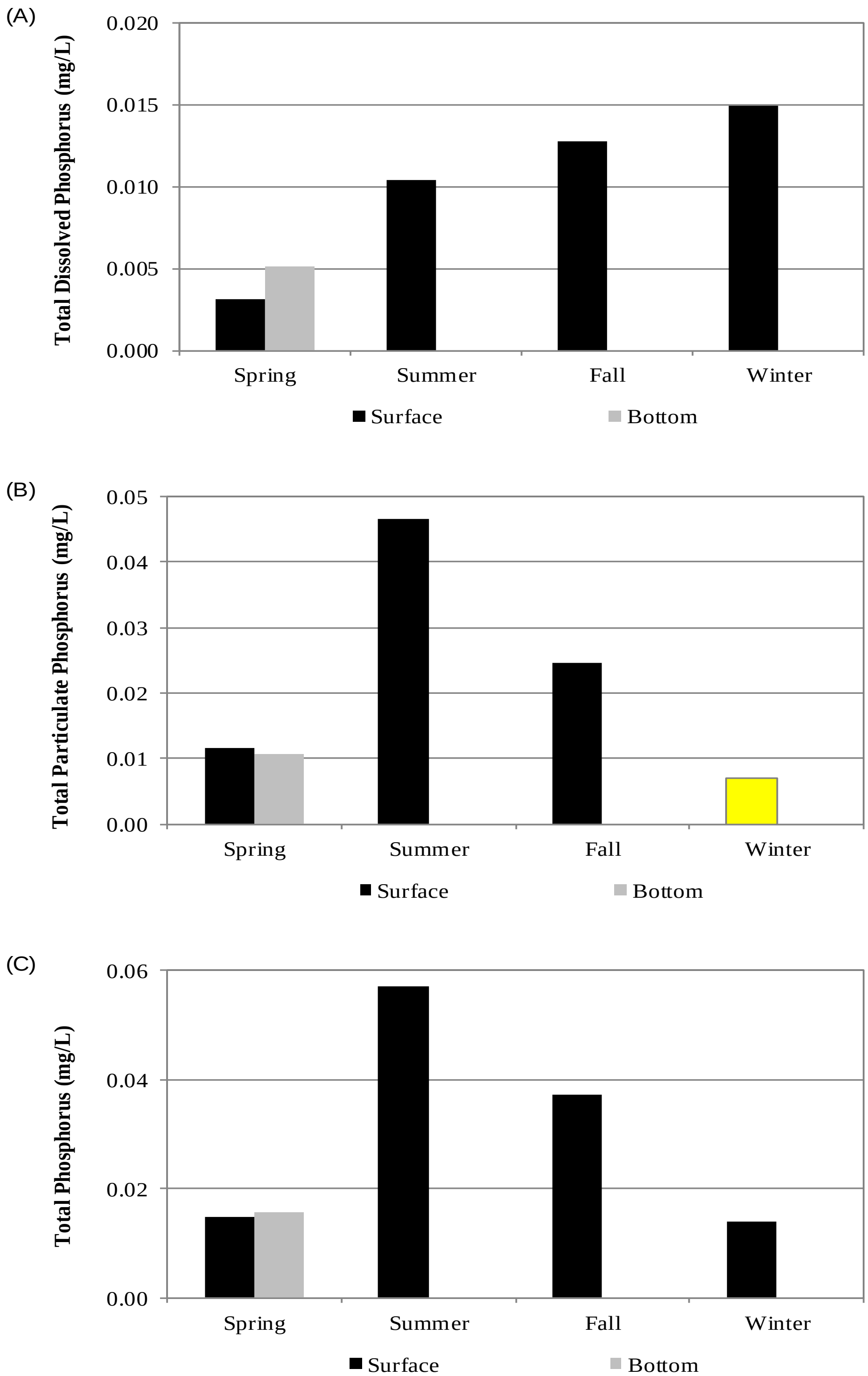


Figure 6.3-14. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Leftrook Lake, 2010/2011. Yellow bars represent values that were below the analytical detection limit.

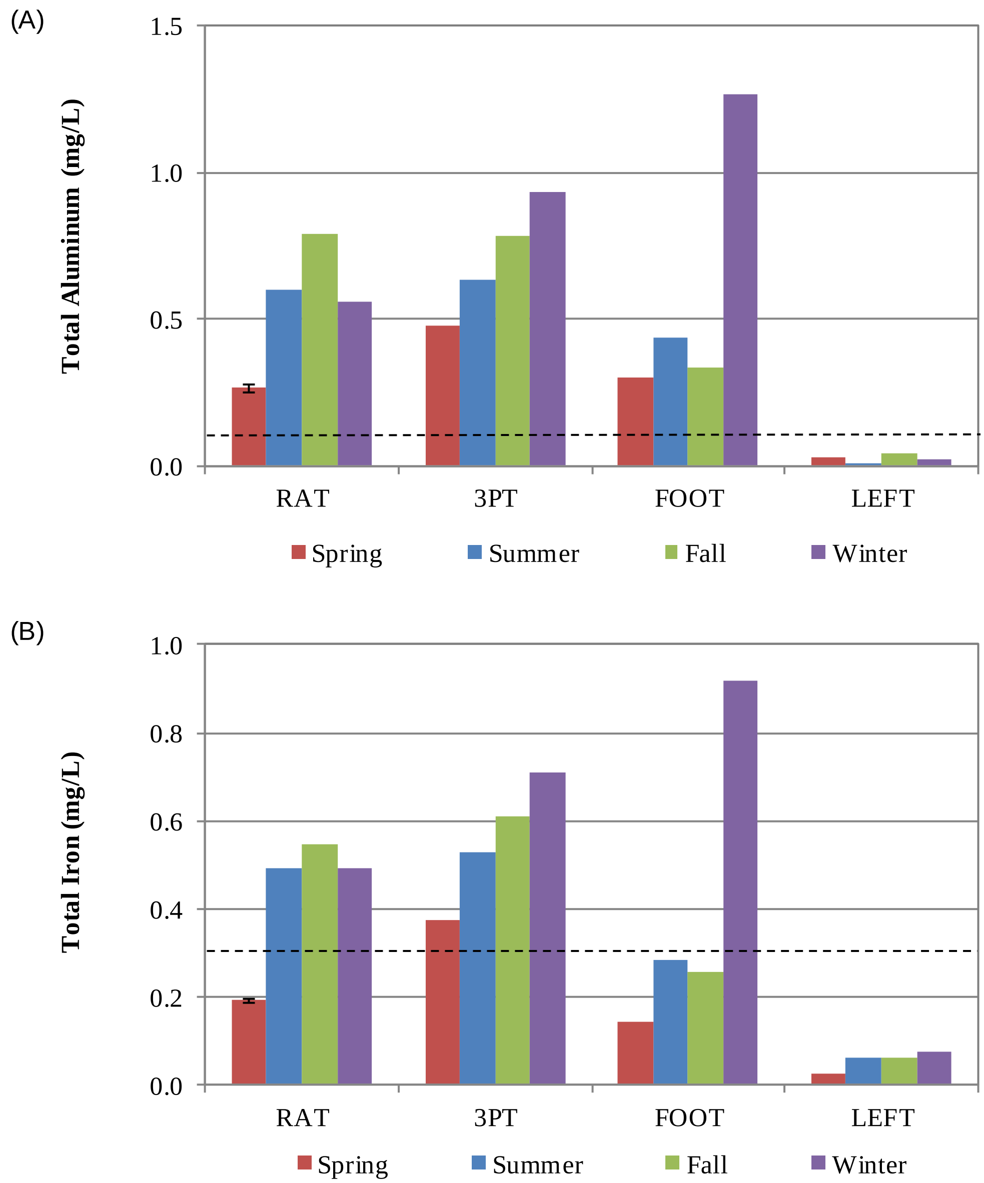


Figure 6.3-15. Total aluminum (A) and total iron (B) measured in surface grabs in the Churchill River Diversion Region, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

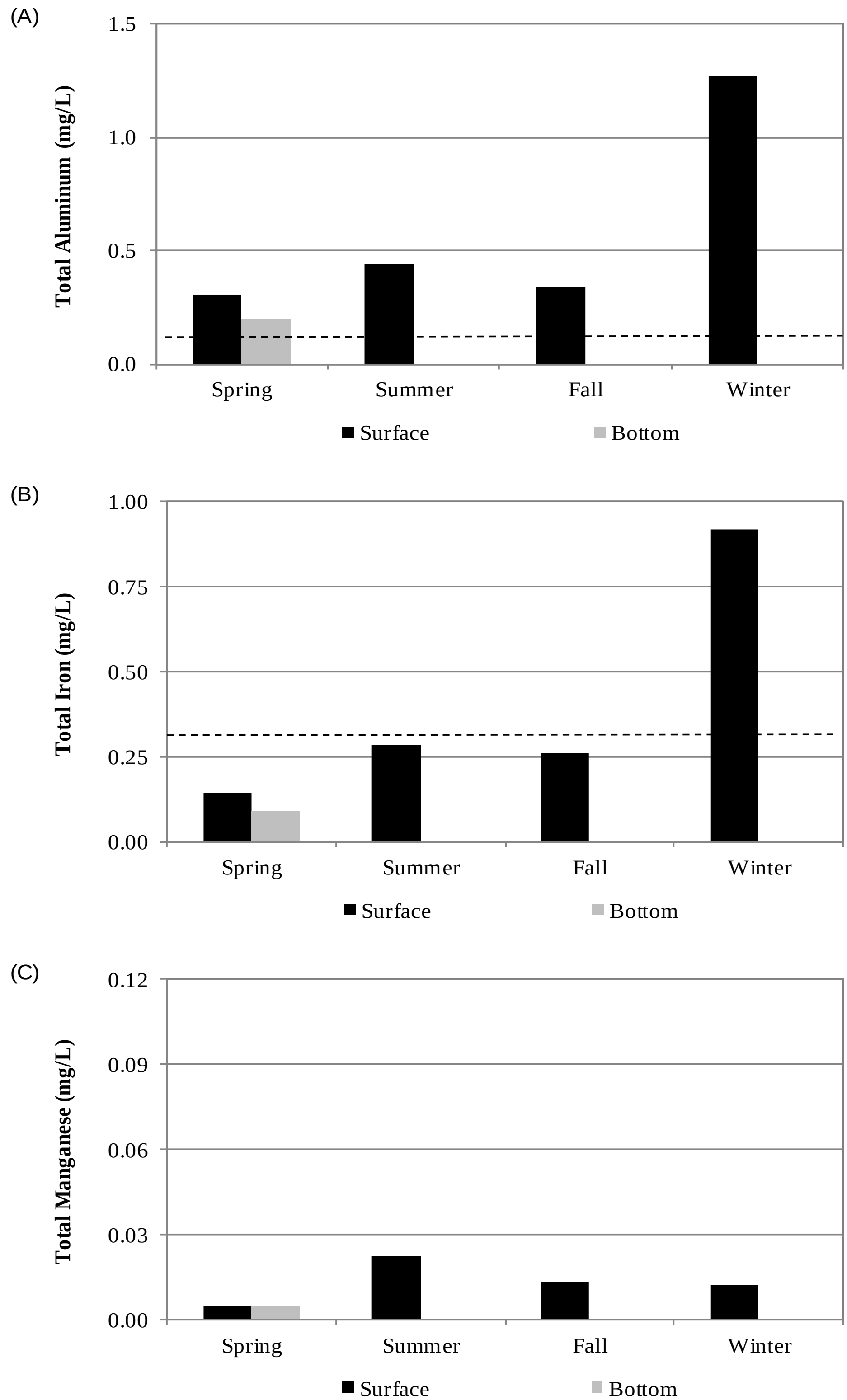


Figure 6.3-16. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Footprint Lake, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

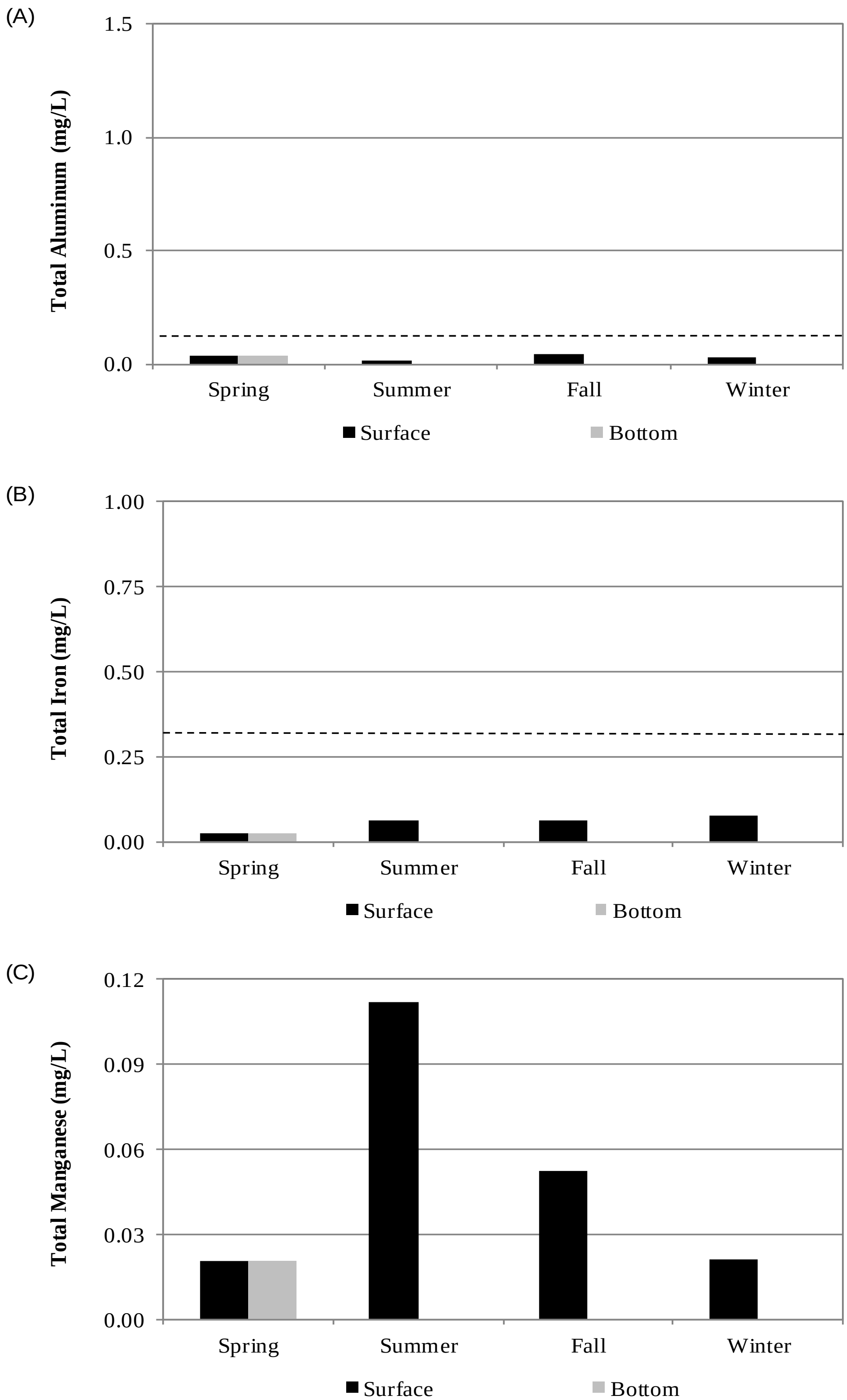


Figure 6.3-17. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Leftrook Lake, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

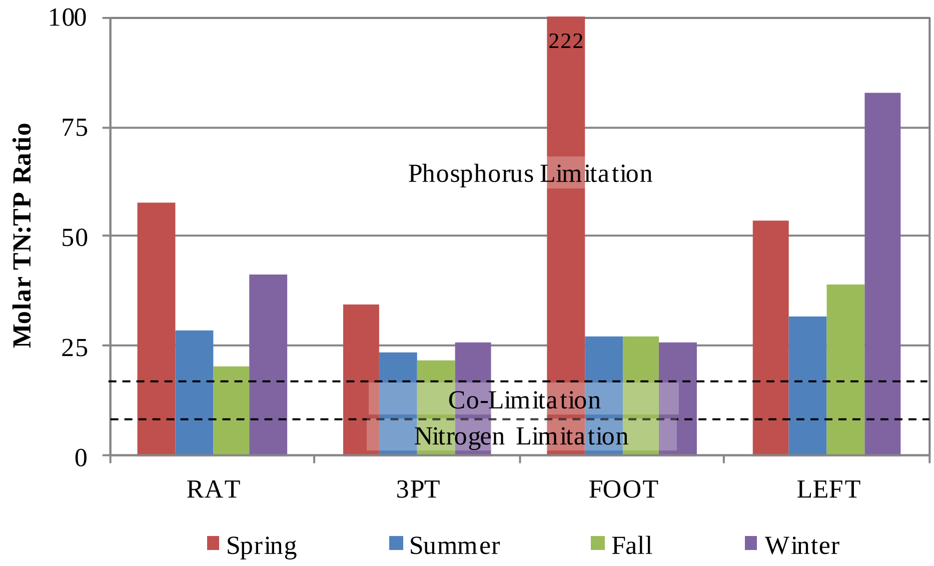


Figure 6.3-18. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Churchill River Diversion Region: 2010/2011.

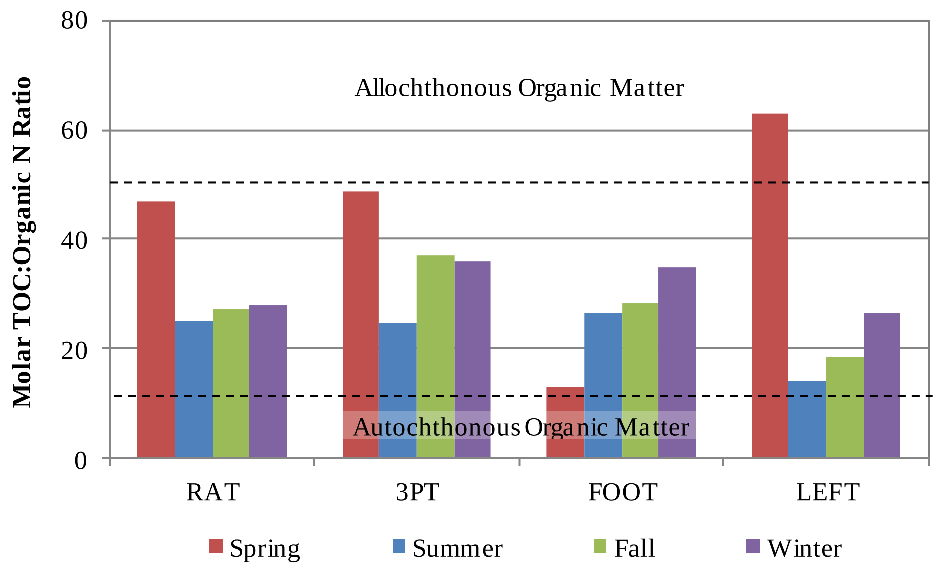


Figure 6.3-19. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Churchill River Diversion Region: 2010/2011.

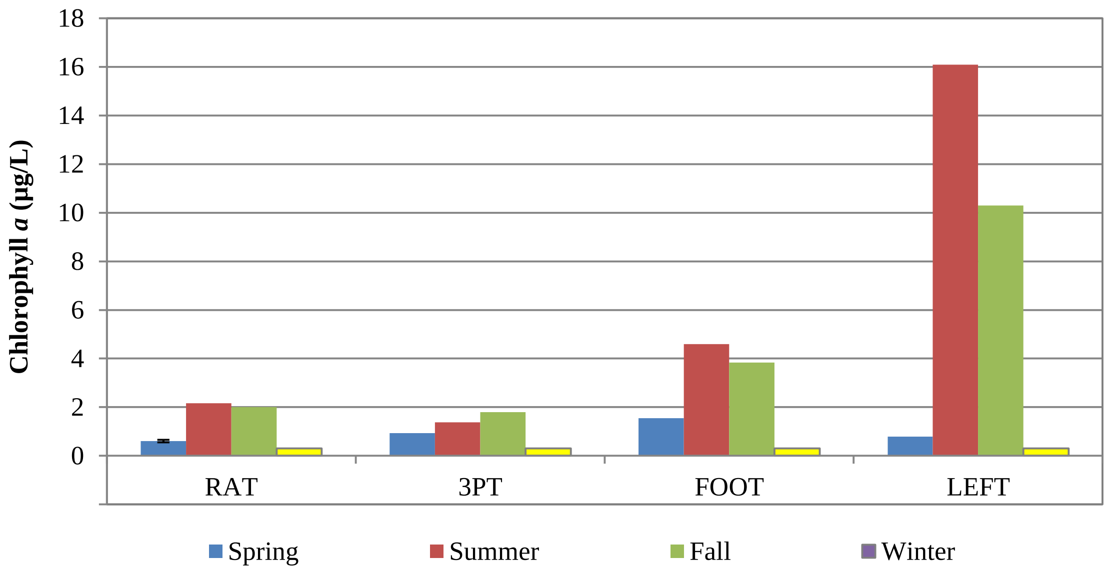


Figure 6.4-1. Chlorophyll *a* concentrations measured within the euphotic zone at sites in the Churchill River Diversion Region in 2010/2011. Yellow bars represent values that were below the analytical detection limit.

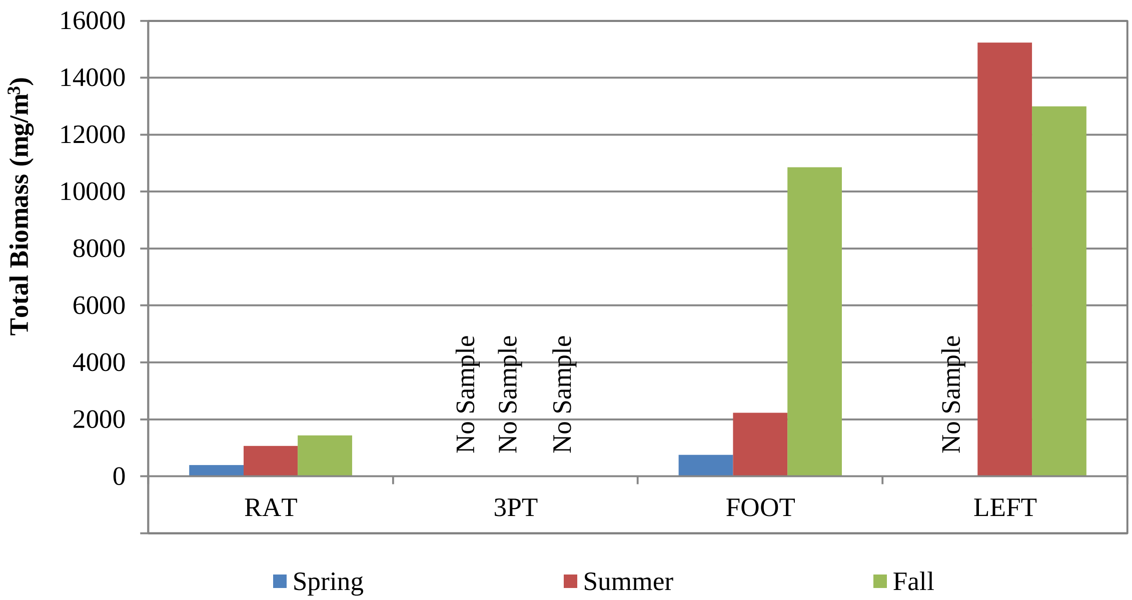


Figure 6.4-2. Phytoplankton biomass measured at sites in the Churchill River Diversion Region during the 2010/2011 open-water period.

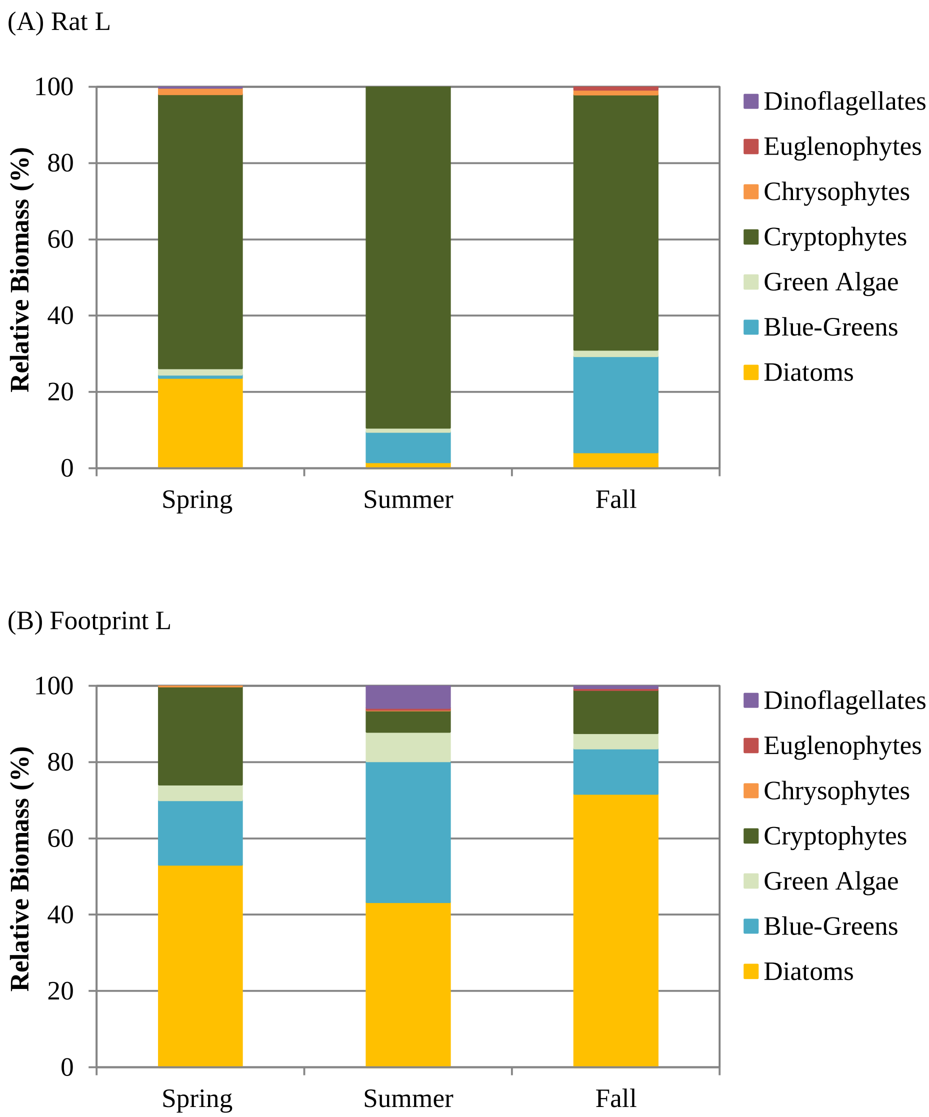
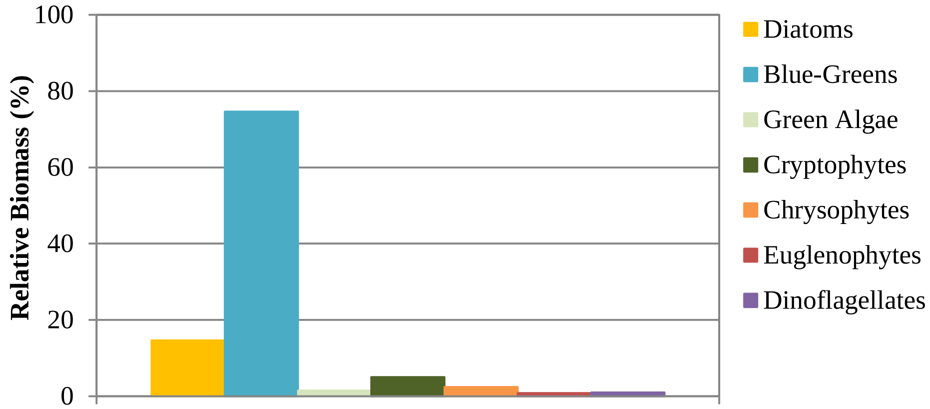


Figure 6.4-3. Phytoplankton community composition in rotational sites in the Churchill River Diversion Region in 2010/2011.

(A) Summer



(B) Fall

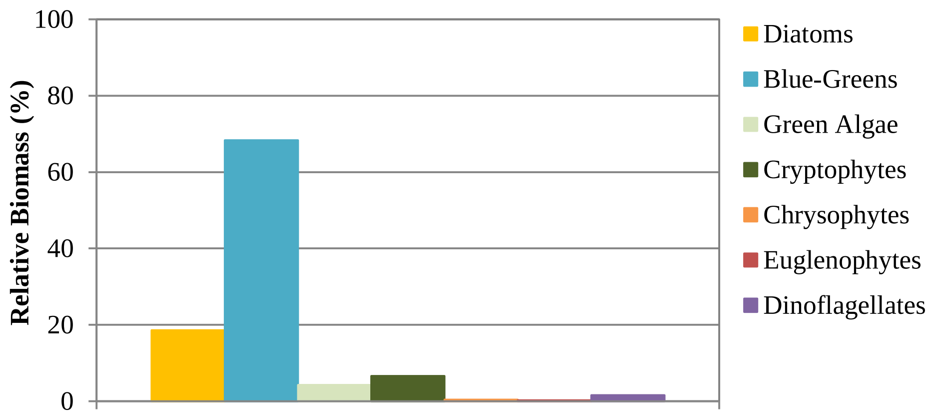


Figure 6.4-4. Phytoplankton community composition during phytoplankton blooms (i.e., chlorophyll *a* > 10 µg/L) in Leftrook Lake, 2010/2011.

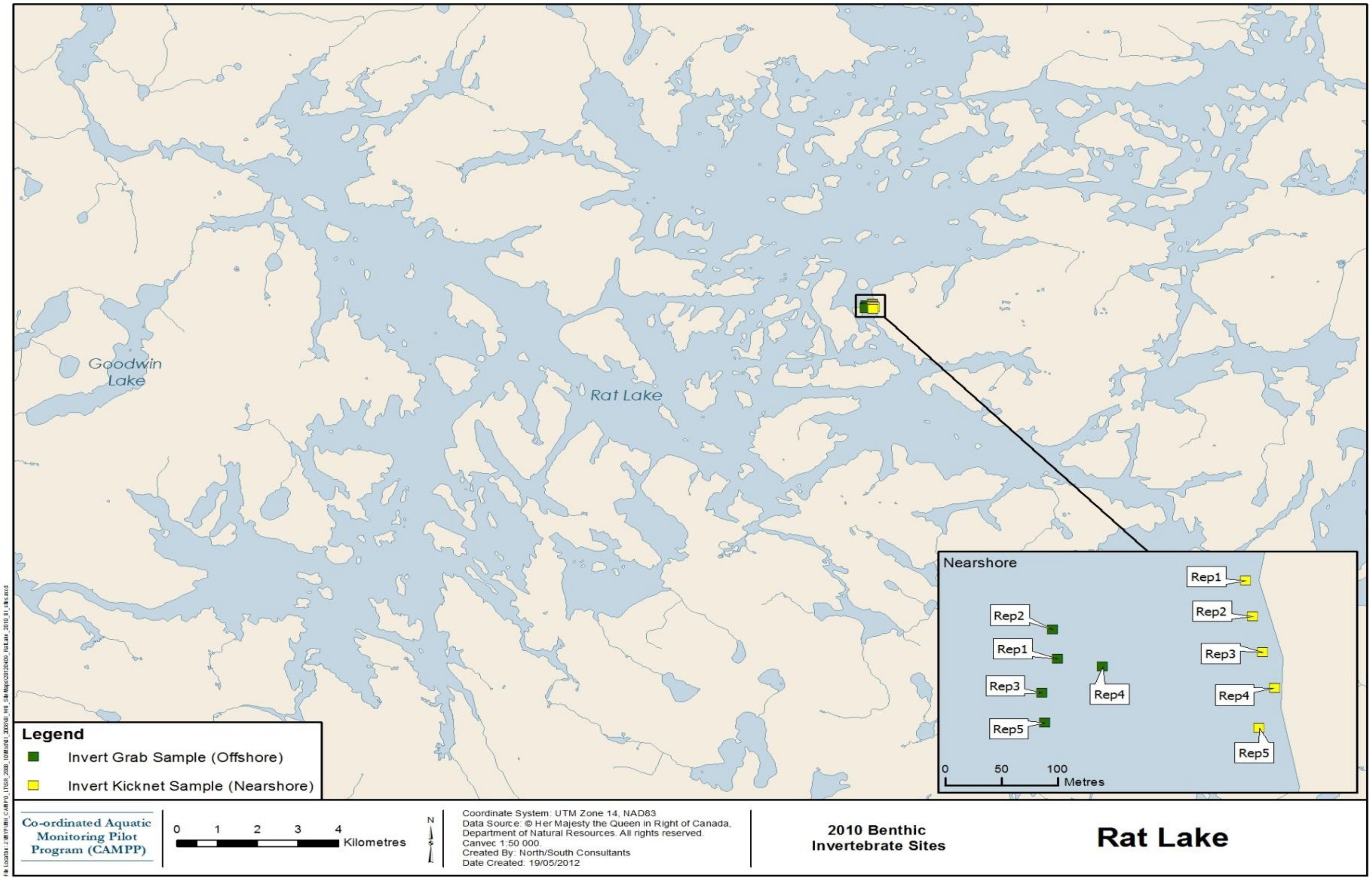


Figure 6.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Rat Lake within the Churchill River Diversion Region, 2010.

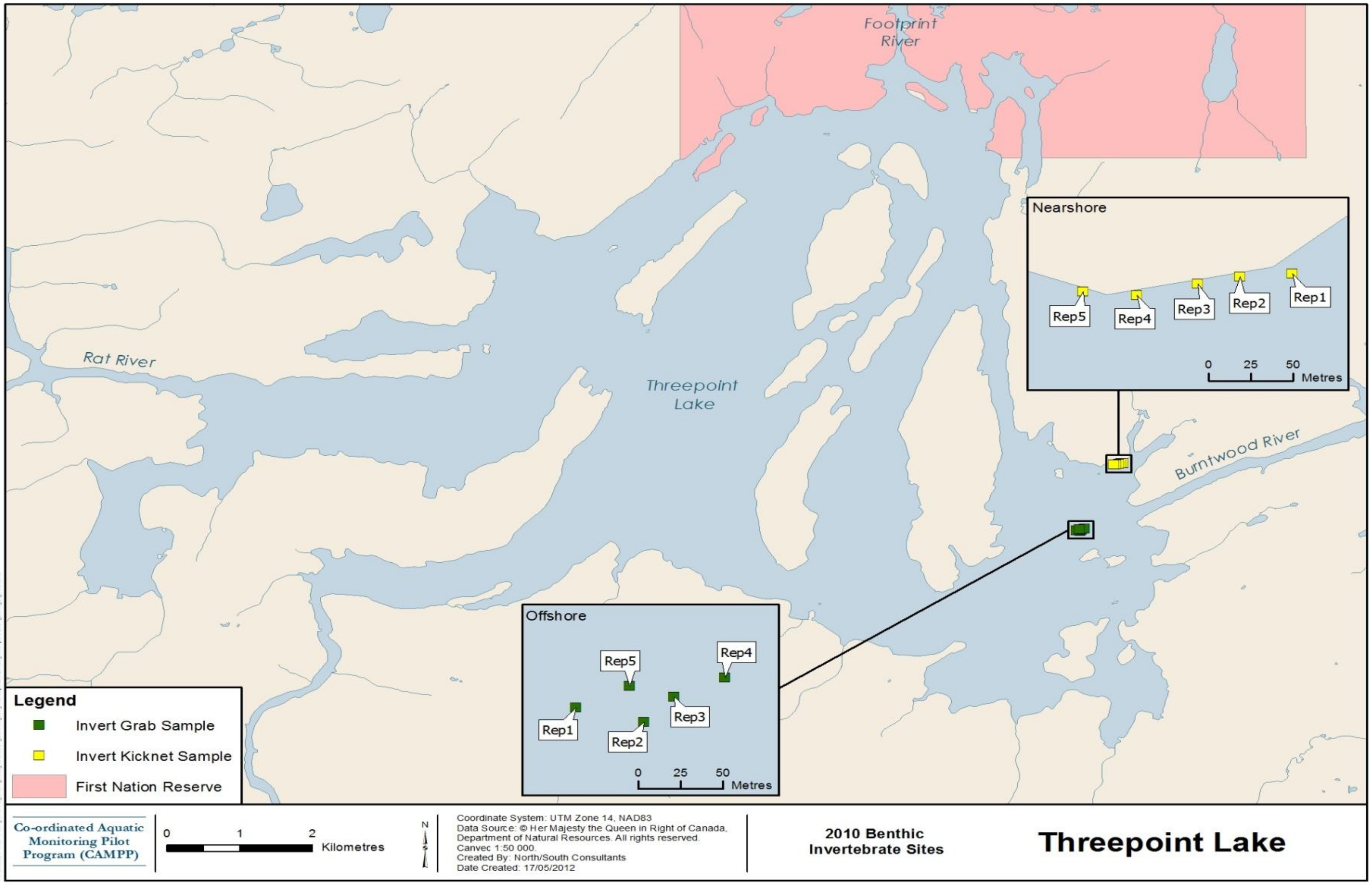


Figure 6.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Threepoint Lake within the Churchill River Diversion Region, 2010.

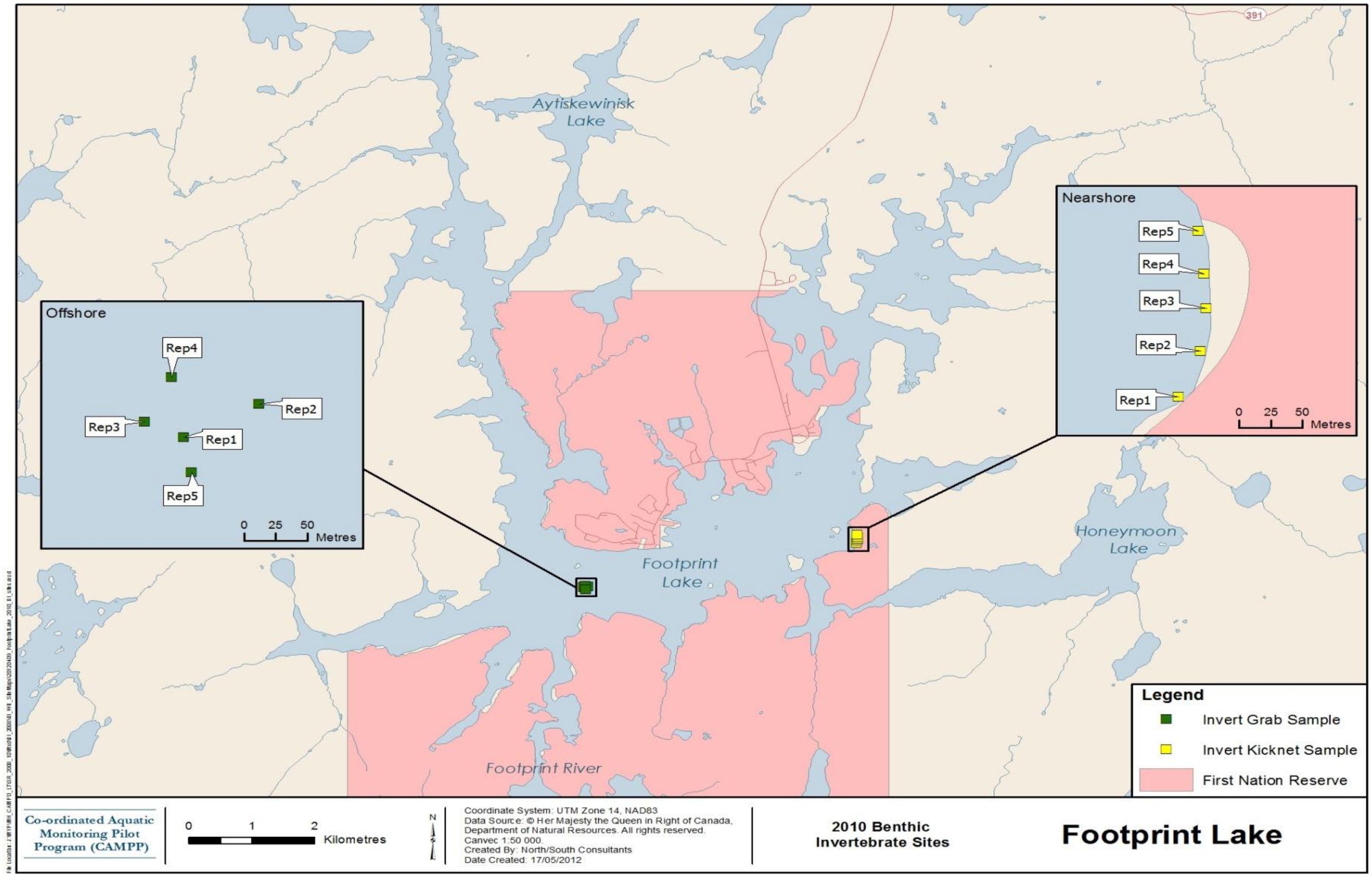


Figure 6.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Footprint Lake within the Churchill River Diversion Region, 2010.

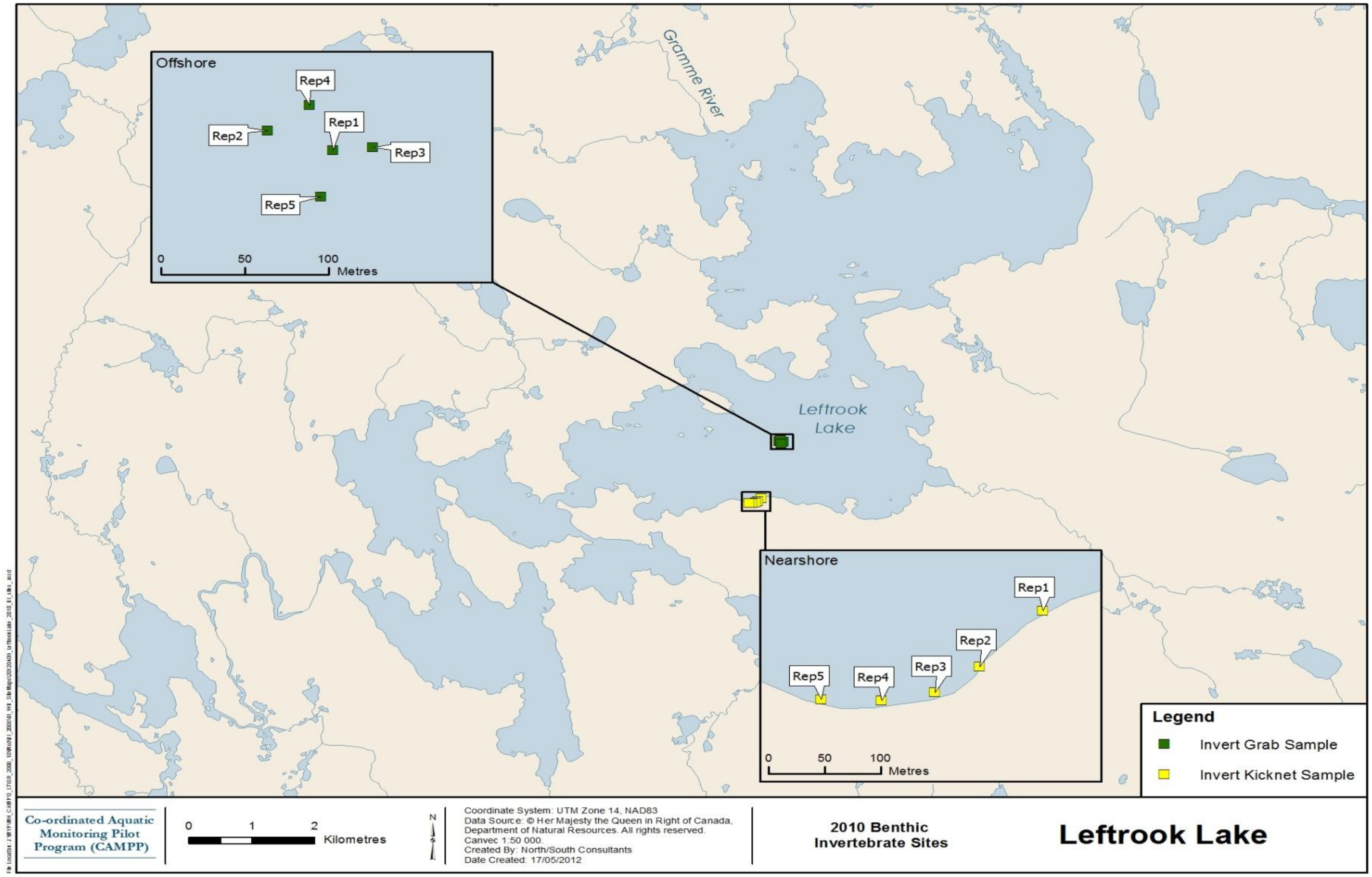


Figure 6.5-4. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Leftrook Lake within the Churchill River Diversion Region, 2010.

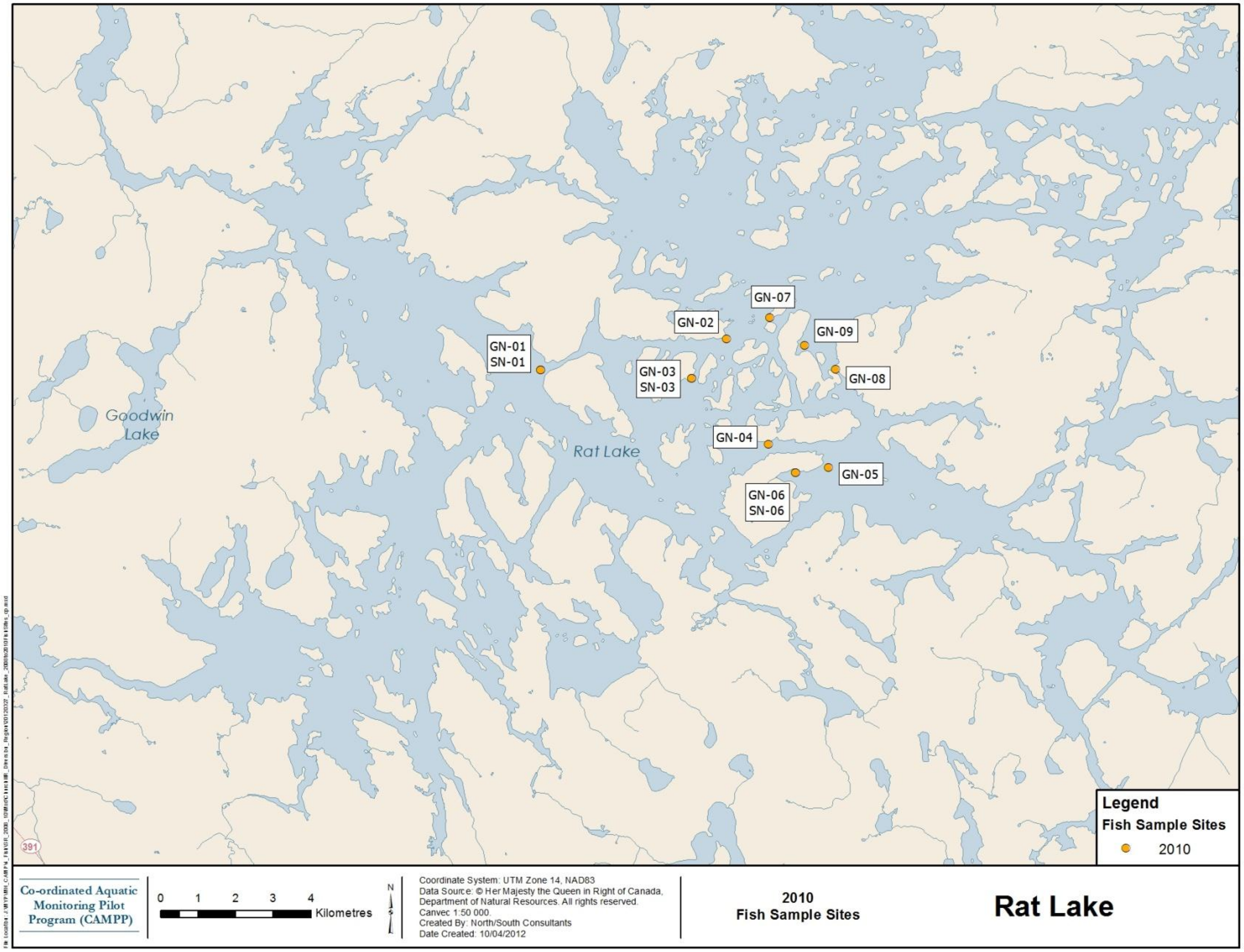


Figure 6.6-1. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Rat Lake, 2010.

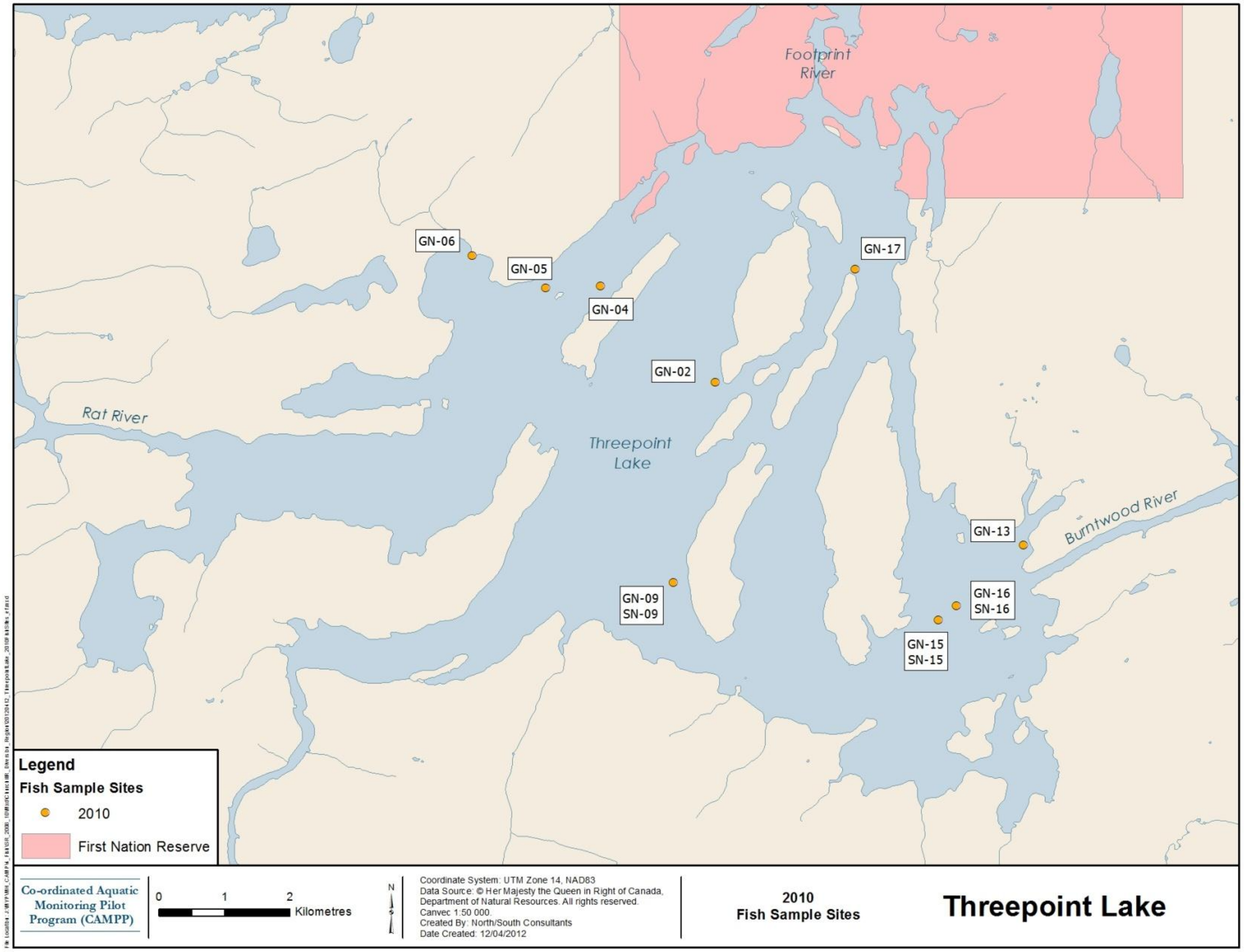


Figure 6.6-2. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Threepoint Lake, 2010.

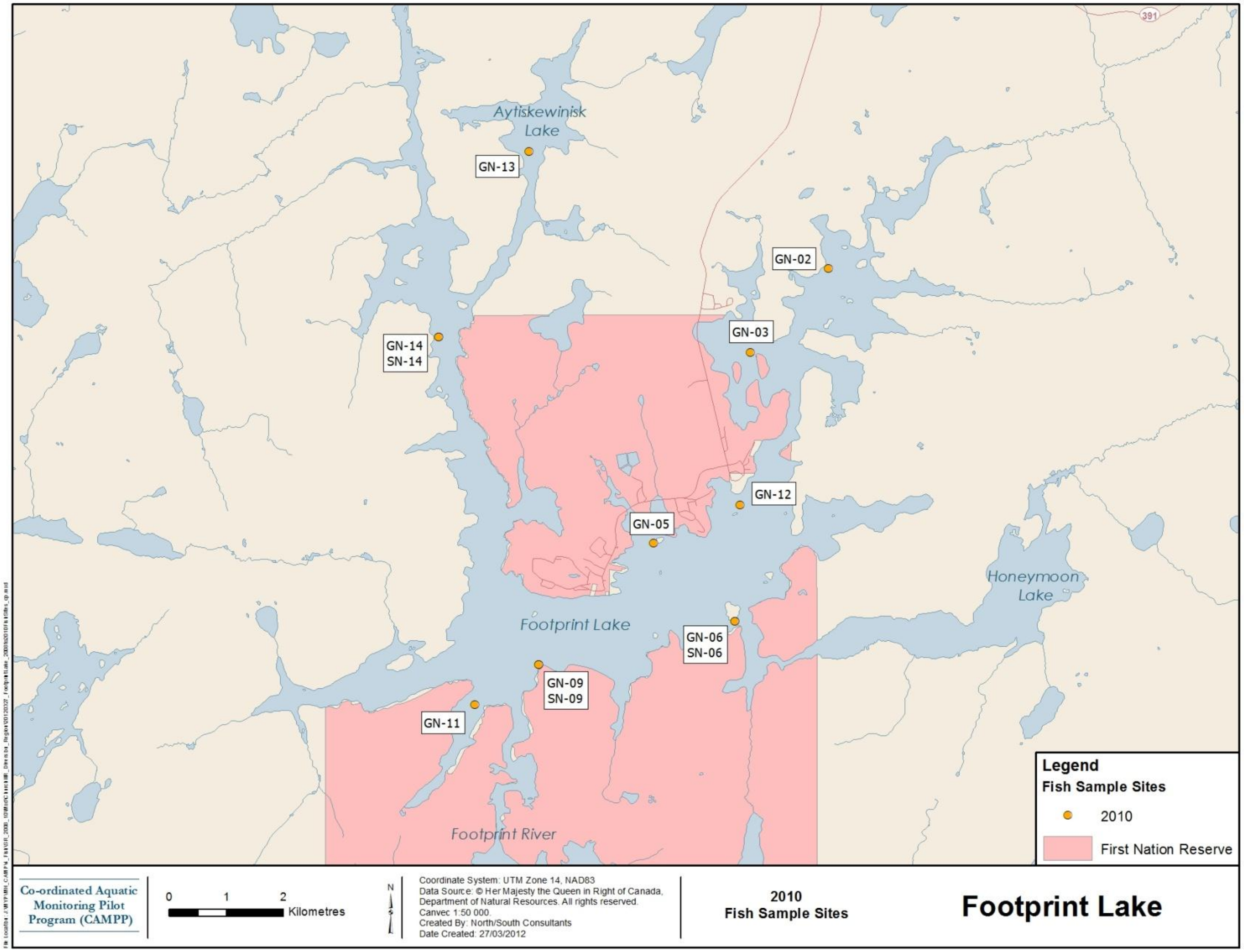


Figure 6.6-3. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Footprint Lake, 2010.

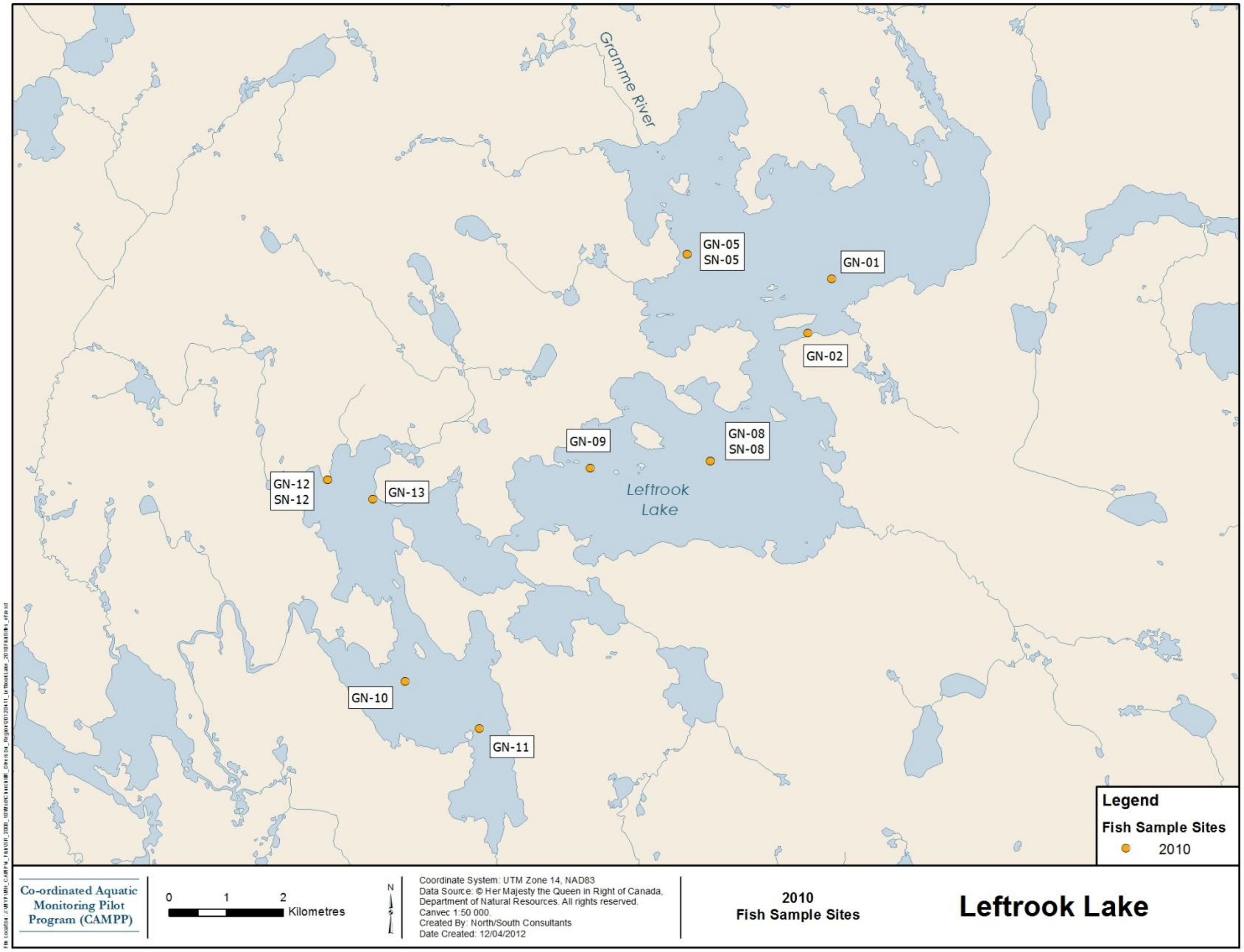


Figure 6.6-4. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Leftrook Lake, 2010.

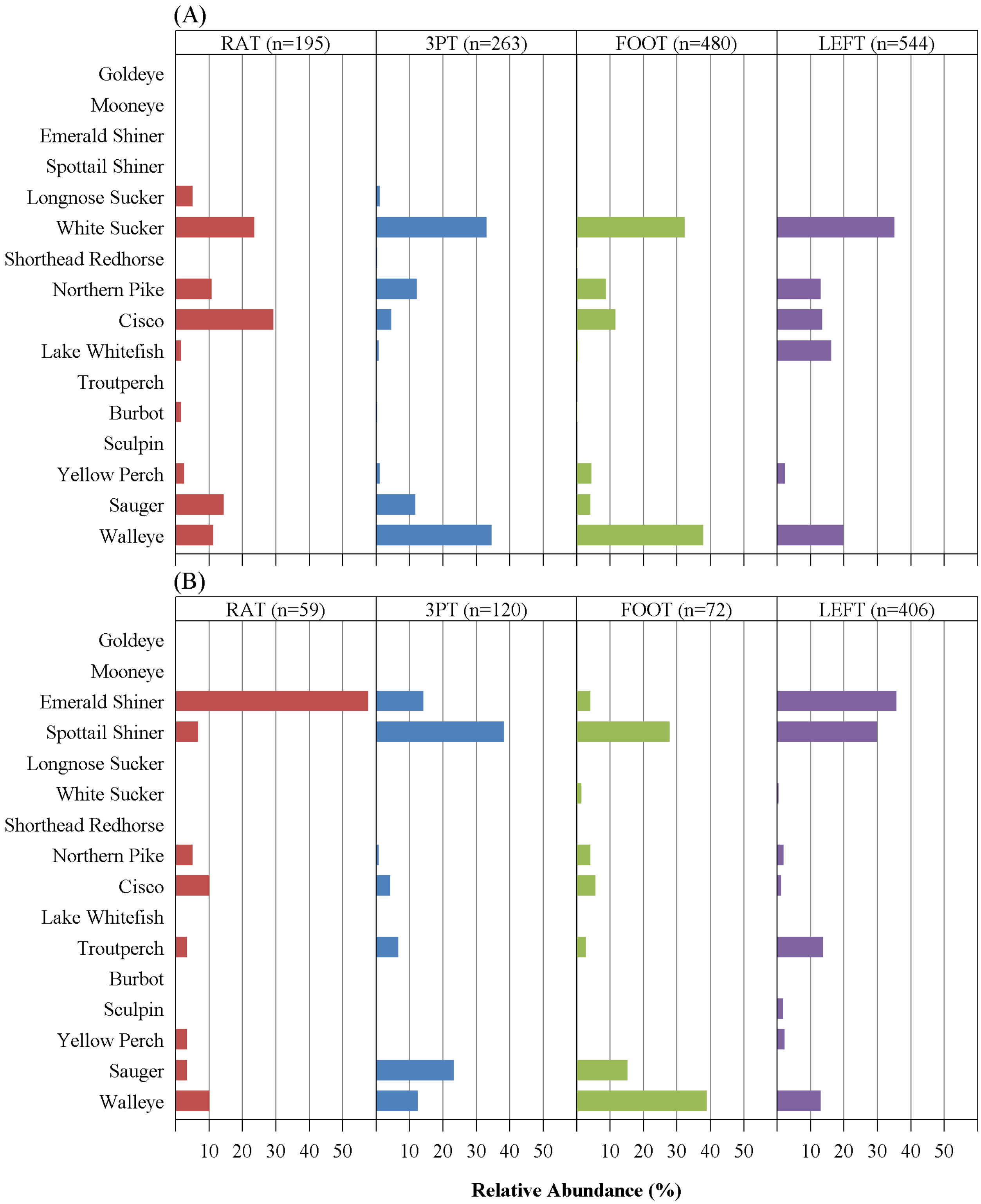


Figure 6.6-5. Relative abundance (%) distributions for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion waterbodies, 2010.

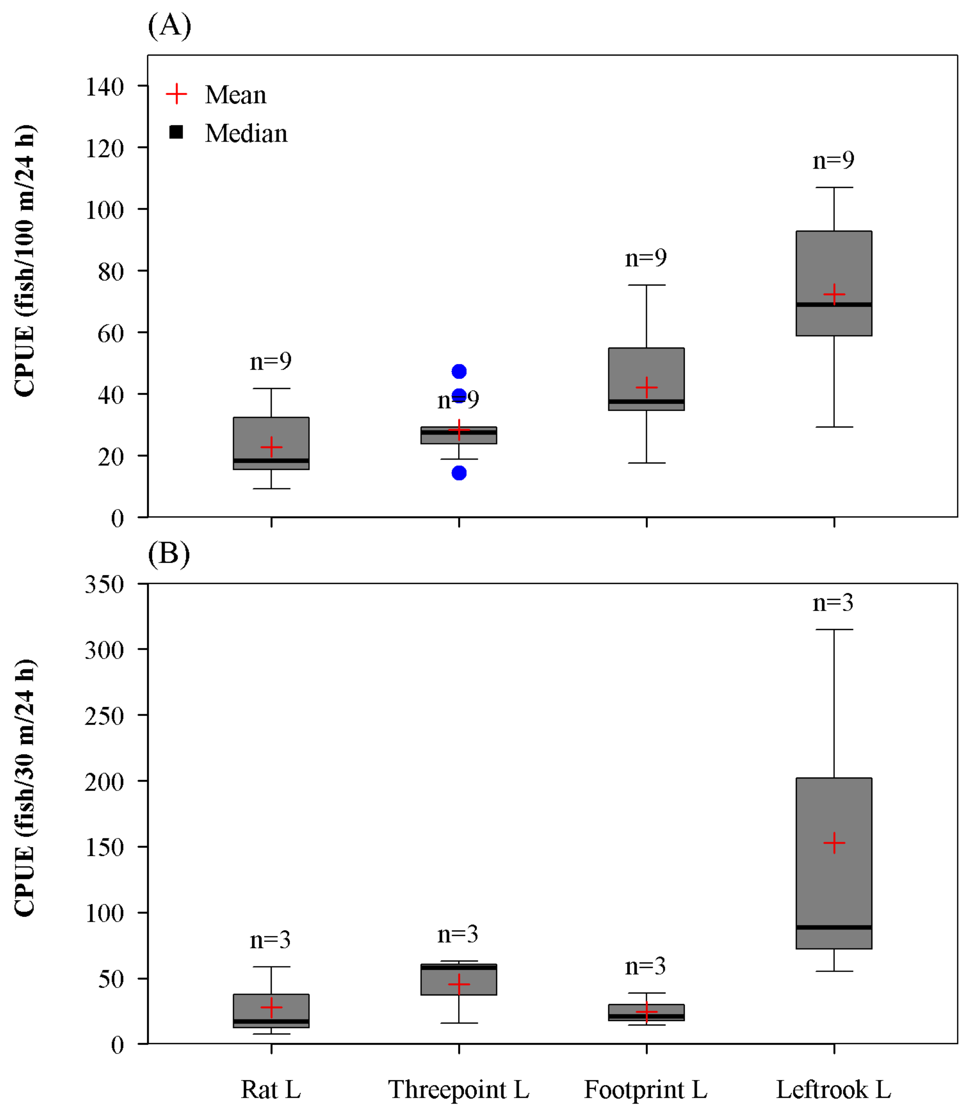


Figure 6.6-6. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang (fish/100 m/24 h) and (B) small mesh (fish/30 m/24 h) index gill nets set in Churchill River Diversion Region waterbodies, 2010.

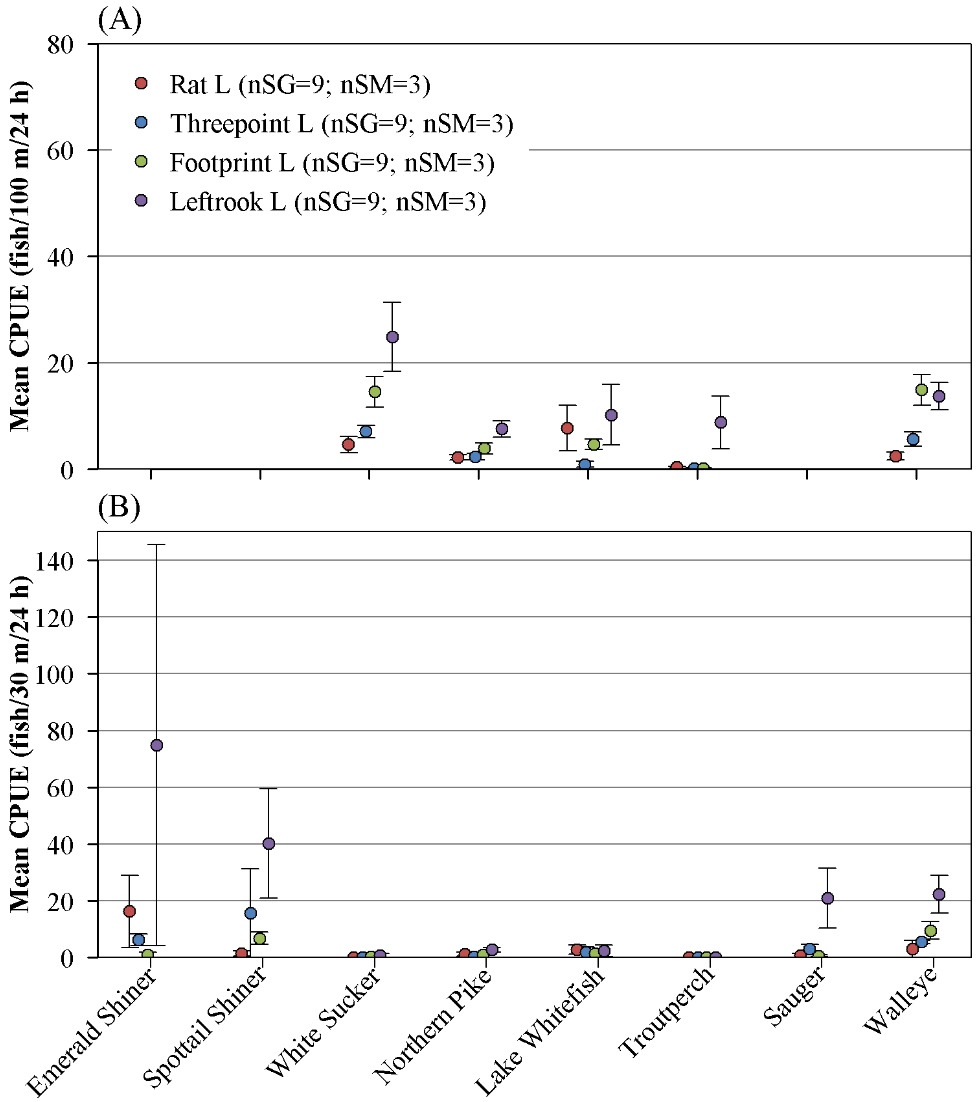


Figure 6.6-7. Mean (SE) CPUE for select species captured in (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Churchill River Diversion Region waterbodies, 2010.

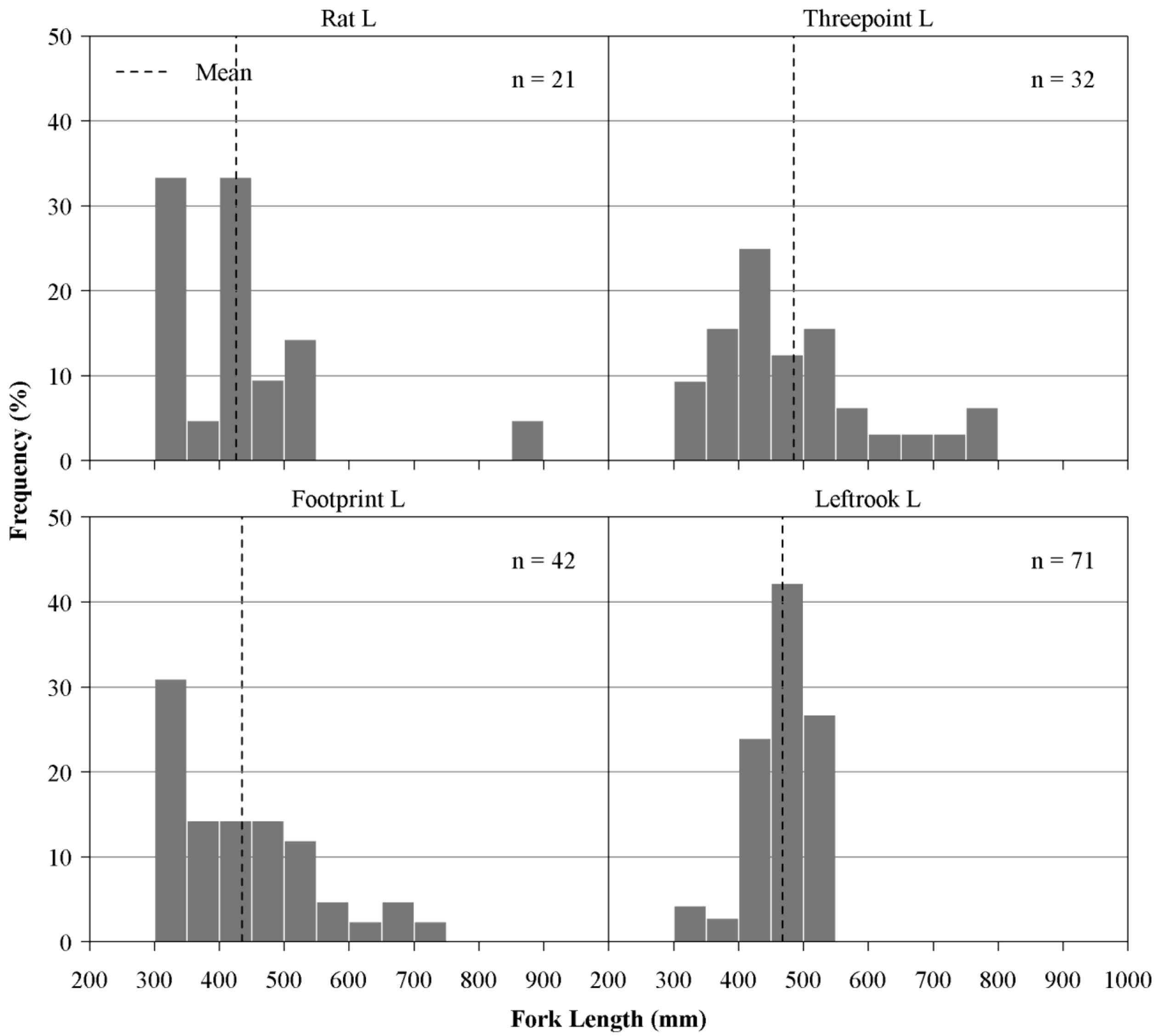


Figure 6.6-6. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

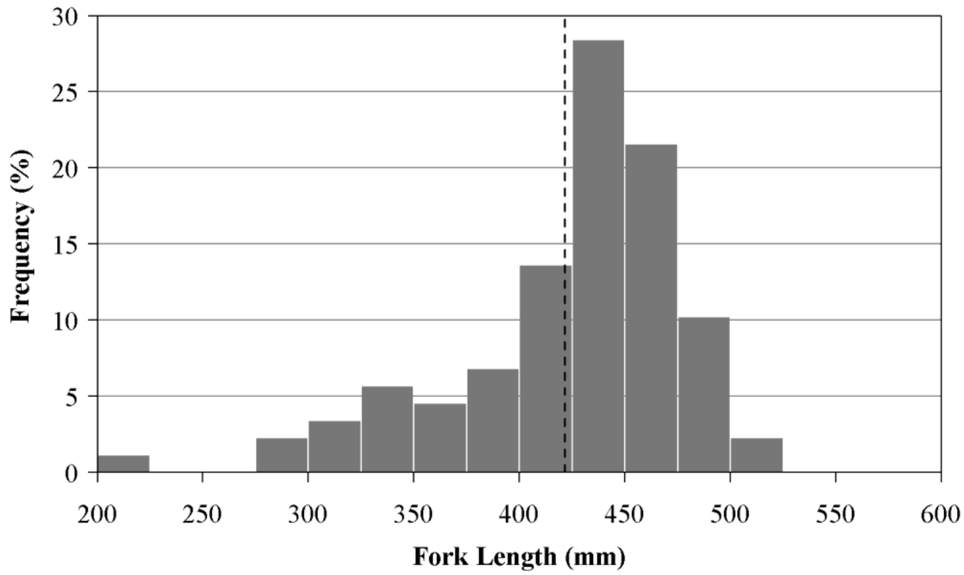


Figure 6.6-9. Fork length frequency histogram for Lake Whitefish captured in standard gang index gill nets set in Leftrook Lake, 2010.

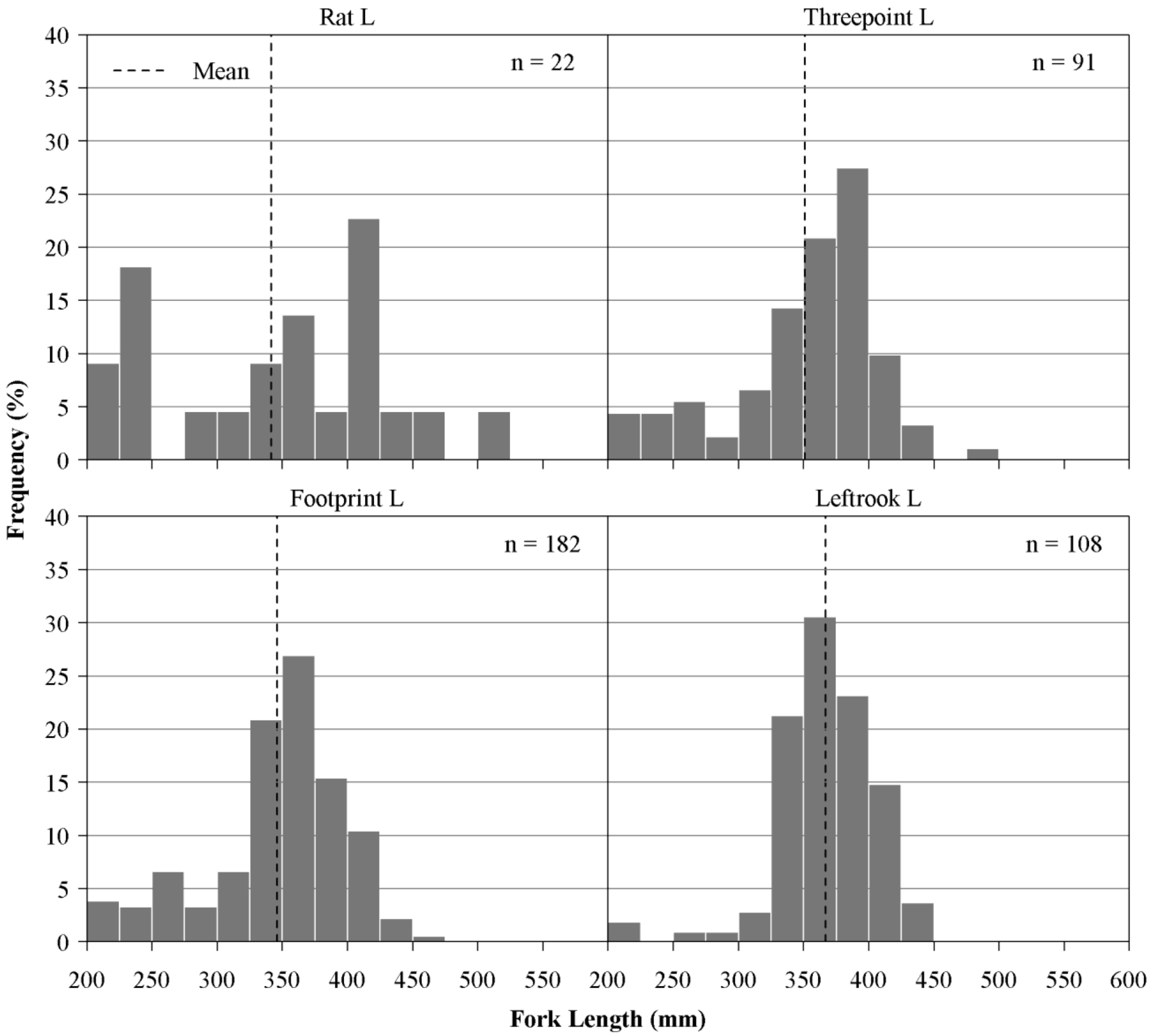


Figure 6.6-10. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2010.

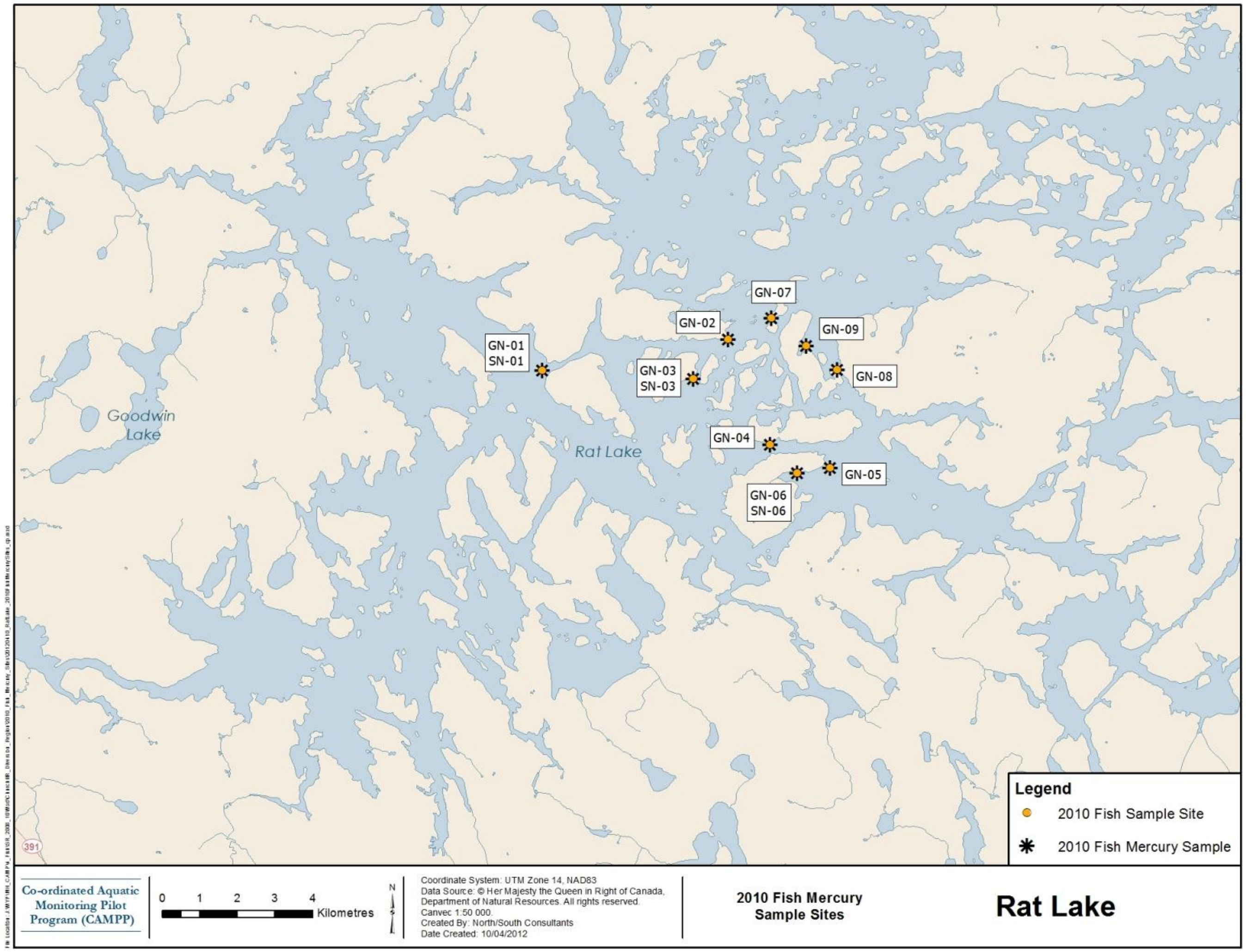


Figure 6.7-1. Fish sampling sites in Rat Lake, indicating those sites where fish were collected for mercury analysis.

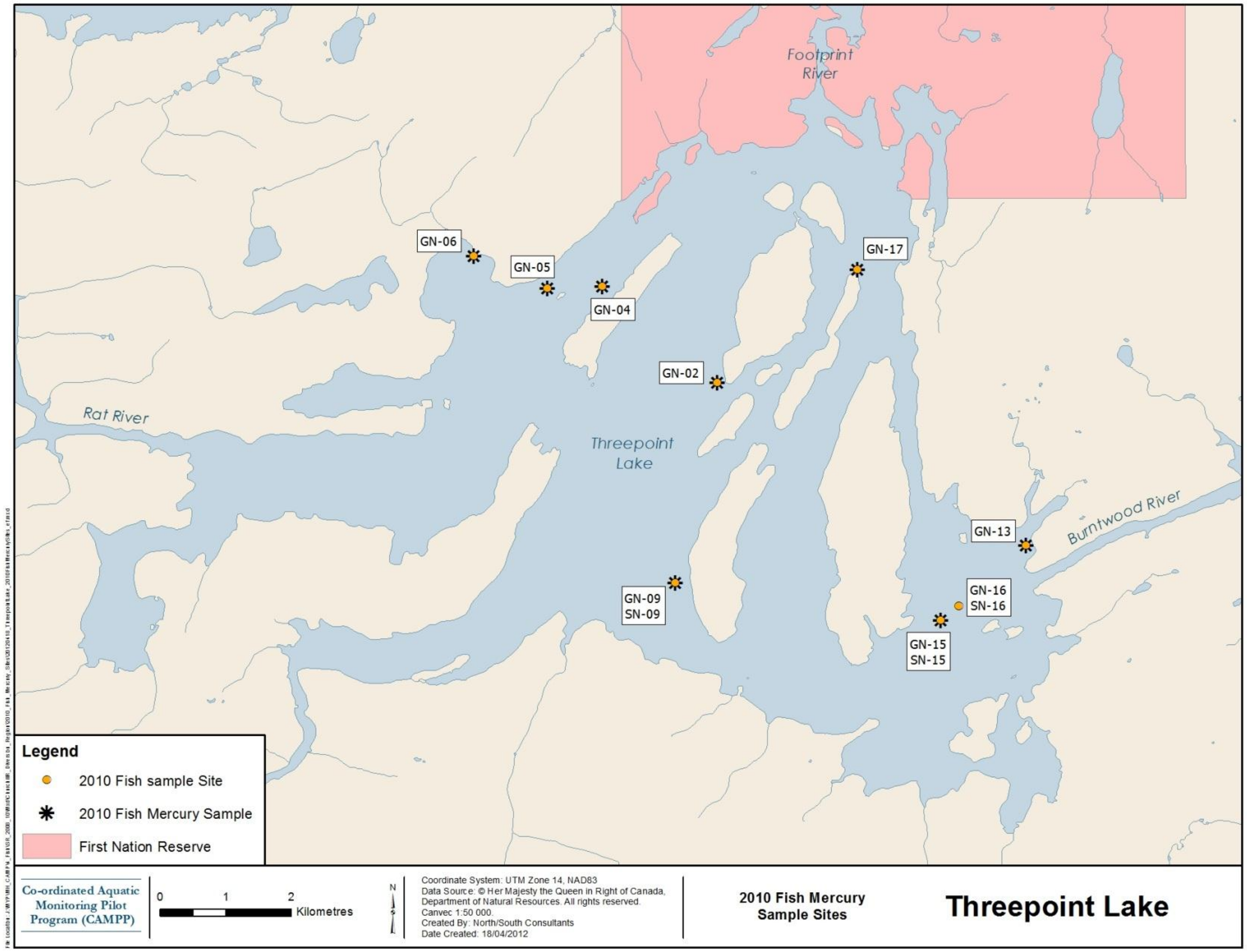


Figure 6.7-2. Fish sampling sites in Threepoint Lake, indicating those sites where fish were collected for mercury analysis.

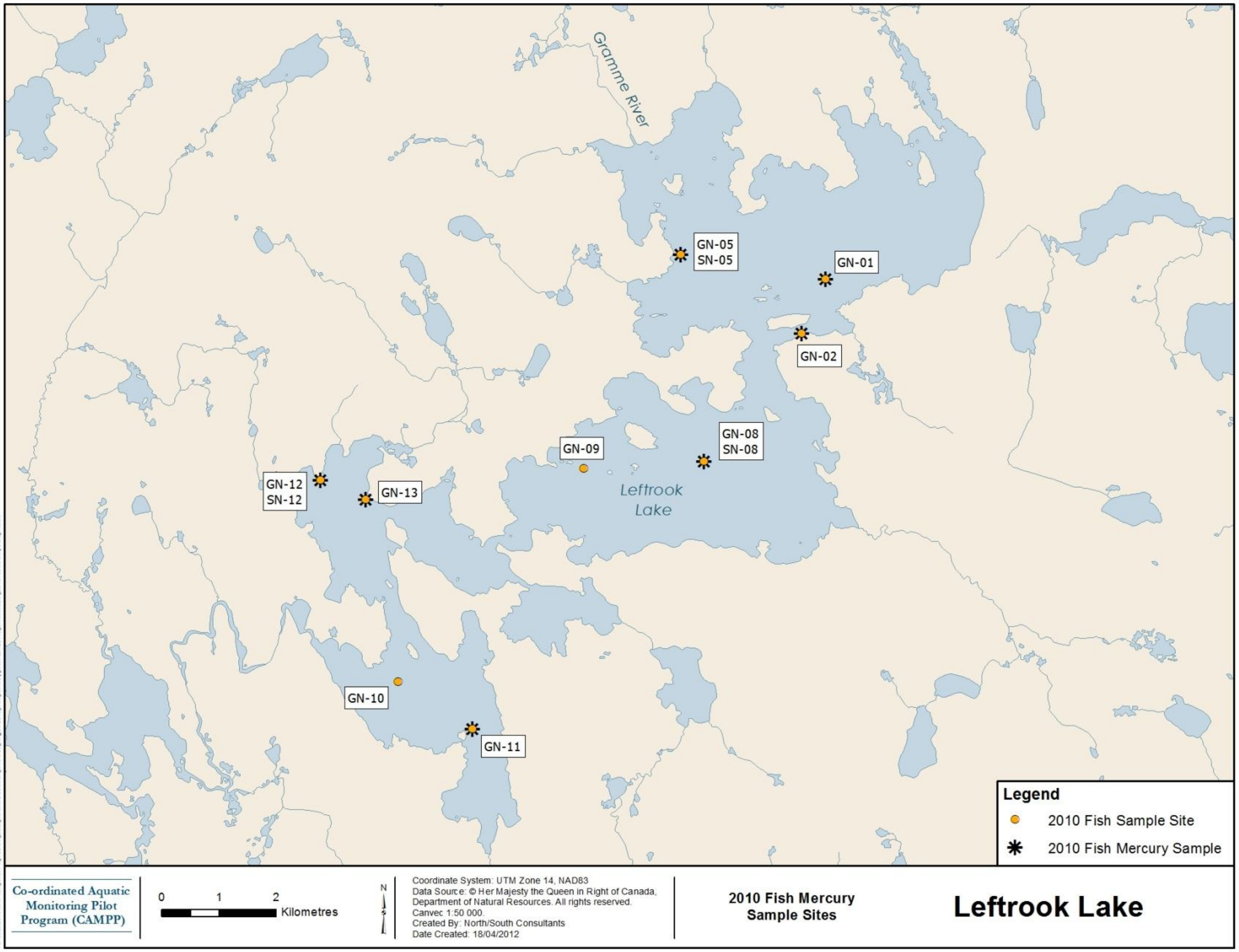


Figure 6.7-3. Fish sampling sites in Leftrook Lake, indicating those sites where fish were collected for mercury analysis.

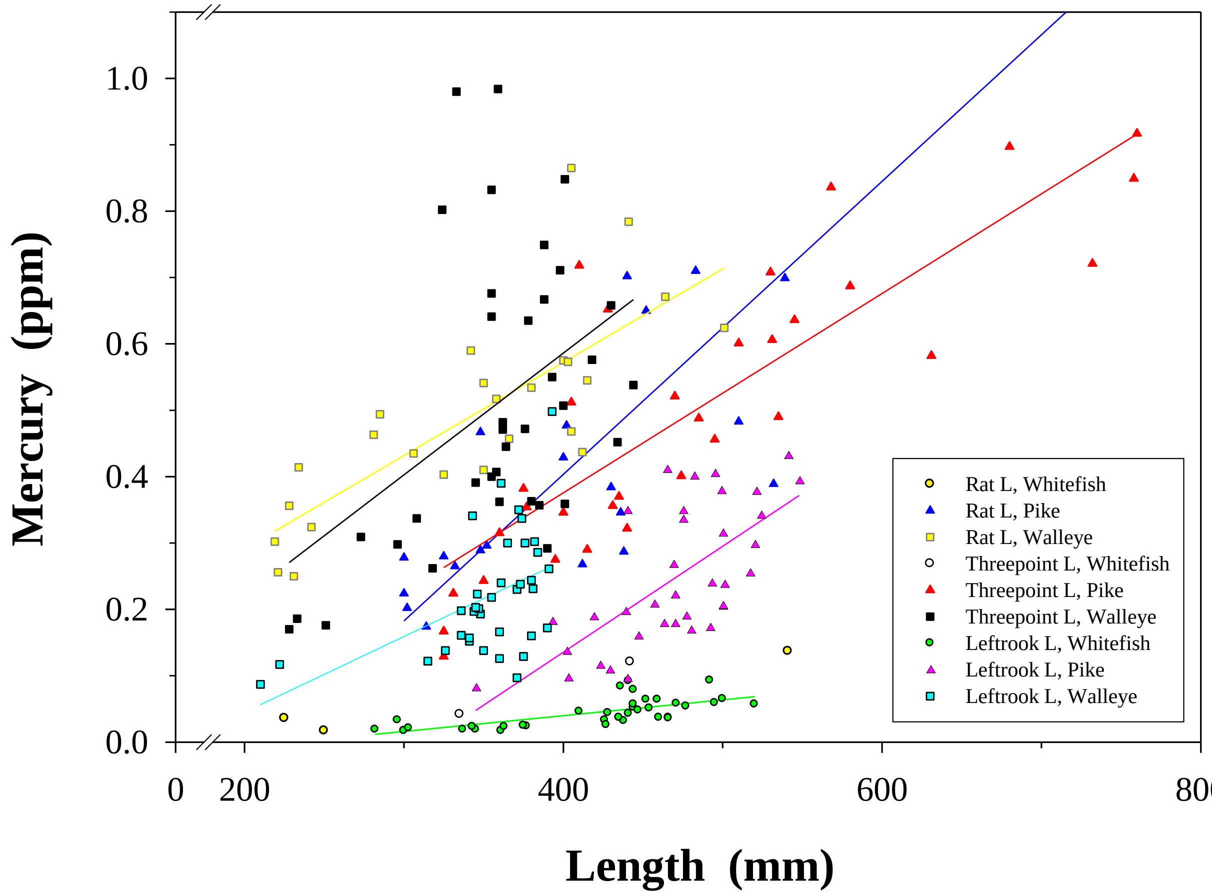


Figure 6.7-4. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Rat, Threepoint, and Leftrook lakes in 2010. Significant linear regression lines are shown. One Northern Pike from Rat Lake with a mercury concentration of 1.61 ppm and a length of 871 mm is not shown but is included in the analyses.

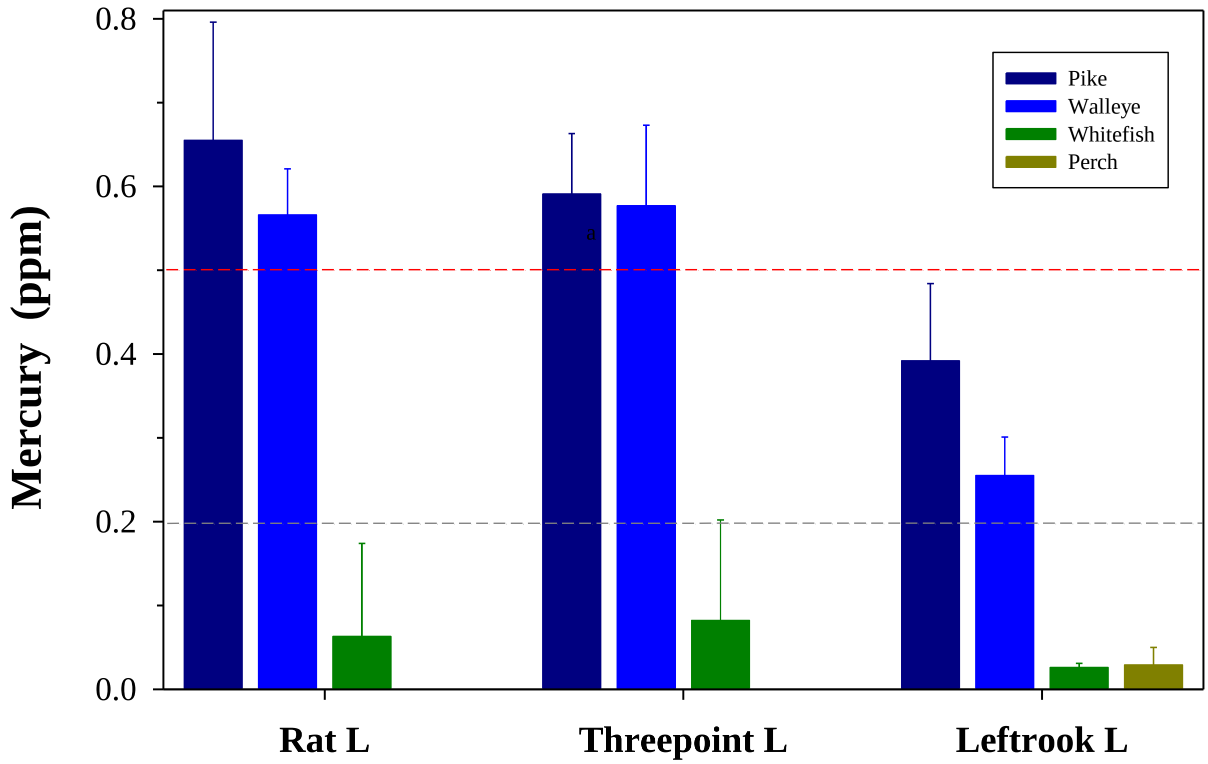


Figure 6.7-5. Mean (+95% CL) mercury concentrations of Northern Pike, Walleye, Lake Whitefish, and Yellow Perch from Rat, Threepoint, and Leftrook lakes in 2010. Means are standardized except for Lake Whitefish from Rat and Threepoint lakes and Yellow Perch from Leftrook Lake. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.

7.0 UPPER NELSON RIVER REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Upper Nelson River Region, by each major component. A general description of methods is provided in Section 4 and in detail in Appendix 1.

7.1 CLIMATE

Mean monthly air temperatures measured at Norway House in 2010 were consistently warmer than the 1971-2000 temperature normals throughout the year, with the exception of September (Figure 7.1-1). The months of March, April and October were notably warmer than normal for those months (6.7 ^{o}C, 5.2 ^{o}C, and 3.9 ^{o}C above normal, respectively). The annual mean air temperature was 3.1 ^{o}C above the normal.

The 1971-2000 precipitation normals at Norway House, MB, indicate a peak in July, with secondary peaks in June and August, and relatively low levels of precipitation in the winter (Figure 7.1-1). In 2010, the spring and summer months exhibited above normal precipitation, most notably the month of August when precipitation was more than double the normal for that month (Figure 7.1-1). November and December exhibited levels of precipitation substantially below normal (13 and 16 % of normal, respectively). Overall, Norway House received approximately 20% more precipitation in 2010 than normal.

Overall, comparison to climate normals indicates that 2010 was characterized by a warmer and overall wetter spring and summer, and a warmer and drier fall and winter (Figure 7.1-1).

7.2 HYDROLOGY

The majority of Lake Winnipeg's discharge flows through the upper Nelson River's West Channel, which is regulated by operations at the Jenpeg Generating Station (GS) for power production purposes and for flood and drought support on Lake Winnipeg. The East Channel is un-regulated and accounts for roughly 15 percent of the total flow.

Upper Nelson River flows at the Kelsey GS in 2010 were above the upper quartile level to start the year until declining to the lower quartile for most of the month of May due to a very low snowpack. In early June, flows increase above the average and continued to increase in early July above the upper quartile, reaching record highs from October through December due to very high precipitation in the Nelson, Winnipeg, and Saskatchewan river drainage basins (Figure 7.2-1).

Playgreen Lake water levels were near or above the upper quartile level for all of 2010, reaching record highs for parts of September through to the end of the year (Figure 7.2-2). Little Playgreen Lake followed the same trend with levels near the upper quartile for most of the year and then rising above the upper quartile for the last few months of the year (Figure 7.2-3).

Cross Lake water levels were above the upper quartile for most of 2010, falling below the average only in the month of May and reaching record high levels for October through December (Figure 7.2-4).

Walker Lake water levels were above average from January until the end of April and then dropped to the lower quartile for May and June. Levels then rose steadily until October and reached record high levels from mid-October to the end of the year (Figure 7.2-5).

Setting Lake water levels dropped from January to early-April and peaked slightly in mid-June before dropping back down to a low in early August. Levels then climbed until October and remained above the previous two years of available record for the rest of the year (Figure 7.2-6).

7.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 3 of CAMPP in the Upper Nelson River Region. Monitoring was conducted at two on-system waterbodies (Little Playgreen Lake and Cross Lake near the community) and two off-system waterbodies (Walker and Setting lakes; Figure 7.3-1).

7.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Upper Nelson River Region for routine water quality variables are presented in Tables 7.3-1 and 7.3-2 and Figures 7.3-2 to 7.3-10.

7.3.1.1 On-system Waterbodies

Water quality of Little Playgreen and Cross lakes can be generally described as moderate to nutrient-rich, slightly alkaline, moderately hard to hard, and well-oxygenated. Neither lake was stratified in 2010/2011 (Figure 7.3-2). Dissolved oxygen (DO) concentrations measured in both of the on-system lakes declined with depth in winter; however, DO was above all Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011) for the protection of aquatic life (PAL; Figure 7.3-3) in 2010/2011. All other *in situ* variables, including turbidity, pH, and specific conductance were relatively consistent across depth (Figures 7.3-4 to 7.3-6) except that pH increased with depth in fall 2010 in both lakes.

Secchi disk depths were low in Little Playgreen and Cross lakes, ranging from 0.6 to 0.8 m during the open-water season (Figure 7.3-7).

In the on-system waterbodies, 100% and 75% of total phosphorus (TP) measurements exceeded the Manitoba narrative guideline for lakes, reservoirs, and ponds (0.025 mg/L; MWS 2011; Figure 7.3-8). *In situ* pH measured in Little Playgreen Lake in summer 2010 was also above the upper limit of the PAL guideline (6.5-9.0) across depth. All other routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011 (MWS 2011).

The relative proportions of particulate and dissolved phosphorus were quite variable across the sampling periods, with particulates dominating in some periods but present in low proportions in others (Figure 7.3-9). Dissolved phosphorus dominated the phosphorus pool in winter in both lakes. Total nitrogen (TN) was consistently dominated by the organic nitrogen pool but the relative proportions of ammonia and nitrate/nitrite varied across the sampling periods (Figure 7.3-10). However, nitrate/nitrite comprised the majority of the dissolved inorganic nitrogen (DIN) in winter.

7.3.1.2 Off-system Waterbodies

Walker and Setting lakes were both thermally stratified during the spring sampling season (Figure 7.3-2). As in the on-system lakes, DO at both sites also declined with depth during winter; however, unlike the on-system sites, DO was slightly below the most stringent DO PAL objective in winter at depth (9.5 mg/L; MWS 2011; Figure 7.3-3). Similar to on-system lakes, other *in situ* variables, including turbidity, pH, and specific conductance were relatively consistent throughout the water column (Figures 7.3-4 to 7.3-6). Secchi disk depths in Walker and Setting lakes were higher than the on-system lakes, ranging from 1.9 to 3.1 m during the open-water season (Figure 7.3-7).

TP exceeded the narrative guideline for lakes, ponds, and reservoirs (0.025 mg/L; MWS 2011) in 50% and 25% of samples from Walker and Setting lakes, respectively (Figure 7.3-8). In both lakes, particulate phosphorus formed a greater proportion of TP than dissolved phosphorus during the open-water season, whereas the opposite occurred in winter (Figure 7.3-9). Like on-system lakes, organic nitrogen was the dominant form of nitrogen and nitrate/nitrite dominated the DIN pool in winter (Figure 7.3-10).

With the exceptions noted above, all other routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011 (MWS 2011).

7.3.2 Metals and Major Ions

A summary of metal concentrations measured and detection frequencies for the Upper Nelson River Region in 2010/2011 is presented in Table 7.3-3 and a summary of detection frequencies for metals is provided in Table 7.3-4.

7.3.2.1 On-system Waterbodies

Antimony, beryllium, bismuth, cesium, chromium, mercury, nickel, selenium, silver, tellurium, thallium, tin, tungsten, and zinc were not detected in Little Playgreen or Cross lakes during any sampling period in 2010/2011. Several metals were consistently detected including aluminum, arsenic, barium, boron, calcium, copper, iron, lead, lithium, magnesium, manganese, molybdenum, potassium, rubidium, silicon, sodium, strontium, titanium, uranium, and vanadium; the remaining metals were detected in some samples (Table 7.3-4).

All aluminum samples measured in Little Playgreen and Cross lakes exceeded the MWQSOG for PAL (0.1 mg/L; MWS 2011) (Table 7.3-5; Figure 7.3-11), and iron exceeded the PAL guideline (0.3 mg/L) in 50% of samples from each of Little Playgreen and Cross lakes (Table 7.3-5; Figure 7.3-11). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines (MWS 2011). However, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods, comparisons to the guideline could not be made.

Both chloride and sulphate were consistently detected in the Upper Nelson River Region in 2010/2011 (Table 7.3-2). Although chloride was higher in Little Playgreen and Cross lakes than most CAMPP waterbodies (maximum concentration of 27 mg/L), all concentrations were well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013). Sulphate concentrations in the on-system lakes were also higher than many other waterbodies studied under CAMPP (maximum of 31.3 mg/L); however, all results were below the British Columbia Ministry of Environment [BCMOE] guidelines, which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013)..

7.3.2.2 Off-system Waterbodies

A number of metals were not detected in Walker or Setting lakes including beryllium, bismuth, cesium, chromium, cobalt, mercury, molybdenum, nickel, selenium, silver, tellurium, thallium, thorium, tin, tungsten, zinc, and zirconium (Table 7.3-4). Arsenic, barium, calcium, iron, magnesium, manganese, potassium, rubidium, silicon, sodium, and strontium were consistently detected and the remaining metals were detected in some samples (Table 7.3-4).

Similar to on-system waterbodies, the PAL guideline for aluminum (0.1 mg/L; MWS 2011) was exceeded in half the samples collected from Setting Lake but none of the no samples from Walker Lake exceeded the guideline (Table 7.3-5 and Figure 7.3-11). All other metals measured in the off-system waterbodies for which there are MWQSOGs for PAL (including iron) were within objectives and guidelines in 2010/2011 (Table 7.3-5). However, as noted in Section 7.3.2.1, comparisons could not be made to the current MWQSOG for mercury (0.000026 mg/L) owing to analytical detection limits.

Concentrations of chloride and sulphate were lower in Walker and Setting lakes than the on-system lakes in 2010/2011 (Table 7.3-2) and were well below the CCME PAL guideline (120 mg/L; CCME 1999, udpated to 2013) and the BCMOE (128-429 mg/L; BCMOE 2000) guidelines, respectively.

7.3.3 Trophic Status and Nutrient Ratios

7.3.3.1 On-system Waterbodies

On-system waterbodies on the upper Nelson River were meso-eutrophic to eutrophic on the basis of TP concentrations (Table 7.3-6), and mesotrophic based on chlorophyll *a* (Table 7.3-7) and TN (Table 7.3-8). On the basis of molar TN:TP ratios, Little Playgreen and Cross lakes were phosphorus limited during all sampling periods (Figure 7.3-12). Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter in these waterbodies was a mixture of allochthonous and autochthonous sources (Figure 7.3-13).

7.3.3.2 Off-system Waterbodies

The trophic status of Walker and Setting lakes was similar to the on-system waterbodies sampled in the Upper Nelson River Region in 2010/2011. Specifically, both lakes were meso-eutrophic based on TP (Table 7.3-6) and mesotrophic based on chlorophyll *a* (Table 7.3-7) and TN (Table 7.3-8).

Also similar to on-system waterbodies, both off-system lakes were phosphorus limited (based on molar TN:TP ratios) and organic matter was, on average, composed of a mixture of allochthonous and autochthonous sources (based on TOC:ON ratios). However, allochthonous organic matter was dominant in spring, indicating that inputs from the drainage basin may be significant during at least some periods.

7.3.4 *Escherichia coli*

7.3.4.1 On-system Waterbodies

A single detection of *E. coli* (measured at the analytical detection limit) occurred for a sample collected from Little Playgreen Lake in the summer of 2010. All measurements were well below the MWQSOGs for recreation of 200 CFU/100 mL (Table 7.3-2; MWS 2011).

7.3.4.2 Off-system Waterbodies

E. coli was detected in one sample from Setting Lake, but like Little Playgreen Lake, the measurement was equivalent to the analytical detection limit. All measurements from Walker and Setting lakes were well below the MWQSOGs for recreation of 200 CFU/100 mL (Table 7.3-2; MWS 2011).

7.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Upper Nelson River Region in Year 3 of CAMPP. Waterbodies sampled included two annual sites, Cross Lake and an off-system lake (Setting Lake), as well as two rotational waterbodies, Little Playgreen Lake and Walker Lake (Figure 7.3-1).

7.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Upper Nelson River Region were moderate, and were generally similar between waterbodies (Figure 7.4-1). Winter chlorophyll *a* concentrations were generally lower than in the open-water season.

7.4.2 Community Composition and Biomass

In 2010/2011, phytoplankton community composition and biomass were measured in all four waterbodies sampled in the Upper Nelson River Region. Unlike chlorophyll a which was relatively similar across sites, phytoplankton biomass was consistently higher at Walker Lake in the open-water season of 2010 (Figure 7.4-2).

Phytoplankton community composition was similar between Walker and Setting lakes, and also between Little Playgreen and Cross lakes (Figure 7.4-3). In spring, all four sites in the region were dominated by blue-greens and diatoms, and this pattern persisted throughout the open-water season in Walker and Setting lakes. Cryptophytes dominated at Little Playgreen and Cross lakes in summer and fall, with green algae being second-dominant in summer and diatoms being the next-most common taxa in fall.

Metrics describing the phytoplankton communities in the region indicated that diversity, heterogeneity, evenness, and species effective richness were lowest in fall at all sites but the season with greatest community complexity varied across sites (Table 7.4-1). Complexity of the phytoplankton assemblage in Setting Lake was consistently greater than that of the other lakes in the region. With one exception, the remaining waterbodies had similar diversity and evenness; the exception occurred in fall when complexity at Cross Lake was lower than the other sites.

7.4.1 Bloom Monitoring

Chlorophyll *a* concentrations in the region were consistently below the bloom monitoring trigger of 10 µg/L in 2010.

7.4.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (algal toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to influence whether microcystins are produced. *Anabaena* and *Aphanizomenon* were present at the four sites sampled in the region in 2010. Additionally, *Oscillatoria* was present in Setting Lake and *Microcystis* was present in Walker Lake in 2010/2011.

Microcystin-LR was not measured in this Region in 2010 as chlorophyll *a* concentrations were always below the 10 µg/L trigger.

7.4.3 Trophic Status

In terms of mean chlorophyll *a* concentrations for 2010/2011 (open-water and annual seasons), Little Playgreen, Cross, Walker and Setting lakes were mesotrophic (OECD 1982; Table 7.3-7).

7.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Upper Nelson River Region in 2010/2011, the third year of CAMPP. Waterbodies sampled included the on-system waterbodies Little Playgreen, and Cross lakes, and the off-system waterbodies Setting and Walker lakes (Figures 7.5-1 to 7.5-4). Cross and Setting lakes are sampled annually, and Little Playgreen and Walker lakes are sampled on a rotational basis (i.e., once every three years).

In 2010, grab sampling in the predominantly-wetted portion of the nearshore habitat was changed to kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize the portion of the littoral zone influenced by water level fluctuations. Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Nearshore and offshore habitat polygons were sampled in all waterbodies. Both kicknet and grab sampling consisted of five composites of three replicate samples per nearshore and offshore habitat polygon for a total of 10 samples per waterbody; the exception was Walker Lake, where five composites of three replicate samples were collected in the nearshore, and six composites of three replicate samples were collected in the offshore, for a total of 11 samples for the waterbody. Sampling was conducted between 25 August and 02 September 2010.

7.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons at each waterbody (Table 7.5-1).

In 2010, mean water depths sampled in the nearshore were 0.7 m in Little Playgreen Lake, 0.9 m in Cross Lake, 0.9 m in Walker Lake, and 0.8 m in Setting Lake. Mean water depth sampled in the offshore was 8.0 m in Little Playgreen Lake, 8.0 m in Cross Lake, 7.1 m in Walker Lake, and 7.4 m in Setting Lake (Table 7.5-1).

Sediment samples were collected and analyzed for TOC and PSA to provide a general characterization of sediment type in each offshore polygon. Nearshore substrates at all but one site (Cross Lake) within the four waterbodies consisted of cobble, boulder, and bedrock, and therefore could not be sampled for TOC or PSA (Table 7.5-2).

With the exception of offshore Walker Lake, habitat polygons sampled in the Upper Nelson River Region had low mean TOC (less than 3%) in the sediments (Table 7.5-2). The sediments within the offshore habitat polygon at Walker Lake had a mean TOC of 7.3%.

Silt and clay were similarly represented in sediment samples within the Little Playgreen Lake offshore polygon; sand was a small component within the samples (Table 7.5-2). At Cross Lake, sand comprised the majority of the sediments collected from the nearshore habitat polygon and silt comprised the majority of the sediments in the offshore habitat polygon (Table 7.5-2). In Walker Lake, sand comprised the majority of sediments collected from the offshore habitat polygon and in Setting Lake, clay dominated the offshore sediment samples (Table 7.5-2).

7.5.2 Species Composition, Distribution, and Relative Abundance

7.5.2.1 Little Playgreen Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Little Playgreen Lake was 7,816 individuals, with numbers ranging from 1,207 to 14,042 (Table 7.5-3). Overall, non-insects dominated the BMI community in abundance (63% of the mean total BMI), with insects comprising 37% of the overall taxa (Table 7.5-3). Of the non-insects, the main groups were Amphipoda (36% of the mean total BMI) and Oligochaeta (21%); Gastropoda, Bivalvia, and a small number of Acari and Hirudinea were also present. Insects mainly consisted of Chironomidae (27% of the mean total BMI) and Ephemeroptera (7%), with a small number of Hemiptera, Trichoptera, Coleoptera (beetles) also found (Table 7.5-3). Mean BMI density in offshore benthic grab samples was 3,916 individuals/m^2, with densities ranging from 3,650 to 4,141 (Table 7.5-3). Overall, non-insects dominated the BMI community (77% of the mean total BMI), with insects comprising 23% of the overall taxa (Table 7.5-3). Of the non-insects, the main group was Bivalvia (65%); Hirudinea, Gastropods, Amphipoda, and Acari were also present (Table 7.5-3). Insects mainly consisted of Chironomidae (17% of the mean total BMI); a small number of Ephemeroptera, Trichoptera, Ceratopogonidae, and Hemiptera were also collected (Table 7.5-3).

Total EPT comprised 7% of the mean total nearshore BMI community, with the prevalence being within the mayflies (Table 7.5-3). Genus analysis of the mayflies indicated that *Caenis* sp. was dominant in nearshore kicknet samples. *Caenis* sp. is a ubiquitous group with general habitat requirements, commonly found in depositional sediments in both lentic and lotic environments (Merritt and Cummins 1996). Genera of Baetidae, Leptophlebiidae and Heptageniidae were also present (Table 7.5-3). Trichoptera were also collected in small numbers and Plecoptera were absent. In the offshore polygon, total EPT comprised 5% of the BMI community, with the prevalence being within the mayflies. Genus analysis of Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore samples (Table 7.5-3). Trichoptera were also collected in small numbers and similar to the nearshore polygon, Plecoptera were not collected. The ratio of EPT:C was 0.44 in the nearshore and 0.32 in the offshore polygons (Table 7.5-3). Both ratios indicate that Chironomidae were dominant over EPT in their respective BMI communities.

Taxonomic richness in the nearshore was 25 families, with richness values ranging from 13 to 18 within each sample (Table 7.5-3). Hill's Effective Richness (E^H) was seven with Hyalellidae, Chironomidae, and Oligochaeta notably dominating the BMI community (Table 7.5-3). Taxonomic richness in the offshore polygon was 12 families, with richness values ranging from eight to nine within each sample (Table 7.5-3). Hill's Effective Richness (E^H) was four; Pisidiidae was notably dominant.

Mean diversity (Simpson's Diversity Index [D]) was 0.78 and 0.55 in the nearshore and offshore polygons, respectively (Table 7.5-3). Evenness (Simpson's Equitability [E_D]) was 0.27 in the nearshore polygon and 0.20 in the offshore polygon (Table 7.5-3).

7.5.2.2 Cross Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Cross Lake was 248 individuals, with numbers ranging from 173 to 454 (Table 7.5-4). Overall, insects dominated the BMI community in abundance (94% of the mean total BMI), with non-insects comprising 6% of the overall taxa. Insects mainly consisted of Corixidae (43% of the mean total BMI) and Chironomidae (36%); Ephemeroptera (15%) were also present (Table 7.5-4). Of the non-insects, the main groups were Oligochaeta (3%) and Amphipoda (2%), with small numbers of Gastropoda (1%) also present (Table 7.5-4). The mean BMI density in the offshore habitat was 1,414 individuals/m^2, with densities ranging from 967 to 1,674 (Table 7.5-4). Overall, insects dominated the BMI community (62% of the mean total BMI), with the non-insects comprising 38% of the overall taxa. Insects mainly consisted of Ephemeroptera (32% of the mean total BMI) and Chironomidae (28%); a small number of Megaloptera and Ceratopogonidae were also collected (Table 7.5-4). Of the non-insects, the main group was Bivalvia (32% of the mean total BMI) though Amphipoda, Oligochaeta, and Hirudinea were also present.

Total EPT comprised 15% and 32% of the mean BMI in the nearshore and offshore polygons, respectively; with the prevalence being within the mayflies in both habitats (Table 7.5-4). Genus analysis of the Ephemeroptera indicated that *Caenis* sp. was dominant within the nearshore polygon, and *Hexagenia* sp. within the offshore polygon. Neither Trichoptera nor Plecoptera were collected in either the nearshore or offshore habitats (Table 7.5-4). The ratio of EPT:C was 1.27 in the offshore and 0.62 in the nearshore indicating that EPT and Chironomidae were fairly well balanced in both habitats with EPT slightly dominating Chironomidae in the offshore habitat and Chironomidae slightly dominating EPT in the nearshore habitat (Table 7.5-4).

Taxonomic richness in the nearshore polygon was 16 families, with richness values ranging from seven to 13 within each sample (Table 7.5-4). Hill's Effective Richness (E^H) was four; Corixidae and Chironomidae were notably dominant. Taxonomic richness in the offshore habitat was eight families, with richness values ranging from four to six (Table 7.5-4). In the offshore polygon, Hill's Effective Richness (E^H) was five; this community was primarily dominated by Pisidiidae, Ephemeridae, and Chironomidae (Table 7.5-4).

Simpson's Diversity Index (D) was 0.49 in the nearshore polygon and 0.73 in the offshore polygon (Table 7.5-4). Evenness (Simpson's Equitability [E_D]) was 0.15 in the nearshore polygon and 0.54 in the offshore polygon (Table 7.5-4).

7.5.2.3 Walker Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Walker Lake was 339 individuals, with numbers ranging from 109 to 928 (Table 7.5-5). Overall, non-insects dominated the BMI community in abundance (67% of the mean total BMI), with insects comprising 33% of the overall taxa. Of the non-insects, the main groups were Amphipoda (45% of the mean total BMI) and Oligochaeta (19%); smaller numbers of Gastropoda, Acari, Bivalvia, Ostracoda, and Hirudinea were also present (Table 7.5-5). Insects mainly consisted of Chironomidae (20% of the mean total BMI) and Ephemeroptera (9%); Trichoptera (4%) and smaller numbers of Corixidae and an unidentified Diptera were also identified. The mean BMI density in the offshore habitat was 1,226 individuals/m^2, with densities ranging from 923 to 1,832 (Table 7.5-5). Overall, insects dominated the BMI community (81% of the mean total BMI), with the non-insects comprising 19% of the overall taxa. Insects mainly consisted of Chironomidae (68% of the mean total BMI); Chaoboridae and a small number of Ephemeroptera, Ceratopogonidae, Trichoptera, and Corixidae were also collected (Table 7.5-5). Of the non-insects, the main groups were Oligochaeta (11%) and Bivalvia (7%) though small numbers of Acari and Amphipoda were also present.

Total EPT comprised 13% of the mean total nearshore BMI community, with the prevalence being within the Ephemeroptera (7.5-5). Genus analysis of the mayflies indicated that *Caenis* sp. and an unidentified Leptophlebiidae were both dominant in nearshore grab samples; genera within Baetidae, Heptageniidae and Ephemerellidae were also identified (Table 7.5-5). Trichoptera were also collected and included Hydroptilidae, Limnephilidae, Leptoceridae, Polycentropodidae, Lepidostomatidae and Phryganeidae. Plecoptera were absent. In the offshore polygon, total EPT comprised 2% of the mean total BMI, with prevalence being within the *Hexagenia* sp. Trichoptera was also present within the offshore polygon and consisted of Leptoceridae (Table 7.5-5). Plecoptera were again not collected. The ratio of EPT:C was 0.66 in the nearshore community and 0.03 in the offshore BMI community (Table 7.5-5). Both nearshore and offshore ratios indicate that Chironomidae dominated the community with respect to EPT, but that Chironomidae in the offshore community were much more abundant compared to EPT than in the nearshore community.

Taxonomic richness within the nearshore habitat polygon was 33 families, with richness values ranging from 15 to 24 within each sample (7.5-5). Hill's Effective Richness (E^H) was seven in the nearshore; Hyalellidae, followed by Chironomidae were the most dominant families. In the offshore polygon, taxonomic richness was 11 families, with richness values ranging from four to eight within each sample (Table 7.5-5). Hill's Effective Richness (E^H) was four families; Chironomidae was the most dominant family in the offshore polygon.

The mean index of diversity (Simpson's Diversity Index [D]) was similar in both nearshore and offshore habitat polygons, at 0.77 and 0.71, respectively (Table 7.5-5). Evenness (Simpson's Equitability [E_D]) was 0.21 in the nearshore habitat polygon and 0.51 in the offshore polygon (Table 7.5-5).

