Manitoba/Manitoba Hydro

Coordinated Aquatic Monitoring Pilot Program (CAMPP):

Three Year Summary Report (2008-2010) - Volume 12

Appendix 4: Results of CAMPP: 2009/2010

<u>VOLUME 12</u>

APPENDIX 4
RESULTS OF CAMPP: 2009/2010

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.

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1.0 OVERVIEW OF COMPONENTS AND WATERBODIES FOR 2009/2010 PROGRAM

In addition to pre-established climatological and hydrological monitoring in the CAMPP regions, monitoring of the following components was conducted under CAMPP in 2009/2010:

- Water quality;
- Phytoplankton;
- Benthic macroinvertebrates;
- Fish communities; and
- Fish mercury (Stephens Lake-South only).

In Year 2 of CAMPP, sampling was conducted in each of the eight regions at a total of 28 waterbodies/areas (Table 1-1; Figure 1-1). Year 2 represents the first year in which the full complement of annual waterbodies/areas were sampled as well as the initiation of sampling at rotational waterbodies/areas. In addition, water quality was sampled at the mouth of the Burntwood River (at Split Lake).

Year 2 also represents the first year in which phytoplankton community composition/biomass was sampled at each annual water quality site, as well as the rotational waterbodies/areas sampled in 2009/10. Fish mercury was only analysed at Stephens Lake-South and no aquatic habitat surveys were undertaken in 2009/10.

The following sections provide a description of the results of Year 2 of CAMPP. For an overview of sampling and analysis methods see Section 4.

SECTION 1: TABLES AND FIGURES

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Table 1-1. Waterbodies sampled in Year 2 of CAMPP (2009/2010) by component and sampling organization. Rotational sites are indicated with shading.

Region	Waterbody	Water Quality [1, 2]		Benthic Invertebrates [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	Pointe du Bois Forebay	O, I	-	X	-	X	-	-	-
	Lac du Bonnet	O, I	-	X	-	-	X	-	-
	Manigotagan Lake	O, I	-	X	-	A	X	-	-
Saskatchewan River	South Moose Lake	O, I	-	X	-	A	X	-	-
	Cedar Lake-Southeast	O, I	-	X	-	A	X	-	-
	Cormorant Lake	O, I	-	X	-	A	X	-	-
Lake Winnipeg	Lake Winnipeg (north basin)	-	O, I	-	X	-	X	-	
	Lake Winnipegosis	O, I	-	X	-	-	X	-	
Upper Churchill River	Granville Lake	I	O	X	-	A	X	-	-
	Southern Indian Lake-Area 4	I	O	X	-	A	X	-	-
	Southern Indian Lake-Area 1	I	O	X	-	A	X	-	-
Lower Churchill River	Partridge Breast Lake	O, I	-	X	-	X	-	-	-
	Northern Indian Lake	I	O	X	-	X	-	-	-
	Lower Churchill River at the Little Churchill River	O, I	-	X	-	X	-	-	-
	Gauer Lake	I	O	X	-	X	-	-	-
Churchill River Diversion	Notigi Lake	O, I	-	X	-	X	-	-	-
	Threepoint Lake	O, I	-	X	-	X	-	-	-
	Apussigamasi Lake	O, I	-	X	-	X	-	-	-
	Leftrook Lake	O, I	-	X	-	X	-	-	-

Table 1-1. - continued-

Region	Waterbody	Water Quality [1, 2]		Benthic Invertebrates [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	Playgreen Lake	I	O	X	-	-	X	-	-
	Cross Lake	I	O	X	-	X	-	-	-
	Setting Lake	I	O	X	-	-	X	-	-
Lower Nelson River	Split Lake	I	O	X	-	X	-	-	-
	Burntwood River	O, I	-	-	-	-	-	-	-
	Lower Nelson River downstream of the Limestone GS	O, I	-	X	-	X	-	-	-
	Stephens Lake-North	O, I	-	X	-	X	-	-	-
	Stephens Lake-South	O, I	-	X	-	X	-	X	-
	Assean Lake	O, I	-	X	-	X	-	-	-
	Hayes River	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.

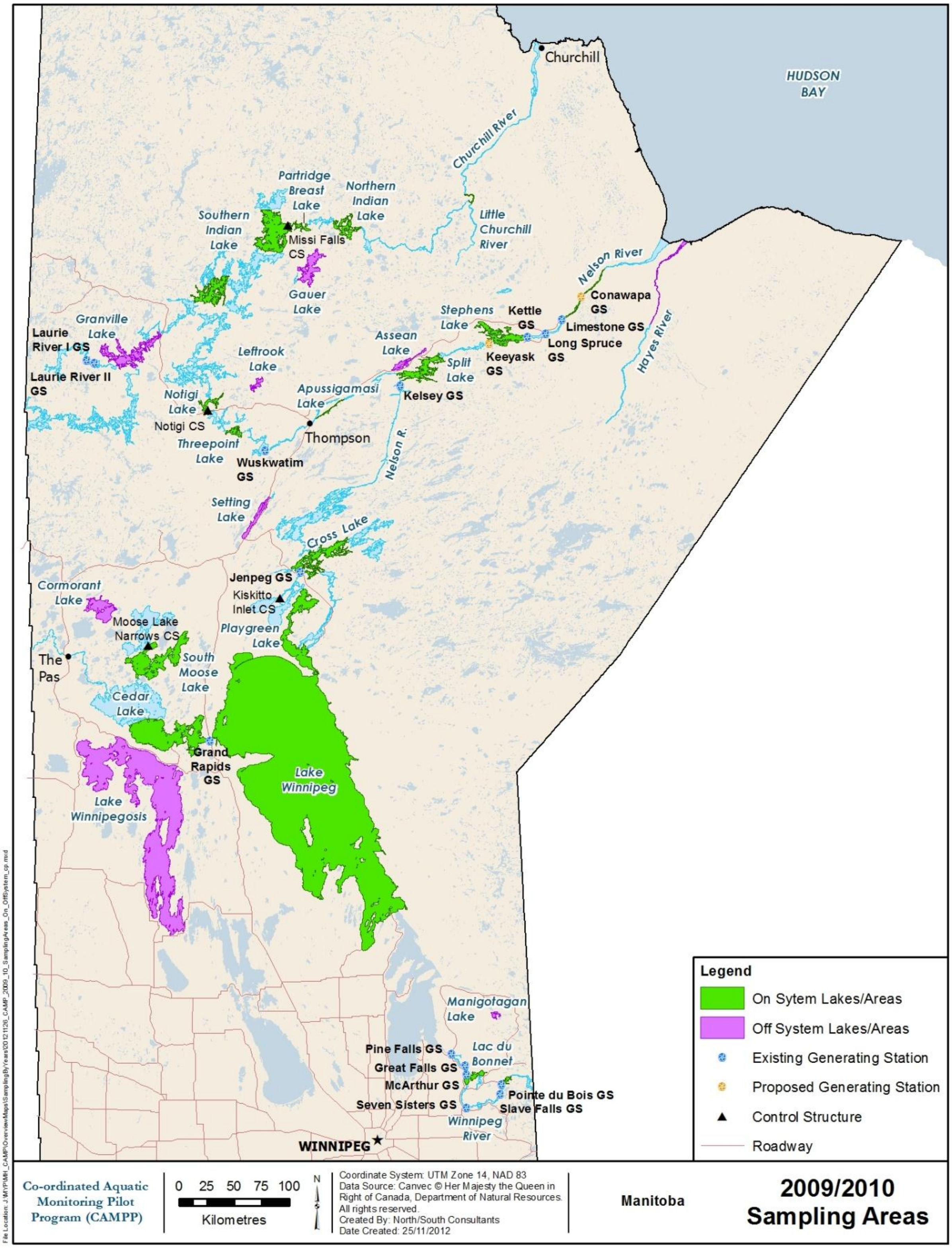

Figure 1-1. On-system and off-system waterbodies/areas sampled under CAMPP in 2009/2010.

2.0 WINNIPEG RIVER REGION

The following provides an overview of the results of CAMPP for 2009/2010 for the Winnipeg River Region, by each major component. A description of methods is provided in Section 4 and in detail in Appendix 1.

2.1 CLIMATE

Based on comparisons to climate normals, 2009 was characterized by a relatively cool spring and early summer, while the month of September was notably warmer and wetter than normal (Figure 2.1-1). In addition, the majority of the open-water season was wetter than normal, most notably the month of August.

Mean monthly air temperatures measured at Pinawa in 2009 were generally similar to or slightly lower than the 1971-2000 temperature normal over the open-water sampling period (Figure 2.1-1). Notable exceptions included the months of May, where air temperature was approximately 3.5 °C below normal, and September, where air temperature was approximately 6 °C above normal (approximately 50% higher than normal). The annual mean air temperature was nearly identical to the normal annual mean.

Precipitation normals indicate peaks in June and relatively low levels of precipitation in winter (Figure 2.1-1). In 2009, the highest precipitation occurred in August (approximately 250% of the normal for that month) with secondary peaks in June and September. Conversely, April was notably drier than normal (approximately 19% of the normal for that month). Overall, 2009 was characterized by higher than normal total precipitation.

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. In 2009, CAMPP monitoring occurred in the Pointe du Bois GS Forebay and on Lac du Bonnet, which acts as the McArthur Falls GS Forebay. Flows for the entire reach 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 Lake is the off-system waterbody for this region.

Winnipeg River flows in 2009 were at or above the upper quartile for most of the year (Figure 2.2-1). Above average snowpack in the Winnipeg River basin led to very high spring to early summer flows, while average precipitation in 2009 kept flows above the upper quartile for much of the year until flows returned to average for November and December.

The Pointe du Bois Forebay water levels are controlled within a narrow range, typically fluctuating by less than 0.1 metres. Water levels in 2009 generally remained within this range (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 2009 were very near the average (Figure 2.2-3).

There are no direct water level data for Manigotagan Lake. Manigotagan River flows have been measured by Water Survey of Canada from 1913 to 1996 however there is no data available for 2009.

2.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 2 of CAMPP in the Winnipeg River Region. Waterbodies sampled were consistent with Year 1 of CAMPP and included the Pointe du Bois Forebay, Lac du Bonnet (approximately 86.5 km downstream) and an off-system lake (Manigotagan Lake; Figure 2.3-1). Winter sampling was not completed in the Pointe du Bois Forebay due to poor ice conditions.

2.3.1 Routine Variables and Limnology

Results of the 2009/2010 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 in the Pointe du Bois Forebay and in Lac du Bonnet, can be generally described as moderately nutrient-rich, clear, slightly alkaline, and soft. Neither the Pointe du Bois Forebay nor Lac du Bonnet were thermally stratified in 2009/2010 (Figure 2.3-2). Although dissolved oxygen (DO) concentrations decreased with depth in Lac du Bonnet in summer 2009, both sites on the Winnipeg River exhibited DO concentrations 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; 5.5 to 9.5

depending on season) across depth over the monitoring periods in 2009/2010. *In situ* turbidity, pH, and specific conductance, were generally relatively consistent across depth in each of the waterbodies (Figures 2.3-4 to 2.3-6). Secchi disk depths ranged between 1 and 1.5 m in the Pointe du Bois Forebay and from 0.55 to 1.25 m in Lac du Bonnet in the open-water season (Figure 2.3-7).

Two of the three samples collected from the Pointe du Bois Forebay and three of the four samples collected from Lac du Bonnet we at or above the Manitoba narrative guideline for total phosphorus (TP) of 0.025 mg/L for lakes, ponds, and reservoirs (Figure 2.3-8). All other routine water quality variables for which there are MWQSOGs (MWS 2011), including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010 at sites along the Winnipeg River.

The majority of TP was in dissolved form (Figure 2.3-9) and the majority of total nitrogen (TN) was composed of organic nitrogen (Figure 2.3-10). On average, nitrate/nitrite comprised a larger portion of dissolved inorganic nitrogen (DIN) than ammonia in each of the waterbodies. Concentrations and the relative proportion of TN represented by nitrate/nitrite were higher in the ice-cover season in Lac du Bonnet (no winter sample was collected at Pointe du Bois).

2.3.1.2 Off-system Waterbody

Unlike sites on the Winnipeg River, Manigotagan Lake was stratified in summer and fall 2009 (Figure 2.3-2) and DO was below the long-term PAL objectives for cool and cold-water species (6.5 and 9.5 depending on season; MWS 2011) in fall 2009 and winter 2010 in the lower portion of the water column (Figure 2.3-3).

In situ turbidity and specific conductance were generally relatively consistent across depth in Manigotagan Lake (Figures 2.3-4 to 2.3-6). In fall 2009, pH in the lower portion of the water column was below the lower PAL limit (6.5-9.0); otherwise pH was relatively consistent across depth in 2009. Mean Secchi disk depth was 1.66 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). All samples were within MWQSOGs for PAL for ammonia (objectives are site specific based on pH and temperature) and nitrate/nitrite (2.93 mg N/L) in Manigotagan Lake in 2009/2010.

As observed along the Winnipeg River, 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) in Manigotagan Lake. Also consistent with Winnipeg River sites, on average, nitrate/nitrite comprised a larger portion of DIN than ammonia in each of the waterbodies. Concentrations and the relative proportion of TN represented by nitrate/nitrite were also higher in the ice-cover season in Manigotagan Lake, as observed in Lac du Bonnet.

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

2.3.2 Metals and Major Ions

2.3.2.1 On-system Waterbodies

Summaries of metal concentrations and detection frequencies measured in the Winnipeg River Region in 2009/2010 are presented in Table 2.3-3. A number of metals were not detected at either Winnipeg River site during any sampling period including beryllium, bismuth, boron, cesium, nickel, tellurium, thallium, tungsten, and zinc. Aluminum, arsenic, barium, calcium, copper, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and titanium were consistently detected and the remaining metals were detected in some but not all samples.

Aluminum exceeded the MWQSOG PAL guideline (0.100 mg/L; MWS 2011) in samples collected in spring, summer, and fall in Lac du Bonnet and the Pointe du Bois Forebay (Table 2.3-4, Figure 2.3-13). Iron exceeded the MWQSOG PAL guideline (0.3 mg/L) in spring and fall in Lac du Bonnet and the Pointe du Bois Forebay (Figure 2.3-13).

Selenium and silver were each detected in one of four samples collected from Lac du Bonnet in 2009/2010; the analytical detection limits (DLs) for selenium (0.001 mg/L) and silver (0.0001 mg/L) are equivalent to the Manitoba PAL guidelines (MWS 2011). Measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit.

One sample collected from the Pointe du Bois Forebay contained mercury at a concentration above the current Manitoba PAL guideline (MWS 2011). Mercury was not detected in any other samples; however, as the current Manitoba PAL guideline for mercury (0.000026 mg/L inorganic mercury) is lower than the analytical DLs for some of the sampling periods in 2009/2010, direct comparisons to the guideline could not be made for all samples. All other metals for which there are MWQSOGs for PAL were within objectives and guidelines (Table 2.3-4).

Chloride concentrations were relatively low in the Winnipeg River (i.e., ≤ 1.9 mg/L; Table 2.3-2), which is consistent with concentrations reported elsewhere in the "unimpacted Canadian shield region of central Canada" (Canadian Council of Ministers of the Environment [CCME] 1999; updated to 2013). Concentrations of chloride were also well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 10 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). 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 waters ranging from soft to very hard (Meays and Nordin 2013).

2.3.2.2 Off-system Waterbody

With the exception of tungsten which was detected in two of the four samples collected in 2009/2010, metals not detected at Winnipeg River sites were also not detected in Manigotagan Lake (Table 2.3-3). Mercury was also not detected in Manigotagan Lake in 2009/2010.

Also like the 2009/2010 monitoring results for sites along the Winnipeg River, aluminum, arsenic, barium, calcium, copper, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and titanium were consistently detected in Manigotagan Lake. Uranium was also consistently detected in the off-system waterbody in 2009/2010.

Although aluminum exceeded the MWQSOG PAL guideline (0.100 mg/L; MWS 2011) in three samples collected from Manigotagan Lake in 2009/2010, concentrations were lower than observed along the Winnipeg River (Figure 2.3-13). In contrast to Lac du Bonnet and the Pointe du Bois Forebay, iron was consistently below the MWQSOG PAL (0.3 mg/L) in surface water samples collected from Manigotagan Lake (Figure 2.3-13).

Selenium was detected in one sample collected from Manigotagan Lake and the concentration marginally exceeded the MWQSOG PAL (0.001 mg/L; MWS 2011). As noted above, measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit. All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in surface samples collected from Manigotagan Lake in 2009/2010 (Table 2.3-4).

Concentrations of total aluminum, iron, and manganese were higher in samples collected near the sediment-water interface in summer and fall 2009 in Manigotagan Lake (Figure 2.3-14), when the lake was thermally stratified and DO was lower at depth. Aluminum concentrations exceeded the MWQSOG PAL (0.100 mg/L) in these bottom samples and iron exceeded the MWQSOG PAL (0.3 mg/L) in the bottom sample collected in summer.

Like the Winnipeg River, chloride concentrations were low in Manigotagan Lake (i.e., < 1.2 mg/L; Table 2.3-2), which is consistent with concentrations reported elsewhere in the "unimpacted Canadian shield region of central Canada" (CCME 1999; updated to 2013), and well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 15 mg/L (Table 2.3-2) and fell on the lower range of concentrations reported across Canada (CCREM 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013).

2.3.3 Trophic Status and Nutrient Ratios

2.3.3.1 On-system Waterbodies

In 2009/2010, Lac du Bonnet and the Pointe du Bois Forebay were classified as meso-eutrophic on the basis of open-water season mean TP concentrations (Table 2.3-5) and mesotrophic on the basis of both TN and chlorophyll *a* concentrations (open-water means; Tables 2.3-6 and 2.3-7).

On average, Lac du Bonnet and the Pointe du Bois Forebay were phosphorus limited during the 2009/2010 sampling periods, as estimated from TN:TP molar ratios (Figure 2.3-15). Similarly, examination of mean total organic carbon (TOC) to organic nitrogen molar ratios indicates that organic matter in the three waterbodies was a mixture of allochthonous and autochthonous sources (Figure 2.3-16).

The TN:TP ratio in Lac du Bonnet in fall was notably lower than during other sampling periods in the lake and relative to other sites. The TOC to organic nitrogen ratio was also notably different at this site in fall and indicated that allochthonous materials were the largest source of organic matter at this time (Figure 2.3-16). These observations relate to a relatively low concentration of TKN measured in this sample.

2.3.3.2 Off-system Waterbody

The 2009/2010 trophic status of Manigotagan Lake was on the mesotrophic to meso-eutrophic boundary on the basis of TP; and mesotrophic TN and chlorophyll *a* concentrations (open-water means; Tables 2.3-5 to 2.3-7). Like sites on the Winnipeg River, molar TN:TP ratios indicate that Manigotagan lake was phosphorus limited in 2009/2010 (Figure 2.3-15). TOC to organic N molar ratios indicate that organic matter in the lake 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 both of the samples collected from the Pointe du Bois Forebay (2 to 3 CFU/100 mL) and in two of three samples from Lac du Bonnet (<1 to 50 CFU/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 in Manigotagan Lake in 2009/2010 and all measurements were well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 2.3-2; MWS 2011).

2.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 2 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 lake (Manigotagan Lake; Figure 2.3-1).

2.4.1 Chlorophyll *a*

Open-water season chlorophyll *a* concentrations in the Winnipeg River Region were moderate to high (Figure 2.4-1), and were similar between waterbodies. Winter chlorophyll *a* concentrations were consistently lower than those of the open-water season, indicating that productivity was low under-ice.

2.4.2 Community Composition and Biomass

In general, phytoplankton biomass was similar between waterbodies in the region in 2009/2010; however, in spring, it was higher at both sites in the Winnipeg River than in Manigotagan Lake (Figure 2.4-2). Overall, phytoplankton biomass was highest in summer and lowest in fall.

At sites sampled along the Winnipeg River, the phytoplankton community was dominated by diatoms throughout the open-water season (Figure 2.4-3). In spring, dinoflagellates were the next most common group; however, in summer and fall, cryptophytes, chrysophytes, green algae and blue-greens made up the remainder of the phytoplankton community. Phytoplankton community composition differed in Manigotagan Lake. In spring, dinoflagellates, cryptophytes and diatoms made up the majority of the phytoplankton community. In summer, diatoms were the dominant group, with chrysophytes and blue-greens also abundant. By fall, the phytoplankton community of Manigotagan Lake resembled that in Lac du Bonnet (i.e., dominated by diatoms, with cryptophytes, chrysophytes, green algae and blue-greens), but with a higher proportion of blue-greens.

Phytoplankton species richness ranged from 13 to 23 in the Winnipeg River Region in 2009/10 (Table 2.4-1) and was generally similar between waterbodies. Species diversity (Simpson's Diversity, D) was moderate to high, but diversity, evenness ($E_{D,}$ $E_{H,}$ $E^{H'}$/S), heterogeneity (H), and effective richness (E^{H}) were all lower in the Pointe du Bois Forebay than in Lac du Bonnet and Manigotagan Lake.

2.4.1 Bloom Monitoring

Chlorophyll *a* concentrations were always below the bloom monitoring trigger of 10 µg/L in 2009/2010.

2.4.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 in all waterbodies sampled in 2009.

Microcystin-LR was not measured in this region in 2009 as the chlorophyll *a* concentration was always below the 10 µg/L trigger.

2.4.3 Trophic Status

In terms of mean chlorophyll *a* concentrations (open-water and annual), the Pointe du Bois Forebay, Lac du Bonnet, and Manigotagan Lake were mesotrophic in 2009 (Table 2.3-6).

2.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Winnipeg River Region in 2009/2010; the second year of CAMPP. Areas sampled included the on-system waterbodies Pointe du Bois Forebay and Lac du Bonnet, and the off-system waterbody Manigotagan Lake. The Winnipeg River at Pointe du Bois Forebay and Lac du Bonnet, and Manigotagan Lake, are all sampled annually (Figures 2.5-1 to 2.5-3).

Fifteen BMI samples were collected in each of the nearshore and offshore polygons in Pointe du Bois Forebay, Lac du Bonnet, and Manigotagan Lake using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted between 17 and 23 September 2009.

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 2009, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and for the offshore habitat water depths of greater than 5 m were targeted. In 2009, mean water depths sampled in the nearshore were: 1.9 m in the Pointe du Bois Forebay, 4.2 m in Lac du Bonnet, and 2.9 m in Manigotagan Lake. Mean water depths sampled in the offshore were: 10.5 m in Pointe du Bois Forebay, 12.4 m in Lac du Bonnet, and 19.5 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 (Table 2.5-2). The nearshore and offshore habitat polygons sampled in the Winnipeg River Region had low mean TOC in the sediments (less than 3.0%) with the exception of the offshore polygon in Manigotagan Lake which was slightly higher at 4.6% Table 2.5-2). Mean TOC in the nearshore habitat was highest at Lac du Bonnet (2.1%), followed by Pointe du Bois (1.9%), and Manigotagan Lake (1.7%) (Table 2.5-2). Within the region, Manigotagan Lake had the highest TOC in the offshore (4.6%) followed by Lac du Bonnet (2.6%), and Point du Bois (1.5%) (Table 2.5-2).

Silt comprised the majority of the sediments collected from predominantly wetted nearshore polygons in all waterbodies, though silt and sand were similarly represented in the Manigotagan Lake nearshore polygon (Table 2.5-2). Sand dominated sediments in the offshore habitat within the Pointe du Bois Forebay, while silt comprised the majority of the sediments collected from the offshore polygons in Lac du Bonnet and Manigotagan Lake (Table 2.5-2).

2.5.2 Species Composition, Distribution, and Relative Abundance

2.5.2.1 Pointe du Bois Forebay

Mean BMI density in benthic grab samples in the nearshore habitat of the Pointe du Bois Forebay was 3,636 individuals/m^2 with densities ranging from 173 to 17,529 (Table 2.5-3). Overall, non-insects dominated the BMI community in abundance (65% of the mean total BMI), with insects comprising 34% of the overall taxa (Table 2.5-3). Of the non-insects, the main group was Amphipoda (40% of the mean total BMI), followed by Oligochaeta (10%), Bivalvia (7%), Gastropoda (7%); small numbers of Hirudinea were also present. Insects mainly consisted of Chironomidae (21%); Ephemeroptera (7%) and Trichoptera (3%); a small number of Ceratopogonidae, Megaloptera, Anisoptera (dragonflies), Lepidoptera (butterflies and moths), and Coleoptera were also identified The overall mean BMI density in benthic grab samples in the offshore habitat was 869 individuals/m^2 with densities ranging from 87 to 1,601 (Table 2.5-3). Overall, insects dominated the BMI community (80% of the mean total invertebrates sampled), with the non-insects comprising 20% of the overall taxa (Table 2.5-3). Insects mainly consisted of Ephemeroptera (61% of the mean total BMI); Chironomidae (14%), Trichoptera (2%), and a small number of Ceratopogonidae, Megaloptera, and Hemiptera were also collected (Table 2.5-3). The non-insects were comprised of Oligochaeta (13%) and Bivalvia (6%).

Total EPT comprised 10% of the mean total nearshore BMI, with prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in nearshore grab samples though other genera in the Ephemeridae, Leptophlebiidae, and Caenidae were also identified (Table 2.5-3). Trichoptera were also collected in small numbers and Plecoptera were absent. In the offshore polygon, total EPT comprised 63% of the mean total BMI, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was singly dominant in offshore grab samples (Table 2.5-3). Trichoptera were also collected in small numbers and Plecoptera were again absent. The ratio of EPT:C was 0.72 in the nearshore polygon and 6.67 in the offshore polygon (Figure 2.5-1; Table 2.5-3). The ratio in the nearshore indicated Chironomidae dominated over EPT in the insect community. The ratio in the offshore indicated an insect community dominated by EPT compared to Chironomidae.

Taxonomic richness in the nearshore was 23 families, with sample richness values ranging from three to 14 (Table 2.5-3). Hill’s Effective Richness (E^H) was six; Hyalellidae, Chironomidae, Oligochaeta, Pisidiidae, and Ephemeridae were the most dominant taxa. Taxonomic richness in the offshore was nine families; with sample richness values ranging from one to six (Table 2.5-3). Hill’s Effective Richness (E^H) was three with Ephemeridae, Chironomidae, and Oligochaeta dominating the invertebrates sampled.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.75 and 0.51 in the nearshore and offshore polygons, respectively (Table 2.5-3). Evenness (Simpson's Equitability [E_D]) was 0.56 in the nearshore polygon and 0.63 in the offshore polygon (Table 2.5-3).

2.5.2.2 Lac du Bonnet

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat in Lac du Bonnet was 825 individuals/m^2 with numbers ranging from 130 to 2,121 (Table 2.5-4). Overall, non-insects dominated the BMI community in abundance (82% of the mean total BMI), with insects comprising 18% of the overall taxa (Table 2.5-4). Of the non-insects, the main groups were Gastropoda (41% of the mean BMI) and Bivalvia (39%), though Oligochaeta and Amphipoda were also present (Table 2.5-4). Insects mainly consisted of Ephemeroptera (12%) and Chironomidae (3%); Coleoptera, Ceratopogonidae, Megaloptera, and Plecoptera, were also identified in small numbers (Table 2.5-4). The overall mean BMI density in benthic grab samples in the offshore habitat was 2,629 individuals/m^2 with densities ranging from 1,385 to 5,280 (Table 2.5-4). Overall, non-insects dominated this BMI community (86% of the mean total BMI), with insects comprising 14% of the overall taxa (Table 2.5-4). Of the non-insects, the main group was Amphipoda (75%) followed by Bivalvia (10%), Oligochaeta (1%) and a small number of Hirudinea (Table 2.5-4). Insects mainly consisted of Chironomidae (7%) and Ephemeroptera (7%) with small numbers of Trichoptera and Coleoptera (Table 2.5-4).

Total EPT comprised 12% and 7% of the mean total BMI community sampled in the nearshore and offshore polygons, respectively, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in both habitats (Table 2.5-4). Small numbers of Plecoptera were identified in the nearshore habitat, but not the offshore habitat, and one other Ephemeroptera family was identified in the offshore habitat (Table 2.5-4). Trichoptera were also collected in small numbers in the offshore only (Table 2.5-4). The ratio of EPT:C was completely balanced in the nearshore polygon (1.00) and EPT slightly dominated (1.30) over Chironomidae in the offshore polygon (Table 2.5-4).

Overall taxonomic richness was 12 families in the nearshore habitat, with sample richness values ranging from one to seven (Table 2.5-4). Hill's Effective Richness (E^H) was three; Pisidiidae, Gastropoda, and Ephemeridae dominated this habitat (Table 2.5-4). Taxonomic richness was 10 families in the offshore, with sample richness values ranging from three to six (Table 2.5-4). Hill's Effective Richness (E^H) was three in the offshore habitat with Haustoriidae notably dominating the polygon (Table 2.5-4).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.44 in the nearshore and 0.51 in the offshore polygon (Table 2.5-4). Evenness values (Simpson's Equitability [E_D]) was 0.64 in the nearshore polygon and 0.37 in the offshore polygon (Table 2.5-4).

2.5.2.3 Manigotagan Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Manigotagan Lake was 2,505 individuals/m^2 with densities ranging from 866 to 5,367 (Table 2.5-5). Overall, insects dominated the BMI community in abundance (73% of the mean total BMI), with the non-insects comprising 27% of the overall taxa (Table 2.5-5). Insects mainly consisted of Chironomidae (64% of the mean total BMI) with small numbers of Ephemeroptera (4%), Megaloptera, Trichoptera, Ceratopogonidae, Anisoptera, and Chaoboridae were also identified (Table 2.5-5). Of the non-insects, the main group was Oligochaeta (23%); Bivalvia, Amphipoda, and Gastropoda were also present in small numbers. The overall mean BMI in benthic grab samples in the offshore habitat was 2,404 individuals/m^2 with densities ranging from 1,212 to 3,592 (Table 2.5-5). Overall, insects dominated the BMI community in abundance (55% of the mean total BMI), with non-insects comprising 45% of the overall taxa (Table 2.5-5). Insects mainly consisted of Chaoboridae (33% of the mean total BMI) and Chironomidae (22%); small numbers of Ephemeroptera were also collected. Non-insects were comprised of Amphipoda (24%), Bivalvia (11%), and Oligochaeta (10%).

Total EPT comprised 6% of the mean total nearshore BMI, with the prevalence being within the Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in nearshore grab samples; though genera within Baetidae and Leptophlebiidae were also present (Table 2.5-5). Three families within Trichoptera were present and Plecoptera were absent (Table 2.5-5). In the offshore polygon, total EPT was 0% of the mean total nearshore BMI; only 3 individuals/m^2 were present. Genus analysis of the Ephemeroptera indicated that Hexagenia sp. was the sole mayfly present (Table 2.5-5). The ratio of EPT:C was 0.13 in the nearshore polygon indicating Chironomidae were dominant over EPT in this habitat (Table 2.5-5). The ratio of EPT:C was 0.00 in the offshore polygon, indicating that very few EPT were present in comparison to Chironomidae (Table 2.5-5).

Taxonomic richness in the nearshore was 17 families with richness values ranging from three to nine (Table 2.5-5). Hill's Effective Richness (E^H) was four; Chironomidae and Oligochaeta were most dominant. Taxonomic richness in the offshore was six families with sample richness values ranging from four to six (Table 2.5-5). Hill's Effective Richness (E^H) was four; Chaoboridae, Haustoriidae, and Chironomidae were notably dominant in this offshore habitat.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.60 and 0.71 in the nearshore and offshore polygons, respectively (Table 2.5-5). Evenness (Simpson's Equitability [E_D]) was 0.47 in the nearshore polygon and 0.61 in the offshore polygon (Table 2.5-5).

2.6 FISH COMMUNITY

2.6.1 Gill netting

In 2009, in the Winnipeg River Region, gill netting was conducted in the Pointe du Bois Forebay (14 - 20 July) and Lac du Bonnet (20 – 24 September) (Figures 2.6-1 and 2.6-2). Gill netting was also conducted in Manigotagan Lake (1 – 3 September), an off-system waterbody (Figure 2.6-3). No sampling occurred in Eaglenest Lake in 2009.

A total of 15, ten, and six standard gang gillnet sites were sampled in the Pointe du Bois Forebay, Lac du Bonnet, and Manigotagan Lake (Table 2.6-1). Small mesh index gill nets were set at 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).

Surface water temperatures in July in the Pointe du Bois Forebay ranged from 16.0 to 20.5°C in 2009 while late September temperatures in Lac du Bonnet ranged from 19.3 to 21.3°C and early September temperatures in Manigotagan Lake ranged from 18.0 to 22.7°C.

2.6.2 Species Composition

In 2009, 20 species of fish were captured in the Winnipeg River Region (Table 2.6-2).

2.6.2.1 Pointe du Bois Forebay

A total of 891 fish representing 17 species were captured in standard gang index gill nets, and a total of 107 fish representing seven 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 = 30.6%), while the next three most common species were Yellow Perch (21.1%), Sauger (15.4%) and Walleye (11.3%) (Table 2.6-3, Figure 2.6-4). In the small mesh index gillnet catch, Sauger (41.1%) was the most common species captured followed by Yellow Perch (21.5%), Troutperch (19.6%) and Walleye (8.4%).

White Sucker represented 48.75% of the biomass in the standard gang index gillnet catch, followed by Walleye (16.93%), Northern Pike (9.90%) and Sauger (5.28%) (Table 2.6-4). In the small mesh index gillnet catch, Sauger represented 33.03% of the biomass followed by Northern Pike (31.10%) and Walleye (23.99%) (Table 2.6-4).

2.6.2.2 Lac du Bonnet

A total of 349 fish representing 14 species were captured in standard gang index gill nets set in Lac du Bonnet in 2009 (Table 2.6-3). For the small mesh index gill nets, a total of 102 fish representing eight species were captured.

The most common species captured in standard gang index gill nets was Sauger (relative abundance = 33.2%) and the next three most common species were Walleye (15.8%), Yellow Perch (15.2%) and White Sucker (9.7%) (Table 2.6-3, Figure 2.6-4). In the small mesh index gillnet catch, Sauger was the most common species captured overall at 52%. Yellow Perch (24.5%) and Walleye (11.8%) were also abundant in 2009 small mesh index gillnet catches.

White sucker represented 25.14% of the biomass in the standard gang index gillnet catch, followed by Walleye (16.27%), Northern Pike (11.70%) and Lake Whitefish (11.41%) (Table 2.6-4). In the small mesh index gillnet catch, Sauger represented 80.77% of the biomass followed by Yellow Perch (9.38%) and Walleye (7.08%) (Table 2.6-4).

2.6.2.3 Manigotagan Lake

A total of 281 fish representing eight 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 five fish representing three species were captured.

The most common species captured in standard gang index gill nets were Walleye (relative abundance = 34.2%), followed by Cisco (29.9%) and Lake Whitefish (14.6%) (Table 2.6-3, Figure 2.6-4). In the small mesh index gillnet catch Walleye made up 60% of the catch, while Cisco and Smallmouth Bass made up the remainder of the catch at 20% each.

Walleye represented 38.70% of the biomass in the standard gang index gillnet catch, followed by Lake Whitefish (22.57%), White Sucker (12.62%) and Burbot (9.40%) (Table 2.6-4). In the small mesh index gillnet catch, Walleye represented 85.37% of the biomass followed by Cisco (14.46%) and Smallmouth Bass (0.17%) (Table 2.6-4).

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

2.6.3.1 Pointe du Bois Forebay

The overall mean CPUE value for the standard gang index gillnet catch in the Pointe du Bois Forebay in 2009 was 45.6 fish/100 m/24 h (Table 2.6-5, Figure 2.6-5). For the small mesh index gillnet catch this value was 14.0 fish/30 m/24 h.

The highest CPUE values for the standard gang index gillnet catch were recorded for White Sucker (14.0). Yellow Perch (9.6), Sauger (6.8) and Walleye (5.1) recorded the next highest CPUE values (Table 2.6-5, Figure 2.6-6). For the small mesh index gill nets the highest CPUE values were recorded for Sauger (6.5), Troutperch (2.6) and Yellow Perch (2.4) (Table 2.6-5, Figure 2.6.6).

Mean BPUE for the standard gang index gillnet catch was 31,428 g/100 m /24 h (Table 2.6-6). White Sucker had the highest BPUE (15,615) followed by Walleye (5,382) and Northern Pike (2,609). Small mesh index gill nets produced a BPUE of 1,682 g/30 m /24 h (Table 2.6-6) with Sauger having the highest BPUE (673).

2.6.3.2 Lac du Bonnet

The overall mean CPUE value for the standard gang index gillnet catch in Lac du Bonnet in 2009 was 37.5 (Table 2.6-5, Figure 2.6-5). For the small mesh index gillnet catch this value was 40.6.

The highest CPUE values for the standard gang index gillnet catch were recorded for Sauger (12.7), Walleye (5.9) and Yellow Perch (5.4) (Table 2.6-5, Figure 2.6-6). For the small mesh index gill nets the highest CPUE values were recorded for Sauger (21.2), Yellow Perch (20.4) and Walleye (12.0) (Table 2.6-5, Figure 2.6-6).

Mean BPUE for the standard gang index gillnet catch was 20,147 g (Table 2.6-6). White Sucker had the highest BPUE (5,003) followed by Walleye (3,293) and Northern Pike (2,486). Small mesh index gill nets produced a BPUE of 2164 g (Table 2.6-6) with Walleye having the highest BPUE (1,754).

2.6.3.3 Manigotagan Lake

In Manigotagan Lake, the overall mean CPUE value for the standard gang index gillnet catch in 2009 was 50.4 (Tables 2.6-5, Figure 2.6-5). For the small mesh index gillnet catch this value was 3.0.

The highest CPUE values for the standard gang index gillnet catch were recorded for Walleye (16.2) and Cisco (16.1), followed by Lake Whitefish (7.6) a distant third (Table 2.6-5, Figure 2.6-6). For the small mesh index gill nets in 2009, only Walleye (1.7), Cisco (0.7) and Smallmouth Bass (0.6) were captured (Table 2.6-5, Figure 2.6-6).

Mean BPUE for the standard gang index gillnet catch was 28,992 g (Table 2.6-6). Walleye had the highest BPUE (10,808) followed by Lake Whitefish (6,940) and White Sucker (3,584). Small mesh index gill nets produced a BPUE of 695 g (Table 2.6-6) with Walleye having the highest BPUE (577).

2.6.4 Size and Condition

2.6.4.1 Pointe du Bois Forebay

Fish length and condition factor data were collected and analyzed for Northern Pike, Sauger and Walleye collected from standard gang index gill nets set in the Pointe du Bois Forebay during 2009 (Table 2.6-7). Mean (SD) fork lengths were as follows: Northern Pike = 552 mm (155); Sauger = 297 mm (40) and Walleye = 413 mm (131). Mean weights for the same species were 1495 g, 206 g and 987 g respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.7 (0.12); Sauger = 0.87 (0.10) and Walleye = 1.10 (0.16). Length frequency distributions for Northern Pike, Lake Whitefish, Sauger and Walleye captured in 2009 are provided in Figures 2.6-7, 2.6-8, 2.6-9 and 2.6-10.

2.6.4.2 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 2009 (Table 2.6-7). Mean (SD) fork length for Northern Pike was 594 mm (184), Lake Whitefish 448 mm (109), Sauger 235 mm (45) and Walleye 290 mm (132). Mean (SD) weights for the same species were 1847 g (2057), 1292 g, 133 g and 463 g respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.66 (0.07); Lake Whitefish = 1.56 (0.22); Sauger 0.91 (0.13) and Walleye = 1.07 (0.10).

Length frequency distributions for Northern Pike, Lake Whitefish, Sauger, and Walleye for 2009 are provided in Figures 2.6-7, 2.6-8, 2.6-9 and 2.6-10, respectively.

2.6.4.3 Manigotagan Lake

Fish length and condition factor data were collected and analyzed for Northern Pike, Lake Whitefish and Walleye collected from standard gang index gill nets set in Manigotagan Lake during 2009 (Table 2.6-7). Mean (SD) fork lengths were as follows: Northern Pike = 556 mm (77); Lake Whitefish = 402 mm (57) and Walleye = 354 mm (131). Mean (SD) weights for the same species were 1196 g (638), 920 g (378) and 661 g respectively. Mean (SD) condition factors were as follows: Northern Pike = 0.66 (0.09); Lake Whitefish = 1.34 (0.18) and Walleye = 1.00 (0.13).

Length frequency distributions for Northern Pike, Lake Whitefish and Walleye are provided in Figures 2.6-7, 2.6-8, and 2.6-10, respectively.

2.6.5 Age Composition

2.6.5.1 Pointe du Bois Forebay

Age- and year-class frequency distributions were calculated for Northern Pike, Sauger and Walleye captured in standard gang index gill nets in the Pointe du Bois Forebay during 2009 (Table 2.6-8).

Age was determined for 39 Northern Pike, 134 Sauger and 101 Walleye captured in standard gang index gill nets set in the Pointe du Bois Forebay in 2009 (Table 2.6-8). Ages ranged from 3 to 12 years for Northern Pike, 3 to 14 years for Sauger and 3 to 16 years for Walleye.

For Northern Pike, over 60% of the aged fish ranged between 4 and 6 years of age, while a large majority of the Sauger were 4, 6 or 7 years old. Walleye aged 3 through 16 were quite evenly represented, with 3-year old fish captured in the highest numbers.

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

2.6.5.2 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 the Lac du Bonnet during 2009 (Table 2.6-8).

Age was determined for 11 Northern Pike, 12 Lake Whitefish, 134 Sauger and 55 Walleye. Ages ranged from 3 to 12 years for Northern Pike, 1 to 16 years for Lake Whitefish, 1 to 12 years for Sauger and 0+ to 15 years for Walleye. A majority of the aged Northern Pike were 4 years of age (36.36%), Lake Whitefish between 3 and 6 years (66.67%), Sauger 3 or 4 years (53.91%), and Walleye 2 and 3 years (56.36%).

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

2.6.5.3 Manigotagan Lake

Age- and year-class frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Manigotagan Lake during 2009 (Table 2.6-8).

Age was determined for 13 Northern Pike, 41 Lake Whitefish and 96 Walleye. Ages ranged from 4 to 13 years for Northern Pike, 6 to 24 years for Lake Whitefish and 2 to 19 years for Walleye. A majority of the aged Northern Pike were 4 to 6 years of age (69.23%), Lake Whitefish 8, 11, or 12 years of age (46.35%), and Walleye 2 or 3 years (66.67%).

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

2.6.6 Deformities, Erosion, Lesions and Tumours (DELTs)

2.6.6.1 Pointe du Bois Forebay

A total of four instances (0.7%) of DELTs were recorded from 565 individuals of six species of fish examined from Pointe du Bois Forebay in 2009 (Table 2.6-13). All incidences of DELTs were observed to occur in Lake Sturgeon (40%, n = 5) and White Sucker (0.7%, n = 5). In total, two lesions were found on White Sucker; while two deformities were found on Lake Sturgeon. Northern Pike (n = 40), Lake Whitefish (n = 9), Sauger (n=137) and Walleye (n = 101) also were examined for DELTs but none were observed.

2.6.6.2 Lac du Bonnet

No instances of DELTs were recorded from 233 individuals of six species fish examined from Lac du Bonnet in 2009 (Table 2.6-13). In all, Lake Sturgeon (n = 4), White Sucker (n = 34) Northern Pike (n = 11), Lake Whitefish (n = 13), Sauger (n = 116), and Walleye (n = 55) and were examined for DELTs.

2.6.6.3 Manigotagan Lake

Only two DELTs from the same fish were recorded from 170 individuals (1.2%) of four fish species examined from Manigotagan Lake in 2009 (Table 2.6-13). The DELTs recorded were a deformity and a lesion observed to occur on a single individual Walleye (1.0%, n = 96). White

Sucker (n = 20), Northern Pike (n = 13) and Lake Whitefish (n = 41) were also examined for DELTs but none were observed.

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Table 2.3-1. Summary statistics for *in situ* variables (near surface) measured in the Winnipeg River Region: 2009/2010.

	Temperature (°C)			*In situ* pH			Dissolved Oxygen (DO) (mg/L)			DO Saturation (% saturation)			*In situ* Specific Conductance (µS/cm)			*In situ* Turbidity (NTU)			ORP (mV)		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	14.77	11.38	11.03	7.57	7.66	7.75	12.10	12.80	12.30	121	119	114	83.7	89.8	65.8	5.8	6.5	1.4	133	135	138
Median	18.32	12.67	12.17	7.54	7.62	7.84	13.47	13.79	13.04	115	113	106	84.0	90.5	66.0	6.0	7.3	1.6	126	130	127
Minimum	6.08	-0.03	0.79	6.97	7.09	6.93	9.14	9.46	8.88	102	105	97	80.0	85.0	61.0	5.2	2.3	0.0	122	112	115
Maximum	19.90	20.20	19.00	8.20	8.33	8.39	13.70	14.16	14.24	145	146	146	87.0	93.0	70.0	6.3	8.9	2.5	151	167	181
SD	7.56	9.69	8.97	0.62	0.64	0.72	2.57	2.25	2.39	22	19	22	3.5	3.4	4.4	0.6	2.9	1.2	16	25	30
SE	4.37	4.84	4.48	0.36	0.32	0.36	1.48	1.12	1.19	13	10	11	2.0	1.7	2.2	0.3	1.5	0.6	9	13	15
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4

Table 2.3-2. – continued –

	Secchi Disk Depth (m)			Estimated Euphotic Depth (m)			Calculated Euphotic Depth (m)		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	1.43	0.88	1.66	2.9	1.8	3.3	3.0	1.8	3.2
Median	1.43	0.85	1.60	2.9	1.7	3.2	3.0	1.8	3.0
Minimum	1.36	0.55	1.60	2.7	1.1	3.2	3.0	1.1	3.0
Maximum	1.50	1.25	1.78	3.0	2.5	3.6	3.0	2.5	3.6
SD	0.10	0.35	0.10	0.2	0.7	0.2	-	0.7	0.3
SE	0.07	0.20	0.06	0.1	0.4	0.1	-	0.4	0.2
N	2	3	3	2	3	3	1	3	3

Table 2.3-2. Summary statistics for routine laboratory variables measured in the Winnipeg River Region: 2009/2010.

	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)			DIN [1] (mg/L)		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	39.7	42.5	33.2	48.4	51.8	40.5	<0.6	<0.6	<0.6	<0.4	<0.4	0.200	0.005	0.006	0.006	0.0399	0.0665	0.0466	0.37	0.39	0.46	0.045	0.072	0.053
Median	38.7	42.2	33.1	47.2	51.5	40.4	<0.6	<0.6	<0.6	<0.4	<0.4	0.200	0.003	0.005	0.006	0.0433	0.0452	0.0385	0.33	0.43	0.48	0.045	0.048	0.042
Minimum	36.5	39.0	31.7	44.6	47.6	38.7	<0.6	<0.6	<0.6	<0.4	<0.4	0.200	<0.003	<0.003	<0.003	0.0240	0.0160	<0.005	0.31	0.23	0.34	0.034	0.027	0.014
Maximum	43.8	46.4	34.8	53.4	56.6	42.5	<0.6	<0.6	<0.6	<0.4	<0.4	0.200	0.010	0.011	0.012	0.0523	0.1597	0.1070	0.46	0.47	0.55	0.055	0.165	0.112
SD	3.7	3.1	1.7	4.5	3.8	2.0	-	-	-	-	-	0.000	0.004	0.004	0.004	0.0145	0.0638	0.0471	0.08	0.11	0.11	0.011	0.062	0.044
SE	2.2	1.6	0.8	2.6	1.9	1.0	-	-	-	-	-	0.000	0.003	0.002	0.002	0.0084	0.0319	0.0235	0.05	0.06	0.05	0.006	0.031	0.022
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4

Table 2.3-2. – continued –

	Organic Nitrogen[1] (mg/l)			TN[1] (mg/L)			TDP (mg/L)			TPP[1] (mg/L)			TP (mg/L)			TN:TP [1]			DIN:TDP [1]			DIN:TP [1]		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	0.36	0.38	0.46	0.41	0.45	0.51	0.0140	0.0173	0.0163	0.010	0.009	0.007	0.024	0.026	0.023	39	39	53	7	9	7	4	6	5
Median	0.33	0.42	0.47	0.38	0.46	0.51	0.0145	0.0164	0.0139	0.010	0.009	0.006	0.025	0.026	0.023	35	43	50	7	7	7	4	4	4
Minimum	0.31	0.23	0.33	0.35	0.27	0.36	0.0103	0.0132	0.0078	0.008	0.006	0.005	0.022	0.023	0.014	32	22	35	6	5	4	3	3	2
Maximum	0.45	0.47	0.55	0.48	0.63	0.66	0.0171	0.0234	0.0295	0.011	0.012	0.011	0.025	0.029	0.035	50	48	79	8	17	10	5	14	8
SD	0.08	0.11	0.10	0.07	0.15	0.13	0.0034	0.0048	0.0101	0.002	0.002	0.002	0.002	0.003	0.010	10	12	20	1	6	2	1	5	3
SE	0.04	0.06	0.05	0.04	0.07	0.06	0.0020	0.0024	0.0051	0.0009	0.0010	0.0012	0.001	0.001	0.005	6	6	10	1	3	1	0	3	1
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4

Table 2.3-2. – continued –

	DOC (mg/L)			TOC (mg/L)			TIC (mg/L)			TOC:ON[1]			TOC:TN[1]			TDS (mg/L)			Laboratory Conductivity (μmhos/cm)			TSS (mg/L)			Laboratory Turbidity (NTU)		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	10.8	11.0	13.6	10.9	11.0	14.0	8.5	9.1	7.1	36	42	38	32	34	34	68.7	76.5	64.0	87.6	94.0	70.9	2.9	4.3	<2.0	4.78	5.58	1.92
Median	10.9	11.1	13.7	10.9	11.0	14.3	8.2	9.0	6.8	39	32	36	33	28	31	70.0	76.3	67.0	86.9	94.4	70.8	2.8	5.0	<2.0	4.33	5.58	2.00
Minimum	10.4	10.1	12.6	10.5	10.2	12.8	8.1	8.6	6.7	27	26	28	25	20	26	58.0	65.3	50.0	81.6	87.2	65.5	2.4	<2.0	<2.0	3.90	3.76	1.28
Maximum	11.1	11.8	14.3	11.3	11.7	14.5	9.1	9.7	7.9	43	78	51	37	59	47	78.0	88.0	72.0	94.3	100.1	76.5	3.5	6.0	<2.0	6.10	7.40	2.40
SD	0.4	0.7	0.8	0.4	0.6	0.8	0.6	0.5	0.6	8	24	10	6	17	10	10.1	9.3	9.7	6.4	6.0	5.4	0.5	2.1	-	1.17	1.74	0.53
SE	0.2	0.4	0.4	0.2	0.3	0.4	0.3	0.2	0.3	5	12	5	4	9	5	5.8	4.6	4.8	3.7	3.0	2.7	0.3	1.0	-	0.67	0.87	0.26
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4

Table 2.3-2. – continued –

	True Colour (TCU)			Laboratory pH			*E. coli* (CFU/100 mL) [2]			Chlorophyll *a* (μg/L)			Hardness as $CaCO_3$ (mg/L)			Chloride (mg/L)			Sulphate (mg/L)		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	45.0	42.5	62.5	7.88	7.89	7.85	3	18	<1	5.60	5.36	4.75	43.7	46.6	37.5	1.53	1.64	0.85	6.6	7.4	8.6
Median	50.0	40.0	65.0	7.90	7.94	7.81	3	4	<1	6.11	5.75	5.15	43.2	46.3	37.3	1.67	1.79	0.85	6.7	7.9	8.5
Minimum	35.0	40.0	50.0	7.84	7.69	7.72	2	<1	<1	4.20	1.53	0.68	40.9	44.5	35.9	1.06	1.10	0.59	4.5	4.0	3.4
Maximum	50.0	50.0	70.0	7.91	7.98	8.05	3	50	<1	6.50	8.40	8.02	46.9	49.5	39.7	1.85	1.90	1.10	8.7	9.8	14.1
SD	8.7	5.0	9.6	0.04	0.14	0.15	1	28	-	1.23	2.99	3.35	3.0	2.1	1.6	0.41	0.37	0.21	2.1	2.5	4.5
SE	5.0	2.5	4.8	0.02	0.07	0.07	<1	16	-	0.71	1.50	1.68	1.8	1.0	0.8	0.24	0.19	0.11	1.2	1.3	2.3
N	3	4	4	3	4	4	2	3	3	3	4	4	3	4	4	3	4	4	3	4	4

[1] Calculated.

[2] Results from spring (i.e., <10 CFU/100 mL) excluded from statistical calculations.

Table 2.3-3. Summary statistics for metals and major ions measured in the Winnipeg River Region: 2009/2010. Values are presented as mg/L.

	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			Boron			Cadmium		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	0.338	0.316	0.109	0.00051	<0.0005	0.00052	0.00083	0.00085	0.00073	0.01217	0.01207	0.00842	<0.0010	<0.0010	<0.0010	<0.0002	<0.0002	<0.0002	<0.030	<0.030	<0.030	0.000014	0.00004	0.000024
Median	0.37	0.337	0.128	0.0006	<0.0005	0.00058	0.00078	0.00084	0.00069	0.0124	0.01245	0.00849	<0.0010	<0.0010	<0.0010	<0.0002	<0.0002	<0.0002	<0.031	<0.031	<0.031	0.000011	0.000013	0.000018
Minimum	0.258	0.096	0.047	<0.0005	<0.0005	<0.0005	0.00075	0.00072	0.00059	0.0115	0.00962	0.00737	<0.0010	<0.0010	<0.0010	<0.0002	<0.0002	<0.0002	<0.032	<0.032	<0.032	0.000005	0.000011	<0.000010
Maximum	0.385	0.495	0.135	0.00069	0.00057	0.00066	0.00097	0.00098	0.00096	0.0126	0.01377	0.00933	<0.0010	<0.0010	<0.0010	<0.0002	<0.0002	<0.0002	<0.033	<0.033	<0.033	0.000025	0.000124	0.000056
SD	0.069	0.185	0.042	0.00023	0.00016	0.00018	0.00012	0.00012	0.00017	0.00059	0.00185	0.00083	-	-	-	-	-	-	-	-	-	0.00001	0.000056	0.000022
SE	0.04	0.092	0.021	0.00013	0.00008	0.00009	0.00007	0.00006	0.00009	0.00034	0.00093	0.00042	-	-	-	-	-	-	-	-	-	0.000006	0.000028	0.000011
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4
N>DL	3	4	4	2	1	3	3	4	4	3	4	4	0	0	0	0	0	0	0	0	0	2	4	3
% Detections	100	100	100	67	25	75	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	67	100	75

Table 2.3-3. – continued –

	Calcium			Cesium			Chromium			Cobalt			Copper			Iron			Lead			Magnesium		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	11.62	12.37	9.59	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00024	0.00023	<0.00020	0.0015	0.0017	0.0013	0.307	0.308	0.193	<0.00050	<0.00050	<0.00050	3.56	3.82	3.3
Median	11.5	12.23	9.45	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	0.00022	<0.00020	0.0014	0.0017	0.0012	0.306	0.314	0.185	<0.00050	<0.00050	<0.00050	3.54	3.8	3.33
Minimum	11	11.8	9.27	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	0.0001	<0.00020	0.0014	0.0014	0.001	0.259	0.115	0.143	<0.00050	<0.00050	<0.00050	3.24	3.63	3.08
Maximum	12.37	13.2	10.2	<0.00010	<0.00010	<0.00010	0.0011	0.001	<0.0010	0.00043	0.00039	0.00035	0.0017	0.0023	0.0019	0.357	0.489	0.26	<0.00050	0.00053	0.00051	3.91	4.05	3.47
SD	0.69	0.61	0.43	-	-	-	-	-	-	0.00017	0.00013	-	0.0002	0.0004	0.0004	0.049	0.16	0.052	-	-	-	0.34	0.17	0.16
SE	0.4	0.3	0.21	-	-	-	-	-	-	0.0001	0.00006	-	0.0001	0.0002	0.0002	0.028	0.08	0.026	-	-	-	0.19	0.09	0.08
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4
N>DL	3	4	4	0	0	0	1	1	0	2	3	1	3	4	4	3	4	4	0	1	1	3	4	4
% Detections	100	100	100	0	0	0	33	25	0	67	75	25	100	100	100	100	100	100	0	25	25	100	100	100

Table 2.3-3. – continued –

	Manganese			Mercury			Molybdenum			Nickel			Potassium			Rubidium			Selenium			Silver		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	0.0126	0.0122	0.007	0.0001	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.002	<0.002	<0.002	1.02	1.03	0.85	0.00185	0.00186	0.00168	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010
Median	0.013	0.0132	0.0046	<0.000020	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.002	<0.002	<0.002	0.99	1.01	0.84	0.00188	0.00195	0.00168	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010
Minimum	0.0104	0.0064	0.0021	<0.000020	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.002	<0.002	<0.002	0.96	0.97	0.76	0.00173	0.00133	0.00167	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010
Maximum	0.0143	0.016	0.0167	0.0001	<0.00010	<0.00010	<0.00020	0.00023	0.00047	<0.002	<0.002	<0.002	1.11	1.12	0.97	0.00195	0.00222	0.0017	<0.0010	0.001	0.0015	<0.00010	0.00011	<0.00010
SD	0.002	0.0042	0.0066	-	-	-	-	-	-	-	-	-	0.08	0.07	0.09	0.00011	0.00042	0.00002	-	-	-	-	-	-
SE	0.0011	0.0021	0.0033	-	-	-	-	-	-	-	-	-	0.05	0.03	0.05	0.00007	0.00021	0.00001	-	-	-	-	-	-
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4
N>DL	3	4	4	1	0	0	0	1	1	0	0	0	3	4	4	3	4	4	0	1	1	0	1	0
% Detections	100	100	100	33	0	0	0	25	25	0	0	0	100	100	100	100	100	100	0	25	25	0	25	0

Table 2.3-3. – continued –

	Sodium			Strontium			Tellurium			Thallium			Tin			Titanium			Tungsten		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	2.45	2.49	1.08	0.0234	0.0243	0.0201	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.0006	<0.0006	<0.0006	0.01692	0.01074	0.00338	<0.00020	<0.00050	0.00027
Median	2.63	2.52	1.1	0.0234	0.0241	0.0198	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.0006	<0.0006	<0.0006	0.0141	0.01189	0.00392	<0.00020	<0.00020	0.00018
Minimum	2.07	2.2	1	0.0223	0.024	0.0196	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.0006	<0.0006	<0.0006	0.00825	0.00273	<0.00090	<0.00020	<0.00020	<0.00020
Maximum	2.66	2.73	1.14	0.0246	0.0251	0.0213	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.0006	0.00097	<0.0006	0.0284	0.01647	0.00521	<0.00020	<0.00050	0.00063
SD	0.33	0.26	0.06	0.0012	0.0005	0.0008	-	-	-	-	-	-	-	-	-	0.01037	0.00679	0.00205	-	-	0.00025
SE	0.19	0.13	0.03	0.0007	0.0003	0.0004	-	-	-	-	-	-	-	-	-	0.00598	0.0034	0.00103	-	-	0.00013
N	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4	4
N>DL	3	4	4	3	4	4	0	0	0	0	0	0	0	1	0	3	4	3	0	0	2
% Detections	100	100	100	100	100	100	0	0	0	0	0	0	0	25	0	100	100	75	0	0	50

Table 2.3-3. – continued –

	Uranium			Vanadium			Zinc			Zirconium		
	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG	PDB	LDB	MANIG
Mean	0.00012	0.00012	0.00012	0.0011	<0.0010	<0.0010	<0.010	<0.010	<0.010	0.0004	0.0004	0.00042
Median	0.00012	0.00013	0.00012	0.0012	<0.0010	<0.0010	<0.010	<0.010	<0.010	0.00046	0.00039	0.00043
Minimum	0.00012	<0.00010	0.0001	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Maximum	0.00013	0.00016	0.00012	0.0015	0.0015	<0.0010	<0.010	<0.010	<0.010	0.00054	0.00063	0.00061
SD	0.00001	0.00005	0.00001	0.0005	-	-	-	-	-	0.00018	0.00023	0.00017
SE	0	0.00002	0.00001	0.0003	-	-	-	-	-	0.0001	0.00012	0.00008
N	3	4	4	3	4	4	3	4	4	3	4	4
N>DL	3	3	4	2	2	0	0	0	0	2	2	3
% Detections	100	75	100	67	50	0	0	0	0	67	50	75

Table 2.3-4. 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: 2009/2010. 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	0.00013-0.00016	0.0345-0.0497	0.0036-0.0053	0.3	0.00077-0.00135	0.000026
PDB	N	**3**	3	3	3	3	3	**3**	3	**3**
	# Exceedances	**3**	0	0	0	0	0	**2**	0	**1**
	% Exceedences	**100**	0	0	0	0	0	**67**	0	**33**
LDB	N	**4**	4	4	4	4	4	**4**	4	2
	# Exceedances	**3**	0	0	0	0	0	**2**	0	0
	% Exceedences	**75**	0	0	0	0	0	**50**	0	0
MANIG	N	**4**	4	4	4	4	4	4	4	2
	# Exceedances	**3**	0	0	0	0	0	0	0	0
	% Exceedences	**75**	0	0	0	0	0	0	0	0

Table 2.3-4. – 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
PDB	N	3	3	3	3	3	3	3	4	4
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedences	0	0	0	0	0	0	0	0	0
LDB	N	4	4	**4**	**4**	4	4	4	4	4
	# Exceedances	0	0	**1**	**1**	0	0	0	0	0
	% Exceedences	0	0	**25**	**25**	0	0	0	0	0
MANIG	N	4	4	**4**	4	4	4	4	4	4
	# Exceedances	0	0	**1**	0	0	0	0	0	0
	% Exceedences	0	0	**25**	0	0	0	0	0	0

[1]Comparisons to the current PAL guideline could not be made for samples collected in winter as the analytical detection limit was higher than the guideline.

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

[3]Comparison to the BCMOE guideline.

Table 2.3-5. Total phosphorus concentrations (open-water season and annual means) measured in the Winnipeg River Region and CCME trophic categorization: 2009/2010.

		Trophic Status Based on TP (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
Pointe du Bois Forebay	Open-water season				0.024		
	Annual				0.024		
Lac du Bonnet	Open-water season				0.025		
	Annual				0.026		
Manigotagan Lake	Open-water season			0.020			
	Annual				0.023		

Table 2.3-6. 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): 2009/2010.

		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
Pointe du Bois Forebay	Open-water season			0.41			
	Annual			0.41			
Lac du Bonnet	Open-water season			0.40			
	Annual			0.45			
Manigotagan Lake	Open-water season			0.46			
	Annual			0.51			

Table 2.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Winnipeg River Region (2009/2010) and the OECD (1982) trophic categorization scheme for lakes.

		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
Pointe du Bois Forebay	Open-water season			5.6			
	Annual			5.6			
Lac du Bonnet	Open-water season			6.6			
	Annual			5.4			
Manigotagan Lake	Open-water season			6.1			
	Annual			4.8			

Table 2.4-1. Community metrics for phytoplankton samples collected in the Winnipeg River Region during the open-water season of 2009.

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 ($E^{H`}/S$)
Pointe du Bois Forebay	Spring	15	0.42	0.11	1.03	0.38	2.81	0.19
	Summer	23	0.61	0.11	1.49	0.48	4.43	0.19
	Fall	14	0.66	0.21	1.54	0.58	4.66	0.33
Lac du Bonnet	Spring	21	0.85	0.31	2.22	0.73	9.19	0.44
	Summer	21	0.74	0.18	1.79	0.59	5.99	0.29
	Fall	18	0.80	0.28	1.94	0.67	6.99	0.39
Manigotagan Lake	Spring	14	0.80	0.36	1.82	0.69	6.17	0.44
	Summer	21	0.85	0.31	2.16	0.71	8.66	0.41
	Fall	13	0.84	0.47	1.99	0.77	7.29	0.56

Table 2.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Winnipeg River Region for the CAMPP, 2009.

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)			(%)	
Pointe du Bois Forebay (2009)	Nearshore	15	1.9	0.9	3.7	0.01	1.05	20.0	--	reeds, mixed forest	0	--
	Offshore	15	10.5	6.0	15.3	0.07	1.23	19.0	--	--	--	--
Lac du Bonnet (2009)	Nearshore	15	4.2	3.6	4.9	0.15	1.00	20.0	--	shrubs, mixed forest	0	--
	Offshore	15	12.4	10.7	14.7	0.15	1.15	19.0	--	--	--	--
Manigotagan Lake (2009)	Nearshore	15	2.9	2.0	3.4	0.02	0.90	18.0	--	reeds, shrubs, mixed forest	0	--
	Offshore	15	19.5	18.3	20.4	0.01	1.05	18.0	--	--	--	--

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, 2009.

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
Pointe du Bois Forebay (2009)	Nearshore	Mean	3	2.5	1.89	29.33	49.00	21.67	Loam
		SD	--	1.25	0.785	21.221	22.716	14.154	--
		SE	--	0.72	0.453	12.252	13.115	8.172	--
		Median	--	2.6	1.92	23.00	39.00	14.00	--
		Min	--	1.2	1.09	12.00	33.00	13.00	--
		Max	--	3.7	2.66	53.00	75.00	38.00	--
	Offshore	Mean	3	12.3	1.52	53.00	34.33	12.67	Sandy Loam
		SD	--	4.63	1.374	32.970	22.368	10.693	--
		SE	--	2.67	0.794	19.035	12.914	6.173	--
		Median	--	14.7	0.76	70.00	24.00	7.00	--
		Min	--	7.0	0.70	15.00	19.00	6.00	--
		Max	--	15.3	3.11	74.00	60.00	25.00	--
Lac du Bonnet (2009)	Nearshore	Mean	3	4.1	2.08	24.33	43.00	32.00	Clay Loam
		SD	--	0.38	0.855	16.073	6.928	12.767	--
		SE	--	0.22	0.494	9.280	4.000	7.371	--
		Median	--	4.3	1.63	31.00	47.00	29.00	--
		Min	--	3.7	1.55	6.00	35.00	21.00	--
		Max	--	4.4	3.07	36.00	47.00	46.00	--
	Offshore	Mean	3	13.5	2.55	10.00	66.67	23.00	Silt Loam
		SD	--	1.11	0.146	2.646	3.786	4.000	--
		SE	--	0.64	0.084	1.528	2.186	2.309	--
		Median	--	13.3	2.49	9.00	65.00	23.00	--
		Min	--	12.5	2.45	8.00	64.00	19.00	--
		Max	--	14.7	2.72	13.00	71.00	27.00	--
Manigotagan Lake (2009)	Nearshore	Mean	3	3.3	1.72	40.33	47.33	12.67	Loam
		SD	--	0.23	0.628	18.009	14.012	4.726	--
		SE	--	0.13	0.363	10.398	8.090	2.728	--
		Median	--	3.4	1.55	41.00	48.00	11.00	--
		Min	--	3.0	1.20	22.00	33.00	9.00	--
		Max	--	3.4	2.42	58.00	61.00	18.00	--
	Offshore	Mean	3	20.2	4.57	9.00	55.33	35.33	Silty Clay Loam
		SD	--	0.23	1.247	12.166	6.429	5.686	--
		SE	--	0.13	0.720	7.024	3.712	3.283	--
		Median	--	20.3	5.04	3.00	58.00	37.00	--
		Min	--	19.9	3.16	1.00	48.00	29.00	--
		Max	--	20.3	5.52	23.00	60.00	40.00	--

Table 2.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in the Pointe du Bois Forebay within the Winnipeg River Region for CAMPP, 2009.

	Pointe du Bois Forebay						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3636	5002.2	1288.3	1472	173	17529
Oligochaeta	--	352	469.8	121.3	260	0	1948
Hirudinea	--	49	90.9	23.5	0	0	260
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	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	--	1454	3390.8	875.5	43	0	10994
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	11.2	2.9	0	0	43
Pisidiidae	--	260	388.2	100.2	87	0	1428
Gastropoda - unid	--	9	33.5	8.7	0	0	130
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	98	181.0	46.7	43	0	693
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	12	25.7	6.6	0	0	87
Planorbidae	--	46	135.4	35.0	0	0	519
Valvatidae	--	107	204.2	52.7	0	0	736
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	--	2389	4372.6	1129.0	519	87	13894
Non-Insecta (%)	65	--	--	--	--	--	--
Oligochaeta	--	352	469.8	121.3	260	0	1948
Oligochaeta (%)	10	--	--	--	--	--	--
Amphipoda	--	1454	3390.8	875.5	43	0	10994
Amphipoda (%)	40	--	--	--	--	--	--
Bivalvia	--	263	387.6	100.1	87	0	1428
Bivalvia (%)	7	--	--	--	--	--	--
Gastropoda	--	271	543.9	140.4	87	0	2121
Gastropoda (%)	7	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	6	15.2	3.9	0	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	--	3	11.2	2.9	0	0	43

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	3	11.2	2.9	0	0	43
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)	--	17	67.1	17.3	0	0	260
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	6	15.2	3.9	0	0	43
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	--	12	34.6	8.9	0	0	130
Hexagenia	--	214	225.8	58.3	173	0	822
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

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Paraleptophlebia	--	9	33.5	8.7	0	0	130
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
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	--	32	100.1	25.9	0	0	390
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)	--	32	52.9	13.7	0	0	173
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	29	55.9	14.4	0	0	173
Phryganeidae	--	3	11.2	2.9	0	0	43
Polycentropodidae	--	14	55.9	14.4	0	0	216
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)	--	92	87.9	22.7	87	0	260
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	33.5	8.7	0	0	130
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	332	552.3	142.6	173	0	2251
Orthocladiinae	--	35	61.6	15.9	0	0	173
Tanypodinae	--	401	624.3	161.2	216	0	2424
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

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	1247	1198.2	309.4	822	87	4155
Insecta (%)	34	--	--	--	--	--	--
Chironomidae	--	776	955.5	246.7	433	0	3030
Chironomidae (%)	21	--	--	--	--	--	--
Ephemeroptera	--	239	218.2	56.3	216	0	822
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	110	115.5	29.8	87	0	390
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	349	272.5	70.4	260	87	995
EPT (%)	10	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.72	0.551	0.142	0.60	0.00	1.77
Genus analysis of Ephemeroptera	4 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	23	8	3.4	0.9	8	3	14
Simpson's Diversity Index (D)	--	0.75	0.149	0.038	0.79	0.29	0.90
Evenness (Simpson's Equitability E_D)	--	0.56	0.25	0.06	0.53	0.10	0.90
Shannon-Weaver Index (H)	--	1.66	0.406	0.105	1.71	0.78	2.25
Evenness (Shannon's Equitability E_H)	--	0.80	0.169	0.044	0.83	0.29	0.96
Hill's Effective Richness ($E^{H'}$)	--	6	2	1	6	2	10
Evenness ($E^{H'}$/S)	--	0.68	0.223	0.058	0.68	0.16	0.94

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	869	522.8	135.0	909	87	1601
Oligochaeta	--	115	138.5	35.8	43	0	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
Crangonycitidae	--	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	--	55	97.4	25.2	0	0	346
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	--	170	179.6	46.4	130	0	476
Non-Insecta (%)	20	--	--	--	--	--	--
Oligochaeta	--	115	138.5	35.8	43	0	390
Oligochaeta (%)	13	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	55	97.4	25.2	0	0	346
Bivalvia (%)	6	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	6	15.2	3.9	0	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

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	3	11.2	2.9	0	0	43
Corixidae (adult)	--	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	--	531	349.5	90.2	563	43	1082
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

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Offshore n=15						
	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	--	3	11.2	2.9	0	0	43
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	25.7	6.6	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	--	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	35.8	9.3	0	0	130
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	--	23	45.9	11.8	0	0	130
Orthocladiinae	--	6	15.2	3.9	0	0	43
Tanypodinae	--	89	104.1	26.9	43	0	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

Table 2.5-3. – continued –

	Pointe du Bois Forebay						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	698	414.5	107.0	736	43	1342
Insecta (%)	80	--	--	--	--	--	--
Chironomidae	--	118	121.8	31.5	87	0	433
Chironomidae (%)	14	--	--	--	--	--	--
Ephemeroptera	--	531	349.5	90.2	563	43	1082
Ephemeroptera (%)	61	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	14	26.7	6.9	0	0	87
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	545	350.8	90.6	563	43	1125
EPT (%)	63	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	6.67	6.861	1.772	4.20	0.00	21.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	9	4	1.6	0.4	4	1	6
Simpson's Diversity Index (D)	--	0.51	0.186	0.048	0.51	0.00	0.76
Evenness (Simpson's Equitability E_D)	--	0.63	0.24	0.06	0.57	0.29	1.02
Shannon-Weaver Index (H)	--	0.96	0.406	0.105	1.08	0.00	1.63
Evenness (Shannon’s Equitability E_H)	--	0.70	0.246	0.064	0.68	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	3	1	0	3	1	5
Evenness ($E^{H'}/S$)	--	0.72	0.186	0.048	0.73	0.43	1.00

Table 2.5-4. 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, 2009.

	Lac du Bonnet						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	825	718.8	185.6	476	130	2121
Oligochaeta	--	9	17.9	4.6	0	0	43
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	6	15.2	3.9	0	0	43
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	--	323	461.2	119.1	87	0	1342
Gastropoda - unid	--	222	502.3	129.7	0	0	1472
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	92	86.4	22.3	43	0	216
Lymnaeidae	--	26	35.8	9.3	0	0	130
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	--	678	620.9	160.3	346	0	1731
Non-Insecta (%)	82	--	--	--	--	--	--
Oligochaeta	--	9	17.9	4.6	0	0	43
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	6	15.2	3.9	0	0	43
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	323	461.2	119.1	87	0	1342
Bivalvia (%)	39	--	--	--	--	--	--
Gastropoda	--	340	524.7	135.5	130	0	1601
Gastropoda (%)	41	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	3	11.2	2.9	0	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	--	9	17.9	4.6	0	0	43

Table 2.5-4. – continued –

	Lac du Bonnet						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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
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)	--	6	15.2	3.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	98	91.8	23.7	130	0	260
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

Table 2.5-4. – continued –

	Lac du Bonnet						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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
Perlidae	--	0	0.0	0.0	0	0	0
Perlodidae	--	3	11.2	2.9	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	--	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	15.2	3.9	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	6	15.2	3.9	0	0	43
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	17	27.4	7.1	0	0	87
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

Table 2.5-4. – continued –

	Lac du Bonnet						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	147	128.6	33.2	130	0	433
Insecta (%)	18	--	--	--	--	--	--
Chironomidae	--	23	32.2	8.3	0	0	87
Chironomidae (%)	3	--	--	--	--	--	--
Ephemeroptera	--	98	91.8	23.7	130	0	260
Ephemeroptera (%)	12	--	--	--	--	--	--
Plecoptera	--	3	11.2	2.9	0	0	43
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	101	89.1	23.0	130	0	260
EPT (%)	12	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.00	1.615	0.417	0.00	0.00	5.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	12	4	1.9	0.5	4	1	7
Simpson's Diversity Index (D)	--	0.44	0.262	0.068	0.53	0.00	0.75
Evenness (Simpson's Equitability E_D)	--	0.64	0.31	0.08	0.59	0.26	1.01
Shannon-Weaver Index (H)	--	0.87	0.504	0.130	1.10	0.00	1.39
Evenness (Shannon’s Equitability E_H)	--	0.57	0.344	0.089	0.60	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	3	1	0	3	1	4
Evenness ($E^{H'}$/S)	--	0.72	0.250	0.065	0.74	0.38	1.00

Table 2.5-4. – continued –

	Lac du Bonnet						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2629	975.1	251.8	2424	1385	5280
Oligochaeta	--	29	62.7	16.2	0	0	216
Hirudinea	--	6	15.2	3.9	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	208	275.3	71.1	130	0	1125
Haustoriidae	--	1752	751.4	194.0	1558	909	3549
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	--	271	243.5	62.9	260	0	822
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	--	2265	877.7	226.6	1904	1298	4675
Non-Insecta (%)	86	--	--	--	--	--	--
Oligochaeta	--	29	62.7	16.2	0	0	216
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	1959	963.3	248.7	1688	952	4675
Amphipoda (%)	75	--	--	--	--	--	--
Bivalvia	--	271	243.5	62.9	260	0	822
Bivalvia (%)	10	--	--	--	--	--	--
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	--	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

Table 2.5-4. – continued –

	Lac du Bonnet						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	173	107.3	27.7	130	0	303
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	--	3	11.2	2.9	0	0	43
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 –

	Lac du Bonnet						
	Offshore n=15						
	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)	--	12	25.7	6.6	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	--	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	21.9	5.7	0	0	43
Orthocladiinae	--	14	26.7	6.9	0	0	87
Tanypodinae	--	141	118.5	30.6	130	0	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	--	364	215.0	55.5	433	0	693
Insecta (%)	14	--	--	--	--	--	--

Table 2.5-4. – continued –

	Lac du Bonnet						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	173	131.9	34.1	130	0	433
Chironomidae (%)	7	--	--	--	--	--	--
Ephemeroptera	--	176	104.1	26.9	130	0	303
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	25.7	6.6	0	0	87
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	188	109.3	28.2	173	0	346
EPT (%)	7	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.30	0.781	0.202	1.33	0.00	3.00
Genus analysis of Ephemeroptera	2 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	5	0.9	0.2	5	3	6
Simpson's Diversity Index (D)	--	0.51	0.082	0.021	0.50	0.40	0.71
Evenness (Simpson's Equitability E_D)	--	0.37	0.13	0.03	0.33	0.28	0.78
Shannon-Weaver Index (H)	--	1.06	0.180	0.046	1.01	0.79	1.44
Evenness (Shannon's Equitability E_H)	--	0.60	0.103	0.027	0.57	0.49	0.84
Hill's Effective Richness ($E^{H'}$)	--	3	1	0	3	2	4
Evenness ($E^{H'}$/S)	--	0.50	0.116	0.030	0.46	0.41	0.84

Table 2.5-5. 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, 2009.

	Manigotagan Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2505	1371.7	354.2	2381	866	5367
Oligochaeta	--	577	746.6	192.8	260	0	2857
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	3	11.2	2.9	0	0	43
Hyalellidae	--	32	100.1	25.9	0	0	390
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	--	69	114.3	29.5	0	0	303
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	15.2	3.9	0	0	43
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	--	687	812.7	209.8	346	0	3160
Non-Insecta (%)	27	--	--	--	--	--	--
Oligochaeta	--	577	746.6	192.8	260	0	2857
Oligochaeta (%)	23	--	--	--	--	--	--
Amphipoda	--	35	99.8	25.8	0	0	390
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	69	114.3	29.5	0	0	303
Bivalvia (%)	3	--	--	--	--	--	--
Gastropoda	--	6	15.2	3.9	0	0	43
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	58	64.8	16.7	43	0	216
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

Table 2.5-5. - continued -

	Manigotagan Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	3	11.2	2.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	6	15.2	3.9	0	0	43
Corixidae (adult)	--	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	11.2	2.9	0	0	43
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	--	101	101.7	26.3	87	0	303
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

Table 2.5-5. - continued -

	Manigotagan Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	3	11.2	2.9	0	0	43
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
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	--	6	15.2	3.9	0	0	43
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	67.2	17.3	0	0	260
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	11.2	2.9	0	0	43
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	31.9	8.2	0	0	87
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	3	11.2	2.9	0	0	43
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	--	300	364.5	94.1	216	0	1515
Orthocladiinae	--	12	25.7	6.6	0	0	87
Tanypodinae	--	1281	797.2	205.8	1169	260	2900
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

Table 2.5-5. - continued -

	Manigotagan Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	1818	1035.7	267.4	1775	649	4198
Insecta (%)	73	--	--	--	--	--	--
Chironomidae	--	1593	1020.6	263.5	1342	476	3939
Chironomidae (%)	64	--	--	--	--	--	--
Ephemeroptera	--	107	105.9	27.3	87	0	303
Ephemeroptera (%)	4	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	32	68.4	17.7	0	0	260
Trichoptera (%)	1						
EPT	--	139	153.6	39.7	87	0	563
EPT (%)	6						
EPT:CHIRONOMIDAE (EPT:C)	--	0.13	0.152	0.039	0.08	0.00	0.55
Genus analysis of Ephemeroptera			3 spp. (Dominant: *Hexagenia*)				
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	17	5	1.7	0.4	4	3	9
Simpson's Diversity Index (D)	--	0.60	0.138	0.036	0.63	0.27	0.79
Evenness (Simpson's Equitability E_D)	--	0.47	0.14	0.04	0.40	0.27	0.76
Shannon-Weaver Index (H)	--	1.22	0.333	0.086	1.21	0.60	1.83
Evenness (Shannon’s Equitability E_H)	--	0.69	0.130	0.033	0.68	0.37	0.90
Hill's Effective Richness ($E^{H'}$)	--	4	1	0	3	2	6
Evenness ($E^{H'}$/S)	--	0.59	0.131	0.034	0.59	0.36	0.84

Table 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2404	723.9	186.9	2597	1212	3592
Oligochaeta	--	245	195.4	50.5	216	43	779
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	568	440.4	113.7	476	43	1861
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	--	265	332.8	85.9	173	0	1125
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	--	1079	535.5	138.3	909	303	2251
Non-Insecta (%)	45	--	--	--	--	--	--
Oligochaeta	--	245	195.4	50.5	216	43	779
Oligochaeta (%)	10	--	--	--	--	--	--
Amphipoda	--	568	440.4	113.7	476	43	1861
Amphipoda (%)	24	--	--	--	--	--	--
Bivalvia	--	265	332.8	85.9	173	0	1125
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	--	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 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	3	11.2	2.9	0	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

Table 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=15						
	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	0.0	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	--	785	266.2	68.7	779	173	1255
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	--	479	254.2	65.6	433	87	866
Orthocladiinae	--	9	17.9	4.6	0	0	43
Tanypodinae	--	49	36.1	9.3	43	0	87
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 2.5-5. - continued -

	Manigotagan Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	1324	414.1	106.9	1385	303	1991
Insecta (%)	55	--	--	--	--	--	--
Chironomidae	--	537	264.7	68.3	476	130	909
Chironomidae (%)	22	--	--	--	--	--	--
Ephemeroptera	--	3	11.2	2.9	0	0	43
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	--	3	11.2	2.9	0	0	43
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.00	0.014	0.004	0.00	0.00	0.05
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	5	0.4	0.1	5	4	6
Simpson's Diversity Index (D)	--	0.71	0.057	0.015	0.74	0.59	0.77
Evenness (Simpson's Equitability E_D)	--	0.61	0.09	0.02	0.57	0.45	0.72
Shannon-Weaver Index (H)	--	1.43	0.149	0.039	1.53	1.17	1.59
Evenness (Shannon's Equitability E_H)	--	0.81	0.060	0.016	0.81	0.69	0.88
Hill's Effective Richness ($E^{H'}$)	--	4	1	0	5	3	5
Evenness ($E^{H'}/S$)	--	0.71	0.077	0.020	0.70	0.58	0.81

Table 2.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Winnipeg River system, 2009.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Pointe du Bois	GN-01	14	326366	5579325	14-Jul-09	46.25	7.2	7.9	17.0
Pointe du Bois	GN-02	14	325251	5580104	20-Jul-09	26.42	6.2	6.8	16.5
Pointe du Bois	GN-03	14	324972	5580891	17-Jul-09	25.58	6.0	5.0	16.0
Pointe du Bois	GN-05	14	333487	5577708	17-Jul-09	24.75	15.4	15.2	16.0
Pointe du Bois	GN-06	14	325369	5579037	15-Jul-09	28.75	14.7	17.4	17.0
Pointe du Bois	GN-07	14	322561	5578643	13-Jul-09	22.25	6.6	5.1	20.5
Pointe du Bois	GN-08	14	322802	5580072	14-Jul-09	24.83	6.8	7.9	17.5
Pointe du Bois	GN-09	14	321159	5578606	19-Jul-09	26.33	16.6	16.0	16.0
Pointe du Bois	GN-10	14	322191	5577415	18-Jul-09	25.58	12.5	12.6	16.5
Pointe du Bois	GN-11	14	320112	5578578	15-Jul-09	48.83	5.1	4.5	17.0
Pointe du Bois	GN-12	14	319738	5577533	18-Jul-09	24.67	11.0	12.5	16.0
Pointe du Bois	GN-14	14	321238	5577641	19-Jul-09	22.92	5.8	5.6	17.0
Pointe du Bois	GN-15	14	319493	5575532	19-Jul-09	22.83	6.9	7.4	16.5
Pointe du Bois	GN-16	14	323786	5581047	20-Jul-09	26.92	4.8	4.6	16.5
Pointe du Bois	GN-17	14	322710	5575740	20-Jul-09	23.75	11.8	11.0	17.0
Pointe du Bois	SN-01	14	326386	5579343	14-Jul-09	46.25	7.1	7.2	17.0
Pointe du Bois	SN-05	14	323529	5577737	17-Jul-09	24.75	14.2	15.4	16.0
Pointe du Bois	SN-09	14	321197	5578609	19-Jul-09	26.33	15.0	16.6	16.0
Pointe du Bois	SN-12	14	319755	5577493	18-Jul-09	24.67	11.4	11.0	16.0
Pointe du Bois	SN-16	14	323839	5581029	20-Jul-09	26.92	4.5	4.8	16.5
Lac du Bonnet	GN-01	15	300801	5586766	20-Sep-09	17.75	17.0	17.0	20.4
Lac du Bonnet	GN-02	15	301078	5588621	20-Sep-09	18.13	6.5	3.5	21.3
Lac du Bonnet	GN-03	15	297768	5586211	21-Sep-09	20.53	7.9	7.9	20.3
Lac du Bonnet	GN-04	15	298678	5583062	21-Sep-09	20.05	1.7	5.8	20.0
Lac du Bonnet	GN-05	15	294285	5584308	22-Sep-09	18.35	7.8	7.6	19.9
Lac du Bonnet	GN-06	15	293285	5587369	22-Sep-09	18.58	4.5	-	19.9
Lac du Bonnet	GN-07	15	291360	5583363	23-Sep-09	19.93	4.4	5.1	19.6
Lac du Bonnet	GN-08	15	288602	5586327	23-Sep-09	20.50	1.6	11.5	19.3
Lac du Bonnet	GN-09	15	288150	5582048	24-Sep-09	20.17	3.5	8.0	20.3
Lac du Bonnet	GN-10	15	286655	5579739	24-Sep-09	21.08	5.3	5.0	19.9
Lac du Bonnet	SN-01	15	300801	5686766	20-Sep-09	17.75	17.0	17.0	20.4
Lac du Bonnet	SN-04	15	298678	5583062	21-Sep-09	20.05	1.7	1.7	20.0
Lac du Bonnet	SN-08	15	288602	5586327	23-Sep-09	20.50	4.4	4.4	19.3
Manigotagan Lake	GN-01	15	318955	5640676	1-Sep-09	17.42	19.0	19.0	18.2
Manigotagan Lake	GN-02	15	320137	5639470	1-Sep-09	18.67	7.6	4.7	18.0
Manigotagan Lake	GN-03	15	317135	5639444	2-Sep-09	20.87	1.0	13.0	19.7
Manigotagan Lake	GN-04	15	317454	5636318	2-Sep-09	23.37	4.5	1.5	18.5
Manigotagan Lake	GN-05	15	316224	5637833	3-Sep-09	17.58	21.7	21.5	22.7
Manigotagan Lake	GN-06	15	314846	5640208	3-Sep-09	18.42	16.0	14.8	22.0
Manigotagan Lake	SN-01	15	318955	5640676	1-Sep-09	17.42	19.0	19.0	18.2
Manigotagan Lake	SN-03	15	317135	5639444	2-Sep-09	20.87	1.0	13.0	19.7

Table 2.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Winnipeg River Region waterbodies, 2009.

Common Name	Scientific Name	ID Code	Captured in Waterbody		
			PDB	LDB	MANIG
Silver Lamprey	*Ichthyomyzon unicuspis*	SLLM	+		
Lake Sturgeon	*Acipenser fulvescens*	LKST	+	+	
Mooneye	*Hiodon tergisus*	MOON	+	+	
Emerald Shiner	*Notropis atherinoides*	EMSH	+	+	
Spottail Shiner	*Notropis hudsonius*	SPSH	+	+	
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	+	+	
Channel Catfish	*Ictalurus punctatus*	CHCT		+	
Northern Pike	*Esox lucius*	NRPK	+	+	+
Rainbow Smelt	*Osmerus mordax*	RNSM			
Cisco	*Coregonus artedi*	CISC	+	+	+
Lake Whitefish	*Coregonus clupeaformis*	LKWH	+	+	+
Troutperch	*Percopsis omiscomaycus*	TRPR	+	+	
Burbot	*Lota lota*	BURB	+		+
Rock Bass	*Ambloplites rupestris*	RCBS	+	+	
Smallmouth Bass	*Micropterus dolomieu*	SMBS	+	+	+
Black Crappie	*Pomoxis nigromaculatus*	BLCR			
Yellow Perch	*Perca flavescens*	YLPR	+	+	+
Logperch	*Percina caprodes*	LGPR			
Sauger	*Sander canadensis*	SAUG	+	+	
Walleye	*Sander vitreus*	WALL	+	+	+

PDB = Pointe du Bois Forebay; LDB = Lac du Bonnet; MANIG = Manigotagan Lake

Table 2.6-3. Standard gang index and small mesh index gillnet relative abundance summaries from Winnipeg River Region waterbodies, 2009.

Species	Standard Gang						Small Mesh					
	PDB		LDB		MANIG		PDB		LDB		MANIG	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Silver Lamprey	17	1.91	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	5	0.56	4	1.15	-	-	-	-	-	-	-	-
Mooneye	4	0.45	5	1.43	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	1	0.93	1	0.98	-	-
Spottail Shiner	-	-	-	-	-	-	5	4.67	1	0.98	-	-
Longnose Sucker	-	-	-	-	-	-		-	-	-	-	-
White Sucker	273	30.64	34	9.74	20	7.12		-	-	-	-	-
Silver Redhorse	1	0.11	16	4.58	-	-		-	-	-	-	-
Golden Redhorse	2	0.22	-	-	-	-		-	-	-	-	-
Shorthead Redhorse	13	1.46	8	2.29	-	-		-	-	-	-	-
Channel Catfish	-	-	6	1.72	-	-		-	-	-	-	-
Northern Pike	40	4.49	11	3.15	13	4.63	4	3.74	1	0.98	-	-
Rainbow Smelt	-	-	-	-	-	-		-	-	-	-	-
Cisco	72	8.08	23	6.59	84	29.89		-	2	1.96	1	20.00
Lake Whitefish	9	1.01	13	3.72	41	14.59		-	-	-	-	-
Troutperch	1	0.11	-	-	-	-	21	19.63	7	6.86	-	-
Burbot	12	1.35	-	-	18	6.41		-	-	-	-	-
Rock Bass	13	1.46	3	0.86	-	-		-	-	-	-	-
Smallmouth Bass	3	0.34	2	0.57	1	0.36		-	-	-	1	20.00
Black Crappie	-	-	-	-	-	-		-	-	-	-	-
Yellow Perch	188	21.10	53	15.19	8	2.85	23	21.50	25	24.51	-	-
Logperch	-	-	-	-	-	-		-	-	-	-	-
Sauger	137	15.38	116	33.24	-	-	44	41.12	53	51.96	-	-
Walleye	101	11.34	55	15.76	96	34.16	9	8.41	12	11.76	3	60.00
Total	891	100	349	100	281	100	107	100	102	100	5	100

PDB = Pointe du Bois Forebay; LDB = Lac du Bonnet; MANIG = Manigotagan Lake
n = number of fish caught and RA = percent relative abundance

Table 2.6-4. Standard gang and small mesh index gillnet biomass summaries from Winnipeg River Region waterbodies, 2009.

Common Name	Standard Gang									Small Mesh								
	Pointe du Bois			Lac du Bonnet			Manigotagan L			Pointe du Bois			Lac du Bonnet			Manigotagan L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	5	14897	2.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	4	1400	0.22	5	1400	0.74	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	1	7	0.05	1	2	0.04	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	5	27	0.20	1	3	0.06	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	273	303430	48.75	34	47430	25.14	20	21075	12.62	-	-	-	-	-	-	-	-	-
Silver Redhorse	1	2600	0.42	16	18580	9.85	-	-	-	-	-	-	-	-	-	-	-	-
Golden Redhorse	2	2690	0.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	13	21290	3.42	8	4690	2.49	-	-	-	-	-	-	-	-	-	-	-	-
Channel Catfish	-	-	-	6	9790	5.19	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	40	61600	9.90	11	22080	11.70	13	15550	9.31	4	4200	31.10	1	80	1.49	-	-	-
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	70	23220	3.73	23	2317	1.23	84	10055	6.02	-	-	-	2	30	0.56	1	170	14.46
Lake Whitefish	9	14830	2.38	13	21526	11.41	41	37700	22.57	-	-	-	-	-	-	-	-	-
Troutperch	1	10	0.00	-	-	-	-	-	-	21	170	1.26	7	34	0.63	-	-	-
Burbot	12	6040	0.97	-	-	-	18	15700	9.40	-	-	-	-	-	-	-	-	-
Rock Bass	13	2240	0.36	3	530	0.28	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth Bass	3	1980	0.32	2	2120	1.12	1	1100	0.66	-	-	-	-	-	-	1	2	0.17
Black Crappie	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	188	27900	4.48	53	9380	4.97	8	1200	0.72	23	1400	10.37	25	505	9.38	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	137	32880	5.28	116	18111	9.60	-	-	-	44	4460	33.03	53	4347	80.77	-	-	-
Walleye	101	105370	16.93	55	30686	16.27	96	64632	38.70	9	3240	23.99	12	381	7.08	3	1004	85.37
Total	872	622377	100	345	188639	100	281	167012	100	107	13504	100	102	5382	100	5	1176	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); % = proportion 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, 2009.

Species	Standard Gang									Small Mesh								
	PDB (#sites=15)			LDB (#sites=10)			MANIG (#sites=6)			PDB (#sites=5)			LDB (#sites=3)			MANIG (#sites=2)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Silver Lamprey	17	0.9	10.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	5	0.2	1.86	4	0.4	3.17	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	4	0.2	1.81	5	0.5	3.68	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	1	0.1	0.52	1	0.4	1.20	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	5	0.5	2.59	1	0.4	1.20	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	273	14.0	79.22	34	3.6	8.02	20	3.4	10.96	-	-	-	-	-	-	-	-	-
Silver Redhorse	1	0.1	0.82	16	1.7	9.44	-	-	-	-	-	-	-	-	-	-	-	-
Golden Redhorse	2	0.1	0.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	13	0.6	3.48	8	0.8	6.34	-	-	-	-	-	-	-	-	-	-	-	-
Channel Catfish	-	-	-	6	0.6	4.08	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	40	1.8	5.37	11	1.2	2.61	13	2.0	8.89	4	0.4	2.08	1	0.4	1.17	-	-	-
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	72	4.3	61.78	23	2.6	10.89	84	16.1	68.29	-	-	-	2	0.9	2.70	1	0.7	1.38
Lake Whitefish	9	0.5	3.26	13	1.4	3.78	41	7.6	18.56	-	-	-	-	-	-	-	-	-
Troutperch	1	0.03	0.45	-	-	-	-	-	-	21	2.58	7.62	7	2.8	6.67	-	-	-
Burbot	12	0.6	5.23	-	-	-	18	3.5	11.57	-	-	-	-	-	-	-	-	-
Rock Bass	13	0.7	3.45	3	0.3	2.22	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth Bass	3	0.2	1.39	2	0.2	1.40	1	0.1	0.90	-	-	-	-	-	-	1	0.6	1.15
Black Crappie	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	188	9.6	43.65	53	5.6	28.71	8	1.4	5.83	23	2.4	11.94	25	9.8	21.07	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	137	6.8	30.35	116	12.7	19.20	-	-	-	44	6.5	12.58	53	21.2	33.21	-	-	-
Walleye	101	5.1	17.35	55	5.9	9.10	96	16.2	43.57	9	1.5	3.26	12	4.8	9.52	3	1.7	3.45
Total	891	45.6	140.05	349	37.45	51.2	281	50.4	39.95	107	14.0	33.79	102	40.61	54.0	5	3.0	3.22

PDB = Pointe du Bois Forebay; LDB = Lac du Bonnet; MANIG = Manigotagan Lake

#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, 2009.

Species	Standard Gang									Small Mesh								
	Pointe du Bois			Lac du Bonnet			Manigotagan L			Pointe du Bois			Lac du Bonnet			Manigotagan L		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	5	744	1415	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	4	74	228	5	151	333	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	1	1	2	1	1	1	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	5	3	6	1	1	2	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	273	15615	22868	34	5003	3516	20	3584	4980	-	-	-	-	-	-	-	-	-
Silver Redhorse	1	142	551	16	1933	3120	-	-	-	-	-	-	-	-	-	-	-	-
Golden Redhorse	2	114	308	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	13	1042	1447	8	483	1202	-	-	-	-	-	-	-	-	-	-	-	-
Channel Catfish	-	-	-	6	995	2106	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	40	2609	2736	11	2486	2899	13	2371	4744	4	436	975	1	31	54	-	-	-
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	70	1369	5301	23	260	334	84	1938	3376	-	-	-	2	14	23	1	117	166
Lake Whitefish	9	783	1601	13	2285	2457	41	6940	6588	-	-	-	-	-	-	-	-	-
Troutperch	1	0	1	-	-	-	-	-	-	21	20	29	7	14	20	-	-	-
Burbot	12	276	769	-	-	-	18	2967	3658	-	-	-	-	-	-	-	-	-
Rock Bass	13	127	183	3	55	116	-	-	-	-	-	-	-	-	-	-	-	-
Smallmouth Bass	3	114	242	2	223	527	1	165	403	-	-	-	-	-	-	1	1	2
Black Crappie	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	188	1414	1681	53	983	1725	8	219	407	23	145	325	25	199	175	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	137	1622	1914	116	1996	1392	-	-	-	44	673	579	53	1754	746	-	-	-
Walleye	101	5382	5518	55	3293	2389	96	10808	11773	9	404	561	12	151	144	3	577	816
Total	872	31428	27152	345	20147	11984	281	28992	16306	107	1682	2203	102	2164	1072	5	695	652

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

Table 2.6-7. Summary of mean fork length (mm), weight (g) and condition factor (K) calculated for Northern Pike, Lake Whitefish, Sauger, and Walleye captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2009.

Species	Pointe du Bois			Lac du Bonnet			Manigotagan L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	40	552	155	12	594	184	13	556	77
Lake Whitefish	9	445	75	13	448	109	41	402	57
Sauger	137	297	40	169	235	45	-	-	-
Walleye	101	413	131	67	290	132	99	354	131
Weight (g)									
Northern Pike	44	1495	-	12	1847	2057	13	1196	638
Lake Whitefish	9	1648	742	13	1292	-	41	920	378
Sauger	181	206	-	169	133	-	-	-	-
Walleye	110	987	-	67	463	-	99	661	-
Condition Factor (K)									
Northern Pike	40	0.67	0.12	12	0.66	0.07	13	0.66	0.09
Lake Whitefish	9	1.76	0.13	12	1.56	0.22	41	1.34	0.18
Sauger	137	0.87	0.10	167	0.91	0.13	-	-	-
Walleye	101	1.10	0.16	66	1.07	0.10	97	1.00	0.13

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, 2009.

Age	Year-Class	Northern Pike						Lake Whitefish				Sauger				Walleye					
		PDB		LDB		MANIG		LDB		MANIG		PDB		LDB		PDB		LDB		MANIG	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5.45	-	-
2	2008	-	-	-	-	-	-	1	8.33	-	-	-	-	2	1.74	-	-	1	1.82	-	-
3	2007	-	-	-	-	-	-	-	-	-	-	-	-	6	5.22	-	-	20	36.36	22	22.92
4	2006	2	5.13	1	9.09	-	-	2	16.67	-	-	7	5.22	39	33.91	13	12.87	11	20.00	42	43.75
5	2005	11	28.21	4	36.36	3	23.08	3	25.00	-	-	25	18.66	23	20.00	7	6.93	1	1.82	2	2.08
6	2004	10	25.64	1	9.09	5	38.46	-	-	-	-	4	2.99	5	4.35	6	5.94	2	3.64	6	6.25
7	2003	6	15.38	2	18.18	2	15.38	3	25.00	2	4.88	37	27.61	9	7.83	12	11.88	3	5.45	3	3.13
8	2002	2	5.13	1	9.09	1	7.69	-	-	3	7.32	20	14.93	13	11.30	8	7.92	3	5.45	2	2.08
9	2001	1	2.56	-	-	-	-	-	-	5	12.20	13	9.70	7	6.09	6	5.94	2	3.64	-	-
10	2000	2	5.13	1	9.09	1	7.69	-	-	1	2.44	1	0.75	2	1.74	1	0.99	-	-	3	3.13
11	1999	2	5.13	-	-	-	-	1	8.33	3	7.32	8	5.97	3	2.61	12	11.88	1	1.82	-	-
12	1998	2	5.13	1	9.09	-	-	1	8.33	9	21.95	8	5.97	5	4.35	5	4.95	-	-	4	4.17
13	1997	1	2.56	-	-	-	-	-	-	5	12.20	7	5.22	1	0.87	3	2.97	3	5.45	5	5.21
14	1996	-	-	-	-	1	7.69	-	-	2	4.88	1	0.75	-	-	9	8.91	1	1.82	-	-
15	1995	-	-	-	-	-	-	-	-	-	-	3	2.24	-	-	9	8.91	3	5.45	3	3.13
16	1994	-	-	-	-	-	-	-	-	1	2.44	-	-	-	-	7	6.93	1	1.82	2	2.08
17	1993	-	-	-	-	-	-	1	8.33	2	4.88	-	-	-	-	3	2.97	-	-	1	1.04
18	1992	-	-	-	-	-	-	-	-	1	2.44	-	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	1	2.44	-	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.04
21	1989	-	-	-	-	-	-	-	-	2	4.88	-	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	2	4.88	-	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	1	2.44	-	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	1	2.44	-	-	-	-	-	-	-	-	-	-
Total		39	100	11	100	13	100	12	100	41	100	134	100	115	100	101	100	55	100	96	100

PDB = Pointe du Bois Forebay; LDB = Lac du Bonnet; MANIG = Manigotagan Lake

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, 2009.

Age	Year-Class	Pointe du Bois									Lac du Bonnet									Manigotagan L								
		FL			W			K			FL			W			K			FL			W			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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	2	384	54	2	405	163	2	0.70	0.01	1	510	-	1	700	-	1	0.53	-	-	-	-	-	-	-	-	-	-
4	2005	11	427	35	11	486	120	11	0.61	0.04	4	509	44	4	860	218	4	0.64	0.02	3	506	32	3	850	132	3	0.65	0.07
5	2004	10	504	31	10	781	133	10	0.61	0.07	1	602	-	1	1530	-	1	0.70	-	5	538	51	5	1010	315	5	0.64	0.05
6	2003	6	580	57	6	1177	337	6	0.59	0.07	2	680	3	2	2185	177	2	0.70	0.05	2	550	25	2	1300	212	2	0.78	0.02
7	2002	2	595	4	2	1565	134	2	0.75	0.08	1	708	-	1	2390	-	1	0.67	-	1	596	-	1	1000	-	1	0.47	-
8	2001	1	713	-	1	3120	-	1	0.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	2	733	66	2	3680	608	2	0.94	0.10	1	678	-	1	1690	-	1	0.54	-	1	550	-	1	1200	-	1	0.72	-
10	1999	2	874	38	2	5815	1549	2	0.86	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	2	854	51	2	4410	240	2	0.72	0.17	1	1000	-	1	7960	-	1	0.80	-	-	-	-	-	-	-	-	-	-
12	1997	1	884	-	1	6210	-	1	0.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	772	-	1	3150	-	1	0.68	-

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, 2009.

Age	Year-Class	Lac du Bonnet									Manigotagan L								
		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	2008	1	180	-	1	60	-	1	1.03	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	2	424	34	2	1150	297	2	1.49	0.03	-	-	-	-	-	-	-	-	-
4	2005	3	413	43	3	1113	304	3	1.55	0.06	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	2003	3	468	10	3	1780	219	3	1.74	0.20	2	290	6	2	338	18	2	1.39	0.01
7	2002	-	-	-	-	-	-	-	-	-	3	337	51	3	575	288	3	1.42	0.09
8	2001	-	-	-	-	-	-	-	-	-	5	400	18	5	860	171	5	1.34	0.16
9	2000	-	-	-	-	-	-	-	-	-	1	276	-	1	300	-	1	1.43	-
10	1999	1	494	-	1	1920	-	1	1.59	-	3	380	46	3	767	347	3	1.33	0.16
11	1998	1	490	-	1	1750	-	1	1.49	-	9	412	56	9	1033	388	9	1.41	0.12
12	1997	-	-	-	-	-	-	-	-	-	5	412	42	5	940	286	5	1.31	0.06
13	1996	-	-	-	-	-	-	-	-	-	2	448	14	2	1288	124	2	1.43	0.00
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	1	434	-	1	1150	-	1	1.41	-
16	1993	1	492	-	1	2090	-	1	1.75	-	2	478	31	2	1475	247	2	1.35	0.04
17	1992	-	-	-	-	-	-	-	-	-	1	446	-	1	1525	-	1	1.72	-
18	1991	-	-	-	-	-	-	-	-	-	1	438	-	1	700	-	1	0.83	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	2	428	42	2	988	194	2	1.26	0.13
21	1988	-	-	-	-	-	-	-	-	-	2	400	25	2	650	106	2	1.01	0.03
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	1	420	-	1	700	-	1	0.94	-
24	1985	-	-	-	-	-	-	-	-	-	1	466	-	1	1525	-	1	1.51	-

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, 2009.

Age	Year-Class	Pointe du Bois									Lac du Bonnet								
		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	2008	-	-	-	-	-	-	-	-	-	2	180	6	2	42	2	2	0.72	0.11
2	2007	-	-	-	-	-	-	-	-	-	6	206	23	6	89	42	6	0.97	0.27
3	2006	7	220	36	7	104	45	7	0.90	0.06	39	234	12	39	116	23	39	0.90	0.14
4	2005	25	257	14	25	144	31	25	0.84	0.12	23	254	15	23	148	27	23	0.90	0.06
5	2004	4	282	6	4	173	43	4	0.77	0.18	5	264	18	5	167	40	5	0.89	0.11
6	2003	37	293	23	37	233	58	37	0.91	0.08	9	267	11	9	177	33	9	0.92	0.08
7	2002	20	316	24	20	280	77	20	0.87	0.09	13	278	13	13	203	23	13	0.95	0.15
8	2001	13	319	25	13	280	70	13	0.85	0.09	7	281	14	7	231	56	7	1.03	0.15
9	2000	1	382	-	1	380	-	1	0.68	-	2	288	17	2	238	18	2	1.00	0.10
10	1999	8	323	15	8	279	31	8	0.83	0.11	3	291	8	3	243	12	3	0.99	0.05
11	1998	8	350	23	8	379	86	8	0.87	0.07	5	293	22	5	256	63	5	1.01	0.18
12	1997	7	340	16	7	344	52	7	0.88	0.05	1	298	-	1	340	-	1	1.28	-
13	1996	1	350	-	1	420	-	1	0.98	-	-	-	-	-	-	-	-	-	-
14	1995	3	342	21	3	317	75	3	0.78	0.06	-	-	-	-	-	-	-	-	-

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, 2009.

Age	Year-Class	Pointe du Bois									Lac du Bonnet									Manigotagan L								
		FL			W			K			FL			W			K			FL			W			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
0	2009	-	-	-	-	-	-	-	-	-	3	126	6	2	18	4	2	0.94	0.09	-	-	-	-	-	-	-	-	-
1	2008	-	-	-	-	-	-	-	-	-	1	210	-	1	100	-	1	1.08	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	20	249	13	20	164	37	20	1.06	0.10	22	235	10	22	113	21	22	0.87	0.13
3	2006	13	237	25	13	135	53	13	0.95	0.16	11	291	30	11	272	88	11	1.07	0.09	42	294	30	41	277	89	41	1.04	0.08
4	2005	7	256	39	7	209	103	7	1.18	0.35	1	278	-	1	220	-	1	1.02	-	2	354	3	2	450	71	2	1.02	0.18
5	2004	6	287	38	6	272	99	6	1.09	0.10	2	365	21	2	520	85	2	1.07	0.01	6	410	71	6	775	345	6	1.04	0.04
6	2003	12	337	35	12	453	144	12	1.14	0.09	3	399	9	3	713	25	3	1.13	0.05	3	509	18	3	1517	176	3	1.15	0.07
7	2002	8	374	40	8	601	224	8	1.10	0.12	3	369	86	3	630	453	3	1.13	0.06	2	480	14	2	1375	247	2	1.24	0.11
8	2001	6	402	55	6	747	349	6	1.09	0.16	2	366	17	2	555	78	2	1.13	0.00	0	-	-	0	-	-	0	-	-
9	2000	1	513	-	1	1700	-	1	1.26	-	0	-	-	0	-	-	0	-	-	3	541	55	3	1767	448	3	1.10	0.05
10	1999	12	456	61	12	1139	470	12	1.12	0.11	1	506	-	1	1590	-	1	1.23	-	0	-	-	0	-	-	0	-	-
11	1998	5	511	119	5	1712	1067	5	1.08	0.17	0	-	-	0	-	-	0	-	-	4	542	39	4	1788	440	4	1.11	0.12
12	1997	3	524	71	3	1830	645	3	1.24	0.04	3	500	59	3	1563	629	3	1.21	0.05	5	578	87	5	2130	886	5	1.06	0.08
13	1996	9	558	77	9	2100	931	9	1.12	0.16	1	460	-	1	1190	-	1	1.22	-	0	-	-	0	-	-	0	-	-
14	1995	9	563	35	9	2021	470	9	1.11	0.15	3	619	47	3	2697	585	3	1.12	0.02	3	615	20	3	2283	431	3	0.97	0.09
15	1994	7	566	66	7	2063	733	7	1.10	0.09	1	604	-	1	2300	-	1	1.04	-	2	602	25	2	2063	265	2	0.94	0.00
16	1993	3	513	97	3	1620	811	3	1.15	0.09	0	-	-	0	-	-	0	-	-	1	582	-	1	1500	-	1	0.76	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	-	-	0	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	-	-	0	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	646	-	1	2250	-	1	0.83	-

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

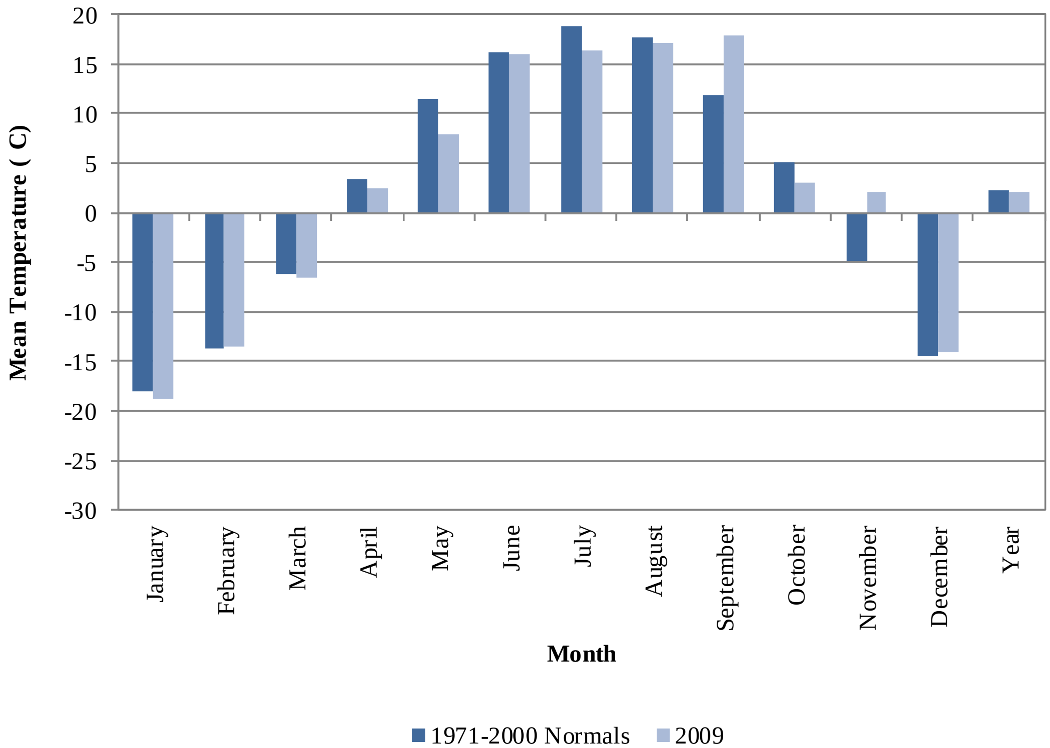
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 2.6-13. Deformities, erosions, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2009.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTS}	$\%_{DELTS}$
Pointe du Bois											
Lake Sturgeon	2	40	-	-	-	-	-	-	5	2	40.0
White Sucker	-	-	-	-	2	0.7	-	-	273	2	0.7
Northern Pike	-	-	-	-	-	-	-	-	40	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	9	-	-
Sauger	-	-	-	-	-	-	-	-	137	-	-
Walleye	-	-	-	-	-	-	-	-	101	-	-
Lac du Bonnet											
Lake Sturgeon	-	-	-	-	-	-	-	-	4	-	-
White Sucker	-	-	-	-	-	-	-	-	34	-	-
Northern Pike	-	-	-	-	-	-	-	-	11	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	13	-	-
Sauger	-	-	-	-	-	-	-	-	116	-	-
Walleye	-	-	-	-	-	-	-	-	55	-	-
Manigotagan Lake											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker			-	-	-	-	-	-	20	-	-
Northern Pike	-	-	-	-	-	-	-	-	13	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	41	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-
Walleye	1	1.0	-	-	1	1.0	-	-	96	1*	1.0

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 ($n_{DELTs}/n_{Inspect}\times100$)

(A)



(B)

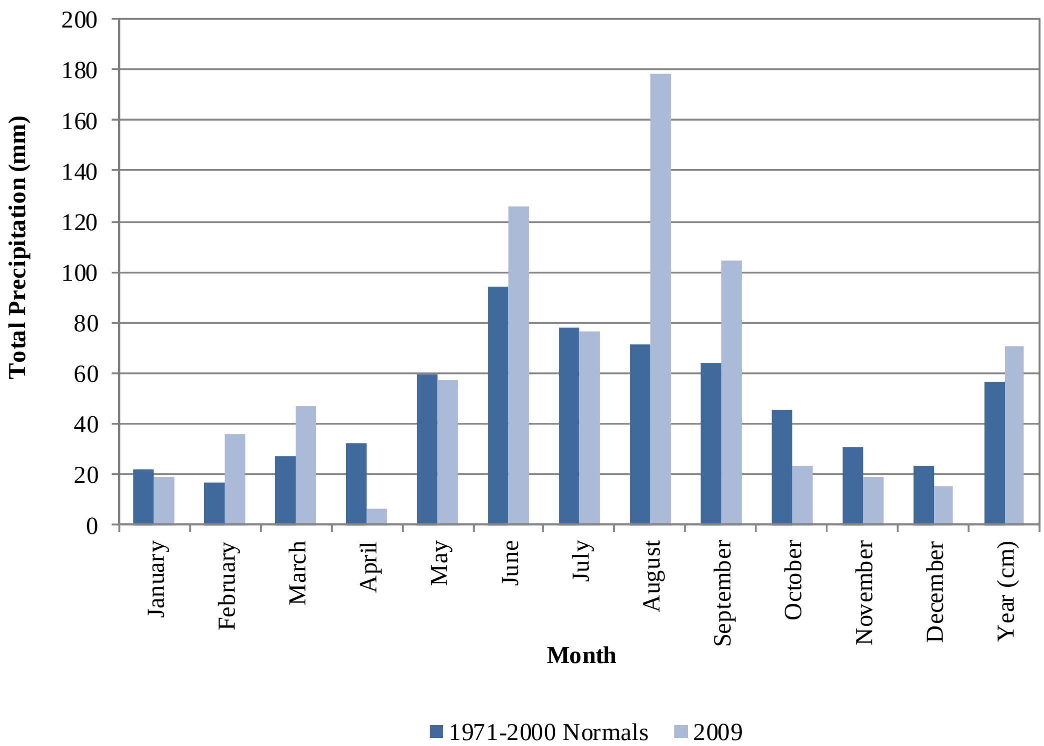


Figure 2.1-1. Monthly mean air temperature (A) and monthly total precipitation (B) for 2009 compared to climate normals (1971-2000), Pinawa, MB.

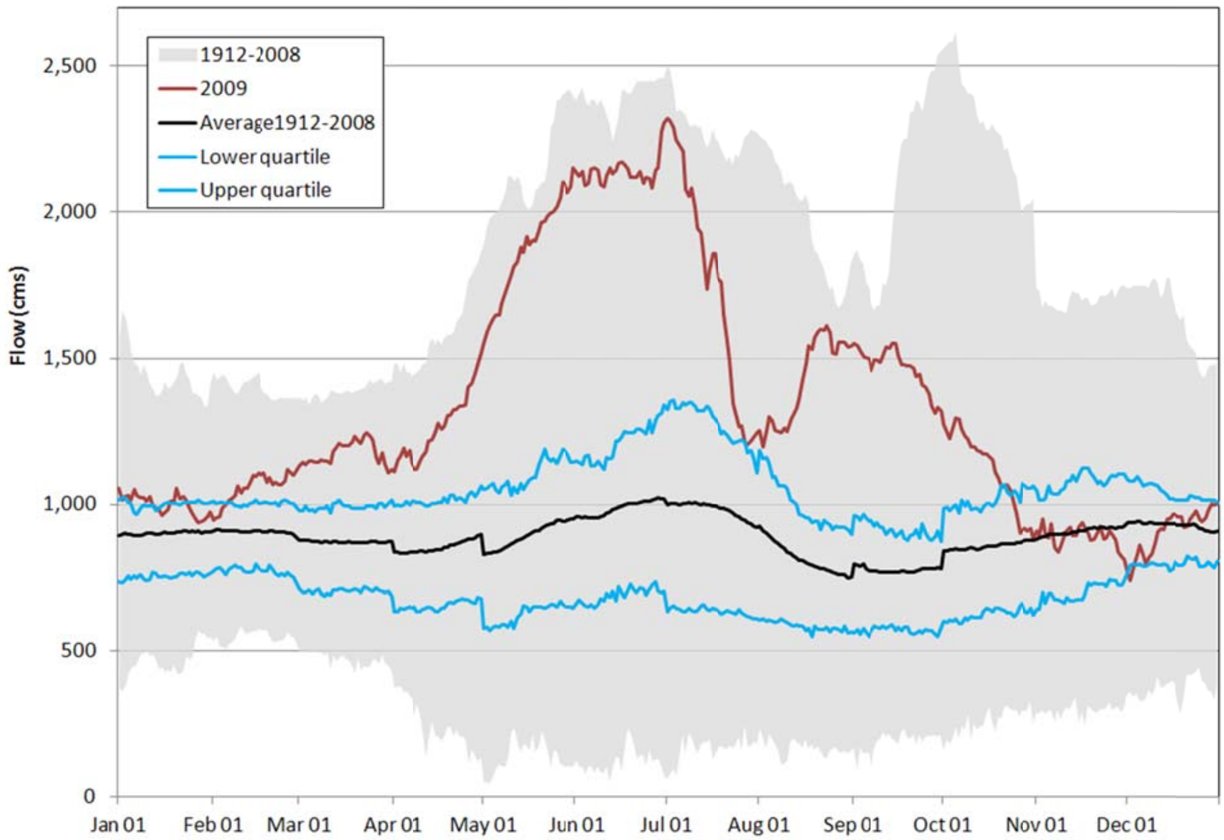


Figure 2.2-1. 2009 Winnipeg River flow at the Slave Falls Generating Station.

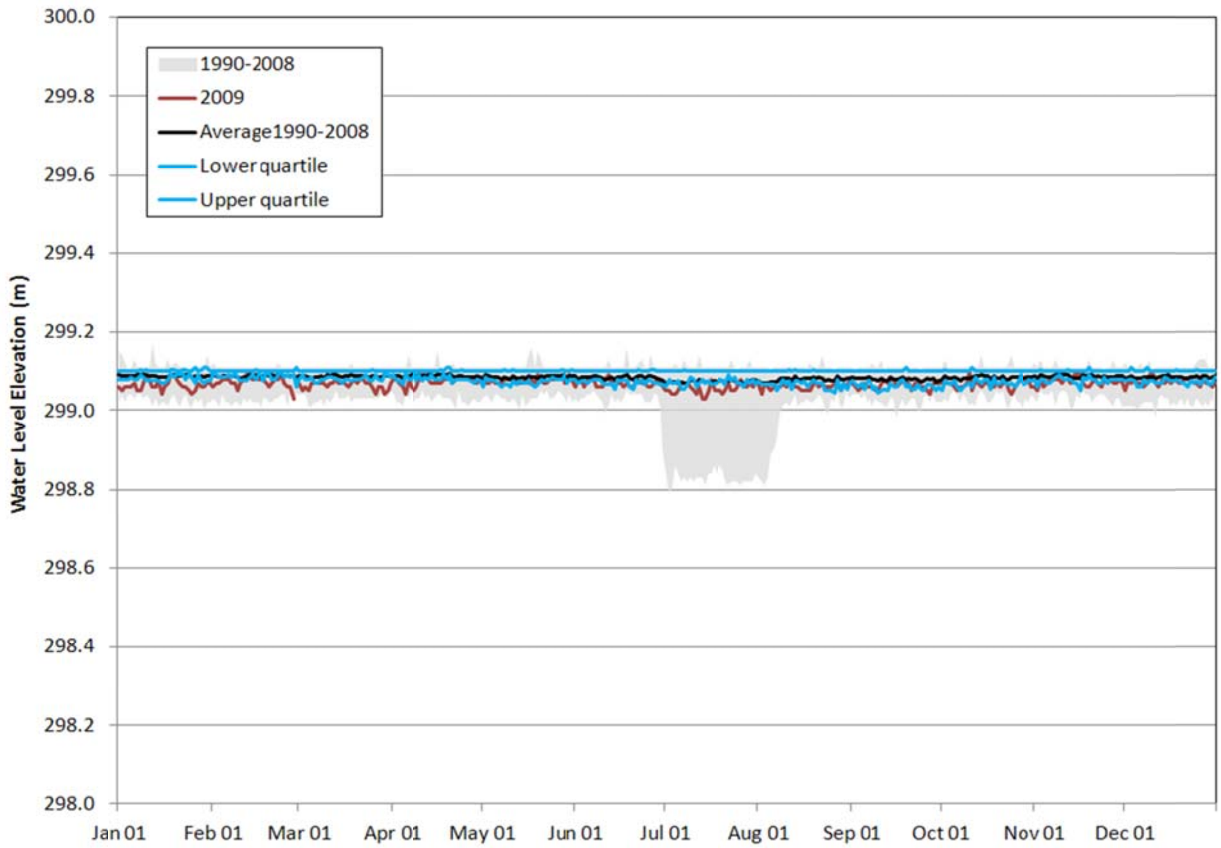


Figure 2.2-2. 2009 Pointe du Bois outer Forebay water level elevation.

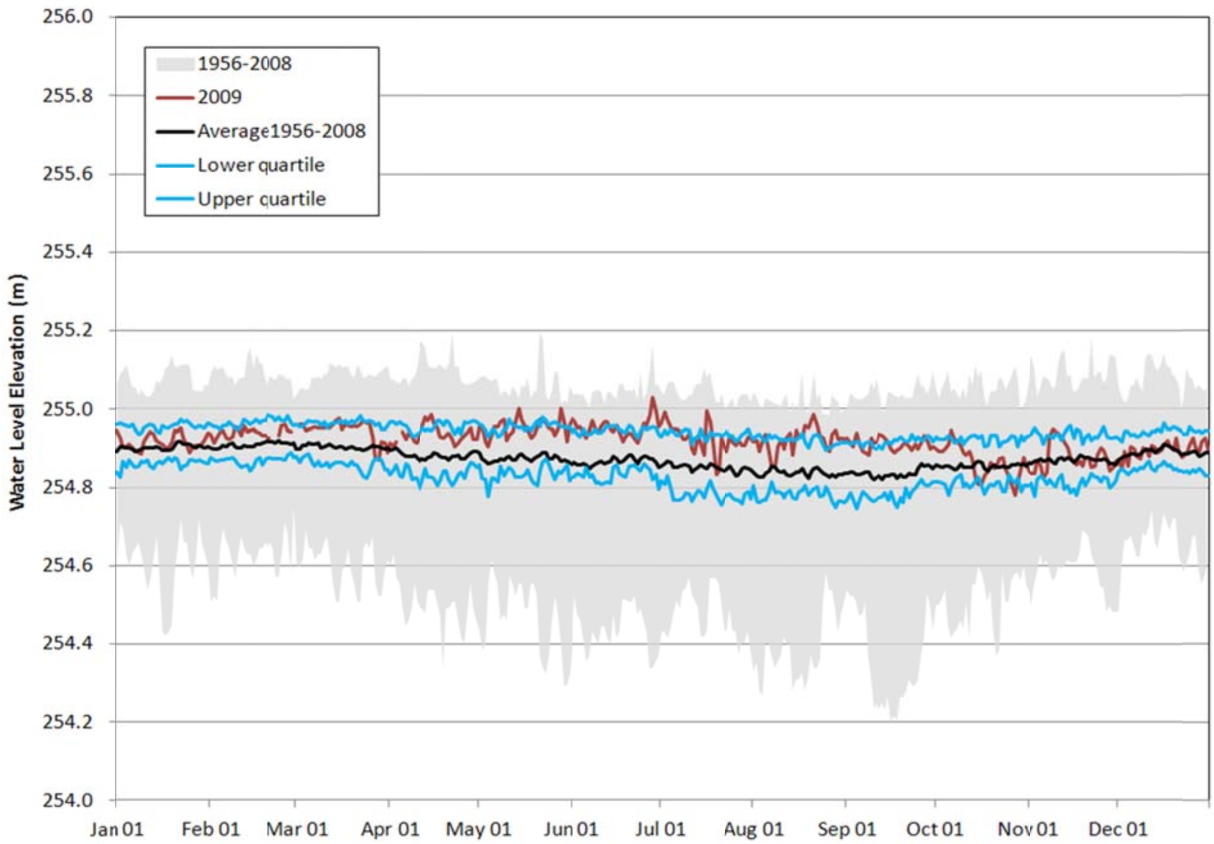


Figure 2.2-3. 2009 Lac du Bonnet water level elevation (05PF062).

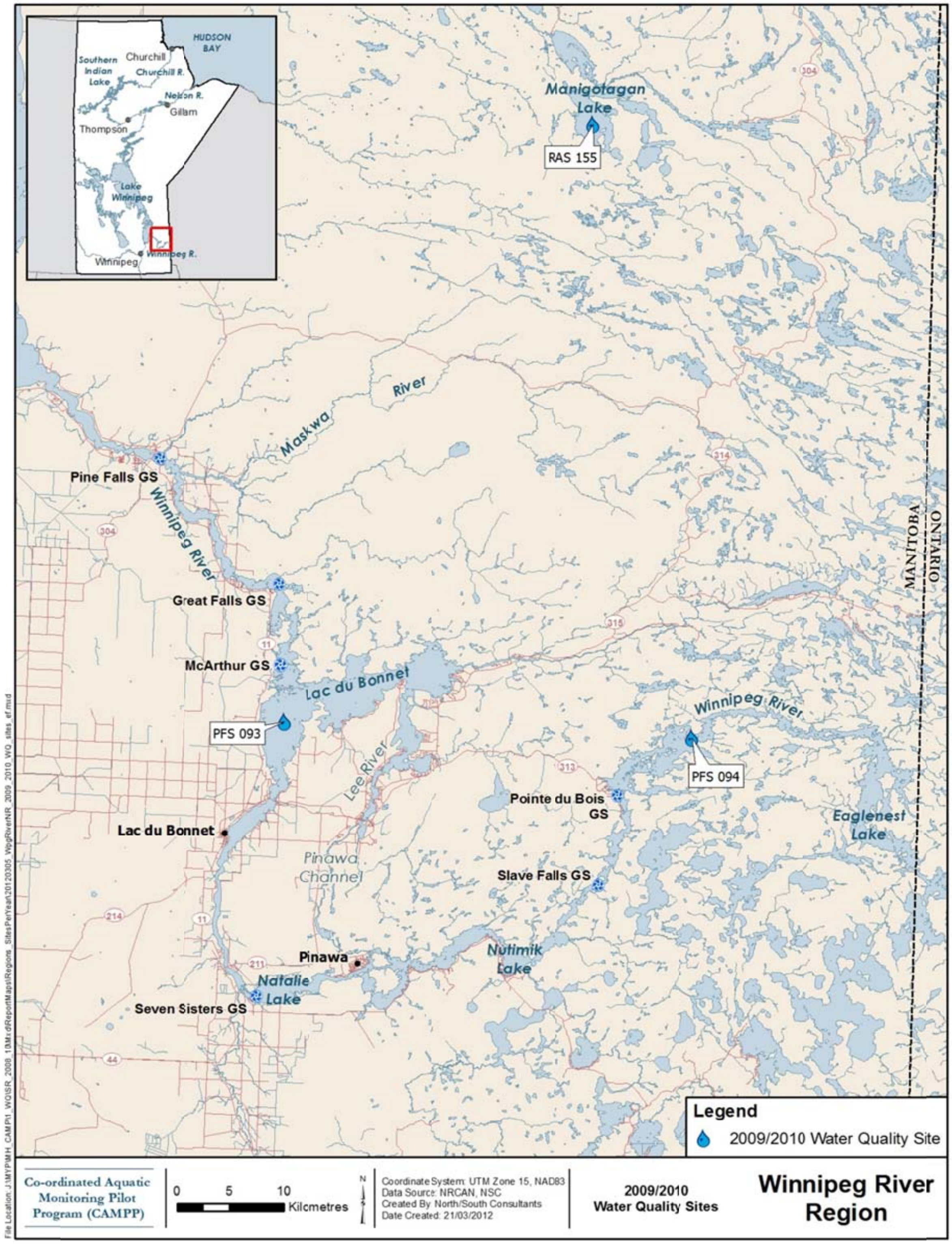


Figure 2.3-1. Water quality and phytoplankton monitoring sites in the Winnipeg River Region: 2009/2010.

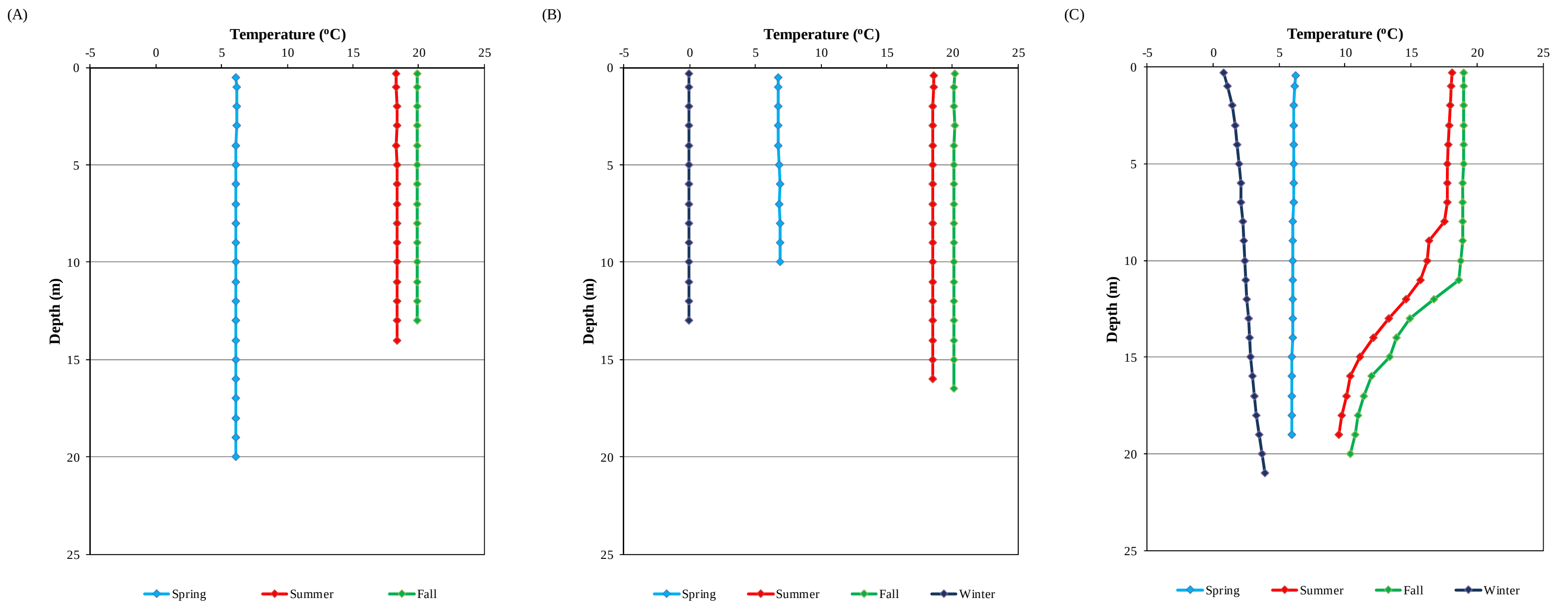


Figure 2.3-2. Water temperature profiles measured in the Winnipeg River Region in 2009/2010: (A) Pointe du Bois Forebay; (B) Lac du Bonnet; and (C) Manigotagan Lake. Note, winter sampling was not completed at the Pointe du Bois Forebay due to poor ice conditions.

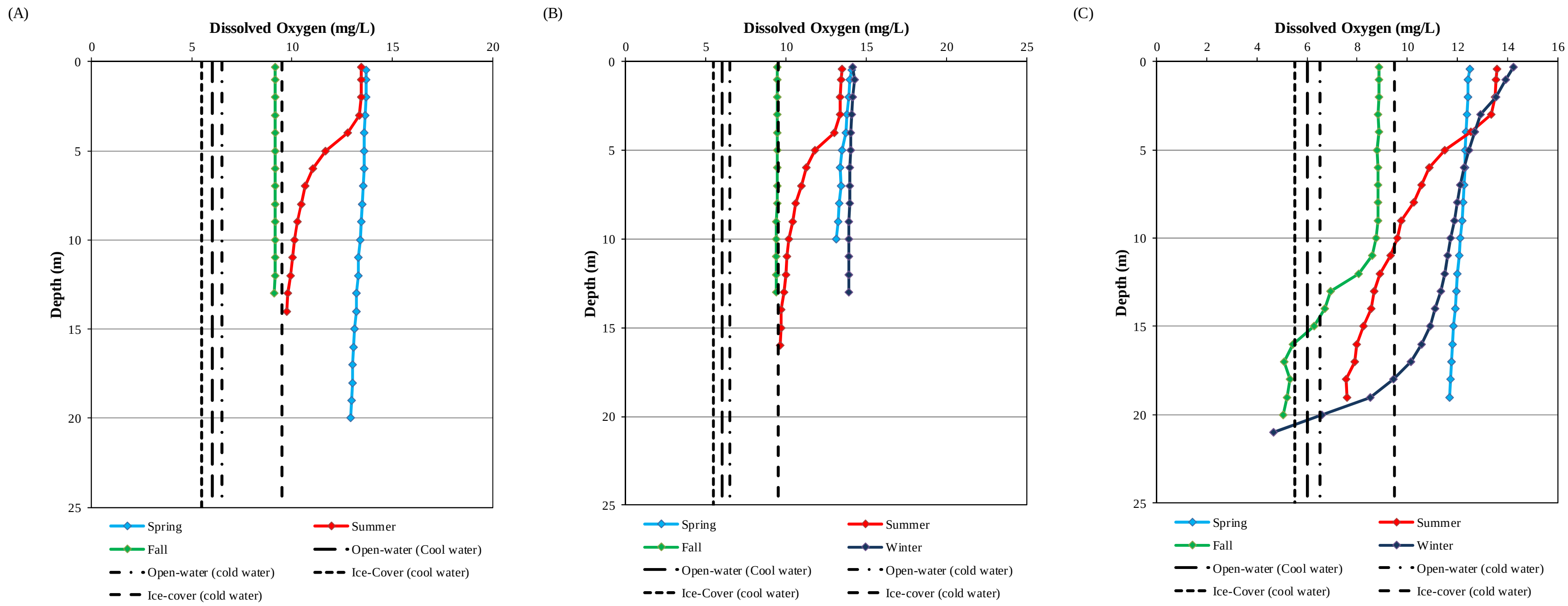


Figure 2.3-3. Dissolved oxygen depth profiles measured in the Winnipeg River Region in 2009/2010: (A) Pointe du Bois Forebay; (B) Lac du Bonnet; and (C) Manigotagan Lake. Note, winter sampling was not completed at the Pointe du Bois Forebay due to poor ice conditions. Dashed lines represent selected MWQSOGs for PAL.

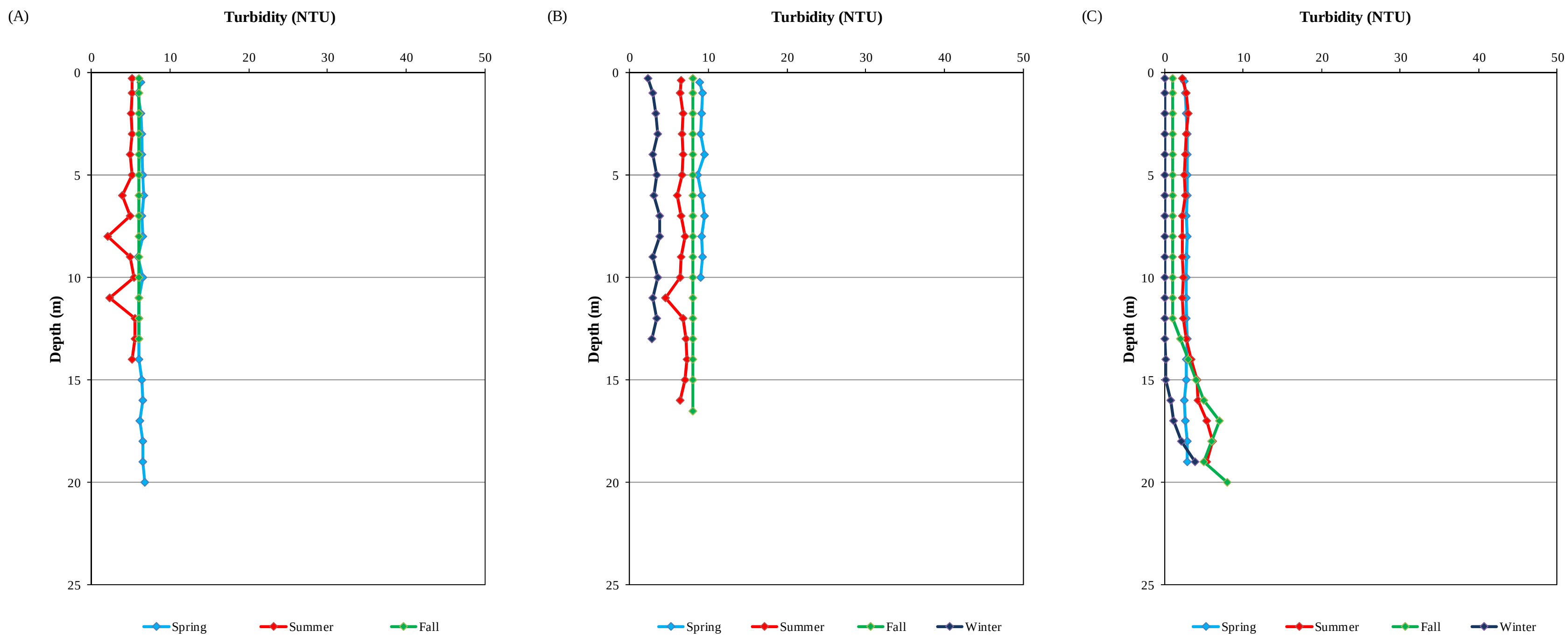


Figure 2.3-4. Turbidity depth profiles measured in the Winnipeg River Region in 2009/2010: (A) Pointe du Bois Forebay; (B) Lac du Bonnet; and (C) Manigotagan Lake. Note, winter sampling was not completed at the Pointe du Bois Forebay due to poor ice conditions.

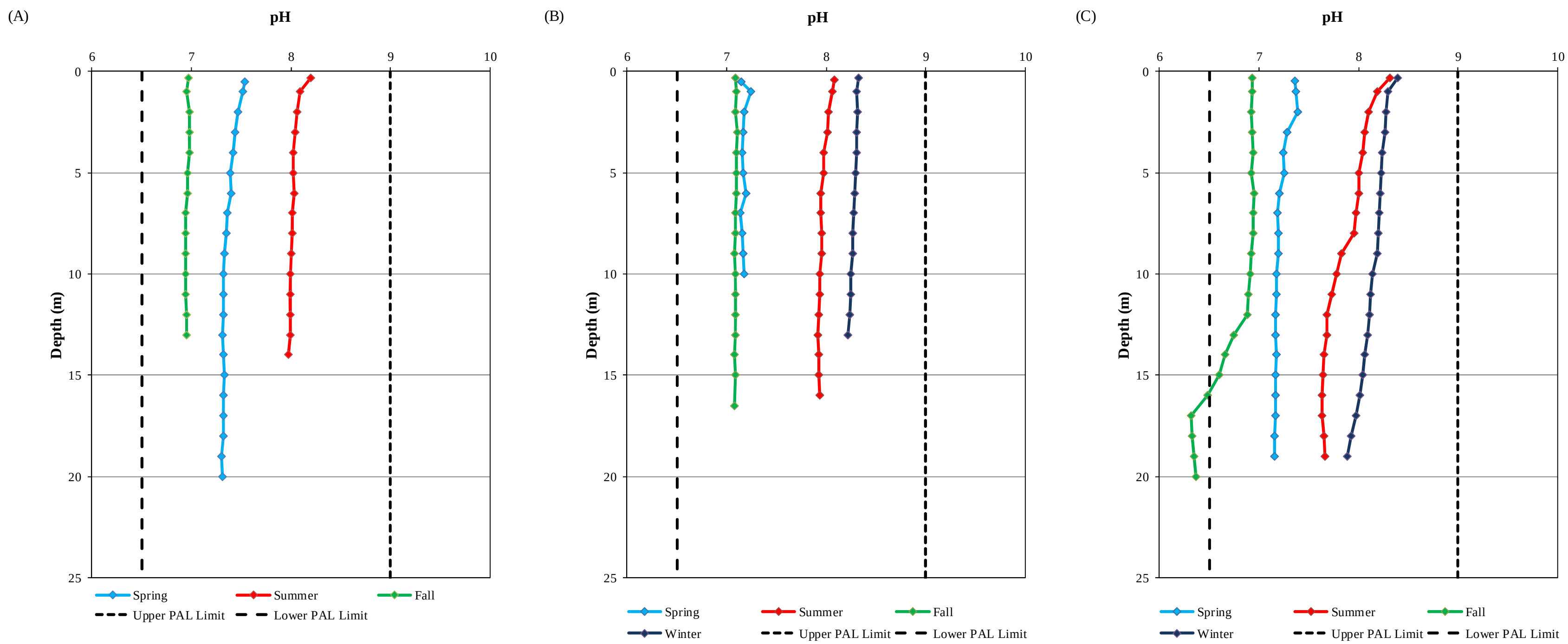


Figure 2.3-5. pH depth profiles measured in the Winnipeg River Region in 2009/2010: (A) Pointe du Bois Forebay; (B) Lac du Bonnet; and (C) Manigotagan Lake. Note, winter sampling was not completed at the Pointe du Bois Forebay due to poor ice conditions.

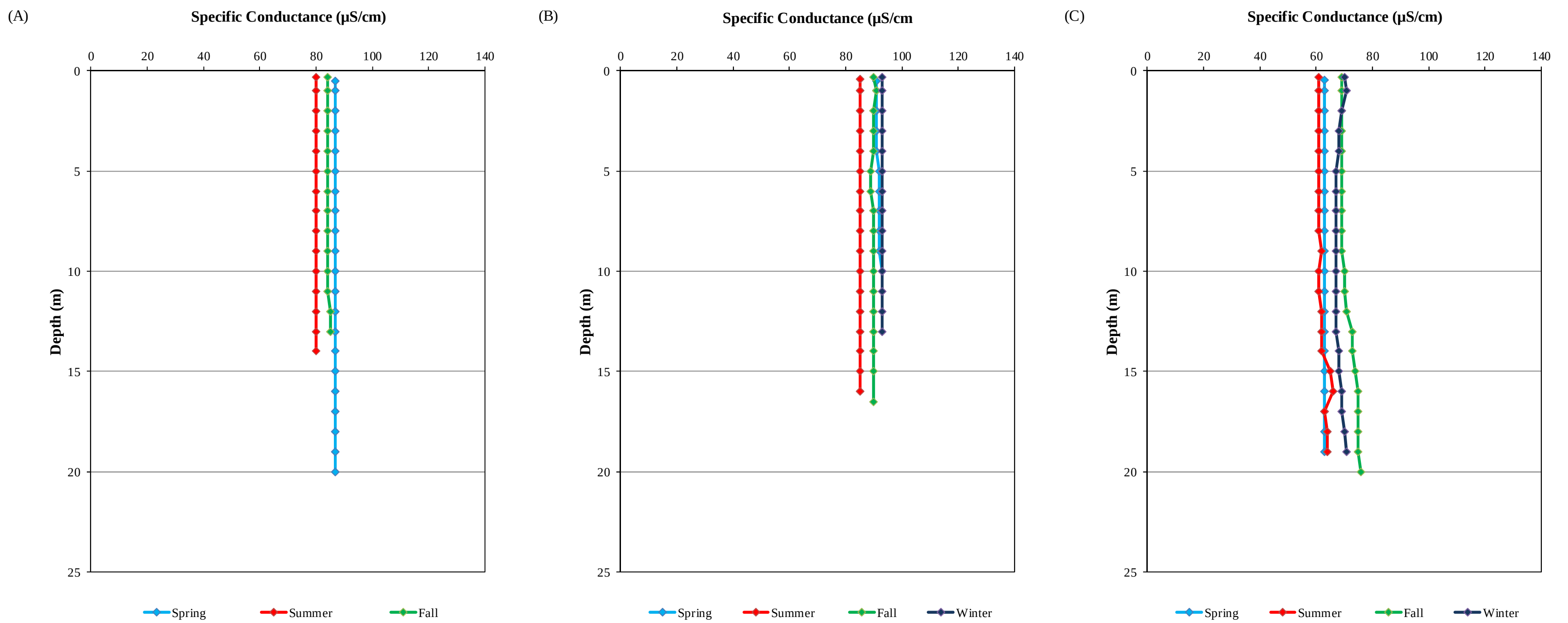


Figure 2.3-6. Specific conductance depth profiles measured in the Winnipeg River Region in 2009/2010: (A) Pointe du Bois Forebay; (B) Lac du Bonnet; and (C) Manigotagan Lake. Note, winter sampling was not completed at the Pointe du Bois Forebay due to poor ice conditions.

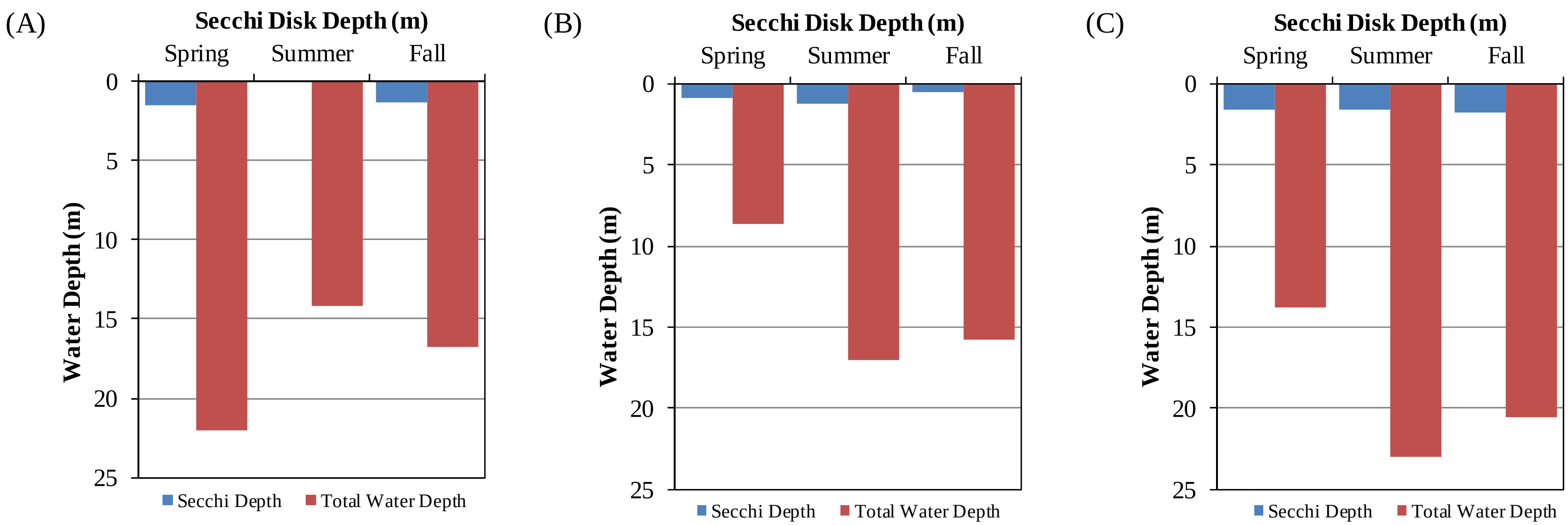


Figure 2.3-7. Secchi disk depths measured in the Winnipeg River Region in 2009/2010: (A) Pointe du Bois Forebay; (B) Lac du Bonnet; and (C) Manigotagan Lake.

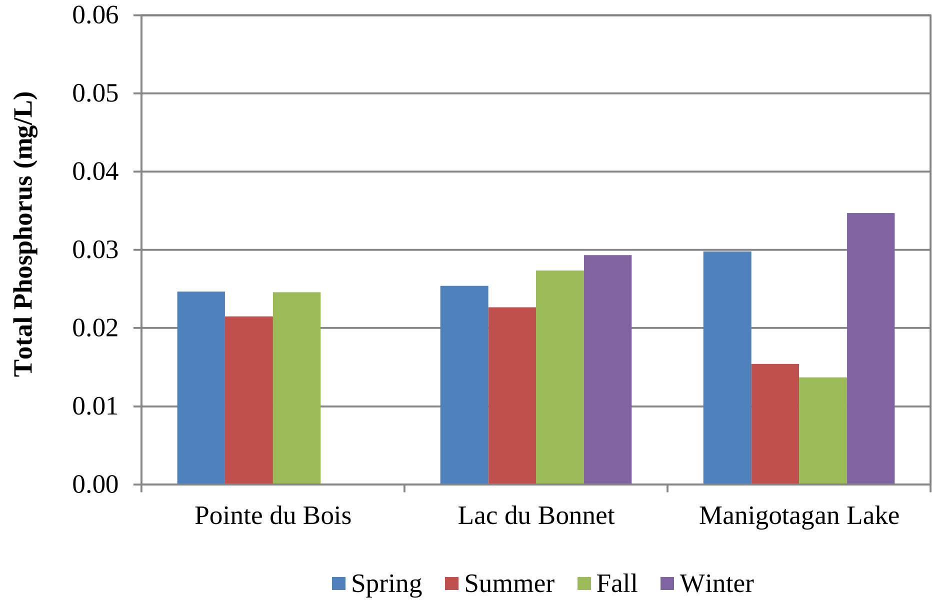


Figure 2.3-8. Total phosphorus measured in surface grabs in the Winnipeg River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

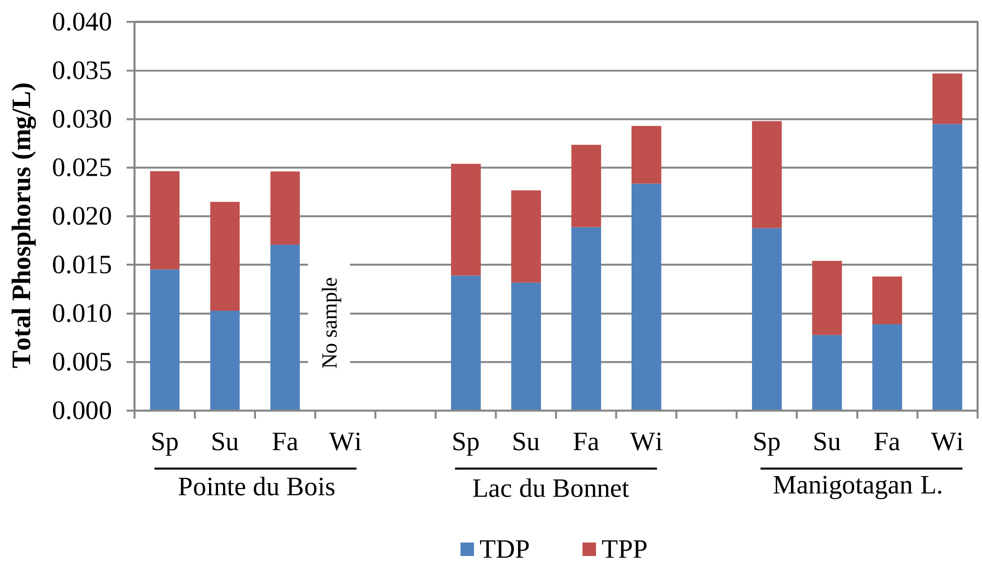


Figure 2.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Winnipeg River Region: 2009/2010.

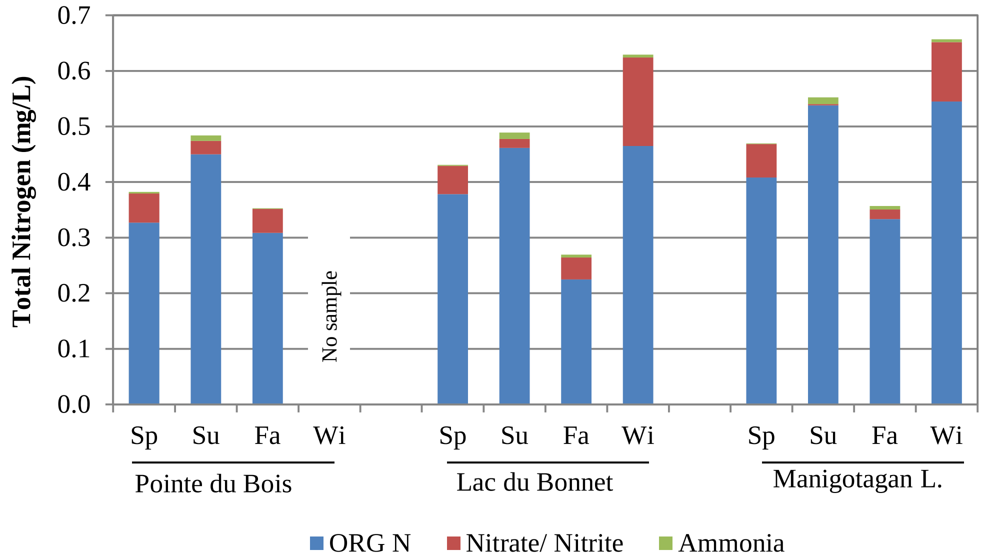


Figure 2.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Winnipeg River Region: 2009/2010.

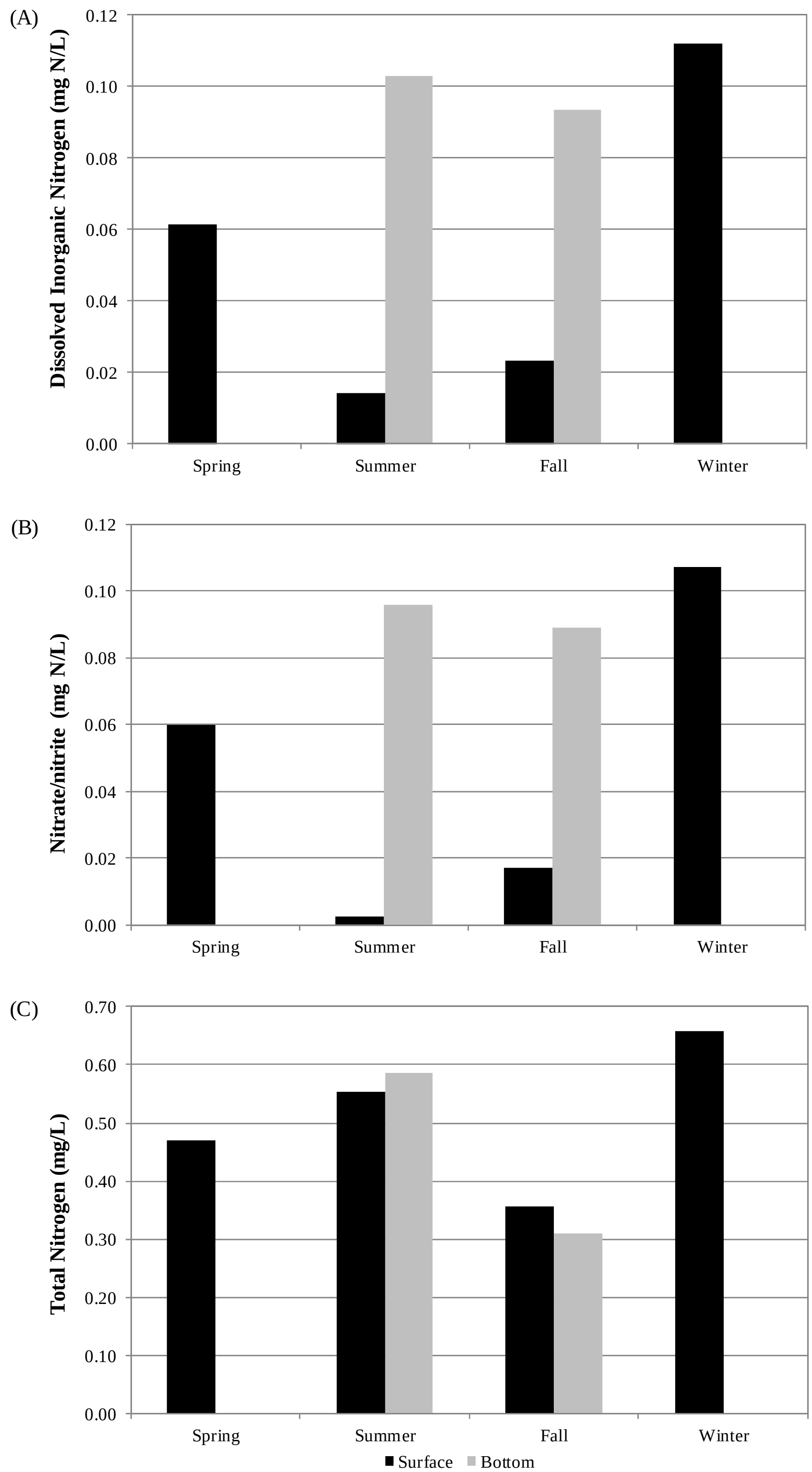


Figure 2.3-11. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Manigotagan Lake, 2009/2010.

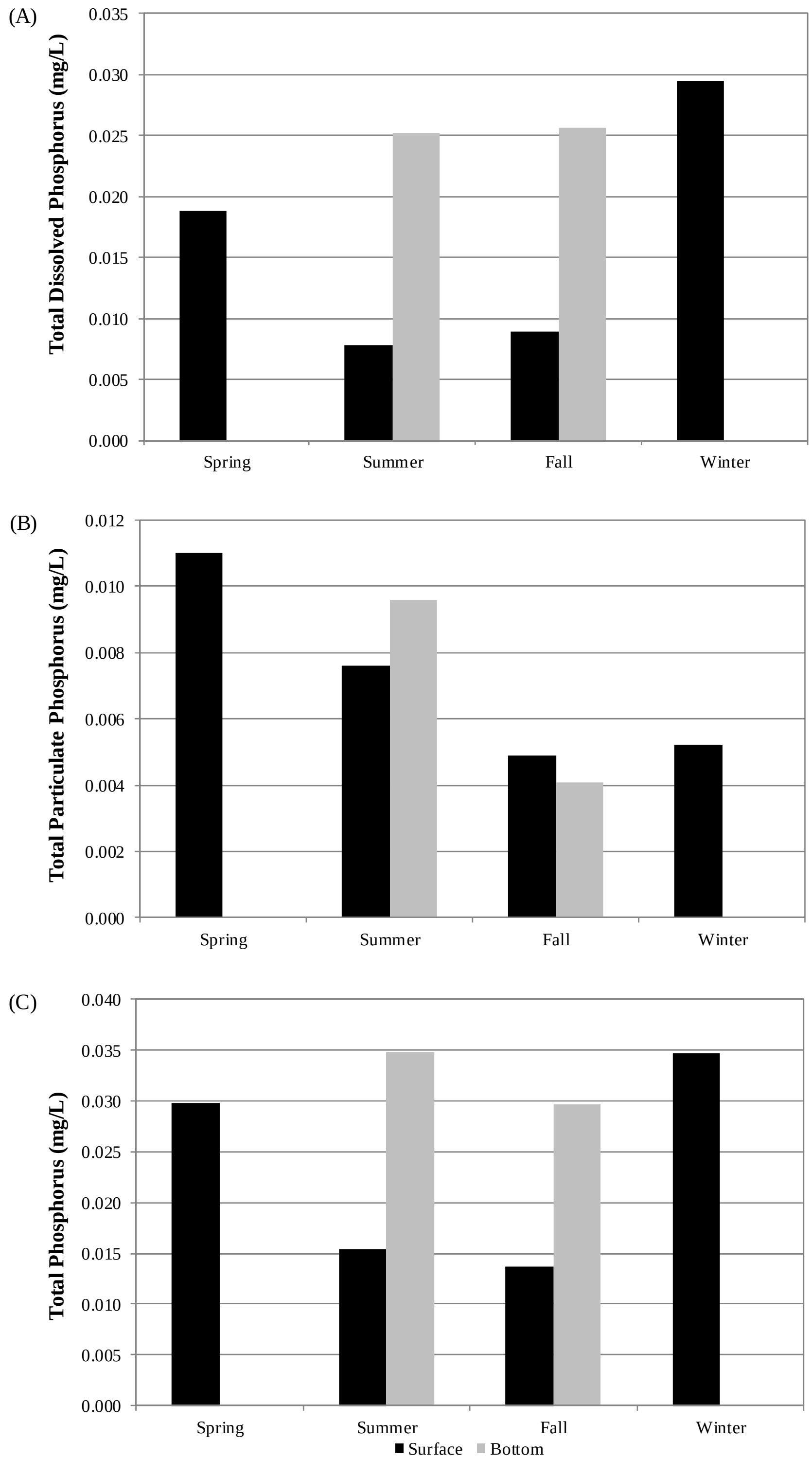
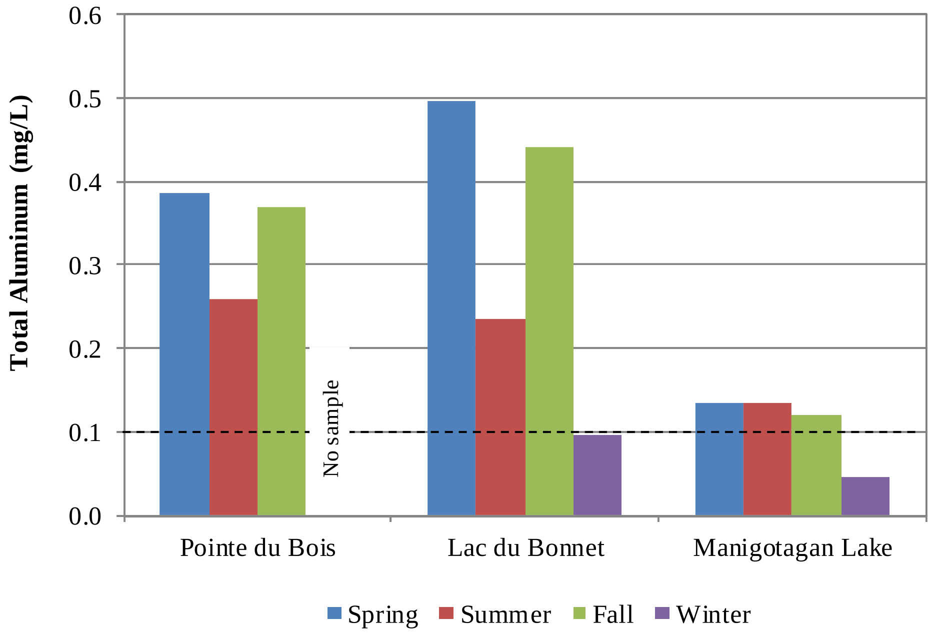


Figure 2.3-12. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Manigotagan Lake, 2009/2010.

(A)



(B)

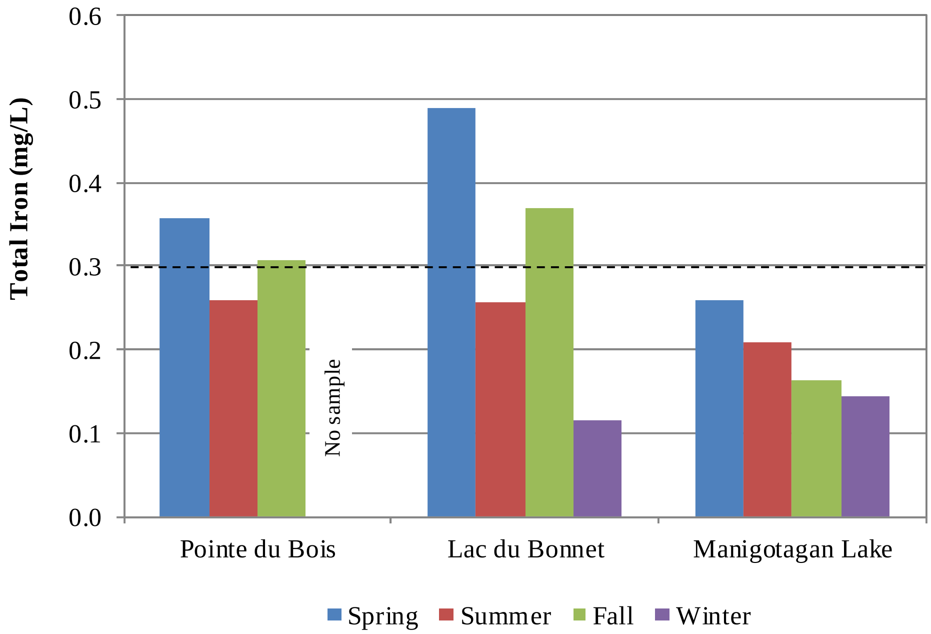


Figure 2.3-13. Total aluminum (A) and total iron (B) measured in surface grabs in the Winnipeg River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

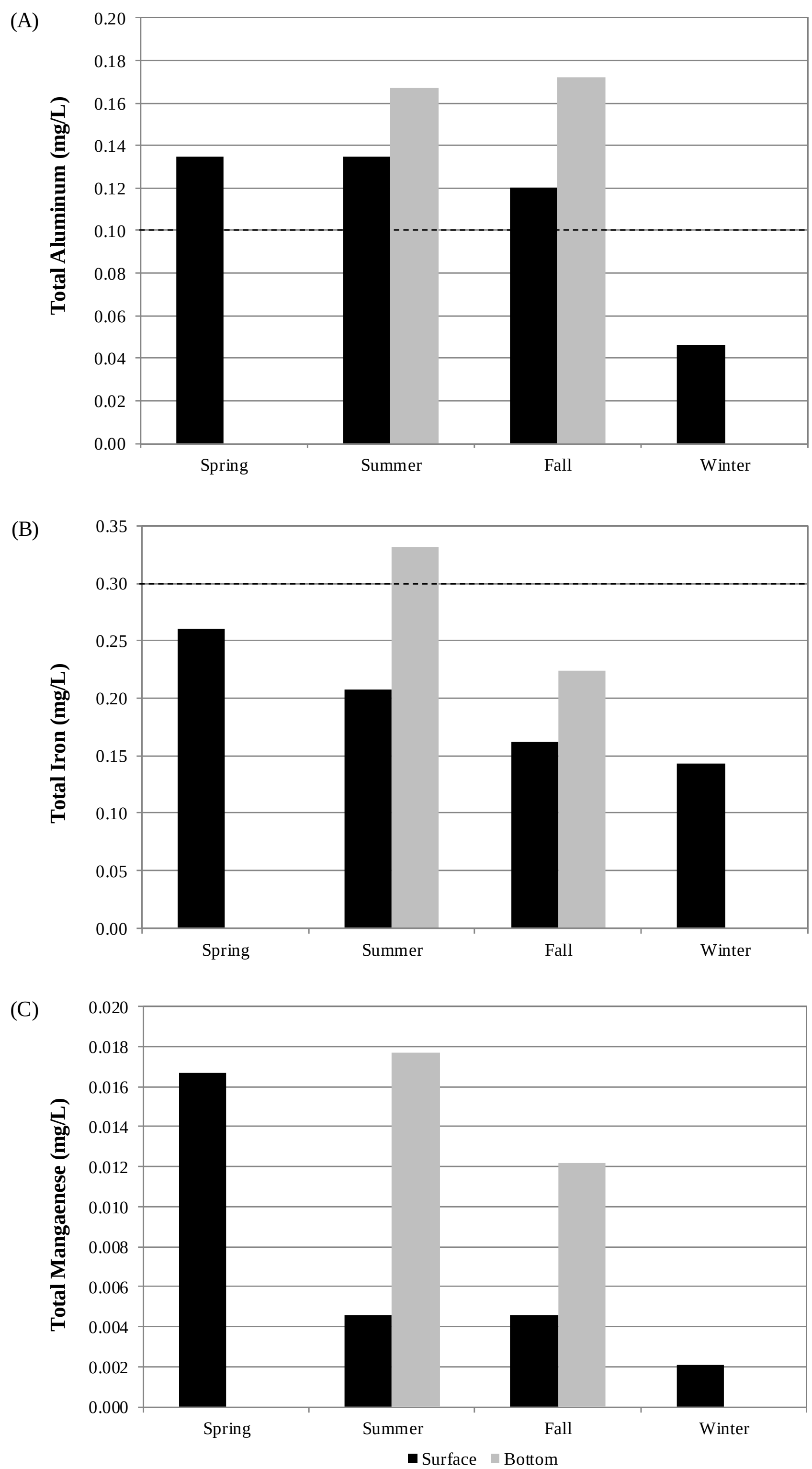


Figure 2.3-14. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Manigotagan Lake, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

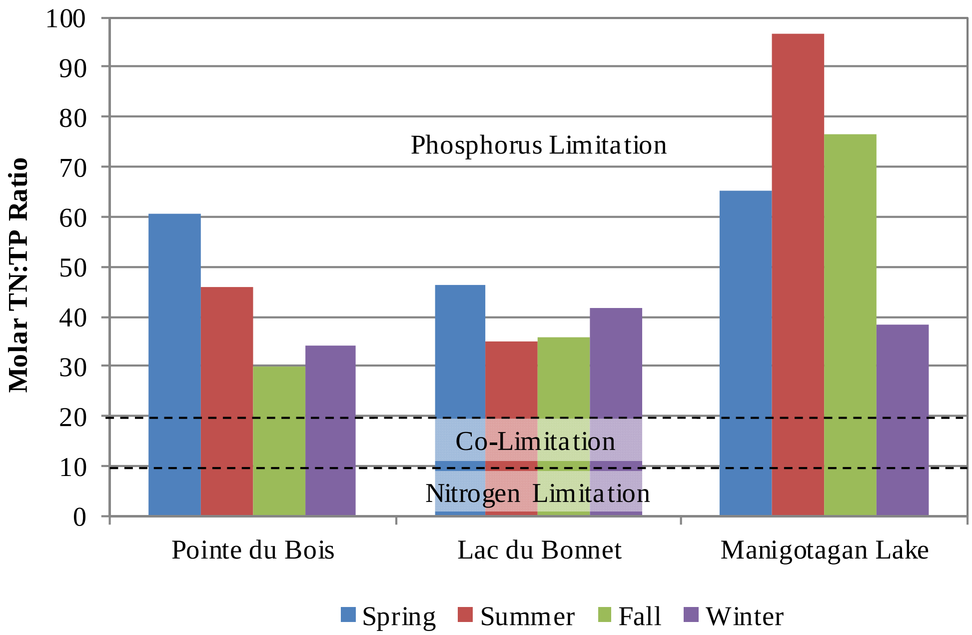


Figure 2.3-15. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Winnipeg River Region: 2009/2010.

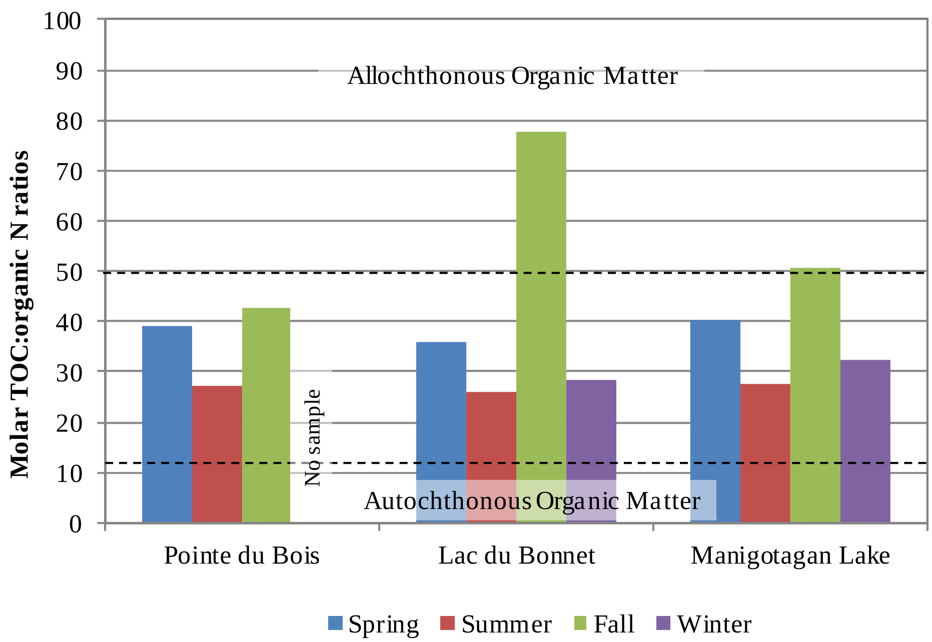
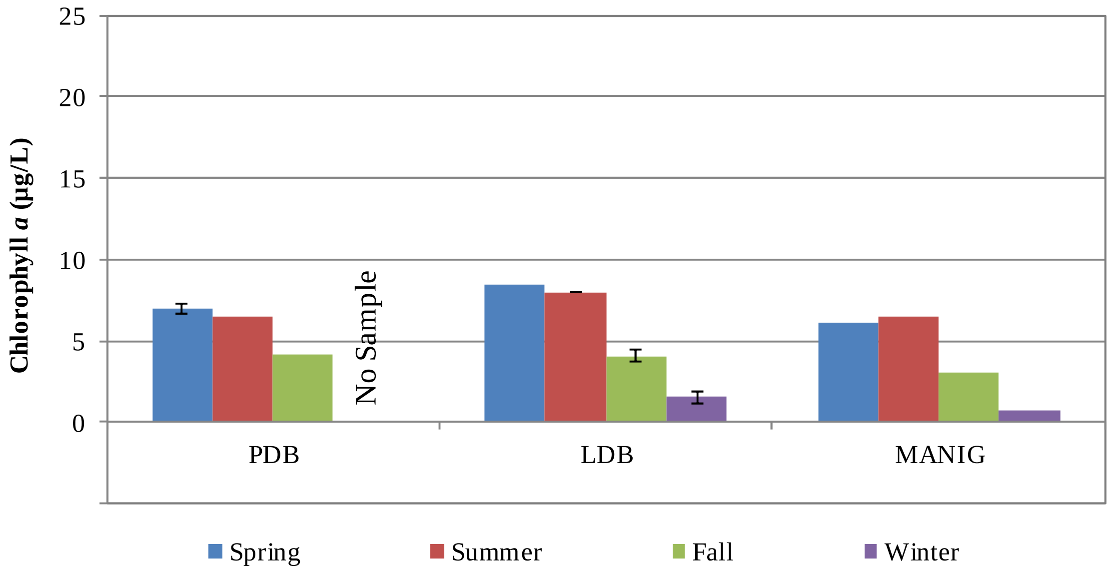


Figure 2.3-16. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios ratios in the Winnipeg River Region: 2009/2010.