7.5.2.4 Setting Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Setting Lake was 331 individuals, with numbers ranging from 105 to 582 (Table 7.5-6). Overall, insects dominated the BMI community in abundance (59% of the mean total BMI), with non-insects comprising 41% of the overall taxa. Insects mainly consisted of Chironomidae (30% of the mean total BMI) and Ephemeroptera (17%). Trichoptera (9%) and a smaller number of Coleoptera, Hemiptera, and Ceratopogonidae were also found (Table 7.5-6). Of the non-insects, the main groups were Oligochaeta (16% of the mean total BMI) and Amphipoda (12%); Gastropoda (7%), Bivalvia (5%), and smaller numbers of Hirudinea, Acari, Hydrozoa and Ostracoda were also present (Table 7.5-6). The mean BMI density in the offshore habitat was 2,796 individuals/m^2, with densities ranging from 2,164 to 3,780 (Table 7.5-6). Overall, non-insects dominated the BMI community (64% of the mean total BMI), with insects comprising 36% of the overall taxa. Of the non-insects, the main group was Amphipoda (50%) followed by Bivalvia (11%). Ostracoda, Hirudinea, Gastropoda, and Oligochaeta were also present. Insects mainly consisted of Chironomidae (25% of the mean total BMI); Ephemeroptera (7%) and a small number of Chaoboridae, Ceratopogonidae, Trichoptera, Hemiptera, and Megaloptera were also collected (Table 7.5-6).

Total EPT comprised 26% and 8% of the mean total BMI in the nearshore and offshore polygons, respectively; with the prevalence being within the mayflies in both habitats (Table 7.5-6). In the nearshore habitat polygon, genus analysis of the Ephemeroptera indicated that *Caenis* sp. was dominant; in the offshore habitat, *Hexagenia* sp. was dominant. Trichoptera were collected in relatively small numbers in both the nearshore and offshore habitats. Plecoptera were not collected in the nearshore or offshore polygon. The ratio of EPT:C was 1.10 in the nearshore and 0.32 in the offshore indicating a fairly balanced community with respect to the numbers of EPT compared to Chironomidae in the nearshore habitat, and a chironomid-dominated community with respect to EPT in the offshore habitat.

Taxonomic richness in the nearshore polygon was 34 families, with richness values ranging from 21 to 23 within each sample. Hill's Effective Richness (E^H) was 12 families in the nearshore community; Chironomidae, Ephemeroptera, and Oligochaeta were notably dominant within this habitat (Table 7.5-6). In the offshore habitat, taxonomic richness was 15 families, with richness values ranging from six to 11 within each sample. Hill's Effective Richness (E^H) was five with Haustoriidae, followed by Chironomidae, most dominant (Table 7.5-6).

Simpson's Diversity Index (D) was 0.89 in the nearshore and 0.68 in the offshore polygon (Table 7.5-6). Evenness (Simpson's Equitability [E_D]) values were 0.34 in both nearshore and offshore polygons (Table 7.5-6).

7.6 FISH COMMUNITY

7.6.1 Gill Netting

In 2010, gill netting was conducted in the Upper Nelson River Region in Playgreen Lake (23 – 27 June), Little Playgreen Lake (10 – 15 June), Cross Lake (17 – 21 August), Walker Lake (21 – 24 August), and Setting Lake (19 August – 1 September) (Table 7.6-1).

In Playgreen Lake, 14 sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Table 7.6-1; Figure 7.6-1). Water temperature during the sampling period ranged from 14.6 – 19.2°C.

In Little Playgreen Lake, ten sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Table 7.6-1; Figure 7.6-2). Water temperature during the sampling period ranged from 13.0 – 18.0°C.

In Cross Lake, 12 sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Table 7.6-1; Figure 7.6-3). Water temperature during the sampling period ranged from 14.0 – 18.0°C.

In Walker Lake, nine sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Table 7.6-1; Figure 7.6-4). Water temperature during the sampling period ranged from 16.0 – 17.5°C.

In Setting Lake, 16 sites were sampled with standard gang index gill nets and four sites were sampled with small mesh index gill nets (Table 7.6-1; Figure 7.6-5). Water temperature during the sampling period ranged from 15.0 – 17.4°C.

7.6.2 Species Composition

In 2010, 18 species of fish were captured in the Upper Nelson River Region (Table 7.6-2).

7.6.2.1 Playgreen Lake

A total of 958 fish, representing 14 species, were captured in standard gang index gill nets (Table 7.6-3) and 2,618 fish, representing nine species, were captured in small mesh index gill nets (Table 7.6-4). White Sucker (n = 471 fish) represented almost half (49.16%) of the standard gang index gillnet catch. Rainbow Smelt (n = 135 fish; 14.09%) and Walleye (n = 115 fish; 12.00%) were also common (Table 7.6-3; Figure 7.6-6). In small mesh index gill nets, Spottail Shiner (n = 1640 fish; 62.64%) was the most frequently captured species, followed by Rainbow Smelt (n = 503 fish; 19.21%) and Emerald Shiner (n = 400 fish; 15.28%) (Table 7.6-4; Figure 7.6-6).

White Sucker accounted for approximately half (49.98%) of the biomass in the standard gang index gillnet catch, followed by Northern Pike (28.23%) and Walleye (15.66%) (Table 7.6-5). In the small mesh index gillnet catch, Northern Pike (38.40%), Spottail Shiner (29.78%), and Rainbow Smelt (19.71%) composed the majority of the biomass.

7.6.2.2 Little Playgreen Lake

A total of 734 fish, representing 11 species, were captured in standard gang index gill nets (Table 7.6-3) and a total of 2,719 fish, representing nine species, were captured in small mesh index gill nets (Table 7.6-4). The majority of the catch in standard gang index gill nets consisted of White Sucker (n = 382 fish; 52.04%), Northern Pike (n = 124 fish; 16.89%), and Walleye (n = 113 fish; 15.40%) (Table 7.6-3; Figure 7.6-6). Spottail Shiner dominated the small mesh index gillnet catch (n = 2,496 fish; 91.80%) (Table 7.6-4; Figure 7.6-6).

White Sucker (54.70%), Northern Pike (22.32), and Walleye (14.69%) composed the majority of the biomass in the standard gang index gillnet catch (Table 7.6-5). In the small mesh index gillnet catch, Spottail Shiner (67.98%) and Northern Pike (21.02%) accounted for most of the biomass (Table 7.6-6).

7.6.2.3 Cross Lake

A total of 424 fish, representing nine species, were captured in standard gang index gill nets (Table 7.6-3) and a total of 489 fish, representing eight species, were captured in small mesh index gill nets (Table 7.6-4). Walleye (n = 146 fish) represented 34.43% of the standard gang index gillnet catch, followed by Northern Pike (n = 92 fish; 21.70%) and White Sucker (n = 70 fish; 16.51%) (Table 7.6-3; Figure 7.6-6). In small mesh index gill nets, Spottail Shiner (n = 238 fish; 48.67%) and Yellow Perch (n = 196 fish; 40.08%) were most common (Table 7.6-4; Figure 7.6-6).

Northern Pike (35.16%), Walleye (33.97%), and White Sucker (18.61%) accounted for the majority of the biomass in the standard gang index gillnet catch (Table 7.6-5). In small mesh index gill nets, Northern Pike (28.00%), Walleye (21.61%), and Yellow Perch (20.24%) comprised the majority of the biomass (Table 7.6-6).

7.6.2.4 Walker Lake

A total of 276 fish, representing eight species, were captured in standard gang index gill nets (Table 7.6-3) and 165 fish, representing eight species, were captured in small mesh index gill nets (Table 7.6-4). White Sucker (n = 129 fish; 46.74%) and Cisco (n = 63 fish; 22.83%) were the most frequently captured species in standard gang index gill nets (Table 7.6-3; Figure 7.6-6), while Spottail Shiner (n = 81 fish; 49.09%) and Yellow Perch (n = 47 fish; 28.48%) were the most frequently captured species in small mesh index gill nets (Table 7.6-4; Figure 7.6-6).

In terms of biomass, White Sucker (63.46%) dominated the standard gang index gillnet catch (Table 7.6-5) and Walleye (53.28%) dominated the small mesh index gillnet catch (Table 7.6-6).

7.6.2.5 Setting Lake

A total of 1,418 fish, representing 11 species, were captured in standard gang index gill nets (Table 7.6-3). Cisco was the most abundant species (n = 448 fish; 31.59%), followed by Walleye (n = 276 fish; 19.46%) and Sauger (n = 264 fish; 18.62%) (Table 7.6-3; Figure 7.6-6). In small mesh index gill nets, a total of 318 fish were captured, representing eight species (Table 7.6-4). The majority of the small mesh index gillnet catch consisted of Spottail Shiner (n = 120 fish; 37.74%) and Sauger (n = 67 fish; 21.07%) (Table 7.6-4; Figure 7.6-6).

In terms of biomass, White Sucker represented 26.90% of the standard gang index gillnet catch, followed by Walleye (19.50%) and Cisco (17.90%) (Table 7.6-5). The biomass in the small mesh index gillnet catch consisted primarily of Sauger (60.11%), Walleye (21.65%), and Cisco (14.20%) (Table 7.6-6).

7.6.3 Catch-Per-Unit-Effort (CPUE) and Biomass-Per-Unit-Effort (BPUE)

7.6.3.1 Playgreen Lake

In 2010, the mean CPUE for the standard gang index gillnet catch was 80.4 fish/100 m/24 h (Table 7.6-7; Figure 7.6-7). White Sucker had the highest species-specific CPUE (40.2) (Table 7.6-7; Figure 7.6-8). Mean CPUE in small mesh index gill nets was 880.5 fish/30 m/24 h (Table

7.6-8; Figure 7.6-7). Species having the highest CPUE were Spottail Shiner (559.2), Rainbow Smelt (160.5), and Emerald Shiner (135.9) (Table 7.6-8; Figure 7.6-8).

Mean BPUE for standard gang index gill nets was 62,075 g/100 m/24 h (Table 7.6-9). White Sucker had the highest mean BPUE (31,641), followed by Northern Pike (17,106) (Table 7.6-9). Small mesh index gill nets produced a mean BPUE of 10,339 g/30 m/24 h (Table 7.6-10). Northern Pike and Spottail Shiner had the highest species-specific BPUE (3,940 and 3,171, respectively).

7.6.3.2 Little Playgreen Lake

The mean CPUE for standard gang index gill nets set in 2010 was 80.3 fish (Table 7.6-7; Figure 7.6-7). White Sucker had the highest species-specific CPUE (42.0), followed by Northern Pike (13.6) and Walleye (12.3) (Table 7.6-7, Figure 7.6-8). Small mesh index gill nets produced a mean CPUE of 1,175.3 fish (Table 7.6-8; Figure 7.6-7). Spottail Shiner (1,078.2) had the highest mean CPUE in the small mesh index gillnet catch (Table 7.6-8; Figure 7.6-8).

Mean BPUE for the standard gang index gillnet catch was 68,579 g (Table 7.6-9). The species with the highest BPUE were White Sucker (37,639), Northern Pike (15,324), and Walleye (10,008) (Table 7.6-9). In small mesh index gill nets, the mean BPUE was 8,548 g, with Spottail Shiner (5,936) having the highest value (Table 7.6-10).

7.6.3.3 Cross Lake

In 2010, the mean CPUE for the standard gang index gillnet catch was 35.2 fish (Table 7.6-7; Figure 7.6-7). Walleye had the highest species-specific CPUE (12.1) followed by Northern Pike (7.6) (Table 7.6-7; Figure 7.6-8). Mean CPUE for the small mesh index gillnet catch was 136.6 fish (Table 7.6-8; Figure 7.6-7). Spottail Shiner and Yellow Perch had the highest species-specific CPUE (66.4 and 54.9, respectively) (Table 7.6-8).

Mean BPUE for the standard gang index gillnet catch was 27,004 g (Table 7.6-9). Northern Pike had the highest BPUE (9,424) followed by Walleye (9,189). Small mesh index gill nets produced a BPUE of 2,856 g (Table 7.6-10). Northern Pike (799) and Walleye (624) had the highest BPUE values.

7.6.3.4 Walker Lake

The mean CPUE for standard gang index gill nets set in 2010 was 30.8 fish (Table 7.6-7; Figure 7.6-7). The species with the highest CPUE were White Sucker (14.1) and Cisco (8.4) (Table 7.6-7; Figure 7.6-8). For small mesh index gill nets, the mean CPUE was 61.7 fish (Table 7.6-8;

Figure 7.6-7). Spottail Shiner (33.8) and Yellow Perch (13.4) had the highest species-specific CPUE values (Table 7.6-8).

Mean BPUE for standard gang index gill nets was 17,684 g, with White Sucker (11,109) and Northern Pike (3,058) having the highest species-specific BPUE values (Table 7.6-9). Small mesh index gill nets produced a mean BPUE of 2,773 g (Table 7.6-10). The species with the highest BPUE were Walleye (1,349) and Sauger (458).

7.6.3.5 Setting Lake

The mean CPUE for standard gang index gill nets was 83.5 fish (Table 7.6-7; Figure 7.6-7). Cisco had the highest mean CPUE (26.4), followed by Walleye (16.4) and Sauger (15.4) (Table 7.6-7; Figure 7.6-8). For small mesh index gill nets, the mean CPUE was 84.4 fish (Table 7.6-8; Figure 7.6-7). Species with the highest CPUE values were Spottail Shiner (32.6), Sauger (17.2), and Emerald Shiner (14.0) (Table 7.6-8; Figure 7.6-8).

Mean BPUE for the standard gang index gillnet catch was 36,428 g (Table 7.6-9). White Sucker had the highest mean BPUE (9,707), followed by Walleye (7,105) and Cisco (6,501). Small mesh index gill nets produced a mean BPUE of 6,081 g (Table 7.6-10), with Sauger (3,606) and Walleye (1,366) having the highest values.

7.6.4 Size and Condition

Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies in 2010 were measured for fork length (mm) and weight (g) (Table 7.6-11). Condition factor (K) was calculated for individual fish based on these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, and Walleye are illustrated for each waterbody in figures 7.6-9, 7.6-10, and 7.6-11, respectively.

Fish captured in small mesh index gill nets were bulk weighed; only a few individuals from Playgreen Lake, Little Playgreen Lake, and Setting Lake were measured for fork length (Table 7.6-12).

7.6.4.1 Playgreen Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 667 mm, a mean weight of 2,759 g, and a mean condition factor of 0.88. Lake Whitefish had a mean fork length of 260 mm, a mean weight of 461 g, and a mean condition factor of 1.44. Walleye had a mean fork length of 443 mm, a mean weight of 1,261 g, and a mean condition factor of 1.34 (Table 7.6-11).

7.6.4.2 Little Playgreen Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 538 mm, a mean weight of 1,420 g, and a mean condition factor of 0.83. Lake Whitefish had a mean fork length of 472 mm, a mean weight of 1,912 g, and a mean condition factor of 1.78. Walleye had a mean fork length of 405 mm, a mean weight of 1,018 g, and a mean condition factor of 1.39 (Table 7.6-11).

7.6.4.3 Cross Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 566 mm, a mean weight of 1,563 g, and a mean condition factor of 0.77. No Lake Whitefish were captured in Cross Lake. Walleye had a mean fork length of 416 mm, a mean weight of 952 g, and a mean condition factor of 1.25 (Table 7.6-11).

7.6.4.4 Walker Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 557 mm, a mean weight of 1,413 g, and a mean condition factor of 0.70. Only one Lake Whitefish was captured, and had a fork length of 221 mm, a weight of 140 g, and a condition factor of 1.30. Walleye captured in standard gang index gill nets had a mean fork length of 436 mm, a mean weight of 1,009 g, and a mean condition factor of 1.14 (Table 7.6-11).

7.6.4.5 Setting Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 505 mm, a mean weight of 1,045 g, and a mean condition factor of 0.73. Lake Whitefish had a mean fork length of 288 mm, a mean weight of 357 g, and a mean condition factor of 1.40. Walleye had a mean fork length of 352 mm, a mean weight of 548 g, and a mean condition factor of 1.15 (Table 7.6-11).

7.6.5 Age Composition

Age frequency distributions were calculated for Northern Pike (Table 7.6-13), Lake Whitefish (Table 7.6-14), and Walleye (Table 7.6-15) captured in standard gang index gill nets set in Upper Nelson River Region waterbodies during 2010.

Mean fork length (mm), weight (g), and condition factor are also presented, by cohort, for Northern Pike (Table 7.6-16), Lake Whitefish (Table 7.6-17), and Walleye (Table 7.6-18).

7.6.5.1 Playgreen Lake

Age was determined for 92 Northern Pike captured in standard gang index gill nets set in 2010 (Table 7.6-13). Northern Pike ranged from 2 - 12 years of age, with the majority ranging from 5 – 10 years of age.

A total of 26 Lake Whitefish captured in standard gang index gill nets were aged (Table 7.6-14). The majority of fish (69.23%) were one year of age.

Age was determined for 114 Walleye captured in standard gang index gill nets (Table 7.6-15). Walleye ranged in age from 2 – 9 years, with 5-year old fish most common in the sample.

7.6.5.2 Little Playgreen Lake

A total of 124 Northern Pike captured in standard gang index gill nets were aged (Table 7.6-13). Northern Pike ranged from 1 – 12 years of age, with strong representation of fish between the ages of three and six.

The five Lake Whitefish captured in standard gang index gill nets ranged in age from 5 – 18 years (Table 7.6-14).

Age was determined for 108 Walleye captured in standard gang index gill nets (Table 7.6-15). Walleye ranged in age from 2 – 9 years and from 13 – 15 years. Walleye aged 7 and 8-years were most abundant, with poor representation of 6-year old fish. No Walleye between the ages of 10 and 12 years were captured.

7.6.5.3 Cross Lake

Age was determined for 88 Northern Pike captured in standard gang index gill nets (Table 7.6-13). Northern Pike ranged in age from 2 – 13 years although not all cohorts were present in the overall catch. Northern Pike between the ages of 3 and 7 years were well represented.

No Lake Whitefish were captured in standard gang index gill nets in Cross Lake in 2010 (Table 7.6-14).

Age was determined for 145 Walleye captured in standard gang index gill nets (Table 7.6-15). Walleye ranged from 3 – 12 years of age, as well as one fish determined to be 24-years of age. Walleye aged 5 – 7 years were most abundant in the sample.

7.6.5.4 Walker Lake

A total of 26 Northern Pike were aged, with the majority of fish ranging from 3 – 8 years of age (Table 7.6-13).

Only one Lake Whitefish was captured, and was determined to be 5-years of age (Table 7.6-14).

Age was determined for a total of 22 Walleye (Table 7.6-15). Walleye ranged from 6 – 17 years of age, although not all cohorts were present in the sample.

7.6.5.5 Setting Lake

A total of 85 Northern Pike captured in standard gang index gill nets were aged (Table 7.6-13). Northern Pike ranged from 1 – 11 of age, with strong representation of fish aged 4 – 6 years.

A total of 25 Lake Whitefish captured in standard gangs were aged (Table 7.6-14). These fish ranged in age from 1 – 4 years, with the majority (72.00%) determined to be 3-years of age.

A total of 274 Walleye were aged (Table 7.6-15). Walleye between the ages of two and nine years were well represented in the sample.

7.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies in 2010 were examined externally for DELTs (Table 7.6-19).

7.6.6.1 Playgreen Lake

DELTs were documented on 13 out of 725 fish. Eleven White Sucker displayed lesions and one had a deformity, representing 2.55% of the White Sucker catch. One Northern Pike exhibited lesions.

7.6.6.2 Little Playgreen Lake

DELTs were documented for 19 out of 626 fish captured in standard gang index gill nets. The most frequently observed category of DELT was lesions; these were observed on six White Sucker and four Northern Pike. A total of three White Suckers, one Northern Pike, and one Walleye displayed deformities. Tumours were observed on one White Sucker and one Northern Pike. Erosion was observed on two Northern Pike.

7.6.6.3 Cross Lake

DELTs were documented for seven fish captured in standard gang index gill nets set in 2010. All DELTs were deformities, which afflicted three White Suckers and four Northern Pike.

7.6.6.4 Walker Lake

DELTs were documented for four fish captured in standard gang index gill nets. White Sucker was the only species to display DELTs, including two fish with deformities and two with lesions.

7.6.6.5 Setting Lake

DELTs were documented on seven fish captured in in standard gang index gill nets in 2010. Two White Sucker and two Walleye displayed deformities. One White Sucker had lesions, one Sauger had erosion, and one Walleye had tumours.

7.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Upper Nelson River Region. Waterbodies sampled included Playgreen Lake (24-26 June), Little Playgreen Lake (11-16 June), Cross Lake (18-21 August), and an off-system waterbody, Setting Lake (20-23 August and 31 August-1 September). Standard nets were set at 14 sites in Playgreen Lake (Figure 7.7-1), at 10 sites in Little Playgreen Lake (Figure 7.7-2), at 12 sites in Cross Lake (Figure 7.7-3), and at 16 sites in Setting Lake (Figure 7.7-4) of which 10, 8, 7, and 12 sites, respectively, yielded fish for mercury analysis. Small mesh nets were set at 3-4 sites at all four waterbodies, but only at Cross and Setting lakes were fish from one of these sites used for mercury analysis (Figures 7.7-1 to 7.7-4).

7.7.1 Species Comparisons

A total of 390 fish were analyzed for mercury (Table 7.7-1). One-year old Yellow Perch were not captured from Playgreen Lake and the number of fish available for mercury analysis from Little Playgreen and Setting lakes was approximately half the target sample size. Actual Yellow Perch ages were only available for Cross Lake, indicating a mean of 1.2 years at a mean length of 84 mm (Table 7.7-2). No Lake Whitefish were obtained for mercury analysis from Cross Lake and only five Lake Whitefish were captured from Little Playgreen Lake. Whitefish sample sizes from Playgreen and Setting lakes were well below the target sample size, whereas captures of Northern Pike and Walleye were close to or at the target sample size (Table 7.7-1).

A significant positive relationship between mercury concentration and fish length existed for Lake Whitefish, Northern Pike, and Walleye from all waterbodies, except for Lake Whitefish from Setting Lake (Figure 7.7-5), indicating that standardization of concentrations was necessary for comparative purposes. In contrast, the correlation between mercury levels and fish length for Yellow Perch from Cross and Setting lakes was negative and for Setting Lake this relationship was significant ($p<0.01$). These Yellow Perch measured only 64 mm on average, and their standardized mercury concentration was less than 0.01 ppm, several times lower than the arithmetic concentration.

Except for Northern Pike and Walleye from Setting Lake, standardized mercury concentrations were often lower than the corresponding arithmetic concentrations, reflecting the fact that the mean lengths for these two species were generally larger than the respective standard lengths of 550 mm and 400 mm (Table 7.7-2). Within each waterbody, mean arithmetic mercury concentrations of Walleye and Northern Pike were similar, except for Setting Lake where concentrations in Northern Pike were 45% higher than in Walleye (Table 7.7-1). Both piscivorous species from all four waterbodies had mean mercury concentrations several fold higher than Lake Whitefish and Yellow Perch.

7.7.2 Comparison to Consumption Guidelines

Standard mercury concentrations of all species captured in the region were substantially below 0.5 ppm (Table 7.7-1; Figure 7.7-6), the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). With a mean concentration of 0.39 ppm, only Northern Pike from Setting Lake substantially exceeded the human consumption guideline of 0.2 ppm (see section 4.8.2.3). Standardized mercury concentrations of Northern Pike and Walleye from Little Playgreen Lake, Northern Pike from Playgreen Lake, and Walleye from Setting Lake were just above 0.2 ppm, and concentrations for Walleye from Playgreen Lake (0.16 ppm) was slightly below this guideline value. All means for Lake Whitefish and Yellow Perch were substantially below 0.2 ppm (Table 7.7-1; Figure 7.7-6).

Based on individual concentrations, only 12 Northern Pike and 4 Walleye exceeded 0.5 ppm mercury, with more than half of these fish coming from Setting Lake. Approximately 55% of the piscivores captured in the Upper Nelson River Region had mercury levels above 0.2 ppm, but all Lake Whitefish and Yellow Perch had mercury concentrations within the guideline. However, 92% of all perch and 21% of all whitefish from the Region exceeded a total mercury concentration of 0.033 ppm, the Canadian and Manitoba tissue residue guideline for methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999 updated to 2013; MWS 2011). None of the piscivores had concentrations below the tissue residue guideline.

SECTION 7: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 7.3-1. Summary statistics for *in situ* variables (near surface) measured in the Upper Nelson River Region: 2010/2011.

	Temperature (°C)				*In situ* pH				DO (mg/L)				DO (% Saturation)				*In situ* Specific Conductance (µS/cm)				*In situ* Turbidity (NTU)				ORP (mV)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	11.3	11.9	13.5	12.0	8.32	7.89	7.97	7.67	12.40	12.23	11.94	10.52	110	110	111	97	316	297	141	161	18.23	21.05	76.88	4.15	153	161	130	195
Median	13.1	13.9	16.7	15.4	8.26	7.86	7.96	7.61	10.32	9.84	9.89	9.48	99	96	102	96	318	304	137	159	18.90	20.00	3.00	4.05	129	135	119	191
Minimum	0.0	0.0	0.4	0.4	7.40	6.96	7.72	6.61	8.51	8.38	8.30	8.59	92	92	92	90	285	239	131	153	14.00	15.00	0.00	0.80	98	108	90	123
Maximum	18.9	19.8	20.2	17.1	9.36	8.88	8.24	8.85	20.44	20.85	19.70	14.51	151	154	146	108	344	344	158	173	21.10	29.20	301.50	7.70	258	267	193	275
SD	8.1	8.6	8.9	7.9	0.81	0.81	0.28	1.03	5.43	5.79	5.23	2.70	27	30	24	8	24	45	12	9	3.31	6.02	149.76	2.92	71	72	48	65
SE	4.0	4.3	4.5	4.0	0.40	0.40	0.14	0.52	2.72	2.90	2.61	1.35	14	15	12	4	12	22	6	4	1.65	3.01	74.88	1.46	36	36	24	33
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-1. - continued -

	Secchi Disk Depth (m)				Calculated Euphotic Depth (m)				Estimated Euphotic Depth (m)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.73	0.78	2.53	1.97	1.5	1.6	5.1	3.9	1.4	1.6	5.1	4.0
Median	0.79	0.78	2.45	2.00	1.6	1.6	4.9	4.0	1.5	1.5	5.0	4.0
Minimum	0.60	0.73	2.10	1.91	1.2	1.5	4.2	3.8	1.2	1.5	4.2	4.0
Maximum	0.81	0.83	3.05	2.00	1.6	1.7	6.1	4.0	1.6	1.7	6.0	4.0
SD	0.11	0.05	0.48	0.05	0.2	0.1	1.0	0.1	0.2	0.1	0.9	0.0
SE	0.07	0.03	0.28	0.03	0.1	0.1	0.6	0.1	0.1	0.1	0.5	0.0
N	3	3	3	3	3	3	3	3	3	3	3	3

Table 7.3-2. Summary statistics for routine laboratory variables measured in the Upper Nelson River Region: 2010/2011.

	Total Alkalinity ($CaCO_3$ mg/L)				Bicarbonate Alkalinity (HCO_3 mg/L)				Carbonate Alkalinity (CO_3 mg/L)				Hydroxide Alkalinity (OH mg/L)				Ammonia (mg N/L)				Nitrate/Nitrite (mg N/L)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	95	91	69	77	115	110	84	94	0.78	0.73	<0.60	<0.60	<0.40	<0.40	<0.40	<0.40	<0.050	0.029	0.028	<0.050	0.054	0.065	<0.050	<0.050
Median	95	92	68	76	114	110	83	93	<0.60	<0.60	<0.60	<0.60	<0.40	<0.40	<0.40	<0.40	<0.050	0.022	0.021	<0.050	<0.050	<0.050	<0.050	<0.050
Minimum	89	78	67	75	108	95	81	91	<0.60	<0.60	<0.60	<0.60	<0.40	<0.40	<0.40	<0.40	<0.010	0.015	<0.010	<0.010	<0.050	<0.050	<0.0050	<0.0050
Maximum	102	101	73	82	125	123	89	99	2.23	2.03	0.92	<0.60	<0.40	<0.40	<0.40	<0.40	0.062	0.059	0.067	<0.050	0.151	0.191	0.0706	0.0539
SD	5	10	3	3	7	11	4	4	0.97	0.87	0.31	-	-	-	-	-	0.025	0.021	0.030	0.010	0.065	0.084	0.0321	0.0211
SE	3	5	1	1	4	6	2	2	0.48	0.43	0.16	-	-	-	-	-	0.013	0.010	0.015	0.005	0.032	0.042	0.0161	0.0105
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-2. - continued -

	TKN (mg/L)				DIN (mg/L) [1]				Organic Nitrogen (mg/L) [1]				TN (mg/L) [1]				TDP (mg/L)				TPP (mg/L)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.61	0.53	0.53	0.51	0.047	0.086	0.043	0.040	0.53	0.50	0.50	0.56	0.58	0.60	0.55	0.60	0.0228	0.0247	0.0085	0.0106	0.0184	0.0097	0.0176	0.0153
Median	0.50	0.52	0.53	0.52	0.041	0.049	0.044	0.047	0.46	0.49	0.49	0.51	0.52	0.58	0.54	0.54	0.0208	0.0244	0.0076	0.0116	0.0193	0.0102	0.0202	0.0112
Minimum	0.38	0.40	0.41	0.41	<0.010	0.040	<0.010	<0.010	0.43	0.39	0.41	0.39	0.45	0.50	0.48	0.43	0.0135	0.0108	0.0055	0.0051	<0.010	<0.002	<0.010	<0.010
Maximum	1.05	0.70	0.63	0.60	0.085	0.206	0.076	0.059	0.78	0.64	0.59	0.82	0.81	0.73	0.63	0.87	0.0360	0.0390	0.0131	0.0140	0.0300	0.0172	0.0251	0.0337
SD	0.30	0.13	0.10	0.08	0.028	0.080	0.028	0.023	0.17	0.11	0.10	0.18	0.16	0.09	0.07	0.19	0.0102	0.0115	0.0033	0.0043	0.0106	0.0079	0.0088	0.0128
SE	0.15	0.06	0.05	0.04	0.014	0.040	0.014	0.011	0.08	0.06	0.05	0.09	0.08	0.05	0.04	0.10	0.0051	0.0058	0.0017	0.0022	0.0053	0.0039	0.0044	0.0064
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	2	3	2

Table 7.3-2. - continued -

	TP (mg/L)				TN:TP [1]				DIN:DP [1]				DIN:TP [1]				DOC (mg/L)				TOC (mg/L)				TIC (mg/L)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.0416	0.0345	0.0245	0.0241	35	41	55	68	7	9	16	11	4	6	6	6	9.6	11.5	10.2	14.3	9.9	11.6	10.5	13.8	21.7	20.2	15.8	17.4
Median	0.0446	0.0341	0.0272	0.0183	32	40	46	72	8	8	11	8	4	6	6	6	9.3	10.9	10.0	14.6	9.7	11.2	10.4	13.1	21.2	19.4	15.3	17.0
Minimum	0.0296	0.0229	0.0120	0.0120	26	28	41	20	3	4	2	2	1	2	1	1	8.3	9.6	9.6	12.6	8.3	9.6	10.1	12.5	20.6	18.0	14.3	15.3
Maximum	0.0477	0.0470	0.0318	0.0477	51	57	89	108	10	17	37	27	8	10	14	11	11.3	14.6	11.1	15.5	11.8	14.6	11.2	16.3	23.7	23.9	18.2	20.2
SD	0.0083	0.0110	0.0091	0.0164	11	14	22	41	3	6	15	11	3	3	6	5	1.4	2.2	0.7	1.3	1.6	2.1	0.5	1.8	1.4	2.7	1.9	2.4
SE	0.0041	0.0055	0.0045	0.0082	6	7	11	20	2	3	7	5	2	2	3	3	0.7	1.1	0.3	0.7	0.8	1.1	0.2	0.9	0.7	1.4	0.9	1.2
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-2. - continued -

	TOC:ON [1]				TOC:TN [1]				TDS (mg/L)				Laboratory Conductivity (µmhos/cm)				TSS (mg/L)				Laboratory Turbidity (NTU)				True Colour (TCU)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	23	28	26	55	19	23	23	37	194	182	106	113	312	292	139	161	9.4	8.7	<2.0	3.3	8.32	9.95	1.28	1.89	20.2	30.7	9.9	31.3
Median	22	31	25	37	19	24	22	33	189	180	103	112	318	303	137	160	10.0	8.7	<2.0	3.0	9.03	9.25	1.42	1.97	16.6	21.8	9.8	29.6
Minimum	13	17	20	32	13	15	19	32	172	149	60.0	98.0	284	238	133	159	3.6	4.4	<2.0	<2.0	3.53	7.31	0.47	1.38	11.7	15.6	9.2	23.1
Maximum	34	33	32	112	23	30	27	51	226	218	160	130	329	322	149	167	14.0	12.8	2.0	6.0	11.70	14.00	1.81	2.25	35.9	63.5	10.6	43.1
SD	8	7	6	39	4	6	4	9	24	30	43.2	13.9	21	39	7	4	4.7	4.0	0.6	2.1	3.54	2.91	0.62	0.37	10.8	22.1	0.6	8.7
SE	4	4	3	19	2	3	2	5	12	15	21.6	6.9	10	20	4	2	2.4	2.0	0.3	1.1	1.77	1.45	0.31	0.18	5.4	11.1	0.3	4.4
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-2. - continued -

	Laboratory pH				*E. coli* (CFU/100 mL)				Chlorophyll *a* (µg/L)				Hardness as $CaCO_3$ (mg/L)				Chloride (mg/L)				Sulphate (mg/L)			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	8.26	8.19	8.13	8.09	<1	<1	<1	<1	3.6	3.6	3.8	2.8	118	111	72.2	80.6	23.2	21.4	1.18	2.47	28.8	25.6	2.04	2.95
Median	8.27	8.18	8.21	8.11	<1	<1	<1	<1	3.5	3.3	3.6	3.3	120	116	71.9	81.2	23.6	22.1	1.08	2.43	29.7	27.2	1.41	2.20
Minimum	8.09	8.03	7.81	7.82	<1	<1	<1	<1	2.1	1.6	1.2	1.3	106	92.7	69.4	77.0	18.6	14.2	0.95	2.29	24.5	17.9	1.03	1.85
Maximum	8.40	8.39	8.30	8.30	1	<1	<1	1	5.2	6.1	7.0	3.3	125	122	75.4	83.0	26.9	27.2	1.62	2.73	31.3	30.1	4.30	5.55
SD	0.13	0.16	0.22	0.20	0	-	-	0	1.4	2.1	2.6	1.0	8	12.9	2.9	2.7	3.5	5.5	0.31	0.19	3.2	5.6	1.53	1.74
SE	0.06	0.08	0.11	0.10	0	-	-	0	0.7	1.1	1.3	0.5	4	6.4	1.5	1.3	1.8	2.8	0.15	0.09	1.6	2.8	0.76	0.87
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

[1] Calculated.

Table 7.3-3. Summary statistics for metals and major ions measured in the Upper Nelson River Region: 2010/2011. Values are presented as mg/L.

	Aluminum				Antimony				Arsenic				Barium				Beryllium				Bismuth			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.397	0.421	0.0064	0.0995	<0.00020	<0.00020	<0.00020	<0.00020	0.00163	0.00158	0.00043	0.00084	0.0347	0.0328	0.00853	0.00890	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Median	0.395	0.431	0.0046	0.1045	<0.00020	<0.00020	<0.00020	<0.00020	0.00160	0.00150	0.00043	0.00084	0.0322	0.0311	0.00873	0.00901	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	0.362	0.355	<0.0050	0.0699	<0.00020	<0.00020	<0.00020	<0.00020	0.00146	0.00135	0.00036	0.00069	0.0315	0.0273	0.00751	0.00797	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.434	0.466	0.0138	0.1190	<0.00020	<0.00020	0.00020	<0.00020	0.00187	0.00198	0.00052	0.00099	0.0428	0.0416	0.00914	0.00961	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
SD	0.031	0.052	0.0053	0.0217	-	-	0.00005	-	0.00019	0.00027	0.00007	0.00013	0.0054	0.0062	0.00073	0.00075	-	-	-	-	-	-	-	-
SE	0.016	0.026	0.0027	0.0109	-	-	0.00003	-	0.00009	0.00014	0.00003	0.00006	0.0027	0.0031	0.00036	0.00037	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-3. - continued -

	Boron				Cadmium				Calcium				Cesium				Chromium				Cobalt			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.025	0.024	<0.010	<0.010	0.000024	<0.000010	0.000012	<0.000010	28.0	26.6	20.8	20.0	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020
Median	0.027	0.027	<0.010	<0.010	<0.000010	<0.000010	<0.000010	<0.000010	28.7	27.5	20.9	20.2	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	0.020	0.016	<0.010	<0.010	<0.000010	<0.000010	<0.000010	<0.000010	25.6	22.6	19.7	19.2	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.027	0.027	<0.010	0.011	0.000074	<0.000010	0.000024	<0.000010	29.1	29.0	21.6	20.6	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	0.00021	<0.00020	<0.00020
SD	0.003	0.005	-	0.003	0.000034	-	0.000009	-	1.6	2.8	0.9	0.6	-	-	-	-	-	-	-	-	-	0.00006	-	-
SE	0.002	0.003	-	0.002	0.000017	-	0.000004	-	0.8	1.4	0.5	0.3	-	-	-	-	-	-	-	-	-	0.00003	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-3. - continued -

	Copper				Iron				Lead				Lithium				Magnesium				Manganese			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.00180	0.00172	<0.00020	0.00107	0.293	0.324	0.076	0.076	0.000304	0.000229	<0.000090	<0.000090	0.0101	0.0091	<0.0020	0.0028	11.7	10.9	4.91	7.44	0.0145	0.0123	0.0379	0.00833
Median	0.00181	0.00172	<0.00020	0.00109	0.294	0.322	0.079	0.083	0.000207	0.000202	<0.000090	<0.000090	0.0100	0.0096	<0.0020	0.0027	11.8	11.4	4.95	7.52	0.0146	0.0124	0.0414	0.00919
Minimum	0.00172	0.00165	<0.00020	0.00102	0.270	0.257	0.019	0.041	0.000178	0.000186	<0.000090	<0.000090	0.0097	0.0069	<0.0020	0.0023	10.3	8.83	4.51	7.05	0.00750	0.0101	0.00613	0.00352
Maximum	0.00187	0.00181	0.00025	0.00110	0.313	0.396	0.127	0.097	0.000624	0.000325	0.000130	0.000105	0.0108	0.0104	0.0021	0.0033	12.9	12.1	5.25	7.68	0.0211	0.0144	0.0627	0.0114
SD	0.00007	0.00008	0.00008	0.00004	0.020	0.066	0.057	0.025	0.000214	0.000065	0.000042	0.000028	0.0005	0.0016	0.0006	0.0005	1.1	1.4	0.32	0.30	0.00556	0.0020	0.02580	0.00337
SE	0.00003	0.00004	0.00004	0.00002	0.010	0.033	0.029	0.013	0.000107	0.000032	0.000021	0.000014	0.0002	0.0008	0.0003	0.0003	0.5	0.7	0.16	0.15	0.00278	0.0010	0.01290	0.00169
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-3. - continued -

	Mercury				Molybdenum				Nickel				Potassium				Rubidium				Selenium			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	<0.000050	<0.000050	<0.000050	<0.000050	0.00071	0.00065	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	3.01	2.81	0.780	0.982	0.00206	0.00216	0.00140	0.00109	<0.0010	<0.0010	<0.0010	<0.0010
Median	<0.000050	<0.000050	<0.000050	<0.000050	0.00070	0.00066	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	3.06	2.98	0.782	0.977	0.00206	0.00216	0.00143	0.00111	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	<0.000050	<0.000050	<0.000050	<0.000050	0.00066	0.00051	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	2.73	2.26	0.722	0.952	0.00202	0.00208	0.00124	0.00092	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	<0.000050	<0.000050	<0.000050	<0.000050	0.00077	0.00078	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	3.19	3.03	0.833	1.02	0.00210	0.00222	0.00149	0.00120	<0.0010	<0.0010	<0.0010	<0.0010
SD	-	-	-	-	0.00005	0.00011	-	-	-	-	-	-	0.20	0.37	0.050	0.033	0.00004	0.00007	0.00011	0.00012	-	-	-	-
SE	-	-	-	-	0.00002	0.00006	-	-	-	-	-	-	0.10	0.19	0.025	0.017	0.00002	0.00003	0.00006	0.00006	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-3. - continued -

	Silicon				Silver				Sodium				Strontium				Tellurium				Thallium			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	2.76	3.50	0.387	2.11	<0.00010	<0.00010	<0.00010	<0.00010	18.1	17.0	1.98	3.22	0.104	0.0958	0.0296	0.0383	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Median	2.89	3.39	0.169	2.18	<0.00010	<0.00010	<0.00010	<0.00010	18.4	18.0	2.07	3.23	0.104	0.0957	0.0296	0.0380	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Minimum	2.35	2.36	0.096	1.89	<0.00010	<0.00010	<0.00010	<0.00010	14.8	11.5	1.55	3.07	0.0961	0.0767	0.0262	0.0356	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Maximum	2.90	4.87	1.113	2.22	<0.00010	<0.00010	<0.00010	<0.00010	20.7	20.5	2.25	3.36	0.113	0.115	0.0331	0.0416	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
SD	0.27	1.03	0.486	0.15	-	-	-	-	2.6	4.1	0.30	0.14	0.0069	0.0157	0.0028	0.0025	-	-	-	-	-	-	-	-
SE	0.14	0.52	0.243	0.08	-	-	-	-	1.3	2.1	0.15	0.07	0.0035	0.0079	0.0014	0.0012	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-3. - continued -

	Thorium				Tin				Titanium				Tungsten				Uranium			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.00011	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	0.0135	0.0147	0.00023	0.0024	<0.0010	<0.0010	<0.0010	<0.0010	0.00070	0.00062	<0.00010	<0.00010
Median	0.00011	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	0.0139	0.0148	<0.00020	0.0023	<0.0010	<0.0010	<0.0010	<0.0010	0.00065	0.00058	<0.00010	<0.00010
Minimum	0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	0.0117	0.0122	<0.00020	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	0.00061	0.00046	<0.00010	<0.00010
Maximum	0.00011	0.00013	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	0.0145	0.0171	0.00045	0.0032	<0.0010	<0.0010	<0.0010	<0.0010	0.00087	0.00087	0.00010	0.00011
SD	0.00001	0.00004	-	-	-	-	-	-	0.0013	0.0020	0.00017	0.0007	-	-	-	-	0.00012	0.00017	0.00003	0.00003
SE	0.00000	0.00002	-	-	-	-	-	-	0.0006	0.0010	0.00008	0.0003	-	-	-	-	0.00006	0.00009	0.00001	0.00002
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-3. - continued -

	Vanadium				Zinc				Zirconium			
	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT	LPLAY	CROSS	WLKR	SETT
Mean	0.00170	0.00167	<0.00020	0.00046	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040	<0.00040
Median	0.00163	0.00167	<0.00020	0.00040	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040	<0.00040
Minimum	0.00153	0.00138	<0.00020	0.00032	<0.0050	<0.0050	<0.0050	<0.0050	<0.00040	<0.00040	<0.00040	<0.00040
Maximum	0.00203	0.00197	0.00039	0.00072	<0.0050	<0.0050	<0.0050	<0.0050	0.00045	0.00046	<0.00040	<0.00040
SD	0.00023	0.00027	0.00014	0.00018	-	-	-	-	0.00013	0.00013	-	-
SE	0.00011	0.00014	0.00007	0.00009	-	-	-	-	0.00006	0.00007	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 7.3-4. Frequency of detections of total metals measured in Upper Nelson River Region: 2010/2011.

Waterbody		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper	Iron
Little Playgreen Lake	# Detections	4	0	4	4	0	0	4	2	4	0	0	0	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	100	50	100	0	0	0	100	100
Cross Lake	# Detections	4	0	4	4	0	0	4	0	4	0	0	2	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	100	0	100	0	0	50	100	100
Walker Lake	# Detections	2	1	4	4	0	0	0	2	4	0	0	0	2	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	50	25	100	100	0	0	0	50	100	0	0	0	50	100
Setting Lake	# Detections	4	0	4	4	0	0	1	0	4	0	0	0	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	25	0	100	0	0	0	100	100

Table 7.3-4. - continued -

Waterbody		Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium
Little Playgreen Lake	# Detections	4	4	4	4	0	4	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	100	0	100	100	0	100	0	100
Cross Lake	# Detections	4	4	4	4	0	4	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	100	0	100	100	0	100	0	100
Walker Lake	# Detections	1	1	4	4	0	0	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	25	25	100	100	0	0	0	100	100	0	100	0	100
Setting Lake	# Detections	2	4	4	4	0	0	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	50	100	100	100	0	0	0	100	100	0	100	0	100

Table 7.3-4. - continued -

Waterbody		Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Little Playgreen Lake	# Detections	4	0	0	4	0	4	0	4	4	0	1
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	100	0	100	0	100	100	0	25
Cross Lake	# Detections	4	0	0	2	0	4	0	4	4	0	1
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	50	0	100	0	100	100	0	25
Walker Lake	# Detections	4	0	0	0	0	2	0	1	2	0	0
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	0	0	50	0	25	50	0	0
Setting Lake	# Detections	4	0	0	0	0	4	0	2	4	0	0
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	0	0	100	0	50	100	0	0

Table 7.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Upper Nelson River Region: 2010/2011. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00021-0.00032	0.0639-0.1035	0.0068-0.0113	0.3	0.0020-0.0042	0.000026
Little Playgreen Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	2	0	NA
	% Exceedances	100	0	0	0	0	0	50	0	NA
Cross Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	2	0	NA
	% Exceedances	100	0	0	0	0	0	50	0	NA
Walker Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	NA
	% Exceedances	0	0	0	0	0	0	0	0	NA
Setting Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	2	0	0	0	0	0	0	0	NA
	% Exceedances	50	0	0	0	0	0	0	0	NA

Table 7.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.038-0.063	0.001	0.0001	0.0008	0.015	0.088-0.145	120	128-429
Little Playgreen Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Cross Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Walker Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Setting Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

[1] Mercury was analysed at a detection limit of 0.0005 mg/L and results cannot be compared to the current Manitoba PAL guideline for mercury.
[2] Comparison to the long-term CCME PAL guideline.
[3] Comparison to the BCMOE guideline.

Table 7.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Upper Nelson River Region and CCME (1999; updated to 2013) trophic categorization: 2010/2011.

		Trophic Status Based on Total Phosphorous (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 – 0.100	> 0.100
Little Playgreen Lake	Open-water season					0.041	
	Annual					0.042	
Cross Lake	Open-water season				0.030		
	Annual				0.035		
Walker Lake	Open-water season				0.029		
	Annual				0.025		
Setting Lake	Open-water season				0.028		
	Annual				0.024		

Table 7.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Upper Nelson River Region and the OECD (1982) trophic categorization scheme for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<2.5	2.5 - 8	-	8 - 25	> 25
Little Playgreen Lake	Open-water season			4.06			
	Annual			3.57			
Cross Lake	Open-water season			4.08			
	Annual			3.59			
Walker Lake	Open-water season			4.73			
	Annual			3.84			
Setting Lake	Open-water season			3.32			
	Annual			2.82			

Table 7.3-8. Total nitrogen concentrations (open-water season and annual means) measured in the Upper Nelson River Region and comparison to a trophic categorization scheme for lakes (Nürnberg 1996): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Little Playgreen Lake	Open-water season			0.50			
	Annual			0.58			
Cross Lake	Open-water season			0.60			
	Annual			0.60			
Walker Lake	Open-water season			0.57			
	Annual			0.55			
Setting Lake	Open-water season			0.60			
	Annual			0.60			

Table 7.4-1. Community metrics for phytoplankton samples collected in the Upper Nelson River Region during the open-water season of 2010.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Wiener Index (H)	Evenness (E_H)	Hill's Effective Richness ($e^{H`}$)	Evenness ($e^{H`}/S$)
Little Playgreen Lake	Spring	25	0.75	0.16	1.87	0.58	6.49	0.26
	Summer	21	0.76	0.20	1.88	0.62	6.54	0.31
	Fall	25	0.62	0.11	1.36	0.42	3.91	0.16
Cross Lake	Spring	47	0.79	0.10	1.82	0.47	6.17	0.13
	Summer	17	0.70	0.19	1.70	0.60	5.45	0.32
	Fall	37	0.37	0.04	1.00	0.28	2.70	0.07
Walker Lake	Spring	39	0.71	0.09	1.92	0.53	6.85	0.18
	Summer	51	0.82	0.11	2.50	0.64	12.19	0.24
	Fall	35	0.61	0.07	1.39	0.39	4.00	0.11
Setting Lake	Spring	34	0.91	0.32	2.72	0.77	15.21	0.45
	Summer	35	0.90	0.29	2.68	0.76	14.65	0.42
	Fall	25	0.78	0.18	2.14	0.67	8.51	0.34

Table 7.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Upper Nelson River Region for CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Disk Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Little Playgreen Lake (2010)	Nearshore	5	0.7	0.5	0.9	0.00	--	16.0	bedrock, boulder	shrubs, coniferous	0-24	slime, crust, attached, filamentous
	Offshore	5	8.0	7.2	8.4	0.05	0.73	16.0	clay	--	--	--
Cross Lake (2010)	Nearshore	5	0.9	0.8	1.0	0.00	0.35	15.0	bedrock, boulder	shrubs, coniferous	0-24	slime, crust
	Offshore	5	8.0	6.5	9.5	0.12	0.35	15.0	clay, silt	--	--	--
Walker Lake (2010)	Nearshore	5	0.9	0.5	1.0	1.00	--	15.0	bedrock, cobble	shrubs, coniferous	0-24	slime, crust
	Offshore	6	7.1	5.4	8.0	1.00	1.60	15.0	silt, organic matter	--	--	--
Setting Lake (2010)	Nearshore	5	0.8	0.7	1.0	0.00	--	16.0	cobble, bedrock, boulder	coniferous	0-24	slime, crust, floating, attached
	Offshore	5	7.4	6.9	8.0	0.00	1.32	15.0	clay, silt	--	--	--

Table 7.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Upper Nelson River Region for CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Little Playgreen Lake (2010)	Offshore	Mean	5	8.2	2.20	1.96	55.46	42.56	Silty Clay Loam
		SD	--	0.23	0.118	0.984	5.394	4.732	--
		SE	--	0.10	0.041	0.663	3.857	0.635	--
		Median	--	8.3	2.25	1.81	59.10	39.90	--
		Min	--	7.9	2.00	0.93	48.30	38.50	--
		Max	--	8.4	2.29	3.46	59.70	48.20	--
Cross Lake (2010)	Nearshore	Mean	1	0.8	2.27	77.00	11.30	11.70	Sandy Loam
		SD	--	--	--	--	--	--	--
		SE	--	--	--	--	--	--	--
		Median	--	--	--	--	--	--	--
		Min	--	--	--	--	--	--	--
		Max	--	--	--	--	--	--	--
	Offshore	Mean	5	7.9	2.44	3.00	58.26	38.74	Silty Clay Loam
		SD	--	1.36	0.102	2.914	3.572	6.229	--
		SE	--	0.61	0.036	1.866	2.063	0.816	--
		Median	--	7.4	2.47	1.82	57.20	40.90	--
		Min	--	6.6	2.26	1.36	54.20	28.00	--
		Max	--	9.4	2.52	8.18	63.80	44.00	--
Walker Lake (2010)	Offshore	Mean	6	7.1	7.34	71.48	17.75	10.74	Sandy Loam
		SD	--	1.14	7.614	28.635	17.195	11.563	--
		SE	--	0.47	2.864	10.573	2.034	2.744	--
		Median	--	7.3	6.11	73.80	18.25	8.15	--
		Min	--	5.0	0.48	36.30	0.39	0.45	--
		Max	--	8.1	17.00	99.20	37.70	26.00	--
Setting Lake (2010)	Offshore	Mean	5	7.5	2.77	12.15	35.44	52.42	Silty Clay
		SD	--	0.47	0.627	23.357	8.725	14.837	--
		SE	--	0.21	0.229	14.029	2.503	2.492	--
		Median	--	7.4	3.03	1.53	39.30	58.70	--
		Min	--	6.9	1.67	0.77	20.00	26.10	--
		Max	--	8.0	3.21	53.90	40.80	61.30	--

Table 7.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Little Playgreen Lake within the Upper Nelson River Region for CAMPP, 2010.

	Little Playgreen Lake						
	Nearshore						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	7816	4890.2	2187.0	6498	1207	14042
Oligochaeta	--	1668	1251.5	559.7	1643	129	3477
Hirudinea	--	2	1.0	0.4	2	0	3
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	13	11.7	5.2	21	0	21
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	2789	2029.5	907.6	2261	176	4864
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.1	0.1	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	2	4.8	2.1	0	0	11
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	2	4.8	2.1	0	0	11
Gastropoda - unid	--	6	14.3	6.4	0	0	32
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	6	9.5	4.3	0	0	21
Physidae	--	146	155.9	69.7	64	24	384
Planorbidae	--	204	250.7	112.1	96	64	651
Valvatidae	--	102	66.9	29.9	107	11	171
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	4941	3166.2	1416.0	4354	474	8962
Non-Insecta (%)	63	--	--	--	--	--	--
Oligochaeta	--	1668	1251.5	559.7	1643	129	3477
Oligochaeta (%)	21	--	--	--	--	--	--
Amphipoda	--	2802	2030.9	908.2	2283	176	4864
Amphipoda (%)	36	--	--	--	--	--	--
Bivalvia	--	2	4.8	2.1	0	0	11
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	465	381.4	170.6	267	168	1056
Gastropoda (%)	6	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Nearshore						
	Count	Mean	SD	SE	Median	Min	Max
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	1	0.8	0.4	0	0	2
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	217	135.2	60.5	299	1	320
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	12	9.2	4.1	11	0	21
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	513	236.6	105.8	533	261	853
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	1	1.2	0.5	0	0	3
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	1	1.2	0.5	0	0	3
Stenomena	--	3	7.0	3.1	0	0	16
Leptophlebiidae	--	7	8.9	4.0	5	0	21
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Nearshore						
	Count	Mean	SD	SE	Median	Min	Max
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.1	0.1	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	5	9.3	4.2	0	0	21
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	1	2.4	1.1	0	0	5
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.1	0.1	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.3	0.1	0	0	1
Polycentropodidae	--	4	9.5	4.3	0	0	21
Psychomyiidae	--	4	5.8	2.6	0	0	11
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	112	75.2	33.6	117	5	192
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	161	52.0	23.3	181	69	192
Orthocladiinae	--	1708	1316.4	588.7	1205	165	3307
Tanypodinae	--	124	57.6	25.7	139	24	171
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	2875	1747.0	781.3	2284	733	5080
Insecta (%)	37	--	--	--	--	--	--
Chironomidae	--	2105	1468.3	656.6	1653	264	3840
Chironomidae (%)	27	--	--	--	--	--	--
Ephemeroptera	--	537	240.5	107.6	533	296	896

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Nearshore						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	15	6.6	3.0	11	8	22
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	552	245.2	109.6	555	304	918
EPT (%)	7	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.44	0.407	0.182	0.25	0.17	1.15
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	25	15	1.9	0.8	15	13	18
Simpson's Diversity Index (D)	--	0.78	0.060	0.027	0.77	0.71	0.87
Evenness (Simpson's Equitability E_D)	--	0.27	0.070	0.031	0.25	0.20	0.38
Shannon-Weaver Index (H)	--	1.85	0.275	0.123	1.76	1.54	2.24
Evenness (Shannon’s Equitability E_H)	--	0.63	0.077	0.034	0.62	0.54	0.75
Hill's Effective Richness ($E^{H'}$)	--	7	1.877	0.839	5.78	4.68	9.39
Evenness ($E^{H'}$/S)	--	0.35	0.074	0.033	0.34	0.28	0.47

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3916	182.1	81.4	3910	3650	4141
Oligochaeta	--	0	0.0	0.0	0	0	0
Hirudinea	--	214	78.0	34.9	231	87	289
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	78	94.9	42.5	14	0	202
Hyalellidae	--	20	24.1	10.8	14	0	58
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	3	6.5	2.9	0	0	14
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	2557	295.7	132.3	2626	2236	2900
Gastropoda - unid	--	12	25.8	11.5	0	0	58
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	141	135.1	60.4	159	0	317
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	3024	334.4	149.6	3174	2525	3318
Non-Insecta (%)	77	--	--	--	--	--	--
Oligochaeta	--	0	0.0	0.0	0	0	0
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	98	78.6	35.2	72	29	202
Amphipoda (%)	3	--	--	--	--	--	--
Bivalvia	--	2557	295.7	132.3	2626	2236	2900
Bivalvia (%)	65	--	--	--	--	--	--
Gastropoda	--	153	154.9	69.3	159	0	375
Gastropoda (%)	4	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	3	6.5	2.9	0	0	14
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	153	54.6	24.4	130	101	231
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	40	51.4	23.0	29	0	130
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	14	14.4	6.5	14	0	29
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	9	7.9	3.5	14	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	9	12.9	5.8	0	0	29
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	141	44.9	20.1	144	72	188
Orthocladiinae	--	167	71.8	32.1	188	43	216
Tanypodinae	--	355	112.0	50.1	361	188	476
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	892	239.3	107.0	967	548	1125
Insecta (%)	23	--	--	--	--	--	--
Chironomidae	--	672	190.2	85.1	721	375	837
Chironomidae (%)	17	--	--	--	--	--	--
Ephemeroptera	--	153	54.6	24.4	130	101	231

Table 7.5-3. - continued -

	Little Playgreen Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	4	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	55	59.0	26.4	29	14	159
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	208	64.2	28.7	216	130	289
EPT (%)	5	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.32	0.082	0.037	0.34	0.21	0.42
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	12	9	0.5	0.2	9	8	9
Simpson's Diversity Index (D)	--	0.55	0.066	0.030	0.55	0.48	0.64
Evenness (Simpson's Equitability E_D)	--	0.20	0.035	0.015	0.19	0.17	0.25
Shannon-Weaver Index (H)	--	1.32	0.140	0.062	1.34	1.17	1.50
Evenness (Shannon's Equitability E_H)	--	0.54	0.058	0.026	0.54	0.49	0.63
Hill's Effective Richness ($E^{H'}$)	--	4	0.529	0.237	3.82	3.23	4.50
Evenness ($E^{H'}$/S)	--	0.34	0.049	0.022	0.32	0.29	0.41

Table 7.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Cross Lake within the Upper Nelson River Region for CAMPP, 2010.

	Cross Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	248	117.0	52.3	215	173	454
Oligochaeta	--	6	7.5	3.4	4	0	19
Hirudinea	--	0	0.2	0.1	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	6	5.0	2.3	6	1	13
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.6	0.3	0	0	1
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.3	0.1	0	0	1
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.0	0.0	0	0	0
Gastropoda - unid	--	0	0.1	0.1	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	1	1.6	0.7	1	0	4
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.2	0.1	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	15	11.9	5.3	14	2	33
Non-Insecta (%)	6	--	--	--	--	--	--
Oligochaeta	--	6	7.5	3.4	4	0	19
Oligochaeta (%)	3	--	--	--	--	--	--
Amphipoda	--	6	5.0	2.3	6	1	13
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	0	0.0	0.0	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	2	1.7	0.7	1	0	4
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 7.5-4. - continued -

	Cross Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	107	79.8	35.7	127	4	206
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.2	0.1	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.7	0.3	0	0	2
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	20	41.0	18.4	2	0	93
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.1	0.1	0	0	0
Hexagenia	--	0	0.7	0.3	0	0	2
Heptageniidae	--	1	1.7	0.8	1	0	4
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	1	1.0	0.4	0	0	2
Stenomena	--	4	5.3	2.4	3	0	13
Leptophlebiidae	--	2	4.0	1.8	0	0	9
Leptophlebia	--	1	1.5	0.7	1	0	4
Paraleptophlebia	--	6	8.3	3.7	0	0	19
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0

Table 7.5-4. - continued -

	Cross Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.6	0.3	0	0	1
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.2	0.1	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.3	0.1	0	0	1
Chironomidae (pupa)	--	4	2.6	1.2	4	1	8
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	69	120.7	54.0	16	2	284
Orthocladiinae	--	16	23.7	10.6	5	0	57
Tanypodinae	--	1	1.1	0.5	0	0	3
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	234	107.3	48.0	198	162	420

Table 7.5-4. - continued -

	Cross Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta (%)	94	--	--	--	--	--	--
Chironomidae	--	91	116.5	52.1	35	10	288
Chironomidae (%)	36	--	--	--	--	--	--
Ephemeroptera	--	36	51.7	23.1	17	8	128
Ephemeroptera (%)	15	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.2	0.1	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	37	51.7	23.1	17	8	128
EPT (%)	15	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.62	0.475	0.212	0.48	0.08	1.35
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	16	11	2.3	1.0	11	7	13
Simpson's Diversity Index (D)	--	0.49	0.218	0.097	0.53	0.16	0.77
Evenness (Simpson's Equitability E_D)	--	0.15	0.071	0.032	0.11	0.09	0.26
Shannon-Weaver Index (H)	--	1.19	0.446	0.200	1.23	0.48	1.71
Evenness (Shannon's Equitability E_H)	--	0.43	0.153	0.068	0.45	0.19	0.60
Hill's Effective Richness ($E^{H'}$)	--	4	1.394	0.623	3.43	1.62	5.52
Evenness ($E^{H'}$/S)	--	0.22	0.081	0.036	0.19	0.12	0.32

Table 7.5-4. - continued -

	Cross Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1414	264.7	118.4	1472	967	1674
Oligochaeta	--	6	12.9	5.8	0	0	29
Hirudinea	--	3	6.5	2.9	0	0	14
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	75	66.4	29.7	101	0	159
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	459	271.1	121.3	491	173	721
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	542	210.7	94.2	592	274	750
Non-Insecta (%)	38	--	--	--	--	--	--
Oligochaeta	--	6	12.9	5.8	0	0	29
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	75	66.4	29.7	101	0	159
Amphipoda (%)	5	--	--	--	--	--	--
Bivalvia	--	459	271.1	121.3	491	173	721
Bivalvia (%)	32	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	9	7.9	3.5	14	0	14
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 7.5-4. - continued -

	Cross Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	459	63.2	28.3	462	375	519
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0

Table 7.5-4. - continued -

	Cross Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Plecoptera – unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	6	12.9	5.8	0	0	29
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	3	6.5	2.9	0	0	14
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	167	51.6	23.1	159	115	245
Orthocladiinae	--	173	56.8	25.4	173	115	260
Tanypodinae	--	55	44.9	20.1	43	14	115
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	871	180.4	80.7	880	693	1125
Insecta (%)	62	--	--	--	--	--	--
Chironomidae	--	398	143.0	64.0	346	245	577
Chironomidae (%)	28	--	--	--	--	--	--
Ephemeroptera	--	459	63.2	28.3	462	375	519
Ephemeroptera (%)	32	--	--	--	--	--	--

Table 7.5-4. - continued -

	Cross Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	459	63.2	28.3	462	375	519
EPT (%)	32	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.27	0.442	0.198	1.24	0.81	1.88
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	5	0.7	0.3	5	4	6
Simpson's Diversity Index (D)	--	0.73	0.059	0.027	0.74	0.64	0.80
Evenness (Simpson's Equitability E_D)	--	0.54	0.082	0.037	0.56	0.40	0.60
Shannon-Weaver Index (H)	--	1.53	0.211	0.094	1.53	1.25	1.82
Evenness (Shannon's Equitability E_H)	--	0.78	0.077	0.034	0.80	0.64	0.83
Hill's Effective Richness ($E^{H'}$)	--	5	1.001	0.448	4.63	3.49	6.19
Evenness ($E^{H'}$/S)	--	0.65	0.087	0.039	0.69	0.50	0.71

Table 7.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Walker Lake within the Upper Nelson River Region for CAMPP, 2010.

	Walker Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	339	336.7	150.6	177	109	928
Oligochaeta	--	63	51.5	23.0	45	12	133
Hirudinea	--	1	1.6	0.7	1	0	4
Ostracoda	--	1	1.2	0.5	0	0	3
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	3	6.4	2.9	1	0	15
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	149	228.9	102.4	69	21	556
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.1	0.1	0	0	0
Arachnida - unid	--	0	0.3	0.1	0	0	1
Acari	--	3	2.3	1.1	2	0	6
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	2	4.2	1.9	0	0	9
Gastropoda - unid	--	0	0.1	0.1	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.3	0.1	0	0	1
Lymnaeidae	--	2	3.6	1.6	0	0	8
Physidae	--	0	0.4	0.2	0	0	1
Planorbidae	--	2	2.9	1.3	0	0	7
Valvatidae	--	0	0.3	0.1	0	0	1
Platyhelminthes	--	0	0.3	0.1	0	0	1
Hydrozoa	--	0	0.4	0.2	0	0	1
Collembola	--	0	0.3	0.1	0	0	1
Non-Insecta	--	226	288.5	129.0	123	39	731
Non-Insecta (%)	67	--	--	--	--	--	--
Oligochaeta	--	63	51.5	23.0	45	12	133
Oligochaeta (%)	19	--	--	--	--	--	--
Amphipoda	--	152	235.3	105.2	69	22	571
Amphipoda (%)	45	--	--	--	--	--	--
Bivalvia	--	2	4.2	1.9	0	0	9
Bivalvia (%)	1	--	--	--	--	--	--
Gastropoda	--	4	4.2	1.9	2	0	10
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 7.5-5. - continued -

	Walker Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.6	0.3	0	0	1
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	2	2.3	1.0	0	0	5
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	1	1.7	0.8	0	0	4
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	2	4.6	2.1	1	0	11
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	10	6.8	3.0	12	2	19
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	4	4.9	2.2	1	1	12
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.5	0.2	0	0	1
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	2	1.8	0.8	1	0	5
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	1	1.8	0.8	0	0	4
Stenomena	--	3	5.3	2.4	0	0	12
Leptophlebiidae	--	7	7.4	3.3	4	1	19
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0

Table 7.5-5. - continued -

	Walker Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.1	0.1	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.9	0.4	0	0	2
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	4	2.5	1.1	3	2	8
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	1	1.2	0.5	0	0	3
Leptoceridae (larva)	--	3	2.0	0.9	4	0	5
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	4	2.6	1.1	3	2	7
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	1	0.5	0.2	1	0	1
Polycentropodidae	--	1	1.2	0.5	0	0	3
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	1	0.6	0.3	0	0	1
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.3	0.1	0	0	1
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	8	6.9	3.1	5	1	17
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	36	21.7	9.7	29	12	60
Orthocladiinae	--	23	7.4	3.3	21	14	33
Tanypodinae	--	1	0.6	0.3	1	0	1
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	113	56.1	25.1	117	54	197
Insecta (%)	33	--	--	--	--	--	--

Table 7.5-5. - continued -

	Walker Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	67	28.1	12.6	67	28	98
Chironomidae (%)	20	--	--	--	--	--	--
Ephemeroptera	--	30	31.1	13.9	19	6	83
Ephemeroptera (%)	9	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	14	4.3	1.9	15	9	19
Trichoptera (%)	4	--	--	--	--	--	--
EPT	--	43	34.3	15.3	27	16	101
EPT (%)	13	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.66	0.376	0.168	0.67	0.28	1.13
Genus analysis of Ephemeroptera	Caenidae: *Caenis* + Leptophlebiidae: unidentified						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	33	20	3.7	1.7	19	15	24
Simpson's Diversity Index (D)	--	0.77	0.093	0.042	0.82	0.62	0.84
Evenness (Simpson's Equitability E_D)	--	0.21	0.092	0.041	0.19	0.09	0.35
Shannon-Weaver Index (H)	--	1.97	0.220	0.098	2.07	1.65	2.17
Evenness (Shannon’s Equitability E_H)	--	0.62	0.083	0.037	0.64	0.49	0.72
Hill's Effective Richness ($E^{H'}$)	--	7	1.498	0.670	7.94	5.20	8.72
Evenness ($E^{H'}$/S)	--	0.31	0.093	0.041	0.30	0.18	0.44

Table 7.5-5. - continued -

	Walker Lake						
	Offshore n=6						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1226	355.5	145.1	1089	923	1832
Oligochaeta	--	130	139.3	56.9	94	14	390
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	2	5.9	2.4	0	0	14
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	10	17.5	7.1	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	91	80.4	32.8	65	14	216
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	233	156.0	63.7	202	29	476
Non-Insecta (%)	19	--	--	--	--	--	--
Oligochaeta	--	130	139.3	56.9	94	14	390
Oligochaeta (%)	11	--	--	--	--	--	--
Amphipoda	--	2	5.9	2.4	0	0	14
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	91	80.4	32.8	65	14	216
Bivalvia (%)	7	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 7.5-5. - continued -

	Walker Lake						
	Offshore n=6						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	2	5.9	2.4	0	0	14
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	2	5.9	2.4	0	0	14
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	19	25.3	10.3	7	0	58
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0

Table 7.5-5. - continued -

	Walker Lake						
	Offshore n=6						
	Count	Mean	SD	SE	Median	Min	Max
Plecoptera – unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	5	11.8	4.8	0	0	29
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	12	10.9	4.4	14	0	29
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	123	128.0	52.3	79	0	346
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	481	187.6	76.6	418	303	837
Orthocladiinae	--	2	5.9	2.4	0	0	14
Tanypodinae	--	346	82.6	33.7	368	216	447
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	993	242.0	98.8	909	765	1356
Insecta (%)	81	--	--	--	--	--	--
Chironomidae	--	830	209.4	85.5	772	649	1226
Chironomidae (%)	68	--	--	--	--	--	--
Ephemeroptera	--	22	28.5	11.6	7	0	58
Ephemeroptera (%)	2	--	--	--	--	--	--

Table 7.5-5. - continued -

	Walker Lake						
	Offshore n=6						
	Count	Mean	SD	SE	Median	Min	Max
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	5	11.8	4.8	0	0	29
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	26	37.0	15.1	7	0	87
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.03	0.040	0.016	0.01	0.00	0.09
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	6	1.5	0.6	6	4	8
Simpson's Diversity Index (D)	--	0.71	0.043	0.018	0.70	0.64	0.76
Evenness (Simpson's Equitability E_D)	--	0.51	0.142	0.058	0.52	0.35	0.67
Shannon-Weaver Index (H)	--	1.44	0.110	0.045	1.42	1.33	1.63
Evenness (Shannon's Equitability E_H)	--	0.75	0.070	0.029	0.75	0.66	0.82
Hill's Effective Richness ($E^{H'}$)	--	4	0.489	0.200	4.14	3.76	5.12
Evenness ($E^{H'}/S$)	--	0.61	0.115	0.047	0.61	0.48	0.75

Table 7.5-6. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Setting Lake within the Upper Nelson River Region for CAMPP, 2010.

	Setting Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	331	178.3	79.7	328	105	582
Oligochaeta	--	51	38.0	17.0	61	6	101
Hirudinea	--	3	3.1	1.4	1	0	7
Ostracoda	--	1	2.4	1.1	0	0	5
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.6	0.3	0	0	1
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	39	15.8	7.1	40	18	61
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.3	0.1	0	0	1
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	1	0.2	0.1	1	1	2
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	16	16.3	7.3	12	4	44
Gastropoda - unid	--	1	1.8	0.8	0	0	4
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.9	0.4	0	0	2
Lymnaeidae	--	4	5.4	2.4	2	1	14
Physidae	--	1	0.5	0.2	0	0	1
Planorbidae	--	16	27.0	12.1	8	0	64
Valvatidae	--	1	0.7	0.3	1	0	1
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	1	0.7	0.3	1	0	1
Collembola	--	0	0.6	0.3	0	0	1
Non-Insecta	--	136	78.9	35.3	147	50	249
Non-Insecta (%)	41	--	--	--	--	--	--
Oligochaeta	--	51	38.0	17.0	61	6	101
Oligochaeta (%)	16	--	--	--	--	--	--
Amphipoda	--	39	15.8	7.1	41	18	61
Amphipoda (%)	12	--	--	--	--	--	--
Bivalvia	--	16	16.3	7.3	12	4	44
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	23	28.4	12.7	15	2	71
Gastropoda (%)	7	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 7.5-6. - continued -

	Setting Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	5	8.0	3.6	1	0	19
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	2	4.0	1.8	0	0	9
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.6	0.3	0	0	1
Baetidae	--	1	2.4	1.1	0	0	5
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.6	0.3	0	0	1
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	34	27.9	12.5	21	5	67
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	2	2.9	1.3	0	0	7
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.6	0.3	0	0	1
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	10	14.8	6.6	2	0	35
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.1	0.1	0	0	0
Stenomena	--	9	7.1	3.2	10	0	17
Leptophlebiidae	--	0	0.1	0.1	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 7.5-6. - continued -

	Setting Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	1	1.2	0.5	0	0	3
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	1	0.7	0.3	1	0	1
Hydropsychidae	--	0	0.1	0.1	0	0	0
Hydroptilidae (larva)	--	10	5.5	2.5	11	4	18
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	1	1.1	0.5	0	0	3
Leptoceridae (larva)	--	9	5.8	2.6	8	2	18
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	9	11.9	5.3	3	0	28
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.6	0.3	0	0	1
Polycentropodidae	--	0	0.3	0.1	0	0	1
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	2	1.6	0.7	1	0	4
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	3	2.6	1.2	2	0	7
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	37	17.5	7.8	32	14	55
Orthocladiinae	--	45	43.4	19.4	31	5	119
Tanypodinae	--	14	19.3	8.6	7	0	46
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.6	0.3	0	0	1
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 7.5-6. - continued -

	Setting Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	195	101.9	45.6	181	55	333
Insecta (%)	59	--	--	--	--	--	--
Chironomidae	--	99	57.7	25.8	111	21	177
Chironomidae (%)	30	--	--	--	--	--	--
Ephemeroptera	--	57	45.3	20.3	39	19	120
Ephemeroptera (%)	17	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	30	11.4	5.1	27	14	45
Trichoptera (%)	9	--	--	--	--	--	--
EPT	--	87	54.4	24.3	65	33	155
EPT (%)	26	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.10	0.744	0.333	0.76	0.42	2.15
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	34	22	1.0	0.4	22	21	23
Simpson's Diversity Index (D)	--	0.89	0.006	0.003	0.89	0.88	0.89
Evenness (Simpson's Equitability E_D)	--	0.34	0.027	0.012	0.34	0.31	0.38
Shannon-Weaver Index (H)	--	2.47	0.031	0.014	2.48	2.42	2.49
Evenness (Shannon's Equitability E_H)	--	0.76	0.014	0.006	0.76	0.73	0.77
Hill's Effective Richness ($E^{H'}$)	--	12	0.365	0.163	11.91	11.27	12.09
Evenness ($E^{H'}/S$)	--	0.45	0.025	0.011	0.45	0.42	0.48

Table 7.5-6. - continued -

	Setting Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2796	753.7	337.1	2366	2164	3780
Oligochaeta	--	3	6.5	2.9	0	0	14
Hirudinea	--	6	12.9	5.8	0	0	29
Ostracoda	--	46	64.0	28.6	0	0	130
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	1408	387.3	173.2	1385	895	1933
Hyalellidae	--	3	6.5	2.9	0	0	14
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	315	200.8	89.8	303	29	592
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	6.5	2.9	0	0	14
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	1783	479.4	214.4	1688	1270	2337
Non-Insecta (%)	64	--	--	--	--	--	--
Oligochaeta	--	3	6.5	2.9	0	0	14
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	1411	389.1	174.0	1385	895	1933
Amphipoda (%)	50	--	--	--	--	--	--
Bivalvia	--	315	200.8	89.8	303	29	592
Bivalvia (%)	11	--	--	--	--	--	--
Gastropoda	--	3	6.5	2.9	0	0	14
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	3	6.5	2.9	0	0	14
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0

Table 7.5-6. - continued -

	Setting Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	3	6.5	2.9	0	0	14
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	202	123.7	55.3	188	72	404
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0

Table 7.5-6. - continued -

	Setting Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	3	6.5	2.9	0	0	14
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	23	26.2	11.7	14	0	58
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	38	41.6	18.6	14	0	101
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	49	40.3	18.0	58	0	87
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	150	26.2	11.7	159	115	173
Orthocladiinae	--	14	17.7	7.9	14	0	43
Tanypodinae	--	528	189.4	84.7	534	303	808
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1013	346.5	154.9	967	678	1558
Insecta (%)	36	--	--	--	--	--	--
Chironomidae	--	693	193.3	86.4	664	476	981
Chironomidae (%)	25	--	--	--	--	--	--
Ephemeroptera	--	202	123.7	55.3	188	72	404
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	26	23.7	10.6	14	0	58
Trichoptera (%)	1	--	--	--	--	--	--

Table 7.5-6. - continued -

	Setting Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
EPT	--	228	139.3	62.3	202	87	462
EPT (%)	8	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.32	0.123	0.055	0.30	0.15	0.47
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	15	8	2.3	1.0	7	6	11
Simpson's Diversity Index (D)	--	0.68	0.060	0.027	0.67	0.62	0.75
Evenness (Simpson's Equitability E_D)	--	0.34	0.039	0.018	0.34	0.27	0.38
Shannon-Weaver Index (H)	--	1.48	0.195	0.087	1.46	1.29	1.72
Evenness (Shannon's Equitability E_H)	--	0.66	0.036	0.016	0.66	0.62	0.72
Hill's Effective Richness ($E^{H'}$)	--	5	0.875	0.391	4.29	3.62	5.56
Evenness ($E^{H'}$/S)	--	0.47	0.050	0.022	0.48	0.40	0.53

Table 7.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Upper Nelson River Region waterbodies, 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Playgreen Lake	GN-01	14	570062	5961764	24-Jun-10	17.35	2.4	2.4	15.8
Playgreen Lake	GN-02	14	570417	5958708	24-Jun-10	17.78	9.1	6.2	14.8
Playgreen Lake	GN-03	14	562662	5961404	24-Jun-10	21.72	2.4	1.6	14.6
Playgreen Lake	GN-04	14	559140	5965536	23-Jun-10	18.98	2.3	2.2	-
Playgreen Lake	GN-05	14	559906	5969510	23-Jun-10	17.33	3.0	2.8	-
Playgreen Lake	GN-06	14	561061	5972058	23-Jun-10	17.40	3.3	5.8	16.4
Playgreen Lake	GN-07	14	560732	5974015	23-Jun-10	18.88	1.8	2.3	17.1
Playgreen Lake	GN-09	14	553985	5972432	24-Jun-10	16.88	2.9	3.1	15.9
Playgreen Lake	GN-10	14	557002	5976770	24-Jun-10	18.08	2.8	2.6	19.2
Playgreen Lake	GN-11	14	549574	5975530	25-Jun-10	14.87	3.1	3.4	15.0
Playgreen Lake	GN-12	14	552138	5979837	25-Jun-10	16.32	3.7	4.0	16.7
Playgreen Lake	GN-13	14	546917	5984235	26-Jun-10	18.80	3.1	2.8	16.7
Playgreen Lake	GN-14	14	549205	5988070	26-Jun-10	20.33	9.8	4.6	17.9
Playgreen Lake	GN-19	14	546906	5976982	25-Jun-10	19.77	3.1	3.2	15.3
Playgreen Lake	SN-03	14	562662	5961404	24-Jun-10	21.72	2.4	1.6	14.6
Playgreen Lake	SN-05	14	559906	5969510	23-Jun-10	17.33	3.0	2.8	-
Playgreen Lake	SN-10	14	557002	5976770	24-Jun-10	18.08	2.8	2.6	19.2
Playgreen Lake	SN-12	14	552138	5979837	25-Jun-10	16.32	3.7	4.0	16.7
Little Playgreen Lake	GN-01	14	567396	5981638	10-Jun-10	19.10	2.1	2.1	13.0
Little Playgreen Lake	GN-02	14	569156	5983028	10-Jun-10	18.80	4.3	4.3	13.3
Little Playgreen Lake	GN-03	14	572141	5984818	11-Jun-10	18.43	3.4	3.4	14.7
Little Playgreen Lake	GN-04	14	572641	5986286	11-Jun-10	20.25	3.1	3.7	13.2
Little Playgreen Lake	GN-05	14	576197	5984530	12-Jun-10	18.02	2.1	3.1	15.5
Little Playgreen Lake	GN-06	14	576903	5983742	12-Jun-10	16.88	3.7	3.1	14.2
Little Playgreen Lake	GN-07	14	579112	5986714	13-Jun-10	20.17	3.7	4.6	16.7
Little Playgreen Lake	GN-08	14	581052	5987088	13-Jun-10	19.88	3.1	3.1	18.0
Little Playgreen Lake	GN-09	14	582352	5988626	14-Jun-10	21.15	2.4	3.4	15.0
Little Playgreen Lake	GN-10	14	579439	5988799	14-Jun-10	19.18	3.4	2.4	17.6
Little Playgreen Lake	SN-03	14	572141	5984818	11-Jun-10	18.43	3.4	3.4	14.7
Little Playgreen Lake	SN-06	14	576903	5983742	12-Jun-10	16.88	3.7	3.1	14.2
Little Playgreen Lake	SN-09	14	582352	5988626	14-Jun-10	21.15	2.4	3.4	15.0
Cross Lake	GN-01	14	570433	6042356	20-Aug-10	19.25	8.5	7.5	18.0
Cross Lake	GN-02	14	569243	6042791	20-Aug-10	19.75	5.5	7.5	18.0
Cross Lake	GN-03	14	570568	6043543	20-Aug-10	21.78	5.0	4.0	18.0
Cross Lake	GN-04	14	570035	6043309	19-Aug-10	22.58	7.5	7.0	18.0
Cross Lake	GN-07	14	568233	6043471	19-Aug-10	23.25	9.0	9.0	18.0
Cross Lake	GN-09	14	560831	6044947	19-Aug-10	22.00	3.1	3.0	15.0
Cross Lake	GN-12	14	560269	6050172	17-Aug-10	20.42	3.8	3.5	16.0
Cross Lake	GN-13	14	562518	6052908	17-Aug-10	20.83	3.0	3.5	16.0

Table 7.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Cross Lake	GN-14	14	561618	6053567	17-Aug-10	20.50	4.0	3.8	14.0
Cross Lake	GN-15	14	574167	6060511	18-Aug-10	21.33	3.3	3.0	14.0
Cross Lake	GN-16	14	575008	6059244	18-Aug-10	22.00	3.5	3.5	14.0
Cross Lake	GN-19	14	591299	6066715	18-Aug-10	19.42	3.5	3.5	14.0
Cross Lake	SN-03	14	570608	6043545	20-Aug-10	21.40	6.0	5.0	15.0
Cross Lake	SN-09	14	560784	6044958	19-Aug-10	21.92	3.0	3.1	15.0
Cross Lake	SN-12	14	560235	6050151	17-Aug-10	20.75	3.0	3.8	16.0
Cross Lake	SN-15	14	574150	6060526	18-Aug-10	21.17	3.0	3.3	14.0
Walker Lake	GN-01	14	630679	6070574	21-Aug-10	16.35	8.5	3.5	17.0
Walker Lake	GN-02	14	628175	6069475	21-Aug-10	16.42	5.3	5.5	17.0
Walker Lake	GN-03	14	629383	6066545	21-Aug-10	16.47	7.8	6.0	17.0
Walker Lake	GN-04	14	635001	6070392	22-Aug-10	21.58	4.2	5.0	17.5
Walker Lake	GN-05	14	635619	6073665	22-Aug-10	20.58	4.1	4.0	17.5
Walker Lake	GN-06	14	633430	6071158	22-Aug-10	20.83	8.0	5.5	17.5
Walker Lake	GN-07	14	626660	6065515	23-Aug-10	45.08	4.0	3.5	16.0
Walker Lake	GN-08	14	624877	6064758	23-Aug-10	44.50	2.5	2.5	16.0
Walker Lake	GN-09	14	630975	6065359	23-Aug-10	43.58	4.5	4.5	16.0
Walker Lake	SN-01	14	630708	6070531	21-Aug-10	16.18	9.5	8.5	17.0
Walker Lake	SN-06	14	633430	6071158	22-Aug-10	20.58	8.0	8.0	17.5
Walker Lake	SN-07	14	626692	6065507	23-Aug-10	44.92	3.8	4.0	16.0
Setting Lake	GN-01	14	512135	6076808	19-Aug-10	23.37	8.4	6.1	15.3
Setting Lake	GN-02	14	514970	6078909	19-Aug-10	24.05	9.6	5.6	16.2
Setting Lake	GN-03	14	515661	6083916	20-Aug-10	22.52	10.1	5.4	16.8
Setting Lake	GN-04	14	518124	6085573	20-Aug-10	20.85	13.4	13.9	17.2
Setting Lake	GN-05	14	518361	6087649	20-Aug-10	20.63	5.8	6.9	16.9
Setting Lake	GN-06	14	521553	6088887	20-Aug-10	23.68	18.7	18.7	17.3
Setting Lake	GN-07	14	521565	6092584	21-Aug-10	20.28	11.4	14.6	17.0
Setting Lake	GN-08	14	524308	6092935	20-Aug-10	25.22	7.1	14.1	17.4
Setting Lake	GN-09	14	523267	6094461	20-Aug-10	24.33	17.9	8.1	17.0
Setting Lake	GN-11	14	526156	6101101	30-Aug-10	21.70	7.8	7.1	15.4
Setting Lake	GN-12	14	526832	6105358	30-Aug-10	22.43	4.6	7.2	16.0
Setting Lake	GN-13	14	528021	6105429	30-Aug-10	23.28	3.3	4.8	15.8
Setting Lake	GN-15	14	529812	6102184	31-Aug-10	22.60	5.7	11.2	15.0
Setting Lake	GN-16	14	527934	6099900	31-Aug-10	21.50	11.0	10.6	15.3
Setting Lake	GN-17	14	523369	6097002	22-Aug-10	19.78	6.0	5.5	16.2
Setting Lake	GN-20	14	524089	6096322	22-Aug-10	21.43	5.7	5.4	16.6
Setting Lake	SN-03	14	515661	6083916	20-Aug-10	22.52	10.1	5.4	16.8
Setting Lake	SN-06	14	521553	6088887	20-Aug-10	23.68	18.7	18.7	17.3
Setting Lake	SN-09	14	523267	6094461	20-Aug-10	24.33	17.9	8.1	17.0
Setting Lake	SN-11	14	526156	6101101	30-Aug-10	21.70	7.8	7.1	15.4

Table 7.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Upper Nelson River Region waterbodies, 2010.

Family	Species	Scientific Name	ID Code
Cyprinidae	Emerald Shiner	*Notropis atherinoides*	EMSH
	Spottail Shiner	*Notropis hudsonius*	SPSH
Catostomidae	Quillback	*Carpiodes cyprinus*	QUIL
	Longnose Sucker	*Catostomus catostomus*	LNSC
	White Sucker	*Catostomus commersonii*	WHSC
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD
Esocidae	Northern Pike	*Esox lucius*	NRPK
Osmeridae	Rainbow Smelt	*Osmerus mordax*	RNSM
Salmonidae	Cisco	*Coregonus artedi*	CISC
	Lake Whitefish	*Coregonus clupeaformis*	LKWH
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR
Gadidae	Burbot	*Lota lota*	BURB
Cottidae	Slimy Sculpin	*Cottus cognatus*	SLSC
Centrarchidae	Rock Bass	*Ambloplites rupestris*	RCBS
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Sauger	*Sander canadensis*	SAUG
	Walleye	*Sander vitreus*	WALL
Sciaenidae	Freshwater Drum	*Aplodinotus grunniens*	FRDR

Table 7.6-3. Standard gang index gillnet relative abundance summaries from Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L		Little Playgreen L		Cross L		Walker L		Setting L	
	n	RA	n	RA	n	RA	n	RA	n	RA
Emerald Shiner	-	-	-	-	-	-	-	-	1	0.07
Spottail Shiner	3	0.31	-	-	-	-	-	-	-	-
Quillback	1	0.10	-	-	-	-	-	-	-	-
Longnose Sucker	1	0.10	-	-	-	-	-	-	76	5.36
White Sucker	471	49.16	382	52.04	70	16.51	129	46.74	199	14.03
Shorthead Redhorse	4	0.42	53	7.22	28	6.60	-	-	3	0.21
Northern Pike	95	9.92	124	16.89	92	21.70	26	9.42	85	5.99
Rainbow Smelt	135	14.09	4	0.54	2	0.47	-	-	-	-
Cisco	22	2.30	1	0.14	1	0.24	63	22.83	448	31.59
Lake Whitefish	27	2.82	5	0.68	-	-	1	0.36	25	1.76
Troutperch	-	-	-	-	-	-	-	-	-	-
Burbot	1	0.10	-	-	-	-	-	-	5	0.35
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	1	0.14	-	-	-	-	-	-
Yellow Perch	64	6.68	48	6.54	55	12.97	20	7.25	36	2.54
Sauger	17	1.77	2	0.27	26	6.13	14	5.07	264	18.62
Walleye	115	12.00	113	15.40	146	34.43	22	7.97	276	19.46
Freshwater Drum	2	0.21	1	0.14	4	0.94	1	0.36	-	-
Total	958	100	734	100	424	100	276	100	1418	100

n = number of fish caught and RA = percent relative abundance

Table 7.6-4. Small mesh index gillnet relative abundance summaries from Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L		Little Playgreen L		Cross L		Walker L		Setting L	
	n	RA	n	RA	n	RA	n	RA	n	RA
Emerald Shiner	400	15.28	71	2.61	7	1.43	4	2.42	53	16.67
Spottail Shiner	1640	62.64	2496	91.80	238	48.67	81	49.09	120	37.74
Quillback	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-
White Sucker	4	0.15	2	0.07	-	-	3	1.82	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	0.27	4	0.15	2	0.41	-	-	-	-
Rainbow Smelt	503	19.21	21	0.77	15	3.07	-	-	-	-
Cisco	1	0.04	-	-	-	-	8	4.85	39	12.26
Lake Whitefish	-	-	1	0.04	-	-	-	-	-	-
Troutperch	26	0.99	65	2.39	24	4.91	4	2.42	14	4.40
Burbot	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	2	0.63
Rock Bass	-	-	-	-	-	-	-	-	-	-
Yellow Perch	18	0.69	48	1.77	196	40.08	47	28.48	7	2.20
Sauger	-	-	-	-	5	1.02	10	6.06	67	21.07
Walleye	19	0.73	11	0.40	2	0.41	8	4.85	16	5.03
Freshwater Drum	-	-	-	-	-	-	-	-	-	-
Total	2618	100	2719	100	489	100	165	100	318	100

n = number of fish caught

RA = percent relative abundance

Table 7.6-5. Standard gang index gillnet biomass (g) summaries from Upper Nelson River waterbodies, 2010.

Species	Playgreen L			Little Playgreen L			Cross L			Walker L			Setting L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	1	11	0.001
Spottail Shiner	3	40	0.004	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	1	1610	0.17	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	1	870	0.09	-	-	-	-	-	-	-	-	-	76	94400	12.18
White Sucker	471	462917	49.98	382	428095	54.7	70	76117	18.61	129	131370	63.46	199	208460	26.9
Shorthead Redhorse	4	3540	0.38	53	51970	6.64	28	29120	7.12	-	-	-	3	3120	0.4
Northern Pike	95	261521	28.23	124	174687	22.32	92	143800	35.16	26	36740	17.75	85	88577	11.43
Rainbow Smelt	135	2050	0.22	4	34	0.004	2	18	0.004	-	-	-	-	-	-
Cisco	22	11860	1.28	1	960	0.12	1	820	0.2	63	10080	4.87	448	138700	17.9
Lake Whitefish	27	12450	1.34	5	2060	0.26	-	-	-	1	140	0.07	25	8930	1.15
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	1950	0.21	-	-	-	-	-	-	-	-	-	5	3370	0.43
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	1	120	0.02	-	-	-	-	-	-	-	-	-
Yellow Perch	64	10470	1.13	48	6703	0.86	55	5660	1.38	20	1933	0.93	36	6990	0.9
Sauger	17	8700	0.94	2	1135	0.15	26	11110	2.72	14	3580	1.73	264	71220	9.19
Walleye	114	145050	15.66	113	114995	14.69	146	138940	33.97	22	22200	10.72	276	151122	19.5
Freshwater Drum	2	3210	0.35	1	1900	0.24	4	3390	0.83	1	980	0.47	-	-	-
Total	957	926238	100	734	782659	100	424	408975	100	276	207023	100	1418	774900	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = percent of total biomass

Table 7.6-6. Small mesh index gillnet biomass (g) summaries from Upper Nelson River waterbodies, 2010.

Species	Playgreen L			Little Playgreen L			Cross L			Walker L			Setting L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Emerald Shiner	400	2170	6.98	71	360	1.78	7	27	0.27	4	14	0.17	53	244	1.04
Spottail Shiner	1640	9259	29.78	2496	13744	67.98	238	1184	11.63	81	395	4.89	120	593	2.53
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	4	360	1.16	2	311	1.54	-	-	-	3	610	7.56	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	11940	38.4	4	4250	21.02	2	2850	28	-	-	-	-	-	-
Rainbow Smelt	503	6130	19.71	21	181	0.9	15	156	1.53	-	-	-	-	-	-
Cisco	1	16	0.05	-	-	-	-	-	-	8	697	8.64	39	3325	14.2
Lake Whitefish	-	-	-	1	18	0.09	-	-	-	-	-	-	-	-	-
Troutperch	26	212	0.68	65	384	1.9	24	173	1.7	4	16	0.2	14	71	0.3
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	2	6	0.03
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	18	66	2.1	48	794	3.92	196	2060	20.24	47	989	12.26	7	33	0.14
Sauger	-	-	-	-	-	-	5	1530	15.03	10	1049	13	67	14073	60.11
Walleye	19	356	1.15	11	177	0.88	2	2200	21.61	8	4300	53.28	16	5069	21.65
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2618	31096	100	2719	20219	100	489	10180	100	165	8070	100	318	23413	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = percent of total biomass

Table 7.6-7. Mean catch-per-unit-effort (CPUE; fish/100 m/24 h) calculated for fish species captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L (# sites=14)			Little Playgreen L (# sites=10)			Cross Lake (# sites=12)			Walker L (# sites=9)			Setting Lake (# sites=16)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	1	0.1	0.22
Spottail Shiner	3	0.3	0.71	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	1	0.1	0.34	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	1	0.1	0.30	-	-	-	-	-	-	-	-	-	76	4.5	6.47
White Sucker	471	40.2	25.07	382	42.0	12.24	70	5.8	4.23	129	14.1	15.25	199	11.6	7.97
Shorthead Redhorse	4	0.3	0.52	53	5.7	4.14	28	2.4	2.75	-	-	-	3	0.2	0.51
Northern Pike	95	7.8	9.13	124	13.6	9.39	92	7.6	6.98	26	2.4	1.34	85	5.0	2.51
Rainbow Smelt	135	11.0	12.53	4	0.4	1.08	2	0.2	0.41	-	-	-	-	-	-
Cisco	22	1.9	4.42	1	0.1	0.35	1	0.1	0.31	63	8.4	11.34	448	26.4	18.93
Lake Whitefish	27	2.3	3.74	5	0.6	1.39	-	-	-	1	0.1	0.34	25	1.5	2.45
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	0.1	0.30	-	-	-	-	-	-	-	-	-	5	0.3	0.66
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	1	0.1	0.32	-	-	-	-	-	-	-	-	-
Yellow Perch	64	5.4	6.88	48	5.2	2.50	55	4.5	5.05	20	1.8	1.13	36	2.1	2.21
Sauger	17	1.4	2.62	2	0.2	0.47	26	2.2	2.62	14	1.6	2.63	264	15.4	13.52
Walleye	115	9.4	14.37	113	12.3	5.91	146	12.1	7.58	22	2.2	1.45	276	16.4	17.84
Freshwater Drum	2	0.2	0.60	1	0.1	0.38	4	0.3	0.86	1	0.1	0.43	-	-	-
Total	958	80.4	36.68	734	80.3	15.13	424	35.2	12.04	276	30.8	23.19	1418	83.5	23.52

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site
SD = standard deviation

Table 7.6-8. Mean catch-per-unit-effort (CPUE; fish/30 m/24 h) calculated for fish species captured in small mesh index gill nets set in Upper Nelson River Region waterbodies, 2010

Species	Playgreen L (# sites=4)			Little Playgreen L (# sites=3)			Cross Lake (# sites=4)			Walker L (# sites=3)			Setting Lake (# sites=4)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Emerald Shiner	400	135.9	108.00	71	30.4	12.06	7	2.0	3.97	4	1.6	2.69	53	14.0	24.22
Spottail Shiner	1640	559.2	536.64	2496	1078.2	1725.00	238	66.4	43.96	81	33.8	26.54	120	32.6	37.60
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	4	1.3	2.66	2	0.9	0.74	-	-	-	3	1.2	1.58	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	2.3	1.32	4	1.6	1.71	2	0.6	1.12	-	-	-	-	-	-
Rainbow Smelt	503	160.5	134.20	21	9.1	12.42	15	4.1	7.49	-	-	-	-	-	-
Cisco	1	0.3	0.56	-	-	-	-	-	-	8	3.3	3.51	39	10.2	12.51
Lake Whitefish	-	-	-	1	0.4	0.74	-	-	-	-	-	-	-	-	-
Troutperch	26	8.5	8.08	65	29.4	24.70	24	6.7	5.57	4	1.8	1.56	14	3.6	3.10
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	2	0.5	0.99
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	18	6.0	9.32	48	20.6	13.22	196	54.9	108.41	47	13.4	10.77	7	1.9	3.87
Sauger	-	-	-	-	-	-	5	1.4	1.67	10	4.4	3.91	67	17.2	12.25
Walleye	19	6.4	10.10	11	4.7	3.03	2	0.6	1.13	8	2.3	2.34	16	4.4	6.02
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2618	880.5	633.91	2719	1175.3	1726.08	489	136.6	121.37	165	61.7	39.65	318	84.4	63.91

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site
SD = standard deviation

Table 7.6-9. Mean biomass-per-unit-effort (BPUE; g/100 m/24 h) calculated for fish species captured in standard gang index gill nets set in the Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L (# sites=14)			Little Playgreen L (# sites=10)			Cross Lake (# sites=12)			Walker L (# sites=9)			Setting Lake (# sites=16)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
Spottail Shiner	3	3	8	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	1	111	417	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	1	59	219	-	-	-	-	-	-	-	-	-	76	4538	6747
White Sucker	471	31641	17219	382	37639	12667	70	4977	5304	129	11109	10991	199	9707	6836
Shorthead Redhorse	4	230	384	53	4459	3069	28	2012	2532	-	-	-	3	148	414
Northern Pike	95	17106	16681	124	15324	13543	92	9424	11350	26	3058	2741	85	4177	2563
Rainbow Smelt	135	137	221	4	3	7	2	1	3	-	-	-	-	-	-
Cisco	22	817	1658	1	86	271	1	59	205	63	1070	1467	448	6501	5358
Lake Whitefish	27	839	1970	5	184	582	-	-	-	1	13	38	25	434	735
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	124	465	-	-	-	-	-	-	-	-	-	5	158	410
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	1	10	30	-	-	-	-	-	-	-	-	-
Yellow Perch	64	713	850	48	577	356	55	374	345	20	123	94	36	327	300
Sauger	17	580	997	2	100	213	26	748	952	14	338	594	264	3333	3277
Walleye	114	9511	16153	113	10008	5740	146	9189	6450	22	1862	1146	276	7105	6974
Freshwater Drum	2	204	763	1	189	597	4	221	623	1	112	335	-	-	-
Total	957	62075	34931	734	68579	29566	424	27004	17374	276	17684	12058	1418	36428	9470

#sites = number of sites sampled
n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m/24 h) per site
SD = standard deviation

Table 7.6-10. Mean biomass-per-unit-effort (BPUE; g/30 m/24h) calculated for fish species captured in small mesh index gill nets set in the Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L (# sites=4)			Little Playgreen L (# sites=3)			Cross Lake (# sites=4)			Walker L (# sites=3)			Setting Lake (# sites=4)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Emerald Shiner	400	740	562	71	155	48	7	8	15	4	5	9	53	64	99
Spottail Shiner	1640	3171	3133	2496	5936	9490	238	329	258	81	165	131	120	161	186
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	4	120	239	2	145	220	-	-	-	3	210	242	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	7	3940	1011	4	1644	2395	2	799	1598	-	-	-	-	-	-
Rainbow Smelt	503	1954	1645	21	79	109	15	43	81	-	-	-	-	-	-
Cisco	1	4	9	-	-	-	-	-	-	8	297	268	39	855	1129
Lake Whitefish	-	-	-	1	8	14	-	-	-	-	-	-	-	-	-
Troutperch	26	71	81	65	167	54	24	48	47	4	7	8	14	18	18
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	2	2	3
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	18	219	338	48	339	202	196	577	1097	47	281	37	7	9	18
Sauger	-	-	-	-	-	-	5	428	750	10	458	397	67	3606	3529
Walleye	19	121	178	11	75	41	2	624	1247	8	1349	1680	16	1366	1821
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2618	10339	4647	2719	8548	6815	489	2856	3190	165	2773	1902	318	6081	4596

#sites = number of sites sampled
n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/30 m/24 h) per site
SD = standard deviation

Table 7.6-11. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L			Little Playgreen L			Cross L			Walker L			Setting L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length															
Northern Pike	95	667	105	124	538	97	92	566	111	26	557	128	85	505	90
Lake Whitefish	27	260	115	5	472	37	-	-	-	1	221	-	25	288	46
Walleye	115	443	91	113	405	72	145	416	56	22	436	66	276	352	60
Weight															
Northern Pike	92	2759	1210	121	1420	705	92	1563	1029	26	1413	1001	84	1045	739
Lake Whitefish	27	461	659	5	1912	512	-	-	-	1	140	-	25	357	166
Walleye	115	1261	742	113	1018	481	146	952	469	22	1009	468	273	548	257
Condition Factor															
Northern Pike	92	0.88	0.08	121	0.83	0.06	92	0.77	0.07	26	0.70	0.08	84	0.73	0.07
Lake Whitefish	27	1.44	0.20	5	1.78	0.05	-	-	-	1	1.30	-	25	1.40	0.10
Walleye	115	1.34	0.15	113	1.39	0.12	145	1.25	0.11	22	1.14	0.07	273	1.15	0.08

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 7.6-12. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, and Walleye captured in small mesh index gill nets set in Upper Nelson River Region waterbodies, 2010.

Species	Playgreen L			Little Playgreen L			Cross L			Walker L			Setting L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length															
Northern Pike	2	571	27	1	356	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	3	122	29	1	124	-	-	-	-	-	-	-	4	268	151
Weight															
Northern Pike	7	1706	-	4	1063	-	2	1425	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	1	18	-	-	-	-	-	-	-	-	-	-
Walleye	19	19	-	11	16	-	2	1100	-	8	538	-	16	317	-
Condition Factor															
Northern Pike	2	0.76	0.06	1	0.84	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	3	1.11	0.25	1	1.03	-	-	-	-	-	-	-	4	1.05	0.17

n = number of fish measured (may not equal number of fish caught)
SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 7.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Age	Year-Class	Northern Pike									
		Playgreen L		Little Playgreen L		Cross L		Walker L		Setting L	
		n	%	n	%	n	%	n	%	n	%
1	2009	-	-	1	0.81	-	-	-	-	1	1.18
2	2008	1	1.09	6	4.84	1	1.14	-	-	5	5.88
3	2007	6	6.52	17	13.71	11	12.50	3	11.54	4	4.71
4	2006	5	5.43	18	14.52	15	17.05	4	15.38	17	20.00
5	2005	15	16.30	35	28.23	26	29.55	6	23.08	18	21.18
6	2004	13	14.13	14	11.29	18	20.45	5	19.23	19	22.35
7	2003	8	8.70	6	4.84	10	11.36	3	11.54	8	9.41
8	2002	12	13.04	7	5.65	4	4.55	3	11.54	5	5.88
9	2001	11	11.96	8	6.45	-	-	-	-	4	4.71
10	2000	13	14.13	5	4.03	1	1.14	-	-	3	3.53
11	1999	4	4.35	6	4.84	1	1.14	1	3.85	1	1.18
12	1998	4	4.35	1	0.81	-	-	-	-	-	-
13	1997	-	-	-	-	1	1.14	-	-	-	-
14	1996	-	-	-	-	-	-	1	3.85	-	-
Total		92	100	124	100	88	100	26	100	85	100

Table 7.6-14. Age/year-class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

		Lake Whitefish									
Age	Year-Class	Playgreen L		Little Playgreen L		Cross L		Walker L		Setting L	
		n	%	n	%	n	%	n	%	n	%
1	2009	18	69.23	-	-	-	-	-	-	1	4.00
2	2008	1	3.85	-	-	-	-	-	-	5	20.00
3	2007	2	7.69	-	-	-	-	-	-	18	72.00
4	2006	-	-	-	-	-	-	-	-	1	4.00
5	2005	-	-	1	20.00	-	-	1	100.00	-	-
6	2004	2	7.69	2	40.00	-	-	-	-	-	-
7	2003	-	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	1	20.00	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-
18	1992	3	11.54	1	20.00	-	-	-	-	-	-
Total		26	100	5	100	-	-	1	100	25	100

Table 7.6-15. Age/year-class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

		Walleye									
Age	Year-Class	Playgreen L		Little Playgreen L		Cross L		Walker L		Setting L	
		n	%	n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-	-	-
2	2008	1	0.88	6	5.56	-	-	-	-	12	4.38
3	2007	5	4.39	5	4.63	2	1.38	-	-	15	5.47
4	2006	20	17.54	12	11.11	8	5.52	-	-	19	6.93
5	2005	45	39.47	17	15.74	26	17.93	-	-	81	29.56
6	2004	10	8.77	1	0.93	46	31.72	2	9.09	11	4.01
7	2003	6	5.26	24	22.22	18	12.41	2	9.09	32	11.68
8	2002	12	10.53	26	24.07	7	4.83	2	9.09	80	29.20
9	2001	15	13.16	7	6.48	12	8.28	4	18.18	19	6.93
10	2000	-	-	-	-	22	15.17	3	13.64	2	0.73
11	1999	-	-	-	-	2	1.38	3	13.64	2	0.73
12	1998	-	-	-	-	1	0.69	-	-	-	-
13	1997	-	-	3	2.78	-	-	2	9.09	1	0.36
14	1996	-	-	6	5.56	-	-	3	13.64	-	-
15	1995	-	-	1	0.93	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	1	4.55	-	-
18	1992	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	1	0.69	-	-	-	-
Total		114	100	108	100	145	100	22	100	274	100

n = number of fish aged

% = proportion of the fish aged in each year class

Table 7.6-16. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Age	Year-Class	Playgreen Lake									Little Playgreen Lake									Cross Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	1	258	-	1	140	-	1	0.82	-	-	-	-	-	-	-	-	-	-
2	2008	1	354	-	-	-	-	-	-	-	6	327	46	6	312	136	6	0.85	0.05	1	274	-	1	160	-	1	0.78	-
3	2007	6	498	36	5	594	283	5	0.83	0.10	17	451	52	17	792	251	17	0.83	0.06	11	451	35	11	716	203	11	0.76	0.06
4	2006	5	548	25	5	1016	457	5	0.81	0.02	18	497	46	16	1083	295	16	0.84	0.05	15	484	62	15	889	349	15	0.75	0.07
5	2005	15	603	69	18	1329	350	18	0.84	0.11	35	542	52	35	1365	420	35	0.84	0.05	26	564	55	26	1407	463	26	0.76	0.06
6	2004	13	643	65	14	1829	304	14	0.83	0.06	14	605	56	13	1864	511	13	0.81	0.07	18	601	64	18	1768	542	18	0.80	0.08
7	2003	8	694	65	19	2196	898	19	0.81	0.08	6	606	70	6	1960	652	6	0.86	0.05	10	615	59	10	1901	532	10	0.80	0.07
8	2002	12	712	44	13	2529	1108	13	0.87	0.09	7	615	32	7	1967	323	7	0.84	0.07	4	767	124	4	3420	1440	4	0.73	0.05
9	2001	11	719	84	6	2465	704	6	0.83	0.09	8	574	24	8	1624	223	8	0.86	0.07	-	-	-	-	-	-	-	-	-
10	2000	14	736	97	5	3370	1726	5	0.83	0.06	5	610	26	5	1832	375	5	0.80	0.11	1	912	-	1	5420	-	1	0.71	-
11	1999	4	765	119	2	2770	325	2	0.87	0.01	6	698	101	6	2827	1139	6	0.80	0.05	1	807	-	1	3620	-	1	0.69	-
12	1998	4	716	113	3	2963	294	3	0.84	0.06	1	688	-	1	2320	-	1	0.71	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	1	5040	-	1	0.86	-	-	-	-	-	-	-	-	-	-	1	902	-	1	6320	-	1	0.86	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-16. - continued -

Age	Year-Class	Walker Lake									Setting Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	1	290	-	1	180	-	1	0.74	-
2	2008	-	-	-	-	-	-	-	-	-	5	372	77	5	372	9	5	0.74	0.05
3	2007	3	359	103	3	360	230	3	0.72	0.11	4	415	33	4	568	71	4	0.80	0.11
4	2006	4	433	38	4	568	83	4	0.70	0.09	17	463	44	17	729	202	17	0.73	0.06
5	2005	6	556	35	6	1147	298	6	0.66	0.07	18	506	65	18	975	354	18	0.72	0.05
6	2004	5	545	11	5	1138	58	5	0.71	0.04	19	514	47	19	1001	279	19	0.72	0.07
7	2003	3	671	48	3	2167	732	3	0.70	0.11	8	547	48	7	1279	361	7	0.72	0.05
8	2002	3	667	21	3	2200	522	3	0.73	0.12	5	612	139	5	1876	1620	5	0.68	0.08
9	2001	-	-	-	-	-	-	-	-	-	4	660	124	4	2705	1714	4	0.83	0.18
10	2000	-	-	-	-	-	-	-	-	-	3	559	24	3	1227	188	3	0.70	0.02
11	1999	1	764	-	1	3460	-	1	0.78	-	1	620	-	1	1650	-	1	0.69	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	1	831	-	1	4260	-	1	0.74	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-17. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Age	Year-Class	Playgreen Lake									Little Playgreen Lake									Cross Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	18	191	8	18	96	15	18	1.36	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	1	302	-	1	410	-	1	1.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	2	382	17	2	925	106	2	1.66	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2005	-	-	-	-	-	-	-	-	-	1	436	-	1	1460	-	1	1.76	-	-	-	-	-	-	-	-	-	-
6	2004	2	419	13	2	1310	99	2	1.79	0.30	2	454	6	2	1650	0	2	1.77	0.06	-	-	-	-	-	-	-	-	-
7	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	1	528	-	1	2740	-	1	1.86	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	3	496	30	3	1920	490	3	1.55	0.13	1	488	-	1	2060	-	1	1.77	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-17. - continued -

Age	Year-Class	Walker Lake FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Setting Lake FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	1	188	-	1	100	-	1	1.50	-
2	2008	-	-	-	-	-	-	-	-	-	5	232	8	5	176	18	5	1.41	0.09
3	2007	-	-	-	-	-	-	-	-	-	18	303	22	18	391	77	18	1.39	0.11
4	2006	-	-	-	-	-	-	-	-	-	1	396	-	1	910	-	1	1.47	-
5	2005	1	221	-	1	140	-	1	1.30	-	-	-	-	-	-	-	-	-	-
6	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-18. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Age	Year-Class	Playgreen Lake									Little Playgreen Lake									Cross Lake								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-
2	2008	1	228	-	1	130	-	1	1.10	-	6	227	9	6	140	21	6	1.19	0.05	-	-	-	-	-	-	-	-	-
3	2007	5	314	60	5	414	288	5	1.19	0.11	5	290	12	5	310	43	5	1.27	0.05	2	313	1	2	340	28	2	1.11	0.08
4	2006	20	374	20	20	710	122	20	1.34	0.08	12	348	22	12	599	122	12	1.40	0.10	8	346	40	8	529	168	8	1.22	0.07
5	2005	45	423	29	45	1064	239	45	1.38	0.12	17	386	48	17	823	290	17	1.37	0.10	25	368	33	26	616	186	25	1.21	0.11
6	2004	10	480	96	10	1487	656	10	1.34	0.20	1	392	-	1	920	-	1	1.53	-	46	403	29	46	823	212	46	1.23	0.10
7	2003	6	493	134	6	1512	929	6	1.16	0.25	24	430	36	24	1144	317	24	1.41	0.11	18	425	39	18	1004	329	18	1.27	0.10
8	2002	12	528	101	12	1984	884	12	1.33	0.19	26	441	36	26	1219	306	26	1.40	0.12	7	449	33	7	1164	265	7	1.27	0.09
9	2001	15	538	89	15	2135	906	15	1.34	0.16	7	466	51	7	1503	562	7	1.43	0.15	12	456	41	12	1287	387	12	1.32	0.11
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	470	33	22	1307	285	22	1.25	0.11
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	488	107	2	1635	997	2	1.32	0.02
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	469	-	1	1460	-	1	1.42	-
13	1997	-	-	-	-	-	-	-	-	-	3	449	13	3	1330	122	3	1.46	0.01	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	6	480	23	6	1583	335	6	1.41	0.10	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	1	494	-	1	2020	-	1	1.68	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	671	-	1	4220	-	1	1.40	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-18. - continued -

		Walker Lake									Setting Lake								
Age	Year-Class	FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	12	219	13	12	123	17	12	1.18	0.13
3	2007	-	-	-	-	-	-	-	-	-	15	253	24	15	190	54	15	1.16	0.10
4	2006	-	-	-	-	-	-	-	-	-	19	302	42	18	326	115	18	1.08	0.06
5	2005	-	-	-	-	-	-	-	-	-	81	331	35	81	428	148	81	1.14	0.07
6	2004	2	313	23	2	330	42	2	1.08	0.10	11	356	29	10	498	109	10	1.12	0.06
7	2003	2	363	1	2	525	35	2	1.10	0.06	32	378	24	32	648	140	32	1.19	0.08
8	2002	2	468	18	2	1200	141	2	1.17	0.00	81	397	32	80	739	192	80	1.16	0.08
9	2001	4	410	22	4	830	183	4	1.19	0.10	19	402	32	19	760	169	19	1.15	0.08
10	2000	3	442	27	3	990	157	3	1.14	0.07	2	412	17	2	840	85	2	1.20	0.03
11	1999	3	442	21	3	1027	140	3	1.18	0.03	2	404	31	2	745	134	2	1.13	0.06
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	2	509	105	2	1630	933	2	1.18	0.02	1	504	-	1	1680	-	1	1.31	-
14	1996	3	505	49	3	1460	513	3	1.10	0.05	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	1	472	-	1	1080	-	1	1.03	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	22			22			22			275			272			272		

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-19. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Playgreen Lake											
White Sucker	1	0.21	-	-	11	2.34	-	-	471	12	2.55
Northern Pike	-	-	-	-	1	1.05	-	-	95	1	1.05
Lake Whitefish	-	-	-	-	-	-	-	-	27	0	0.00
Sauger	-	-	-	-	-	-	-	-	17	0	0.00
Walleye	-	-	-	-	-	-	-	-	115	0	0.00
Little Playgreen Lake											
White Sucker	3	0.79	-	-	6	1.57	1	0.26	382	10	2.62
Northern Pike	1	0.81	2	1.61	4	3.23	1	0.81	124	8	6.45
Lake Whitefish	-	-	-	-	-	-	-	-	5	0	0.00
Sauger	-	-	-	-	-	-	-	-	2	0	0.00
Walleye	1	0.88	-	-	-	-	-	-	113	1	0.88
Cross Lake											
White Sucker	3	4.29	-	-	-	-	-	-	70	3	4.29
Northern Pike	4	4.35	-	-	-	-	-	-	92	4	4.35
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	26	0	0.00
Walleye	-	-	-	-	-	-	-	-	146	0	0.00
Walker Lake											
White Sucker	2	1.55	-	-	2	1.55	-	-	129	4	3.10
Northern Pike	-	-	-	-	-	-	-	-	26	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	1	0	0.00
Sauger	-	-	-	-	-	-	-	-	14	0	0.00
Walleye	-	-	-	-	-	-	-	-	22	0	0.00
Setting Lake											
White Sucker	2	1.01	-	-	1	0.50	-	-	199	3	1.51
Northern Pike	-	-	-	-	-	-	-	-	85	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	25	0	0.00
Sauger	-	-	1	0.38	-	-	-	-	264	1	0.38
Walleye	2	0.72	-	-	-	-	1	0.36	276	3	1.09

n = number of inspected fish with DELTs
$n_{Inspect}$ = total number of fish inspected for DELTs
n_{DELTs} = total number of fish with DELTs
% - percentage of inspected fish with deformities, erosions, lesions or tumours
$\%_{DELTs}$ = total percentage of fish inspected for DELTs with DELTs ($n_{DELTs}/n_{Inspect}$ X100)

Table 7.7-1. Mean arithmetic (± standard error, SE) and standardized (± 95% confidence limit, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, Walleye, and Yellow Perch from Playgreen Lake, Little Playgreen Lake, the west basin of Cross Lake, and Setting Lake in 2010.

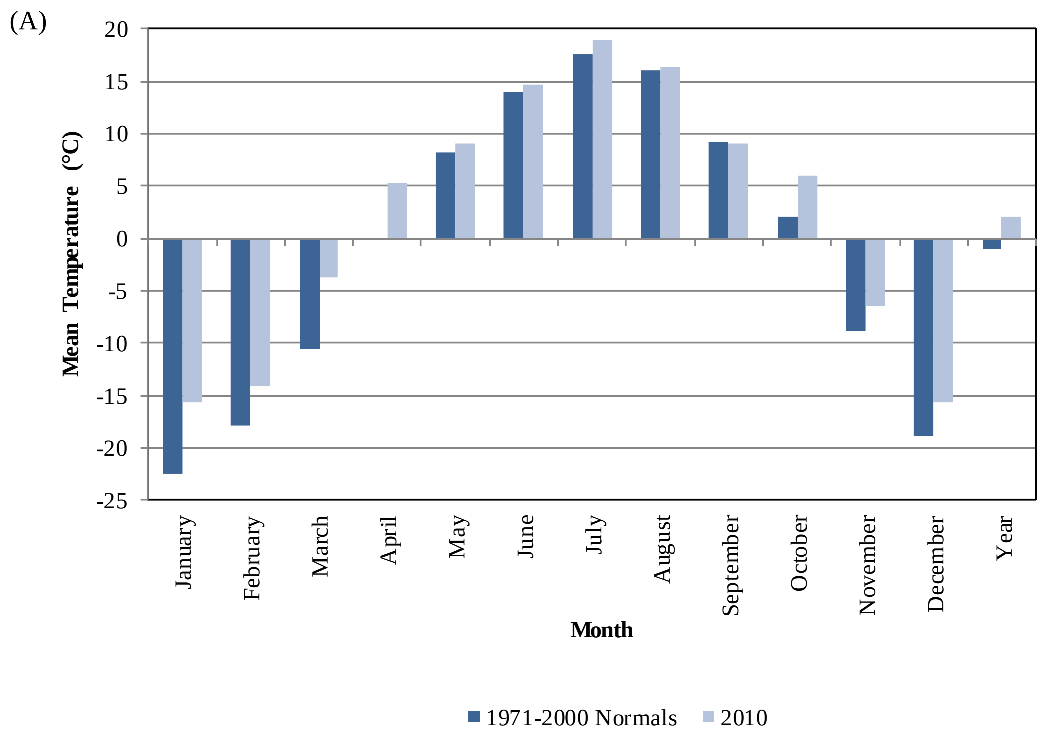
Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Playgreen L	Northern Pike	36	0.242	0.011	0.215	0.197 - 0.234
	Walleye	36	0.181	0.017	0.156	0.137 - 0.178
	Lake Whitefish	27	0.018	0.003	0.024	0.019 - 0.030
	Yellow Perch	0	-	-	-	-
Little Playgreen L	Northern Pike	35	0.227	0.013	0.214	0.196 - 0.235
	Walleye	36	0.265	0.020	0.231	0.199 - 0.269
	Lake Whitefish	5	0.058	0.015	-*	0.017 - 0.099
	Yellow Perch	10	0.052	0.010	-*	0.029 - 0.075
Cross L	Northern Pike	36	0.233	0.026	0.187	0.159 - 0.219
	Walleye	36	0.202	0.021	0.149	0.130 - 0.170
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	25	0.075	0.003	-*	0.069 - 0.081
Setting L	Northern Pike	36	0.391	0.048	0.392	0.332 - 0.463
	Walleye	35	0.269	0.021	0.277	0.243 - 0.315
	Lake Whitefish	24	0.025	0.001	-*	0.023 - 0.028
	Yellow Perch	13	0.054	0.005	0.009	0.003 - 0.028

* The relationship between mercury concentration and fish length was not significant; the CL is for the arithmetic mean.

Table 7.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from Playgreen Lake, Little Playgreen Lake, the west basin of Cross Lake, and Setting Lake in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Playgreen L	Northern Pike [a]	36	614.1 ± 18.5	2239.4 ± 212.6	0.89 ± 0.01	6.4 ± 0.5
	Walleye [b]	36	412.1 ± 19.1	1171.8 ± 112.2	1.35 ± 0.02	6.1 ± 0.3
	Lake Whitefish [c]	27	260.1 ± 22.1	461.1 ± 126.9	1.44 ± 0.04	3.5 ± 1.1
	Yellow Perch	0	-	-	-	-
LPLAY	Northern Pike	35	560.9 ± 17.9	1646.9 ± 137.9	0.86 ± 0.01	5.8 ± 0.4
	Walleye [d]	36	409.6 ± 12.9	1077.2 ± 80.5	1.41 ± 0.02	6.9 ± 0.5
	Lake Whitefish	5	472.0 ± 16.4	1942.0 ± 229.0	1.79 ± 0.02	9.6 ± 2.5
	Yellow Perch	10	166.0 ± 2.3	83.0 ± 5.6	1.80 ± 0.07	-
Cross L	Northern Pike [e]	36	588.9 ± 23.2	1835.0 ± 226.3	0.77 ± 0.01	5.5 ± 0.4
	Walleye	36	427.5 ± 11.5	1093.1 ± 113.1	1.28 ± 0.02	7.3 ± 0.6
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	25	84.0 ± 1.0	6.7 ± 0.2	1.13 ± 0.02	1.2 ± 0.1
	Lake Whitefish	24	286.6 ± 9.4	354.2 ± 34.4	1.41 ± 0.02	2.8 ± 0.1
Setting L	Northern Pike	36	514.3 ± 17.1	1123.6 ± 141.4	0.73 ± 0.02	5.9 ± 0.4
	Walleye	36	376.4 ± 11.4	677.8 ± 49.6	1.16 ± 0.01	5.9 ± 0.4
	Lake Whitefish	24	286.6 ± 9.4	354.2 ± 34.4	1.41 ± 0.02	2.8 ± 0.1
	Yellow Perch	13	64.3 ± 1.0	3.1 ± 0.2	1.15 ± 0.04	-

[a] n = 34 for age
[b] n = 32 for age
[c] n = 26 for age
[d] n = 33 for age
[e] n = 34 for age



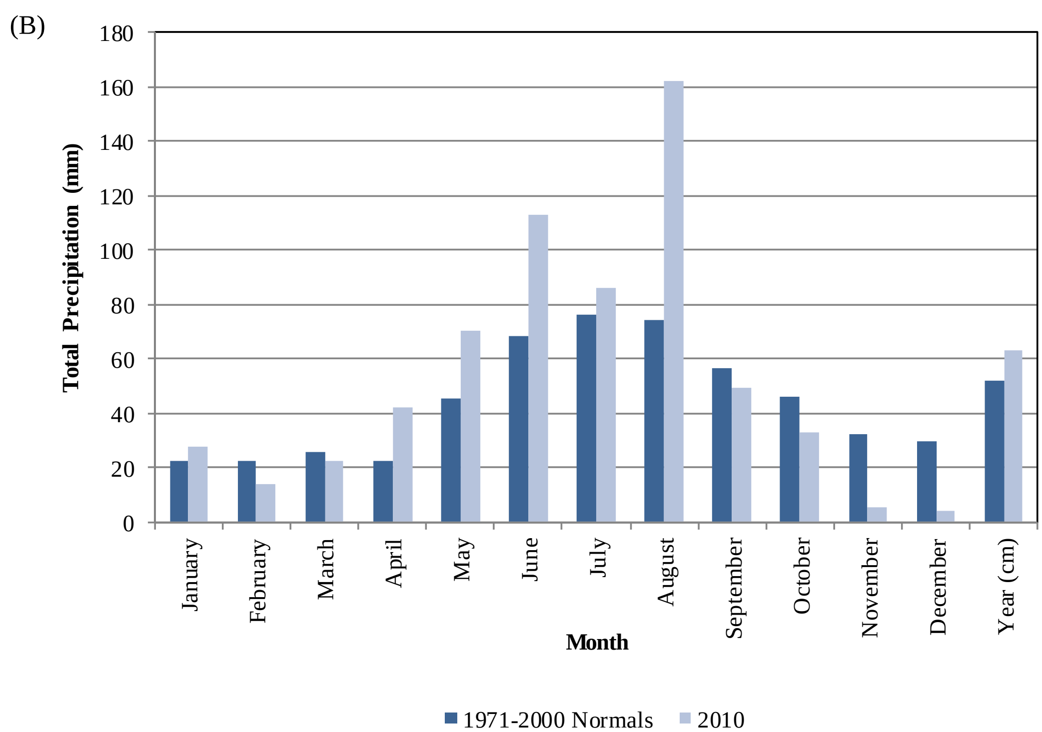


Figure 7.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Norway House, MB.