(A) Surface



(B) Euphotic

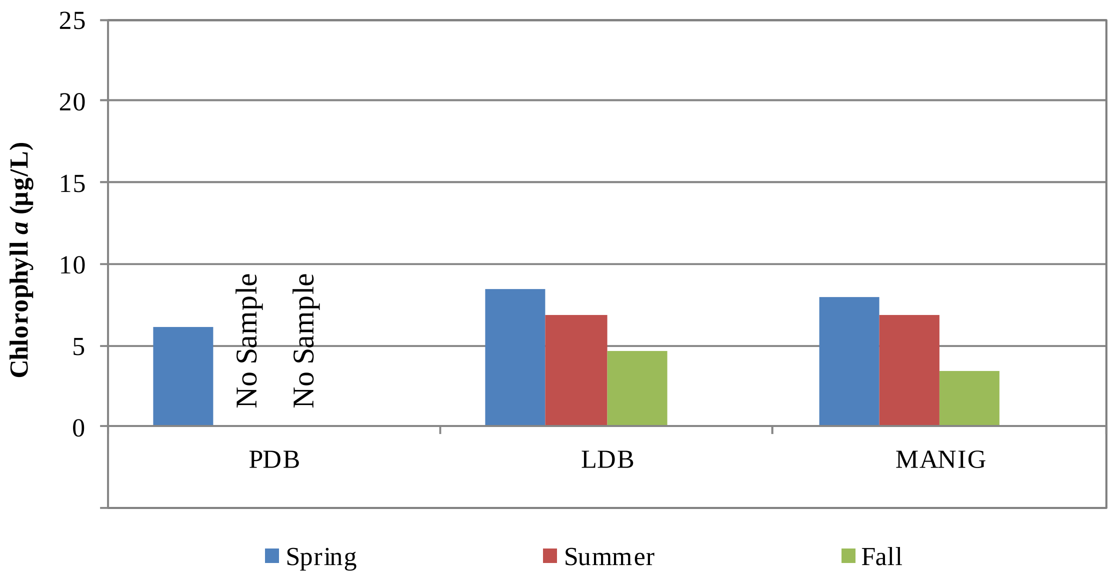


Figure 2.4-1. Chlorophyll *a* concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Winnipeg River Region in 2009/2010. Error bars represent the standard error of triplicate samples.

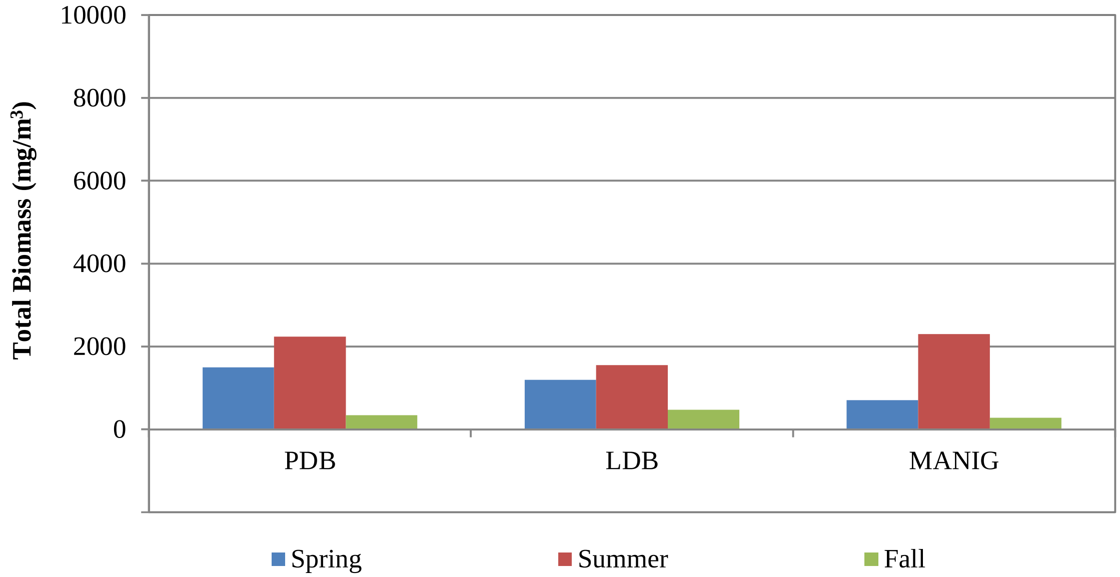


Figure 2.4-2. Phytoplankton biomass measured at sites in the Winnipeg River Region in 2009/2010.

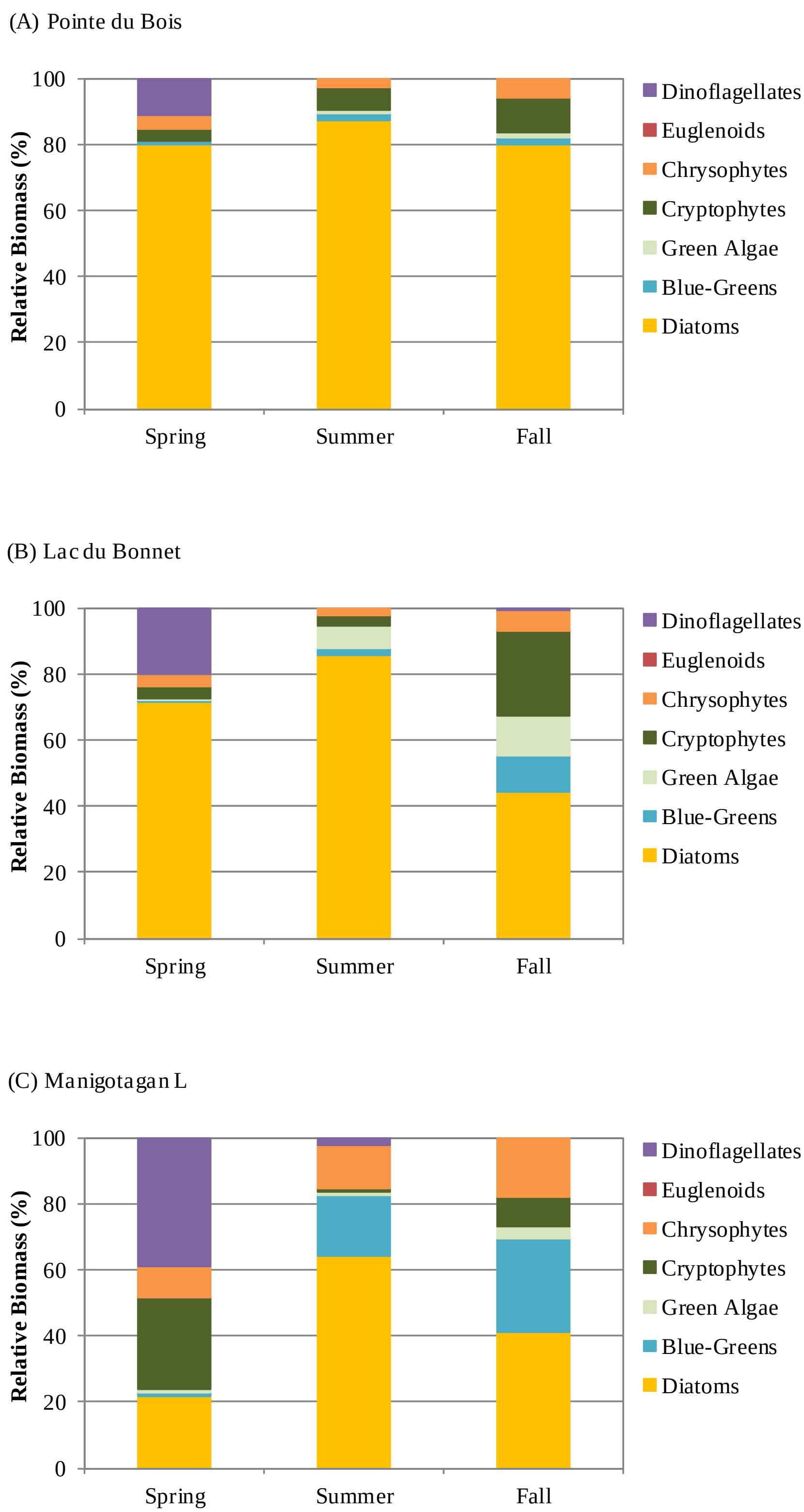


Figure 2.4-3. Phytoplankton community composition at sites in the Winnipeg River Region in 2009/2010.

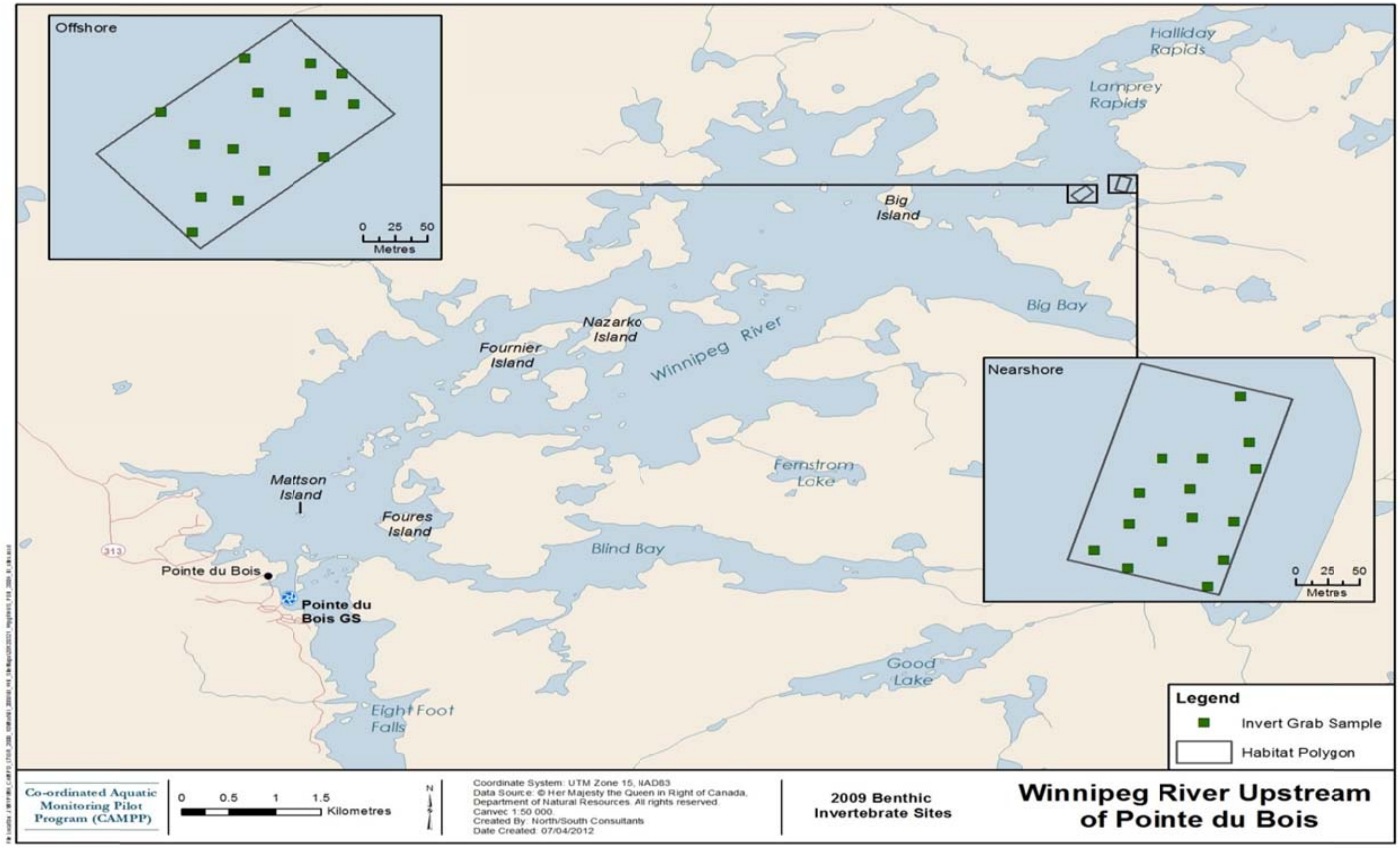


Figure 2.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Pointe du Bois Forebay in the Winnipeg River Region, 2009.

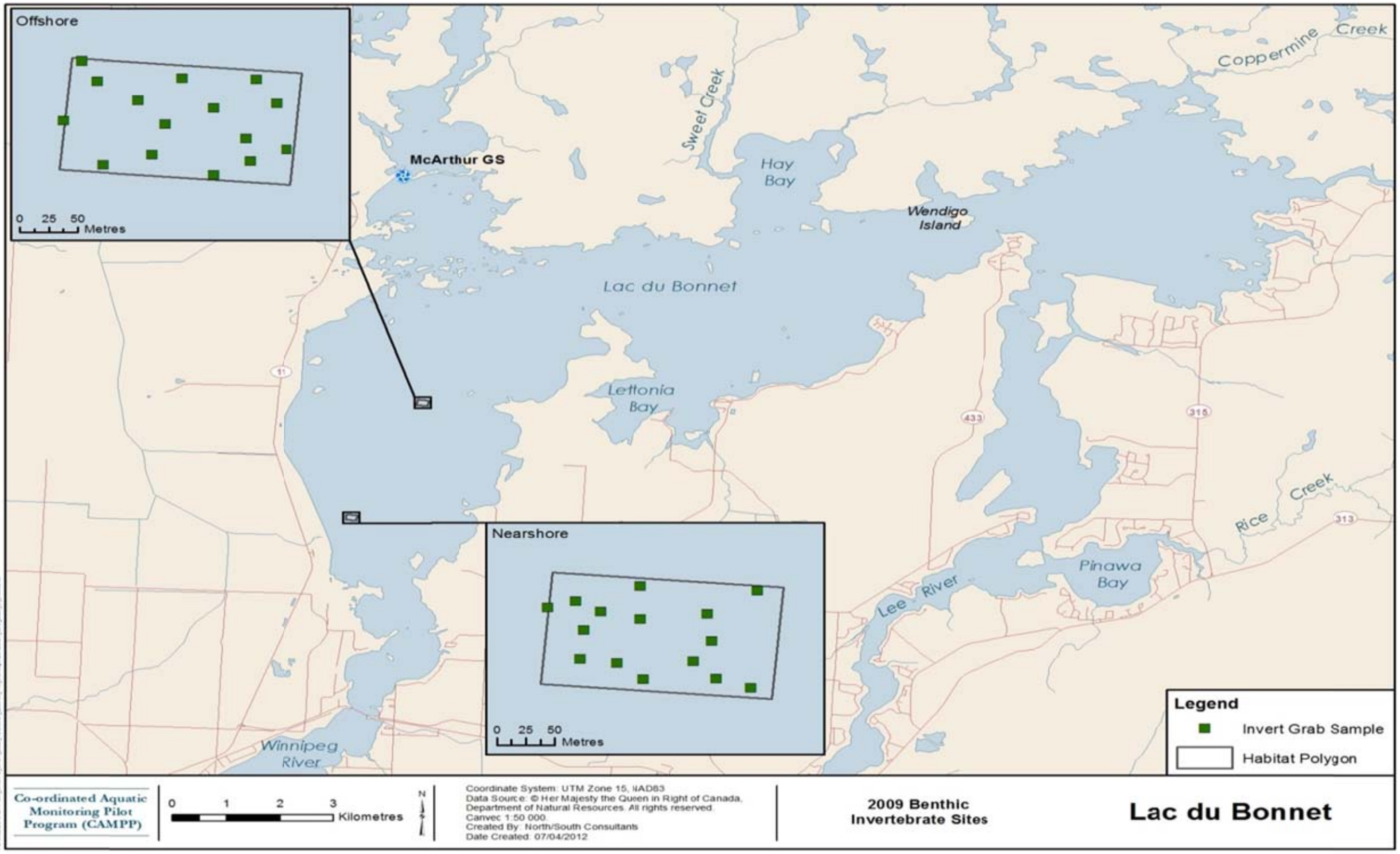


Figure 2.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Lac du Bonnet in the Winnipeg River Region, 2009.

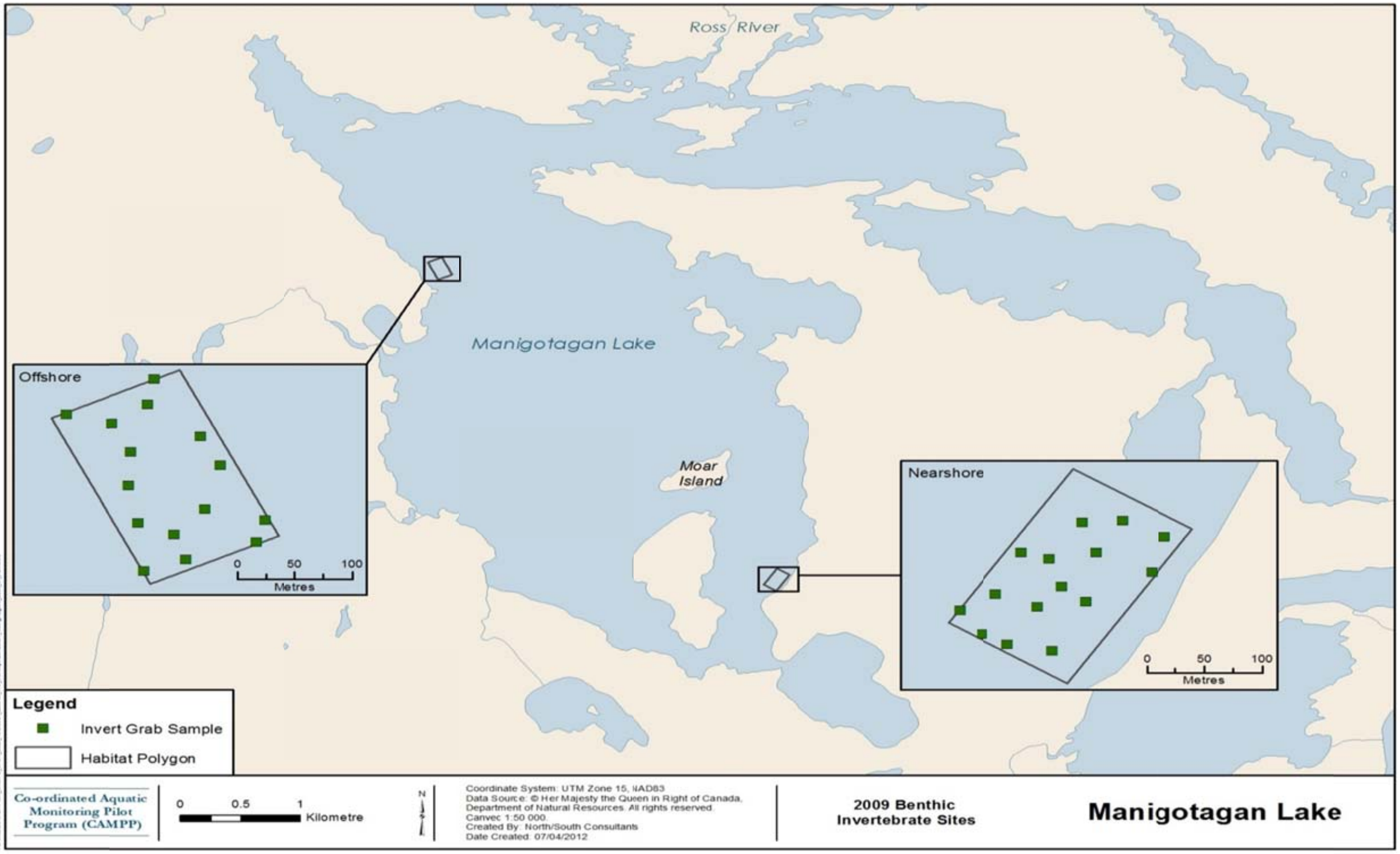


Figure 2.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Manigotagan Lake in the Winnipeg River Region, 2009.

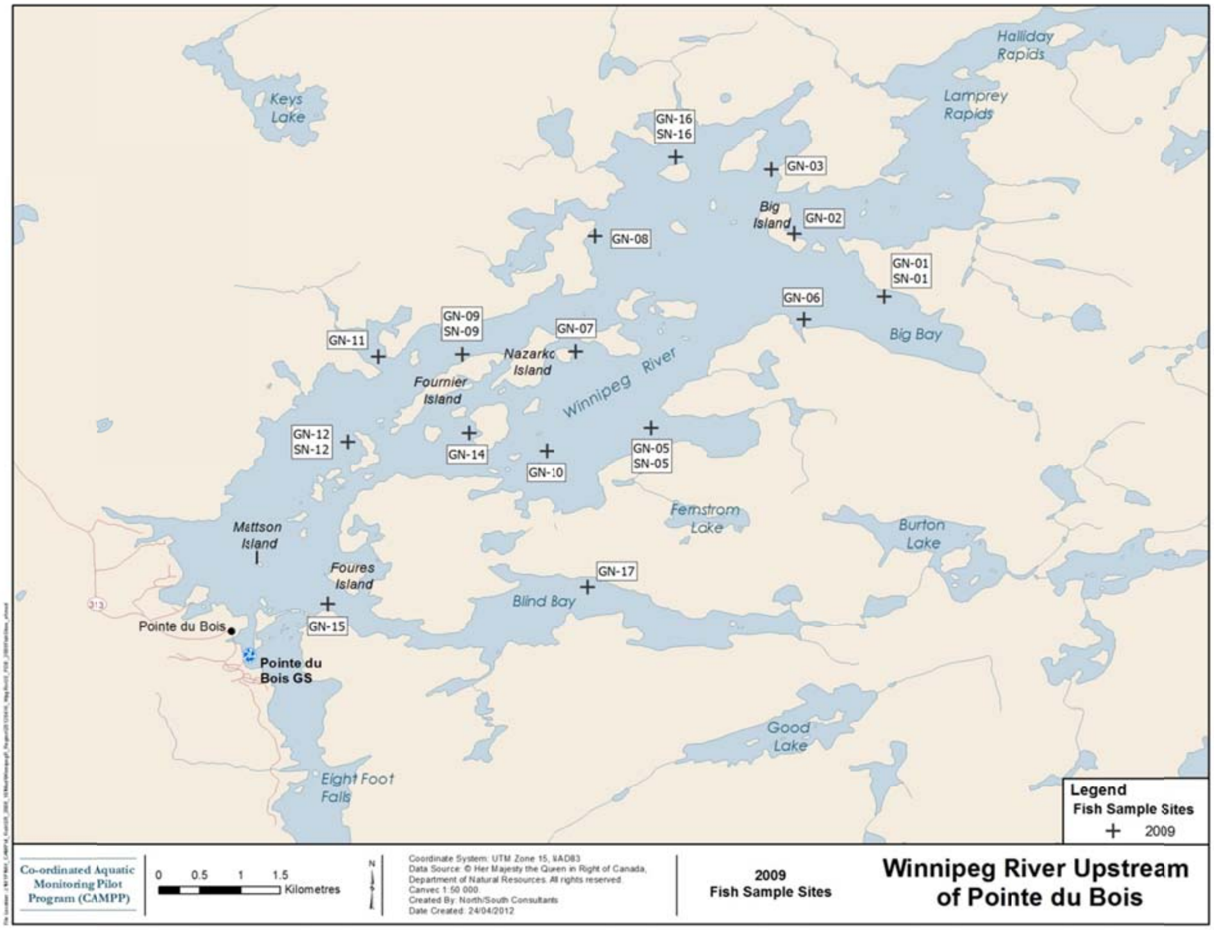


Figure 2.6-1. Map depicting standard gang and small mesh index gillnet sites sampled in Pointe du Bois Forebay, 2009.

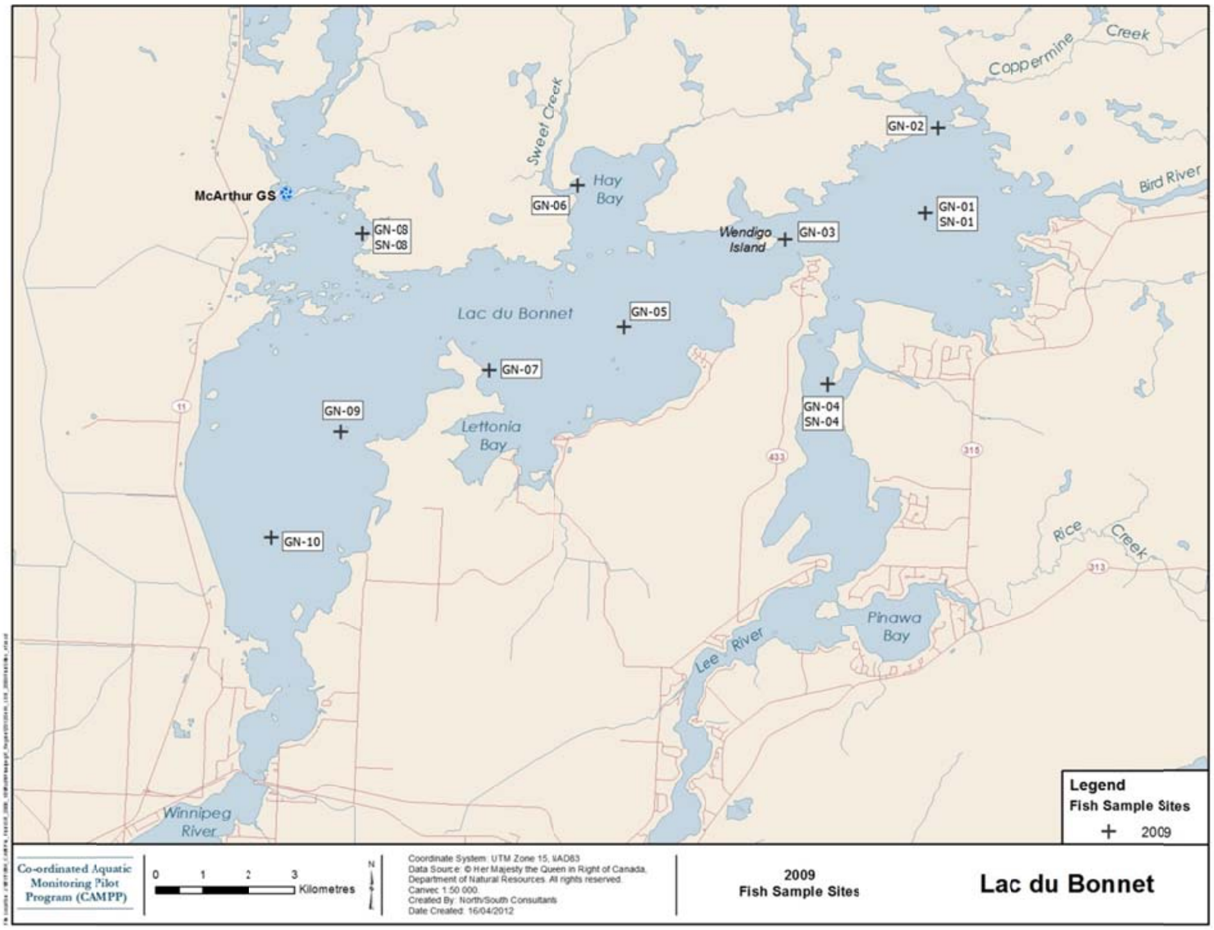


Figure 2.6-2. Map depicting standard gang and small mesh index gillnet sites sampled in Lac du Bonnet, 2009.

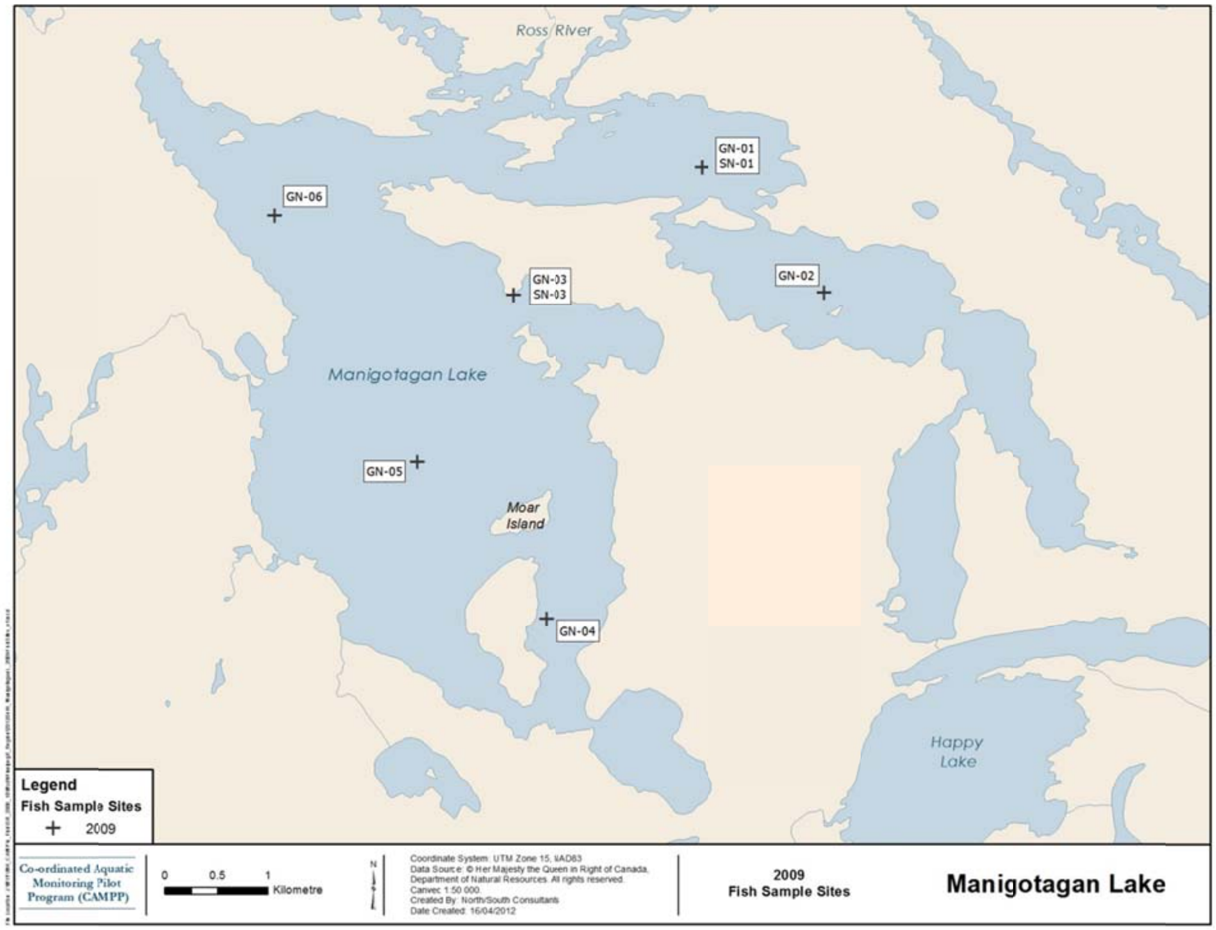


Figure 2.6-3. Map depicting standard gang and small mesh index gillnet sites sampled in Manigotagan Lake, 2009.

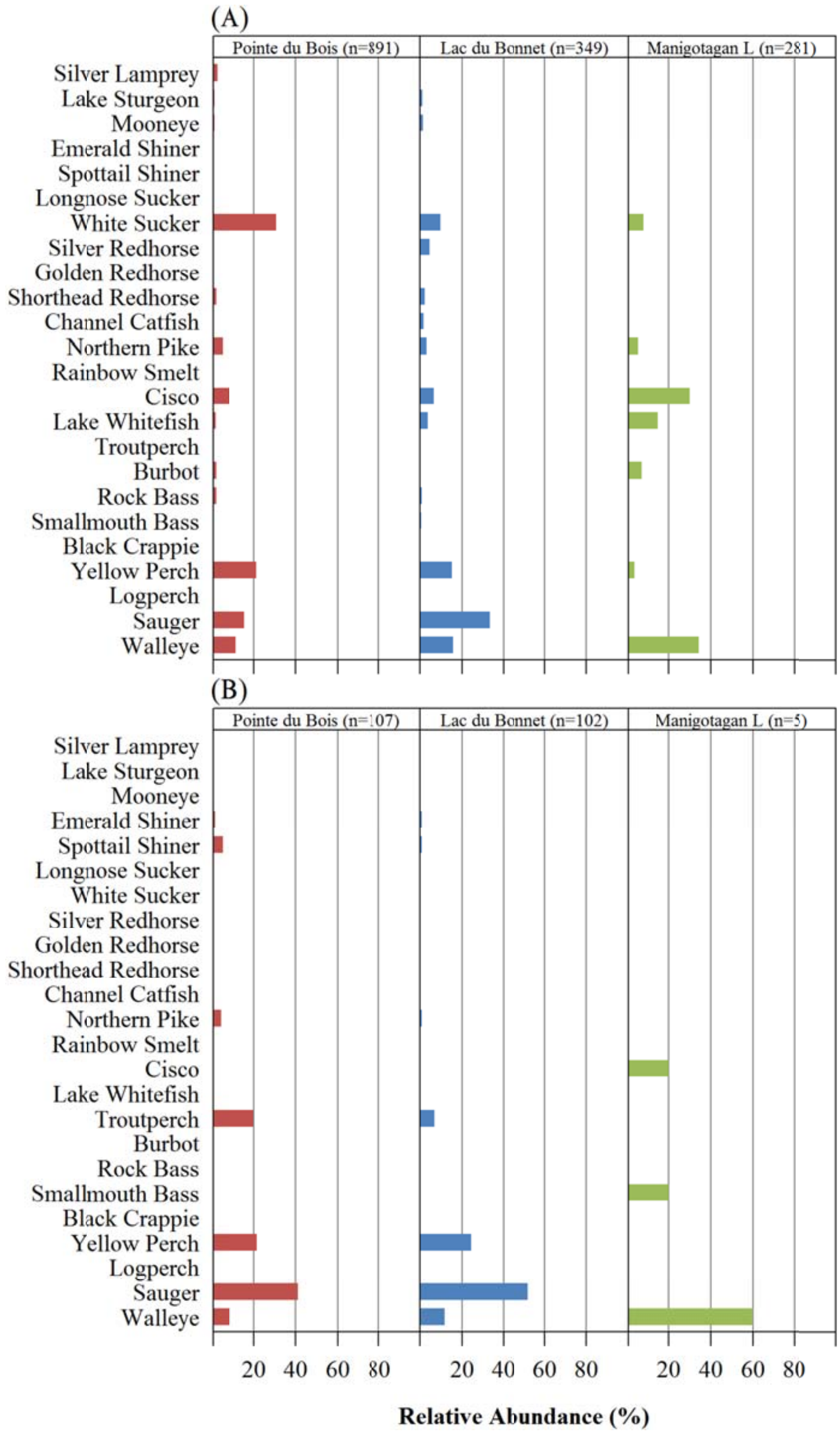


Figure 2.6-4. Relative abundance (%) distributions for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Winnipeg River Region waterbodies, 2009.

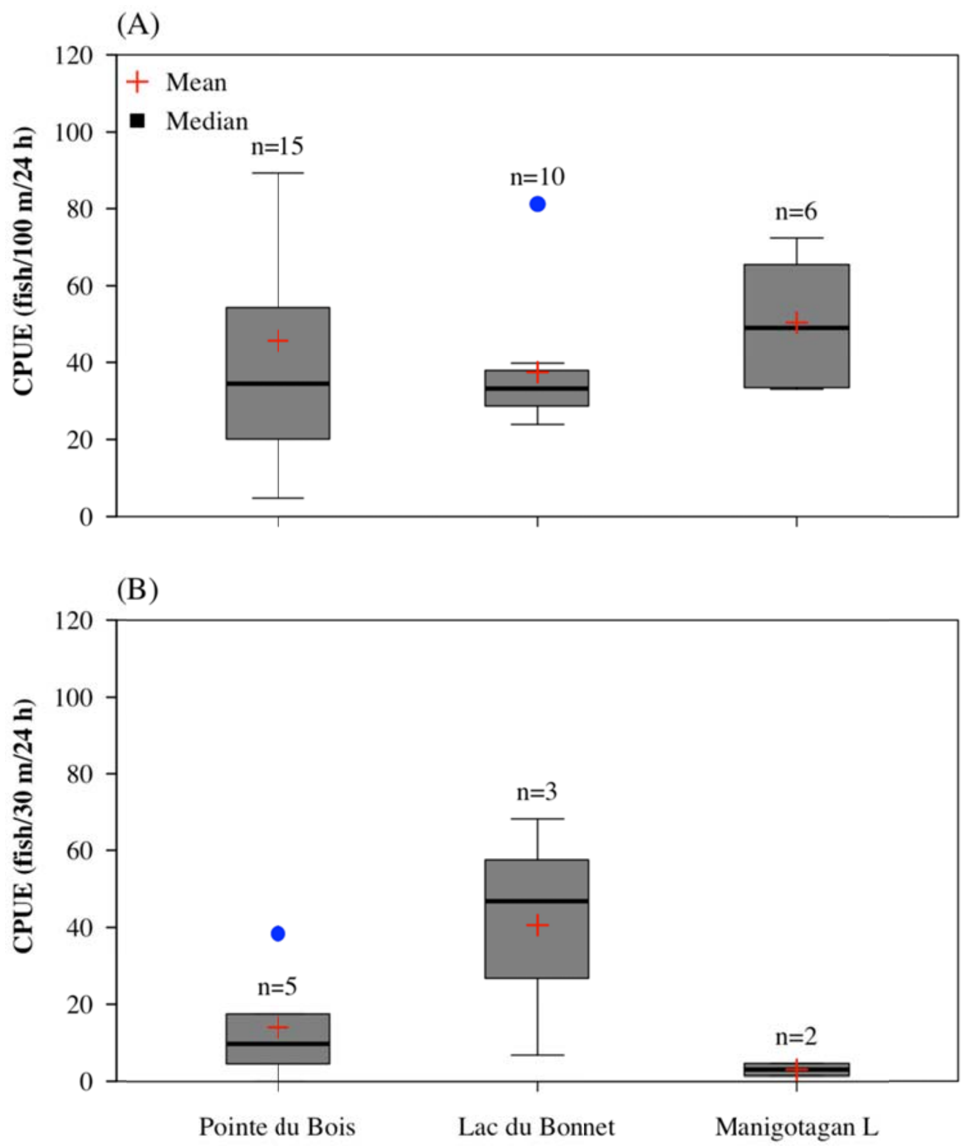


Figure 2.6-5. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Winnipeg River Region waterbodies, 2009.

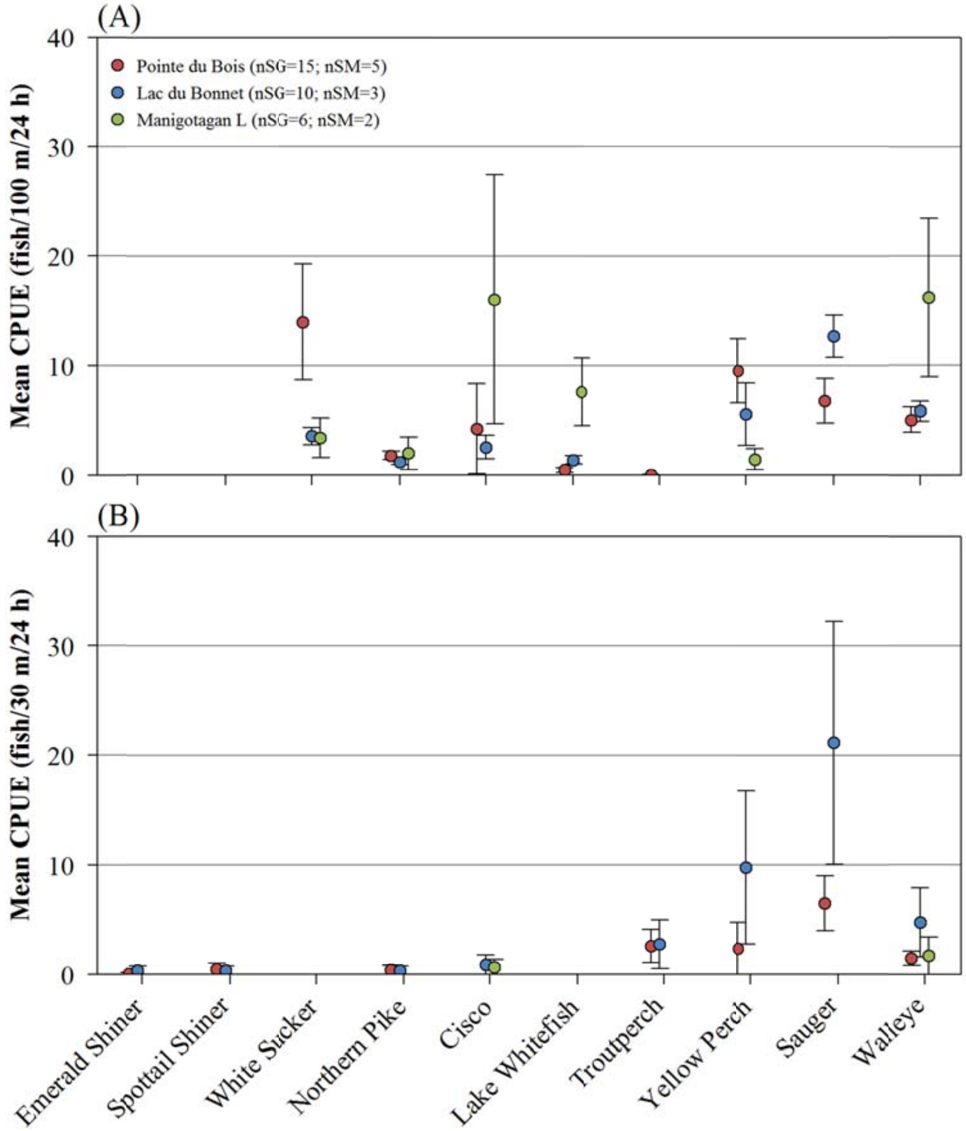


Figure 2.6-6. Mean (SE) CPUE for select species captured in (A) standard gang and (B) small mesh index gill nets set in Winnipeg River Region waterbodies, 2009

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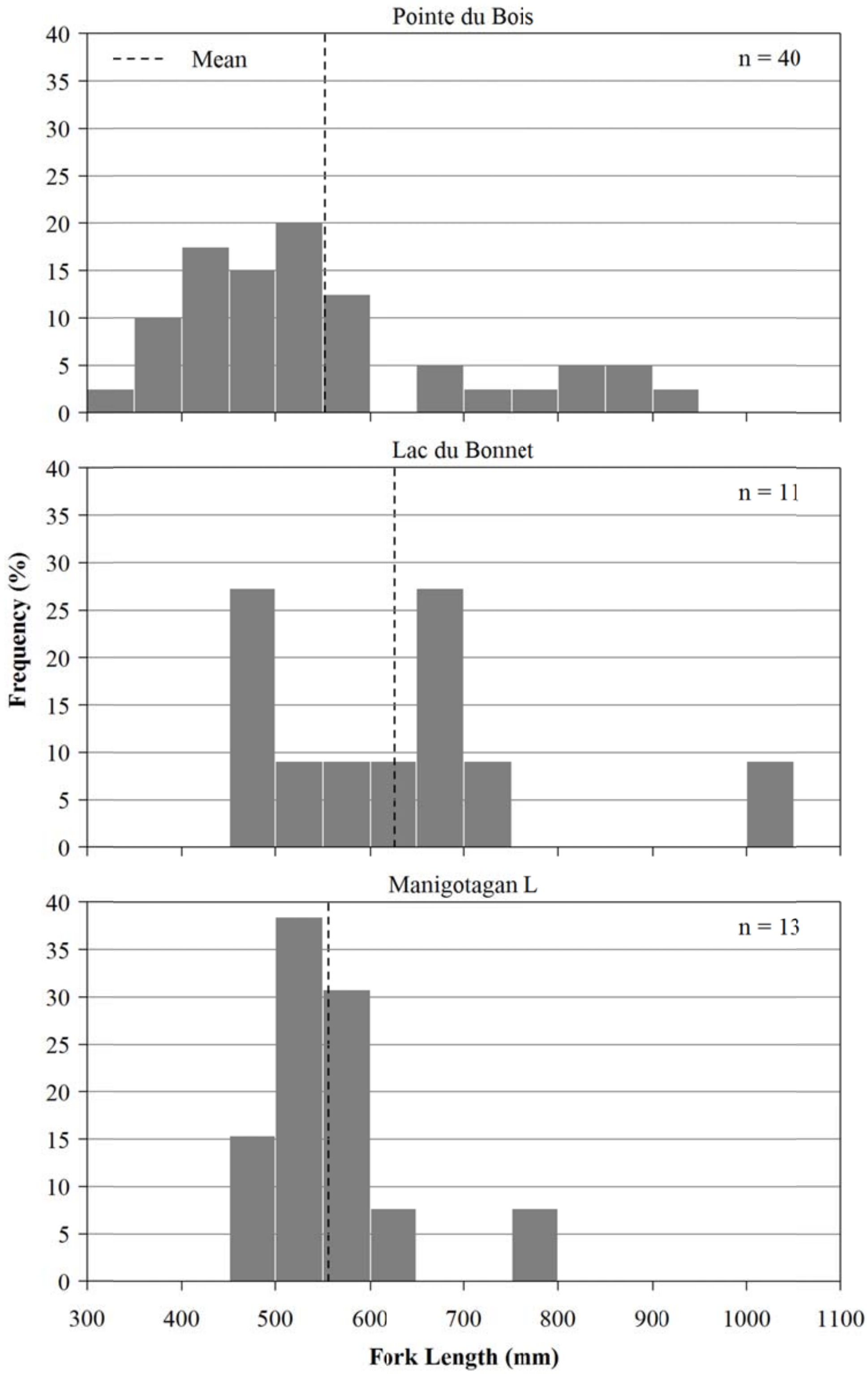

Figure 2.6-7. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2009.

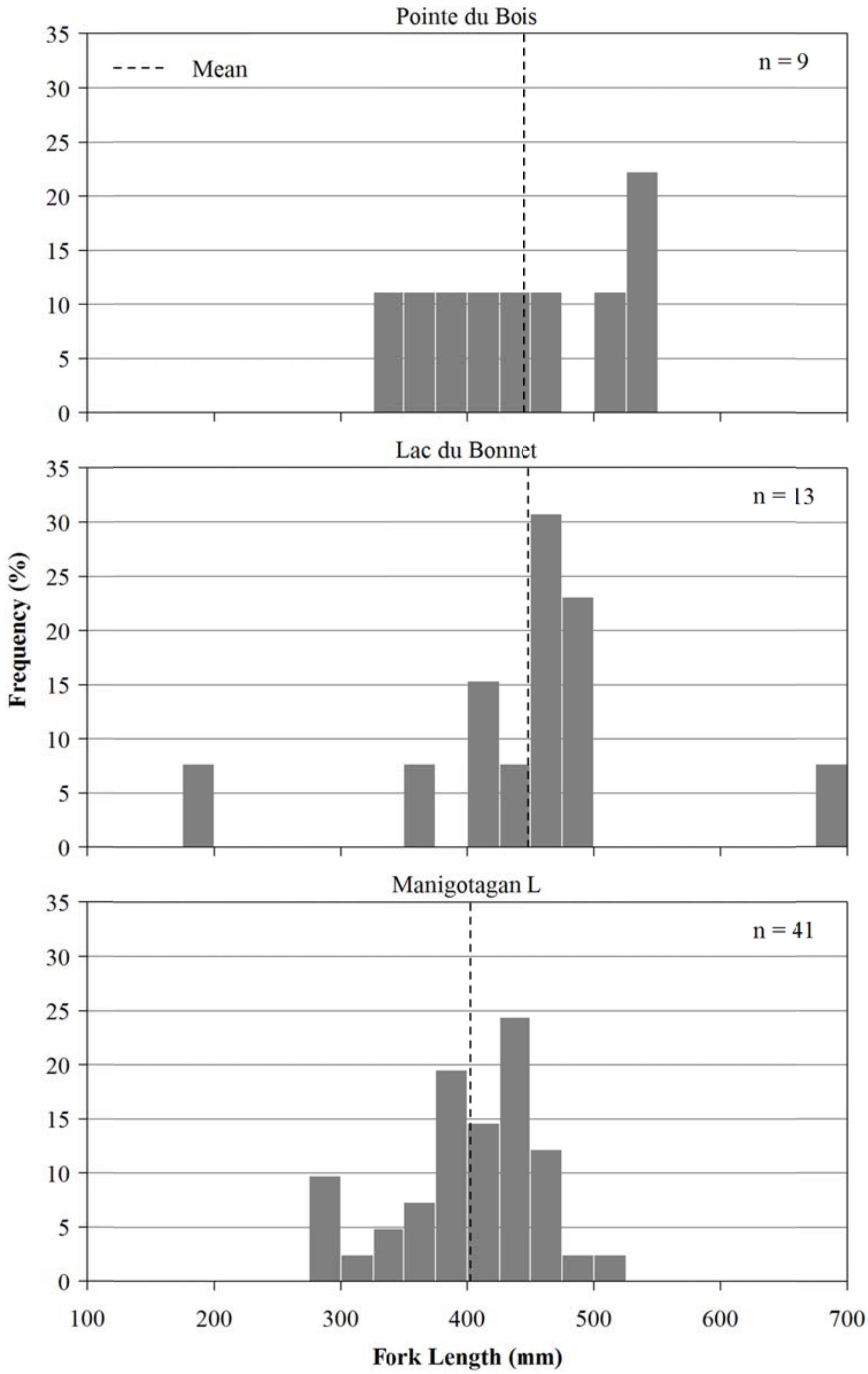

Figure 2.6-8. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2009.

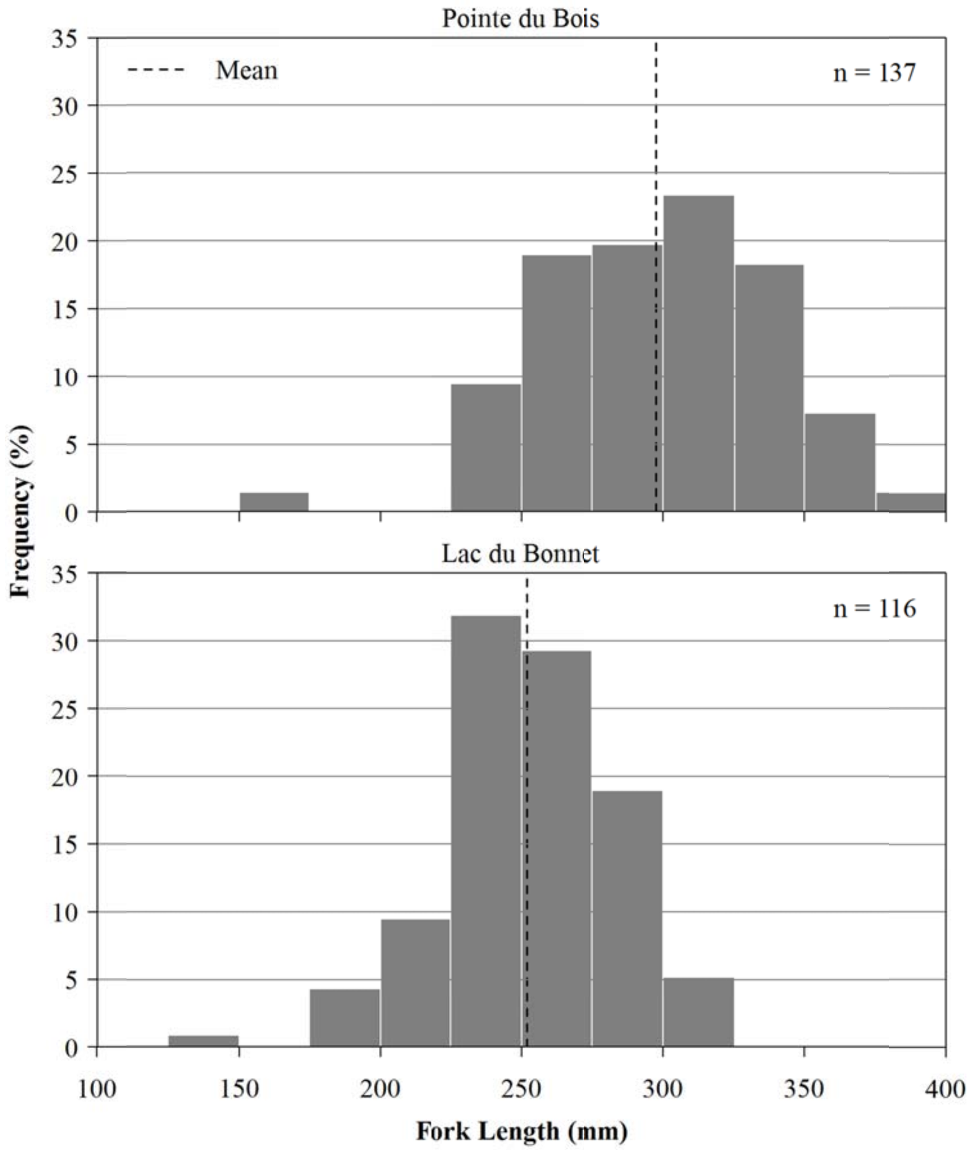

Figure 2.6-9. Fork length frequency histograms for Sauger captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2009.

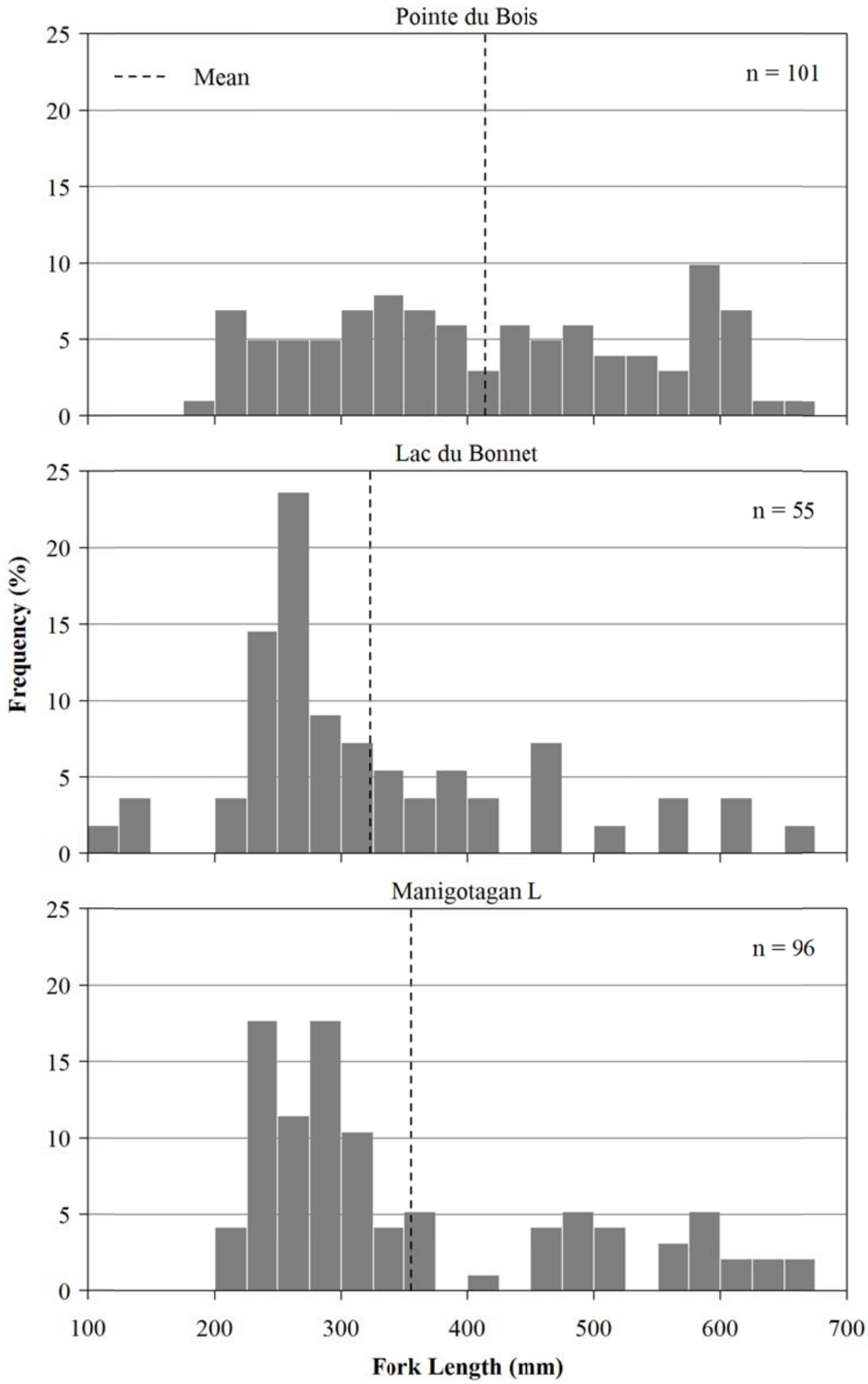

Figure 2.6-10. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Winnipeg River Region waterbodies, 2009.

3.0 SASKATCHEWAN RIVER REGION

The following provides an overview of the results of CAMPP for 2009/2010 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. The data record for Grand Rapids was incomplete; no data were available for a number of days in most months in 2009. Therefore, total precipitation values likely represent underestimates of actual precipitation on a monthly and annual basis. In addition, due to missing data points, monthly mean and annual mean temperatures may not be accurately depicted using the available data.

3.1.1 The Pas

Mean monthly air temperatures measured at The Pas in 2009 were generally similar to the 1971-2000 temperature normals over the open-water sampling period (Figure 3.1-1). Notable exceptions include September when temperatures were 5.6 °C above normal, and May in which the air temperature was 3.4 °C below normal. The winter months were also similar to normals with the exception of November, when the air temperature was 6.9 °C above normal.The annual mean temperature in 2009 was the same as the normal.

The 1971-2000 normals for precipitation indicate a peak in June with secondary peaks in July, August and September, and relatively low levels of precipitation in winter (Figure 3.1-1). In 2009, the highest precipitation occurred in July followed by August. The month of March exhibited above normal precipitation (almost two times the normal for that month), whereas September and November exhibited below normal precipitation (17%).

Overall, the comparison to climate normals shows that 2009 was characterized by a cooler and drier spring, a cooler and wetter summer, an atypically warmer and dryer September, and overall cooler winter which was drier than normal in November and December (Figure 3.1-1).

3.1.2 Grand Rapids

Mean monthly air temperatures measured at Grand Rapids in 2009 were generally lower than the 1971-2000 temperature normals during the open-water sampling season (Figure 3.1-2). Notable exceptions included September which exhibited an air temperature 5.4 ^{o}C above normal, and May which exhibited an air temperature 3.2 ^{o}C below normal. Winter air temperatures were also similar to the normals, with the notable excpetion of November when air temperatures were 7.4 ^{o}C above normal. The annual mean air temperature in was similar to the annual normal.

The 1971-2000 normals for precipitation indicates a peak in June with secondary peaks in July, August and September, as measured at Grand Rapids, MB (Figure 3.1-2). In 2009, precipitation was highest in August followed by June. The month of September exhibited precipitation levels significantly below normal (approximately 15% of normal), as did November. Notably, March exhibited 70% more precipitation than normal.

Overall, the comparison to climate normals shows that 2009 was characterized by a cool spring, summer and fall, with an atypically warm and dry September and November (Figure 3.1-2). The winter months were wetter than normal early in the year and dryer than normal later in the year.

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 hydro-electric generation, irrigation and flood control. In 2009, CAMPP monitoring occurred on Cedar Lake, which acts as a hydro-electric reservoir for the Grand Rapids Generating Station (GS). Monitoring also occurred on South Moose Lake, which is influenced by levels on Cedar Lake. Cormorant Lake is the off-system waterbody for this region.

Saskatchewan River flows entering Manitoba at The Pas in 2009 were slightly above average from January through April. Although there was a slightly above average snowpack, below average precipitation over the summer led to flows below the lower quartile from May to September. Flows remained below average until November before climbing to the upper quartile for the remainder of the year (Figure 3.2-1).

Cedar Lake water levels were generally slightly above average to upper quartile level for most of the year, while South Moose Lake was slightly below average to lower quartile level for most of the year (Figures 3.2-2, 3).

Discharge from the Grand Rapids GS was about average, varying between the lower and upper quartile for power production, for January and February. Outflows varied closer to the lower quartile for most of the rest of the year with periods of higher outflows only in September, October, and December (Figure 3.2-4).

Cormorant Lake water levels were slightly below average for all of 2009 (Figure 3.2-5).

3.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 2 of CAMPP in the Saskatchewan River Region. Waterbodies sampled included South Moose Lake, Cedar Lake (in the southeast area) and an off-system lake (Cormorant Lake; Figure 3.3-1).

3.3.1 Routine Variables and Limnology

Results of the 2009/2010 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 3.3-10.

3.3.1.1 On-system Waterbodies

Water quality of waterbodies sampled along the Saskatchewan River can be generally described as clear, alkaline, hard, well-oxygenated and with a moderate amount of nutrients. Neither South Moose nor Cedar lakes were stratified in 2009/2010 (Figure 3.3-2); although, in winter, there was an increase in temperature and decrease in dissolved oxygen (DO) with depth in both lakes (Figure 3.3-3). South Moose Lake exhibited DO concentrations below the MWQSOGs PAL objective for cold-water species and the long term objective for cool-water species (Manitoba Water Stewardship [MWS] 2011) in winter 2009/2010. Other *in situ* variables, including turbidity, pH, and specific conductance, were generally relatively consistent across depth (Figures 3.3-4 to 3.3-6). Secchi disk depths ranged from approximately 1.5 m to 3 m in South Moose and Cedar lakes.

With the exception of DO as noted above, all other routine water quality variables for which there are MWQSOGs (MWS 2011), including total phosphorus (TP; narrative guideline for lakes of 0.025 mg/L; Figure 3.3-8), pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in South Moose and Cedar lakes in 2009/2010.

In both South Moose and Cedar lakes, TP consisted of approximately equal portions dissolved and particulate forms in spring, was predominately dissolved in summer, and was predominately particulate in fall (Figure 3.3-9). In winter, TP was predominately dissolved in South Moose Lake and an equal mixture of dissolved and particulate forms in Cedar Lake. The majority of total nitrogen (TN) was composed of organic nitrogen (Figure 3.3-10) at all sites and sampling periods. During the open-water season, dissolved inorganic nitrogen (DIN) consisted of similar portions nitrate/nitrite and ammonia on average. Conversely, during the ice-cover season, concentrations and the relative proportion of nitrate/nitrite was higher.

3.3.1.2 Off-system Waterbody

The water quality of Cormorant Lake can also be generally described as clear, alkaline, hard, well-oxygenated and with a moderate amount of nutrients. Cormorant Lake did not stratify in 2009/2010, although, there was evidence of the beginnings of thermal stratification during the spring sampling season as temperature consistently decreased with depth (Figure 3.3-2). During the winter months, temperature increased and DO decreased with depth to a point where DO concentrations dropped below the MWQSOGs cold-water objective (MWS 2011; Figure 3.3-3). DO was above the most stringent MWQSOGs PAL objective during the open-water season in 2009/2010. Other *in situ* variables, including turbidity, pH, and specific conductance, were generally relatively consistent throughout the water column (Figures 3.3-4 to 3.3-6). Secchi disk depths in Cormorant Lake (3.5 to 5.0 m) were higher than those measured for sites along the Saskatchewan River (Figure 3.3-7).

With the exception of DO as noted above, all other routine water quality variables for which there are MWQSOGs (MWS 2011), including TP (narrative guideline for lakes of 0.025 mg/L; Figure 3.3-8), pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in Cormorant Lake in 2009/2010.

Nutrient conditions in Cormorant Lake were similar to those of South Moose and Cedar lakes. TP consisted of approximately equal portions dissolved and particulate forms in spring, was predominately dissolved in summer and winter, and was predominately particulate in fall (Figure 3.3-9). The majority of TN was organic nitrogen and on average DIN consisted of similar portions nitrate/nitrite and ammonia (Figure 3.3-10).

3.3.2 Metals and Major Ions

3.3.2.1 On-system Waterbodies

A summary of metal concentrations measured and detection frequencies for the Saskatchewan River Region in 2009/2010 is presented in Table 3.3-3.

Many metals were not detected in South Moose or Cedar lakes, these included, beryllium, bismuth, cesium, lead, mercury, nickel, selenium, silver, tellurium, thallium, tungsten, vanadium, and zirconium. Arsenic, barium, calcium, magnesium, manganese, molybdenum, potassium, rubidium, sodium, strontium, and uranium were consistently detected and the remaining metals were detected in some samples. All metals for which there are MWQSOGs for PAL were within objectives and guidelines in South Moose and Cedar lakes (Table 3.3-4).

Chloride concentrations in waterbodies along the Saskatchewan River (i.e., 3.0 to 16.2 mg/L; Table 3.3-2), were on the lower range reported for the central and western regions of Canada (< 1 mg/L to approximately 500 mg/L; Canadian Council of Resource and Environment Ministers [CCREM] 1987). Concentrations of chloride were also well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were less than 22 mg/L at South Moose Lake and ranged between 32.2 and 50.2 mg/L in Cedar Lake (Table 3.3-2); these concentrations fell on the lower range of concentrations reported across Canada (< 1 mg/L to approximately 3,000 mg/L; 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 3.3-4).

3.3.2.2 Off-system Waterbody

A number of metals were not detected in Cormorant Lake including, beryllium, bismuth, boron, cesium, iron, lead, mercury, nickel, selenium, silver, tellurium, thallium, tin, tungsten, zinc, and zirconium. Aluminum, arsenic, barium, calcium, magnesium, manganese, potassium, rubidium, sodium, strontium, and uranium were consistently detected and the remaining metals were detected in some samples.

All metals for which there are MWQSOGs for PAL were within objectives and guidelines in Cormorant Lake in 2009/2010 (Table 3.3-4).

Chloride concentrations were lower than at on-system sites (i.e., < 2.0 mg/L; Table 3.3-2) and were well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were also low and consistently less than 5 mg/L (Table 3.3-2). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013; Table 3.3-4).

3.3.3 Trophic Status and Nutrient Ratios

3.3.3.1 On-system Waterbodies

In 2009/2010, both South Moose and Cedar lakes were mesotrophic on the basis of TP (open-water mean; Table 3.3-5). Similarly, South Moose Lake was mesotrophic based on TN and chlorophyll *a* concentrations; however, Cedar Lake was oligotrophic based on TN and eutrophic based on chlorophyll *a* (Table 3.3-6).

On the basis of molar TN:TP ratios (Figure 3.3-12), both lakes were, with one exception, phosphorus limited during all periods sampled. The exception was Cedar Lake, which was nitrogen limited in fall. Examination of total organic carbon (TOC) to organic nitrogen molar ratios indicates that organic matter in the on-system sites was a mixture of allochthonous and autochthonous sources (Figure 3.3-13).

3.3.3.2 Off-system Waterbody

In 2009/2010, Cormorant Lake was mesotrophic based on TP and TN, but oligotrophic based on chlorophyll *a* (open-water means; Tables 3.3-5 to 3.3-7). Examination of molar TN:TP ratios (Figure 3.3-12) reveals that Cormorant Lake was phosphorus limited during all sampling periods. Similar to the on-system waterbodies, the TOC:ON molar ratio for Cormorant Lake indicates that the organic matter in the lake was a mixture of allochthonous and autochthonous sources (Figure 3.3-13).

3.3.4 Escherichia coli

3.3.4.1 On-system Waterbodies

E. coli was not detected in either South Moose or Cedar lakes in 2009/2010 and was well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 2.3-2; MWS 2011).

3.3.4.2 Off-system Waterbody

E. coli was not detected in Cormorant Lake in 2009/2010 and was well below the MWQSOG recreational guideline of 200 CFU/100 mL (Table 2.3-2; MWS 2011).

3.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 2 of CAMPP in the Saskatchewan River Region. Waterbodies sampled included South Moose Lake, Cedar Lake (in the southeast area), and an off-system lake (Cormorant Lake; Figure 3.3-1).

3.4.1 Chlorophyll a

Open-water season chlorophyll *a* concentrations in the Saskatchewan River Region varied between waterbodies; concentrations were low to moderate in South Moose Lake, moderate to high in Cedar Lake, and low in Cormorant Lake (Figure 3.4-1). Winter chlorophyll *a* concentrations were consistently lower than those of the open-water season, indicating that productivity was low under ice.

3.4.2 Community Composition and Biomass

As with chlorophyll *a* concentrations, mean phytoplankton biomass measured during the open-water season was lower at South Moose and Cormorant lakes than at Cedar Lake (Figure 3.4-2). However, the lowest biomass was measured in spring at Cedar Lake and in summer at Cormorant Lake. The greatest biomass occurred at all sites in fall. Phytoplankton were not analysed in South Moose Lake in spring 2009.

Phytoplankton community composition varied between the waterbodies in the region, particularly between South Moose Lake, and Cedar and Cormorant lakes (Figure 3.4-3). Phytoplankton assemblages at South Moose Lake were dominated by blue-green algae whereas Cedar and Cormorant lakes were generally dominated by diatoms. Diatoms and dinoflagellates were also prevalent at South Moose Lake; whereas, the latter, if present, comprised only a small portion of the assemblage in Cedar and Cormorant lakes. Blue-green algae were typically the second-most abundant taxa at Cedar and Cormorant lakes, with chrysophytes also abundant in spring.

Phytoplankton species richness ranged from 20 to 36 at the on-system sites (i.e., Cedar and South Moose Lakes) and from 14 to 17 at Cormorant Lake (Table 3.4-1). Diversity and effective richness were moderate to high in the Saskatchewan River Region and were slightly higher at South Moose Lake than at Cedar and Cormorant lakes. Community complexity was fairly similar throughout the open-water season at all waterbodies sampled in the region.

3.4.1 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L at Cedar Lake in fall 2009. Total phytoplankton biomass during this period was 8,675 mg/m^3 and the community was dominated by diatoms (Figure 3.4-3).

3.4.2 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 ubiquitous in the region in 2009, and *Planktothrix* was present in Cedar Lake.

Microcystin-LR was analysed twice in 2009/2010 in the Saskatchewan River Region: once when chlorophyll *a* concentrations exceeded 10 µg/L (i.e., the trigger for microcystin-LR analysis) at

Cedar Lake, and once (in error) at South Moose Lake. Microcystin-LR was not detected (i.e., < 0.2 μg/L) in either sample.

3.4.3 Trophic Status

Based on mean open-water chlorophyll *a* concentrations, South Moose, Cedar and Cormorant lakes are classified as mesotrophic, eutrophic and oligotrophic, respectively (OECD 1982; Table 3.3-7). If 2009/2010 annual means are considered, the classification would be similar for South Moose and Cormorant lakes; however, Cedar Lake would be classified as mesotrophic.

3.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Saskatchewan River Region in 2009/2010; the second year of CAMPP. Waterbodies sampled included: the on-system lakes South Moose and Cedar Lake-Southeast, and the off-system waterbody Cormorant Lake. (Figures 3.5-1 to 3.5-3). Cedar Lake-Southeast and Cormorant Lake are sampled annually, and South Moose Lake is sampled rotationally (i.e., once every three years).

Fifteen BMI samples were collected in each of the nearshore and offshore habitat polygons of South Moose, Cedar Lake-Southeast, and Cormorant lakes using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted between 04 and 08 September 2009.

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 2009, nearshore habitat was defined by water depth less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and offshore habitat was defined by water depths greater than 5 m. In 2009, mean water depths at nearshore sampling sites were 1.3 m, 4.2 m, and 3.4 m in South Moose Lake, Cedar Lake-Southeast and Cormorant Lake, respectively; mean water depths offshore were 6.1 m, 10.6 m, and 14.6 m, respectively (Table 3.5-1).

Sediment samples were collected from benthic invertebrate sample locations and analyzed for TOC and PSA to provide a general characterization of sediment type in each nearshore and offshore polygon (Table 3.5-2). Mean TOC in Cedar Lake-Southeast was 20.0% in the nearshore polygon and 9.1% in the offshore polygon. Mean TOC was 4.7% and 4.0% in South Moose Lake, and 0.6% and 3.0% in Cormorant Lake (in nearshore and offshore polygons, respectively) (Table 3.5-2).

Silt followed by clay dominated the sediment at offshore polygons in all waterbodies; however, at nearshore polygons, each lake was notably different. In the nearshore, clay, sand and silt were similarly represented in South Moose Lake, silt and clay dominated the sampling area of Cedar Lake-Southeast, and sand dominated Cormorant Lake (Table 3.5-2).

3.5.2 Species Composition, Distribution, and Relative Abundance

3.5.2.1 South Moose Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of South Moose Lake was 7,811 individuals/m^2, with densities ranging from 3,852 to 16,707 (Table 3.5-3). Insects dominated the benthic community in this habitat, comprising 76% of the total mean BMI; non-insects comprised the remaining 24% (Table 3.5-3). Insects mainly consisted of Chironomidae (69% of the mean total BMI). Other insect taxa included Ephemeroptera, Megaloptera, Trichoptera, Odonata (damselflies/dragonflies), Ceratopogonidae, and Coleoptera (beetles) (Table 3.5-3). Of the non-insects, the main groups were Amphipoda (14%), Bivalvia, (5%), Oligochaeta (4%), and Gastropoda (1%) (Table 3.5-3). Mean BMI density in offshore benthic grab samples was 762 individuals/m^2, with numbers ranging from 303 to 1,601 (Table 3.5-3). Non-insects dominated the benthic community in this habitat, comprising 70% of the mean total BMI; insects comprised 30% (Table 3.5-3). Oligochaeta and Bivalvia made up most of the non-insect portion, comprising 43% and 24% of the mean total invertebrates, respectively; Gastropoda (3%) were also identified (Table 3.5-3). Insects were comprised almost entirely of Chironomidae (27% of the mean total BMI). Other taxa found in lesser numbers included Chaoboridae (phantom midges), Ephemeroptera, and Coleoptera.

The total proportion of EPT and the ratio of EPT:C in the nearshore polygons was 4% and 0.14 (indicating Chironomidae dominated EPT in this insect community), respectively (Table 3.5-3). Genus analysis of Ephemeroptera indicated that of the five genera identified, *Hexagenia sp.* was the most common. Families Caenidae and Leptophlebiidae were also represented. Leptoceridae was the most common Trichoptera family (Table 3.5-3). In the offshore, total EPT and the ratio of EPT:C was 1% and 0.07 (indicating Chironomidae dominated EPT in this insect community), respectively (Table 3.5-3). Ephemeropterans were the only taxon of the EPT found, and *Hexagenia* sp. was the only genus identified.

Taxonomic richness in the nearshore habitat was 22 families with richness values ranging from five to 12 within each sample (Table 3.5-3). Hill's Effective Richness (E^H) was four with Chironomidae and Hyalellidae the most notable families in this habitat. Taxonomic richness in the offshore polygon was seven families and ranged from two to five within each sample (Table

3.5-3). Hill's Effective Richness (E^H) was three in this habitat and included Oligochaeta, Chironomidae, and Pisidiidae (Table 3.5-3).

Simpson's Diversity Index (D) was 0.59 and 0.61 in the nearshore and offshore polygons, respectively (Table 3.5-3). Mean evenness in the nearshore habitat was 0.28 and was 0.65 in the offshore habitat, based on Simpson's Equitability Index (E_D) (Table 3.5-3).

3.5.2.2 Cedar Lake - Southeast

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Cedar Lake-Southeast was 1,434 individuals/m^2, with densities ranging from 346 to 2,857 (Table 3.5-4). Non-insects dominated the BMI community in this habitat, comprising 66% of the mean total BMI; insects comprised 34% (Table 3.5-4). Of the non-insects, the dominant group was Amphipoda (25%), followed by Bivalvia (20%), Oligochaeta (14%), and Gastropoda (7%) (Table 3.5-4). Insects consisted mainly of Chironomidae (32%), with a small number of Trichoptera (2%); Corixidae (water boatmen) were also present (Table 3.5-4). Mean BMI density in offshore benthic grab samples was 1,907 individuals/m^2, with densities ranging from 995 to 4,675 (Table 3.5-4). In this habitat type, the BMI community was equally represented by non-insects and insects (50% of the mean total invertebrates sampled each) (Table 3.5-4). Bivalvia (25%) and Oligochaeta (25%) comprised the majority of non-insects with small numbers of Gastropoda, Hirudinea, and Acari also present (Table 3.5-4).

Total EPT comprised 2% of the mean total nearshore BMI and consisted solely of Trichoptera. The ratio of EPT:C was 0.05 indicating that the nearshore habitat was dominated by chironomids when compared to EPT. Of the Trichoptera, only a single family, Molannidae (hood case making caddisflies), was present. Insects in the offshore habitat were entirely comprised of Chironomidae resulting in a total EPT, and the ratio of EPT:C, of zero (Table 3.5-4).

Nearshore habitat was represented by ten families and ranged from three to eight within each sample (Table 3.5-4). Hill's Effective Richness (E^H) was four in this habitat and consisted of Chironomidae, Hyalellidae, Pisidiidae, and Oligochaeta (Table 3.5-4). Taxonomic richness in the offshore polygon was six families and ranged from three to five within each sample (Table 3.5-4). Hill's Effective Richness (E^H) was three; Chironomidae, Oligochaeta, and Pisidiidae dominated the invertebrate community (Table 3.5-4).

The mean Simpson's Diversity Index (D) was 0.68 and 0.64 in the nearshore and offshore polygons, respectively (Table 3.5-4). Mean evenness (Simpson's Equitability [E_D]) in the nearshore habitat was 0.63; evenness in the offshore habitat was 0.69 (Table 3.5-4).

3.5.2.3 Cormorant Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Cormorant Lake was 5,439 individuals/m^2, with densities ranging from 2,164 to 8,743 (Table 3.5-5). Non-insects dominated the benthic community in this habitat, comprising 72% of the total mean BMI; insects comprised the remaining 28% (Table 3.5-5). Of the non-insects, the dominant group was Amphipoda (40% of total mean invertebrates), followed by Bivalvia (20%), Oligochaeta (9%), and Gastropoda (3%); Hirudinea were also present (Table 3.5-5). The dominant group among the insects was Chironomidae (26%); Ephemeroptera, Trichoptera, Coenagrionidae, and Haliplidae (crawling water beetles) were also present in small numbers (Table 3.5-5). Mean BMI density in offshore benthic grab samples was 779 individuals/m^2 and with densities ranging from zero to 1,688 (Table 3.5-5). Non-insects dominated the benthic community in this habitat, comprising 60% of the total mean BMI; insects comprised the remaining 40% (Table 3.5-5). Oligochaeta (22%), Bivalvia (20%) and Amphipoda (18%) made up the majority of the non-insects; Gastropoda were also found (Table 3.5-5). Insects were comprised almost entirely of Chironomidae (39%), with Ephemeroptera (1%) being the only other taxa present.

Total EPT and the ratio of EPT:C, in the nearshore habitat, was 1% and 0.06, respectively. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was the dominant genus of four present in the nearshore habitat. Leptoceridae and Molannidae were the only Trichoptera families represented (Table 3.5-5). Total EPT and the ratio of EPT:C in the offshore habitat was 1% and 0.09, respectively. Ephemeroptera was the only taxon present of the EPT in the offshore habitat, and *Hexagenia* sp. was the only genus identified. The EPT:C ratios for the nearshore and offshore habitats both indicate that chironomids were dominant relative to EPT (Table 3.5-5).

The nearshore was represented by 19 BMI families, with richness values ranging from five to ten within each sample (Table 3.5-5). Hill's Effective Richness (E^H) was five with Hyalellidae, Chironomidae, Pisidiidae, Haustoriidae, and Oligochaeta all dominating the habitat (Table 3.5-5). Overall taxonomic richness in the offshore polygon was seven and ranged from zero to five within each sample (Table 3.5-5). Four families dominated (Hill's Effective Richness [E^H]) the BMI community in this habitat and included Chironomidae, Oligochaeta, Pisidiidae, and Haustoriidae (Table 3.5-5).

Simpson's Diversity Index (D) was 0.77 and 0.66 in the nearshore and offshore polygons, respectively (Table 3.5-5). Evenness (Simpson's Equitability [E_D]) values were 0.50 in the nearshore habitat and 0.70 in the offshore habitat (Table 3.5-5).

3.6 FISH COMMUNITY

3.6.1 Gill netting

In 2009, in the Saskatchewan River Region, gill netting was conducted in South Moose Lake (9 – 16 September), the southeast basin of Cedar Lake (14 – 19 August), and Cormorant Lake (17 – 23 August) (Table 3.6-1; figures 3.6-1, 3.6-2, and 3.6-3, respectively).

In South Moose Lake, 14 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 3.6-1). Water temperature during the sampling period ranged from 18 – 19°C.

In the southeast basin of Cedar Lake, 14 sites were sampled using standard gang index gill nets and six 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 16.7 – 19.1°C.

In Cormorant Lake, 18 sites were sampled using standard gang index gill nets and six 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 16.4 – 18.0°C.

3.6.2 Species Composition

In 2009, 17 species of fish were captured in the Saskatchewan River Region (Table 3.6-2).

3.6.2.1 South Moose Lake

A total of 547 fish representing nine species were captured in standard gang index gill nets and a total of 1,866 fish representing seven species were captured in small mesh index gill nets (Table 3.6-3). White Sucker comprised the majority (n = 315 fish; 57.59%) of the standard gang index gillnet catch, followed by Northern Pike (n = 92 fish; 16.82%) and Cisco (n = 65 fish; 11.88%) (Table 3.6-3; Figure 3.6-4). In the small mesh index gillnet catch, Yellow Perch was the most common species captured (n = 1,554 fish; 83.28%) followed by Spottail Shiner (n = 239 fish; 12.81%) (Table 3.6-3; Figure 3.6-4).

White Sucker represented the majority (60.10%) of the biomass in the standard gang index gillnet catch followed by Northern Pike (27.88%) (Table 3.6-4). In the small mesh index gillnet catch, Yellow Perch (55.78%) and Northern Pike (38.19%) accounted for the majority of the total biomass (Table 3.6-5).

3.6.2.2 Cedar Lake - SE

A total of 829 fish representing nine species were captured in standard gang index gill nets and 838 fish representing eight species were captured in small mesh index gill nets (Table 3.6-3). The most common species captured in standard gang index gill nets were Walleye (n = 283 fish; 34.14%) and White Sucker (n = 232 fish; 27.99%). Yellow Perch (n = 125 fish; 15.08%) and Sauger (n = 92 fish; 11.10%) comprised most of the remaining standard gang index gillnet catch (Table 3.6-3; Figure 3.6-5). In the small mesh index gillnet catch, Yellow Perch (n = 437 fish; 52.15%) and Spottail Shiner (n = 266 fish; 31.74%) were most abundant.

White Sucker (44.89%) and Walleye (32.59%) represented the majority of the biomass in the standard gang index gillnet catch (Table 3.6-4). In the small mesh index gillnet catch, Yellow Perch (32.50%), Sauger (31.86%) and Walleye (20.54%) comprised most of the biomass (Table 3.6-5).

3.6.2.3 Cormorant Lake

In 2009, 962 fish from nine species were captured in Cormorant Lake standard gang index gill nets while 566 fish from 13 species were captured in small mesh index gill nets (Table 3.6-3). White Sucker (n = 473 fish; 49.17%) and Walleye (n = 213 fish; 22.14%) were the most abundant fish in the standard gang index gillnet catch (Table 3.6-3; Figure 3.6-6). Yellow Perch (n = 303 fish; 53.53%), Emerald Shiner (n = 109 fish; 19.26%), and Sauger (n = 68 fish; 12.01%) were most common in the small mesh index gillnet catch (Table 3.6-3; Figure 3.6-6).

In the standard gang index gillnet catch, White Sucker represented 49.85% of the total biomass followed by Walleye (27.53%) (Table 3.6-4). Yellow Perch (36.26%) and Sauger (31.14%) comprised the majority of the biomass in the small mesh index gillnet catch (Table 3.6-5).

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

3.6.3.1 South Moose Lake

In 2009, the mean CPUE for the standard gang index gillnet catch in South Moose Lake was 38.4 fish/100 m of net/24 h (Table 3.6-6; Figure 3.6-7). White Sucker had the highest CPUE (22.1) followed by Northern Pike (6.5) (Figure 3.6-8).

Mean CPUE for the small mesh index gillnet catch was 535.3 fish /30 m of net/24 h, more than triple the value from any other sampled waterbody in the Saskatchewan River Region (Table 3.6-7; Figure 3.6-7). Yellow Perch had the highest CPUE (445.3) in small mesh index gill nets.

Mean BPUE for the standard gang index gillnet catch was 35,965 g/100 m of net/24 h (Table 3.6-8). White Sucker (21,670) and Northern Pike (9,908) comprised the majority of the BPUE in standard gang index gill nets. Small mesh index gill nets produced a BPUE of 7,430 g/30 m of net/24 h (Table 3.6-9). Yellow Perch (4,156) and Northern Pike (2,820 g) contributed the majority of the biomass.

3.6.3.2 Cedar Lake - SE

Standard gang index gill nets set in the southeast basin of Cedar Lake in 2009 had a CPUE of 55.2 (Table 3.6-6; Figure 3.6-7). Walleye (18.9) and White Sucker (15.5) had the highest CPUE values (Figure 3.6-8).

The overall CPUE for small mesh index gill nets was 154.8 (Table 3.6-7; Figure 3.6-7). Yellow Perch (80.7) and Spottail Shiner (49.2) comprised the majority of the CPUE for small mesh index gill nets (Figure 3.6-8).

Mean BPUE for the standard gang index gillnet catch was 32,831 g (Table 3.6-8). White Sucker had the highest BPUE (14,732) followed by Walleye (10,745). BPUE for the remaining seven species totalled less than 7,500 g. Small mesh index gill nets produced a BPUE of 2,915 g (Table 3.6-9) with Yellow Perch (939), Sauger (933), and Walleye (605) comprising the majority of the biomass.

3.6.3.3 Cormorant Lake

In 2009, Cormorant Lake had the highest overall CPUE (65.1) for standard gang index gill nets of the three Saskatchewan River Region waterbodies sampled (Table 3.6-6; Figure 3.6-7). In contrast, small mesh index gill nets from Cormorant Lake had the lowest CPUE (129.6) in the region (Table 3.6-7; Figure 3.6-7).

White Sucker had the highest CPUE (31.8) in the standard gang index gillnet catch, followed by Walleye (14.5) (Figure 3.6-8). Yellow Perch, as in other Saskatchewan River Region waterbodies sampled, had the highest CPUE (70.1) in the small mesh index gillnet catch. Emerald Shiner (24.2) and Sauger (15.4) were also common.

Mean BPUE for the standard gang index gillnet catch in Cormorant Lake (49,883 g) was higher than in other regional waterbodies (Table 3.6-8). White Sucker had the highest BPUE value (24,650) followed by Walleye (13,784). Mean BPUE for the small mesh index gillnet catch was 2,866 g (Table 3.6-9). Yellow Perch had the highest BPUE value (1,031) followed by Sauger (868).

3.6.4 Size and Condition

Northern Pike and Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies in 2009 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 South Moose Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 582 mm, a mean weight of 1,530 g, and a mean condition factor of 0.71 (Table 3.6-10). Most Northern Pike were in the 550-599 mm size class, but 500-549 mm size class was also well represented (Figure 3.6-9).

Walleye captured in standard gang index gill nets had a mean fork length of 369 mm, a mean weight of 771 g, and a mean condition factor of 1.14 (Table 3.6-10). Almost 30% of sampled Walleye were in the 400-424 size class with several smaller size classes each contributing approximately 10-15% of the total (Figure 3.6-10).

3.6.4.2 Cedar Lake - SE

Northern Pike captured in standard gang index gill nets in Cedar Lake had a lower mean fork length (537 mm) and weight (1,313 g), but higher mean condition factor (0.80) than other regional waterbodies surveyed in 2009 (Table 3.6-10). Similarly, the length-frequency distribution was skewed towards smaller size classes with fish 500-549 representing approximately 35% of the catch (Figure 3.6-9).

Similar to Northern Pike, Walleye captured in Cedar Lake standard gang index gill nets had a lower mean fork length (345 mm) and weight (578 g) and a higher mean condition factor (1.22) than other regional waterbodies surveyed in 2009 (Table 3.6-10). The length-frequency distribution is skewed to the left with relatively few fish measured from size classes larger than 400-424 mm (Figure 3.6-10).

3.6.4.3 Cormorant Lake

Northern Pike and Walleye captured in Cormorant Lake standard gang index gill nets in 2009 were larger and heavier than in other surveyed regional waterbodies (Table 3.6-10). Captured Northern Pike had a mean fork length of 610 mm, a mean weight of 1,808 g, and a mean condition factor of 0.75. Walleye had a mean fork length of 415 mm, a mean weight of 920 g, and a mean condition factor of 1.08.

Fork length frequencies for both species were skewed towards larger size classes (figures 3.6-9 and 3.6-10). More than 35% of Northern Pike were from the 600-649 mm size class while Walleye were well-represented by both the 450-474 and 500-524 mm size classes.

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 2009. 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 South Moose Lake

Age was determined for 90 Northern Pike captured in standard gang index gill nets set in South Moose Lake in 2009 (Table 3.6-11). The majority of these fish (42.22%) were 4 years of age (2005 year class), while 5 to 7-year old fish combined to represent another 40% of the aged fish.

Ages were determined for 29 Walleye captured in standard gang index gill nets (Table 3.6-11). Walleye aged 3, 4, and 6 were well represented in the catch, with 3-year old fish (2006 year class) the most abundant.

3.6.5.2 Cedar Lake - SE

Ages were determined for a total of 34 Northern Pike captured in standard gang index gill nets set in Cedar Lake in 2009 (Table 3.6-11). The majority (41.18%) of aged Northern Pike were 5 years of age. More than 90% of the sampled Northern Pike were 3-6 years of age.

Ages were determined for 279 Walleye (Table 3.6-11). Most (40.14%) were 6 years of age (2003 year class), but Walleye aged 3, 4, 7, and 8 were also well-represented.

3.6.5.3 Cormorant Lake

A total of 47 Northern Pike captured in Cormorant Lake in 2009 were aged (Table 3.6-11). Although the majority of fish were aged 4-6, more than 30% of the sample was 7-14 years of age.

Of the 213 Walleye for which ages were determined, the majority were 8 years of age (Table 3.6-11). Walleye aged 2-4, 6, and 13 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 2009 were examined externally for DELTs (Table 3.6-14).

3.6.6.1 South Moose Lake

DELTs were documented for five of the 202 inspected fish from standard gang index gill nets set in South Moose Lake in 2009. All five of these fish were White Sucker with lesions.

3.6.6.2 Cedar Lake - SE

None of the 400 fish examined from Cedar Lake in 2009 were determined to have DELTs.

3.6.6.3 Cormorant Lake

None of the 532 fish examined from Cormorant Lake in 2009 were determined to have DELTs.

SECTION 3: TABLES AND FIGURES

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Table 3.3-1. Summary statistics for *in situ* variables (near surface) measured in the Saskatchewan River Region: 2009/2010.

	Temperature (°C)			*In situ* pH			DO (mg/L)			DO (% saturation)			*In situ* Specific Conductance (µS/cm)			*In situ* Turbidity (NTU)			ORP (mV)		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	14.21	13.63	13.24	8.61	8.53	8.37	11.95	12.40	12.26	118	120	119	354	386	292	5.13	3.37	0.28	101	94	120
Median	18.50	17.88	17.17	8.56	8.53	8.34	12.56	13.22	13.34	117	119	121	340	370	290	2.25	1.50	0.25	102	95	116
Minimum	0.19	0.12	0.47	8.42	8.32	8.12	8.21	8.22	8.25	88	89	88	317	349	271	0.00	0.60	0.00	83	79	83
Maximum	19.63	18.64	18.15	8.91	8.72	8.70	14.46	14.94	14.12	148	155	146	418	454	316	16.0	8.00	0.60	116	108	165
SD	8.11	7.82	7.40	0.19	0.15	0.21	2.42	2.63	2.34	22	24	23	41	43	20	6.39	3.30	0.28	12	11	29
SE	4.68	4.52	4.27	0.11	0.09	0.12	1.40	1.52	1.35	13	14	13	23	25	12	3.69	2.33	0.16	7	7	17
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4

Table 3.3-1. - continued -

	Secchi Disk Depth (m)			Calculated Euphotic Depth (m)			Estimated Euphotic Depth (m)		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	2.19	2.10	4.26	4.38	4.20	8.52	4.40	4.27	8.52
Median	1.85	1.90	3.93	3.70	3.80	7.86	3.70	3.80	7.80
Minimum	1.70	1.45	3.50	3.40	2.90	7.00	3.50	3.00	7.00
Maximum	3.03	2.95	5.35	6.05	5.90	10.70	6.00	6.00	10.75
SD	0.59	0.63	0.79	1.18	1.26	1.58	1.13	1.27	1.61
SE	0.42	0.44	0.56	0.84	0.89	1.12	0.80	0.90	1.14
N	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: 2009/2010.

	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)		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	184	149	165	212	173	191	6.20	4.29	5.07	-	-	-	0.012	0.010	0.012	0.0118	0.0127	0.0136	0.49	0.37	0.34
Median	178	141	163	203	162	188	6.61	4.26	5.04	-	-	-	<0.010	<0.010	<0.010	0.0096	0.0136	0.0122	0.49	0.36	0.38
Minimum	172	138	161	197	161	184	4.19	2.82	3.99	-	-	-	<0.010	<0.010	<0.010	0.0050	<0.0050	0.0050	0.45	<0.20	0.22
Maximum	207	174	175	244	206	206	7.39	5.82	6.22	-	-	-	0.025	0.022	0.028	0.0230	0.0210	0.0250	0.54	0.67	0.39
SD	14	15	6	19	19	9	1.21	1.12	0.87	-	-	-	0.008	0.007	0.010	0.0067	0.0080	0.0075	0.04	0.20	0.07
SE	8	9	3	11	11	5	0.70	0.65	0.50	-	-	-	0.005	0.004	0.006	0.0039	0.0046	0.0043	0.02	0.12	0.04
N	4	4	4	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4	-	-	-	3	3	3	4	3	4	4	3	4
% Detected	100	100	100	100	100	100	100	100	100	-	-	-	75	75	75	100	75	100	100	75	100

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]		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	0.0238	0.0227	0.0251	0.48	0.36	0.33	0.50	0.38	0.36	0.0094	0.0088	0.0082	0.0079	0.0098	0.0049	0.0173	0.0186	0.0132	65	50	61
Median	0.0231	0.0195	0.0182	0.48	0.35	0.36	0.51	0.37	0.39	0.0087	0.0074	0.0080	0.0070	0.0089	0.0034	0.0173	0.0175	0.0132	65	52	67
Minimum	0.0140	0.0086	0.0111	0.44	0.09	0.21	0.46	<0.20	0.23	0.0061	0.0065	0.0020	0.0050	0.0030	<0.001	0.0155	0.0145	0.0116	54	9	35
Maximum	0.0350	0.0430	0.0530	0.54	0.67	0.39	0.55	0.69	0.42	0.0142	0.0140	0.0149	0.0127	0.0183	0.0124	0.0192	0.0248	0.0146	76	85	76
SD	0.0082	0.0132	0.0166	0.05	0.21	0.07	0.04	0.21	0.08	0.0032	0.0031	0.0046	0.0036	0.0064	0.0054	0.0017	0.0038	0.0013	8	27	17
SE	0.0048	0.0076	0.0096	0.03	0.12	0.04	0.02	0.12	0.04	0.0018	0.0018	0.0027	0.0018	0.0032	0.0027	0.0010	0.0022	0.0008	5	16	10
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	4	4	4	4	4	2	4	4	4	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	100	100	100	100	100	50	100	100	100	-	-	-

Table 3.3-2. - continued -

	DIN:DP [1]			DIN:TP [1]			DOC (mg/L)			TOC (mg/L)			TIC (mg/L)			TOC:ON[1]			TOC:TN[1]		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	6	7	9	3	3	4	7.2	5.0	6.9	7.4	5.4	7.0	44.0	35.8	39.3	18	29	27	17	26	25
Median	6	5	8	3	2	3	7.1	5.1	6.7	7.3	5.1	6.8	42.2	34.0	38.7	18	15	22	17	13	19
Minimum	2	2	3	2	1	2	6.6	4.2	6.4	6.9	4.2	6.1	41.4	33.1	37.8	15	12	20	15	12	18
Maximum	11	15	17	5	7	10	8.1	5.8	7.7	8.1	7.3	8.4	50.4	42.2	42.2	22	72	46	21	66	44
SD	3	5	6	1	2	3	0.6	0.7	0.5	0.5	1.3	0.8	3.7	3.7	1.7	2	25	11	2	23	11
SE	2	3	3	1	1	2	0.3	0.4	0.3	0.3	0.7	0.5	2.1	2.1	1.0	1	14	6	1	13	6
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	100	100	100	100	100	100	100	100	100	-	-	-	-	-	-

Table 3.3-2. - continued -

	TDS (mg/L)			Laboratory Conductivity (μmhos/cm)			TSS (mg/L)			Laboratory Turbidity (NTU)			True Colour (TCU)			Laboratory pH			*E. coli* (CFU/100 mL)		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	223	247	189	360	393	296	2.2	<2.0	<2.0	1.30	1.85	0.84	7.5	10.0	7.1	8.42	8.35	8.38	<1	<1	<1
Median	220	239	186	339	371	291	2.4	<2.0	<2.0	1.40	1.55	0.77	7.5	10.0	6.7	8.42	8.35	8.39	<1	<1	<1
Minimum	192	228	174	335	368	285	<2.0	<2.0	<2.0	0.31	0.80	0.10	5.0	5.0	5.0	8.24	8.14	8.17	<1	<1	<1
Maximum	258	280	212	426	462	320	2.8	2.8	3.2	2.10	3.50	1.70	10.0	15.0	10.0	8.59	8.57	8.56	<1	<1	<1
SD	24	21	14	38	40	14	0.7	0.8	1.0	0.70	1.07	0.57	2.5	3.5	2.2	0.16	0.17	0.18	-	-	-
SE	14	12	8	22	23	8	0.4	0.4	0.6	0.40	0.62	0.33	1.4	2.0	1.3	0.09	0.10	0.10	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3
N >DL	4	4	4	4	4	4	3	2	1	4	4	4	4	4	4	4	4	4	0	0	0
% Detected	100	100	100	100	100	100	75	50	25	100	100	100	100	100	100	100	100	100	0	0	0

Table 3.3-2. - continued -

	Chlorophyll *a* (μg/L)			Hardness as $CaCO_3$ (mg/L)			Chloride (mg/L)			Sulphate (mg/L)		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	3.68	7.19	1.17	186	171	161	4.32	11.1	1.58	13.5	42.7	4.11
Median	4.00	5.00	1.10	183	165	164	4.01	9.56	1.55	12.1	44.2	3.97
Minimum	1.02	1.16	0.58	156	139	137	3.02	9.21	1.30	7.90	32.2	3.80
Maximum	5.70	17.6	1.90	222	215	180	6.25	16.2	1.91	21.8	50.2	4.70
SD	2.07	6.35	0.47	24	29	16	1.24	2.93	0.24	5.33	6.7	0.36
SE	1.20	3.67	0.27	14	17	9	0.72	1.69	0.14	3.08	3.9	0.21
N	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100	100	100	100	100	100

[1] Calculated.

Table 3.3-3. Summary statistics for metals and major ions measured in the Saskatchewan River Region: 2009/2010. Values are presented as mg/L.

	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			Boron		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	0.0169	0.0365	0.0361	<0.00050	<0.00050	0.00054	0.00139	0.00111	0.00103	0.0817	0.0789	0.0356	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Median	0.0136	0.0397	0.0334	<0.00050	<0.00050	0.00062	0.00138	0.00109	0.00103	0.0838	0.0790	0.0361	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Minimum	<0.0050	0.0125	0.0135	<0.00050	<0.00050	<0.00050	0.00116	0.00055	0.00085	0.0700	0.0642	0.0323	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Maximum	0.0378	0.0541	0.0640	0.00061	0.00074	0.00068	0.00165	0.00172	0.00124	0.0891	0.0936	0.0379	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.033	0.031	<0.030
SD	0.0129	0.0156	0.0191	0.00016	0.00021	0.00017	0.00022	0.00044	0.00014	0.0071	0.0105	0.0021	-	-	-	-	-	-	0.008	0.007	-
SE	0.0075	0.0090	0.0110	0.00009	0.00012	0.00010	0.00012	0.00025	0.00008	0.0041	0.0060	0.0012	-	-	-	-	-	-	0.005	0.004	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	3	4	4	1	2	3	4	4	4	4	4	4	0	0	0	0	0	0	1	1	0
% Detected	75	100	100	25	50	75	100	100	100	100	100	100	0	0	0	0	0	0	25	25	0

Table 3.3-3. - continued -

	Cadmium			Calcium			Cesium			Chromium			Cobalt			Copper			Iron		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	<0.000010	0.000018	0.000024	34.2	42.0	33.1	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	0.0011	0.0010	0.027	0.026	<0.010
Median	<0.000010	<0.000010	0.000018	34.2	41.3	33.9	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	0.029	0.026	<0.010
Minimum	<0.000010	<0.000010	<0.000010	28.0	34.1	27.8	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	<0.0010	<0.010	0.021	<0.010
Maximum	0.000013	0.000047	0.000055	40.3	51.4	37.1	<0.00010	<0.00010	<0.00010	0.0024	0.0017	0.0018	0.00025	0.00023	0.00021	0.0014	0.0024	0.0021	0.038	0.030	<0.010
SD	0.000004	0.000017	0.000019	4.4	6.4	3.4	-	-	-	0.0008	0.0005	0.0006	0.00006	0.00006	0.00005	0.0004	0.0008	0.0006	0.011	0.003	-
SE	0.000002	0.000010	0.000011	2.5	3.7	2.0	-	-	-	0.0005	0.0003	0.0003	0.00004	0.00003	0.00003	0.0002	0.0004	0.0004	0.007	0.002	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	2	2	3	4	4	4	0	0	0	1	1	1	1	1	1	1	2	2	1	4	0
% Detected	50	50	75	100	100	100	0	0	0	25	25	25	25	25	25	25	50	50	25	100	0

Table 3.3-3. - continued -

	Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	<0.00050	<0.00050	<0.00050	-	-	-	24.5	16.1	19.1	0.00875	0.00939	0.00213	<0.00010	<0.00010	<0.00010	0.00053	0.00120	<0.00020	<0.0020	<0.0020	<0.0020
Median	<0.00050	<0.00050	<0.00050	-	-	-	23.8	15.1	19.3	0.00969	0.00627	0.00239	<0.000020	<0.000020	<0.000020	0.00051	0.00116	<0.00020	<0.0020	<0.0020	<0.0020
Minimum	<0.00050	<0.00050	<0.00050	-	-	-	21.0	13.1	16.4	0.00274	0.00511	0.00095	<0.000020	<0.000020	<0.000020	0.00028	0.00092	<0.00020	<0.0020	<0.0020	<0.0020
Maximum	<0.00050	<0.00050	<0.00050	-	-	-	29.4	21.1	21.3	0.0129	0.0199	0.00278	<0.00010	<0.00010	<0.00010	0.00083	0.00155	0.00023	<0.0020	<0.0020	<0.0020
SD	-	-	-	-	-	-	3.1	3.2	1.9	0.00372	0.00612	0.00072	-	-	-	0.00021	0.00023	0.00006	-	-	-
SE	-	-	-	-	-	-	1.8	1.8	1.1	0.00215	0.00353	0.00042	-	-	-	0.00012	0.00013	0.00003	-	-	-
N	4	4	4	0	0	0	4	4	4	4	4	4	3	3	3	4	4	4	4	4	4
N >DL	0	0	0	-	-	-	4	4	4	4	4	4	0	0	0	4	4	1	0	0	0
% Detected	0	0	0	-	-	-	100	100	100	100	100	100	0	0	0	100	100	25	0	0	0

Table 3.3-3. - continued -

	Potassium			Rubidium			Selenium			Silicon			Silver			Sodium			Strontium		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	2.18	2.53	1.22	0.00114	0.00096	0.00103	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	8.02	17.8	2.65	0.138	0.264	0.0612
Median	2.14	2.46	1.26	0.00119	0.00101	0.00104	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	7.42	16.8	2.64	0.132	0.256	0.0624
Minimum	1.79	2.08	1.02	0.00095	0.00079	0.00095	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	6.14	14.9	2.39	0.116	0.230	0.0551
Maximum	2.64	3.13	1.32	0.00123	0.00102	0.00107	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	11.1	22.5	2.96	0.174	0.313	0.0650
SD	0.32	0.40	0.12	0.00011	0.00010	0.00005	-	-	-	-	-	-	-	-	-	2.06	3.0	0.24	0.023	0.031	0.0038
SE	0.18	0.23	0.07	0.00006	0.00006	0.00003	-	-	-	-	-	-	-	-	-	1.19	1.7	0.14	0.013	0.018	0.0022
N	4	4	4	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	0	0	0	-	-	-	0	0	0	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	0	0	0	-	-	-	0	0	0	100	100	100	100	100	100

Table 3.3-3. - continued -

	Tellurium			Thallium			Thorium			Tin			Titanium			Tungsten			Uranium		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.0010	0.00065	<0.0010	<0.00090	0.00100	0.00107	<0.00050	<0.00050	<0.00050	0.00039	0.00075	0.00018
Median	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.0010	<0.00060	<0.0010	<0.00090	<0.00090	0.00121	<0.00020	<0.00020	<0.00020	0.00039	0.00076	0.00018
Minimum	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.00060	<0.00060	<0.00060	<0.00090	<0.00090	<0.00090	<0.00020	<0.00020	<0.00020	0.00025	0.00060	0.00014
Maximum	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.0010	0.00170	<0.0010	0.00218	0.00202	0.00141	<0.00050	<0.00050	<0.00050	0.00051	0.00089	0.00020
SD	-	-	-	-	-	-	-	-	-	-	0.00061	-	0.00075	0.00064	0.00039	-	-	-	0.00010	0.00011	0.00003
SE	-	-	-	-	-	-	-	-	-	-	0.00035	-	0.00043	0.00037	0.00023	-	-	-	0.00006	0.00007	0.00002
N	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	0	0	0	0	0	-	-	-	0	1	0	1	2	3	0	0	0	4	4	4
% Detected	0	0	0	0	0	0	-	-	-	0	25	0	25	50	75	0	0	0	100	100	100

Table 3.3-3. - continued -

	Vanadium			Zinc			Zirconium		
	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM	SMOOSE	CEDAR-SE	CORM
Mean	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Median	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Minimum	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Maximum	<0.0010	<0.0010	0.0011	<0.010	0.014	<0.010	<0.00040	<0.00040	<0.00040
SD	-	-	0.0003	-	0.004	-	-	-	-
SE	-	-	0.0002	-	0.002	-	-	-	-
N	4	4	4	4	4	4	4	4	4
N >DL	0	0	1	0	1	0	0	0	0
% Detected	0	0	25	0	25	0	0	0	0

Table 3.3-4. 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: 2009/2010. Values in bold indicate exceedances occurred at a given site.

Waterbody		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury[1]
MWQSOGs PAL (mg/L)		0.1	0.15	1.5	0.00034-0.00049	0.112-0.166	0.0122-0.0184	0.3	0.00475-0.00878	0.000026
SMOOSE	N	4	4	4	4	4	4	4	4	2
	# Exceedences	0	0	0	0	0	0	0	0	0
	% Exceedence	0	0	0	0	0	0	0	0	0
CEDAR-SE	N	4	4	4	4	4	4	4	4	2
	# Exceedences	0	0	0	0	0	0	0	0	0
	% Exceedence	0	0	0	0	0	0	0	0	0
CORM	N	4	4	4	4	4	4	4	4	2
	# Exceedences	0	0	0	0	0	0	0	0	0
	% Exceedence	0	0	0	0	0	0	0	0	0

Table 3.3-4. – continued –

Waterbody		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.068-0.102	0.001	1E-04	0.0008	0.015	0.156-0.235	120	128-429
SMOOSE	N	4	4	4	4	4	4	4	4	4
	# Exceedences	0	0	0	0	0	0	0	0	0
	% Exceedence	0	0	0	0	0	0	0	0	0
CEDAR-SE	N	4	4	4	4	4	4	4	4	**4**
	# Exceedences	0	0	0	0	0	0	0	0	**1**
	% Exceedence	0	0	0	0	0	0	0	0	**25**
CORM	N	4	4	4	4	4	4	4	4	4
	# Exceedences	0	0	0	0	0	0	0	0	0
	% Exceedence	0	0	0	0	0	0	0	0	0

[1]Comparisons to the current PAL guideline could not be made for samples collected in winter as the analytical detection limit was higher than the guideline.

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

[3]Comparison to the BCMOE guideline.

Table 3.3-5. Total phosphorus concentrations (open-water season and annual means) measured in the Saskatchewan River Region and CCME (1999; updated to 2013) trophic categorization: 2009/2010.

		Trophic Status Based on TP (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
South Moose Lake	Open-water season			0.018			
	Annual			0.017			
Cedar Lake	Open-water season			0.019			
	Annual			0.019			
Cormorant Lake	Open-water season			0.014			
	Annual			0.013			

Table 3.3-6. 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): 2008/2009-2010/2011.

		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
South Moose Lake	Open-water season			0.49			
	Annual			0.50			
Cedar Lake	Open-water season		0.28				
	Annual			0.38			
Cormorant Lake	Open-water season			0.34			
	Annual			0.36			

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: 2009/2010.

		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
South Moose Lake	Open-water season			4.6			
	Annual			3.7			
Cedar Lake	Open-water season					9.2	
	Annual			7.2			
Cormorant Lake	Open-water season		1.4				
	Annual		1.2				

Table 3.4-1. Community metrics for phytoplankton samples collected in the Saskatchewan River Region during the open-water season of 2009.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H`}$)	Evenness ($E^{H`}/S$)
South Moose Lake	Spring	-	-		-	-	-	-
	Summer	31	0.88	0.26	2.48	0.72	11.92	0.38
	Fall	34	0.89	0.27	2.62	0.74	13.70	0.40
Cedar Lake-Southeast	Spring	36	0.78	0.13	1.95	0.54	7.03	0.20
	Summer	20	0.82	0.27	2.01	0.67	7.45	0.37
	Fall	30	0.82	0.18	2.19	0.64	8.93	0.30
Cormorant Lake	Spring	14	0.81	0.37	1.89	0.72	6.64	0.47
	Summer	15	0.84	0.42	2.21	0.82	9.13	0.61
	Fall	17	0.82	0.33	2.02	0.71	7.54	0.44

Table 3.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Saskatchewan River Region for the CAMPP, 2009.

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)			(%)	
South Moose Lake (2009)	Nearshore	15	1.3	0.8	1.7	--	1.50	18.0	--	reeds, shrubs	--	--
	Offshore	15	6.1	5.3	6.3	--	1.50	17.0	--	--	--	--
Cedar Lake - SE (2009)	Nearshore	15	4.2	3.7	4.9	--	2.10	19.0	--	reeds, shrubs, conifers	--	--
	Offshore	15	10.6	10.4	10.8	--	1.50	16.0	--	--	--	--
Cormorant Lake (2009)	Nearshore	15	3.4	3.2	3.6	--	2.90	18.0	--	reeds, shrubs, mixed forest	--	--
	Offshore	15	14.6	13.5	15.2	--	3.50	17.0	--	--	--	--

Table 3.5-2. Sediment analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Saskatchewan River Region for the CAMPP, 2009.

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
South Moose Lake (2009)	Nearshore	Mean	3	1.3	4.67	34.00	24.00	42.00	Clay Loam
		SD	--	0.44	5.924	21.656	22.338	17.578	--
		SE	--	0.25	3.420	12.503	12.897	10.149	--
		Median	--	1.5	1.63	22.00	17.00	35.00	--
		Min	--	0.8	0.89	21.00	6.00	29.00	--
		Max	--	1.6	11.50	59.00	49.00	62.00	--
	Offshore	Mean	3	6.1	4.00	1.00	55.33	44.00	Silty Clay
		SD	--	0.00	0.140	0.000	1.528	1.732	--
		SE	--	0.00	0.081	0.000	0.882	1.000	--
		Median	--	6.1	4.04	1.00	55.00	45.00	--
		Min	--	6.1	3.84	1.00	54.00	42.00	--
		Max	--	6.1	4.11	1.00	57.00	45.00	--
Cedar Lake (2009)	Nearshore	Mean	3	4.5	19.97	6.00	47.67	46.33	Silty Clay
		SD	--	0.61	1.563	3.606	3.215	5.686	--
		SE	--	0.35	0.902	2.082	1.856	3.283	--
		Median	--	4.8	20.20	5.00	49.00	48.00	--
		Min	--	3.8	18.30	3.00	44.00	40.00	--
		Max	--	4.9	21.40	10.00	50.00	51.00	--
	Offshore	Mean	3	10.5	9.05	4.00	50.00	46.00	Silty Clay
		SD	--	0.06	0.646	2.000	1.000	1.000	--
		SE	--	0.03	0.373	1.155	0.577	0.577	--
		Median	--	10.5	9.30	4.00	50.00	46.00	--
		Min	--	10.4	8.32	2.00	49.00	45.00	--
		Max	--	10.5	9.54	6.00	51.00	47.00	--
Cormorant Lake (2009)	Nearshore	Mean	3	3.4	0.64	78.00	17.00	5.00	Loamy Sand
		SD	--	0.12	0.068	7.550	6.557	1.000	--
		SE	--	0.07	0.039	4.359	3.786	0.577	--
		Median	--	3.5	0.66	79.00	16.00	5.00	--
		Min	--	3.3	0.56	70.00	11.00	4.00	--
		Max	--	3.5	0.69	85.00	24.00	6.00	--
	Offshore	Mean	3	14.7	2.95	2.00	63.00	35.00	Silty Clay Loam
		SD	--	0.15	0.165	0.000	1.000	1.000	--
		SE	--	0.09	0.095	0.000	0.577	0.577	--
		Median	--	14.7	2.86	2.00	63.00	35.00	--
		Min	--	14.6	2.85	2.00	62.00	34.00	--
		Max	--	14.9	3.14	2.00	64.00	36.00	--

Table 3.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in South Moose Lake within the Saskatchewan River Region for CAMPP, 2009.

	Moose Lake (south)						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	7811	3471.2	896.3	7834	3852	16707
Oligochaeta	--	280	408.6	105.5	43	0	1255
Hirudinea	--	6	22.4	5.8	0	0	87
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	6	15.2	3.9	0	0	43
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	1076	744.3	192.2	822	216	2337
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	--	9	24.3	6.3	0	0	87
Pisidiidae	--	349	382.4	98.7	260	0	1342
Gastropoda - unid	--	3	11.2	2.9	0	0	43
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	69	134.7	34.8	0	0	390
Lymnaeidae	--	3	11.2	2.9	0	0	43
Physidae	--	9	17.9	4.6	0	0	43
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	29	70.7	18.2	0	0	260
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	--	1838	1309.1	338.0	1255	519	4761
Non-Insecta (%)	24	--	--	--	--	--	--
Oligochaeta	--	280	408.6	105.5	43	0	1255
Oligochaeta (%)	4	--	--	--	--	--	--
Amphipoda	--	1082	744.5	192.2	822	216	2337
Amphipoda (%)	14	--	--	--	--	--	--
Bivalvia	--	358	376.4	97.2	260	0	1342
Bivalvia (%)	5	--	--	--	--	--	--
Gastropoda	--	113	194.8	50.3	43	0	693
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	202	156.6	40.4	173	0	519
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	--	14	26.7	6.9	0	0	87
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	--	3	11.2	2.9	0	0	43

Table 3.5-3. - continued –

	Moose Lake (south)						
	Nearshore n=15						
	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)	--	6	15.2	3.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	17	35.8	9.3	0	0	130
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	--	87	161.9	41.8	0	0	563
Hexagenia	--	141	224.6	58.0	43	0	779
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	--	3	11.2	2.9	0	0	43
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	6	22.4	5.8	0	0	87
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 3.5-3. - continued –

	Moose Lake (south)						
	Nearshore n=15						
	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)	--	52	43.9	11.3	43	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	--	9	24.3	6.3	0	0	87
Polycentropodidae	--	26	45.7	11.8	0	0	130
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	26.7	6.9	0	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	4628	2930.3	756.6	3852	1082	11167
Orthocladiinae	--	66	125.5	32.4	0	0	476
Tanypodinae	--	698	697.1	180.0	476	43	2164
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 3.5-3. - continued –

	Moose Lake (south)						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	5973	2765.4	714.0	5410	2684	12336
Insecta (%)	76	--	--	--	--	--	--
Chironomidae	--	5393	2963.5	765.2	5064	1125	12033
Chironomidae (%)	69	--	--	--	--	--	--
Ephemeroptera	--	254	327.1	84.5	87	0	995
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	87	54.3	14.0	87	0	173
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	340	334.4	86.3	173	0	1082
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.14	0.255	0.066	0.03	0.00	0.96
Genus analysis of Ephemeroptera	5 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	22	9	2.2	0.6	10	5	12
Simpson's Diversity Index (D)	--	0.59	0.186	0.048	0.61	0.21	0.80
Evenness (Simpson's Equitability E_D)	--	0.28	0.136	0.035	0.26	0.16	0.63
Shannon-Weaver Index (H)	--	1.32	0.414	0.107	1.34	0.50	1.86
Evenness (Shannon's Equitability E_H)	--	0.56	0.169	0.044	0.61	0.24	0.84
Hill's Effective Richness ($E^{H'}$)	--	4	1.5	0.4	4	2	6
Evenness ($E^{H'}$/S)	--	0.39	0.145	0.037	0.40	0.21	0.71

Table 3.5-3. - continued –

	Moose Lake (south)						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	762	377.3	97.4	606	303	1601
Oligochaeta	--	326	275.1	71.0	260	43	952
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
Crangonycitidae	--	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	--	182	123.7	31.9	130	0	476
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	26	48.5	12.5	0	0	173
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	--	534	389.1	100.5	433	130	1472
Non-Insecta (%)	70	--	--	--	--	--	--
Oligochaeta	--	326	275.1	71.0	260	43	952
Oligochaeta (%)	43	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	182	123.7	31.9	130	0	476
Bivalvia (%)	24	--	--	--	--	--	--
Gastropoda	--	26	48.5	12.5	0	0	173
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 3.5-3. - continued –

	Moose Lake (south)						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Hydrophilidae (larva)	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	6	15.2	3.9	0	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 3.5-3. - continued –

	Moose Lake (south)						
	Offshore n=15						
	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	--	14	35.3	9.1	0	0	130
Chironomidae (adult)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	159	149.6	38.6	130	0	606
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	43	40.1	10.3	43	0	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	--	228	154.7	40.0	216	43	693
Insecta (%)	30	--	--	--	--	--	--
Chironomidae	--	205	148.6	38.4	216	0	649
Chironomidae (%)	27	--	--	--	--	--	--
Ephemeroptera	--	6	15.2	3.9	0	0	43

Table 3.5-3. - continued –

	Moose Lake (south)						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	6	15.2	3.9	0	0	43
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.07	0.258	0.067	0.00	0.00	1.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	7	4	0.8	0.2	4	2	5
Simpson's Diversity Index (D)	--	0.61	0.113	0.029	0.60	0.42	0.74
Evenness (Simpson's Equitability E_D)	--	0.65	0.144	0.037	0.64	0.38	0.86
Shannon-Weaver Index (H)	--	1.15	0.270	0.070	1.14	0.61	1.54
Evenness (Shannon's Equitability E_H)	--	0.80	0.099	0.026	0.82	0.61	0.94
Hill's Effective Richness ($E^{H'}$)	--	3	0.9	0.2	3	2	5
Evenness ($E^{H'}$/S)	--	0.76	0.112	0.029	0.77	0.53	0.93

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, 2009.

	Cedar Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1434	713.8	184.3	1515	346	2857
Oligochaeta	--	199	303.8	78.4	0	0	995
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
Crangonycitidae	--	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	--	361	278.4	71.9	346	0	909
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	11.2	2.9	0	0	43
Pisidiidae	--	289	170.5	44.0	303	0	606
Gastropoda - unid	--	3	11.2	2.9	0	0	43
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	35	49.6	12.8	0	0	130
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	3	11.2	2.9	0	0	43
Valvatidae	--	58	48.2	12.4	43	0	130
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	--	949	655.9	169.4	779	87	2424
Non-Insecta (%)	66	--	--	--	--	--	--
Oligochaeta	--	199	303.8	78.4	0	0	995
Oligochaeta (%)	14	--	--	--	--	--	--
Amphipoda	--	361	278.4	71.9	346	0	909
Amphipoda (%)	25	--	--	--	--	--	--
Bivalvia	--	291	171.2	44.2	346	0	606
Bivalvia (%)	20	--	--	--	--	--	--
Gastropoda	--	98	97.4	25.2	43	0	303
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	--	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 3.5-4. - continued -

	Cedar Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	3	11.2	2.9	0	0	43
Corixidae (adult)	--	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

Table 3.5-4. - continued -

	Cedar Lake						
	Nearshore n=15						
	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	0.0	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	--	23	36.1	9.3	0	0	87
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	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	387	251.6	65.0	260	87	952
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	69	76.4	19.7	43	0	216
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 3.5-4. - continued -

	Cedar Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	485	300.4	77.6	390	130	1082
Insecta (%)	34	--	--	--	--	--	--
Chironomidae	--	459	294.8	76.1	346	130	1082
Chironomidae (%)	32	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	0	0	0
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	23	36.1	9.3	0	0	87
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	23	36.1	9.3	0	0	87
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.05	0.088	0.023	0.00	0.00	0.29
Genus analysis of Ephemeroptera	--	--	--	--	--	--	--
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	5	1.6	0.4	5	3	8
Simpson's Diversity Index (D)	--	0.68	0.122	0.032	0.74	0.41	0.85
Evenness (Simpson's Equitability E_D)	--	0.63	0.139	0.036	0.64	0.42	0.90
Shannon-Weaver Index (H)	--	1.39	0.359	0.093	1.45	0.74	2.00
Evenness (Shannon’s Equitability E_H)	--	0.81	0.092	0.024	0.84	0.62	0.95
Hill's Effective Richness ($E^{H'}$)	--	4	1.5	0.4	4	2	7
Evenness ($E^{H'}/S$)	--	0.74	0.104	0.027	0.76	0.54	0.95

Table 3.5-4. - continued -

	Cedar Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1907	1092.0	281.9	1428	995	4675
Oligochaeta	--	470	491.8	127.0	303	87	1645
Hirudinea	--	12	25.7	6.6	0	0	87
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	470	227.8	58.8	476	130	866
Gastropoda - unid	--	3	11.2	2.9	0	0	43
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	--	3	11.2	2.9	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	--	961	634.3	163.8	693	346	2424
Non-Insecta (%)	50	--	--	--	--	--	--
Oligochaeta	--	470	491.8	127.0	303	87	1645
Oligochaeta (%)	25	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	470	227.8	58.8	476	130	866
Bivalvia (%)	25	--	--	--	--	--	--
Gastropoda	--	6	15.2	3.9	0	0	43
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 3.5-4. - continued -

	Cedar Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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 3.5-4. - continued -

	Cedar Lake						
	Offshore n=15						
	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	--	819	538.5	139.0	693	346	2424
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	127	87.3	22.5	130	0	260
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	--	946	565.5	146.0	909	346	2597
Insecta (%)	50	--	--	--	--	--	--
Chironomidae	--	946	565.5	146.0	909	346	2597
Chironomidae (%)	50	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	0	0	0

Table 3.5-4. - continued -

	Cedar Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	0.0	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)	6	3	0.6	0.2	3	3	5
Simpson's Diversity Index (D)	--	0.64	0.078	0.020	0.65	0.42	0.71
Evenness (Simpson's Equitability E_D)	--	0.69	0.129	0.033	0.69	0.43	0.90
Shannon-Weaver Index (H)	--	1.17	0.158	0.041	1.19	0.80	1.37
Evenness (Shannon's Equitability E_H)	--	0.83	0.096	0.025	0.83	0.58	0.95
Hill's Effective Richness ($E^{H'}$)	--	3	0.5	0.1	3	2	4
Evenness ($E^{H'}/S$)	--	0.78	0.108	0.028	0.78	0.56	0.94

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, 2009.

	Cormorant Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	5439	1591.2	410.8	5151	2164	8743
Oligochaeta	--	505	244.7	63.2	476	130	1039
Hirudinea	--	6	22.4	5.8	0	0	87
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	17	31.9	8.2	0	0	87
Haustoriidae	--	508	334.3	86.3	476	43	1125
Hyalellidae	--	1665	705.1	182.1	1558	260	3073
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	11.2	2.9	0	0	43
Pisidiidae	--	1073	463.3	119.6	1039	216	1861
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	147	161.8	41.8	87	0	476
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	6	15.2	3.9	0	0	43
Valvatidae	--	9	17.9	4.6	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	--	3939	1063.2	274.5	4025	1515	5930
Non-Insecta (%)	72	--	--	--	--	--	--
Oligochaeta	--	505	244.7	63.2	476	130	1039
Oligochaeta (%)	9	--	--	--	--	--	--
Amphipoda	--	2190	674.7	174.2	2294	519	3203
Amphipoda (%)	40	--	--	--	--	--	--
Bivalvia	--	1076	461.5	119.2	1039	216	1861
Bivalvia (%)	20	--	--	--	--	--	--
Gastropoda	--	162	155.6	40.2	130	0	476
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

Table 3.5-5. - continued -

	Cormorant Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Coenagrionidae	--	9	24.3	6.3	0	0	87
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)	--	3	11.2	2.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	6	15.2	3.9	0	0	43
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	11.2	2.9	0	0	43
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	11.2	2.9	0	0	43
Hexagenia	--	46	50.3	13.0	43	0	130
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 3.5-5. - continued -

	Cormorant Lake						
	Nearshore n=15						
	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)	--	9	17.9	4.6	0	0	43
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	3	11.2	2.9	0	0	43
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	15.2	3.9	0	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)	--	6	15.2	3.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1330	623.3	160.9	1255	476	2640
Orthocladiinae	--	23	39.6	10.2	0	0	130
Tanypodinae	--	55	55.4	14.3	43	0	173
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 3.5-5. - continued -

	Cormorant Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	1500	669.3	172.8	1472	649	2813
Insecta (%)	28	--	--	--	--	--	--
Chironomidae	--	1414	636.9	164.4	1342	606	2727
Chironomidae (%)	26	--	--	--	--	--	--
Ephemeroptera	--	58	48.2	12.4	43	0	130
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	19.8	5.1	0	0	43
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	69	51.2	13.2	87	0	130
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.06	0.056	0.014	0.05	0.00	0.21
Genus analysis of Ephemeroptera	4 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	19	8	1.6	0.4	8	5	10
Simpson's Diversity Index (D)	--	0.77	0.033	0.009	0.76	0.73	0.84
Evenness (Simpson's Equitability E_D)	--	0.50	0.123	0.032	0.48	0.31	0.69
Shannon-Weaver Index (H)	--	1.65	0.117	0.030	1.63	1.48	1.92
Evenness (Shannon’s Equitability E_H)	--	0.76	0.075	0.019	0.75	0.63	0.87
Hill's Effective Richness ($E^{H'}$)	--	5	0.6	0.2	5	4	7
Evenness ($E^{H'}/S$)	--	0.59	0.120	0.031	0.57	0.40	0.76

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	779	422.8	109.2	779	0	1688
Oligochaeta	--	173	175.4	45.3	130	0	563
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	139	106.3	27.4	130	0	390
Hyalellidae	--	3	11.2	2.9	0	0	43
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	--	153	100.7	26.0	173	0	346
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	--	3	11.2	2.9	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	--	470	242.6	62.6	433	0	909
Non-Insecta (%)	60	--	--	--	--	--	--
Oligochaeta	--	173	175.4	45.3	130	0	563
Oligochaeta (%)	22	--	--	--	--	--	--
Amphipoda	--	141	105.3	27.2	130	0	390
Amphipoda (%)	18	--	--	--	--	--	--
Bivalvia	--	153	100.7	26.0	173	0	346
Bivalvia (%)	20	--	--	--	--	--	--
Gastropoda	--	3	11.2	2.9	0	0	43
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
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	6	15.2	3.9	0	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
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=15						
	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	--	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)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	237	237.0	61.2	130	0	736
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	63	60.9	15.7	43	0	173
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	--	309	248.6	64.2	216	0	779
Insecta (%)	40	--	--	--	--	--	--
Chironomidae	--	303	253.4	65.4	216	0	779
Chironomidae (%)	39	--	--	--	--	--	--
Ephemeroptera	--	6	15.2	3.9	0	0	43
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--

Table 3.5-5. - continued -

	Cormorant Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	6	15.2	3.9	0	0	43
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.09	0.266	0.069	0.00	0.00	1.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	1	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	7	4	1.2	0.3	4	0	5
Simpson's Diversity Index (D)	--	0.66	0.191	0.049	0.69	0.00	0.79
Evenness (Simpson's Equitability E_D)	--	0.70	0.218	0.056	0.76	0.00	0.95
Shannon-Weaver Index (H)	--	1.27	0.386	0.100	1.32	0.00	1.58
Evenness (Shannon's Equitability E_H)	--	0.82	0.234	0.060	0.87	0.00	0.98
Hill's Effective Richness ($E^{H'}$)	--	4	1.0	0.2	4	1	5
Evenness ($E^{H'}$/S)	--	0.78	0.227	0.059	0.84	0.00	0.97

Table 3.6-1. Summary of site-specific physical measurements collected during CAMPP index gill netting conducted in the Saskatchewan River Region, 2009.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
South Moose Lake	GN-01	14	408467	5964536	9-Sep-09	20.50	2.5	3.8	-
South Moose Lake	GN-02	14	410544	5964358	9-Sep-09	21.32	5.5	4.5	-
South Moose Lake	GN-03	14	424671	5975209	10-Sep-09	21.70	1.8	2.2	-
South Moose Lake	GN-04	14	421004	5969754	10-Sep-09	22.00	3.0	2.0	-
South Moose Lake	GN-05	14	426127	5962144	11-Sep-09	21.42	4.5	4.7	-
South Moose Lake	GN-06	14	424091	5961138	11-Sep-09	19.45	6.1	6.0	-
South Moose Lake	GN-07	14	427866	5961258	12-Sep-09	22.68	4.7	5.7	-
South Moose Lake	GN-08	14	426193	5958815	12-Sep-09	20.75	8.9	8.8	-
South Moose Lake	GN-09	14	442518	5970693	13-Sep-09	22.87	8.7	8.7	-
South Moose Lake	GN-10	14	434716	5966204	13-Sep-09	19.58	1.3	5.9	-
South Moose Lake	GN-11	14	438028	5955121	14-Sep-09	21.75	3.9	4.5	18.0
South Moose Lake	GN-12	14	427032	5951284	14-Sep-09	22.55	3.3	3.3	19.0
South Moose Lake	GN-13	14	420736	5952749	15-Sep-09	20.92	1.0	1.3	18.0
South Moose Lake	GN-14	14	416124	5950831	15-Sep-09	20.33	1.7	1.5	18.0
South Moose Lake	SN-01	14	408467	5964536	10-Sep-09	22.00	3.0	2.0	-
South Moose Lake	SN-04	14	421004	5969754	9-Sep-09	20.50	2.5	3.8	-
South Moose Lake	SN-05	14	426127	5962144	11-Sep-09	21.42	4.5	4.7	-
South Moose Lake	SN-08	14	426193	5958815	12-Sep-09	20.75	8.9	8.9	-
Cedar Lake-Southeast	GN-01	14	449887	5895326	14-Aug-09	21.25	-	-	-
Cedar Lake-Southeast	GN-02	14	445892	5891153	14-Aug-09	21.93	2.3	2.0	-
Cedar Lake-Southeast	GN-03	14	442185	5887567	15-Aug-09	17.85	-	-	-
Cedar Lake-Southeast	GN-04	14	445549	5887524	16-Aug-09	22.02	8.6	8.4	17.2
Cedar Lake-Southeast	GN-06	14	437011	5886227	15-Aug-09	21.22	12.3	12.0	17.1
Cedar Lake-Southeast	GN-07	14	430477	5890926	14-Aug-09	20.63	6.0	6.2	18.3
Cedar Lake-Southeast	GN-14	14	455231	5901393	18-Aug-09	22.10	8.7	8.8	17.2
Cedar Lake-Southeast	GN-15	14	431768	5894910	16-Aug-09	19.18	7.8	7.8	19.1
Cedar Lake-Southeast	GN-16	14	428397	5887127	16-Aug-09	22.33	-	-	-
Cedar Lake-Southeast	GN-17	14	451422	5892957	17-Aug-09	21.62	-	-	-
Cedar Lake-Southeast	GN-18	14	439949	5888343	15-Aug-09	22.12	7.0	7.4	17.2
Cedar Lake-Southeast	GN-19	14	440306	5885378	17-Aug-09	20.45	6.5	6.4	16.7
Cedar Lake-Southeast	GN-20	14	435329	5897042	18-Aug-09	21.30	9.9	10.6	17.4
Cedar Lake-Southeast	GN-21	14	435279	5900308	18-Aug-09	21.85	7.2	2.7	17.3
Cedar Lake-Southeast	SN-02	14	445892	5891153	14-Aug-09	21.93	2.3	2.0	-
Cedar Lake-Southeast	SN-04	14	445549	5887524	16-Aug-09	22.02	8.6	8.4	17.2
Cedar Lake-Southeast	SN-06	14	437011	5886227	15-Aug-09	21.22	12.3	12.0	17.1
Cedar Lake-Southeast	SN-18	14	439949	5888343	15-Aug-09	22.12	7.0	7.4	17.2
Cedar Lake-Southeast	SN-20	14	435329	5897042	18-Aug-09	21.30	9.9	10.6	17.4
Cedar Lake-Southeast	SN-21	14	435279	5900308	18-Aug-09	21.85	7.2	2.7	17.3

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-01	14	373160	6014695	17-Aug-09	15.92	2.7	11.9	16.9
Cormorant Lake	GN-02	14	372747	6017416	17-Aug-09	16.02	3.4	10.7	16.8
Cormorant Lake	GN-05	14	389979	6013846	22-Aug-09	18.17	4.9	7.6	16.5
Cormorant Lake	GN-07	14	383450	6003367	21-Aug-09	17.03	3.1	5.8	17.0
Cormorant Lake	GN-08	14	384652	6010792	19-Aug-09	18.17	6.7	9.1	17.0
Cormorant Lake	GN-09	14	381704	6010060	21-Aug-09	17.40	13.1	14.3	17.0
Cormorant Lake	GN-11	14	385132	6007321	20-Aug-09	17.05	3.7	12.2	16.8
Cormorant Lake	GN-13	14	379334	6008537	18-Aug-09	17.50	4.3	12.8	17.0
Cormorant Lake	GN-14	14	377935	6009140	18-Aug-09	17.25	9.8	12.5	17.0
Cormorant Lake	GN-15	14	368965	6010577	17-Aug-09	15.97	4.9	10.7	16.7
Cormorant Lake	GN-16	14	388228	6011088	20-Aug-09	17.08	7.6	16.8	16.5
Cormorant Lake	GN-17	14	384452	6012953	19-Aug-09	18.17	11.3	12.8	17.0
Cormorant Lake	GN-22	14	384235	6009916	20-Aug-09	16.97	7.6	11.3	17.0
Cormorant Lake	GN-23	14	380571	6010017	18-Aug-09	17.33	14.3	14.3	17.0
Cormorant Lake	GN-24	14	380001	6010766	21-Aug-09	17.02	11.3	11.3	18.0
Cormorant Lake	GN-25	14	380395	6006622	22-Aug-09	18.33	2.7	10.7	16.4
Cormorant Lake	GN-29	14	386432	6015001	22-Aug-09	18.33	3.7	6.4	16.5
Cormorant Lake	GN-30	14	378355	6013792	19-Aug-09	17.57	3.7	4.6	17.0
Cormorant Lake	SN-02	14	372747	6017416	17-Aug-09	16.02	3.4	3.4	16.8
Cormorant Lake	SN-07	14	383450	6003367	21-Aug-09	17.03	3.1	3.1	17.0
Cormorant Lake	SN-08	14	384652	6010792	19-Aug-09	18.17	6.7	6.7	17.0
Cormorant Lake	SN-11	14	385132	6007321	20-Aug-09	17.05	3.7	3.7	16.8
Cormorant Lake	SN-23	14	380571	6010017	18-Aug-09	17.33	14.3	14.3	17.0
Cormorant Lake	SN-25	14	380395	6006622	22-Aug-09	18.33	2.7	2.7	16.4

Table 3.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Saskatchewan River Region waterbodies, 2009.

Family	Common Name	Scientific Name	ID Code	Captured in Waterbody		
				SMOOSE	CEDAR-SE	CORM
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH			+
	Emerald Shiner	*Notropis atherinoides*	EMSH	+		+
	Spottail Shiner	*Notropis hudsonius*	SPSH	+	+	+
	Fathead Minnow	*Pimephales promelas*	FTMN	+		
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	Slimy Sculpin	*Cottus cognatus*	SLSC			+
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+	+	+
	Logperch	*Percina caprodes*	LGPR		+	+
	Sauger	*Sander canadensis*	SAUG	+	+	+
	Walleye	*Sander vitreus*	WALL	+	+	+

SMOOSE = South Moose Lake; CEDAR-SE = Cedar Lake-SE; CORM = Cormorant Lake

Table 3.6-3. Standard gang and small mesh index gillnet relative abundance summaries from Saskatchewan River Region waterbodies, 2009.

Species	Standard Gang						Small Mesh					
	South Moose L.		Cedar L. - SE		Cormorant L.		South Moose L.		Cedar L. - SE		Cormorant L.	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-	-	-	-	-	2	0.35
Emerald Shiner	-	-	-	-	-	-	51	2.73	-	-	109	19.26
Spottail Shiner	-	-	-	-	-	-	239	12.81	266	31.74	15	2.65
Fathead Minnow	-	-	-	-	-	-	6	0.32	-	-	-	-
Longnose Sucker	9	1.65	17	2.05	7	0.73	-	-	-	-	-	-
White Sucker	315	57.59	232	27.99	473	49.17	5	0.27	4	0.48	11	1.94
Shorthead Redhorse	1	0.18	9	1.09	-	-	-	-	-	-	-	-
Northern Pike	92	16.82	34	4.10	46	4.78	8	0.43	-	-	1	0.18
Cisco	65	11.88	36	4.34	63	6.55	-	-	4	0.48	14	2.47
Lake Whitefish	22	4.02	1	0.12	82	8.52	-	-	-	-	3	0.53
Troutperch	-	-	-	-	-	-	3	0.16	36	4.30	12	2.12
Burbot	-	-	-	-	2	0.21	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	1	0.18
Yellow Perch	11	2.01	125	15.08	40	4.16	1554	83.28	437	52.15	303	53.53
Logperch	-	-	-	-	-	-	-	-	46	5.49	20	3.53
Sauger	1	0.18	92	11.10	36	3.74	-	-	33	3.94	68	12.01
Walleye	31	5.67	283	34.14	213	22.14	-	-	12	1.43	7	1.24
Total	547	100	829	100	962	100	1866	100	838	100	566	100

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

Table 3.6-4. Standard gang index gillnet biomass summaries from Saskatchewan River Region waterbodies, 2009.

Species	South Moose Lake			Cedar Lake - SE			Cormorant Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-	-
Longnose Sucker	9	6970	1.36	17	18200	3.69	7	4470	0.61
White Sucker	315	308290	60.10	232	221610	44.89	473	365955	49.85
Shorthead Redhorse	1	190	0.04	9	5200	1.05	-	-	-
Northern Pike	92	143026	27.88	34	44628	9.04	46	83355	11.35
Cisco	65	12305	2.40	36	7990	1.62	63	8440	1.15
Lake Whitefish	22	19790	3.86	1	1270	0.26	82	57800	7.87
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	2	3050	0.42
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	11	1200	0.23	125	15300	3.10	40	3960	0.54
Logperch	-	-	-	-	-	-	-	-	-
Sauger	1	310	0.06	92	18600	3.77	36	4945	0.67
Walleye	31	20902	4.07	283	160902	32.59	213	202125	27.53
Total	547	512983	100	829	493700	100	962	734100	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, 2009.

Species	South Moose Lake			Cedar Lake - SE			Cormorant Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	2	40	0.32
Emerald Shiner	51	250	0.96	-	-	-	109	500	4.03
Spottail Shiner	239	1200	4.61	266	1280	8.19	15	160	1.29
Fathead Minnow	6	10	0.04	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	5	100	0.38	4	110	0.70	11	300	2.42
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	8	9935	38.19	-	-	-	1	1600	12.91
Cisco	-	-	-	4	530	3.39	14	660	5.32
Lake Whitefish	-	-	-	-	-	-	3	330	2.66
Troutperch	3	10	0.04	36	160	1.02	12	120	0.97
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	5	0.04
Yellow Perch	1554	14510	55.78	437	5080	32.50	303	4495	36.26
Logperch	-	-	-	46	280	1.79	20	135	1.09
Sauger	-	-	-	33	4980	31.86	68	3860	31.14
Walleye	-	-	-	12	3210	20.54	7	190	1.53
Total	1866	26015	100	838	15630	100	566	12395	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, 2009.

Species	South Moose Lake (#sites=14)			Cedar Lake - SE (#sites=14)			Cormorant Lake (#sites=18)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-	-
Longnose Sucker	9	0.7	0.18	17	1.1	0.11	7	0.5	0.06
White Sucker	315	22.1	1.30	232	15.5	0.61	473	31.8	0.57
Shorthead Redhorse	1	0.1	0.02	9	0.6	0.09	-	-	-
Northern Pike	92	6.5	0.25	34	2.3	0.09	46	3.2	0.11
Cisco	65	4.5	0.46	36	2.4	0.21	63	4.2	0.39
Lake Whitefish	22	1.6	0.16	1	0.1	0.02	82	5.6	0.33
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	2	0.1	0.02
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	11	0.8	0.06	125	8.5	0.85	40	2.7	0.17
Logperch	-	-	-	-	-	-	-	-	-
Sauger	1	0.1	0.02	92	6.1	0.38	36	2.4	0.21
Walleye	31	2.3	0.22	283	18.9	0.47	213	14.5	0.50
Total	547	38.4	1.64	829	55.2	1.16	962	65.1	1.10

#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, 2009.

Species	South Moose Lake (#sites=4)			Cedar Lake - SE (#sites=6)			Cormorant Lake (#sites=6)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	2	0.5	0.19
Emerald Shiner	51	14.7	6.63	-	-	-	109	24.2	6.96
Spottail Shiner	239	69.0	16.96	266	49.2	9.57	15	3.5	0.66
Fathead Minnow	6	1.8	0.88	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	5	1.5	0.73	4	0.8	0.23	11	2.4	0.71
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	8	2.3	0.24	-	-	-	1	0.3	0.10
Cisco	-	-	-	4	0.7	0.15	14	3.2	1.32
Lake Whitefish	-	-	-	-	-	-	3	0.7	0.19
Troutperch	3	0.9	0.44	36	6.6	1.60	12	2.8	0.80
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	0.3	0.10
Yellow Perch	1554	445.3	82.58	437	80.7	14.93	303	70.1	6.78
Logperch	-	-	-	46	8.4	3.43	20	4.7	1.92
Sauger	-	-	-	33	6.2	1.56	68	15.4	3.18
Walleye	-	-	-	12	2.3	0.92	7	1.6	0.53
Total	1866	535.3	91.24	838	154.8	21.79	566	129.6	10.63

#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/100m of net/24 h) set in Saskatchewan River Region waterbodies, 2009.

Species	South Moose Lake (#sites=14)			Cedar Lake - SE (#sites=14)			Cormorant Lake (#sites=18)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Fathead Minnow	-	-	-	-	-	-	-	-	-
Longnose Sucker	9	510	136	17	1177	129	7	304	39
White Sucker	315	21670	1442	232	14732	581	473	24650	389
Shorthead Redhorse	1	14	4	9	333	60	-	-	-
Northern Pike	92	9908	615	34	2978	112	46	5758	255
Cisco	65	846	79	36	527	56	63	573	48
Lake Whitefish	22	1402	139	1	81	21	82	4017	276
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	2	202	33
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	11	83	8	125	1029	87	40	265	18
Logperch	-	-	-	-	-	-	-	-	-
Sauger	1	23	6	92	1230	76	36	331	31
Walleye	31	1510	125	283	10745	314	213	13784	485
Total	547	35965	1791	829	32831	609	962	49883	785

#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 (g/30 m of net/24 h) set in Saskatchewan River Region waterbodies, 2009.

Species	South Moose Lake (#sites=4)			Cedar Lake - SE (#sites=6)			Cormorant Lake (#sites=6)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	2	9	4
Emerald Shiner	51	72	32	-	-	-	109	111	30
Spottail Shiner	239	346	83	266	237	48	15	38	8
Fathead Minnow	6	3	1	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	5	29	14	4	20	5	11	66	17
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	8	2820	228	-	-	-	1	400	163
Cisco	-	-	-	4	100	39	14	152	62
Lake Whitefish	-	-	-	-	-	-	3	85	28
Troutperch	3	3	1	36	29	7	12	28	7
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	1	1
Yellow Perch	1554	4156	814	437	939	174	303	1031	118
Logperch	-	-	-	46	51	21	20	32	13
Sauger	-	-	-	33	933	264	68	868	184
Walleye	-	-	-	12	605	247	7	44	11
Total	1866	7430	829	838	2915	491	566	2866	282

#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) calculated for Northern Pike and Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2009.

Species	South Moose Lake			Cedar Lake - SE			Cormorant Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	90	582	102	34	537	90	44	610	89
Walleye	31	369	87	283	345	4	213	415	112
Weight (g)									
Northern Pike	100	1530	1097	34	1313	607	47	1808	895
Walleye	31	771	473	284	578	347	220	920	657
Condition Factor (K)									
Northern Pike	90	0.71	0.05	34	0.80	0.13	44	0.75	0.08
Walleye	31	1.14	0.14	283	1.22	0.16	213	1.08	0.14

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, 2009.

Age	Year-Class	Northern Pike						Walleye					
		South Moose L		Cedar L-SE		Cormorant L		South Moose L		Cedar L-SE		Cormorant L	
		n	%	n	%	n	%	n	%	n	%	n	%
1	2008	2	2.22	-	-	-	-	1	3.45	2	0.72	3	1.41
2	2007	1	1.11	1	2.94	-	-	4	13.79	4	1.43	16	7.51
3	2006	6	6.67	5	14.71	2	4.26	8	27.59	34	12.19	13	6.10
4	2005	38	42.22	6	17.65	5	10.64	6	20.69	31	11.11	35	16.43
5	2004	17	18.89	14	41.18	13	27.66	-	-	8	2.87	3	1.41
6	2003	10	11.11	6	17.65	11	23.40	5	17.24	112	40.14	14	6.57
7	2002	9	10.00	1	2.94	4	8.51	2	6.90	38	13.62	7	3.29
8	2001	3	3.33	-	-	1	2.13	3	10.34	46	16.49	59	27.70
9	2000	2	2.22	1	2.94	1	2.13	-	-	-	-	11	5.16
10	1999	2	2.22	-	-	2	4.26	-	-	-	-	11	5.16
11	1998	-	-	-	-	1	2.13	-	-	2	0.72	2	0.94
12	1997	-	-	-	-	4	8.51	-	-	-	-	9	4.23
13	1996	-	-	-	-	2	4.26	-	-	2	0.72	27	12.68
14	1995	-	-	-	-	1	2.13	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	2	0.94
16	1993	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	1	0.47
Total		90	100	34	100	47	100	29	100	279	100	213	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, 2009.

Age	Year-Class	South Moose Lake									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
1	2008	2	398	3.5	2	430	28.3	2	0.69	0.02	-	-	-	-	-	-	-	-	-
2	2007	1	415	-	1	500	-	1	0.70	-	1	306	-	1	200	-	1	0.70	-
3	2006	6	501	28.4	6	897	168.1	6	0.71	0.03	5	444	64.8	5	682	264.5	5	0.75	0.06
4	2005	38	559	53.9	38	1288	460.6	38	0.71	0.06	6	510	36.8	6	1130	303.2	6	0.83	0.07
5	2004	17	585	56.5	17	1448	487.5	17	0.70	0.04	14	565	60.9	14	1467	341.6	14	0.82	0.19
6	2003	10	601	55.7	10	1571	356.4	10	0.72	0.06	6	562	65.9	6	1473	639.8	6	0.80	0.06
7	2002	9	665	156.0	9	2435	1673.4	9	0.72	0.05	1	633	-	1	1580	-	1	0.62	-
8	2001	2	622	65.1	3	1435	517.2	2	0.68	0.01	-	-	-	-	-	-	-	-	-
9	2000	2	816	291.3	2	4789	4142.2	2	0.77	0.07	1	758	-	1	3280	-	1	0.75	-
10	1999	2	615	49.5	2	1680	28.3	2	0.74	0.19	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-
3	2006	2	494	36.8	2	855	148.5	2	0.71	0.04
4	2005	4	577	55.7	5	1366	612.7	4	0.78	0.09
5	2004	13	566	56.7	13	1371	363.6	13	0.74	0.06
6	2003	11	603	65.7	11	1687	490.2	11	0.75	0.09
7	2002	4	637	48.3	4	1863	443.7	4	0.72	0.05
8	2001	1	604	-	1	1550	-	1	0.70	-
9	2000	1	688	-	1	2100	-	1	0.64	-
10	1999	2	641	32.5	2	1880	381.8	2	0.71	0.04
11	1998	1	570	-	1	1570	-	1	0.85	-
12	1997	3	650	50.5	4	2713	957.3	3	0.84	0.11
13	1996	2	849	72.1	2	4125	954.6	2	0.67	0.01
14	1995	1	810	-	1	4500	-	1	0.85	-

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, 2009.

Age	Year-Class	South Moose Lake									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
1	2008	1	215	-	1	80	-	1	0.80	-	2	166	4	2	55	21	2	1.23	0.55
2	2007	4	244	109	4	246	355	4	1.02	0.11	4	211	10	4	113	21	4	1.19	0.07
3	2006	8	357	25	8	537	85	8	1.18	0.10	34	232	23	34	146	60	34	1.08	0.12
4	2005	6	407	18	6	768	121	6	1.13	0.06	31	269	32	31	245	81	31	1.23	0.31
5	2004	-	-	-	-	-	-	-	-	-	8	346	40	8	473	182	8	1.12	0.19
6	2003	5	439	42	5	994	239	5	1.17	0.17	112	370	30	112	641	158	112	1.24	0.12
7	2002	2	395	7	2	765	49	2	1.24	0.01	38	384	32	38	712	177	38	1.23	0.08
8	2001	3	454	57	3	1220	399	3	1.29	0.10	47	395	33	47	808	218	47	1.28	0.09
9	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	2	456	64	2	1300	495	2	1.35	0.05
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	2	533	35	2	1935	375	2	1.27	0.00
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	3	129	46	3	37	46	3	1.13	0.32
2	2007	16	212	27	16	103	34	16	1.00	0.19
3	2006	13	256	54	13	182	79	13	0.98	0.19
4	2005	35	323	56	35	365	141	35	1.04	0.19
5	2004	3	359	19	3	543	143	3	1.15	0.12
6	2003	14	410	62	14	786	296	14	1.06	0.09
7	2002	7	467	31	7	1106	243	7	1.07	0.07
8	2001	59	465	57	59	1163	358	59	1.10	0.12
9	2000	11	479	38	11	1214	235	11	1.10	0.09
10	1999	11	478	81	11	1359	589	11	1.13	0.15
11	1998	2	531	35	2	1715	375	2	1.14	0.02
12	1997	9	490	88	9	1389	660	9	1.07	0.12
13	1996	27	515	62	27	1601	667	27	1.12	0.09
14	1995	-	-	-	-	-	-	-	-	-
15	1994	2	492	65	2	1185	346	2	0.99	0.10
16	1993	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-
18	1991	1	688	-	1	3720	-	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 3.6-14. Deformities, erosions, lesions, and tumours (DELTs) on select fish species captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2009.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
South Moose Lake											
White Sucker	-	-	-	-	5	8.77	-	-	57	5	8.77
Northern Pike	-	-	-	-	-	-	-	-	92	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	22	0	0
Walleye	-	-	-	-	-	-	-	-	31	0	0
Cedar Lake - SE											
White Sucker	-	-	-	-	-	-	-	-	58	0	0
Northern Pike	-	-	-	-	-	-	-	-	34	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	1	0	0
Sauger	-	-	-	-	-	-	-	-	24	0	0
Walleye	-	-	-	-	-	-	-	-	283	0	0
Cormorant Lake											
White Sucker	-	-	-	-	-	-	-	-	191	0	0
Northern Pike	-	-	-	-	-	-	-	-	46	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	82	0	0
Walleye	-	-	-	-	-	-	-	-	213	0	0

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 ($n_{DELTs}/n_{Inspect}\times100$)

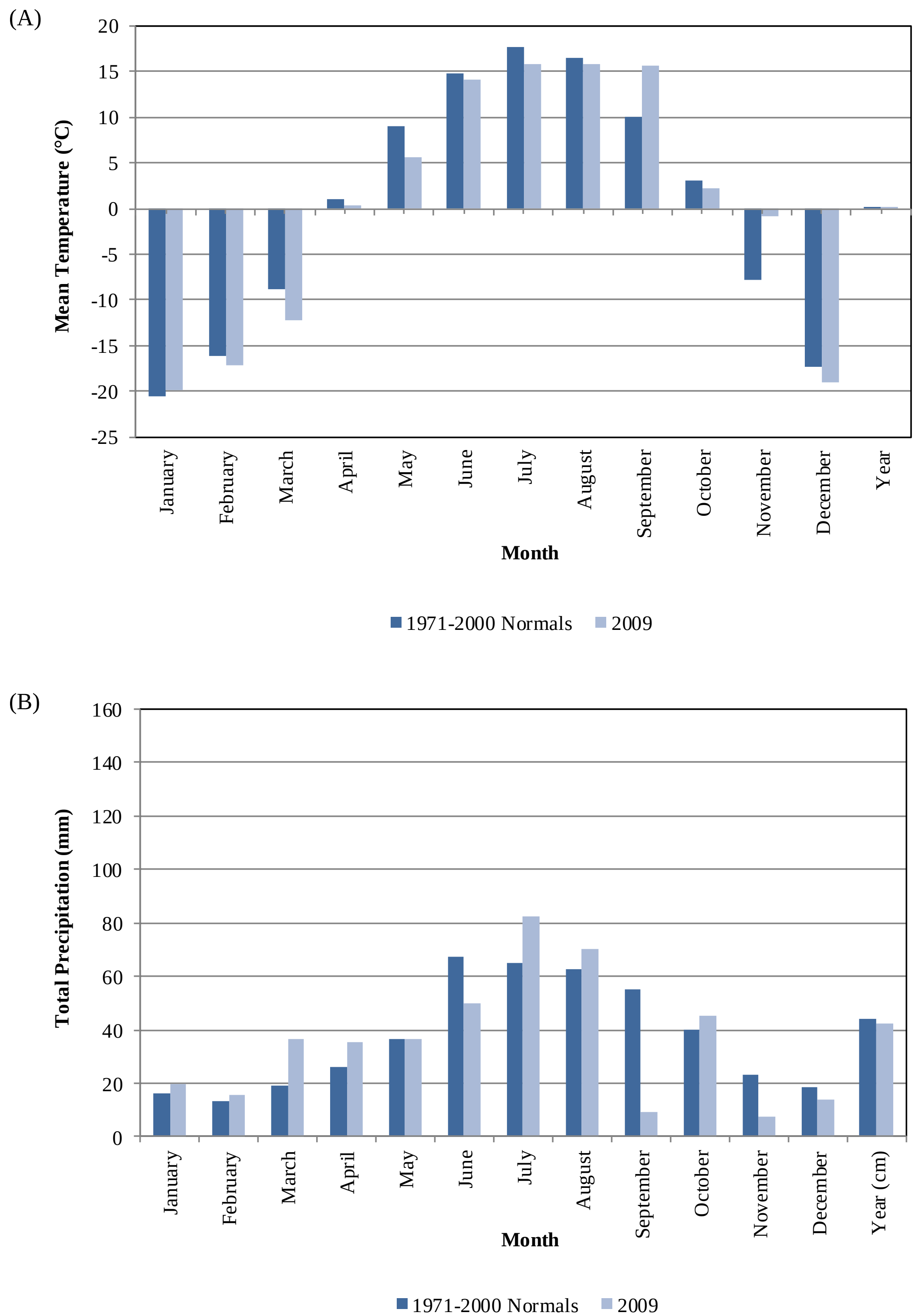


Figure 3.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), The Pas, MB.

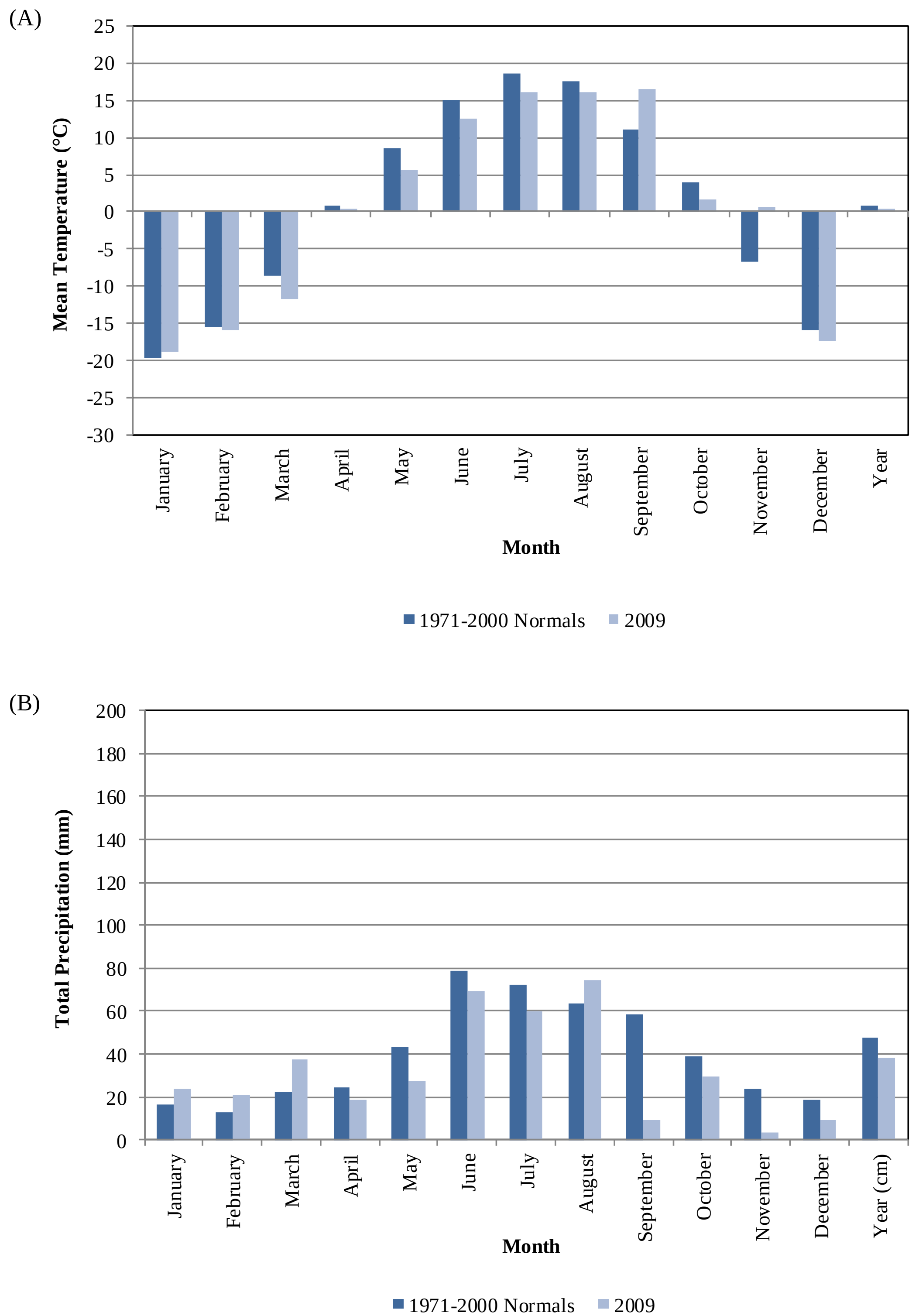


Figure 3.1-2. Monthly mean air temperature (A) and monthly total precipitation (B) for 2009 compared to climate normals (1971-2000), Grand Rapids, MB.

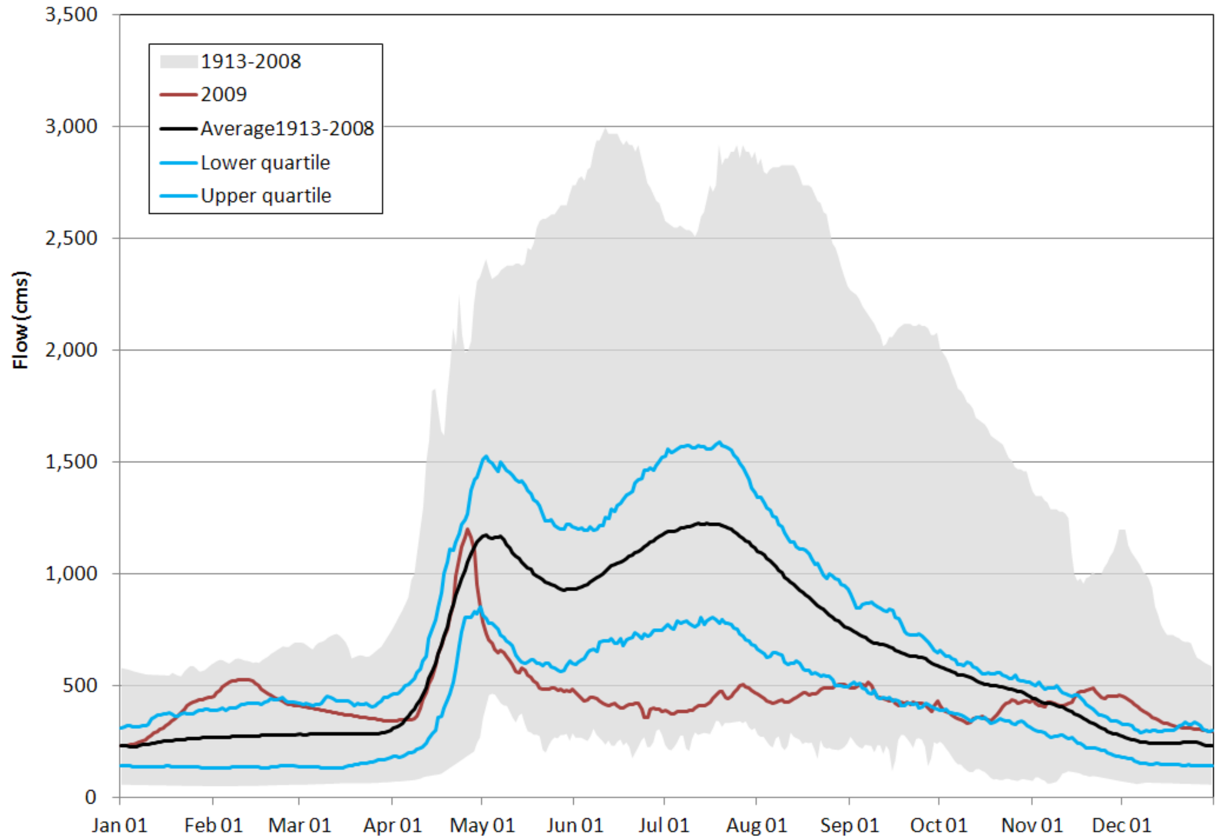


Figure 3.2-1. 2009 Saskatchewan River flow at The Pas (05KJ001)

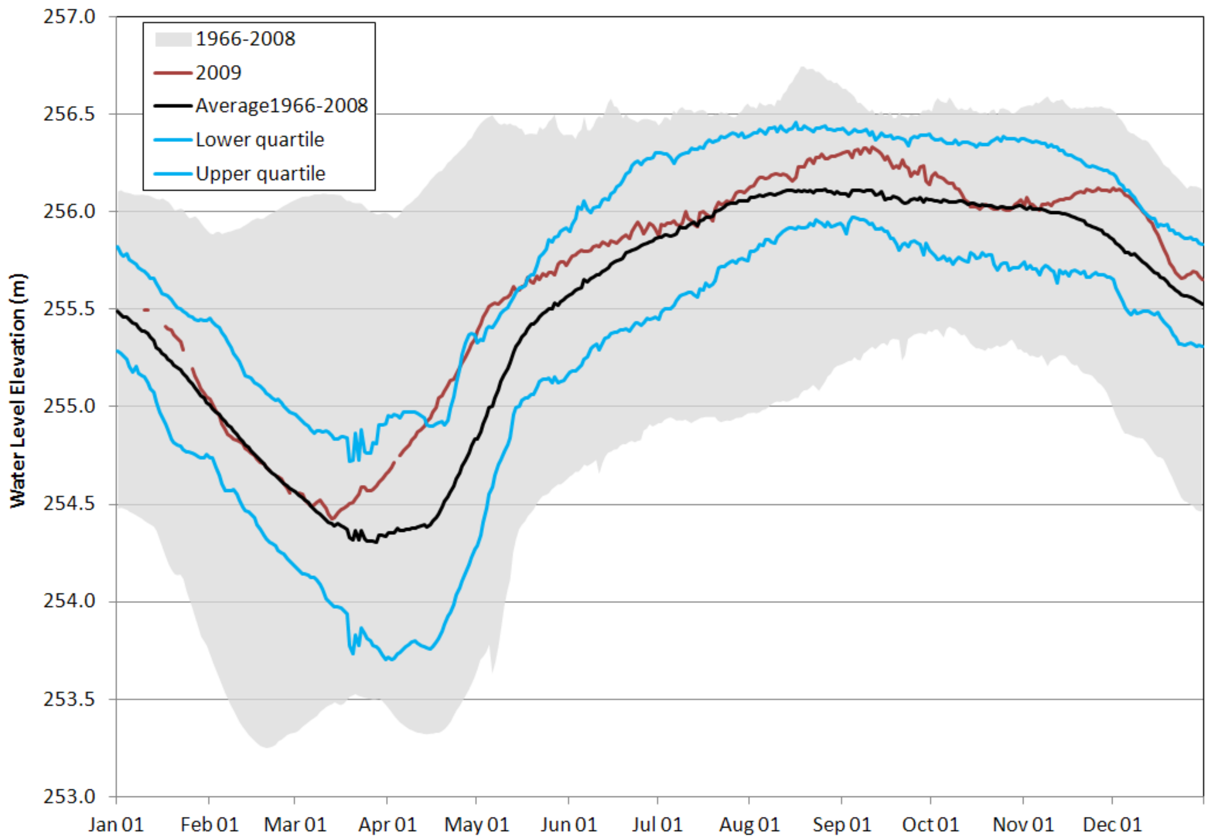


Figure 3.2-2. 2009 Cedar Lake Water Level Elevation.

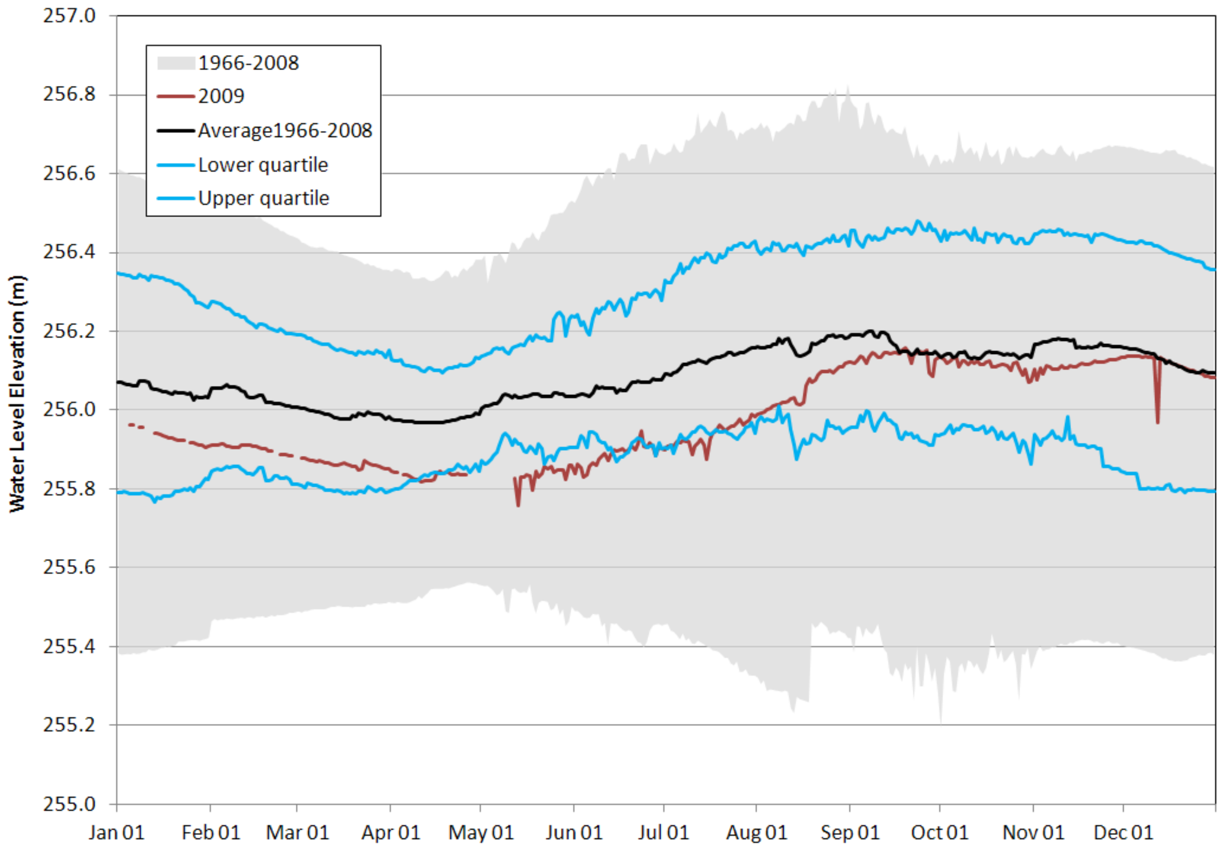


Figure 3.2-3. 2009 South Moose Lake water level elevation (05KK006).

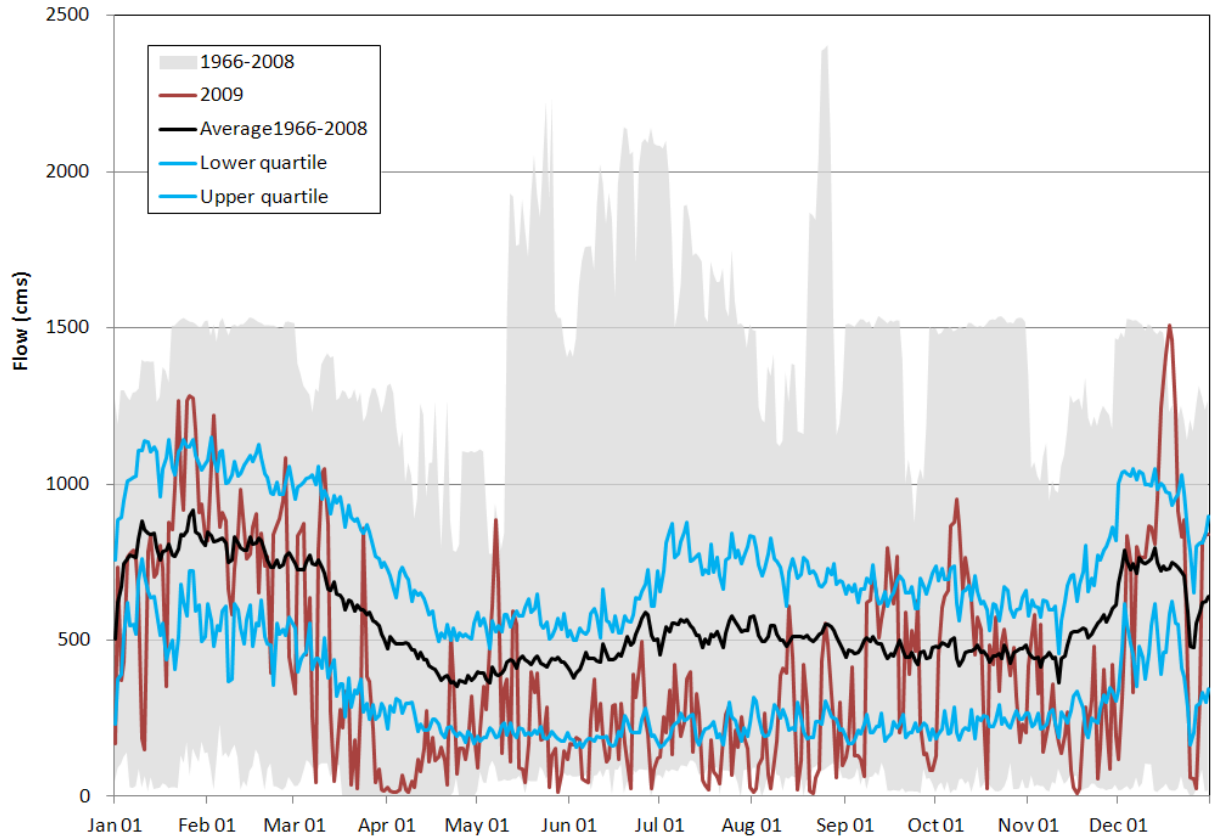


Figure 3.2-4. 2009 Grand Rapids Generating Station outflow.

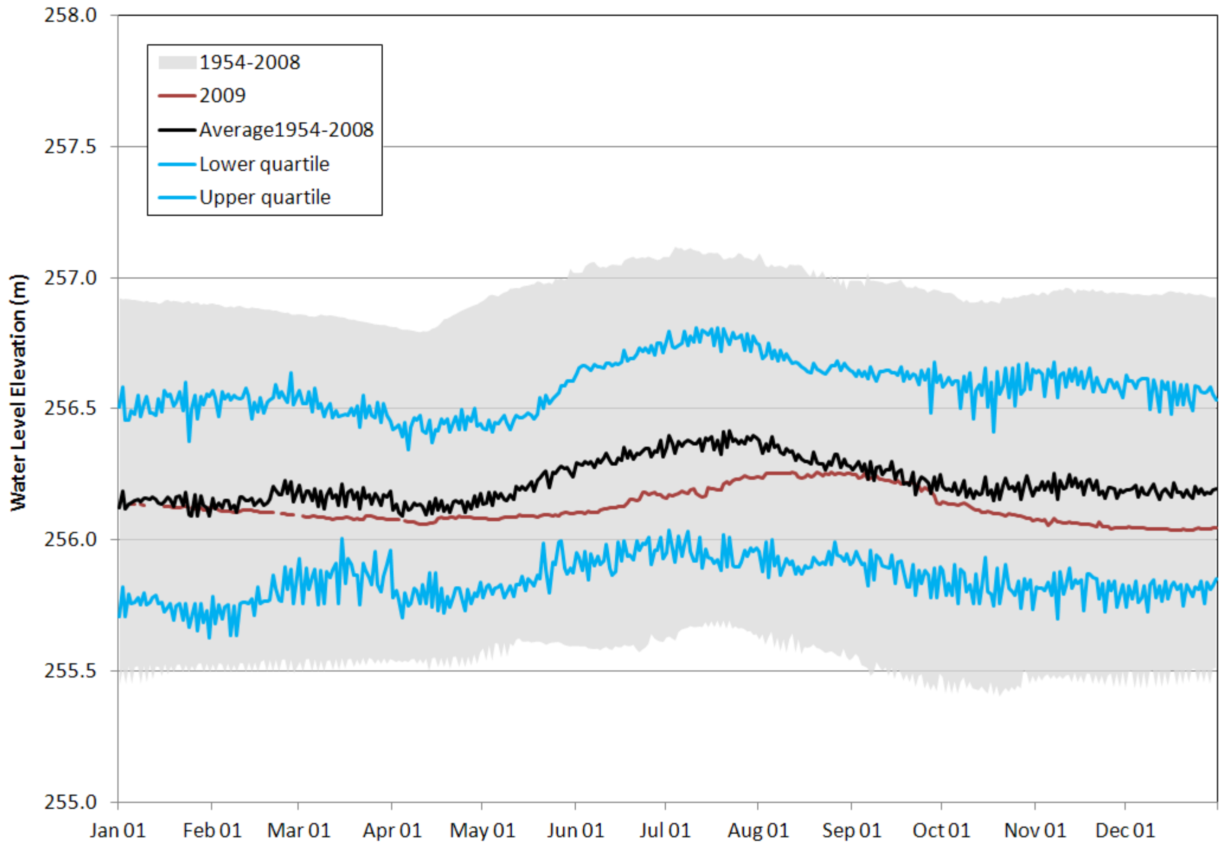


Figure 3.2-5. 2009 Cormorant Lake water level elevation (05KK002).