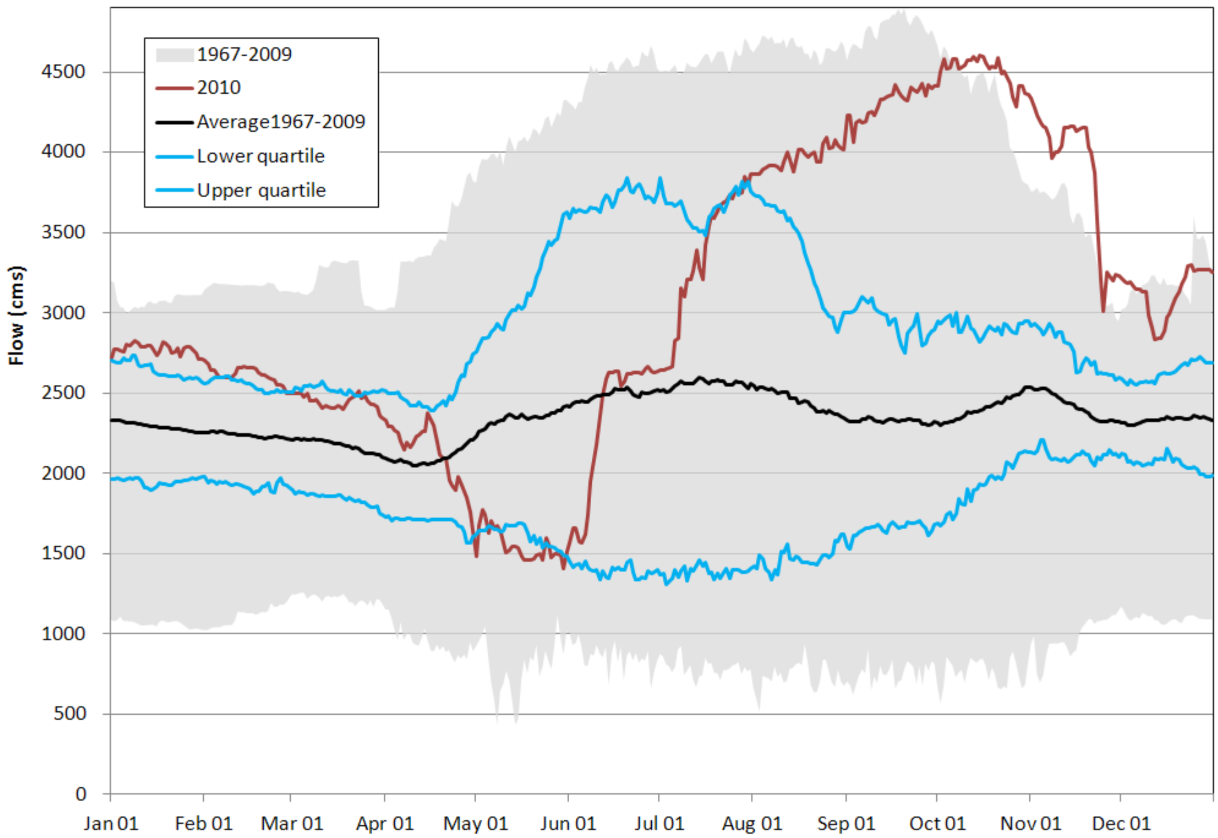


Figure 7.2-1. Outflow from the Kelsey Generating Station in 2010.

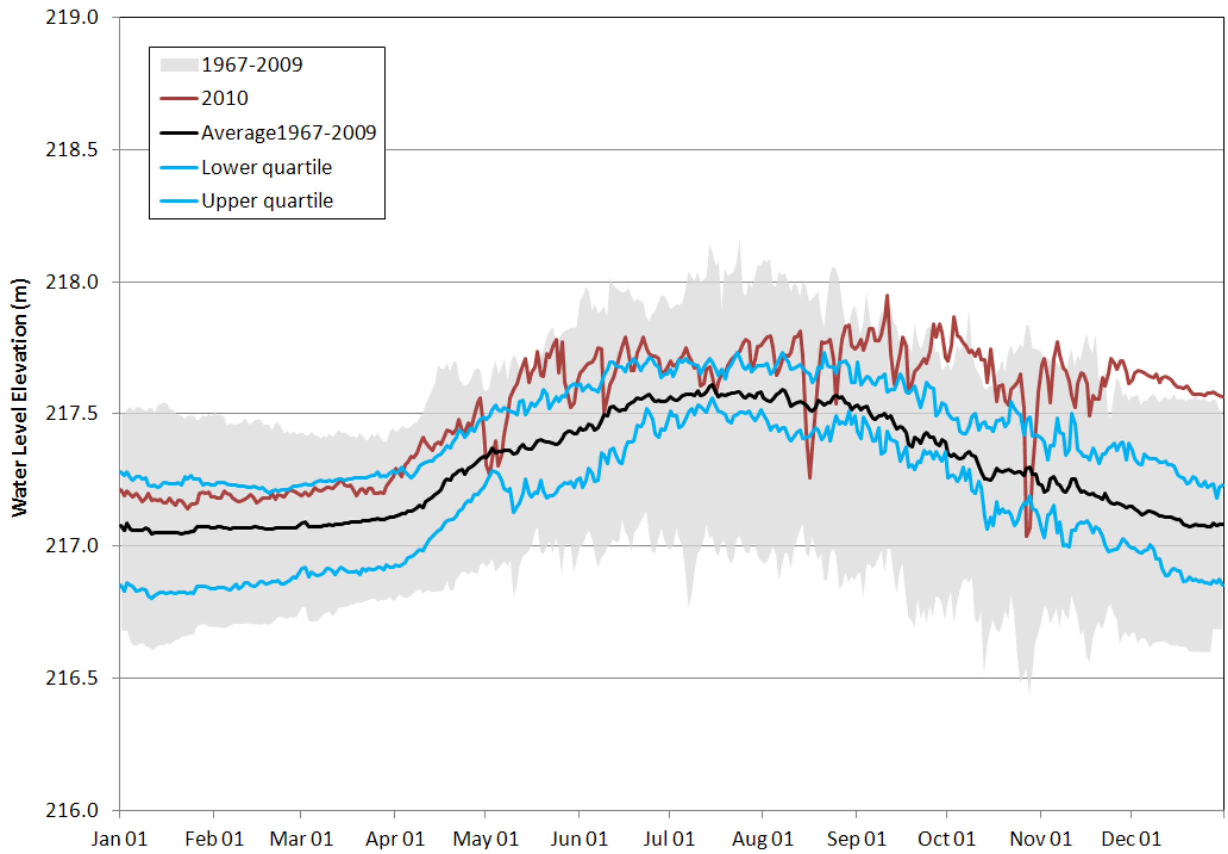


Figure 7.2-2. Water level elevation of Playgreen Lake (05UB005) in 2010.

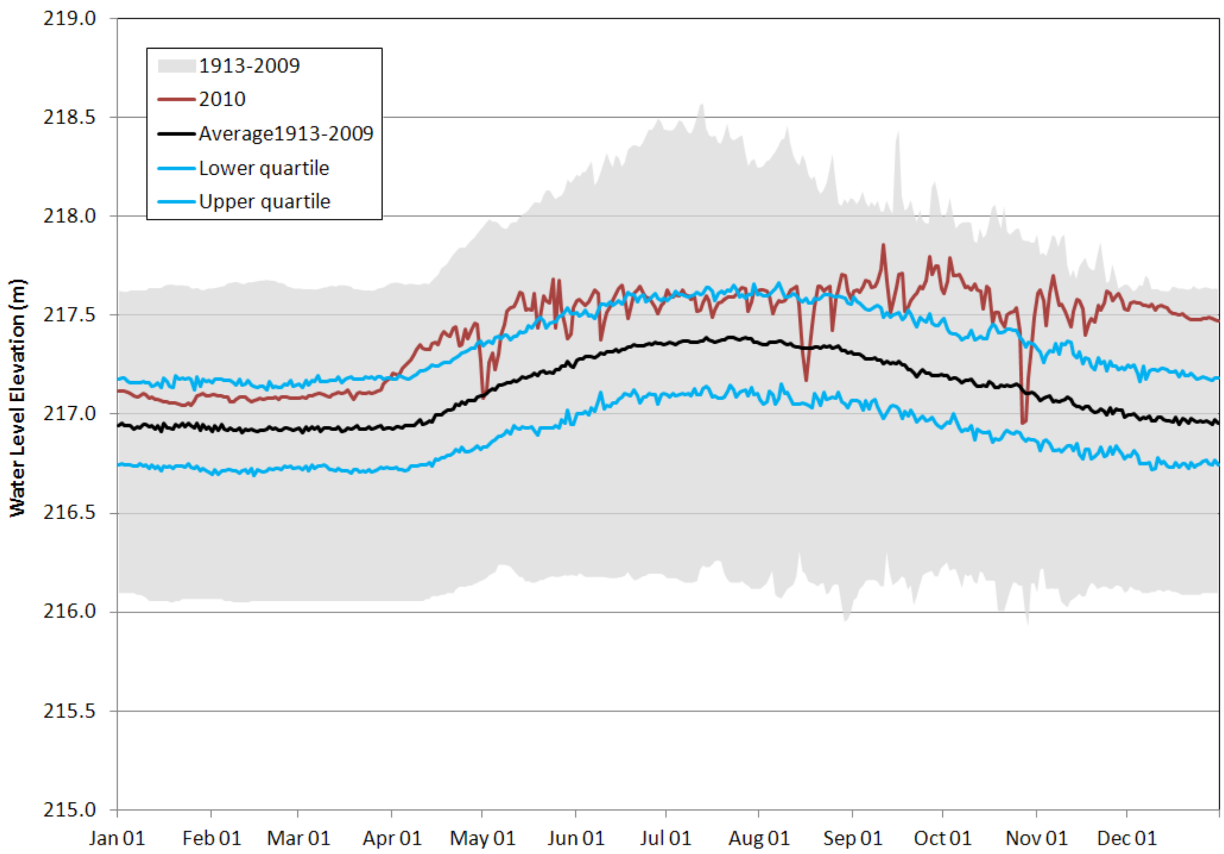


Figure 7.2-3. Water level elevation of Little Playgreen Lake (05UB001) in 2010.

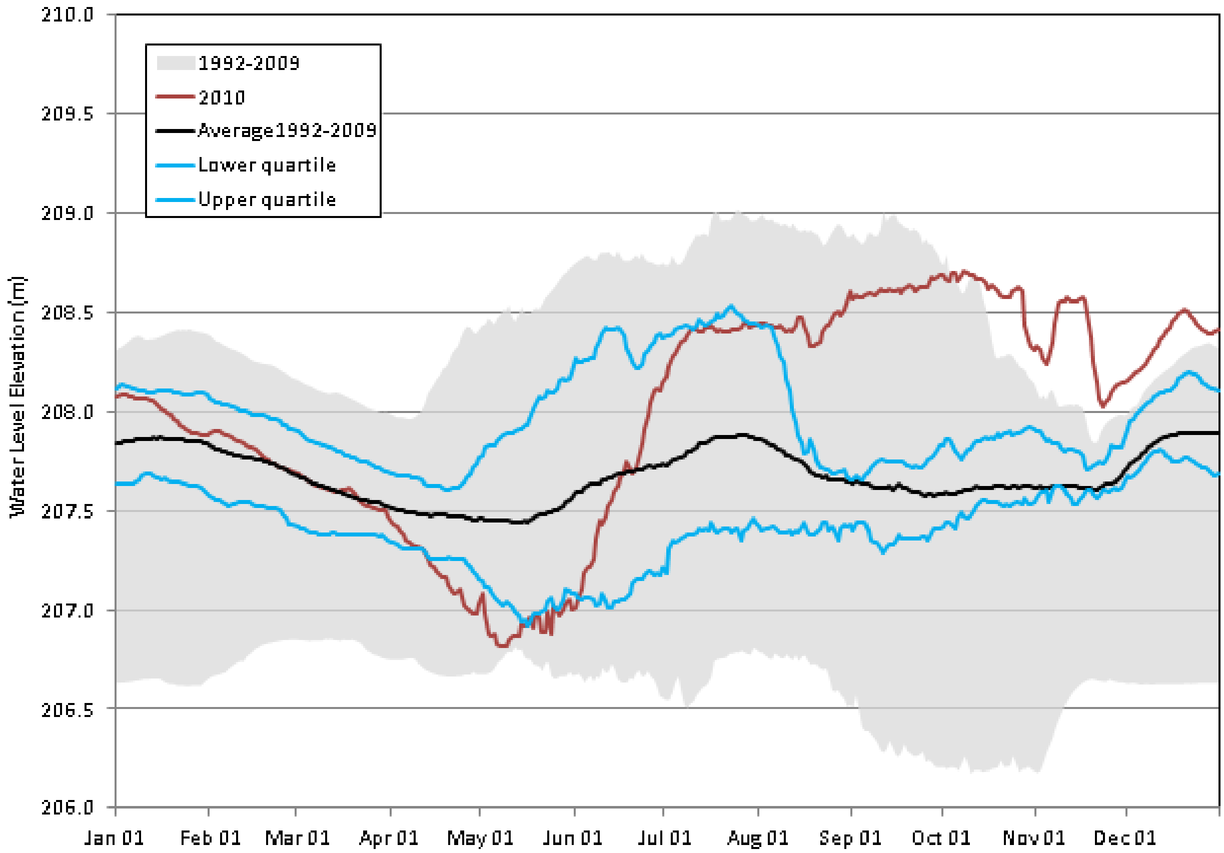


Figure 7.2-4. Water level elevation of Cross Lake (05UD001) in 2010.

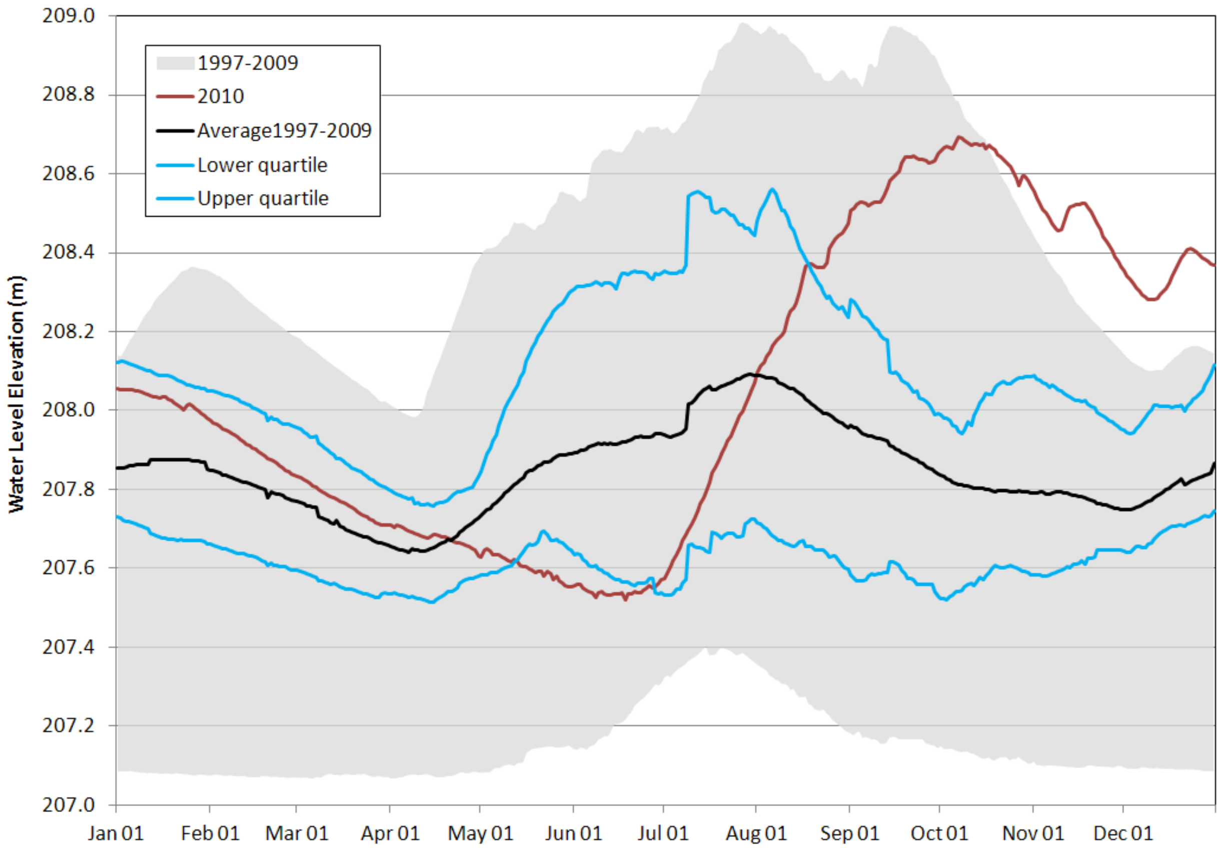


Figure 7.2-5. Water level elevation of Walker Lake (05UD704) in 2010.

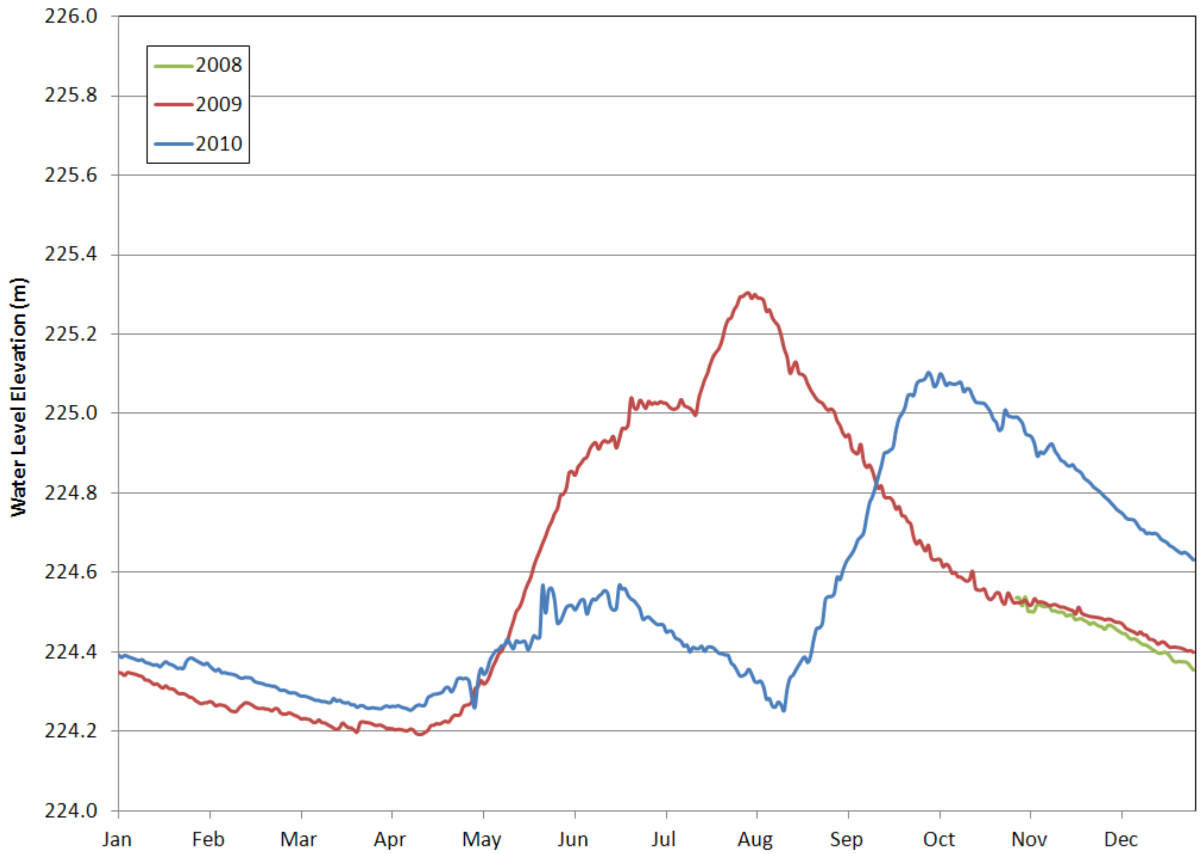


Figure 7.2-6. Water level elevation of Setting Lake (05TC701) in 2010.

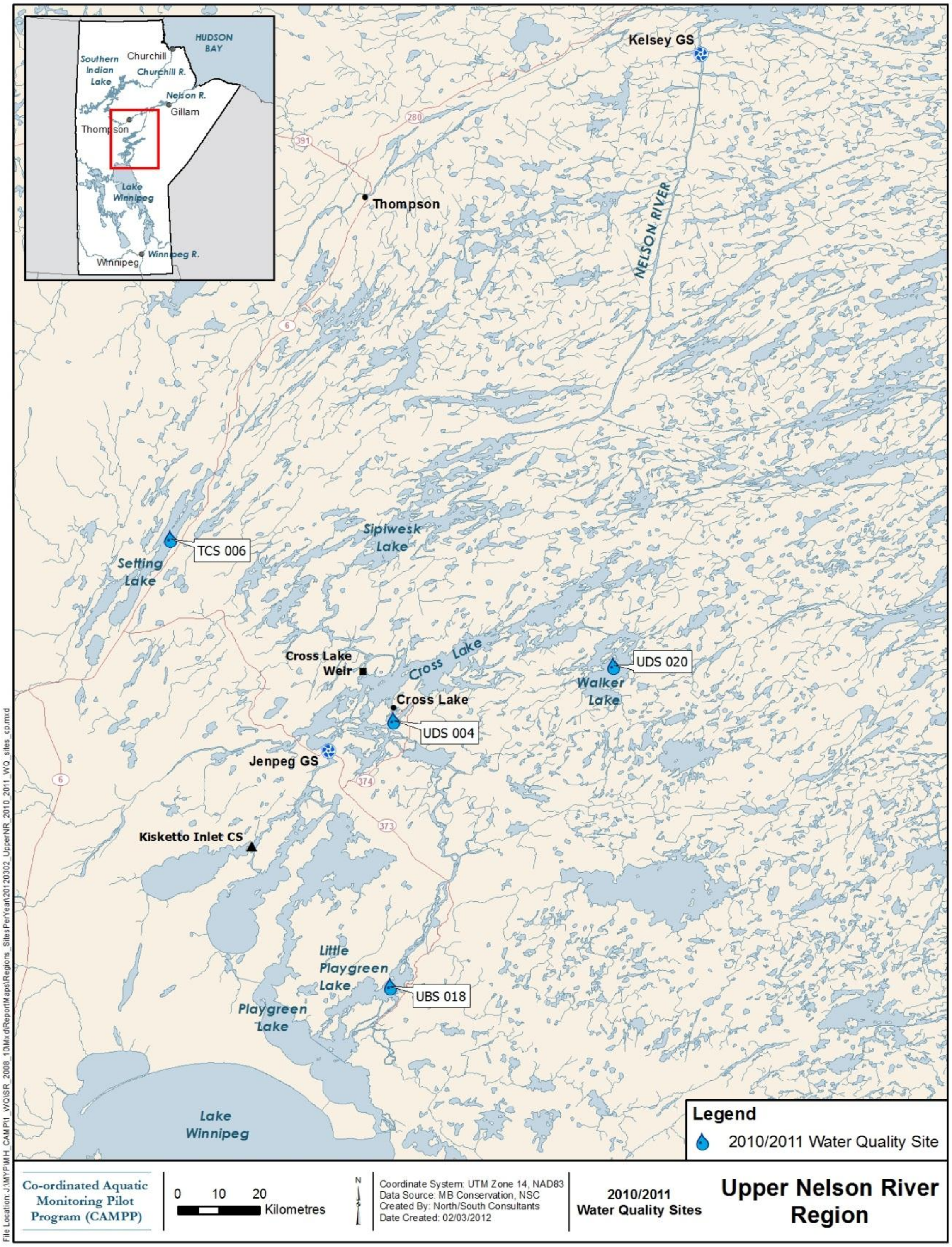


Figure 7.3-1. Water quality and phytoplankton monitoring sites in the Upper Nelson River Region: 2010/2011.

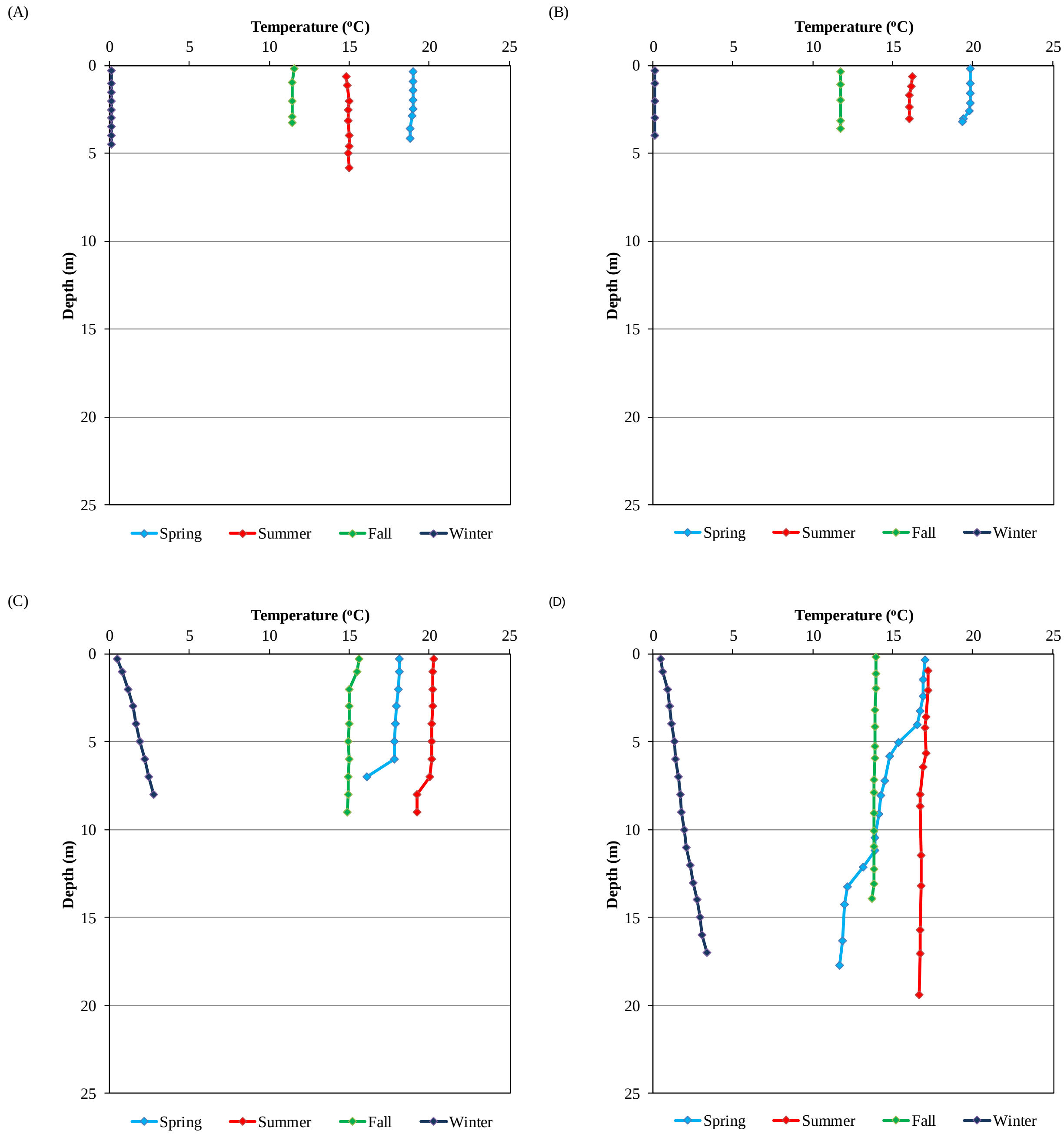


Figure 7.3-2. Water temperature profiles measured in the Upper Nelson River Region in 2010/2011: (A) Little Playgreen Lake; (B) Cross Lake; (C) Walker Lake; and (D) Setting Lake.

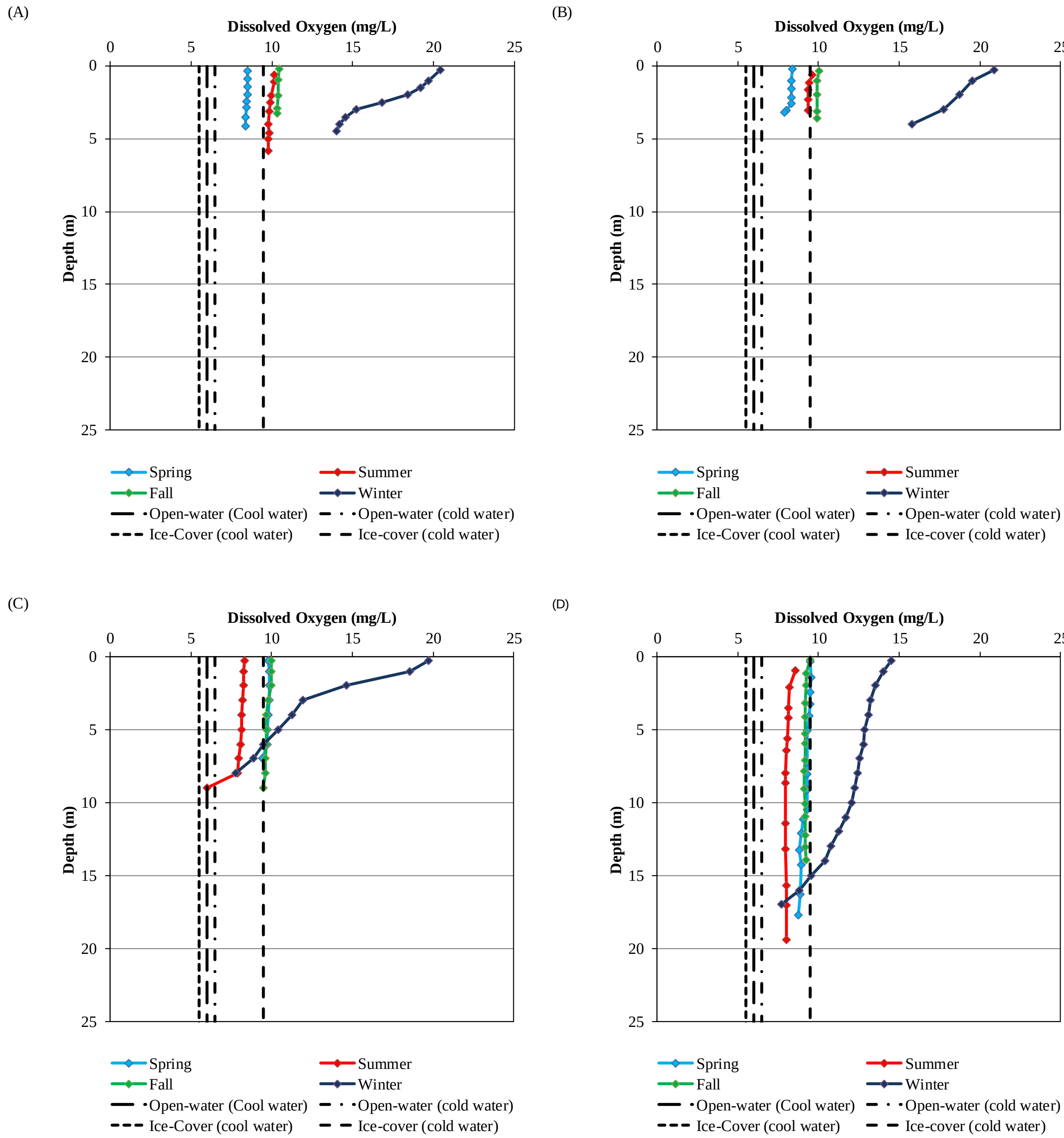


Figure 7.3-3. Dissolved oxygen depth profiles measured in the Upper Nelson River Region in 2010/2011: (A) Little Playgreen Lake; (B) Cross Lake; (C) Walker Lake and; (D) Setting Lake. Dashed lines represent selected MWQSOGs for PAL.

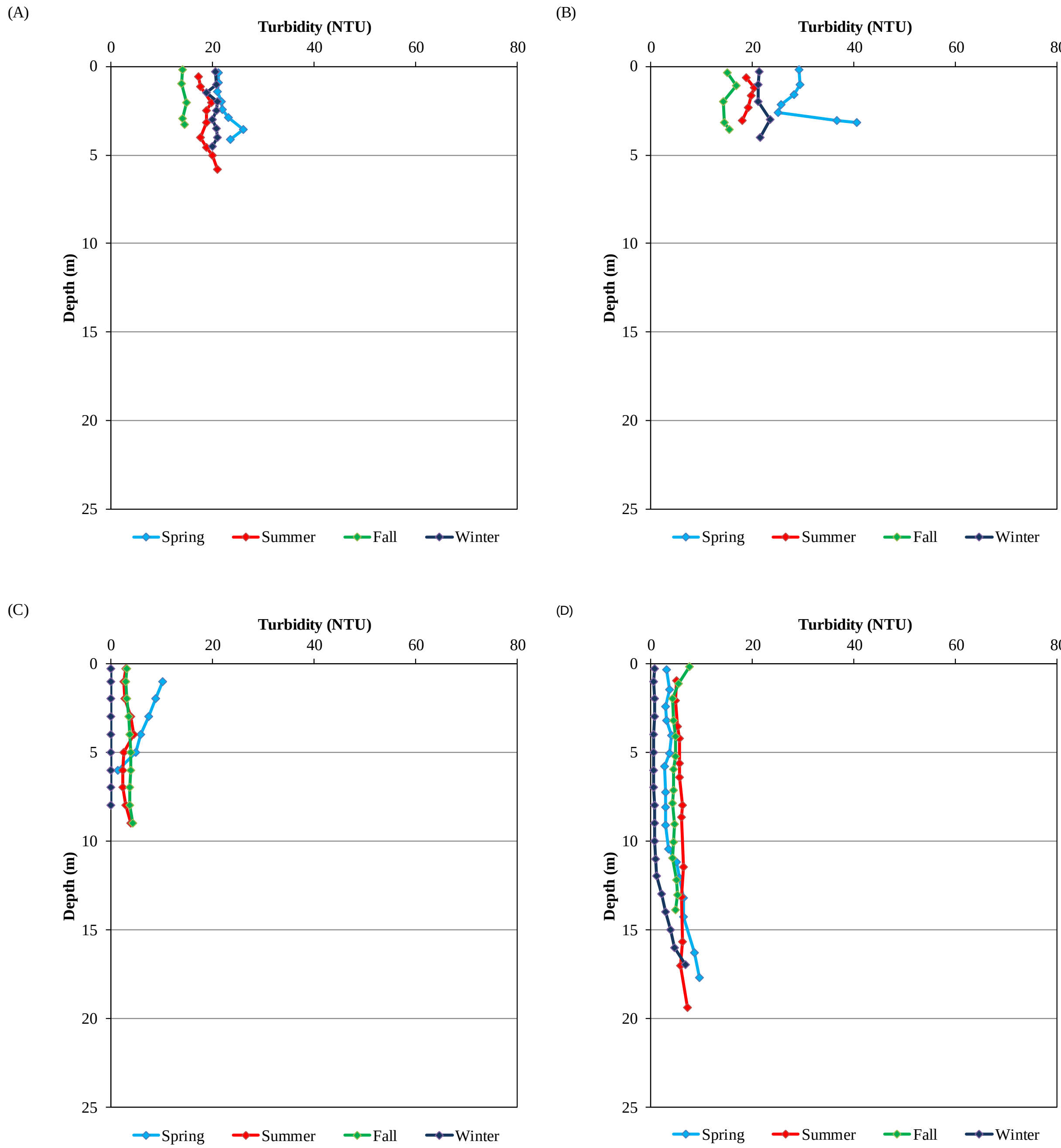


Figure 7.3-4. Turbidity depth profiles measured in the Upper Nelson River Region in 2010/2011: (A) Little Playgreen Lake; (B) Cross Lake; (C) Walker Lake; and (D) Setting Lake.

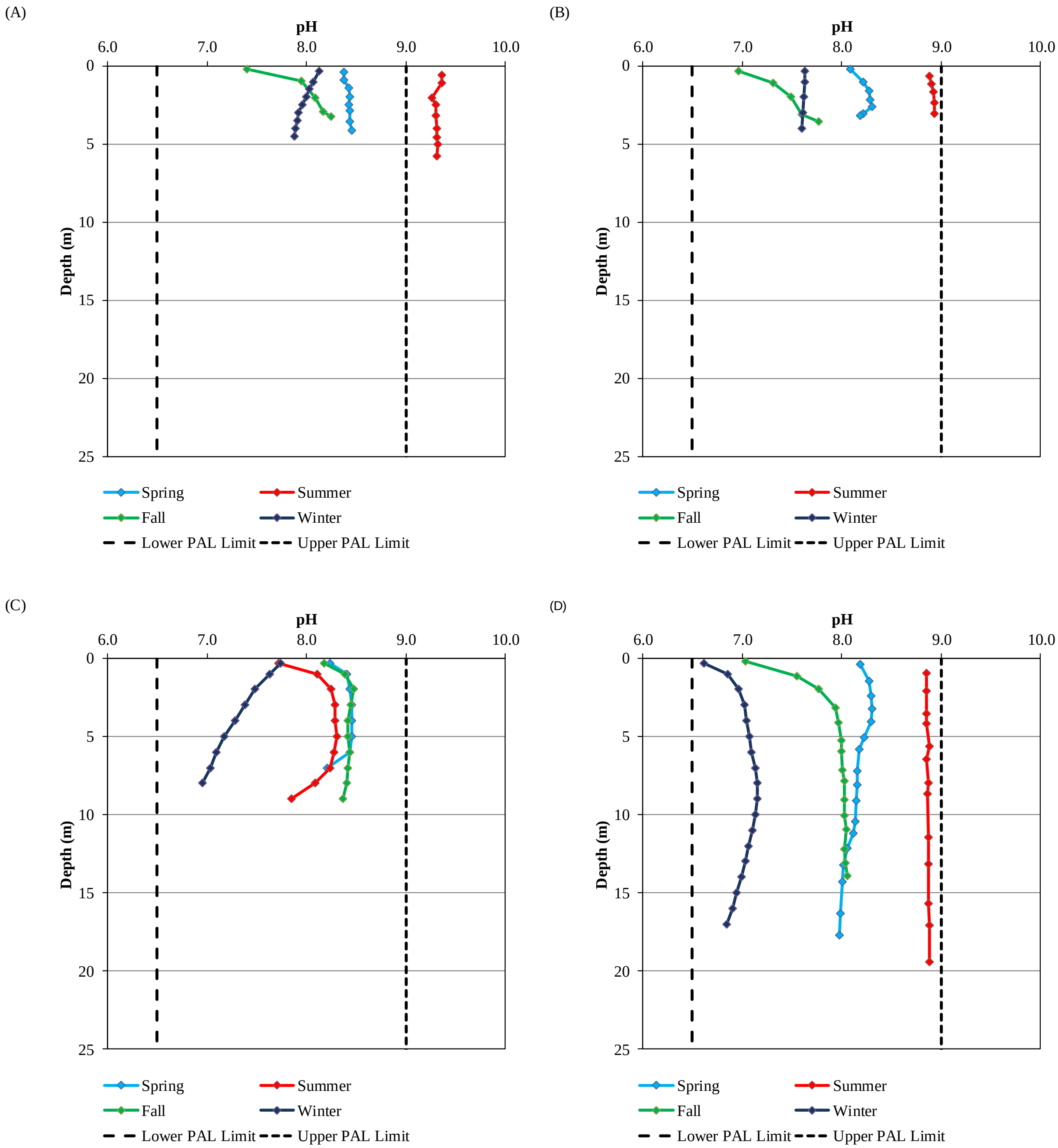


Figure 7.3-5. pH depth profiles measured in the Upper Nelson River Region in 2010/2011: (A) Little Playgreen Lake; (B) Cross Lake; (C) Walker Lake; and (D) Setting Lake.

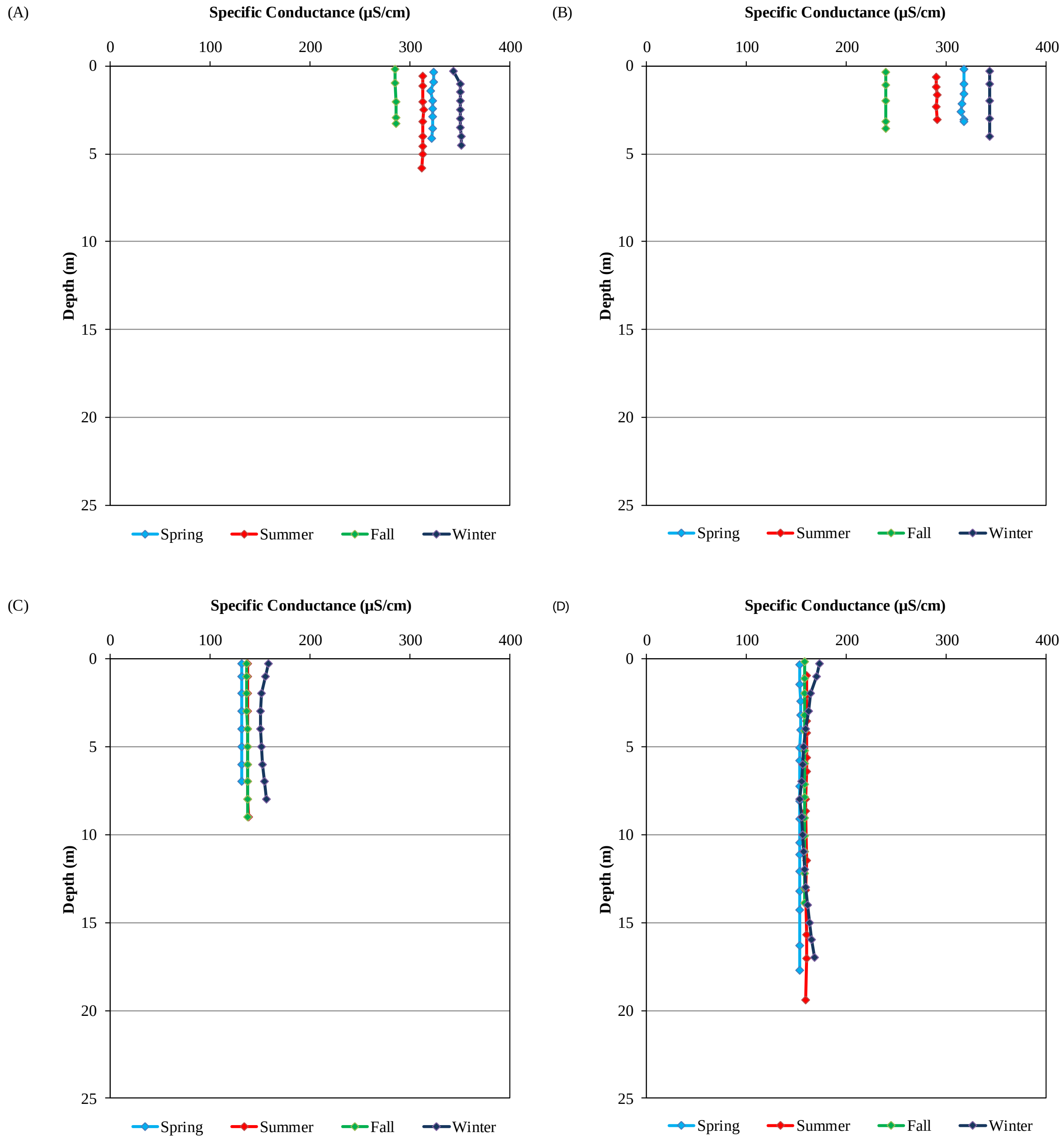


Figure 7.3-6. Specific conductance depth profiles measured in the Upper Nelson River Region in 2010/2011: (A) Little Playgreen Lake; (B) Cross Lake; (C) Walker Lake; and (D) Setting Lake.

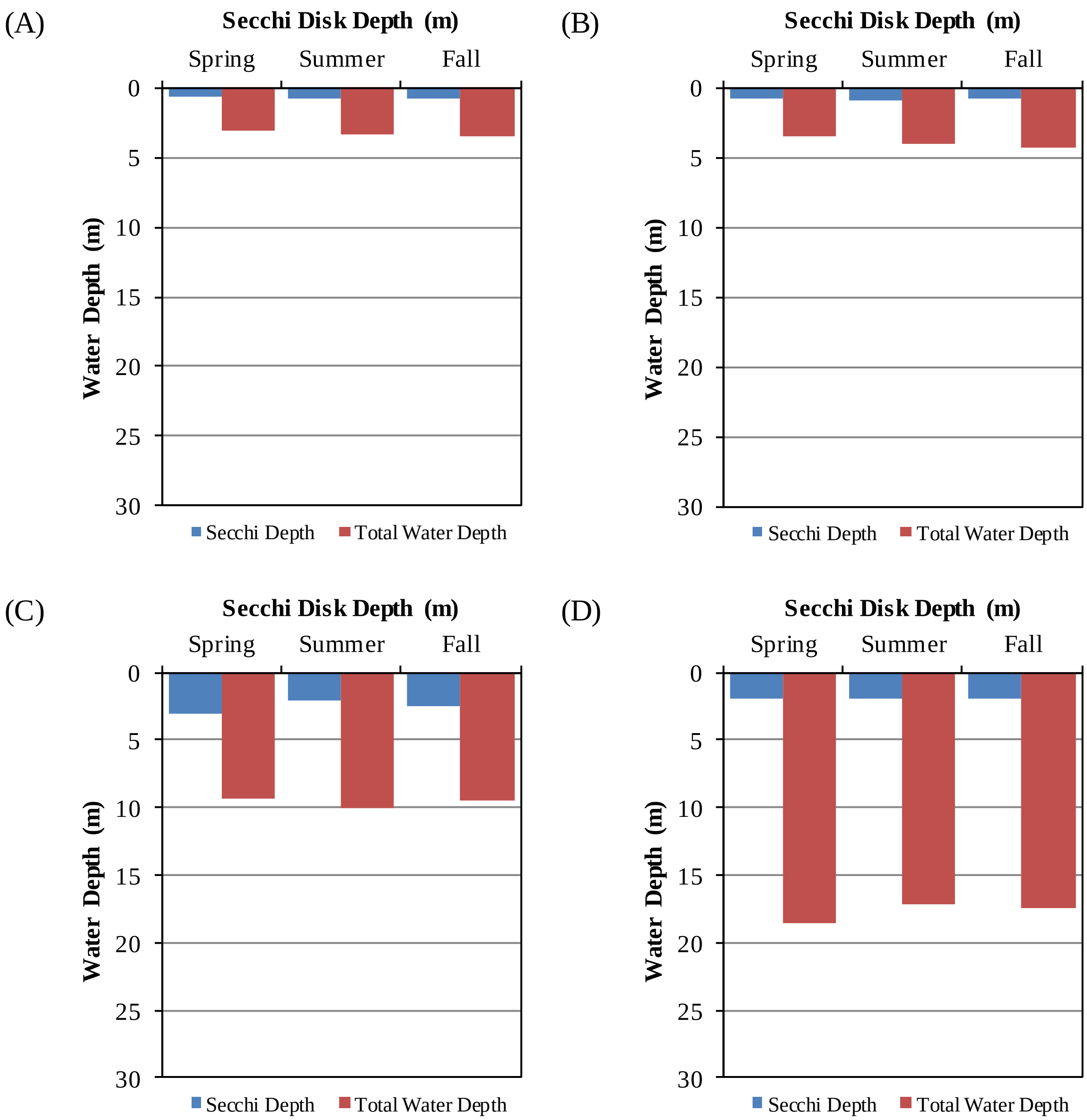


Figure 7.3-7. Secchi disk depths measured in the Upper Nelson River Region in 2010/2011: (A) Little Playgreen Lake; (B) Cross Lake; (C) Walker Lake; and (D) Setting Lake.

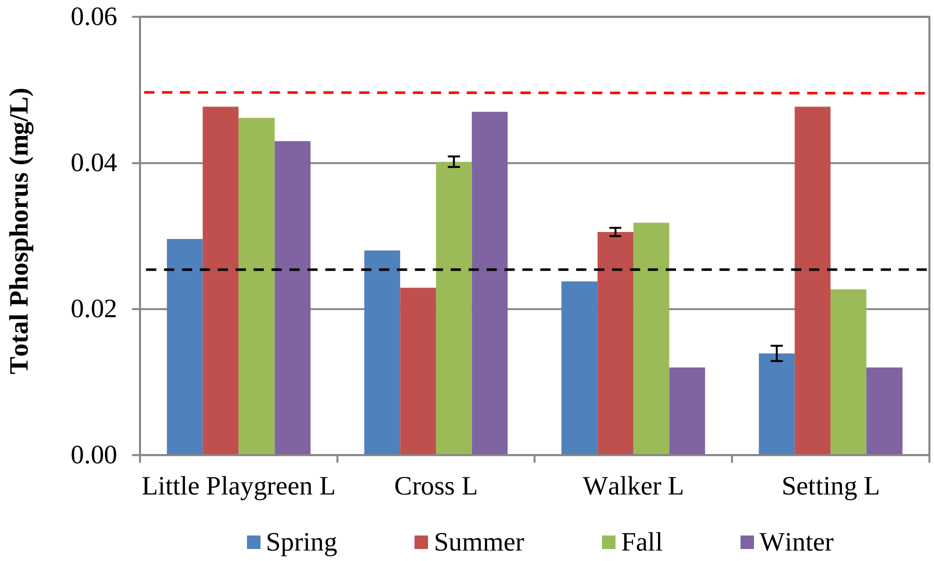


Figure 7.3-8. Total phosphorus measured in surface grabs in the Upper Nelson River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

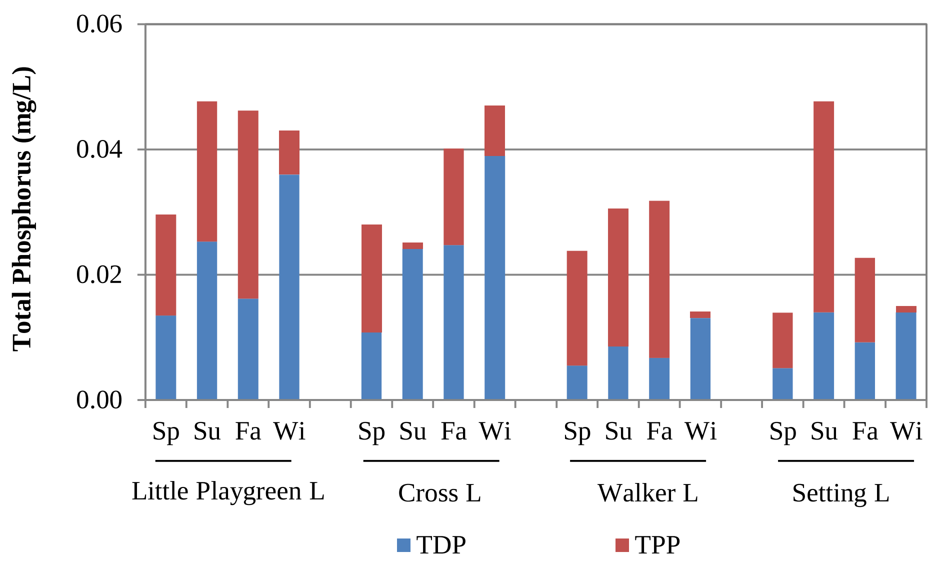


Figure 7.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Upper Nelson River Region: 2010/2011.

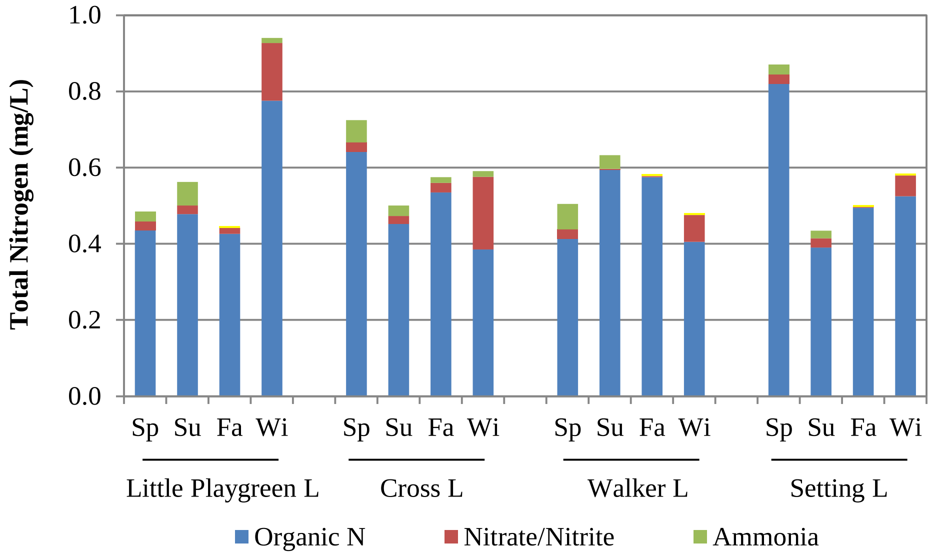
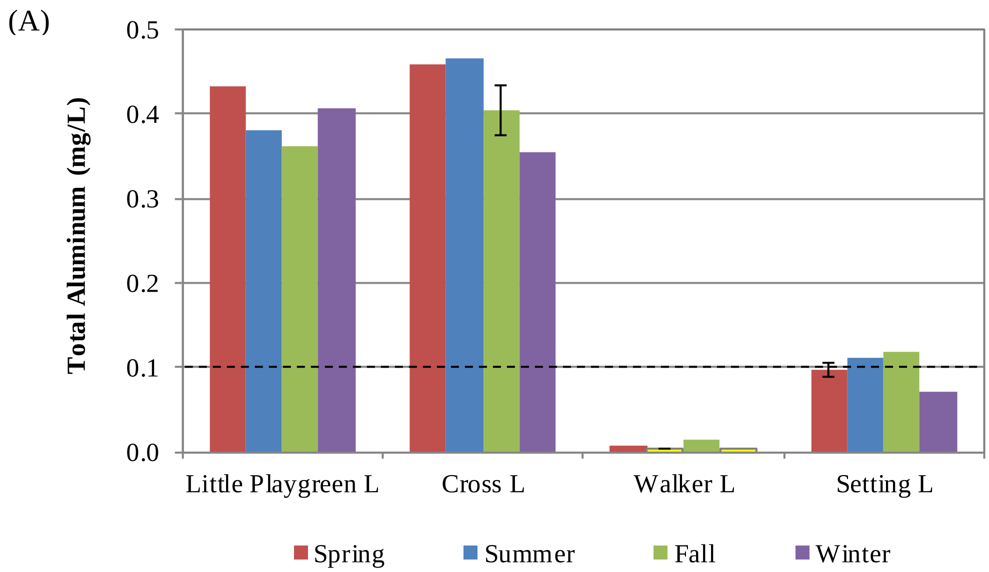


Figure 7.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Upper Nelson River Region: 2010/2011.



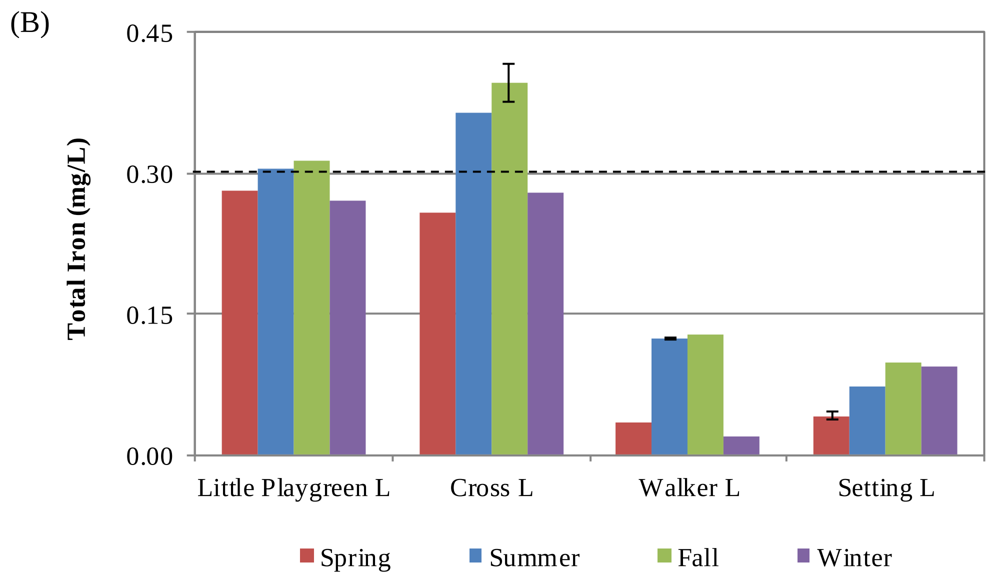


Figure 7.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Upper Nelson River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron. Yellow bars represent values that were below the analytical detection limit.

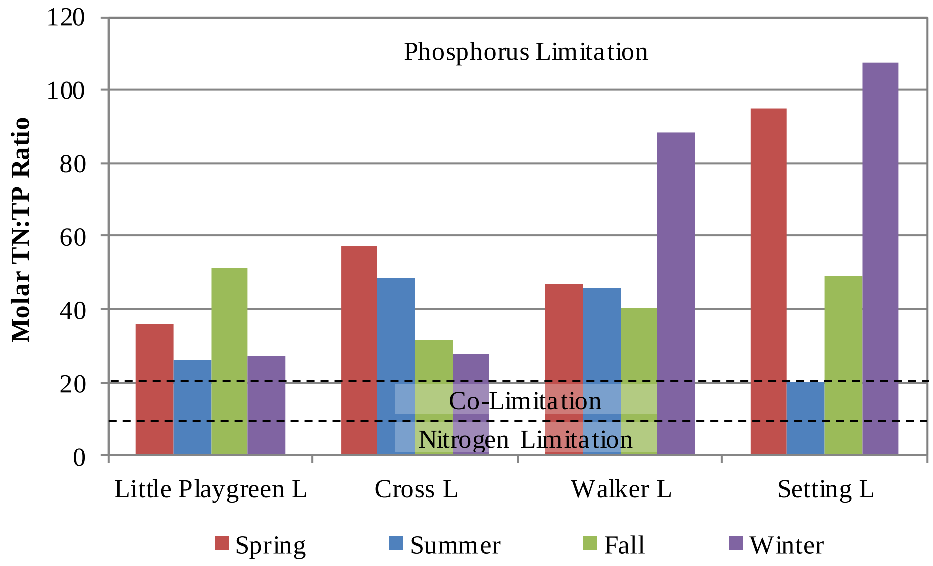


Figure 7.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Upper Nelson River Region: 2010/2011.

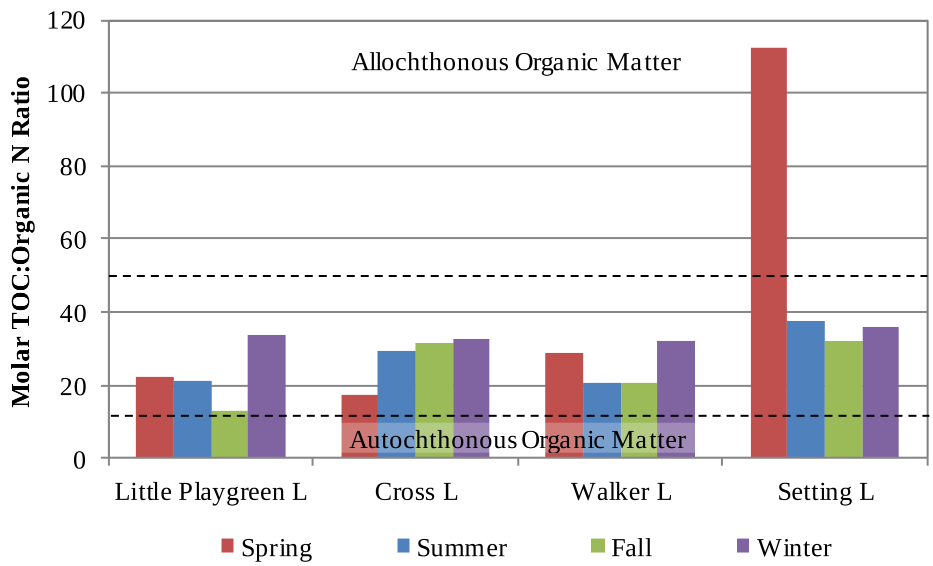


Figure 7.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Upper Nelson River Region: 2010/2011.

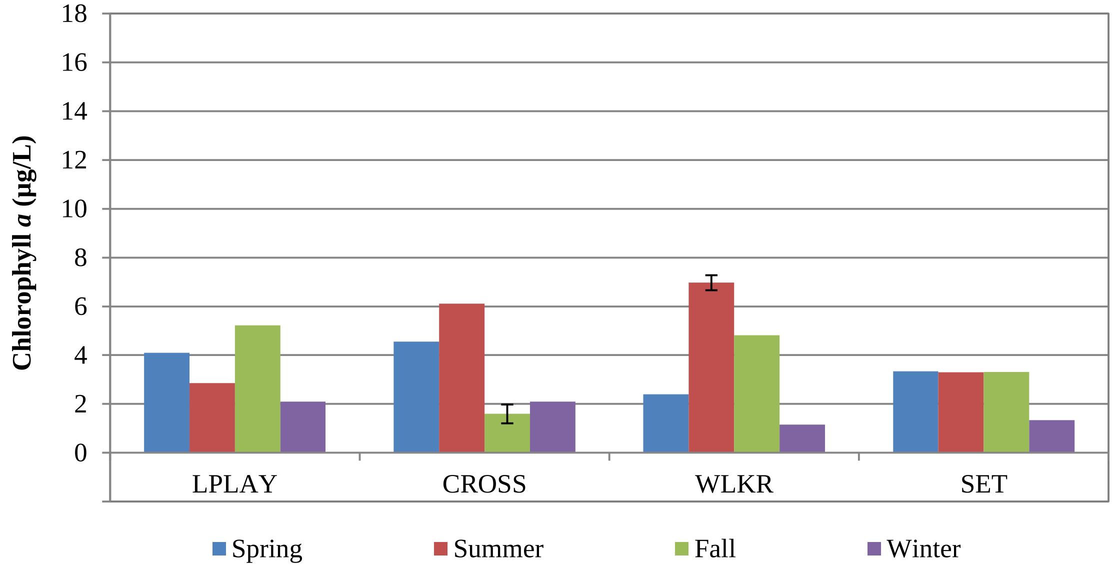


Figure 7.4-1. Chlorophyll *a* concentrations measured within the euphotic zone at sites in the Upper Nelson River Region in 2010/2011. Error bars represent the standard error of triplicate samples.

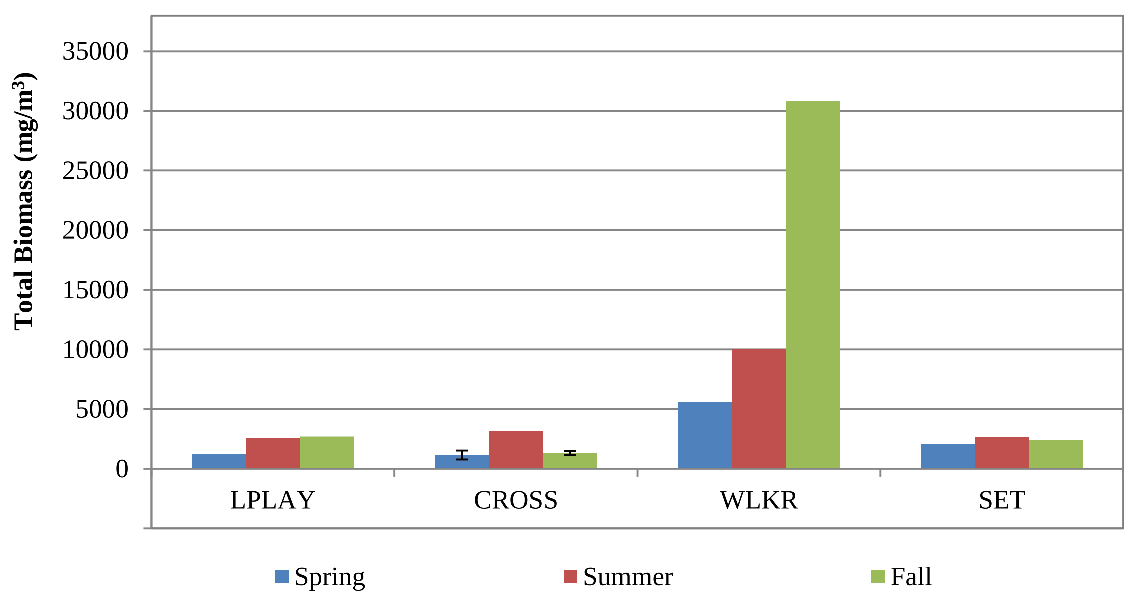


Figure 7.4-2. Phytoplankton biomass measured at sites in the Upper Nelson River Region in 2010. Error bars represent the standard error of samples analysed in triplicate for quality assurance.

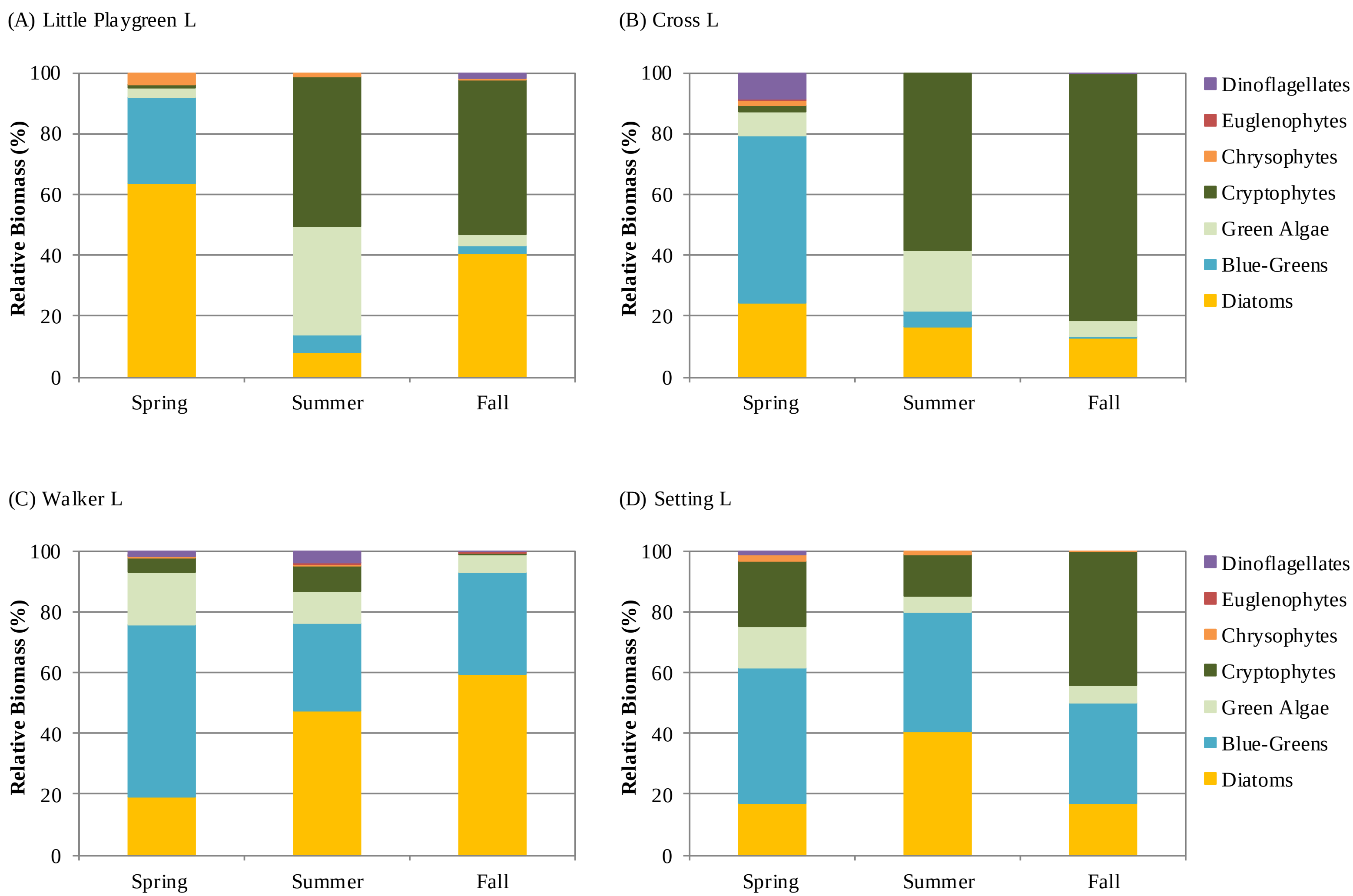


Figure 7.4-3. Phytoplankton community composition at sites in the Upper Nelson River Region in 2010.

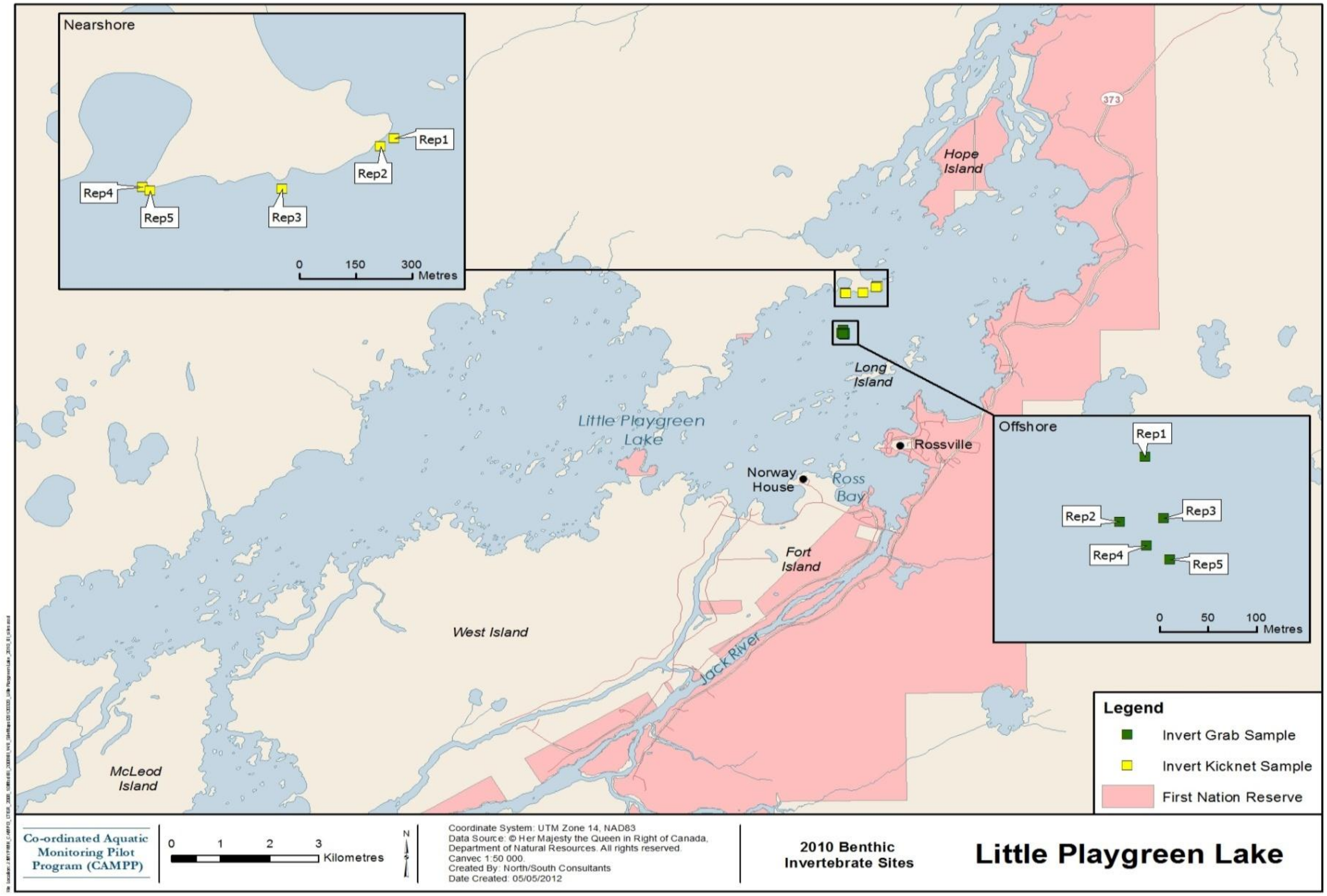


Figure 7.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Little Playgreen Lake in the Upper Nelson River Region, 2010.

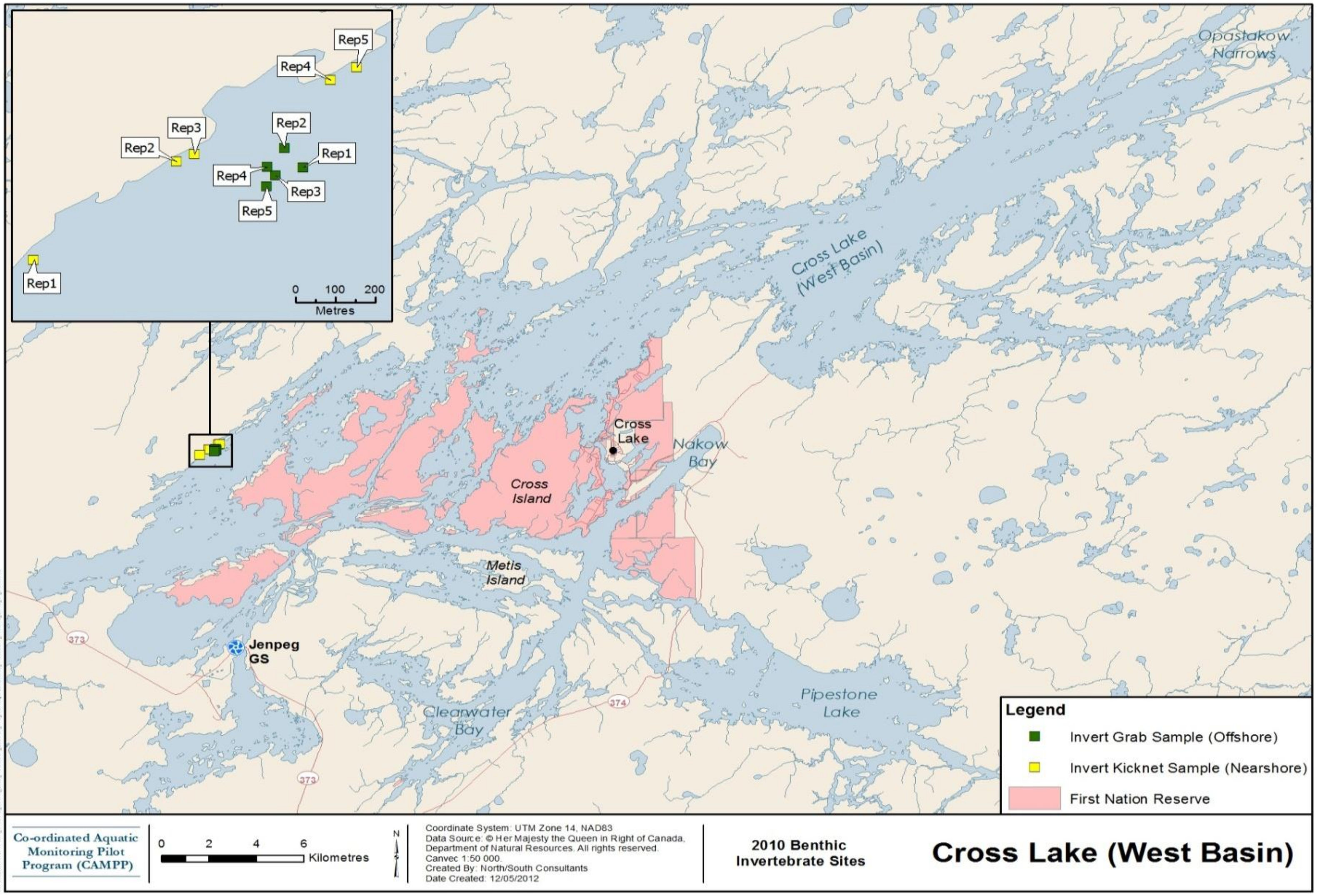


Figure 7.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Cross Lake in the Upper Nelson River Region, 2010.

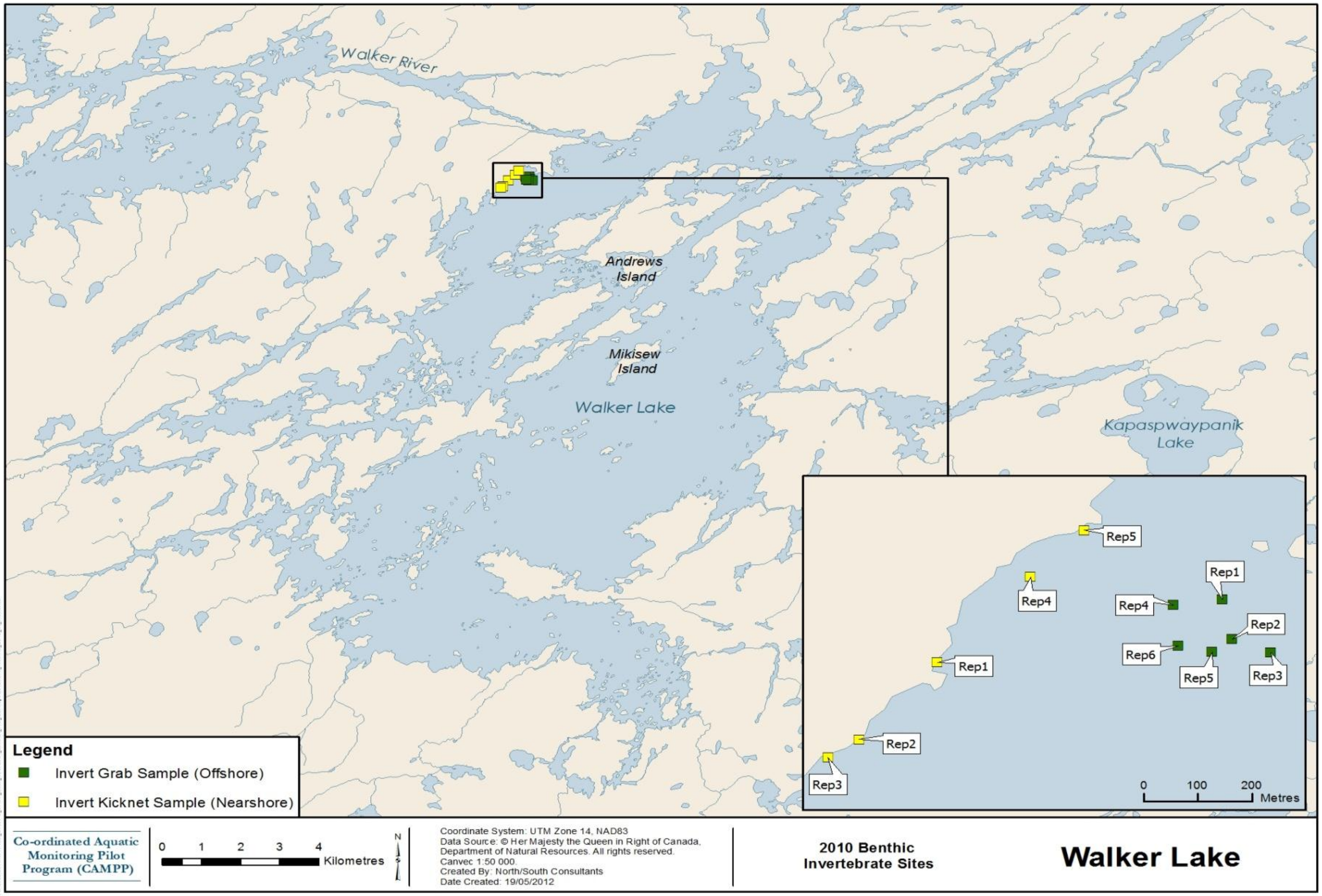


Figure 7.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Walker Lake in the Upper Nelson River Region, 2010.

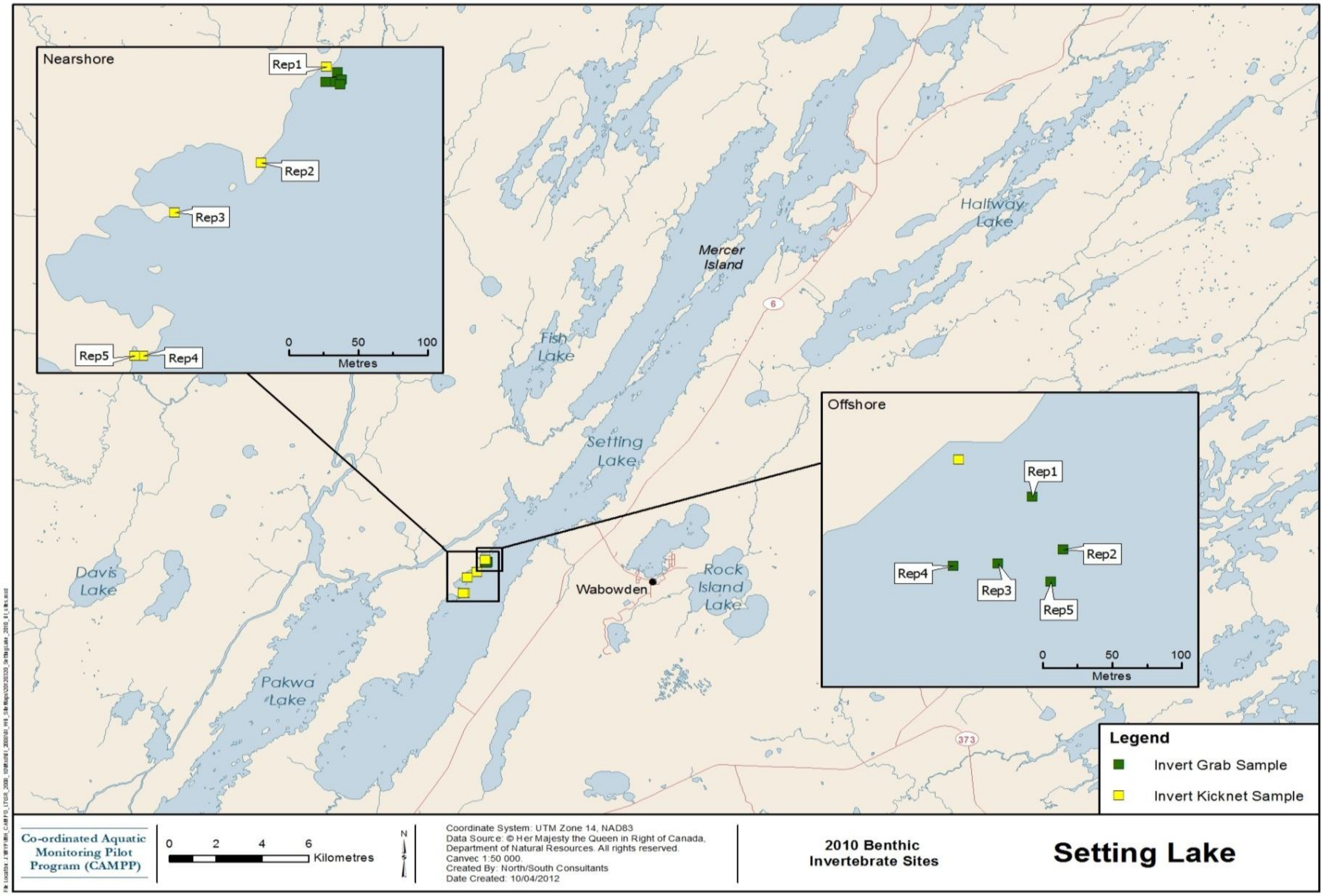


Figure 7.5-4. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Setting Lake in the Upper Nelson River Region, 2010.

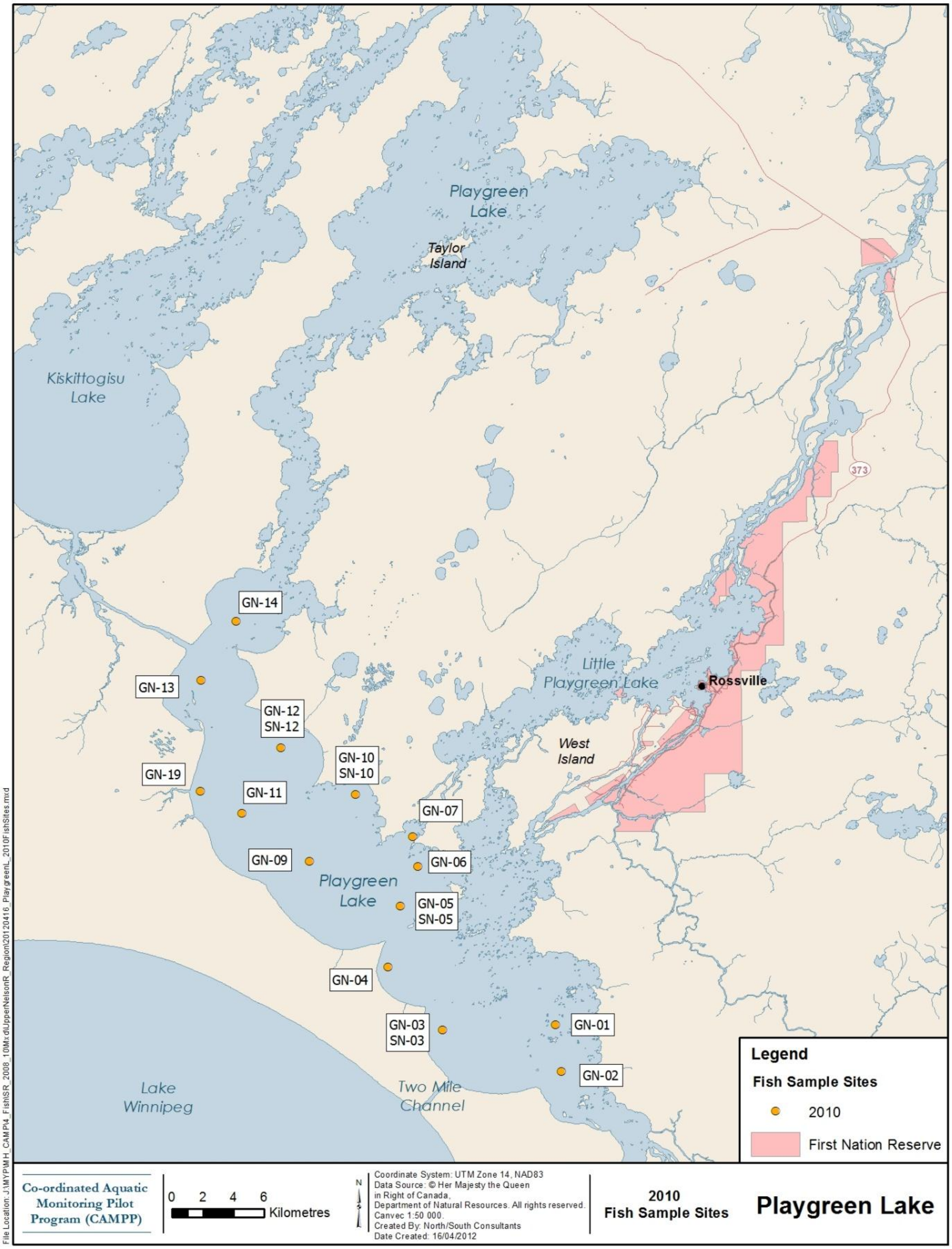


Figure 7.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Playgreen Lake, 2010.

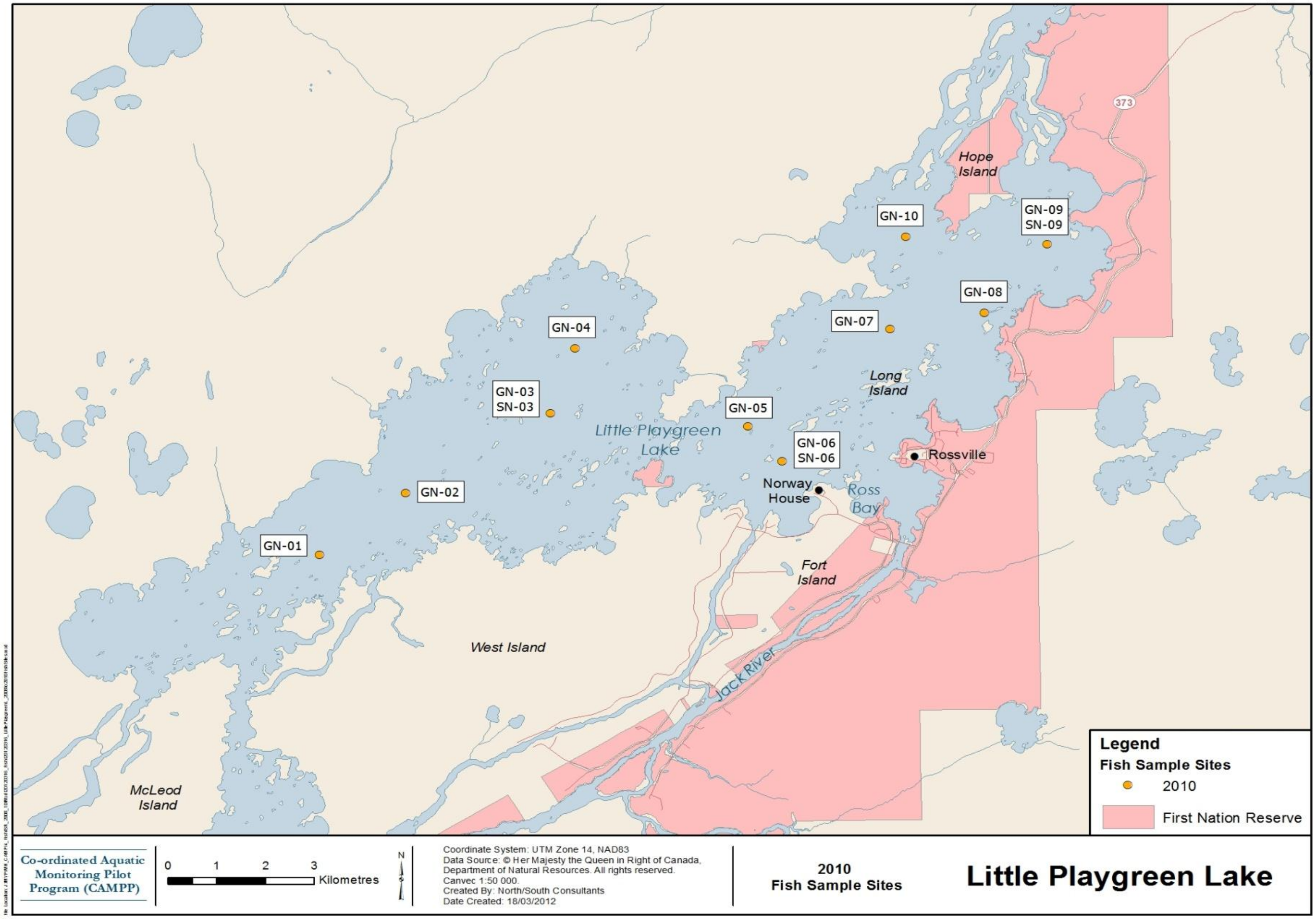


Figure 7.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Little Playgreen Lake, 2010.

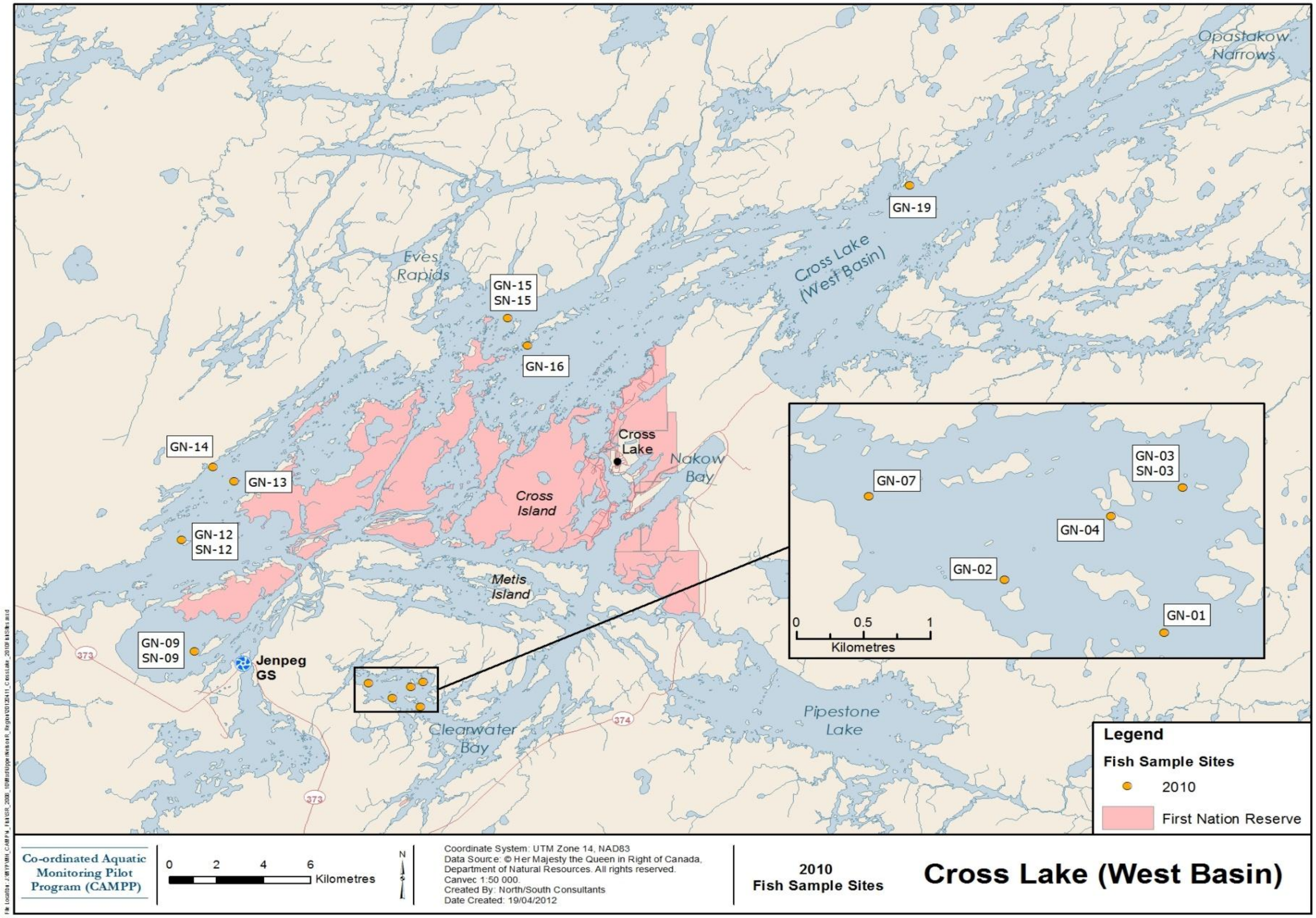


Figure 7.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Cross Lake, 2010.

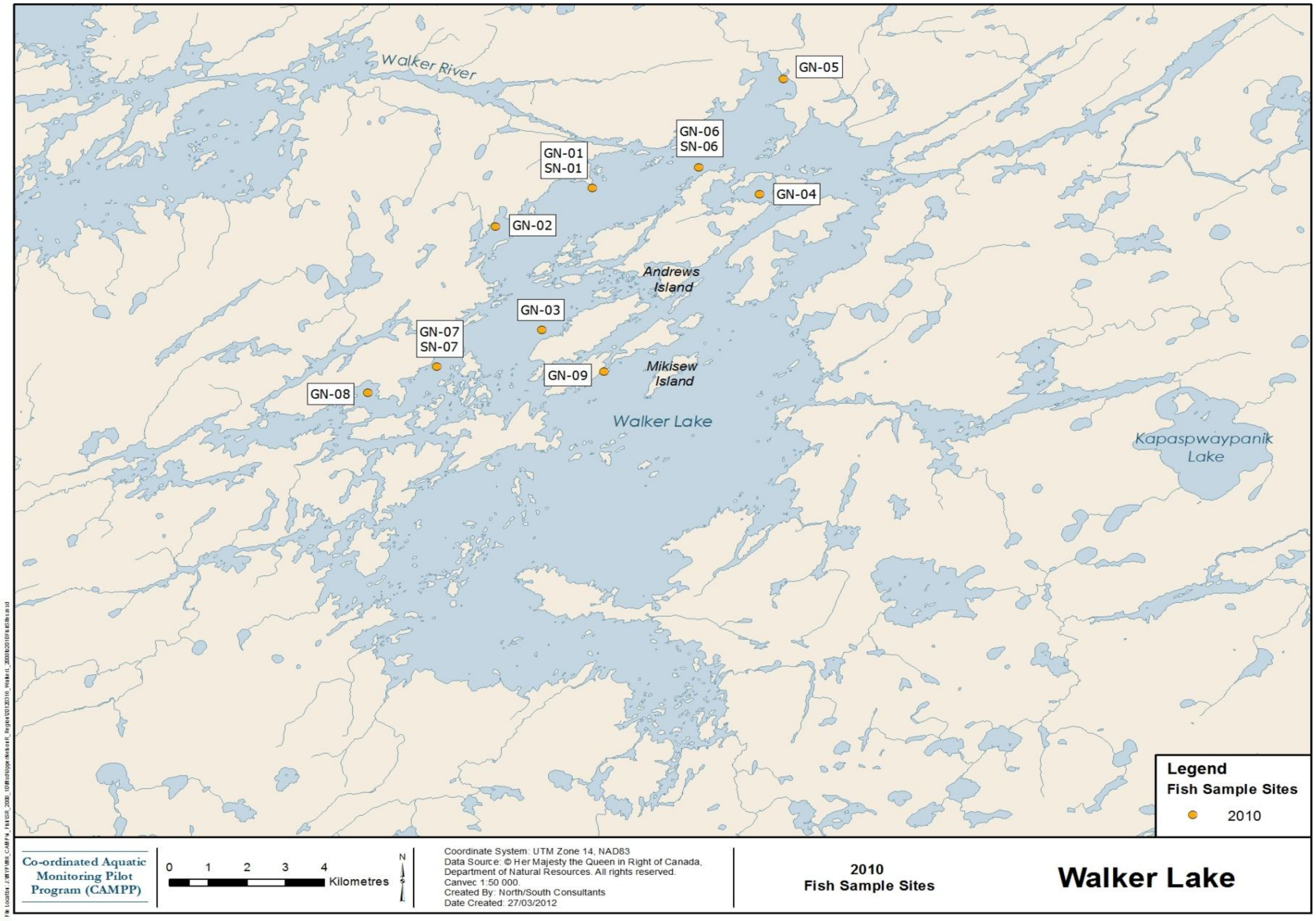


Figure 7.6-4. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Walker Lake, 2010.

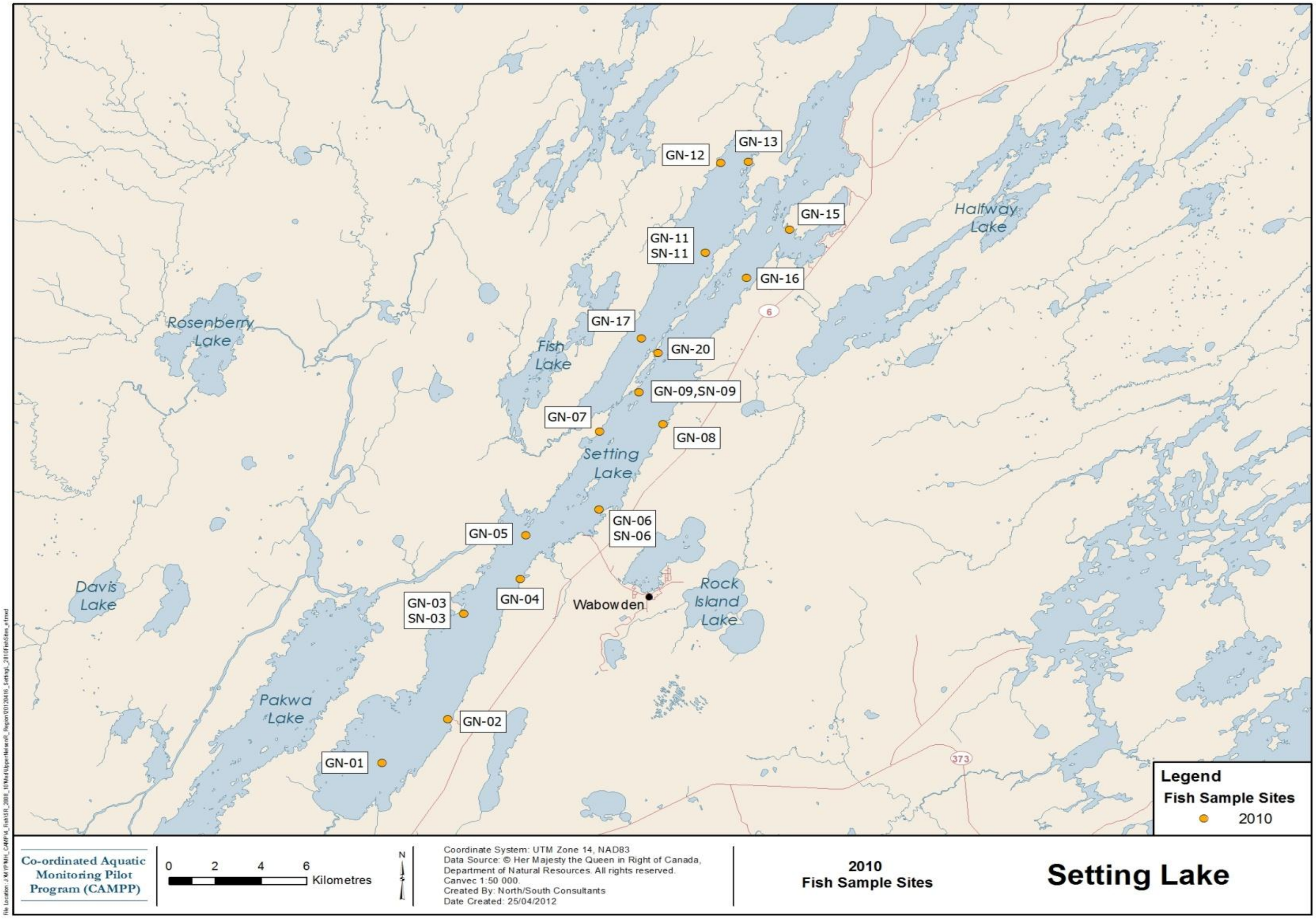


Figure 7.6-5. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Setting Lake, 2010.

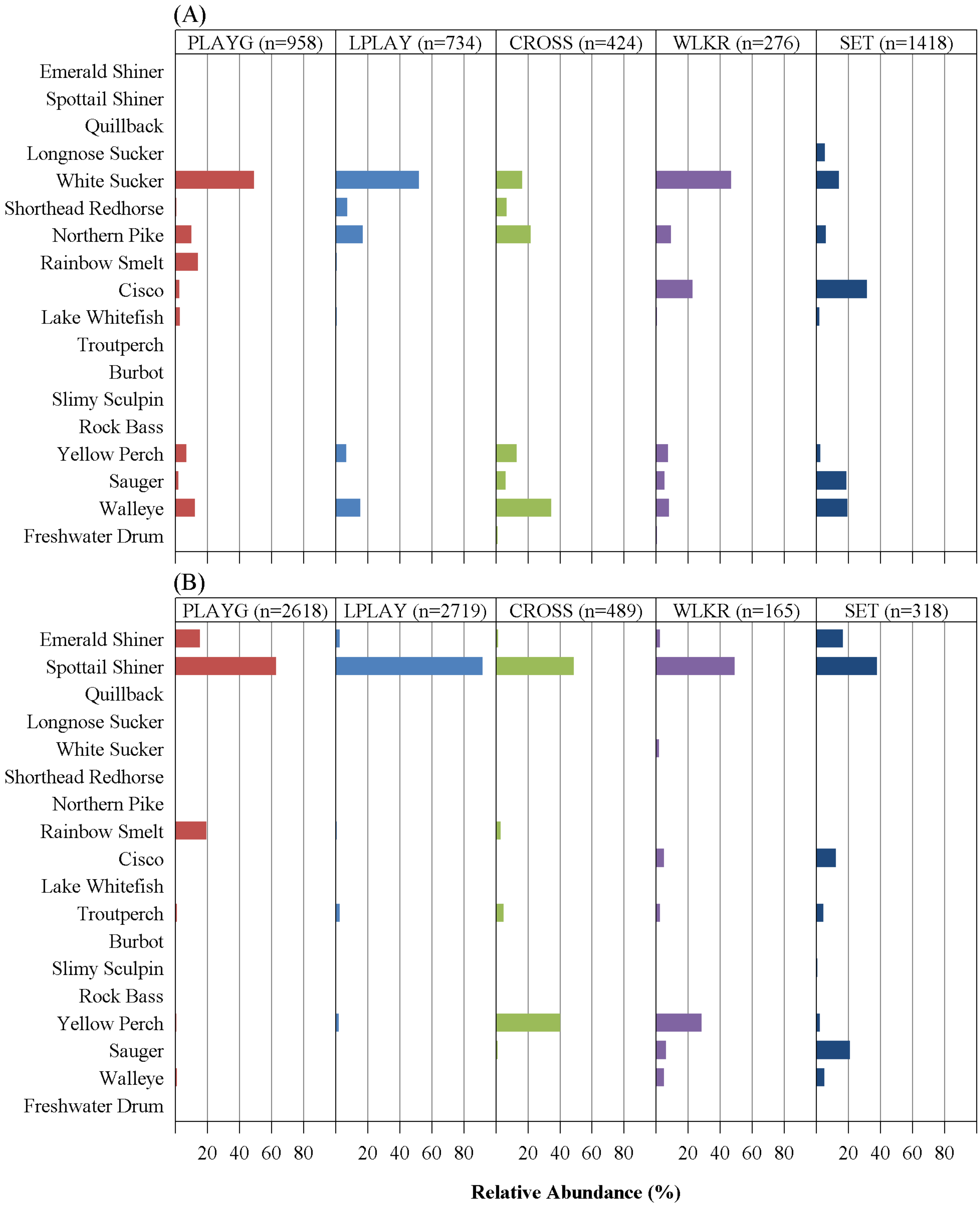


Figure 7.6-6. Relative abundance (%) distributions for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2010.

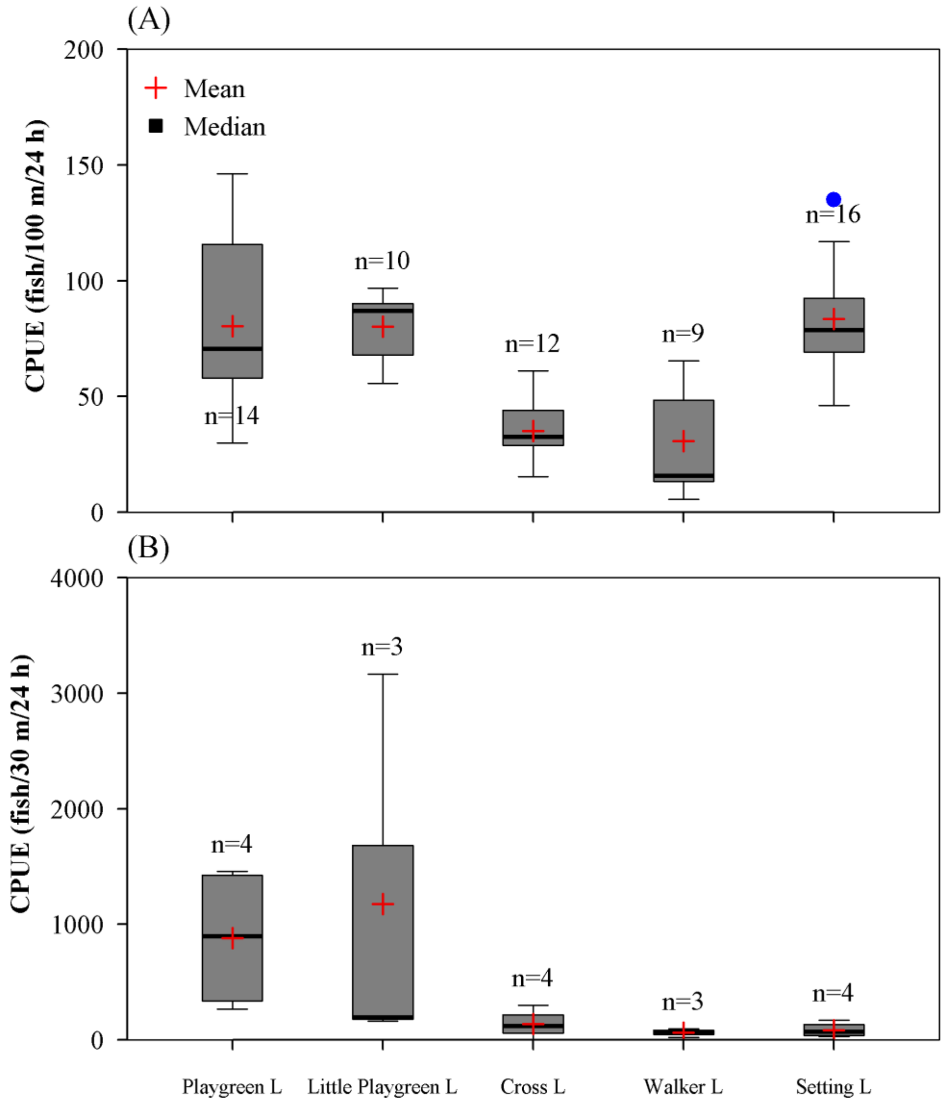


Figure 7.6-7. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2010.

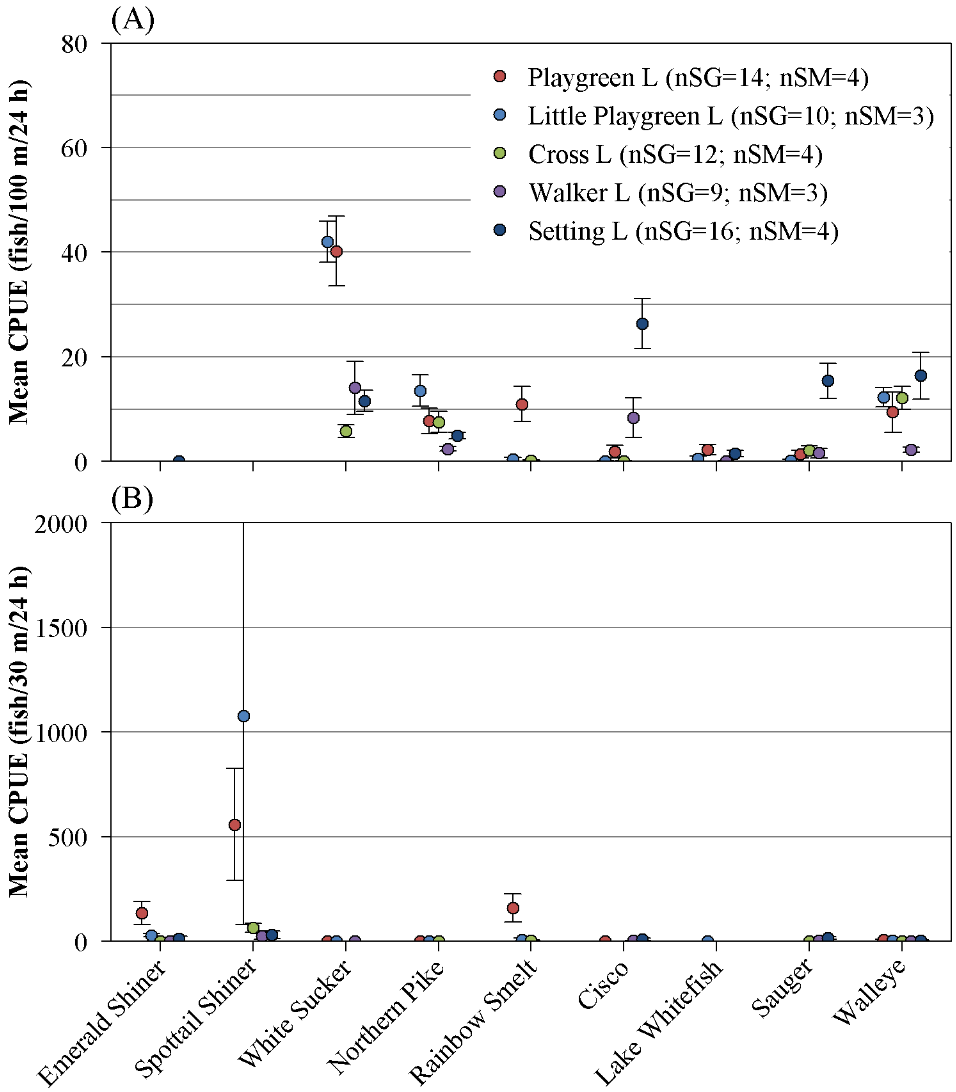


Figure 7.6-8. Mean (SE) CPUE for select species captured in (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Upper Nelson River Region waterbodies, 2010.

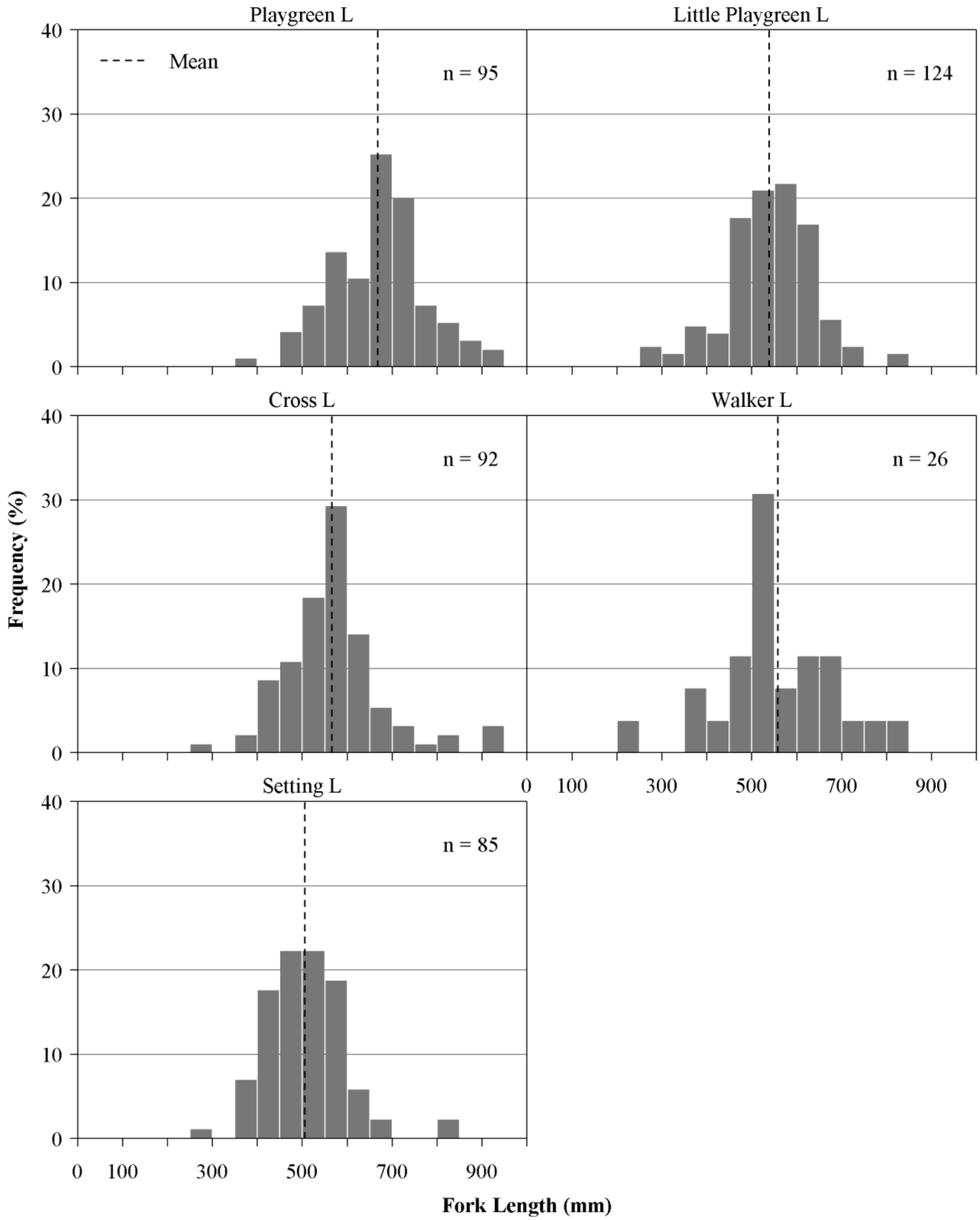


Figure 7.6-9. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

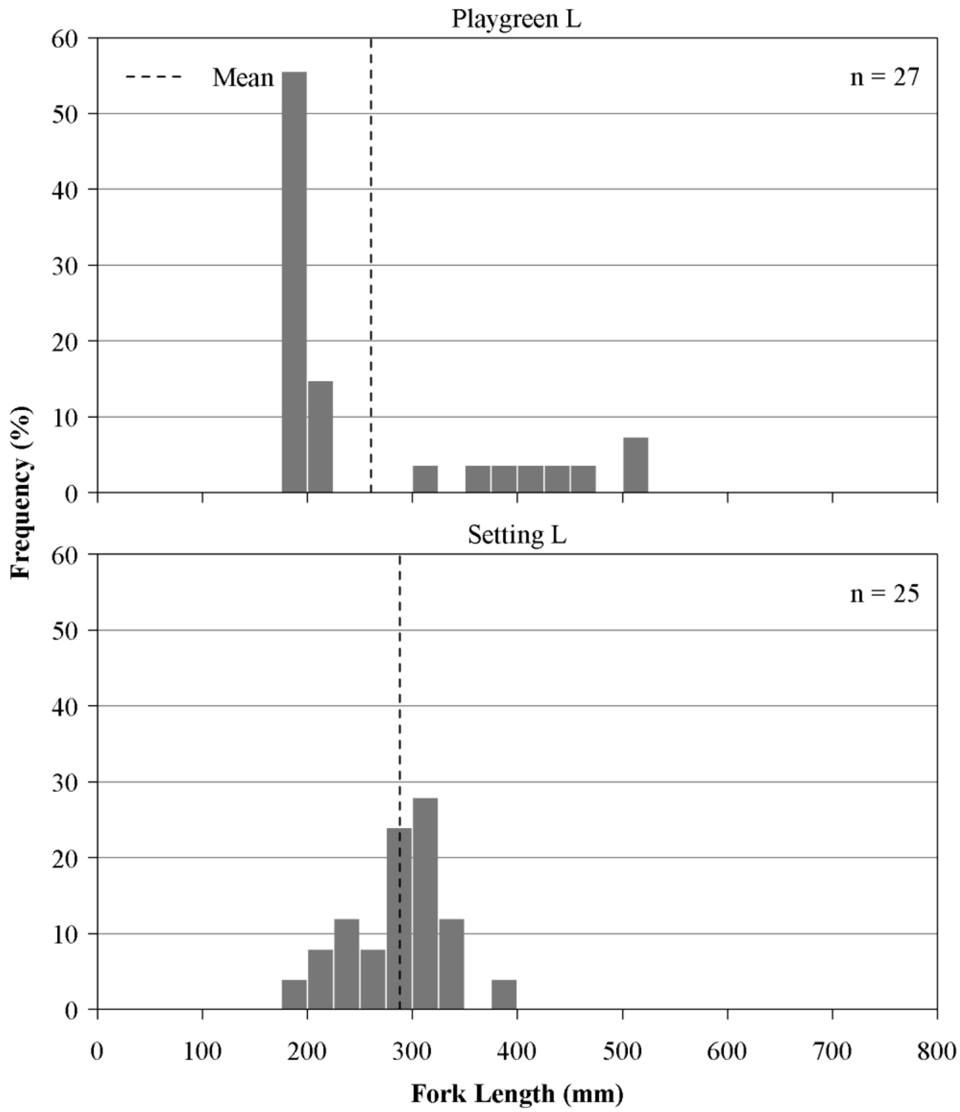


Figure 7.6-10. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

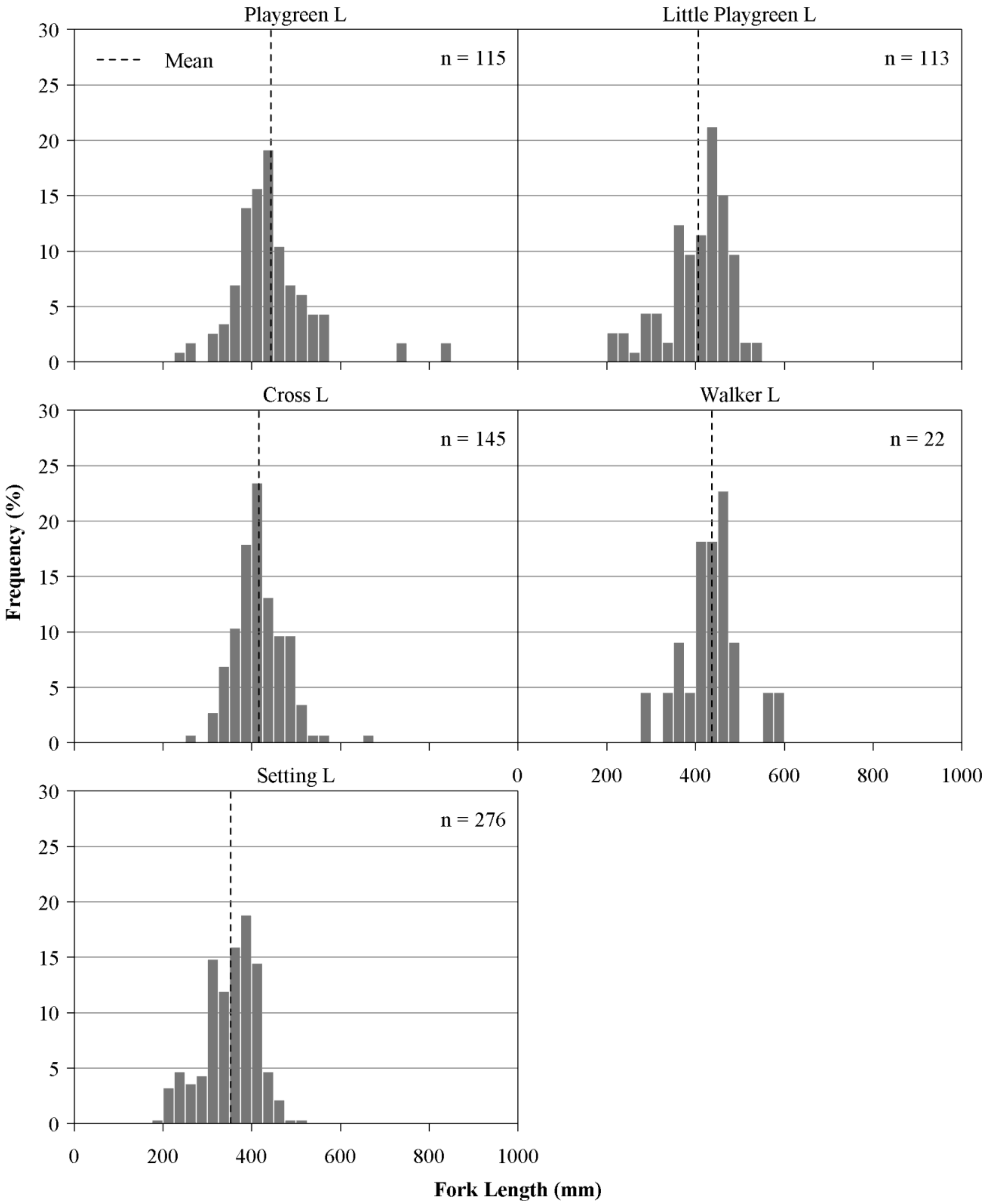


Figure 7.6-11. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2010.