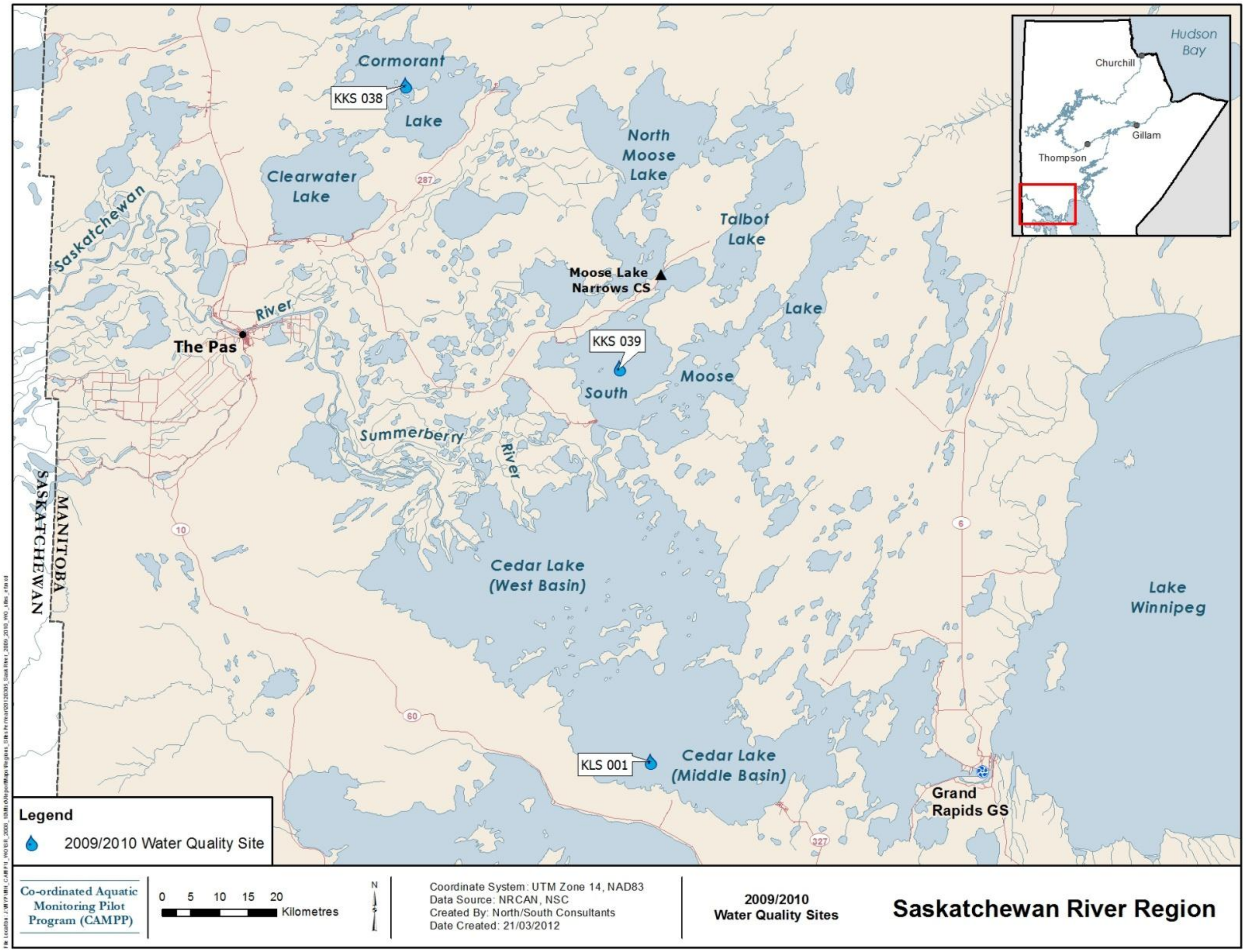


Figure 3.3-1. Water quality and phytoplankton monitoring sites in the Saskatchewan River Region: 2009/2010.

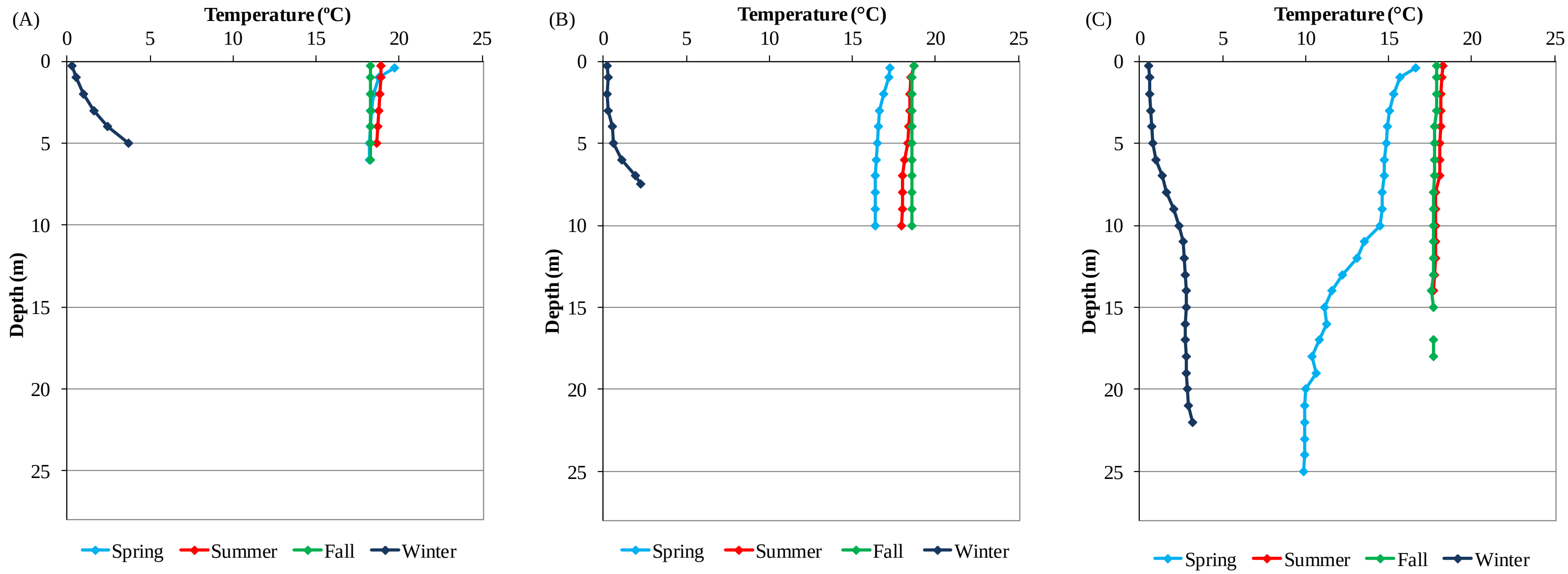


Figure 3.3-2. Water temperature profiles measured in the Saskatchewan River Region in 2009/2010: (A) South Moose Lake; (B) Cedar Lake-SE; and (C) Cormorant Lake.

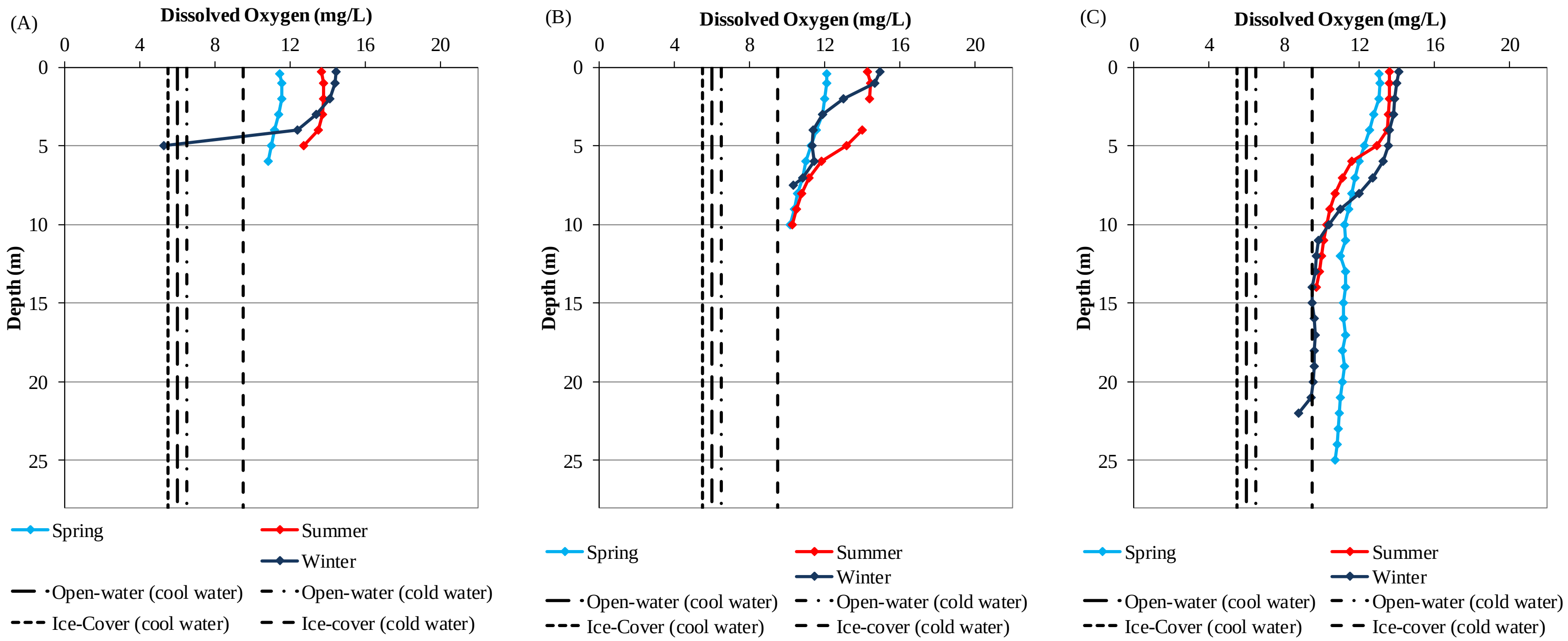


Figure 3.3-3. Dissolved oxygen depth profiles measured in the Saskatchewan River Region in 2009/2010: (A) South Moose Lake; (B) Cedar Lake-SE; and (C) Cormorant Lake. Dashed lines represent selected MWQSOGs for PAL.

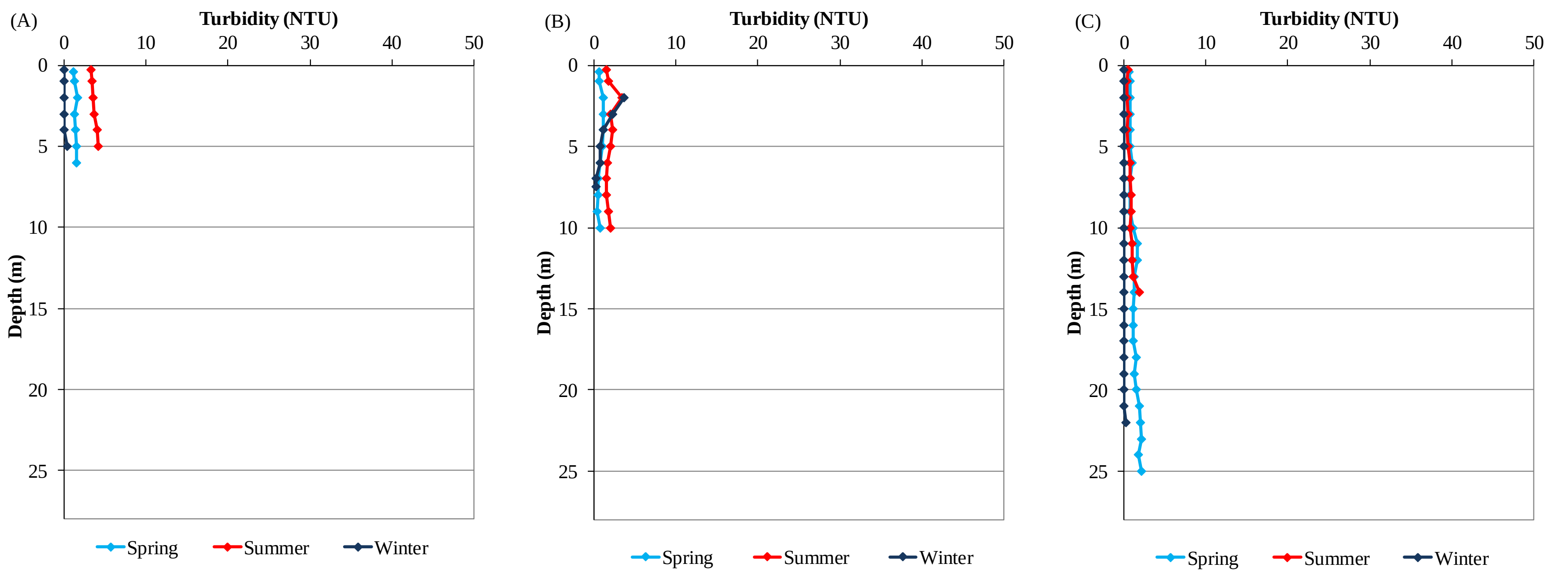


Figure 3.3-4. Turbidity depth profiles measured in the Saskatchewan River Region in 2009/2010: (A) South Moose Lake; (B) Cedar Lake-SE; and (C) Cormorant Lake.

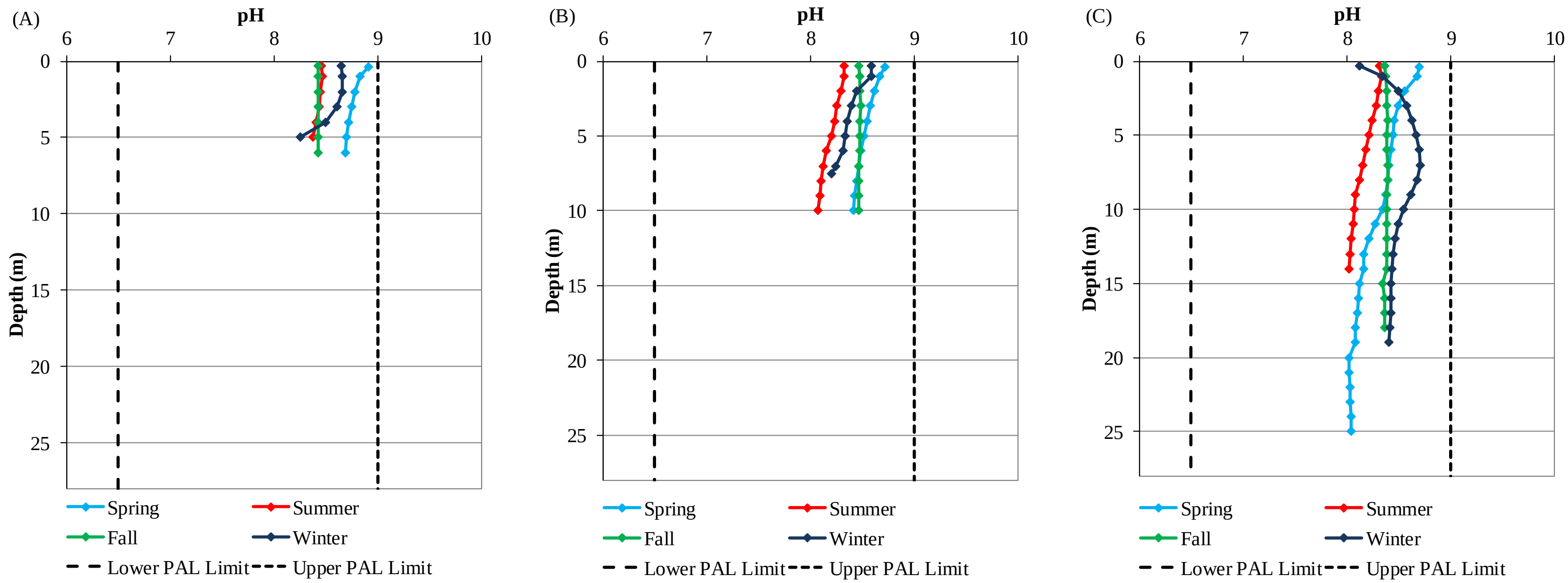


Figure 3.3-5. pH depth profiles measured in the Saskatchewan River Region in 2009/2010: (A) South Moose Lake; (B) Cedar Lake-SE; and (C) Cormorant Lake.

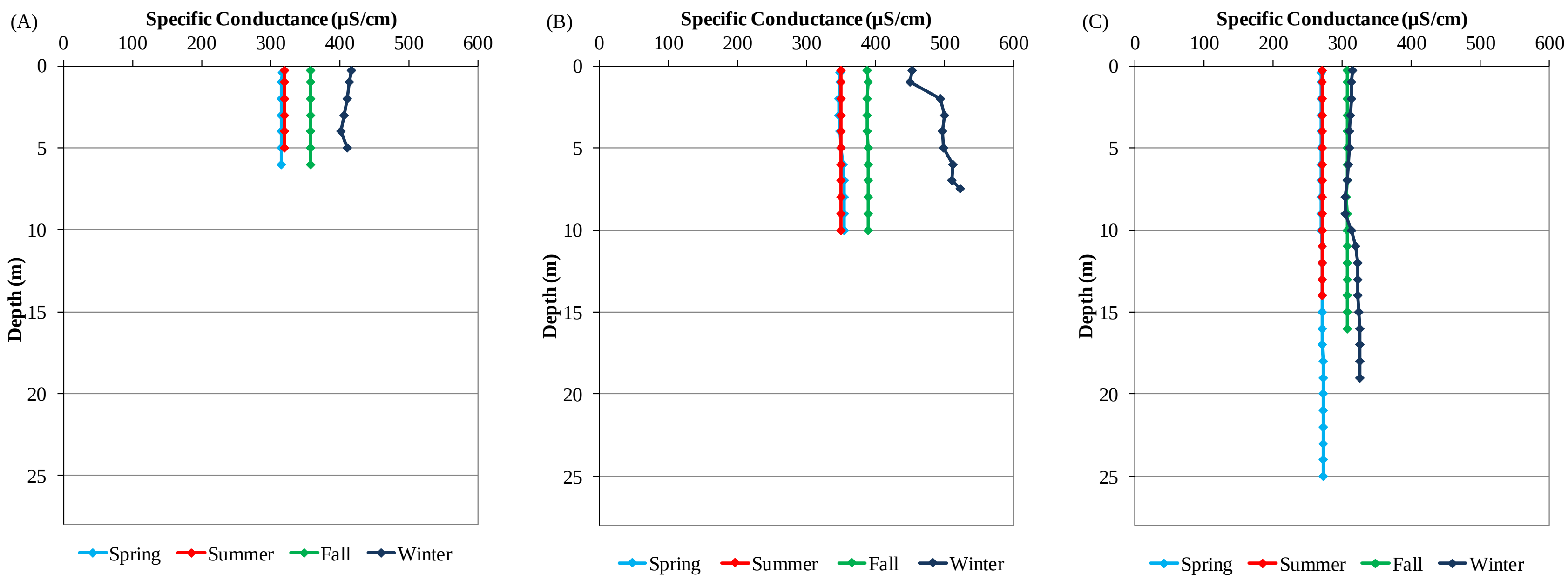


Figure 3.3-6. Specific conductance depth profiles measured in the Saskatchewan River Region in 2009/2010: (A) South Moose Lake; (B) Cedar Lake-SE; and (C) Cormorant Lake.

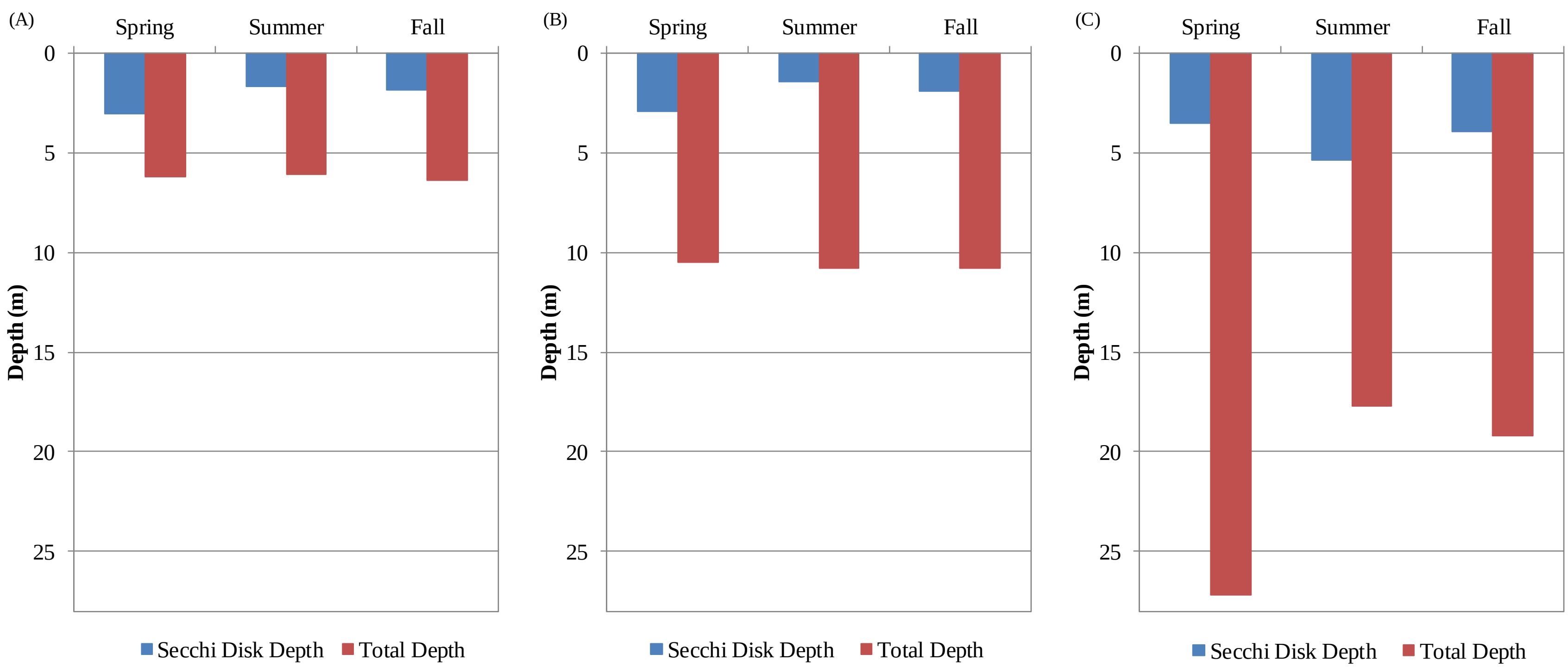


Figure 3.3-7. Secchi disk depths measured in the Saskatchewan River Region in 2009/2010: (A) South Moose Lake; (B) Cedar Lake-SE; and (C) Cormorant Lake.

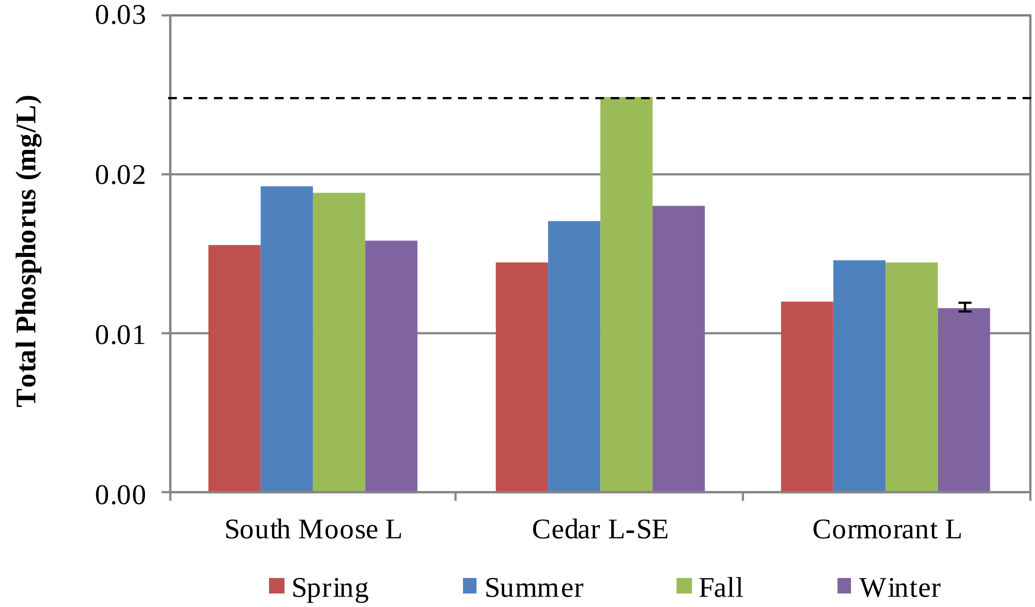


Figure 3.3-8. Total phosphorus measured in surface grabs in the Saskatchewan River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

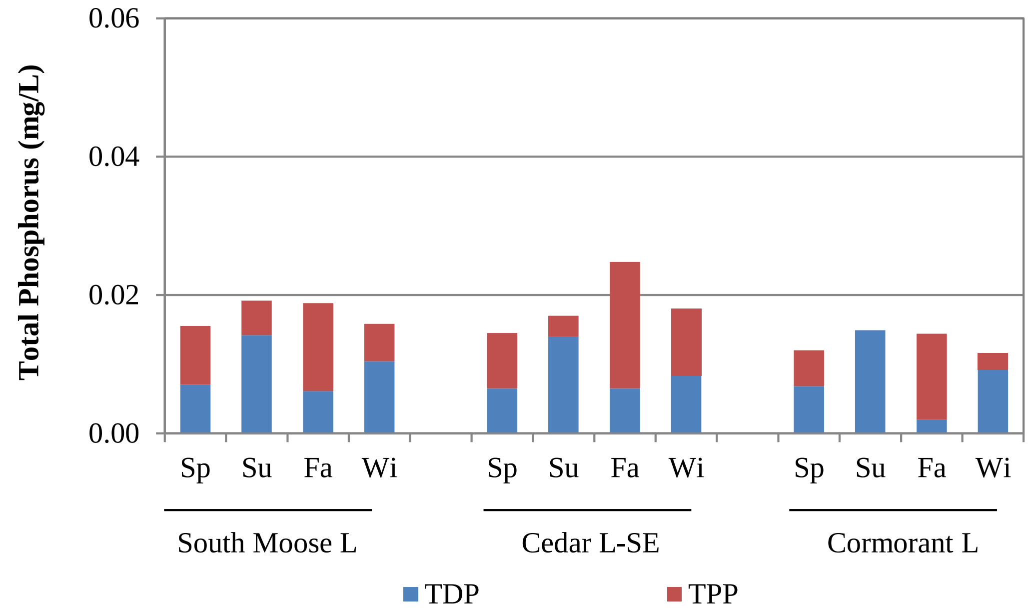


Figure 3.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Saskatchewan River Region: 2009/2010.

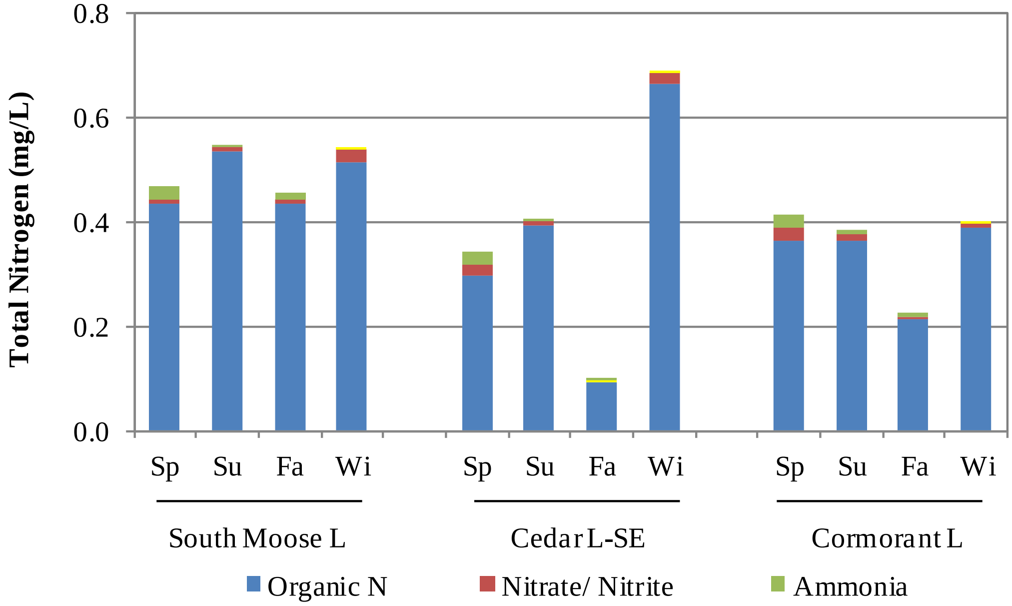


Figure 3.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Saskatchewan River Region: 2009/2010. Yellow bars represent values that were below the analytical detection limit.

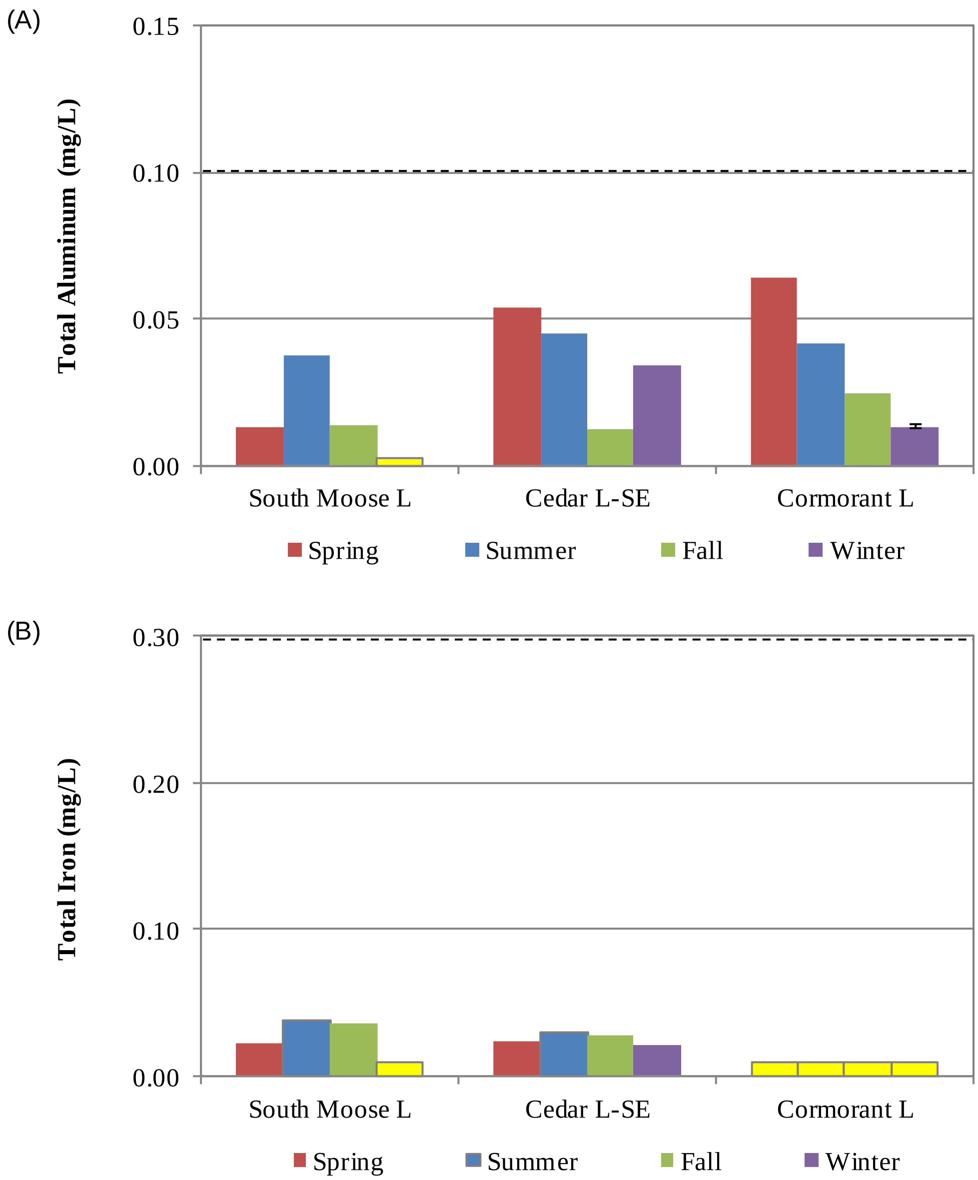


Figure 3.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Saskatchewan River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron. Yellow bars represent values that were below the analytical detection limit.

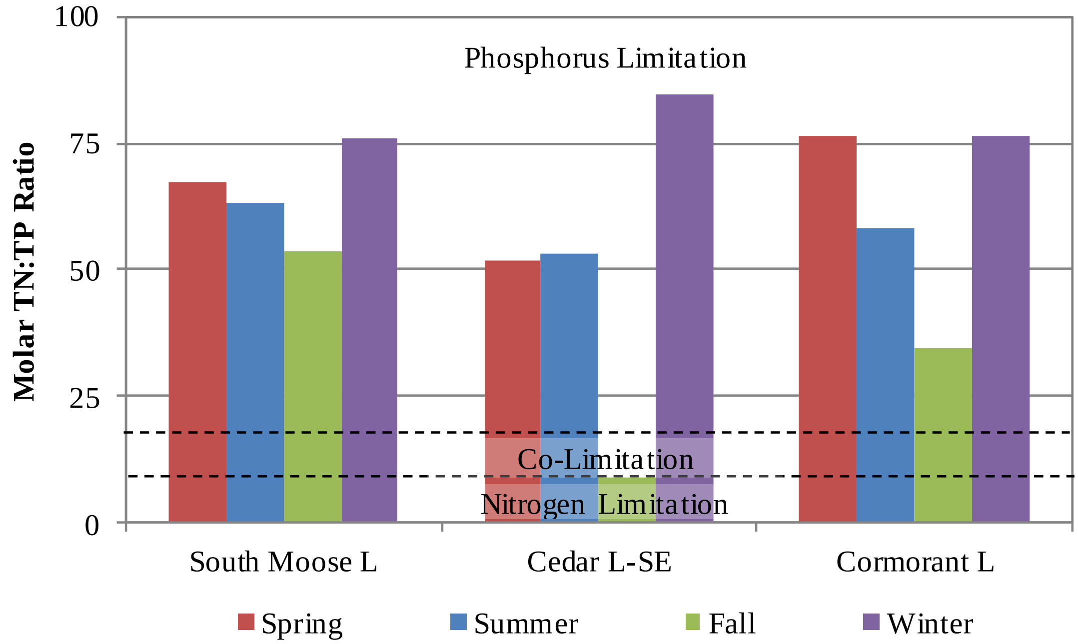


Figure 3.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Saskatchewan River Region: 2009/2010.

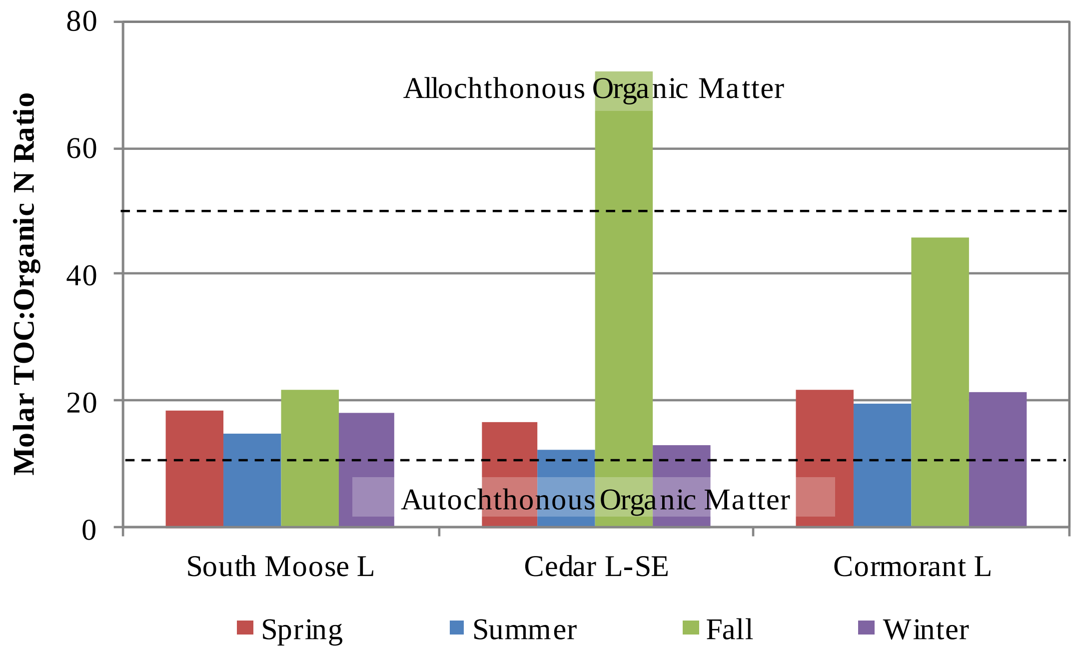
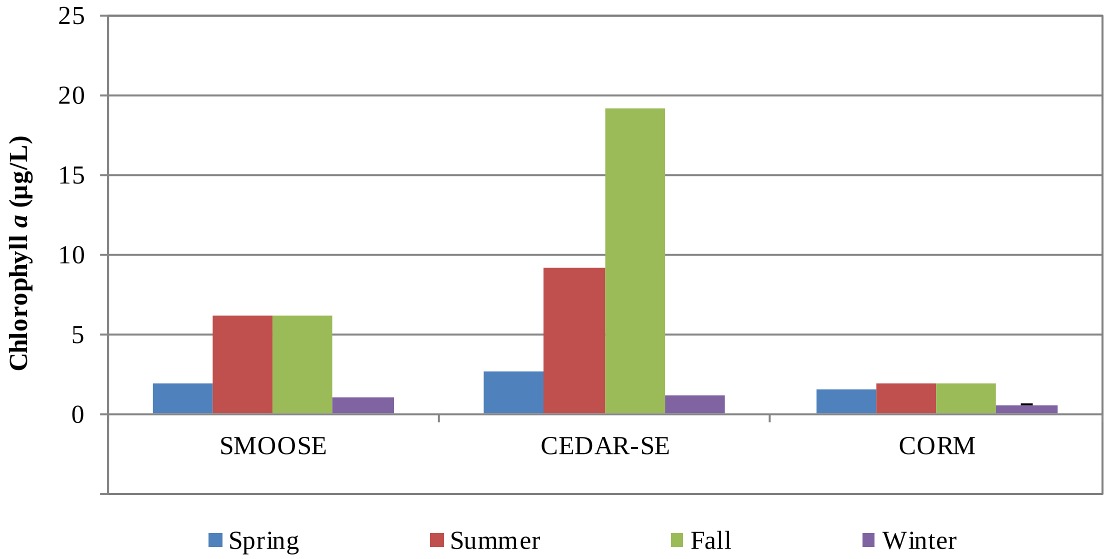


Figure 3.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Saskatchewan River Region: 2009/2010.

(A) Surface



(B) Euphotic

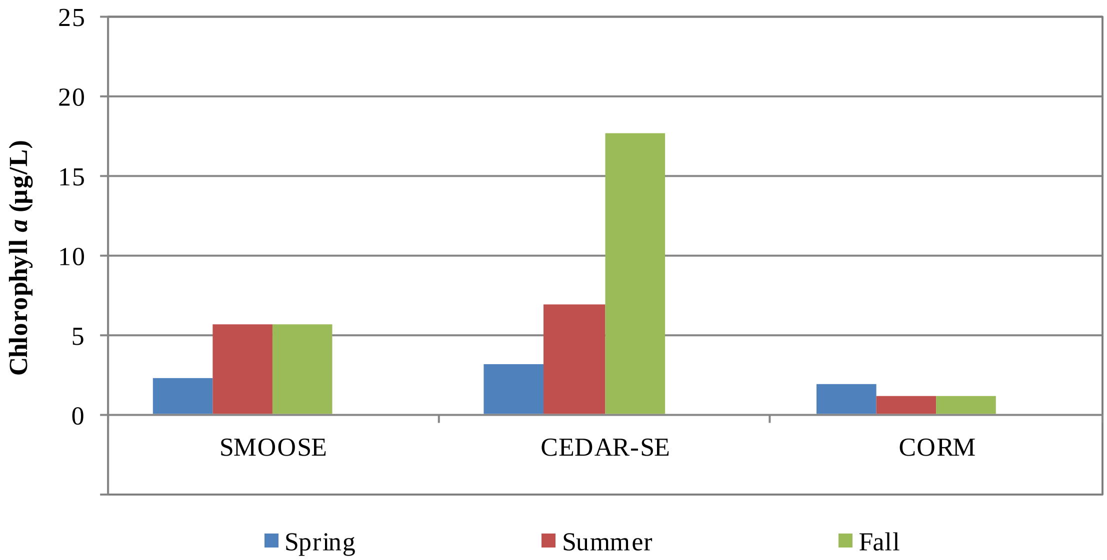


Figure 3.4-1. Chlorophyll a concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Saskatchewan River Region in 2009/2010. Error bars represent the standard error of triplicate samples

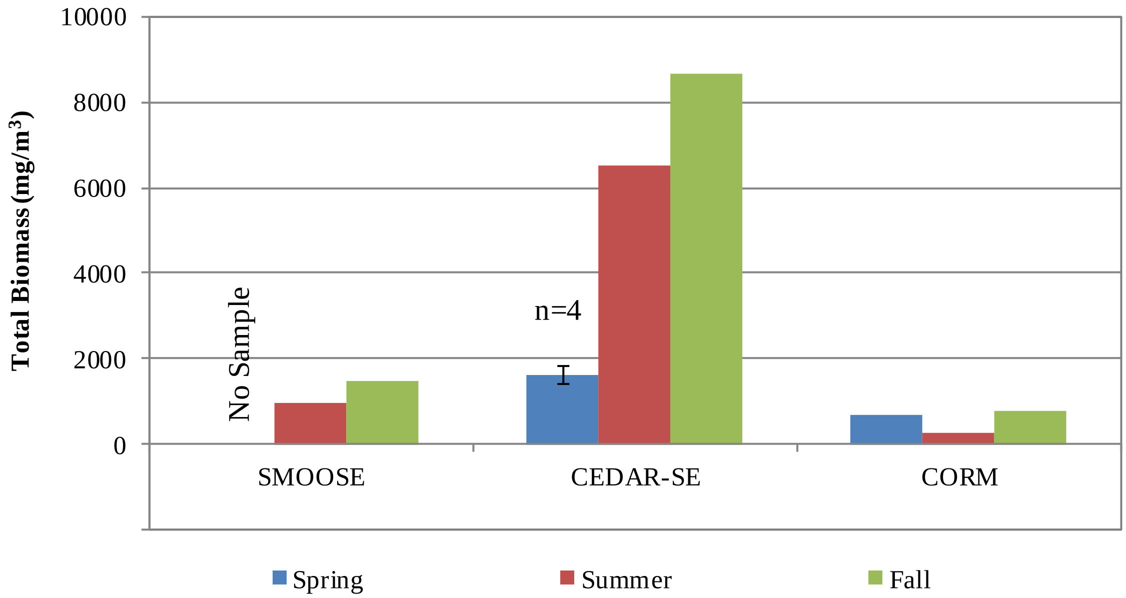


Figure 3.4-2. Phytoplankton biomass measured at sites in the Saskatchewan River Region in 2009. Error bars represent the standard error of samples analysed for quality assurance.

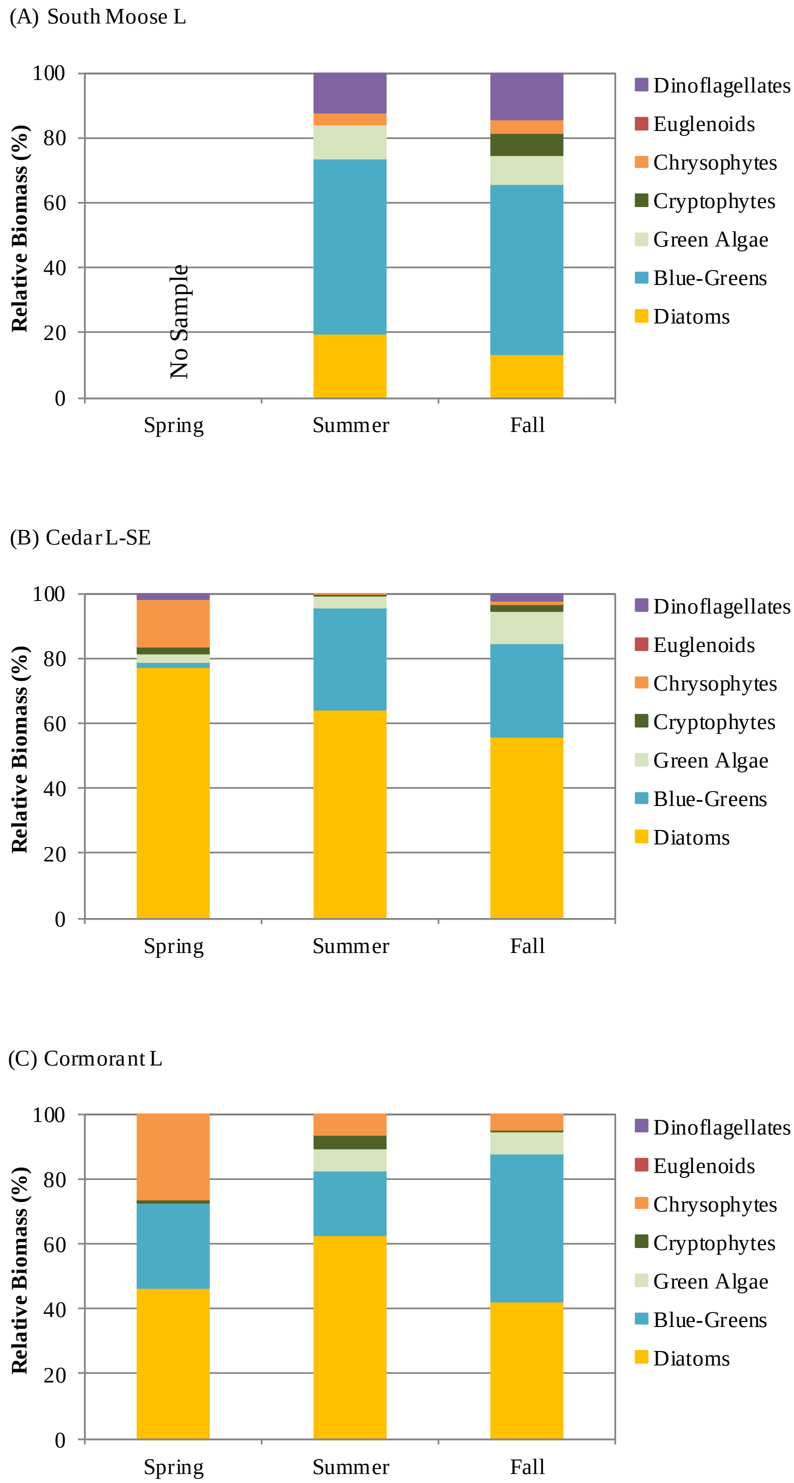


Figure 3.4-3. Phytoplankton community composition at sites in the Saskatchewan River Region in 2009.

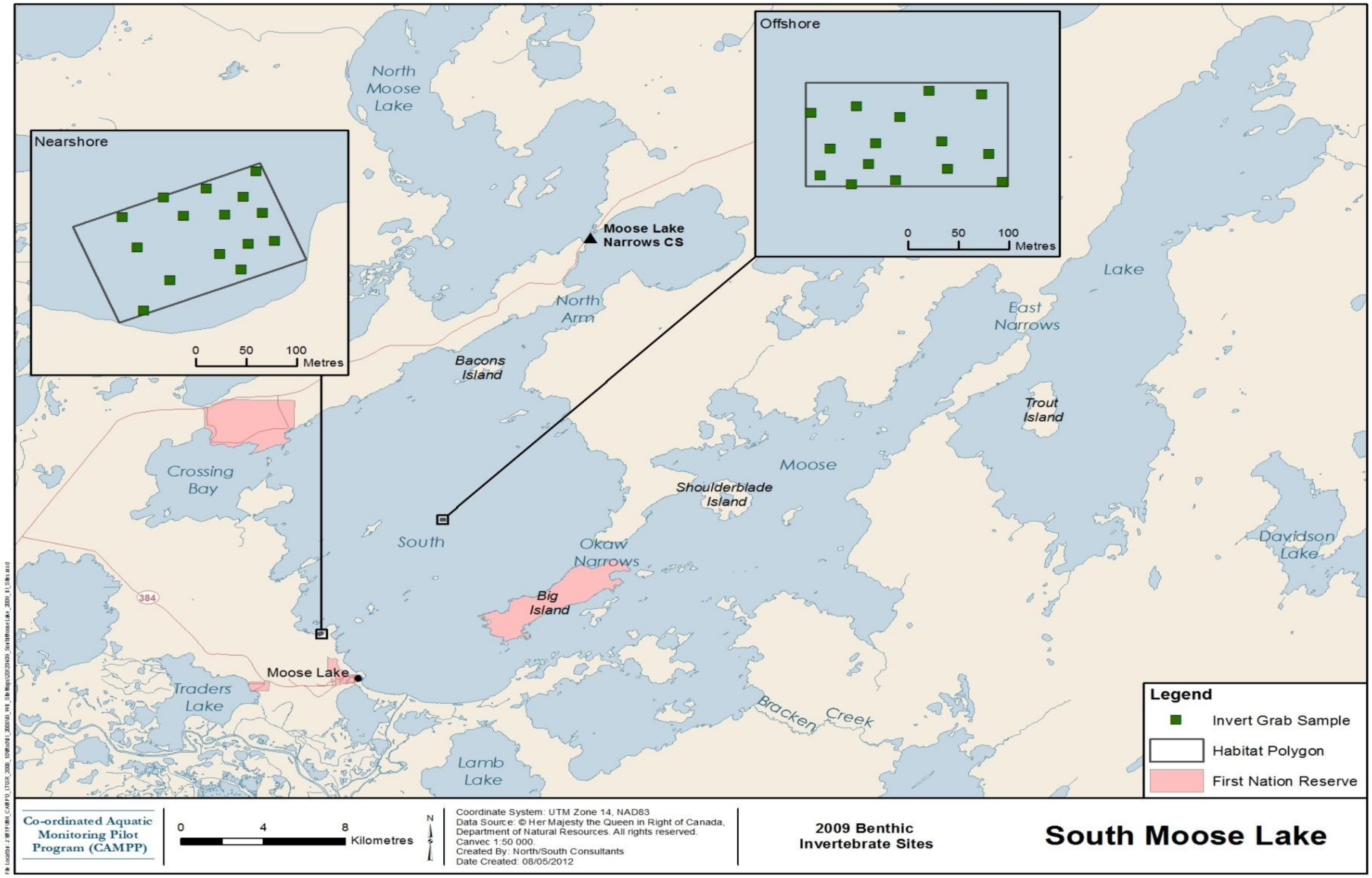


Figure 3.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in South Moose Lake in the Saskatchewan River Region, 2009.

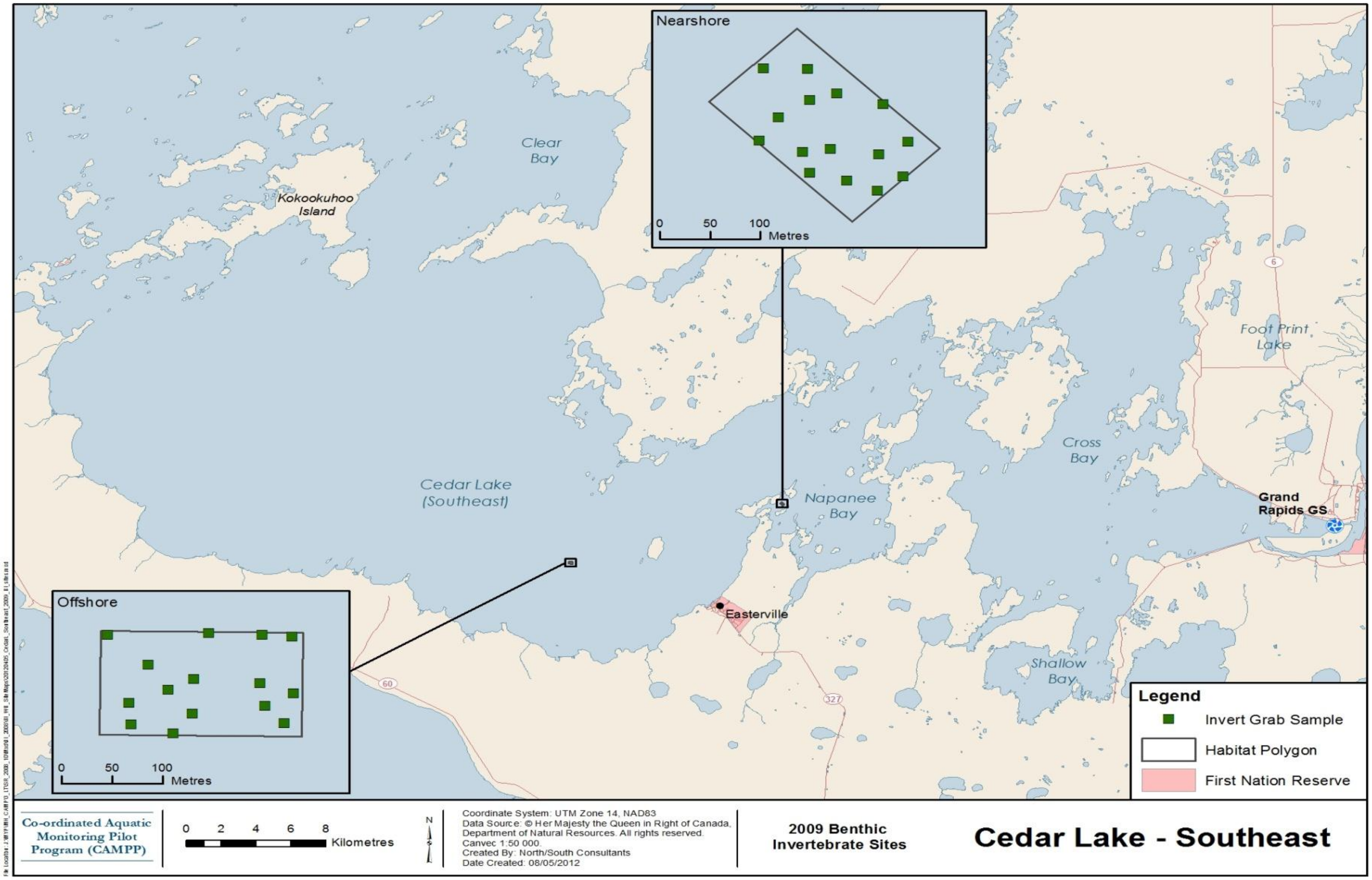


Figure 3.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Cedar Lake - Southeast in the Saskatchewan River Region, 2009.

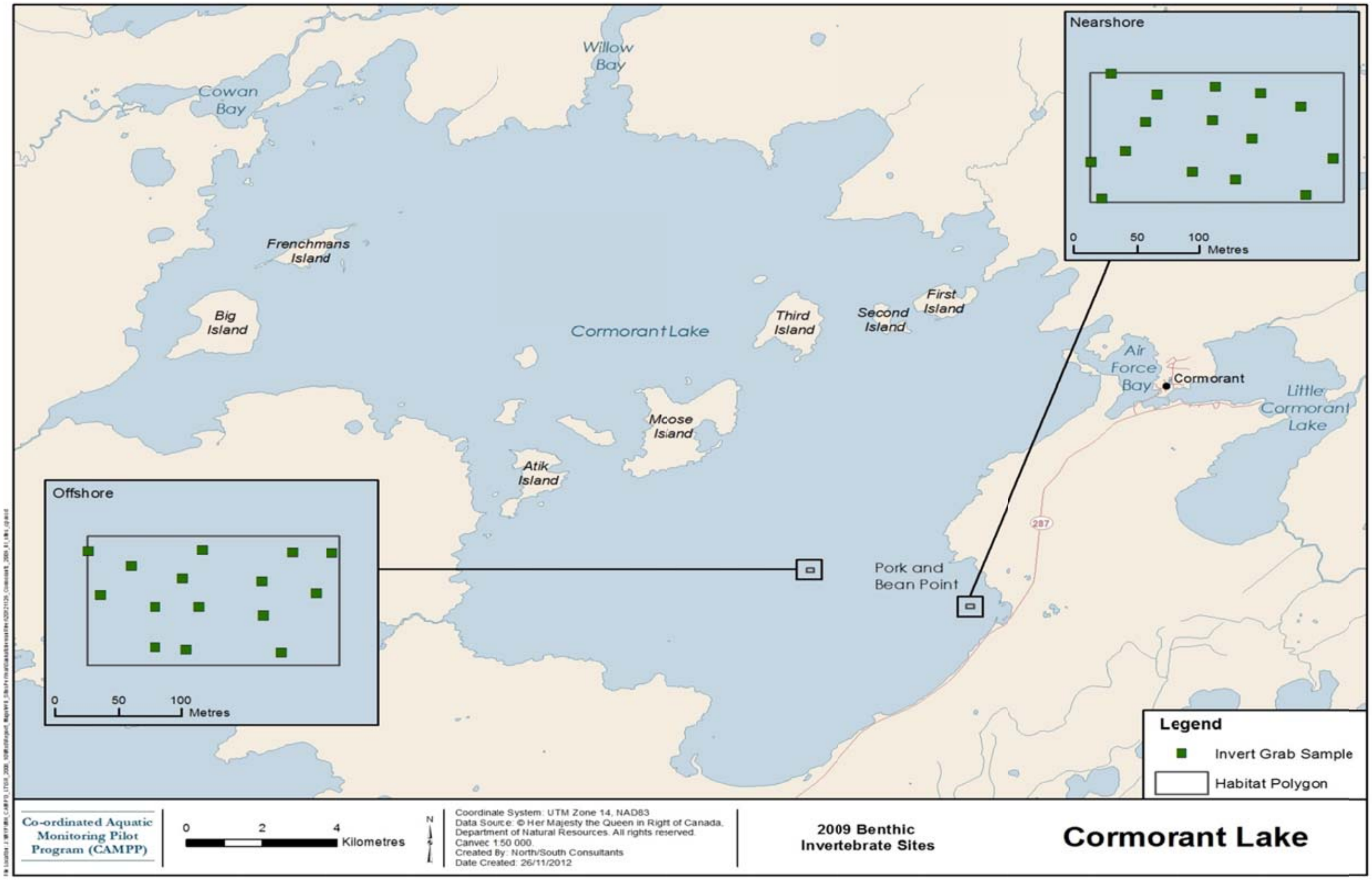


Figure 3.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Cormorant Lake in the Saskatchewan River Region, 2009.

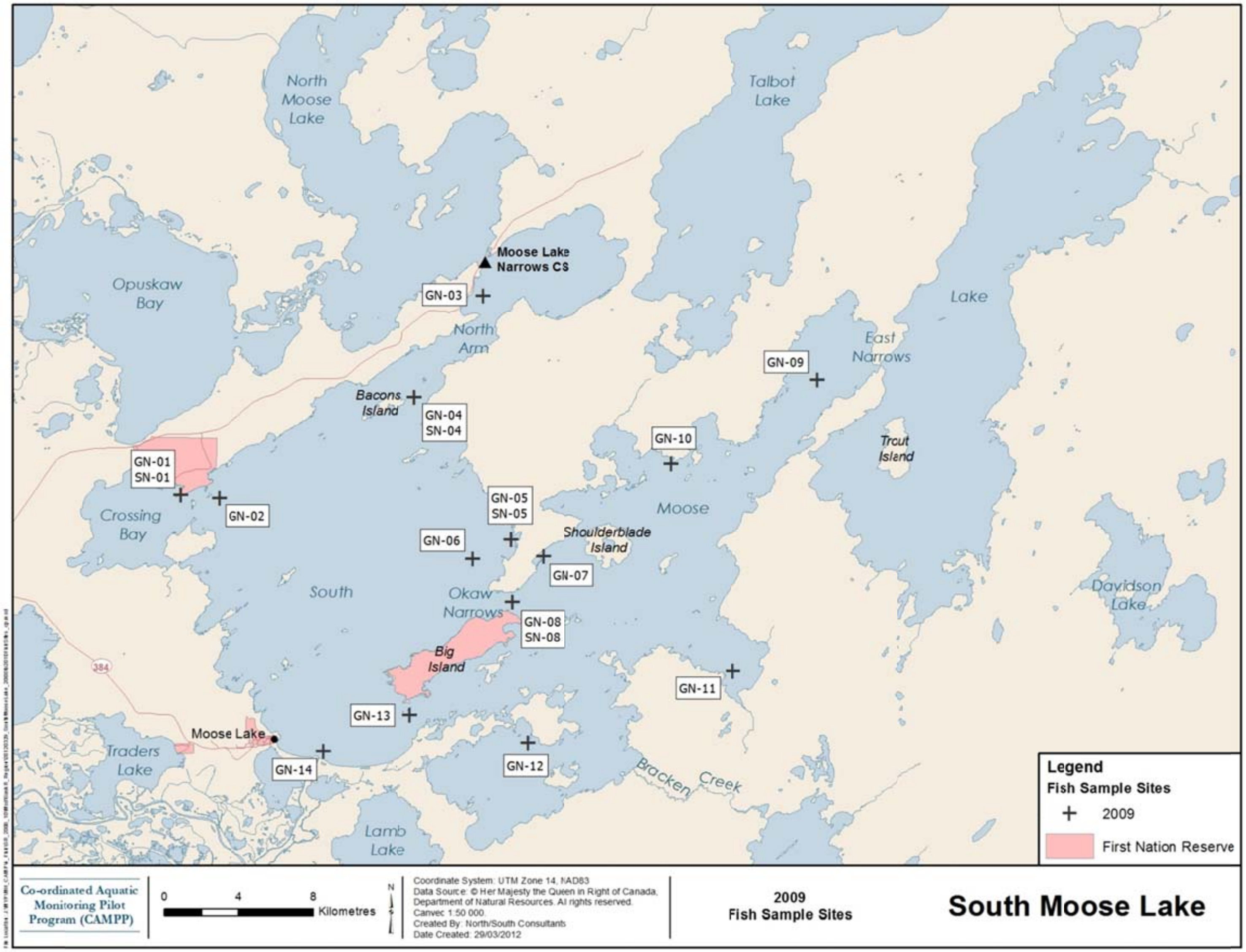


Figure 3.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in South Moose Lake, 2009.

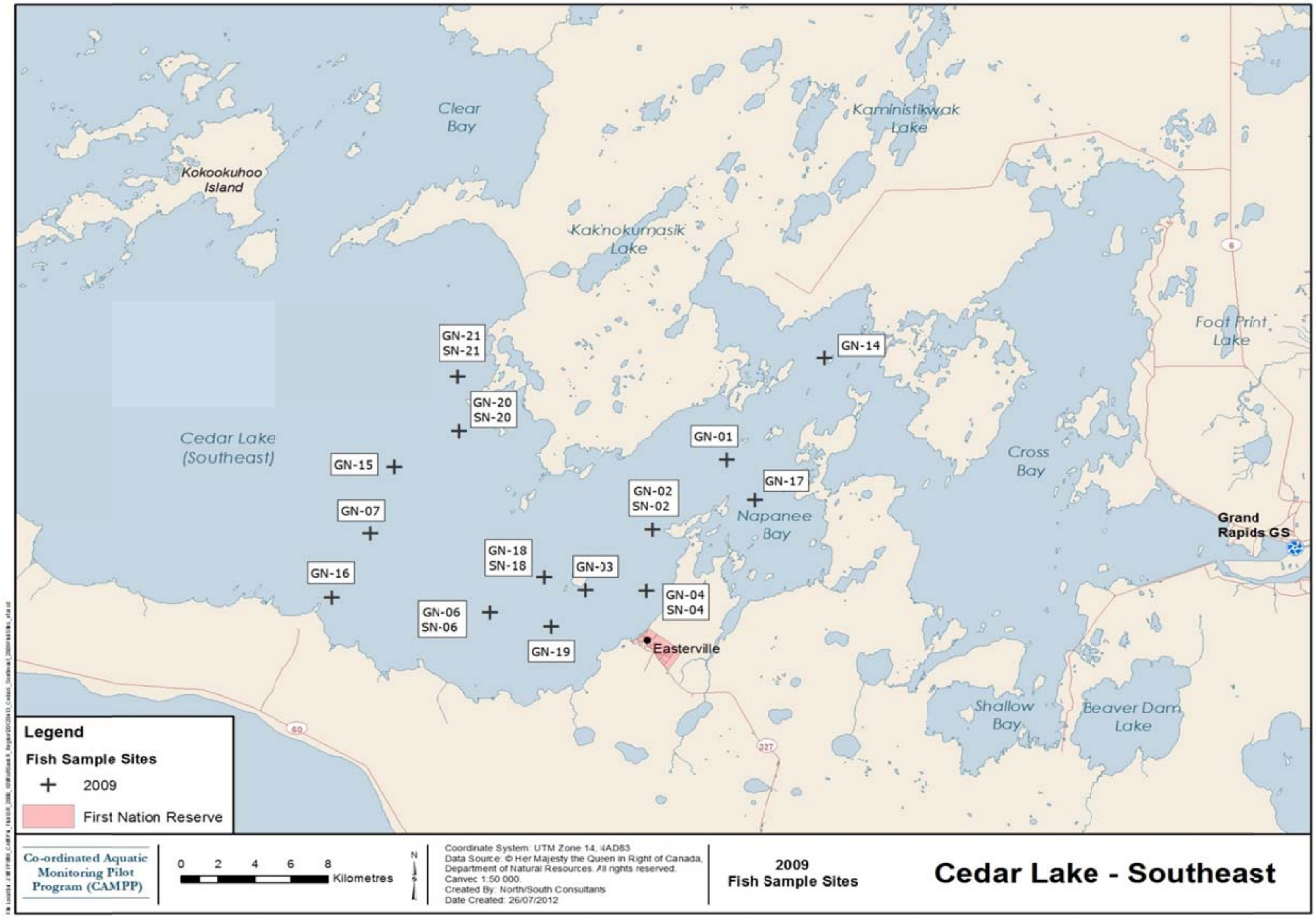


Figure 3.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Cedar Lake - SE, 2009.

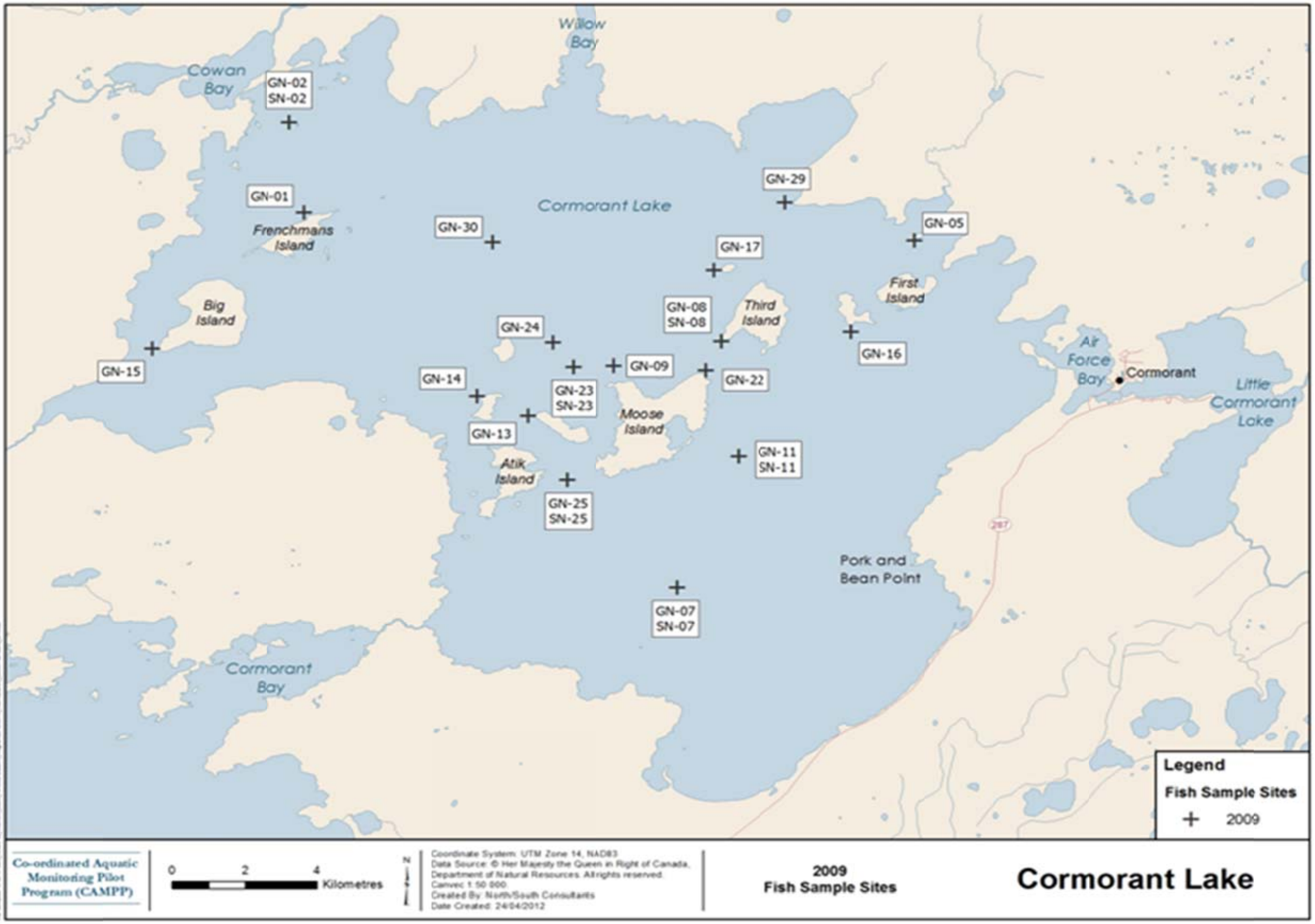


Figure 3.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Cormorant Lake, 2009.

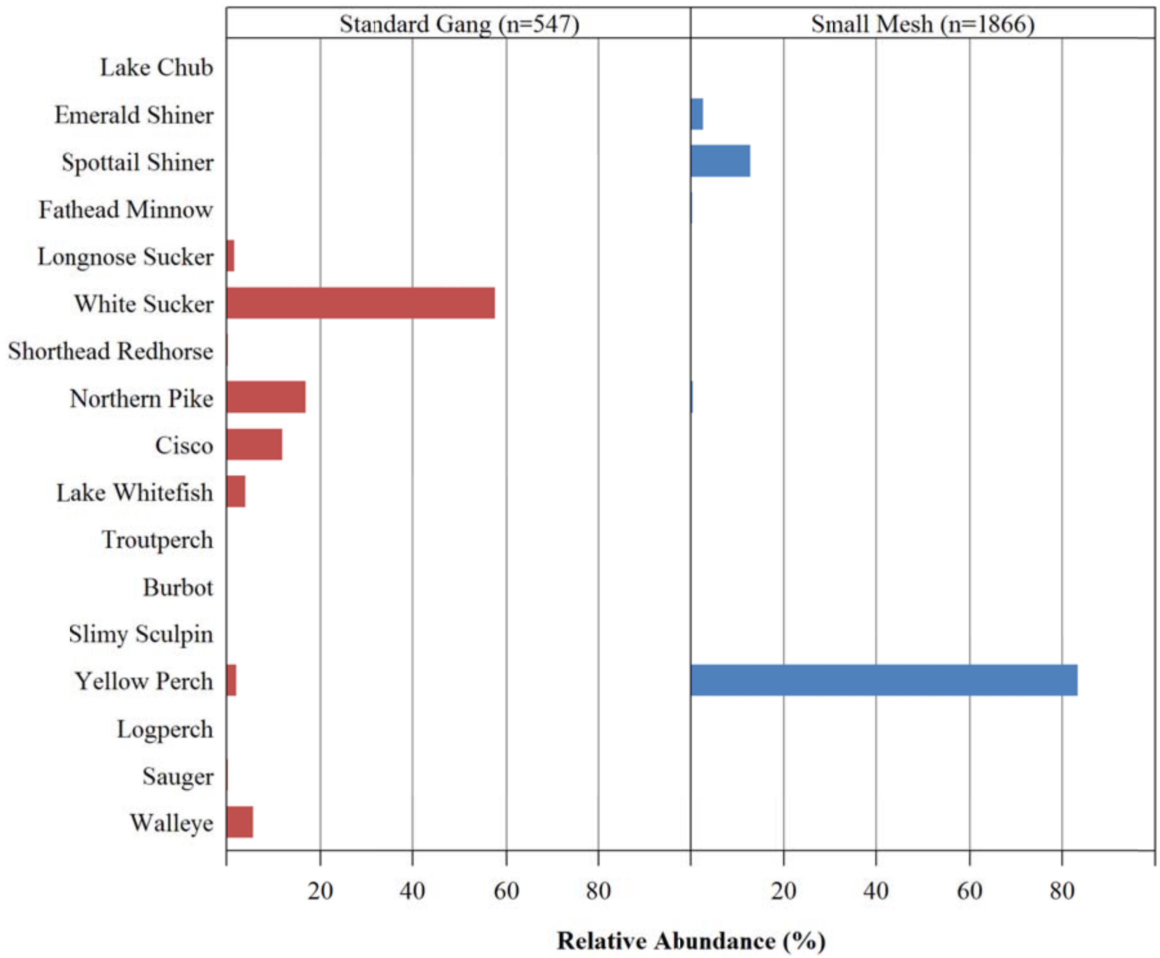


Figure 3.6-4. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in South Moose Lake, 2009.

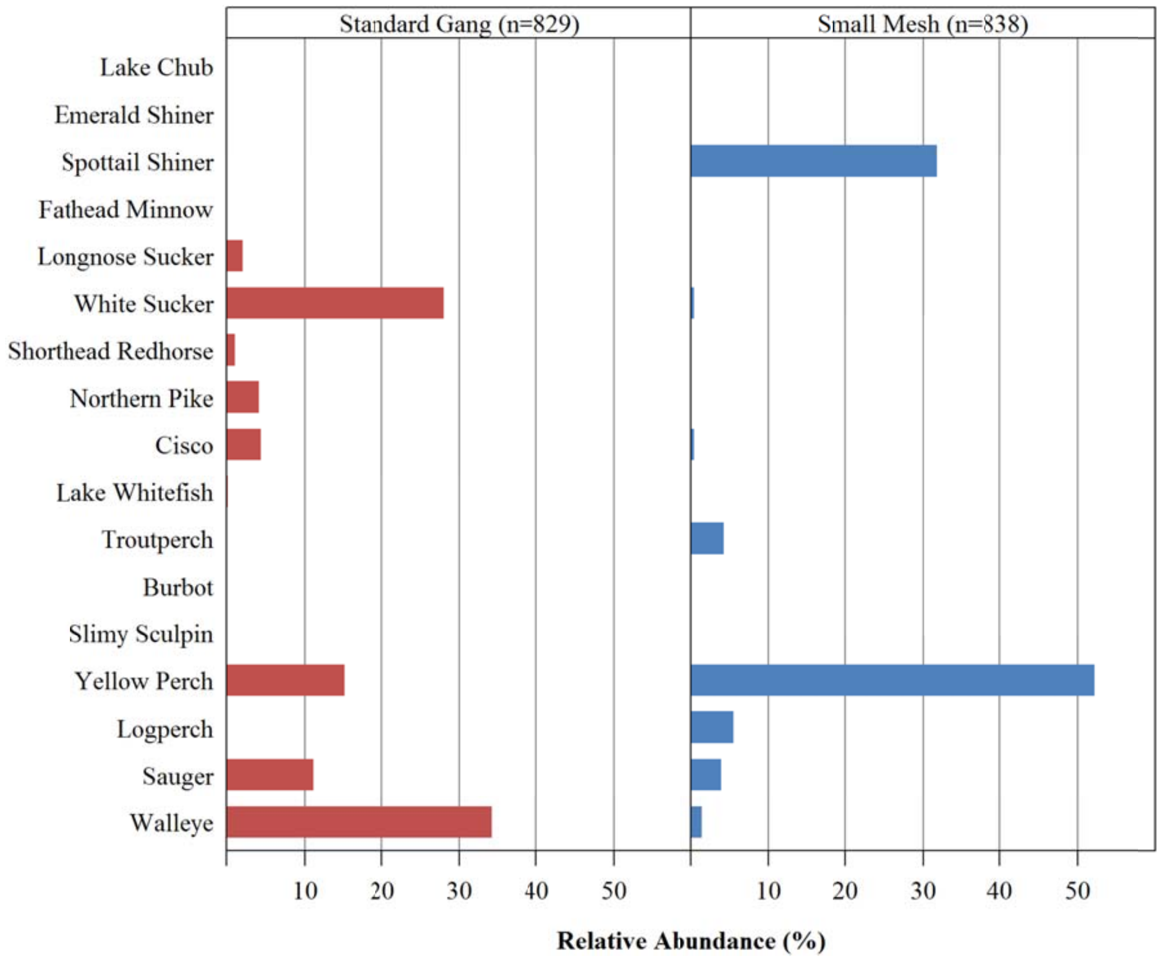


Figure 3.6-5. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Cedar Lake - SE, 2009.

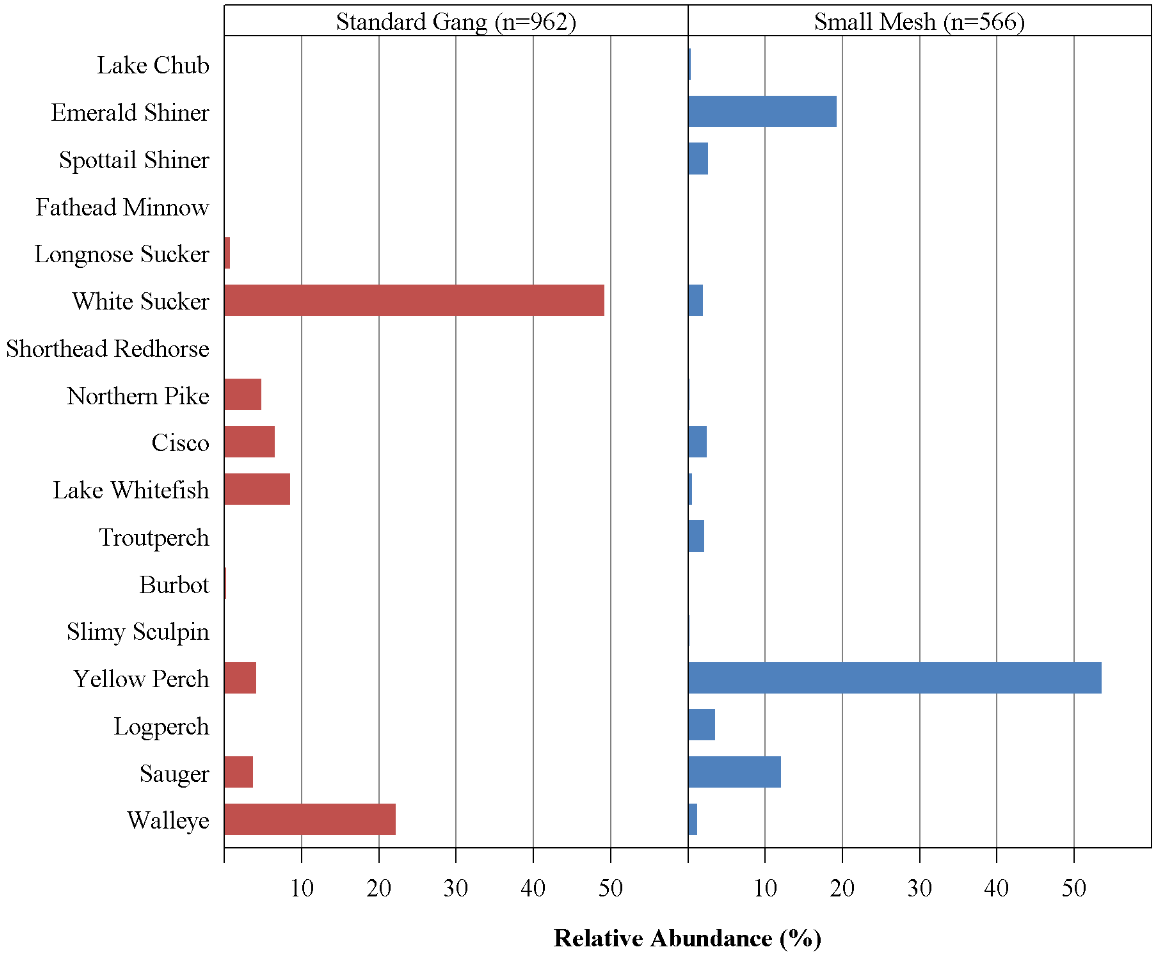


Figure 3.6-6. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Cormorant Lake, 2009.

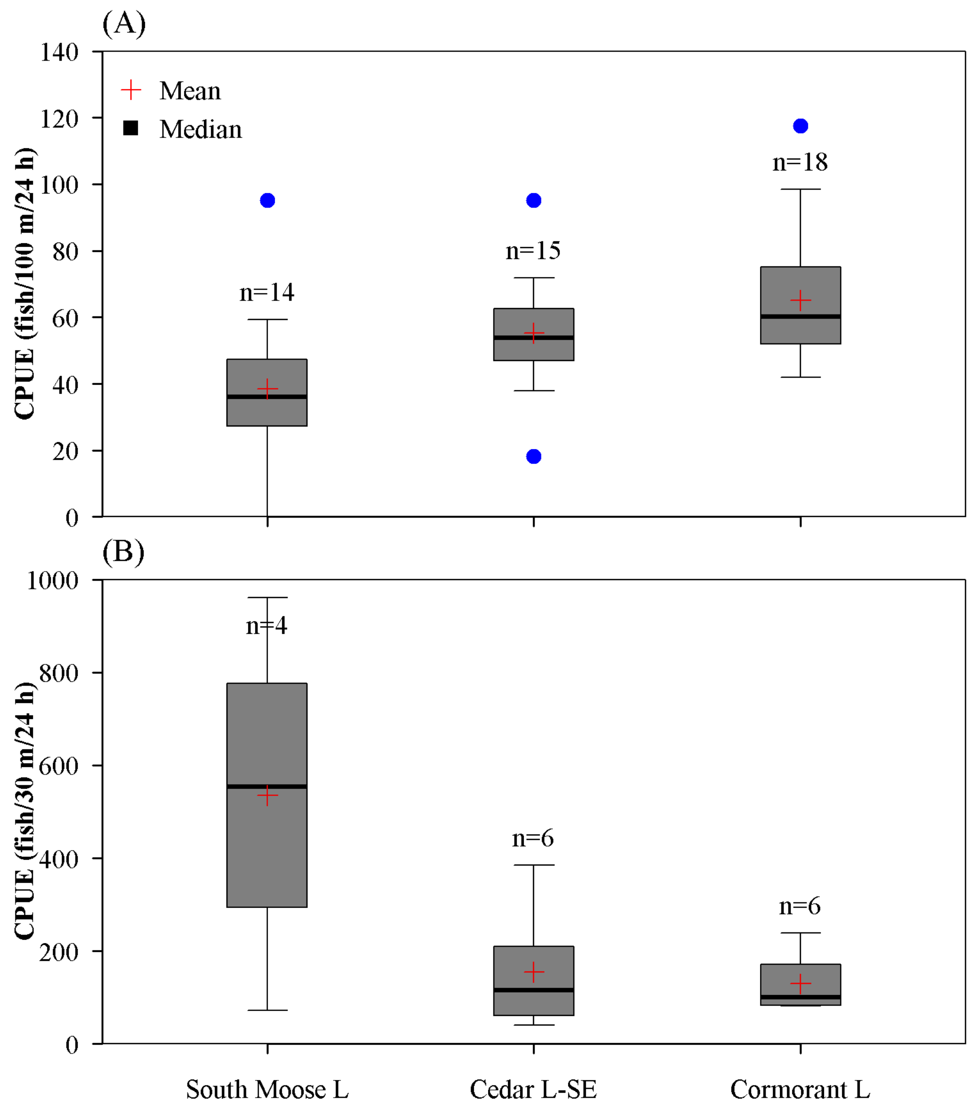


Figure 3.6-7. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Saskatchewan River Region waterbodies, 2009.

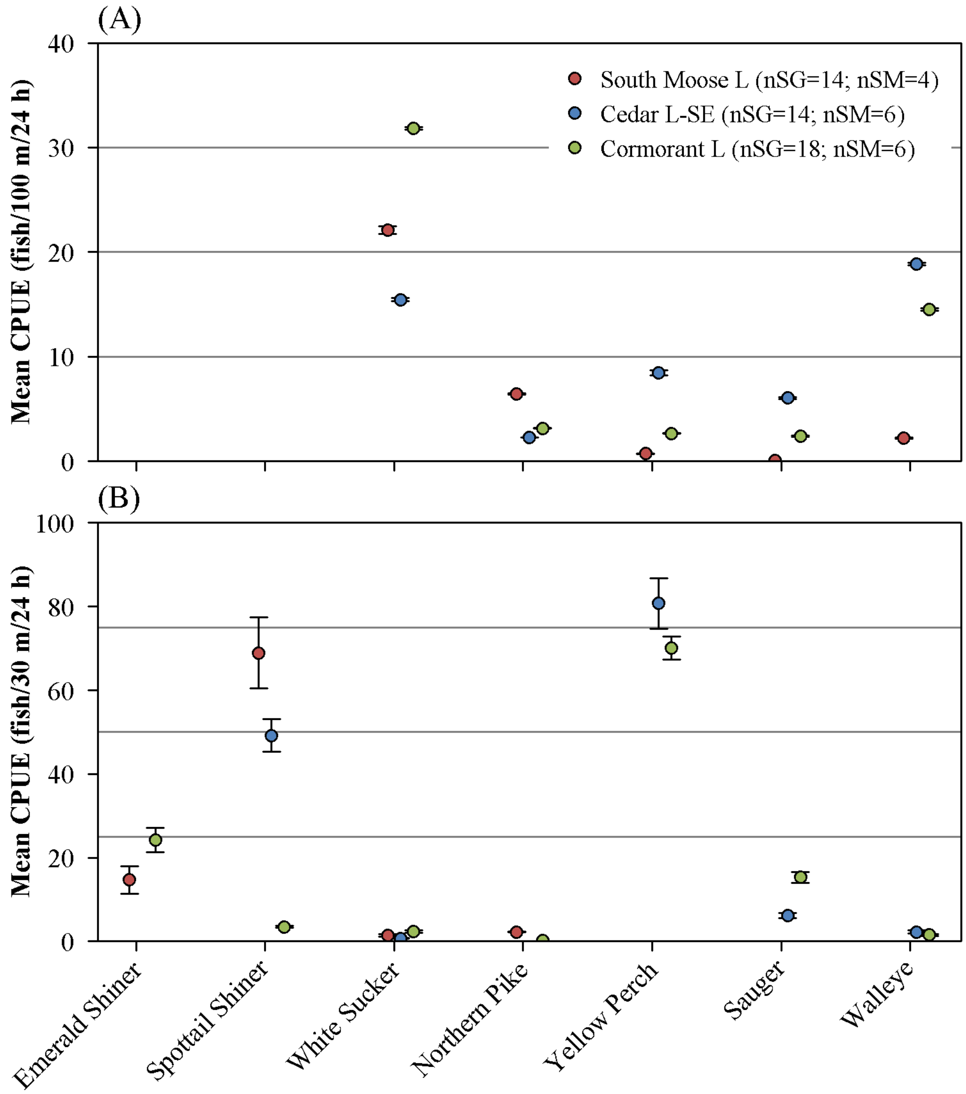


Figure 3.6-8. Mean (SE) CPUE calculated for select species captured in (A) standard gang and (B) small mesh index gill nets set in Saskatchewan River Region waterbodies, 2009. (NOTE: Yellow Perch captured in small mesh index gill nets set in South Moose Lake had a CPUE = 445.3 fish/30m of net/24h and is not illustrated).

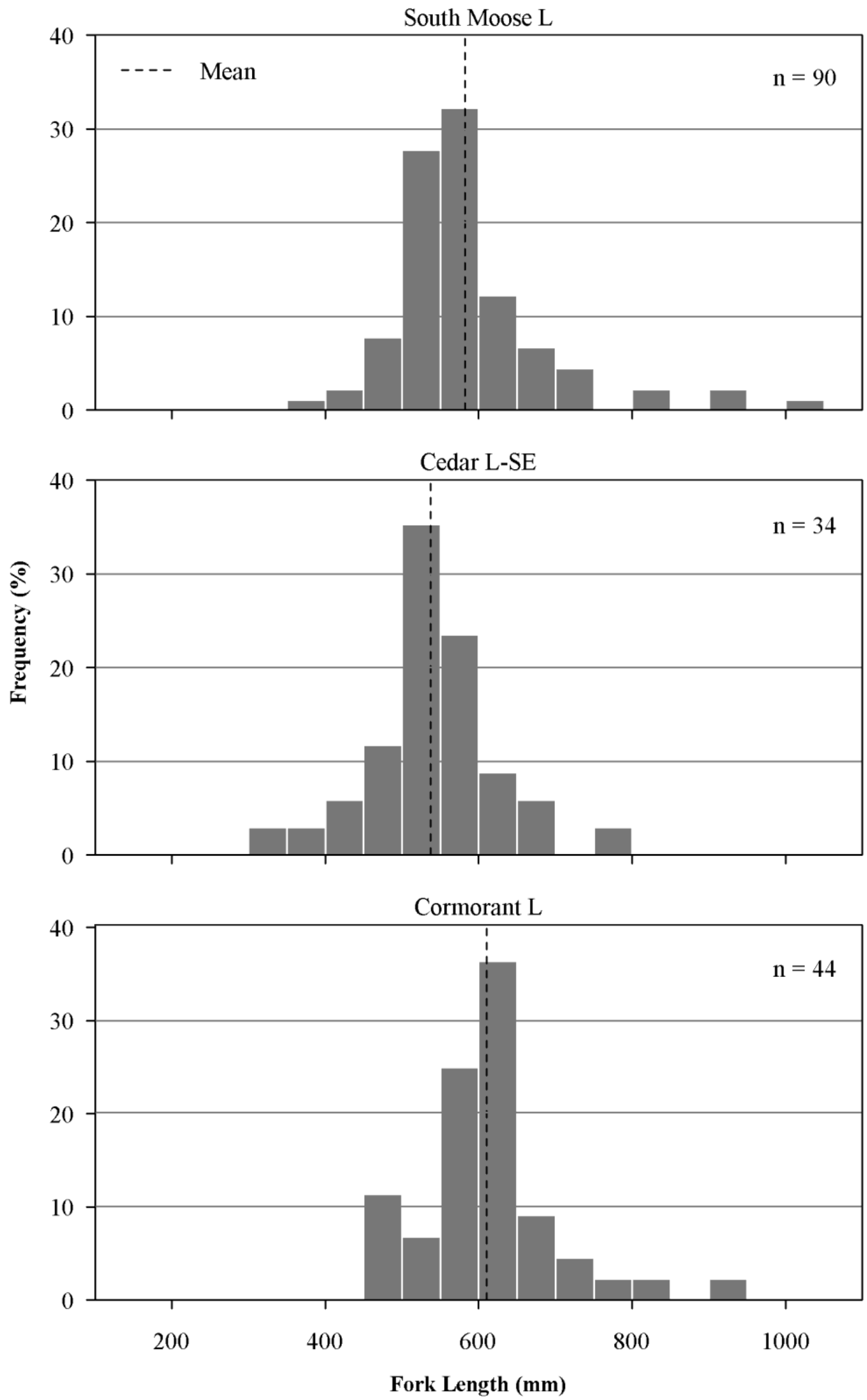


Figure 3.6-9. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2009.

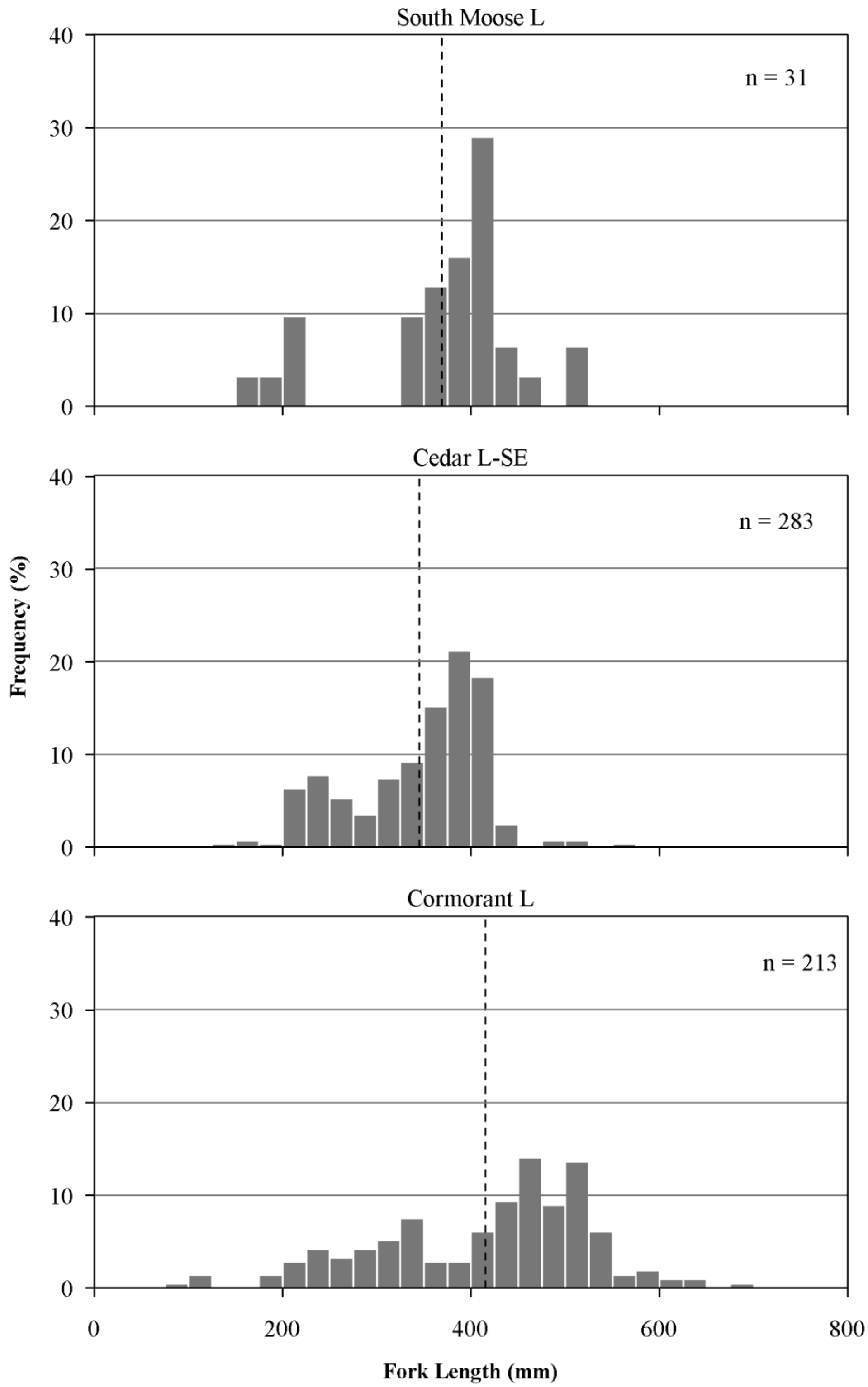


Figure 3.6-10. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Saskatchewan River Region waterbodies, 2009.

4.0 UPPER CHURCHILL RIVER REGION

The following provides an overview of the results of CAMPP for 2009/2010 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 were generally slightly below the 1971-2000 temperature normals throughout the year (Figure 4.1-1). Notable exceptions included January, September and November, when air temperature was above normal; and, May when air temperature was approximately 6.0 ^{o}C below normal. The annual mean air temperature was 0.6 ^{o}C below the normal.

The 1971-2000 normals for precipitation indicate a peak in July and relatively low levels of precipitation in winter, as measured at Lynn Lake, MB (Figure 4.1-1). In 2009, the highest precipitation occurred in July and August, exhibiting nearly 50% more precipitation than normal. February and March, also exhibited above normal levels of precipitation (greater than 150% of the normals). Atypically dry conditions occurred in October and November, receiving less than half the normal levels of precipitation.

Overall, the comparison to climate normals shows that 2009 was characterized a cooler spring and summer, a drier spring and autumn, and an atypically wet summer and late winter (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 2009, 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 Lake as the off-system waterbody for this region.

Upper Churchill River flow in 2009 was close to average from January to early-May and rose above the upper quartile due to an above average snowpack in the Reindeer Lake basin. Flows remained above the upper quartile and reached a record high in late-August due to above average precipitation in the Reindeer Lake basin (Figure 4.2-1).

Southern Indian Lake water levels in 2009 followed the typical pattern, rising with the spring freshet, and peaking in late summer/fall although they did not start to decline at the end of the year as they typically do since inflows remained well above average. Water levels in 2009 were also between the lower and upper quartile from January to mid-June and remained above the upper quartile for the rest of the year. Record high levels were reached in parts of June, July, and late-October to early-November (Figure 4.2-2).

Granville Lake water levels followed a similar trend as upper Churchill River flows in 2009 being close to average from January to mid-May. Water levels then climbed above the upper quartile for the rest of the year, reaching near record highs for late-August (Figure 4.2-3).

4.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 2 of CAMPP in the Upper Churchill River Region. Waterbodies sampled included Southern Indian Lake-Area 1 (SIL-Area 1), Southern Indian Lake-Area 4 (SIL-Area 4; near Missi Falls) and an off-system lake (Granville Lake; Figure 4.3-1).

4.3.1 Routine Variables and Limnology

Results of the 2009/2010 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 Waterbody

Water quality of Southern Indian Lake (Areas 1 and 4) can be generally described as moderately nutrient-rich, moderately clear, neutral to slightly alkaline, soft, and well-oxygenated. Neither site was stratified in 2009/2010 (Figure 4.3-2) and both exhibited dissolved oxygen (DO) concentrations above MWQSOGs for PAL across depth (Manitoba Water Stewardship [MWS] 2011; Figure 4.3-3).

Other *in situ* variables, including turbidity, pH, and specific conductance, were relatively consistent across depth except although pH occasionally changed with depth in SIL-Area 1 and SIL-Area 4 (Figure 4.3-4 to 4.3-6). Secchi disk depths varied between seasons, ranging between 0.6 m and 2.8 m, and was higher in SIL-Area 4 than in SIL-Area 1 (Figure 4.3-7).

Two of the four samples collected in SIL-Area 1 and one of the four samples collected in SIL-Area 4 exceeded the Manitoba narrative guideline for total phosphorus (TP) of 0.025 mg/L for lakes, ponds, and reservoirs (MWS 2011; Figure 4.3-8). Other routine water quality variables for which there are MWQSOGs, including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

TP concentrations in SIL-Area 1 were generally composed of equivalent proportions of dissolved and particulate forms during the open-water season, whereas the dissolved form predominated in winter. In contrast, the majority of TP was in dissolved form SIL-Area 4 in 2009/2010 (Figure 4.3-9). The majority of total nitrogen (TN) was composed of organic nitrogen, with ammonia comprising a larger portion of the dissolved inorganic nitrogen (DIN) pool than nitrate/nitrite during the open-water season at both sites (Figure 4.3-10). Concentrations and the relative proportion of TN represented by nitrate/nitrite were higher during the ice-cover season.

4.3.1.2 Off-system Waterbody

Water quality of Granville Lake was similar to the on-system sites and can be generally described as moderately nutrient-rich, moderately clear, neutral to slightly alkaline, soft, and well-oxygenated. Similar to Southern Indian Lake, Granville Lake did not stratify in 2009/2010 (Figure 4.3-2) and DO was consistently above MWQSOGs for PAL across depth (MWS 2011; Figure 4.3-3).

Other *in situ* variables, including turbidity, pH, and specific conductance, were relatively consistent across depth in Granville Lake (Figure 4.3-4 to 4.3-6). Secchi disk depths were within the range measured at the on-system (1.17 m to 1.6 m in the open-water season; Figure 4.3-7).

All routine water quality variables for which there are MWQSOGs (MWS 2011), including TP (0.025 mg/L for lakes, ponds, and reservoirs), pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

Similar to SIL-Area 1, TP in Granville Lake was generally composed of equivalent proportions of dissolved and particulate forms during the open-water season but was dominated by the dissolved form in winter. Like the on-system sites, the majority of TN in Granville Lake was composed of organic nitrogen, with ammonia comprising a larger portion of the DIN pool than nitrate/nitrite during the open-water season (Figure 4.3-10). Concentrations and the relative proportion of TN represented by nitrate/nitrite were higher during the ice-cover season.

4.3.2 Metals and Major Ions

4.3.2.1 On-system Waterbody

Summaries of metal concentrations and detection frequencies measured in the Upper Churchill River Region in 2009/2010 are presented in Table 4.3-3.

A number of metals were not detected in Southern Indian Lake in 2009/2010 including antimony, arsenic, beryllium, bismuth, boron, mercury, silver, tellurium, thallium, tungsten, and zinc. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and titanium were consistently detected; the remaining metals were detected in some samples.

Aluminum exceeded the MWQSOG PAL guideline (0.100 mg/L) in 100% of samples from both sites in Southern Indian Lake and iron concentrations exceeded the MWQSOG PAL guideline (0.3 mg/L) in 50% of samples from SIL-Area 1 (MWS 2011; Figure 4.3-11). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in surface samples collected from the on-system sites in 2009/2010 (Table 4.3-4).

Chloride concentrations were low in Southern Indian Lake (i.e., < 1.4 mg/L; Table 4.3-2) and well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 8.5 mg/L 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 4.3-4).

4.3.2.2 Off-system Waterbody

A number of metals were not detected in Granville Lake in 2009/2010 including antimony, arsenic, beryllium, bismuth, boron, cadmium, cesium, lead, mercury, molybdenum, silver, tellurium, thallium, tin, tungsten, vanadium and zinc. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and titanium were consistently detected; the remaining metals were detected in some samples.

Aluminum exceeded the MWQSOG PAL guideline (0.100 mg/L) in all samples collected in Granville Lake (MWS 2011; Figure 4.3-11). In addition, one of the four samples analysed for selenium from Granville Lake was just above the analytical detection limit, which is equivalent to the MWQSOG PAL guideline (0.001 mg/L). Measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit. All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in surface samples collected from this lake in 2009/2010 (Table 4.3-4).

Similar to the on-system sites, chloride concentrations were low in Granville Lake (i.e., < 1.1 mg/L; Table 4.3-2) and well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 7.4 mg/L and fell on the lower range of concentrations reported across Canada (CCREM 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013; Table 4.3-4).

4.3.3 Trophic Status and Nutrient Ratios

4.3.3.1 On-system Waterbody

In 2009/2010, the trophic status of the on-system sites in the Upper Churchill River Region varied depending on parameter and site (Tables 4.3-5 to 4.3-7). SIL-Area 4 was meso-eutrophic based on TP, oligotrophic based on TN, and mesotrophic based on chlorophyll *a* and SIL-Area 4 was mesotrophic based on TP and oligotrophic based on TN and chlorophyll *a*.

On the basis of molar TN:TP ratios, nutrient limitation also varied between sites and seasons in 2009/2010 (Figure 4.3-12). SIL-Area 1 was nitrogen and phosphorus co-limited in spring, phosphorus limited in summer and winter, and nitrogen limited in fall. SIL-Area 4 was nitrogen and phosphorus co-limited in fall, but phosphorus limited during the other three seasons. Examination of total organic carbon to organic nitrogen (TOC:ON) molar ratios indicates that organic matter in Southern Indian Lake was a mixture of allochthonous and autochthonous sources in summer and winter but was allochthonous in spring and fall, in 2009/2010 (Figure 4.3-13).

4.3.3.2 Off-system Waterbody

In 2009/2010, Granville Lake was mesotrophic based on TP and chlorophyll *a*, and oligotrophic based on TN (Tables 4.3-5 to 4.3-7). Similar to the on-system sites, nutrient limitation (based on TN:TP molar ratios) in Granville Lake varied between seasons in 2009/2010 (Figure 4.3-12). Granville Lake was phosphorus limited in spring, summer and winter, but nitrogen and phosphorus co-limited in fall. Examination of TOC:ON molar ratios indicates that, similar to Southern Indian Lake, organic matter in Granville Lake was a mixture of allochthonous and autochthonous sources in summer and winter but was allochthonous in spring and fall, in 2009/2010 (Figure 4.3-13).

4.3.4 *Escherichia coli*

4.3.4.1 *On-system Waterbody*

E. coli not detected in SIL-Area 1 or SIL-Area 4 in 2009/2010 (Table 4.3-2) and was well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL (MWS 2011).

4.3.4.2 *Off-system Waterbody*

E. coli was detected in one of four samples (1 CFU/100 mL) collected in Granville Lake in 2009/2010 (Table 4.3-2). All *E. coli* measurements were well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

4.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 2 of CAMPP in the Upper Churchill River Region. Waterbodies sampled included Southern Indian Lake-Area 1 (SIL-Area 1), Southern Indian Lake-Area 4 (SIL-Area 4; near Missi Falls) and an off-system lake (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 (Figure 4.4-1), and were similar between waterbodies. Winter chlorophyll *a* concentrations were lower than those of the open-water season, indicating that productivity was low under ice.

4.4.2 Community Composition and Biomass

In general, phytoplankton biomass was relatively low at all waterbodies in the region in 2009/2010, but was consistently lower at SIL-Area 4 compared to the other sampling sites (Figure 4.4-2). The seasonality of peak biomass differed at each site, with highest abundance occurring in spring in Granville Lake and summer in SIL-Area 1; all seasons produced similar phytoplankton biomass at SIL-Area 4.

Sites sampled in the Upper Churchill River Region were often dominated by diatoms but some spatial differences in the phytoplankton communities occurred in summer and fall (Figure 4.4-3). In spring, all sites were dominated by diatoms followed by equivalent proportions of dinoflagellates, chrysophytes, and cryptophytes. In summer and fall, SIL-Area 1 was domiated by cryptophytes and diatoms, respectively, whereas the reverse pattern occurred at SIL-Area 4. Conversely, the community at Granville Lake continued to be dominated by diatoms during summer and fall, with either dinoflagellates or green algae as the next most dominant group.

Phytoplankton species richness ranged from 9 to 18 in the Upper Churchill River Region in 2009/2010 (Table 4.4-1). Diversity and effective richness were moderate to high in SIL-Area 1 in spring, in SIL-Area 4 in spring and summer, and in Granville Lake during all sampling events. However, the community metrics for the on-system sites (i.e, SIL-Area 1 and SIL-Area 4) indicated that these areas were less diverse and tended to be dominated by few species later in the season.

4.4.3 Bloom Monitoring

Chlorophyll a concentrations in the region were always below the bloom monitoring trigger of 10 µg/L in 2009.

4.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 ubiquitous in the region in 2009 and *Planktothrix* was present Granville Lake.

Microcystin-LR was not measured in this region in 2009 as the chlorophyll *a* concentration was always below the 10 µg/L trigger.

4.4.5 Trophic Status

Chlorophyll *a* concentrations were indicative of mesotrophic conditions in SIL-Area 1 and Granville Lake and oligotrophic conditions in SIL-Area 4 (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 2009/2010; the second year of CAMPP. Waterbodies sampled included the on-system lakes Southern Indian Lake-Area 1, and Southern Indian Lake-Area 4, and the off-system waterbody Granville Lake. (Figures 4.5-1 to 4.5-3). Southern Indian Lake-Area 4 and Granville Lake are sampled annually, and Southern Indian Lake-Area 1 is sampled on a rotational basis (i.e., once every three years). 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.

Fifteen BMI samples were collected in each of the nearshore and offshore habitat polygons of Granville Lake, Southern Indian Lake-Area 1, and Southern Indian Lake-Area 4 using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted between 20 and 27 August 2009.

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 2009, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and for the offshore habitat water depths of greater than 5 m were targeted. In 2009, mean water depths sampled in the nearshore 4.6 m in Granville Lake, 4.3 m in Southern Indian Lake-Area 1, and 3.8 m in Southern Indian Lake-Area 4. Mean water depth sampled in the offshore was 13.8 m in Granville Lake, 13.5 m in Southern Indian Lake-Area 1, and 21.5 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 nearshore and offshore polygon (Table 4.5-2). The habitat polygons sampled in the Upper Churchill River Region generally had low mean organic carbon in the sediments (all were less than 3%; Table 4.5-2). Mean TOC values were relatively similar within lakes in the nearshore and offshore polygons and also did not differ greatly between lakes.

Silt comprised the majority of the sediments collected from nearshore polygons in Granville Lake and Southern Indian Lake-Area 4, while clay represented the majority of sediments collected from the nearshore polygon of Southern Indian Lake-Area 1 (Table 4.5-2). Silt followed by clay comprised the majority of the sediments collected from the offshore polygon in Granville Lake and in the nearshore polygon of Southern Indian Lake-Area 4. In Southern Indian Lake-Area 4, sand dominated in the offshore while clay dominated sediments in Southern Indian Lake-Area 1 (Table 4.5-2).

4.5.2 Species Composition, Distribution, and Relative Abundance

4.5.2.1 Granville Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Granville Lake was 733 individuals/m^2, with densities ranging from 260 to 1,818 (Table 4.5-3). Overall, non-insects dominated the BMI community in abundance (79% of the mean total BMI), with insects comprising 21% of the overall taxa (Table 4.5-3). Of the non-insects, the main group was Amphipoda (62% of the mean total BMI) followed by Oligochaeta (12%) and Bivalvia (4%); a small number of Acari (mites), Diplostraca, and Gastropoda (snails) were also present. Insects mainly consisted of Ephemeroptera (11%) and Chironomidae (7%); a small number of Sialidae (alderflies) and Phryganeidae (large caddisflies) were found. Mean BMI density in offshore benthic grab samples was 2,709 individuals/m^2, with numbers ranging from 1,082 to 4,328 (Table 4.5-3). Overall, non-insects dominated the BMI community (91% of the mean total BMI), with insects comprising 9% of the overall taxa (Table 4.5-3). Non-insects consisted mainly of Amphipoda (79% of the mean total invertebrates sampled) and Oligochaeta (12%), with a small number of Bivalvia (1%) also collected (Table 4.5-3). Of the insects, the main groups present were Chironomidae (6% of the mean total BMI) and Ephemeroptera (3%).

Total EPT comprised 11% of the mean total nearshore BMI community, with the prevalence being within Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. were dominant in nearshore grab samples. Trichoptera were also collected in small numbers and were comprised solely of Phryganeidae (Table 4.5-3). In the offshore polygon, total EPT comprised 3% of the BMI community, with the prevalence being within Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was also dominant in offshore samples (Table 4.5-3). The ratio of EPT:C was 0.70 in the nearshore and 0.86 in the offshore polygons (Table 4.5-3). Both ratio values indicated a fairly balanced community with respect to the numbers of EPT compared to Chironomidae, with Chironomidae slightly more dominant.

Taxonomic richness in the nearshore was 14, with richness values ranging from two to six within each sample (Table 4.5-3). Hill's Effective Richness (E^H) was three; Haustoriidae, Oligochaeta, and Ephemeridae notably dominated the BMI community (Table 4.5-3). Taxonomic richness in the offshore polygon was eight families, with richness values ranging from three to six within each sample (Table 4.5-3). Hill's Effective Richness (E^H) was two; Haustoriidae and Oligochaeta were both prevalent in this habitat (Table 4.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.51 and 0.38 in the nearshore and offshore polygons, respectively (Table 4.5-3). Evenness (Simpson's Equitability [E_D]) was 0.64 in the nearshore polygon and 0.34 in the offshore (Table 4.5-3).

4.5.2.2 Southern Indian Lake-Area 1

The overall mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Southern Indian Lake-Area 1 was 459 individuals/m^2, with densities ranging from 130 to 1,472 (Table 4.5-4). Overall, insects dominated the BMI community in abundance (53% of the mean total invertebrates sampled), with non-insects comprising 47% of the overall taxa. Insects consisted of Ephemeroptera (30% of the mean total BMI), Chironomidae (18%), and small numbers of Sialidae and Ceratopogonidae. Non-insects mainly consisted of Bivalvia (22% of the mean BMI) and Oligochaeta (20%), with small numbers of Gastropoda and Hirudinea (leeches) also present. The mean BMI density in the offshore habitat was 1,094 individuals/m^2, with densities ranging from 130 to 2,640 (Table 4.5-4). Overall, non-insects dominated the BMI community (91% of the mean BMI), with insects comprising 9% of the overall taxa. Of the non-insects, the main group was Amphipoda (86%) followed by Bivalvia (4%) and Oligochaeta (1%). Insects primarily consisted of Chironomidae (6% of the mean total BMI) and Ephemeroptera (3%) (Table 4.5-4).

Total EPT comprised 30% and 3% of the mean total BMI community in the nearshore and offshore polygons, respectively, with the prevalence being solely within the mayflies (Table 4.5-4). In both habitat types, genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant. The ratio of EPT:C was 1.30 in the nearshore and 0.50 in the offshore (Table 4.5-4). The nearshore ratio indicates that EPT dominated Chironomidae in this habitat, while the offshore ratio indicates that Chironomidae were dominant over EPT.

Taxonomic richness in the nearshore polygon was 11 families, and in the offshore polygon it was six families, with richness values ranging from one to five within each sample in both polygons (Table 4.5-4). In the nearshore and offshore polygons, Hill's Effective Richness (E^H) was three and two, respectively. The nearshore habitat was dominated by Oligochaeta, Ephemeridae, and Pisidiidae; offshore habitat was dominated by Haustoriidae and Chironomidae.

Simpson's Diversity Index (D) was 0.52 in the nearshore and 0.31 in the offshore polygon (Table 4.5-4). Evenness (Simpson's Equitability [E_D]) was 0.75 in the nearshore polygon and 0.58 in the offshore polygon (Table 4.5-4).

4.5.2.3 Southern Indian Lake-Area 4

The mean BMI density in the benthic grab samples in the predominantly wetted nearshore habitat of Southern Indian Lake-Area 4 was 3,512 individuals/m^2, with densities ranging from 1,342 to 5,583 (Table 4.5-5). Overall, non-insects dominated the BMI community in abundance (52% of the mean total BMI), with the insects comprising 48% of the overall taxa. Of the non-insects, the main group was Oligochaeta (23% of the mean total invertebrates sampled) followed by Amphipoda (19%) and Bivalvia (10%); Gastropoda and Hirudinea were also present. Insects mainly consisted of Chironomidae (47% of the mean total invertebrates sampled). The mean BMI density in the offshore habitat was 2,502 individuals/m^2, with densities ranging from 260 to 5,843(Table 4.5-5). Overall, non-insects dominated the BMI community (94% of the mean total BMI), with insects comprising 6% of the overall taxa. Of the non-insects, the main group was Amphipoda (82% of the mean total BMI); Oligochaeta (10%) and Bivalvia (1%) were also present. Insects consisted solely of Chironomidae (6%) (Table 4.5-5).

Total EPT comprised 0% of the mean total nearshore and offshore BMI sampled and as a result, the ratio of EPT:C was not available (Table 4.5-5). Chironomidae were present in both nearshore and offshore habitats.

Taxonomic richness in the nearshore polygon was 15 families, with richness values ranging from four to seven within each sample. Taxonomic richness in the offshore habitat was seven families, with richness values ranging from two to five within each sample (Table 4.5-5). Hill's Effective Richness (E^H) was five and two in the nearshore and offshore polygons, respectively. The nearshore habitat was primarily dominated by Chironomidae, Oligochaeta, Haustoriidae, and Pisidiidae; offshore habitat was primarily dominated by Haustoriidae and Oligochaeta.

Simpson's Diversity Index (D) was 0.73 in the nearshore and 0.32 in the offshore polygon (Table 4.5-5). Evenness (Simpson's Equitability [E_D]) values were 0.59 in the nearshore habitat and 0.42 in the offshore habitat (Table 4.5-5).

4.6 FISH COMMUNITY

4.6.1 Gill netting

Gill netting was conducted in Granville Lake, an off-system waterbody, from 22 to 26 July, 2009. 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 4.6-1).

In Area 1 of Southern Indian Lake, gillnetting was conducted from 27 to 29 July. Standard gang index gill nets were set at twelve sites and a small mesh index gill net was set at one site (Table 4.6-1; Figure 4.6-2). In Area 4 of Southern Indian Lake, between 6 and 10 August, 17 sites were fished with standard gang index gill nets and three sites were fished with small mesh index gill nets. Between 17 and 19 September, seven additional sites were sampled with standard gang index gill nets (Table 4.6-1; Figure 4.6-3).

4.6.2 Species Composition

In 2009, 16 species of fish were captured in the Upper Churchill River Region (Table 4.6-2).

4.6.2.1 Granville Lake

A total of 887 fish representing ten species were captured in standard gang index gill nets (Table 4.6-3) and a total of 190 fish representing 11 species were captured in small mesh index gill nets (Table 4.6-4). White Sucker represented 59.75% (n = 530 fish) of the standard gang index gillnet catch, followed by sauger (n = 135 fish; 15.22%). In small mesh index gill nets, Troutperch was the most common species captured (n = 96 fish; 49.23%) followed by Spottail Shiner (n = 31; 15.90%), Sauger (n = 24; 12.31%), and Yellow Perch (n = 21; 10.77%) (Table 4.6-4; Figure 4.6-4).

White Sucker represented 67.12% of the biomass in the standard gang index gillnet catch (Table 4.6-5). Sauger represented 25.84% of the biomass in the small mesh index gillnet catch followed by White Sucker (21.31%) and Northern Pike (21.06%) (Table 4.6-6).

4.6.2.2 Southern Indian Lake (Area 1)

A total of 308 fish representing nine species were captured in standard gang index gill nets and only three fish representing three 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 Lake Whitefish (n = 63 fish; 20.45%), Cisco (n = 48 fish; 15.58%), Northern Pike (n = 43 fish; 13.96%), and Burbot (n = 43 fish; 13.96%) (Table 4.6-3; Figure 4.6-5).

In terms of biomass, Lake Whitefish represented 25.95% of the standard gang index gillnet catch, followed by Longnose Sucker (20.21%), Northern Pike (17.87%), and Burbot (15.83%) (Table 4.6-5).

4.6.2.3 Southern Indian Lake (Area 4)

A total of 1,183 fish representing seven species were captured in standard gang index gill nets and 13 fish representing five 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 = 407 fish; 34.40%), Lake Whitefish (n = 261 fish; 22.06%), and Cisco (n = 256 fish; 21.64%) (Table 4.6-3; Figure 4.6-6).

In terms of biomass, Longnose Sucker represented 41.00% of the standard gang index gillnet catch, followed by Burbot (17.63%), Lake Whitefish (16.64%) and Northern Pike (15.48%) (Table 4.6-5).

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

4.6.3.1 Granville Lake

In 2009, the mean CPUE for the standard gang index gillnet catch in Granville Lake was 73.5 fish/100 m of net/24 h (Table 4.6-7; Figure 4.6-7). White Sucker had the highest CPUE (43.9), followed by Sauger (11.2) (Table 4.6-7; Figure 4.6-8).

Mean CPUE for the small mesh index gillnet catch was 55.1 fish/30 m of net/24 h (Table 4.6-8; Figure 4.6-7). Troutperch had the highest CPUE (26.9) followed by Spottail Shiner (8.6) (Figure 4.6-8).

Mean BPUE for the standard gang index gillnet catch was 62,417 g/100 m of net/24 h (Table 4.6-9). White Sucker had the highest mean BPUE (41,850). Small mesh index gill nets produced a BPUE of 3,546 g/30 m of net/24 h (Table 4.6-10) with Sauger (875) having the highest value, followed by White Sucker (816), and Northern Pike (735).

4.6.3.2 Southern Indian Lake (Area 1)

Standard gang index gill nets set in Area 1 of Southern Indian Lake in 2009 had a CPUE of 32.2 (Table 4.6-7; Figure 4.6-7). Lake Whitefish had the highest CPUE (6.7) followed by Cisco (5.1) and Burbot (4.5) (Table 4.6-7; Figure 4.6-8). The overall CPUE for small mesh index gill nets was 4.0 (Table 4.6-8; Figure 4.6-7).

Mean BPUE for the standard gang index gillnet catch was 25,511 g (Table 4.6-9). Lake Whitefish had the highest BPUE (6,664) followed by Longnose Sucker (5,159), Northern Pike (4,727), and Burbot (3,961). Only three fish were captured in small mesh index gill nets, yielding a mean BPUE of 284 g (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 2009 had a CPUE of 54.5 (Table 4.6-7; Figure 4.6-7). Longnose Sucker had the highest CPUE (18.9) followed by Cisco (12.0) and Lake Whitefish (11.8) (Table 4.6-7; Figure 4.6-8). The overall CPUE for small mesh index gill nets was 5.5 (Table 4.6-8; Figure 4.6-7).

Mean BPUE for the standard gang index gillnet catch was 37,856 g (Table 4.6-9). Longnose Sucker had the highest BPUE (15,134) followed by Lake Whitefish (6,915) and Burbot (6,484). Small mesh index gill nets produced a BPUE of 1,773 g (Table 4.6-10) with Burbot having the highest BPUE value of 1,116 g.

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 2009 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 figures 4.6-9, 4.6-10, and 4.6-11, respectively.

Size information for fish captured in small mesh index gill nets is presented in Table 4.6-12.

4.6.4.1 Granville Lake

Northern Pike captured in Granville Lake in 2009 had a mean fork length of 548 mm, a mean weight of 1,129 g, and a mean condition factor of 0.70 (Table 4.6-11). Only three Northern Pike were captured in small mesh index gill nets, and had a mean weight of 830 g (Table 4.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 366 mm, a mean weight of 944 g, and a mean condition factor of 1.61 (Table 4.6-11). Only two Lake Whitefish were captured in small mesh index gill nets, and had a mean weight of 665 g (Table 4.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 382 mm, a mean weight of 675 g, and a mean condition factor of 1.10 (Table 4.6-11). Only two Walleye were captured in small mesh index gill nets and had a mean weight of 725 g (Table 4.6-12).

4.6.4.2 Southern Indian Lake (Area 1)

Northern Pike captured in Southern Indian Lake (Area 1) in 2009 had a mean fork length of 540 mm, a mean weight of 1,041 g, and a mean condition factor of 0.66 (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 370 mm, a mean weight of 999 g, and a mean condition factor of 1.66 (Table 4.6-11). One Lake Whitefish was captured in a small mesh index gill net (Table 4.6-12).

Walleye captured in Area 1 of Southern Indian Lake in 2009 had a mean fork length of 359 mm, a mean weight of 588 g, and a mean condition factor of 1.17 (Table 4.6-11). Walleye were not 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 2009 had a mean fork length of 572 mm, a mean weight of 1,271 g, and a mean condition factor of 0.65 (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 337 mm, a mean weight of 528 g, and a mean condition factor of 1.31 (Table 4.6-11). Three Lake Whitefish were captured in small mesh index gill nets and had a mean weight of 427 g (Table 4.6-12).

No walleye were captured in Area 4 of Southern Indian Lake in 2009.

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 2009.

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 40 Northern Pike captured in Granville Lake in 2009 (Table 4.6-13). Northern Pike ranged in age from three to fourteen years of age.

A total of 67 Lake Whitefish captured in standard gang index gill nets were aged (Table 4.6-14). Lake Whitefish ranged in age from two and fifteen years.

Ages were determined for eight Walleye captured in standard gang index gill nets (Table 4.6-15).

4.6.5.2 Southern Indian Lake (Area 1)

Ages were determined for 42 Northern Pike captured in Area 1 of Southern Indian Lake in 2009 (Table 4.6-13). Northern Pike ranged from five to eleven years of age, with 8-year old fish most common.

A total of 62 Lake Whitefish captured in standard gang index gill nets were aged (Table 4.6-14). Lake Whitefish ranged in age from two to eleven years, with strong representation by fish aged seven and eight years.

Twelve Walleye captured in Area 1 of Southern Indian Lake in 2009 were aged (Table 4.6-15). Ages ranged from three to twelve years.

4.6.5.3 Southern Indian Lake (Area 4)

Ages were determined for 101 Northern Pike captured in Area 4 of Southern Indian Lake in 2009 (Table 4.6-13). Northern Pike ranged in age from four to seventeen years, with strong representation from fish aged seven to eleven years.

A total of 254 Lake Whitefish captured in standard gang index gill nets were aged. Sampled Lake Whitefish ranged in age from 3 to 19 years with strong representation by fish aged 6 to 13 years. Greater than 50% of aged Lake Whitefish were determined to be 9 and 10 years of age (Table 4.6-14).

No Walleye were captured in Area 4 of Southern Indian Lake in 2009.

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 2009 were examined externally for DELTs (Table 4.6-19).

4.6.6.1 Granville Lake

A total of 40 Northern Pike, 67 Lake Whitefish, and eight Walleye captured in standard gang index gill nets were examined externally for DELTs. No DELTs were observed for any fish.

4.6.6.2 Southern Indian Lake (Area 1)

A total of 24 White Sucker, 43 Northern Pike, 63 Lake Whitefish, and 12 Walleye captured in standard gang index gill nets were examined externally for DELTs. No DELTs were observed for any fish.

4.6.6.3 Southern Indian Lake (Area 4)

A total of one White Sucker, 102 Northern Pike, and 261 Lake Whitefish captured in standard gang index gill nets were examined externally for DELTs. No DELTs were observed for any fish.

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Table 4.3-1. Summary statistics for *in situ* variables (near surface) measured in the Upper Churchill Region: 2009/2010.

	Temperature (°C)			*In situ* pH			DO (mg/L)			DO (% saturation)			*In situ* Specific Conductance (µS/cm)			*In situ* Turbidity (NTU)			ORP (mV)		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	11.85	10.02	7.92	7.38	7.22	7.65	11.56	11.80	12.55	107	106	108	80	77	120	7.48	14.2	14.0	123	144	143
Median	14.03	11.22	8.56	7.39	7.13	7.29	10.48	11.31	12.54	106	107	106	83	77	120	8.40	14.1	16.2	140	145	146
Minimum	0.00	0.00	0.00	6.52	6.30	6.83	9.41	9.32	10.10	100	97	100	62	67	114	4.40	4.10	3.40	25	54	63
Maximum	19.33	17.66	14.55	8.24	8.30	9.20	15.88	15.28	15.05	118	113	120	92	86	127	8.70	24.6	20.2	188	232	216
SD	7.43	7.11	6.27	0.65	0.72	0.97	2.64	2.57	2.45	7	7	8	11	9	6	1.78	9.48	6.81	66	63	55
SE	4.29	4.11	3.62	0.38	0.42	0.56	1.52	1.48	1.41	4	4	5	7	5	3	1.03	5.48	3.93	38	37	32
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4.3-1. - continued -

	Secchi Disk Depth (m)			Calculated Euphotic Depth (m)			Estimated Euphotic Depth (m)		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	1.43	0.97	1.72	2.85	1.94	3.44	1.84	1.84	3.10
Median	1.51	0.66	1.45	3.02	1.32	2.90	1.32	1.32	3.00
Minimum	1.17	0.60	0.90	2.34	1.20	1.80	1.20	1.20	1.80
Maximum	1.60	1.65	2.82	3.20	3.29	5.63	3.00	3.00	4.50
SD	0.23	0.59	0.99	0.45	1.17	1.97	1.01	1.01	1.35
SE	0.13	0.34	0.57	0.26	0.68	1.14	0.58	0.58	0.78
N	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: 2009/2010.

	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]		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	34.9	35.2	58.3	42.6	42.9	71.1	<0.60	<0.60	<0.60	<0.010	0.014	0.014	0.0219	0.0193	0.0169	0.25	0.26	0.25	0.031	0.034	0.031
Median	34.9	34.1	56.5	42.6	41.6	68.9	<0.60	<0.60	<0.60	<0.010	<0.010	<0.010	<0.0050	0.0058	<0.0050	0.24	0.26	0.22	0.018	0.027	0.026
Minimum	28.5	32.1	53.6	34.7	39.1	65.4	<0.60	<0.60	<0.60	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.20	<0.20	<0.20	0.007	0.012	0.008
Maximum	41.2	40.5	66.5	50.3	49.4	81.1	<0.60	<0.60	<0.60	0.021	0.035	0.042	0.0770	0.0630	0.0600	0.43	0.43	0.46	0.082	0.068	0.065
SD	4.5	3.3	4.9	5.5	4.1	6.0	-	-	-	0.007	0.012	0.016	0.0318	0.0254	0.0249	0.15	0.16	0.15	0.030	0.022	0.025
SE	2.6	1.9	2.8	3.2	2.3	3.5	-	-	-	0.004	0.007	0.009	0.0184	0.0147	0.0144	0.09	0.09	0.09	0.017	0.013	0.014
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	0	0	0	3	3	3	2	2	1	2	2	2	-	-	-
% Detected	100	100	100	100	100	100	0	0	0	75	75	75	50	50	25	50	50	50	-	-	-

Table 4.3-2. - continued -

	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]		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	0.25	0.25	0.23	0.27	0.28	0.26	0.0097	0.0123	0.0109	0.0077	0.0085	0.0051	0.0174	0.0205	0.0160	34	34	37	6	8	7
Median	0.25	0.25	0.21	0.27	0.27	0.22	0.0094	0.0134	0.0099	0.0076	0.0091	0.0048	0.0186	0.0208	0.0140	33	26	34	5	7	5
Minimum	0.09	0.07	0.06	<0.20	<0.20	<0.20	0.0057	0.0056	0.0059	0.0044	<0.003	0.0020	0.0119	0.0122	0.0093	16	9	13	2	2	2
Maximum	0.41	0.42	0.46	0.46	0.48	0.52	0.0144	0.0167	0.0179	0.0113	0.0141	0.0087	0.0206	0.0283	0.0266	54	74	67	13	15	17
SD	0.14	0.17	0.16	0.17	0.18	0.18	0.0031	0.0041	0.0044	0.0030	0.0056	0.0030	0.0033	0.0073	0.0068	16	25	20	4	6	6
SE	0.08	0.10	0.09	0.10	0.10	0.10	0.0018	0.0024	0.0025	0.0015	0.0028	0.0015	0.0019	0.0042	0.0039	9	14	12	2	3	4
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	4	4	4	4	3	4	4	4	4	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	100	100	100	100	75	100	100	100	100	-	-	-	-	-	-

Table 4.3-2. - continued -

	DIN:TP[1]			DOC (mg/L)			TOC (mg/L)			TIC (mg/L)			TOC:ON[1]			TOC:TN[1]			TDS (mg/L)		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	4	5	5	7.6	7.5	7.1	7.9	7.8	7.0	7.9	7.9	12.6	59	68	63	52	52	47	62.7	63.2	79.5
Median	2	4	3	7.8	7.5	7.3	8.2	8.0	6.8	8.0	7.8	12.9	53	65	54	50	49	46	64.0	61.3	78.0
Minimum	1	1	1	6.5	6.5	6.0	7.1	6.7	6.1	5.8	6.6	10.0	23	22	22	18	18	18	43.3	48.0	78.0
Maximum	10	10	11	8.3	8.4	7.8	8.3	8.5	8.1	9.7	9.2	14.5	105	120	123	92	91	79	79.3	82.0	84.0
SD	3	4	4	0.7	0.8	0.8	0.5	0.7	0.7	1.4	1.0	1.6	36	46	43	33	32	27	14.6	12.6	2.6
SE	2	2	2	0.4	0.5	0.4	0.3	0.4	0.4	0.8	0.6	0.9	21	26	25	19	18	15	8.4	7.3	1.5
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-	4	4	4
% Detected	-	-	-	100	100	100	100	100	100	100	100	100	-	-	-	-	-	-	100	100	100

Table 4.3-2. - continued -

	Laboratory Conductivity (µmhos/cm)			TSS (mg/L)			Laboratory Turbidity (NTU)			True Colour (TCU)			Laboratory pH			*E. coli* (CFU/100 mL)			Chlorophyll *a* (µg/L)		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	74.0	73.3	114	3.8	3.9	2.3	4.64	8.89	7.20	21.3	27.5	23.8	7.72	7.80	8.12	<10	<10	<10	2.8	2.7	1.5
Median	75.7	72.6	110	3.9	4.0	2.4	4.27	8.75	6.95	17.5	27.5	22.5	7.78	7.83	8.12	<10	<10	<10	3.3	2.7	1.0
Minimum	60.5	66.0	108	2.0	<2.0	<2.0	2.20	2.07	2.50	10.0	15.0	15.0	7.36	7.64	7.99	<1	<1	<1	0.8	0.5	<1.0
Maximum	84.0	82.0	128	5.3	6.4	3.2	7.83	16.0	12.4	40.0	40.0	35.0	7.95	7.90	8.25	<10	<10	<10	3.8	5.0	3.4
SD	8.5	6.9	8.3	1.2	2.1	0.8	2.13	6.17	3.88	11.4	9.0	8.9	0.23	0.10	0.09	1.9	-	-	1.2	1.7	1.2
SE	4.9	4.0	4.8	0.7	1.2	0.5	1.23	3.56	2.24	6.6	5.2	5.2	0.14	0.06	0.05	1.1	-	-	0.7	1.0	0.7
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	1	0	0	4	4	3
% Detected	100	100	100	100	75	75	100	100	100	100	100	100	100	100	100	25	0	0	100	100	75

Table 4.3-2. - continued -

	Hardness as $CaCO_3$ (mg/L)			Chloride (mg/L)			Sulphate (mg/L)		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	33.5	35.6	61.4	0.92	0.98	1.10	4.93	6.14	5.00
Median	33.0	34.5	58.0	0.94	0.94	1.10	4.37	6.05	4.90
Minimum	27.2	32.8	54.7	0.80	0.79	0.86	3.70	4.07	3.90
Maximum	40.7	40.6	74.9	1.01	1.23	1.35	7.30	8.40	6.30
SD	4.9	3.0	7.9	0.08	0.17	0.21	1.41	1.74	0.88
SE	2.9	1.7	4.6	0.04	0.10	0.12	0.81	1.00	0.51
N	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100	100	100

[1] Calculated.

Table 4.3-3. Summary statistics for metals and major ions measured in the Upper Churchill River Region: 2009/2010. Values are presented as mg/L.

	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			Boron		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	0.230	0.513	0.300	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0128	0.0147	0.0115	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Median	0.238	0.531	0.328	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0124	0.0143	0.0117	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Minimum	0.121	0.133	0.146	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00924	0.0101	0.00911	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Maximum	0.323	0.856	0.399	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0174	0.0201	0.0135	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
SD	0.093	0.320	0.103	-	-	-	-	-	-	0.00317	0.0040	0.00166	-	-	-	-	-	-	-	-	-
SE	0.054	0.185	0.059	-	-	-	-	-	-	0.00183	0.0023	0.00096	-	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	0	0	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0
% Detected	100	100	100	0	0	0	0	0	0	100	100	100	0	0	0	0	0	0	0	0	0

Table 4.3-3. - continued -

	Cadmium			Calcium			Cesium			Chromium			Cobalt			Copper			Iron		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	<0.000010	0.000022	<0.000010	8.06	8.62	16.5	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00030	<0.00020	<0.00020	<0.0010	0.0013	0.0014	0.226	0.442	0.194
Median	<0.000010	<0.000010	<0.000010	8.00	8.37	15.7	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	0.0014	0.0014	0.246	0.427	0.217
Minimum	<0.000010	<0.000010	<0.000010	6.63	8.09	14.3	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.0010	<0.0010	0.0011	0.127	0.119	0.077
Maximum	<0.000010	0.000072	0.000015	9.61	9.65	20.5	<0.00010	0.00010	<0.00010	<0.0010	0.0015	<0.0010	0.00091	0.00030	<0.00020	0.0010	0.0019	0.0016	0.285	0.795	0.263
SD	-	0.000029	0.000004	1.10	0.61	2.4	-	0.00002	-	-	0.0005	-	0.00035	0.00010	-	0.0002	0.0005	0.0003	0.061	0.272	0.074
SE	-	0.000017	0.000003	0.63	0.35	1.4	-	0.00001	-	-	0.0003	-	0.00020	0.00006	-	0.0001	0.0003	0.0001	0.035	0.157	0.043
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	1	1	4	4	4	0	1	0	0	2	0	1	2	0	1	3	4	4	4	4
% Detected	0	25	25	100	100	100	0	25	0	0	50	0	25	50	0	25	75	100	100	100	100

Table 4.3-3. - continued -

	Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	<0.00050	0.00072	<0.00050	-	-	-	3.24	3.42	4.89	0.0120	0.0112	0.00417	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020
Median	<0.00050	0.00068	<0.00050	-	-	-	3.17	3.30	4.65	0.0104	0.0122	0.00434	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020
Minimum	<0.00050	<0.00050	<0.00050	-	-	-	2.58	3.06	4.49	0.00867	0.00412	0.00241	<0.000020	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020
Maximum	<0.00050	0.00127	<0.00050	-	-	-	4.06	4.02	5.75	0.0183	0.0163	0.00559	<0.00010	<0.00010	<0.00010	<0.00020	0.00042	0.00035	<0.0020	0.0037	0.0036
SD	-	0.00047	-	-	-	-	0.54	0.38	0.51	0.00373	0.00493	0.00116	-	-	-	-	0.00014	0.00011	-	0.0012	0.0011
SE	-	0.00027	-	-	-	-	0.31	0.22	0.29	0.00215	0.00285	0.00067	-	-	-	-	0.00008	0.00006	-	0.0007	0.0007
N	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	2	0	-	-	-	4	4	4	4	4	4	0	0	0	0	1	1	0	1	1
% Detected	0	50	0	-	-	-	100	100	100	100	100	100	0	0	0	0	25	25	0	25	25

Table 4.3-3. - continued -

	Potassium			Rubidium			Selenium			Silicon			Silver			Sodium			Strontium		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	1.15	1.26	1.18	0.00195	0.00250	0.00145	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	2.84	2.85	2.79	0.0311	0.0305	0.0340
Median	1.12	1.22	1.19	0.00190	0.00250	0.00155	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	2.80	2.80	2.78	0.0310	0.0296	0.0336
Minimum	0.98	1.13	1.10	0.00156	0.00162	0.00099	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	2.19	2.36	2.62	0.0250	0.0261	0.0325
Maximum	1.37	1.49	1.23	0.00242	0.00339	0.00170	0.0011	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	3.58	3.43	2.98	0.0374	0.0367	0.0363
SD	0.17	0.14	0.05	0.00036	0.00087	0.00029	0.0003	-	-	-	-	-	-	-	-	0.50	0.40	0.13	0.0046	0.0039	0.0016
SE	0.10	0.08	0.03	0.00021	0.00050	0.00017	0.0002	-	-	-	-	-	-	-	-	0.29	0.23	0.07	0.0026	0.0022	0.0009
N	4	4	4	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	1	0	0	-	-	-	0	0	0	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	25	0	0	-	-	-	0	0	0	100	100	100	100	100	100

Table 4.3-3. - continued –

	Tellurium			Thallium			Thorium			Tin			Titanium			Tungsten			Uranium		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.00060	0.00293	0.00285	0.0105	0.0226	0.00983	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	0.00013
Median	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.00060	<0.00060	<0.00060	0.0101	0.0234	0.0110	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	0.00014
Minimum	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.00060	<0.00060	*<0.00060*	0.00592	0.00455	0.00399	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	0.00012
Maximum	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.0010	0.0106	0.0103	0.0158	0.0391	0.0133	<0.00050	<0.00050	<0.00050	0.00011	0.00015	0.00014
SD	-	-	-	-	-	-	-	-	-	-	0.00443	0.00430	0.00403	0.0146	0.00374	-	-	-	0.00003	0.00005	0.00001
SE	-	-	-	-	-	-	-	-	-	-	0.00256	0.00248	0.00233	0.00844	0.00216	-	-	-	0.00002	0.00003	0.00000
N	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	0	0	0	0	0	-	-	-	0	1	1	4	4	4	0	0	0	1	2	4
% Detected	0	0	0	0	0	0	-	-	-	0	25	25	100	100	100	0	0	0	25	50	100

Table 4.3-3. - continued –

	Vanadium			Zinc			Zirconium		
	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4	GRV	SIL-1	SIL-4
Mean	<0.0010	0.0011	<0.0010	<0.010	<0.010	<0.010	<0.00040	0.00061	<0.00040
Median	<0.0010	0.0011	<0.0010	<0.010	<0.010	<0.010	<0.00040	0.00056	<0.00040
Minimum	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Maximum	<0.0010	0.0017	<0.0010	<0.010	<0.010	<0.010	0.00047	0.00112	0.00063
SD	-	0.0006	-	-	-	-	0.00012	0.00041	0.00018
SE	-	0.0003	-	-	-	-	0.00007	0.00024	0.00010
N	4	4	4	4	4	4	4	4	4
N >DL	0	2	0	0	0	0	1	2	2
% Detected	0	50	0	0	0	0	25	50	50

Table 4.3-4. 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: 2009/2010. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury[1]
MWQSOGs PAL		0.1	0.15	1.5	0.00010-0.00022	0.0297-0.0680	0.0031-0.0073	0.3	0.00061-0.00220	0.000026
GRV	N	**4**	4	4	4	4	4	4	4	3
	# Exceedances	**4**	0	0	0	0	0	0	0	0
	% Exceedances	**100**	0	0	0	0	0	0	0	0
SIL-1	N	**4**	4	4	4	4	4	**4**	**4**	4
	# Exceedances	**4**	0	0	0	0	0	**2**	**2**	0
	% Exceedances	**100**	0	0	0	0	0	**50**	**50**	0
SIL- 4	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

Table 4.3-4. – continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL		0.073	0.0713-0.0408	0.001	0.0001	0.0008	0.015	0.0398-0.0938	120	128-429
GRV	N	4	4	**4**	4	4	4	4	4	4
	# Exceedances	0	0	**1**	0	0	0	0	0	0
	% Exceedances	0	0	**25**	0	0	0	0	0	0
SIL-1	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
SIL-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

[1]Comparisons to the current PAL guideline could not be made for samples collected in winter as the analytical detection limit was higher than the guideline.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 4.3-5. Total phosphorus concentrations (open-water season and annual means) measured in the Upper Churchill River Region and CCME (1999; updated to 2013) trophic categorization: 2009/2010.

		Lake Trophic Status Based on TP (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			0.017			
	Annual			0.017			
Southern Indian Lake-Area 1	Open-water season				0.023		
	Annual				0.021		
Southern Indian Lake-Area 4	Open-water season			0.012			
	Annual			0.016			

Table 4.3-6. 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): 2009/2010.

		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		0.21				
	Annual		0.27				
Southern Indian Lake-Area 1	Open-water season		0.21				
	Annual		0.28				
Southern Indian Lake-Area 4	Open-water season		0.18				
	Annual		0.26				

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: 2009/2010.

		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			3.4			
	Annual			2.8			
Southern Indian Lake-Area 1	Open-water season			3.4			
	Annual			2.7			
Southern Indian Lake-Area 4	Open-water season		1.8				
	Annual		1.8				

Table 4.4-1. Community metrics for phytoplankton samples collected in the Upper Churchill River Region during the open-water season of 2009.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($e^{H`}$)	Evenness ($e^{H`}/S$)
Granville Lake	Spring	18	0.82	0.32	2.11	0.73	8.29	0.46
	Summer	18	0.82	0.30	2.01	0.70	7.47	0.41
	Fall	15	0.80	0.33	1.87	0.69	6.49	0.43
SIL-Area 1	Spring	15	0.82	0.37	2.08	0.77	8.01	0.53
	Summer	10	0.21	0.13	0.48	0.21	1.61	0.16
	Fall	15	0.43	0.12	1.05	0.39	2.86	0.19
SIL-Area 4	Spring	11	0.79	0.43	1.66	0.69	5.25	0.48
	Summer	14	0.79	0.34	1.83	0.69	6.24	0.45
	Fall	9	0.44	0.20	1.03	0.47	2.80	0.31

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, 2009.

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 (2009)	Nearshore	15	4.0	1.3	5.0	--	1.01	17.0	--	shrubs, coniferous	0	--
	Offshore	15	13.8	12.8	14.6	--	0.94	17.0	--	--	0	--
Southern Indian Lake-Area 1 (2009)	Nearshore	15	4.3	2.6	4.9	--	0.50	16.0	--	shrubs, coniferous	0	--
	Offshore	15	13.3	11.7	14.7	--	0.60	15.0	--	--	0	--
Southern Indian Lake-Area 4 (2009)	Nearshore	15	4.1	2.8	4.9	--	1.43	14.0	--	coniferous	0	--
	Offshore	15	21.2	17.6	23.1	--	1.61	13.5	--	--	0	--

Table 4.5-2. Sediment analysis analyses (particle size and total organic carbon) results from samples collected at nearshore and offshore benthic invertebrate sites in the Upper Churchill River Region for the CAMPP, 2009.

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 Lake (2009)	Nearshore	Mean	3	4.6	2.14	27.00	51.00	21.33	Silty Loam
		SD	--	0.35	0.569	26.889	16.523	10.263	--
		SE	--	0.20	0.329	15.524	9.539	5.925	--
		Median	--	4.8	2.38	13.00	59.00	24.00	--
		Min	--	4.2	1.49	10.00	32.00	10.00	--
		Max	--	4.8	2.55	58.00	62.00	30.00	--
	Offshore	Mean	3	13.8	2.80	1.67	53.33	44.33	Silty Clay
		SD	--	0.71	0.162	0.577	0.577	1.155	--
		SE	--	0.41	0.094	0.333	0.333	0.667	--
		Median	--	13.9	2.88	2.00	53.00	45.00	--
		Min	--	13.0	2.61	1.00	53.00	43.00	--
		Max	--	14.4	2.90	2.00	54.00	45.00	--
Southern Indian Lake-Area 1 (2009)	Nearshore	Mean	3	4.3	1.55	2.67	32.00	65.67	Clay
		SD	--	0.50	0.525	1.155	8.185	6.807	--
		SE	--	0.29	0.303	0.667	4.726	3.930	--
		Median	--	4.4	1.55	2.00	30.00	68.00	--
		Min	--	3.8	1.02	2.00	25.00	58.00	--
		Max	--	4.8	2.07	4.00	41.00	71.00	--
	Offshore	Mean	3	13.5	1.68	23.00	34.67	42.33	Clay
		SD	--	0.42	0.119	4.583	7.638	11.547	--
		SE	--	0.24	0.069	2.646	4.410	6.667	--
		Median	--	13.4	1.63	22.00	33.00	49.00	--
		Min	--	13.2	1.60	19.00	28.00	29.00	--
		Max	--	14.0	1.82	28.00	43.00	49.00	--
Southern Indian Lake-Area 4 (2009)	Nearshore	Mean	1	3.8	2.66	3.00	56.00	41.00	Silt Clay Loam
		SD	--	--	--	--	--	--	--
		SE	--	--	--	--	--	--	--
		Median	--	--	--	--	--	--	--
		Min	--	--	--	--	--	--	--
		Max	--	--	--	--	--	--	--
	Offshore	Mean	3	21.5	1.82	60.67	20.33	19.00	Sandy Loam
		SD	--	0.21	0.348	13.051	8.386	6.928	--
		SE	--	0.12	0.201	7.535	4.842	4.000	--
		Median	--	21.4	1.99	62.00	16.00	23.00	--
		Min	--	21.3	1.42	47.00	15.00	11.00	--
		Max	--	21.7	2.05	73.00	30.00	23.00	--

Table 4.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Granville Lake within the Upper Churchill River Region for CAMPP, 2009.

	Granville Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	733	450.5	116.3	649	260	1818
Oligochaeta	--	87	173.1	44.7	0	0	519
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	3	11.2	2.9	0	0	43
Haustoriidae	--	410	451.5	116.6	260	0	1601
Hyalellidae	--	40	125.1	32.3	0	0	476
Diplostraca	--	3	11.2	2.9	0	0	43
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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	32	57.8	14.9	0	0	173
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	--	3	11.2	2.9	0	0	43
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	--	580	464.1	119.8	476	87	1688
Non-Insecta (%)	79	--	--	--	--	--	--
Oligochaeta	--	87	173.1	44.7	0	0	519
Oligochaeta (%)	12	--	--	--	--	--	--
Amphipoda	--	453	426.9	110.2	346	0	1601
Amphipoda (%)	62	--	--	--	--	--	--
Bivalvia	--	32	57.8	14.9	0	0	173
Bivalvia (%)	4	--	--	--	--	--	--
Gastropoda	--	3	11.2	2.9	0	0	43
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	17	35.8	9.3	0	0	130
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 4.5-3. - continued -

	Granville Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	78	83.7	21.6	43	0	260
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

Table 4.5-3. - continued -

	Granville Lake						
	Nearshore n=15						
	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	0.0	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	--	6	15.2	3.9	0	0	43
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	27.4	7.1	0	0	87
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	35	40.7	10.5	43	0	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

Table 4.5-3. - continued -

	Granville Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	98.0	25.3	173	0	346
Insecta (%)	21	--	--	--	--	--	--
Chironomidae	--	52	43.9	11.3	43	0	130
Chironomidae (%)	7	--	--	--	--	--	--
Ephemeroptera	--	78	83.7	21.6	43	0	260
Ephemeroptera (%)	11	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	6	15.2	3.9	0	0	43
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	84	87.3	22.5	43	0	260
EPT (%)	11	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.70	0.943	0.244	0.00	0.00	3.00
Genus analysis of Ephemeroptera				1 sp. (*Hexagenia*)			
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	14	4	1.1	0.3	4	2	6
Simpson's Diversity Index (D)	--	0.51	0.226	0.058	0.60	0.09	0.75
Evenness (Simpson's Equitability E_D)	--	0.64	0.169	0.044	0.61	0.32	0.93
Shannon-Weaver Index (H)	--	0.96	0.419	0.108	1.14	0.18	1.49
Evenness (Shannon's Equitability E_H)	--	0.71	0.231	0.060	0.82	0.27	0.96
Hill's Effective Richness ($E^{H'}$)	--	3	1.015	0.262	3.12	1.20	4.46
Evenness ($E^{H'}/S$)	--	0.74	0.152	0.039	0.75	0.41	0.94

Table 4.5-3. - continued -

	Granville Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2709	1061.9	274.2	2943	1082	4328
Oligochaeta	--	312	122.6	31.7	346	43	476
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	2132	973.5	251.4	2381	779	3766
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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	26	39.4	10.2	0	0	130
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	--	2473	1008.4	260.4	2640	995	4198
Non-Insecta (%)	91	--	--	--	--	--	--
Oligochaeta	--	312	122.6	31.7	346	43	476
Oligochaeta (%)	12	--	--	--	--	--	--
Amphipoda	--	2132	973.5	251.4	2381	779	3766
Amphipoda (%)	79	--	--	--	--	--	--
Bivalvia	--	26	39.4	10.2	0	0	130
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	--	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=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	75	44.7	11.5	87	0	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 4.5-3. - continued -

	Granville Lake						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	3	11.2	2.9	0	0	43
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	20	32.2	8.3	0	0	87
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	55	82.6	21.3	43	0	260
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	81	74.7	19.3	43	0	260
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	--	237	165.1	42.6	173	87	606
Insecta (%)	9	--	--	--	--	--	--
Chironomidae	--	156	173.7	44.9	87	0	563
Chironomidae (%)	6	--	--	--	--	--	--
Ephemeroptera	--	75	44.7	11.5	87	0	173

Table 4.5-3. - continued -

	Granville Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	75	44.7	11.5	87	0	173
EPT (%)	3	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.86	1.040	0.269	0.25	0.00	3.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	4	0.7	0.2	4	3	6
Simpson's Diversity Index (D)	--	0.38	0.107	0.028	0.36	0.22	0.55
Evenness (Simpson's Equitability E_D)	--	0.34	0.105	0.027	0.32	0.20	0.60
Shannon-Weaver Index (H)	--	0.77	0.204	0.053	0.74	0.50	1.19
Evenness (Shannon’s Equitability E_H)	--	0.48	0.122	0.031	0.46	0.30	0.69
Hill's Effective Richness ($E^{H'}$)	--	2	0.470	0.121	2.09	1.65	3.27
Evenness ($E^{H'}/S$)	--	0.44	0.116	0.030	0.45	0.28	0.71

Table 4.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Southern Indian Lake-Area 1 within the Upper Churchill River Region for CAMPP, 2009.

	Southern Indian Lake-Area 1 (south)						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	459	359.8	92.9	346	130	1472
Oligochaeta	--	92	243.7	62.9	0	0	952
Hirudinea	--	3	11.2	2.9	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	101	110.6	28.5	43	0	303
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	11.2	2.9	0	0	43
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	--	12	44.7	11.5	0	0	173
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	298.3	77.0	87	0	1125
Non-Insecta (%)	47	--	--	--	--	--	--
Oligochaeta	--	92	243.7	62.9	0	0	952
Oligochaeta (%)	20	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	101	110.6	28.5	43	0	303
Bivalvia (%)	22	--	--	--	--	--	--
Gastropoda	--	14	45.3	11.7	0	0	173
Gastropoda (%)	3	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	14	31.3	8.1	0	0	87
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 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	139	164.6	42.5	87	0	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

Table 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Nearshore n=15						
	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	0.0	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	22.4	5.8	0	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	14	26.7	6.9	0	0	87
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	69	92.3	23.8	43	0	346
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	11.2	2.9	0	0	43
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 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	160.8	41.5	173	87	649
Insecta (%)	53	--	--	--	--	--	--
Chironomidae	--	84	93.2	24.1	87	0	346
Chironomidae (%)	18	--	--	--	--	--	--
Ephemeroptera	--	139	164.6	42.5	87	0	519
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	--	139	164.6	42.5	87	0	519
EPT (%)	30	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.30	2.266	0.585	0.00	0.00	7.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	3	1.1	0.3	3	1	5
Simpson's Diversity Index (D)	--	0.52	0.190	0.049	0.53	0.00	0.75
Evenness (Simpson's Equitability E_D)	--	0.75	0.163	0.042	0.74	0.50	1.00
Shannon-Weaver Index (H)	--	0.91	0.383	0.099	0.98	0.00	1.48
Evenness (Shannon’s Equitability E_H)	--	0.77	0.235	0.061	0.79	0.00	0.96
Hill's Effective Richness ($E^{H'}$)	--	3	0.926	0.239	2.67	1.00	4.37
Evenness ($E^{H'}$/S)	--	0.83	0.114	0.029	0.82	0.65	1.00

Table 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1094	1006.8	260.0	563	130	2640
Oligochaeta	--	12	25.7	6.6	0	0	87
Hirudinea	--	0	0.0	0.0	0	0	0
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	3	11.2	2.9	0	0	43
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	941	898.5	232.0	476	43	2337
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	--	40	62.2	16.1	0	0	173
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	--	995	950.0	245.3	519	43	2467
Non-Insecta (%)	91	--	--	--	--	--	--
Oligochaeta	--	12	25.7	6.6	0	0	87
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	944	895.6	231.2	476	43	2337
Amphipoda (%)	86	--	--	--	--	--	--
Bivalvia	--	40	62.2	16.1	0	0	173
Bivalvia (%)	4	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	3	11.2	2.9	0	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
Coleoptera (adult) - unid	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	30.5	7.9	43	0	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
Siphlonurus	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0

Table 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Offshore n=15						
	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	--	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	--	14	35.3	9.1	0	0	130
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	49	72.9	18.8	43	0	260
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	--	98	110.3	28.5	87	0	433
Insecta (%)	9	--	--	--	--	--	--
Chironomidae	--	63	99.3	25.6	43	0	390
Chironomidae (%)	6	--	--	--	--	--	--
Ephemeroptera	--	32	30.5	7.9	43	0	87
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--

Table 4.5-4. - continued -

	Southern Indian Lake-Area 1 (south)						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	32	30.5	7.9	43	0	87
EPT (%)	3	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.50	0.728	0.188	0.00	0.00	2.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	3	1.1	0.3	3	1	5
Simpson's Diversity Index (D)	--	0.31	0.185	0.048	0.27	0.00	0.67
Evenness (Simpson's Equitability E_D)	--	0.58	0.248	0.064	0.56	0.26	1.01
Shannon-Weaver Index (H)	--	0.56	0.292	0.075	0.51	0.00	1.10
Evenness (Shannon’s Equitability E_H)	--	0.53	0.280	0.072	0.49	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	2	0.539	0.139	1.66	1.00	3.00
Evenness ($E^{H'}/S$)	--	0.66	0.224	0.058	0.62	0.33	1.00

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, 2009.

	Southern Indian Lake-Area 4 (Missi)						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3512	1404.1	362.5	3549	1342	5583
Oligochaeta	--	819	662.4	171.0	736	87	2467
Hirudinea	--	3	11.2	2.9	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	655	684.5	176.7	346	0	2034
Hyalellidae	--	3	11.2	2.9	0	0	43
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	--	335	154.7	40.0	303	87	693
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	17.9	4.6	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	--	1824	893.9	230.8	1991	346	3160
Non-Insecta (%)	52	--	--	--	--	--	--
Oligochaeta	--	819	662.4	171.0	736	87	2467
Oligochaeta (%)	23	--	--	--	--	--	--
Amphipoda	--	658	682.0	176.1	346	0	2034
Amphipoda (%)	19	--	--	--	--	--	--
Bivalvia	--	335	154.7	40.0	303	87	693
Bivalvia (%)	10	--	--	--	--	--	--
Gastropoda	--	9	17.9	4.6	0	0	43
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	6	15.2	3.9	0	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

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	11.2	2.9	0	0	43
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	--	3	11.2	2.9	0	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

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Nearshore n=15						
	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	--	3	11.2	2.9	0	0	43
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	--	6	22.4	5.8	0	0	87
Leptoceridae (larva)	--	0	0.0	0.0	0	0	0
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	3	11.2	2.9	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)	--	6	22.4	5.8	0	0	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)	--	52	73.5	19.0	43	0	216
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	612	283.3	73.1	563	43	1125
Orthocladiinae	--	38	74.7	19.3	0	0	216
Tanypodinae	--	955	610.2	157.6	736	260	2164
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	11.2	2.9	0	0	43
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 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	1688	769.1	198.6	1558	519	3030
Insecta (%)	48	--	--	--	--	--	--
Chironomidae	--	1656	782.8	202.1	1515	476	3030
Chironomidae (%)	47	--	--	--	--	--	--
Ephemeroptera	--	6	15.2	3.9	0	0	43
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	25.7	6.6	0	0	87
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	17	27.4	7.1	0	0	87
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.01	0.024	0.006	0.00	0.00	0.08
Genus analysis of Ephemeroptera	2 spp. (*Hexagenia* + *Caenis*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta+/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level; S)	15	5	1.0	0.3	5	4	7
Simpson's Diversity Index (D)	--	0.73	0.064	0.017	0.77	0.62	0.82
Evenness (Simpson's Equitability E_D)	--	0.59	0.104	0.027	0.60	0.44	0.76
Shannon-Weaver Index (H)	--	1.52	0.194	0.050	1.58	1.23	1.89
Evenness (Shannon's Equitability E_H)	--	0.80	0.068	0.018	0.81	0.69	0.91
Hill's Effective Richness ($E^{H'}$)	--	5	0.907	0.234	4.84	3.44	6.59
Evenness ($E^{H'}$/S)	--	0.69	0.087	0.022	0.69	0.57	0.85

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2502	1381.0	356.6	2251	260	5843
Oligochaeta	--	263	241.8	62.4	216	0	909
Hirudinea	--	3	11.2	2.9	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	1933	1346.1	347.6	1818	0	4891
Hyalellidae	--	130	502.9	129.8	0	0	1948
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	6	15.2	3.9	0	0	43
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	--	17	31.9	8.2	0	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	--	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	--	2352	1400.4	361.6	2164	130	5800
Non-Insecta (%)	94	--	--	--	--	--	--
Oligochaeta	--	263	241.8	62.4	216	0	909
Oligochaeta (%)	10	--	--	--	--	--	--
Amphipoda	--	2063	1235.7	319.1	1948	130	4891
Amphipoda (%)	82	--	--	--	--	--	--
Bivalvia	--	17	31.9	8.2	0	0	87
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	--	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

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	17	35.8	9.3	0	0	130
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	40	44.7	11.5	43	0	130
Orthocladiinae	--	6	15.2	3.9	0	0	43
Tanypodinae	--	84	79.2	20.5	43	0	260
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	--	150	127.6	33.0	130	43	433
Insecta (%)	6	--	--	--	--	--	--

Table 4.5-5. - continued -

	Southern Indian Lake-Area 4 (Missi)						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	150	127.6	33.0	130	43	433
Chironomidae (%)	6	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	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	0.0	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	3	0.8	0.2	3	2	5
Simpson's Diversity Index (D)	--	0.32	0.146	0.038	0.28	0.13	0.60
Evenness (Simpson's Equitability E_D)	--	0.42	0.198	0.051	0.39	0.25	1.00
Shannon-Weaver Index (H)	--	0.63	0.270	0.070	0.52	0.29	1.23
Evenness (Shannon's Equitability E_H)	--	0.48	0.202	0.052	0.43	0.26	1.00
Hill's Effective Richness ($E^{H'}$)	--	2	0.578	0.149	1.68	1.34	3.41
Evenness ($E^{H'}$/S)	--	0.51	0.183	0.047	0.50	0.33	1.00

Table 4.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Upper Churchill River System, 2009.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Granville Lake	GN-01	14	428161	6253597	22-Jul-09	18.25	15.1	5.5	-
Granville Lake	GN-02	14	427318	6250652	22-Jul-09	18.17	12.1	12.6	-
Granville Lake	GN-03	14	421946	6248762	22-Jul-09	19.93	17.0	21.1	-
Granville Lake	GN-05	14	413317	6243243	23-Jul-09	20.73	7.4	7.2	-
Granville Lake	GN-06	14	415624	6239177	23-Jul-09	21.68	10.9	2.6	-
Granville Lake	GN-07	14	411203	6238186	23-Jul-09	22.43	8.0	9.3	-
Granville Lake	GN-08	14	405280	6239071	24-Jul-09	21.78	13.0	12.7	-
Granville Lake	GN-09	14	399704	6239114	24-Jul-09	22.27	2.9	8.0	-
Granville Lake	GN-10	14	401517	6234673	24-Jul-09	24.08	8.0	8.3	-
Granville Lake	GN-11	14	396189	6235417	25-Jul-09	20.60	11.5	10.8	-
Granville Lake	GN-12	14	394540	6237871	25-Jul-09	20.85	3.8	11.8	-
Granville Lake	GN-13	14	389190	6241189	25-Jul-09	21.52	7.7	10.4	-
Granville Lake	SN-02	14	427318	6250652	22-Jul-09	18.17	12.1	12.6	-
Granville Lake	SN-07	14	411203	6238186	23-Jul-09	22.43	8.0	9.2	-
Granville Lake	SN-08	14	405280	6239071	24-Jul-09	21.78	13.0	12.7	-
Granville Lake	SN-13	14	389190	6241189	25-Jul-09	21.52	7.7	10.4	-
Southern Indian Lake-Area 1	GN-01	14	497373	6305287	27-Jul-09	17.50	5.3	15.6	-
Southern Indian Lake-Area 1	GN-02	14	497354	6306649	27-Jul-09	17.73	15.7	17.8	-
Southern Indian Lake-Area 1	GN-03	14	497426	6308282	27-Jul-09	17.92	16.9	15.9	-
Southern Indian Lake-Area 1	GN-04	14	498274	6310374	27-Jul-09	15.90	8.1	8.2	14.2
Southern Indian Lake-Area 1	GN-05	14	494724	6307726	27-Jul-09	15.92	15.4	19.1	15.2
Southern Indian Lake-Area 1	GN-06	14	496048	6312355	27-Jul-09	16.47	-	12.1	14.8
Southern Indian Lake-Area 1	GN-07	14	485006	6303778	28-Jul-09	17.67	3.3	5.1	-
Southern Indian Lake-Area 1	GN-08	14	483715	6298245	28-Jul-09	17.83	8.6	9.2	-
Southern Indian Lake-Area 1	GN-09	14	490108	6296218	28-Jul-09	17.83	14.0	4.8	-
Southern Indian Lake-Area 1	GN-10	14	490740	6305162	28-Jul-09	15.58	-	-	15.0
Southern Indian Lake-Area 1	GN-11	14	487114	6309751	28-Jul-09	15.32	-	-	15.7
Southern Indian Lake-Area 1	GN-12	14	481245	6308770	28-Jul-09	15.87	-	-	-
Southern Indian Lake-Area 1	SN-03	14	497426	6308282	27-Jul-09	17.92	16.9	15.9	-
Southern Indian Lake-Area 4	GN-01	14	548163	6357169	07-Aug-09	17.00	6.6	-	17.7
Southern Indian Lake-Area 4	GN-02	14	542809	6358537	07-Aug-09	16.55	14.1	-	17.2
Southern Indian Lake-Area 4	GN-04	14	542453	6360030	07-Aug-09	17.80	21.5	-	18.1
Southern Indian Lake-Area 4	GN-05	14	537415	6362855	08-Aug-09	22.50	25.7	-	15.8
Southern Indian Lake-Area 4	GN-06	14	538208	6366208	07-Aug-09	16.50	11.6	13.4	15.8
Southern Indian Lake-Area 4	GN-07	14	533961	6364346	07-Aug-09	21.83	9.1	6.0	17.0

Table 4.6-1. - continued -

Location	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-08	14	531399	6365708	06-Aug-09	20.42	16.7	8.1	17.3
Southern Indian Lake-Area 4	GN-09	14	530657	6369731	08-Aug-09	19.67	17.4	15.6	17.4
Southern Indian Lake-Area 4	GN-10	14	533770	6371217	08-Aug-09	21.00	13.1	12.9	17.8
Southern Indian Lake-Area 4	GN-11	14	537243	6368027	07-Aug-09	16.67	13.3	13.2	17.4
Southern Indian Lake-Area 4	GN-12	14	542154	6363938	07-Aug-09	18.43	20.4	20.6	15.4
Southern Indian Lake-Area 4	GN-13	14	531189	6359290	09-Aug-09	19.83	20.8	21.0	15.8
Southern Indian Lake-Area 4	GN-14	14	534543	6356161	09-Aug-09	20.67	17.5	18.2	115.5
Southern Indian Lake-Area 4	GN-15	14	534504	6350533	09-Aug-09	19.92	-	-	-
Southern Indian Lake-Area 4	GN-16	14	526131	6345042	18-Sep-09	18.67	19.8	19.5	14.5
Southern Indian Lake-Area 4	GN-17	14	525779	6339304	18-Sep-09	19.25	18.9	18.8	14.2
Southern Indian Lake-Area 4	GN-18	14	529683	6338614	18-Sep-09	17.38	18.2	18.5	-
Southern Indian Lake-Area 4	GN-19	14	533161	6338337	18-Sep-09	16.62	15.8	17.6	13.8
Southern Indian Lake-Area 4	GN-20	14	542786	6338209	17-Sep-09	19.42	16.8	17.1	17.3
Southern Indian Lake-Area 4	GN-21	14	537367	6343772	17-Sep-09	15.83	-	19.7	18.1
Southern Indian Lake-Area 4	GN-22	14	540279	6345038	08-Aug-09	25.92	20.8	20.9	14.1
Southern Indian Lake-Area 4	GN-23	14	540360	6347989	08-Aug-09	24.57	12.4	17.9	14.7
Southern Indian Lake-Area 4	GN-24	14	541062	6353125	08-Aug-09	24.35	10.0	13.6	14.2
Southern Indian Lake-Area 4	GN-25	14	538070	6338692	17-Sep-09	18.42	20.7	19.8	17.7
Southern Indian Lake-Area 4	SN-07	14	531399	6365708	08-Aug-09	20.42	17.4	15.6	17.3
Southern Indian Lake-Area 4	SN-10	14	537243	6368027	07-Aug-09	16.67	11.6	13.4	17.4
Southern Indian Lake-Area 4	SN-15	14	534504	6350533	09-Aug-09	19.92	-	-	-

Table 4.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Upper Churchill River Region waterbodies, 2009.

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
	Logperch	*Percina shumardi*	LGPR
	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, 2009.

Species	Granville L		SIL-Area 1		SIL-Area 4	
	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-
Longnose Sucker	40	4.51	34	11.04	407	34.40
White Sucker	530	59.75	24	7.79	1	0.08
Shorthead Redhorse	5	0.56	-	-	-	-
Northern Pike	40	4.51	43	13.96	102	8.62
Cisco	18	2.03	48	15.58	256	21.64
Lake Whitefish	67	7.55	63	20.45	261	22.06
Troutperch	-	-	-	-	-	-
Burbot	22	2.48	43	13.96	155	13.10
Slimy Sculpin	-	-	-	-	-	-
Yellow Perch	22	2.48	1	0.32	-	-
Logperch	-	-	-	-	-	-
Sauger	135	15.22	40	12.99	1	0.08
Walleye	8	0.90	12	3.90	-	-
Total	887	100	308	100	1183	100

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

Table 4.6-4. Small mesh index gillnet relative abundance summaries from Upper Churchill River Region waterbodies, 2009.

Species	Granville L		SIL-Area 1		SIL-Area 4	
	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-
Emerald Shiner	5	2.56	-	-	-	-
Spottail Shiner	31	15.90	-	-	-	-
Longnose Sucker	-	-	-	-	1	7.69
White Sucker	4	2.05	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-
Northern Pike	3	1.54	-	-	-	-
Cisco	4	2.05	-	-	3	23.08
Lake Whitefish	2	1.03	1	33.33	3	23.08
Troutperch	96	49.23	1	33.33	3	23.08
Burbot	-	-	-	-	3	23.08
Slimy Sculpin	-	-	1	33.33	-	-
Yellow Perch	21	10.77	-	-	-	-
Logperch	3	1.54	-	-	-	-
Sauger	24	12.31	-	-	-	-
Walleye	2	1.03	-	-	-	-
Total	195	100	3	100	13	100

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

Table 4.6-5. Standard gang index gillnet biomass summaries from Upper Churchill River Region waterbodies, 2009.

Species	Granville Lake			SIL-Area 1			SIL-Area 4		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	40	52120	6.93	34	48260	20.21	407	326470	41.00
White Sucker	530	505020	67.12	24	13590	5.69	1	120	0.02
Shorthead Redhorse	5	2590	0.34	-	-	-	-	-	-
Northern Pike	40	50690	6.74	43	42670	17.87	102	123272	15.48
Cisco	18	5540	0.74	48	21520	9.01	256	73210	9.19
Lake Whitefish	67	62295	8.28	63	61960	25.95	261	132514	16.64
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	22	41880	5.57	43	37790	15.83	155	140350	17.63
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	22	2030	0.27	1	120	0.05	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	135	24860	3.30	40	5820	2.44	1	370	0.05
Walleye	8	5400	0.72	12	7050	2.95	-	-	-
Total	887	752425	100	308	238780	100	1183	796306	100

n = number of fish measured (may not equal number of fish caught) and % = proportion of total biomass

Table 4.6-6. Small mesh index gillnet biomass summaries from Upper Churchill River Region waterbodies, 2009.

Species	Granville Lake			SIL-Area 1			SIL-Area 4		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	5	22	0.19	-	-	-	-	-	-
Spottail Shiner	31	46	0.39	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	100	2.27
White Sucker	4	2520	21.31	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	3	2490	21.06	-	-	-	-	-	-
Cisco	4	310	2.62	-	-	-	3	200	4.54
Lake Whitefish	2	1330	11.25	1	190	89.62	3	1280	29.02
Troutperch	96	462	3.91	1	17	8.02	3	50	1.13
Burbot	-	-	-	-	-	-	3	2780	63.04
Slimy Sculpin	-	-	-	1	5	2.36	-	-	-
Yellow Perch	21	132	1.12	-	-	-	-	-	-
Logperch	3	8	0.07	-	-	-	-	-	-
Sauger	24	3055	25.84	-	-	-	-	-	-
Walleye	2	1450	12.26	-	-	-	-	-	-
Total	195	11825	100	3	212	100	13	4410	100

n = number of fish measured (may not equal number of fish caught) and % = proportion 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, 2009.

Species	Granville Lake (# sites=12)			SIL-Area 1 (# sites = 12)			SIL-Area 4 (# sites = 24)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	40	3.3	6.98	34	3.6	5.18	407	18.9	14.23
White Sucker	530	43.9	27.16	24	2.5	2.61	1	0.1	-
Shorthead Redhorse	5	0.4	0.85	-	-	-	-	-	-
Northern Pike	40	3.3	2.89	43	4.4	7.79	102	4.7	6.29
Cisco	18	1.4	2.22	48	5.1	6.56	256	12.0	13.96
Lake Whitefish	67	5.7	10.04	63	6.7	7.18	261	11.8	8.52
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	22	1.9	2.37	43	4.5	3.30	155	7.2	6.08
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	22	1.7	2.04	1	0.1	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	135	11.2	8.24	40	4.1	6.68	1	0.1	-
Walleye	8	0.7	1.32	12	1.2	2.79	-	-	-
Total	887	73.5	23.68	308	32.2	13.1	1183	54.5	25.48

#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, 2009.

Species	Granville Lake (# sites = 4)			SIL-Area 1 (# sites = 1)			SIL-Area 4 (# sites = 3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	5	1.4	2.75	-	-	-	-	-	-
Spottail Shiner	31	8.6	17.29	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	0.5	-
White Sucker	4	1.3	1.87	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	3	0.9	0.60	-	-	-	-	-	-
Cisco	4	1.2	1.56	-	-	-	3	1.2	2.09
Lake Whitefish	2	0.6	1.10	1	1.3	-	3	1.2	1.18
Troutperch	96	26.9	49.02	1	1.3	-	3	1.4	2.49
Burbot	-	-	-	-	-	-	3	1.2	2.09
Slimy Sculpin	-	-	-	1	1.3	-	-	-	-
Yellow Perch	21	5.9	11.71	-	-	-	-	-	-
Logperch	3	0.8	1.67	-	-	-	-	-	-
Sauger	24	6.9	4.85	-	-	-	-	-	-
Walleye	2	0.7	1.32	-	-	-	-	-	-
Total	195	55.1	72.81	3	4.0	-	13	5.5	3.05

#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, 2009.

Species	Granville Lake (# sites = 12)			SIL-Area 1 (# sites = 12)			SIL-Area 4 (# sites = 24)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-		-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	40	4303	9756	34	5159	7765	407	15134	14246
White Sucker	530	41850	28372	24	1396	1464	1	5	-
Shorthead Redhorse	5	210	390	-	-	-	-	-	-
Northern Pike	40	4223	3586	43	4727	7940	102	5892	7942
Cisco	18	452	597	48	2295	2847	256	3411	4033
Lake Whitefish	67	5318	11304	63	6664	8607	261	6915	5922
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	22	3329	4755	43	3961	2864	155	6484	5252
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	22	158	182	1	12	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-
Sauger	135	2068	1612	40	596	920	1	17	-
Walleye	8	504	966	12	701	1641	-	-	-
Total	887	62417	20656	308	25511	11660	1183	37856	21028

#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 4.6-10. Mean biomass-per-unit-effort (BPUE) (g/30 m/24 h) calculated for fish species captured in small mesh index gill nets set in Upper Churchill River Region waterbodies, 2009.

Species	Granville Lake (# sites = 4)			SIL-Area 1 (# sites = 1)			SIL-Area 4 (# sites = 3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-
Emerald Shiner	5	6	12	-	-	-	-	-	-
Spottail Shiner	31	13	26	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	48	-
White Sucker	4	816	1404	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	3	735	575	-	-	-	-	-	-
Cisco	4	88	137	-	-	-	3	80	139
Lake Whitefish	2	366	733	1	255	-	3	504	589
Troutperch	96	129	234	1	23	-	3	24	42
Burbot	-	-	-	-	-	-	3	1116	1934
Slimy Sculpin	-	-	-	1	7	-	-	-	-
Yellow Perch	21	37	74	-	-	-	-	-	-
Logperch	3	2	4	-	-	-	-	-	-
Sauger	24	875	917	-	-	-	-	-	-
Walleye	2	479	958	-	-	-	-	-	-
Total	195	3546	3009	1	284	-	13	1773	1944

#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 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 index gill nets set in Upper Churchill River Region waterbodies, 2009.

Species	Granville Lake			SIL-Area 1			SIL-Area 4		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	40	548	109	43	540	64	102	572	68
Lake Whitefish	67	366	83	63	370	87	261	337	67
Walleye	8	382	64	12	359	67	-	-	-
Weight (g)									
Northern Pike	38	1334	652	41	1041	337	97	1271	420
Lake Whitefish	66	944	583	62	999	593	251	528	248
Walleye	8	675	325	12	588	303	-	-	-
Condition Factor (K)									
Northern Pike	38	0.70	0.06	41	0.66	0.08	97	0.65	0.08
Lake Whitefish	66	1.61	0.19	62	1.66	0.20	251	1.31	0.13
Walleye	8	1.10	0.14	12	1.17	0.09	-	-	-

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 4.6-12. 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 Churchill River Region waterbodies, 2009.