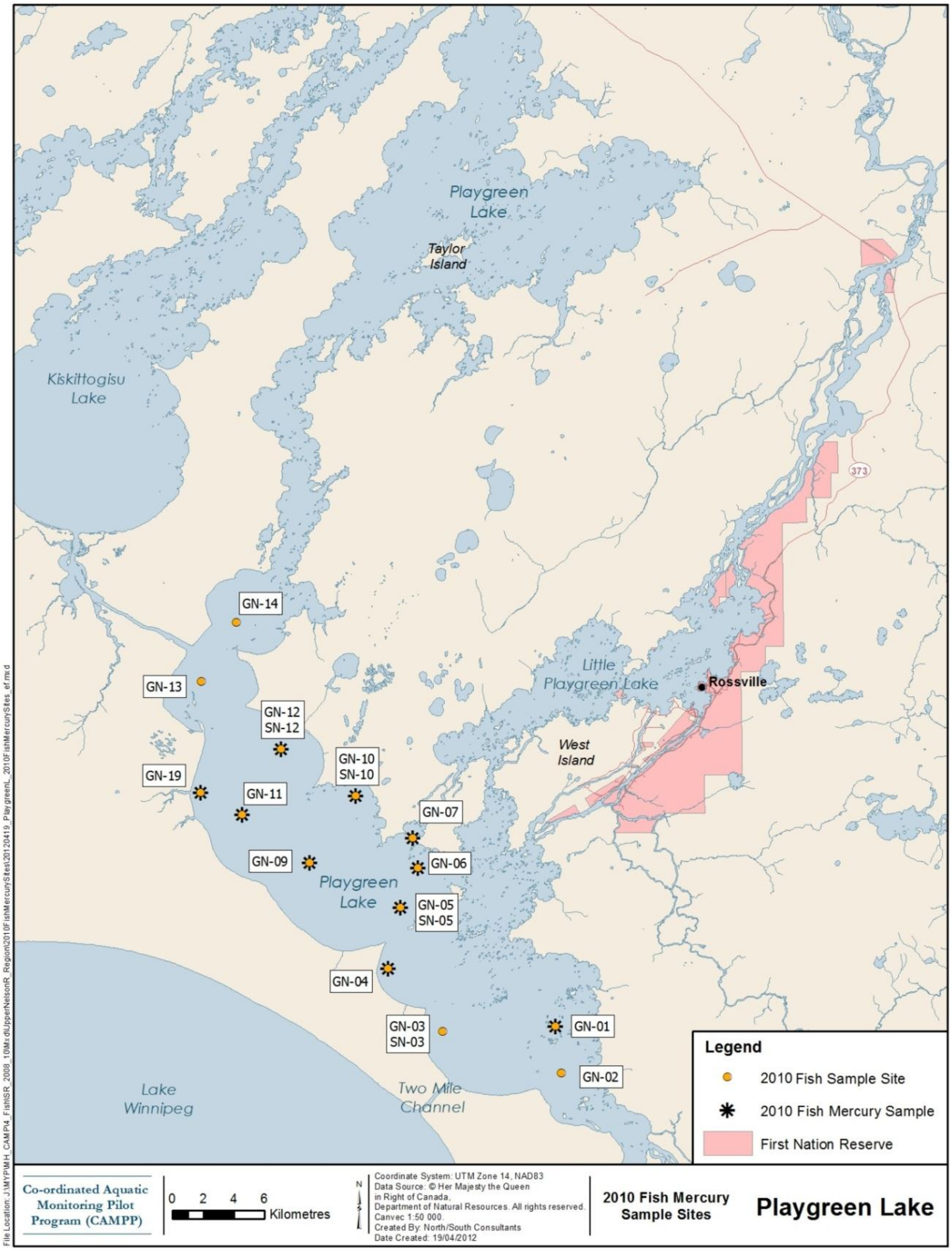


Figure 7.7-1. Fish sampling sites in Playgreen Lake, indicating those sites where fish were collected for mercury analysis.

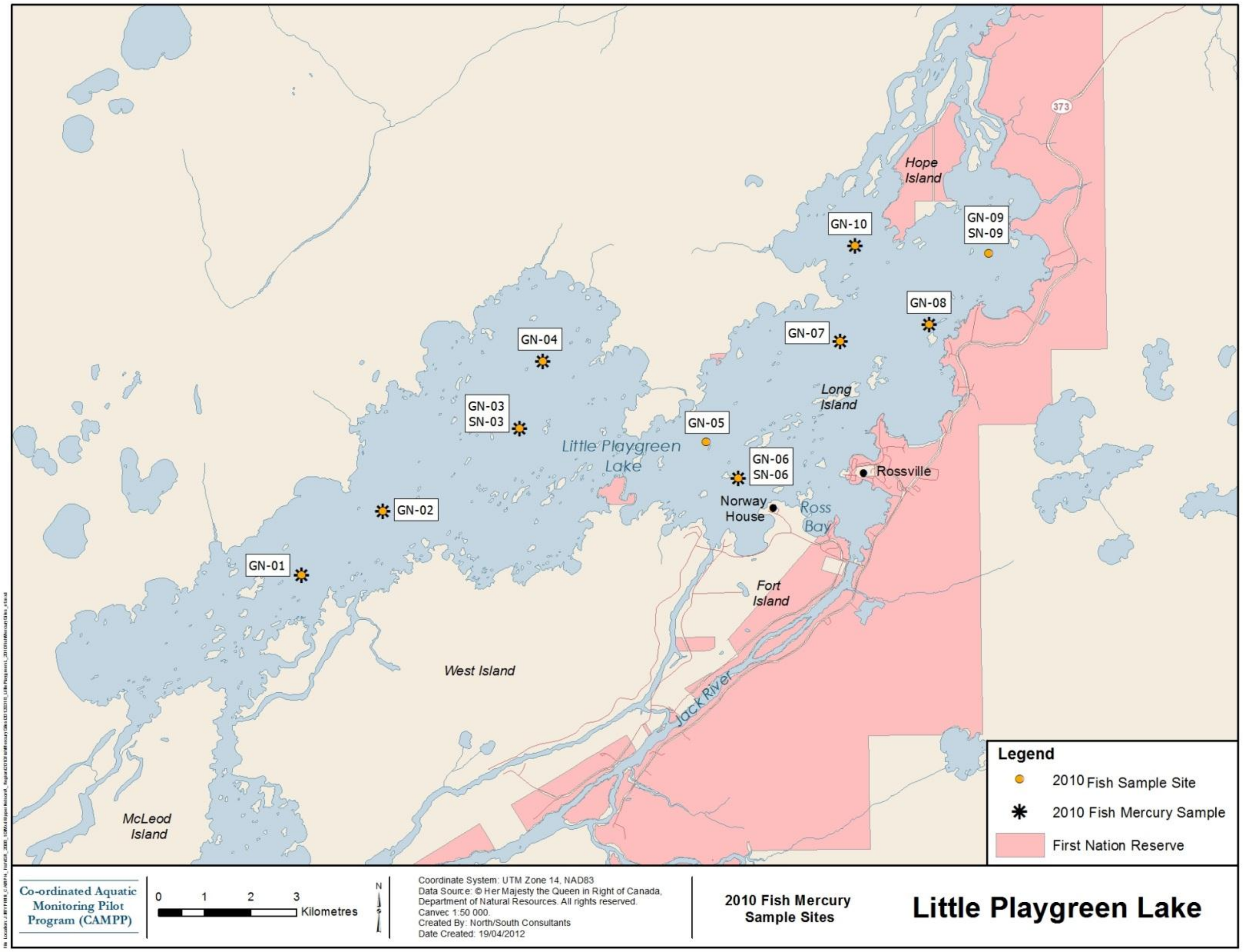


Figure 7.7-2. Fish sampling sites in Little Playgreen Lake, indicating those sites where fish were collected for mercury analysis.

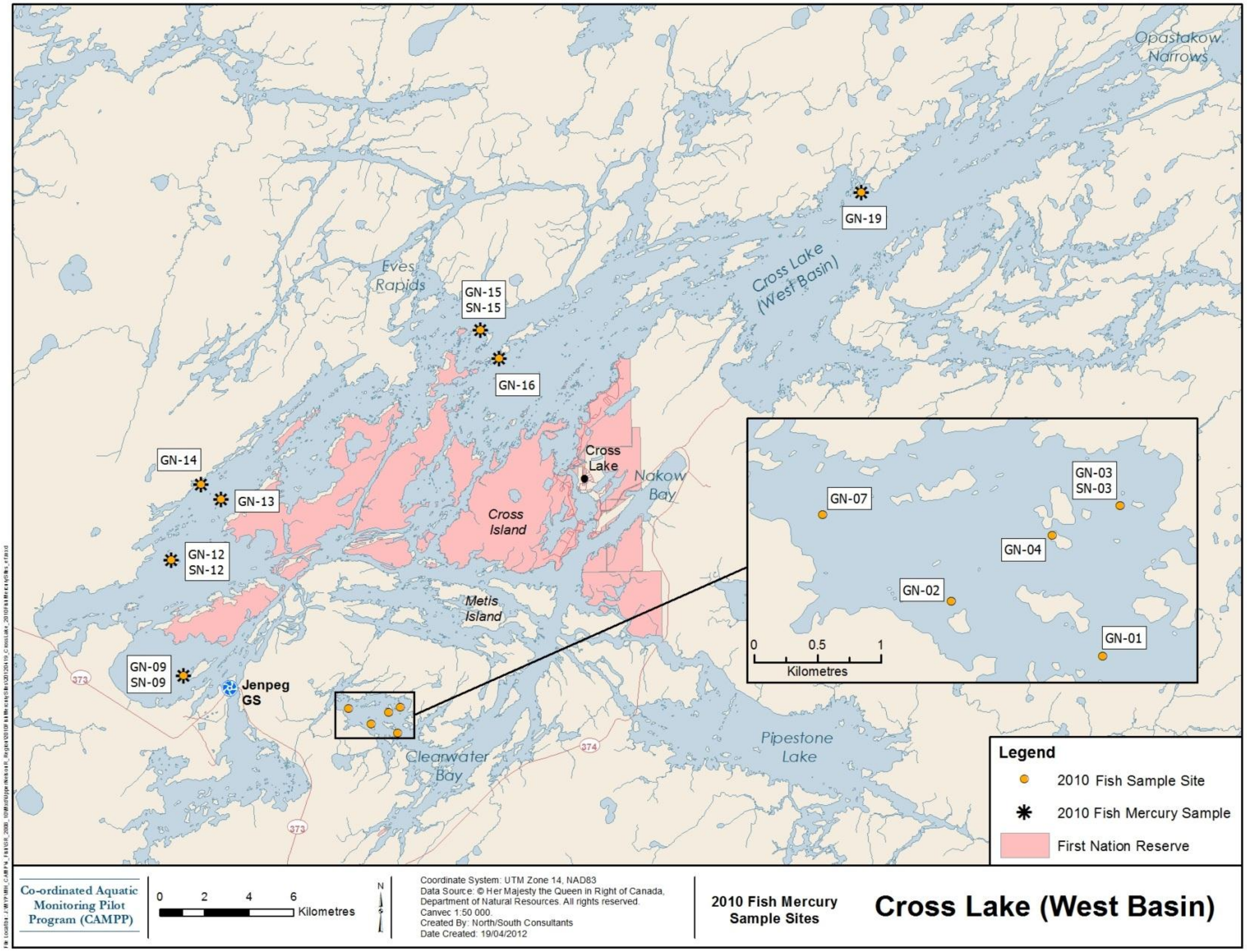


Figure 7.7-3. Fish sampling sites in Cross Lake, indicating those sites where fish were collected for mercury analysis.

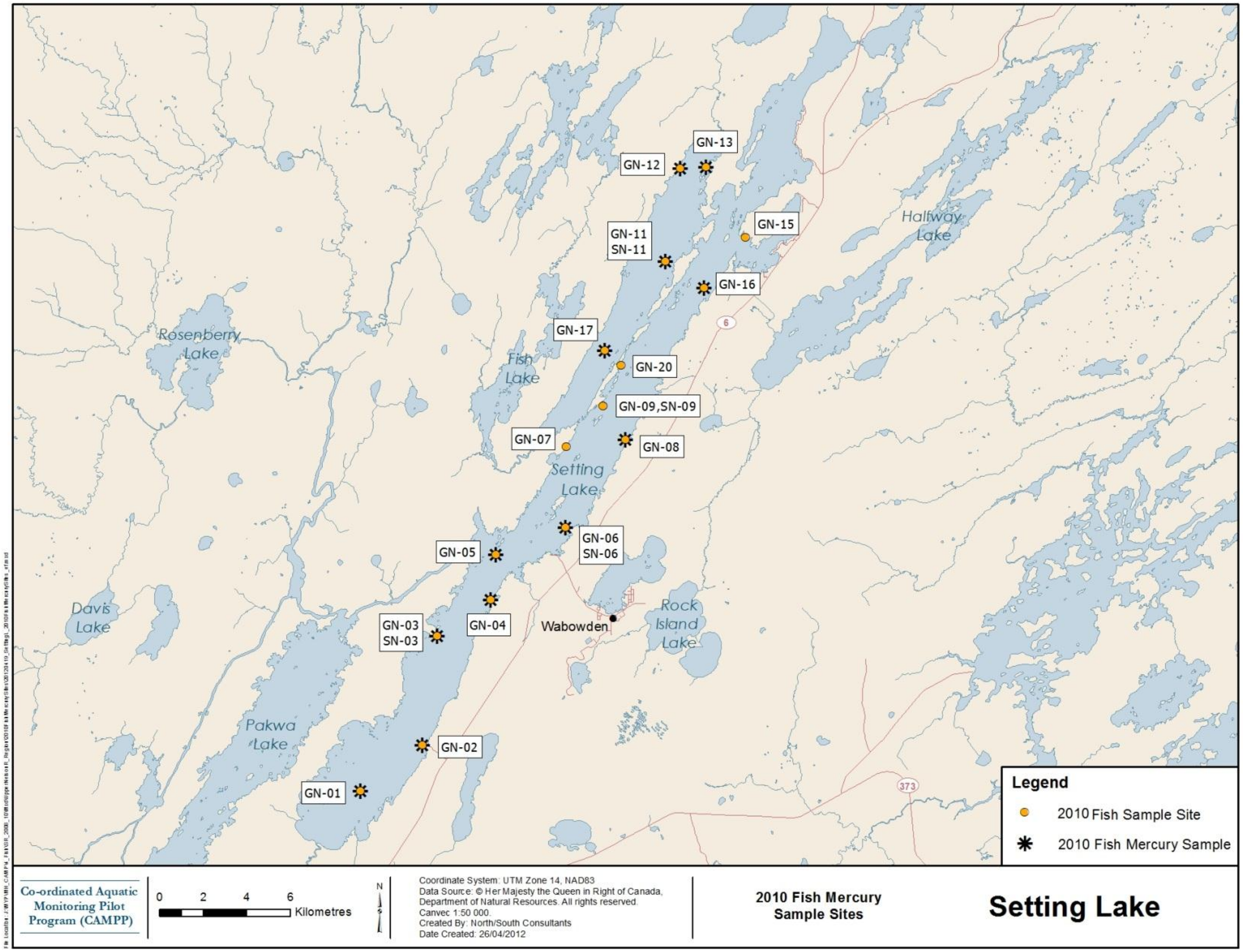


Figure 7.7-4. Fish sampling sites in Setting Lake, indicating those sites where fish were collected for mercury analysis.

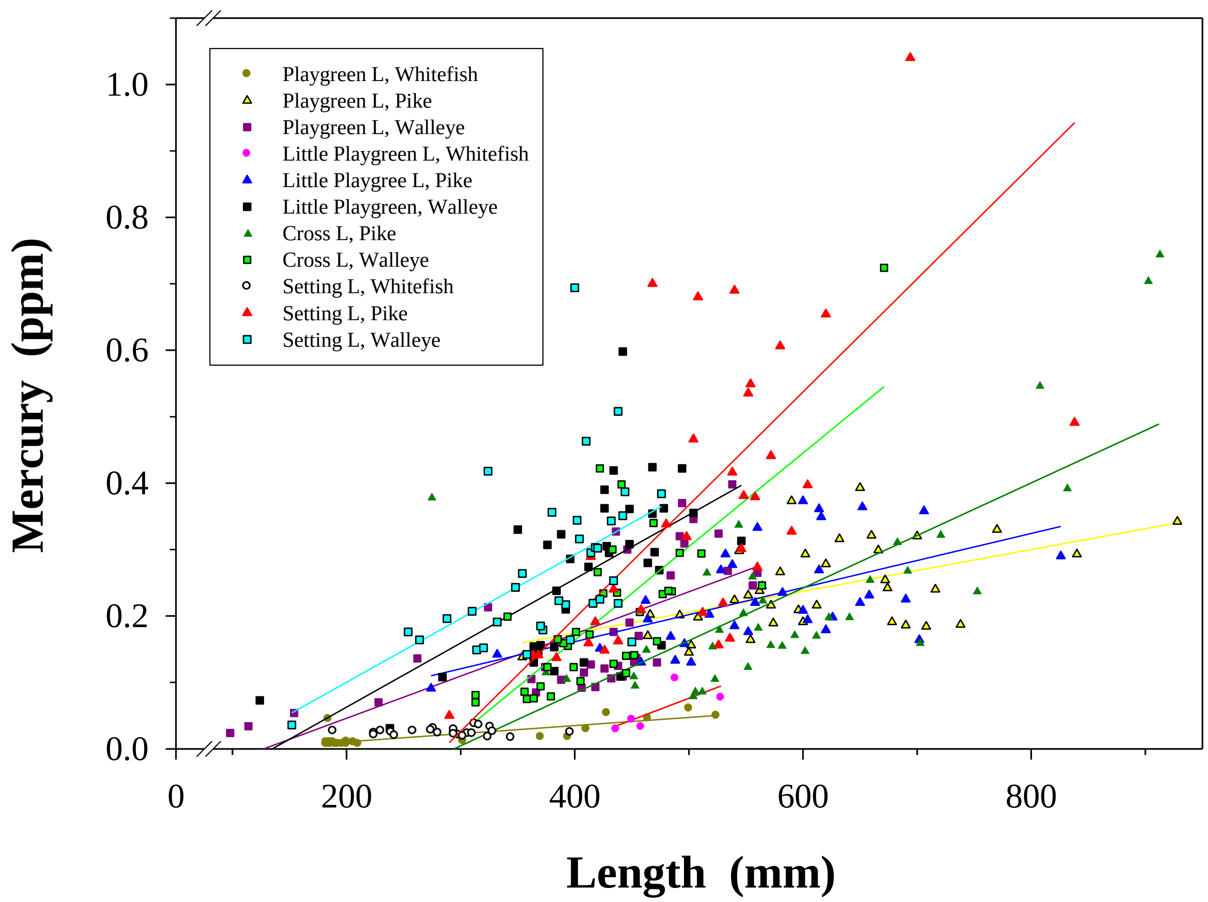


Figure 7.7-5. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Playgreen, Little Playgreen, Cross, and Setting lakes in 2010. Significant linear regression lines are shown. One Northern Pike from Setting Lake with a mercury concentration of 1.49 ppm and a length of 652 mm is not shown but is included in the analyses.

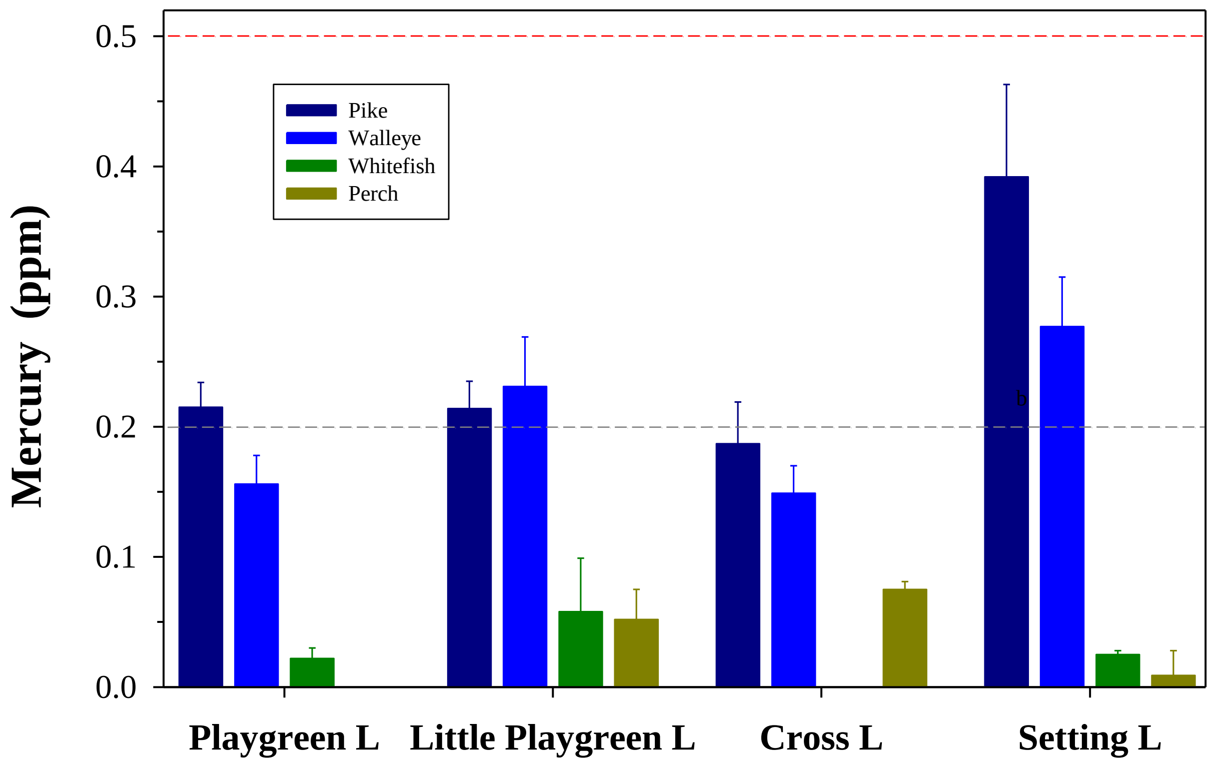


Figure 7.7-6. Mean (+95% CL) mercury concentrations of Lake Whitefish, Northern Pike, and Walleye from Playgreen, Little Playgreen, Cross, and Setting lakes in 2010. Means are standardized except for Lake Whitefish from Little Playgreen and Setting lakes and Yellow Perch from Little Playgreen and Cross lakes. Means with different letters indicate a significant difference between waterbodies within species. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption

8.0 LOWER NELSON RIVER REGION

The following provides an overview of the results of CAMPP for 2010/2011 for the Lower Nelson River Region, by each major component. A general description of methods is provided in Section 4 and in detail in Appendix 1.

8.1 CLIMATE

Mean monthly air temperatures measured at Gillam in 2010 were warmer than the 1971-2000 temperature normals, particularly in July and over the winter months (Figure 8.1-1). Most notably, the months of March and April exhibited air temperatures approximately 9.5 ^{o}C and 7 ^{o}C above normal, respectively. May was the only exception, when the mean temperature was less than normal. The annual mean air temperature in 2010 was 3.8 ^{o}C above the normal.

The 1971-2000 precipitation normals measured at Gillam, MB indicate peaks in July and August and relatively low levels of precipitation in winter (Figure 8.1-1). In 2010, the highest precipitation occurred in August (over two times the normal for that month) with secondary peaks in July, September, and October. Precipitation was notably lower in May and June, when it was less than 30% of the normal during those months. Precipitation in 2010 was approximately 25% greater than the normal.

Overall, the comparison to climate normals shows that 2010 was characterized by warmer temperatures in all four seasons, with an overall drier spring and atypically higher levels of precipitation from July to October (Figure 8.1-1).

8.2 HYDROLOGY

The lower Nelson River drainage basin covers an area greater than one million square kilometers. Lower Nelson River flows are influenced by regulation of Lake Winnipeg outflows and the Churchill River Diversion, which diverts the majority of the Churchill River flow into the Nelson River through the Rat-Burntwood River system.

Lower Nelson River flows in 2010 were above average for most of the year except from May to mid-June when flows dropped due to a below average snowpack across all lower Nelson River drainage basins (Figure 8.2-1). Above average precipitation in the Nelson, Saskatchewan, and Winnipeg river drainage basins also led to record high flows from October to December. Relative water levels downstream from the Limestone Generating Station (GS) can be inferred based on lower Nelson River flows. Water levels on Split Lake followed a similar trend to lower Nelson River flows (Figure 8.2-2).

Water levels in the Limestone GS Forebay typically fluctuate within a fairly narrow range and in 2010 water levels were generally within the range (Figure 8.2-3).

Water level monitoring on Assean Lake was initiated in August 2009 in support of CAMPP. In 2010, water level on Assean Lake were generally stable with a peak in late October, likely as a result of local precipitation (Figure 8.2.4).

The Hayes River flow record in 2010 began in mid-May and was near record low until mid-August, likely as a result of below average snowpack. Flows then rose quickly above average and reached record highs late in the year as a result of high precipitation (Figure 8.2-5).

8.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 3 of CAMPP in the Lower Nelson River Region. Waterbodies sampled included: the Burntwood River (at the inlet of Split Lake), Split Lake (near the community), the Limestone Forebay, and the lower Nelson River (approximately 40 km downstream of the Limestone GS; open-water season only) as well as two off-system waterbodies, the Hayes River (riverine reference) and Assean Lake (lacustrine reference; Figure 8.3-1).

8.3.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Lower Nelson River Region for routine water quality variables are presented in Tables 8.3-1 and 8.3-2 and Figures 8.3-2 to 8.3-10.

8.3.1.1 On-system Waterbodies

Water quality in the Lower Nelson River Region varies by waterbody. Overall, the region can be described as moderate to nutrient-rich, clear to turbid, alkaline, moderately soft to hard, and well-oxygenated. None of the lakes or the Limestone Forebay were thermally stratified during 2010/2011, and dissolved oxygen (DO) concentrations were relatively consistent across depth (Figures 8.3-2 and 8.3-3). Further, DO concentrations were consistently above Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011; Table 8.3-1 and Figure 8.3-3) for the protection of aquatic life (PAL) over the monitoring period. Other *in situ* variables including turbidity (8.3-4), pH (Figure 8.3-5), and specific conductance (Figure 8.3-6) were, with a few exceptions, generally similar across depth in each of the waterbodies. Secchi disk depths in the on-system lakes ranged between 0.3 m and 1 m (Figure 8.3-7).

Total phosphorus (TP) exceeded the Manitoba narrative guideline for lakes, reservoirs, ponds, and tributaries at the point of entry to such waterbodies (0.025 mg/L; MWS 2011) in the

Burntwood River, Split Lake, and the Limestone Forebay on at least three occasions each (Figure 8.3-8). The lower Nelson River also exceeded the narrative guideline for streams and rivers (0.050 mg/L) on two occasions during the open-water season (the site was not sampled during winter). In addition, *in situ* pH measured in Split Lake in summer 2010 was in excess of the upper range of the PAL guideline (6.5-9.0; MWS 2011) throughout the water column. With the exceptions of TP and pH, other routine variables for which there are MWQSOGs were within PAL objectives and guidelines in 2010/2011 (MWS 2011).

On average, dissolved and particulate forms comprised approximately equal portions of TP at sites along the lower Nelson River; particulate phosphorus was proportionally more significant in the Burntwood River (Figure 8.3-9). The majority of total nitrogen (TN) was composed of organic nitrogen at all sites during all sampling periods (Figure 8.3-10). Though ammonia and nitrate/nitrite were not detected at the sites on a number of occasions, the dissolved inorganic nitrogen (DIN) pool was dominated by nitrate/nitrite in winter at all sites.

8.3.1.2 Off-system Waterbodies

In situ depth profiles were only collected in the Hayes River when flows were low enough to accommodate measurement (i.e., during winter). However, the available data showed that neither Assean Lake nor the Hayes River were stratified during the sampling periods in 2010/2011 (Figure 8.3-2), DO concentrations were above the MWQSOGs for PAL (MWS 2011; Figure 8.3-3), and *in situ* variables were generally similar across depth in 2010/2011 (Figures 8.3-4 to 8.3-6). With one exception, routine water quality variables were within MWQSOGs for PAL. TP exceeded the narrative guideline in lakes, reservoirs and ponds (0.025 mg/L) in half of the samples collected from Assean Lake (Figure 8.3-8). The Hayes River contained low concentrations of TP and TP was consistently within the Manitoba narrative guideline for rivers and streams (0.050 mg/L).

The TP pool was dominated by particulate phosphorus in the open-water season, whereas dissolved phosphorus dominated in winter at both sites (Figure 8.3-9). Like on-system sites, concentrations of ammonia and nitrate/nitrite were low and the DIN pool was dominated by nitrate/nitrite in winter in the off-system waterbodies (Figure 8.3-10).

8.3.2 Metals and Major Ions

A summary of metal concentrations measured in the Lower Nelson River Region in 2010/2011 is presented in Table 8.3-3 and a summary of detection frequencies for metals is provided in Table 8.3-4.

8.3.2.1 On-system Waterbodies

A number of metals were not detected at any site or sampling period including beryllium, bismuth, mercury, selenium, silver, tellurium, thallium, tungsten, and zinc (Table 8.3-4). Aluminum, arsenic, barium, calcium, copper, iron, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, titanium, and vanadium were consistently detected and the remaining metals were detected in some samples.

Aluminum and iron exceeded the MWQSOGs for PAL (0.1 and 0.3 mg/L, respectively; MWS 2011) in all samples collected at the on-system sites (Table 8.3-5; Figure 8.3-11). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines (Table 8.3-5). However, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical detection limits employed for the 2010/2011 sampling periods, comparisons to the guideline could not be made.

Both chloride and sulphate were higher at sites located downstream of the Burntwood River than the Burntwood River itself (Table 8.3-2). However, concentrations of both ions were relatively low, averaging less than 20 mg/L and 25 mg/L, respectively. Chloride was well below the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013), and while there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment [BCMOE] guidelines, which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013).

8.3.2.2 Off-system Waterbodies

A number of metals were not detected at either off-system site including antimony, beryllium, bismuth, boron, cesium, chromium, cobalt, mercury, molybdenum, nickel, phosphorus, selenium, silver, tellurium, thallium, tungsten, and zinc (Table 8.3-4). Aluminum, arsenic, barium, calcium, copper, iron, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, titanium, and vanadium were consistently detected. The remaining metals were detected in some samples.

Aluminum, copper, and iron exceeded MWQSOGs for PAL (0.1 mg/L for aluminum, site specific guideline for copper, and 0.3 mg/L for iron; MWS 2011) in the Hayes River and Assean Lake in: 50% and 100%, 25% and 0%, and 25% and 50%, respectively (Table 8.3-5; Figure 8.3-11). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines for both off-system reference sites in 2010/2011 (Table 8.3-5). However, as noted in Section 8.3.2.1, comparisons could not be made to the current MWQSOG for mercury (0.000026 mg/L) owing to analytical detection limits.

Concentrations of chloride and sulphate were low in both off-system waterbodies sampled in the region in 2010/2011 (Table 8.3-2) and were well below the CCME PAL guideline (120 mg/L; CCME 1999, updated to 2013) and the BCMOE guidelines (128-429 mg/L; BCMOE 2000), respectively.

8.3.3 Trophic Status and Nutrient Ratios

8.3.3.1 On-system Waterbodies

The trophic status of the on-system lakes/reservoirs in the Lower Nelson River Region varied depending on the parameter; Split Lake and the Limestone Forebay were eutrophic based on TP (Table 8.3-6), oligotrophic-mesotrophic based on chlorophyll *a* (Table 8.3-7), and mesootrophic based on TN (Table 8.3-8). The Burntwood River ranked as meso-eutrophic whereas the lower Nelson River ranked as eutrophic based on TP (Table 8.3-6), but both sites ranked as oligotrophic based on TN (8.3-9) and chlorophyll *a* (Table 8.3-10).

Like most other waterbodies sampled under CAMPP, sites along the lower Nelson River and the Burntwood River were phosphorus limited on average, though co-limitation occurred during some sampling periods (Figure 8.3-12). Phosphorus limitation was most pronounced in spring. Mean total organic carbon to organic nitrogen molar ratios (TOC:ON) indicate that organic matter in the lower Nelson River waterbodies and the Burntwood River was a mixture of allochthonous and autochthonous sources (Figure 8.3-13).

8.3.3.2 Off-system Waterbodies

The trophic status of both the Hayes River (mesotrophic) and Assean Lake (meso-eutrophic) ranked lower than on-system river or lake sites, based on TP (Table 8.3-6). Conversely, trophic status of these waterbodies based on TN (oligotrophic and mesotrophic; Tables 8.3-8 and 8.3-9) and chlorophyll *a* (both oligotrophic; Tables 8.3-7 and 8.3-10) was similar to on-system waterbodies.

Both the Hayes River and Assean Lake were more strongly phosphorus-limited than on-system waterbodies (Figure 8.3-12); however, the relative contribution of allochthonous and autochthonous sources of organic matter was similar to on-system sites and indicative of a mixture of the two (Figure 8.3-13).

8.3.4 *Escherichia coli*

8.3.4.1 On-system Waterbodies

E. coli was detected in samples collected from the Burntwood River, Split Lake and the Limestone Forebay in 2010/2011; concentrations ranged from 1 to 39 CFU/100 mL (Table 8.3-2). *E. coli* was below the analytical detection limits in the lower Nelson River. *E. coli* was consistently below the MWQSOGs for recreation (200 CFU/100 mL) in the region in 2010/2011 (Table 8.3-2; MWS 2011).

8.3.4.2 Off-system Waterbodies

E. coli was not detected in any samples collected from any of the off-system sites and was consistently below the MWQSOGs for recreation (200 CFU/100 mL) in 2010/11 (Table 8.3-2).

8.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Lower Nelson River Region in Year 3 of CAMPP. Waterbodies sampled included the Burntwood River (at the inlet to Split Lake), Split Lake (near the community), the Limestone Forebay; the lower Nelson River (approximately 40 km downstream of the Limestone GS), an off-system river (Hayes River), and an off-system lake (Assean Lake; Figure 8.3-1).

8.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Lower Nelson River Region were low to moderate (Figure 8.4-1), and were similar between waterbodies in fall and winter but were higher at Split Lake during spring and summer. Chlorophyll *a* was not detected (i.e., < 1 µg/L) in the Burntwood River, Split Lake, the Limestone Forebay, or the Hayes River in winter.

8.4.2 Community Composition and Biomass

Phytoplankton community composition and biomass were measured in 2010/2011 in the Burntwood River, Split Lake and Assean Lake, and the Limestone Forebay.

In 2010, phytoplankton biomass measured during the open-water season varied across waterbodies in the Lower Nelson River Region with the most notable difference being the higher biomass measured in Split Lake in spring and summer, relative to the other sampling sites (Figure 8.4-2). These peaks are consistent with the results of the chlorophyll *a* analysis as described in Section 8.4.1. Phytoplankton biomass in the Burntwood River and the Limestone Forebay was lowest in spring and highest in fall, whereas the biomass in Assean Lake was lowest in fall and highest in spring. At Split Lake, biomass was similar between spring and fall but highest in summer.

Phytoplankton community composition also varied between the waterbodies in the region (Figure 8.4-3). In the Burntwood River, green algae and diatoms comprised the majority of the biomass in spring whereas cryptophytes dominated the community in both summer and fall. The phytoplankton assemblage in the Limestone Forebay was almost completely composed of diatoms in spring 2010 and this taxonomic group continued to dominate the community in summer and fall; however, similar to the Burntwood River, cryptophytes also became more prevalent in summer and fall, as did green algae. The assemblages in Split and Assean lakes were fairly similar in spring and summer; both were dominated by diatoms in spring and by blue-green algae in summer. In fall, the community at Split Lake was not dominated by any particular group and consisted of cryptophytes, diatoms, blue-green algae and green algae. Similar to the other on-system sites cryptophytes were common at Split Lake during all seasons. Assean Lake was dominated by blue-green algae in fall 2010, with green algae also being abundant.

Metrics describing the phytoplankton community indicate there was considerable variation in community complexity between seasons. Community complexity was generally highest in the Burntwood River in spring, the Limestone Forebay in summer, and Assean Lake in fall, and metrics were generally lowest in Split Lake in 2010/2011 (Table 8.4-1). In Split Lake, diversity, heterogeneity, and effective richness were generally lowest in spring and highest in fall. In contrast, the assemblages in the Burntwood River and Limestone Forebay showed the opposite pattern, with the most heterogeneous, even, and rich community occurring in spring whereas complexity was lowest in fall. In Assean Lake, community metrics were also highest in fall, but lowest in summer.

8.4.3 Bloom Monitoring

Chlorophyll *a* concentrations were consistently below the bloom monitoring trigger of 10 µg/L in the region in 2010.

8.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (algal toxins), including species of *Anabaena*, *Aphanizomenon, Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to influence whether microcystins are produced. *Anabaena* and *Aphanizomenon* were both present in the Burntwood River, Split Lake, the Limestone Forebay and Assean Lake. Additionally, *Planktothrix* was present in the

Burntwood River and the Limestone Forebay. Taxonomic information is not available for the other waterbodies.

Microcystin-LR was not measured in this region in 2010 as the chlorophyll *a* concentration was always below the 10 µg/L trigger.

8.4.5 Trophic Status

Following the classification scheme for lakes based on chlorophyll *a* concentrations (OECD 1982), Split Lake was mesotrophic and the Limestone Forebay and Assean Lake were oligotrophic (open-water and annual seasons means; Table 8.3-7). According to chlorophyll *a* trophic categories for rivers (Dodds et al. 1998), the Burntwood, lower Nelson and Hayes rivers were all oligotrophic in 2010/2011 (Table 8.3-10).

8.5 BENTHIC MACROINVERTEBRATES

The following is an overview of the benthic macroinvertebrate (BMI) community sampled in the Lower Nelson River Region in 2010/2011; the third year of CAMPP. (Figures 8.5-1 to 8.5-5). Waterbodies sampled included the on-system lake Split Lake; the on-system rivers Limestone Forebay, lower Nelson River (d/s of Limestone Forebay), and the off-system waterbodies Hayes River, and Assean Lake. Split Lake, lower Nelson River (d/s of Limestone Forebay), Hayes River, and Assean Lake are sampled annually, and Limestone Forebay is sampled on a rotational basis (i.e., once every three years).

In 2010, nearshore rock baskets and nearshore grab sampling was replaced with kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize that portion of the littoral zone influenced by fluctuations in water level. Water depth criteria for offshore polygons in 2010 was defined as greater than 5 m to a maximum depth of 10 m; samples continued to be collected with a benthic grab sampler (Ekman or petite Ponar). Nearshore and offshore habitat polygons were sampled in each waterbody, except in the Hayes River where high water velocities precluded sampling in offshore areas. Both kicknet and grab sampling consisted of five composites (except offshore in the lower Nelson River downstream of the forebay where it was four composites) of three replicate samples per habitat polygon. Sampling was conducted between 20 and 28 August 2010.

8.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons (where applicable) at each waterbody (Table 8.5-1).

Mean water depths in the nearshore were 0.9 m in Split Lake and the Limestone Forebay, and 1.0 m in the lower Nelson River, Hayes River, and Assean Lake (Table 8.5-1). Mean water depths in offshore areas were 7.4, 6.6, 4.2, and 5.6 m for Split Lake, the Limestone Forebay, the lower Nelson River, and Assean Lake, respectively. Sampling depths greater than 5 m were not attainable in the lower Nelson River due to the high water velocities encountered.

Sediment samples were collected from all the Lower Nelson River Region waterbodies visited in 2010 and analyzed for TOC and PSA. Overall, TOC was low throughout the region and was similar in nearshore and offshore areas. Mean TOC was less than 1.0% in all waterbodies and habitats with the exception of the offshore habitats of Split Lake (1.3%), Limestone Forebay (1.1%), and Assean Lake (1.6%) (Table 8.5-2).

In all waterbodies, sand comprised the majority of the sediment collected from the nearshore habitat polygons; silt dominated the offshore areas, with the exception of the lower Nelson River where sand was dominant (Table 8.5-2).Clay was present in both habitats in all waterbodies.

8.5.2 Species Composition, Distribution, and Relative Abundance

8.5.2.1 Split Lake

The total mean BMI abundance in kicknet samples in the nearshore/intermittently exposed habitat of Split Lake was 95 individuals, with numbers ranging from 36 to 243 (Table 8.5-3). Non-insects (53%) and insects (47%) co-dominated the BMI community in this habitat. The non-insects consisted of Amphipoda (40% of the mean total BMI) and Oligochaeta (11%) (Table 8.5-3). Insects mainly consisted of Ephemeroptera (21% of the mean total BMI) and Chironomidae (17%); Hemiptera, Trichoptera, and Dytiscidae (predaceous diving beetles) were also identified (Table 8.5-3). Mean BMI density in offshore benthic grab samples was 4,917 individuals/m^2, with densities ranging from 3,996 to 6,420 (Table 8.5-3). Overall, non-insects dominated the BMI community, comprising 69% of the mean total BMI; insects comprised the remaining 31% (Table 8.5-3). Of the non-insects, the main groups were Bivalvia (47% of the mean total BMI), followed by Amphipoda (17%), and Gastropoda (14%); small numbers of Oligochaeta and Diplostraca were also present (Table 8.5-3). Insects mainly consisted of Ephemeroptera and Chironomidae, which comprised 21 and 8% of the mean total BMI, respectively. Trichoptera were also present in small numbers, as well as, Megaloptera and Ceratopogonidae (Table 8.5-3).

Total EPT comprised 23% and 22% of the nearshore and offshore BMI communities, respectively. In both habitats, Ephemeroptera was the prevalent group within the EPT. Genus analysis indicated that *Caenis* sp. was dominant in nearshore kicknet samples, while *Hexagenia* sp. was dominant in offshore grab samples (Table 8.5-3). *Caenis* sp. is a ubiquitous group with general habitat requirements, commonly found in lotic depositional and lentic-littoral environments (Merritt and Cummins 1996). Baetidae and Ephemeridae were present in both habitats; Caenidae was present only in the nearshore samples. Within the Trichoptera, Leptoceridae was present in both nearshore and offshore habitats. Additionally, Hydropsychidae was found in the offshore polygon. Plecoptera were not present in either habitat. The EPT:C ratio was 1.37 in the nearshore habitat, indicating EPT were slightly dominant over Chironomidae. In the offshore polygon, the EPT:C ratio was 2.76, indicating EPT dominated Chironomidae in the BMI community.

Taxonomic richness in the nearshore was 18 families, with values ranging from 11 to 17 within each sample (Table 8.5-3). Hill's Effective Richness (E^H) was eight with Hyalellidae notably dominating this habitat (Table 8.5-3). Taxonomic richness in the offshore polygon was 14 families, ranging from eight to 12 within each sample (Table 8.5-3). Hill's Effective Richness (E^H) was five; Pisidiidae, Ephemeridae, Haustoriidae, Hydrobiidae, and Chironomidae were all dominant in this habitat (Table 8.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.82 and 0.75 in the nearshore and offshore polygons, respectively (Table 8.5-3). Evenness (Simpson's Equitability [E_D]) was 0.38 and 0.37 in the nearshore and offshore habitats, respectively Table 8.5-3).

8.5.2.2 Limestone Forebay

The total mean BMI abundance in kicknet samples in the nearshore habitat of the Limestone Forebay was 36 individuals, with numbers ranging from 10 to 76 (Table 8.5-4). Insects dominated the kicknet samples, comprising 87% of the mean total BMI; non-insects comprised the remaining 13% (Table 8.5-4). The insect portion consisted mostly of Chironomidae (65% of the mean total BMI); Hemiptera and Ephemeridae were also present (Table 8.5-4). Oligochaeta dominated the non-insect group, comprising 10% of the mean total BMI; Amphipoda (2%) were also present (Table 8.5-4). Mean BMI density in offshore benthic grab samples was 1,838 individuals/m^2 with densities ranging from 909 to 4,588 (Table 8.5-4). Non-insects and insects were similarly represented in the BMI community in this habitat (54 and 46% of the mean total BMI, respectively; Table 8.5-4). Of the non-insects, the main group was Bivalvia (comprised 35% of mean total BMI), followed by Oligochaeta (11%), and Amphipoda and Gastropoda (4% each); small numbers of Diplostraca were also present (Table 8.5-4). Insects were mostly comprised of Chironomidae (17% of the mean total BMI), followed by Ephemeroptera (11%), Megaloptera (10%), and Trichoptera (8%); small numbers of Ceratopogonidae and Hemiptera were also present (Table 8.5-4).

Total EPT comprised 2% of the BMI community sampled in the nearshore habitat and consisted entirely of Ephemeroptera. Genus analysis of the mayflies indicated that three genera were dominant; *Caenis* sp., *Procloeon* sp., and *Stenonema* sp. Plecoptera were not present in nearshore samples. Total EPT within the offshore was 19%, with Ephemeroptera and Trichoptera both present. Genus analysis of the mayflies indicated *Hexagenia* sp. was dominant in offshore samples, though *Ephemera* sp. was also present in small numbers. Trichoptera was dominated by Dipseudopsidae, with smaller numbers of Polycentropodidae, Hydropsychidae, and Leptoceridae also present. No Plecoptera were identified in offshore samples. The ratio of EPT:C was 0.02 in the nearshore habitat, indicating Chironomidae dominated EPT in this insect community (Table 8.5-4). The offshore EPT:C ratio was 1.22, indicating a fairly balanced community with respect to numbers of EPT compared to Chironomidae (Table 8.5-4).

The nearshore habitat was represented by 13 invertebrate families, with richness values ranging from four to eight within each sample (Table 8.5-4). Hill's Effective Richness (E^H) was three; Chironomidae, Corixidae (water boatmen), and Oligochaeta dominated the BMI community in this habitat. Overall taxonomic richness in the offshore polygon was 16 families with richness values ranging from eight to 12 within each sample (Table 8.5-4). Hill's Effective Richness (E^H) was seven with Pisidiidae, Chironomidae, Ephemeridae, Sialidae, and Dipseudopsidae notably dominating the community.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.59 in nearshore habitat and0.82 in offshore habitat. (Table 8.5-4). Evenness (Simpson's Equitability [E_D]) values were 0.38 in the nearshore and 0.54 in the offshore.

8.5.2.3 Lower Nelson River (d/s of Limestone Forebay)

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of the lower Nelson River was 57 individuals, with numbers ranging from 15 to 146 (Table 8.5-5). Insects comprised 92% of the BMI community, and non-insects comprised the remaining 8%. Insects mostly consisted of Chironomidae, Hemiptera, and Ephemeroptera (comprised 43%, 35%, and 12% of the BMI, respectively); a small number of Coleoptera were also present (Table 8.5-5). Oligochaeta was the main non-insect group, comprising 6% of mean total BMI sampled; Amphipoda and Gastropoda were also present (1% each; Table 8.5-5). Mean BMI density in offshore benthic grab samples was 2,204 individuals/m^2 and densities ranged from 736 to 3,766 (Table 8.5-5). Insects dominated the BMI community in this habitat, comprising 63% of the mean total BMI (Table 8.5-5). Insects mainly consisted of Chironomidae and Trichoptera, at 36 and 27% of the mean total BMI, respectively; small numbers of Ceratopogonidae were also present (Table 8.5-5). Non-insects comprised the remaining 37% of the mean total BMI sampled;

the main group was Oligochaeta (26%), followed by Gastropoda (8%), and Bivalvia (3%; Table 8.5-5).

Total EPT in the nearshore habitat was 12% of the mean total BMI, and consisted almost entirely of mayflies. Genus analysis of the Ephemeroptera indicated that *Procloeon* sp. was dominant in nearshore kicknet samples. *Procloeon* sp. is a ubiquitous group with general habitat requirements, commonly found in depositional lotic and lentic-littoral environments (Merritt and Cummins 1996). Total EPT was 27% of the BMI community in the offshore, consisting solely of Trichoptera. Families represented included Hydropsychidae, and smaller numbers of Limnephilidae, Lepidostomatidae, and Leptoceridae. The mean EPT:C ratio was 0.60 and 0.54 in the nearshore and offshore polygons, respectively, indicating Chironomidae dominated EPT in both habitats.

The nearshore habitat was represented by 17 invertebrate families, with richness values ranging from eight to ten within each sample (Table 8.5-5). Hill's Effective Richness (E^H) was five with Chironomidae and Corixidae notably dominating this habitat. Taxonomic richness in the offshore polygon was nine families and ranged from four to eight within each sample (Table 8.5-5). Hill's Effective Richness (E^H) was three; Chironomidae, Hydropsychidae, and Oligochaeta dominated the invertebrate community in this habitat.

Simpson's Diversity Index (D) was 0.69 and 0.60 in the nearshore and offshore polygons, respectively (Table 8.5-5). Mean evenness values (Simpson's Equitability [E_D]) were 0.37 in the nearshore and 0.46 in the offshore (Table 8.5-5).

8.5.2.4 Hayes River

The total mean BMI abundance in kicknet samples in the nearshore habitat of the Hayes River was 440 individuals, with numbers ranging from 62 to 902 (Table 8.5-6). Overall, insects dominated the BMI community, comprising 99% of the mean total abundance, with non-insects comprising the remaining 1% (Table 8.5-6). Hemiptera, specifically Corixidae, dominated the insect portion, comprising 95% of the mean total BMI abundance; Ephemeroptera (2%) and Chironomidae (1%) were also present in small numbers. Non-insects mainly consisted of Oligochaeta (1% of the mean total invertebrates), with small numbers of Amphipoda and Acari (Table 8.5-6).

Total EPT and total Chironomidae abundance comprised 2 % and 1 % of the mean total BMI, respectively. The resulting EPT:C was 1.83 indicating EPT were dominant over Chironomidae (Table 8.5-6). Taxonomic richness was 18 families and ranged from six to 13 taxa within each sample (Table 8.5-6). Hill's Effective Richness (E^H) was two with Corixidae notably dominating the habitat.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.20 and evenness (Simpson's Equitability [E_D]) was 0.12 in the nearshore kicknet samples (Table 8.5-6).

8.5.2.5 Assean Lake

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Assean Lake was 708 individuals, with numbers ranging from 305 to 1,193 (Table 8.5-7). Non-insects (48% of the mean total BMI) and insects (52%) co-dominated the BMI community in this habitat (Table 8.5-7). Amphipoda dominated the non-insect portion, comprising 34% of mean total BMI, followed by Bivalvia and Oligochaeta (each 6%); small numbers of Gastropoda and Hirudinea were also present (Table 8.5-7). Insects were mostly comprised of Ephemeroptera (40% of the mean BMI); Hemiptera, Trichoptera, Chironomidae, Coleoptera, and Tabanidae were also found (Table 8.5-7). Mean BMI density in offshore benthic grab samples was 1,094 individuals/m^2 and ranged from 491 to 1,688 (Table 8.5-7). Insects dominated the BMI community in this habitat, comprising 73% of the mean total BMI, with non-insects comprising the remaining 27% (Table 8.5-7). Insects were dominated by Ephemeroptera and Chironomidae, comprising 46% and 21% of mean BMI, respectively; smaller numbers of Ceratopogonidae, Hemiptera and Trichoptera were also present (Table 8.5-7). Of the non-insects, Bivalvia was the most abundant taxa at 25%; smaller numbers of Gastropoda and Diplostraca were also found (Table 8.5-7).

Total EPT was 44% and 46% of the mean total BMI in the nearshore and offshore habitat, respectively, and both habitats were dominated by Ephemeroptera. Genus analysis of the mayflies indicated that *Caenis* sp. was the most abundant genus in the nearshore habitat. Trichoptera were represented by the families Helicopsychidae, Leptoceridae, Lepidostomatidae, and Limnephilidae. In the offshore habitat, mayflies were represented by *Hexagenia* sp. and Trichoptera were represented by Leptoceridae and Molannidae. Plecoptera were not present in either habitat. The ratio of EPT:C was 15.68 in the nearshore and 2.90 in the offshore indicating EPT dominated Chironomidae in both habitats, most notably in the nearshore.

The nearshore habitat was represented by 30 invertebrate families with richness values ranging from 15 to 20 within each sample (Table 8.5-7). Hill's Effective Richness (E^H) was five; Caenidae and Hyalellidae notably dominated the habitat. Taxonomic richness in the offshore polygon was ten families with richness values ranging from four to eight within each sample (Table 8.5-7). Hill's Effective Richness (E^H) was four. Ephemeridae, Pisidiidae, and Chironomidae notably dominated the BMI community in this habitat (Table 8.5-7).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.71 and 0.67 in the nearshore and offshore polygons, respectively (Table 8.5-7). Evenness (Simpson's Equitability [E_D]) values were 0.17 in the nearshore and 0.43 in the offshore (Table 8.5-7).

8.6 FISH COMMUNITY

8.6.1 Gill Netting

During 2010, in the Lower Nelson River Region, gill netting was conducted in Split Lake (20 – 24 August), the Limestone Forebay (12 – 16 July), and the lower Nelson River mainstem (5 – 9 August). Gill netting was also conducted in two off-system waterbodies including the Hayes River (18 - 21 July) and Assean Lake (12 - 19 August).

In Split Lake, twelve sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Table 8.6-1; Figure 8.6-1). During sampling, water temperature ranged from 15 - 16°C.

In each of the remaining four waterbodies, nine sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Table 8.6-1; figures 8.6-2 – 8.6-5). During sampling water temperature ranged from 18 - 20°C in the Limestone Forebay, 18 - 22°C in the Hayes River and 9 - 23°C in Assean Lake. Water temperature was constant at 20°C in the lower Nelson River mainstem throughout sampling.

8.6.2 Species Composition

In 2010, 20 species of fish were captured in Lower Nelson River Region waterbodies (Table 8.6-2).

8.6.2.1 Split Lake

A total of 560 fish representing 13 species were captured in standard gang index gill nets (Table 8.6-3). Walleye and White Sucker were the most common species captured, representing 34.64% (n = 194 fish) and 27.50% (n = 154 fish) of the total catch, respectively (Table 8.6-3; Figure 8.6-6).

In small mesh index gill nets, 248 fish representing eight species were captured (Table 8.6-4). Spottail Shiner (n = 101 fish; 40.73%) was the most common species captured (Table 8.6-4; Figure 8.6-7).

The total biomass for the standard gang index gillnet catch was 553,511 g, with the majority represented by White Sucker (33.27%) and Walleye (32.45%) (Table 8.6-5). In small mesh index gill nets, total biomass was 4,398 g. Walleye (50.02%) represented the highest proportion of biomass in the small mesh index gill net catch (Table 8.6-6).

8.6.2.2 Limestone Forebay

A total of 148 fish representing seven species were captured in standard gang index gill nets (Table 8.6-3) and 56 fish representing four species were captured in small mesh index gill nets set in the Limestone Forebay (Table 8.6-4).

Longnose Sucker (n = 76 fish; 51.35%) was the most common species in the standard gang index gillnet catch, followed by Northern Pike (n = 43 fish; 29.05%) (Table 8.6-3; Figure 8.6-6). In small mesh index gill nets, Troutperch (n = 45 fish; 80.36%) represented the highest proportion of the catch (Table 8.6-4; Figure 8.6-7).

The total biomass in standard gang and small mesh index gillnet catches were 158,369 g (Table 8.6-5) and 426 g (Table 8.6-6), respectively. Northern Pike and Longnose Sucker represented the majority of biomass in standard gang index gill nets (47.12% and 34.74%, respectively) and Troutperch and Longnose Sucker provided the majority of biomass in small mesh index gill nets (46.24% and 42.02%, respectively).

8.6.2.3 Lower Nelson River Mainstem

A total of 286 fish representing eleven species were captured in standard gang index gill nets (Table 8.6-3). Northern Pike were most abundant (n = 80 fish; 27.97%), followed by Longnose Sucker (n = 57 fish; 19.93%) and Walleye (n = 46 fish; 16.08%) (Table 8.6-3; Figure 8.6-6).

In small mesh index gill nets, a total of 108 fish representing eight species were captured. Rainbow Smelt (n = 59 fish; 54.63%) and Emerald Shiner (n = 35 fish; 32.41%) were most common (Table 8.6-4; Figure 8.6-7).

Northern Pike (43.43%) represented the highest proportion of biomass in the standard gang index gillnet catch, followed by Lake Sturgeon (24.56%) (Table 8.6-5). Northern Pike (81.99%) also represented the bulk of the biomass in the small mesh index gill net catch (Table 8.6-6).

8.6.2.4 Hayes River

In the Hayes River in 2010, a total of 159 fish representing eight species were captured in standard gang index gill nets, whereas only 15 fish representing five species were captured in small mesh index gill nets (tables 3 and 4, respectively). Lake Sturgeon (n = 60 fish; 37.74%) and Walleye (n = 44 fish; 27.67%) were the most abundant species captured in standard gang index gill nets (Figure 8.6-6). Lake Sturgeon represented six of the fifteen fish captured in small mesh index gill nets (Table 8.6-4; Figure 8.6-7).

Standard gang index gill nets produced a total of 178,554g of biomass, primarily attributed to Lake Sturgeon (37.91% of the total) and Walleye (34.28%) (Table 8.6-5). Total biomass captured in small mesh index gill nets was 6,191g with Lake Sturgeon comprising 77.53% of the total (Table 8.6-6).

8.6.2.5 Assean Lake

A total of 742 fish representing seven species were captured in standard gang index gill nets set in Assean Lake. Walleye was the most common species captured (n = 315 fish; 42.45%), followed by Cisco (n = 163 fish; 21.97%) (Table 8.6-3; Figure 8.6-6). In small mesh index gill nets, 499 fish representing nine species were captured. Yellow Perch (n = 301 fish; 60.32%) was the most common species captured, followed by Spottail Shiner (n = 110 fish; 22.04%) (Table 8.6-4; Figure 8.6-7).

The total biomass captured in standard gang index gill nets was 430,356 g (Table 8.6-5). Most of the biomass in the standard gang index gillnet catch consisted of Walleye (41.11%), followed by Northern Pike (20.64%), White Sucker (18.98%) and Lake Whitefish (14.70%) (Table 8.6-5). In small mesh index gill nets, total biomass was 15,064 g, with Walleye comprising 59.02% and Northern Pike comprising 21.53% of the total (Table 8.6-6).

8.6.3 Catch Per Unit Effort (CPUE) and Biomass Per Unit Effort (BPUE)

8.6.3.1 Split Lake

The mean CPUE for the standard gang index gillnet catch in Split Lake was 32.0 fish/100 m of net/24 h (Table 8.6-7; Figure 8.6-8). Walleye had the highest CPUE (10.7) followed by White Sucker (9.1) (Table 8.6-7; Figure 8.6-9).

The mean CPUE for the small mesh index gillnet catch was 33.3 fish /30 m of net/24 h (Table 8.6-8; Figure 8.6-8). Spottail Shiner (12.7), Rainbow Smelt (10.0), and Troutperch (9.1) had the highest CPUE values (Table 8.6-8; Figure 8.6-9).

Mean BPUE for the standard gang index gillnet catch was 31,201 g (Table 8.6-9). BPUE was highest for White Sucker (10,591), followed by Walleye (9,723) and Northern Pike (5,320). The small mesh index gillnet catch had a mean BPUE of 586 g, with Walleye having the highest BPUE value (272) (Table 8.6-10).

8.6.3.2 Limestone Forebay

The mean CPUE for the standard gang index gillnet catch in the Limestone Forebay was 14.1 (Table 8.6-7; Figure 8.6-8). Longnose Sucker had the highest CPUE (7.2) (Table 8.6-7; Figure 8.6-9). In the small mesh index gillnet catch, the mean CPUE was 17.6 (Table 8.6-8; Figure 8.6-8). Troutperch had the highest CPUE (14.2) in the small mesh index gillnet catch (Table 8.6-8).

Mean BPUE for the standard gang index gillnet catch was 13,944 g with Northern Pike (5,901) and Longnose Sucker (5,223) having the highest BPUE values (Table 8.6-9). In small mesh index gill nets, mean BPUE was 137 g (Table 8.6-10). Troutperch (62) and Longnose Sucker (60) had the highest BPUE values.

8.6.3.3 Lower Nelson River Mainstem

In the lower Nelson River mainstem, the mean CPUE for the standard gang index gillnet catch was 26.5 (Table 8.6-7; Figure 8.6-8). Northern Pike had the highest mean CPUE (7.6), followed by Longnose Sucker (5.1) (Table 8.6-7; Figure 8.6-9).

In the small mesh index gillnet catch, the mean CPUE was 32.4 (Table 8.6-8; Figure 8.6-8). Rainbow Smelt (17.1) and Emerald Shiner (11.1) had the highest CPUE values of the small mesh index gillnet catch.

Mean BPUE was 33,490 g for the standard gang index gillnet catch (Table 8.6-9) and 1,538 g for the small mesh index gill net catch (Table 8.6-10). Northern Pike had the highest BPUE in both the standard gang and small mesh index gillnet catches at 14,703 g and 1,278 g, respectively.

8.6.3.4 Hayes River

In the Hayes River in 2010, the overall mean CPUE for standard gang index gill nets set at nine sites was 15.4 (Table 8.6-7; Figure 8.6-8). For the small mesh index gillnet catch, the overall mean CPUE was 5.1 (Table 8.6-8; Figure 8.6-8).

Lake Sturgeon had the highest CPUE values for both the standard gang and small mesh index gillnet catches (Table 8.6-7and 8; Figure 8.6-9).

Mean BPUE for standard gang index gill nets was 17,336 g (Table 8.6-9). Lake Sturgeon had the highest BPUE value of 6,807 g, followed by Walleye (5,895). Mean BPUE per site for small mesh index gill nets was 2,159 g with Lake Sturgeon having the highest value of 1,695 (Table 8.6-10).

8.6.3.5 *Assean Lake*

In Assean Lake, the overall mean CPUE was 63.4 in standard gang index gill nets (Table 8.6-7; Figure 8.6-8). Mean CPUE was highest for Walleye (28.0), followed by Cisco (14.0). In small mesh index gill nets, the overall mean CPUE was 141.3 (Table 8.6-8; Figure 8.6-8). Yellow Perch had the highest CPUE (90.0) of the small mesh index gillnet catch.

Mean BPUE for the standard gang index gill net catch was 36,346 g (Table 8.6-9). Walleye (15,855) had the highest BPUE followed by Northern Pike (7,240). Mean BPUE was 4,108 g for the small mesh index gill net catch, with Walleye (2,449) having the highest mean BPUE value (Table 8.6-10).

8.6.4 Size and Condition

Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies in 2010 were measured for fork length (mm) and weight (g) (Table 8.6-11). Condition factors were calculated for each species based on these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, and Walleye are illustrated in figures 10 - 13.

In general, fish captured in small mesh index gill nets were measured for fork length and weight (Table 8.6-12). In some instances, fish were bulked weighed only (i.e., no individual measurements).

8.6.4.1 *Split Lake*

Northern Pike captured in standard gang index gill nets had a mean fork length of 528 mm, a mean weight of 1,374 g, and a mean condition factor of 0.76 (Table 8.6-11). Fork length and weight were measured for two Northern Pike captured in small mesh index gill nets (Table 8.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 381 mm, a mean weight of 1,047 g, and a mean condition factor of 1.61 (Table 8.6-11). Lake Whitefish were not captured in small mesh index gill nets.

Walleye captured in standard gang index gill nets had a mean fork length of 398 mm, a mean weight of 926 g, and a mean condition factor of 1.27 (Table 8.6-11). Fork length and weight were measured for five Walleye captured in small mesh index gillnets (Table 8.6-12).

8.6.4.2 Limestone Forebay

Northern Pike captured in standard gang index gill nets had a mean fork length of 613 mm, a mean weight of 1,820 g, and a mean condition factor of 0.76 (Table 8.6-11). Only one Lake Whitefish was captured in a standard gang index gill net. Five Walleye were captured, and had a mean fork length, weight and condition factor of 498 mm, 1,660 g, and 1.33, respectively (Table 8.6-11).

Northern Pike, Lake Whitefish and Northern Pike were not captured in small mesh index gill nets (Table 8.6-12).

8.6.4.3 Lower Nelson River Mainstem

Northern Pike captured in standard gang index gill nets set in the lower Nelson River mainstem had a mean fork length of 608 mm, a mean weight of 1,923 g, and a mean condition factor of 0.76 (Table 8.6-11). Two Northern Pike were captured in small mesh index gill nets and bulk weighed (Table 8.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 397 mm, a mean weight of 942 g, and a mean condition factor of 1.40 (Table 8.6-11). Lake Whitefish were not captured in small mesh index gill nets (Table 8.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 415 mm, a mean weight of 1,018 g, and a mean condition factor of 1.29 (Table 8.6-11). Fork length and weight were measured for one Walleye captured in a small mesh index gill net (Table 8.6-12).

8.6.4.4 Hayes River

Northern Pike captured in standard gang index gill nets set in the Hayes River in 2010 had a mean fork length of 620 mm, a mean weight of 1,916 g, and a mean condition factor of 0.72 (Table 8.6-11). Lake Whitefish had a mean fork length of 334 mm, a mean weight of 561 g, and a mean condition factor of 1.48. The walleye catch had a mean fork length of 481 mm, a mean weight of 1,391 g, and a mean condition factor of 1.13. There were an insufficient number of fish captured and/or measured in small mesh index gill nets to warrant analyses based on size metrics.

8.6.4.5 Assean Lake

Northern Pike captured in standard gang index gill nets set in Assean Lake had a mean fork length of 543 mm, a mean weight of 1,154 g, and a mean condition factor of 0.64 (Table 8.6-11).

Fork length and weight were measured for eight Northern Pike captured in small mesh index gill nets, with mean values of 336 mm, 406 g, and 0.72 (Table 8.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 343 mm, a mean weight of 801 g, and a mean condition factor of 1.58 (Table 8.6-11). Size was measured for two Lake Whitefish captured in small mesh index gill nets, while three additional Lake Whitefish were bulk weighed (Table 8.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 365 mm, a mean weight of 562 g, and a mean condition factor of 1.09 (Table 8.6-11). Size and condition factor was determined for 17 Walleye captured in small mesh index gill nets. Mean fork length, weight and condition factor for these fish were 357 mm, 523 g and 1.10, respectively (Table 8.6-12).

8.6.5 Age Composition

Age frequency distributions were calculated for Northern Pike (Table 8.6-13), Lake Whitefish (Table 8.6-14) and Walleye (Table 8.6-15) captured in standard gang index gill nets set in the Lower Nelson River Region waterbodies during 2010.

Mean fork length (mm), weight (g) and condition factor are also presented, by cohort, for Northern Pike (Table 8.6-16), Lake Whitefish (Table 8.6-17) and Walleye (Table 8.6-18).

8.6.5.1 Split Lake

Age was determined for 74 Northern Pike captured in standard gang index gill nets set in Split Lake in 2010 (Table 8.6-13). With the exception of the 12-year old age class, all cohorts from age two through age 15 were represented in the sample. The majority of Northern Pike ranged from three to six years of age.

Ages were determined for 20 Lake Whitefish captured in Split Lake in 2010 (Table 8.6-14). Lake Whitefish of age 7-years were most common in the sample, however no trends in cohort strength were evident.

Ages were determined for 169 Walleye captured in standard gang index gill nets (Table 8.6-15). The majority of Walleye ranged in age from 2 – 9 years, with 7-year old fish most abundant in the sample.

8.6.5.2 Limestone Forebay

Age was determined for 40 Northern Pike captured in standard gang index gill nets set in the Limestone Forebay in 2010 (Table 8.6-13). Northern Pike ranged from 3 – 9 years of age, with 6-year old fish most abundant.

Few Lake Whitefish and Walleye were captured in the Limestone Forebay in 2010 (tables 14 and 15, respectively). Trends in cohort strength could not be determined.

8.6.5.3 Lower Nelson River Mainstem

Ages were determined for 77 Northern Pike captured in the lower Nelson River mainstem (Table 8.6-13). Aged fish ranged from three to 14 years with strong representation by five to seven-year olds.

Ages were determined for 23 Lake Whitefish. Ages ranged from five to 22 years. No cohort was particularly dominant within the sample (Table 8.6-14).

Ages were determined for 46 Walleye captured in the lower Nelson River mainstem. Walleye ranged in age from 2 – 15 years, with 7- and 8-year old Walleye most abundant.

8.6.5.4 Hayes River

Few Northern Pike and Lake Whitefish were captured in the Hayes River in 2010 (tables 13 and 14, respectively). Ages were determined for 44 captured Walleye. Although captured Walleye ranged in age from 4 – 26 years, no cohort was particularly dominant in the sample (Table 8.6-15).

8.6.5.5 Assean Lake

Ages were determined for 73 Northern Pike captured in Assean Lake in 2010 (Table 8.6-13). Aged fish ranged from 2 – 10 years old, with strong representation by 4 – 7-year olds.

Ages were determined for 78 Lake Whitefish captured in Assean Lake (Table 8.6-14). The majority of aged Lake Whitefish ranged from 2 – 6 years of age.

Ages were determined for 261 Walleye captured in Assean Lake (Table 8.6-15). Walleye aged 4 – 12 years were well represented in the sample, with the exception of the 6-year old age class which was relatively less common.

8.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

All Lake Sturgeon, White Sucker, Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies in 2010 were examined externally for DELTs (Table 8.6-19).

8.6.6.1 Split Lake

In Split Lake, DELTs were documented on two of 452 inspected fish (Table 8.6-19). One Walleye with a tumour (0.35%) and one Northern Pike with a deformity (1.35%) were documented.

8.6.6.2 Limestone Forebay

DELTs were documented on four of 61 fish captured in the Limestone Forebay. All DELTs were observed on Northern Pike and included one deformity, two erosions and one lesion.

8.6.6.3 Lower Nelson River Mainstem

In the lower Nelson River mainstem, DELTs were documented on two of 213 fish. Both DELTs were observed on Northern Pike, including one deformity and one erosion.

8.6.6.4 Hayes River

Four of the 137 fish captured in the Hayes River were determined to have DELTs. Lesions were observed on one White Sucker and one Lake Whitefish. Two Walleye were determined to have DELTs; one deformity and one tumour.

8.6.6.5 Assean Lake

In Assean Lake, DELTs were identified on nine of 564 captured fish. DELTs were documented on six Walleye (1.90%) and three White Suckers (3.23%). Four Walleye had deformities and two White Suckers had lesions.

8.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in the Lower Nelson River Region during Year 3 of CAMPP. Waterbodies sampled include Split Lake (21-25 August), the Limestone Forebay (13-16 July), the lower Nelson River downstream of the Limestone GS (6-9 August), and two off-system waterbodies, the Hayes River (19-21 July) and Assean Lake (13-19 August). Standard nets were set at 12 sites in Split Lake (Figure 8.7-1) and at 9 sites each in the Limestone Forebay (Figure 8.7-2), the Nelson River (Figure 8.7-3), the

Hayes River (Figure 8.7-4), and Assean Lake (Figure 8.7-5) of which 8, 4, 8, 9, and 9 sites, respectively, yielded fish for mercury analysis. Small mesh nets were set at 4 sites in Split Lake and 3 sites at all other waterbodies, but only fish from one site each at the Hayes River and Assean Lake were used for mercury analysis (Figures 8.7-1 to 8.7-5).

8.7.1 Species Comparisons

A total of 373 fish were analyzed for mercury, including one Lake Sturgeon each from the Nelson and Hayes rivers that represented accidental mortalities (Table 8.7-1). No Yellow Perch of suitable size were captured from the waterbodies of the Region. Except for Assean Lake, the number of Lake Whitefish available for mercury analysis was substantially lower than the target sample size of 36 fish for large-bodied species (Table 8.7-1). Additionally, only five Walleye were available for mercury analysis from the Limestone Forebay, whereas Walleye sample size was at or close to the target size for all other waterbodies. The numbers of Northern Pike captured for mercury analysis from Split Lake and the Hayes River, respectively, were substantially lower than the target sample size (Table 8.7-1).

A significant positive relationship between mercury concentration and fish length existed for all species with a sample size of five or more fish (Figure 8.7-7). The significant relationships between fish mercury concentration and fork length indicated that standardization of concentrations was necessary for comparative purposes. Except for Lake Whitefish, Northern Pike, and Walleye from Assean Lake, standard concentrations were often substantially lower than the corresponding arithmetic concentrations, reflecting the fact that the mean lengths for these three species were generally larger than the respective standard lengths (Table 8.7-2). This pattern was particularly pronounced for Lake Whitefish from the lower Nelson River and Walleye from the Hayes River.

Arithmetic mean mercury concentrations of Walleye were significantly lower than those of Northern Pike in Split Lake whereas the reverse pattern existed for the Hayes River, where mercury levels in Walleye were almost triple that of Northern Pike (Table 8.7-1). In addition to the small sample size for Hayes River Northern Pike, which may have resulted in an inadequate representation of the population mean, biological metrics may help to explain the above discrepancy in the relationship of mercury concentrations between the two piscivorous species. For Split Lake, Walleye were slightly younger than Northern Pike, but for the Hayes River, Walleye were almost twice the age of Northern Pike (Table 8.7-2). Mercury concentrations in the two piscivorous species were always several times higher than in Lake Whitefish. However, the percentage differences in mercury levels between the two piscivores and Lake Whitefish were relatively low, particularly for Split Lake and the lower Nelson River (Table 8.7-1).

8.7.2 Comparison to Consumption Guidelines

Standard concentrations of all species from all five waterbodies were generally substantially below 0.5 ppm (Table 8.7-1; Figure 8.7-8), the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b). With 0.46 ppm mercury, only Walleye from the Hayes River were close to the Health Canada standard. Concentrations in the remaining populations of the two piscivorous species ranged between 0.20 and 0.29 ppm, at or only slightly exceeding the 0.2 ppm guideline for human consumption (see section 4.8.2.3). With standard concentrations of 0.04-0.07 ppm, Lake Whitefish from all waterbodies remained substantially below the guideline value.

Based on individual concentrations, approximately 20% each of all Northern Pike and Walleye analyzed from the Region exceeded 0.5 ppm mercury. For Walleye, approximately 70% of these fish were captured in the Hayes River, for which 64% of all individuals had concentrations above 0.5 ppm and all fish exceeded 0.2 ppm. Northern Pike exceeding 0.5 ppm mercury were captured from all waterbodies at approximately equal proportions, except from the Hayes River, where no Northern Pike had a concentration higher than the Health Canada standard. Overall, almost 80% of the Northern Pike and more than 70% of the Walleye from the Region had mercury levels above 0.2 ppm. Conversely, just over 10% of Lake Whitefish from the Region exceeded concentrations of 0.2 ppm; almost all of these were captured from the lower Nelson River. This location also yielded the only Lake Whitefish with a concentration above 0.5 ppm mercury. Except for 20 Lake Whitefish and three Northern Pike, mostly from Assean Lake, all fish analyzed from the lower Nelson River Region exceeded a total mercury concentration of 0.033 ppm, the Canadian and Manitoba tissue residue guideline for methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; updated to 2013; MWS 2011). The three Northern Pike were 1-year olds.

SECTION 8: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 8.3-1. Summary statistics for *in situ* variables (near surface) measured in the Lower Nelson River Region: 2010/2011.

	Temperature (°C)						*In situ* pH						DO (mg/L)						DO (% Saturation)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	12.20	11.39	11.58	11.44	11.87	12.50	8.19	8.21	8.27	8.26	8.20	8.21	11.72	11.26	11.86	11.85	10.48	11.41	108	102	107	106	95	105
Median	14.74	13.91	13.28	13.21	14.25	14.93	8.23	8.19	8.24	8.22	8.25	8.27	10.68	10.19	11.00	11.03	10.12	10.09	106	99	105	104	96	101
Minimum	-0.08	-0.08	-0.09	-0.09	-0.08	1.00	7.94	7.39	8.10	8.10	7.90	7.80	9.10	9.09	8.98	8.91	9.11	8.82	99	96	98	95	91	95
Maximum	19.41	17.84	19.84	19.44	19.05	19.16	8.37	9.06	8.48	8.48	8.40	8.49	16.42	15.56	16.44	16.44	12.55	16.62	120	114	119	119	99	125
SD	7.39	7.02	7.26	8.24	7.63	7.02	0.18	0.59	0.14	0.16	0.19	0.28	2.80	2.55	2.78	3.22	1.43	3.06	9	7	8	10	3	12
SE	4.27	4.05	4.19	4.12	4.40	4.05	0.10	0.34	0.08	0.08	0.11	0.16	1.62	1.47	1.60	1.61	0.83	1.76	5	4	5	5	2	7
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-1. - continued -

	In situ Specific Conductance (µS/cm)						*In situ* Turbidity (NTU)						ORP (mV)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	122	272	257	233	160	255	52.0	43.1	37.1	65.6	10.5	13.8	176	223	180	176	182	184
Median	125	277	258	240	163	235	46.7	45.8	37.6	39.7	5.4	14.1	178	234	175	169	184	184
Minimum	105	214	215	212	134	224	38.8	22.6	27.1	27.4	1.4	0.8	78	155	144	140	131	97
Maximum	132	319	298	247	178	325	76.0	58.3	45.9	155.7	30.0	26.1	270	268	226	226	227	271
SD	10	38	32	19	17	41	14.5	14.2	7.5	60.6	11.4	11.3	70	43	31	38	40	64
SE	6	22	18	11	10	24	8.3	8.2	4.3	30.3	6.6	6.5	40	25	18	19	23	37
N	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-1. - continued -

	Secchi Disk Depth- Open-Water Period (m)						Calculated Euphotic Depth (m)						Estimated Euphotic Depth (m)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.35	0.44	0.43	-	1.12	0.94	0.70	0.87	0.87	-	2.24	1.88	0.50	0.91	0.90	-	2.24	1.88
Median	0.35	0.46	0.45	-	1.12	0.62	0.70	0.91	0.90	-	2.24	1.24	0.50	1.00	1.00	-	2.24	1.25
Minimum	0.35	0.29	0.35	-	1.12	0.45	0.70	0.58	0.70	-	2.24	0.90	0.50	0.60	0.70	-	2.24	0.90
Maximum	0.35	0.56	0.50	-	1.12	1.75	0.70	1.12	1.00	-	2.24	3.50	0.50	1.12	1.00	-	2.24	3.50
SD	-	0.14	0.08	-	-	0.71	-	0.27	0.15	-	-	1.41	-	0.27	0.17	-	-	1.41
SE	-	0.08	0.04	-	-	0.41	-	0.16	0.09	-	-	0.82	-	0.16	0.10	-	-	0.81
N	1	3	3	0	1	3	1	3	3	0	1	3	1	3	3	0	1	3

Table 8.3-2. Summary statistics for routine laboratory variables measured in the Lower Nelson River Region: 2010/2011.

	Total Alkalinity ($CaCO_3$ mg/L)						Bicarbonate Alkalinity (HCO_3 mg/L)						Carbonate Alkalinity (CO_3 mg/L)						Ammonia (mg N/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	58.2	92.5	90.6	90.7	81.5	134	71.0	112	110	111	98.3	160	<0.60	0.77	<0.60	<0.60	0.77	1.73	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Median	58.9	91.7	94.1	94.3	82.6	125	71.9	111	115	115	100	148	<0.60	<0.60	<0.60	<0.60	<0.60	1.87	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Minimum	51.0	87.2	77.0	76.9	68.0	118	62.2	103	93.9	93.9	83.0	141	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.010	<0.010	<0.050	<0.010	<0.010	<0.010
Maximum	64.0	99.2	97.2	97.3	92.6	167	78.1	121	119	119	110	204	<0.60	1.70	<0.60	<0.60	1.64	2.88	<0.050	<0.050	0.088	<0.050	<0.050	<0.050
SD	4.7	4.5	8.2	9.6	8.8	20	5.7	7	10.1	11.8	9.8	26	-	0.57	-	-	0.55	1.00	-	0.012	0.028	0.010	-	0.008
SE	2.7	2.6	4.7	4.8	5.1	11	3.3	4	5.8	5.9	5.7	15	-	0.33	-	-	0.32	0.58	-	0.007	0.016	0.005	-	0.005
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-2. - continued -

	Nitrate/Nitrite (mg N/L)						TKN (mg/L)						DIN (mg/L) [1]						Organic Nitrogen (mg/L) [1]					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	<0.050	0.058	0.059	0.059	<0.050	<0.050	0.32	0.47	0.39	0.40	0.37	0.40	<0.050	0.071	0.094	0.065	<0.050	<0.050	0.31	0.45	0.34	0.39	0.36	0.38
Median	<0.050	<0.050	<0.050	0.046	<0.050	<0.050	0.32	0.45	0.37	0.42	0.35	0.40	<0.050	0.066	0.106	0.051	<0.050	<0.050	0.30	0.42	0.33	0.40	0.34	0.39
Minimum	<0.0050	<0.050	<0.050	0.025	<0.0050	<0.0050	0.24	0.38	0.34	0.30	0.28	0.34	<0.010	<0.050	<0.050	<0.050	<0.010	<0.010	0.24	0.37	0.25	0.30	0.28	0.32
Maximum	0.060	0.117	0.118	0.118	0.0507	0.0550	0.40	0.59	0.47	0.47	0.50	0.45	0.065	0.129	0.139	0.133	0.056	0.069	0.40	0.57	0.46	0.46	0.50	0.44
SD	0.022	0.038	0.035	0.042	0.0199	0.0215	0.06	0.09	0.05	0.07	0.09	0.04	0.023	0.037	0.046	0.048	0.021	0.026	0.06	0.08	0.08	0.07	0.08	0.05
SE	0.013	0.022	0.020	0.021	0.0115	0.0124	0.04	0.05	0.03	0.04	0.05	0.02	0.013	0.022	0.027	0.024	0.012	0.015	0.04	0.04	0.04	0.03	0.05	0.03
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-2. - continued -

	TN (mg/L) [1]						TDP (mg/L)						TPP (mg/L)						TP (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.34	0.52	0.44	0.46	0.39	0.42	0.0101	0.0263	0.0226	0.0209	0.0038	0.0075	0.0172	0.0191	0.0221	0.0245	<0.014	<0.014	0.0329	0.0454	0.0447	0.0454	0.0128	0.0197
Median	0.36	0.51	0.40	0.46	0.39	0.40	0.0097	0.0275	0.0244	0.0223	0.0040	0.0069	0.0172	0.0190	0.0222	0.0238	<0.014	<0.014	0.0330	0.0474	0.0481	0.0503	0.0131	0.0226
Minimum	0.24	0.46	0.38	0.33	0.28	0.37	0.0060	0.0213	0.0134	0.0109	0.0025	0.0021	<0.0030	0.0137	0.0183	0.0138	<0.0030	<0.0030	0.0208	0.0350	0.0317	0.0247	0.0086	0.0063
Maximum	0.41	0.62	0.59	0.59	0.50	0.51	0.0150	0.0288	0.0280	0.0280	0.0048	0.0140	0.0329	0.0248	0.0257	0.0368	<0.014	0.0157	0.0449	0.0518	0.0507	0.0562	0.0163	0.0274
SD	0.06	0.06	0.08	0.10	0.08	0.06	0.0036	0.0029	0.0055	0.0075	0.0010	0.0049	0.0114	0.0048	0.0030	0.0099	0.0035	0.0053	0.0088	0.0070	0.0076	0.0142	0.0035	0.0084
SE	0.04	0.03	0.05	0.05	0.05	0.03	0.0021	0.0017	0.0032	0.0038	0.0006	0.0028	0.0066	0.0028	0.0018	0.0050	0.0020	0.0031	0.0051	0.0040	0.0044	0.0071	0.0020	0.0048
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-2. - continued -

	TN:TP[1]						DIN:DP[1]						DIN:TP [1]						DOC (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	25	27	23	25	73	63	5	6	9	7	13	10	2	3	4	3	5	4	8.4	9.4	9.2	9.1	10.3	10.5
Median	20	24	23	23	81	47	5	5	9	6	13	7	2	3	5	2	3	4	7.7	9.3	8.6	8.6	9.6	9.9
Minimum	18	19	17	14	38	30	2	3	4	3	2	1	0	2	2	2	1	0	7.1	8.2	7.8	7.8	9.1	8.6
Maximum	41	39	29	41	93	128	10	10	13	11	26	26	4	7	6	6	14	9	11.1	11.0	11.8	11.6	12.8	13.4
SD	9	7	5	12	22	39	3	3	3	3	11	10	1	2	2	2	6	4	1.6	1.1	1.6	1.7	1.5	1.9
SE	5	4	3	6	13	23	2	2	2	2	6	6	1	1	1	1	3	2	0.9	0.6	0.9	0.9	0.9	1.1
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-2. - continued -

	TOC (mg/L)						TIC (mg/L)						TOC:ON[1]						TOC:TN[1]					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	8.7	9.5	9.4	9.5	10.2	10.7	13.1	20.5	21.0	21.1	20.1	31.0	33	26	34	29	34	32	30	22	26	25	31	30
Median	8.1	9.5	8.9	9.1	9.6	10.0	13.2	20.4	21.3	21.5	19.8	29.0	35	26	28	29	34	32	31	21	24	25	30	29
Minimum	7.3	8.4	8.0	8.2	9.2	8.8	12.0	18.0	18.2	18.1	19.2	26.6	28	18	25	24	29	29	24	17	19	19	26	28
Maximum	11.3	10.7	11.9	11.7	12.4	13.9	14.0	23.1	23.2	23.2	21.7	39.4	37	32	55	35	39	37	35	27	35	30	38	32
SD	1.5	0.9	1.6	1.6	1.3	2.0	0.8	2.2	1.8	2.2	1.0	5.0	4	5	12	6	5	3	4	4	6	6	5	2
SE	0.9	0.5	0.9	0.8	0.8	1.2	0.5	1.3	1.1	1.1	0.5	2.9	2	3	7	3	3	2	2	2	4	3	3	1
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-2. - continued -

	TDS (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	76.2	171	171	163	97.5	141
Median	75.4	168	182	175	99.0	124
Minimum	58.0	154	126	110	80.0	107
Maximum	96.0	192	196	190	112	210
SD	13.5	14	27	36	13.1	42
SE	7.8	8	15	18	7.5	24
N	4	4	4	4	4	4

	Laboratory Conductivity (µmhos/cm)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	121	282	268	268	158	248
Median	122	282	281	281	160	233
Minimum	107	271	216	215	134	224
Maximum	133	294	294	294	176	301
SD	9	11	31	37	15	32
SE	5	6	18	18	9	18
N	4	4	4	4	4	4

	TSS (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	15.1	14.2	9.7	11.2	5.5	5.6
Median	15.6	14.6	9.7	10.1	5.0	5.0
Minimum	9.2	6.4	6.8	8.8	<2.0	<2.0
Maximum	20.0	21.2	12.8	16.0	10.8	11.2
SD	4.1	5.3	2.1	3.3	3.5	3.8
SE	2.4	3.0	1.2	1.6	2.0	2.2
N	4	4	4	4	4	4

	Laboratory Turbidity (NTU)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	24.9	19.0	17.5	17.9	3.70	6.61
Median	25.9	18.4	18.5	18.5	2.57	6.63
Minimum	16.4	12.9	13.2	13.3	1.29	1.50
Maximum	31.2	26.3	19.9	21.3	8.36	11.7
SD	5.40	4.96	2.57	3.3	2.76	4.66
SE	3.12	2.86	1.48	1.7	1.59	2.69
N	4	4	4	4	4	4

Table 8.3-2. - continued –

	True Colour (TCU)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	26.7	21.6	19.5	17.5	23.3	24.1
Median	25.8	20.5	19.6	17.1	19.5	23.5
Minimum	15.3	15.3	15.6	13.4	16.4	11.0
Maximum	39.7	30.0	23.2	22.6	37.7	38.2
SD	10.8	5.8	2.7	4.1	8.4	11.4
SE	6.3	3.3	1.6	2.1	4.9	6.6
N	4	4	4	4	4	4

	Laboratory pH					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	8.12	8.27	8.19	8.19	8.16	8.33
Median	8.13	8.29	8.21	8.21	8.21	8.36
Minimum	8.03	8.14	8.09	8.09	7.88	8.21
Maximum	8.18	8.37	8.24	8.24	8.34	8.40
SD	0.06	0.08	0.06	0.07	0.18	0.08
SE	0.04	0.05	0.03	0.03	0.11	0.04
N	4	4	4	4	4	4

	E. coli (CFU/100 mL)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	15	2	1	1	<1	<1
Median	10	<1	<1	<1	<1	<1
Minimum	<1	<1	<1	<1	<1	<1
Maximum	39	7	4	4	<1	<1
SD	15	3	2	2	-	-
SE	9	2	1	1	-	-
N	4	4	4	4	4	4

	Chlorophyll *a* (µg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.86	2.93	1.79	1.49	0.94	1.34
Median	0.84	2.88	1.79	1.84	1.06	1.16
Minimum	<0.60	<0.60	<0.60	<0.60	<0.60	0.83
Maximum	1.44	5.65	3.29	2.32	1.46	2.23
SD	0.47	2.54	1.06	1.06	0.48	0.55
SE	0.33	1.46	0.61	0.61	0.34	0.32
N	3	4	4	3	3	4

Table 8.3-2. - continued –

	Hardness as $CaCO_3$ (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	61.6	117	110	113	86.2	135
Median	61.7	115	115	119	85.6	127
Minimum	51.6	107	84.7	87.9	77.4	115
Maximum	71.2	129	126	126	96.1	173
SD	7.1	10	15.3	17.2	7.5	22
SE	4.1	6	8.9	8.6	4.3	13
N	4	4	4	4	4	4

	Chloride (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	1.11	17.8	16.7	16.5	1.10	1.03
Median	1.11	17.9	17.6	17.6	1.05	1.04
Minimum	0.98	16.4	12.7	12.2	0.71	0.82
Maximum	1.24	18.9	18.7	18.7	1.60	1.22
SD	0.10	0.9	2.4	3.0	0.38	0.16
SE	0.06	0.5	1.4	1.5	0.22	0.09
N	4	4	4	4	4	4

	Sulphate (mg/L)					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	3.39	23.5	22.3	22.1	1.53	2.09
Median	2.73	23.3	23.2	23.1	<0.50	1.35
Minimum	2.59	21.8	17.2	16.5	<0.50	1.07
Maximum	5.50	25.4	25.5	25.6	5.00	4.60
SD	1.23	1.3	3.4	4.2	2.01	1.46
SE	0.71	0.8	1.9	2.1	1.16	0.84
N	4	4	4	4	4	4

[1] Calculated.

Table 8.3-3. Summary statistics for metals and major ions measured in the Lower Nelson River Region: 2010/2011. Values are presented as mg/L.

	Aluminum					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	1.16	0.719	0.876	1.04	0.137	0.306
Median	1.16	0.659	0.924	0.987	0.104	0.270
Minimum	0.843	0.447	0.404	0.879	0.052	0.111
Maximum	1.46	1.11	1.25	1.29	0.290	0.571
SD	0.224	0.246	0.312	0.180	0.093	0.188
SE	0.129	0.142	0.180	0.090	0.054	0.109
N	4	4	4	4	4	4

	Antimony					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Median	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.00022	<0.00020	0.00025	0.00022	<0.00020	<0.00020
SD	0.00005	-	0.00006	0.00006	-	-
SE	0.00003	-	0.00004	0.00003	-	-
N	4	4	4	4	4	4

	Arsenic					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.00046	0.00143	0.00130	0.00136	0.00052	0.00073
Median	0.00046	0.00148	0.00142	0.00146	0.00052	0.00079
Minimum	0.00036	0.00115	0.00083	0.00093	0.00039	0.00052
Maximum	0.00056	0.00160	0.00153	0.00160	0.00065	0.00082
SD	0.00007	0.00018	0.00028	0.00032	0.00010	0.00012
SE	0.00004	0.00011	0.00016	0.00016	0.00006	0.00007
N	4	4	4	4	4	4

	Barium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.0201	0.0333	0.0336	0.0352	0.00890	0.0148
Median	0.0209	0.0325	0.0356	0.0370	0.00857	0.0155
Minimum	0.0174	0.0273	0.0223	0.0259	0.00826	0.0105
Maximum	0.0211	0.0409	0.0410	0.0410	0.01020	0.0177
SD	0.0015	0.0050	0.0071	0.0066	0.00076	0.0027
SE	0.0009	0.0029	0.0041	0.0033	0.00044	0.0015
N	4	4	4	4	4	4

Table 8.3-3. - continued -

	Beryllium						Bismuth						Boron						Cadmium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.010	0.025	0.020	0.021	<0.010	<0.010	0.000015	<0.000010	0.000014	<0.000010	0.000021	0.000012
Median	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.012	0.024	0.022	0.023	<0.010	<0.010	0.000013	<0.000010	0.000011	<0.000010	0.000016	0.000012
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.010	0.022	0.013	0.014	<0.010	<0.010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Maximum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.013	0.031	0.025	0.023	<0.010	<0.010	0.000029	0.000019	0.000028	0.000015	0.000045	0.000020
SD	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.004	0.004	0.004	-	-	0.000009	0.000006	0.000009	0.000005	0.000017	0.000005
SE	-	-	-	-	-	-	-	-	-	-	-	-	0.002	0.002	0.003	0.002	-	-	0.000005	0.000003	0.000005	0.000003	0.000010	0.000003
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued -

	Calcium						Cesium						Chromium						Cobalt					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	16.5	28.2	27.2	27.9	26.1	42.2	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0017	<0.0010	0.0012	0.0015	<0.0010	<0.0010	0.00044	0.00029	0.00030	0.00036	<0.00020	<0.00020
Median	16.5	28.1	28.3	29.4	26.0	39.2	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0018	<0.0010	0.0013	0.0015	<0.0010	<0.0010	0.00045	0.00028	0.00036	0.00038	<0.00020	<0.00020
Minimum	13.8	26.4	21.4	22.0	23.4	36.3	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0012	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.00034	0.00021	<0.00020	0.00028	<0.00020	<0.00020
Maximum	19.2	30.0	30.8	30.8	29.1	54.3	0.00013	<0.00010	0.00010	0.00010	<0.00010	<0.00010	0.0019	0.0015	0.0016	0.0017	<0.0010	<0.0010	0.00052	0.00039	0.00040	0.00040	<0.00020	<0.00020
SD	1.9	1.7	3.5	4.1	2.3	7.2	0.00003	-	0.00002	0.00003	-	-	0.0003	0.0004	0.0004	0.0003	-	-	0.00006	0.00007	0.00012	0.00005	-	-
SE	1.1	1.0	2.0	2.1	1.3	4.2	0.00002	-	0.00001	0.00001	-	-	0.0002	0.0002	0.0002	0.0001	-	-	0.00004	0.00004	0.00007	0.00003	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued -

	Copper						Iron						Lead						Lithium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.0020	0.0021	0.0028	0.0030	0.0040	0.0019	0.948	0.567	0.664	0.806	0.211	0.242	0.000563	0.000337	0.000639	0.000666	0.000166	0.000361	0.0046	0.0088	0.0086	0.0082	<0.0020	<0.0020
Median	0.0021	0.0021	0.0024	0.0028	0.0008	0.0019	0.963	0.530	0.727	0.812	0.167	0.258	0.000558	0.000327	0.000636	0.000635	0.000124	0.000310	0.0045	0.0089	0.0092	0.0088	<0.0020	<0.0020
Minimum	0.0017	0.0019	0.0018	0.0019	0.0006	0.0017	0.705	0.322	0.309	0.638	0.102	0.069	0.000476	0.000293	0.000441	0.000432	<0.000090	<0.000090	0.0040	0.0074	0.0060	0.0061	<0.0020	<0.0020
Maximum	0.0022	0.0022	0.0045	0.0045	0.0135	0.0023	1.16	0.887	0.894	0.961	0.408	0.385	0.000661	0.000401	0.000843	0.000962	0.000371	0.000778	0.0054	0.0101	0.0099	0.0092	0.0020	0.0025
SD	0.0002	0.0001	0.0010	0.0011	0.0055	0.0002	0.162	0.205	0.221	0.133	0.121	0.120	0.000081	0.000040	0.000190	0.000264	0.000135	0.000267	0.0006	0.0010	0.0015	0.0014	0.0004	0.0006
SE	0.0001	0.0001	0.0006	0.0006	0.0032	0.0001	0.093	0.118	0.127	0.067	0.070	0.069	0.000047	0.000023	0.000110	0.000132	0.000078	0.000154	0.0003	0.0006	0.0009	0.0007	0.0003	0.0004
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued –

	Magnesium						Manganese						Mercury						Molybdenum					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	4.97	11.2	10.3	10.5	5.10	7.21	0.0207	0.0166	0.0153	0.0178	0.0212	0.0210	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	0.00060	0.00059	0.00060	<0.00020	<0.00020
Median	5.03	10.9	10.8	11.2	5.06	6.97	0.0189	0.0170	0.0167	0.0185	0.0239	0.0186	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	0.00059	0.00063	0.00064	<0.00020	<0.00020
Minimum	4.16	9.73	7.61	8.0	4.59	5.82	0.0177	0.0129	0.0085	0.0120	0.00321	0.00534	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00020	0.00050	0.00041	0.00043	<0.00020	<0.00020
Maximum	5.67	13.1	11.9	11.9	5.68	9.07	0.0273	0.0193	0.0195	0.0220	0.0337	0.0417	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00021	0.00071	0.00068	0.00067	<0.00020	<0.00020
SD	0.56	1.41	1.64	1.7	0.43	1.19	0.0039	0.0025	0.0041	0.0046	0.0122	0.0131	-	-	-	-	-	-	0.00005	0.00007	0.00011	0.00011	-	-
SE	0.32	0.82	0.95	0.9	0.25	0.69	0.0022	0.0015	0.0024	0.0023	0.0070	0.0076	-	-	-	-	-	-	0.00003	0.00004	0.00006	0.00006	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued –

	Nickel						Potassium						Rubidium						Selenium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	1.43	2.75	2.63	2.73	0.612	0.881	0.00338	0.00267	0.00291	0.00321	0.00112	0.00115	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Median	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	1.39	2.73	2.80	2.89	0.598	0.905	0.00349	0.00269	0.00310	0.00321	0.00109	0.00122	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	1.31	2.49	1.94	2.16	0.530	0.705	0.00292	0.00191	0.00183	0.00272	0.00100	0.00068	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	0.0022	<0.0020	0.0022	0.0022	<0.0020	<0.0020	1.63	3.04	2.96	2.96	0.721	1.01	0.00363	0.00339	0.00363	0.00372	0.00131	0.00149	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
SD	0.0006	-	0.0005	0.0006	-	-	0.13	0.24	0.40	0.38	0.070	0.111	0.00028	0.00053	0.00066	0.00041	0.00012	0.00032	-	-	-	-	-	-
SE	0.0003	-	0.0003	0.0003	-	-	0.08	0.14	0.23	0.19	0.040	0.064	0.00016	0.00031	0.00038	0.00021	0.00007	0.00019	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued –

	Silicon						Silver						Sodium						Strontium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	4.27	3.46	3.85	4.52	1.94	2.78	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	3.34	15.6	12.8	12.8	1.98	2.50	0.0394	0.0929	0.0909	0.0921	0.0348	0.0544
Median	4.41	3.80	4.11	4.33	1.99	2.76	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	3.33	15.1	12.9	12.9	1.80	2.45	0.0391	0.0897	0.0943	0.0966	0.0341	0.0501
Minimum	3.45	2.10	1.66	3.46	1.20	1.63	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	3.07	14.4	9.60	9.78	1.70	2.01	0.0359	0.0832	0.0669	0.0671	0.0316	0.0463
Maximum	4.83	4.16	5.52	5.95	2.58	3.97	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	3.61	17.7	15.9	15.7	2.61	3.09	0.0437	0.109	0.108	0.1080	0.0395	0.0711
SD	0.52	0.80	1.47	1.11	0.49	0.83	-	-	-	-	-	-	0.20	1.3	2.78	3.1	0.37	0.39	0.0030	0.0106	0.0149	0.0176	0.0030	0.0098
SE	0.30	0.46	0.85	0.55	0.28	0.48	-	-	-	-	-	-	0.11	0.7	1.60	1.5	0.21	0.22	0.0017	0.0061	0.0086	0.0088	0.0017	0.0056
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued –

	Tellurium						Thallium						Thorium						Tin					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00047	0.00024	0.00029	0.00034	<0.00010	<0.00010	0.00043	0.00042	0.00024	0.00024	<0.00020	<0.00020
Median	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00049	0.00025	0.00031	0.00033	<0.00010	<0.00010	0.00026	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00034	0.00013	0.00015	0.00031	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00054	0.00033	0.00037	0.00039	<0.00010	0.00014	0.00112	0.00138	0.00067	0.00067	0.00026	0.00036
SD	-	-	-	-	-	-	-	-	-	-	-	-	0.00008	0.00007	0.00008	0.00003	-	0.00004	0.00042	0.00055	0.00025	0.00029	0.00007	0.00011
SE	-	-	-	-	-	-	-	-	-	-	-	-	0.00004	0.00004	0.00005	0.00002	-	0.00002	0.00024	0.00032	0.00014	0.00014	0.00004	0.00007
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued –

	Titanium						Tungsten						Uranium						Vanadium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	0.0439	0.0255	0.0320	0.0388	0.0062	0.0085	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00019	0.00059	0.00057	0.00059	0.00013	0.00030	0.00210	0.00208	0.00216	0.00245	0.00047	0.00098
Median	0.0442	0.0254	0.0340	0.0381	0.0056	0.0078	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00018	0.00055	0.00057	0.00061	0.00014	0.00027	0.00214	0.00215	0.00240	0.00261	0.00046	0.00102
Minimum	0.0344	0.0143	0.0148	0.0336	0.0021	0.0035	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00015	0.00047	0.00044	0.00045	<0.00010	0.00024	0.00163	0.00149	0.00115	0.00180	0.00026	0.00057
Maximum	0.0526	0.0368	0.0452	0.0454	0.0116	0.0148	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00026	0.00080	0.00068	0.00068	0.00018	0.00043	0.00248	0.00251	0.00270	0.00279	0.00071	0.00129
SD	0.0064	0.0080	0.0115	0.0050	0.0036	0.0050	-	-	-	-	-	-	0.00004	0.00012	0.00011	0.00011	0.00005	0.00007	0.00030	0.00038	0.00061	0.00044	0.00017	0.00029
SE	0.0037	0.0046	0.0066	0.0025	0.0021	0.0029	-	-	-	-	-	-	0.00002	0.00007	0.00006	0.00006	0.00003	0.00004	0.00018	0.00022	0.00035	0.00022	0.00010	0.00017
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-3. - continued –

	Zinc						Zirconium					
	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN	BURNT	SPLIT	LMFB	LNR	HAYES	ASSN
Mean	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00128	0.00122	0.00088	0.00103	<0.00040	0.00040
Median	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00132	0.00080	0.00087	0.00105	<0.00040	0.00044
Minimum	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00111	0.00072	0.00060	0.00069	<0.00040	<0.00040
Maximum	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.00139	0.00257	0.00118	0.00134	<0.00040	0.00053
SD	-	-	-	-	-	-	0.00011	0.00078	0.00024	0.00027	-	0.00012
SE	-	-	-	-	-	-	0.00006	0.00045	0.00014	0.00013	-	0.00007
N	4	4	4	4	4	4	4	4	4	4	4	4

Table 8.3-4. Frequency of detections of total metals measured in the Lower Nelson River Region: 2010/2011.

		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper	Iron
Burntwood River	# Detections	4	1	4	4	0	0	3	3	4	3	4	4	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	25	100	100	0	0	75	75	100	75	100	100	100	100
Split Lake	# Detections	4	0	4	4	0	0	4	2	4	0	2	4	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	100	50	100	0	50	100	100	100
Limestone Forebay	# Detections	4	1	4	4	0	0	4	3	4	1	3	3	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	25	100	100	0	0	100	75	100	25	75	75	100	100
Lower Nelson River	# Detections	4	1	4	4	0	0	4	2	4	1	4	4	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	25	100	100	0	0	100	50	100	25	100	100	100	100
Hayes River	# Detections	4	0	4	4	0	0	0	2	4	0	0	0	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	0	50	100	0	0	0	100	100
Assean Lake	# Detections	4	0	4	4	0	0	0	3	4	0	0	0	4	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	100	100	0	0	0	75	100	0	0	0	100	100

Table 8.3-4. - continued –

		Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium
Burntwood River	# Detections	4	4	4	4	0	1	2	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	25	50	100	100	0	100	0	100
Split Lake	# Detections	4	4	4	4	0	4	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	100	0	100	100	0	100	0	100
Limestone Forebay	# Detections	4	4	4	4	0	4	1	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	100	25	100	100	0	100	0	100
Lower Nelson River	# Detections	4	4	4	4	0	4	1	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	100	100	0	100	25	100	100	0	100	0	100
Hayes River	# Detections	2	1	4	4	0	0	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	50	25	100	100	0	0	0	100	100	0	100	0	100
Assean Lake	# Detections	3	1	4	4	0	0	0	4	4	0	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	75	25	100	100	0	0	0	100	100	0	100	0	100

Table 8.3-4. - continued –

		Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Burntwood River	# Detections	4	0	0	4	2	4	0	4	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	100	50	100	0	100	100	0	100
Split Lake	# Detections	4	0	0	4	1	4	0	4	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	100	25	100	0	100	100	0	100
Limestone Forebay	# Detections	4	0	0	4	1	4	0	4	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	100	25	100	0	100	100	0	100
Lower Nelson River	# Detections	4	0	0	4	1	4	0	4	4	0	4
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	100	25	100	0	100	100	0	100
Hayes River	# Detections	4	0	0	0	1	4	0	3	4	0	0
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	0	25	100	0	75	100	0	0
Assean Lake	# Detections	4	0	0	2	1	4	0	4	4	0	3
	n	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	0	0	50	25	100	0	100	100	0	75

Table 8.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in the Lower Nelson River Region: 2010/2011. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00017-0.00041	0.050-0.135	0.0053-0.0149	0.3	0.00137-0.00639	0.000026
Burntwood River	n	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	4	0	0
	% Exceedances	100	0	0	0	0	0	100	0	0
Split Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	4	0	0
	% Exceedances	100	0	0	0	0	0	100	0	0
Limestone Forebay	n	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	4	0	0
	% Exceedances	100	0	0	0	0	0	100	0	0
Lower Nelson River	n	3	3	3	3	3	3	3	3	3
	# Exceedances	3	0	0	0	0	0	3	0	0
	% Exceedances	100	0	0	0	0	0	100	0	0
Hayes River	n	4	4	4	4	4	4	4	4	4
	# Exceedances	2	0	0	0	0	1	1	0	0
	% Exceedances	50	0	0	0	0	25	25	0	0
Assean Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	4	0	0	0	0	0	2	0	0
	% Exceedances	100	0	0	0	0	0	50	0	0

Table 8.3-5. - continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.030-0.083	0.001	0.0001	0.0008	0.015	0.068-0.191	120	128-429
Burntwood River	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Split Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Limestone Forebay	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lower Nelson River	n	3	3	3	3	3	3	3	3	3
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Hayes River	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Assean Lake	n	4	4	4	4	4	4	4	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

[1] Mercury was analysed at a detection limit of 0.0005 mg/L and results cannot be compared to the current Manitoba PAL guideline for mercury.
[2] Comparison to the long-term CCME PAL guideline.
[3] Comparison to the BCMOE guideline.

Table 8.3-6. Total phosphorus concentrations (open-water season and annual means) measured in the Lower Nelson River Region and CCME (1999; updated to 2013) trophic categorization: 2010/2011.

Trophic Categories		Trophic Status Based on Total Phosphorus (mg/L)					
		Ultra-oligotrophic <0.004	Oligotrophic 0.004 - 0.010	Mesotrophic 0.010 - 0.020	Meso-eutrophic 0.020 - 0.035	Eutrophic 0.035 - 0.100	Hypereutrophic > 0.100
Burntwood River	Open-water season				0.032		
	Annual				0.033		
Split Lake	Open-water season					0.046	
	Annual					0.045	
Limestone Forebay	Open-water season					0.044	
	Annual					0.045	
Lower Nelson River	Open-water season					0.045	
	Annual					0.045	
Hayes River	Open-water season			0.014[a]			
	Annual			0.013[a]			
Assean Lake	Open-water season			0.020			
	Annual			0.020			

[a] No sample was obtained in August 2010 at the Hayes River.

Table 8.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Lower Nelson River Region and the OECD (1982) trophic categorization schemes for lakes: 2010/2011.

Trophic Categories		Lake Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic -	Oligotrophic <2.5	Mesotrophic 2.5 - 8	Meso-eutrophic -	Eutrophic 8 - 25	Hypereutrophic > 25
Split Lake	Open-water season			3.8			
	Annual			2.9			
Limestone Forebay	Open-water season		2.3				
	Annual		1.8				
Assean Lake	Open-water season		1.3				
	Annual		1.5				

Table 8.3-8. Total nitrogen concentrations (open-water season and annual means) measured in lakes and reservoirs in the Lower Nelson River Region and comparison to a trophic categorization scheme (Nürnberg 1996): 2010/2011.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Split Lake	Open-water season			0.53			
	Annual			0.52			
Limestone Forebay	Open-water season			0.44			
	Annual			0.40			
Assean Lake	Open-water season			0.39			
	Annual			0.42			

Table 8.3-9. Mean (open-water season and annual) concentrations of TN in the Burntwood, Lower Nelson and Hayes rivers and comparison to a trophic categorization scheme for rivers/streams (Dodds et al. 1998): 2010/2011.

		River Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<0.7	0.7-1.5	-	>1.5	-
Burntwood River	Open-water season		0.35				
	Annual		0.34				
Lower Nelson River	Open-water season		0.42				
	Annual		0.46				
Hayes River	Open-water season		0.40[a]				
	Annual		0.39[a]				

[b] No sample was obtained in August 2010 at the Hayes River.

Table 8.3-10. Mean (open-water season and annual) concentrations of chlorophyll *a* in the Burntwood, Lower Nelson, and Hayes rivers and comparison to a trophic categorization scheme for rivers/streams (Dodds et al. 1998): 2010/2011.

		River Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic
Trophic Categories		-	<10	10-30	-	>30	-
Burntwood River	Open-water season		1.1				
	Annual		0.9				
Lower Nelson River	Open-water season		2.1				
	Annual		1.5				
Hayes River	Open-water season		1.3[a]				
	Annual		0.9[a]				

[a] No sample was obtained in August 2010 at the Hayes River.

Table 8.4-1. Community metrics for phytoplankton samples collected in the Lower Nelson River Region during the open-water season of 2010.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Wiener Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H`}$)	Evenness ($E^{H`}/S$)
Burntwood River	Spring	22	0.85	0.31	2.44	0.79	11.44	0.52
	Summer	11	0.41	0.15	1.06	0.44	2.88	0.26
	Fall	18	0.40	0.09	1.03	0.36	2.81	0.16
Split Lake	Spring	16	0.47	0.12	1.10	0.40	3.00	0.19
	Summer	26	0.68	0.12	1.21	0.37	3.37	0.13
	Fall	16	0.78	0.28	1.79	0.64	5.96	0.37
Limestone Forebay	Spring	20	0.70	0.17	2.33	0.78	10.24	0.51
	Summer	29	0.82	0.19	1.94	0.58	6.97	0.24
	Fall	25	0.73	0.15	1.66	0.52	5.25	0.21
Assean Lake	Spring	19	0.83	0.31	2.14	0.73	8.48	0.45
	Summer	18	0.77	0.24	1.91	0.66	6.77	0.38
	Fall	28	0.90	0.35	2.56	0.77	12.94	0.46

Table 8.5-1. Habitat and physical characteristics recorded at nearshore (kicknet) and offshore (grab) benthic invertebrate sites in the Lower Nelson River Region for the CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples (n)	Water Depth Mean (m)	Water Depth Min (m)	Water Depth Max (m)	Mean Water Velocity (m/sec)	Mean Secchi Disk Depth (m)	Water Temperature (ºC)	Predominant Substrate	Riparian Vegetation	Canopy Cover (%)	Algae
Split Lake (2010)	Nearshore	5	0.9	0.7	1.0	--*	0.43	14.0	sand, organic matter	shrubs, coniferous	0-24	filamentous, algal balls
	Offshore	5	7.4	6.0	8.8	--*	0.44	16.0	clay	--	--	--
Limestone Forebay (2010)	Nearshore	5	0.9	0.9	0.9	0.00	0.17	16.0	sand, woody debris	grass, coniferous	0	--
	Offshore	5	6.6	5.5	8.1	0.06	0.35	15.5	clay, sand	--	--	--
Lower Nelson River (d/s of Limestone Forebay) (2010)	Nearshore	5	1.0	1.0	1.0	0.00	0.21	15.5	sand	shrubs, mixed forest	0	--
	Offshore	4	4.2	3.8	4.5	0.00	0.33	15.0	sand	--	--	--
Hayes River (2010)	Nearshore	5	1.0	1.0	1.0	0.49	0.17	--	sand, gravel, cobble	shrubs, mixed forest	0	--
Assean Lake (2010)	Nearshore	5	1.0	0.9	1.1	--*	0.93	15.0	cobble, boulder	shrubs, coniferous	0-24	--
	Offshore	5	5.6	4.9	6.4	--*	1.18	14.0	clay	--	--	--

*Measurements not taken but assumed nil.

Table 8.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Lower Nelson River Region for the CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Split Lake (2010)	Nearshore	Mean	5	0.8	0.86	66.62	25.87	7.50	Sand
		SD	--	0.26	1.611	38.931	37.532	6.919	--
		SE	--	0.12	0.720	17.411	16.785	3.094	--
		Median	--	0.8	0.21	81.30	15.60	4.95	--
		Min	--	0.5	0.05	2.40	0.41	3.13	--
		Max	--	1.2	3.74	96.40	90.90	19.60	--
	Offshore	Mean	5	6.9	1.31	4.39	62.94	32.66	Silty Clay Loam
		SD	--	1.31	0.191	2.010	4.238	6.127	--
		SE	--	0.59	0.086	0.899	1.895	2.740	--
		Median	--	7.3	1.38	4.94	63.00	32.00	--
		Min	--	4.6	1.09	0.99	56.80	26.20	--
		Max	--	7.8	1.54	6.08	68.20	42.20	--
Limestone Forebay (2010)	Nearshore	Mean	5	0.5	0.18	62.86	23.79	13.32	Loam
		SD	--	0.21	0.111	22.603	13.484	9.495	--
		SE	--	0.09	0.050	10.108	6.030	4.246	--
		Median	--	0.5	0.19	50.10	31.30	16.50	--
		Min	--	0.3	0.05	44.70	6.96	2.76	--
		Max	--	0.8	0.34	90.30	35.80	24.00	--
	Offshore	Mean	5	7.0	1.06	16.44	66.48	17.08	Silt Loam
		SD	--	0.95	0.111	8.131	7.284	1.829	--
		SE	--	0.43	0.049	3.636	3.257	0.818	--
		Median	--	7.2	1.10	13.20	70.40	16.30	--
		Min	--	5.5	0.88	8.96	57.80	15.20	--
		Max	--	7.9	1.15	25.90	73.20	19.90	--
Lower Nelson River (d/s of Limestone Forebay) (2010)	Nearshore	Mean	5	0.3	0.72	72.92	18.24	8.85	Sandy Loam
		SD	--	0.02	0.269	8.307	4.765	3.763	--
		SE	--	0.01	0.120	3.715	2.131	1.683	--
		Median	--	0.3	0.67	77.00	16.90	7.30	--
		Min	--	0.3	0.49	59.40	13.90	6.17	--
		Max	--	0.3	1.18	79.30	25.10	15.40	--
	Offshore	Mean	4	4.4	0.38	93.08	5.71	1.24	Sand
		SD	--	0.45	0.094	5.408	4.274	1.182	--
		SE	--	0.23	0.047	2.704	2.137	0.591	--
		Median	--	4.4	0.39	94.75	4.45	0.91	--
		Min	--	3.8	0.28	85.60	2.32	0.26	--
		Max	--	4.9	0.46	97.20	11.60	2.87	--

Table 8.5-2. – continued –

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Hayes River (2010)	Nearshore	Mean	5	0.3	0.28	88.16	10.65	1.18	Sand
		SD	--	0.00	0.130	2.805	2.540	0.567	--
		SE	--	0.00	0.065	1.402	1.270	0.284	--
		Median	--	0.3	0.20	87.40	10.70	0.99	--
		Min	--	0.3	0.18	85.60	7.86	0.54	--
		Max	--	0.3	0.45	91.60	13.60	1.87	--
Assean Lake (2010)	Nearshore	Mean	3	0.8	0.87	88.10	8.95	2.96	Sand
		SD	--	0.20	0.085	4.616	3.756	0.857	--
		SE	--	0.12	0.049	2.665	2.168	0.495	--
		Median	--	0.9	0.91	86.05	10.54	3.40	--
		Min	--	0.6	0.78	6.08	5.78	2.07	--
		Max	--	7.8	1.54	92.20	68.20	42.20	--
	Offshore	Mean	5	5.5	1.60	35.64	52.72	11.62	Loam
		SD	--	0.54	0.341	17.576	24.901	9.056	--
		SE	--	0.24	0.153	7.860	11.136	4.050	--
		Median	--	5.6	1.67	35.40	43.90	16.50	--
		Min	--	4.9	1.06	17.60	20.50	1.68	--
		Max	--	6.2	1.89	62.70	80.70	21.00	--

Table 8.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Split Lake within the Lower Nelson River Region for the CAMPP, 2010.