Species	Granville Lake			SIL-Area 1			SIL-Area 4		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
Northern Pike	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-
Weight (g)									
Northern Pike	3	830	316	-	-	-	-	-	-
Lake Whitefish	2	665	-	1	190	-	3	427	-
Walleye	2	725	-	-	-	-	-	-	-
Condition Factor (K)									
Northern Pike	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-

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 4.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

Age	Year-Class	Granville Lake		SIL-Area 1		SIL-Area 4	
		n	%	n	%	n	%
1	2008	-	-	-	-	-	-
2	2007	-	-	-	-	-	-
3	2006	3	7.50	-	-	-	-
4	2005	4	10.00	-	-	1	0.99
5	2004	3	7.50	4	9.52	3	2.97
6	2003	5	12.50	8	19.05	6	5.94
7	2002	3	7.50	4	9.52	15	14.85
8	2001	5	12.50	12	28.57	9	8.91
9	2000	4	10.00	6	14.29	18	17.82
10	1999	7	17.50	5	11.90	25	24.75
11	1998	2	5.00	3	7.14	11	10.89
12	1997	-	-	-	-	5	4.95
13	1996	3	7.50	-	-	3	2.97
14	1995	1	2.50	-	-	2	1.98
15	1994	-	-	-	-	1	0.99
16	1993	-	-	-	-	1	0.99
17	1992	-	-	-	-	1	0.99
Total		40	100	42	100	101	100

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

Table 4.6-14. Age/year-class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

Age	Year-Class	Granville Lake		SIL-Area 1		SIL-Area 4	
		n	%	n	%	n	%
1	2008	-	-	-	-	-	-
2	2007	7	10.45	2	3.23	-	-
3	2006	8	11.94	5	8.06	1	0.39
4	2005	8	11.94	8	12.90	1	0.39
5	2004	2	2.99	3	4.84	1	0.39
6	2003	4	5.97	7	11.29	12	4.72
7	2002	14	20.90	17	27.42	7	2.76
8	2001	7	10.45	10	16.13	25	9.84
9	2000	3	4.48	3	4.84	41	16.14
10	1999	4	5.97	2	3.23	98	38.58
11	1998	3	4.48	5	8.06	15	5.91
12	1997	3	4.48	-	-	17	6.69
13	1996	-	-	-	-	15	5.91
14	1995	2	2.99	-	-	6	2.36
15	1994	2	2.99	-	-	6	2.36
16	1993	-	-	-	-	4	1.57
17	1992	-	-	-	-	1	0.39
18	1991	-	-	-	-	1	0.39
19	1990	-	-	-	-	3	1.18
20	1989	-	-	-	-	-	-
21	1988	-	-	-	-	-	-
22	1987	-	-	-	-	-	-
23	1988	-	-	-	-	-	-
Total		67	100	62	100	254	100

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

Table 4.6-15. Age/year-class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

Age	Year-Class	Granville Lake		SIL-Area 1		SIL-Area 4	
		n	%	n	%	n	%
1	2008	-	-	-	-	-	-
2	2007	-	-	-	-	-	-
3	2006	-	-	1	8.33	-	-
4	2005	2	25.00	-	-	-	-
5	2004	-	-	1	8.33	-	-
6	2003	-	-	3	25.00	-	-
7	2002	-	-	1	8.33	-	-
8	2001	1	12.50	2	16.67	-	-
9	2000	-	-	2	16.67	-	-
10	1999	1	12.50	1	8.33	-	-
11	1998	1	12.50	-	-	-	-
12	1997	1	12.50	1	8.33	-	-
13	1996	-	-	-	-	-	-
14	1995	1	12.50	-	-	-	-
15	1994	1	12.50	-	-	-	-
16	1993	-	-	-	-	-	-
17	1992	-	-	-	-	-	-
18	1991	-	-	-	-	-	-
19	1990	-	-	-	-	-	-
Total		8	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, 2009.

Age	Year-Class	Granville Lake									SIL-Area 1								
		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	2006	3	335	76	2	405	21	2	0.70	0.01	-	-	-	-	-	-	-	-	-
4	2005	4	414	49	3	427	102	3	0.70	0.05	-	-	-	-	-	-	-	-	-
5	2004	3	450	9	3	623	95	3	0.70	0.07	4	525	130	3	723	355	3	0.60	0.12
6	2003	5	527	23	5	984	121	5	0.70	0.02	8	515	50	8	958	264	8	0.70	0.03
7	2002	3	497	86	3	867	395	3	0.70	0.05	4	559	62	4	1185	429	4	0.70	0.06
8	2001	5	592	47	5	1424	348	5	0.70	0.04	12	544	54	12	1128	370	12	0.70	0.10
9	2000	4	640	49	4	2023	461	4	0.80	0.08	6	566	52	6	1140	348	6	0.60	0.07
10	1999	7	630	36	7	1763	327	7	0.70	0.08	5	550	36	5	1052	186	5	0.60	0.07
11	1998	2	607	49	2	1575	460	2	0.70	0.04	3	566	36	2	1025	106	2	0.60	0.01
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	3	654	31	3	2037	441	3	0.70	0.07	-	-	-	-	-	-	-	-	-
14	1995	1	682	-	1	2400	-	1	0.80	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	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 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	2008	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-
4	2005	1	438	-	1	620	-	1	0.70	-
5	2004	3	483	17	2	795	64	2	0.70	0.04
6	2003	6	517	29	6	892	186	6	0.60	0.05
7	2002	15	517	56	13	985	238	13	0.70	0.04
8	2001	9	570	39	9	1202	220	9	0.70	0.09
9	2000	18	560	54	18	1197	302	18	0.70	0.08
10	1999	25	591	59	24	1300	312	24	0.60	0.05
11	1998	11	624	59	10	1547	471	10	0.60	0.09
12	1997	5	636	49	5	1648	433	5	0.60	0.07
13	1996	3	599	37	3	1607	224	3	0.70	0.07
14	1995	2	588	122	2	1375	1039	2	0.60	0.13
15	1994	1	666	-	1	2040	-	1	0.70	-
16	1993	1	636	-	1	1760	-	1	0.70	-
17	1992	1	722	-	1	2800	-	1	0.70	-

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, 2009.

Age	Year-Class	Granville Lake									SIL-Area 1								
		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	7	233	10	7	169	34	7	1.30	0.19	2	209	47	2	170	85	2	1.80	0.28
3	2006	8	257	12	8	258	41	8	1.50	0.14	5	199	16	5	106	30	5	1.30	0.09
4	2005	8	306	45	7	391	176	7	1.50	0.16	8	280	42	7	279	56	7	1.50	0.13
5	2004	2	350	3	2	740	28	2	1.70	0.03	3	308	33	3	497	176	3	1.60	0.09
6	2003	4	348	38	4	700	223	4	1.60	0.12	7	385	29	7	986	273	7	1.70	0.16
7	2002	14	403	32	14	1135	281	14	1.70	0.15	17	405	24	17	1160	260	17	1.70	0.12
8	2001	7	430	13	7	1326	154	7	1.70	0.08	10	423	39	10	1365	350	10	1.80	0.22
9	2000	3	432	26	3	1447	344	3	1.80	0.19	3	430	26	3	1450	420	3	1.80	0.21
10	1999	4	443	30	4	1478	307	4	1.70	0.04	2	404	57	2	1115	559	2	1.60	0.17
11	1998	3	443	38	3	1643	635	3	1.80	0.28	5	484	55	5	1976	531	5	1.70	0.13
12	1997	3	450	13	3	1583	76	3	1.70	0.10	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	2	462	28	2	1650	382	2	1.70	0.07	-	-	-	-	-	-	-	-	-
15	1994	2	475	18	2	1815	78	2	1.70	0.13	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	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 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	2008	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-
3	2006	1	178	-	1	70	-	1	1.20	-
4	2005	1	190	-	1	80	-	1	1.20	-
5	2004	1	242	-	1	200	-	1	1.40	-
6	2003	12	234	25	11	176	85	11	1.30	0.17
7	2002	7	252	29	7	207	74	7	1.30	0.08
8	2001	25	296	36	24	351	118	24	1.30	0.20
9	2000	41	315	27	41	410	129	41	1.30	0.13
10	1999	98	337	36	95	526	159	95	1.30	0.10
11	1998	15	361	28	15	630	172	15	1.30	0.15
12	1997	17	397	103	16	693	171	16	1.30	0.12
13	1996	15	384	29	15	779	173	15	1.40	0.12
14	1995	6	407	26	5	838	193	5	1.30	0.11
15	1994	6	410	28	6	1010	273	6	1.40	0.12
16	1993	4	396	14	4	903	94	4	1.50	0.10
17	1992	1	442	-	1	1040	-	1	1.20	-
18	1991	1	414	-	1	1120	-	1	1.60	-
19	1990	3	424	32	3	1110	285	3	1.40	0.14
20	1989	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-
23	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 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, 2009.

Age	Year-Class	Granville Lake									SIL-Area 1								
		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	2006	-	-	-	-	-	-	-	-	-	1	204	-	1	110	-	1	1.30	-
4	2005	2	291	30	2	245	134	2	0.90	0.25	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-	1	324	-	1	370	-	1	1.10	-
6	2003	-	-	-	-	-	-	-	-	-	3	348	7	3	503	38	3	1.20	0.05
7	2002	-	-	-	-	-	-	-	-	-	1	328	-	1	450	-	1	1.30	-
8	2001	1	394	-	1	710	-	1	1.20	-	2	366	51	2	530	170	2	1.10	0.10
9	2000	-	-	-	-	-	-	-	-	-	2	411	23	2	785	92	2	1.10	0.06
10	1999	1	372	-	1	590	-	1	1.20	-	1	382	-	1	640	-	1	1.20	-
11	1998	1	452	-	1	1140	-	1	1.20	-	-	-	-	-	-	-	-	-	-
12	1997	1	421	-	1	800	-	1	1.10	-	1	478	-	1	1340	-	1	1.20	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	1	382	-	1	660	-	1	1.20	-	-	-	-	-	-	-	-	-	-
15	1994	1	451	-	1	1010	-	1	1.10	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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			W (g) n			K n		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-
6	2003	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	-	-	-
8	2001	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-

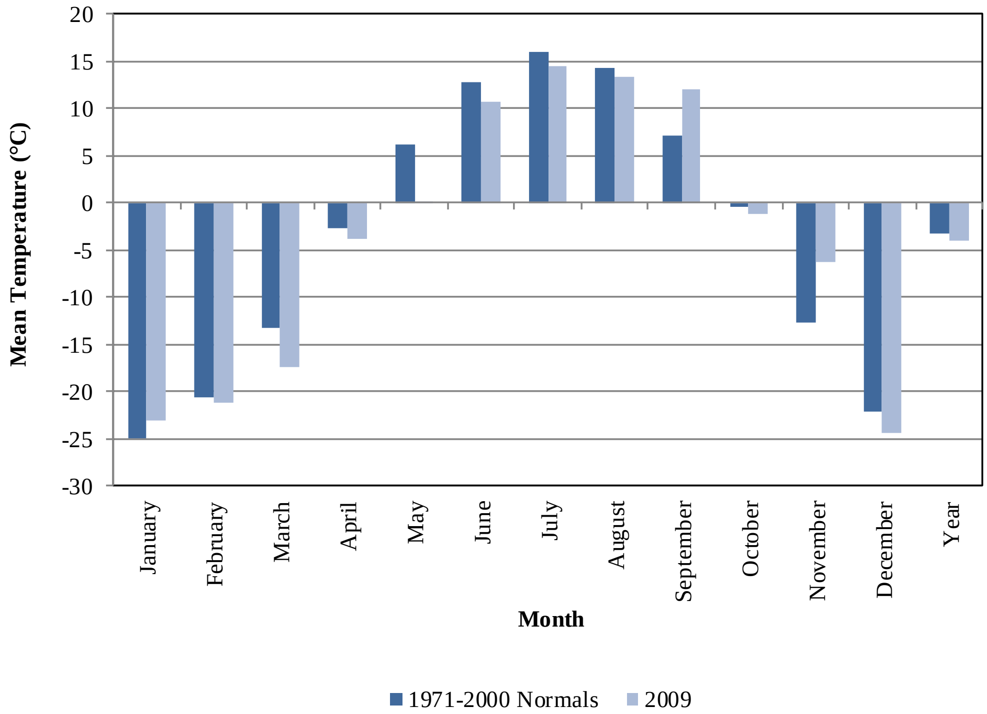
FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 4.6-19. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Granville Lake											
White Sucker	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	-	-	-	-	40	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	67	0	0
Sauger	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	8	0	0
SIL-Area 1											
White Sucker	-	-	-	-	-	-	-	-	24	0	0
Northern Pike	-	-	-	-	-	-	-	-	43	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	63	0	0
Sauger	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	12	0	0
SIL-Area 4											
White Sucker	-	-	-	-	-	-	-	-	1	0	0
Northern Pike	-	-	-	-	-	-	-	-	102	0	0
Lake Whitefish	-	-	-	-	-	-	-	-	261	0	0
Sauger	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-	-	-

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 ($n_{DELTs}/n_{Inspect} \times 100$)

(A)



(B)

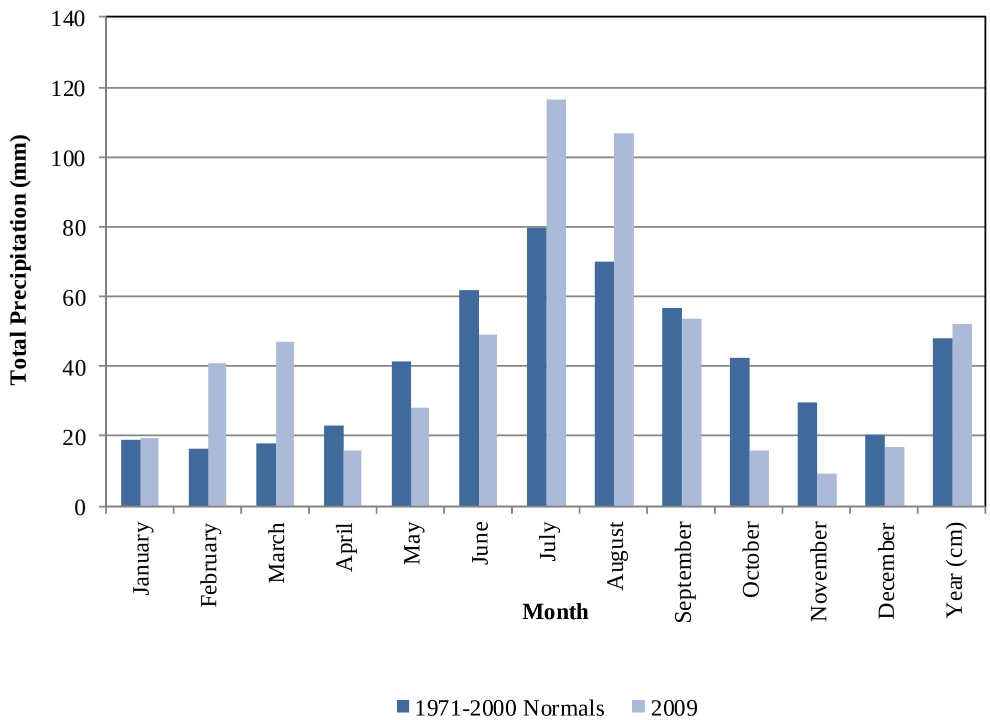


Figure 4.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), Lynn Lake, MB.

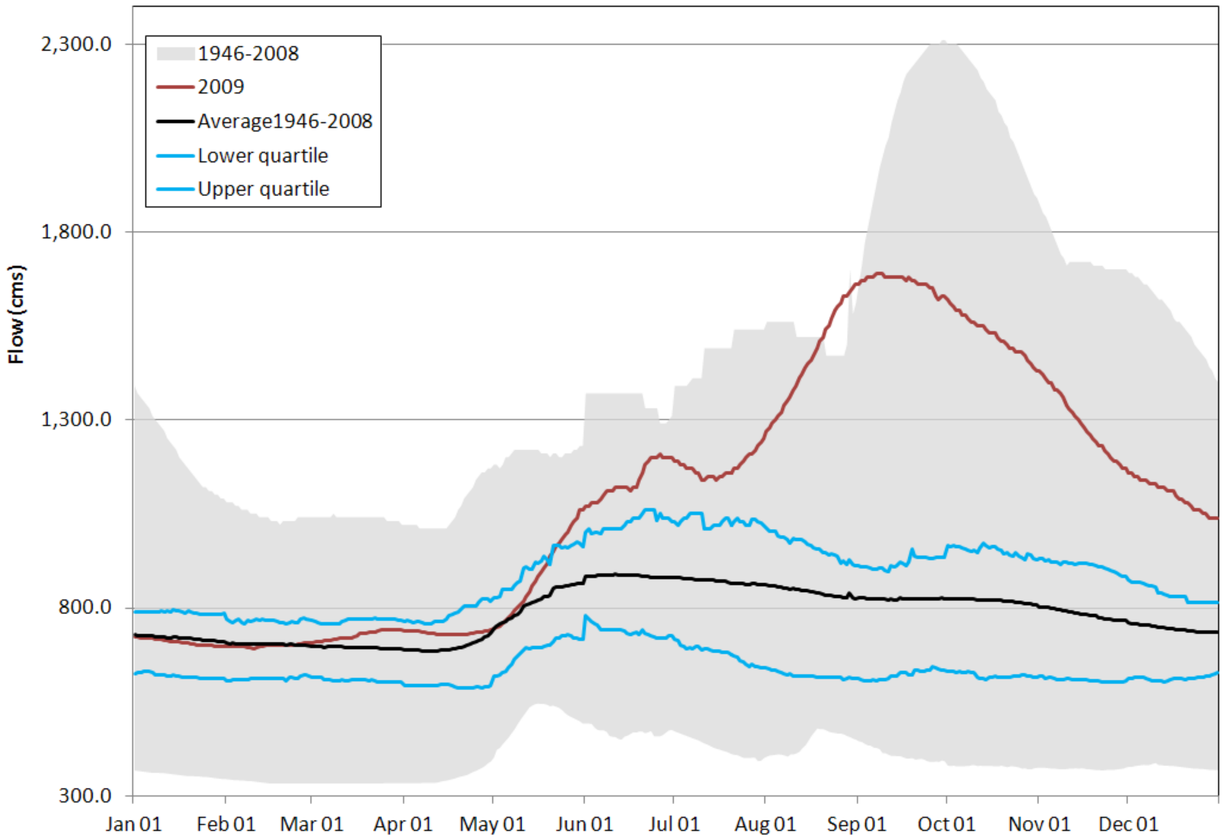


Figure 4.2-1. 2009 upper Churchill River flow at Granville Falls (06EC006).

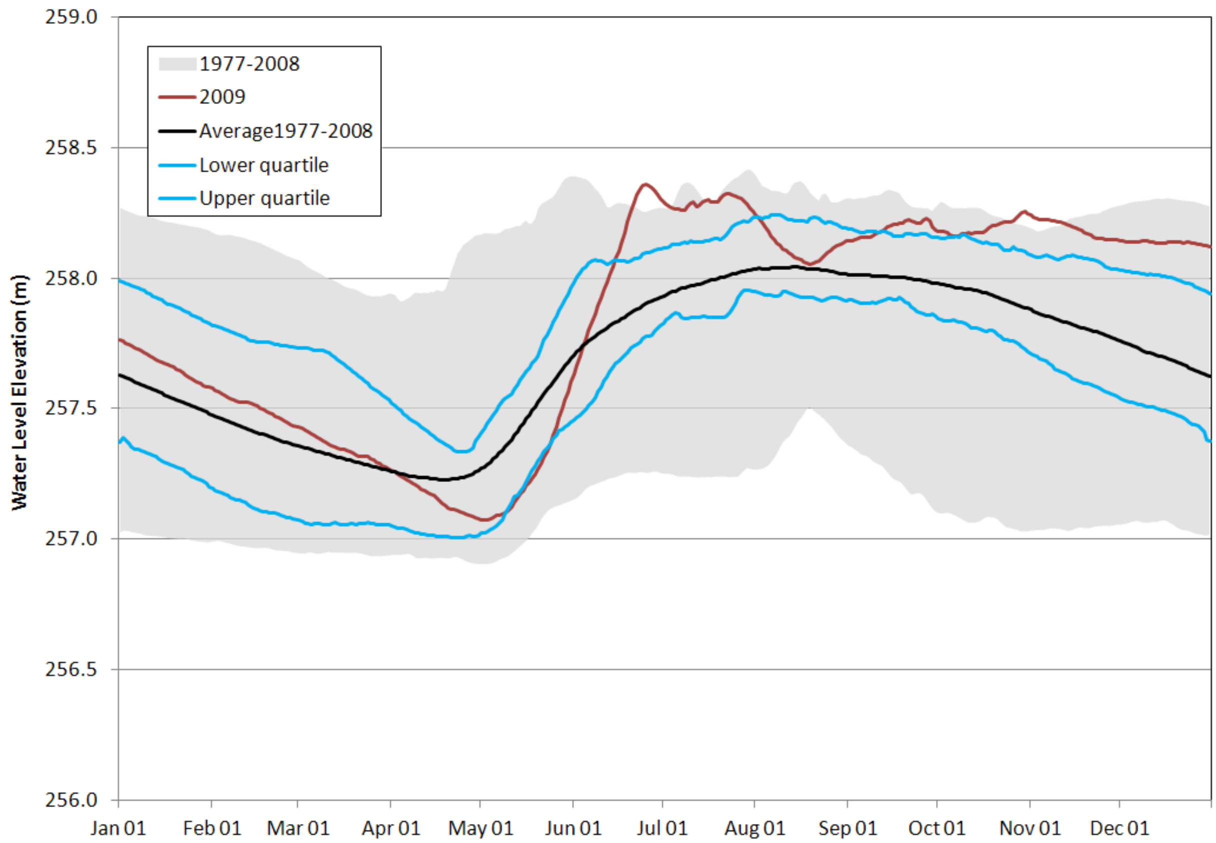


Figure 4.2-2. 2009 Southern Indian Lake average water level elevation.

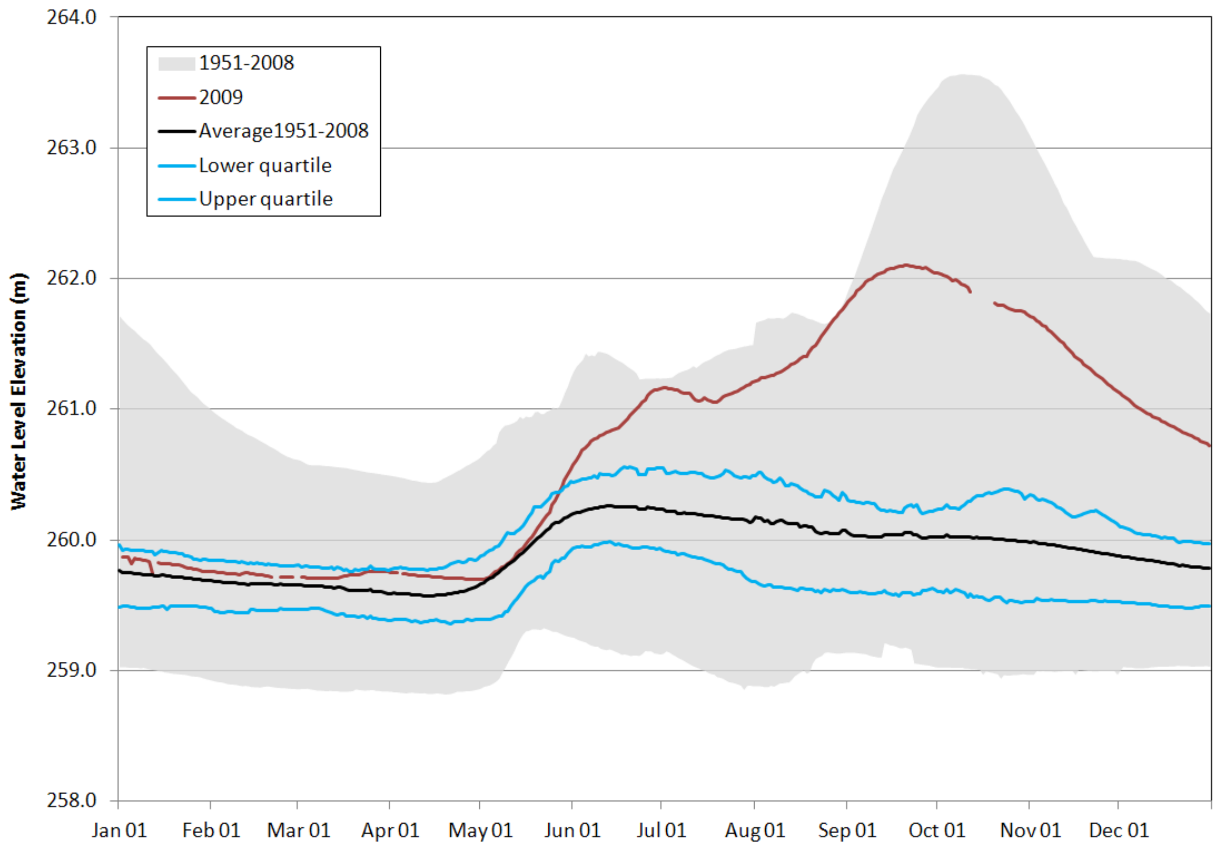


Figure 4.2-3. 2009 Granville Lake (06EB002) water level elevation.

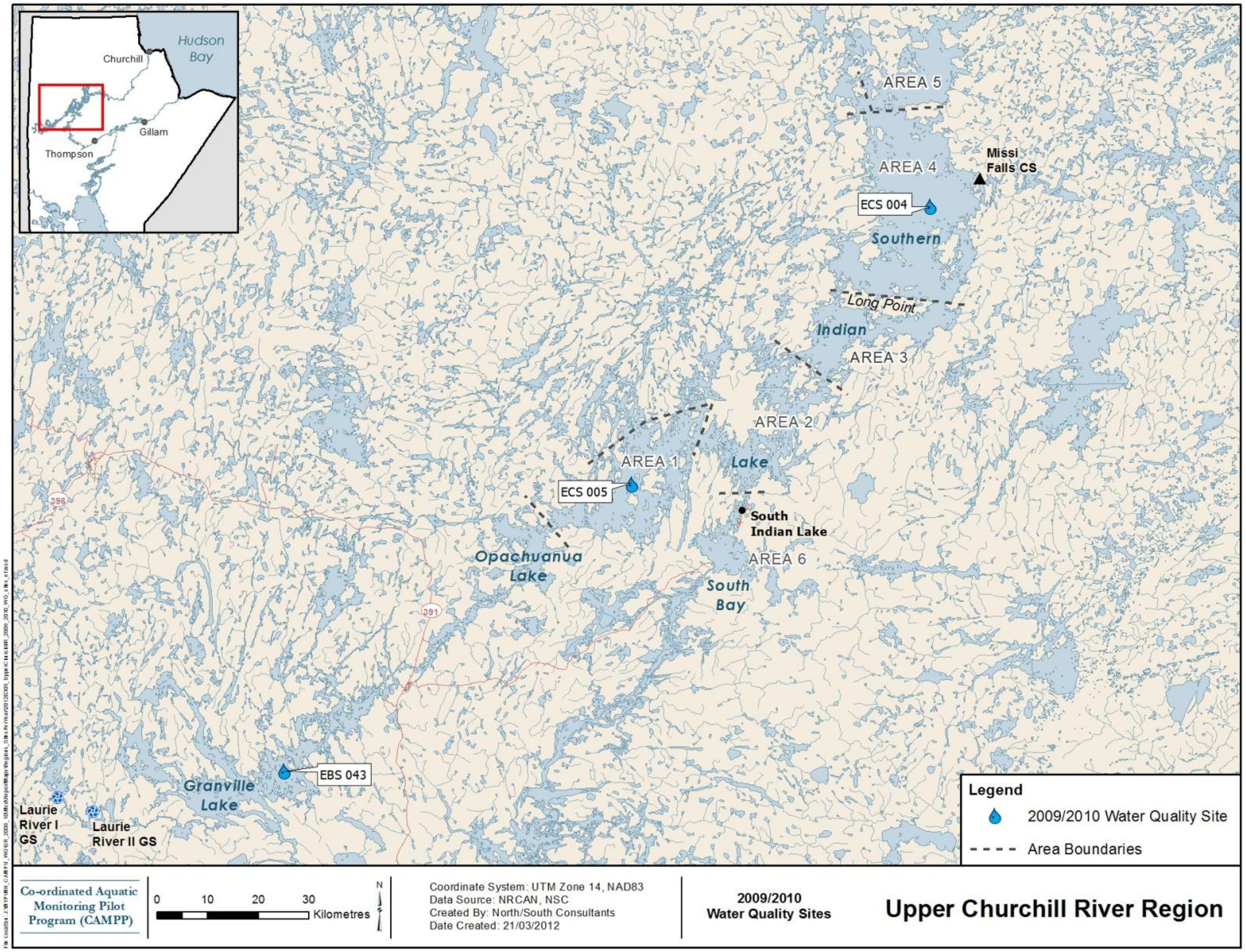


Figure 4.3-1. Water quality and phytoplankton monitoring sites in the Upper Churchill River Region: 2009/2010.

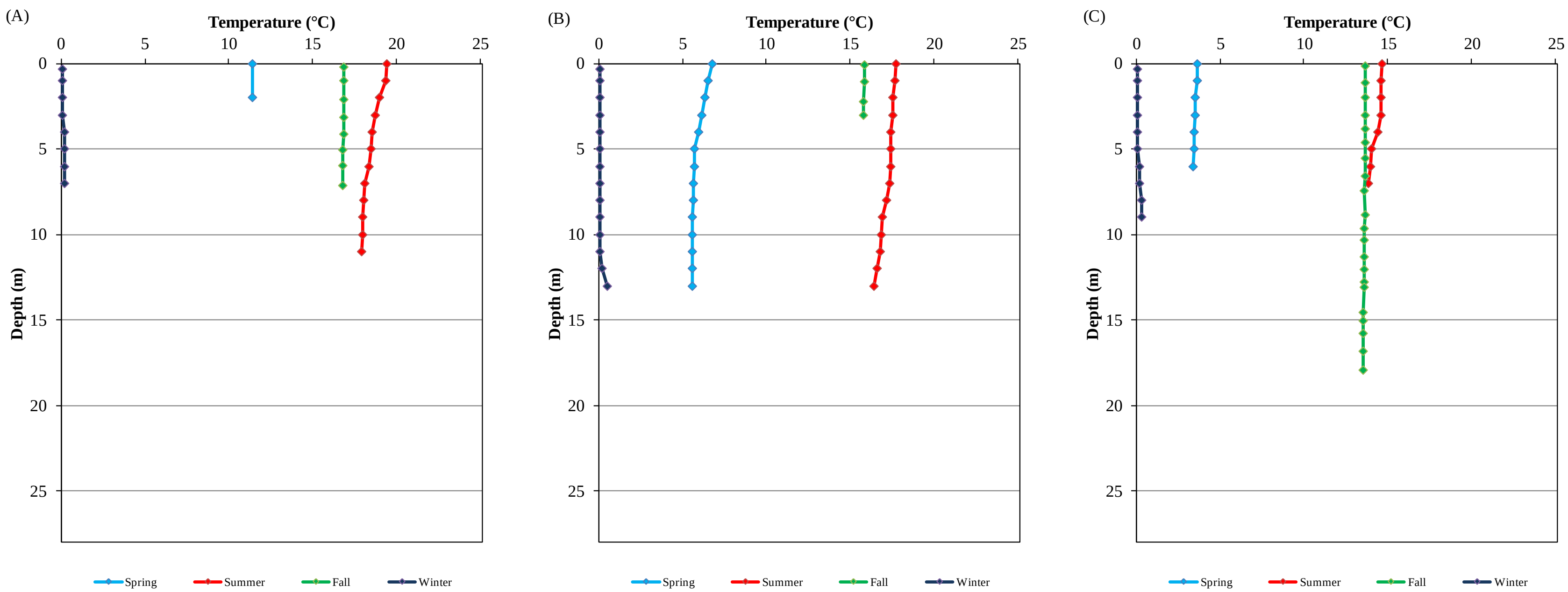


Figure 4.3-2. Water temperature profiles measured in the Upper Churchill River Region in 2009/2010: (A) Granville Lake; (B) Southern Indian Lake-Area 1; and (C) Southern Indian Lake-Area 4.

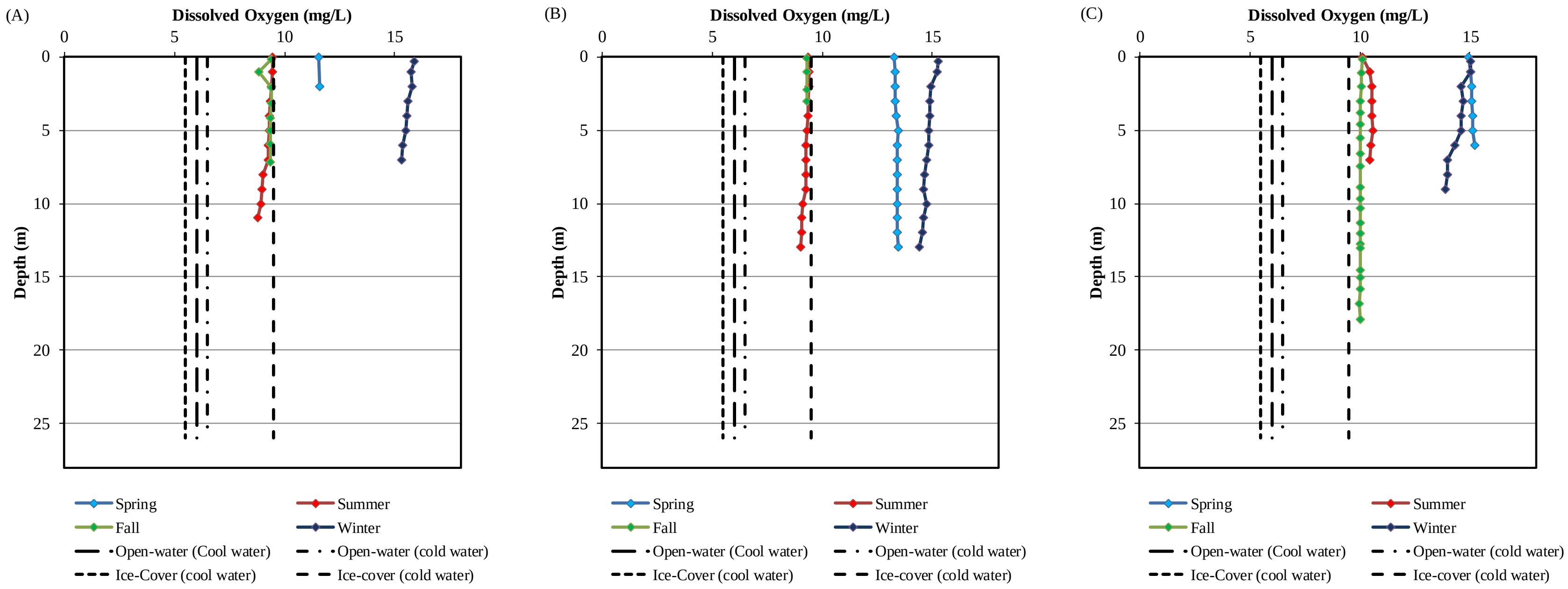


Figure 4.3-3. Dissolved oxygen depth profiles measured in the Upper Churchill River Region in 2009/2010: (A) Granville Lake; (B) Southern Indian Lake-Area 1; and (C) Southern Indian Lake-Area 4. Dashed lines represent selected MWQSOGs for PAL.

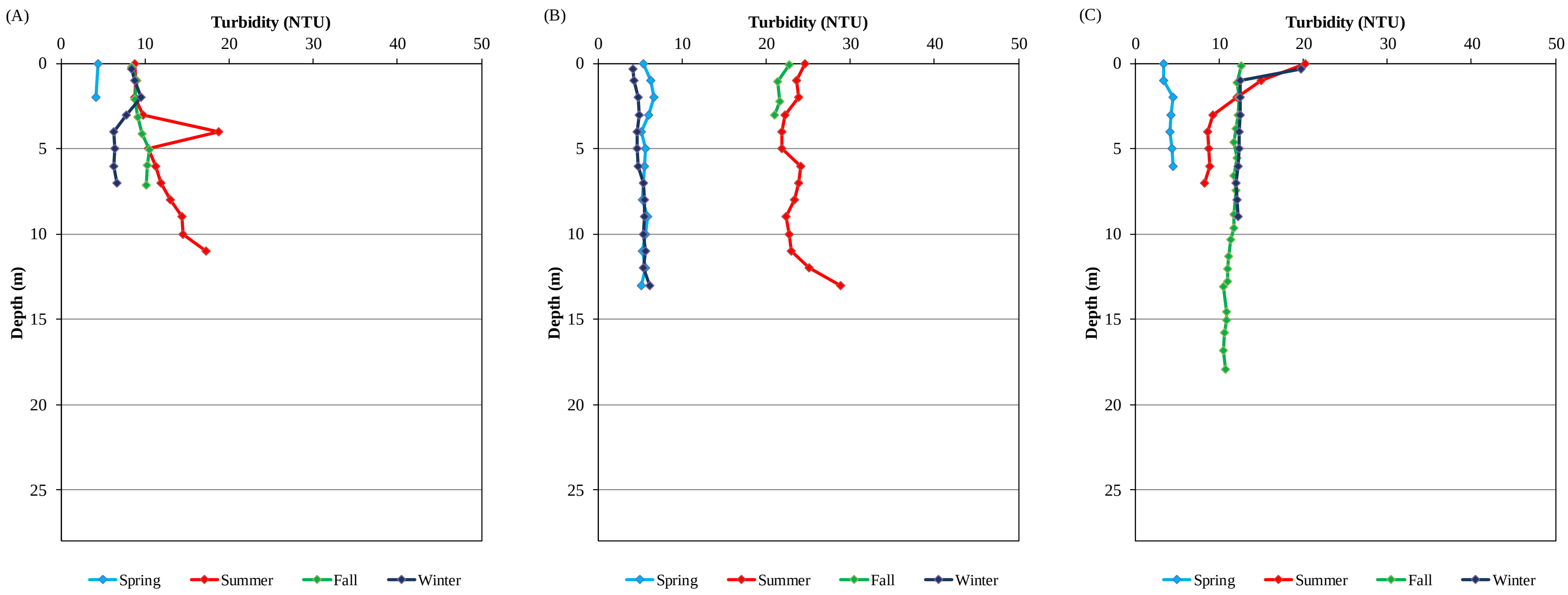


Figure 4.3-4. Turbidity depth profiles measured in the Upper Churchill River Region in 2009/2010: (A) Granville Lake; (B) Southern Indian Lake-Area 1; and (C) Southern Indian Lake-Area 4.

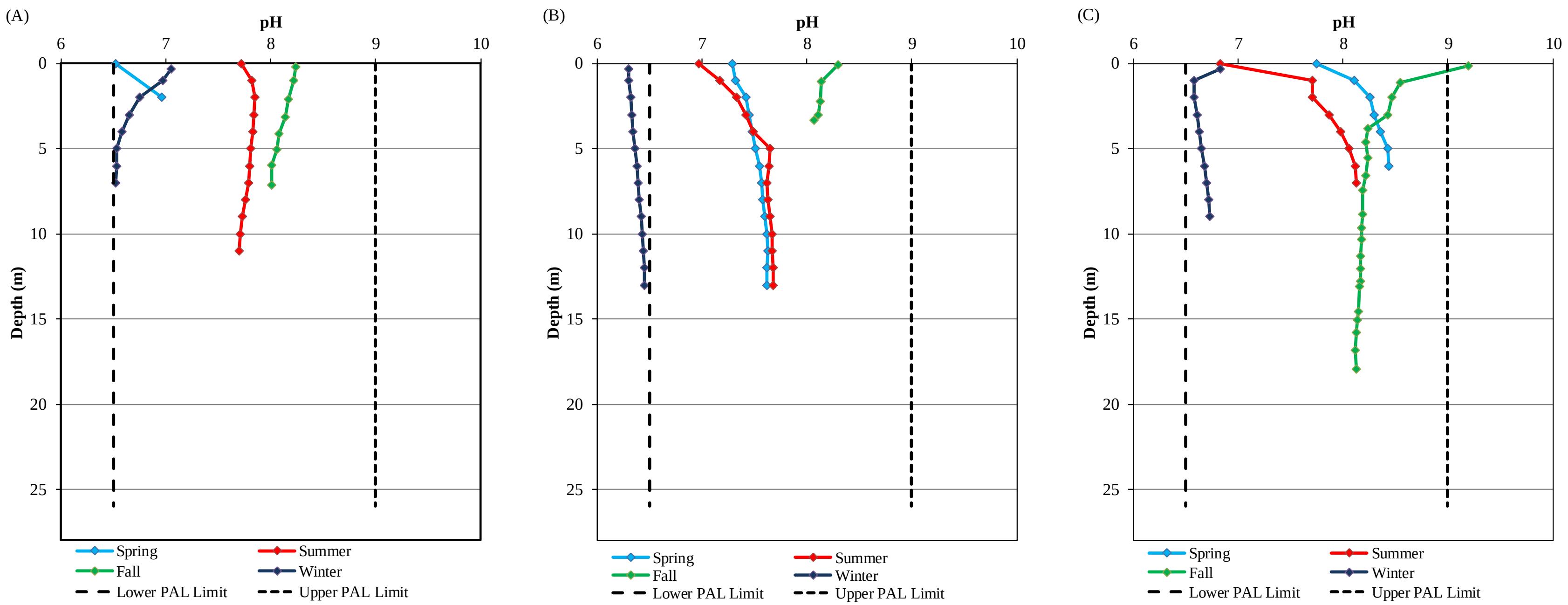


Figure 4.3-5. pH depth profiles measured in the Upper Churchill River Region in 2009/2010: (A) Granville Lake; (B) Southern Indian Lake-Area 1; and (C) Southern Indian Lake-Area 4.

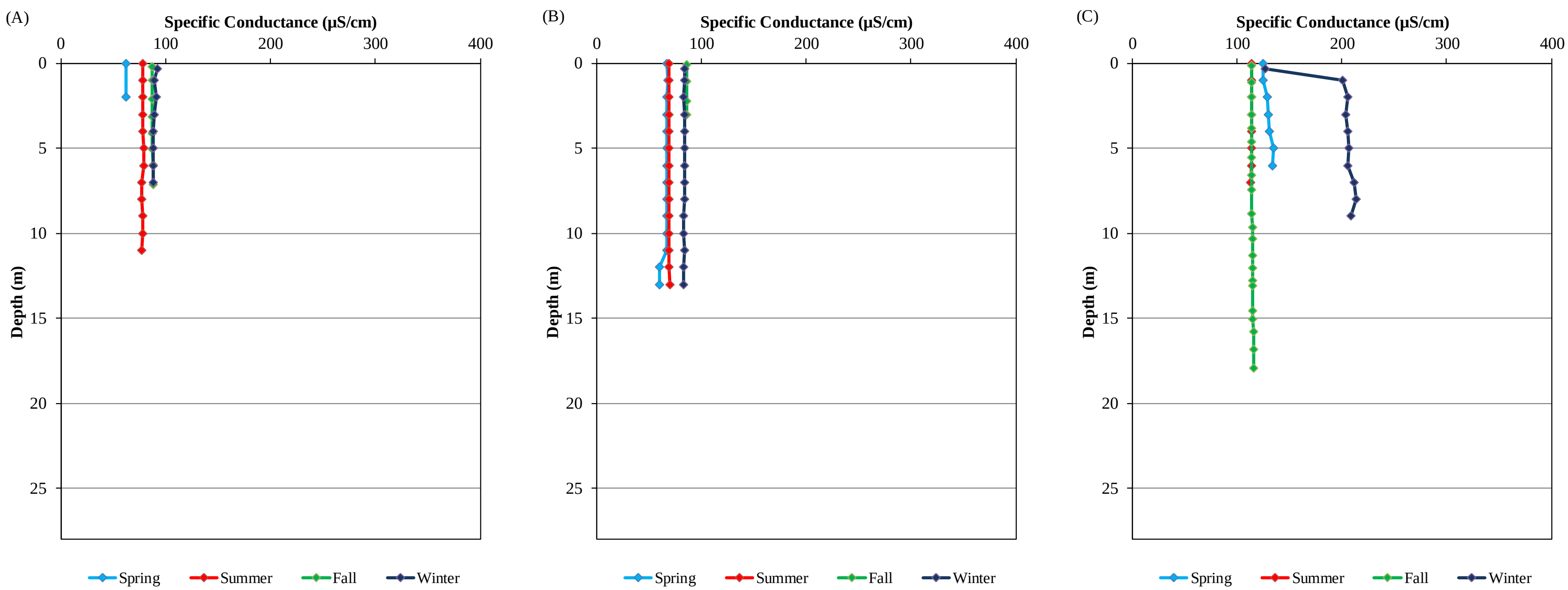


Figure 4.3-6. Specific conductance depth profiles measured in the Upper Churchill River Region in 2009/2010: (A) Granville Lake; (B) Southern Indian Lake-Area 1; and (C) Southern Indian Lake-Area 4.

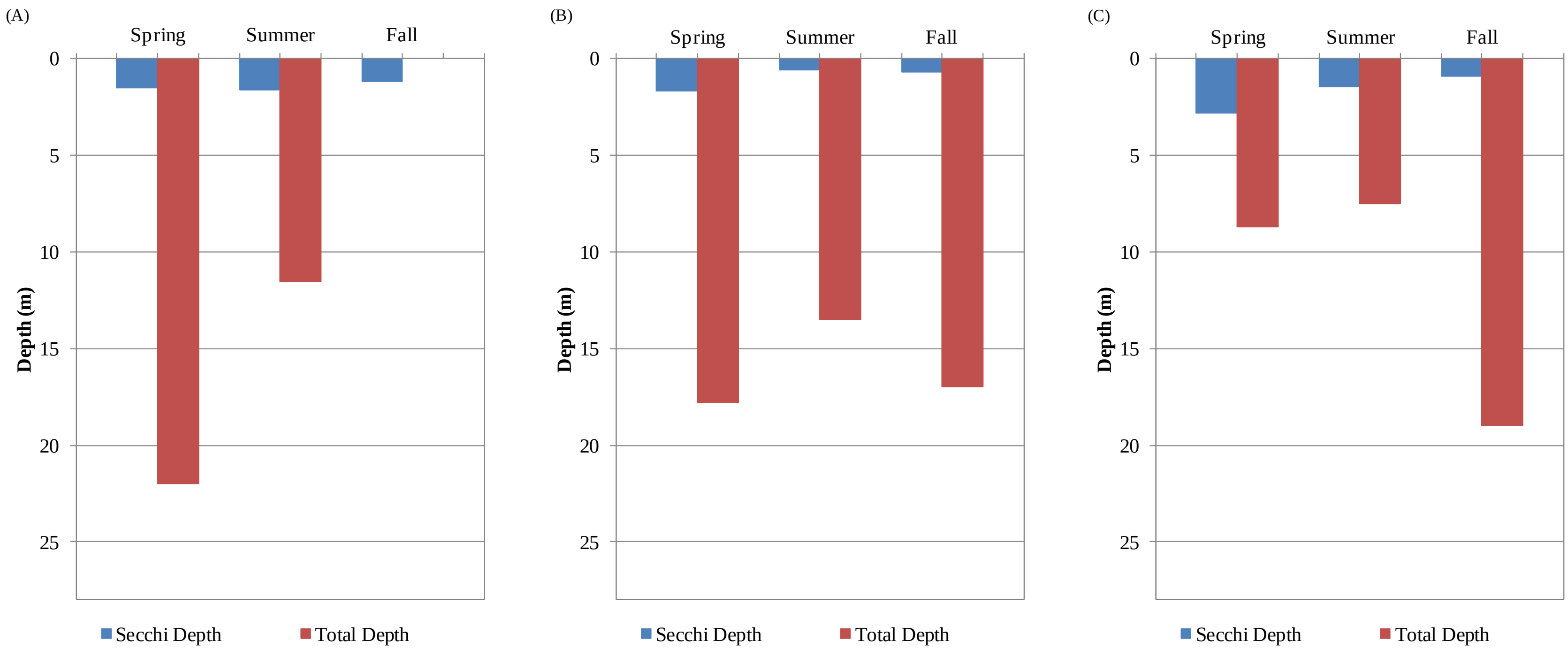


Figure 4.3-7. Secchi disk depths measured in the Upper Churchill River Region in 2009/2010: (A) Granville Lake; (B) Southern Indian Lake-Area 1; and (C) Southern Indian Lake-Area 4.

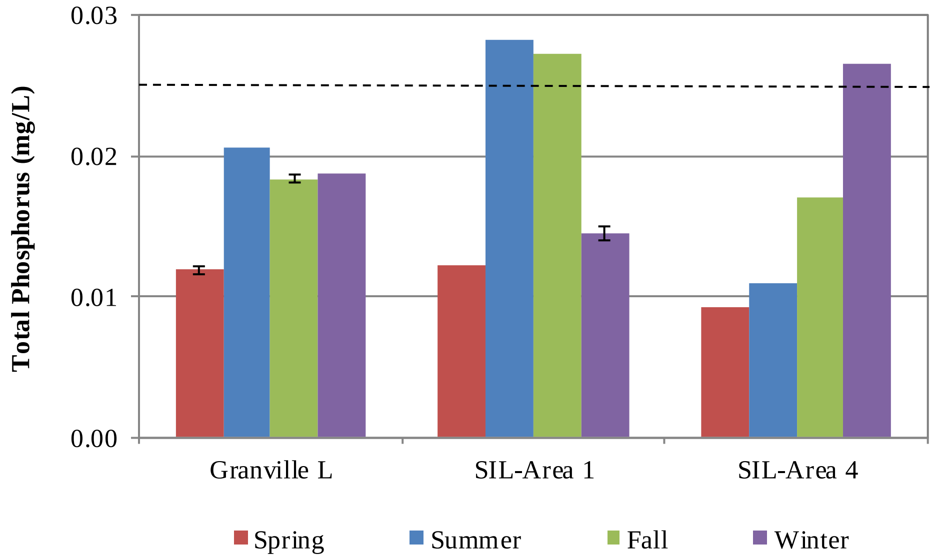


Figure 4.3-8. Total phosphorus measured in surface grabs in the Upper Churchill River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

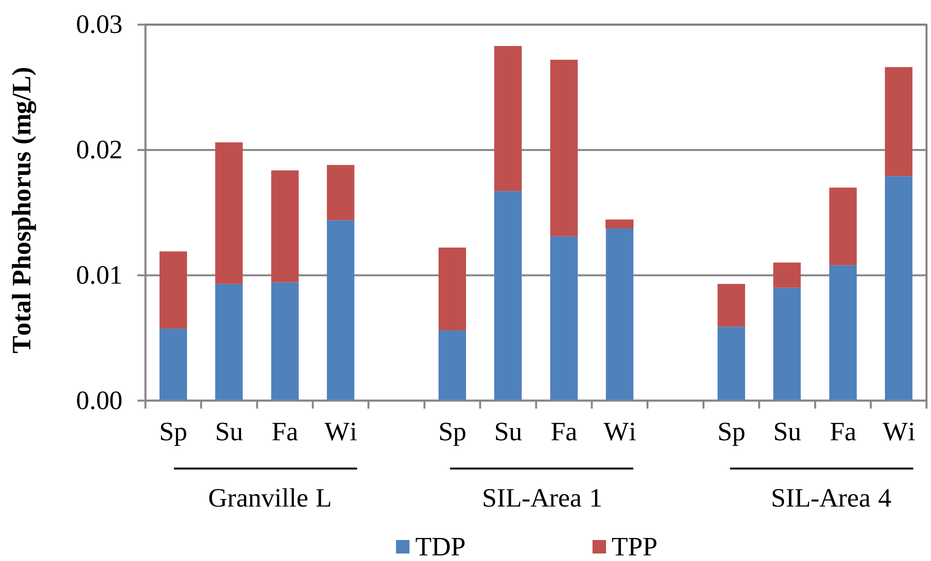


Figure 4.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Upper Churchill River Region: 2009/2010.

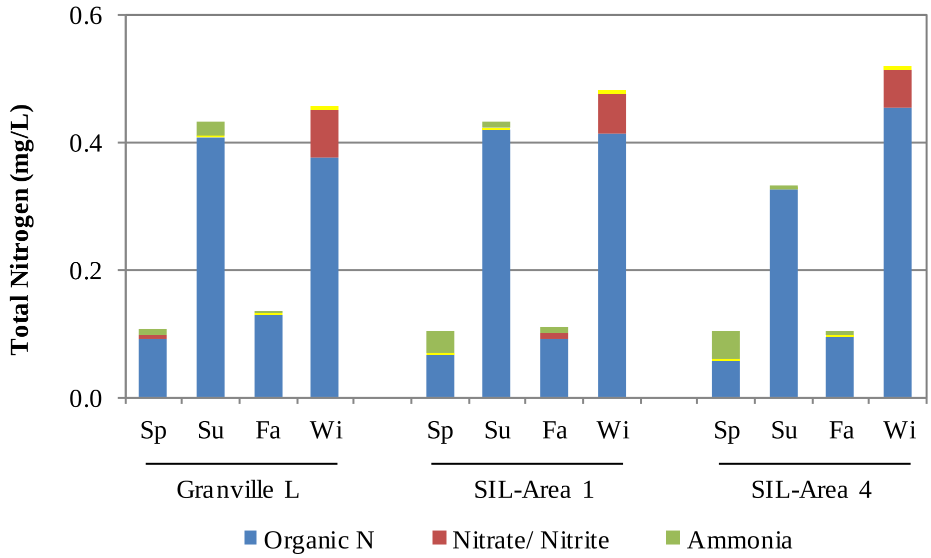
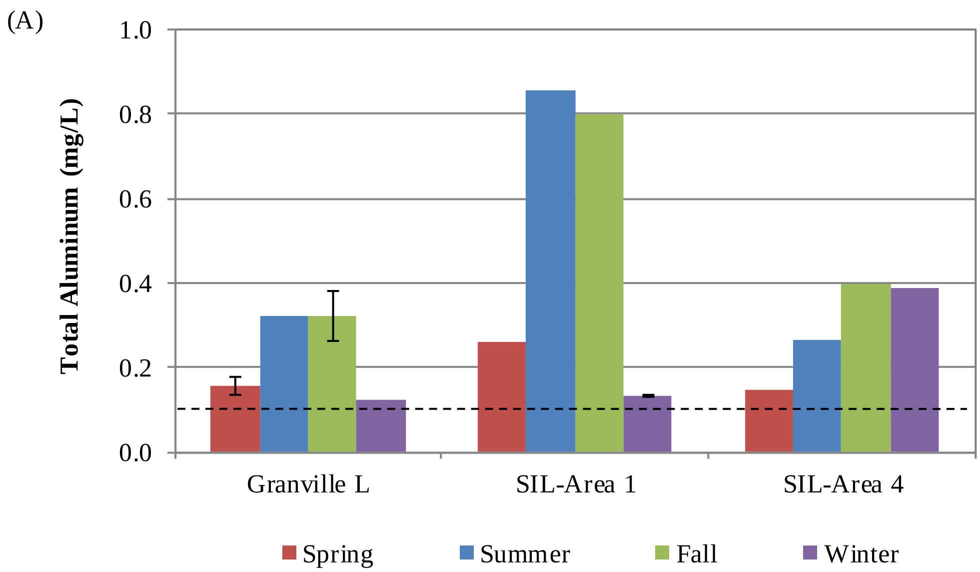


Figure 4.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Upper Churchill River Region: 2009/2010. Yellow bars represent values that were below the analytical detection limit.



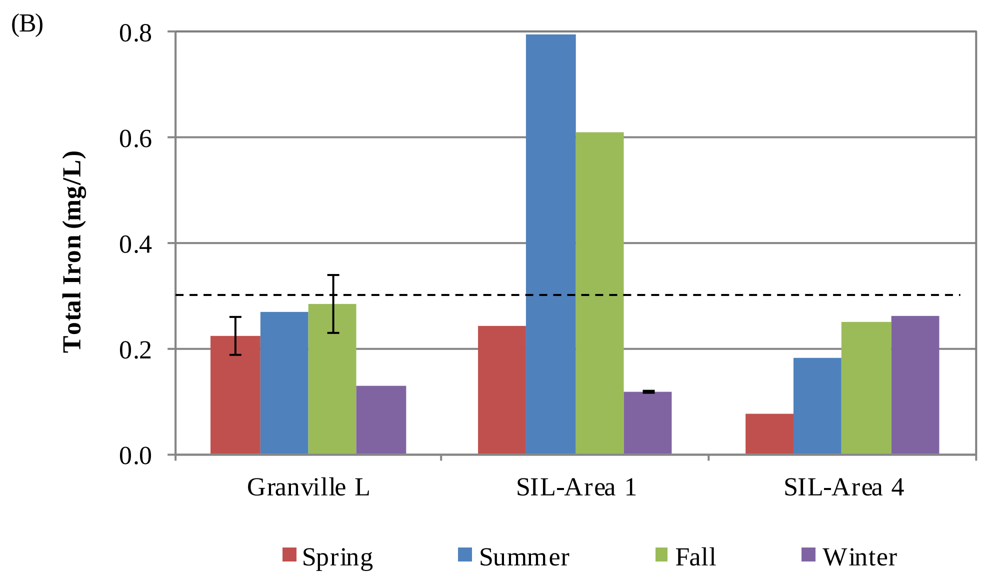


Figure 4.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Upper Churchill River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

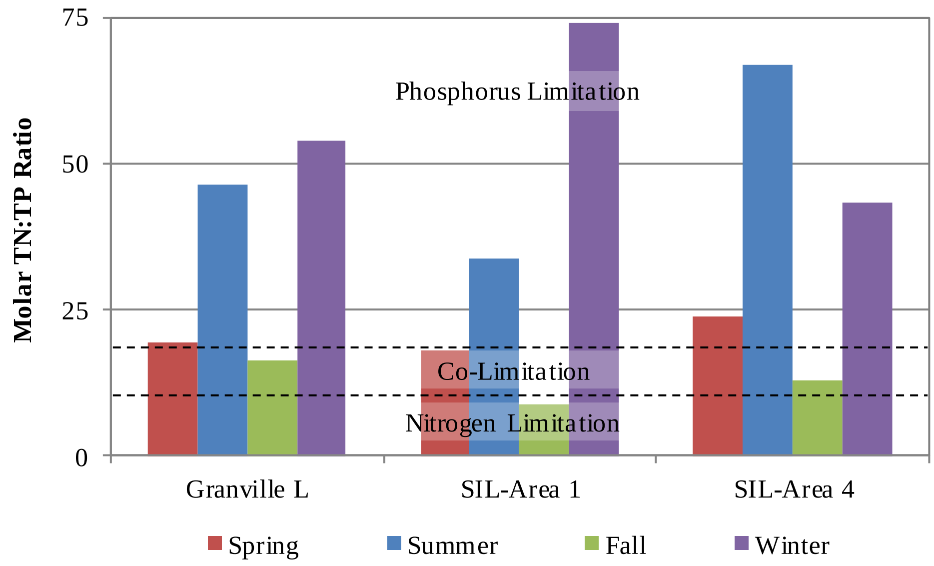


Figure 4.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Upper Churchill River Region: 2009/2010.

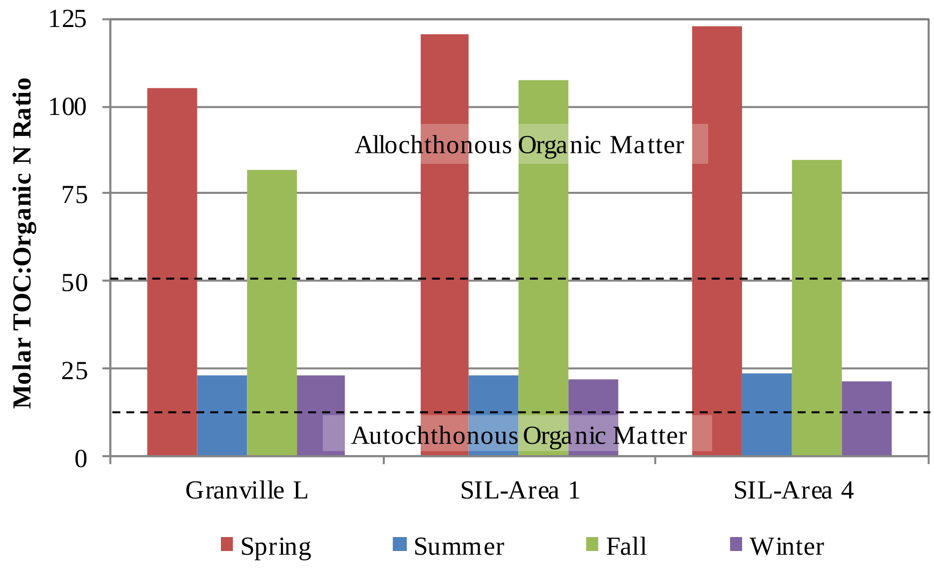
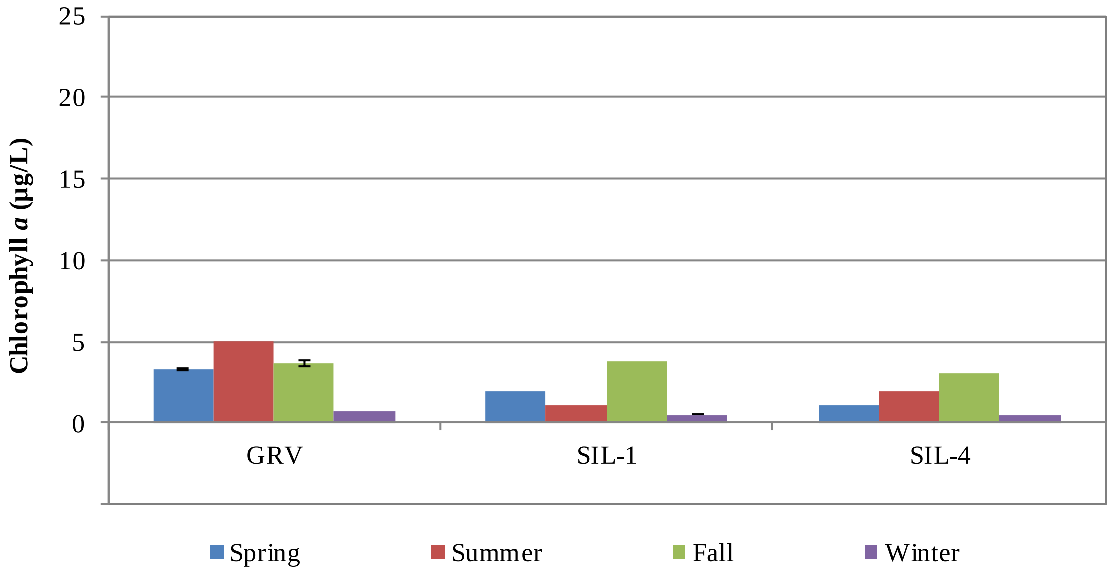


Figure 4.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Upper Churchill River Region: 2009/2010.

(A) Surface



(B) Euphotic

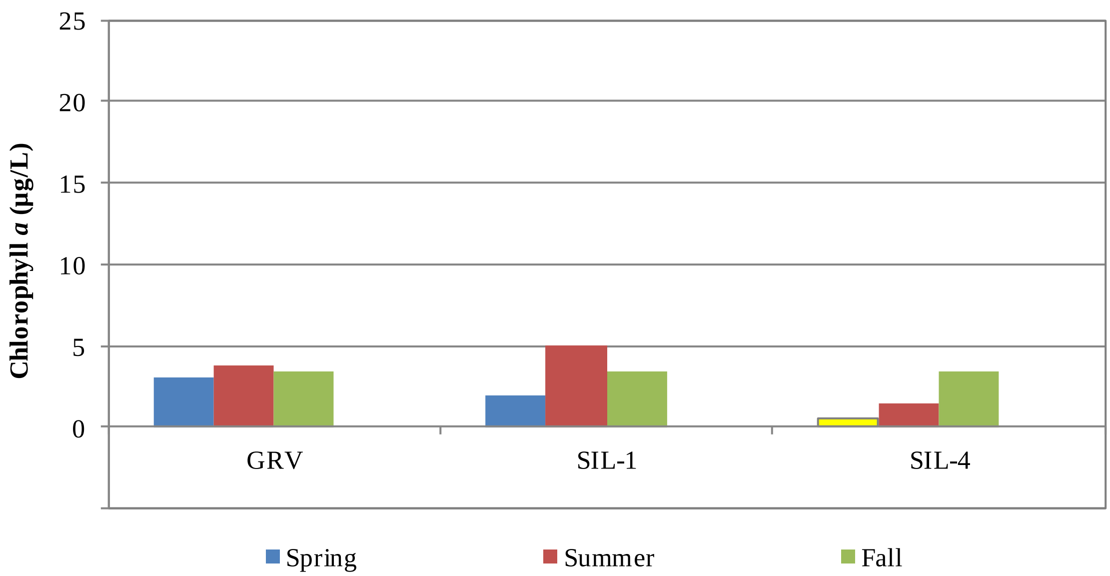


Figure 4.4-1. Chlorophyll *a* concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Upper Churchill River Region in 2009/2010. Yellow bars represent values that were below the analytical detection limit; error bars represent the standard error of triplicate samples.

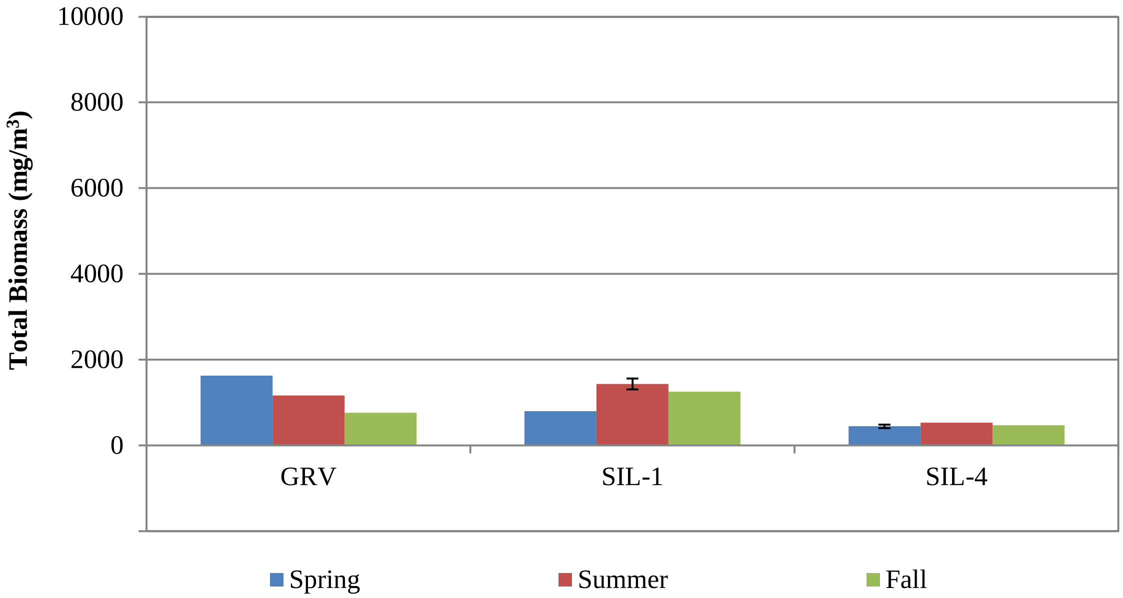


Figure 4.4-2. Phytoplankton biomass measured at sites in the Upper Churchill River Region in 2009/2010. Error bars represent the standard error of samples analysed in duplicate for quality assurance.

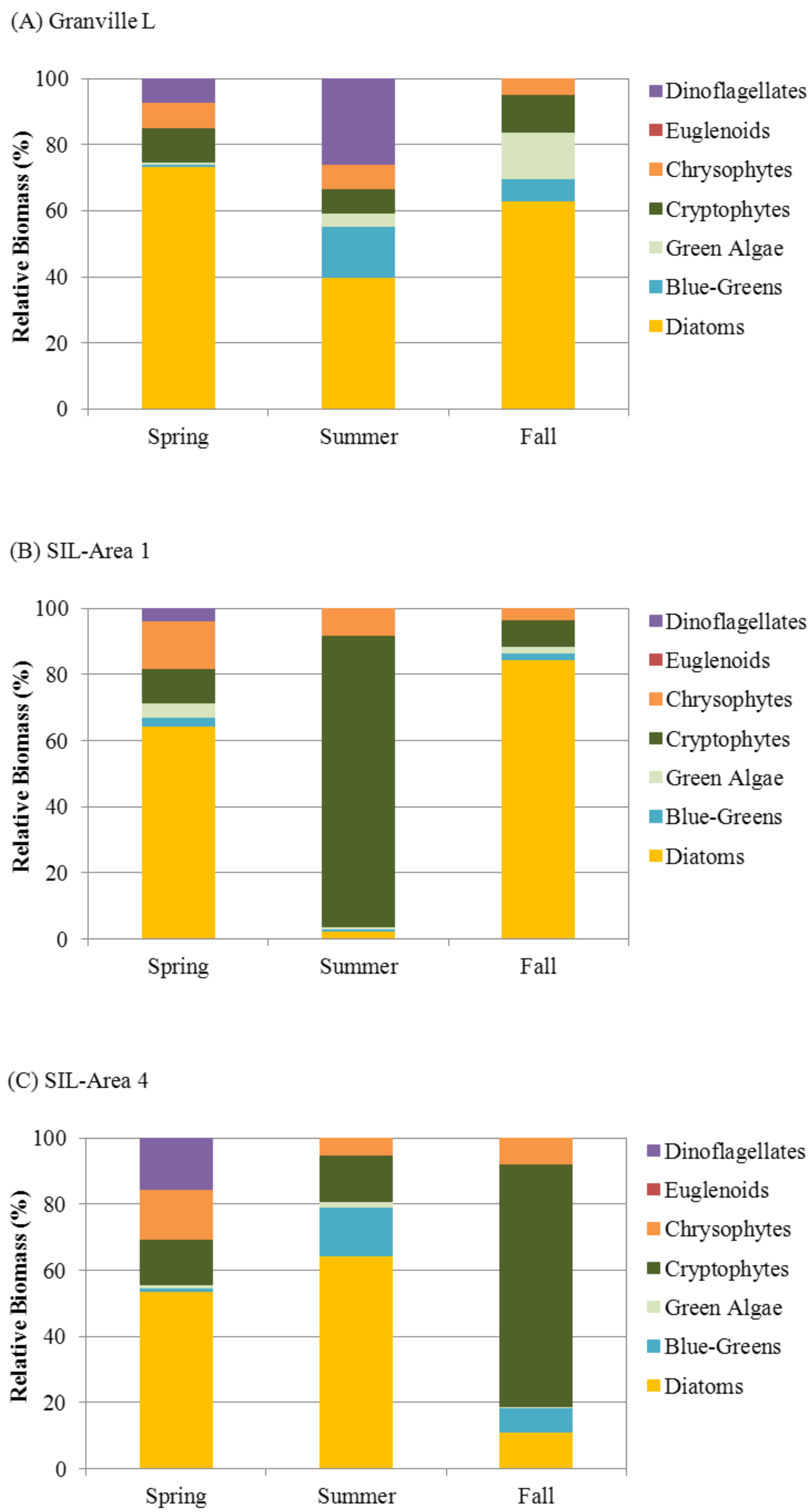


Figure 4.4-3. Phytoplankton community composition at sites in the Upper Churchill River Region in 2009/2010.

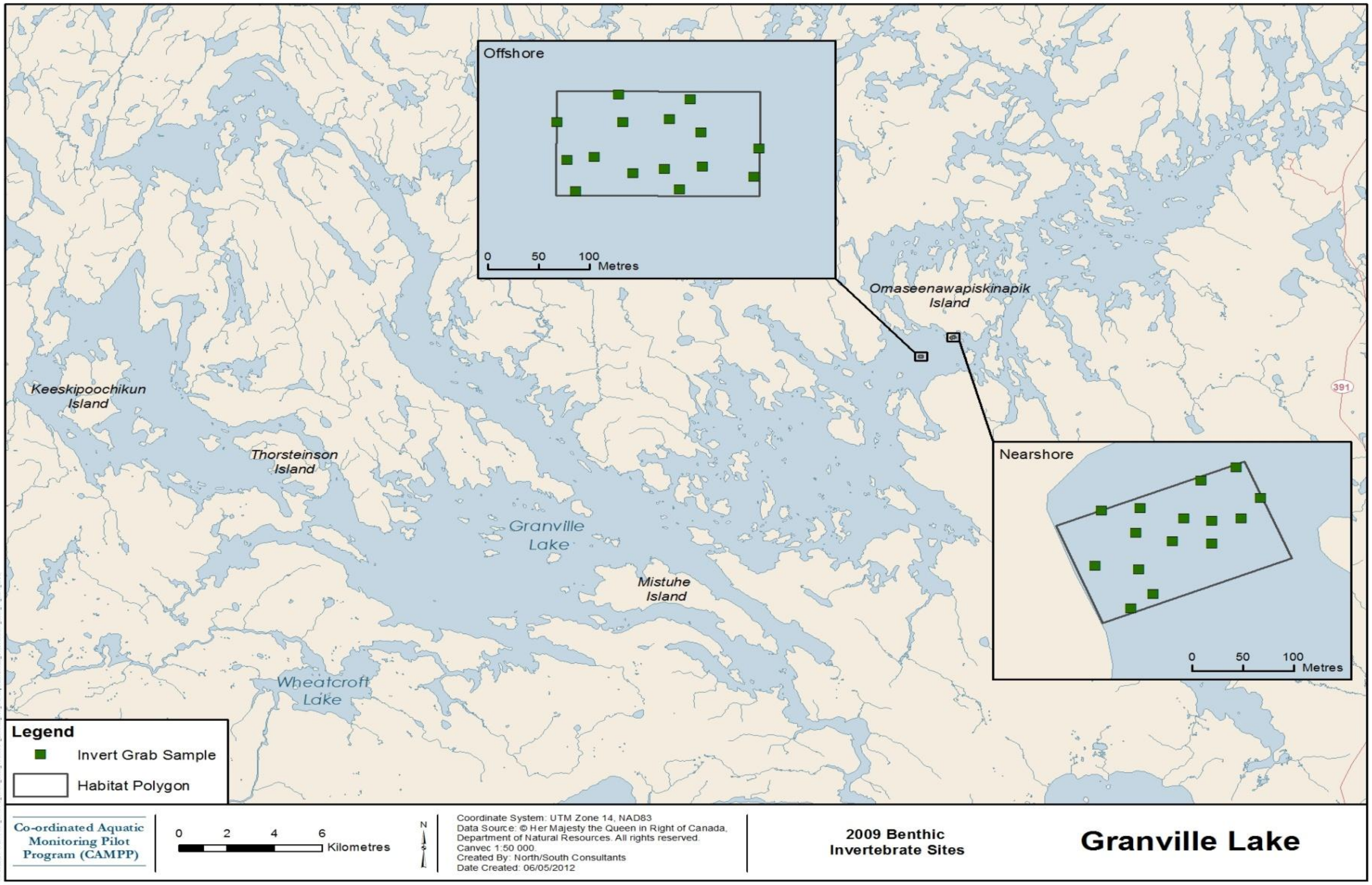


Figure 4.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Granville Lake in the Upper Churchill River Region, 2009.

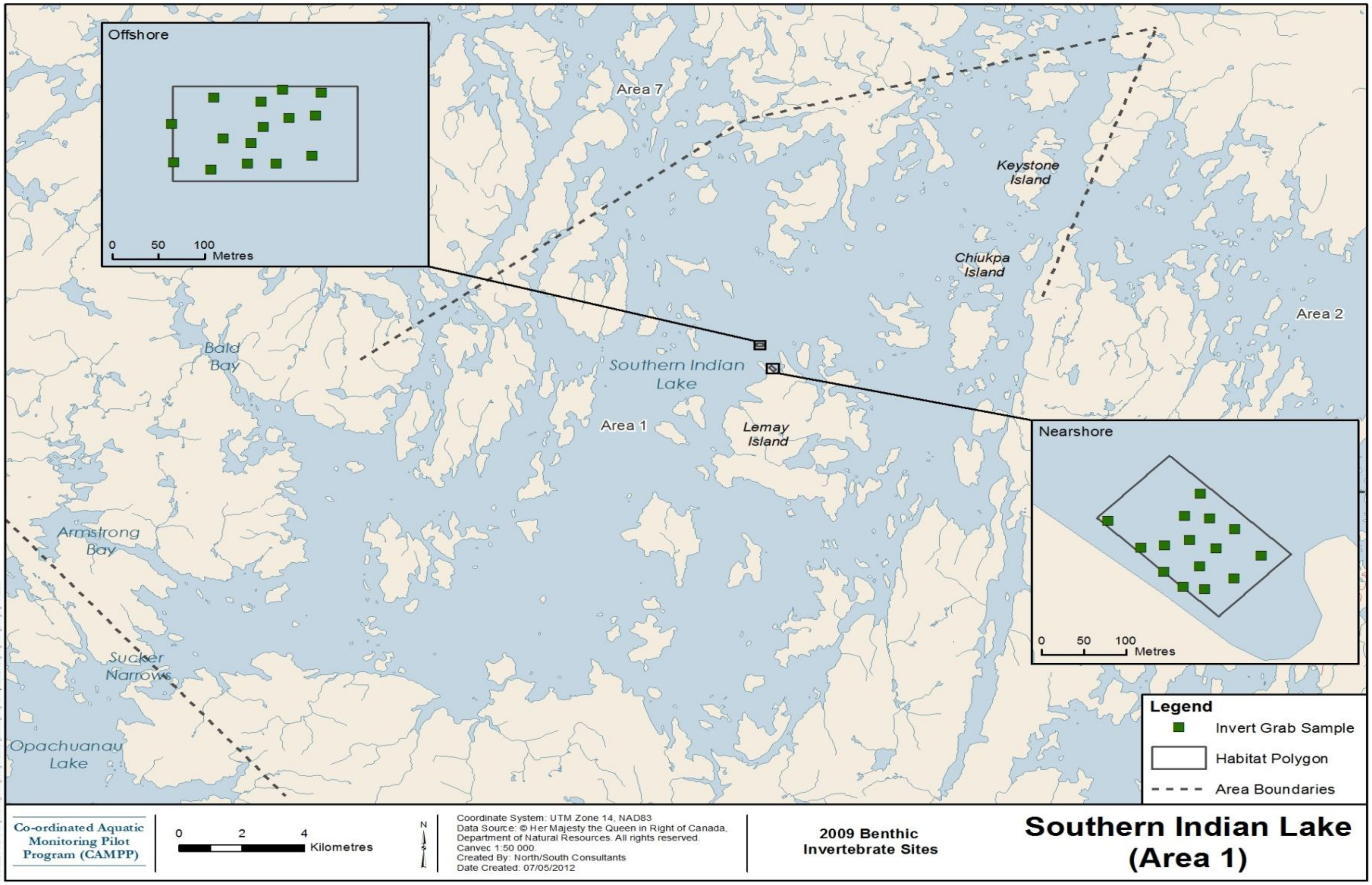


Figure 4.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Southern Indian Lake-Area 1 in the Upper Churchill River Region, 2009.

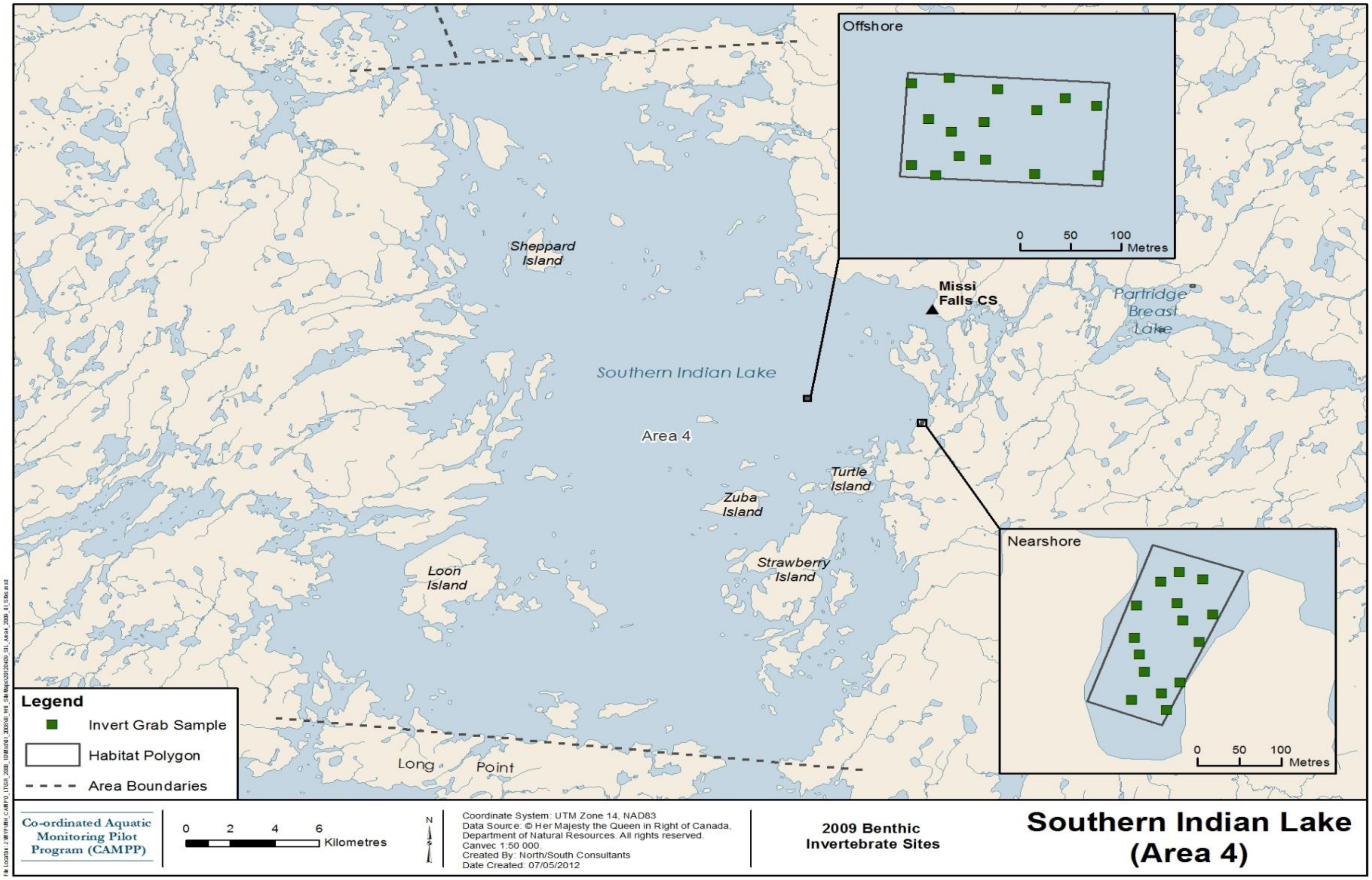


Figure 4.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Southern Indian Lake-Area 4 in the Upper Churchill River Region, 2009.

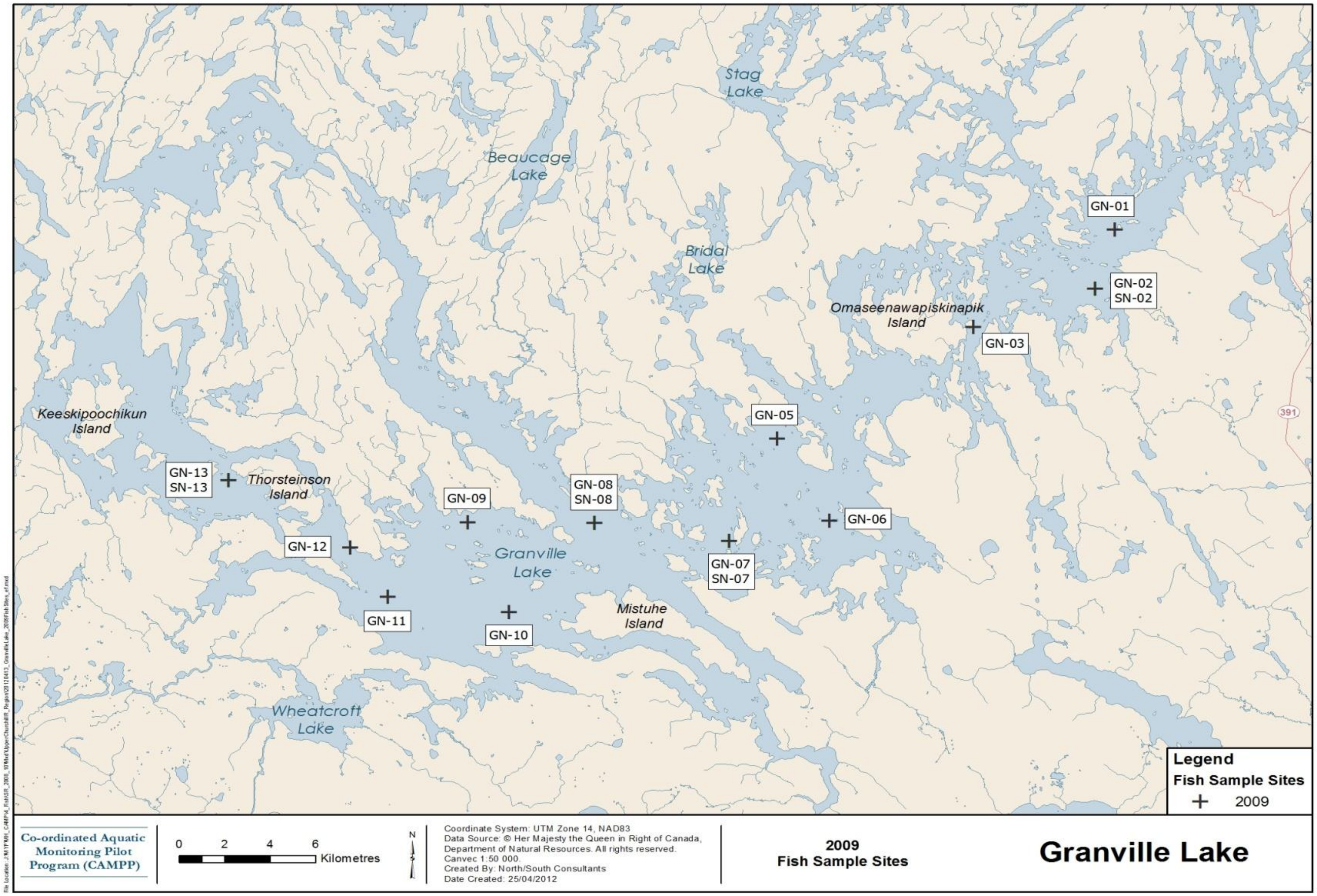


Figure 4.6-1. Map depicting standard gang and small mesh index gillnet sites sampled in Granville Lake, 2009.

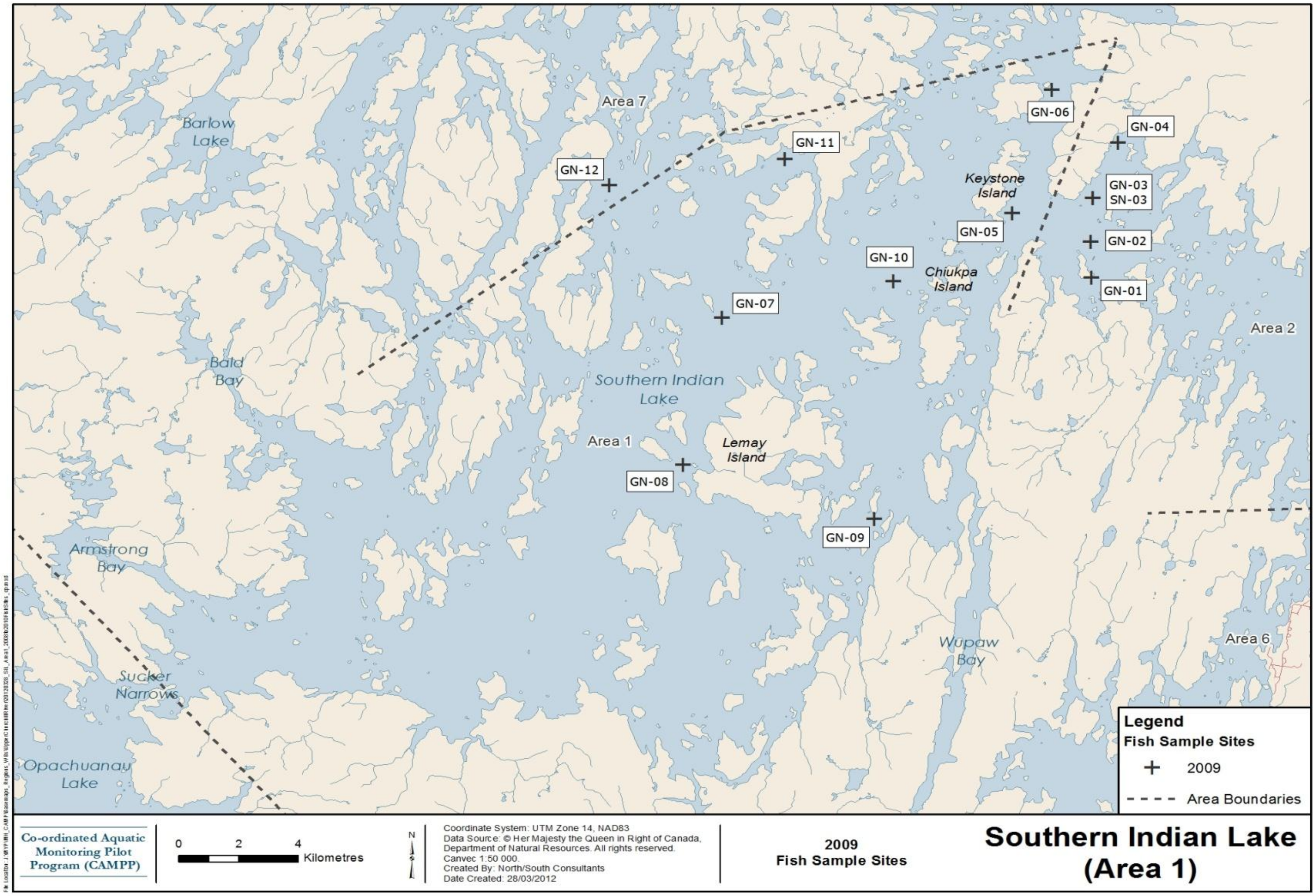


Figure 4.6-2. Map depicting standard gang and small mesh index gillnet sites sampled in Southern Indian Lake – Area 1, 2009.