	Split Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	95	84.1	37.6	64	36	243
Oligochaeta	--	11	5.7	2.6	9	5	17
Hirudinea	--	0	0.1	0.1	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	1	0.8	0.4	1	0	2
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	38	43.6	19.5	17	7	112
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.1	0.1	0	0	0
Acari	--	0	0.2	0.1	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.0	0.0	0	0	0
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.1	0.1	0	0	1
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.3	0.1	0	0	1
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	50	47.0	21.0	29	15	132
Non-Insecta (%)	53	--	--	--	--	--	--
Oligochaeta	--	11	5.7	2.6	9	5	17
Oligochaeta (%)	11	--	--	--	--	--	--
Amphipoda	--	38	43.8	19.6	18	7	113
Amphipoda (%)	40	--	--	--	--	--	--
Bivalvia	--	0	0.0	0.0	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	0	0.1	0.1	0	0	1
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 8.5-3. – continued –

	Split Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	1	1.2	0.5	0	0	3
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	6	2.9	1.3	5	3	10
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.2	0.1	0	0	0
Baetidae	--	1	1.0	0.5	1	0	3
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	1	1.7	0.7	0	0	4
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	4	2.3	1.0	4	2	8
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	11	11.8	5.3	6	4	32
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	3	4.9	2.2	1	0	11
Hexagenia	--	0	0.2	0.1	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.1	0.1	0	0	0
Leptophlebiidae	--	0	0.2	0.1	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 8.5-3. – continued –

	Split Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	1	0.8	0.4	1	0	2
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.3	0.1	0	0	1
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.4	0.2	0	0	1
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	1	1.8	0.8	0	0	4
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	11	11.4	5.1	7	5	31
Orthocladiinae	--	3	1.5	0.7	3	1	5
Tanypodinae	--	1	2.0	0.9	1	0	5
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 8.5-3. – continued –

	Split Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	45	37.5	16.8	34	21	111
Insecta (%)	47	--	--	--	--	--	--
Chironomidae	--	16	15.7	7.0	10	7	44
Chironomidae (%)	17	--	--	--	--	--	--
Ephemeroptera	--	20	18.2	8.1	13	9	52
Ephemeroptera (%)	21	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	1	1.1	0.5	1	0	3
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	22	19.1	8.6	14	10	55
EPT (%)	23	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.37	0.155	0.069	1.38	1.19	1.58
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	18	13	2.5	1.1	12	11	17
Simpson's Diversity Index (D)	--	0.82	0.072	0.032	0.84	0.74	0.89
Evenness (Simpson's Equitability E_D)	--	0.38	0.177	0.079	0.37	0.17	0.61
Shannon-Weaver Index (H)	--	2.06	0.193	0.086	2.09	1.83	2.26
Evenness (Shannon's Equitability E_H)	--	0.72	0.091	0.041	0.74	0.61	0.82
Hill's Effective Richness ($E^{H'}$)	--	8	2	1	8	6	10
Evenness ($E^{H'}$/S)	--	0.47	0.132	0.059	0.47	0.29	0.62

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	4917	902.6	403.7	4747	3996	6420
Oligochaeta	--	46	47.2	21.1	29	14	130
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	845	424.3	189.7	620	491	1529
Hyalellidae	--	3	6.5	2.9	0	0	14
Diplostraca	--	6	7.9	3.5	0	0	14
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	1792	917.0	410.1	1472	1039	3362
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	675	328.7	147.0	592	332	1197
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	35	36.2	16.2	29	0	72
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	3402	1206.3	539.5	3419	2063	5252
Non-Insecta (%)	69	--	--	--	--	--	--
Oligochaeta	--	46	47.2	21.1	29	14	130
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	848	422.4	188.9	635	491	1529
Amphipoda (%)	17	--	--	--	--	--	--
Bivalvia	--	2317	1261.3	564.1	1775	1039	3939
Bivalvia (%)	47	--	--	--	--	--	--
Gastropoda	--	710	338.6	151.4	620	404	1270
Gastropoda (%)	14	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	38	19.4	8.7	29	14	58
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	3	6.5	2.9	0	0	14
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	1036	395.3	176.8	866	693	1544
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	9	19.4	8.7	0	0	43
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	20	28.1	12.6	0	0	58
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	6	7.9	3.5	0	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	219	85.0	38.0	202	130	361
Orthocladiinae	--	38	33.2	14.9	14	14	87
Tanypodinae	--	147	38.7	17.3	144	87	188
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1515	379.7	169.8	1327	1169	1933
Insecta (%)	31	--	--	--	--	--	--
Chironomidae	--	404	62.1	27.8	433	317	462
Chironomidae (%)	8	--	--	--	--	--	--
Ephemeroptera	--	1039	398.4	178.2	866	693	1544

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	21	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	29	27.0	12.1	43	0	58
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	1068	387.1	173.1	866	736	1544
EPT (%)	22	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.76	1.339	0.599	2.12	1.59	4.86
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	14	9	1.7	0.7	9	8	12
Simpson's Diversity Index (D)	--	0.75	0.046	0.020	0.77	0.67	0.78
Evenness (Simpson's Equitability E_D)	--	0.37	0.078	0.035	0.40	0.25	0.45
Shannon-Weaver Index (H)	--	1.65	0.129	0.058	1.67	1.47	1.83
Evenness (Shannon's Equitability E_H)	--	0.68	0.052	0.023	0.70	0.59	0.73
Hill's Effective Richness ($E^{H'}$)	--	5	0.7	0.3	5	4	6
Evenness ($E^{H'}$/S)	--	0.47	0.066	0.030	0.49	0.36	0.53

Table 8.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in the Limestone Forebay within the Lower Nelson River Region for the CAMPP, 2010.

	Limestone Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	36	25.9	11.6	37	10	76
Oligochaeta	--	4	5.3	2.4	2	1	13
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	1	1.3	0.6	0	0	3
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.1	0.1	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.1	0.1	0	0	0
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.2	0.1	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	5	6.6	2.9	2	1	16
Non-Insecta (%)	13	--	--	--	--	--	--
Oligochaeta	--	4	5.3	2.4	2	1	13
Oligochaeta (%)	10	--	--	--	--	--	--
Amphipoda	--	1	1.3	0.6	0	0	3
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	0	0.1	0.1	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	0	0.2	0.1	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.1	0.1	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0

Table 8.5-4. – continued –

	Limestone Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	7	4.4	2.0	6	3	15
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.3	0.1	0	0	1
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.3	0.1	0	0	1
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.1	0.1	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.3	0.1	0	0	1
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0

Table 8.5-4. – continued –

	Limestone Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.3	0.1	0	0	1
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.2	0.1	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	22	16.1	7.2	22	6	46
Orthocladiinae	--	1	2.6	1.2	0	0	6
Tanypodinae	--	0	0.6	0.2	0	0	1
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.1	0.1	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 8.5-4. – continued –

	Limestone Forebay						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	32	20.5	9.2	35	9	60
Insecta (%)	87	--	--	--	--	--	--
Chironomidae	--	24	18.8	8.4	24	6	53
Chironomidae (%)	65	--	--	--	--	--	--
Ephemeroptera	--	1	0.8	0.4	0	0	2
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.3	0.1	0	0	1
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	1	0.8	0.4	0	0	2
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.02	0.020	0.009	0.01	0.00	0.04
Genus analysis of Ephemeroptera	Caenidae: *Caenis* + Baetidae: *Procloeon* + Heptageniidae: *Stenonema*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	6	1.6	0.7	6	4	8
Simpson's Diversity Index (D)	--	0.59	0.068	0.030	0.61	0.47	0.65
Evenness (Simpson's Equitability E_D)	--	0.38	0.205	0.092	0.26	0.21	0.64
Shannon-Weaver Index (H)	--	1.10	0.144	0.064	1.08	0.97	1.33
Evenness (Shannon's Equitability E_H)	--	0.58	0.111	0.050	0.56	0.46	0.70
Hill's Effective Richness ($E^{H'}$)	--	3	0.5	0.2	3	3	4
Evenness ($E^{H'}$/S)	--	0.45	0.170	0.076	0.35	0.30	0.66

Table 8.5-4. – continued –

	Limestone Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1838	1567.5	701.0	1125	909	4588
Oligochaeta	--	208	232.1	103.8	101	72	620
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	66	51.6	23.1	58	14	144
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	3	6.5	2.9	0	0	14
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	6	7.9	3.5	0	0	14
Pisidiidae	--	641	976.0	436.5	289	14	2366
Gastropoda - unid	--	14	25.0	11.2	0	0	58
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	49	37.6	16.8	43	14	101
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	3	6.5	2.9	0	0	14
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	990	1295.6	579.4	462	188	3275
Non-Insecta (%)	54	--	--	--	--	--	--
Oligochaeta	--	208	232.1	103.8	101	72	620
Oligochaeta (%)	11	--	--	--	--	--	--
Amphipoda	--	66	51.6	23.1	58	14	144
Amphipoda (%)	4	--	--	--	--	--	--
Bivalvia	--	646	981.5	438.9	289	14	2381
Bivalvia (%)	35	--	--	--	--	--	--
Gastropoda	--	66	52.6	23.5	43	14	130
Gastropoda (%)	4	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	185	81.2	36.3	173	87	303
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 8.5-4. – continued –

	Limestone Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	3	6.5	2.9	0	0	14
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	3	6.5	2.9	0	0	14
Hexagenia	--	193	78.1	34.9	159	115	317
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 8.5-4. – continued –

	Limestone Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	124	67.4	30.1	115	43	231
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	3	6.5	2.9	0	0	14
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	3	6.5	2.9	0	0	14
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	17	38.7	17.3	0	0	87
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	6	7.9	3.5	0	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	113	111.5	49.9	72	29	303
Orthocladiinae	--	6	12.9	5.8	0	0	29
Tanypodinae	--	193	111.1	49.7	159	101	375
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	848	280.8	125.6	721	635	1313
Insecta (%)	46	--	--	--	--	--	--
Chironomidae	--	312	153.6	68.7	216	188	519
Chironomidae (%)	17	--	--	--	--	--	--
Ephemeroptera	--	196	79.4	35.5	159	115	317

Table 8.5-4. – continued –

	Limestone Forebay						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	11	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	147	99.1	44.3	115	58	317
Trichoptera (%)	8	--	--	--	--	--	--
EPT	--	343	92.6	41.4	346	231	476
EPT (%)	19	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.22	0.383	0.171	1.07	0.87	1.71
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	16	10	1.9	0.8	11	8	12
Simpson's Diversity Index (D)	--	0.82	0.069	0.031	0.84	0.70	0.87
Evenness (Simpson's Equitability E_D)	--	0.54	0.199	0.089	0.63	0.24	0.74
Shannon-Weaver Index (H)	--	2.00	0.170	0.076	2.02	1.72	2.17
Evenness (Shannon's Equitability E_H)	--	0.82	0.104	0.047	0.86	0.65	0.92
Hill's Effective Richness ($E^{H'}$)	--	7	1.2	0.5	8	6	9
Evenness ($E^{H'}$/S)	--	0.66	0.170	0.076	0.73	0.40	0.84

Table 8.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in the Lower Nelson River (downstream of Limestone Forebay) within the Lower Nelson River Region for the CAMPP, 2010.

	Lower Nelson River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	57	52.8	23.6	44	15	146
Oligochaeta	--	3	1.9	0.9	3	1	6
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.6	0.2	0	0	1
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.6	0.3	0	0	1
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.0	0.0	0	0	0
Gastropoda - unid	--	0	0.1	0.1	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.4	0.2	0	0	1
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	4	2.3	1.0	4	2	8
Non-Insecta (%)	8	--	--	--	--	--	--
Oligochaeta	--	3	1.9	0.9	3	1	6
Oligochaeta (%)	6	--	--	--	--	--	--
Amphipoda	--	0	0.6	0.2	0	0	1
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	0	0.0	0.0	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	0	0.3	0.1	0	0	1
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0

Table 8.5-5. – continued –

	Lower Nelson River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Zygoptera – unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.1	0.1	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	1	0.8	0.4	0	0	2
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.2	0.1	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	20	22.3	10.0	11	4	59
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.1	0.1	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.3	0.1	0	0	1
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	7	6.4	2.9	7	0	14
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.2	0.1	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.1	0.1	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.1	0.1	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0

Table 8.5-5. – continued –

	Lower Nelson River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.1	0.1	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.1	0.1	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.1	0.1	0	0	0
Ceratopogonidae (larva)	--	0	0.1	0.1	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.6	0.3	0	0	1
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	23	29.5	13.2	14	1	74
Orthocladiinae	--	1	1.0	0.4	1	0	3
Tanypodinae	--	0	0.1	0.1	0	0	0
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0

Table 8.5-5. – continued –

	Lower Nelson River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (larva)	--	0	0.3	0.1	0	0	1
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	53	52.5	23.5	42	10	142
Insecta (%)	92						
Chironomidae	--	24	29.7	13.3	16	1	75
Chironomidae (%)	43	--	--	--	--	--	--
Ephemeroptera	--	7	6.6	2.9	7	0	15
Ephemeroptera (%)	12	--	--	--	--	--	--
Plecoptera	--	0	0.1	0.1	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.1	0.1	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	7	6.5	2.9	7	0	15
EPT (%)	12	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.60	0.589	0.263	0.57	0.07	1.50
Genus analysis of Ephemeroptera	Baetidae: *Procloeon*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	17	9	0.9	0.4	8	8	10
Simpson's Diversity Index (D)	--	0.69	0.157	0.070	0.78	0.47	0.84
Evenness (Simpson's Equitability E_D)	--	0.37	0.189	0.084	0.32	0.24	0.69
Shannon-Weaver Index (H)	--	1.46	0.376	0.168	1.73	1.04	1.74
Evenness (Shannon's Equitability E_H)	--	0.62	0.139	0.062	0.66	0.46	0.79
Hill's Effective Richness ($E^{H'}$)	--	5	1.5	0.7	6	3	6
Evenness ($E^{H'}$/S)	--	0.43	0.132	0.059	0.41	0.29	0.63

Table 8.5-5. – continued –

	Lower Nelson River						
	Offshore n=4						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2204	1257.1	628.6	2157	736	3766
Oligochaeta	--	570	415.1	207.5	563	72	1082
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	58	58.9	29.5	58	0	115
Gastropoda - unid	--	22	25.0	12.5	22	0	43
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	159	89.7	44.9	188	29	231
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	808	469.3	234.6	685	404	1457
Non-Insecta (%)	37	--	--	--	--	--	--
Oligochaeta	--	570	415.1	207.5	563	72	1082
Oligochaeta (%)	26	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	58	58.9	29.5	58	0	115
Bivalvia (%)	3	--	--	--	--	--	--
Gastropoda	--	180	105.7	52.8	209	29	274
Gastropoda (%)	8	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 8.5-5. – continued –

	Lower Nelson River						
	Offshore n=4						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 8.5-5. – continued –

	Lower Nelson River						
	Offshore n=4						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	584	977.1	488.6	151	0	2034
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	4	7.2	3.6	0	0	14
Leptoceridae (larva)	--	4	7.2	3.6	0	0	14
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	11	21.6	10.8	0	0	43
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	4	7.2	3.6	0	0	14
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	783	444.9	222.5	851	188	1241
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	7	8.3	4.2	7	0	14
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1396	1365.2	682.6	1010	202	3362
Insecta (%)	63	--	--	--	--	--	--
Chironomidae	--	790	451.7	225.9	858	188	1255
Chironomidae (%)	36	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	0	0	0

Table 8.5-5. – continued –

	Lower Nelson River						
	Offshore n=4						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	602	1002.9	501.4	159	0	2092
Trichoptera (%)	27	--	--	--	--	--	--
EPT	--	602	1002.9	501.4	159	0	2092
EPT (%)	27	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.54	0.773	0.387	0.24	0.00	1.67
Genus analysis of Ephemeroptera	--	--	--	--	--	--	--
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	9	5	1.9	0.9	5	4	8
Simpson's Diversity Index (D)	--	0.60	0.099	0.050	0.62	0.46	0.70
Evenness (Simpson's Equitability E_D)	--	0.46	0.170	0.085	0.46	0.25	0.67
Shannon-Weaver Index (H)	--	1.12	0.214	0.107	1.19	0.81	1.30
Evenness (Shannon’s Equitability E_H)	--	0.64	0.126	0.063	0.62	0.52	0.81
Hill's Effective Richness ($E^{H'}$)	--	3	0.6	0.3	3	2	4
Evenness ($E^{H'}$/S)	--	0.54	0.167	0.083	0.55	0.33	0.74

Table 8.5-6. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore sites in the Hayes River within the Lower Nelson River Region for the CAMPP, 2010.

	Hayes River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	440	313.8	140.3	419	62	902
Oligochaeta	--	5	3.8	1.7	4	0	11
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	1	1.2	0.5	0	0	3
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	1	1.2	0.5	0	0	3
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.1	0.1	0	0	0
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	6	2.7	1.2	5	4	11
Non-Insecta (%)	1	--	--	--	--	--	--
Oligochaeta	--	5	3.8	1.7	4	0	11
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	1	1.2	0.5	0	0	3
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	0	0.1	0.1	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.1	0.1	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 8.5-6. – continued –

	Hayes River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.6	0.3	0	0	1
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.1	0.1	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	418	313.1	140.0	404	38	880
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.3	0.1	0	0	1
Baetidae	--	2	2.8	1.3	1	0	7
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.1	0.1	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.3	0.1	0	0	1
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	1	1.3	0.6	0	0	3
Procloeon	--	0	0.7	0.3	0	0	2
Pseudocloeon	--	0	0.1	0.1	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	4	3.1	1.4	4	0	8
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	0	0.3	0.1	0	0	1
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.1	0.1	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	1	1.7	0.7	1	0	4
Leptophlebia	--	0	0.1	0.1	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	1	1.3	0.6	0	0	3

Table 8.5-6. – continued –

	Hayes River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.1	0.1	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.3	0.1	0	0	1
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	1	1.1	0.5	1	0	3
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	2	1.5	0.7	3	0	4
Orthocladiinae	--	1	1.1	0.5	1	0	3
Tanypodinae	--	2	1.0	0.5	2	0	3
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.6	0.3	0	0	1
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 8.5-6. – continued –

	Hayes River						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	434	312.9	139.9	413	58	897
Insecta (%)	99	--	--	--	--	--	--
Chironomidae	--	6	2.5	1.1	6	4	9
Chironomidae (%)	1	--	--	--	--	--	--
Ephemeroptera	--	9	3.8	1.7	9	5	15
Ephemeroptera (%)	2	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.3	0.1	0	0	1
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	10	4.0	1.8	9	5	16
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.83	1.421	0.636	1.21	1.08	4.36
Genus analysis of Ephemeroptera	Baetiscidae: *Baetisca*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	18	8	2.9	1.3	8	6	13
Simpson's Diversity Index (D)	--	0.20	0.241	0.108	0.12	0.05	0.62
Evenness (Simpson's Equitability E_D)	--	0.12	0.027	0.012	0.12	0.08	0.15
Shannon-Weaver Index (H)	--	0.56	0.633	0.283	0.35	0.16	1.68
Evenness (Shannon's Equitability E_H)	--	0.20	0.191	0.086	0.15	0.08	0.54
Hill's Effective Richness ($E^{H'}$)	--	2	1.8	0.8	1	1	5
Evenness ($E^{H'}/S$)	--	0.16	0.053	0.024	0.15	0.11	0.24

Table 8.5-7. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Assean Lake within the Lower Nelson River Region for the CAMPP, 2010.

	Assean Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	708	388.6	173.8	535	305	1193
Oligochaeta	--	43	25.2	11.3	49	7	75
Hirudinea	--	3	3.2	1.4	2	0	8
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	6	11.8	5.3	0	0	27
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	237	183.2	81.9	136	87	445
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.1	0.1	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.6	0.3	0	0	1
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	45	33.5	15.0	27	15	88
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	1	1.3	0.6	0	0	3
Lymnaeidae	--	1	0.5	0.2	0	0	1
Physidae	--	1	1.2	0.6	0	0	3
Planorbidae	--	1	1.2	0.5	0	0	3
Valvatidae	--	1	0.7	0.3	1	0	1
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.6	0.3	0	0	1
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	339	244.9	109.5	203	124	632
Non-Insecta (%)	48	--	--	--	--	--	--
Oligochaeta	--	43	25.2	11.3	49	7	75
Oligochaeta (%)	6	--	--	--	--	--	--
Amphipoda	--	242	190.8	85.3	137	87	472
Amphipoda (%)	34	--	--	--	--	--	--
Bivalvia	--	45	33.5	15.0	27	15	88
Bivalvia (%)	6	--	--	--	--	--	--
Gastropoda	--	4	1.1	0.5	3	3	5
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Assean Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	12	12.1	5.4	7	1	29
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	1	1.2	0.5	0	0	3
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	27	15.9	7.1	27	8	51
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.6	0.3	0	0	1
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	2	3.5	1.6	0	0	8
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	271	133.1	59.5	269	121	470
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	2	2.2	1.0	1	0	5
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	5	2.8	1.3	5	1	8
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae	--	0	0.6	0.3	0	0	1
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	1	1.2	0.5	0	0	3
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.6	0.3	0	0	1
Paraleptophlebia	--	5	10.5	4.7	0	0	24
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Assean Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	17	17.0	7.6	8	5	45
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	1	1.2	0.5	0	0	3
Leptoceridae (larva)	--	3	2.5	1.1	1	0	5
Leptoceridae (pupa)		0	0.0	0.0	0	0	0
Limnephilidae	--	1	1.2	0.5	0	0	3
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.6	0.3	0	0	1
Polycentropodidae	--	0	0.6	0.3	0	0	1
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.6	0.3	0	0	1
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	12	8.4	3.7	11	4	24
Orthocladiinae	--	3	2.4	1.1	3	0	7
Tanypodinae	--	6	5.0	2.2	5	0	11
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	1	1.2	0.5	0	0	3
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Assean Lake						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	370	166.7	74.6	378	182	616
Insecta (%)	52	--	--	--	--	--	--
Chironomidae	--	21	9.5	4.2	21	11	33
Chironomidae (%)	3	--	--	--	--	--	--
Ephemeroptera	--	287	134.7	60.3	312	127	479
Ephemeroptera (%)	40	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	22	19.5	8.7	15	8	55
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	309	149.5	66.8	320	135	534
EPT (%)	44	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	15.68	6.758	3.022	12.00	10.05	25.02
Genus analysis of Ephemeroptera	Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	30	19	2.1	0.9	19	15	20
Simpson's Diversity Index (D)	--	0.71	0.048	0.022	0.74	0.63	0.74
Evenness (Simpson's Equitability E_D)	--	0.17	0.043	0.019	0.17	0.12	0.24
Shannon-Weaver Index (H)	--	1.70	0.110	0.049	1.77	1.55	1.79
Evenness (Shannon's Equitability E_H)	--	0.56	0.050	0.023	0.56	0.50	0.64
Hill's Effective Richness ($E^{H'}$)	--	5	0.6	0.3	6	5	6
Evenness ($E^{H'}$/S)	--	0.27	0.058	0.026	0.25	0.21	0.37

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1094	534.3	239.0	938	491	1688
Oligochaeta	--	0	0.0	0.0	0	0	0
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	3	6.5	2.9	0	0	14
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	277	187.4	83.8	231	72	577
Gastropoda - unid	--	3	6.5	2.9	0	0	14
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	12.9	5.8	0	0	29
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	9	19.4	8.7	0	0	43
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	297	177.5	79.4	274	87	577
Non-Insecta (%)	27	--	--	--	--	--	--
Oligochaeta	--	0	0.0	0.0	0	0	0
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	277	187.4	83.8	231	72	577
Bivalvia (%)	25	--	--	--	--	--	--
Gastropoda	--	17	31.3	14.0	0	0	72
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unidentified	--	0	0.0	0.0	0	0	0
Anisoptera - unidentified	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera - unidentified	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unidentified	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	9	19.4	8.7	0	0	43
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	499	202.1	90.4	418	303	750
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	6	7.9	3.5	0	0	14
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	3	6.5	2.9	0	0	14
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	49	21.9	9.8	58	14	72
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	32	34.4	15.4	14	0	87
Orthocladiinae	--	69	68.7	30.7	58	14	188
Tanypodinae	--	130	147.1	65.8	72	43	390
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	796	422.4	188.9	635	404	1414
Insecta (%)	73	--	--	--	--	--	--
Chironomidae	--	231	191.4	85.6	144	72	534
Chironomidae (%)	21	--	--	--	--	--	--
Ephemeroptera	--	499	202.1	90.4	418	303	750

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	46	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	9	7.9	3.5	14	0	14
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	508	201.8	90.3	433	317	765
EPT (%)	46	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.90	1.133	0.507	3.00	1.43	4.40
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	6	1.5	0.7	5	4	8
Simpson's Diversity Index (D)	--	0.67	0.052	0.023	0.68	0.58	0.73
Evenness (Simpson's Equitability E_D)	--	0.43	0.072	0.032	0.43	0.34	0.52
Shannon-Weaver Index (H)	--	1.40	0.151	0.067	1.34	1.27	1.65
Evenness (Shannon's Equitability E_H)	--	0.70	0.033	0.015	0.72	0.65	0.73
Hill's Effective Richness ($E^{H'}$)	--	4	0.7	0.3	4	4	5
Evenness ($E^{H'}/S$)	--	0.56	0.047	0.021	0.55	0.51	0.62

Table 8.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Lower Nelson River System, 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Split Lake	GN-03	15	316477	6237843	23-Aug-10	48.58	4.8	5.2	16.0
Split Lake	GN-05	14	673580	6236345	23-Aug-10	45.08	3.5	3.5	15.0
Split Lake	GN-06	14	673465	6233853	23-Aug-10	45.50	3.5	3.7	15.0
Split Lake	GN-13	14	669781	6221741	22-Aug-10	28.58	5.5	4.7	16.0
Split Lake	GN-15	14	657349	6221655	21-Aug-10	25.92	2.7	3.8	16.0
Split Lake	GN-18	14	669558	6225261	22-Aug-10	28.67	3.9	3.6	15.5
Split Lake	GN-20	14	683018	6236587	20-Aug-10	25.58	10.8	9.5	16.0
Split Lake	GN-21	14	675244	6233962	20-Aug-10	25.33	8.9	7.0	16.0
Split Lake	GN-22	14	677978	6233132	20-Aug-10	24.75	10.2	11.8	16.0
Split Lake	GN-26	14	670883	6225531	21-Aug-10	27.17	11.4	11.3	16.0
Split Lake	GN-28	14	657720	6221822	21-Aug-10	27.08	15.9	14.7	16.0
Split Lake	GN-29	14	670875	6222070	22-Aug-10	28.58	8.2	9.2	16.0
Split Lake	SN-03	15	316518	6237827	23-Aug-10	48.58	4.6	4.8	15.0
Split Lake	SN-06	14	673465	6233853	23-Aug-10	45.50	3.5	2.6	15.0
Split Lake	SN-20	14	683018	6236587	20-Aug-10	25.58	10.8	10.7	16.0
Split Lake	SN-26	14	670883	6225531	21-Aug-10	27.17	11.4	12.0	16.0
Limestone Forebay	GN-01	15	432376	6262734	12-Jul-10	24.85	4.0	2.7	19.0
Limestone Forebay	GN-02	15	430571	6261417	12-Jul-10	23.85	23.8	12.2	19.0
Limestone Forebay	GN-03	15	427953	6256825	13-Jul-10	26.45	1.9	1.2	20.0
Limestone Forebay	GN-04	15	430019	6257845	13-Jul-10	26.43	18.5	18.6	20.0
Limestone Forebay	GN-05	15	427310	6255991	14-Jul-10	24.50	16.7	16.5	19.0
Limestone Forebay	GN-06	15	423756	6252134	14-Jul-10	24.25	16.0	14.8	19.0
Limestone Forebay	GN-07	15	420755	6252963	15-Jul-10	23.75	1.6	4.8	18.0
Limestone Forebay	GN-08	15	418465	6251618	15-Jul-10	22.83	1.7	1.2	18.0
Limestone Forebay	GN-09	15	421951	6252789	15-Jul-10	22.37	12.8	11.5	18.0
Limestone Forebay	SN-01	15	432399	6262782	12-Jul-10	25.15	4.2	4.0	19.0
Limestone Forebay	SN-04	15	430034	6257872	13-Jul-10	26.25	17.8	18.5	20.0
Limestone Forebay	SN-06	15	423756	6252134	14-Jul-10	24.05	16.0	15.2	19.0
Lower Nelson River	GN-01	15	443364	6271568	5-Aug-10	23.53	1.6	1.2	20.0
Lower Nelson River	GN-02	15	446436	6274306	5-Aug-10	24.20	2.3	1.4	20.0
Lower Nelson River	GN-03	15	445153	6273019	5-Aug-10	25.22	2.0	1.7	20.0
Lower Nelson River	GN-04	15	447959	6276542	6-Aug-10	26.40	1.0	2.5	20.0
Lower Nelson River	GN-05	15	448044	6278002	6-Aug-10	26.83	1.0	1.5	20.0
Lower Nelson River	GN-06	15	469929	6300885	7-Aug-10	28.10	2.1	4.8	20.0
Lower Nelson River	GN-07	15	468798	6298797	7-Aug-10	26.22	2.1	2.1	20.0
Lower Nelson River	GN-08	15	468274	6297213	8-Aug-10	23.20	5.7	5.9	20.0
Lower Nelson River	GN-09	15	462474	6290371	8-Aug-10	23.33	1.7	5.3	20.0
Lower Nelson River	SN-03	15	445134	6272999	5-Aug-10	25.22	0.5	2.0	20.0
Lower Nelson River	SN-07	15	468748	6298798	7-Aug-10	27.60	2.1	2.1	20.0
Lower Nelson River	SN-09	15	462485	6290392	8-Aug-10	23.20	5.6	5.7	20.0

Table 8.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Hayes River	GN-01	15	519853	6286142	18-Jul-10	21.73	2.8	2.7	18.0
Hayes River	GN-02	15	518539	6286310	18-Jul-10	21.45	1.0	1.2	18.0
Hayes River	GN-03	15	518400	6287034	18-Jul-10	21.42	2.3	2.1	19.0
Hayes River	GN-04	15	519082	6288952	19-Jul-10	27.47	3.2	2.4	20.0
Hayes River	GN-05	15	519009	6291514	19-Jul-10	27.67	2.1	3.1	20.0
Hayes River	GN-06	15	520132	6292558	19-Jul-10	26.97	1.6	2.6	20.0
Hayes River	GN-07	15	520292	6285057	20-Jul-10	24.38	1.7	1.3	22.0
Hayes River	GN-08	15	520123	6283913	20-Jul-10	24.28	2.1	1.8	22.0
Hayes River	GN-09	15	520942	6280508	20-Jul-10	24.17	2.8	2.5	22.0
Hayes River	SN-01	15	519823	6286164	18-Jul-10	21.57	2.8	3.3	18.0
Hayes River	SN-06	15	519832	6292226	19-Jul-10	27.25	0.9	1.6	20.0
Hayes River	SN-09	15	520214	6281475	20-Jul-10	23.98	2.9	2.8	22.0
Assean Lake	GN-01	14	659411	6234940	17-Aug-10	25.92	10.2	9.7	11.0
Assean Lake	GN-03	14	656701	6231968	18-Aug-10	25.25	1.7	2.3	9.0
Assean Lake	GN-04	14	659412	6231645	14-Aug-10	72.83	3.8	3.7	15.0
Assean Lake	GN-05	14	654543	6232827	12-Aug-10	23.08	5.0	4.4	20.0
Assean Lake	GN-07	14	654015	6232579	12-Aug-10	24.00	5.7	5.7	20.0
Assean Lake	GN-08	14	664620	6238238	17-Aug-10	25.33	5.6	5.6	11.0
Assean Lake	GN-09	14	671137	6242179	13-Aug-10	25.58	3.4	3.4	23.0
Assean Lake	GN-10	14	673873	6244968	13-Aug-10	25.58	5.5	5.5	23.0
Assean Lake	GN-11	14	657043	6235845	18-Aug-10	25.75	4.1	3.5	11.0
Assean Lake	SN-04	14	659436	6231680	14-Aug-10	72.83	4.1	3.8	15.0
Assean Lake	SN-08	14	664600	6238215	17-Aug-10	25.33	5.8	5.6	11.0
Assean Lake	SN-11	14	656851	6235879	18-Aug-10	25.75	2.8	3.5	11.0

Table 8.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Lower Nelson River Region waterbodies, 2010.

Family	Species	Scientific Name	ID Code
Petromyzontidae	Silver Lamprey	*Ichthyomyzon unicuspis*	SLLM
Acipenseridae	Lake Sturgeon	*Acipenser fulvescens*	LKST
Hiodontidae	Mooneye	*Hiodon tergisus*	MOON
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH
	Emerald Shiner	*Notropis atherinoides*	EMSH
	Spottail Shiner	*Notropis heterolepis*	SPSH
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC
	White Sucker	*Catostomus commersoni*	WHSC
	Shorthead Redhorse	*Moxstoma macrolepidotum*	SHRD
Esocidae	Northern Pike	*Esox lucius*	NRPK
Osmeridae	Rainbow Smelt	*Osmerus mordax*	RNSM
Salmonidae	Cisco	*Coregonus artedi*	CISC
	Lake Whitefish	*Coregonus clupeaformis*	LKWH
	Brook Trout	*Salvelinus fontinalis*	BRTR
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR
Gadidae	Burbot	*Lota lota*	BURB
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Sauger	*Sander canadensis*	SAUG
	Walleye	*Sander vitreus*	WALL
Sciaenidae	Freshwater Drum	*Aplodinotus grunniens*	FRDR

Table 8.6-3. Summary of Lower Nelson River CAMPP standard gang index gillnet catches, 2010.

Species	Split Lake		Limestone Forebay		Lower Nelson River		Hayes River		Assean Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Silver Lamprey	-	-	-	-	1	0.35	-	-	-	-
Lake Sturgeon	2	0.36	-	-	43	15.03	60	37.74	-	-
Mooneye	12	2.14	6	4.05	1	0.35	-	-	-	-
Longnose Sucker	23	4.11	76	51.35	57	19.93	8	5.03	-	-
White Sucker	154	27.50	12	8.11	19	6.64	13	8.18	93	12.53
Shorthead Redhorse	3	0.54	-	-	-	-	6	3.77	-	-
Northern Pike	74	13.21	43	29.05	80	27.97	10	6.29	77	10.38
Rainbow Smelt	10	1.79	-	-	9	3.15	-	-	-	-
Cisco	2	0.36	-	-	-	-	-	-	163	21.97
Lake Whitefish	28	5.00	1	0.68	25	8.74	10	6.29	79	10.65
Brook Trout	-	-	-	-	-	-	8	5.03	-	-
Burbot	10	1.79	-	-	4	1.40	-	-	1	0.13
Yellow Perch	-	-	-	-	-	-	-	-	14	1.89
Sauger	47	8.39	5	3.38	1	0.35	-	-	-	-
Walleye	194	34.64	5	3.38	46	16.08	44	27.67	315	42.45
Freshwater Drum	1	0.18	-	-	-	-	-	-	-	-
Total	560	100	148	100	286	100	159	100	742	100

n = number of fish caught
RA = percent relative abundance

Table 8.6-4. Summary of Lower Nelson River CAMPP small mesh index gillnet catches, 2010.

Species	Split Lake		Limestone Forebay		Lower Nelson River		Hayes River		Assean Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Sturgeon	-	-	-	-	1	0.93	6	40.00	-	-
Lake Chub	2	0.81	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	1	1.79	35	32.41	-	-	2	0.40
Spottail Shiner	101	40.73	8	14.29	1	0.93	-	-	110	22.04
Longnose Sucker	-	-	2	3.57	5	4.63	2	13.33	-	-
White Sucker	1	0.40	-	-	-	-	-	-	1	0.20
Shorthead Redhorse	-	-	-	-	-	-	1	6.67	-	-
Northern Pike	2	0.81	-	-	2	1.85	-	-	8	1.60
Rainbow Smelt	70	28.23	-	-	59	54.63	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	6	1.20
Lake Whitefish	-	-	-	-	-	-	1	6.67	5	1.00
Troutperch	66	26.61	45	80.36	4	3.70	-	-	49	9.82
Yellow Perch	-	-	-	-	-	-	-	-	301	60.32
Sauger	1	0.40	-	-	-	-	-	-	-	-
Walleye	5	2.02	-	-	1	0.93	5	33.33	17	3.41
Total	248	100	56	100	108	100	15	100	499	100

n = number of fish caught and RA = percent relative abundance

Table 8.6-5. Standard gang index gillnet biomass summaries from Lower Nelson River Region waterbodies, 2010.

Species	Split L			Limestone Forebay			Lower Nelson R			Hayes R			Assean L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	1	15	0.004	-	-	-	-	-	-
Lake Sturgeon	2	2660	0.48	-	-	-	43	86980	24.56	60	67688	37.91	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	12	3560	0.64	6	2050	1.29	1	290	0.08	-	-	-	-	-	-
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	23	19530	3.53	76	55020	34.74	57	30580	8.64	8	2335	1.31	-	-	-
White Sucker	154	184140	33.27	12	12429	7.85	19	11316	3.20	13	9030	5.06	93	81680	18.98
Shorthead Redhorse	3	1440	0.26	-	-	-	-	-	-	6	5460	3.06	-	-	-
Northern Pike	74	101671	18.37	41	74620	47.12	80	153810	43.43	10	19160	10.73	77	88833	20.64
Rainbow Smelt	6	46	0.01	-	-	-	9	52	0.01	-	-	-	-	-	-
Cisco	2	540	0.10	-	-	-	-	-	-	-	-	-	163	17855	4.15
Lake Whitefish	28	29308	5.29	1	2320	1.46	25	23550	6.65	10	5610	3.14	79	63274.9	14.70
Brook Trout	-	-	-	-	-	-	-	-	-	8	8071	4.52	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	4100	0.74	-	-	-	4	2150	0.61	-	-	-	1	190	0.04
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	14	1615	0.38
Sauger	47	25630	4.63	5	3630	2.29	1	580	0.16	-	-	-	-	-	-
Walleye	194	179606	32.45	5	8300	5.24	44	44800	12.65	44	61200	34.28	315	176908	41.11
Freshwater Drum	1	1280	0.23	-	-	-	-	-	-	-	-	-	-	-	-
Total	555	553511	100	146	158369	100	284	354123	100	159	178554	100	742	430356	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = percent of total biomass

Table 8.6-6. Small mesh index gillnet biomass summaries from Lower Nelson River Region waterbodies, 2010.

Species	Split L			Limestone Forebay			Lower Nelson R			Hayes R			Assean L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Sturgeon	-	-	-	-	-	-	-	-	-	6	4800	77.53	-	-	-
Lake Chub	2	15	0.34	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	1	5	1.17	35	131	2.67	-	-	-	2	8	0.05
Spottail Shiner	101	390	8.87	8	45	10.56	1	3	0.06	-	-	-	110	741	4.92
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	2	179	42.02	5	441	8.97	2	57	0.92	-	-	-
White Sucker	1	10	0.23	-	-	-	-	-	-	-	-	-	1	7	0.05
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	1	57	0.92	-	-	-
Northern Pike	2	710	16.14	-	-	-	2	4030	81.99	-	-	-	8	3244	21.53
Rainbow Smelt	70	475	10.80	-	-	-	59	278	5.66	-	-	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	6	264	1.75
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	56	0.90	5	771	5.12
Troutperch	66	398	9.05	45	197	46.24	4	25	0.51	-	-	-	49	295	1.96
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	301	844	5.60
Sauger	1	200	4.55	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	5	2200	50.02	-	-	-	1	7	0.14	5	1221	19.72	17	8890	59.01
Total	248	4398	100	56	426	100	107	4915	100	15	6191	100	499	15064	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g)
% = percent of total biomass

Table 8.6-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Lower Nelson River Region waterbodies, 2010.

Species	Split L (# sites = 12)			Limestone Forebay (# sites = 9)			Lower Nelson R (# sites = 9)			Hayes R (# sites = 9)			Assean L (# sites = 9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Silver Lamprey	-	-	-	-	-	-	1	0.1	0.17	-	-	-	-	-	-
Lake Sturgeon	2	0.1	0.45	-	-	-	43	4.1	3.04	60	6.0	4.14	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	12	0.8	1.76	6	0.6	0.97	1	0.1	0.16	-	-	-	-	-	-
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	23	1.5	4.19	76	7.2	9.73	57	5.1	3.31	8	0.8	1.26	-	-	-
White Sucker	154	9.1	9.17	12	1.2	1.47	19	1.7	0.96	13	1.2	1.35	93	7.2	3.55
Shorthead Redhorse	3	0.2	0.64	-	-	-	-	-	-	6	0.5	0.87	-	-	-
Northern Pike	74	3.6	4.18	43	4.1	5.09	80	7.6	5.22	10	1.0	0.87	77	6.5	3.51
Rainbow Smelt	10	0.6	1.18	-	-	-	9	0.8	1.39	-	-	-	-	-	-
Cisco	2	0.1	0.25	-	-	-	-	-	-	-	-	-	163	14.0	19.01
Lake Whitefish	28	1.7	1.75	1	0.1	0.28	25	2.3	2.28	10	1.0	0.84	79	6.3	6.94
Brook Trout	-	-	-	-	-	-	-	-	-	8	0.8	0.54	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	10	0.7	1.23	-	-	-	4	0.4	0.69	-	-	-	1	0.1	0.28
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	14	1.2	1.73
Sauger	47	3.0	2.94	5	0.5	1.56	1	0.1	0.17	-	-	-	-	-	-
Walleye	194	10.7	14.30	5	0.5	1.22	46	4.1	4.55	44	4.2	2.37	315	28.0	23.74
Freshwater Drum	1	0.1	0.23	-	-	-	-	-	-	-	-	-	-	-	-
Total	560	32.0	19.69	148	14.1	5.92	286	26.5	9.23	159	15.4	4.71	742	63.4	22.95

#sites = number of sites sampled
n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site
SD = standard deviation

Table 8.6-8. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Lower Nelson River Region waterbodies, 2010.

Species	Split L (# sites = 4)			Limestone Forebay (# sites = 3)			Lower Nelson R (# sites = 3)			Hayes R (# sites = 3)			Assean L (# sites = 3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Sturgeon	-	-	-	-	-	-	1	0.3	0.60	6	2.1	1.84	-	-	-
Lake Chub	2	0.3	0.53	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	1	0.3	0.55	35	11.1	18.43	-	-	-	2	0.6	1.09
Spottail Shiner	101	12.7	17.48	8	2.4	4.22	1	0.3	0.55	-	-	-	110	28.9	18.61
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	2	0.7	1.15	5	1.4	2.51	2	0.7	1.16	-	-	-
White Sucker	1	0.1	0.26	-	-	-	-	-	-	-	-	-	1	0.1	0.19
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	1	0.3	0.57	-	-	-
Northern Pike	2	0.3	0.30	-	-	-	2	0.6	1.10	-	-	-	8	2.1	1.54
Rainbow Smelt	70	10.0	7.48	-	-	-	59	17.1	29.62	-	-	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	6	1.3	1.42
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	0.3	0.57	5	1.6	1.94
Troutperch	66	9.1	7.36	45	14.2	16.09	4	1.2	2.01	-	-	-	49	12.4	11.86
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	301	90.0	77.21
Sauger	1	0.2	0.47	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	5	0.6	1.24	-	-	-	1	0.3	0.50	5	1.7	2.89	17	4.3	3.69
Total	248	33.3	32.26	56	17.6	14.82	108	32.4	30.02	15	5.1	6.20	499	141.3	102.03

#sites = number of sites sampled
n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site
SD = standard deviation

Table 8.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Lower Nelson River Region waterbodies, 2010.

Species	Split L (# sites = 12)			Limestone Forebay (# sites = 9)			Lower Nelson R (# sites = 9)			Hayes R (# sites = 9)			Assean L (# sites = 9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	-	-	-	1	2	5	-	-	-	-	-	-
Lake Sturgeon	2	172	595	-	-	-	43	8301	10258	60	6807	5165	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	12	226	526	6	196	329	1	27	80	-	-	-	-	-	-
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	23	1270	3334	76	5223	7750	57	2731	3376	8	229	431	-	-	-
White Sucker	154	10591	9524	12	1193	1523	19	1043	1122	13	815	1005	93	6459	4684
Shorthead Redhorse	3	88	305	-	-	-	-	-	-	6	472	872	-	-	-
Northern Pike	74	5320	5356	41	5901	9093	80	14703	21716	10	1779	1710	77	7240	4103
Rainbow Smelt	6	3	8	-	-	-	9	5	14	-	-	-	-	-	-
Cisco	2	19	67	-	-	-	-	-	-	-	-	-	163	1541	2009
Lake Whitefish	28	1807	1783	1	218	653	25	2239	4112	10	539	441	79	5088	6822
Brook Trout	-	-	-	-	-	-	-	-	-	8	801	583	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	267	543	-	-	-	4	215	645	-	-	-	1	18	53
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	14	145	185
Sauger	47	1629	1695	5	379	1136	1	58	174	-	-	-	-	-	-
Walleye	194	9723	16074	5	834	2018	46	4167	9274	44	5895	4287	315	15855	13065
Freshwater Drum	1	86	299	-	-	-	-	-	-	-	-	-	-	-	-
Total	555	31201	19707	146	13944	8585	286	33490	34481	159	17336	6117	742	36346	9833

#sites = number of sites sampled;

n = number of fish measured (may not equal number of fish caught)

BPUE = mean biomass per unit effort (g/100 m/24 h) per site

SD = standard deviation

Table 8.6-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Lower Nelson River Region waterbodies, 2010.

Species	Split L (# sites = 4)			Limestone Forebay (# sites = 3)			Lower Nelson R (# sites = 3)			Hayes R (# sites = 3)			Assean L (# sites = 3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Sturgeon	-	-	-	-	-	-	-	-	-	6	1695	1491	-	-	-
Lake Chub	2	2	4	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	1	2	3	35	41	68	-	-	-	2	3	4
Spottail Shiner	101	49	68	8	14	24	1	1	2	-	-	-	110	202	156
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	2	60	103	5	128	221	2	19	33	-	-	-
White Sucker	1	1	3	-	-	-	-	-	-	-	-	-	1	1	1
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	1	19	33	-	-	-
Northern Pike	2	93	145	-	-	-	2	1278	2214	-	-	-	8	839	556
Rainbow Smelt	70	66	53	-	-	-	59	81	140	-	-	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	6	51	51
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	19	32	5	240	367
Troutperch	66	57	43	45	62	76	4	7	13	-	-	-	49	79	89
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	301	246	192
Sauger	1	47	94	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	5	272	543	-	-	-	1	2	4	5	407	706	17	2449	2418
Total	248	586	660	56	137	56.0	107	1538	2121	15	2159	1920	499	4108	3134

#sites = number of sites sampled
n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/30 m/24 h) per site
SD = standard deviation

Table 8.6-11. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Species	Split L			Limestone Forebay			Lower Nelson R			Hayes R			Assean L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)															
Northern Pike	74	528	132	41	613	81	80	608	120	10	620	138	77	543	103
Lake Whitefish	28	381	83	1	512	-	25	397	56	10	334	29	79	343	91
Walleye	194	398	85	5	498	55	44	415	79	44	481	103	315	365	55
Weight (g)															
Northern Pike	74	1374	1188	41	1820	673	80	1923	1286	10	1916	1013	77	1154	710
Lake Whitefish	28	1047	628	1	2320	-	25	942	453	10	561	135	79	801	606
Walleye	194	926	526	5	1660	423	44	1018	475	44	1391	829	315	562	227
Condition Factor (K)															
Northern Pike	74	0.76	0.07	41	0.76	0.08	80	0.76	0.09	10	0.72	0.06	77	0.64	0.07
Lake Whitefish	28	1.61	0.22	1	1.73	-	25	1.4	0.11	10	1.48	0.08	79	1.58	0.17
Walleye	194	1.27	0.12	5	1.33	0.14	44	1.29	0.14	44	1.13	0.12	315	1.09	0.07

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 8.6-12. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Northern Pike, Lake Whitefish, and Walleye captured in small mesh index gill nets set in Lower Nelson River Region waterbodies, 2010.

Species	Split L			Limestone Forebay			Lower Nelson R			Hayes R			Assean L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)															
Northern Pike	2	357	129	-	-	-	-	-	-	-	-	-	8	336	156
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	165	-	2	239	98
Walleye	5	317	71	-	-	-	1	82	-	1	510	-	17	357	46
Weight (g)															
Northern Pike	2	355	318	-	-	-	2	2015	-	-	-	-	8	406	357
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	56	-	5	154	-
Walleye	5	440	371	-	-	-	1	7	-	5	244	-	17	523	174
Condition Factor (K)															
Northern Pike	2	0.67	0.03	-	-	-	-	-	-	-	-	-	8	0.72	0.08
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	1.25	-	2	1.35	0.18
Walleye	5	1.19	0.12	-	-	-	1	1.27	-	1	0.91	-	17	1.1	0.06

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 8.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Age	Year-Class	Split Lake		Limestone Forebay		Lower Nelson R		Hayes River		Assean Lake	
		n	%	n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-	-	-
2	2008	2	2.70	-	-	-	-	-	-	1	1.37
3	2007	12	16.22	1	2.50	-	-	1	10.00	2	2.74
4	2006	12	16.22	2	5.00	6	7.79	1	10.00	11	15.07
5	2005	15	20.27	4	10.00	23	29.87	1	10.00	21	28.77
6	2004	16	21.62	12	30.00	11	14.29	2	20.00	14	19.18
7	2003	5	6.76	6	15.00	15	19.48	1	10.00	13	17.81
8	2002	3	4.05	9	22.50	8	10.39	3	30.00	3	4.11
9	2001	2	2.70	6	15.00	4	5.19	-	-	4	5.48
10	2000	2	2.70	-	-	4	5.19	1	10.00	4	5.48
11	1999	1	1.35	-	-	2	2.60	-	-	-	-
12	1998	-	-	-	-	3	3.90	-	-	-	-
13	1997	2	2.70	-	-	-	-	-	-	-	-
14	1996	1	1.35	-	-	1	1.30	-	-	-	-
15	1995	1	1.35	-	-	-	-	-	-	-	-
Total		74	100	40	100	77	100	10	100	73	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 8.6-14. Age/year -class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Age	Year-Class	Split Lake		Limestone Forebay		Lower Nelson R		Hayes River		Assean Lake	
		n	%	n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-	3	3.85
2	2008	1	5.00	-	-	-	-	-	-	10	12.82
3	2007	1	5.00	-	-	-	-	-	-	9	11.54
4	2006	-	-	-	-	-	-	1	10.00	12	15.38
5	2005	2	10.00	-	-	1	4.35	2	20.00	24	30.77
6	2004	3	15.00	-	-	2	8.70	5	50.00	9	11.54
7	2003	6	30.00	-	-	1	4.35	2	20.00	-	-
8	2002	3	15.00	-	-	5	21.74	-	-	2	2.56
9	2001	1	5.00	-	-	3	13.04	-	-	1	1.28
10	2000	1	5.00	-	-	1	4.35	-	-	-	-
11	1999	1	5.00	-	-	-	-	-	-	1	1.28
12	1998	-	-	-	-	2	8.70	-	-	2	2.56
13	1997	-	-	-	-	1	4.35	-	-	-	-
14	1996	-	-	1	100.00	1	4.35	-	-	2	2.56
15	1995	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	1	4.35	-	-	1	1.28
17	1993	1	5.00	-	-	1	4.35	-	-	1	1.28
18	1992	-	-	-	-	2	8.70	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	1	4.35	-	-	1	1.28
21	1989	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	1	4.35	-	-	-	-
Total		20	100	1	100	23	100	10	100	78	100

n = number of fish aged (may not equal number of fish caught)

% = percent of total number of fish aged

Table 8.6-15. Age/year -class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Age	Year-Class	Split Lake		Limestone Forebay		Lower Nelson R		Hayes River		Assean Lake	
		n	%	n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-	-	-
2	2008	13	7.69	-	-	1	2.17	-	-	3	1.15
3	2007	19	11.24	-	-	4	8.70	-	-	3	1.15
4	2006	8	4.73	-	-	1	2.17	1	2.27	17	6.51
5	2005	18	10.65	-	-	4	8.70	-	-	13	4.98
6	2004	6	3.55	-	-	4	8.70	2	4.55	6	2.30
7	2003	57	33.73	1	25.00	12	26.09	6	13.64	38	14.56
8	2002	34	20.12	-	-	11	23.91	3	6.82	46	17.62
9	2001	8	4.73	-	-	2	4.35	1	2.27	57	21.84
10	2000	4	2.37	-	-	1	2.17	4	9.09	40	15.33
11	1999	-	-	1	25.00	2	4.35	2	4.55	11	4.21
12	1998	1	0.59	-	-	3	6.52	3	6.82	13	4.98
13	1997	-	-	1	25.00	-	-	3	6.82	3	1.15
14	1996	-	-	-	-	-	-	4	9.09	7	2.68
15	1995	1	0.59	-	-	1	2.17	1	2.27	1	0.38
16	1994	-	-	-	-	-	-	1	2.27	1	0.38
17	1993	-	-	1	25.00	-	-	1	2.27	-	-
18	1992	-	-	-	-	-	-	1	2.27	-	-
19	1991	-	-	-	-	-	-	-	-	1	0.38
20	1990	-	-	-	-	-	-	5	11.36	1	0.38
21	1989	-	-	-	-	-	-	3	6.82	-	-
22	1988	-	-	-	-	-	-	1	2.27	-	-
23	1987	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	2	4.55	-	-
Total		169	100	4	100	46	100	44	100	261	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 8.6-16. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

		Split L									Limestone Forebay								
Age	Year-Class	FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	2	298	19	2	200	14	2	0.77	0.09	-	-	-	-	-	-	-	-	-
3	2007	12	390	54	12	471	187	12	0.76	0.04	1	329	-	1	270	-	1	0.76	-
4	2006	12	450	57	12	699	252	12	0.74	0.04	2	511	7	2	1025	64	2	0.77	0.01
5	2005	15	522	50	15	1079	369	15	0.74	0.06	4	574	36	4	1368	223	4	0.73	0.13
6	2004	16	554	77	16	1343	547	16	0.74	0.08	12	578	43	12	1483	272	12	0.77	0.09
7	2003	5	555	28	5	1282	221	5	0.75	0.07	6	641	50	6	1863	400	6	0.70	0.07
8	2002	3	698	142	3	3060	1816	3	0.84	0.11	9	667	28	9	2379	502	9	0.79	0.09
9	2001	2	775	58	2	3950	806	2	0.84	0.01	6	693	66	6	2517	711	6	0.74	0.05
10	2000	2	690	71	2	2735	1068	2	0.81	0.07	-	-	-	-	-	-	-	-	-
11	1999	1	680	-	1	2900	-	1	0.92	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	2	851	15	2	5160	198	2	0.84	0.07	-	-	-	-	-	-	-	-	-
14	1996	1	777	-	1	4100	-	1	0.87	-	-	-	-	-	-	-	-	-	-
15	1995	1	748	-	1	3290	-	1	0.79	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-16. - continued -

Age	Year-Class	Lower Nelson R FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Hayes R FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	1	377	-	1	360	-	1	0.67	-
4	2006	6	476	70	6	880	373	6	0.78	0.05	1	405	-	1	520	-	1	0.78	-
5	2005	23	505	31	23	988	174	23	0.77	0.11	1	550	-	1	1130	-	1	0.68	-
6	2004	11	579	58	11	1496	473	11	0.75	0.07	2	660	40	2	2140	283	2	0.75	0.04
7	2003	15	612	46	15	1647	488	15	0.70	0.06	1	610	-	1	1400	-	1	0.62	-
8	2002	8	726	51	8	2914	794	8	0.74	0.09	3	727	38	3	2857	299	3	0.75	0.05
9	2001	4	716	64	4	2820	877	4	0.75	0.06	-	-	-	-	-	-	-	-	-
10	2000	4	837	45	4	4788	1085	4	0.81	0.06	1	756	-	1	2900	-	1	0.67	-
11	1999	2	800	35	2	3640	57	2	0.72	0.08	-	-	-	-	-	-	-	-	-
12	1998	3	805	27	3	4573	869	3	0.87	0.10	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	1	830	-	1	5040	-	1	0.88	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-16. - continued -

Age	Year-Class	Assean L FL (mm) n			W (g) n			K n		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-
2	2008	1	320	-	1	218	-	1	0.67	-
3	2007	2	428	103	2	585	389	2	0.69	-
4	2006	11	439	63	11	576	230	11	0.65	0
5	2005	21	490	55	21	764	263	21	0.63	0.1
6	2004	14	551	59	14	1087	298	14	0.64	0.1
7	2003	13	597	52	13	1363	404	13	0.63	0.1
8	2002	3	699	15	3	2350	416	3	0.69	0.1
9	2001	4	685	109	4	2473	1054	4	0.74	0.1
10	2000	4	711	58	4	2413	746	4	0.66	0.1
11	1999	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-17. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Age	Year-Class	Split L									Limestone Forebay								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	1	190	-	1	80.0	-	1	1.17	-	-	-	-	-	-	-	-	-	-
3	2007	1	300	-	1	397	-	1	1.47	-	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2005	2	417	21	2	1194	9	2	1.66	0.27	-	-	-	-	-	-	-	-	-
6	2004	3	390	10	3	986	146	3	1.65	0.13	-	-	-	-	-	-	-	-	-
7	2003	6	415	19	6	1251	254	6	1.74	0.22	-	-	-	-	-	-	-	-	-
8	2002	3	434	25	3	1382	430	3	1.66	0.24	-	-	-	-	-	-	-	-	-
9	2001	1	426	-	1	1321	-	1	1.71	-	-	-	-	-	-	-	-	-	-
10	2000	1	443	-	1	1540	-	1	1.77	-	-	-	-	-	-	-	-	-	-
11	1999	1	459	-	1	1174	-	1	1.21	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	1	512	-	1	2320	-	1	1.73	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	1	523	-	1	2850	-	1	1.99	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-17. - continued -

Age	Year-Class	Lower Nelson R FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Hayes R FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	1	310	-	1	440	-	1	1.48	-
5	2005	1	350	-	1	510	-	1	1.19	-	2	308	25	2	450	85	2	1.55	0.08
6	2004	2	346	8	2	565	35	2	1.37	0.01	5	346	27	5	620	125	5	1.48	0.09
7	2003	1	354	-	1	570	-	1	1.28	-	2	344	33	2	585	191	2	1.42	0.06
8	2002	5	350	13	5	600	86	5	1.39	0.09	-	-	-	-	-	-	-	-	-
9	2001	3	348	12	3	587	106	3	1.38	0.12	-	-	-	-	-	-	-	-	-
10	2000	1	356	-	1	600	-	1	1.33	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	2	426	48	2	1170	438	2	1.48	0.06	-	-	-	-	-	-	-	-	-
13	1997	1	415	-	1	1060	-	1	1.48	-	-	-	-	-	-	-	-	-	-
14	1996	1	411	-	1	990	-	1	1.43	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	1	470	-	1	1620	-	1	1.56	-	-	-	-	-	-	-	-	-	-
17	1993	1	459	-	1	1410	-	1	1.46	-	-	-	-	-	-	-	-	-	-
18	1992	2	469	16	2	1550	325	2	1.49	0.17	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	1	481	-	1	1400	-	1	1.26	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	1	450	-	1	1260	-	1	1.38	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-17. - continued -

Age	Year-Class	Assean Lake FL (mm) n			W (g) n			K n		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	3	186	8	3	94	17	3	1.44	0.1
2	2008	10	199	25	10	117	56	10	1.39	0.1
3	2007	9	302	20	9	446	100	9	1.6	0.1
4	2006	12	327	31	12	539	188	12	1.49	0.2
5	2005	24	368	41	24	820	294	24	1.58	0.1
6	2004	9	400	22	9	1075	203	9	1.66	0.1
7	2003	-	-	-	-	-	-	-	-	-
8	2002	2	448	1	2	1469	45	2	1.64	0
9	2001	1	464	-	1	1830	-	1	1.83	-
10	2000	-	-	-	-	-	-	-	-	-
11	1999	1	501	-	1	2090	-	1	1.66	-
12	1998	2	484	9	2	2225	233	2	1.97	0.1
13	1997	-	-	-	-	-	-	-	-	-
14	1996	2	496	1	2	2125	49	2	1.75	0
15	1995	-	-	-	-	-	-	-	-	-
16	1994	1	470	-	1	1970	-	1	1.9	-
17	1993	1	486	-	1	2230	-	1	1.94	-
18	1992	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-
20	1990	1	488	-	1	2150	-	1	1.85	-
21	1989	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-18. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Age	Year-Class	Split L									Limestone Forebay								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	13	246	18	13	167	46	13	1.10	0.12	-	-	-	-	-	-	-	-	-
3	2007	19	307	18	19	338	69	19	1.15	0.07	-	-	-	-	-	-	-	-	-
4	2006	8	349	50	8	543	243	8	1.20	0.10	-	-	-	-	-	-	-	-	-
5	2005	18	383	27	18	715	167	18	1.26	0.09	-	-	-	-	-	-	-	-	-
6	2004	6	427	34	6	1018	278	6	1.27	0.09	-	-	-	-	-	-	-	-	-
7	2003	57	452	31	57	1246	268	57	1.33	0.09	1	405	-	1	940	-	1.00	1.42	-
8	2002	34	452	35	34	1246	294	34	1.32	0.10	-	-	-	-	-	-	-	-	-
9	2001	8	453	47	8	1284	413	8	1.34	0.05	-	-	-	-	-	-	-	-	-
10	2000	4	489	74	4	1635	731	4	1.32	0.07	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	1	535	-	1	2050	-	1	1.34	-
12	1998	1	490	-	1	1570	-	1	1.33	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	1	492	-	1	1760	-	1	1.48	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	1	576	-	1	2230	-	1	1.17	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	1	536	-	1	1710	-	1	1.11	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-18. Continued

Age	Year-Class	Lower Nelson R FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Hayes River FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	1	241	-	1	158	-	1	1.13	-	-	-	-	-	-	-	-	-	-
3	2007	4	241	19	4	161	44	4	1.14	0.11	-	-	-	-	-	-	-	-	-
4	2006	1	295	-	1	360	-	1	1.40	-	1	312	-	1	360	-	1	1.19	-
5	2005	4	425	50	4	1100	467	4	1.37	0.10	-	-	-	-	-	-	-	-	-
6	2004	4	407	36	4	805	263	4	1.16	0.16	2	307	13	2	360	42	2	1.25	0.01
7	2003	12	437	41	11	1134	332	11	1.35	0.12	6	395	26	6	760	194	6	1.21	0.08
8	2002	11	424	31	10	1052	179	10	1.31	0.06	3	413	20	3	777	150	3	1.09	0.07
9	2001	2	458	8	2	1205	35	2	1.26	0.04	1	381	-	1	650	-	1	1.18	-
10	2000	1	571	-	1	1700	-	1	0.91	-	4	453	54	4	1135	500	4	1.16	0.12
11	1999	2	426	13	2	1030	156	2	1.33	0.07	2	406	21	2	785	106	2	1.18	0.02
12	1998	3	513	29	3	1813	420	3	1.33	0.20	3	490	59	3	1353	391	3	1.14	0.08
13	1997	-	-	-	-	-	-	-	-	-	3	480	28	3	1263	215	3	1.14	0.07
14	1996	-	-	-	-	-	-	-	-	-	4	520	120	4	1433	659	4	1.01	0.22
15	1995	1	468	-	1	1420	-	1	1.39	-	1	523	-	1	1360	-	1	0.95	-
16	1994	-	-	-	-	-	-	-	-	-	1	605	-	1	2650	-	1	1.20	-
17	1993	-	-	-	-	-	-	-	-	-	1	610	-	1	2680	-	1	1.18	-
18	1992	-	-	-	-	-	-	-	-	-	1	515	-	1	1710	-	1	1.25	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	5	586	81	5	2256	872	5	1.08	0.11
21	1989	-	-	-	-	-	-	-	-	-	3	529	107	3	1495	804	3	0.96	0.10
22	1988	-	-	-	-	-	-	-	-	-	1	620	-	1	2800	-	1	1.17	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	2	626	49	2	2963	357	2	1.22	0.13

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-18. - continued -

Age	Year-Class	Assean Lake FL (mm) n			W (g) n			K n		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-
2	2008	3	190	5	3	65	5	3	0.95	0
3	2007	3	240	9	3	150	20	3	1.08	0.1
4	2006	17	257	18	17	186	32	17	1.08	0.1
5	2005	13	295	20	13	282	59	13	1.08	0.1
6	2004	6	336	31	6	413	132	6	1.07	0
7	2003	38	352	21	38	477	94	38	1.08	0.1
8	2002	46	362	24	46	529	104	46	1.1	0.1
9	2001	57	390	26	57	656	139	57	1.09	0.1
10	2000	40	411	28	40	779	164	40	1.11	0.1
11	1999	11	412	27	11	792	171	11	1.11	0.1
12	1998	13	411	29	13	782	179	13	1.12	0.1
13	1997	3	426	31	3	896	253	3	1.14	0.1
14	1996	7	404	26	7	713	158	7	1.07	0.1
15	1995	1	411	-	1	810	-	1	1.17	-
16	1994	1	412	-	1	740	-	1	1.06	-
17	1993	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-
19	1991	1	446	-	1	1000	-	1	1.13	-
20	1990	1	453	-	1	1080	-	1	1.16	-
21	1989	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 8.6-19. Deformities, erosions, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Split L											
Lake Sturgeon	-	-	-	-	-	-	-	-	2	-	-
White Sucker	-	-	-	-	-	-	-	-	154	-	-
Northern Pike	1	1.35	-	-	-	-	-	-	74	1	1.35
Lake Whitefish	-	-	-	-	-	-	-	-	28	-	-
Walleye	-	-	-	-	-	-	1	0.52	194	1	0.52
Limestone Forebay											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	12	-	-
Northern Pike	1	2.33	2	4.65	1	2.33	-	-	43	4	9.30
Lake Whitefish	-	-	-	-	-	-	-	-	1	-	-
Walleye	-	-	-	-	-	-	-	-	5	-	-
Lower Nelson R											
Lake Sturgeon	-	-	-	-	-	-	-	-	43	-	-
White Sucker	-	-	-	-	-	-	-	-	19	-	-
Northern Pike	1	1.25	1	1.25	-	-	-	-	80	2	2.50
Lake Whitefish	-	-	-	-	-	-	-	-	25	-	-
Walleye	-	-	-	-	-	-	-	-	46	-	-
Hayes R											
Lake Sturgeon	-	-	-	-	-	-	-	-	60	-	-
White Sucker	-	-	-	-	1	7.69	-	-	13	1	7.69
Northern Pike	-	-	-	-	-	-	-	-	10	-	-
Lake Whitefish	-	-	-	-	1	10.00	-	-	10	1	10.00
Walleye	1	2.27	-	-	-	-	1	-	44	2	4.55
Assean L											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	1.08	-	-	2	2.15	-	-	93	3	3.23
Northern Pike	-	-	-	-	-	-	-	-	77	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	79	-	-
Walleye	4	1.27	-	-	1	0.32	1	0.32	315	6	1.90

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect} \times 100$);
%DELTs = total percentage of inspected fish with DELTs (nDELTs/nInspect×100)

Table 8.7-1. Mean arithmetic (± standard error, SE) and standardized (± 95% confidence limit, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, and Walleye captured in Split Lake, the Limestone Forebay, the Lower Nelson River, the Hayes River, and Assean Lake in 2010.

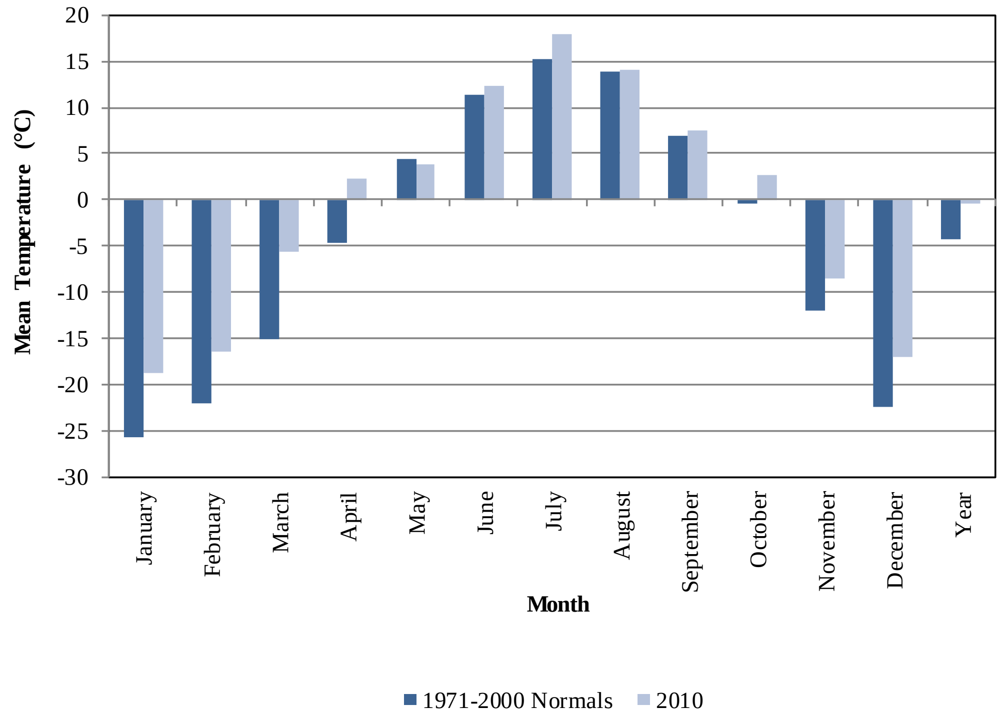
Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
SPLIT	Northern Pike	24	0.363	0.043	0.289	0.249 - 0.335
	Walleye	33	0.197	0.023	0.196	0.173 - 0.222
	Lake Whitefish	16	0.092	0.013	0.062	0.049 - 0.078
LMFB	Northern Pike	36	0.399	0.027	0.292	0.264 - 0.324
	Walleye	5	0.526	0.074	0.250	0.179 - 0.347
	Lake Whitefish	1	0.304	-	-	-
LNR	Northern Pike	36	0.368	0.032	0.242	0.206 - 0.285
	Walleye	36	0.322	0.025	0.277	0.255 - 0.302
	Lake Whitefish	21	0.178	0.029	0.070	0.056 - 0.088
	Lake Sturgeon	1	0.178	-	-	-
HAYES	Northern Pike	10	0.259	0.029	0.202	0.179 - 0.228
	Walleye	36	0.722	0.060	0.463	0.403 - 0.532
	Lake Whitefish	9	0.063	0.006	0.070	0.064 - 0.077
	Lake Sturgeon	1	0.194	-	-	-
ASSN	Northern Pike	36	0.251	0.028	0.248	0.220 - 0.280
	Walleye	36	0.195	0.012	0.235	0.215 - 0.257
	Lake Whitefish	36	0.039	0.003	0.039	0.035 - 0.043

Table 8.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of three fish species sampled for mercury from Split Lake, the Limestone Forebay, the Lower Nelson River, the Hayes River, and Assean Lake in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
SPLIT	Northern Pike	24	583.8 ± 33.0	1936.1 ± 320.0	0.78 ± 0.01	6.0 ± 0.6
	Walleye	33	376.4 ± 19.3	853.9 ± 121.9	1.22 ± 0.02	5.2 ± 0.5
	Lake Whitefish [a]	16	411.8 ± 19.3	1323.6 ± 159.1	1.69 ± 0.06	7.5 ± 0.9
LMFB	Northern Pike	36	611.8 ± 14.1	1815.6 ± 118.3	0.76 ± 0.01	6.7 ± 0.3
	Walleye	5	497.6 ± 24.5	1660.0 ± 189.1	1.33 ± 0.06	12.0 ± 2.1
	Lake Whitefish	1	512	2320	1.73	14
LNR	Northern Pike [b]	36	624.6 ± 22.9	2151.9 ± 252.2	0.76 ± 0.01	6.9 ± 0.4
	Walleye [c]	36	410.2 ± 14.1	979.4 ± 83.1	1.27 ± 0.02	7.2 ± 0.5
	Lake Whitefish [d]	21	400.2 ± 12.0	959.0 ± 94.2	1.40 ± 0.02	11.7 ± 1.1
	Lake Sturgeon	1	690	-	-	-
HAYES	Northern Pike	10	619.8 ± 43.6	1916.0 ± 320.4	0.71 ± 0.02	6.5 ± 0.7
	Walleye	36	470.7 ± 16.6	1350.3 ± 140.5	1.15 ± 0.02	12.9 ± 0.9
	Lake Whitefish [e]	9	318.1 ± 21.4	517.3 ± 72.8	1.45 ± 0.04	5.8 ± 0.4
	Lake Sturgeon	1	664	-	-	-
ASSN	Northern Pike	36	509.9 ± 29.0	1131.0 ± 156.7	0.65 ± 0.01	5.7 ± 0.5
	Walleye [f]	36	348.4 ± 13.3	531.0 ± 54.4	1.07 ± 0.01	7.7 ± 0.5
	Lake Whitefish [f]	36	332.6 ± 17.4	784.9 ± 112.1	1.56 ± 0.03	5.4 ± 0.7

[a] n = 15 for age
[b] n = 35 for age
[c] n = 35 for weight and K
[d] n = 19 for age
[e] n = 8 for age
[f] n = 32 for age

(A)



(B)

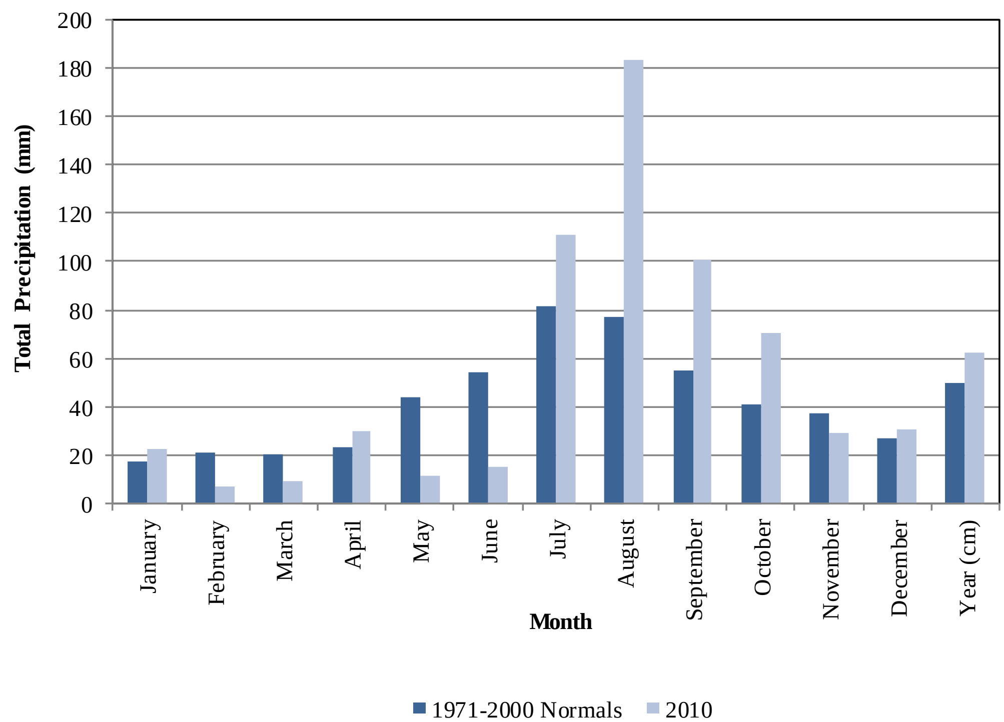


Figure 8.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Gillam, MB.

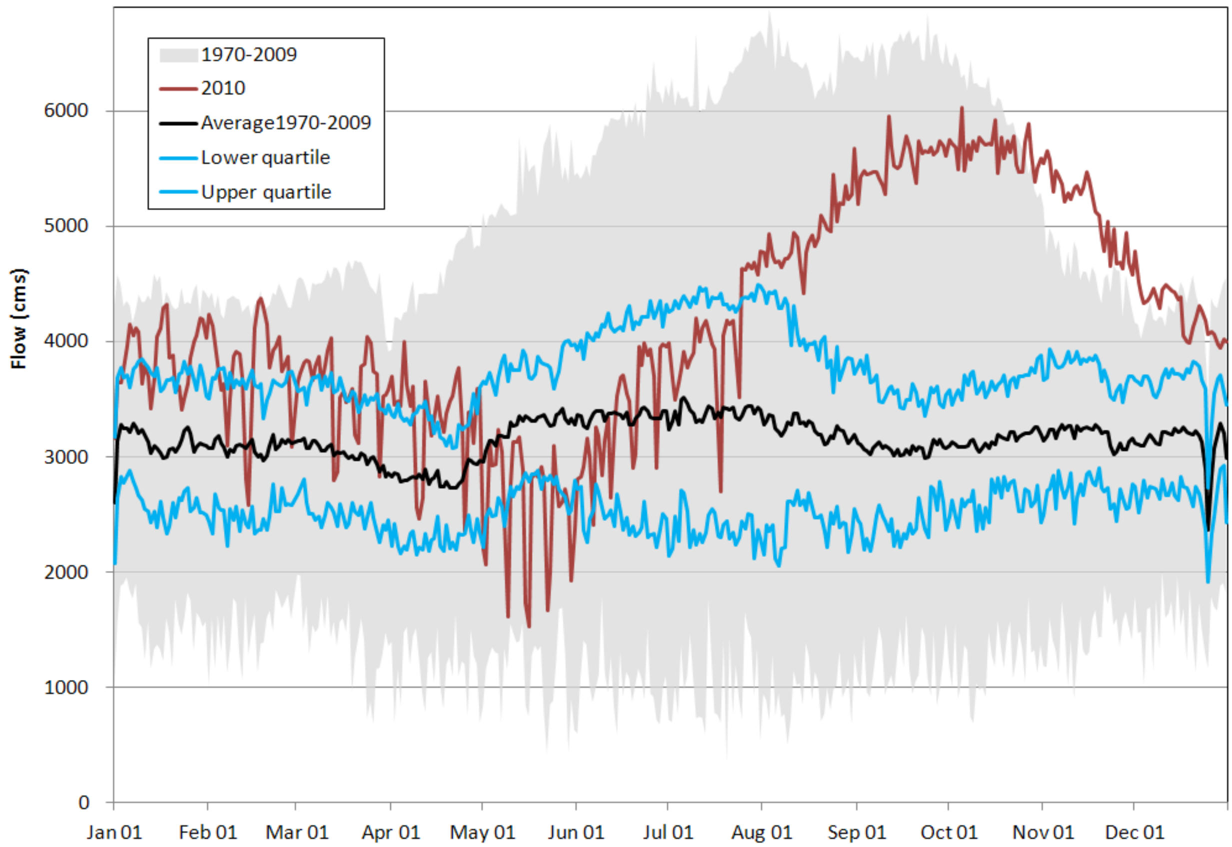


Figure 8.2-1. Outflow of the Kettle Generating Station in 2010.

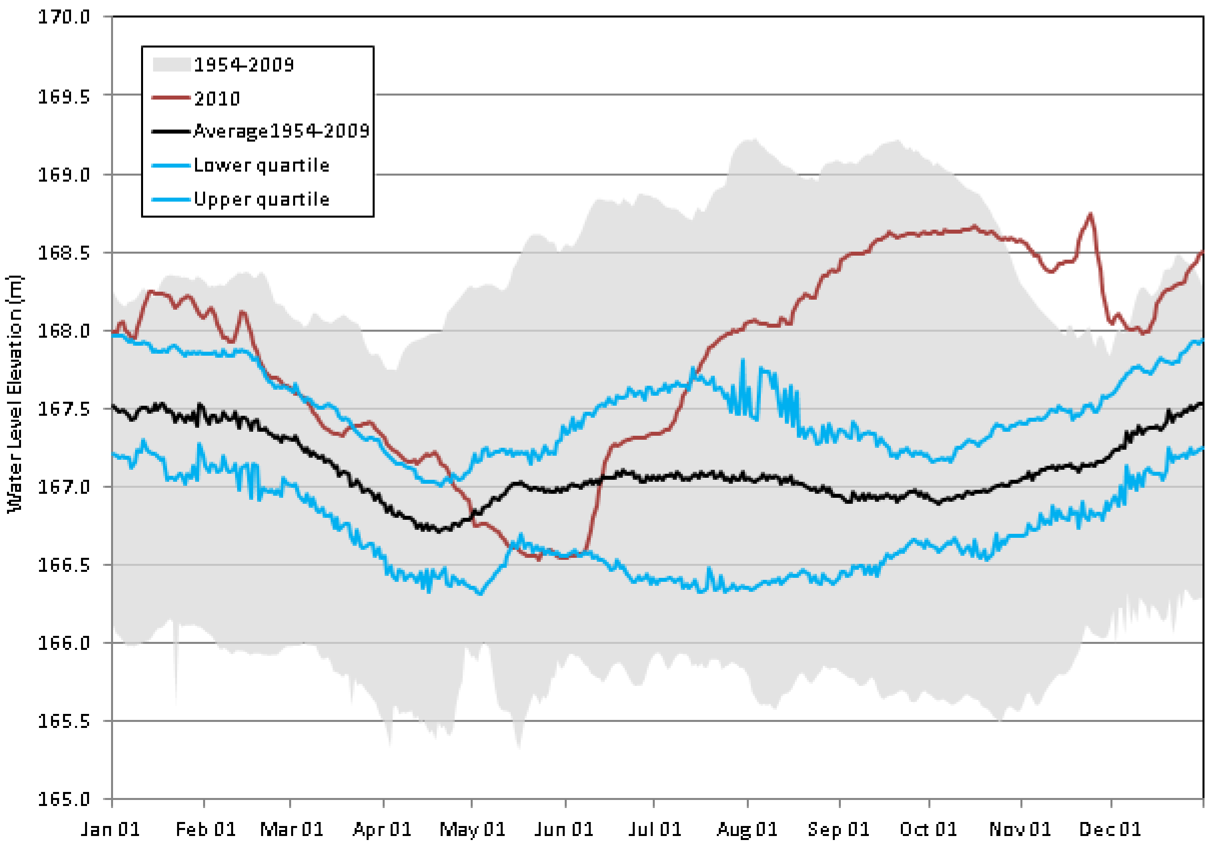


Figure 8.2-2. Water level elevation of Split Lake (05UF003) in 2010.

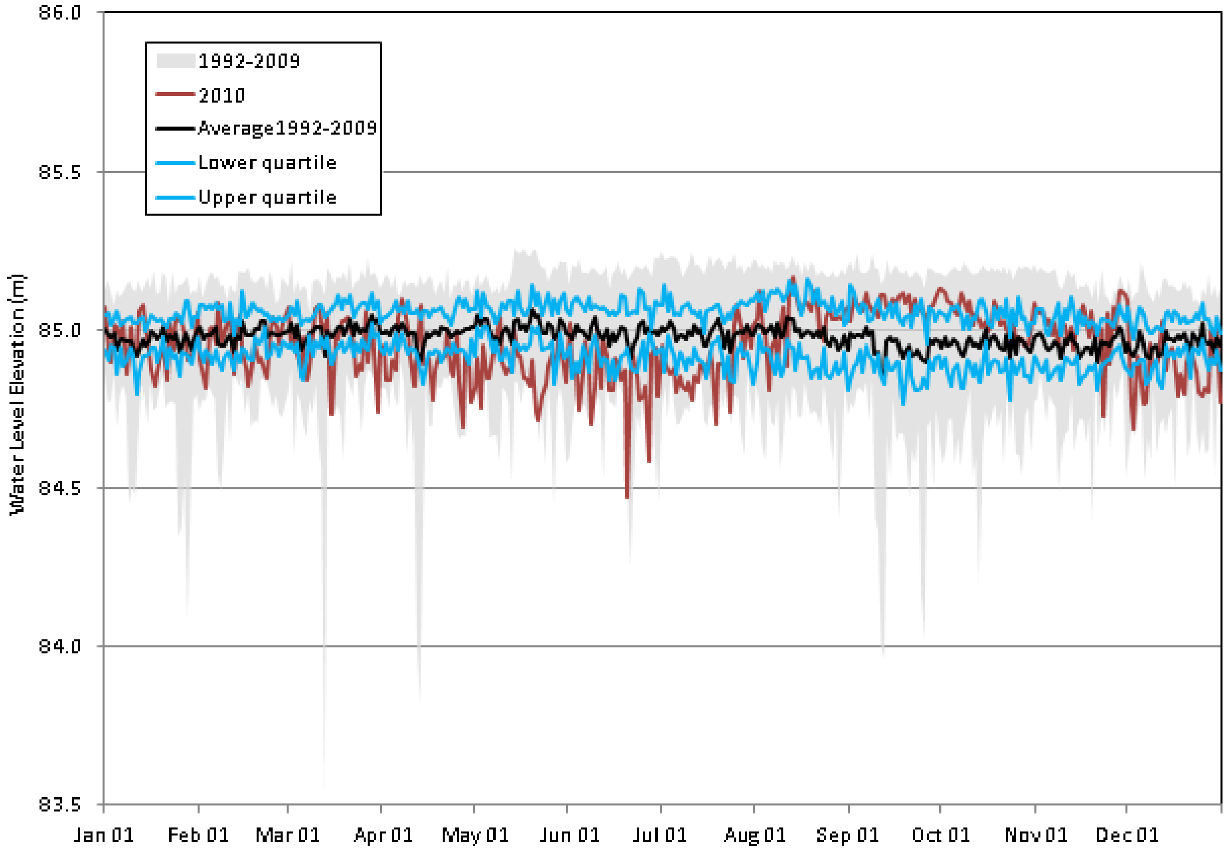


Figure 8.2-3. Water level elevation of the Limestone Generating Station Forebay (05UF008) in 2010.

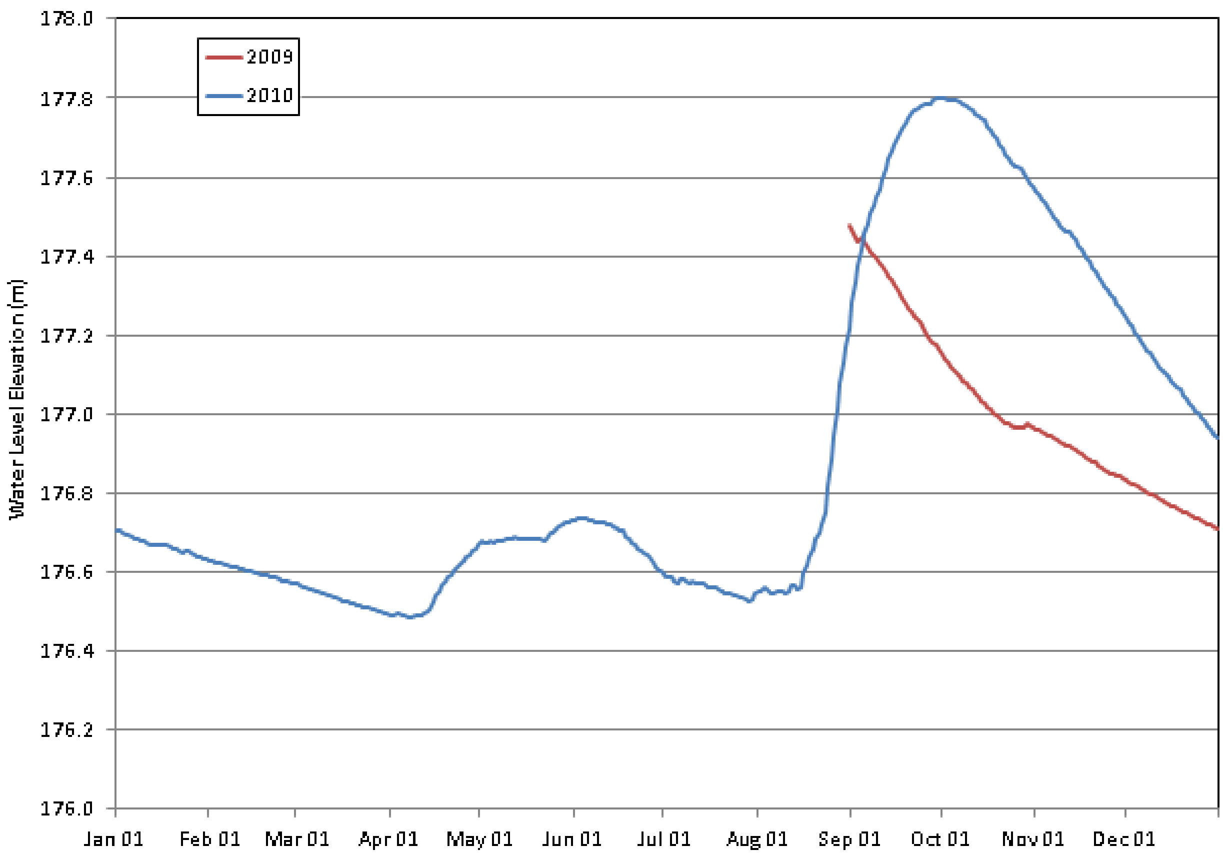


Figure 8.2-4. Water level elevation of Assean Lake (05UF605) in 2010.

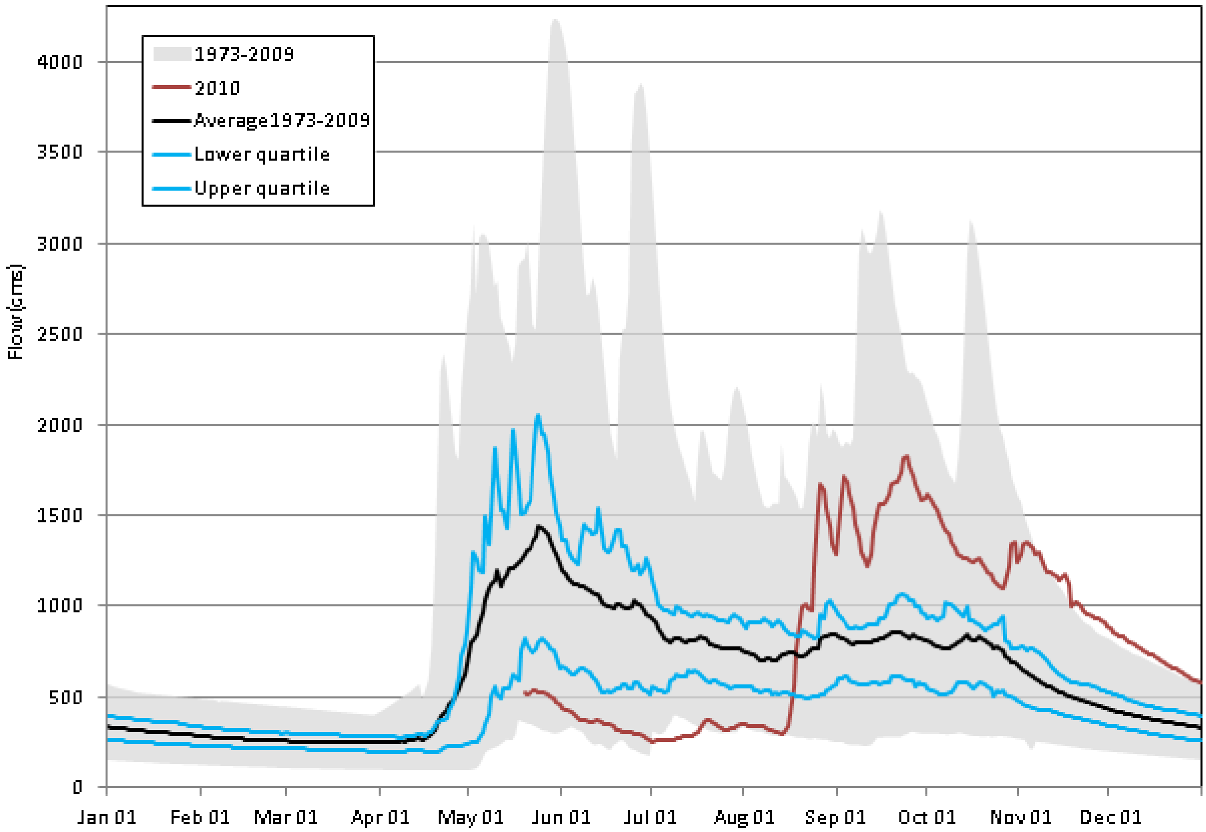


Figure 8.2-5. Flow of the Hayes River (05AB001) in 2010.

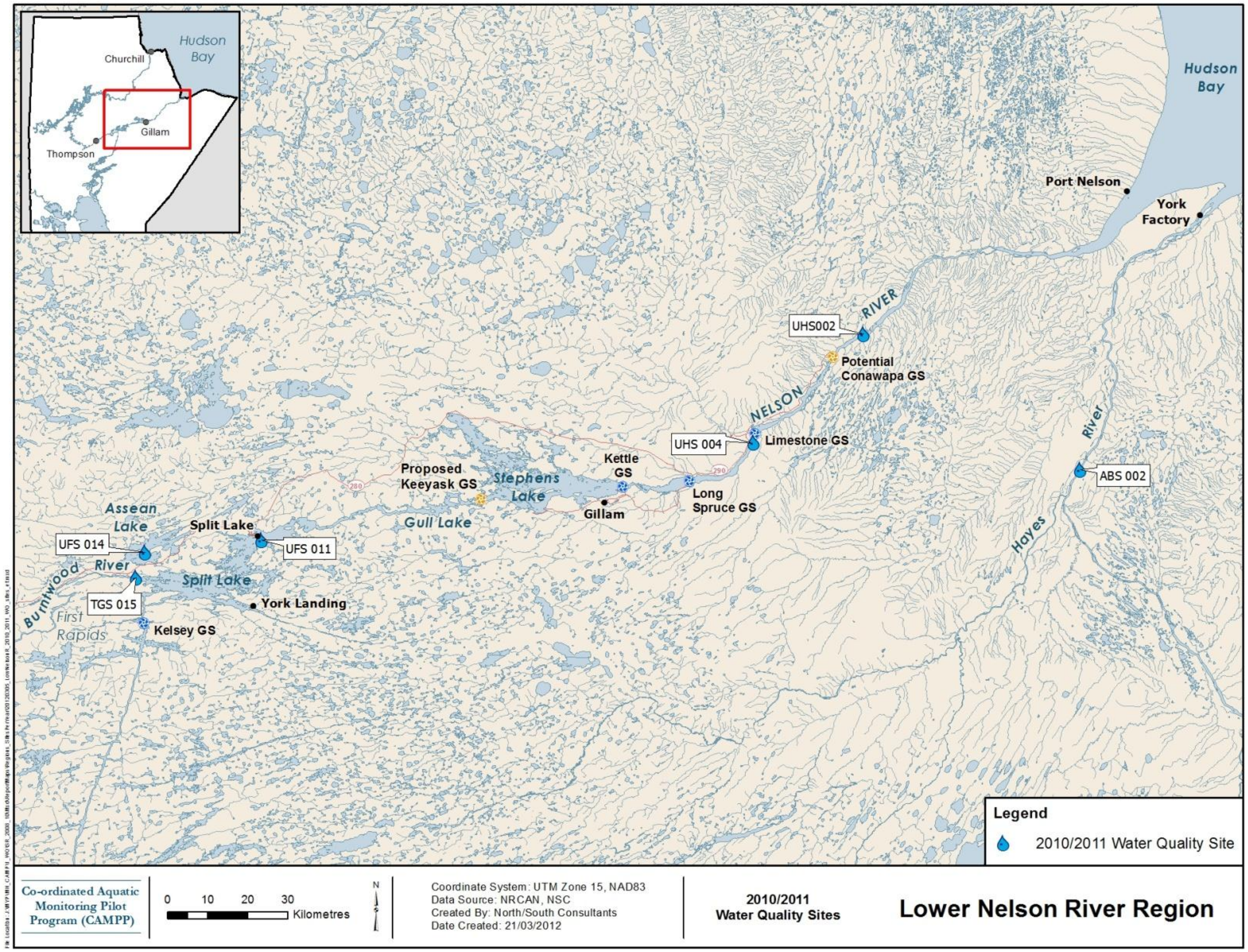


Figure 8.3-1. Water quality and phytoplankton monitoring sites in the Lower Nelson River Region: 2010/2011.

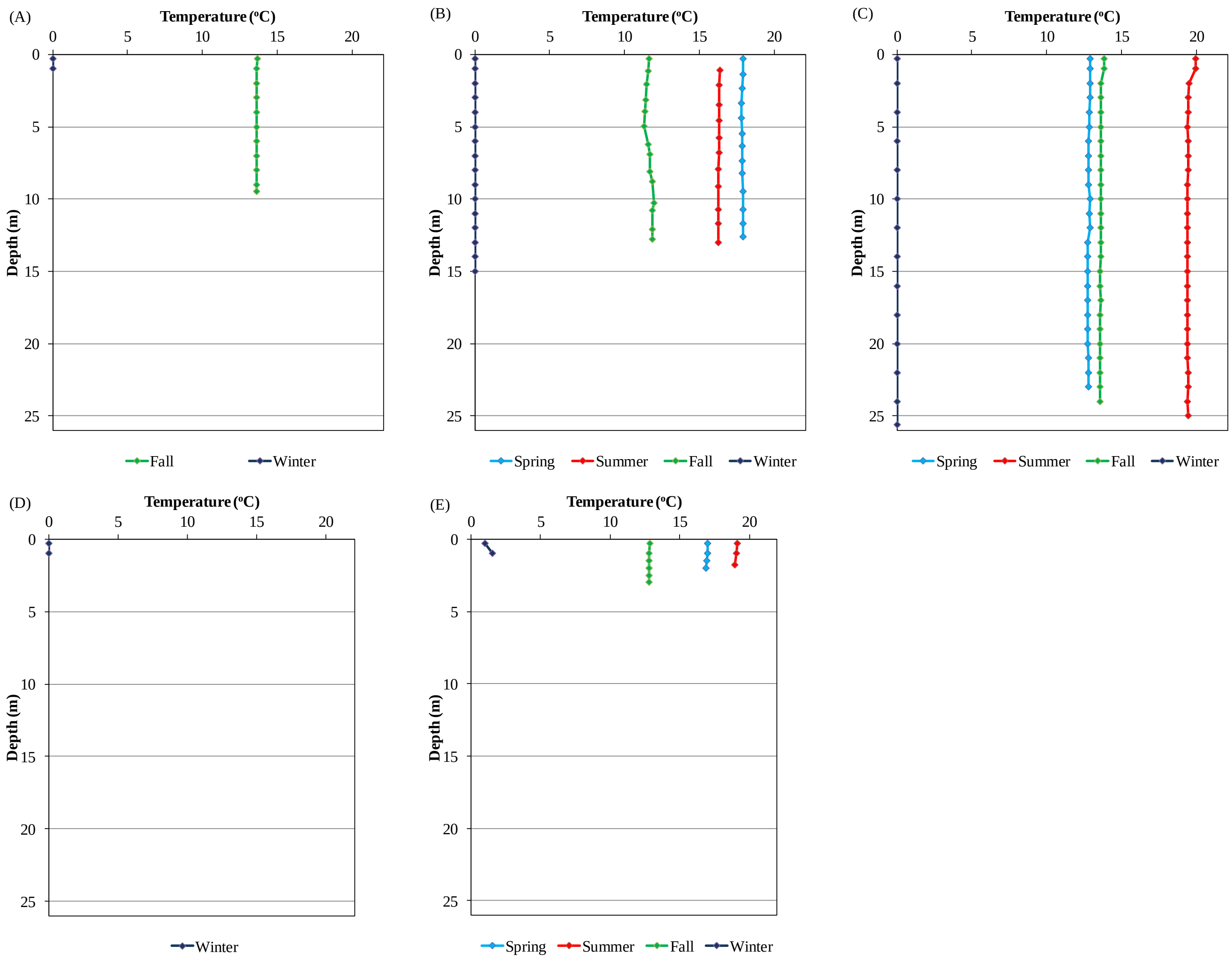


Figure 8.3-2. Water temperature profiles measured in the Lower Nelson River Region in 2010/2011: (A) Burntwood River; (B) Split Lake; (C) Limestone Forebay; (D) Hayes River; and (E) Assean Lake.

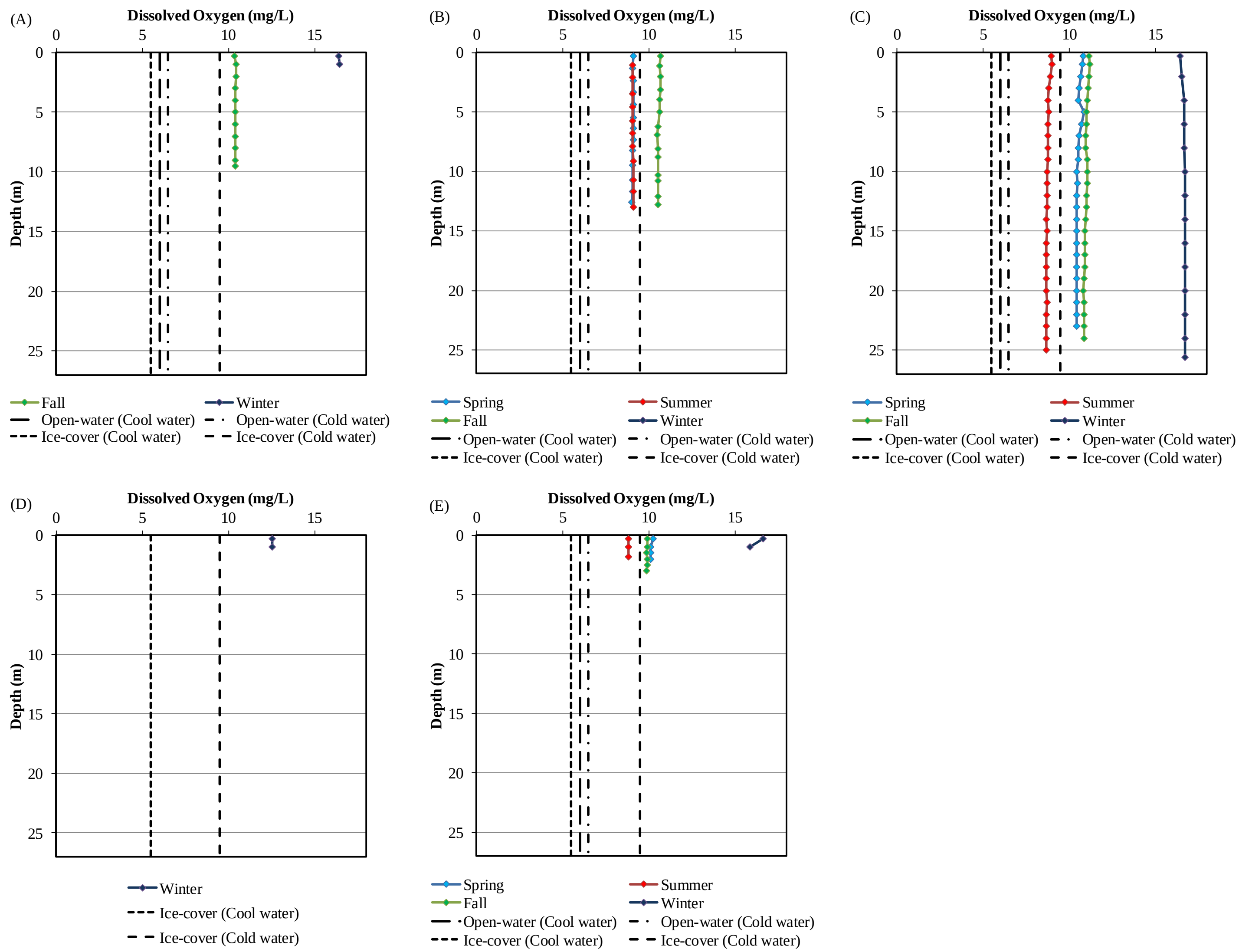


Figure 8.3-3. Dissolved oxygen depth profiles measured in the Lower Nelson River Region in 2010/2011: (A) Burntwood River; (B) Split Lake; (C) Limestone Forebay; (D) Hayes River; and (E) Assean Lake. Dashed lines represent selected MWQSOGs for PAL.

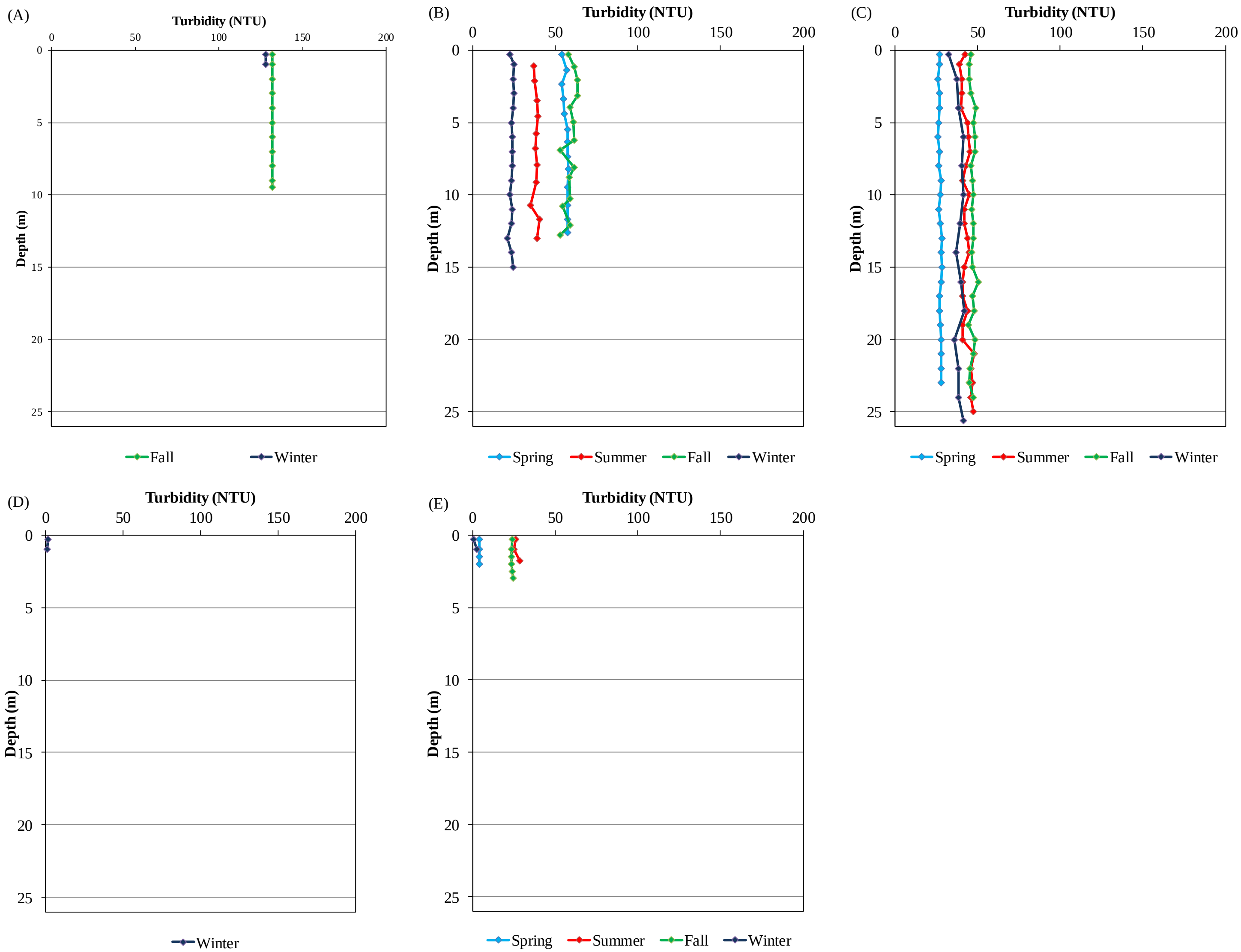


Figure 8.3-4. Turbidity depth profiles measured in the Lower Nelson River Region in 2010/2011: (A) Burntwood River; (B) Split Lake; (C) Limestone Forebay; (D) Hayes River; and (E) Assean Lake.

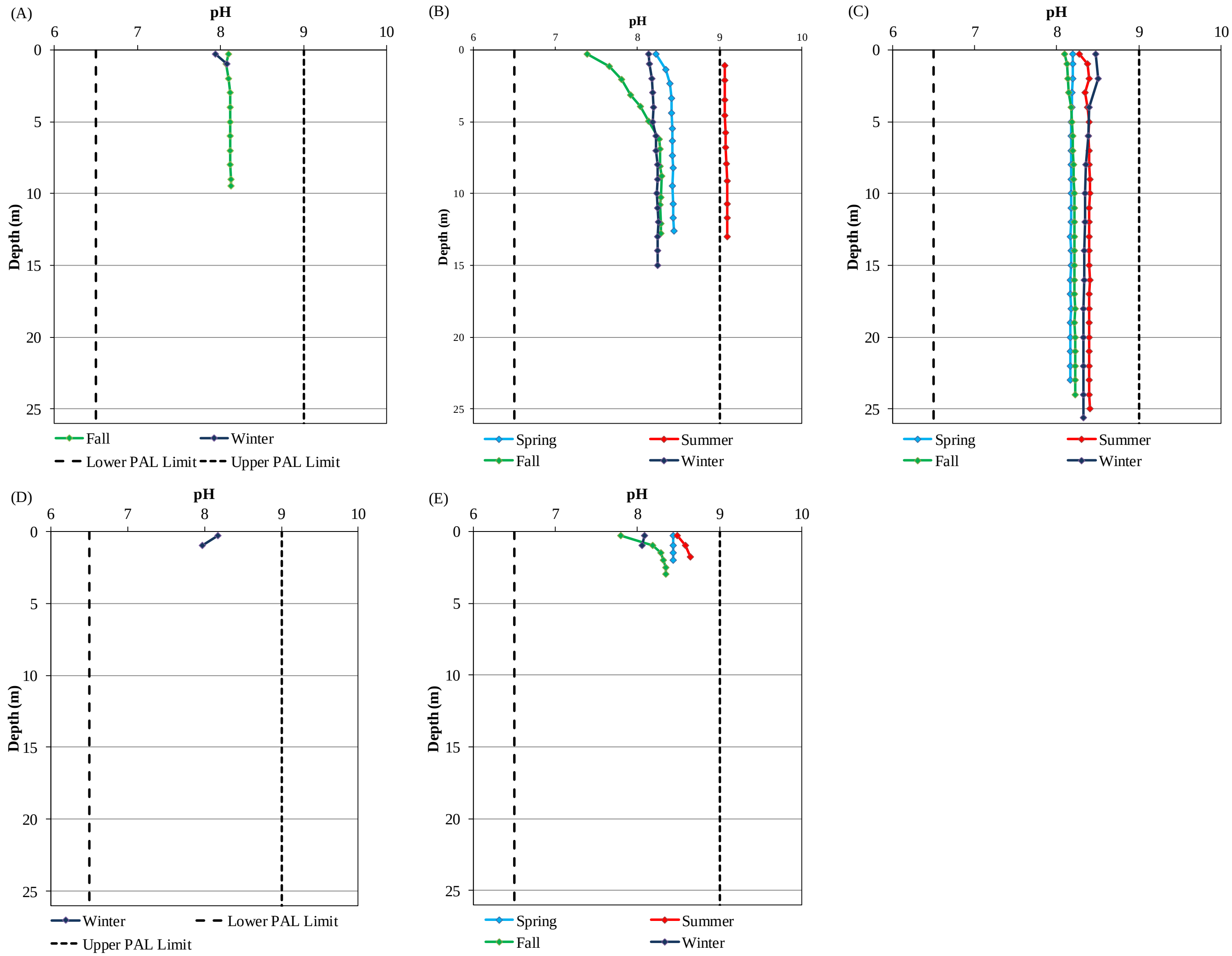


Figure 8.3-5. pH depth profiles measured in the Lower Nelson River Region in 2010/2011: (A) Burntwood River; (B) Split Lake; (C) Limestone Forebay; (D) Hayes River; and (E) Assean Lake.

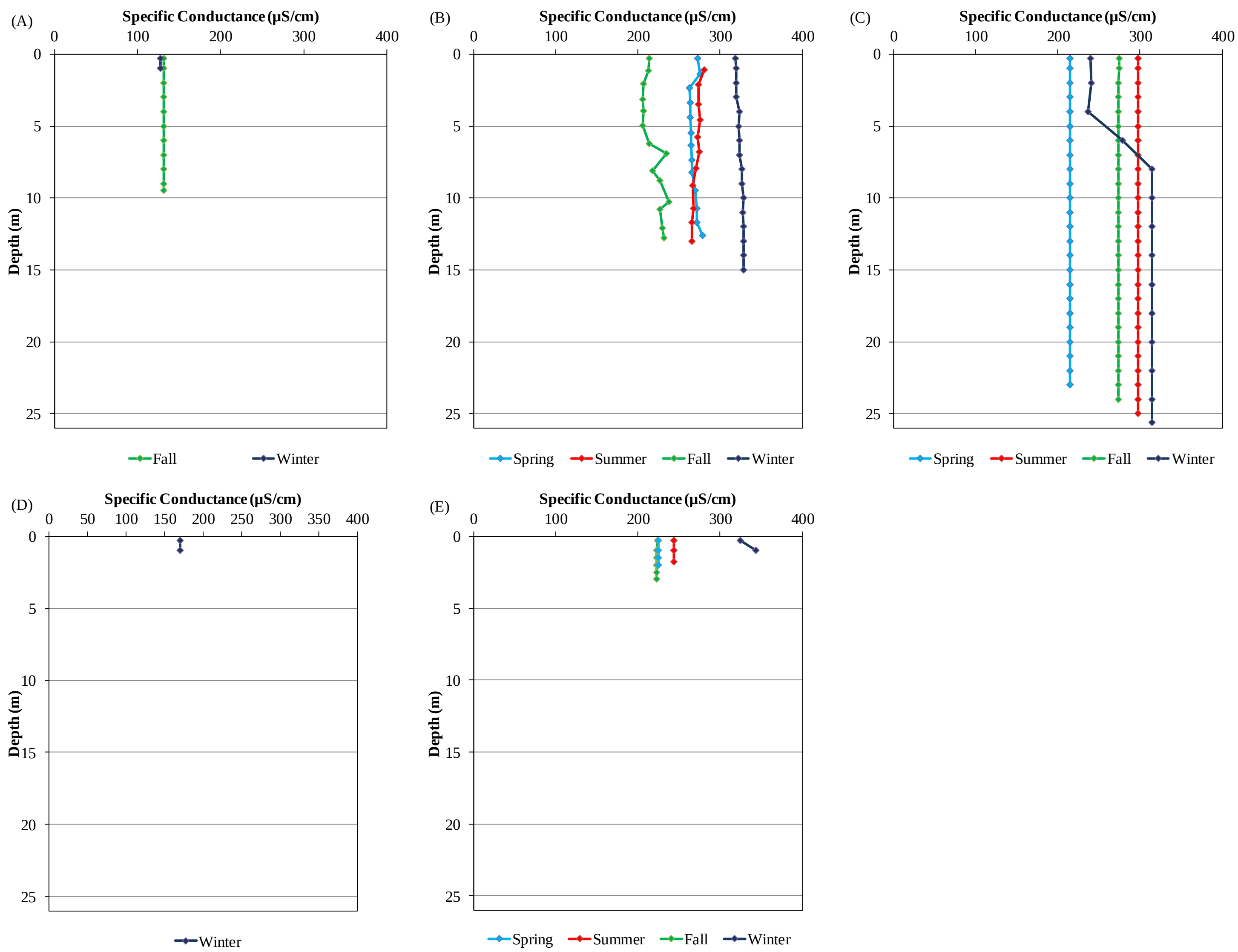


Figure 8.3-6. Specific conductance depth profiles measured in the Lower Nelson River Region in 2010/2011: (A) Burntwood River; (B) Split Lake; (C) Limestone Forebay; (D) Hayes River; and (E) Assean Lake.

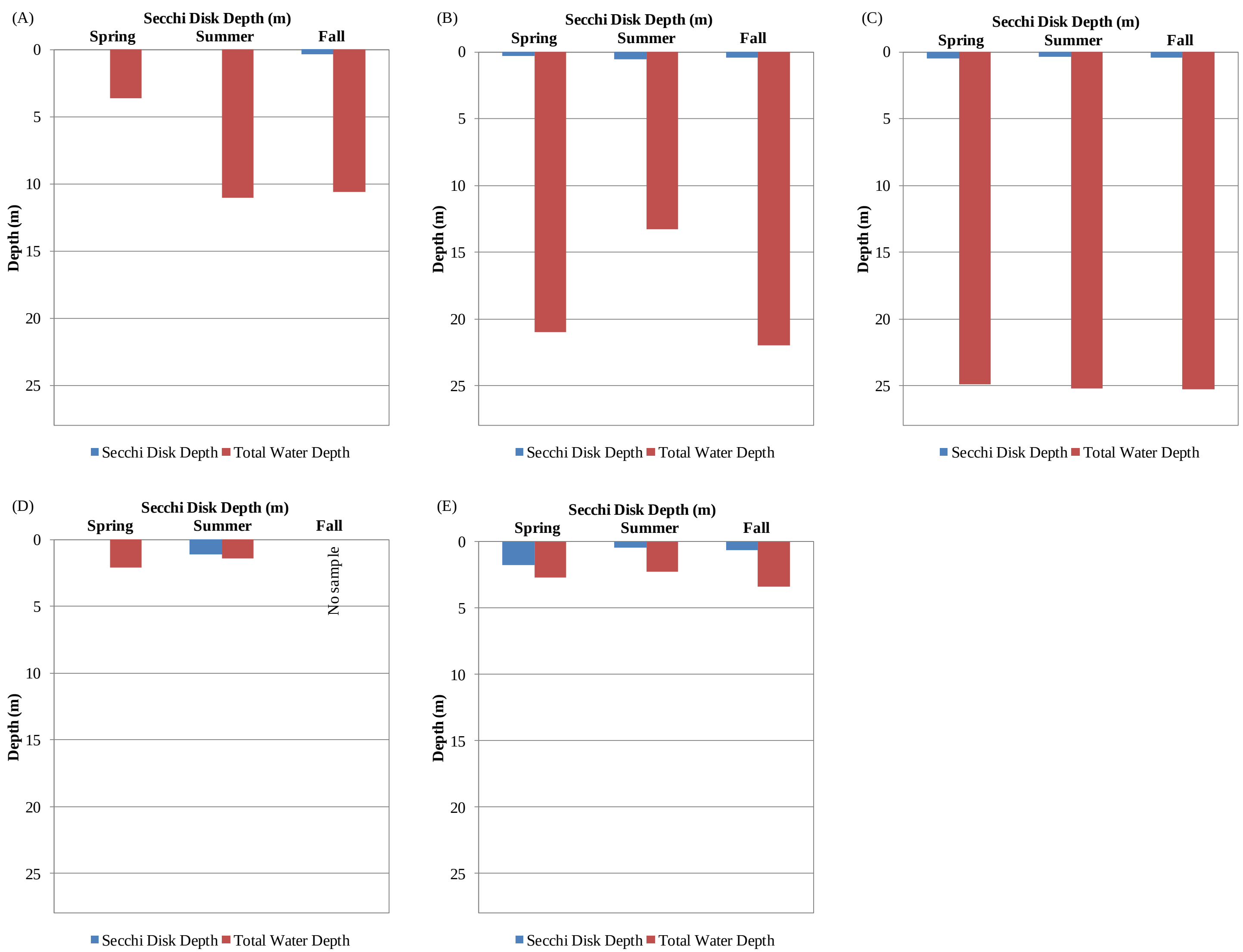


Figure 8.3-7. Secchi disk depths measured in the Lower Nelson River Region in 2010/2011: (A) Burntwood River; (B) Split Lake; (C) Limestone Forebay; (D) Hayes River; and (E) Assean Lake.

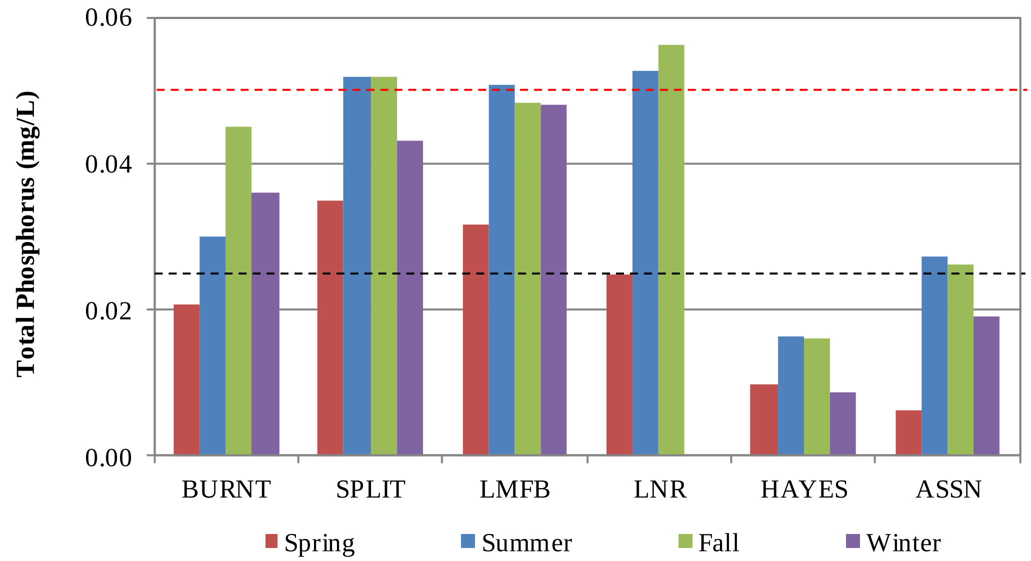


Figure 8.3-8. Total phosphorus measured in surface grabs in the Lower Nelson River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

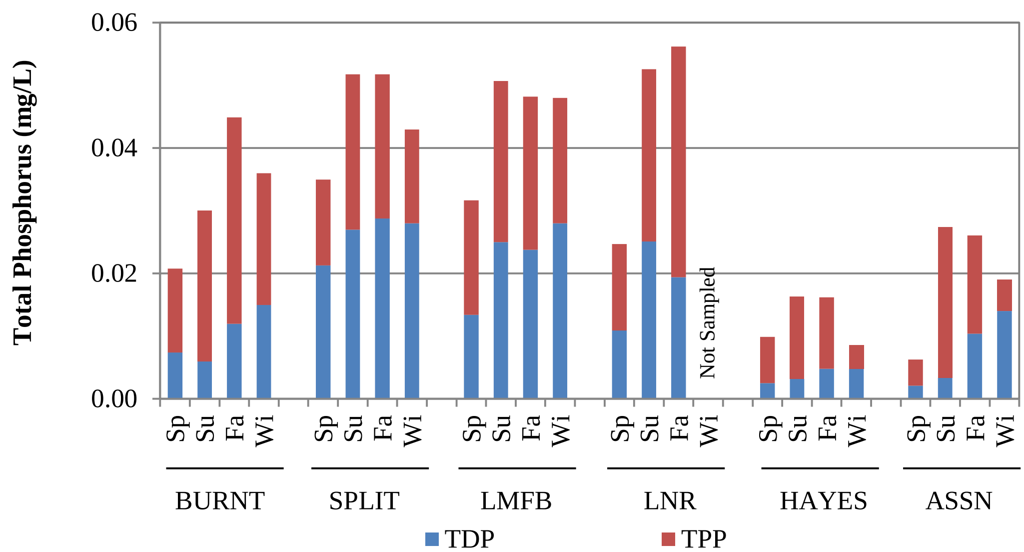


Figure 8.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Lower Nelson River Region: 2010/2011.

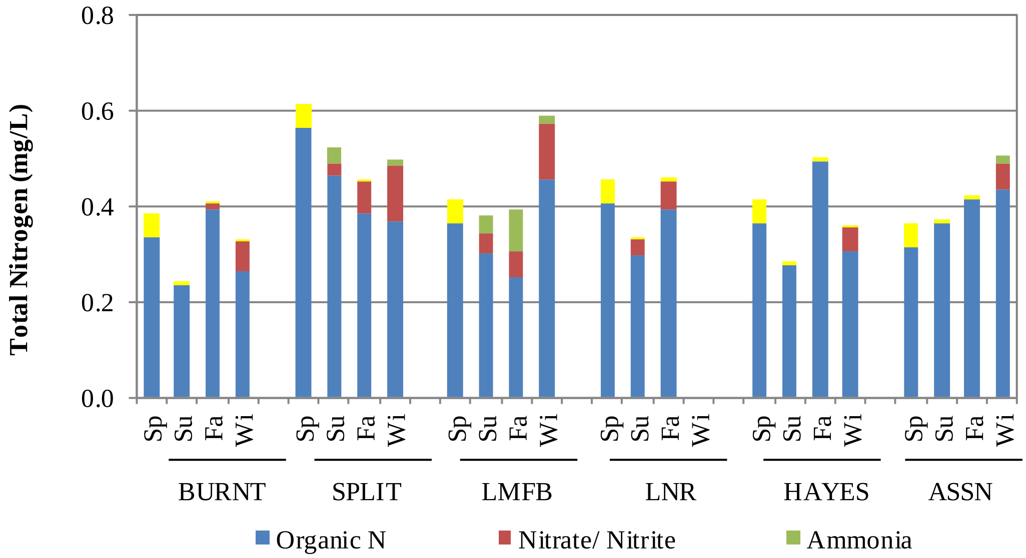
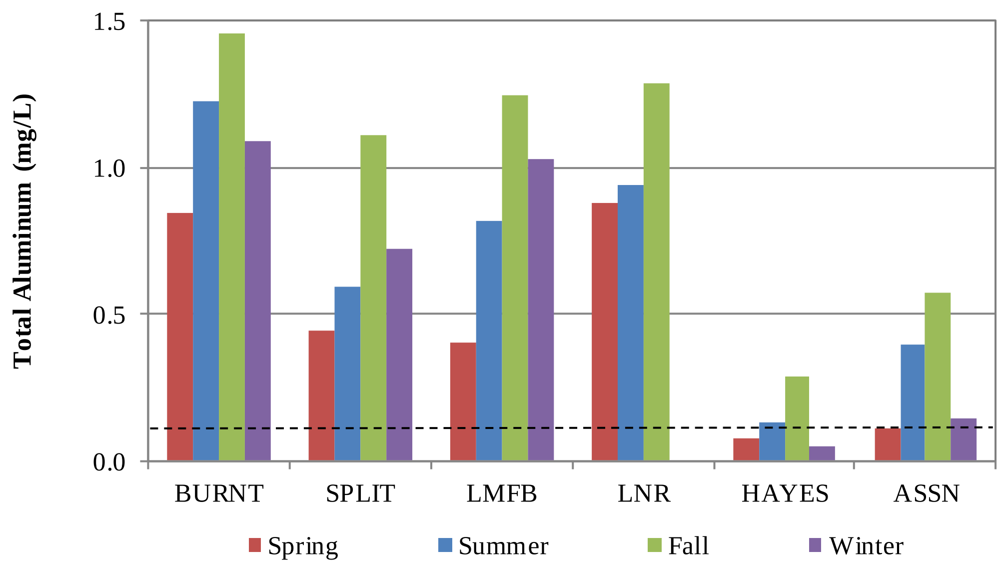


Figure 8.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Lower Nelson River Region: 2010/2011. Yellow bars represent values that were below the analytical detection limit.

(A)



(B)

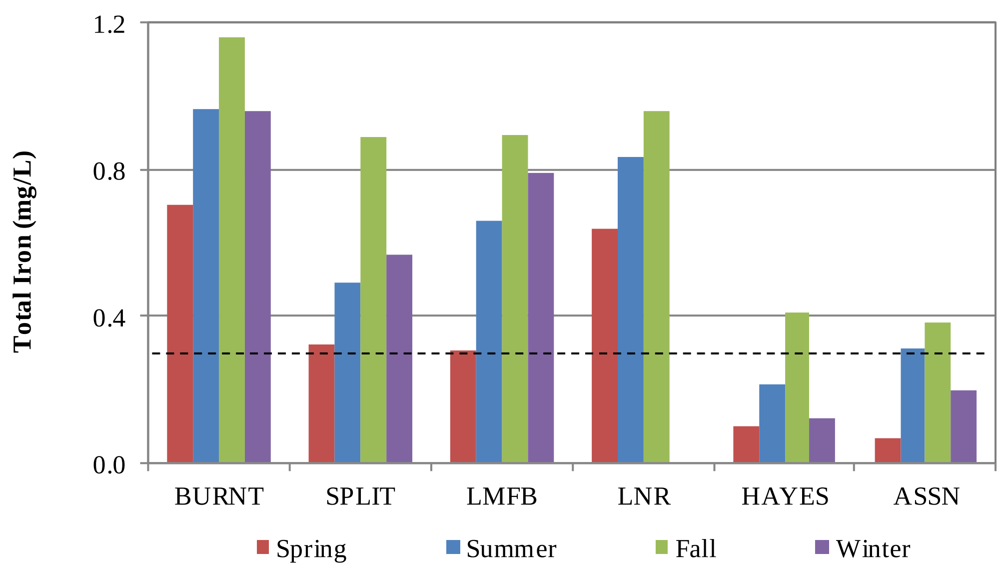


Figure 8.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Lower Nelson River Region, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

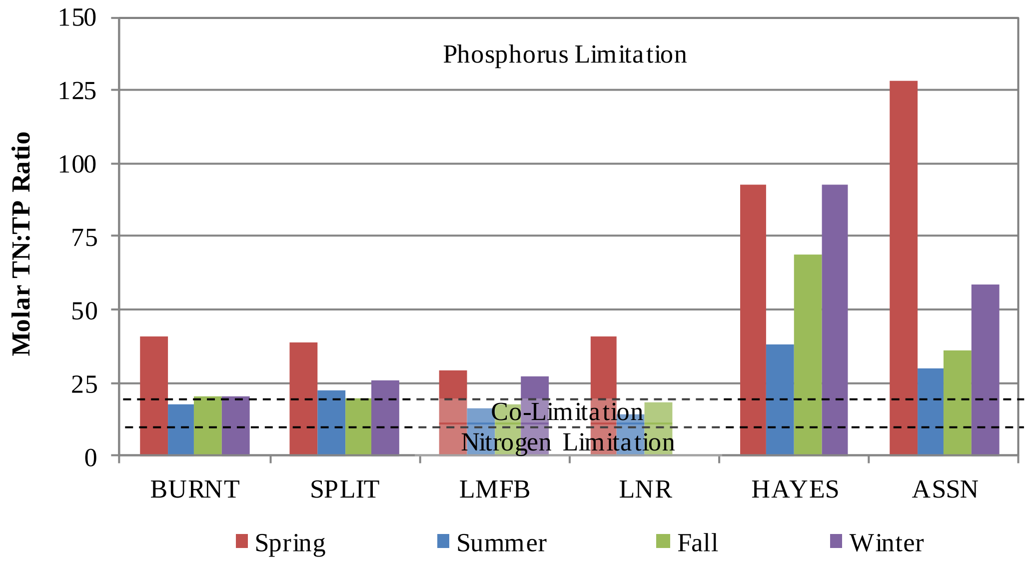


Figure 8.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Lower Nelson River Region: 2010/2011.

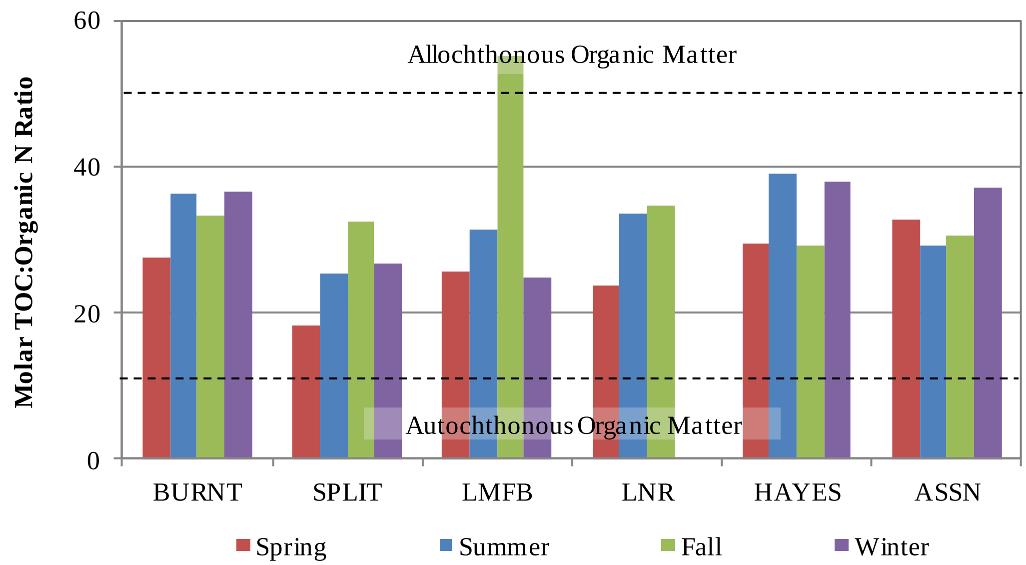


Figure 8.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Lower Nelson River Region: 2010/2011.

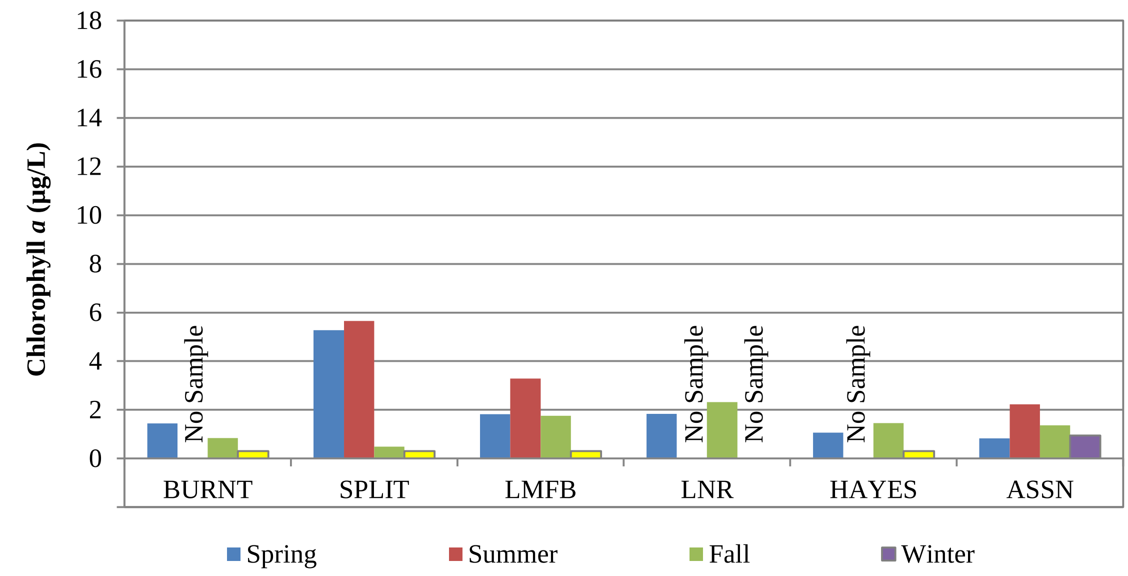


Figure 8.4-1. Chlorophyll *a* concentrations measured near the surface (rivers) and within the euphotic zone (lakes and reservoirs) at sites in the Lower Nelson River Region in 2010/2011. Yellow bars represent values that were below the analytical detection limit.

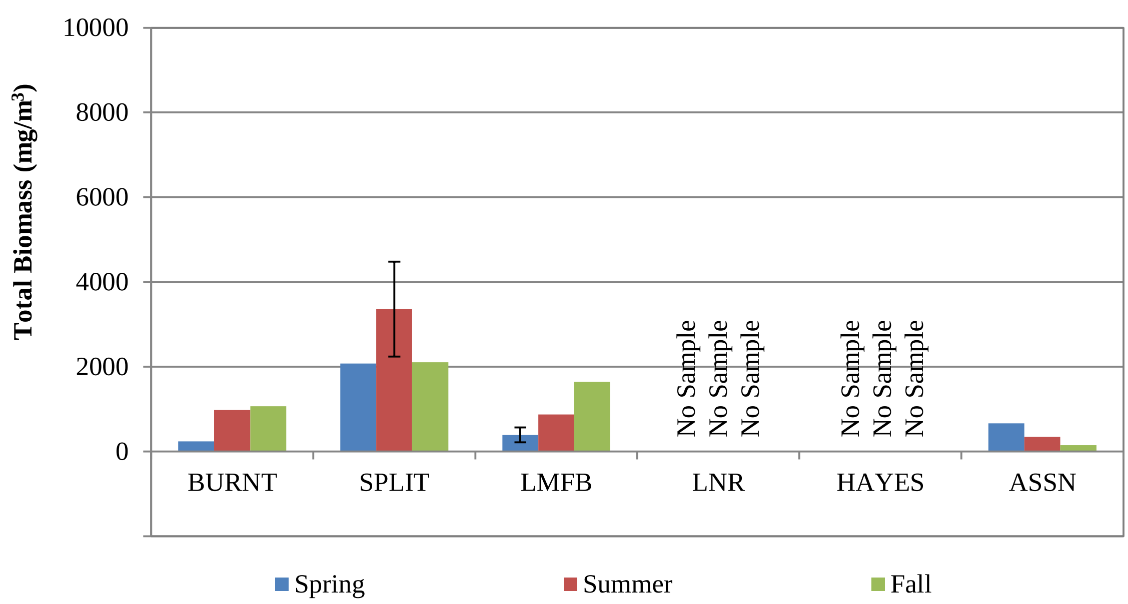


Figure 8.4-2. Phytoplankton biomass measured at sites in the Lower Nelson River Region in 2010. Error bars represent the standard error of samples analysed in duplicate (Limestone Forebay) or triplicate (Split Lake) for quality assurance.

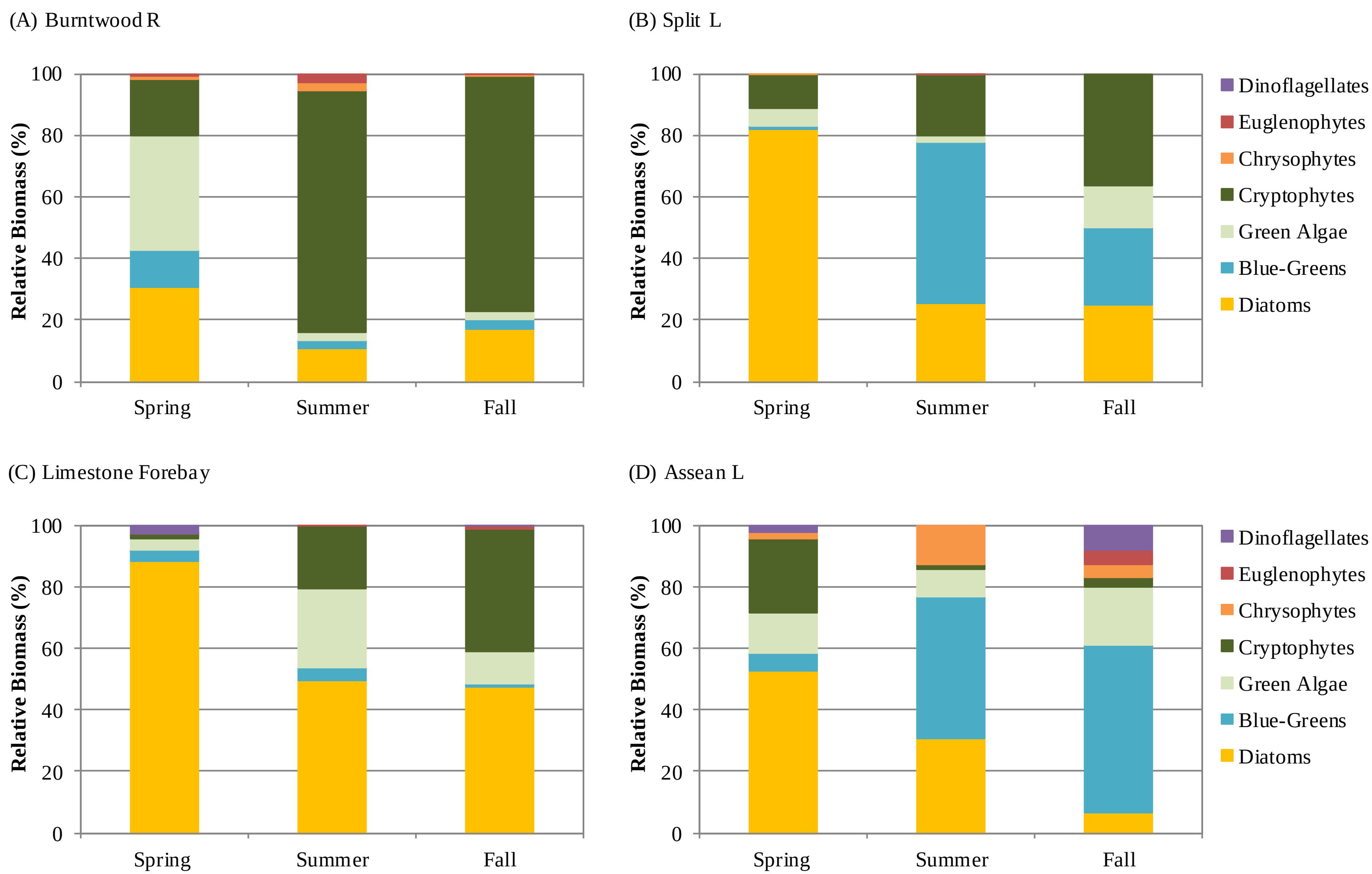


Figure 8.4-3. Phytoplankton community composition at sites in the Lower Nelson River Region in 2010.

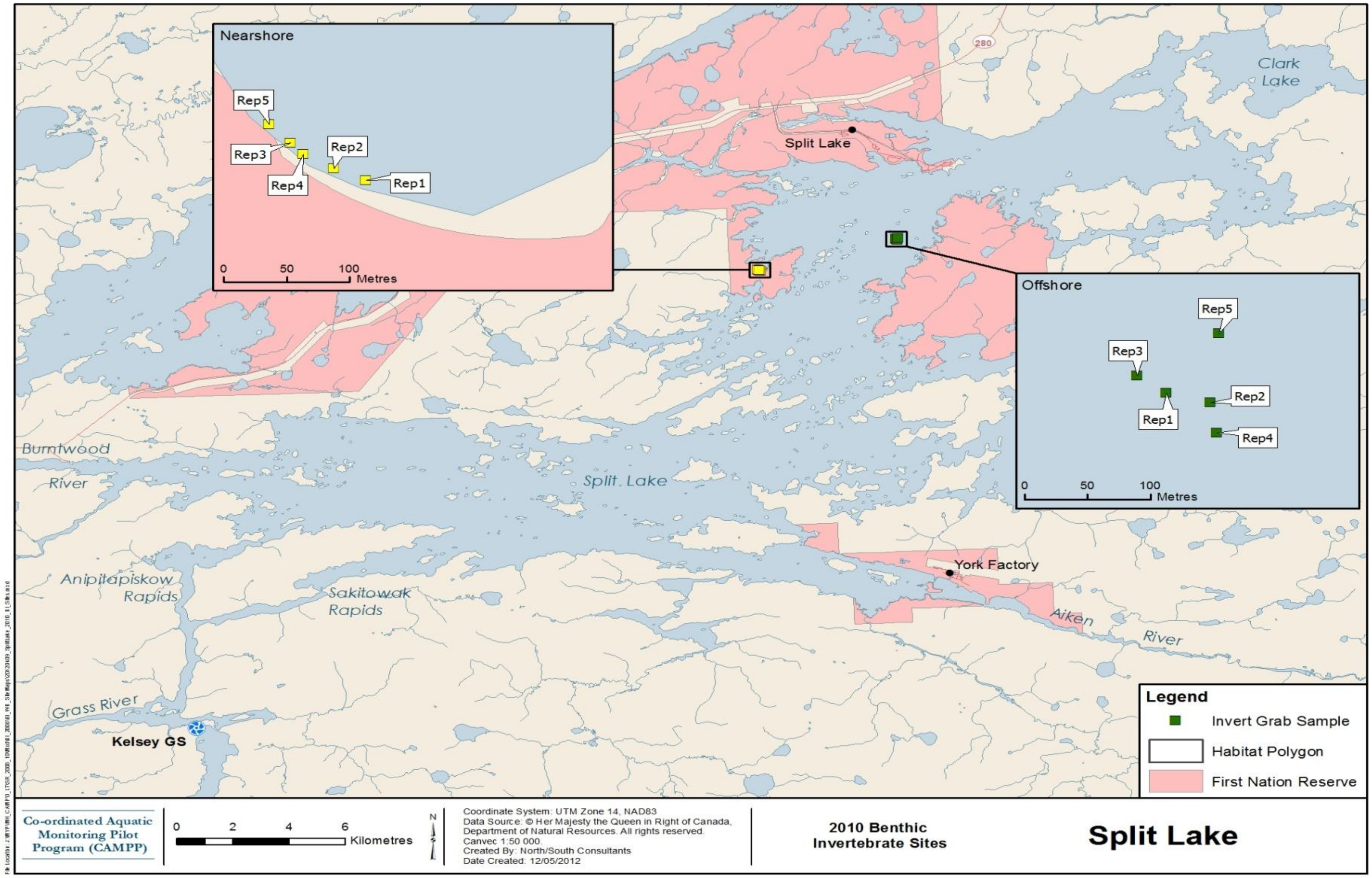


Figure 8.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Split Lake in the Lower Nelson River Region, 2010.

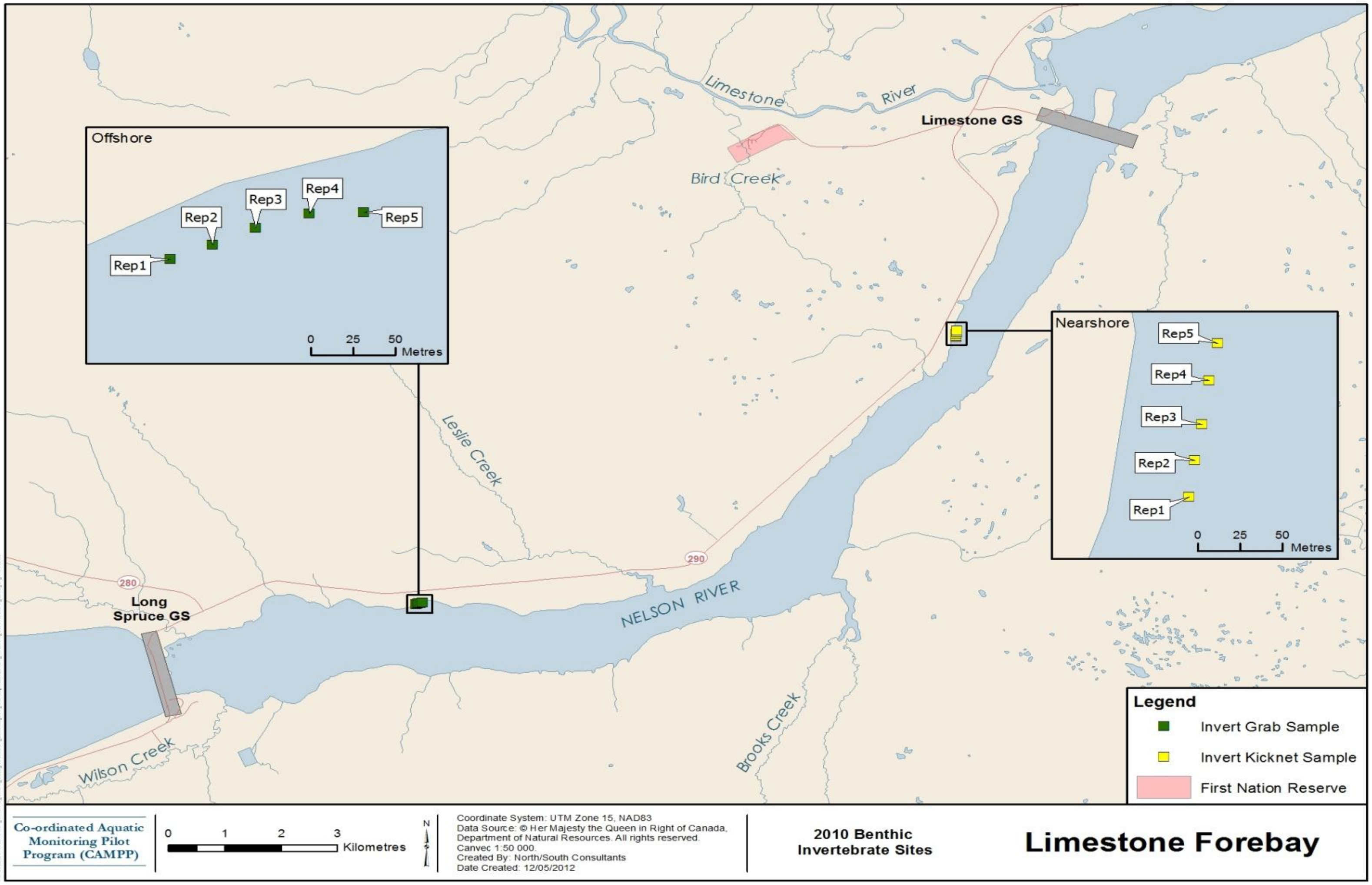


Figure 8.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in the Limestone Forebay in the Lower Nelson River Region, 2010.

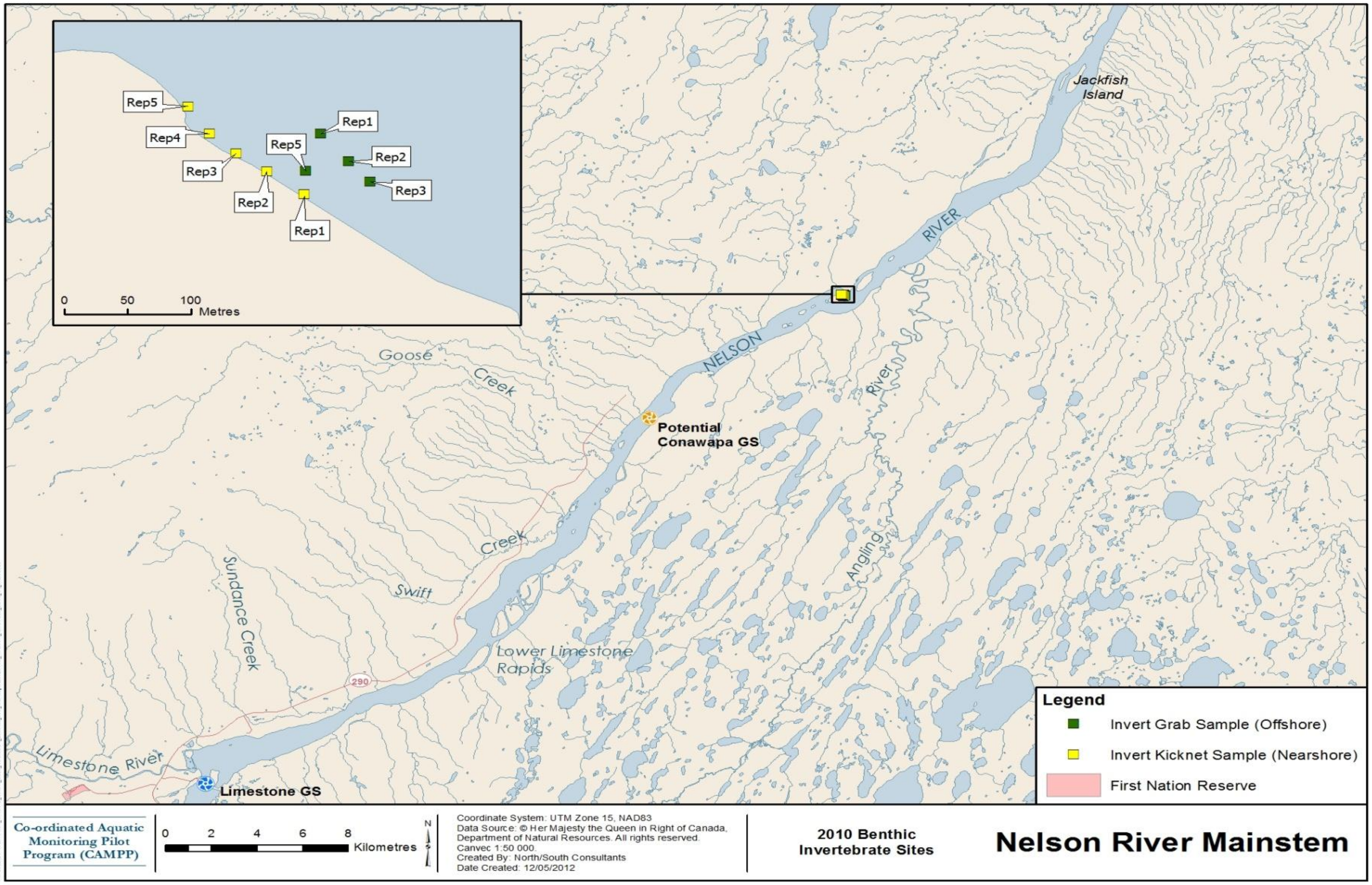


Figure 8.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in the Lower Nelson River (downstream of Limestone Forebay) in the Lower Nelson River Region, 2010.

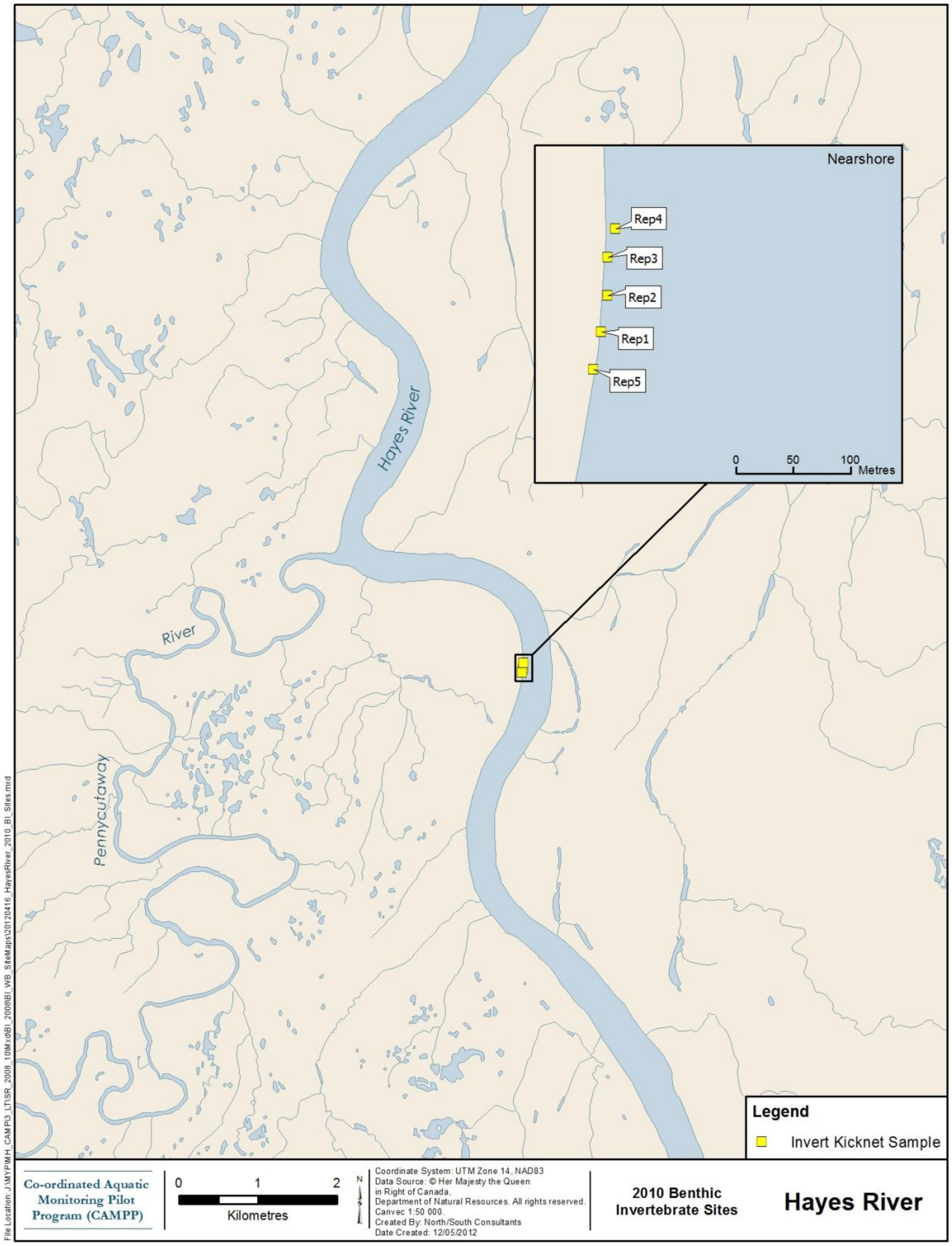


Figure 8.5-4. Randomly-selected benthic invertebrate sampling sites in the nearshore polygon in Hayes River in the Lower Nelson River Region, 2010.

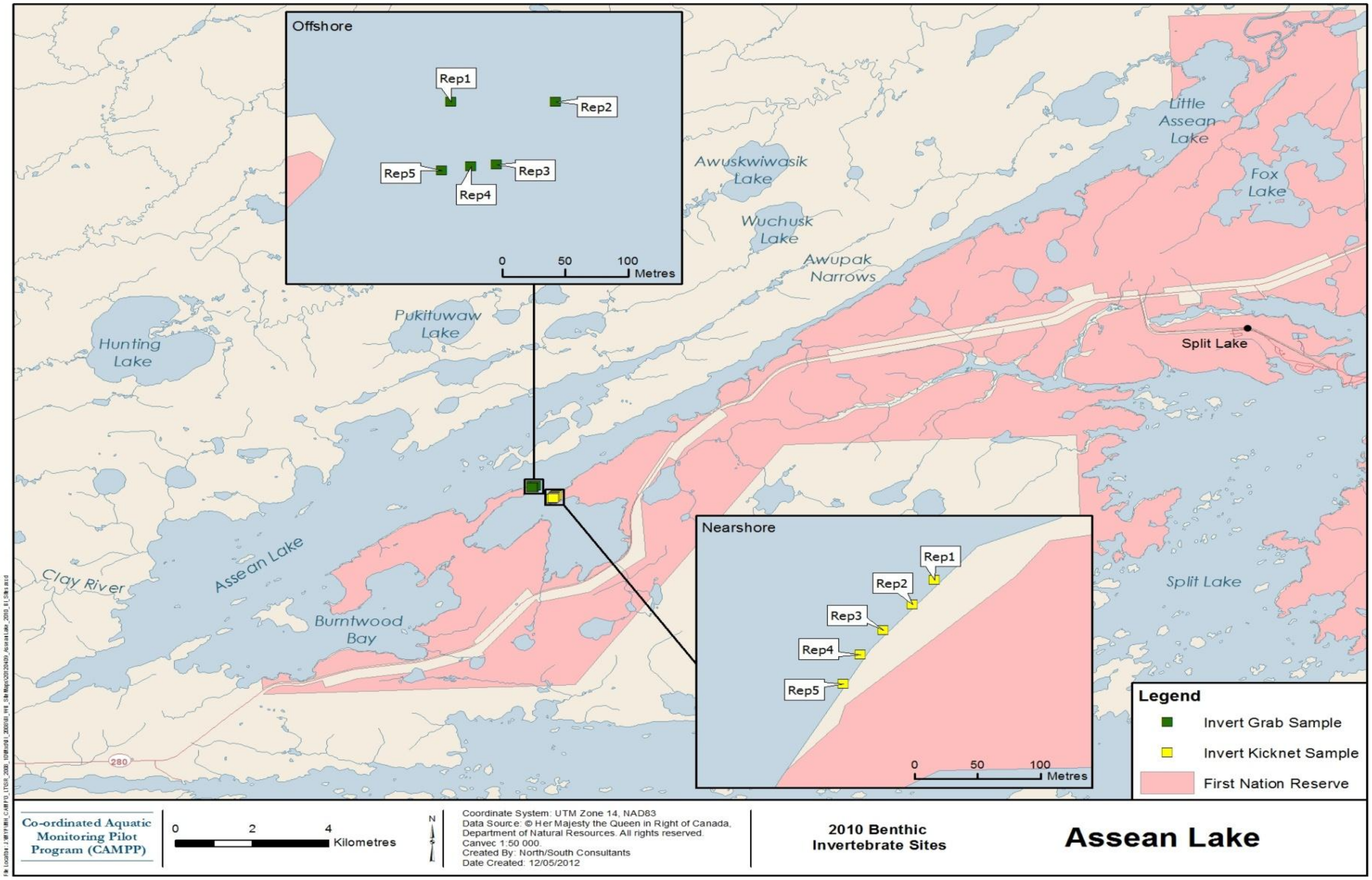


Figure 8.5-5. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Assean Lake in the Lower Nelson River Region, 2010.

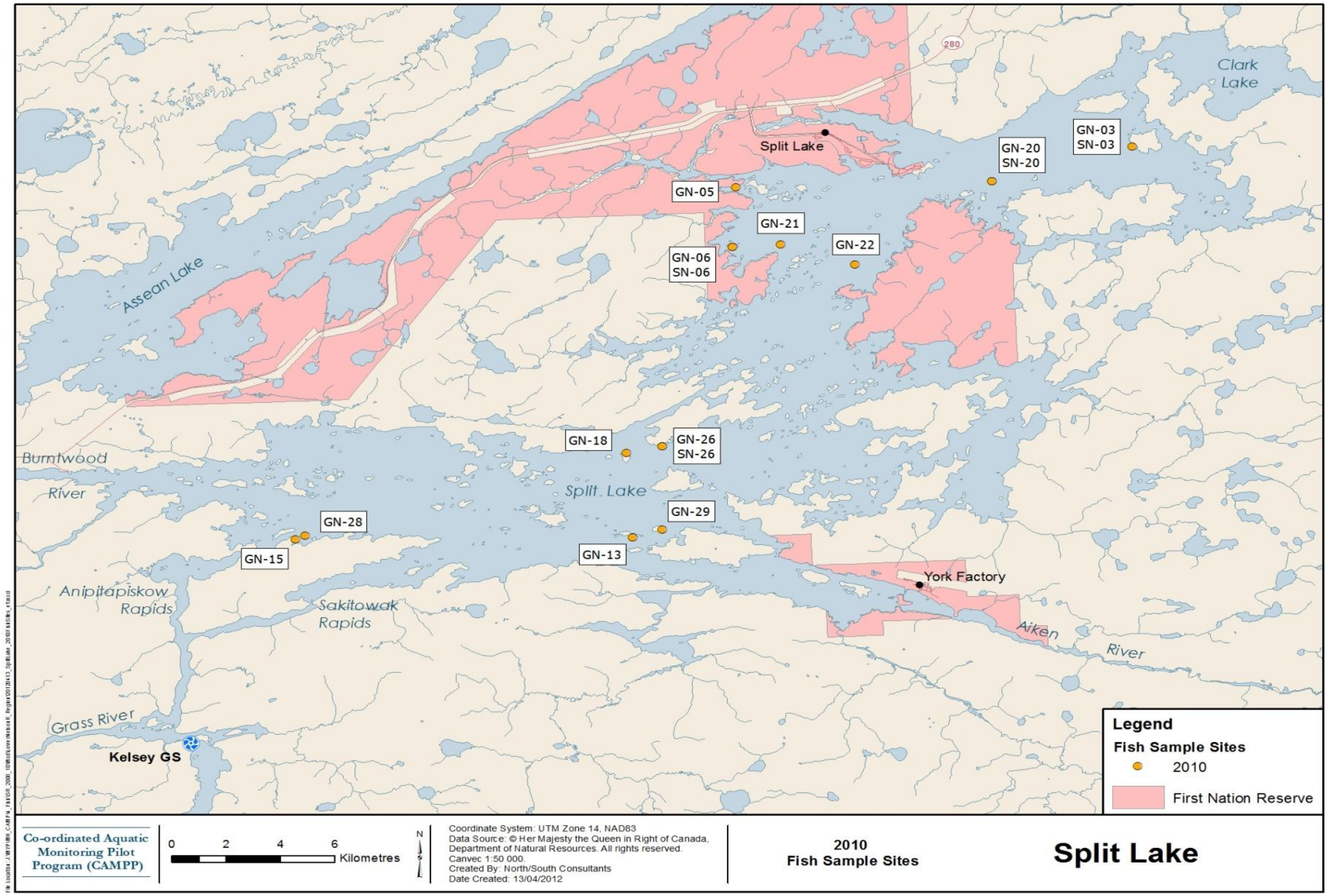


Figure 8.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Split Lake, 2010.

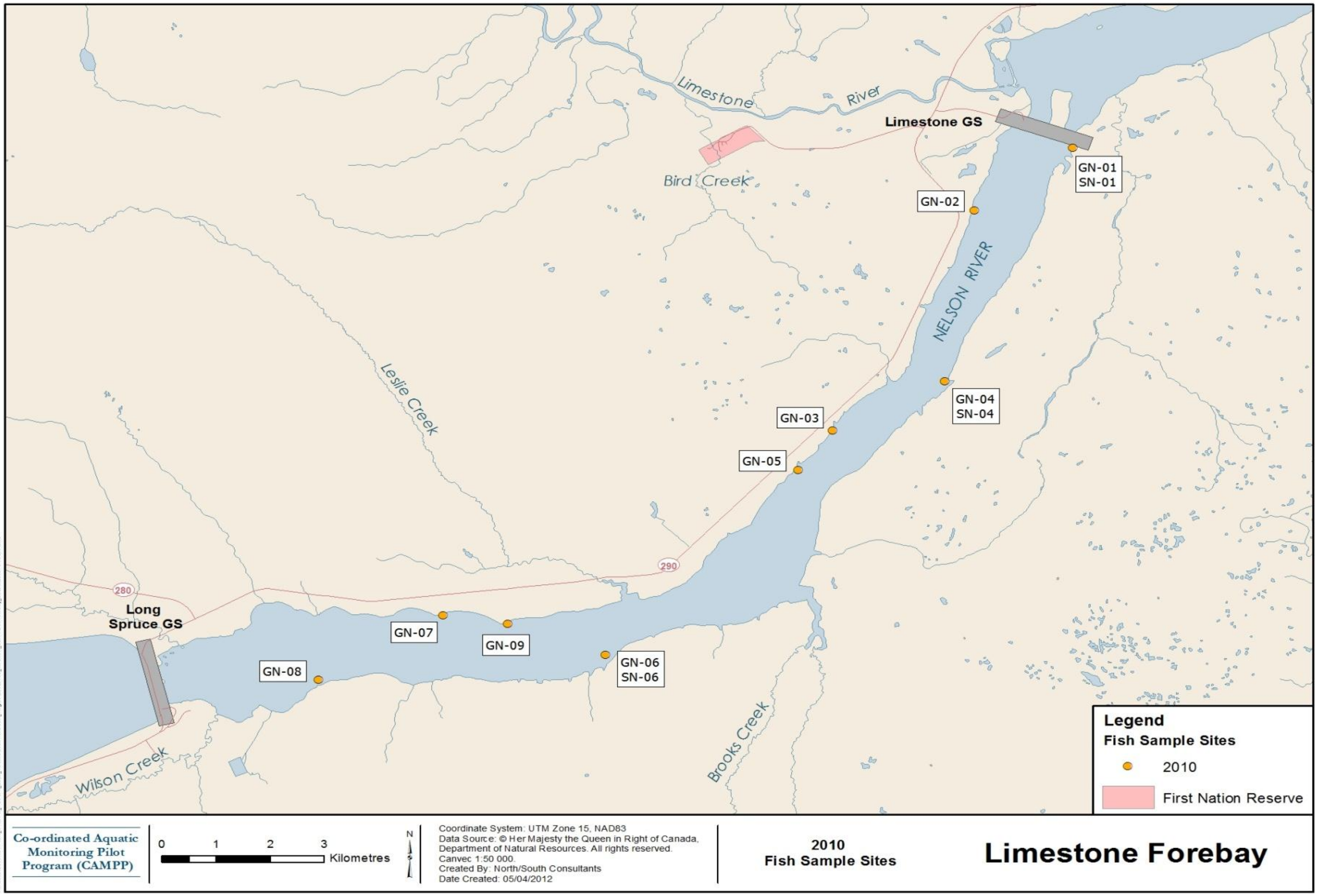


Figure 8.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Limestone Forebay, 2010.

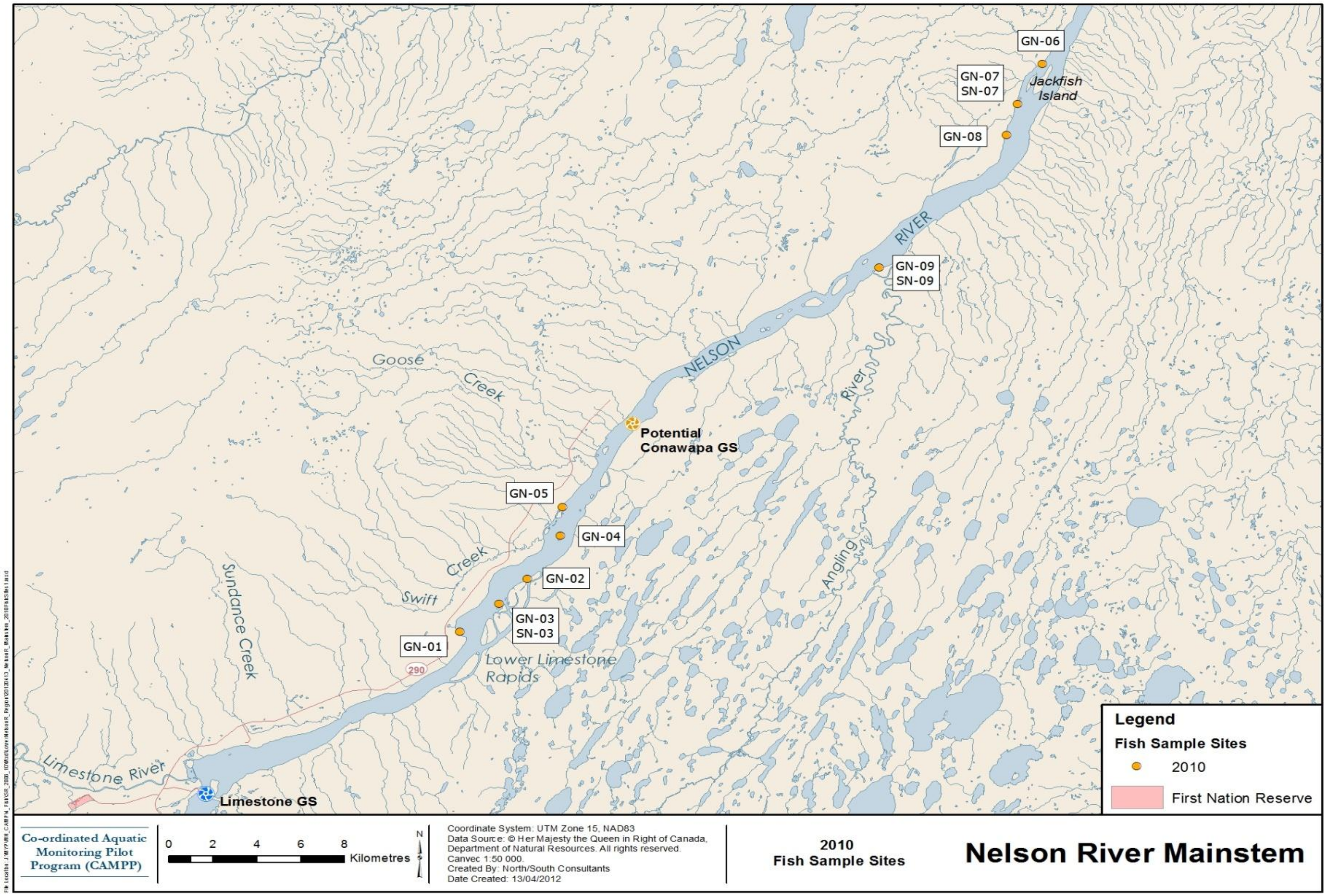


Figure 8.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Nelson River mainstem, 2010.

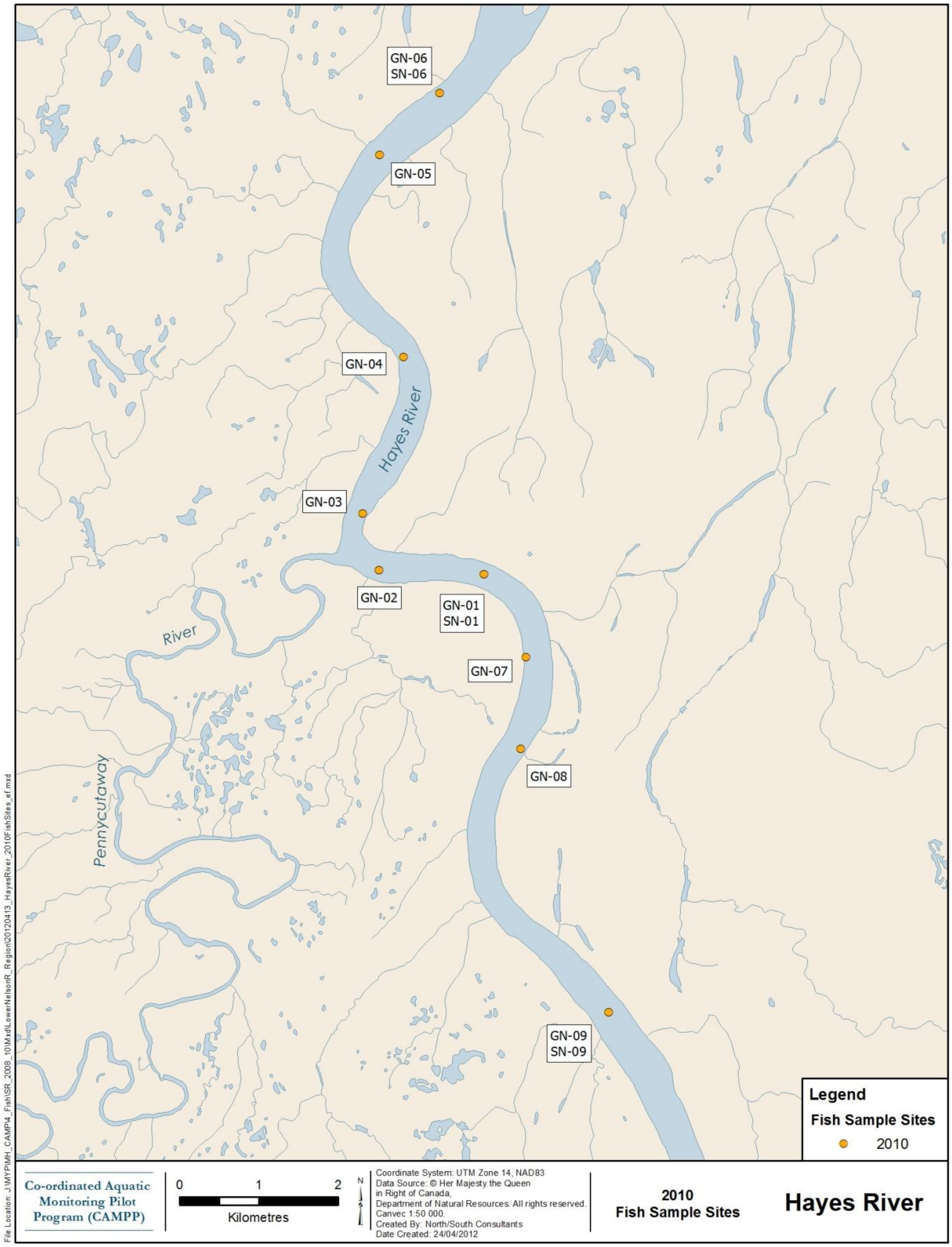


Figure 8.6-4. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Hayes River, 2010.

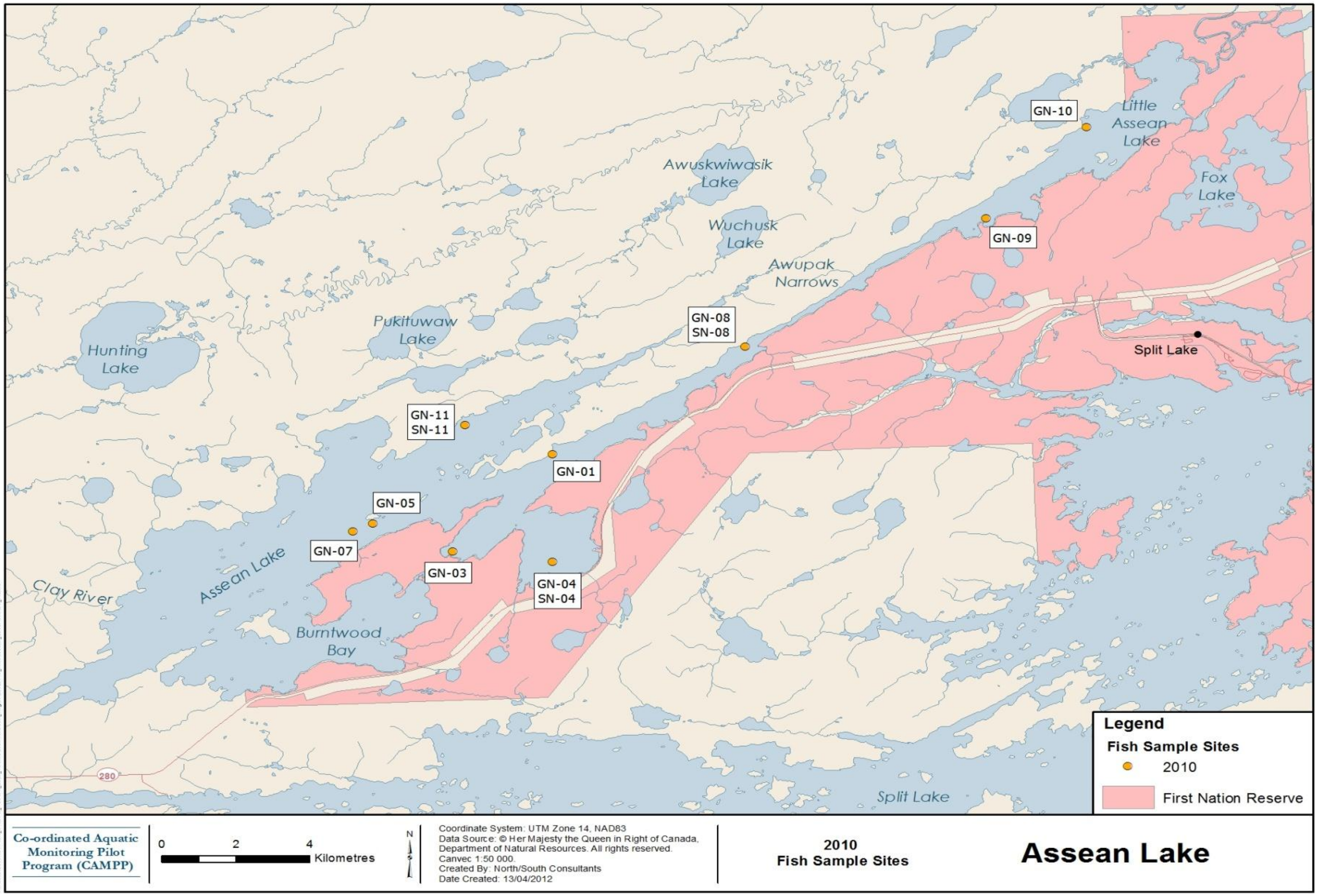


Figure 8.6-5. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Assean Lake, 2010.

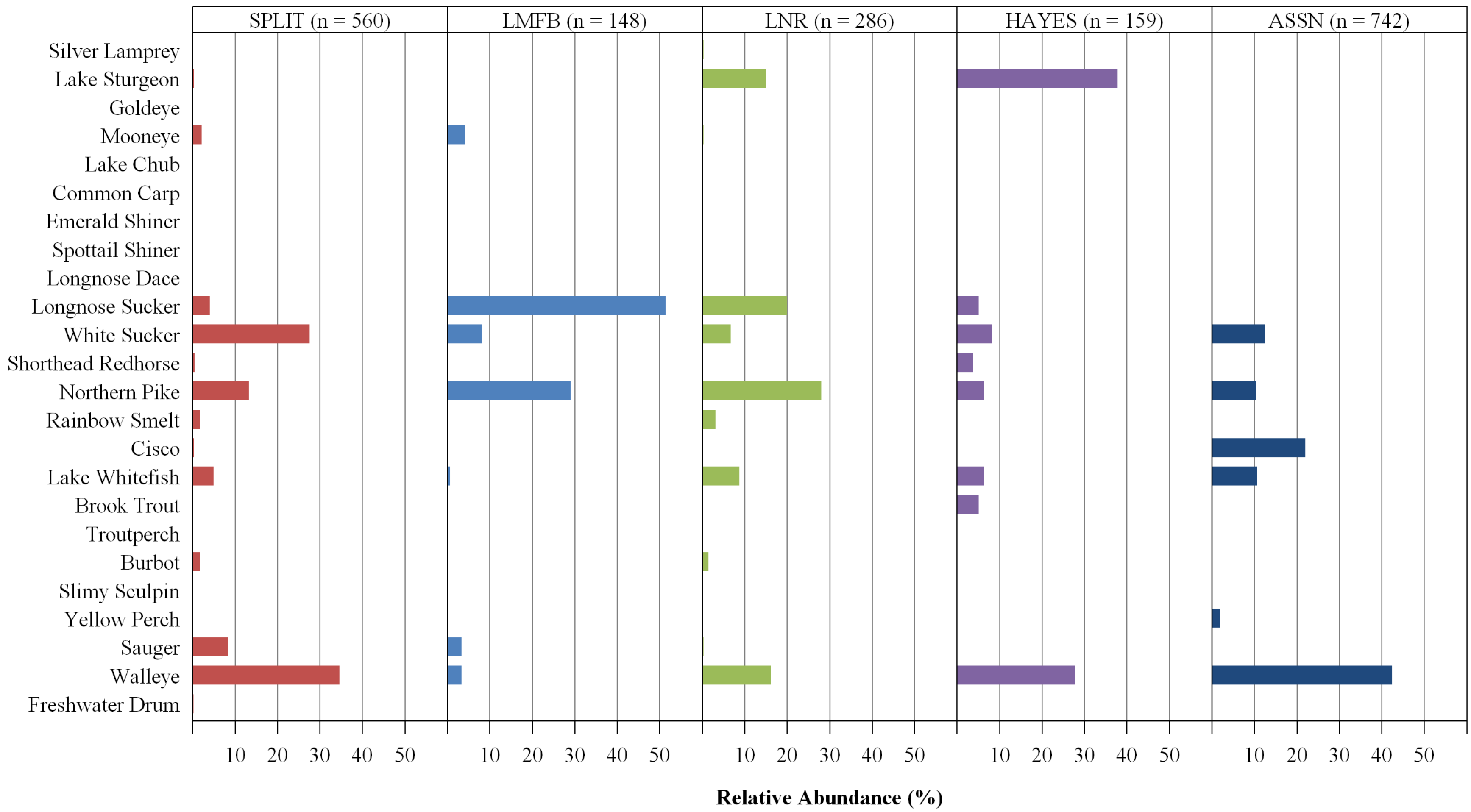


Figure 8.6-6. Relative abundance (%) distributions for fish species captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

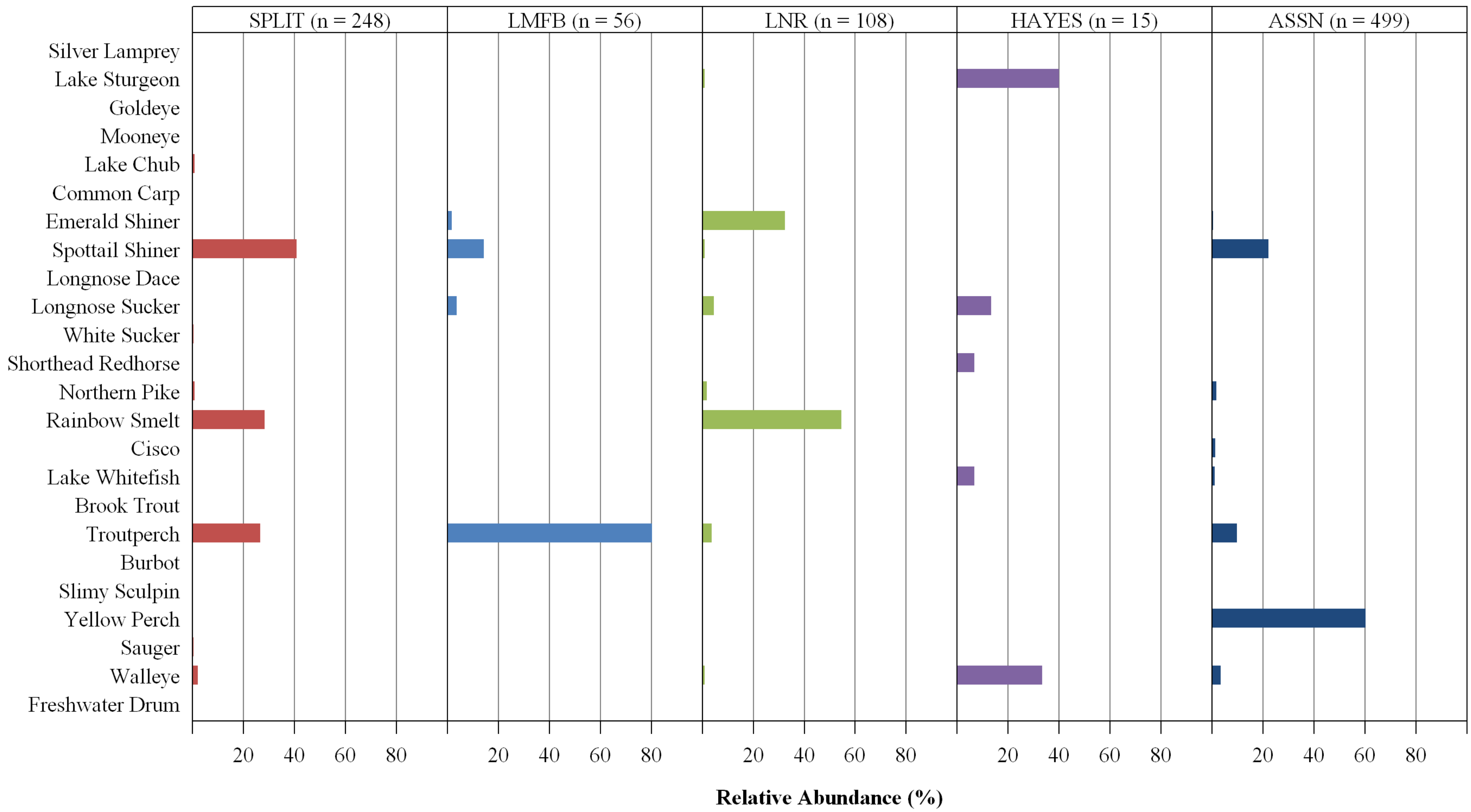


Figure 8.6-7. Relative abundance (%) distribution for fish species captured in small mesh index gill nets set in Lower Nelson River Region waterbodies, 2010.

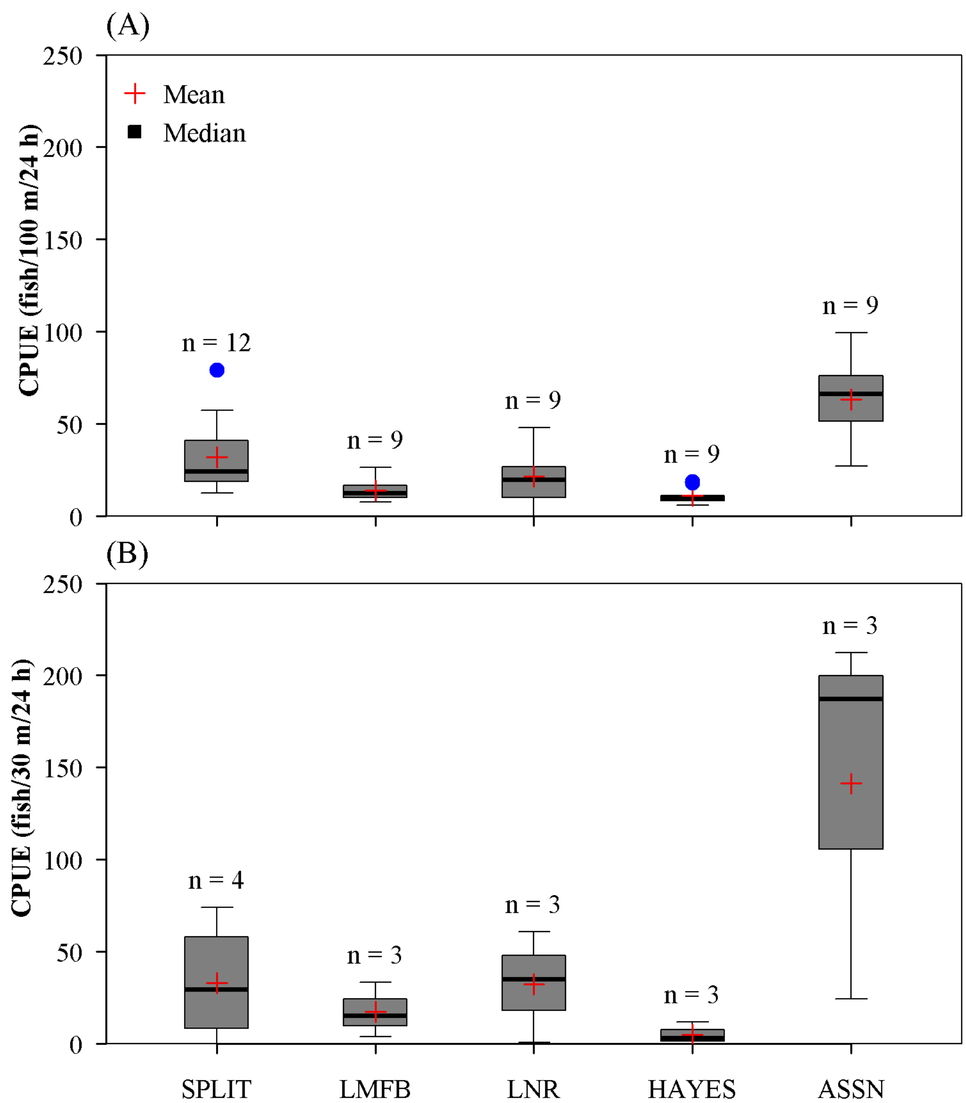


Figure 8.6-8. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang (fish/100 m/24 h) and (B) small mesh (fish/30 m/24 h) index gill nets set in Lower Nelson River Region waterbodies, 2010.

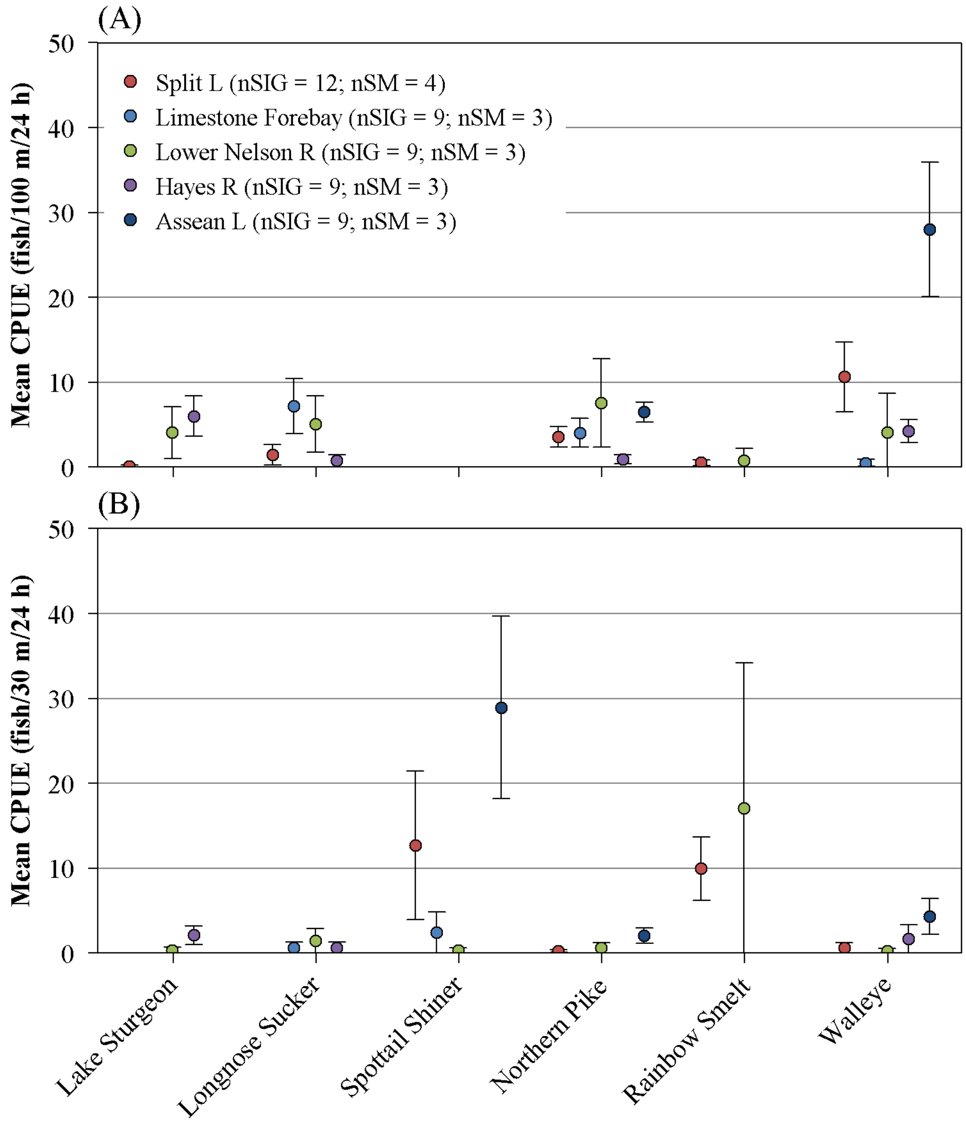


Figure 8.6-9. Mean (SE) CPUE for select species captured in (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Lower Nelson River Region waterbodies, 2010.

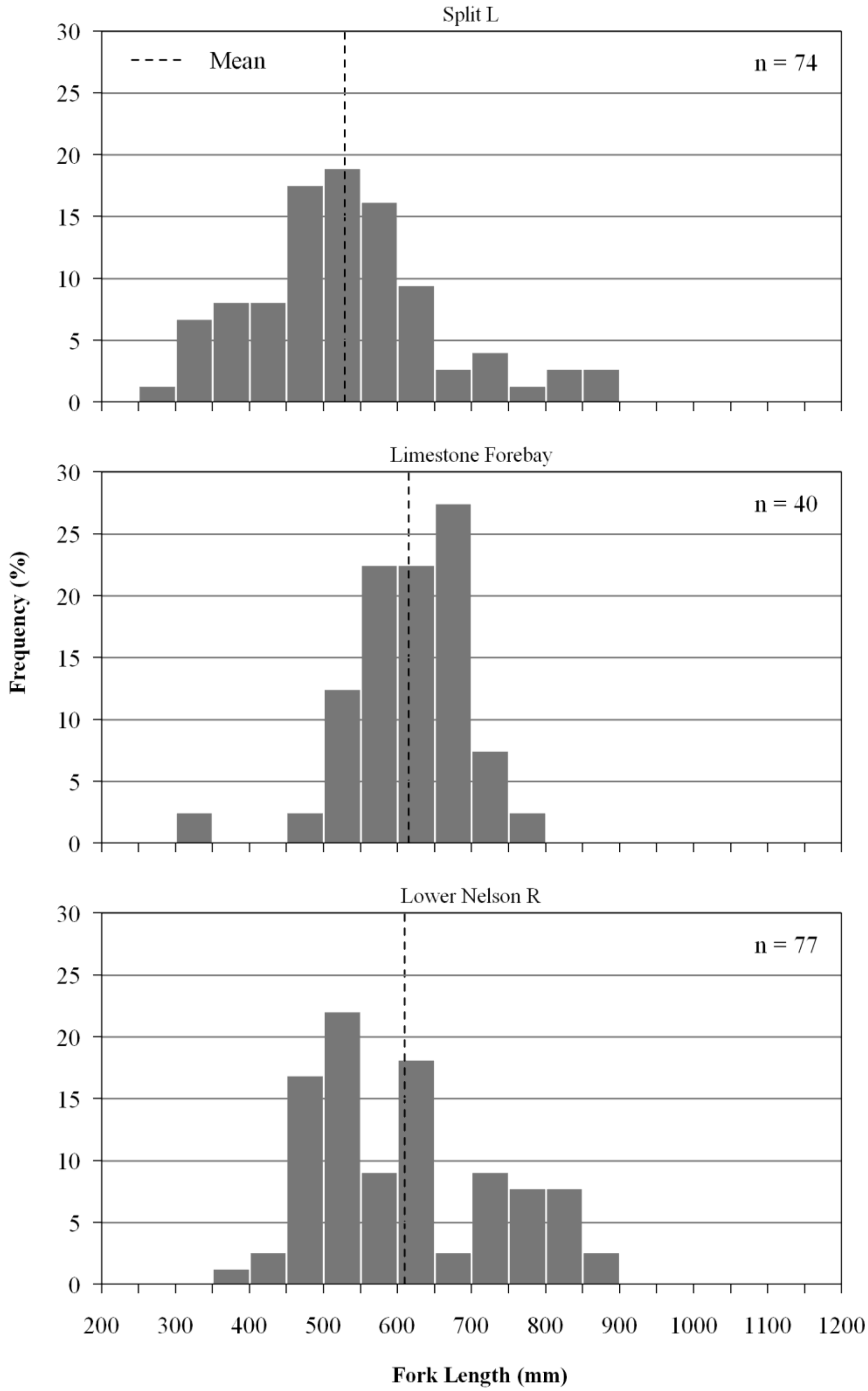


Figure 8.6-10. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

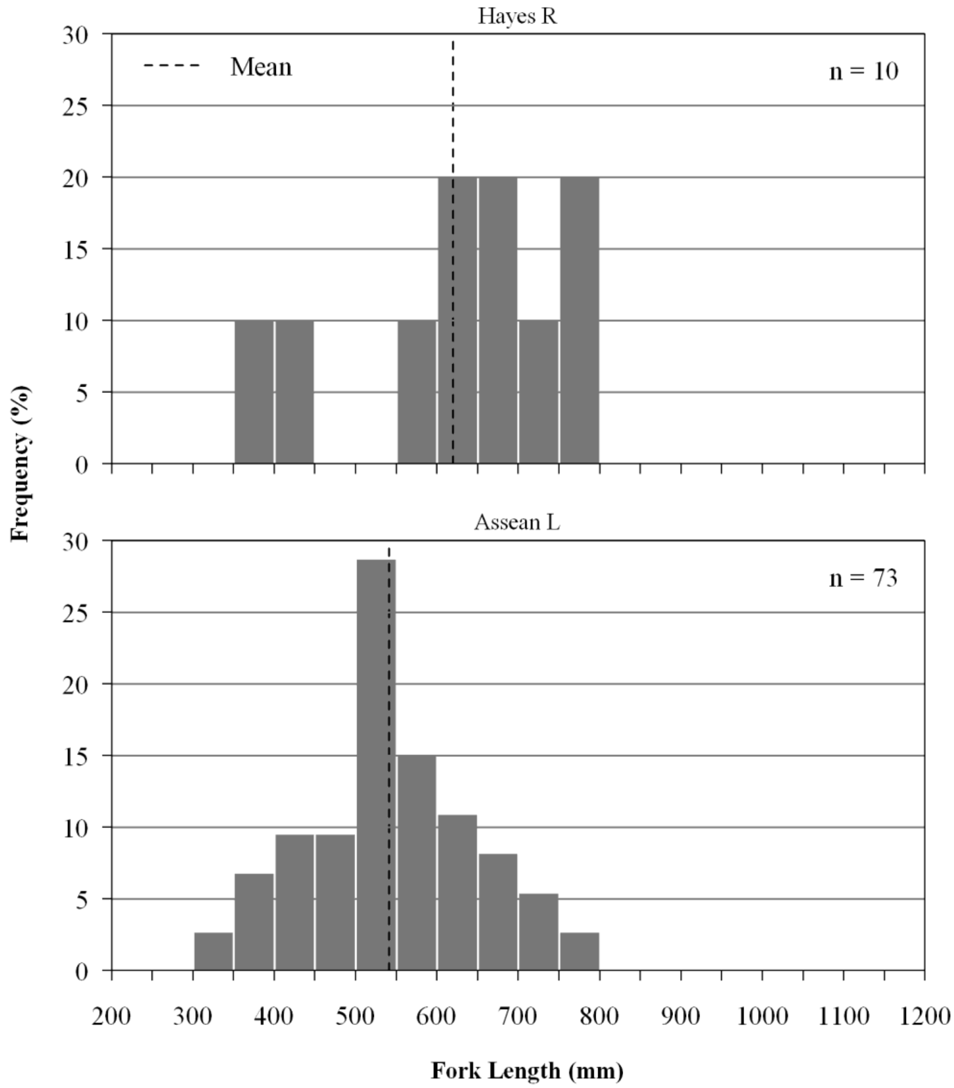


Figure 8.6-11. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

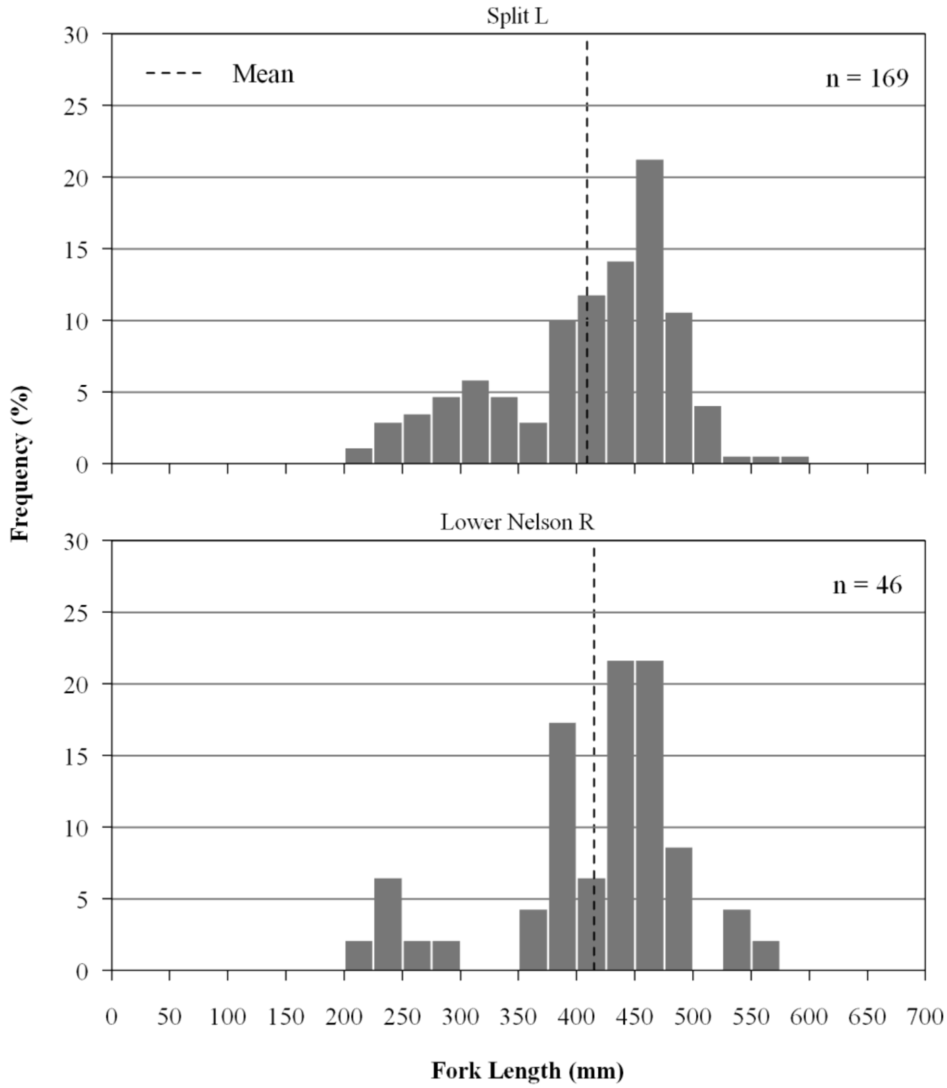


Figure 8.6-12. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

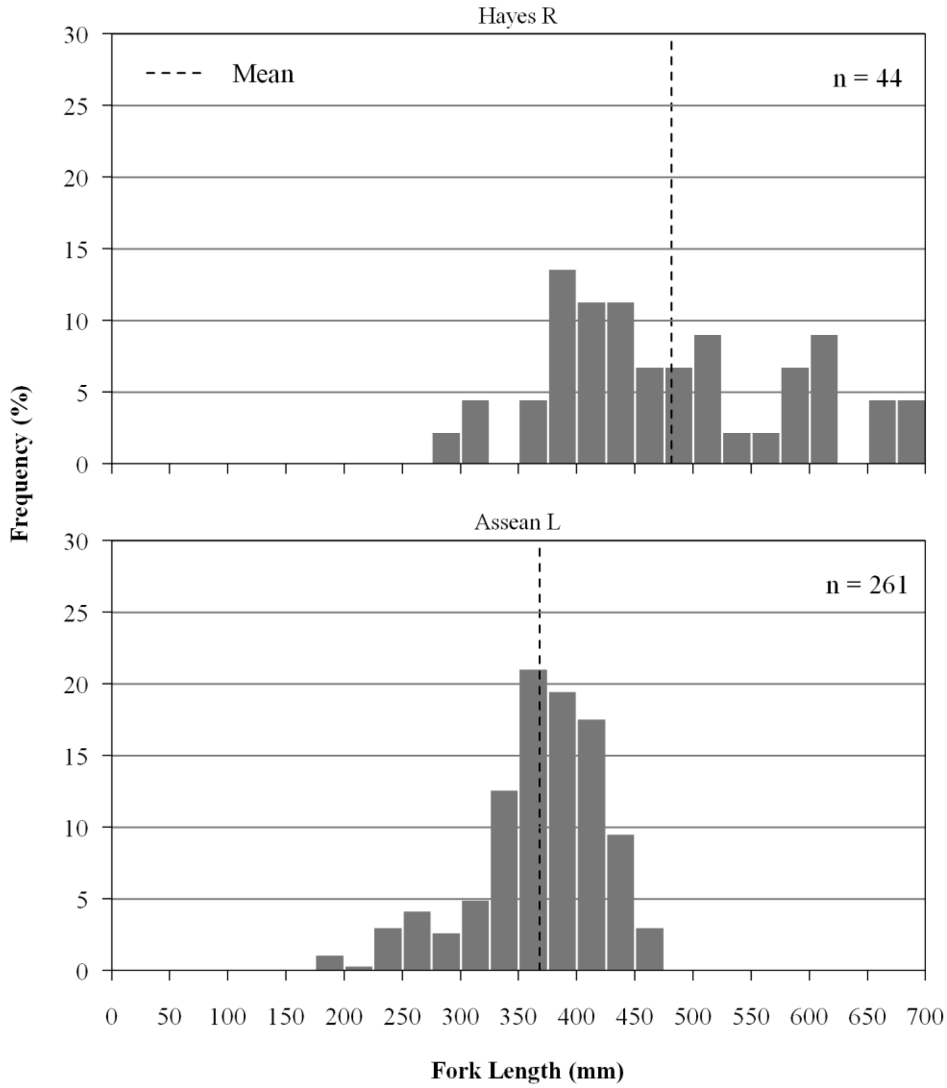


Figure 8.6-13. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2010.

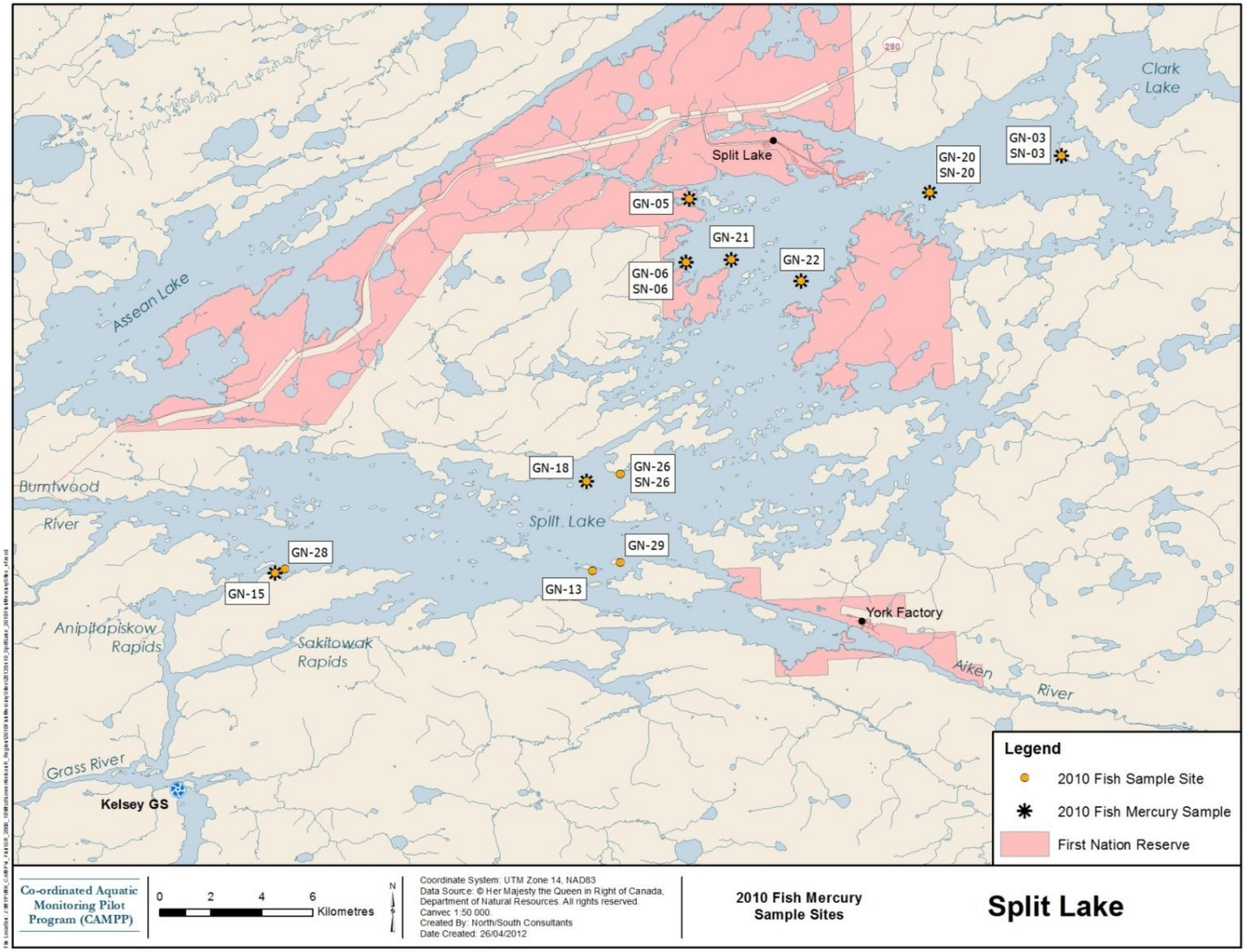


Figure 8.7-1. Fish sampling sites for Split Lake in 2010, indicating those sites where fish were collected for mercury analysis.

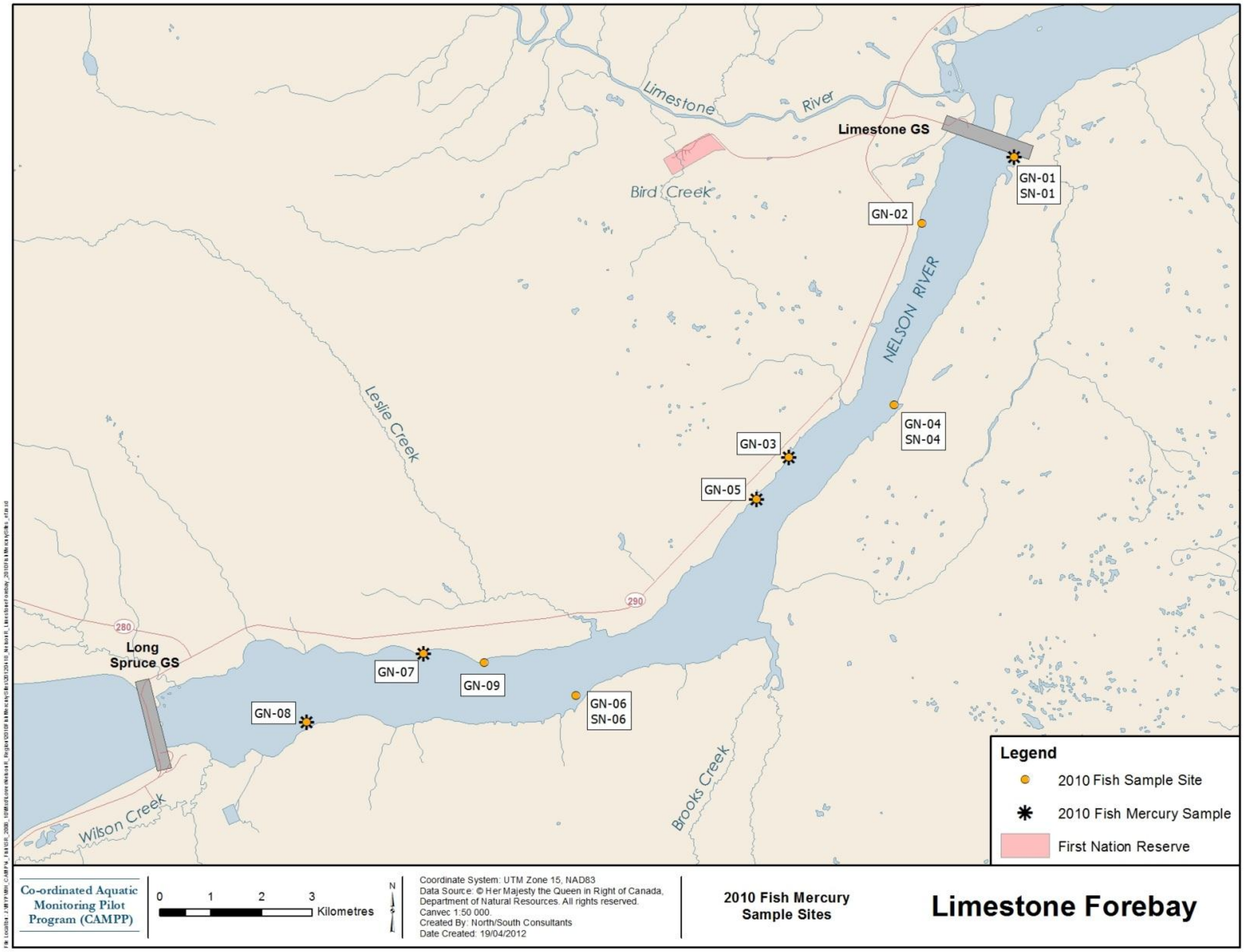


Figure 8.7-2. Fish sampling sites for the Limestone Forebay in 2010, indicating those sites where fish were collected for mercury analysis.

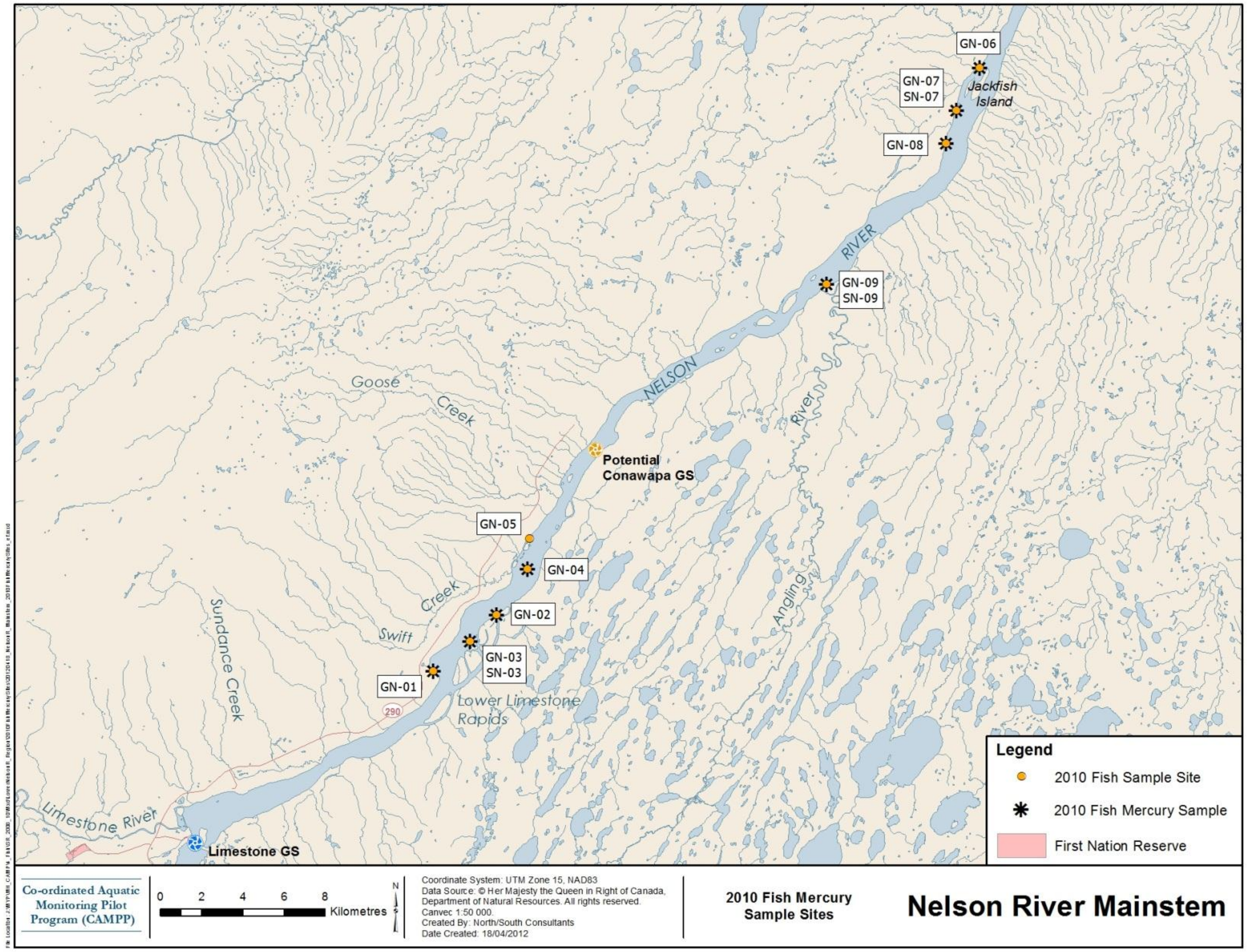


Figure 8.7-3. Fish sampling sites for the Lower Nelson River in 2010, indicating those sites where fish were collected for mercury analysis.

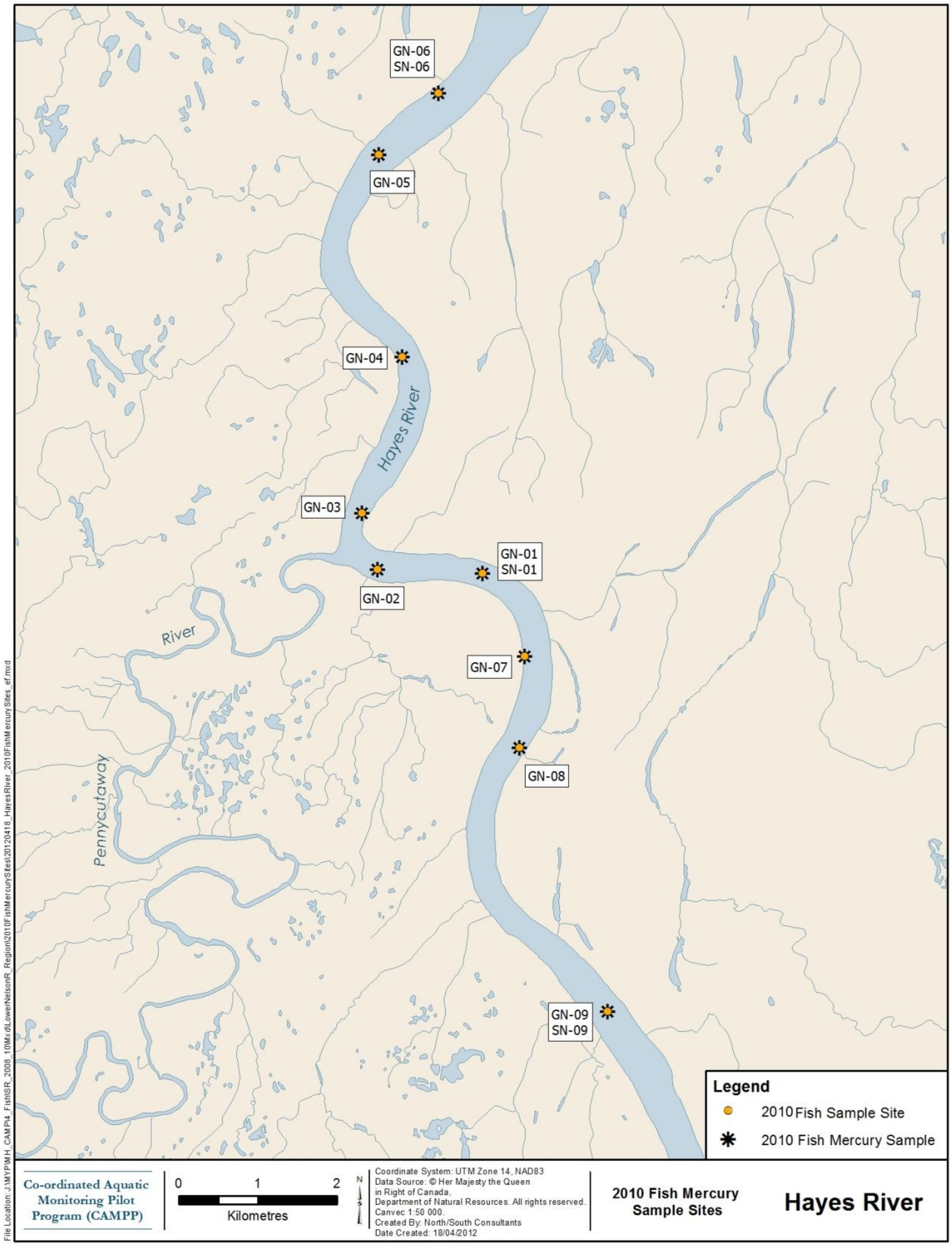


Figure 8.7-4. Fish sampling sites for the Hayes River in 2010, indicating those sites where fish were collected for mercury analysis.

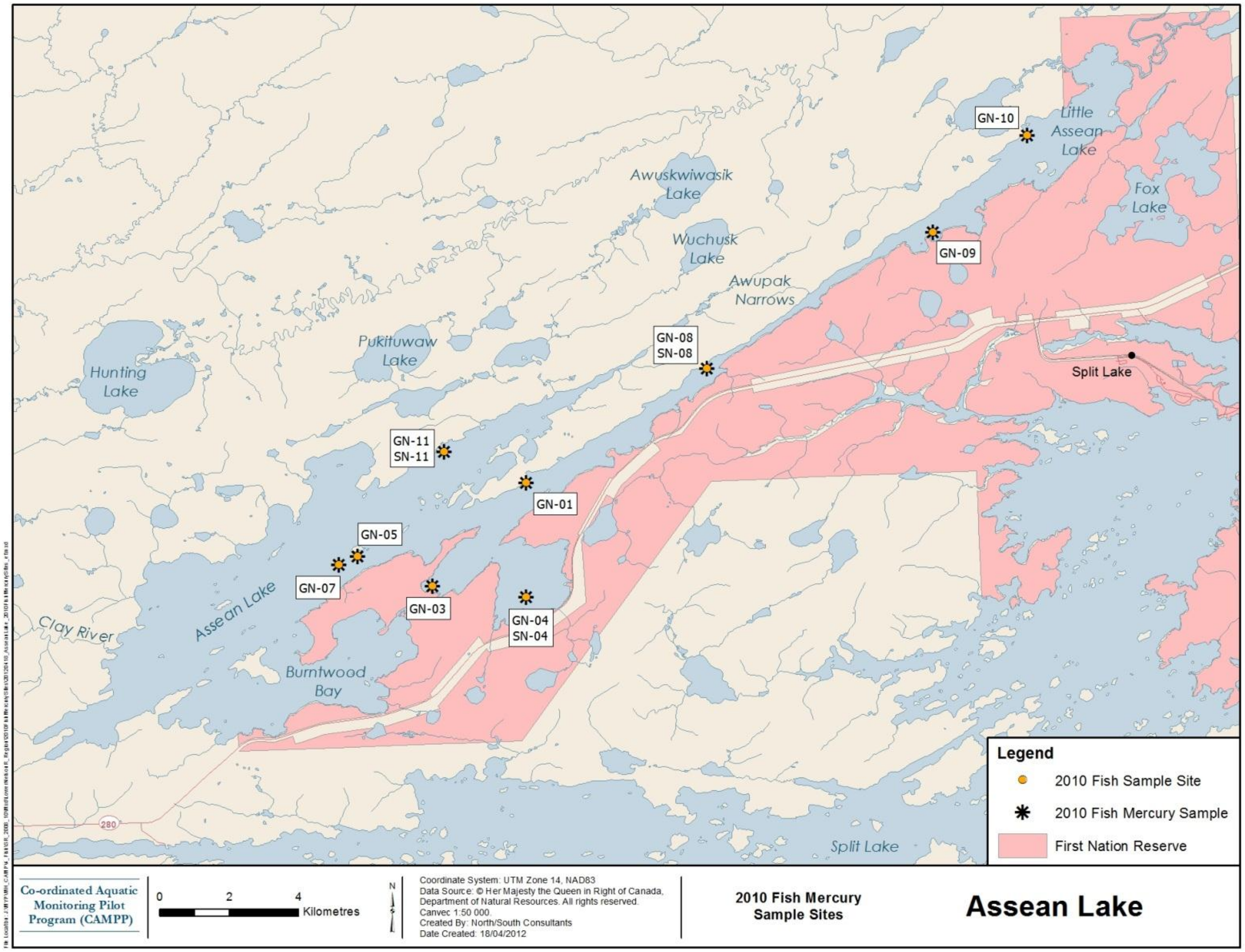


Figure 8.7-5. Fish sampling sites for Assean Lake in 2010, indicating those sites where fish were collected for mercury analysis.

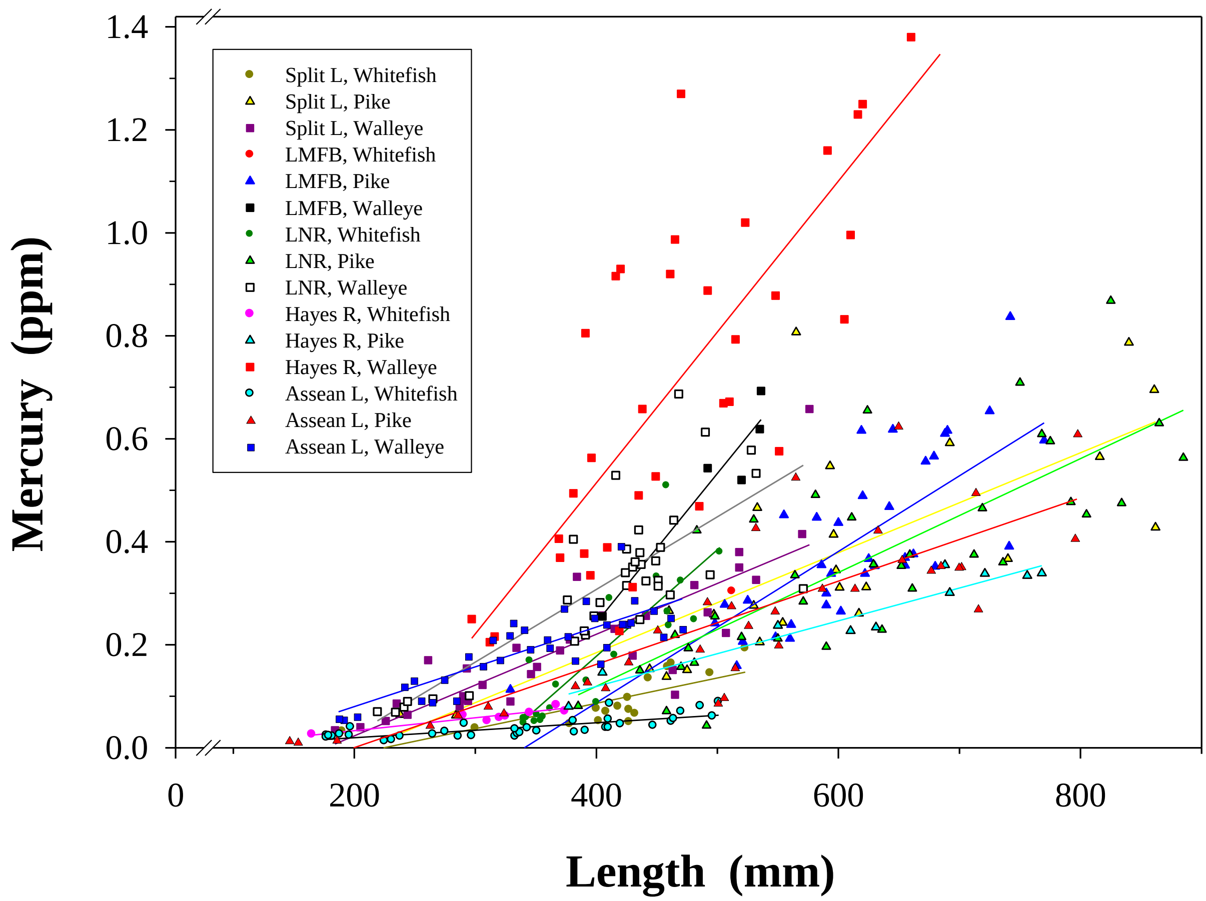


Figure 8.7-7. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Split Lake, the Limestone Forebay, the Lower Nelson and Hayes rivers, and Assean Lake in 2010. Significant linear regression lines are shown.

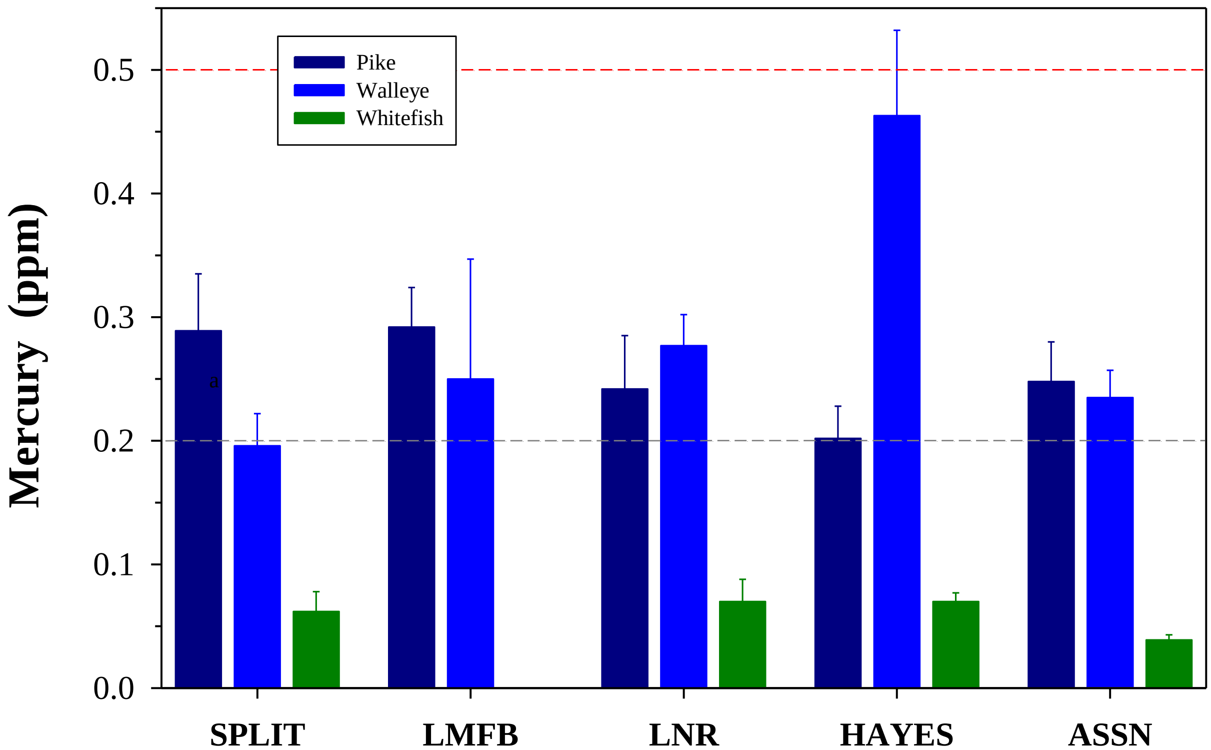


Figure 8.7-8. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye, and Lake Whitefish from Split Lake, the Limestone Forebay, the Lower Nelson and Hayes rivers, and Assean Lake in 2010. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.

9.0 LAKE WINNIPEG REGION

The following provides an overview of the results of CAMPP for 2010/2011, by each major component, for Lake Winnipegosis (the off-system waterbody). Information collected on the fish community (Section 9.6) and fish mercury (Section 9.7) in Lake Winnipeg is also included. A general description of methods is provided in Section 4 and in detail in Appendix 1.

9.6 CLIMATE

Climatological data for the Lake Winnipeg Region were obtained from Environment Canada for Arborg, MB and Cowan, MB; climatological data for the Grand Rapids area is described in Section 3.1.

9.6.1 Arborg

Based on comparisons to climate normals, 2010 was characterized by warmer, wetter conditions in all months except February and March, which were drier than normal (Figure 9.1-1).

Mean monthly air temperatures measured at Arborg in 2010 were warmer than the 1971-2000 temperature normals throughout the entire year (Figure 9.1-1). January and March were notably warmer at 6.9 °C and 7.5 °C above the normal for those months, respectively. Overall, the mean annual temperature was 3.5 °C above the normal.

Precipitation normals indicate peaks during the summer months with less precipitation during the ice-cover season (Figure 9.1-1). With the exception of February and March, total monthly precipitation was greater than normal in 2010, most notably in May and June. In February and March, precipitation was substantively below normal (32% and 18% of the normal, respectively). Overall, the mean annual precipitation was approximately 50% above the normal for this station.

9.6.2 Cowan

Similar to Arborg, MB, based on comparisons to climate normals, 2010 was a generally warmer, wetter year at Cowan, MB (Figure 9.1-2).

Mean monthly air temperatures measured in Cowan in 2010 were higher in all months but May, September, and December (Figure 9.1-2). Temperatures were notably above normal in January, March, and October when air temperature was approximately 4.3 °C, 5.3 °C, and 4.2 °C above the normals, respectively. Overall, the mean annual temperature in 2010 was 2.1 °C warmer than the normal.

Precipitation normals indicate a peak in June with relatively low levels of precipitation in winter at Cowan (Figure 9.1-2). In 2010, the highest precipitation occurred in June (almost 250% the normal for that month) with a secondary peak in August (over 250% the normal for that month). April and May also exhibited much greater than normal precipitation, though relatively less than June and August. Only four months received below normal levels of precipitation (February, March, July, and September) and overall, total annual precipitation at Cowan was nearly 60% higher in 2010 than normal.

9.7 HYDROLOGY

The Lake Winnipeg drainage basin covers an area of approximately 953,000 km^2, and is the second largest drainage basin in Canada. Water levels on Lake Winnipeg depend primarily on inflows from three major tributaries including the Winnipeg River, Saskatchewan River, and Red River. Water levels are also influenced by outflows which have been regulated by the Jenpeg Generating Station (GS) since 1976 for power production, flood control, and drought support. Other inflows come from smaller rivers such as the Dauphin River, Berens River, and Poplar River. Lake Winnipegosis is the off-system waterbody and is located within the Lake Winnipeg drainage basin, draining through Lake Manitoba into Lake Winnipeg.

Water level on Lake Winnipeg started the year near the upper quartile and remained there until July due to an above average snowpack and inflows from the Winnipeg River drainage basin (Figure 9.2-1). Water levels then continued to rise above the upper quartile, reaching record levels from mid-September to the end of the year due to very high precipitation in all of the drainage basins. In accordance with the Lake Winnipeg Water Power License, outflow at the Jenpeg GS was maximized for much of the second half of 2010 as water levels approached and exceeded 217.93 m.

Water levels on Lake Winnipegosis were near the upper quartile until July before rising above the upper quartile to record high levels in October due to very high precipitation in 2010 (Figure 9.2-2).

9.8 WATER QUALITY

The following provides an overview of water quality conditions measured in the Lake Winnipeg Region in Year 3 of CAMPP. While waterbodies sampled in this region include the north basin of Lake Winnipeg and an off-system waterbody (Lake Winnipegosis), only information collected in the latter are presented herein. Five sampling sites were monitored in Lake Winnipegosis under CAMPP in 2010/2011 (Figure 9.3-1). Sampling could not be completed at Site 2 in summer 2010 due to inclement weather.

9.8.1 Routine Variables and Limnology

Results of the 2010/2011 water quality monitoring in the Lake Winnipeg Region for routine water quality variables are presented in Tables 9.3-1 and 9.3-2 and Figures 9.3-2 to 9.3-16.

Lake Winnipegosis can generally be described as moderately nutrient-rich, relatively clear, slightly alkaline, and very hard. Despite the relatively shallow depth of the sites, four of the five sites sampled in Lake Winnipegosis in 2010/2011 were stratified in the ice-cover season (Figure 9.3-2); Site 5 was the exception and did not stratify in 2010/2011. In addition, Sites 2-4 were stratified in spring and Site 1 was stratified in summer 2010. All sites were well-oxygenated in spring and fall but dissolved oxygen (DO) concentrations were at or slightly below the chronic water quality objective for the protection of cold-water aquatic life (6.5 mg/L) at depth at Sites 1 and 5 in summer 2010 (Figure 9.3-2). DO was also below the objective for the protection of aquatic life (PAL) for cool-water aquatic life (6.0 mg/L) at depth at Site 5 in summer 2010. In addition, DO was below the PAL objective for cold-water aquatic life (9.5 mg/L) at Site 2, 4 and 5 at depth in winter 2010.

Other *in situ* variables, including specific conductance, pH, and turbidity, were relatively consistent across depth (Figures 9.3-3 and 9.3-4), though specific conductance increased at depth in winter at Site 2 and 5 and turbidity decreased across depth at Sites 3 and 5 in winter. The lower specific conductance near the surface at Site 5 may reflect dilution due to snow melt during sampling. Secchi disk depths ranged from approximately 1 m to 2.85 m in the open-water season (Figure 9.3-5).

Total phosphorus (TP) was higher at Site 1 than the other four sampling sites in 2010/2011 and 50% of samples from Site 1 exceeded the Manitoba narrative guideline for TP of 0.025 mg/L for lakes, ponds, and reservoirs (Manitoba Water Stewardship [MWS] 2011; Figure 9.3-6). TP also exceeded the narrative guideline at Sites 3 and 5 in fall and Site 5 in summer. Other routine water quality variables for which there are Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for PAL, including pH (laboratory; 6.5-9), ammonia (MWQSOGs PAL calculated from the range of pH and water temperature: 0.453 mg N/L to 6.07 mg N/L), and nitrate/nitrite (2.93 mg N/L), were within PAL objectives and guidelines in 2010/2011. *In situ* pH slightly exceeded the upper end of the PAL guideline (6.5-9.0) in winter 2011 at Site 1.

TP was typically dominated by the particulate fraction in 2010/2011, though dissolved phosphorous comprised a greater fraction of TP in winter at Sites 1 and 5 and in fall at site 4 (Figure 9.3-7). The majority of total nitrogen (TN) was composed of organic nitrogen (Figure 9.3-8) at all sites and sampling periods. On average, ammonia comprised a larger or similar portion of dissolved inorganic nitrogen (DIN) than nitrate/nitrite at all sites excepting Site 3 in

Lake Winnipegosis in 2010/2011 (Figure 9.3-8). Ammonia was also highest in winter across sites. TN concentrations were notably lower at all sites in summer 2010; this is in contrast to the results of 2008/2009 in which TN concentrations peaked in summer (Figure 9.3-8; note: Site 2 could not be sampled in summer 2010 due to inclement weather).

Water samples collected at depth (1 m above the sediment-water interface) from Sites 1 to 4 in winter 2010/2011 when the lake was thermally stratified indicated DIN and nitrate/nitrite were higher at depth relative to the near surface of the water column; however, deep samples from Sites 1 and 2 in summer and spring, respectively, indicated similar concentrations across depth (Figures 9.3-9 to 12). There were no clear and consistent differences for dissolve, particulate, or total phosphorus between surface and bottom samples in 2010/2011 (Figures 9.3-13-16).

9.8.2 Metals and Major Ions

Summaries of metal concentrations and detection frequencies measured in Lake Winnipegosis in 2010/2011 are presented in Tables 9.3-3 and 9.3-4. Sixteen of the 38 metals measured in Lake Winnipegosis in 2010/2011 were not detected including beryllium, bismuth, cesium, chromium, cobalt, mercury, nickel, selenium, silver, tellurium, thallium, thorium, tin, tungsten, zinc, and zirconium. Nearly half the metals were detected in all samples including arsenic, barium, boron, calcium, copper, iron, lithium, magnesium, manganese, molybdenum, potassium, rubidium, silicon, sodium, strontium, titanium, uranium, and vanadium.

In contrast to most of the other CAMPP waterbodies, aluminum and iron were consistently within the MWQSOGs for PAL (0.1 mg/L for aluminum and 0.3 mg/L for iron; MWS 2011) at all sites and sampling times in Lake Winnipegosis in 2010/2011 (Table 9.3-4, Figure 9.3-17). Also unlike other CAMPP waterbodies and the results for Lake Winnipegosis in the first two years of CAMPP, all metals were within MWQSOGs for PAL. Comparisons to the PAL guideline for mercury could not be made as the analytical detection limit was higher than the PAL in 2010/2011.

Concentrations of manganese were notably higher in deep (1 m from the sediment-water interface) water samples relative to surface samples collected under thermally stratified conditions in winter 2010/2011 at Sites 1-4 (Site 5 was not thermally stratified); iron and aluminum were relatively similar in surface and deep samples collected in 2010/2011 (Figures 9.3-18 to 9.3-21).

Both chloride and sulphate were consistently detected in Lake Winnipegosis in 2010/2011. On average, chloride and sulphate were lowest at Site 1 and highest at Sites 4 and 5, respectively (Table 9.3-2). Concentrations of chloride ranged from 114 mg/L to 292 mg/L and sulphate ranged from 46.9 mg/L to 77.6 mg/L. All but one measurement of chloride (Site 1 in winter) exceeded the long-term Canadian Council of Ministers of the Environment (CCME) PAL guideline (120 mg/L; CCME 1999; updated to 2013) across the five sampling sites; concentrations were, however, below the CCME PAL short-term guideline (640 mg/L) at all sites and times in Lake Winnipegosis (there is currently no Manitoba PAL guideline for chloride). Concentrations of chloride fell within the lower range (71-3,793 mg/L) reported for the Interior Plains Region of southern Manitoba (CCME 1999; updated to 2013) and sulphate concentrations in Lake Winnipegosis were consistently below the mean range (7,305 to 108,069 mg/L) for the Interior Plains, but all values in the lake were higher than other CAMPP waterbodies. While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment (BCMOE) guidelines, which range from 128 to 429 mg/L for soft to very hard waters (Meays and Nordin 2013).

9.8.3 Trophic Status and Nutrient Ratios

Sites on Lake Winnipegosis were mesotrophic to eutrophic on the basis of open-water mean TP concentrations (Table 9.3-6) and mesotrophic based on TN (Table 9.3-8). Trophic status based on chlorophyll *a* range from oligotrophic (Sites 3 and 4) to eutrophic (Site 1) in 2010/2011 (Table 9.3-7).

Molar TN:TP ratios indicate all sites sampled in Lake Winnipegosis in 2010/2011 were phosphorus limited during most sampling periods, and strongly phosphorus limited in spring and winter (Figure 9.3-22). Ratios indicate that Sites 1, 3, and 4 were co-limited by nitrogen and phosphorus in summer 2010, at which time TN concentrations were notably lower than other sampling periods (Figure 9.3-8). Total organic carbon to organic nitrogen molar ratios (TOC:ON) indicate that organic matter was a mixture of allochthonous and autochthonous sources in spring, fall, and winter at each site (Figure 9.3-23). Lower organic nitrogen concentrations in summer yielded higher TOC:ON ratios which were indicative of organic matter being primarily allochthonous in origin.

9.8.4 *Escherichia coli*

E. coli was detected in one sample collected from each of Site 3 (fall) and Site 5 (summer) but both measurements were at the analytical detection limit of 1 CFU/100 mL (Table 9.3-2). Concentrations were well below the Manitoba recreational guideline of 200 CFU/100 mL.

9.9 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Lake Winnipeg Region in Year 3 of CAMPP (Figure 9.3-1).

9.9.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Lake Winnipegosis were typically low to moderate (Figure 9.4-1), but were high at Site 1 in summer and fall. Chlorophyll *a* concentrations were also somewhat higher at Site 5 than at Sites 2, 3 and 4 in summer and fall. Winter chlorophyll *a* concentrations were typically lower than those of the open-water season.

9.9.2 Community Composition and Biomass

No samples were analysed for phytoplankton community composition and biomass in 2010/2011.

9.9.1 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L at Site 1 in summer and fall. Phytoplankton biomass was moderate in summer (10,996 mg/m^3)and high in fall (28,100 mg/m^3).. The phytoplankton community was dominated by blue-green algae during the summer bloom and by diatoms during fall (Figure 9.4-2). Green algae were second-most dominant in summer whereas blue-greens were still common in the lake in fall.

9.9.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (algal toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to influence whether microcystins are produced. *Anabaena*, *Aphanizomenon* and *Microcystis* were present at Lake Winnipegosis-Site 1 in 2010.

Microcystin-LR was measured on two occasions when chlorophyll *a* concentrations in the Lake Winnipeg Region exceeded 10 µg/L (i.e., the trigger for microcystin analysis). Microcystin-LR was not detected (<0.2 µg/L) in either of the samples analysed from Site 1 in summer and fall 2010.

9.9.3 Trophic Status

The trophic status of Lake Winnipegosis varied by site, ranging from oligotrophic to eutrophic (Table 9.3-7). Based on mean chlorophyll *a* concentrations measured during the open-water season of 2010, sites 3 and 4 were classified as oligotrophic, sites 2 and 5 were classified as mesotrophic, and Site 1 was classified as eutrophic.

9.10 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in 2010/2011 in the Lake Winnipeg Region; the third year of CAMPP. Lake Winnipegosis-Site 1 is sampled annually and is the off-system waterbody for the Lake Winnipeg Region (Figure 9.5-1).

In 2010, grab sampling in the predominantly-wetted portion of the nearshore habitat was changed to kicknet sampling in the intermittently wetted nearshore areas (i.e., in areas with water depths ≤ 1 m) to better characterize the portion of the littoral zone influenced by water level fluctuations. Samples continued to be collected in the offshore polygons in 2010 using a benthic grab sampler (Ekman or petite Ponar), however, water depth criteria for offshore polygons was now defined as greater than 5 m to a maximum of 10 m. Nearshore and offshore habitat polygons were sampled this year in this region. Kicknet and grab sampling consisted of five composites, of three replicate samples, per nearshore and offshore habitat polygon. Sampling was conducted between 23 and 25 September 2010.

9.10.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons at Lake Winnipegosis-Site 1 (Table 9.5-1).

In Lake Winnipegosis in 2010, mean water depths were 0.6 m in the nearshore and 7.1 m in the offshore (Table 9.5-1).

Sediment samples were collected and analyzed for TOC and PSA to provide a general characterization of sediment type in the nearshore and offshore polygon. Mean TOC was low in both the nearshore and offshore samples (2.0 and 1.2 %, respectively). Sand comprised the majority of the sediment collected from both the intermittently wetted nearshore habitat and offshore habitat (Table 9.5-2). Silt was the next most abundant sediment found in each habitat.

9.10.2 Species Composition, Distribution, and Relative Abundance

9.10.2.1 Lake Winnipegosis

The total mean BMI abundance in kicknet samples in the intermittently wetted nearshore habitat of Lake Winnipegosis was 676 individuals, with numbers ranging from 287 to 995 (Table 9.5-3). Non-insects dominated the BMI community in abundance (68% of the mean total BMI), with insects comprising 32% of the overall taxa (Table 9.5-3). Of the non-insects, the main group was Amphipoda (59% of the mean total BMI); Oligochaeta, Hydrozoa, and Gastropoda were also present (Table 9.5-3). Insects mainly consisted of Ephemeroptera (24% of the mean total BMI); Chironomidae (3%), Trichoptera (3%), and a small number of Hemiptera (true bugs) and Brachycera (circular-seamed flies) were also found (Table 9.5-3). Mean BMI density in offshore benthic grab samples was 2,588 individuals/m^2, with densities ranging from 967 to 6,680 (Table 9.5-3). Overall, insects (51%) and non-insects (49%) were similarly represented within the BMI community (Table 9.5-3). Insects mainly consisted of Chironomidae (48% of the mean total BMI); a small number of Ephemeroptera (2%) were also collected (Table 9.5-3). Of the non-insects the main group was Oligochaeta (49%); a small number of Bivalvia (1%) were also collected (Table 9.5-3).

Total EPT comprised 28% of the mean total nearshore BMI community, with mayflies dominating these groups. Genus analysis of the mayflies indicated that both *Caenis* sp. (small square-gilled mayflies) and an unidentified Leptophlebiidae were dominant in nearshore kicknet samples. Other genera of Heptageniidae, Leptophlebiidae, and Ephemeridae were also present (Table 9.5-3). Trichoptera were also collected in small numbers, and were mainly comprised of Hydropsychidae (net-spinning caddisflies; Table 9.5-3). In the offshore polygon, total EPT comprised 2% of the BMI community, with Ephemeroptera dominating these groups. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in the offshore samples (Table 9.5-3). The ratio of EPT:C was 9.09 in the nearshore polygon indicating a community dominated with ETP in comparison to Chironomidae. The offshore ratio was 0.04 indicating an insect community where Chironomidae were dominant over EPT.

Taxonomic richness in the nearshore was 29 families, with richness values ranging from 13 to 20 within each sample (Table 9.5-3). Hill's Effective Richness (E^H) was seven; Hyalellidae, Gammaridae, Leptophlebiidae, and Heptageniidae comprised the majority of this habitat (Table 9.5-3). Taxonomic richness in the offshore polygon was four families, with richness values ranging from two to four within each sample (Table 9.5-3). Hill's Effective Richness (E^H) was three with Oligochaeta and Chironomidae notably dominating the samples (Table 9.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.72 and 0.56 in the nearshore and offshore polygons, respectively (Table 9.5-3). Evenness (Simpson's Equitability [E_D]) was 0.18 in the nearshore polygon and 0.50 in the offshore polygon (Table 9.5-3).

9.11 FISH COMMUNITY

9.11.1 Gill Netting

Gill netting was conducted in 2010 in Lake Winnipeg in Surgeon Bay (25 – 28 June), near Grand Rapids (28 – 30 June), and in Mossy Bay (26 June – 12 July), and in Lake Winnipegosis (29 August – 24 September) (Table 9.6-1).

In Sturgeon Bay, 10 sites were sampled using standard gang index gill nets and two sites were sampled using small mesh index gill nets (Figure 9.6-1). Water temperature was not measured during the sampling period.

Five sites were sampled in Lake Winnipeg near Grand Rapids using standard gang index gill nets and two sites were sampled using small mesh index gill nets (Figure 9.6-2). Water temperature was not measured during the sampling period.

In Mossy Bay, 16 sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Figure 9.6-3). Water temperature during the sampling period ranged from 14.5 – 16.3°C (Table 9.6-1).

In Lake Winnipegosis, 12 sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets (Figure 9.6-4). Water temperature during the sampling period ranged from 9.5 – 17.0°C (Table 9.6-1).

9.11.2 Species Composition

In 2010, 20 species of fish were captured in the Lake Winnipeg River Region (Table 9.6-2).

9.11.2.1 Sturgeon Bay (Lake Winnipeg)

A total of 463 fish, representing 10 species, was captured in standard gang index gill nets (Table 9.6-3) and an additional 702 fish, representing nine species, was captured in small mesh index gill nets (Table 9.6-4). Almost half (43.20%) of the catch in standard gangs comprised Walleye; Yellow Perch (22.25%) and White Sucker (15.12%) were also common (Table 9.6-3; Figure 9.6-5). In small mesh nets, Yellow Perch (49.29%) was the most frequently captured species, followed by Rainbow Smelt (20.66%) and Troutperch (14.53%) (Table 9.6-4; Figure 9.6-5).

Walleye accounted for half (50.40%) of the biomass in standard gang index gill nets, followed by Northern Pike (23.08%) and White Sucker (17.46%) (Table 9.6-5). Yellow Perch composed the majority of the biomass in small mesh nets (58.07%).

9.11.2.2 Grand Rapids (Lake Winnipeg)

A total of 530 fish, representing 11 species, was captured in standard gang index gill nets (Table 9.6-3) and a total of 405 fish, representing six species, was captured in small mesh index gill nets (Table 9.6-4). Walleye were the most frequently captured species in standard gangs (75.28%) (Table 9.6-3; Figure 9.6-5). In small mesh gangs, Troutperch (30.47%) and Rainbow Smelt (30.47%) dominated the catch in small mesh gangs (Table 9.6-4; Figure 9.6-5).

In terms of biomass, Walleye composed the majority of the catch in standard gangs (79.37%) (Table 9.6-5) and small mesh gangs (52.34%) (Table 9.6-6).

9.11.2.3 Mossy Bay (Lake Winnipeg)

A total of 1,173 fish, representing nine species, was captured in standard gang index gill nets (Table 9.6-3) and a total of 1,067 fish, representing 10 species, was captured in small mesh index gill nets (Table 9.6-4). Yellow Perch represented 42.54% of the catch in standard gangs, followed by Walleye (20.63%) and White Sucker (13.55%) (Table 9.6-3; Figure 9.6-5). In small mesh gangs, Troutperch (44.28%) and Rainbow Smelt (39.02%) were the most common species captured (Table 9.6-4; Figure 9.6-5).

Walleye (40.53%), Yellow Perch (22.36%), and White Sucker (18.53%) accounted for the majority of the biomass in the standard gang catch (Table 9.6-5). The biomass in small mesh gangs comprised primarily Rainbow Smelt (25.31%), Troutperch (22.38%), and Yellow Perch (20.82%) (Table 9.6-6).

9.11.2.4 Lake Winnipegosis

A total of 862 fish, representing 11 species, was captured in standard gang index gill nets (Table 9.6-3) and an additional 257 fish, representing 11 species, was captured in small mesh index gill nets (Table 9.6-4). White Sucker (34.34%) and Cisco (30.51%) were the most frequently captured species in standard gangs (Table 9.6-3; Figure 9.6-5), while Spottail Shiner (31.52%) and Yellow Perch (31.52%) were the most frequently captured species in small mesh gangs (Table 9.6-4; Figure 9.6-5).

In terms of biomass, White Sucker (49.49%) dominated the standard gang catch (Table 9.6-5) and Shorthead Redhorse (49.97%) dominated the small mesh catch (Table 9.6-6).

9.11.3 Catch-Per-Unit-Effort (CPUE) and Biomass-Per-Unit-Effort (BPUE)

9.11.3.1 Sturgeon Bay (Lake Winnipeg)

In 2010, the mean CPUE for the standard gang index gillnet catch was 47.54 fish/100 m/24 h (Table 9.6-7; Figure 9.6-6). Walleye had the highest species-specific CPUE (19.84) (Figure 9.6-7). Mean CPUE in small mesh index gill nets was 485.20 fish/30 m/24 h (Table 9.6-8; Figure 9.6-6). Species having the highest CPUE were Yellow Perch (244.51) and Rainbow Smelt (93.18) (Table 9.6-8; Figure 9.6-7).

Mean BPUE for the standard gangs was 25,033 g/100 m/24 h (Table 9.6-9). Walleye had the highest BPUE (12,618 g), followed by Northern Pike (5,777) and White Sucker (4,371) (Table 9.6-9). Small mesh gangs produced a mean BPUE of 4,537 g/30 m/24 h, of which Yellow Perch had the highest species-specific BPUE (2,635) (Table 9.6-10).

9.11.3.2 Grand Rapids (Lake Winnipeg)

The mean CPUE for standard gang index gill nets set in 2010 was 135.21 (Table 9.6-7; Figure 9.6-6). Walleye had the highest species-specific CPUE (105.99), (Table 9.6-7, Figure 9.6-7). Small mesh gill nets produced a mean CPUE of 221.93 (Table 9.6-8; Figure 9.6-6). Troutperch dominated the catch, with a mean CPUE of 95.05 (Table 9.6-8; Figure 9.6-7).

Mean BPUE for the standard gangs was 79,143 g (Table 9.6-9) and 6,052 g in small mesh gangs (Table 9.6-10). The species with the highest BPUE in both standard and small mesh gangs was Walleye (66,330 g and 3,168 g) (tables 9.6-9 and 9.6-10).

9.11.3.3 Mossy Bay (Lake Winnipeg)

In 2010, the mean CPUE for the standard gang index gillnet catch was 70.37 (Table 9.6-7; Figure 9.6-6). Yellow Perch had the highest species-specific CPUE (30.15), followed by Walleye (14.79) (Table 9.6-7; Figure 9.6-7). Mean CPUE for the small mesh index gillnet catch was 291.98 (Table 9.6-8; Figure 9.6-6). Troutperch and Rainbow Smelt had the highest species-specific CPUE (130.04 and 113.62) (Table 9.6-8; Figure 9.6-7).

Mean BPUE for the standard gang index gillnet catch was 34,091 g (Table 9.6-9). Walleye had the highest BPUE (13,349 g). Small mesh index gill nets produced a BPUE of 5,181 g (Table 9.6-10). Rainbow Smelt (1,312 g), Troutperch (1,160), and Yellow Perch (1,079) had the highest BPUE.

9.11.3.4 Lake Winnipegosis

The mean CPUE for the standard gang index gill nets set in 2010 was 75.29 (Table 9.6-7; Figure 9.6-6). White Sucker and Cisco had the highest species-specific CPUE (25.43 and 23.98) (Table 9.6-7; Figure 9.6-7). In small mesh index gill nets, the mean CPUE was 74.45 (Table 9.6-8; Figure 9.6-6). Species having the highest CPUE were Spottail Shiner (29.45) and Yellow Perch (22.14) (Table 9.6-8; Figure 9.6-7).

Mean BPUE for the standard gang index gillnet catch was 46,366 g (Table 9.6-9). White Sucker had the highest BPUE (19,545 g), followed by Northern Pike (9,389). Small mesh index gill nets produced a BPUE of 1,151 g (Table 9.6-10), with Shorthead Redhorse having the highest BPUE (575).

9.11.4 Size and Condition

Lake Whitefish, Sauger, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies in 2010 were measured for fork length (mm) and weight (g) (Table 9.6-11). Only Northern Pike from Sturgeon Bay and Grand Rapids were measured. Condition factor (K) was calculated for individual fish based on these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, Sauger, and Walleye are illustrated for each waterbody in figures 9.6-8, 9.6-9, 9.6-10, and 9.6-11, respectively.

Fish captured in small mesh index gill nets were bulk weighed; only a few individuals from Mossy Bay were measured for fork length (Table 9.6-12).

9.11.4.1 Sturgeon Bay (Lake Winnipeg)

Northern Pike captured in standard gang index gill nets were not measured for length or weight and none were captured in small mesh gangs.

The Lake Whitefish captured in standard gang index gill nets had a fork length of 398 mm, a weight of 930 g, and a condition factor of 1.48 (Table 9.6-11). No Lake Whitefish were captured in small mesh gangs.

No Sauger were captured in Sturgeon Bay in 2010.

Walleye captured in standard gang index gill nets had a mean fork length of 365 mm, a mean weight of 642 g, and a mean condition factor of 1.24 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 108 g (Table 9.6-12).

9.11.4.2 Grand Rapids (Lake Winnipeg)

Northern Pike captured in standard gang index gill nets were not measured for length or weight and none were captured in small mesh gangs.

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 387 mm, a mean weight of 1,001 g, and a mean condition factor of 1.48 (Table 9.6-11). The Lake Whitefish captured in small mesh gangs weighed 18 g (Table 9.6-12).

Sauger captured in standard gang index gill nets had a mean fork length of 286 mm, a mean weight of 312 g, and a mean condition factor of 1.16 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 86 g (Table 9.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 352 mm, a mean weight of 621 g, and a mean condition factor of 1.27 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 109 g (Table 9.6-12).

9.11.4.3 Mossy Bay (Lake Winnipeg)

Northern Pike captured in standard gang index gill nets had a mean fork length of 606 mm, a mean weight of 2,613 g, and a mean condition factor of 0.90 (Table 9.6-11). The Northern Pike captured in small mesh gangs weighed 1,940 g (Table 9.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 276 mm, a mean weight of 324 g, and a mean condition factor of 1.40 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 40 g; one fish was 148 mm long with a condition factor of 1.85 (Table 9.6-12).

Sauger captured in standard and small mesh gangs were not measured.

Walleye captured in standard gang index gill nets had a mean fork length of 391 mm, a mean weight of 897 g, and a mean condition factor of 1.34 (Table 9.6-11). Those captured in small mesh gangs had a mean length of 140 mm, a mean weight of 24 g, and a mean condition factor of 0.90 (Table 9.6-12).

9.11.4.4 Lake Winnipegosis

Northern Pike captured in standard gang index gill nets had a mean fork length of 577 mm, a mean weight of 1,561 g, and a mean condition factor of 0.78 (Table 9.6-11). No Northern Pike were captured in small mesh gangs.

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 347 mm, a mean weight of 651 g, and a mean condition factor of 1.42 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 45 g (Table 9.6-12).

Sauger were not captured in Lake Winnipegosis in 2010.

Walleye captured in standard gang index gill nets had a mean fork length of 401 mm, a mean weight of 849 g, and a mean condition factor of 1.14 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 22 g (Table 9.6-12).

9.11.5 Age Composition

Age frequency distributions were calculated for Northern Pike, Lake Whitefish, Sauger, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies during 2010 (Table 9.6-13).

Mean fork length (mm), weight (g), and condition factor are also presented, by cohort, for Northern Pike (Table 9.6-14), Lake Whitefish (Table 9.6-15), Sauger (Table 9.6-16), and Walleye (Table 9.6-17).

9.11.5.1 Sturgeon Bay (Lake Winnipeg)

None of the Northern Pike captured in standard gang index gill nets were aged.

The Lake Whitefish captured in standard gangs was aged 6 years (Table 9.6-13).

The six Sauger captured in standard gangs ranged in age from 3 – 7 years (Table 9.6-13).

Age was determined for 200 Walleye captured in standard gangs (Table 9.6-13). Five year-old fish were most common among the catch (48.00%).

9.11.5.2 Grand Rapids (Lake Winnipeg)

None of the Northern Pike captured in standard gangs were aged.

Age was determined for 18 Lake Whitefish captured in standard gang index gill nets (Table 9.6-13). These fish ranged in age from 1 – 18 years.

A total of 19 Sauger captured in standard gangs was aged (Table 9.6-13). The majority of these fish was aged 3 (42.11%) or 5 (31.58%) years.

Age was determined for 270 Walleye captured in standard gangs (Table 9.6-13). The majority of these fish were aged 4 – 6 years (31.11, 28.15, and 34.44%, respectively). There was poor representation of fish aged 8 – 9.

9.11.5.3 Mossy Bay (Lake Winnipeg)

The age of three Northern Pike captured in standard gangs was determined (Table 9.6-13). These fish were 2, 8, and 11 years old.

Age was determined for 32 Lake Whitefish captured in standard gangs in 2010 (Table 9.6-13). These fish ranged from 1 – 3 years, with the majority of the catch (90.63%) aged 2 or 3 years.

None of the Sauger captured in standard gangs were aged.

Age was determined for 234 Walleye captured in standard gang index gill nets (Table 9.6-13). Most of these fish were aged 5 (32.91%) or 6 (38.46%) years.

9.11.5.4 Lake Winnipegosis

A total of 69 Northern Pike captured in standard gangs in 2010 were aged (Table 9.6-13). There was a good representation of fish aged 1 – 5, with most of the fish aged 4 years (36.23%).

A total of 27 Lake Whitefish captured in standard gangs was aged (Table 9.6-13). These fish ranged in age from 1 – 9 years, with the majority (51.85%) aged 5 years.

No Sauger were captured in standard gang index gill nets set in 2010.

The age of 91 Walleye was determined (Table 9.6-13). The two most common age groups were 5 (47.25%) and 4 (20.88%) year-olds.

9.11.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies in 2010 were examined externally for DELTs (Table 9.6-18).

9.11.6.1 Sturgeon Bay (Lake Winnipeg)

DELTs were documented for two fish captured in standard gang index gill nets set in 2010. Approximately 1.00% of the Walleye captured exhibited deformities.

9.11.6.2 Grand Rapids (Lake Winnipeg)

DELTs were not documented for any of the White Sucker, Northern Pike, Lake Whitefish, Sauger, or Walleye captured in standard gangs set in 2010.

9.11.6.3 Mossy Bay (Lake Winnipeg)

DELTs were documented for three fish captured in standard gang index gill nets set in 2010. Two White Sucker displayed lesions, representing 1.26% of the catch. Less than 0.5% of the Walleye catch displayed lesions.

9.11.6.4 Lake Winnipegosis

DELTs were documented for one White Sucker captured in standard gang index gill nets. This fish displayed tumours and represented 0.34% of the catch.

9.12 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 3 of CAMPP in the Lake Winnipeg Region. The only waterbody sampled (26-30 June) from this Region was Lake Winnipeg at Mossy Bay. Standard nets were set at 16 sites and small mesh nets were set at four sites (Figure 9.7-1). Fish for mercury analysis were obtained from standard nets at 12 sites.

9.12.1 Species Comparisons

A total of 70 fish were analyzed for mercury. No 1-year old Yellow Perch and only two Northern Pike were caught from Lake Winnipeg (Tables 9.7-1 and 9.7-2). With 32 fish, sample size of Lake Whitefish was slightly lower than the target sample size of 36 fish.

A significant positive relationship between mercury concentration and fish length existed for Lake Whitefish and Walleye (Figure 9.7-2), indicating that standardization of concentrations was necessary for comparative purposes. Sample size for Northern Pike was too small for regression analysis and mercury concentrations could not be adjusted for length in this species. Standardized mercury concentrations of Lake Whitefish and Walleye were within approximately 10% of arithmetic concentrations (Table 9.7-1) even though the mean length of Lake Whitefish analyzed for mercury was 78 mm less than the standard length of 350 mm (Table 9.7-2).

With 0.012 ppm the standard concentration of Lake Whitefish was very low (Table 9.7-1; Figure 9.7-3) and 12 fish had concentrations below the analytical detection limit of 0.01 ppm. The standardized mean concentration of Walleye (0.112 ppm) was also very low for the species.

Considering the relatively large size (Table 9.7-2; Figure 9.7-2) of the two Northern Pike analyzed for mercury, the mean arithmetic concentration of 0.223 ppm was also quite low for the species. Despite the generally low mercury levels of all three species, arithmetic mean concentrations of the two piscivores (Northern Pike and Walleye) were at least one order of magnitude higher than that of the benthivore (Lake Whitefish).

9.12.2 Comparison to Consumption Guidelines

Standard concentrations of Lake Whitefish and Walleye from Lake Winnipeg were substantially below the 0.2 ppm guideline for human consumption (see section 4.8.2.3. Based on individual concentrations, none of the Lake Whitefish and only four walleye exceeded the 0.2 ppm guideline (Figure 9.7-2). Moreover, the concentration of total mercury in each Lake Whitefish was below the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; updated to 2013; MWS 2011). One walleye also had a concentration below this guideline value. One of the large Northern Pike had a concentration below the 0.2 ppm guideline for human consumption, whereas the second Northern Pike slightly exceeded this guideline value (Figure 9.7-2). None of the fish from Lake Winnipeg had mercury levels higher than 0.5 ppm, the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b).

SECTION 9: TABLES AND FIGURES

LIST OF TABLES

LIST OF FIGURES

Table 9.3-1. Summary statistics for *in situ* variables (near surface) measured in Lake Winnipegosis: 2010/2011.

	Temperature (°C)				
	Site1	Site2	Site3	Site4	Site5
Mean	13.71	11.50	12.97	14.48	14.79
Median	16.16	16.04	14.67	17.34	17.64
Min	0.02	0.14	0.02	0.07	0.15
Max	22.51	18.32	22.52	23.18	23.72
SD	9.61	9.90	9.43	10.07	10.23
SE	4.80	5.72	4.72	5.03	5.12
n	4	3	4	4	4

	In situ pH				
	Site1	Site2	Site3	Site4	Site5
Mean	8.66	8.29	8.46	8.53	8.45
Median	8.73	8.40	8.54	8.55	8.48
Min	8.50	7.87	8.13	8.37	8.20
Max	8.76	8.59	8.64	8.66	8.64
SD	0.14	0.37	0.23	0.12	0.19
SE	0.08	0.22	0.11	0.06	0.09
n	3	3	4	4	4

	DO (mg/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	11.56	13.09	11.02	10.51	9.98
Median	9.77	9.25	9.64	8.99	8.84
Min	9.04	9.20	8.12	8.11	8.53
Max	17.65	20.82	16.67	15.97	13.70
SD	4.08	6.69	3.84	3.66	2.49
SE	2.04	3.87	1.92	1.83	1.25
n	4	3	4	4	4

	DO (% Saturation)				
	Site1	Site2	Site3	Site4	Site5
Mean	109.34	116.11	102.65	100.95	97.80
Median	103.82	99.36	96.06	96.12	97.59
Min	98.95	94.35	94.98	93.13	92.96
Max	130.76	154.62	123.50	118.43	103.08
SD	14.55	33.44	13.92	11.74	5.36
SE	7.27	19.31	6.96	5.87	2.68
n	4	3	4	4	4

	In situ Specific Conductance (µS/cm)				
	Site1	Site2	Site3	Site4	Site5
Mean	891	1164	1229	1322	1082
Median	881	1178	1194	1287	1147
Min	843	1099	1179	1263	815
Max	961	1216	1313	1450	1220
SD	52	60	73	86	184
SE	26	34	42	43	92
n	4	3	3	4	4

Table 9.3-2. - continued -

	ORP (mV)				
	Site1	Site2	Site3	Site4	Site5
Mean	111	160	111	110	179
Median	89	154	124	101	189
Min	80	145	70	49	115
Max	188	182	127	188	222
SD	51	19	27	59	45
SE	26	11	14	29	23
n	4	3	4	4	4

	Secchi Disk Depth (m)				
	Site1	Site2	Site3	Site4	Site5
Mean	2.02	1.82	1.70	1.82	1.18
Median	1.85	1.82	1.70	1.85	0.98
Min	1.35	1.35	1.35	1.65	0.91
Max	2.85	2.28	2.05	1.95	1.65
SD	0.76	0.66	0.49	0.15	0.41
SE	0.44	0.47	0.35	0.09	0.24
n	3	2	2	3	3

	Calculated Euphotic Depth (m)				
	Site1	Site2	Site3	Site4	Site5
Mean	4.03	3.63	3.40	3.63	2.36
Median	3.70	3.63	3.40	3.70	1.96
Min	2.70	2.70	2.70	3.30	1.82
Max	5.70	4.56	4.10	3.90	3.30
SD	1.53	1.32	0.99	0.31	0.82
SE	0.88	0.93	0.70	0.18	0.47
n	3	2	2	3	3

	Estimated Euphotic Depth (m)				
	Site1	Site2	Site3	Site4	Site5
Mean	4.0	3.7	3.5	3.6	2.4
Median	3.7	3.7	3.5	3.7	2.0
Min	2.8	2.8	2.8	3.3	2.0
Max	5.5	4.5	4.1	3.9	3.3
SD	1.4	1.2	0.9	0.3	0.8
SE	0.8	0.9	0.7	0.2	0.4
n	3	2	2	3	3

Table 9.3-2. Summary statistics for routine laboratory variables measured in Lake Winnipegosis: 2010/2011.

	Total Alkalinity ($CaCO_3$ mg/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	178	177	173	170	187
Median	174	176	170	165	172
Min	171	168	164	163	163
Max	194	186	188	188	242
SD	11	9	11	12	37
SE	5	5	5	6	19
n	4	3	4	4	4

	Bicarbonate Alkalinity (HCO_3 mg/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	205	205	202	199	218
Median	199	202	195	189	195
Min	187	191	188	187	189
Max	236	223	230	229	295
SD	21	16	19	20	51
SE	11	9	10	10	26
n	4	3	4	4	4

	Carbonate Alkalinity (CO_3 mg/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	6.1	4.94	4.59	4.46	4.85
Median	6.8	6.15	5.86	5.73	5.27
Min	<0.6	1.64	<0.6	<0.6	<0.6
Max	10.5	7.03	6.35	6.09	8.57
SD	4.5	2.89	2.87	2.78	3.42
SE	2.3	1.67	1.44	1.39	1.71
n	4	3	4	4	4

	Hydroxide Alkalinity (OH mg/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	<4	<4	<4	<4	<4
Median	<4	<4	<4	<4	<4
Min	<4	<4	<4	<4	<4
Max	<4	<4	<4	<4	<4
SD	-	-	-	-	-
SE	-	-	-	-	-
n	4	3	4	4	4

	Ammonia (mg N/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	<0.05	<0.05	<0.05	<0.05	<0.05
Median	<0.05	<0.05	<0.05	<0.05	<0.05
Min	<0.05	<0.01	<0.01	<0.01	<0.05
Max	0.027	0.039	0.036	0.111	0.051
SD	-	-	-	-	-
SE	-	-	-	-	-
n	4	3	4	4	4

Table 9.3-2. - continued –

	Nitrate/Nitrite (mg N/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	<0.05	<0.05	<0.05	<0.05	<0.05
Median	<0.05	<0.05	<0.05	<0.05	<0.05
Min	<0.005	<0.005	<0.0071	<0.005	<0.005
Max	<0.05	<0.05	0.0393	<0.05	0.0714
SD	-	-	-	-	-
SE	-	-	-	-	-
n	4	3	4	4	4

	TKN (mg/L)				
	Site1	Site2	Site3	Site4	Site5
Mean	0.50	0.57	0.45	0.61	0.59
Median	0.53	0.56	0.55	0.63	0.66
Min	0.23	0.54	<0.2	<0.2	0.26
Max	0.73	0.62	0.60	1.06	0.77
SD	0.21	0.04	0.23	0.40	0.23
SE	0.11	0.02	0.12	0.20	0.11
n	4	3	4	4	4

	DIN (mg/L) [1]				
	Site1	Site2	Site3	Site4	Site5
Mean	<0.05	<0.05	<0.05	<0.05	<0.05
Median	<0.05	<0.05	<0.05	<0.05	<0.05
Min	<0.05	<0.01	<0.01	<0.01	<0.05
Max	0.030	<0.05	0.075	0.114	0.122
SD	-	-	-	-	-
SE	-	-	-	-	-
n	4	3	4	4	4

	ON (mg/L) [1]				
	Site1	Site2	Site3	Site4	Site5
Mean	0.48	0.55	0.43	0.56	0.56
Median	0.50	0.54	0.51	0.56	0.62
Min	0.22	0.50	<0.2	<0.2	0.24
Max	0.72	0.61	0.60	1.03	0.74
SD	0.21	0.06	0.23	0.38	0.22
SE	0.11	0.03	0.11	0.19	0.11
n	4	3	4	4	4

	TN (mg/L) [1]				
	Site1	Site2	Site3	Site4	Site5
Mean	0.51	0.58	0.46	0.61	0.61
Median	0.54	0.59	0.58	0.64	0.71
Min	0.23	0.54	<0.2	<0.2	0.26
Max	0.73	0.62	0.60	1.06	0.77
SD	0.21	0.04	0.24	0.40	0.24
SE	0.11	0.02	0.12	0.20	0.12
n	4	3	4	4	4

Table 9.3-2. - continued -

	TDP (mg/L)					TPP (mg/L) [1]					TP (mg/L)					TN:TP [1]					DIN:TDP [1]					DIN:TP [1]				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	0.0094	0.0056	0.0040	0.0053	0.0059	0.016	0.009	0.0136	0.0093	0.0174	0.0258	0.0144	0.0176	0.0146	0.0233	57	111	67	93	66	12	81	58	83	74	4	8	6	9	6
Median	0.0114	0.0048	0.0024	0.0015	0.0056	0.013	0.008	0.0140	0.0094	0.0176	0.0216	0.0100	0.0150	0.0126	0.0237	61	120	64	108	61	4	19	32	39	34	3	9	6	8	5
Min	0.0029	0.0005	0.0010	0.0010	0.0005	0.004	0.005	0.0068	0.0064	0.0100	0.0118	0.0083	0.0106	0.0096	0.0136	18	58	16	19	23	2	2	2	5	6	1	1	1	2	2
Max	0.0119	0.0116	0.0103	0.0174	0.0120	0.037	0.013	0.0195	0.0120	0.0243	0.0483	0.0249	0.0298	0.0238	0.0323	89	156	124	137	118	38	221	167	251	221	9	13	11	19	12
SD	0.0044	0.0056	0.0044	0.0081	0.0060	0.014	0.004	0.0052	0.0027	0.0069	0.0166	0.0092	0.0084	0.0063	0.0078	37	50	47	52	40	17	122	74	114	99	4	6	5	8	5
SE	0.0022	0.0032	0.0022	0.0040	0.0030	0.007	0.002	0.0026	0.0013	0.0035	0.0083	0.0053	0.0042	0.0031	0.0039	18	29	23	26	20	9	70	37	57	50	2	4	3	4	3
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-2. - continued -

	DOC (mg/L)					TOC (mg/L)					TIC (mg/L)					TOC:ON [1]					TOC:TN [1]				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	12.2	12.1	11.9	12.0	12.3	12.9	12.7	12.0	12.7	13.1	41.3	40.7	39.9	39.2	41.5	36	27	54	54	33	34	26	48	49	30
Median	11.9	12.0	11.8	12.1	12.5	12.7	12.6	12.3	12.8	13.0	41.0	41.3	39.4	38.3	39.0	32	27	28	27	24	30	25	25	23	21
Min	10.8	11.9	11.6	11.8	11.7	10.6	12.5	11.1	12.1	12.5	37.8	37.7	36.6	36.6	37.1	22	25	24	15	22	21	24	24	14	20
Max	14.1	12.3	12.3	12.2	12.5	15.8	13.1	12.5	13.2	13.9	45.2	43.1	44.1	43.8	50.7	57	30	136	149	63	53	28	117	136	58
SD	1.6	0.2	0.3	0.2	0.4	2.2	0.3	0.6	0.5	0.6	3.7	2.8	3.1	3.2	6.2	15	3	55	63	20	14	2	46	58	19
SE	0.8	0.1	0.2	0.1	0.2	1.1	0.2	0.3	0.3	0.3	1.8	1.6	1.6	1.6	3.1	7	2	27	32	10	7	1	23	29	9
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-2. - continued -

	TDS (mg/L)					Laboratory Conductivity (umhos/cm)					TSS (mg/L)					Laboratory Turbidity (NTU)					True Colour (TCU)				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	503	649	657	741	641	874	1129	1188	1285	1097	4.3	4.0	2.9	3.5	3.1	2.30	2.00	2.25	2.33	3.71	18.5	8.8	7.2	7.1	11.0
Median	504	674	647	752	639	865	1140	1170	1260	1130	2.4	3.6	<2	3.8	2.5	1.88	1.69	2.22	2.63	3.55	16.4	8.3	6.6	7.9	10.4
Min	466	581	604	652	570	809	1087	1160	1240	926	<2	2.0	<2	<2	<2	1.29	0.65	0.95	0.71	2.49	15.0	8.0	5.7	<5	10.0
Max	536	692	730	810	716	958	1160	1250	1380	1200	11.2	6.3	6.8	5.2	6.4	4.15	3.65	3.60	3.37	5.23	26.3	10.0	10.0	10.0	13.1
SD	36	60	53	66	60	63	38	43	65	125	4.7	2.2	2.7	1.8	2.6	1.35	1.52	1.13	1.19	1.20	5.3	1.1	1.9	3.2	1.5
SE	18	35	26	33	30	31	22	21	32	63	2.3	1.2	1.4	0.9	1.3	0.67	0.88	0.56	0.60	0.60	2.6	0.6	1.0	1.6	0.7
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-2. - continued

	Laboratory pH					*E. coli* (CFU/100 mL)					Chlorophyll *a* (µg/L)					Hardness as $CaCO_3$ (mg/L)					Chloride (mg/L)					Sulphate (mg/L)				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	8.49	8.46	8.45	8.46	8.44	<1	<1	<1	<1	<1	7.17	2.96	1.99	2.06	4.74	217	231	223	232	247	146	227	248	276	226	49.9	54.9	58.5	58.8	65.4
Median	8.54	8.51	8.51	8.51	8.49	<1	<1	<1	<1	<1	6.54	2.15	2.09	2.26	4.92	214	231	220	231	242	145	225	247	273	227	48.6	55.6	57.1	57.5	62.1
Min	8.22	8.31	8.24	8.27	8.17	<1	<1	<1	<1	<1	<0.6	2.10	1.18	1.34	1.53	204	230	208	209	226	114	211	243	265	204	46.9	51.8	53.1	55.4	60.0
Max	8.67	8.55	8.54	8.54	8.62	<1	<1	1	<1	1	15.30	4.64	2.61	2.38	7.57	238	233	243	258	279	182	246	253	292	248	55.7	57.3	66.7	64.9	77.6
SD	0.20	0.13	0.14	0.13	0.19	-	-	-	-	-	6.85	1.45	0.61	0.48	3.03	15	2	15	21	22	28	17	5	12	24	4.0	2.8	6.4	4.3	8.3
SE	0.10	0.07	0.07	0.06	0.10	-	-	-	-	-	3.43	0.84	0.31	0.24	1.52	7	1	7	10	11	14	10	2	6	12	2.0	1.6	3.2	2.2	4.2
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

[1] Calculated.

Table 9.3-3. Summary statistics for metals and major ions measured in Lake Winnipegosis: 2010/2011. Values are presented as mg/L.

	Aluminum					Antimony					Arsenic					Barium					Beryllium				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	0.0237	0.0163	0.0220	0.0158	0.0293	<0.0002	0.00022	<0.0002	<0.0002	<0.0002	0.00182	0.00203	0.00225	0.00239	0.00248	0.0360	0.0376	0.0377	0.0382	0.0413	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Median	0.0224	0.0183	0.0238	0.0159	0.0228	<0.0002	0.00024	<0.0002	<0.0002	<0.0002	0.00187	0.00199	0.00222	0.00238	0.00233	0.0357	0.0359	0.0380	0.0385	0.0403	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Min	<0.005	0.0080	<0.005	<0.005	0.0139	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00137	0.00195	0.00207	0.00220	0.00218	0.0355	0.0358	0.0358	0.0346	0.0380	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Max	0.0477	0.0226	0.0380	0.0289	0.0577	0.00035	0.00031	0.00027	0.00031	0.00029	0.00216	0.00214	0.00249	0.00261	0.00310	0.0370	0.0410	0.0392	0.0412	0.0467	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SD	0.0192	0.0075	0.0157	0.0116	0.0194	-	0.00011	-	-	-	0.00036	0.00010	0.00018	0.00022	0.00043	0.0007	0.0030	0.0014	0.0027	0.0039	-	-	-	-	-
SE	0.0096	0.0043	0.0078	0.0058	0.0097	-	0.00006	-	-	-	0.00018	0.00006	0.00009	0.00011	0.00021	0.0003	0.0017	0.0007	0.0014	0.0019	-	-	-	-	-
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-3. - continued -

	Bismuth					Boron					Cadmium					Calcium					Cesium				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.055	0.070	0.075	0.084	0.089	0.000030	0.000025	0.000016	0.000011	0.000026	52.7	52.2	48.3	48.8	53.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Median	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.055	0.069	0.076	0.085	0.091	0.000015	0.000011	0.000014	0.000011	0.000022	52.9	53.0	48.2	49.7	52.5	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Min	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.052	0.067	0.067	0.073	0.079	0.000012	<0.00001	<0.00001	<0.00001	0.000018	49.0	50.7	44.7	43.5	49.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Max	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.058	0.074	0.080	0.094	0.094	0.000079	0.000058	0.000030	0.000017	0.000042	56.0	53.0	52.2	52.2	58.2	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
SD	-	-	-	-	-	0.002	0.004	0.006	0.009	0.007	0.000033	0.000029	0.000011	0.000005	0.000011	3.0	1.3	3.1	4.1	3.9	-	-	-	-	-
SE	-	-	-	-	-	0.001	0.002	0.003	0.004	0.003	0.000016	0.000017	0.000005	0.000002	0.000006	1.5	0.8	1.6	2.0	1.9	-	-	-	-	-
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-3. - continued -

	Chromium					Cobalt					Copper					Iron					Lead				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0009	0.0006	0.0006	0.0006	0.0008	0.029	<0.02	0.022	<0.02	0.028	0.00017	<0.00009	0.00011	0.00009	0.00026
Median	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0006	0.0006	0.0005	0.0008	0.023	<0.02	<0.02	<0.02	0.031	0.00009	<0.00009	<0.00009	<0.00009	0.00015
Min	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	0.0006	0.0005	0.0004	0.0006	<0.02	<0.02	<0.02	<0.02	<0.02	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Max	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	0.0007	0.0008	0.0008	0.0011	0.059	0.010	0.045	0.034	0.039	0.00047	<0.00009	0.00026	0.00016	0.00070
SD	-	-	-	-	-	-	-	-	-	-	0.0004	0.0001	0.0001	0.0002	0.0002	0.024	-	0.017	-	0.013	0.00020	-	0.00010	0.00005	0.00030
SE	-	-	-	-	-	-	-	-	-	-	0.0002	0.0000	0.0001	0.0001	0.0001	0.012	-	0.008	-	0.007	0.00010	-	0.00005	0.00003	0.00015
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	4	4	4	4

Table 9.3-3. - continued -

	Lithium					Magnesium					Manganese					Mercury					Molybdenum				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	0.0226	0.0267	0.0274	0.0285	0.0295	20.8	24.5	24.7	26.9	28.0	0.0332	0.0101	0.0049	0.0082	0.0125	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00190	0.00187	0.00186	0.00179	0.00232
Median	0.0226	0.0275	0.0275	0.0277	0.0291	19.9	24.4	24.1	26.0	27.0	0.0333	0.0095	0.0051	0.0092	0.0134	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00189	0.00176	0.00184	0.00171	0.00209
Min	0.0211	0.0247	0.0262	0.0260	0.0269	19.7	23.7	23.4	24.4	25.3	0.0222	0.0066	0.0040	0.0031	0.0072	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00178	0.00170	0.00173	0.00165	0.00196
Max	0.0240	0.0278	0.0284	0.0327	0.0329	23.8	25.4	27.3	31.1	32.5	0.0442	0.0142	0.0054	0.0111	0.0161	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00203	0.00216	0.00203	0.00211	0.00314
SD	0.0012	0.0017	0.0010	0.0030	0.0025	2.0	0.9	1.8	2.9	3.2	0.0102	0.0038	0.0006	0.0035	0.0038	-	-	-	-	-	0.00011	0.00025	0.00013	0.00022	0.00055
SE	0.0006	0.0010	0.0005	0.0015	0.0012	1.0	0.5	0.9	1.5	1.6	0.0051	0.0022	0.0003	0.0018	0.0019	-	-	-	-	-	0.00005	0.00015	0.00007	0.00011	0.00028
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-3. - continued -

	Nickel					Potassium					Rubidium					Selenium					Silicon				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	<0.002	<0.002	<0.002	<0.002	<0.002	6.47	7.93	8.00	8.61	8.51	0.00322	0.00392	0.00393	0.00428	0.00399	<0.001	<0.001	<0.001	<0.001	<0.001	3.87	4.41	4.25	3.80	4.29
Median	<0.002	<0.002	<0.002	<0.002	<0.002	6.44	7.94	7.98	8.41	8.45	0.00321	0.00392	0.00389	0.00420	0.00398	<0.001	<0.001	<0.001	<0.001	<0.001	4.14	4.23	4.27	3.88	4.66
Min	<0.002	<0.002	<0.002	<0.002	<0.002	6.31	7.77	7.56	7.75	7.71	0.00303	0.00362	0.00379	0.00411	0.00387	<0.001	<0.001	<0.001	<0.001	<0.001	2.29	4.09	3.80	3.29	2.87
Max	<0.002	<0.002	<0.002	<0.002	<0.002	6.68	8.07	8.48	9.88	9.45	0.00344	0.00423	0.00413	0.00462	0.00413	<0.001	<0.001	<0.001	<0.001	<0.001	4.91	4.91	4.65	4.13	4.98
SD	-	-	-	-	-	0.16	0.15	0.38	0.92	0.72	0.00019	0.00030	0.00015	0.00024	0.00011	-	-	-	-	-	1.27	0.44	0.36	0.36	0.97
SE	-	-	-	-	-	0.08	0.09	0.19	0.46	0.36	0.00010	0.00018	0.00008	0.00012	0.00006	-	-	-	-	-	0.63	0.25	0.18	0.18	0.48
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-3. - continued -

	Silver					Sodium					Strontium					Tellurium					Thallium				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	95	150	156	176	152	0.209	0.265	0.274	0.297	0.286	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Median	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	97	153	156	171	155	0.207	0.267	0.281	0.297	0.293	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Min	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	80	141	153	169	135	0.186	0.252	0.241	0.253	0.239	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Max	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	106	157	160	191	164	0.236	0.277	0.294	0.341	0.318	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
SD	-	-	-	-	-	11	8	3	10	13	0.021	0.013	0.025	0.036	0.033	-	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	6	5	1	5	6	0.010	0.007	0.012	0.018	0.017	-	-	-	-	-	-	-	-	-	-
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-3. - continued -

	Thorium					Tin					Titanium					Tungsten					Uranium				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00104	0.00086	0.00109	0.00142	0.00157	<0.001	<0.001	<0.001	<0.001	<0.001	0.00124	0.00118	0.00112	0.00107	0.00162
Median	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00084	0.00091	0.00106	0.00109	0.00119	<0.001	<0.001	<0.001	<0.001	<0.001	0.00123	0.00108	0.00112	0.00104	0.00150
Min	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00054	0.00048	0.00053	0.00050	0.00084	<0.001	<0.001	<0.001	<0.001	<0.001	0.00102	0.00102	0.00096	0.00092	0.00126
Max	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00195	0.00120	0.00173	0.00301	0.00307	<0.001	<0.001	<0.001	<0.001	<0.001	0.00150	0.00143	0.00127	0.00126	0.00223
SD	-	-	-	-	-	-	-	-	-	-	0.00063	0.00036	0.00058	0.00116	0.00102	-	-	-	-	-	0.00023	0.00022	0.00013	0.00014	0.00046
SE	-	-	-	-	-	-	-	-	-	-	0.00032	0.00021	0.00029	0.00058	0.00051	-	-	-	-	-	0.00011	0.00013	0.00006	0.00007	0.00023
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-3. - continued -

	Vanadium					Zinc					Zirconium				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	0.0012	0.0010	0.0012	0.0011	0.0010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Median	0.0010	0.0010	0.0010	0.0009	0.0010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Min	0.0006	0.0010	0.0008	0.0009	0.0008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Max	0.0021	0.0011	0.0018	0.0016	0.0011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
SD	0.0007	0.0001	0.0004	0.0003	0.0001	-	-	-	-	-	-	-	-	-	-
SE	0.0003	0.0000	0.0002	0.0002	0.0001	-	-	-	-	-	-	-	-	-	-
n	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4

Table 9.3-4. Frequency of detections of total metals (mg/L) measured in Lake Winnipegosis: 2010/2011.

		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chromium	Cobalt	Copper
Lake Winnipegosis	# Detections	3	1	4	4	0	0	4	4	4	0	0	0	4
Site 1	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	75	25	100	100	0	0	100	100	100	0	0	0	100
Lake Winnipegosis	# Detections	3	2	3	3	0	0	3	2	3	0	0	0	3
Site 2	n	3	3	3	3	3	3	3	3	3	3	3	3	3
	% Detections	100	67	100	100	0	0	100	67	100	0	0	0	100
Lake Winnipegosis	# Detections	3	1	4	4	0	0	4	3	4	0	0	0	4
Site 3	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	75	25	100	100	0	0	100	75	100	0	0	0	100
Lake Winnipegosis	# Detections	3	2	4	4	0	0	4	3	4	0	0	0	4
Site 4	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	75	50	100	100	0	0	100	75	100	0	0	0	100
Lake Winnipegosis	# Detections	4	2	4	4	0	0	4	4	4	0	0	0	4
Site 5	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	50	100	100	0	0	100	100	100	0	0	0	100

Table 9.3-4. - continued -

		Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Rubidium	Selenium	Silicon	Silver
Lake Winnipegosis	# Detections	4	2	4	4	4	0	4	0	4	4	0	4	0
Site 1	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	50	100	100	100	0	100	0	100	100	0	100	0
Lake Winnipegosis	# Detections	3	0	3	3	3	0	3	0	3	3	0	3	0
Site 2	n	3	3	3	3	3	3	3	3	3	3	3	3	3
	% Detections	100	0	100	100	100	0	100	0	100	100	0	100	0
Lake Winnipegosis	# Detections	4	2	4	4	4	0	4	0	4	4	0	4	0
Site 3	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	50	100	100	100	0	100	0	100	100	0	100	0
Lake Winnipegosis	# Detections	4	2	4	4	4	0	4	0	4	4	0	4	0
Site 4	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	50	100	100	100	0	100	0	100	100	0	100	0
Lake Winnipegosis	# Detections	4	3	4	4	4	0	4	0	4	4	0	4	0
Site 5	n	4	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	75	100	100	100	0	100	0	100	100	0	100	0

Table 9.3-4. - continued -

		Sodium	Strontium	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Lake Winnipegosis	# Detections	4	4	0	0	0	0	4	0	4	4	0	0
Site 1	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	0	0	0	0	100	0	100	100	0	0
Lake Winnipegosis	# Detections	3	3	0	0	0	0	3	0	3	3	0	0
Site 2	n	3	3	3	3	3	3	3	3	3	3	3	3
	% Detections	100	100	0	0	0	0	100	0	100	100	0	0
Lake Winnipegosis	# Detections	4	4	0	0	0	0	4	0	4	4	0	0
Site 3	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	0	0	0	0	100	0	100	100	0	0
Lake Winnipegosis	# Detections	4	4	0	0	0	0	4	0	4	4	0	0
Site 4	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	0	0	0	0	100	0	100	100	0	0
Lake Winnipegosis	# Detections	4	4	0	0	0	0	4	0	4	4	0	0
Site 5	n	4	4	4	4	4	4	4	4	4	4	4	4
	% Detections	100	100	0	0	0	0	100	0	100	100	0	0

Table 9.3-5. Frequency of exceedances of MWQSOGs for PAL for metals (MWS 2011), CCME PAL guideline for chloride (CCME 1999, updated to 2013), and BCMOE guideline for sulphate (Meays and Nordin 2013) in Lake Winnipegosis: 2010/2011. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00046-0.00058	0.155-0.200	0.0172-0.0224	0.3	0.0079-0.0118	0.000026
Lake Winnipegosis	N	4	4	4	4	4	4	4	4	0
Site 1	# Exceedances	0	0	0	0	0	0	0	0	-
	% Exceedances	0	0	0	0	0	0	0	0	-
Lake Winnipegosis	N	3	3	3	3	3	3	3	3	0
Site 2	# Exceedances	0	0	0	0	0	0	0	0	-
	% Exceedances	0	0	0	0	0	0	0	0	-
Lake Winnipegosis	N	4	4	4	4	4	4	4	4	0
Site 3	# Exceedances	0	0	0	0	0	0	0	0	-
	% Exceedances	0	0	0	0	0	0	0	0	-
Lake Winnipegosis	N	4	4	4	4	4	4	4	4	0
Site 4	# Exceedances	0	0	0	0	0	0	0	0	-
	% Exceedances	0	0	0	0	0	0	0	0	-
Lake Winnipegosis	N	4	4	4	4	4	4	4	4	0
Site 5	# Exceedances	0	0	0	0	0	0	0	0	-
	% Exceedances	0	0	0	0	0	0	0	0	-

Table 9.3-5. - continued -

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.095-0.124	0.001	0.0001	0.0008	0.015	0.219-0.286	120	128-429
Lake Winnipegosis	N	4	4	4	4	4	4	4	**4**	4
Site 1	# Exceedances	0	0	0	0	0	0	0	**3**	0
	% Exceedances	0	0	0	0	0	0	0	**75**	0
Lake Winnipegosis	N	3	3	3	3	3	3	3	**3**	3
Site 2	# Exceedances	0	0	0	0	0	0	0	**3**	0
	% Exceedances	0	0	0	0	0	0	0	**100**	0
Lake Winnipegosis	N	4	4	4	4	4	4	4	**4**	4
Site 3	# Exceedances	0	0	0	0	0	0	0	**4**	0
	% Exceedances	0	0	0	0	0	0	0	**100**	0
Lake Winnipegosis	N	4	4	4	4	4	4	4	**4**	4
Site 4	# Exceedances	0	0	0	0	0	0	0	**4**	0
	% Exceedances	0	0	0	0	0	0	0	**100**	0
Lake Winnipegosis	N	4	4	4	4	4	4	4	**4**	4
Site 5	# Exceedances	0	0	0	0	0	0	0	**4**	0
	% Exceedances	0	0	0	0	0	0	0	**100**	0

[1]Comparisons to the current PAL guideline could not be made for all samples; analytical detection limits varied between sampling periods and were higher than the guideline in spring and winter.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 9.3-6. Total phosphorus concentrations (open-water season and annual means) measured in Lake Winnipegosis and CCME (1999; updated to 2013) trophic categorization: 2010/2011.

		Trophic Status Based on Total Phosphorous (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100
Lake Winnipegosis-Site 1	Open-water season					0.038	
	Annual				0.033		
Lake Winnipegosis-Site 2	Open-water season			0.020			
	Annual			0.020			
Lake Winnipegosis-Site 3	Open-water season			0.018			
	Annual			0.017			
Lake Winnipegosis-Site 4	Open-water season			0.017			
	Annual			0.016			
Lake Winnipegosis-Site 5	Open-water season				0.022		
	Annual				0.021		

Table 9.3-7. Chlorophyll a concentrations (open-water season and annual means) measured in Lake Winnipegosis and the OECD (1982) trophic categorization scheme for lakes: 2010/2011.

		Lake Trophic Status Based on Chlorophyll a (ug/L)						
		Ultra-oligotrophic	Oligotrophic	Oligo-mesotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<2.5	-	2.5 - 8	-	8 - 25	> 25
Lake Winnipegosis -Site 1	Open-water season						9.46	
	Annual				7.17			
Lake Winnipegosis -Site 2	Open-water season				3.39			
	Annual				2.96			
Lake Winnipegosis -Site 3	Open-water season		2.02					
	Annual		1.99					
Lake Winnipegosis -Site 4	Open-water season		2.3					
	Annual		2.06					
Lake Winnipegosis -Site 5	Open-water season				5.80			
	Annual				4.74			

Table 9.3-8. Total nitrogen concentrations (open-water season and annual means) measured in Lake Winnipegosis in the Lake Winnipeg Region and comparison to a trophic categorization scheme (Nürnberg 1996): 2010/11.

		Lake Trophic Status Based on Total Nitrogen (mg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2
Lake Winnipegosis-Site 1	Open-water season			0.48			
	Annual			0.51			
Lake Winnipegosis-Site 2	Open-water season			0.60			
	Annual			0.58			
Lake Winnipegosis-Site 3	Open-water season			0.43			
	Annual			0.46			
Lake Winnipegosis-Site 4	Open-water season			0.59			
	Annual			0.61			
Lake Winnipegosis-Site 5	Open-water season			0.59			
	Annual			0.61			

Table 9.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Lake Winnipeg Region for CAMPP, 2010.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Disk Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Lake Winnipegosis (2010)	Nearshore	5	0.6	0.5	0.7	--	>1.00	10.5	cobble, gravel, boulder	shrubs, mixed forest	0-24	attached
	Offshore	5	7.1	6.9	7.3	0.00	1.00	9.5	clay	--	--	--

Table 9.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites at Lake Winnipegosis in the Lake Winnipeg Region for CAMPP, 2010.

Waterbody	Habitat Type		No. of Samples (n)	Water Depth (m)	Total Organic Carbon (%)	Sand (2.0-0.05 mm) (%)	Silt (0.05-2 µm) (%)	Clay (<2 µm) (%)	Dominant Texture
Lake Winnipegosis (2010)	Nearshore	Mean	4	0.4	2.00	72.68	24.08	3.23	Sandy Loam
		SD	--	0.13	2.424	15.391	12.401	3.692	--
		SE	--	0.06	1.212	7.695	6.200	1.846	--
		Median	--	0.4	0.98	76.60	22.40	1.67	--
		Min	--	0.2	0.46	51.80	12.00	0.87	--
		Max	--	0.5	5.57	85.70	39.50	8.69	--
	Offshore	Mean	5	7.1	1.19	82.80	13.58	3.59	Loamy Sand
		SD	--	0.24	0.133	2.311	2.700	1.089	--
		SE	--	0.11	0.060	1.033	1.208	0.487	--
		Median	--	7.0	1.17	83.00	12.50	3.85	--
		Min	--	6.9	1.02	79.10	11.50	2.37	--
		Max	--	7.5	1.34	85.10	18.30	4.98	--

Table 9.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Lake Winnipegosis within the Lake Winnipeg Region for CAMPP, 2010.

	Lake Winnipegosis						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	676	329.6	147.4	734	287	995
Oligochaeta	--	24	19.6	8.8	17	7	51
Hirudinea	--	0	0.6	0.3	0	0	1
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	61	26.9	12.1	65	20	91
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	340	195.7	87.5	456	126	509
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	0	0.6	0.3	0	0	1
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	1	1.2	0.5	0	0	3
Lymnaeidae	--	1	1.5	0.7	0	0	3
Physidae	--	9	8.1	3.6	8	0	19
Planorbidae	--	6	7.8	3.5	4	0	19
Valvatidae	--	0	0.6	0.3	0	0	1
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	18	22.1	9.9	9	0	56
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	461	242.5	108.5	591	165	677
Non-Insecta (%)	68	--	--	--	--	--	--
Oligochaeta	--	24	19.6	8.8	17	7	51
Oligochaeta (%)	4	--	--	--	--	--	--
Amphipoda	--	402	214.2	95.8	533	146	600
Amphipoda (%)	59	--	--	--	--	--	--
Bivalvia	--	0	0.6	0.3	0	0	1
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	17	16.9	7.5	15	0	37
Gastropoda (%)	3	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	2	2.1	0.9	1	0	5
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	43	21.9	9.8	40	24	80
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	4	4.8	2.1	1	0	11
Hexagenia	--	2	3.6	1.6	0	0	8
Heptageniidae	--	13	13.2	5.9	8	1	35
Heptagenia	--	0	0.6	0.3	0	0	1
Stenacron	--	31	33.3	14.9	16	5	88
Stenomena	--	7	5.4	2.4	7	0	15
Leptophlebiidae	--	57	40.1	17.9	49	1	107
Leptophlebia	--	8	10.5	4.7	5	0	27
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.6	0.3	0	0	1
Hydropsychidae	--	12	9.4	4.2	15	2	24
Hydroptilidae (larva)	--	3	3.2	1.4	1	0	8
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	2	2.4	1.1	3	0	5
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.3	0.1	0	0	1
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.3	0.1	0	0	1
Polycentropodidae	--	4	4.0	1.8	1	0	8
Psychomyiidae	--	1	1.2	0.5	0	0	3
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	1	1.2	0.5	0	0	3
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	1	1.2	0.5	0	0	3
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	6	6.6	3.0	3	0	13
Orthocladiinae	--	8	3.6	1.6	9	3	12
Tanypodinae	--	8	3.6	1.6	8	2	11
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	2	2.0	0.9	1	0	5
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.6	0.3	0	0	1
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	1	1.2	0.5	0	0	3
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	215	106.3	47.6	151	123	355
Insecta (%)	32	--	--	--	--	--	--

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Nearshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	23	9.3	4.2	20	15	37
Chironomidae (%)	3	--	--	--	--	--	--
Ephemeroptera	--	165	94.2	42.1	107	97	309
Ephemeroptera (%)	24	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	21	16.6	7.4	20	4	45
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	187	106.5	47.6	127	103	339
EPT (%)	28	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	9.09	6.864	3.070	6.93	3.98	21.17
Genus analysis of Ephemeroptera	Leptophlebiidae: unidentified + Caenidae: *Caenis*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	29	18	2.9	1.3	19	13	20
Simpson's Diversity Index (D)	--	0.72	0.105	0.047	0.76	0.56	0.84
Evenness (Simpson's Equitability E_D)	--	0.18	0.065	0.029	0.18	0.09	0.25
Shannon-Weaver Index (H)	--	1.94	0.284	0.127	1.95	1.51	2.30
Evenness (Shannon's Equitability E_H)	--	0.62	0.092	0.041	0.64	0.47	0.71
Hill's Effective Richness ($E^{H'}$)	--	7	1.9	0.9	7	5	10
Evenness ($E^{H'}$/S)	--	0.32	0.089	0.040	0.32	0.19	0.41

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2588	2324.3	1039.4	1904	967	6680
Oligochaeta	--	1258	2286.4	1022.5	390	14	5338
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonyctidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Arachnida - unid	--	0	0.0	0.0	0	0	0
Acari	--	0	0.0	0.0	0	0	0
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	23	12.9	5.8	29	0	29
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	0	0.0	0.0	0	0	0
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	0	0.0	0.0	0	0	0
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	1281	2290.4	1024.3	418	14	5367
Non-Insecta (%)	49	--	--	--	--	--	--
Oligochaeta	--	1258	2286.4	1022.5	390	14	5338
Oligochaeta (%)	49	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	23	12.9	5.8	29	0	29
Bivalvia (%)	1	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	0	0.0	0.0	0	0	0
Neuroptera	--	0	0.0	0.0	0	0	0
Sisyridae	--	0	0.0	0.0	0	0	0
Odonata - unid	--	0	0.0	0.0	0	0	0
Anisoptera	--	0	0.0	0.0	0	0	0
Aeshnidae	--	0	0.0	0.0	0	0	0
Corduliidae	--	0	0.0	0.0	0	0	0
Gomphidae	--	0	0.0	0.0	0	0	0
Libellulidae	--	0	0.0	0.0	0	0	0
Zygoptera	--	0	0.0	0.0	0	0	0
Coenagrionidae	--	0	0.0	0.0	0	0	0
Lepidoptera	--	0	0.0	0.0	0	0	0
Pyralidae	--	0	0.0	0.0	0	0	0
Coleoptera (larva) - unid	--	0	0.0	0.0	0	0	0

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Coleoptera (adult) – unid	--	0	0.0	0.0	0	0	0
Curculionidae	--	0	0.0	0.0	0	0	0
Dytiscidae (larva)	--	0	0.0	0.0	0	0	0
Dytiscidae (adult)	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	0	0.0	0.0	0	0	0
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Gerridae	--	0	0.0	0.0	0	0	0
Gyrinidae (larva)	--	0	0.0	0.0	0	0	0
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	0	0.0	0.0	0	0	0
Haliplidae (adult)	--	0	0.0	0.0	0	0	0
Heliophoridae	--	0	0.0	0.0	0	0	0
Helodidae (adult)	--	0	0.0	0.0	0	0	0
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera - unid	--	0	0.0	0.0	0	0	0
Corixidae (larva + adult)	--	0	0.0	0.0	0	0	0
Corixidae	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	0	0.0	0.0	0	0	0
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	0	0.0	0.0	0	0	0
Centroptilum	--	0	0.0	0.0	0	0	0
Paracloeodes	--	0	0.0	0.0	0	0	0
Plauditus	--	0	0.0	0.0	0	0	0
Procloeon	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Baetiscidae	--	0	0.0	0.0	0	0	0
Baetisca	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	0	0.0	0.0	0	0	0
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	0	0.0	0.0	0	0	0
Hexagenia	--	58	45.6	20.4	58	0	115
Heptageniidae	--	0	0.0	0.0	0	0	0
Heptagenia	--	0	0.0	0.0	0	0	0
Stenacron	--	0	0.0	0.0	0	0	0
Stenomena	--	0	0.0	0.0	0	0	0
Leptophlebiidae	--	0	0.0	0.0	0	0	0
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	0	0.0	0.0	0	0	0
Metretopodidae	--	0	0.0	0.0	0	0	0
Siphloplecton	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	0	0.0	0.0	0	0	0
Polymitarcyidae	--	0	0.0	0.0	0	0	0
Ephoron	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Parameletus	--	0	0.0	0.0	0	0	0

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	0	0.0	0.0	0	0	0
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	0	0.0	0.0	0	0	0
Pteronarcyidae	--	0	0.0	0.0	0	0	0
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Helicopsychidae	--	0	0.0	0.0	0	0	0
Hydropsychidae	--	0	0.0	0.0	0	0	0
Hydroptilidae (larva)	--	0	0.0	0.0	0	0	0
Hydroptilidae (pupa)	--	0	0.0	0.0	0	0	0
Lepidostomatidae	--	0	0.0	0.0	0	0	0
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	0	0.0	0.0	0	0	0
Psychomyiidae	--	0	0.0	0.0	0	0	0
Diptera (larva) - unid	--	0	0.0	0.0	0	0	0
Diptera (pupa) - unid	--	0	0.0	0.0	0	0	0
Diptera (adult) - unid	--	0	0.0	0.0	0	0	0
Brachycera (pupa)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (larva)	--	0	0.0	0.0	0	0	0
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	557	154.9	69.3	548	361	794
Orthocladiinae	--	6	7.9	3.5	0	0	14
Tanypodinae	--	687	187.2	83.7	693	390	895
Culicidae	--	0	0.0	0.0	0	0	0
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	0	0.0	0.0	0	0	0
Empididae	--	0	0.0	0.0	0	0	0
Ephydridae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Sciomyzidae	--	0	0.0	0.0	0	0	0
Simuliidae	--	0	0.0	0.0	0	0	0
Stratiomyidae	--	0	0.0	0.0	0	0	0
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae (larva)	--	0	0.0	0.0	0	0	0
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1307	243.7	109.0	1313	952	1573
Insecta (%)	51	--	--	--	--	--	--
Chironomidae	--	1249	223.2	99.8	1197	952	1486
Chironomidae (%)	48	--	--	--	--	--	--
Ephemeroptera	--	58	45.6	20.4	58	0	115

Table 9.5-3. - continued -

	Lake Winnipegosis						
	Offshore n=5						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	2	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	58	45.6	20.4	58	0	115
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.04	0.037	0.017	0.05	0.00	0.10
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	1	--	--	--	--	--	--
Taxonomic Richness (Family-level)	4	4	0.9	0.4	4	2	4
Simpson's Diversity Index (D)	--	0.56	0.138	0.062	0.61	0.34	0.68
Evenness (Simpson's Equitability E_D)	--	0.50	0.148	0.066	0.48	0.30	0.67
Shannon-Weaver Index (H)	--	1.02	0.269	0.120	1.18	0.70	1.25
Evenness (Shannon’s Equitability E_H)	--	0.64	0.125	0.056	0.67	0.44	0.78
Hill's Effective Richness ($E^{H'}$)	--	3	0.7	0.3	3	2	3
Evenness ($E^{H'}$/S)	--	0.58	0.124	0.056	0.55	0.40	0.70

Table 9.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Lake Winnipeg Region waterbodies, 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Lake Winnipeg - Sturgeon Bay	GN-02	14	570970	5753761	25-Jun-10	17.67	3.7	3.1	-
Lake Winnipeg - Sturgeon Bay	GN-06	14	565886	5760296	26-Jun-10	16.08	5.8	6.3	-
Lake Winnipeg - Sturgeon Bay	GN-07	14	565463	5761696	26-Jun-10	16.33	5.5	5.9	-
Lake Winnipeg - Sturgeon Bay	GN-08	14	565918	5762783	26-Jun-10	23.50	6.6	6.1	-
Lake Winnipeg - Sturgeon Bay	GN-09	14	565476	5763150	27-Jun-10	23.17	6.2	6.6	-
Lake Winnipeg - Sturgeon Bay	GN-12	14	565322	5764120	27-Jun-10	23.92	6.2	5.5	-
Lake Winnipeg - Sturgeon Bay	GN-13	14	566630	5760098	26-Jun-10	18.77	6.4	6.4	-
Lake Winnipeg - Sturgeon Bay	GN-17	14	570767	5754698	25-Jun-10	16.33	4.8	4.8	-
Lake Winnipeg - Sturgeon Bay	GN-18	14	571260	5754477	25-Jun-10	16.00	4.6	4.5	-
Lake Winnipeg - Sturgeon Bay	GN-19	14	570393	5753900	25-Jun-10	18.00	3.1	3.1	-
Lake Winnipeg - Sturgeon Bay	SN-13	14	566630	5760098	26-Jun-10	18.77	6.4	6.4	-
Lake Winnipeg - Sturgeon Bay	SN-17	14	570767	5754698	25-Jun-10	16.33	4.8	4.8	-
Lake Winnipeg - Grand Rapids	GN-01	14	492584	5910449	28-Jun-10	12.45	-	-	-
Lake Winnipeg - Grand Rapids	GN-02	14	492253	5910442	29-Jun-10	23.75	-	-	-
Lake Winnipeg - Grand Rapids	GN-09	14	485098	5902336	28-Jun-10	16.72	-	-	-
Lake Winnipeg - Grand Rapids	GN-11	14	485558	5903992	28-Jun-10	20.50	-	-	-
Lake Winnipeg - Grand Rapids	GN-12	14	491648	5909171	29-Jun-10	22.50	-	-	-
Lake Winnipeg - Grand Rapids	SN-02	14	492253	5910442	29-Jun-10	23.75	-	-	-
Lake Winnipeg - Grand Rapids	SN-11	14	485558	5903992	28-Jun-10	20.50	-	-	-
Lake Winnipeg - Mossy Bay	GN-01	14	562767	5950043	26-Jun-10	22.45	7.0	6.9	14.7
Lake Winnipeg - Mossy Bay	GN-02	14	563432	5950851	26-Jun-10	21.32	4.9	4.5	15.3
Lake Winnipeg - Mossy Bay	GN-03	14	560408	5950177	27-Jun-10	22.87	10.8	10.8	14.6
Lake Winnipeg - Mossy Bay	GN-04	14	560481	5951953	27-Jun-10	21.73	8.9	8.8	14.7
Lake Winnipeg - Mossy Bay	GN-05	14	562932	5953318	27-Jun-10	22.82	4.0	3.5	15.0
Lake Winnipeg - Mossy Bay	GN-06	14	561799	5954102	27-Jun-10	24.90	5.7	5.4	15.0
Lake Winnipeg - Mossy Bay	GN-07	14	559351	5954117	28-Jun-10	22.33	7.9	7.7	14.5
Lake Winnipeg - Mossy Bay	GN-08	14	559956	5956536	28-Jun-10	21.15	3.4	4.2	15.3
Lake Winnipeg - Mossy Bay	GN-09	14	557557	5955578	28-Jun-10	21.08	7.9	8.2	15.1
Lake Winnipeg - Mossy Bay	GN-10	14	558243	5957269	28-Jun-10	21.80	8.2	7.9	16.0
Lake Winnipeg - Mossy Bay	GN-11	14	555921	5956893	29-Jun-10	22.42	8.5	8.2	15.5

Table 9.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (°C)
		Zone	Easting	Northing			Start	End	
Lake Winnipeg - Mossy Bay	GN-12	14	554794	5958169	29-Jun-10	18.00	7.9	7.9	16.3
Lake Winnipeg - Mossy Bay	GN-13	14	559876	5956102	9-Jul-10	24.13	4.9	4.9	16.1
Lake Winnipeg - Mossy Bay	GN-14	14	558896	5955935	9-Jul-10	22.00	6.3	6.6	16.1
Lake Winnipeg - Mossy Bay	GN-15	14	560876	5955249	11-Jul-10	19.83	5.4	5.1	16.1
Lake Winnipeg - Mossy Bay	GN-16	14	560633	5953622	11-Jul-10	19.98	6.8	7.4	15.9
Lake Winnipeg - Mossy Bay	SN-03	14	560408	5950177	27-Jun-10	22.87	10.8	10.8	14.6
Lake Winnipeg - Mossy Bay	SN-06	14	561799	5954102	27-Jun-10	24.90	5.7	5.4	15.0
Lake Winnipeg - Mossy Bay	SN-09	14	557557	5955578	28-Jun-10	21.08	7.9	8.2	15.1
Lake Winnipeg - Mossy Bay	SN-12	14	554794	5958169	29-Jun-10	18.00	7.9	7.9	16.3
Lake Winnipegosis	GN-01	14	438945	5724831	27-Sep-10	18.28	3.7	4.1	11.7
Lake Winnipegosis	GN-02	14	442492	5735063	27-Sep-10	21.58	4.5	1.9	11.5
Lake Winnipegosis	GN-03	14	449181	5727279	27-Sep-10	22.20	1.2	3.3	11.9
Lake Winnipegosis	GN-04	14	425618	5789040	29-Sep-10	22.45	2.2	1.5	11.8
Lake Winnipegosis	GN-05	14	421283	5771152	29-Sep-10	18.77	4.9	1.6	12.2
Lake Winnipegosis	GN-06	14	426705	5775537	29-Sep-10	18.87	3.6	7.1	11.7
Lake Winnipegosis	GN-07	14	415243	5861608	29-Aug-10	22.63	1.0	2.5	17.0
Lake Winnipegosis	GN-08	14	412322	5859511	29-Aug-10	22.68	0.7	2.5	17.0
Lake Winnipegosis	GN-09	14	423627	5851444	29-Aug-10	18.33	1.0	3.3	17.0
Lake Winnipegosis	GN-10	14	429979	5853230	29-Aug-10	18.48	1.1	2.5	17.0
Lake Winnipegosis	GN-11	14	366706	5864052	22-Sep-10	21.50	1.0	6.0	9.5
Lake Winnipegosis	GN-12	14	371100	5852172	22-Sep-10	20.00	1.0	3.5	9.5
Lake Winnipegosis	SN-03	14	449181	5727279	27-Sep-10	22.20	3.3	3.3	11.9
Lake Winnipegosis	SN-05	14	421283	5771152	29-Sep-10	18.77	4.9	1.6	12.2
Lake Winnipegosis	SN-08	14	412322	5859511	29-Aug-10	22.68	0.7	2.5	17.0
Lake Winnipegosis	SN-11	14	366706	5864052	22-Sep-10	21.50	1.0	6.0	9.5

Table 9.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Lake Winnipeg Region waterbodies, 2010.

Family	Species	Scientific Name	ID Code	Species Captured in Study Area
Cyprinidae	Common Carp	*Cyprinus carpio*	CARP	+
	Common Shiner	*Luxilus cornutus*	CMSH	
	Emerald Shiner	*Notropis atherinoides*	EMSH	+
	Spottail Shiner	*Notropis hudsonius*	SPSH	+
	Fathead Minnow	*Pimephales promelas*	FTMN	+
Catostomidae	Quillback	*Carpoides cyprinus*	QUIL	
	Longnose Sucker	*Catostomus catostomus*	LNSC	+
	White Sucker	*Catostomus commersoni*	WHSC	+
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD	+
Ictaluridae	Brown bullhead	*Ameiurus nebulosus*	BRBL	+
Esocidae	Northern Pike	*Esox lucius*	NRPK	+
Osmeridae	Rainbow Smelt	*Osmerus mordax*	RNSM	+
Salmonidae	Cisco	*Coregonus artedi*	CISC	+
	Lake Whitefish	*Coregonus clupeaformis*	LKWH	+
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR	+
Gadidae	Burbot	*Lota lota*	BURB	+
Cottidae	Mottled Sculpin	*Cottus bairdi*	MTSC	+
	Slimy Sculpin	*Cottus cognatus*	SLSC	
Moronidae	White Bass	*Morone chrysops*	WHBS	
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+
	Logperch	*Percina caprodes*	LGPR	+
	Sauger	*Sander canadensis*	SAUG	+
	Walleye	*Sander vitreus*	WALL	+
Sciaenidae	Freshwater Drum	*Aplodinotus grunniens*	FRDR	+

Table 9.6-3. Standard gang index gillnet relative abundance summaries from Lake Winnipeg Region waterbodies, 2010

Species	Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Common Carp	-	-	-	-	-	-	4	0.46
Emerald Shiner	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	1	0.19	40	3.41	-	-
White Sucker	70	15.12	29	5.47	159	13.55	296	34.34
Shorthead Redhorse	6	1.30	-	-	-	-	37	4.29
Brown Bullhead	-	-	-	-	-	-	42	4.87
Northern Pike	63	13.61	2	0.38	3	0.26	69	8.00
Rainbow Smelt	7	1.51	3	0.57	94	8.01	-	-
Cisco	1	0.22	33	6.23	13	1.11	263	30.51
Lake Whitefish	1	0.22	18	3.40	40	3.41	36	4.18
Troutperch	-	-	2	0.38	-	-	-	-
Burbot	-	-	-	-	-	-	5	0.58
Mottled Sculpin	-	-	-	-	-	-	-	-
Yellow Perch	103	22.25	18	3.40	499	42.54	11	1.28
Logperch	-	-	-	-	-	-	-	-
Sauger	6	1.30	20	3.77	83	7.08	-	-
Walleye	200	43.20	399	75.28	242	20.63	93	10.79
Freshwater Drum	6	1.30	5	0.94	-	-	6	0.70
Total	463	100	530	100	1173	100	862	100

n = number of fish caught
RA = percent relative abundance

Table 9.6-4. Small mesh index gillnet relative abundance summaries from Lake Winnipeg Region waterbodies, 2010

Species	Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Common Carp	-	-	-	-	-	-	-	-
Common Shiner	-	-	-	-	-	-	-	-
Emerald Shiner	1	0.14	-	-	-	-	17	6.61
Spottail Shiner	37	5.27	8	2.22	1	0.09	96	37.35
Fathead Minnow	-	-	-	-	-	-	1	0.39
Quillback	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-
White Sucker	1	0.14	-	-	-	-	4	1.56
Shorthead Redhorse	-	-	-	-	-	-	2	0.78
Brown Bullhead	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	1	0.09	-	-
Rainbow Smelt	145	20.66	110	30.47	416	38.99	-	-
Cisco	1	0.14	-	-	1	0.09	1	0.39
Lake Whitefish	-	-	-	-	2	0.19	10	3.89
Troutperch	102	14.53	171	47.37	472	44.24	36	14.01
Burbot	-	-	-	-	-	-	-	-
Mottled Sculpin	-	-	-	-	2	0.19	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-
White Bass	-	-	-	-	-	-	-	-
Yellow Perch	346	49.29	44	-	41	3.84	81	31.52
Logperch	63	8.97	1	0.28	43	4.03	6	2.33
Sauger	-	-	21	5.82	1	0.09	-	-
Walleye	6	0.85	50	13.85	87	8.15	3	1.17
Freshwater Drum	-	-	-	-	-	-	-	-
Total	702	100	405	100	1067	100	257	100

n = number of fish caught
RA = percent relative abundance

Table 9.6-5. Standard gang index gillnet biomass summaries from Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Common Carp	-	-	-	-	-	-	-	-	-	4	12728	2.69
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	1	868	0.28	40	25137	5.05	-	-	-
White Sucker	70	43705	17.46	29	21754	7.01	157	92157	18.53	296	234543	49.49
Shorthead Redhorse	6	3268	1.31	-	-	-	-	-	-	37	35760	7.54
Brown Bullhead	-	-	-	-	-	-	-	-	-	42	11519	2.43
Northern Pike	63	57774	23.08	2	2872	0.92	3	6868	1.38	64	34743	7.33
Rainbow Smelt	7	30	0.01	3	38	0.01	94	1196	0.24	-	-	-
Cisco	1	45	0.02	33	7823	2.52	13	2645	0.53	263	25037	5.28
Lake Whitefish	1	1196	0.48	18	16428	5.29	32	9297	1.87	35	23247	4.90
Troutperch	-	-	-	2	43	0.01	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	5	7485	1.58
Mottled Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	103	9381	3.75	18	3650	1.18	499	111223	22.36	11	1294	0.27
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	6	2624	1.05	20	8158	2.63	83	47287	9.51	-	-	-
Walleye	200	126178	50.40	271	246452	79.37	241	201632	40.53	92	76604	16.16
Freshwater Drum	6	6129	2.45	5	2429	0.78	-	-	-	6	10993	2.32
Total	463	250330	100	402	310516	100	1162	497444	100	855	473952	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g);
% = percent of total biomass

Table 9.6-6. Small mesh index gillnet biomass summaries from Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	1	6	0.07	-	-	-	-	-	-	17	102	2.22
Spottail Shiner	37	293	3.23	8	79	0.65	1	10	0.05	92	824	17.88
Fathead Minnow	-	-	-	-	-	-	-	-	-	1	3	0.06
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	15	0.16	-	-	-	-	-	-	4	425	9.22
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	2	2302	49.97
Brown Bullhead	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	-	-	1	2036	9.82	-	-	-
Rainbow Smelt	145	1323	14.58	110	1343	11.10	416	5246	25.31	-	-	-
Cisco	1	6	0.07	-	-	-	1	159	0.77	1	22	0.47
Lake Whitefish	-	-	-	-	-	-	2	80	0.39	10	502	10.91
Troutperch	102	927	10.22	171	1704	14.07	472	4638	22.38	2	11	0.24
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Mottled Sculpin	-	-	-	-	-	-	2	22	0.10	-	-	-
Yellow Perch	346	5270	58.07	44	610	5.04	41	4314	20.82	24	307	6.66
Logperch	63	400	4.41	1	23	0.19	43	322	1.56	6	36	0.79
Sauger	-	-	-	21	2010	16.60	1	1511	7.29	-	-	-
Walleye	6	835	9.20	50	6336	52.34	87	2387	11.52	3	73	1.59
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	702	9075	100	405	12104	100	1067	20725	100	162	4606	100

n = number of fish measured (may not equal number of fish caught)
B = biomass (g);
% = percent of total biomass

Table 9.6-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay (# sites=10)			Grand Rapids (# sites=5)			Mossy Bay (#sites=16)			Lake Winnipegosis (#sites=12)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	4	0.36	0.73
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	1	0.19	0.42	40	2.46	1.63	-	-	-
White Sucker	70	7.22	4.88	29	7.27	5.15	159	9.62	10.35	296	25.43	16.34
Shorthead Redhorse	6	0.65	0.97	-	-	-	-	-	-	37	3.26	3.46
Brown Bullhead	-	-	-	-	-	-	-	-	-	42	3.58	5.73
Northern Pike	63	7.18	6.10	2	0.46	0.63	3	0.16	0.35	69	5.76	5.81
Rainbow Smelt	7	0.65	1.13	3	0.61	0.58	94	5.60	8.26	-	-	-
Cisco	1	0.11	0.35	33	6.06	9.42	13	0.79	0.72	263	23.98	52.86
Lake Whitefish	1	0.13	0.41	18	3.28	4.56	40	1.92	2.59	36	3.09	3.26
Troutperch	-	-	-	2	0.51	0.76	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	5	0.43	0.67
Mottled Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	103	10.46	8.49	18	4.04	2.16	499	30.15	10.56	11	0.97	1.40
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	6	0.62	0.81	20	5.61	7.46	83	4.88	3.40	-	-	-
Walleye	200	19.84	19.51	399	105.99	102.25	242	14.79	15.74	93	7.94	5.98
Freshwater Drum	6	0.69	0.61	5	1.18	2.18	-	-	-	6	0.49	1.09
Total	463	47.5	29.28	530	135.2	102.49	1173	70.4	23.64	862	75.3	59.55

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site
SD = standard deviation

Table 9.6-8. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in and small mesh index gill nets (fish/30 m/24 h) set in Lake Winnipeg Region waterbodies, 2010

Species	Sturgeon Bay (# sites=2)			Grand Rapids (# sites=2)			Mossy Bay (# sites=4)			Lake Winnipegosis (# sites=4)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	1	0.64	0.90	-	-	-	-	-	-	17	5.43	12.15
Spottail Shiner	37	24.99	6.25	8	4.52	3.54	1	0.24	0.48	96	29.45	45.04
Fathead Minnow	-	-	-	-	-	-	-	-	-	1	0.32	0.71
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	0.73	1.04	-	-	-	-	-	-	4	1.23	2.02
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	2	0.64	1.43
Brown Bullhead	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-
Rainbow Smelt	145	93.18	121.38	110	58.14	29.24	416	113.62	20.75	-	-	-
Cisco	1	0.64	0.90	-	-	-	1	0.28	0.57	1	0.27	0.60
Lake Whitefish	-	-	-	-	-	-	2	0.53	0.61	10	2.79	6.24
Troutperch	102	71.52	36.04	171	95.05	44.39	472	130.04	47.62	36	9.55	19.73
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Mottled Sculpin	-	-	-	-	-	-	2	0.53	0.61	-	-	-
Yellow Perch	346	244.51	161.35	44	24.07	4.03	41	11.21	3.75	81	22.14	28.66
Logperch	63	45.05	40.21	1	0.59	0.83	43	10.64	18.71	6	1.77	2.30
Sauger	-	-	-	21	11.41	0.42	1	0.33	0.67	-	-	-
Walleye	6	3.93	3.48	50	28.15	19.80	87	24.30	25.13	3	0.85	0.65
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	702	485.2	105.72	405	221.9	43.76	1066	292.0	101.29	257	74.5	60.02

#sites = number of sites sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site
SD = standard deviation

Table 9.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in the Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay (# sites=10)			Grand Rapids (# sites=5)			Mossy Bay (# sites=16)			Lake Winnipegosis (# sites=12)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	4	1061	2132
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	1	174	388	40	1571	1106	-	-	-
White Sucker	70	4371	2707	29	4351	2105	157	7937	8626	296	19545	14823
Shorthead Redhorse	6	327	515	-	-	-	-	-	-	37	2980	3171
Brown Bullhead	-	-	-	-	-	-	-	-	-	42	960	1470
Northern Pike	63	5777	4929	2	574	799	3	429	1135	69	9389	8455
Rainbow Smelt	7	3	6	3	8	8	94	75	107	-	-	-
Cisco	1	4	14	33	1565	2374	13	165	173	263	2086	4485
Lake Whitefish	1	120	378	18	3286	4580	32	658	780	36	1989	1807
Troutperch	-	-	-	2	9	15	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	5	624	952
Mottled Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	103	938	731	18	730	344	499	6951	2183	11	108	149
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	6	262	343	20	1632	1893	83	2955	2377	-	-	-
Walleye	200	12618	13634	399	66330	62459	241	13349	13839	93	6708	5591
Freshwater Drum	6	613	879	5	486	1028	-	-	-	6	916	2677
Total	463	25033	15286	530	79143	59818	1162	34091	20453	862	46366	21944

#sites = number of sites sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m/24 h) per site
SD = standard deviation

Table 9.6-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m/24 h) set in the Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay (# sites=2)			Grand Rapids (# sites=2)			Mossy Bay (# sites=4)			Lake Winnipegosis (# sites=4)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	1	3	5	-	-	-	-	-	-	17	26	51
Spottail Shiner	37	146	82	8	39	27	1	2	5	92	206	239
Fathead Minnow	-	-	-	-	-	-	-	-	-	1	1	1
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	7	10	-	-	-	-	-	-	4	106	209
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	2	575	1151
Brown Bullhead	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	-	-	1	509	1018	-	-	-
Rainbow Smelt	145	661	873	110	672	436	416	1312	264	-	-	-
Cisco	1	3	5	-	-	-	1	40	80	1	5	11
Lake Whitefish	-	-	-	-	-	-	2	20	27	10	126	251
Troutperch	102	464	113	171	852	319	472	1160	428	2	3	6
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Mottled Sculpin	-	-	-	-	-	-	2	5	9	-	-	-
Yellow Perch	346	2635	743	44	305	83	41	1079	740	24	77	66
Logperch	63	200	174	1	12	17	43	81	152	6	9	12
Sauger	-	-	-	21	1005	549	1	378	755	-	-	-
Walleye	6	417	549	50	3168	4080	87	597	632	3	18	18
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	702	4537	473	405	6052	4471	1067	5181	1756	162	1151	1635

#sites = number of sites sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/30 m/24 h) per site
SD = standard deviation

Table 9.6-11. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, Sauger, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
Northern Pike	-	-	-	-	-	-	3	606	263	69	577	102
Lake Whitefish	1	398	-	18	387	103	33	276	61	28	347	50
Sauger	6	314	77	20	286	59	-	-	-	-	-	-
Walleye	200	365	48	399	352	72	242	391	74	93	401	82
Weight												
Northern Pike	-	-	-	-	-	-	3	2613	2099	64	1561	722
Lake Whitefish	1	930	-	18	1001	549	32	324	230	27	651	354
Sauger	6	418	255	20	312	192	-	-	-	-	-	-
Walleye	200	642	243	271	621	364	241	897	470	92	849	484
Condition Factor												
Northern Pike	-	-	-	-	-	-	3	0.90	0.06	64	0.78	0.08
Lake Whitefish	1	1.48	-	18	1.48	0.18	32	1.40	0.18	27	1.42	0.13
Sauger	6	1.16	0.08	20	1.16	0.13	-	-	-	-	-	-
Walleye	200	1.24	0.10	271	1.27	0.10	241	1.34	0.13	92	1.14	0.12

n = number of fish measured (may not equal number of fish caught)
SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 9.6-12. Summary of mean fork length (mm), weight (g), and condition factor (K) for Northern Pike, Lake Whitefish, Sauger, and Walleye captured in small mesh nets set in Lake Winnipeg Region waterbodies, 2010.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	1	148	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	2	140	17	-	-	-
Weight												
Northern Pike	-	-	-	-	-	-	1	1940	-	-	-	-
Lake Whitefish	-	-	-	1	18	-	2	40	29	10	45	-
Sauger	-	-	-	21	86	-	1	1133	-	-	-	-
Walleye	6	108	-	50	109	-	87	24	-	3	22	-
Condition Factor												
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	1	1.85	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	2	0.90	0.07	-	-	-

n = number of fish measured (may not equal number of fish caught)

SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 9.6-13. Age/Year-class frequency distributions (%) for Northern Pike, Lake Whitefish, Sauger, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Age	Year-Class	Northern Pike								Lake Whitefish							
		Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis		Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	8	11.59	-	-	1	5.56	3	9.38	-	-
2	2008	-	-	-	-	1	33.33	11	15.94	-	-	-	-	14	43.75	3	11.11
3	2007	-	-	-	-	-	-	13	18.84	-	-	4	22.22	15	46.88	-	-
4	2006	-	-	-	-	-	-	25	36.23	-	-	2	11.11	-	-	1	3.70
5	2005	-	-	-	-	-	-	7	10.14	-	-	1	5.56	-	-	14	51.85
6	2004	-	-	-	-	-	-	4	5.80	1	100.00	-	-	-	-	5	18.52
7	2003	-	-	-	-	-	-	1	1.45	-	-	1	5.56	-	-	2	7.41
8	2002	-	-	-	-	1	33.33	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	7.41
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	1	33.33	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	4	22.22	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	2	11.11	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	3	16.67	-	-	-	-
Total		-	-	-	-	3	100	69	100	1	100	18	100	32	100	27	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 9.6-13. - continued -

Age	Year-Class	Sauger								Walleye							
		Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis		Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	14.29
3	2007	1	16.67	8	42.11	-	-	-	-	2	1.00	9	3.33	8	3.42	5	5.49
4	2006	1	16.67	2	10.53	-	-	-	-	51	25.50	84	31.11	23	9.83	19	20.88
5	2005	1	16.67	6	31.58	-	-	-	-	96	48.00	76	28.15	77	32.91	43	47.25
6	2004	1	16.67	1	5.26	-	-	-	-	49	24.50	93	34.44	90	38.46	6	6.59
7	2003	2	33.33	1	5.26	-	-	-	-	1	0.50	4	1.48	4	1.71	2	2.20
8	2002	-	-	1	5.26	-	-	-	-	1	0.50	-	-	9	3.85	2	2.20
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	4	1.71	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	4	1.48	17	7.26	1	1.10
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	2	0.85	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		6	100	19	100	-	-	-	-	200	100	270	100	234	100	91	100

n = number of fish aged (may not equal number of fish caught)
% = percent of total number of fish aged

Table 9.6-14. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Age	Year-Class	Mossy Bay									Lake Winnipegosis								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	8	441	35	8	730	133	8	0.78	0.03
2	2008	1	304	-	1	270	-	1	0.96	-	11	523	16	11	1185	90	11	0.76	0.02
3	2007	-	-	-	-	-	-	-	-	-	13	586	22	13	1680	167	13	0.81	0.03
4	2006	-	-	-	-	-	-	-	-	-	25	593	15	25	1607	131	25	0.77	0.02
5	2005	-	-	-	-	-	-	-	-	-	7	662	34	7	2058	207	7	0.80	0.02
6	2004	-	-	-	-	-	-	-	-	-	4	704	57	4	2641	572	4	0.73	0.02
7	2003	-	-	-	-	-	-	-	-	-	1	666	-	1	2130	-	1	0.72	-
8	2002	1	726	-	1	3250	-	1	0.85	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	1	788	-	1	4320	-	1	0.88	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 9.6-15. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Age	Year-Class	Sturgeon Bay									Grand Rapids								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	1	138	-	1	40	-	1	1.52	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	4	287	29	4	393	105	4	1.50	0.07
4	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2005	-	-	-	-	-	-	-	-	-	2	345	25	2	655	215	2	1.53	0.19
6	2004	1	398	-	1	930	-	1	1.48	-	1	368	-	1	830	-	1	1.67	-
7	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	1	470	-	1	1300	-	1	1.25	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	4	460	14	4	1393	120	4	1.42	0.02
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	2	442	42	2	1310	90	2	1.57	0.34
18	1992	-	-	-	-	-	-	-	-	-	3	477	6	3	1593	128	3	1.46	0.08

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 9.6-15. - continued -

Age	Year-Class	Mossy Bay									Lake Winnipegosis								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	3	198	2	3	107	9	3	1.37	0.11	-	-	-	-	-	-	-	-	-
2	2008	14	238	8	14	195	23	14	1.40	0.06	3	266	24	3	265	67	3	1.33	0.03
3	2007	15	326	12	15	501	64	15	1.40	0.04	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	1	344	-	-	-	-	-	-	-
5	2005	-	-	-	-	-	-	-	-	-	14	341	7	14	572	43	14	1.40	0.03
6	2004	-	-	-	-	-	-	-	-	-	5	366	23	5	760	158	5	1.45	0.05
7	2003	-	-	-	-	-	-	-	-	-	2	368	14	2	720	120	2	1.43	0.08
8	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	2	438	48	2	1415	545	2	1.60	0.13
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 9.6-16. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Sauger captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Age	Year-Class	Sturgeon Bay									Grand Rapids								
		FL (mm)			W (g)			K			FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	1	232	-	1	130	-	1	1.04	-	8	226	8	8	128	12	8	1.08	0.05
4	2006	1	210	-	1	100	-	1	1.08	-	2	307	19	2	390	110	2	1.31	0.14
5	2005	1	318	-	1	400	-	1	1.24	-	6	313	8	6	370	32	6	1.20	0.02
6	2004	1	354	-	1	550	-	1	1.24	-	1	292	-	1	300	-	1	1.20	-
7	2003	2	385	5	2	665	15	2	1.17	0.02	1	354	-	1	550	-	1	1.24	-
8	2002	-	-	-	-	-	-	-	-	-	1	404	-	1	740	-	1	1.12	-
9	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 9.6-17. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Age	Year Class	Sturgeon Bay									Grand Rapids								
		Fork Length			Weight			K			Fork Length			Weight			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
2	2008	2	183	43	2	88	63	2	1.11	0.20	9	221	4	9	140	7	9	1.30	0.06
3	2007	51	306	4	51	351	12	51	1.21	0.01	84	273	3	84	253	9	84	1.20	0.01
4	2006	96	379	2	96	674	12	96	1.23	0.01	76	366	3	76	637	14	76	1.28	0.01
5	2005	49	407	4	49	891	28	49	1.31	0.02	93	406	3	93	907	23	93	1.32	0.01
6	2004	1	426	-	1	1000	-	1	1.29	-	4	435	18	4	1135	147	4	1.36	0.03
7	2003	1	430	-	1	870	-	1	1.09	-	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	4	529	8	4	1925	127	4	1.30	0.03
10	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
Total		200			200			200			270			270			270		

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 9.6-17. - continued -

Age	Year-Class	Mossy Bay FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Lake Winnipegosis FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
0	2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2009	-	-	-	-	-	-	-	-	-	13	249	4	13	155	9	13	1.00	0.05
2	2008	8	225	9	8	125	15	8	1.08	0.05	5	341	28	5	470	88	5	1.11	0.02
3	2007	23	274	8	23	257	22	23	1.18	0.03	19	391	11	18	701	238	18	1.09	0.08
4	2006	77	373	2	77	710	15	77	1.35	0.01	43	436	7	43	1017	50	43	1.19	0.01
5	2005	90	418	3	90	1041	22	90	1.41	0.01	6	484	24	6	1460	245	6	1.23	0.03
6	2004	4	443	8	4	1225	41	4	1.42	0.04	2	421	5	2	865	5	2	1.16	0.05
7	2003	9	447	17	9	1208	123	9	1.31	0.03	2	478	30	2	1340	280	2	1.21	0.03
8	2002	4	530	18	4	1945	113	4	1.31	0.06	-	-	-	-	-	-	-	-	-
9	2001	17	519	9	16	1926	226	16	1.32	0.12	1	558	-	1	2150	-	1	1.24	-
10	2000	2	518	-	2	1780	80	2	1.28	0.06	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		234			234			234			92			92			92		

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 9.6-18. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Sturgeon Bay											
White Sucker	-	-	-	-	-	-	-	-	70	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	63	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	1	0	0.00
Sauger	-	-	-	-	-	-	-	-	6	0	0.00
Walleye	2	1.00	-	-	-	-	-	-	200	2	1.00
Grand Rapids											
White Sucker	-	-	-	-	-	-	-	-	29	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	2	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	18	0	0.00
Sauger	-	-	-	-	-	-	-	-	20	0	0.00
Walleye	-	-	-	-	-	-	-	-	399	0	0.00
Mossy Bay											
White Sucker	-	-	-	-	2	1.26	-	-	159	2	1.26
Northern Pike	-	-	-	-	-	-	-	-	3	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	40	0	0.00
Sauger	-	-	-	-	-	-	-	-	83	0	0.00
Walleye	-	-	-	-	1	0.41	-	-	242	1	0.41
Lake Winnipegosis											
White Sucker	-	-	-	-	-	-	1	0.34	296	1	0.34
Northern Pike	-	-	-	-	-	-	-	-	69	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	36	0	0.00
Sauger	-	-	-	-	-	-	-	-	-	0	0.00
Walleye	-	-	-	-	-	-	-	-	93	0	0.00

n = number of inspected fish with DELTs
nInspect = total number of fish inspected for DELTs
nDELTs = total number of fish with DELTs
% - percentage of inspected fish with deformities, erosions, lesions or tumours
%DELTS = total percentage of fish inspected for DELTs with DELTs (nDELTS/nInspect X100)

Table 9.7-1. Mean arithmetic (± standard error, SE) and standardized (95% confidence limits, CL) mercury concentration (ppm) for Lake Whitefish, Northern Pike, and Walleye from Lake Winnipeg at Mossy Bay in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Mossy Bay	Northern Pike	2	0.223	0.039	-	-
	Walleye	36	0.117	0.010	0.112	0.100 - 0.125
	Lake Whitefish	32	0.011	0.001	0.012	0.011 - 0.014

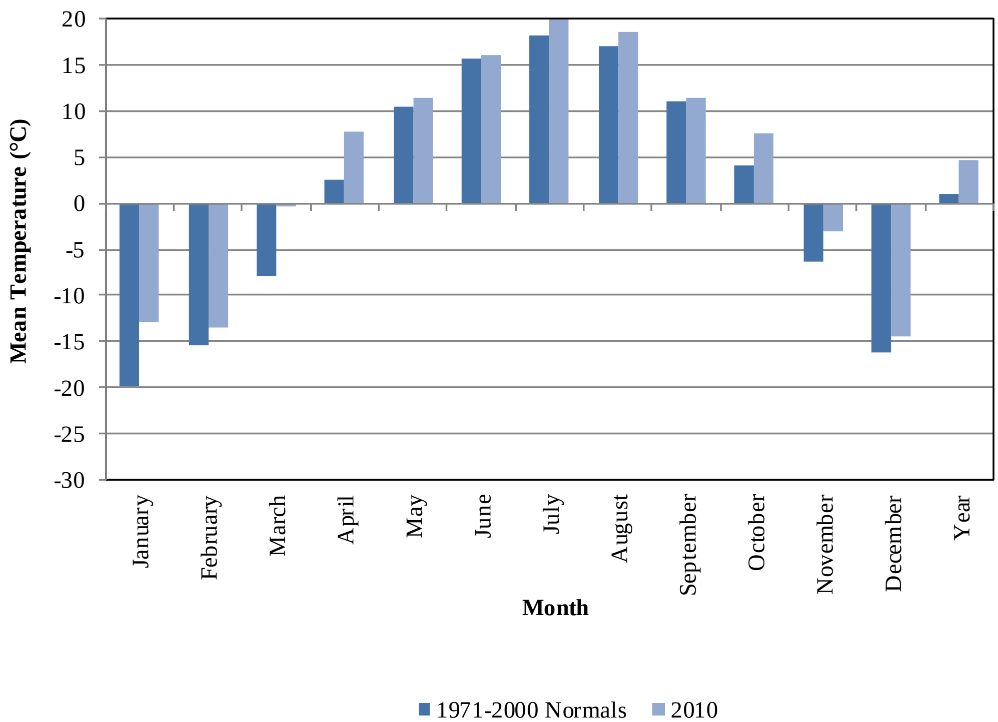
Note: Letters represent significant differences between species within a waterbody.

Table 9.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from Lake Winnipeg at Mossy Bay in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Mossy Bay	Northern Pike	2	757.0 ± 31.0	3785.0 ± 535.0	0.87 ± 0.02	9.5 ± 1.5
	Walleye [b]	36	393.1 ± 16.5	971.9 ± 92.1	1.33 ± 0.02	5.1 ± 0.3
	Lake Whitefish [a]	32	271.6 ± 11.1	312.2 ± 38.6	1.39 ± 0.04	2.8 ± 0.1

[a] n = 30 for age
[b] n = 33 for age

(A)



(B)

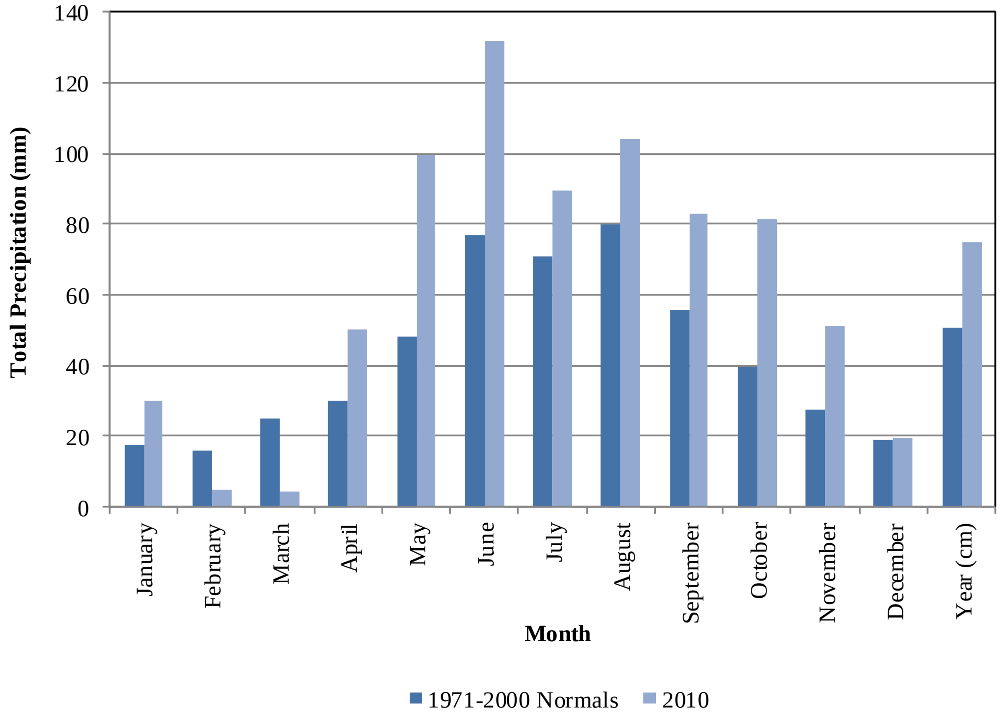
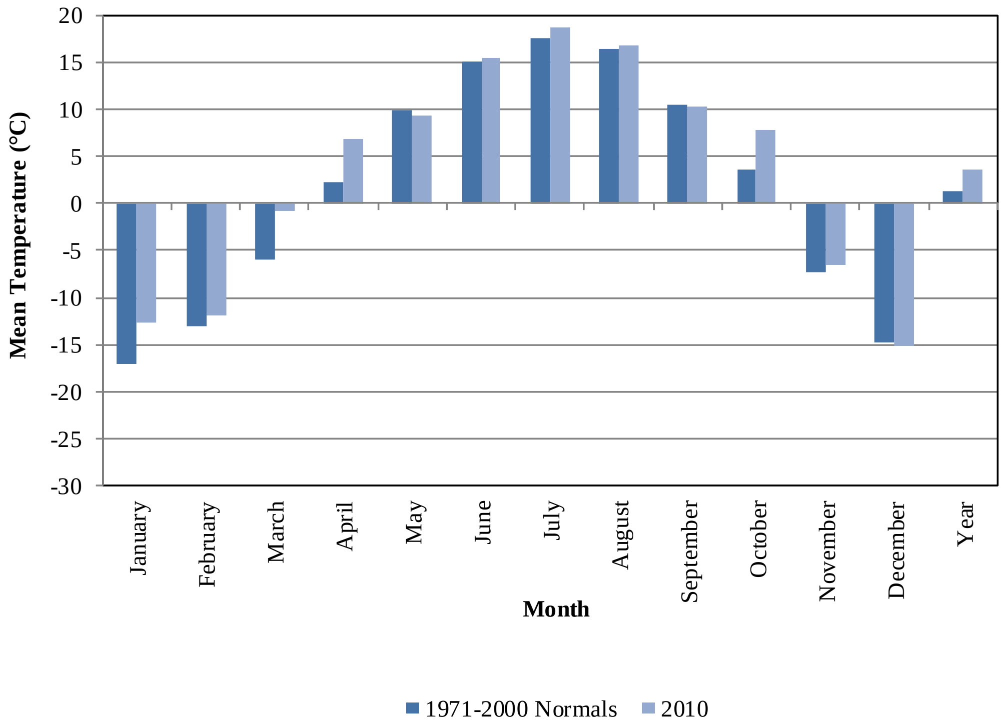


Figure 9.1-1. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Arborg, MB.

(A)



(B)

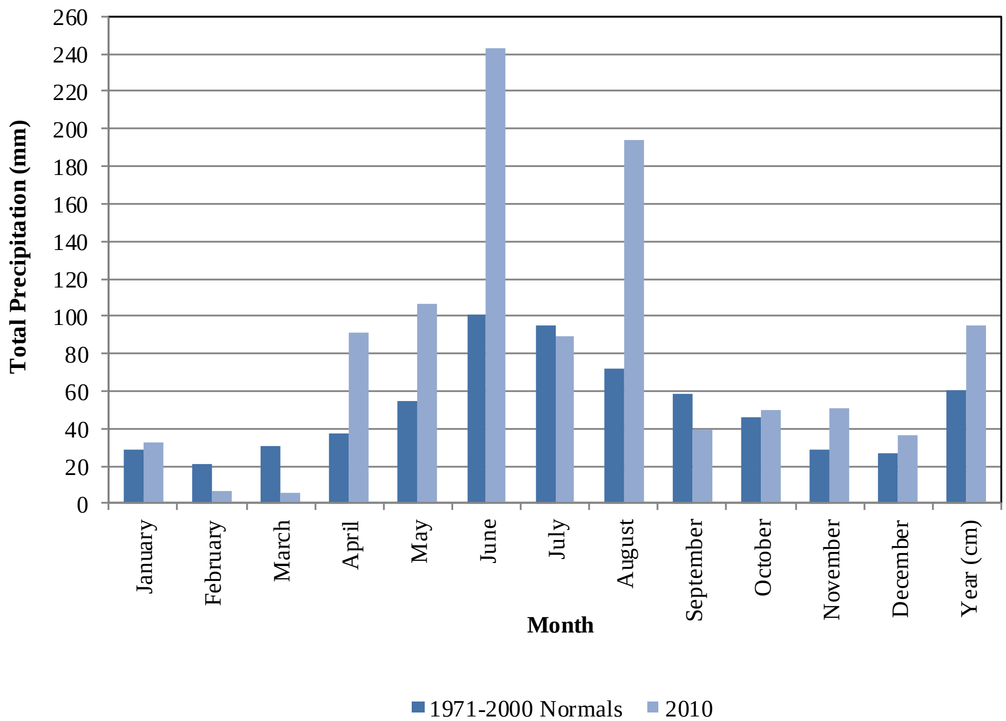


Figure 9.1-2. Monthly mean air temperature and monthly total precipitation for 2010 compared to climate normals (1971-2000), Cowan, MB.

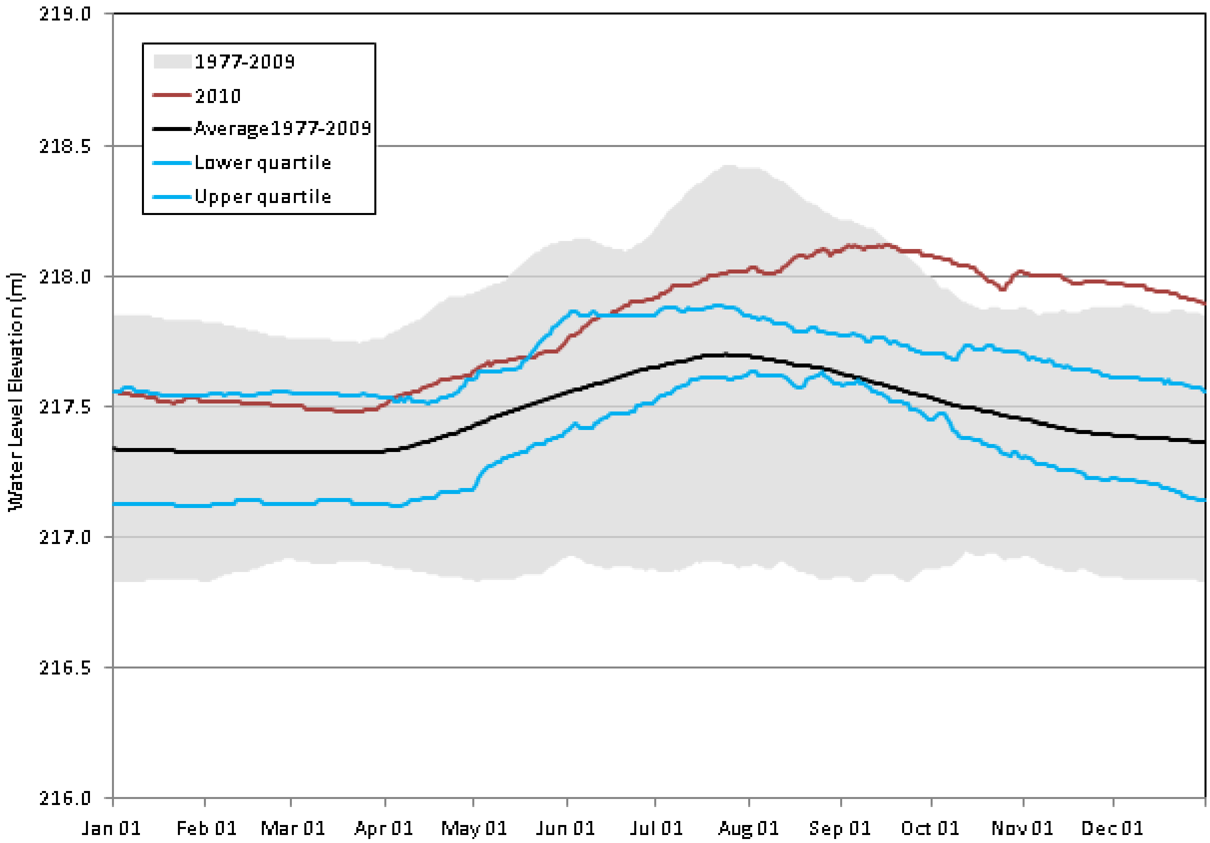


Figure 9.2-1. Water level elevation of Lake Winnipeg in 2010.

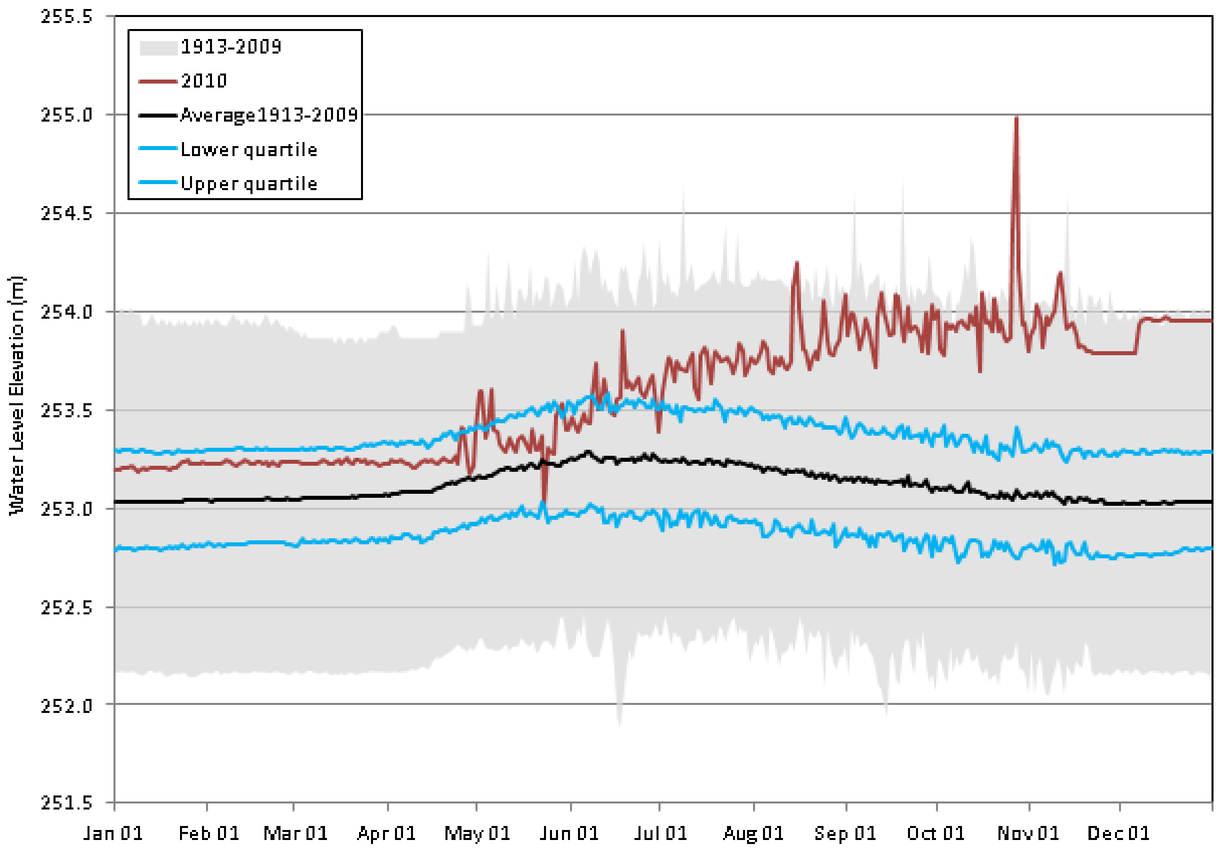


Figure 9.2-2. Water level elevation of Lake Winnipegosis (05LH001) in 2010.

Figure 9.3-1. Water quality and phytoplankton monitoring sites in Lake Winnipegosis: 2010/2011.

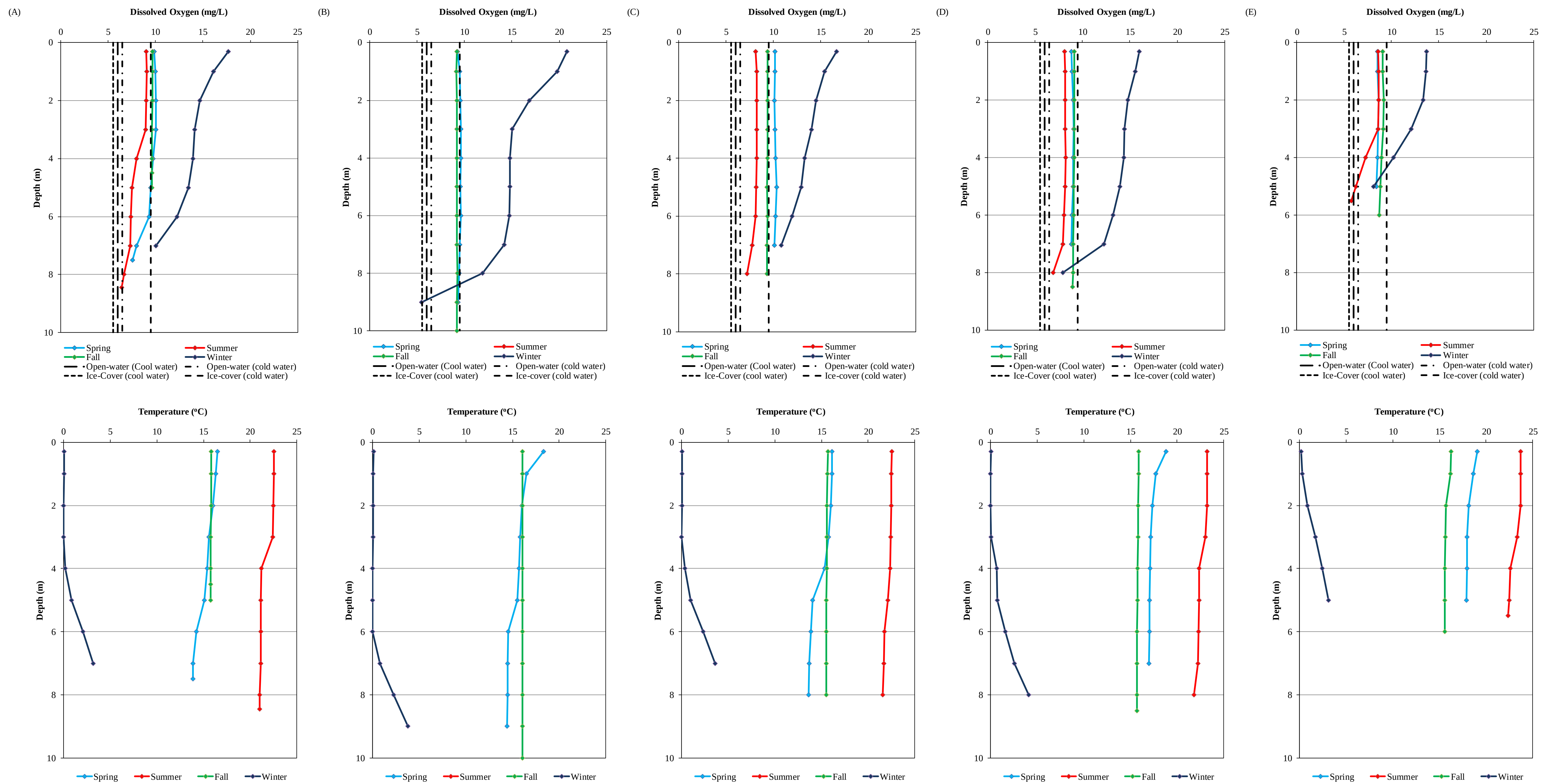


Figure 9.3-2. Dissolved oxygen and water temperature profiles measured in Lake Winnipegosis in 2010/2011: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Dashed lines represent selected MWQSOGs for PAL. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

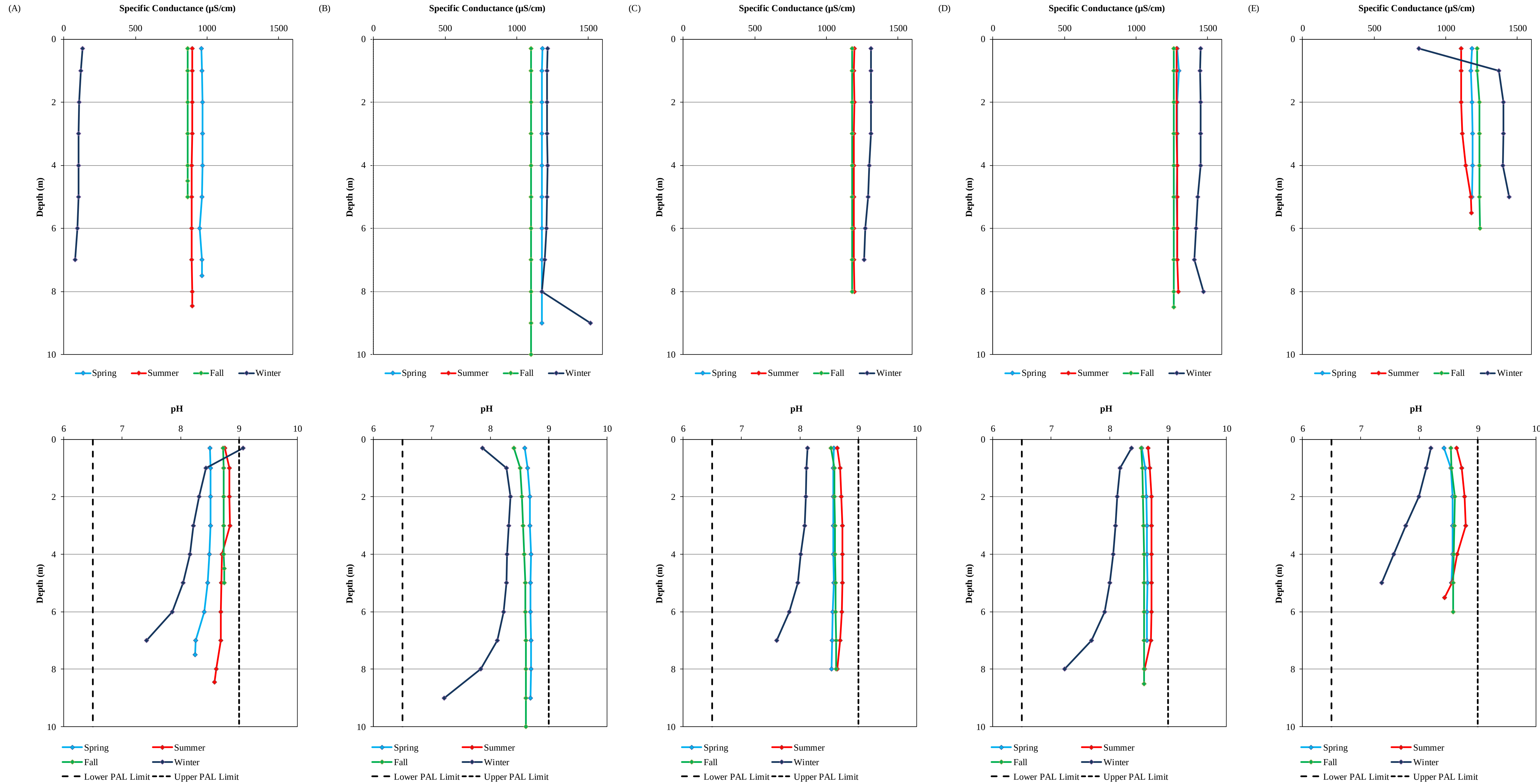


Figure 9.3-3. Specific conductance and pH profiles measured in Lake Winnipegosis in 2010/2011: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Note: summer sampling was not completed at Site 2 due to inclement weather conditions. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

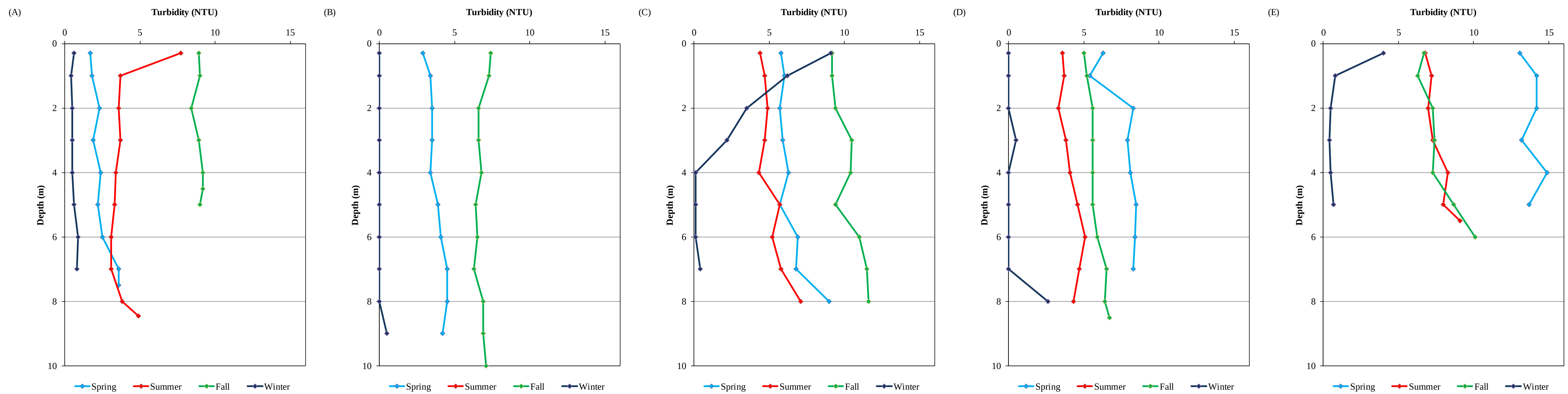


Figure 9.3-4. Turbidity depth profiles measured in Lake Winnipegosis in 2010/2011: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

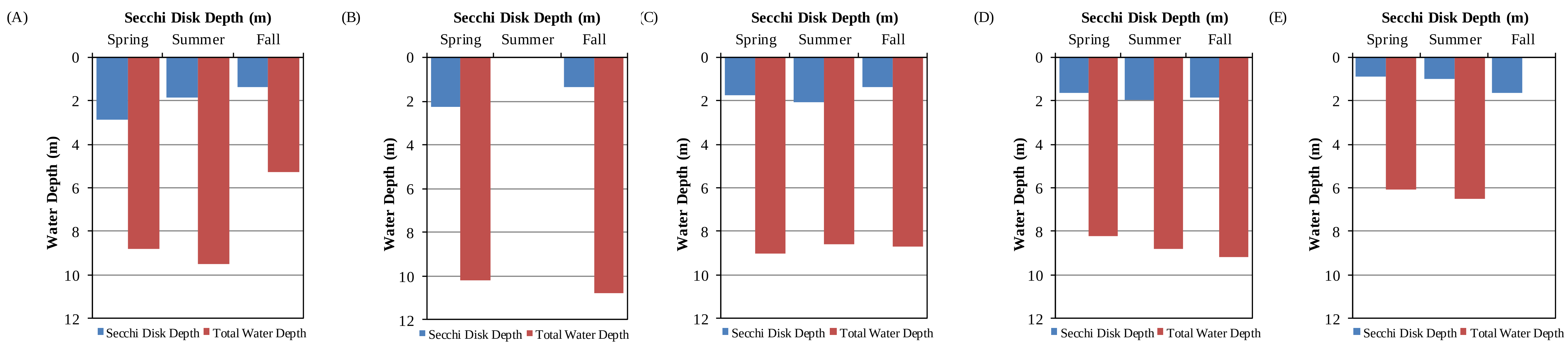


Figure 9.3-5. Secchi disk depths measured in Lake Winnipegosis in 2010/2011: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

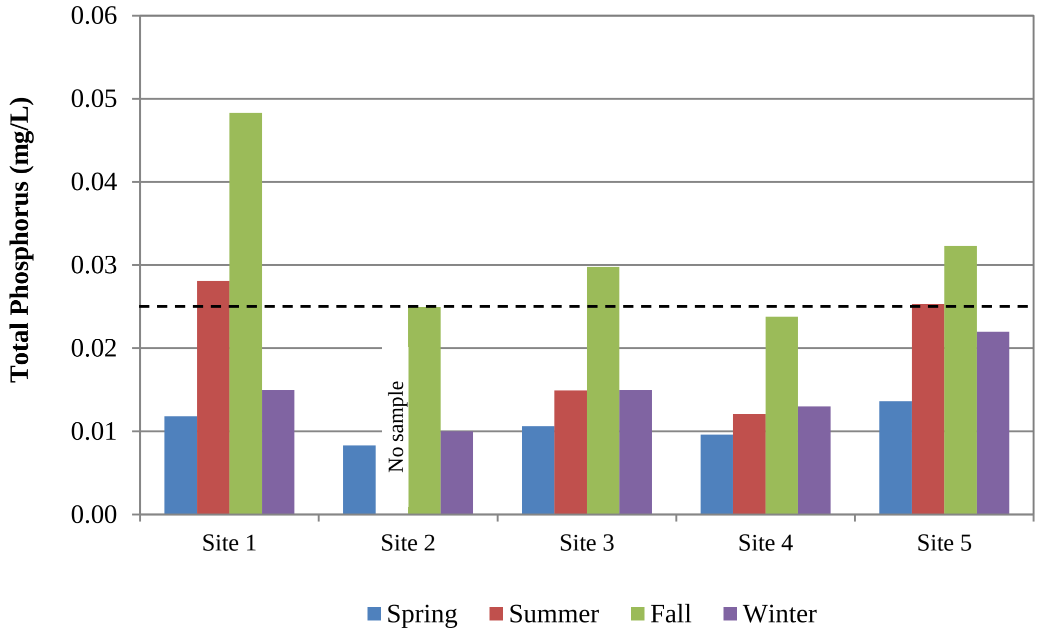


Figure 9.3-6. Total phosphorus measured in surface grabs in Lake Winnipegosis, by sampling period and site: 2010/2011. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies. Note: summer sampling was not completed at Site 2 due to inclement weather conditions

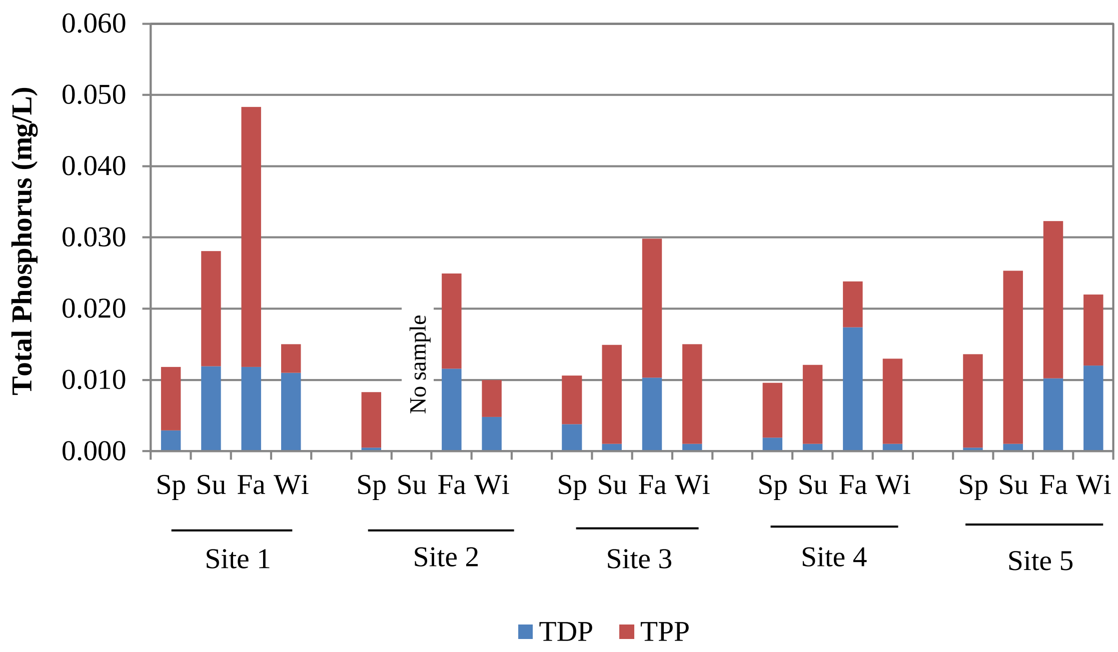


Figure 9.3-7. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in Lake Winnipegosis: 2010/2011. Note: summer sampling was not completed at Site 2 due to inclement weather conditions

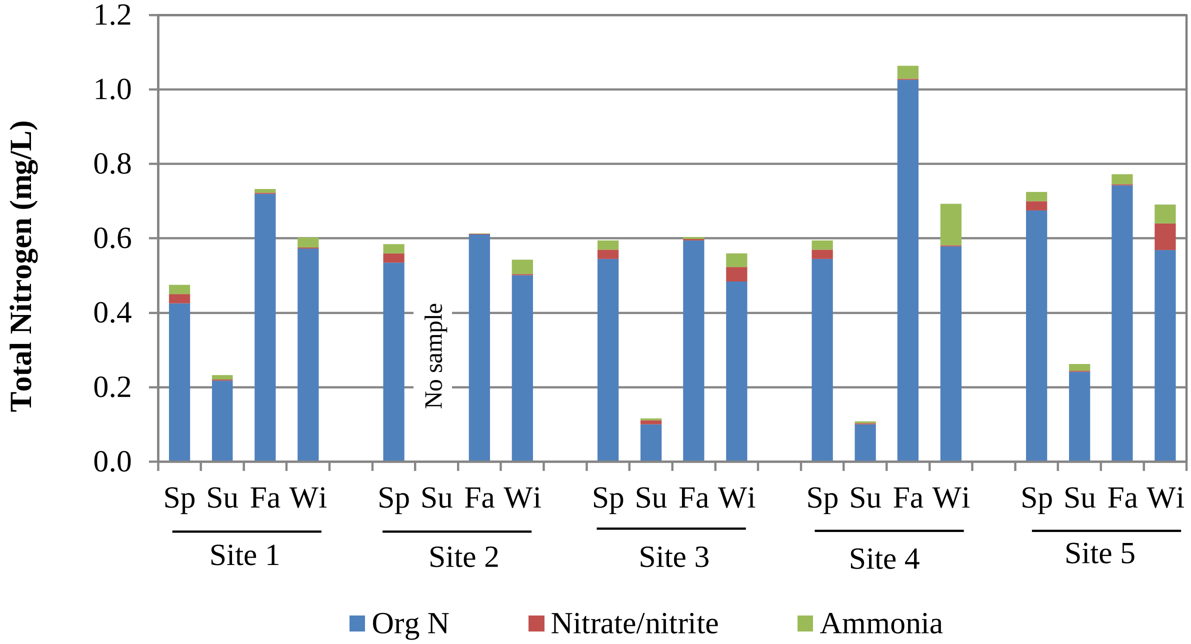


Figure 9.3-8. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in Lake Winnipegosis: 2010/2011. Note: summer sampling was not completed at Site 2 due to inclement weather conditions

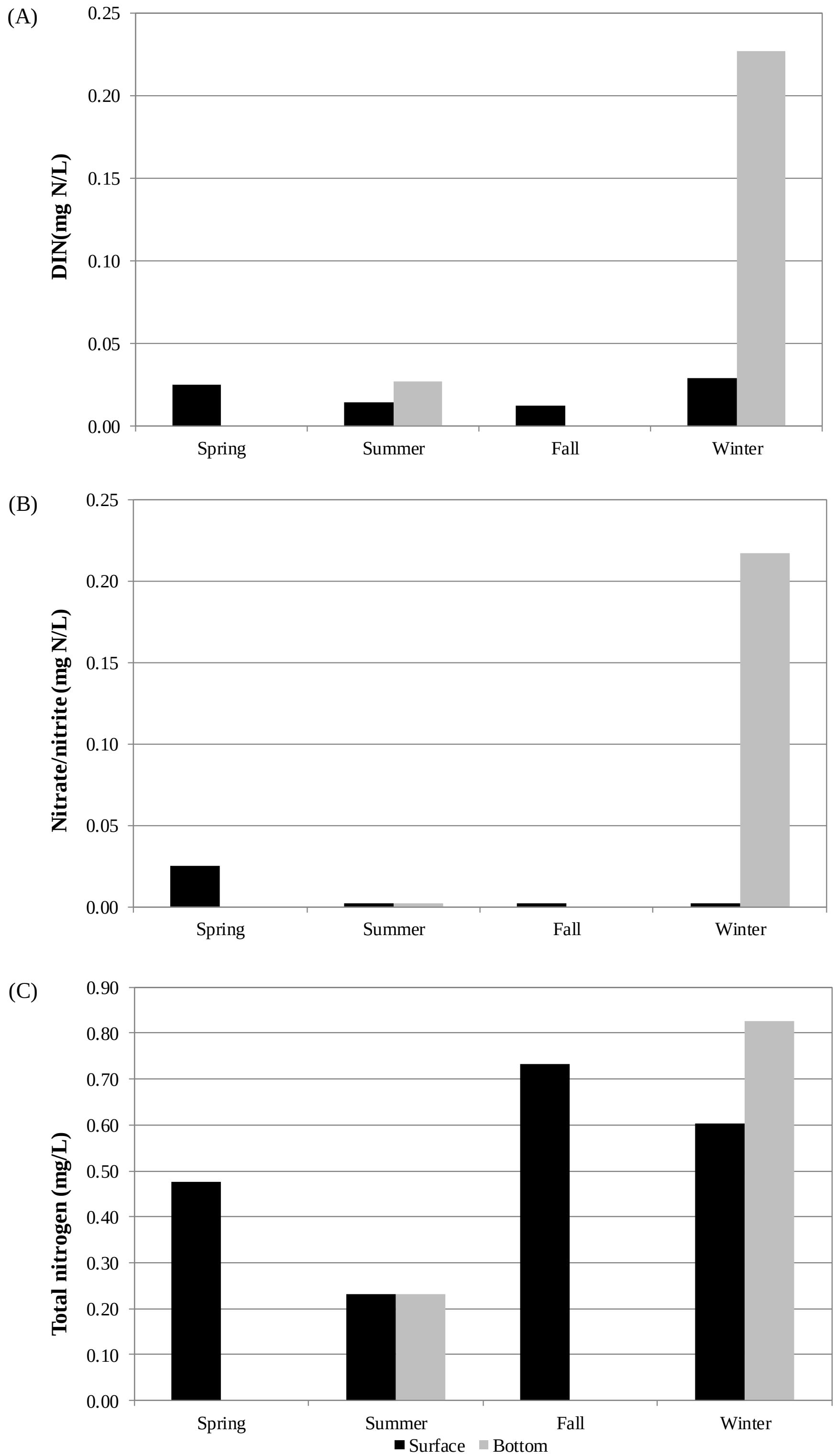


Figure 9.3-9. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 1, 2010/2011.

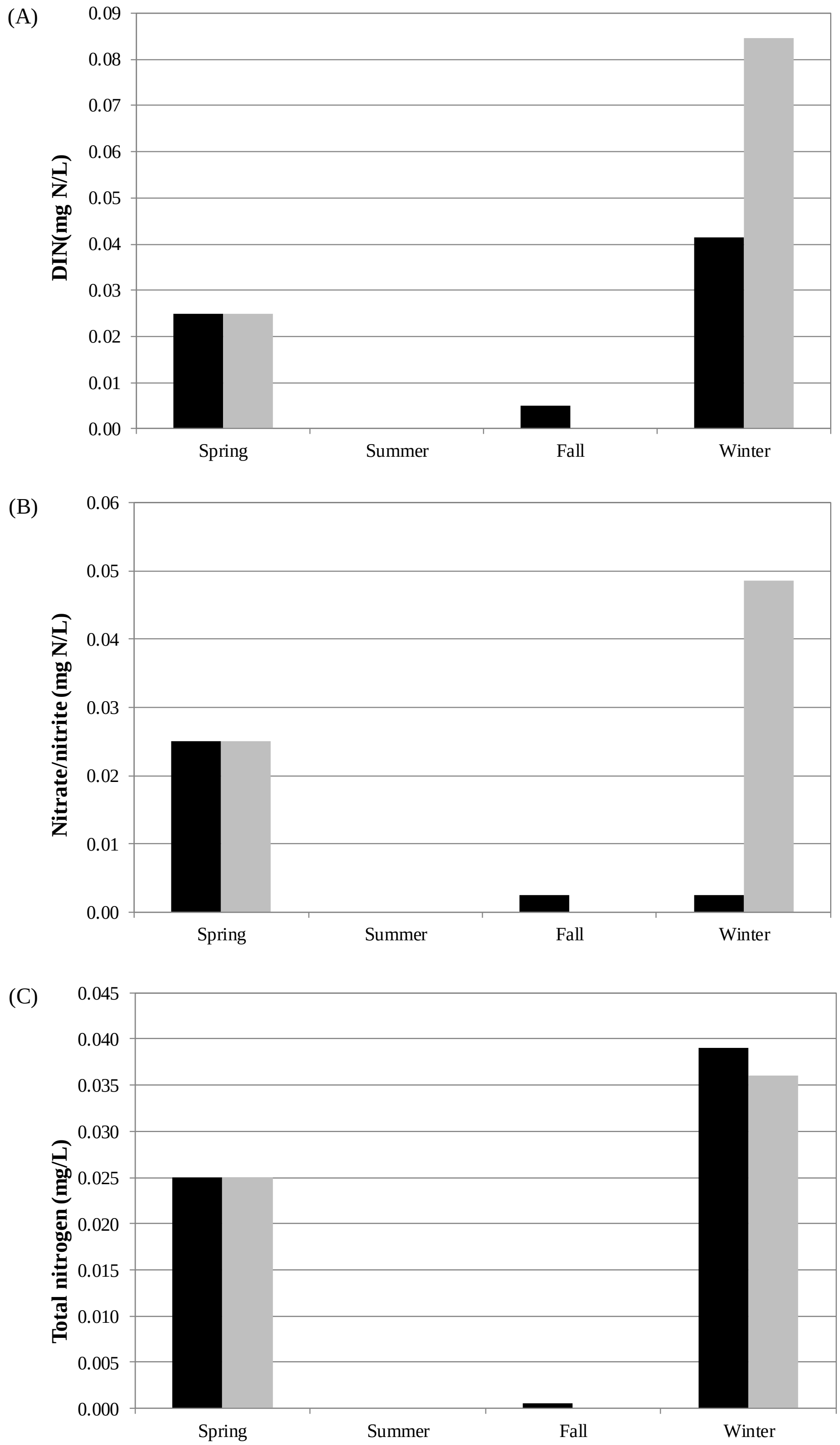


Figure 9.3-10. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 2, 2010/2011. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

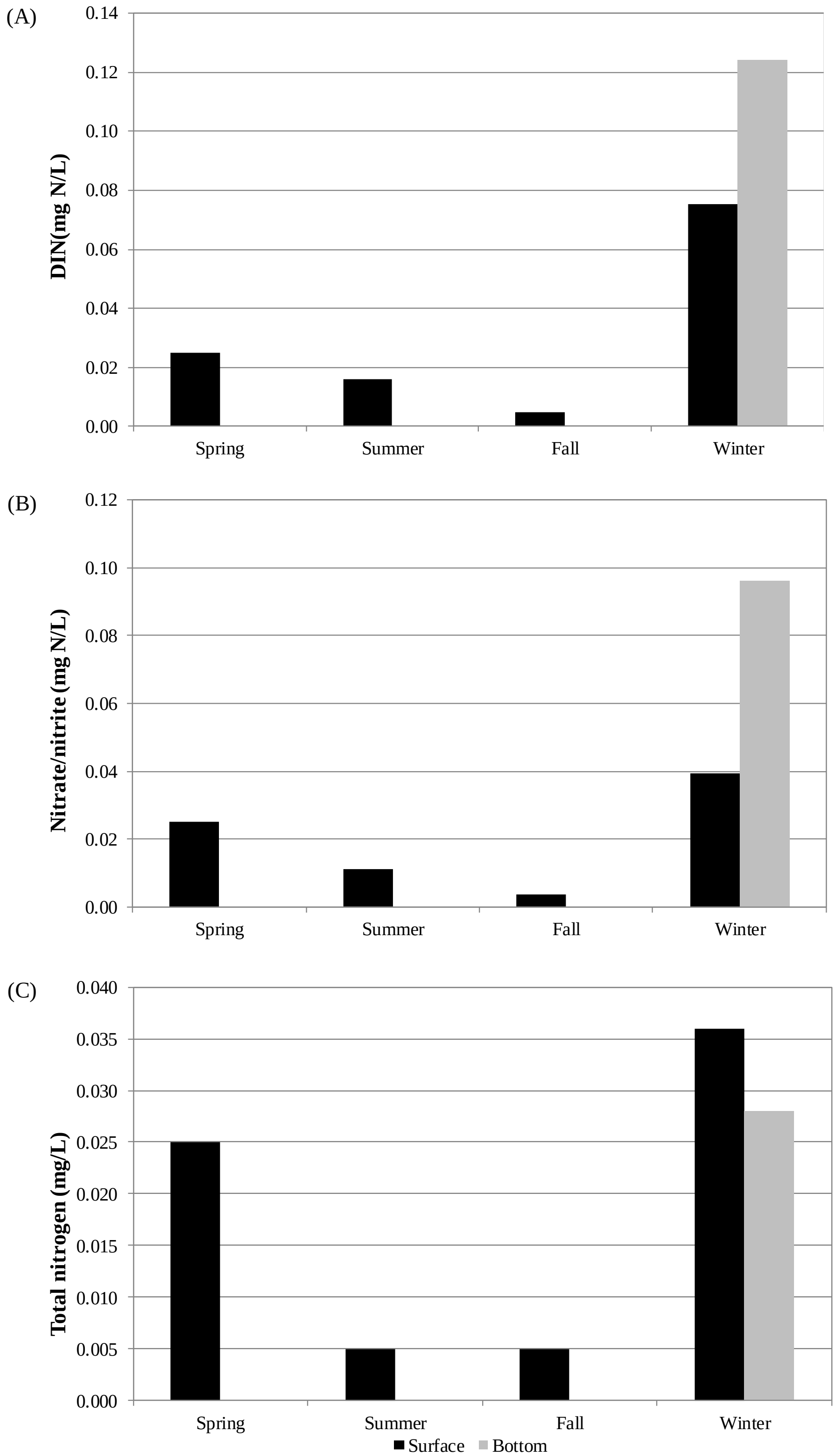


Figure 9.3-11. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 3, 2010/2011.

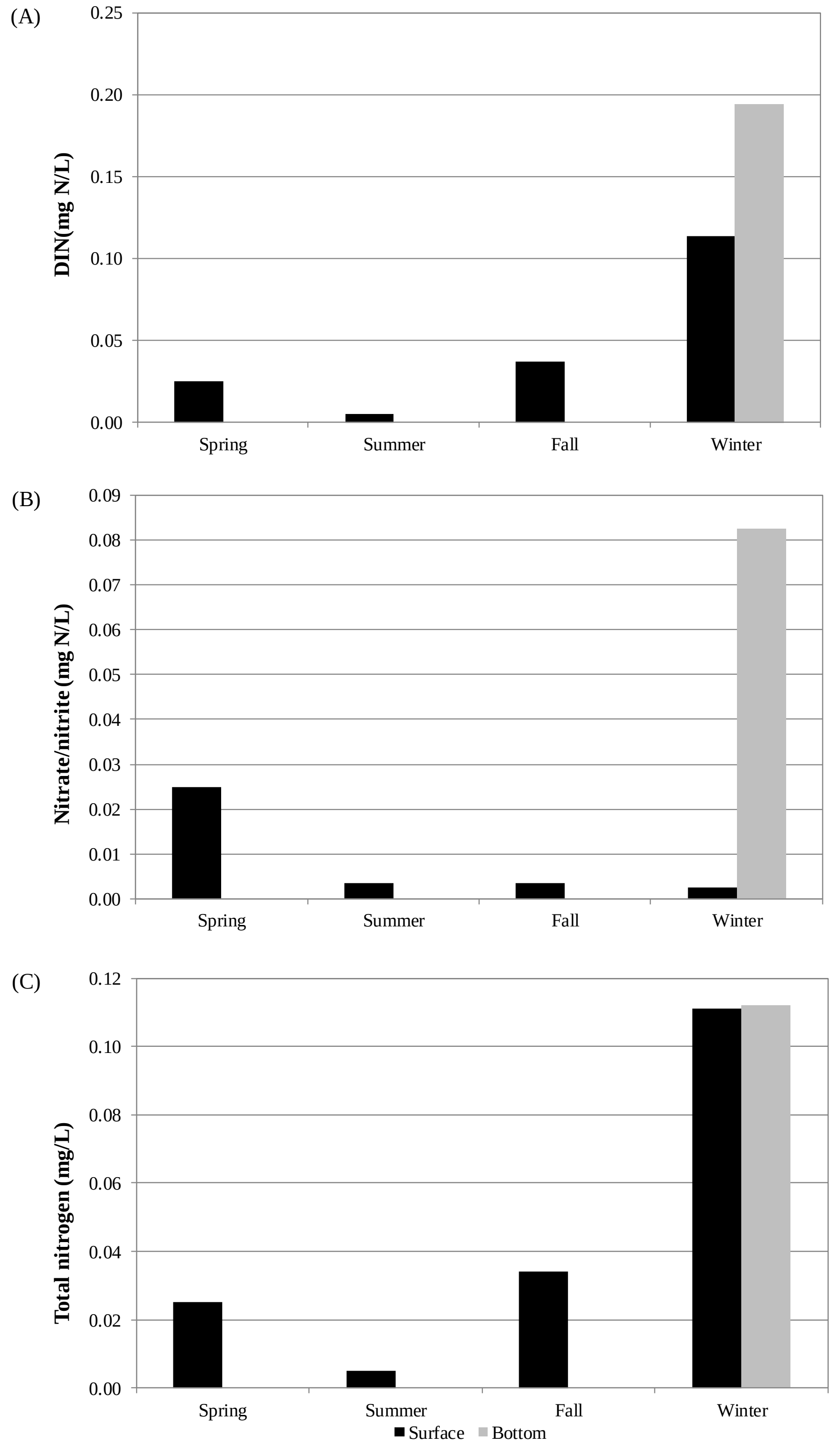
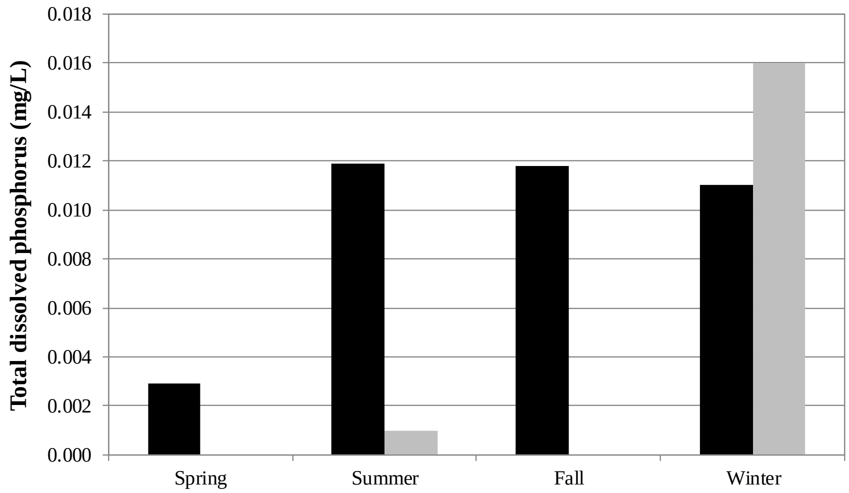
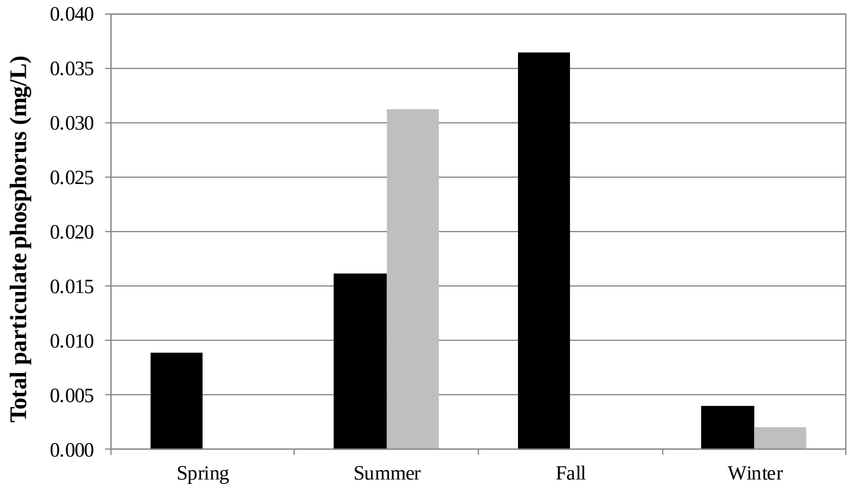


Figure 9.3-12. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 4, 2010/2011.

(A)



(B)



(C)

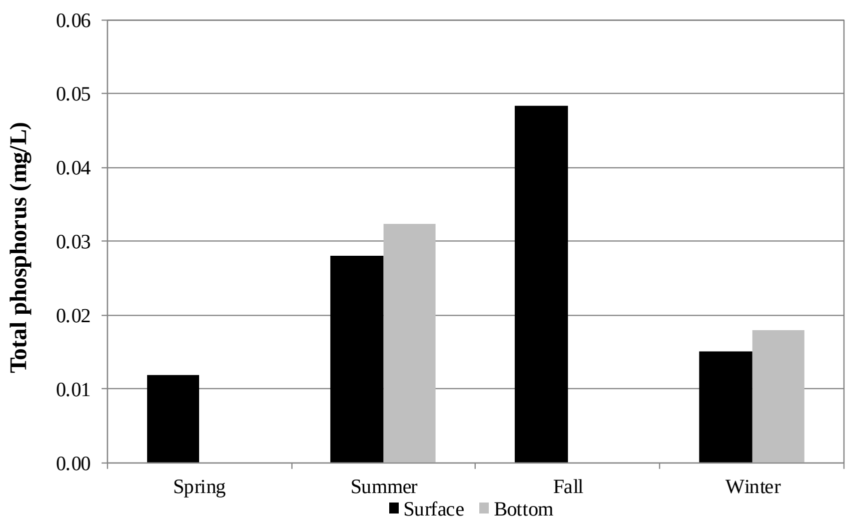


Figure 9.3-13. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 1, 2010/2011.

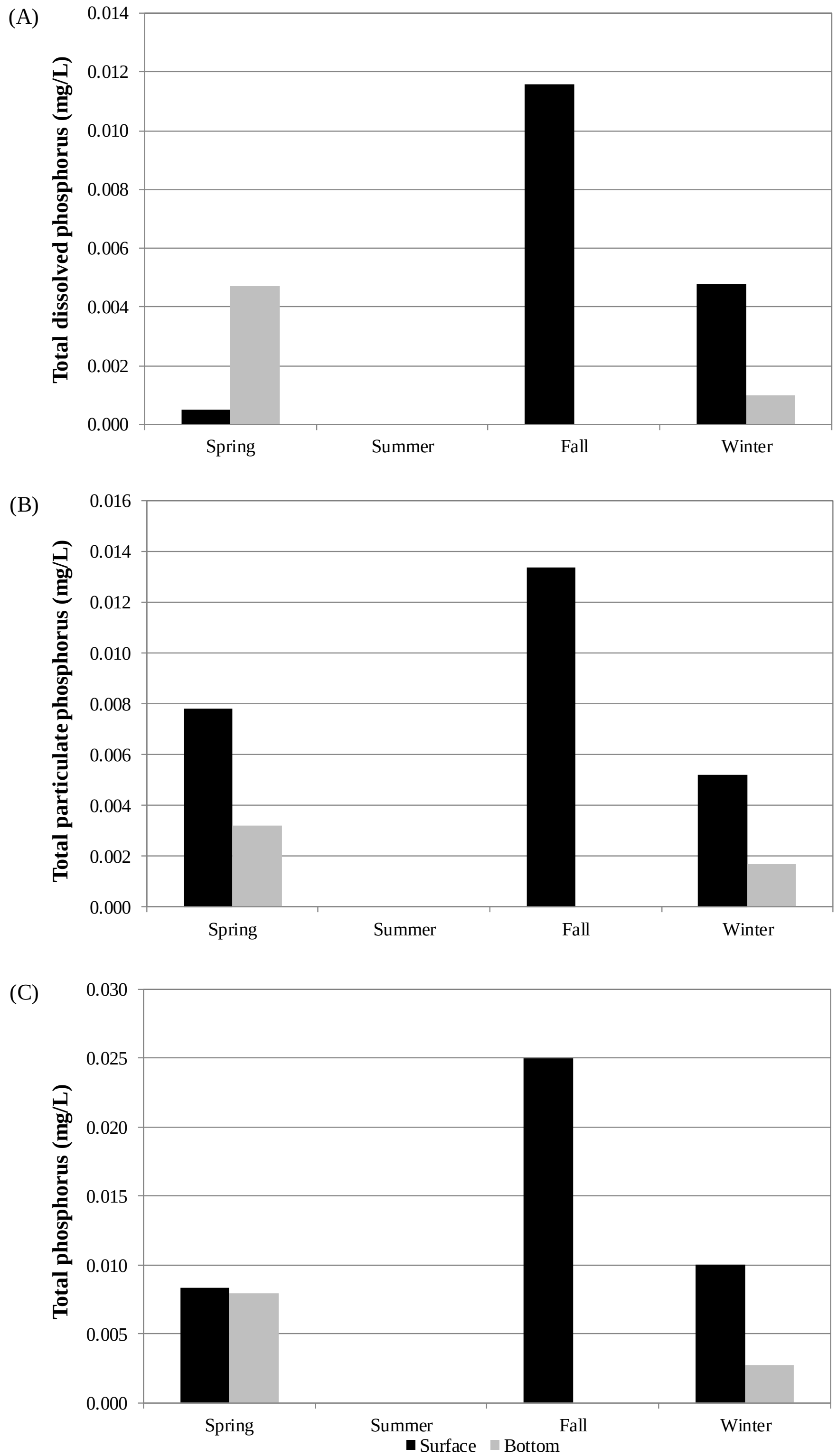


Figure 9.3-14. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 2, 2010/2011. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

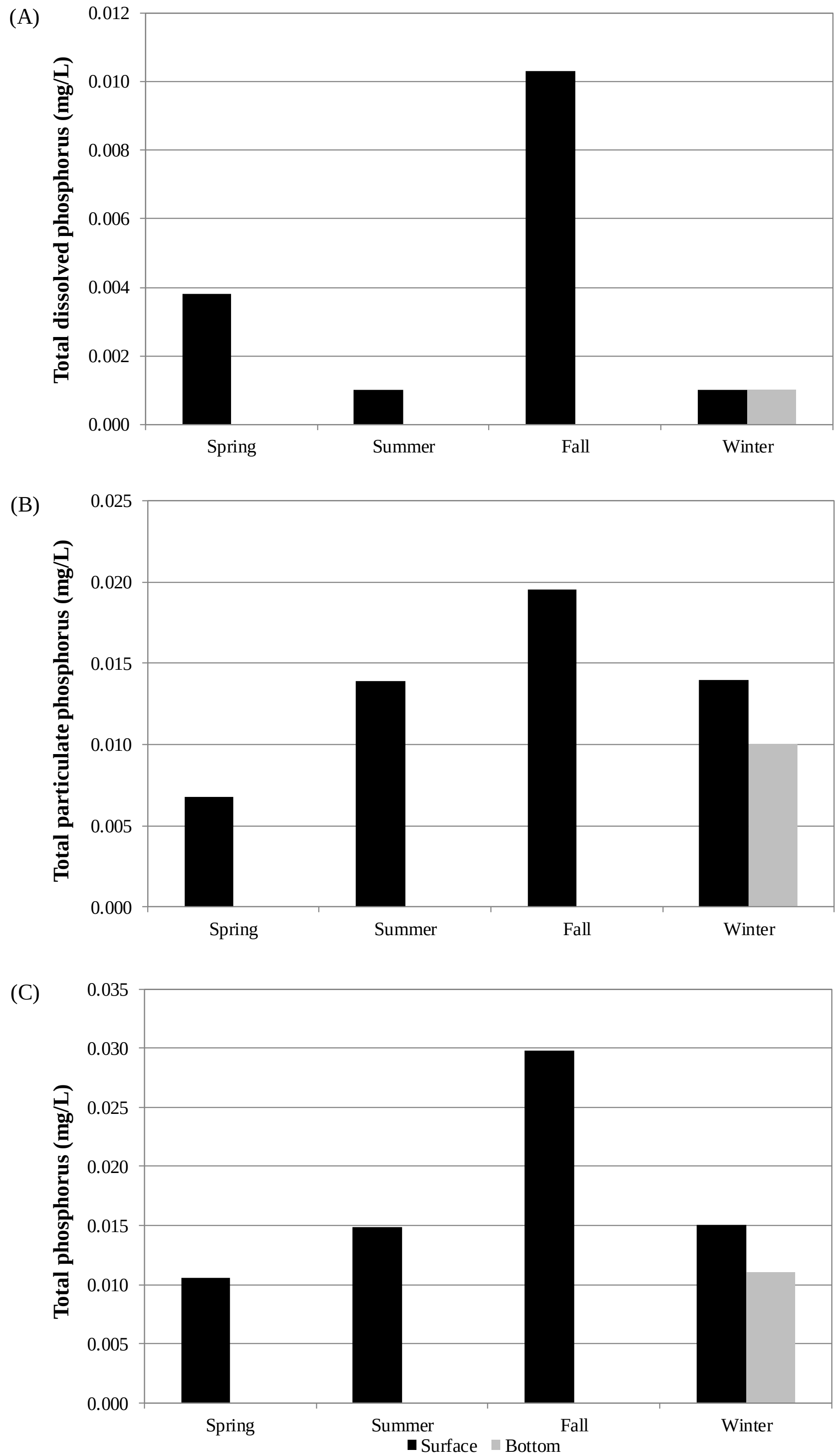


Figure 9.3-15. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 3, 2010/2011.

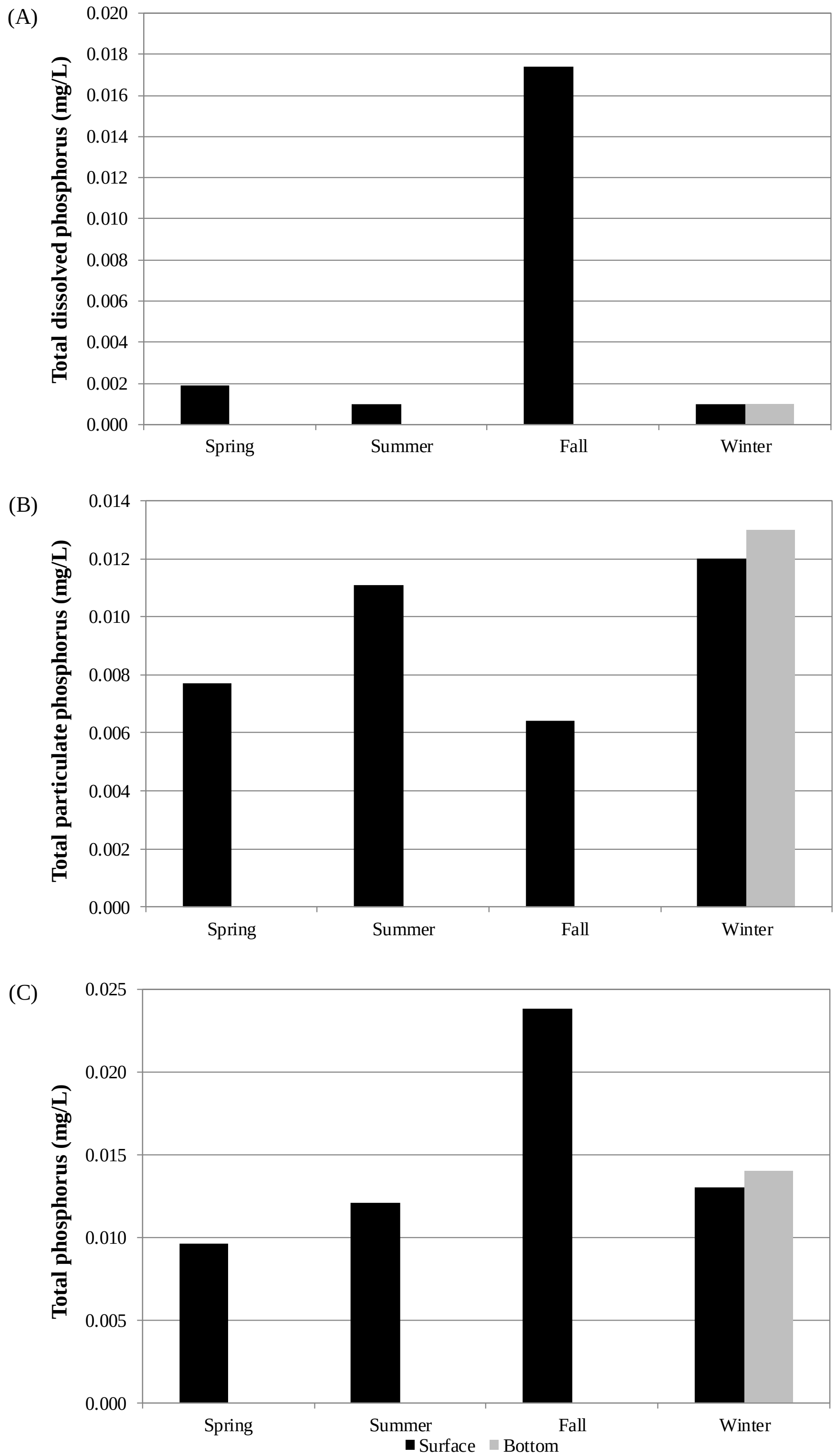


Figure 9.3-16. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 4, 2010/2011.

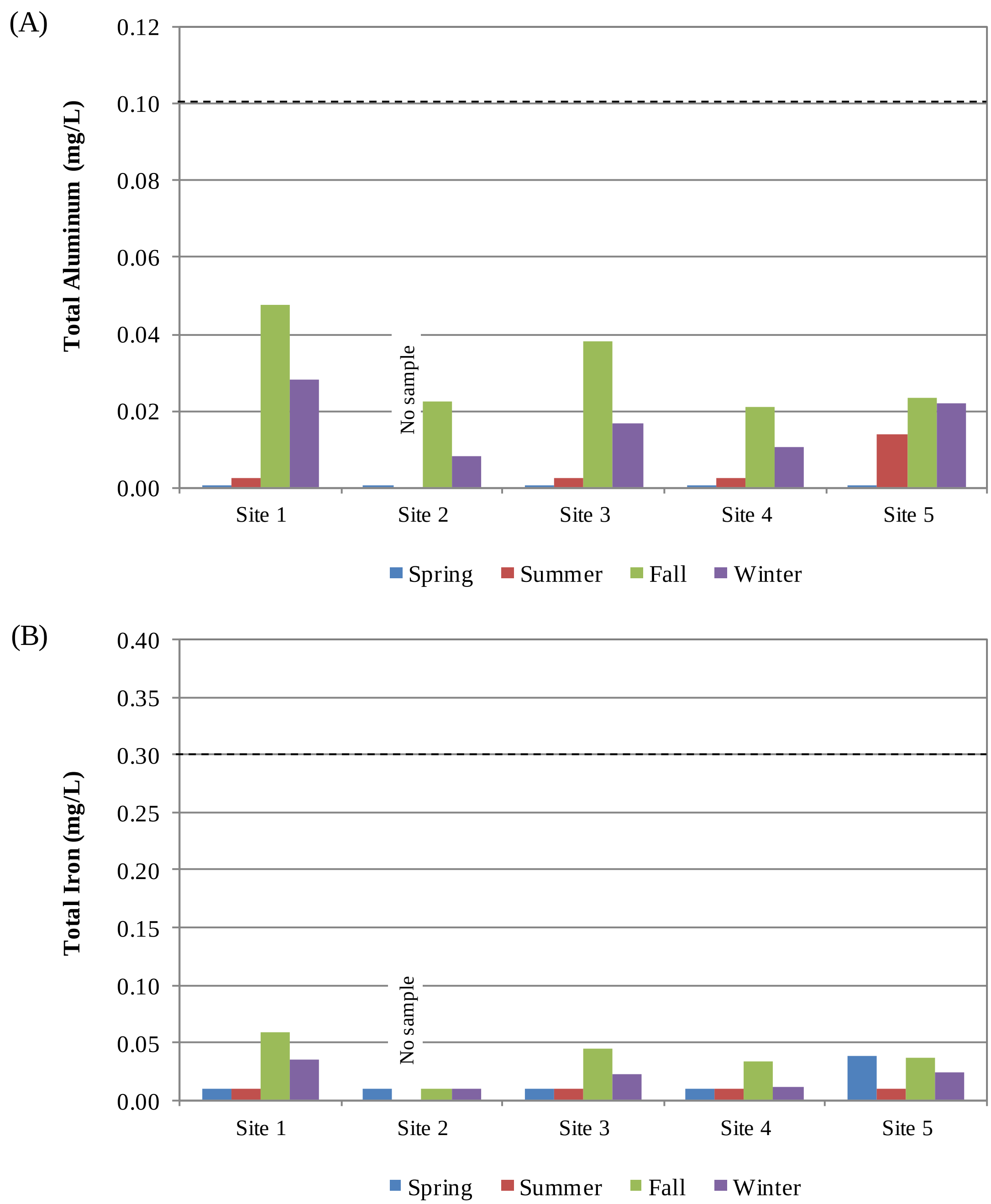


Figure 9.3-17. Total aluminum (A) and total iron (B) measured in surface grabs in Lake Winnipegosis, by sampling period and site: 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron. Note: summer sampling was not completed at Site 2 due to inclement weather conditions

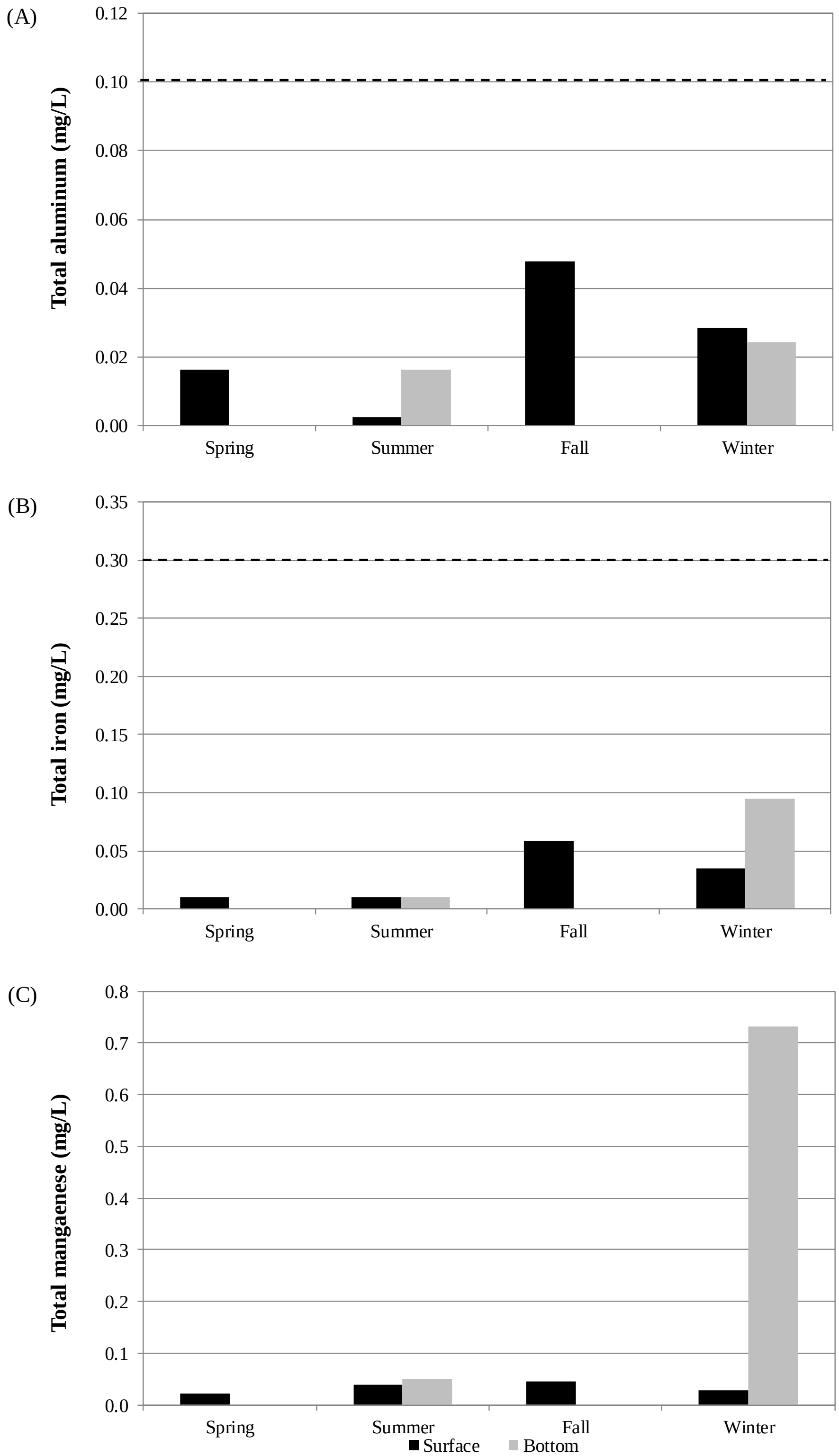


Figure 9.3-18. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 1, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

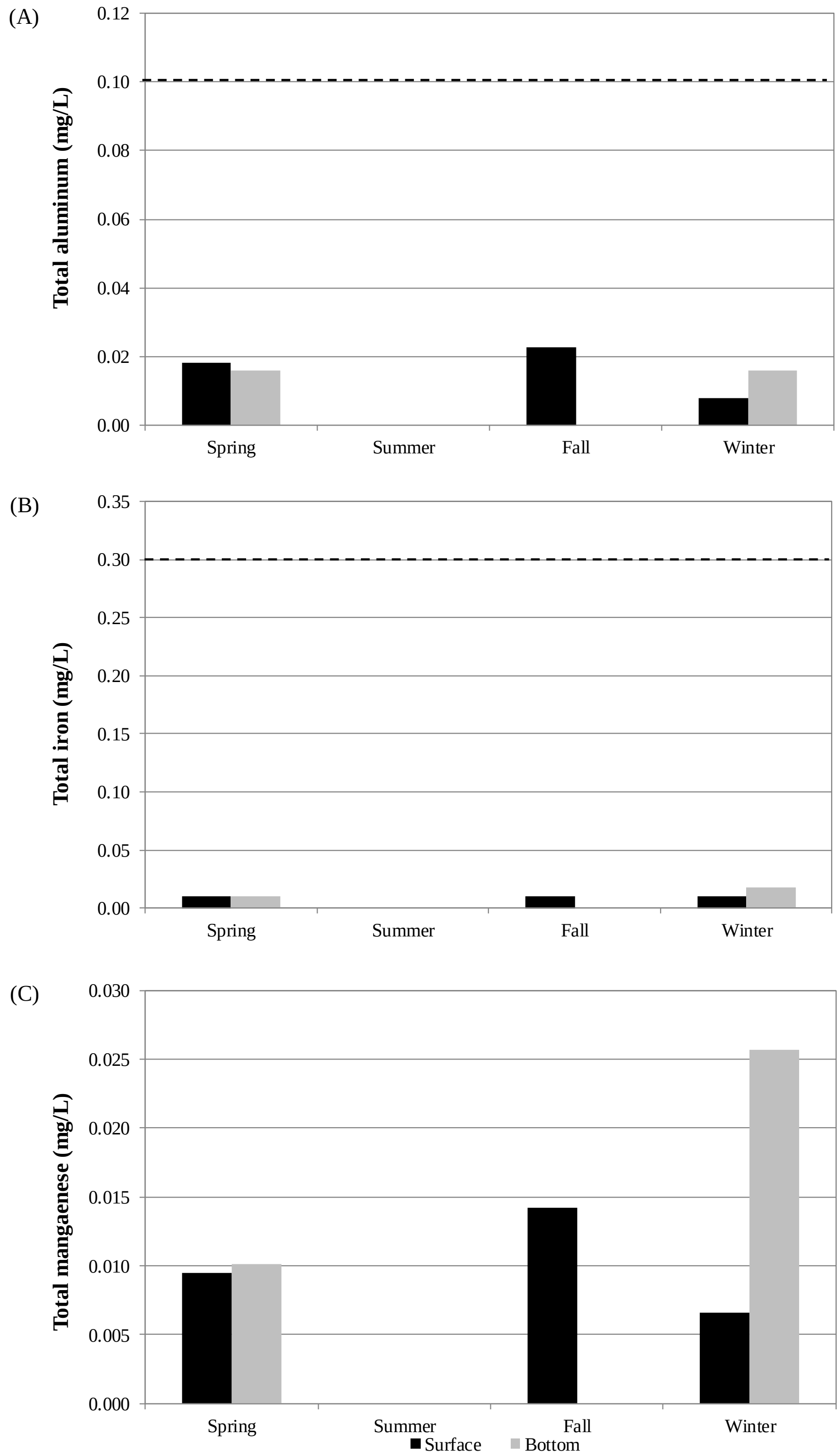


Figure 9.3-19. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 2, 2008/2009. The black dashed line indicates the MWQSOG for PAL for aluminum and iron. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

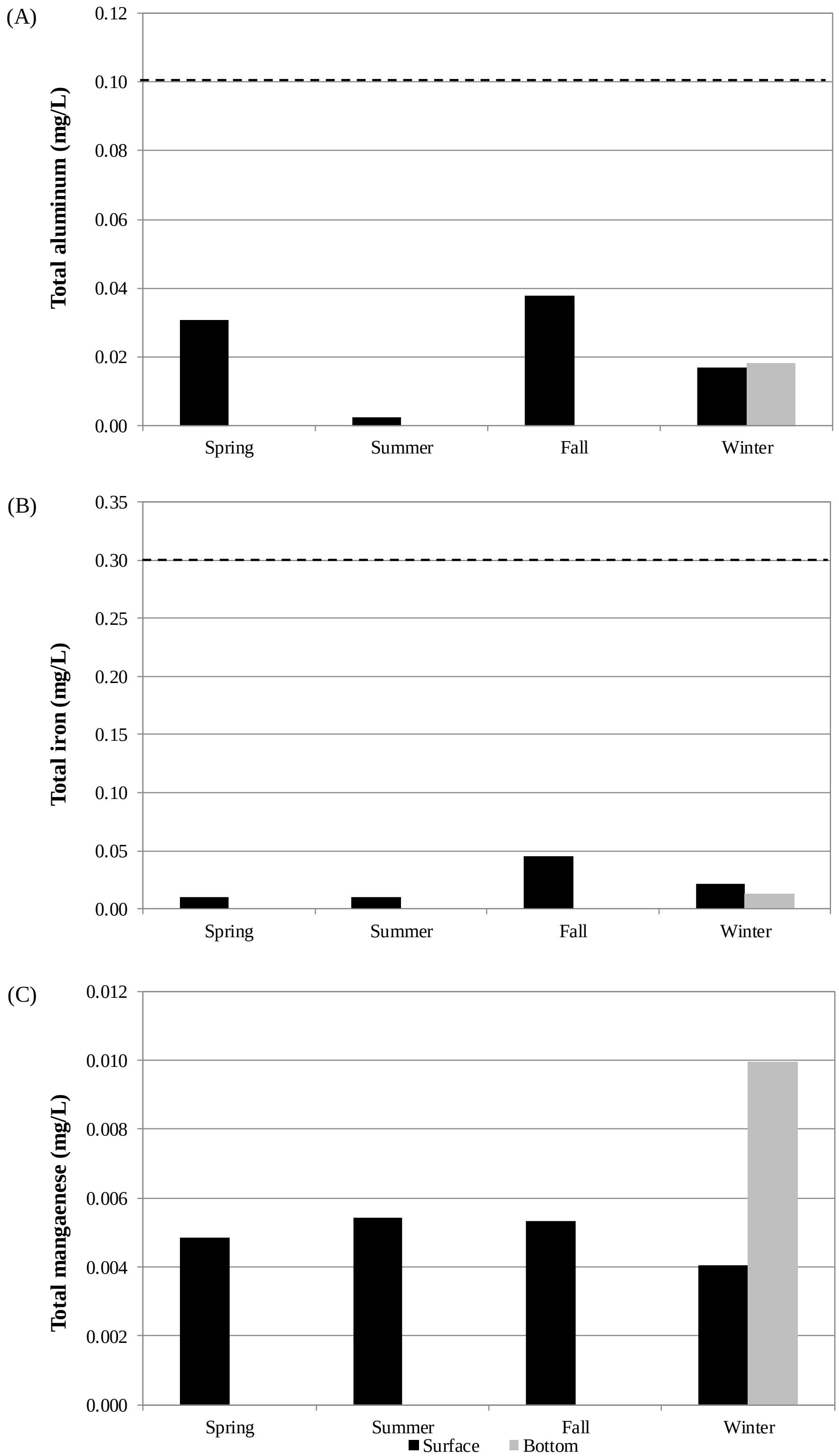


Figure 9.3-20. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 3, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

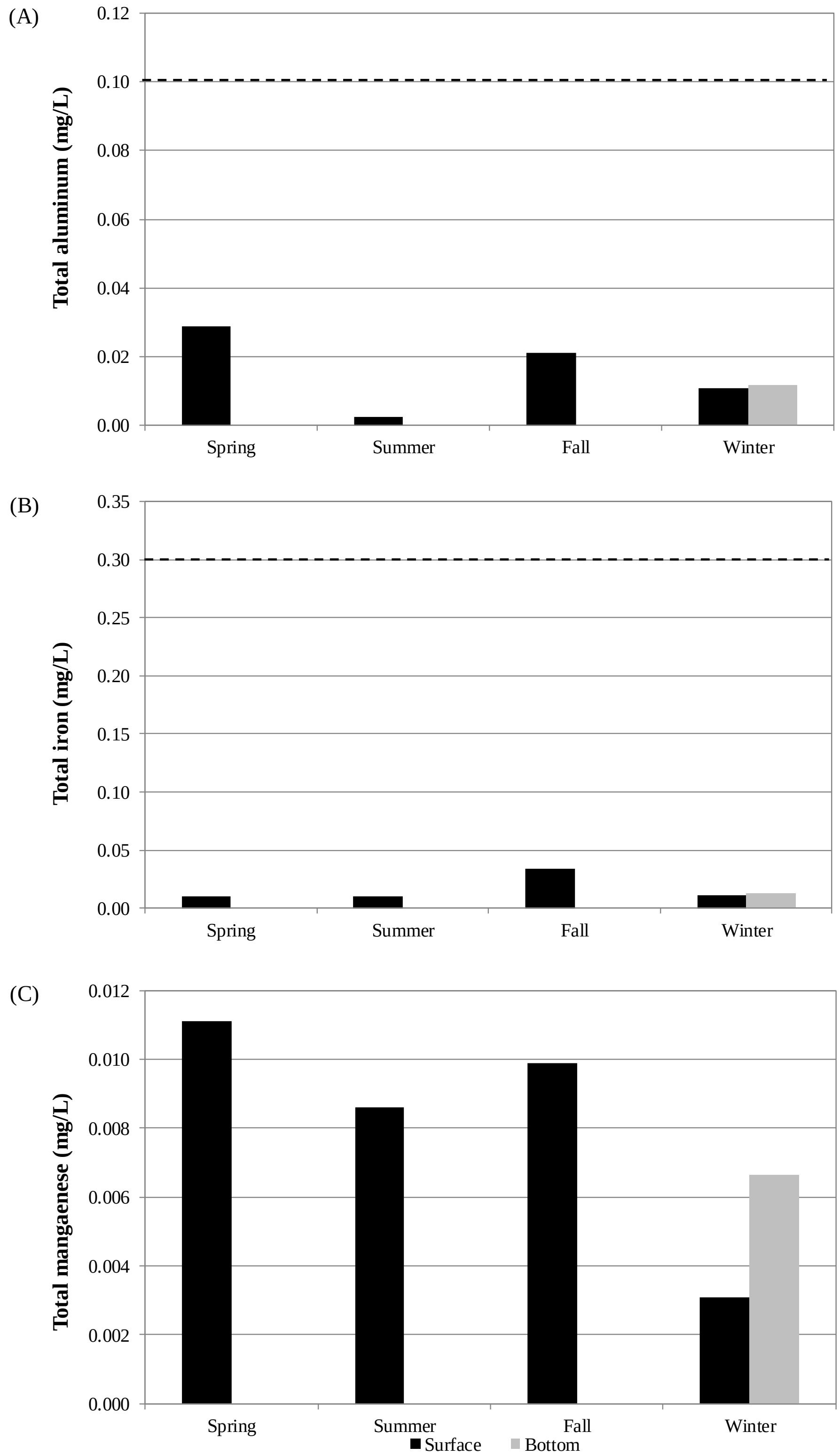


Figure 9.3-21. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 4, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

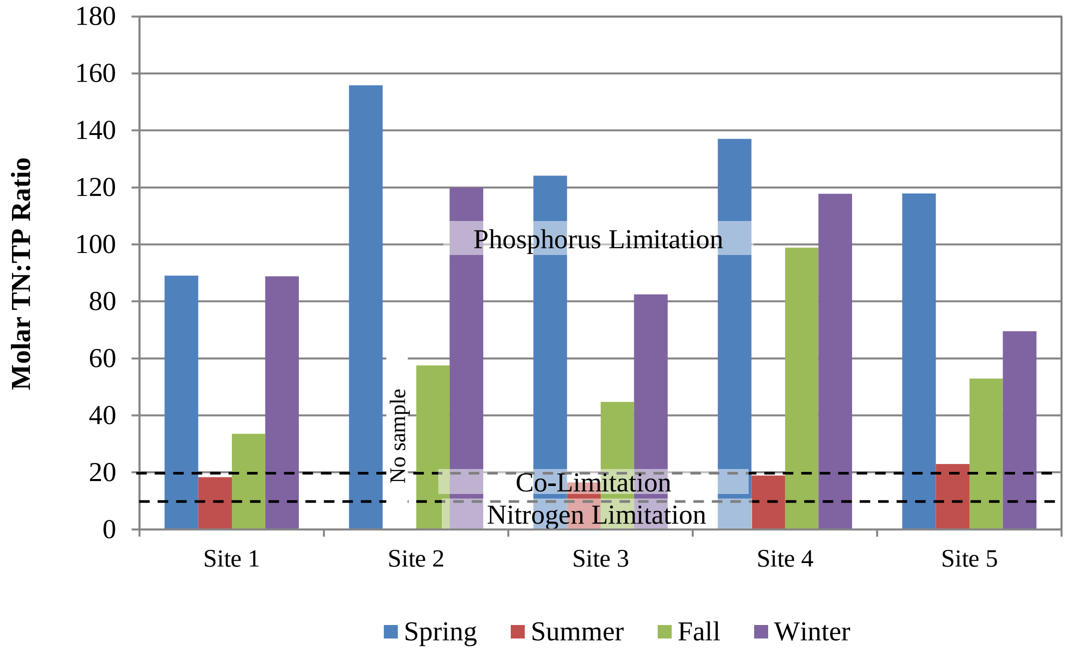


Figure 9.3-22. Total nitrogen to total phosphorus molar ratios (TN:TP) in Lake Winnipegosis: 2010/2011. Note: summer sampling was not completed at Site 2 due to inclement weather conditions

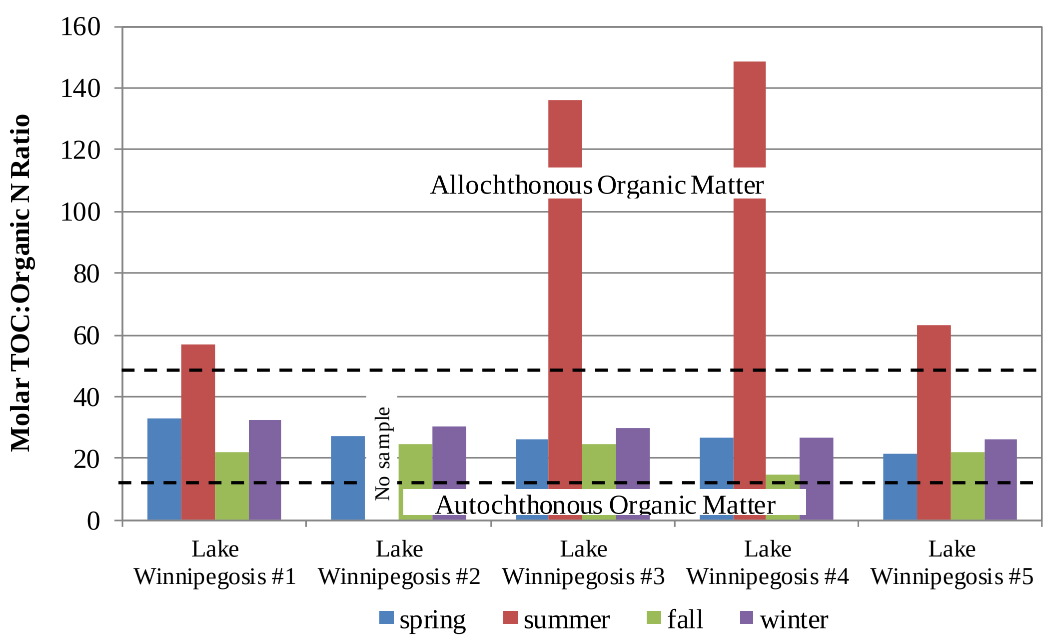


Figure 9.3-23. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios ratios in Lake Winnipegosis: 2010/2011. Note: summer sampling was not completed at Site 2 due to inclement weather conditions.

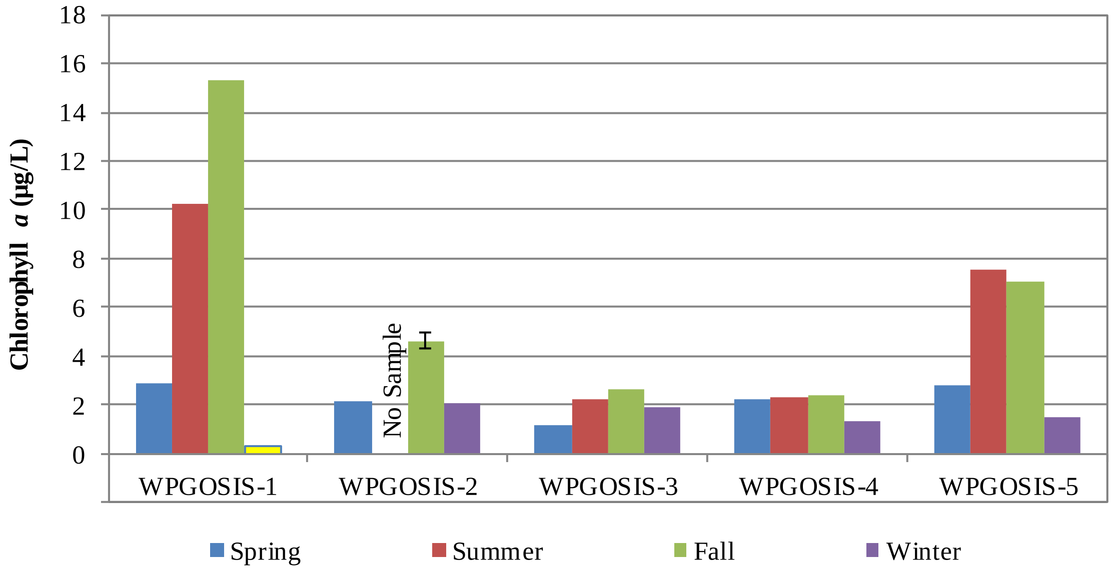
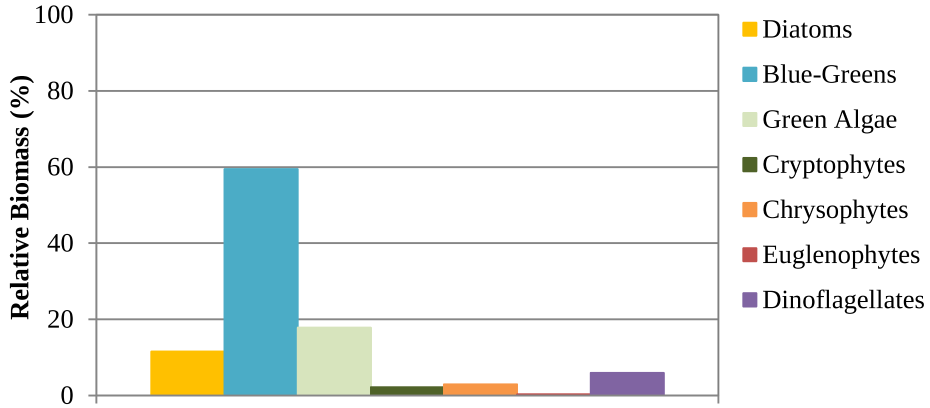


Figure 9.4-1. Chlorophyll a concentrations measured within the euphotic zone at sites in the Lake Winnipeg Region in 2010/2011. Yellow bars represent values that were below the analytical detection limit; and error bars represent the standard error of triplicate samples.

(A) Summer



(B) Fall

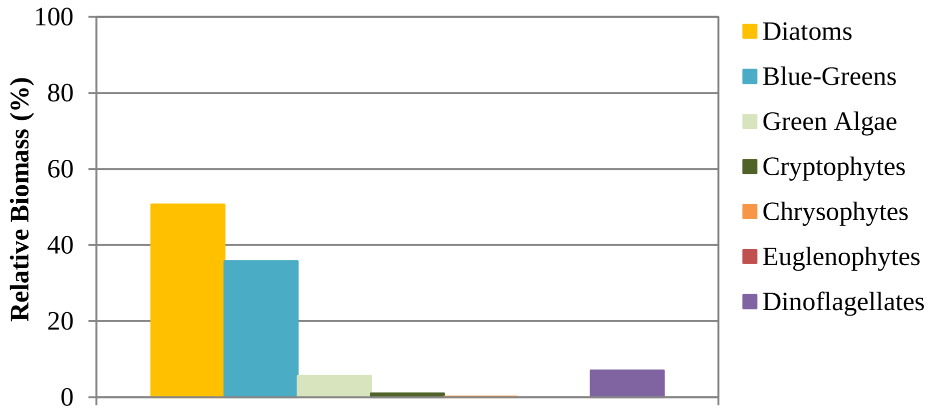


Figure 9.4-2. Phytoplankton community composition measured at Lake Winnipegosis Site 1 during bloom periods in 2010.

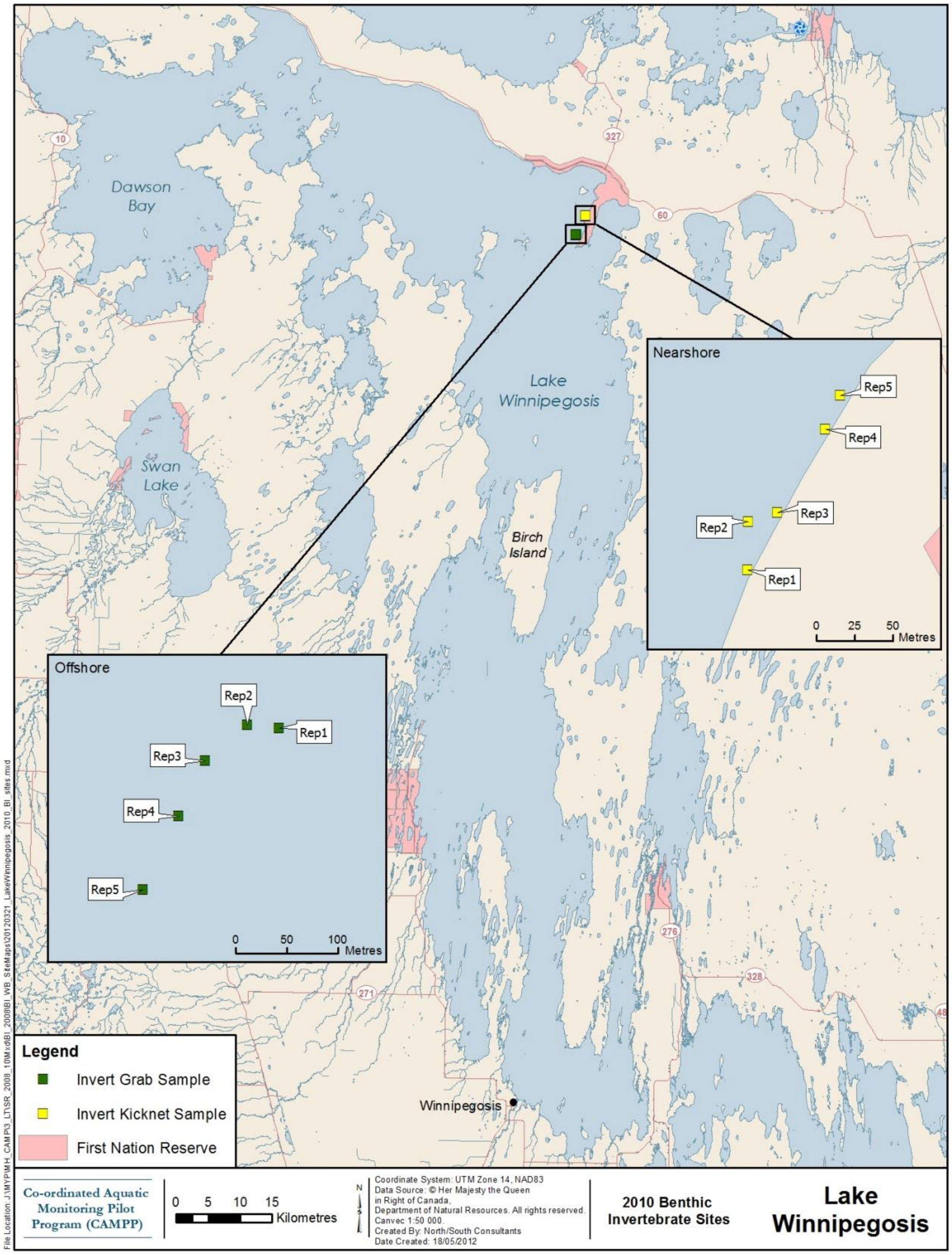


Figure 9.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Lake Winnipegosis within the Lake Winnipeg Region, 2010.

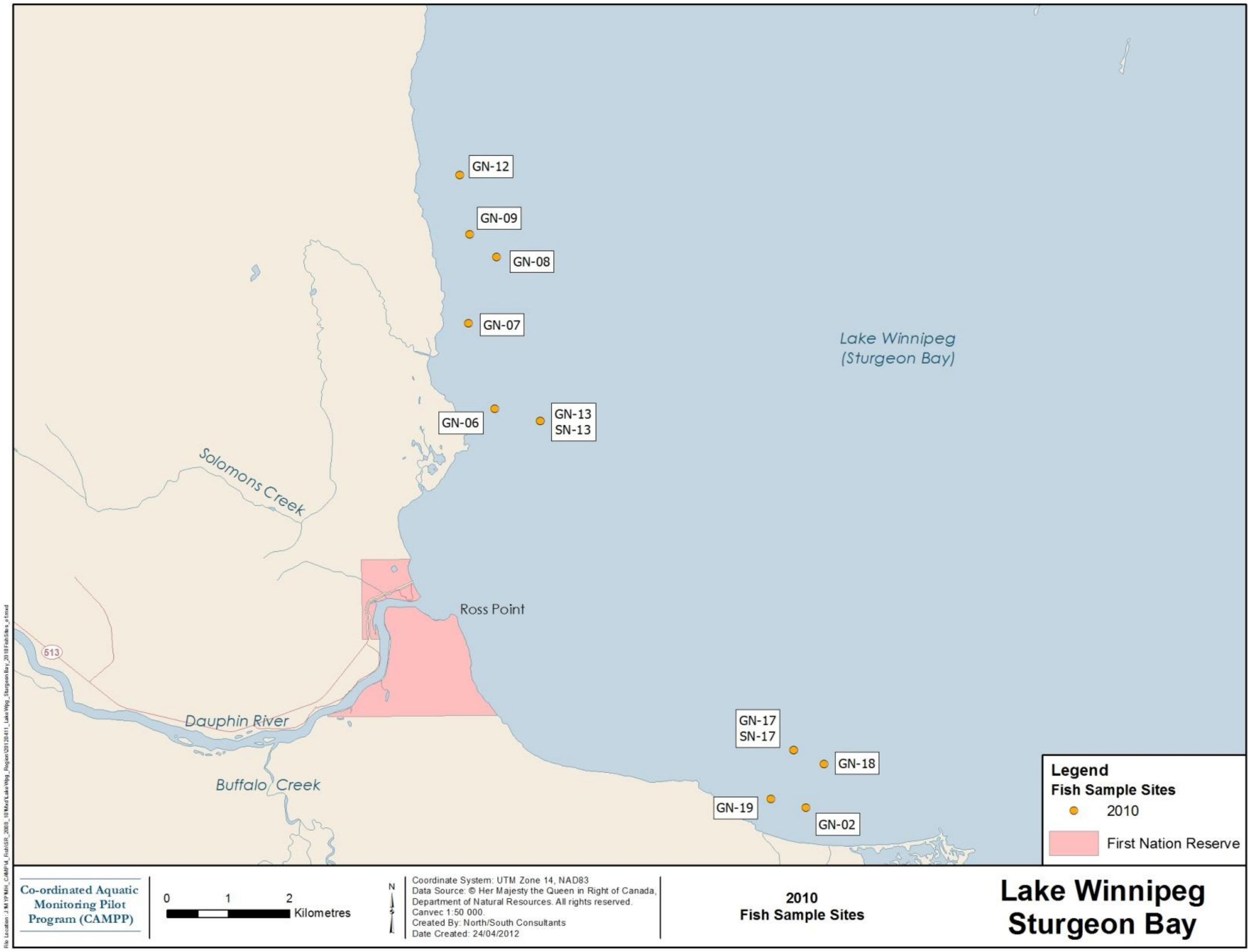


Figure 9.6-1. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Sturgeon Bay of Lake Winnipeg, 2010.

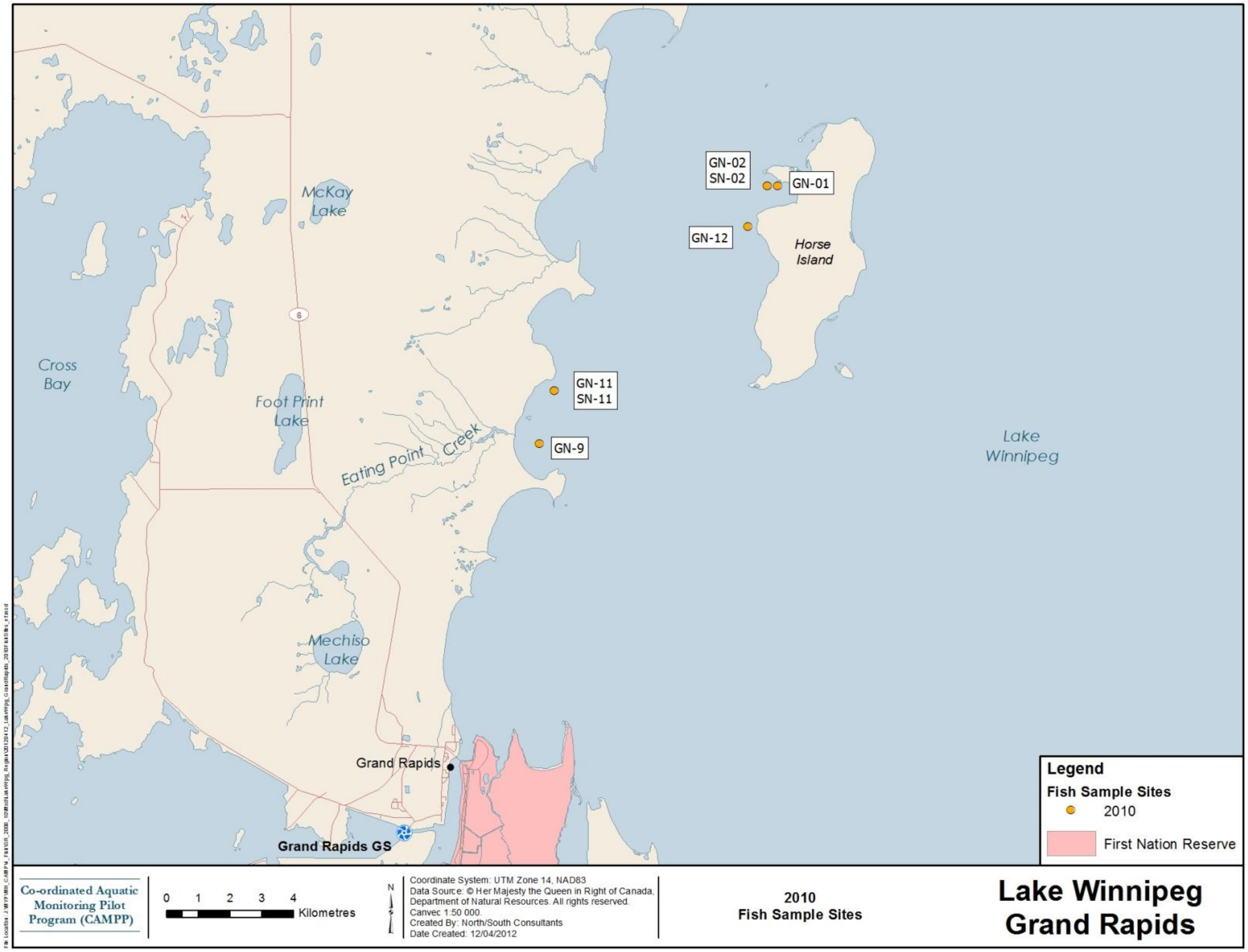


Figure 9.6-2. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Lake Winnipeg near Grand Rapids, 2010.

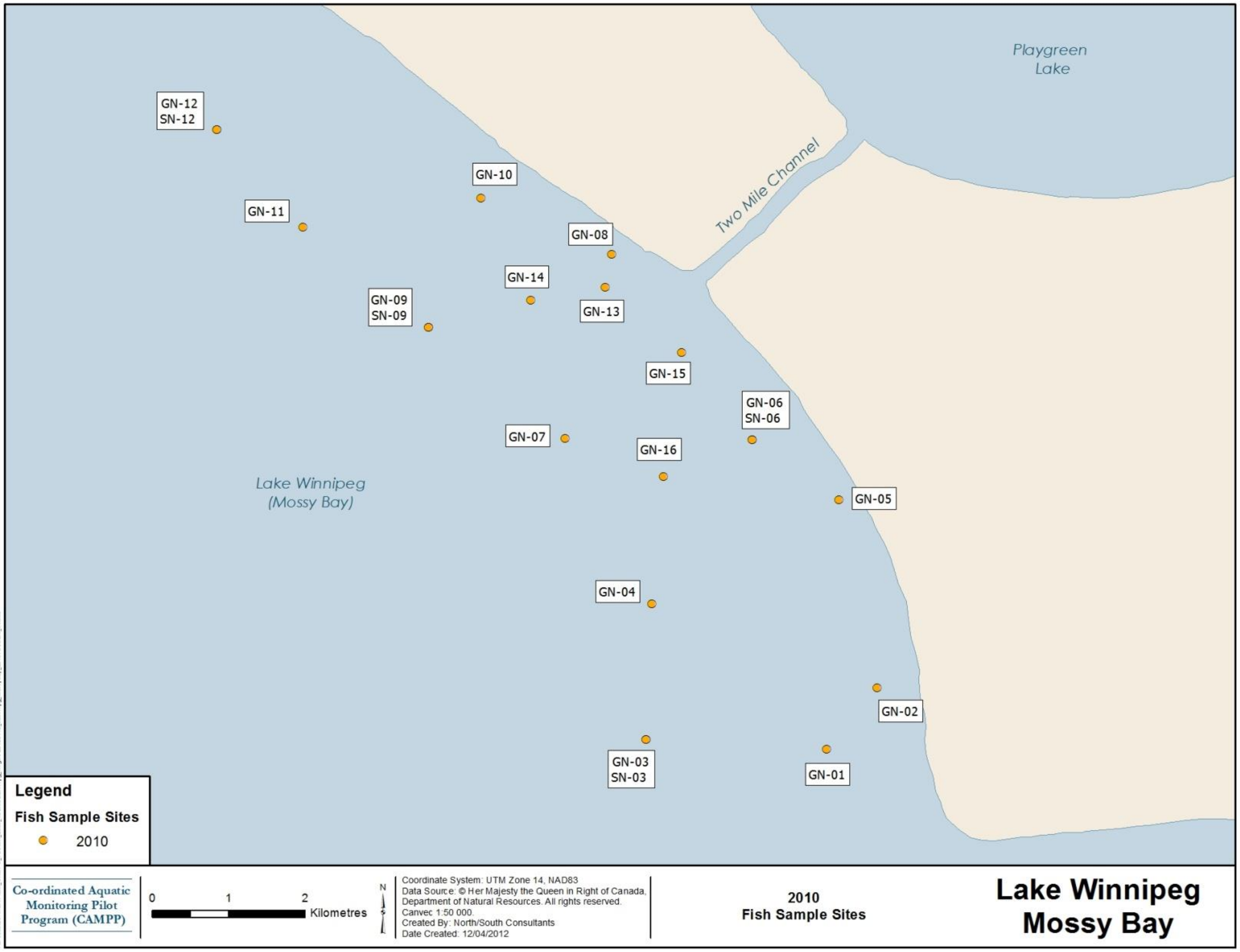


Figure 9.6-3. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Mossy Bay of Lake Winnipeg, 2010.

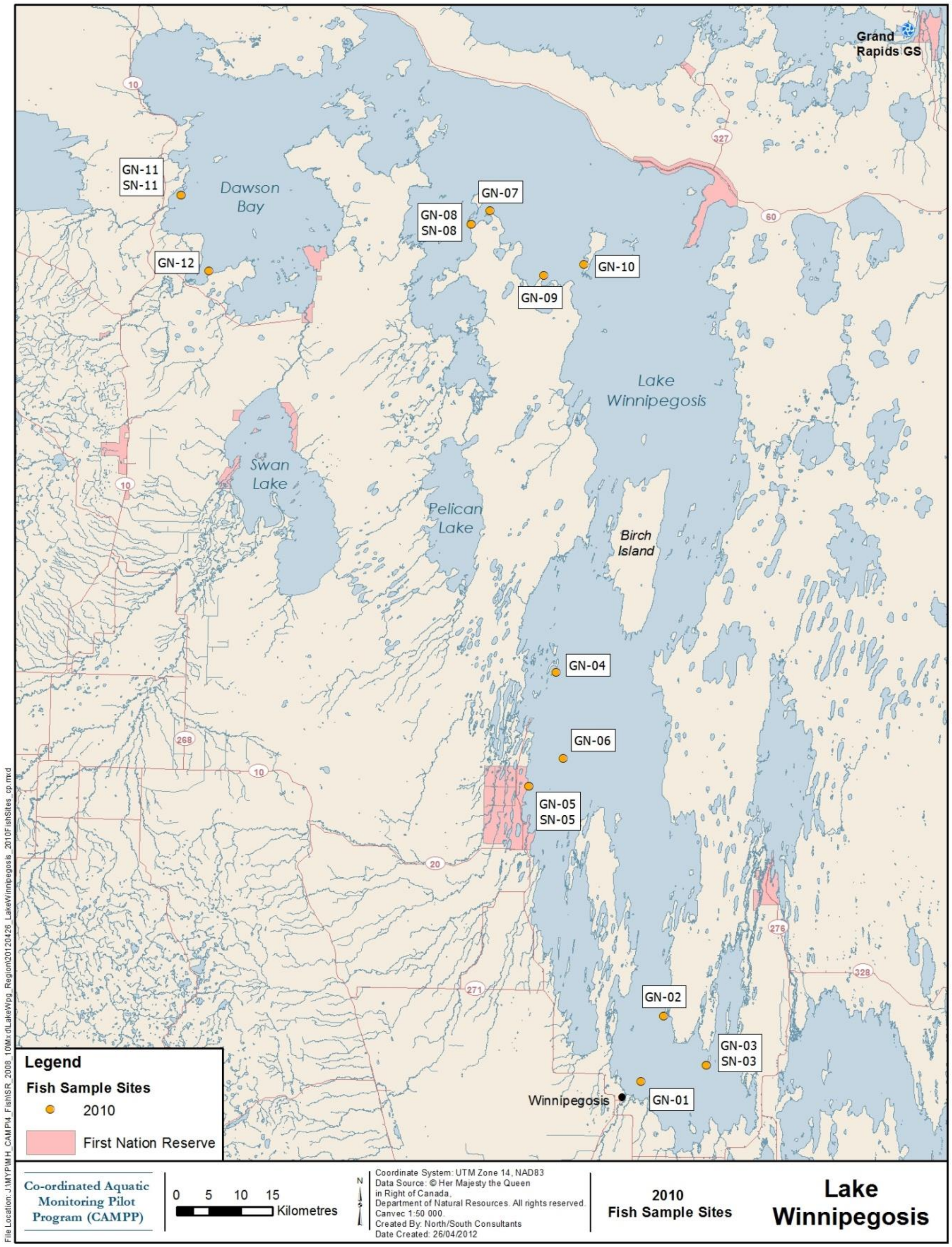


Figure 9.6-4. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Lake Winnipegosis, 2010.

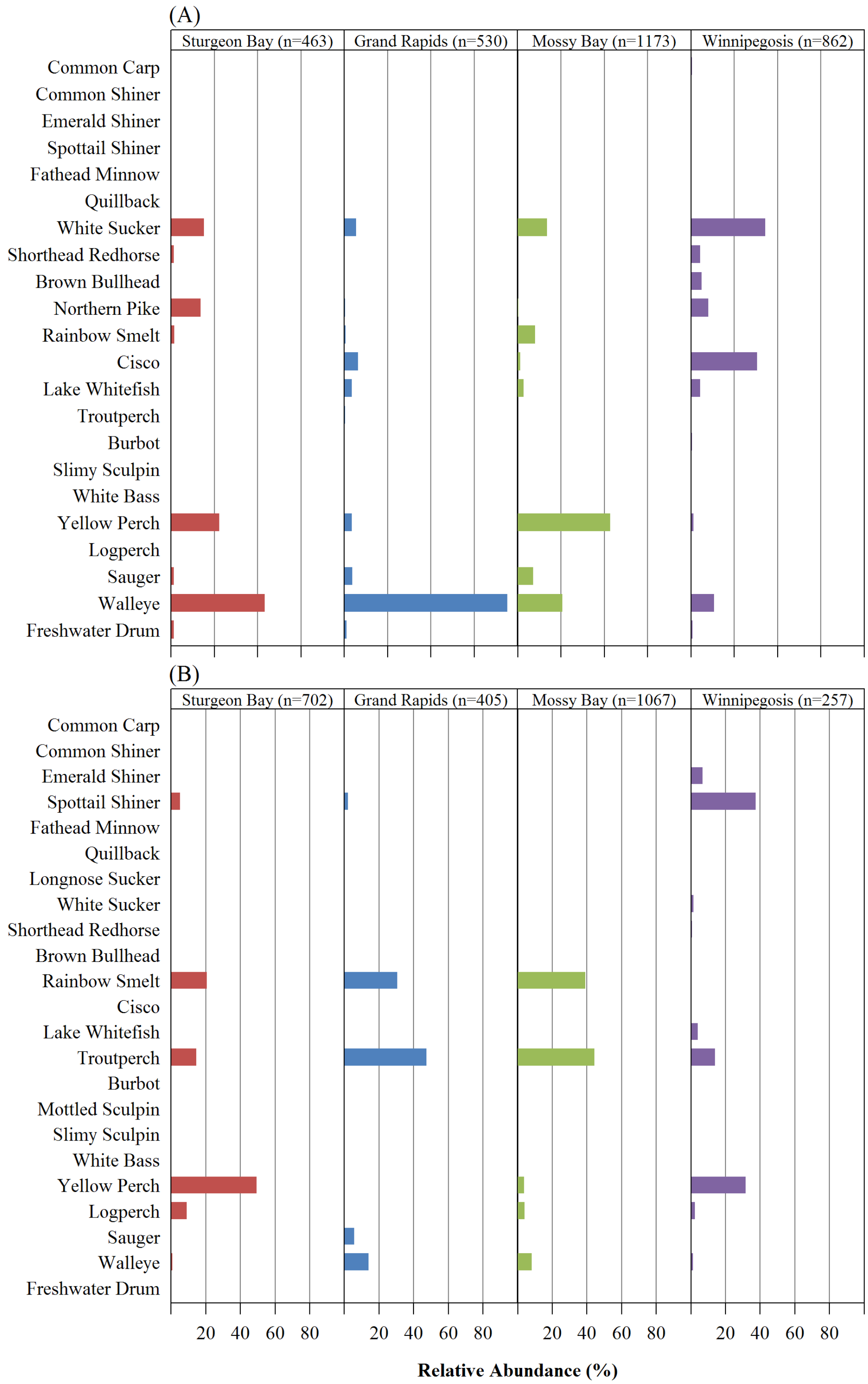


Figure 9.6-5. Relative abundance distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2010.

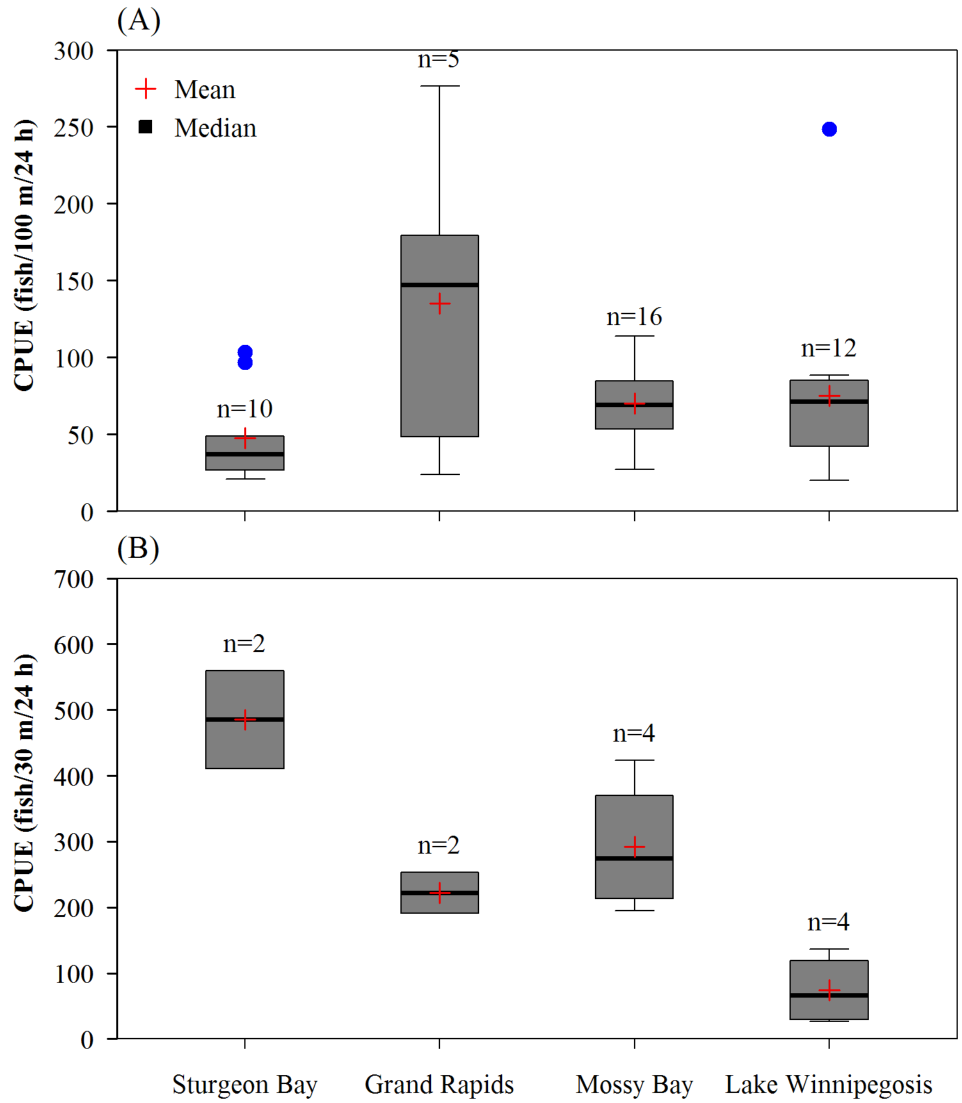


Figure 9.6-6. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2010.

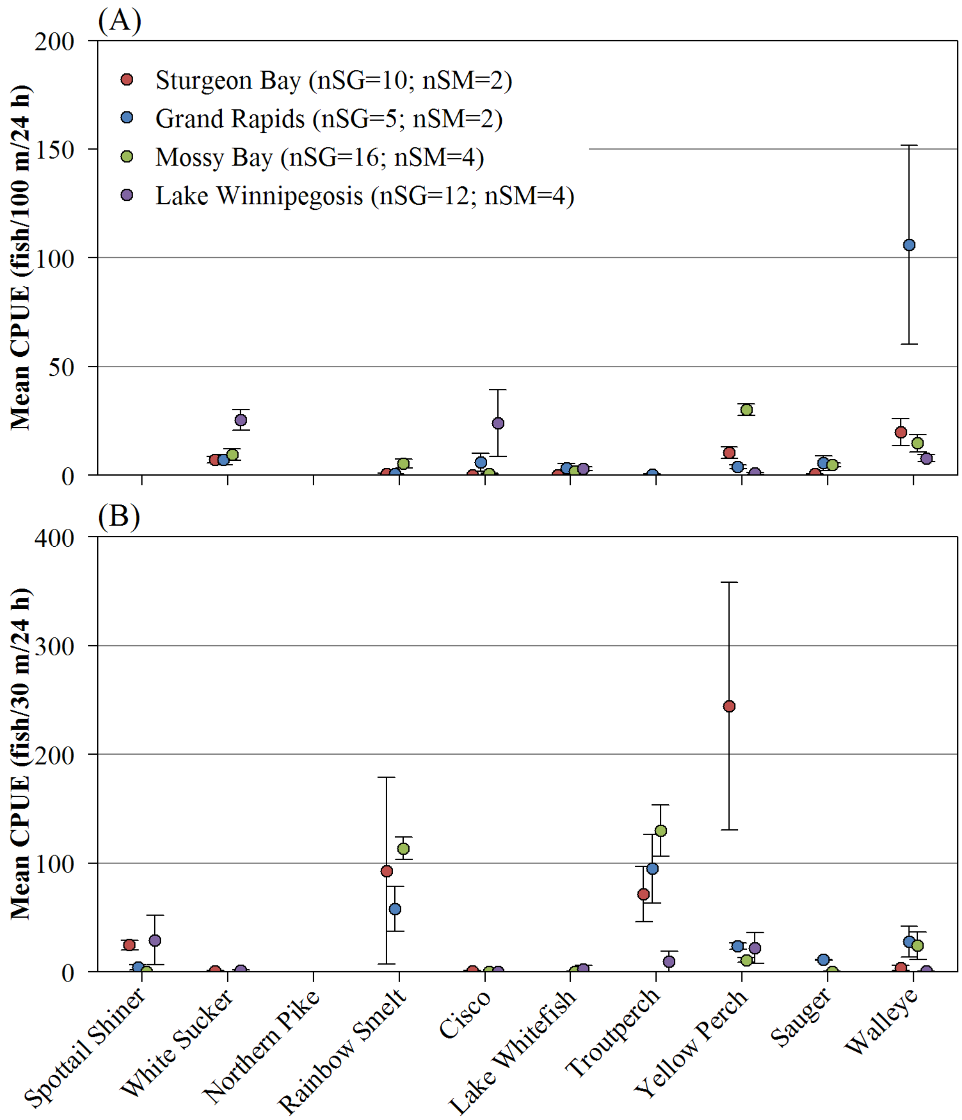


Figure 9.6-7. Mean CPUE (SE) calculated for select fish species captured in (A) standard gang and (B) small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2010.

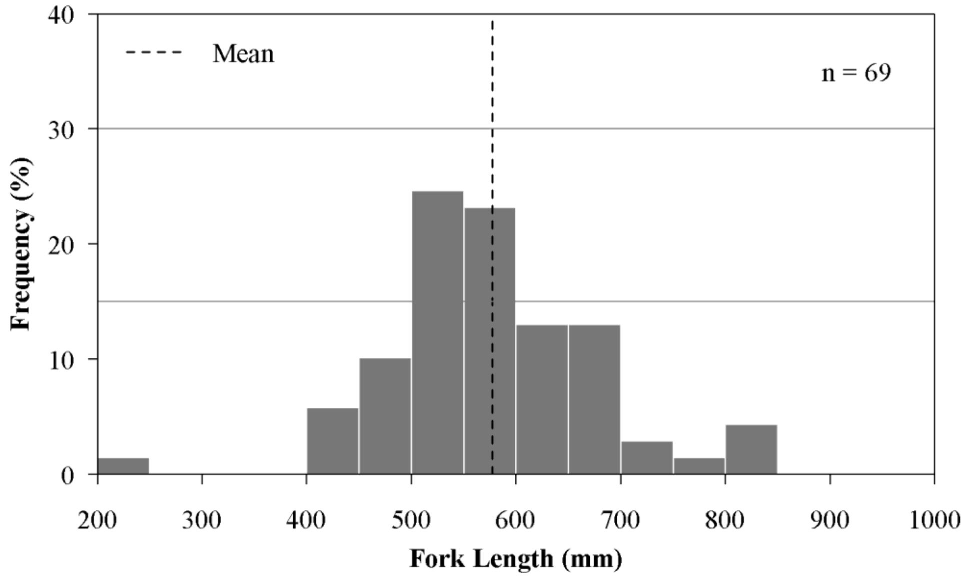


Figure 9.6-8. Fork length frequency histogram for Northern Pike captured in standard gang index gill nets set in Lake Winnipegosis, 2010.

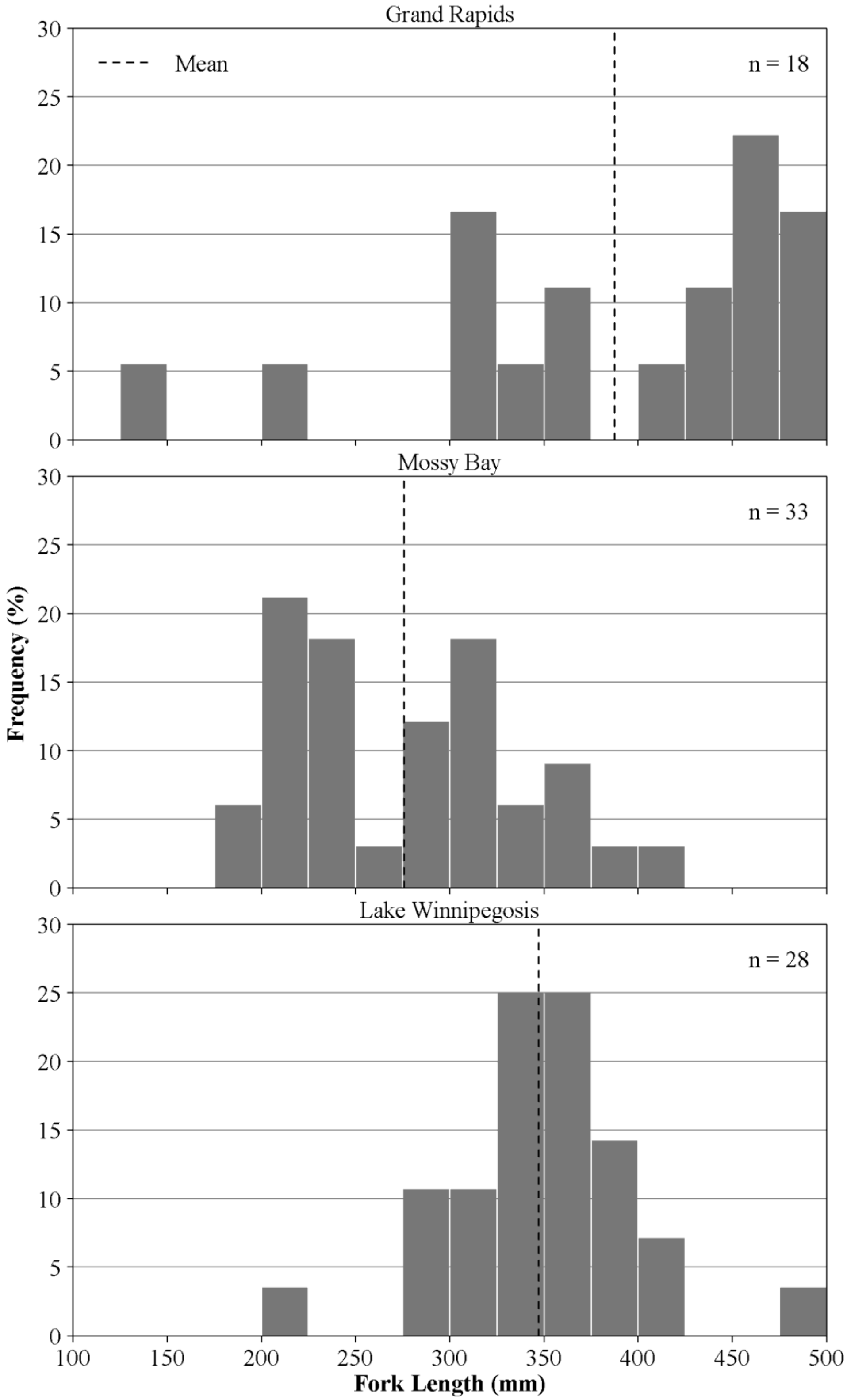


Figure 9.6-9. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

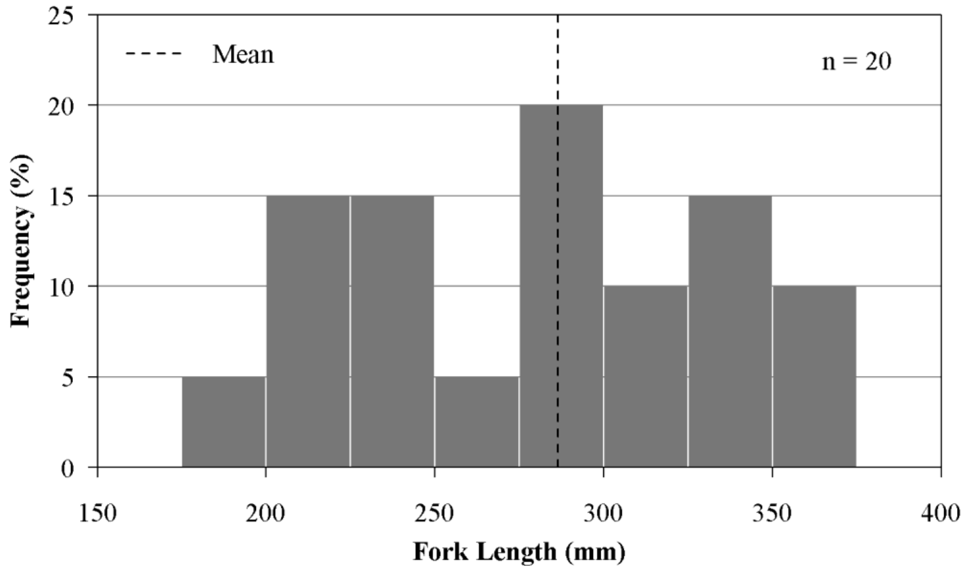


Figure 9.6-10. Fork length frequency histogram for Sauger captured in standard gang index gill nets set in Lake Winnipeg near Grand Rapids, 2010.

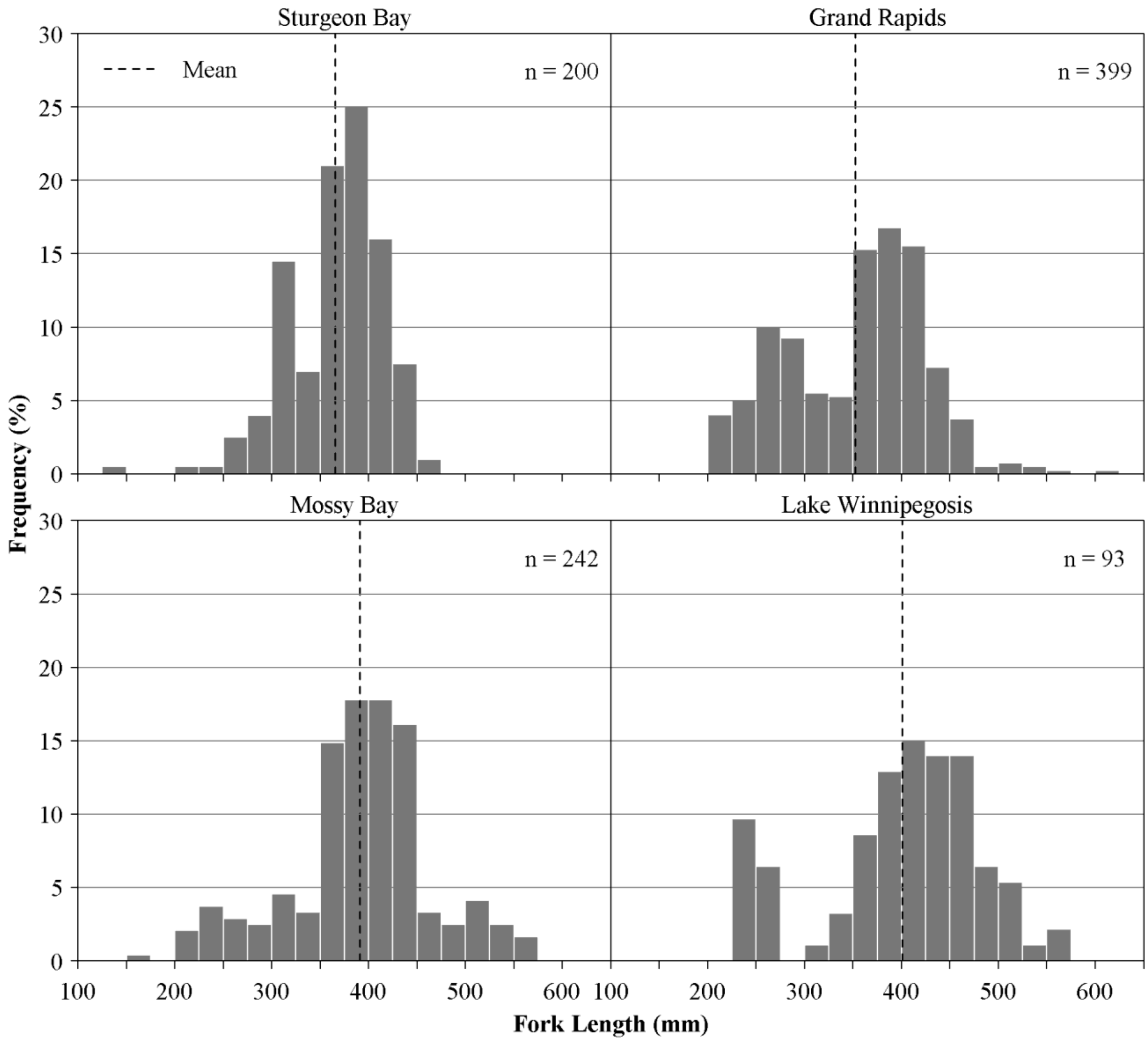


Figure 9.6-11. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2010.

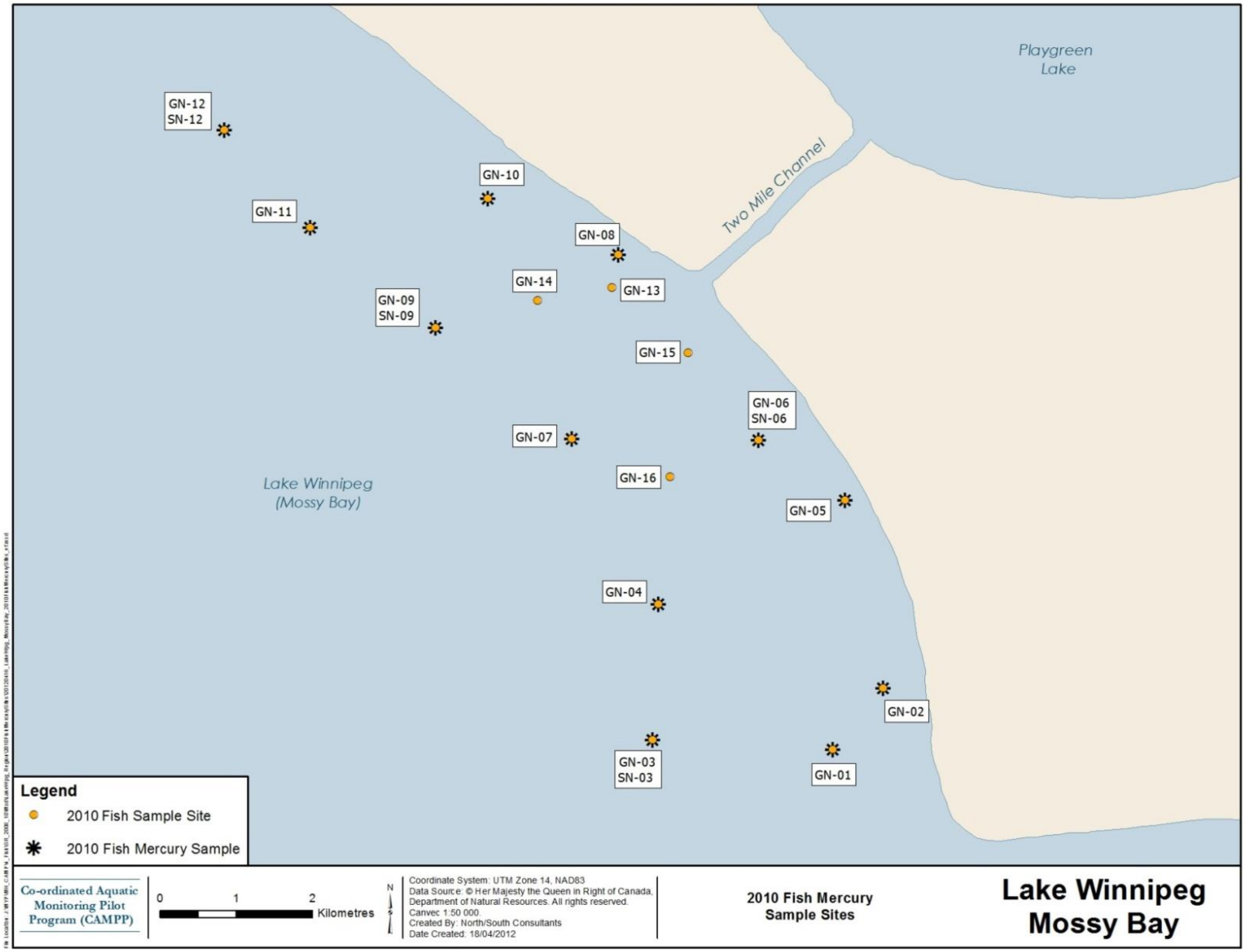


Figure 9.7-1. Fish sampling sites in Lake Winnipeg at Mossy Bay, indicating sites where fish were collected for mercury analysis.

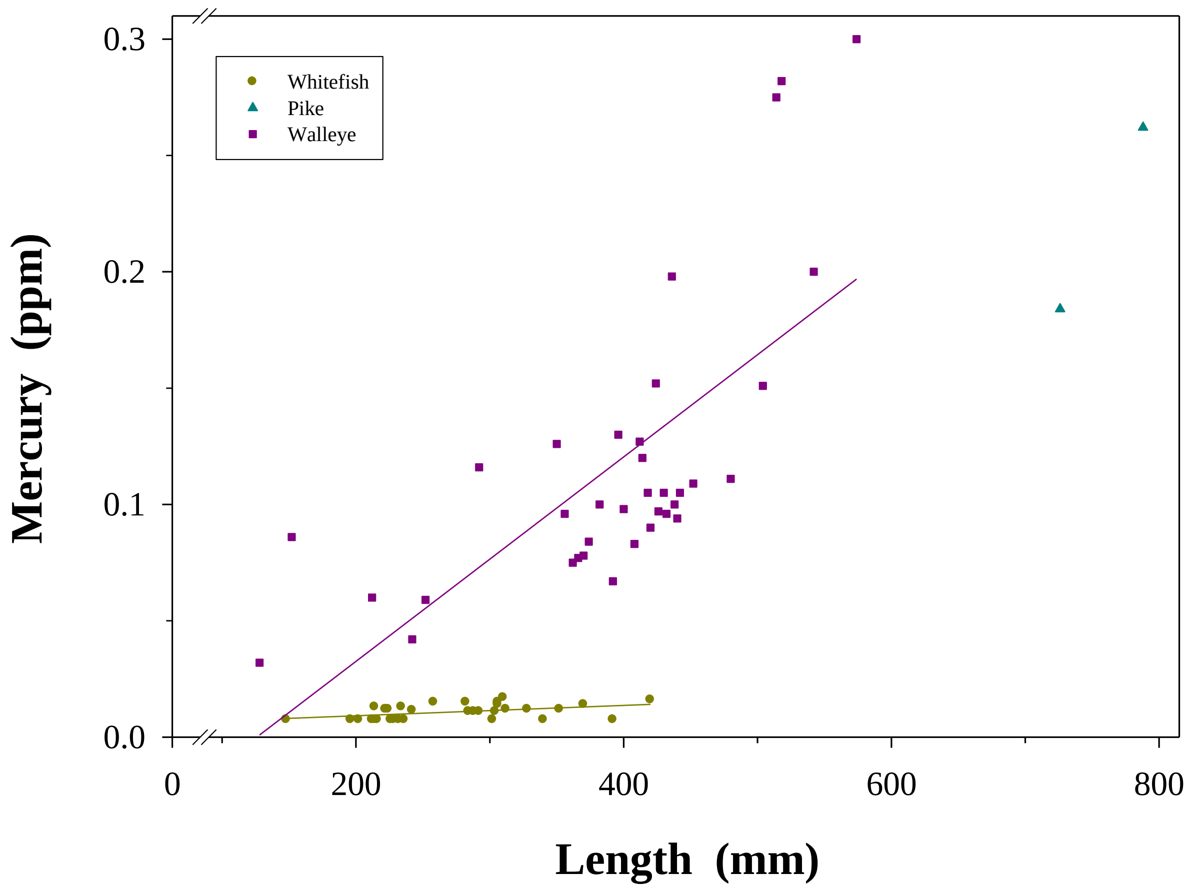


Figure 9.7-2. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye captured from Lake Winnipeg at Mossy Bay in 2010. Significant linear regression lines are shown.

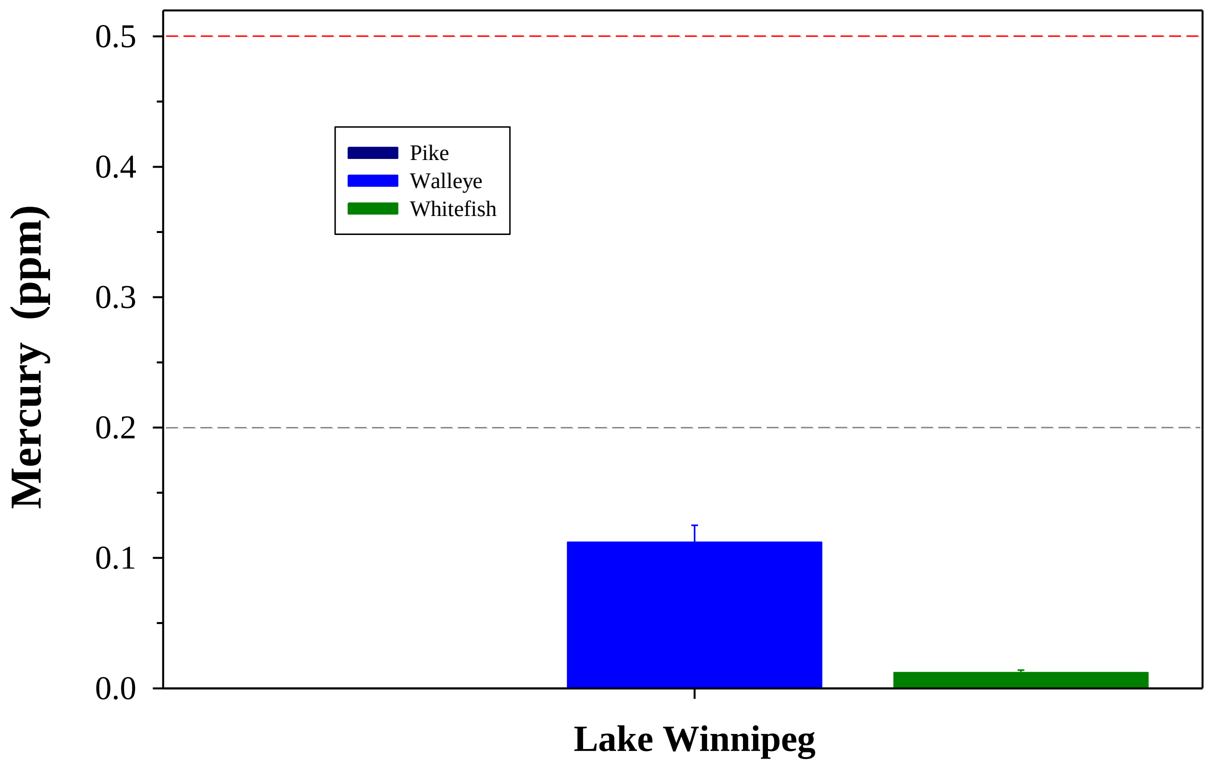


Figure 9.7-3. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye, and Lake Whitefish from Lake Winnipeg at Mossy Bay in 2010. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption. The mean for pike is not shown because of insufficient sample size (n=2).

10.0 REFERENCES

Canadian Council of Ministers of the Environment (CCME). 1999. Canadian environmental quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg, MB. Updated to 2013.

Canadian Council of Resource and Environment Ministers (CCREM). 1987. Canadian water quality guidelines. Canadian Council of Resource and Environment Ministers, Winnipeg, MB.

Dodds, W.K., J.R. Jones, and E.B. Welch. 1998. Suggested classification of stream trophic state: distributions of temperate stream types by chlorophyll, total nitrogen, and phosphorus. Wat. Res. 32: 1455-1462.

Health Canada. 2007a. Human health risk assessment of mercury in fish and health benefits of fish consumption. Health Canada: Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch, Ottawa, ON, 70 pp.

Health Canada. 2007b. Updating the existing risk management strategy for mercury in fish. Health Canada: Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch, Ottawa, ON, 45 pp.

Manitoba Water Stewardship (MWS). 2011. Manitoba water quality standards, objectives, and guidelines. Water Science and Management Branch, MWS Report 2011-01, November 28, 2011. 67 pp.

Meays, C. and R. Nordin. 2013. Ambient water quality guidelines for sulphate. Technical Appendix: Update April 2013. Water Protection & Sustainability Branch Environmental Sustainability and Strategic Policy Division, British Columbia Ministry of Environment (BCMOE).

Merritt, R.W. and Cummins, K.W. 1996. An introduction to the aquatic insects of North America, 3rd Edition. Kendal/Hunt Publishing Co., Dubuque, IA. 862 pp.

Nürnberg. 1996. Trophic state in clear and colored, soft- and hardwater lakes with special consideration of nutrients, anoxia, phytoplankton and fish. Lake Reservoir Manage. 12: 432-447.

Organization for Economic Cooperation and Development (OECD). 1982. Eutrophication of waters: monitoring, assessment and control. Final Report. OECD cooperative programme on monitoring of inland waters (eutrophication control). Environment Directorate, OECD, Paris, France. 154 pp.

Tataskweyak Cree Nation (TCN) 2010. Lake Sturgeon habitat investigation at the Churchill and Little Churchil River confluence area. Preliminary report, July 2010, 9 p. + appendices.

Wheatley, B. 1979. Methylmercury in Canada; exposure of Indian and Inuit residents to methylmercury in the Canadian Environment. Mercury Program Findings to December 31, 1978. Medical Services Branch, Health and Welfare Canada, Ottawa, ON, 200 pp.

Zurawell, R.W., H. Chen, J.M. Burke, and E.E. Prepas. 2005. Hepatotoxic cyanobacteria: a review of the biological importance of microcystins in freshwater environments. J. Toxicol. Environ. Health 8: 1–37.