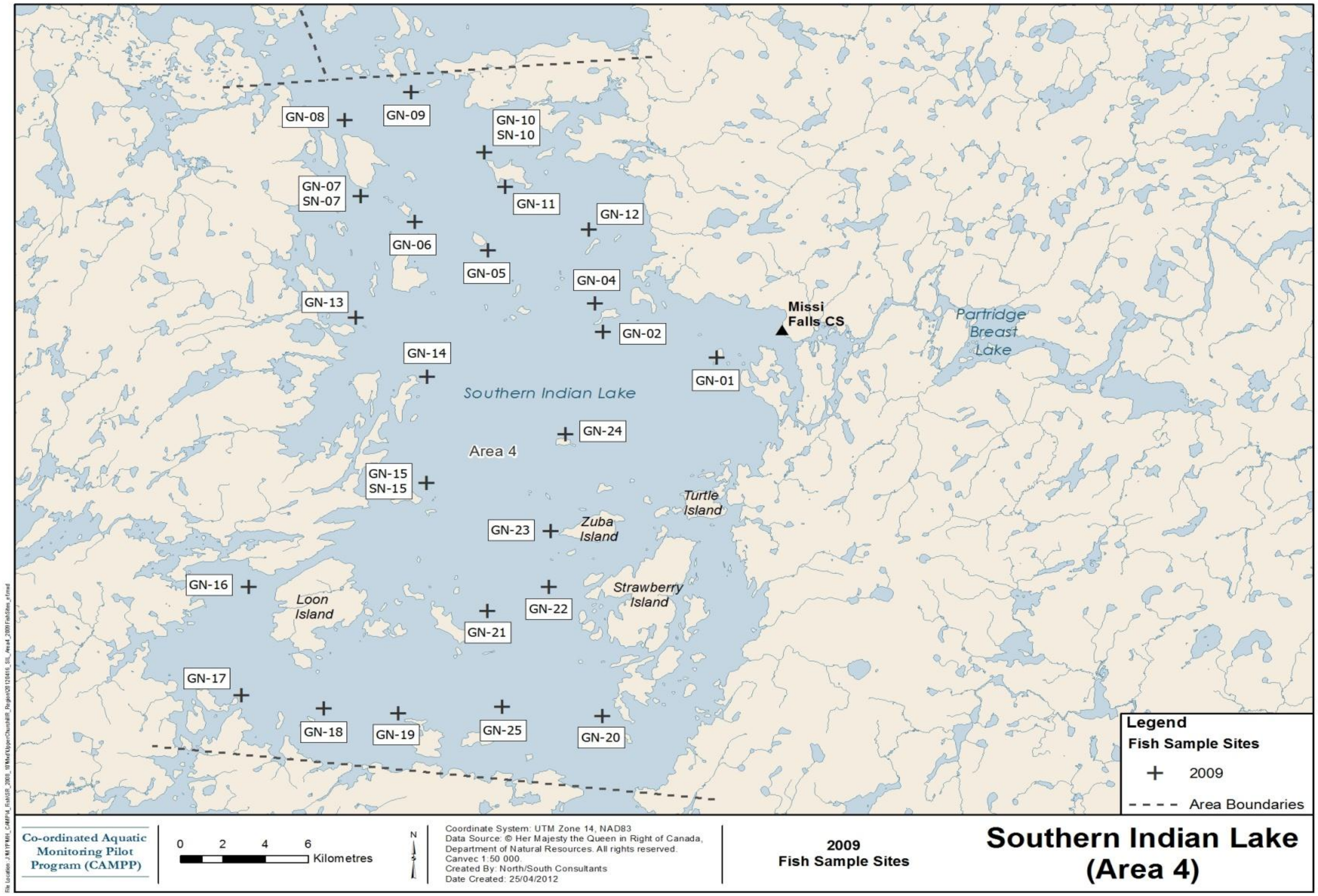


Figure 4.6-3. Map depicting standard gang and small mesh index gillnet sites sampled in Southern Indian Lake – Area 4, 2009.

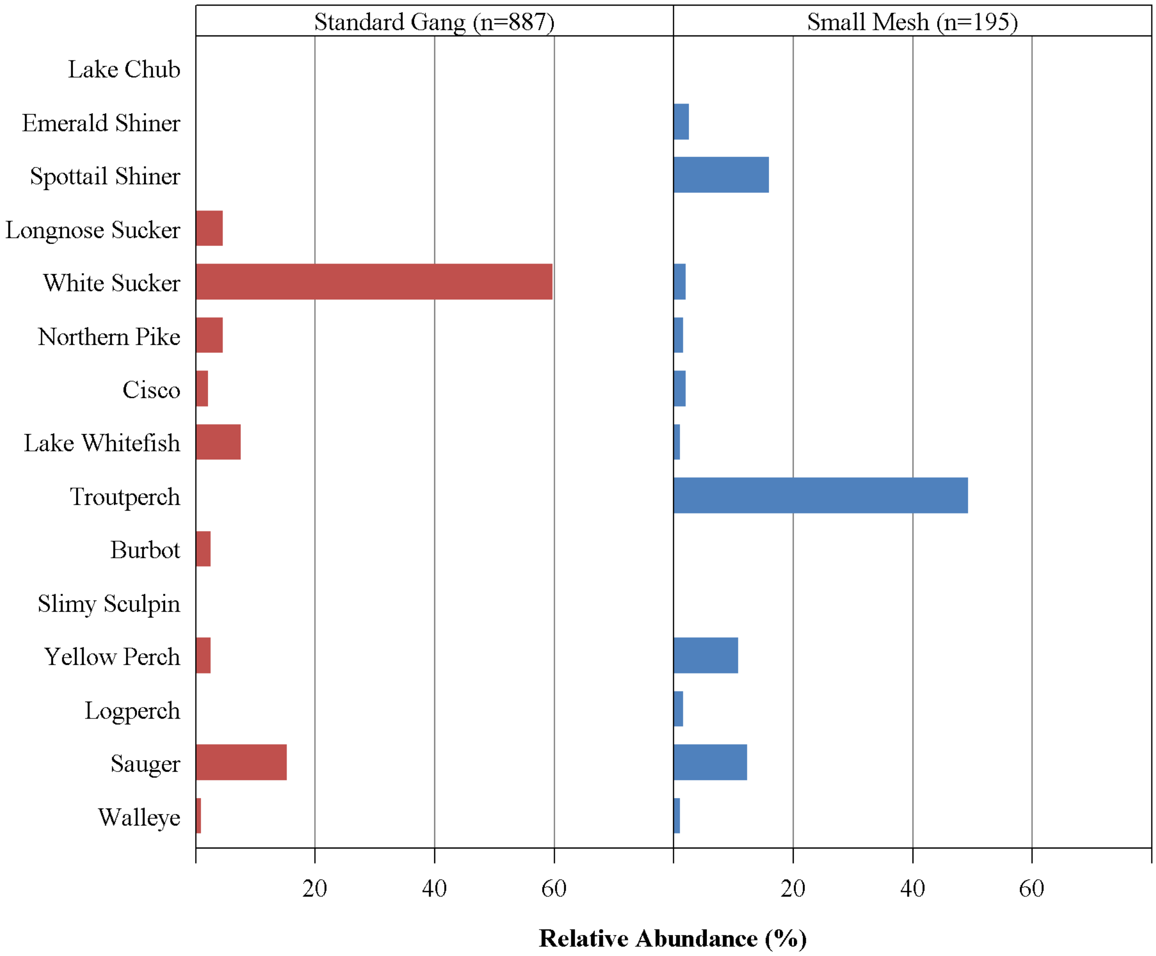


Figure 4.6-4. Relative abundance (%) distributions for fish captured in (A) standard gang and (B) small mesh index gill nets set in Granville Lake, 2009.

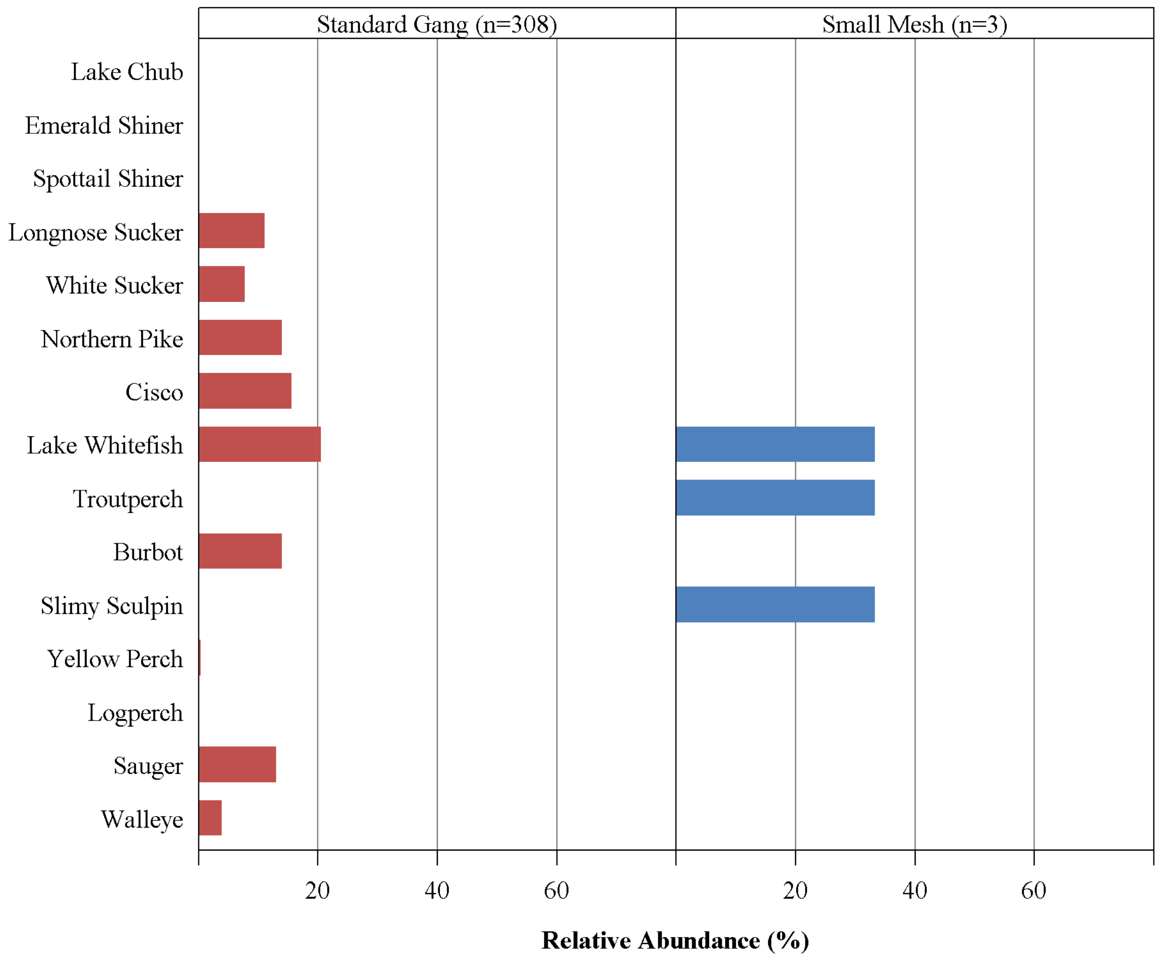


Figure 4.6-5. Relative abundance (%) distributions for fish captured in (A) standard gang and (B) small mesh index gill nets set in Southern Indian Lake – Area 1, 2009.

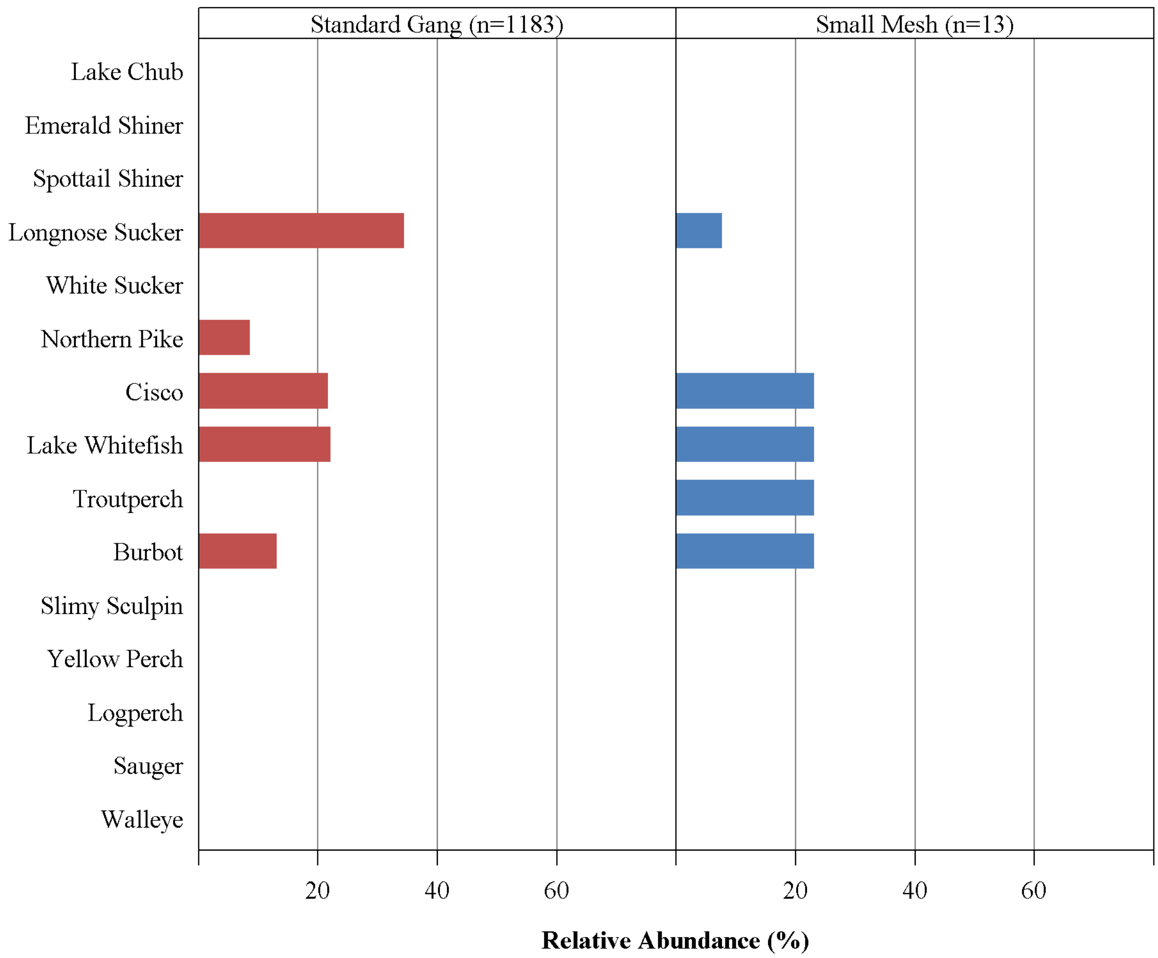


Figure 4.6-5. Relative abundance (%) distributions for fish captured in (A) standard gang and (B) small mesh index gill nets set in Southern Indian Lake – Area 4, 2009.

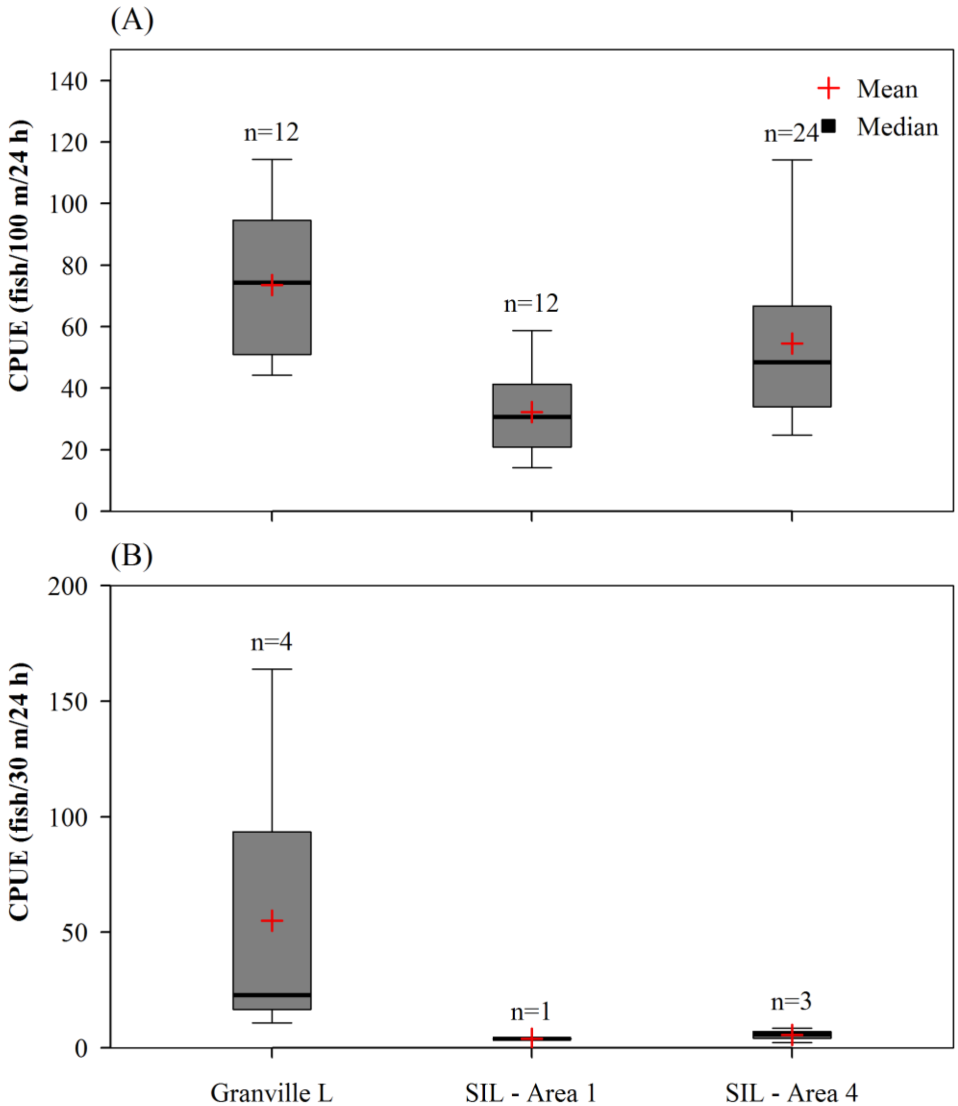


Figure 4.6-6. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Upper Churchill River Region waterbodies, 2009.

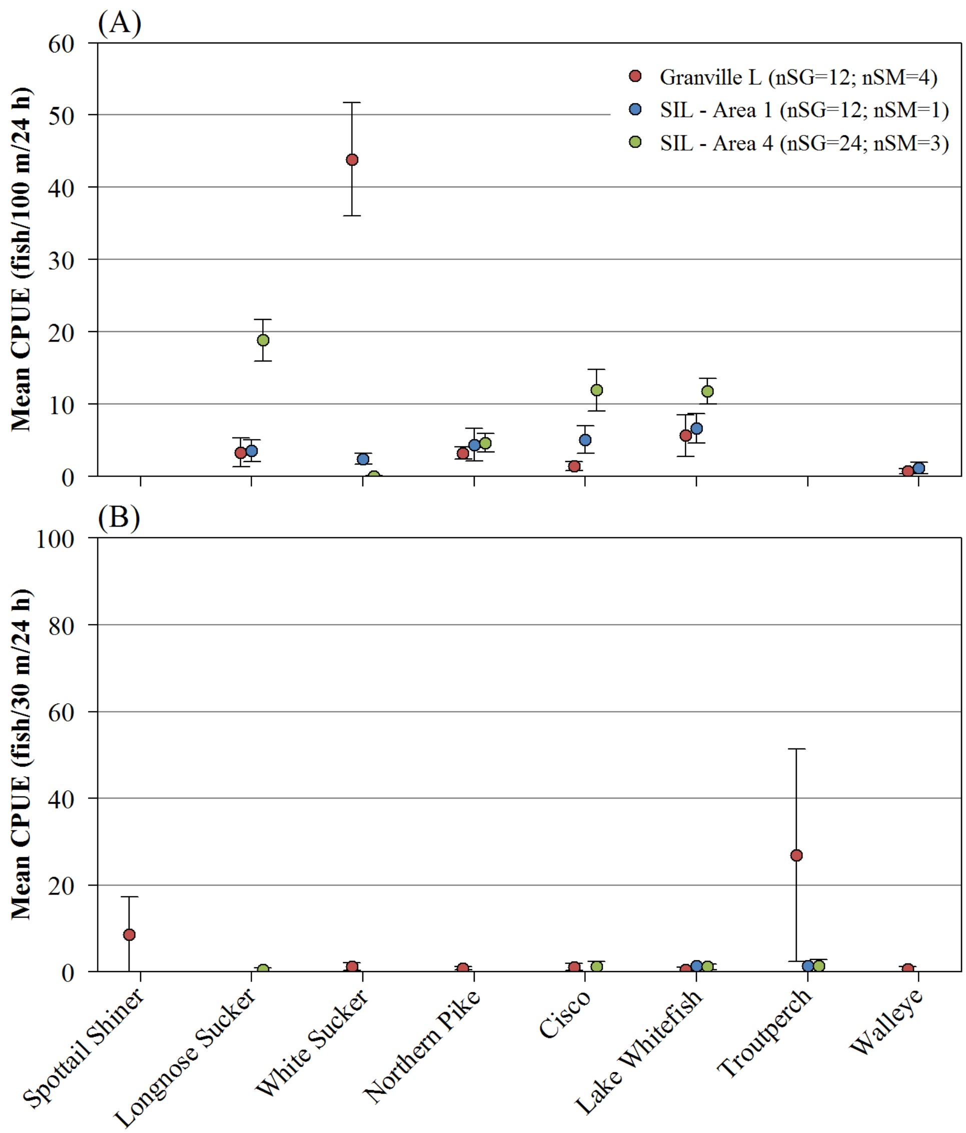


Figure 4.6-7. Mean (SE) CPUE for select species captured in (A) standard gang and (B) small mesh index gill nets set in Upper Churchill River Region waterbodies, 2009.

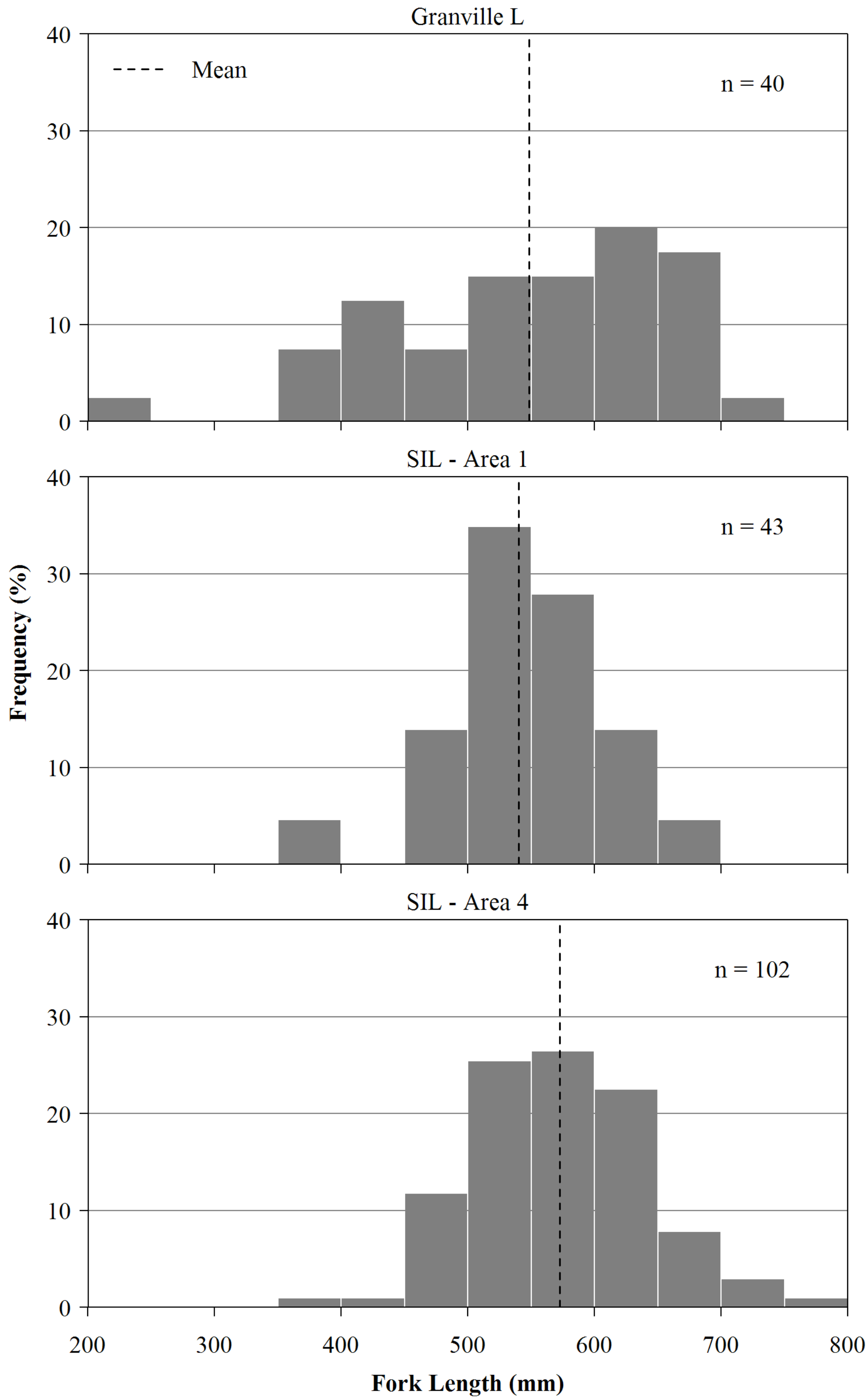


Figure 4.6-8. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

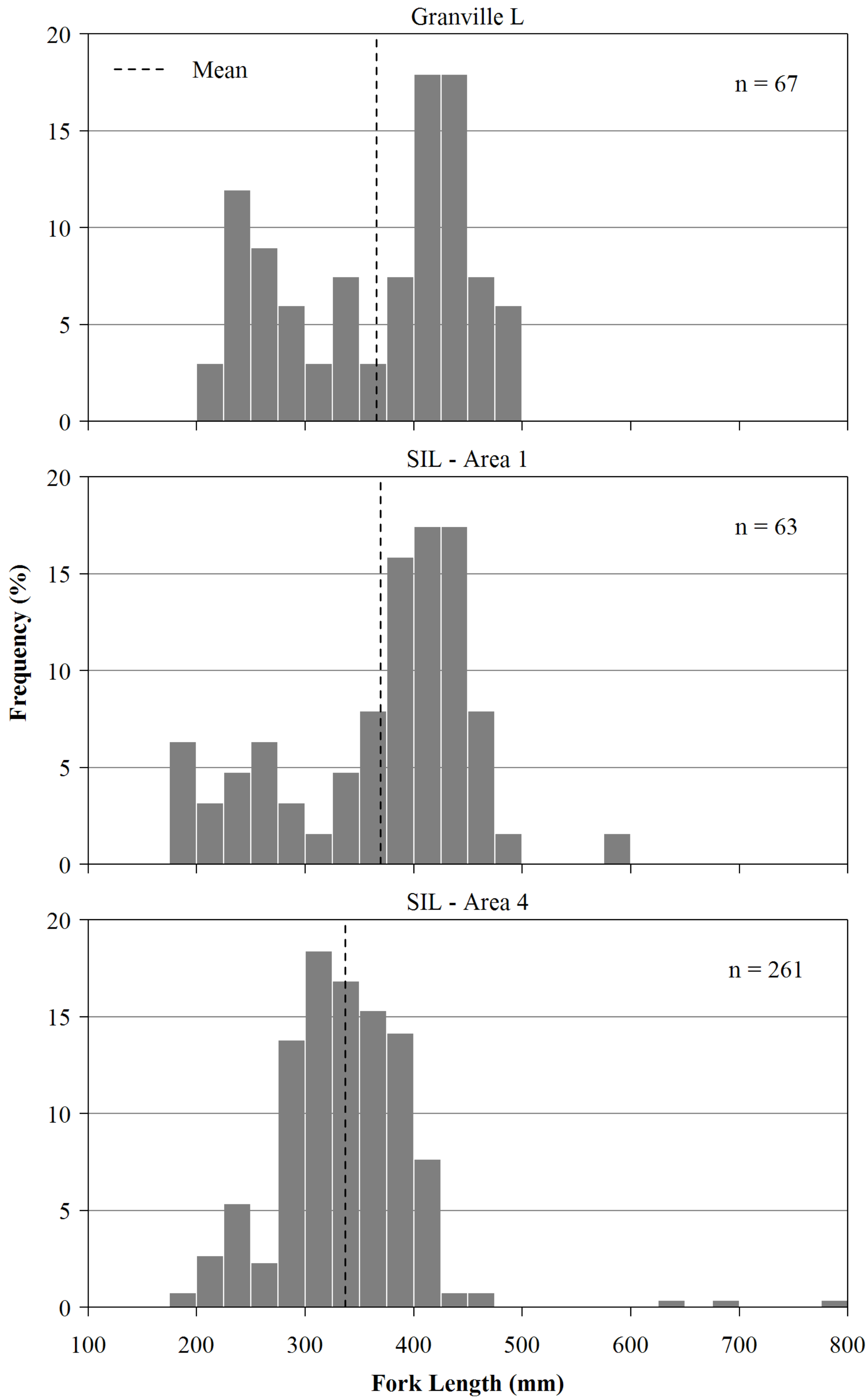


Figure 4.6-9. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

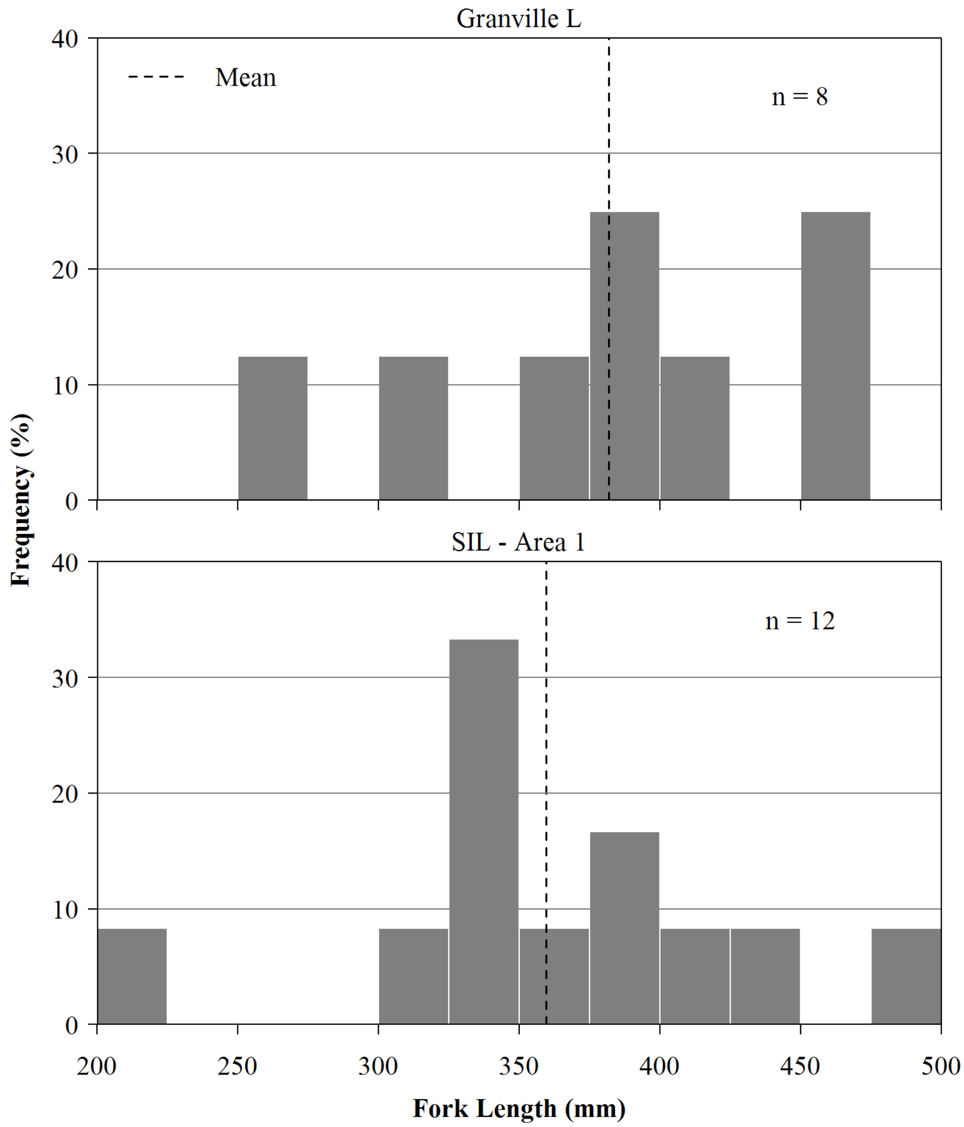


Figure 4.6-10. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2009.

5.0 LOWER CHURCHILL RIVER REGION

The following provides an overview of the results of CAMPP for 2009/2010 for the Lower Churchill River Region, by each major component. A 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 2009 were slightly lower compared to the 1971-2000 temperature normals over the open-water sampling period (Figure 5.1-1). May was particularly cool, exhibiting an air temperature approximately 6.2 ^{o}C below the normal for that month. A notable exception was September when the air temperature was approximately 3.9 ^{o}C above normal. Air temperatures in the fall and winter were slightly above normal with the exception of March. The annual mean air temperature was approximately 0.4 ^{o}C above the normal.

The 1971-2000 normals for precipitation indicate a peak in August followed by secondary peaks in September and July, and moderate levels of precipitation in the winter, as measured at Churchill, MB (Figure 5.1-1). In 2009, precipitation peaked in July (approximately 65% more than normal). August, October, November and December exhibited levels of precipitation that were significantly below normal. Precipitation data from January to May was not available for 2009.

Overall, the comparison to climate normals shows that 2009 was characterized by a cooler spring and summer, with an atypically wet July and atypically dry August, and a warm and overall dry fall and winter (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 to start 2009 and were quickly increased to near record flows from mid-June to mid-August to keep Southern

Indian Lake from exceeding its upper license limit. Missi Falls outflows remained above average though the end of 2009 (Figure 5.2-1). The high Missi Falls outflows were mainly the result of an above average snowpack and above average precipitation in the Reindeer Lake drainage basin but were also influenced by record high flows on the Nelson River and reductions to Notigi flows in the summer of 2009.

Further downstream on the lower Churchill River above Red Head Rapids, flows followed a similar trend to Missi outflows although flow changes were more gradual (Figure 5.2-2). Water levels on Partridge Breast Lake, Northern Indian Lake, and on the lower Churchill River above Swallow Rapids, near the confluence with the Little Churchill River, followed a similar trend to flows (Figures 5.2-3 to 5.2-5). Note that the gauge on Partridge Breast Lake was established in 2009 so there is no previous data available for comparison; however, water levels would likely have reached record highs since 1997 for parts of the year as they did on Northern Indian Lake.

Gauer River flows were slightly below average to start the year before climbing above the upper quartile in late-May. Flow then remained high for the rest of the year, reaching record highs in early August, likely due to above average precipitation in the area (Figure 5.2-6).

5.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 2 of CAMPP in the Lower Churchill River Region. Waterbodies sampled included Partridge Breast Lake, Northern Indian Lake, the lower Churchill River at the confluence with the Little Churchill River (hereafter refered to as "lower Churchill River"), and an off-system lake (Gauer Lake; Figure 5.3-1).

5.3.1 Routine Variables and Limnology

Results of the 2009/2010 water quality monitoring in the Lower Churchill River Region for routine water quality variables are presented in Tables 5.3-1 and 5.3-2 and Figures 5.3-2 to 5.3-10.

5.3.1.1 On-system Waterbodies

Water quality of the lower Churchill River system can be generally described as having a moderate amount of nutrients, slightly alkaline, moderately soft, and well-oxygenated. Partridge Breast and Northern Indian lakes are clear whereas the lower Churchill River at the Little Churchill River is moderately clear. Neither Partridge Breast Lake nor Northern Indian Lake were thermally stratified during the 2009/2010 monitoring periods (Figure 5.3-2). Although dissolved oxygen (DO) decreased at depth in Partridge Breast Lake in summer and fall, DO exceeded the Manitoba Water Quality Standards Objectives and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011) for the protection of aquatic life (PAL; 5.5-9.5 mg/L depending on season) across depth in both lakes (Figure 5.3-3). Other *in situ* variables, including turbidity, pH, and specific conductance, were generally consistent across depth (Figures 5.3-4 to 5.3-6), however, pH occasionally changed with depth. Secchi disk depths were slightly higher in Northern Indian Lake than Partridge Breast Lake, but ranged between 0.8 and 2.5 m in the open-water season (Figure 5.3-7). Flow in the lower Churchill River at the confluence with the Little Churchill River was too high to allow measurement of *in situ* parameters at depth. Secchi disk depth was only measured in fall at this site; Secchi disk depth was 1 m and was similar to the other sites.

One of four samples collected in each Partridge Breast and Northern Indian lakes had a total phosphorus (TP) concentration in excess of the Manitoba narrative guideline for TP of 0.025 mg/L for lakes, ponds, and reservoirs (MWS 2011; Figure 5.3-8). The samples from the lower Churchill River were within the narrative guideline for TP in rivers. Other routine water quality variables for which there are MWQSOGs, including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

In 2009/2010, the majority of TP was composed of dissolved forms in Partridge Breast Lake at all times, in Northern Indian Lake in winter and in the lower Churchill River in fall. Particulate forms typically comprised the majority of TP in Northern Indian Lake during the open-water season and in the lower Churchill River in spring and summer (Figure 5.3-9). The lower Churchill River was not sampled in winter. The majority of total nitrogen (TN) at on-system sites was composed of organic nitrogen, with ammonia comprising a larger portion of dissolved inorganic nitrogen (DIN) than nitrate/nitrite during the open-water season; concentrations and the relative proportion of DIN represented by nitrate/nitrite were higher in the ice-cover season (Figure 5.3-10).

5.3.1.2 Off-system Waterbody

Water quality of Gauer Lake is similar to the on-system lakes in that it has a moderate amount of nutrients, and is slightly alkaline, moderately soft and clear. Similar to Partridge Breast and Northern Indian lakes, Gauer Lake did not stratify and exhibited DO concentrations exceeding the MWQSOGs for PAL (MWS 2011; 5.5-9.5 mg/L) across depth (Figure 5.3-3). *In situ* turbidity and specific conductance were generally consistent across depth; however, pH increased with depth during the open-water season and decreased with depth in winter (Figures 5.3.4 to 5.3-6). *In situ* pH was below the MWQSOGs lower PAL limit (6.5) at the surface in

Gauer Lake in spring 2009. Secchi disk depths were similar to Northern Indian Lake and generally ranged between 1.3 and 2.5 m in the open-water season (Figure 5.3-7).

With the exception of pH as mentioned above, all other routine water quality variables for which there are MWQSOGs (MWS 2011), including TP (0.025 mg/L for lakes, ponds, and reservoirs; Figure 5.3-8), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

The majority of TP measured in Gauer Lake was composed of equal portions of dissolved and particulate forms during the open-water season, but was predominately in dissolved form in winter (Figure 5.3-9). Similar to the on-system sites, the majority of TN in Gauer Lake was composed of organic nitrogen, with ammonia comprising a larger portion of DIN than nitrate/nitrite during the open-water season; concentrations and the relative proportion of DIN represented by nitrate/nitrite were higher in the ice-cover season. (Figure 5.3-10).

5.3.2 Metals and Major Ions

5.3.2.1 On-system Waterbodies

Summaries of metal concentrations and detection frequencies measured in the Lower Churchill River Region in 2009/2010 are presented in Table 5.3-3. A number of metals were not detected along the lower Churchill River system including antimony, arsenic, beryllium, bismuth, boron, cesium, chromium, lead, mercury, silver, tellurium, thallium, tungsten, and zinc. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, titanium, and uranium were consistently detected; the remaining metals were detected in some samples.

Aluminum exceeded the MWQSOG PAL guideline (0.1 mg/L) in 50-75% of samples from Partridge Breast and Northern Indian lakes, and the lower Churchill River (MWS 2011; Figure 5.3-11). Iron concentrations also exceeded the MWQSOG PAL guidelines (0.3 mg/L) in 50% and 25% of samples from Partridge Breast and Northern Indian lakes, respectively. One of the four samples analysed for selenium in Partridge Breast Lake was at the analytical detection limit, which is equivalent to the PAL guideline (0.001 mg/L). Measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit. All other metals for which there are MWQSOGs for PAL were within objectives and guidelines at each of the sampling sites in 2009/2010 (Table 5.3-4).

Chloride concentrations were low along the lower Churchill River system (i.e., <2.1 mg/L) and well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of

120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 10.2 mg/L 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 5.3-4).

5.3.2.2 Off-system Waterbody

A number of metals were not detected in Gauer Lake including antimony, arsenic, beryllium, bismuth, boron, cesium, chromium, cobalt, copper, lead, mercury, selenium, silver, tellurium, thallium, tungsten, vanadium, zinc, and zirconium. Aluminum, barium, calcium, magnesium, manganese, potassium, rubidium, sodium, strontium and uranium were consistently detected; the remaining metals were detected in some samples. All metals for which there are MWQSOGs for PAL (MWS 2011) were within objectives and guidelines in surface samples collected from Gauer Lake in 2009/2010 (Table 5.3-4).

Chloride concentrations were low in Gauer Lake (i.e., <1.1 mg/L) and well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 10.6 mg/L and fell on the lower range of concentrations reported across Canada (CCREM 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013; Table 5.3-4).

5.3.3 Trophic Status and Nutrient Ratios

5.3.3.1 On-system Waterbodies

Partridge Breast Lake was classified as mesotrophic and Northern Indian Lake and the lower Churchill River were classified as borderline mesotrophic to meso-eutrophic based on TP concentrations (open-water mean) measured in 2009/2010 (Table 5.3-5). According to the trophic classification scheme for lakes based on TN, both Partridge Breast and Northern Indian lakes were oligotrophic in 2009/2010 (open-water mean; 5.3-6). Partridge Breast Lake was also oligotrophic based on chlorophyll *a* but Northern Indian Lake was mesotrophic based on 2009/2010 chlorophyll *a* (open-water mean; Table 5.3-7). The lower Churchill River was oligotrophic in 2009/2010 following the trophic classification scheme for rivers based on both TN and chlorophyll *a* (Tables 5.3-8 and 5.3-9).

On the basis of molar TN:TP ratios, waterbodies along the lower Churchill River were typically phosphorus limited in 2009/2010; however, Northern Indian Lake was nitrogen and phosphorus co-limited in spring and nitrogen limited in fall (Figure 5.3-12). Examination of total organic carbon to organic nitrogen (TOC:ON) molar ratios indicates that organic matter in the three on-system waterbodies was generally a mixture of allochthonous and autochthonous sources; however, organic matter in Northern Indian Lake was from allochthonous sources in spring and fall (Figure 5.3-13).

5.3.3.2 Off-system Waterbody

In 2009/2010, Gauer Lake was mesotrophic based on TP and chlorophyll *a* and oligotrophic based on TN (open-water means, Tables 5.3-5 to 5.3-7). On the basis of molar TN:TP ratios, Gauer Lake was nitrogen and phosphorus co-limited in spring and fall, and phosphorus limited in summer and winter (Figure 5.3-12). TOC:ON molar ratios indicate that similar to Northern Indian Lake, organic matter in Gauer Lake was from allochthonous sources in spring and fall and a mixture of allochthonous and autochthonous in summer and winter (Figure 5.3-13).

5.3.4 Escherichia coli

5.3.4.1 On-system Waterbodies

E. coli was detected in one of four samples (2 CFU/100 mL) collected in Partridge Breast Lake and in 100% of samples (3 to 5 CFU/100 mL) from the lower Churchill River at the Little Churchill River (Table 5.3-2). No samples collected in Northern Indian Lake in 2009/2010 had detectable concentrations of *E. coli*. All individual measurements were below the Manitoba guideline for primary recreation (200 CFU/100 mL; MWS 2011).

5.3.4.2 Off-system Waterbodies

E. coli was detected in one of four samples (1 CFU/100 mL) collected in Gauer Lake (Table 5.3-2); this measurement was below the Manitoba guideline for primary recreation (200 CFU/100 mL; MWS 2011).

5.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 2 of CAMPP in the Lower Churchill River Region. Waterbodies sampled included Partridge Breast Lake, Northern Indian Lake, the lower Churchill River at the confluence with the Little Churchill River (hereafter referred to as “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 (Figure 5.4-1), and were slightly higher at Gauer Lake than at the on-system waterbodies. Winter chlorophyll *a* concentrations were lower than those of the open-water season.

5.4.2 Community Composition and Biomass

In 2009/2010, phytoplankton biomass was similar between waterbodies along the lower Churchill River but was higher in Gauer Lake, particularly in summer and fall (Figure 5.4-2). With the exception of Partridge Breast Lake, phytoplankton biomass was highest in fall; peak biomass in Partridge Breast Lake occurred in summer. Phytoplankton biomass was not analysed for the lower Churchill River in summer.

At sites sampled along the lower Churchill River in 2009, the phytoplankton community was generally dominated by diatoms throughout the open-water season (Figure 5.4-3). The exception occurred in spring in Northern Indian Lake, when the community was dominated by dinoflagellates. Dinoflagellates, cryptophytes, or chrysophytes were the next most common group, depending on the site and season.

Phytoplankton composition was slightly different in Gauer Lake. In spring, cryptophytes comprised the majority of the biomass and, although diatoms were the most common group in summer and fall, Gauer Lake differed from the on-system lakes in that blue-green algae was the second most abundant group during these seasons.

Diversity, heterogeneity, and effective richness were generally lower in the on-system sites compared to Gauer Lake, particularly in summer and fall. Metrics describing the phytoplankton community tended to decrease from spring to fall in Partridge Breast Lake and the lower Churchill River but were consistently high in summer in Northern Indian and Gauer lakes (Table 5.4-1).

5.4.3 Bloom Monitoring

Chlorophyll *a* concentrations in the region were always below the bloom monitoring trigger of 10 µg/L in 2009.

5.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 ubiquitous in the region in 2009, and *Planktothrix* was present in all waterbodies excepting Partride Breast Lake in 2009/2010.

Microcystin-LR was not measured for the region in 2009 (i.e., the chlorophyll *a* concentration was always below the 10 µg/L trigger).

5.4.5 Trophic Status

Trophic classification schemes for lakes developed on the basis of mean chlorophyll *a* concentrations indicate that Partridge Breast Lake was oligotrophic and Northern Indian and Gauer lakes were mesotrophic during the open-water season (OECD 1982; Table 5.3-7). If 2009/2010 annual means are considered, the classification would be similar for Partridge Breast and Gauer lakes; however, Northern Indian Lake would be classified as oligotrophic.

According to chlorophyll *a* trophic categories for rivers (Dodds et al. 1998) the lower Churchill River at the Little Churchill River was oligotrophic in 2009/2010 (Table 5.3-9).

5.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Lower Churchill River Region in 2009/2010; the second year of CAMPP. Waterbodies sampled included the on-system lakes Partridge Breast, Northern Indian, and the off-system lake, Gauer. Northern Indian and Gauer lakes are sampled annually. Also sampled annually was the on-system river site, lower Churchill River at the Little Churchill River (hereafter referred to as the "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).

BMI samples were collected in each of the nearshore and offshore habitats of Partridge Breast, Northern Indian, and Gauer lakes using a benthic grab sampler (Ekman or petite Ponar). Fifteen samples were collected in each habitat at Northern Indian and Partridge Breast lakes; and 12 and 15 samples were collected in each of the nearshore and offshore habitats of Gauer Lake, respectively. Rock baskets were deployed and retrieved in the lower Churchill River. Rock baskets were set in the lower Churchill River on 04 July 2009. Fifteen of the twenty rock baskets set in the Churchill River were retrieved on 26 August. Sampling was conducted at lake sites between 16 and 17 August 2009.

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 2009, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and for the offshore habitat water depths of greater than 5 m were targeted. In 2009, mean water depths sampled in the nearshore were: 2.8 m in Partridge Breast Lake, 4.2 m in Northern Indian Lake, and 3.7 m in Gauer Lake. The mean water depth at rock basket sites in the Churchill River was 4.5 m. Mean water depths sampled in the offshore were: 12.7 m in Partridge Breast Lake, 6.9 m in Northern Indian Lake, and 15.2 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 X). In 2009, sediments from the Churchill River were not analyzed. TOC was greatest in the nearshore habitat of Partridge Breast Lake (21.6%) followed by the offshore habitat of Gauer Lake (7.3%). TOC at all other nearshore and offshore habitats was lower ranging between 1.0% (nearshore in Northern Indian Lake) and 2.4% (nearshore in Gauer Lake) (Table 5.5-2).

Sediment composition in the Lower Churchill River Region varied between waterbodies and habitat types. Sand comprised the majority of the sediments from the nearshore polygons of Gauer and Northern Indian lakes and the offshore polygon of Partridge Breast Lake. Clay dominated the sediments from the Partridge Breast Lake nearshore polygon. Silt comprised the majority of sediments collected from the offshore polygons of Northern Indian and Gauer lakes (Table 5.5-2).

5.5.2 Species Composition, Distribution, and Relative Abundance

5.5.2.1 Partridge Breast Lake

The mean BMI density in benthic grab samples in the nearshore habitat of Partridge Breast Lake was 4,250 individuals/m^2, with densities ranging from 433 to 9,089 (Table 5.5-3). Overall, non-insects dominated the mean total BMI (96%), and insects comprised 4% of the overall taxa. Of the non-insects, the main group was Oligochaeta (94% of the mean total BMI), though Diplostraca and Gastropoda were also present (Table 5.5-3). Insects mainly consisted of Chironomidae (4%); small numbers of Ceratopogonidae, Caenidae, Culicidae (mosquitos), and Dolichopodidae (long-legged flies) were also found (Table 5.5-3). The mean BMI density in the offshore habitat was 2,005 individuals/m^2, with densities ranging from 87 to 4,934 (Table 5.5-3). Overall, non-insects dominated the BMI community (91% of the mean total BMI), with insects comprising 9% of the overall taxa. Of the non-insects, the main group was Amphipoda (83%), though Bivalvia and Oligochaeta were also present. Insects mainly consisted of Chironomidae (8%); Ephemeroptera and Trichoptera were also collected in small quantities (Table 5.5-3).

Total EPT comprised <1% and 1% of the mean total BMI in the nearshore and offshore polygons, respectively (Table 5.5-3). Genus analysis of the Ephemeroptera indicated that *Caenise* sp. was the only representative taxa in the nearshore habitat. *Hexagenia* sp. was singly dominant in the offshore habitat (Table 5.5-3). Trichoptera were collected in small numbers only in the offshore polygon and were exclusively Leptoceridae. The ratio of EPT:C was low in both the nearshore (0.03) and offshore (0.11) habitats, indicating that Chironomidae dominated EPT in the insect communities in both habitats (Table 5.5-3).

Taxonomic richness in the nearshore polygon was 11 families with richness values ranging from one to six families per sample; and was notably dominated by a single taxonomic group; Oligochaeta (Table 5.5-3). Hill's Effective Richness (E^H) was one. In the offshore habitat taxonomic richness was six families, with richness values ranging from one to five families per sample (Table 5.5-3). Hill's Effective Richness (E^H) was two. Haustoriidae notably dominated the invertebrate community within this habitat (Table 5.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.13 in the nearshore and 0.26 in the offshore (Table 5.5-3). Evenness (Simpson's Equitability [E_D]) values were 0.39 in the nearshore and 0.50 in the offshore (Table 5.5-3).

5.5.2.2 Northern Indian Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Northern Indian Lake was 909 individuals/m^2, with densities ranging from 216 to 1,948 (Table 5.5-4). Overall, insects dominated the BMI community in abundance (78%), with non-insects comprising 22% of the overall taxa (Table 5.5-4). Insects mainly consisted of Chironomidae (51% of the mean total BMI) and Ephemeroptera (18%); a small number of Trichoptera (1%) were also found (Table 5.5-4). Of the non-insects, the main group was Amphipoda (9%); followed by Oligochaeta (5%), Gastropoda (3%), and Bivalvia (2%). Hirudinea were also present in small numbers (Table 5.5-4). Mean density of invertebrates collected in offshore benthic grab samples was 1,979 individuals/m^2, with numbers ranging from 130 to 2,597 (Table 5.5-4). Overall, non-insects were dominant in the invertebrate samples (66% of the mean total BMI), with insects comprising 34% of the overall taxa (Table 5.5-4). Of the non-insects, the main groups were Amphipoda (50%) and Bivalvia (12%); Oligochaeta and Gastropoda were also present in smaller densities (Table 5.5-4). Insects mainly consisted of Chironomidae (23%) and

Ephemeridae (9%); a small number of Ceratopogonidae and Leptoceridae were also collected (Table 5.5-4).

Total EPT comprised 19% of the mean total nearshore BMI and consisted mainly of mayflies (18%) (Table 5.5-4). Genus analysis of the mayflies indicated that *Hexagenia* sp. were dominant in nearshore grab samples. *Caenis* sp. were also present (Table 5.5-4). Trichoptera were collected in small numbers and were comprised mainly of Leptoceridae (Table 5.5-4). In the offshore polygon, total EPT comprised 9% of the BMI community sampled and consisted mainly of Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was the only species found in offshore samples (Table 5.5-4). Trichoptera were also collected in small numbers, consisting only of Leptoceridae (Table 5.5-4). The ratio of EPT:C was 0.43 in the nearshore and 0.50 in the offshore polygons, indicating that the insect community in both nearshore and offshore habitats was more dominated by chironomids than EPT (Table 5.5-4).

Taxonomic richness in the nearshore was 13 families, with richness values ranging from three to eight within each sample (Table 5.5-4). Hill's Effective Richness (E^H) was five. Chironomidae and Ephemeridae notably dominated the nearshore habitat (Table 5.5-4). Taxonomic richness in the offshore polygon was nine families, with richness values ranging from three to eight within each sample (Table 5.5-4). Hill's Effective Richness (E^H) was four. Haustoriidae and Chironomidae were most dominant within this habitat (Table 5.5-4).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.76 and 0.68 in the nearshore and offshore polygons, respectively (Table 5.5-4). Evenness (Simpson's Equitability [E_D]) was 0.67 in the nearshore and 0.51 in the offshore (Table 5.5-4).

5.5.2.3 Lower Churchill River

The mean BMI density in rock baskets in the lower Churchill River was 9,396 individuals/m^2, with densities ranging from 1,262 to 23,596 (Table 5.5-5). Overall, 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 groups were Bivalvia (42% of the mean total BMI) and Oligochaeta (17%); Hirudinea, Amphipoda, and Gastropoda were also present (Table 5.5-5). Insects mainly consisted of Diptera (notably Chironomidae; [18%]) and Trichoptera (14%). Ephemeroptera, Simuliidae, Plecoptera, and Coleoptera were also found, in addition to other taxa which were minimally represented (Table 5.5-5).

Total EPT comprised 18% of the mean total BMI. Trichoptera were dominant of the three groups; of the six families of Trichoptera identified, the largest representative family was Hydropsychidae (Table 5.5-5). Ephemeroptera and Plecoptera were also found in the samples

(Table 5.5-5). Genus analysis of the Ephemeroptera indicated that of the 10 genera present *Ephemerella* sp. were dominant (Table 5.5-5). Plecoptera were comprised mainly of Pteronarcyidae (Table 5.5-5). The ratio of EPT:C was 0.99, indicating an almost even abundance of EPT and Chironomidae (Table 5.5-5).

Taxonomic richness in the Churchill River was 33 families, with richness values ranging between five and 18 families in individual samples (Table 5.5-5). Hill's Effective Richness (E^H) was seven; Pisidiidae, Chironomidae, Oligochaeta, and Hydropsychidae notably dominated the invertebrate samples in this habitat (Table 5.5-5).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.71 and the evenness (Simpson's Equitability [E_D]) value was 0.30 (Table 5.5-5).

5.5.2.4 Gauer Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Gauer Lake was 505 individuals/m^2, with densities ranging from 43 to 2,424 (Table 5.5-6). The abundance of non-insects and insects was similar in the BMI community, with taxa in each group comprising 53% and 47%, respectively (Table 5.5-6). Of the non-insects, the main groups were Oligochaeta (26% of mean total BMI) and Bivalvia (19%); Gastropoda, Hirudinea, and Diplostraca were also present (Table 5.5-6). Insects were comprised mainly of Chironomidae (31%) and Ephemeroptera (9%); a small number of Ceratopogonidae, Megaloptera (alderflies), Trichoptera, and other taxa were also found (Table 5.5-6). Mean BMI density in offshore benthic grab samples was 2,453 individuals/m^2, with densities ranging from 822 to 5,064 (Table 5.5-6). Overall, the abundance of non-insects and insects was also similar in this BMI community, with taxa in each group comprising 46% and 54% of the mean total BMI, respectively (Table 5.5-6). Insects mainly consisted of Chironomidae (53%) with a small number of Trichoptera and Ephemeroptera also present (Table 5.5-6). Of the non-insects, the main groups were Oligochaeta (25%) and Bivalvia (20%); Amphipoda, Gastropoda, and Hirudinea were also present (Table 5.5-6).

Total EPT comprised 11% of the nearshore BMI community and consisted primarily of mayflies. Genus analysis of the mayflies indicated that of the two genera present in the habitat *Ephemera* sp. were dominant relative to *Hexagenia* sp. (Table 5.5-6). Trichoptera were also collected in small numbers and were comprised solely of Leptoceridae (Table 5.5-6). In the offshore polygon, total EPT comprised less than one percent of the BMI community and consisted of Ephemeroptera (exclusively *Hexagenia* sp.) and Trichoptera (exclusively *Leptoceridae* sp.) (Table 5.5-6). The EPT:C ratio was 0.25 in the nearshore and 0.01 in the offshore polygon, indicating that the insect communities in both habitats had greater abundances of chironomids than EPT (Table 5.5-6).

Taxonomic richness in the nearshore was 11 families, with richness values ranging from one to nine within each sample (Table 5.5-6). Hill's Effective Richness (E^H) was three. In the nearshore, Oligochaeta and Pisidiidae notably dominated the invertebrate community. In the offshore habitat, taxonomic richness was 9 families, with richness values ranging from 2 to 6 families (Table 5.5-6). In the offshore, Chironomidae, Oligochaeta, and Pisidiidae were the most dominant taxa in the BMI community (Table 5.5-6).

Mean diversity (Simpson's Diversity Index [D]) was 0.59 and 0.62 in the nearshore and offshore polygons, respectively (Table 5.5-6). Evenness (Simpson's Equitability [E_D]) was 0.78 in the nearshore polygon and 0.58 in the offshore polygon (Table 5.5-6).

5.6 FISH COMMUNITY

5.6.1 Gill netting

In 2009, in the Lower Churchill River Region, gill netting was conducted in Partridge Breast Lake (26 – 29 August), Northern Indian Lake (11 – 17 August), and in the lower Churchill River (12 – 17 August) (Table 5.6-1; Figures 5.6-1 - 5.6-3). Results of gillnetting efforts conducted in 2009, in Gauer Lake, an off-system waterbody, are also included in this report. Gill netting was conducted in Gauer Lake from 23 – 28 July (Figure 5.6-4 and Table 5.6-1).

In Partridge Breast Lake, nine sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets. Water temperature during the sampling period ranged from 11.0 – 12.0°C.

In Northern Indian Lake, 12 sites were sampled using standard gang index gill nets and four sites were sampled using small mesh index gill nets. Water temperature during the sampling period ranged from 14.0 – 15.0°C.

Nine sites were sampled in the lower Churchill River and Gauer Lake with standard gang index gill nets and three sites were sampled with small mesh index gill nets. During sampling, water temperature ranged from 14.1 – 15.0°C in the lower Churchill River and 15.0 – 19.0°C in Gauer Lake.

5.6.2 Species Composition

In 2009, 12 species of fish were captured in the Lower Churchill River Region (Table 5.6-2).

5.6.2.1 Partridge Breast Lake

A total of 608 fish representing eight species were captured in standard gang index gill nets (Table 5.6-3) and a total of 369 fish representing ten species were captured in small mesh index gill nets (Table 5.6-4). Northern Pike represented 28.78% (n = 175) of the standard gang index gillnet catch, followed by Walleye (n = 170; 27.96%) and White Sucker (n = 162; 26.64%) (Table 5.6-3; Figure 5.6-5). In the small mesh index gillnet catch, Spottail Shiner was the most common species captured (n = 173; 46.88%) followed by Yellow Perch (n = 62; 16.80%) and Emerald Shiner (n = 53; 14.36%) (Table 5.6-4; Figure 5.6-5).

In terms of biomass, the 608 fish captured in standard gang index gill nets weighed a total of 621,412g (Table 5.6-5) with Northern Pike contributing 38.90% (241,740 g) of the biomass, followed by Walleye (157,680 g; 25.37%) and White Sucker (149,844 g; 24.11%). The total small mesh index gillnet catch (n = 369) comprised 25,623 g of biomass (Table 5.6-6). The majority of biomass was attributed to the Northern Pike catch (13,010 g; 50.77%) followed by Walleye (5,681 g; 22.17%) and Lake Whitefish (4,555 g; 17.78%).

5.6.2.2 Northern Indian Lake

A total of 817 fish representing seven species were captured in standard gang index gill nets (Table 5.6-3) and a total of 497 fish representing ten species were captured in small mesh index gill nets (Table 5.6-4). Walleye represented 35.86% (n = 293) of the standard gang index gillnet catch, followed by White Sucker (n = 219; 26.81%), Northern Pike (n = 135; 16.52%) and Lake Whitefish (n = 117; 14.32%) (Table 5.6-3; Figure 5.6-6). In the small mesh index gillnet catch, Spottail Shiner was the most common species captured (n = 195; 39.24%), followed by Walleye (n = 90; 18.11%) and Troutperch (n = 77; 15.49%) (Table 5.6-4; Figure 5.6-6).

Total biomass captured in standard gang index gill nets was 683,224 g (Table 5.6-5) with Walleye contributing 28.57%, followed by Northern Pike (28.15%) and White Sucker (25.25%). Small mesh index gill nets produced a total of 58,033 g of biomass with Northern Pike comprising 47.89% and Walleye contributing 46.00% of the overall total (Table 5.6-6).

5.6.2.3 Lower Churchill River

A total of 205 fish representing seven species were captured in standard gang index gill nets and 146 fish representing nine species were captured in small mesh index gill nets (Tables 5.6-3 and 5.6-4).

The most common species captured in standard gang index gill nets were Lake Whitefish (n = 62; 30.24%), Walleye (n = 51; 24.88%), Northern Pike (n = 36; 17.56%), and Lake Sturgeon (n

= 35; 17.07%) (Table 5.6-3; Figure 5.6-7). In the small mesh index gillnet catch, Troutperch was the most common species captured (n = 102; 69.86%), followed by Spottail Shiner (n = 21; 14.38%) (Table 5.6-4; Figure 5.6-7).

Total biomass captured in standard gang index gill nets was 348,044 g (Table 5.6-5) with Lake Sturgeon comprising 29.51% of the catch, followed by Northern Pike (27.15%), Lake Whitefish (20.23%) and Walleye (18.18%). Total biomass captured in small mesh index gill nets was 5,340 g (Table 5.6-6) with Walleye contributing 71.82% to the overall catch.

5.6.2.4 Gauer Lake

In 2009, a total of 565 fish were captured in standard gang index gill nets (Table 5.6-3). White Sucker was most abundant (n = 171; 30.27%), followed by Walleye (n = 131; 23.19%) and Lake Whitefish (n = 105; 18.58%) (Table 5.6-3; Figure 5.6-8). In small mesh index gill nets, a total of 272 fish were captured, the majority of which were Spottail Shiner (n = 143; 52.57%) and Troutperch (n = 49; 18.01%) (Table 5.6-4; Figure 5.6-8).

Standard gang index gill nets produced 518,068 g of biomass (Table 5.6-5), to which White Sucker contributed 38.66%, followed by Northern Pike (20.37%), Walleye (17.73%) and Lake Whitefish (16.83%). Small mesh index gill nets produced 27,230 g of biomass with Northern Pike (54.79%) and Walleye (29.67%) comprising the majority (Table 5.6-6).

5.6.3 Catch Per Unit of Effort (CPUE) and Biomass Per Unit Effort (BPUE)

5.6.3.1 Partridge Breast Lake

In 2009, the mean CPUE for the standard gang index gillnet catch in Partridge Breast Lake was 58.1 fish/100 m of net/24 h (Table 5.6-7; Figure 5.6-9). Northern Pike had the highest CPUE (16.7), followed by Walleye (16.3) and White Sucker (15.3) (Figure 5.6-10).

Mean CPUE for the small mesh index gillnet catch was 120.8 fish /30 m of net/24 h (Table 5.6-8; Figure 5.6-9). Spottail Shiner had the highest CPUE (56.5), followed by Yellow Perch (20.0) and Emerald Shiner (17.9) (Figure 5.6-10).

Mean BPUE for the standard gang index gillnet catch was 59,268 g/100 m of net/24 h (Table 5.6-9). Northern Pike had the highest BPUE (23,097), followed by Walleye (15,051) and White Sucker (14,168). Mean BPUE for the small mesh index gillnet catch was 8,410 g/30 m of net/24 h (Table 5.6-10). Northern Pike had the highest BPUE (4,302), followed by Walleye (1,822) and Lake Whitefish (1,497).

5.6.3.2 Northern Indian Lake

In 2009, mean CPUE for the standard gang index gillnet catch in Northern Indian Lake was 58.6 (Table 5.6-7; Figure 5.6-9). Walleye had the highest CPUE (20.9), followed by White Sucker (15.6) (Figure 5.6-10).

Mean CPUE for the small mesh index gillnet catch was 121.0 (Table 5.6-8; Figure 5.6-9). Spottail Shiner had the highest CPUE (47.2), followed by Walleye (21.8) and Troutperch (19.1) (Figure 5.6-10).

Mean BPUE for the standard gang index gillnet catch was 49,014 (Table 5.6-9). The highest BPUE values were contributed by Walleye (13,894), Northern Pike (13,854) and White Sucker (12,324). Small mesh index gillnets had a mean BPUE of 14,103 (Table 5.6-10). Northern Pike (6,776) and Walleye (6,470) had the highest BPUE values.

5.6.3.3 Lower Churchill River

Standard gang index gill nets set in the lower Churchill River in 2009 had a CPUE of 21.2 (Table 5.6-7; Figure 5.6-9). Lake Whitefish had the highest CPUE (6.5), followed by Walleye (5.4) (Figure 5.6-10).

The overall CPUE for small mesh index gill nets was 53.8 (Table 5.6-8; Figure 5.6-9). Troutperch was the most frequently captured species having a CPUE of 37.4 (Figure 5.6-10).

Mean BPUE for the standard gang index gillnet catch was 35,765 (Table 5.6-9). Lake Sturgeon had the highest BPUE (10,043), followed by Northern Pike (10,005), Lake Whitefish (7,284), and Walleye (6,358). Mean BPUE for the small mesh index gillnet catch was 1,963 (Table 5.6-10). Walleye had the highest BPUE value of 1,402.

5.6.3.4 Gauer Lake

In Gauer Lake in 2009, standard gang index gill nets had an overall CPUE of 59.9 (Table 5.6-7; Figure 5.6-9) and small mesh index gill nets had a CPUE of 92.4 (Table 5.6-8; Figure 5.6-9).

White Sucker was the most common species in the standard gang index gillnet catch (CPUE = 18.1), followed by Walleye (14.0), and Lake Whitefish (11.5). Spottail Shiner was most abundant in the small mesh index gillnet catch (CPUE = 49.6), followed by Troutperch (15.7) and Walleye (10.8) (Figure 5.6-10).

Mean BPUE for the standard gang index gillnet catch was 55,082 (Table 5.6-9) with White Sucker having the highest BPUE value (21,199), followed by Northern Pike (11,109), Walleye

(9,731) and Lake Whitefish (9,503). The small mesh index gillnet catch had a mean BPUE of 9,314 (Table 5.6-10) with Northern Pike having the highest value (5,155), followed by Walleye (2,701).

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 2009 were measured for fork length (mm) and weight (g). Condition factor was also calculated for each species based on these metrics. Fork length frequency histograms for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets are illustrated in Figures 5.6-11, 5.6-12, and 5.6-13, respectively.

5.6.4.1 Partridge Breast Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 586 mm, a mean weight of 1,381 g, and a mean condition factor of 0.64 (Table 5.6-11). In small mesh index gill nets, Northern Pike had a mean fork length of 566 mm, a mean weight of 1,301 g, and a mean condition factor of 0.69 (Table 5.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 355 mm, a mean weight of 760 g, and a mean condition factor of 1.43 (Table 5.6-11). In small mesh index gill nets, Lake Whitefish had a mean fork length of 351 mm, a mean weight of 240 g, and a mean condition factor of 1.50 (Table 5.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 429 mm, a mean weight of 928 g, and a mean condition factor of 1.10 (Table 5.6-11). In small mesh index gill nets, Walleye had a mean fork length of 425 mm, a mean weight of 379 g, and a mean condition factor of 1.15 (Table 5.6-12).

5.6.4.2 Northern Indian Lake

Northern Pike captured in standard gang index gill nets set in Northern Indian Lake in 2009 had a mean fork length of 584 mm, a mean weight of 1,425 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 550 mm, a mean weight of 1,158 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 356 mm, a mean weight of 794 g, and a mean condition factor of 1.42 (Table 5.6-11). In small mesh index gill nets, Lake Whitefish had a mean fork length of 273 mm, a mean weight of 163 g, and a mean condition factor of 1.28 (Table 5.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 376 mm, a mean weight of 666 g, and a mean condition factor of 1.10 (Table 5.6-11). In small mesh index gill nets, Walleye had a mean fork length of 338 mm, a mean weight of 297 g, and a mean condition factor of 1.08 (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 2009 had a mean fork length of 666 mm, a mean weight of 2,625 g, and a mean condition factor of 0.72 (Table 5.6-11). Lake Whitefish had a mean fork length of 407 mm, a mean weight of 1,135 g, and a mean condition factor of 1.61. The walleye catch had a mean fork length of 475 mm, a mean weight of 1,241 g, and a mean condition factor of 1.10. There were an insufficient number of fish captured in small mesh index gillnets to warrant analyses based on size metrics.

5.6.4.4 Gauer Lake

In standard gang index gill nets set in Gauer Lake in 2009, captured Northern Pike had a mean fork length of 563 mm, a mean weight of 1,319 g, and a mean condition factor of 0.67 (Table 5.6-11). Lake Whitefish had a mean fork length of 363 mm, a mean weight of 831 g, and a mean condition factor of 1.49. Walleye had a mean fork length of 390 mm, a mean weight of 701 g, and a mean condition factor of 1.09 (Table 5.6-11). Fish captured in small mesh gill nets were measured for weight only (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 2009.

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 Partridge Breast Lake

Age was determined for 175 Northern Pike captured in standard gang index gill nets set in Partridge Breast Lake in 2009 (Table 5.6-13). The majority of Northern Pike ranged from six to nine years of age, with 7-year old fish most abundant (n = 45; 25.71%).

A total of 75 Lake Whitefish captured in standard gang index gill nets were aged. Lake Whitefish aged three to seventeen were represented in the catch, with the exception of 16-year old fish (Table 5.6-14).

Ages were determined for 169 Walleye captured in standard gang index gill nets (Table 5.6-15). Walleye aged six through fourteen were well represented, with 11-year old fish captured in low numbers. Walleye ranged in age from three to 20-years old.

5.6.5.2 Northern Indian Lake

Ages were determined for 132 Northern Pike captured in Northern Indian Lake in 2009 (Table 5.6-13). The majority of aged fish ranged from four to ten years of age, with 6-year old fish being most abundant in the catch.

A total of 111 Lake Whitefish were aged (Table 5.6-14). Age classes two through 25 were represented in the sample, with the exception of 21- and 23-year old fish. The majority of captured Lake Whitefish ranged in age from three to nine, although five and six year old fish were comparably lower in number.

Ages were determined for 290 captured Walleye (Table 5.6-15). The majority of Walleye ranged in age from seven to fourteen, with the oldest fish being 27 years of age.

5.6.5.3 Lower Churchill River

A total of 35 Northern Pike captured in the lower Churchill River in 2009 were aged (Table 5.6-13). Most Northern Pike ranged in age from seven to nine, with 11-year old fish also relatively abundant in the sample.

Of the 60 Lake Whitefish for which ages were determined, the majority ranged in age from six to nine years (Table 5.6-14).

Ages were determined for 50 captured Walleye, with fish aged 11 to 14 being 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 2009 were aged (Table 5.6-13). The majority of captured pike ranged in age from six to eight years.

Ages were determined for 103 Lake Whitefish (Table 5.6-14), with fish ranging in age from seven to ten years most abundant. Three-year old Lake Whitefish were also relatively abundant in the catch.

A total of 126 Walleye captured in Gauer Lake in 2009 were aged (Table 5.6-15). The majority of Walleye ranged in age from eight to fourteen years, with 11- and 12-year old fish less abundant.

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 2009 were examined externally for DELTs (Table 5.6-19).

5.6.6.1 Partridge Breast Lake

Of the 586 fish captured in Partridge Breast Lake and examined externally, DELTs were documented for eight fish. Captured Lake Whitefish had the highest percentage (5.06%) of DELTs, with one fish having erosion and three fish having lesions.

5.6.6.2 Northern Indian Lake

DELTs were documented for eleven of the 764 fish captured in standard gang index gill nets set in Northern Indian Lake in 2009. Captured Lake Whitefish had the highest proportion of DELTs (3.42%), with lesions observed on four of the 117 captured fish.

5.6.6.3 Lower Churchill River

In the lower Churchill River, a total of four of the 201 captured fish were determined to have DELTs. Three of the four fish having DELTs were Walleye (two deformities and one tumour).

5.6.6.4 Gauer Lake

Two of the 487 fish captured in Gauer Lake in 2009 had DELTs. White Sucker accounted for both DELTs, with two fish having deformities.

SECTION 5: TABLES AND FIGURES

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Table 5.3-1. Summary statistics for *in situ* variables (near surface) measured in the Lower Churchill River Region: 2009/2010.

	Temperature (°C)				*In situ* pH				DO (mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	7.52	8.88	12.68	9.34	7.62	7.34	7.94	7.25	16.83	11.85	16.18	11.65
Median	8.25	9.89	13.12	10.29	7.58	7.22	8.11	7.45	16.63	11.11	16.57	11.16
Minimum	0.00	0.00	10.76	0.20	7.20	6.58	7.55	6.35	15.25	9.75	15.35	9.56
Maximum	13.56	15.75	14.16	16.57	8.13	8.33	8.16	7.76	18.81	15.45	16.61	14.71
SD	5.41	6.31	1.42	6.58	0.34	0.63	0.28	0.56	1.42	2.23	0.58	2.03
SE	3.12	3.64	1.01	3.80	0.20	0.36	0.20	0.32	0.82	1.29	0.41	1.17
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-

	DO Saturation (%)				*In situ* Specific Conductance (µS/cm)				*In situ* Turbidity (NTU)				ORP (mV)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	146	104	153	104	119	130	111	153	11.3	7.95	10.2	2.75	149	149	142	158
Median	151	102	151	103	116	125	114	139	11.0	5.80	8.80	2.30	144	157	151	160
Minimum	117	100	150	100	110	117	102	129	4.70	1.60	8.20	0.80	115	78	120	107
Maximum	164	114	159	109	133	151	118	206	18.6	18.6	13.5	5.60	195	204	154	205
SD	18	6	4	3	9	13	7	31	5.04	6.82	2.37	1.79	29	49	15	46
SE	10	3	3	2	5	7	5	18	2.91	3.94	1.68	1.03	17	28	11	27
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.3-1. - continued -

	Secchi Disk Depth (m)				Calculated Euphotic Depth (m)				Estimated Euphotic Depth (m)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	1.42	1.78	1.00	2.10	2.28	3.57	2.00	4.19	2.42	3.55	-	3.00
Median	0.95	1.78	1.00	2.50	1.90	3.56	2.00	5.00	2.00	3.50	-	2.50
Minimum	0.83	1.07	1.00	1.26	1.65	2.14	2.00	2.52	1.75	2.14	-	2.50
Maximum	1.65	2.50	1.00	2.53	3.30	5.00	2.00	5.06	3.50	5.00	-	4.00
SD	0.45	0.72	-	0.73	0.89	1.43	-	1.45	0.95	1.43	-	0.87
SE	0.26	0.41	-	0.42	0.51	0.83	-	0.84	0.55	0.83	-	0.50
N	3	3	1	3	3	3	1	3	3	3	0	3
N >DL	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.3-2. Summary statistics for routine laboratory variables measured in the Lower Churchill River Region: 2009/2010.

	Total Alkalinity ($CaCO_3$ mg/L)				Bicarbonate Alkalinity (HCO_3 mg/L)				Carbonate Alkalinity (CO_3 mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	59.7	61.7	60.7	74.9	72.7	75.3	74.1	91.4	<0.60	<0.60	<0.60	<0.60
Median	58.7	62.6	61.0	70.8	71.6	76.4	74.4	86.4	<0.60	<0.60	<0.60	<0.60
Minimum	55.2	58.4	57.9	68.6	67.4	71.2	70.7	83.7	<0.60	<0.60	<0.60	<0.60
Maximum	66.4	63.4	63.2	89.4	80.4	77.4	77.1	109	<0.60	<0.60	<0.60	<0.60
SD	4.3	2.0	2.2	8.5	5.0	2.4	2.6	10.3	-	-	-	-
SE	2.5	1.1	1.5	4.9	2.9	1.4	1.9	5.9	-	-	-	-
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	4	4	4	4	4	4	4	4	0	0	0	0
% Detected	100	100	133	100	100	100	133	100	0	0	0	0

	Ammonia (mg N/L)				Nitrate/Nitrite (mg N/L)				TKN (mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	0.023	0.016	0.0044	0.015	0.0185	0.0199	<0.0050	0.0189	0.31	0.26	0.37	0.30
Median	0.012	<0.010	0.0040	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	0.30	0.22	0.38	0.30
Minimum	<0.010	<0.010	<0.0030	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	0.25	<0.20	0.32	<0.20
Maximum	0.063	0.041	0.0078	0.040	0.0640	0.0720	<0.0050	0.0640	0.40	0.48	0.42	0.50
SD	0.023	0.015	0.0026	0.015	0.0263	0.0301	-	0.0261	0.06	0.16	0.04	0.20
SE	0.013	0.009	0.0018	0.009	0.0152	0.0174	-	0.0151	0.03	0.09	0.03	0.11
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	3	3	2	3	2	1	0	2	4	2	3	2
% Detected	75	75	67	75	50	25	0	50	100	50	100	50

Table 5.3-2. - continued -

	DIN (mg/L)[1]				Organic Nitrogen (mg/L)[1]				TN (mg/L)[1]			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	0.0421	0.0354	0.0064	0.0339	0.29	0.24	0.37	0.28	0.33	0.27	0.38	0.32
Median	0.0418	0.0295	0.0065	0.0305	0.27	0.21	0.38	0.29	0.30	0.22	0.38	0.30
Minimum	0.0158	0.0056	<0.0050	0.0058	0.22	0.06	0.31	0.06	0.26	<0.20	0.32	<0.20
Maximum	0.0690	0.0770	0.0103	0.0690	0.40	0.48	0.42	0.50	0.46	0.55	0.42	0.56
SD	0.0260	0.0277	0.0032	0.0242	0.07	0.17	0.04	0.20	0.08	0.19	0.04	0.22
SE	0.0150	0.0160	0.0023	0.0140	0.04	0.10	0.03	0.12	0.05	0.11	0.03	0.12
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-

	TDP (mg/L)				TPP (mg/L)				TP (mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	0.0110	0.0095	0.0087	0.0085	0.0071	0.0113	0.0116	0.0075	0.0181	0.0208	0.0204	0.0160
Median	0.0106	0.0074	0.0099	0.0080	0.0072	0.0078	0.0153	0.0080	0.0171	0.0196	0.0214	0.0157
Minimum	0.0059	0.0054	0.0060	0.0062	0.0043	0.0050	0.0042	0.0041	0.0116	0.0110	0.0145	0.0145
Maximum	0.0171	0.0179	0.0103	0.0117	0.0095	0.0244	0.0154	0.0101	0.0266	0.0329	0.0252	0.0182
SD	0.0042	0.0050	0.0019	0.0020	0.0024	0.0090	0.0064	0.0025	0.0054	0.0082	0.0044	0.0014
SE	0.0024	0.0029	0.0014	0.0012	0.0012	0.0045	0.0037	0.0013	0.0031	0.0047	0.0031	0.0008
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	4	4	3	4	4	4	3	4	4	4	3	4
% Detected	100	100	100	100	100	100	100	100	100	100	100	100

Table 5.3-2. - continued -

	TN:TP[1]				DIN:DP[1]				DIN:TP[1]				DOC (mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	42	36	42	42	10	8	2	9	6	4	1	5	6.7	7.5	7.8	8.7
Median	40	33	40	38	6	8	1	9	4	5	1	4	6.6	7.5	7.7	8.7
Minimum	32	7	37	14	3	1	1	2	2	0	0	1	5.7	6.8	6.7	7.9
Maximum	57	69	49	79	26	16	2	15	14	7	2	10	7.9	8.1	9.1	9.3
SD	9	26	5	28	9	5	1	6	5	3	1	3	0.9	0.5	1.0	0.5
SE	5	15	4	16	5	3	0	3	3	2	0	2	0.5	0.3	0.7	0.3
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	4	4	3	4
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	100	100	100	100

	TOC (mg/L)				TIC (mg/L)				TOC:ON[1]			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	6.9	7.8	7.8	9.1	13.0	14.0	13.7	17.4	29	73	25	80
Median	6.9	7.8	7.9	9.2	12.9	14.0	13.3	16.7	28	59	25	70
Minimum	5.7	7.5	6.6	8.1	10.7	13.5	12.9	15.1	22	20	20	21
Maximum	8.0	7.9	8.9	9.9	15.6	14.3	14.8	21.0	39	154	30	157
SD	1.1	0.2	0.9	0.7	1.9	0.3	0.8	2.2	6	54	4	59
SE	0.6	0.1	0.7	0.4	1.1	0.2	0.6	1.3	4	31	3	34
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	4	4	3	4	4	4	3	4	-	-	-	-
% Detected	100	100	100	100	100	100	100	100	-	-	-	-

Table 5.3-2. - continued -

	TOC:TN[1]				TDS (mg/L)				Laboratory Conductivity (µmhos/cm)				TSS (mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	25	54	24	61	81.3	88.0	82.7	100	121	120	122	140	2.8	<2.0	10.5	<2.0
Median	22	56	25	56	83.0	88.0	84.0	97.0	120	119	124	130	2.7	<2.0	9.2	<2.0
Minimum	20	17	20	20	70.0	86.0	76.0	90.0	114	112	114	127	<2.0	<2.0	5.6	<2.0
Maximum	37	89	29	109	89.3	90.0	88.0	116	132	129	128	172	4.8	2.8	16.8	2.8
SD	7	33	3	41	7.3	1.4	5.0	10.3	7	6	6	19	1.8	0.8	4.7	0.8
SE	4	19	2	23	4.2	0.8	3.5	5.9	4	4	4	11	1.0	0.5	3.3	0.5
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	-	-	-	-	4	4	3	4	4	4	3	4	2	2	3	1
% Detected	-	-	-	-	100	100	100	100	100	100	100	100	50	50	100	25

	Laboratory Turbidity (NTU)				True Colour (TCU)				Laboratory pH			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	7.73	5.07	6.77	1.27	20.8	26.3	26.7	23.8	8.16	8.02	8.22	8.10
Median	8.05	4.60	7.00	1.50	19.2	25.0	20.0	20.0	8.18	8.02	8.22	8.10
Minimum	3.83	1.50	6.20	0.10	15.0	15.0	10.0	20.0	7.98	7.92	8.16	8.01
Maximum	11.0	9.57	7.10	2.00	30.0	40.0	50.0	35.0	8.30	8.12	8.27	8.18
SD	2.66	3.50	0.40	0.72	6.3	8.9	17.0	6.5	0.12	0.08	0.04	0.08
SE	1.54	2.02	0.28	0.42	3.6	5.2	12.0	3.8	0.07	0.05	0.03	0.05
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	4	4	3	4	4	4	3	4	4	4	3	4
% Detected	100	100	100	100	100	100	100	100	100	100	100	100

Table 5.3-2. - continued -

	E. coli (CFU/100 mL)				Chlorophyll *a* (µg/L)				Hardness as $CaCO_3$ (mg/L)				Chloride (mg/L)				Sulphate (mg/L)			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	<1	<10	4	<10	1.50	2.37	2.93	4.46	61.4	64.9	66.1	78.4	1.11	1.02	1.37	0.88	4.49	6.60	5.13	7.00
Median	<1	<10	4	<10	1.50	2.70	3.10	4.75	61.8	62.7	63.7	74.6	1.06	1.06	1.08	0.93	4.80	6.20	5.60	6.95
Minimum	<1	<1	3	<1	0.30	0.68	1.90	1.03	56.7	59.1	61.2	70.3	0.97	0.67	0.94	0.58	2.87	3.90	3.70	3.60
Maximum	2	<10	5	<10	2.70	3.40	3.80	7.30	65.3	75.3	73.3	94.3	1.34	1.29	2.09	1.06	5.50	10.1	6.10	10.5
SD	1	-	1	2	0.85	1.06	0.78	2.43	3.2	6.2	5.2	9.4	0.14	0.23	0.51	0.18	1.02	2.34	1.03	2.91
SE	0	-	1	1	0.49	0.61	0.55	1.40	1.9	3.6	3.7	5.4	0.08	0.13	0.36	0.10	0.59	1.35	0.73	1.68
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	1	0	3	1	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
% Detected	25	0	100	25	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

[1] Calculated.

Table 5.3-3. Summary statistics for metals and major ions measured in the Lower Churchill River Region: 2009/2010. Values are presented as mg/L.

	Aluminum				Antimony				Arsenic				Barium				Beryllium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	0.390	0.240	0.143	0.0235	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0128	0.0106	0.0111	0.00910	<0.0010	<0.0010	<0.0010	<0.0010
Median	0.405	0.222	0.143	0.0283	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0130	0.0107	0.0120	0.00934	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	0.0871	0.0772	0.0369	0.0051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00967	0.00813	0.00905	0.00710	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	0.664	0.436	0.250	0.0323	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0158	0.0129	0.0122	0.0106	<0.0010	<0.0010	<0.0010	<0.0010
SD	0.211	0.156	0.0870	0.0110	-	-	-	-	-	-	-	-	0.00234	0.00225	0.00144	0.00135	-	-	-	-
SE	0.122	0.0899	0.0615	0.0063	-	-	-	-	-	-	-	-	0.00135	0.00130	0.00102	0.00078	-	-	-	-
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	4	4	3	4	0	0	0	0	0	0	0	0	4	4	3	4	0	0	0	0
% Detected	100	100	100	100	0	0	0	0	0	0	0	0	100	100	100	100	0	0	0	0

Table 5.3-3. - continued -

	Bismuth				Boron				Cadmium				Calcium				Cesium				Chromium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	<0.00020	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030	<0.030	0.000024	<0.000010	0.000012	0.000015	16.4	17.9	18.2	22.3	<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	<0.030	<0.030	<0.030	<0.030	<0.000010	<0.000010	0.000014	<0.000010	16.6	17.2	17.3	21.2	<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	<0.030	<0.030	<0.030	<0.030	<0.000010	<0.000010	<0.000010	<0.000010	14.8	15.9	17.1	20.2	<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	<0.030	<0.030	<0.030	<0.030	0.000080	0.000013	0.000018	0.000035	17.8	21.5	20.2	26.5	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010
SD	-	-	-	-	-	-	-	-	0.000032	0.000003	0.000005	0.000012	1.1	2.1	1.4	2.5	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	0.000019	0.000002	0.000004	0.000007	0.7	1.2	1.0	1.4	-	-	-	-	-	-	-	-
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	0	0	0	0	0	0	0	0	1	1	2	2	4	4	3	4	0	0	0	0	0	0	0	0
% Detected	0	0	0	0	0	0	0	0	25	25	67	50	100	100	100	100	0	0	0	0	0	0	0	0

Table 5.3-3. - continued -

	Cobalt				Copper				Iron				Lead				Lithium				Magnesium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	<0.00020	0.00027	<0.00020	<0.00020	0.0015	<0.0010	<0.0010	<0.0010	0.261	0.190	0.165	0.05	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	4.93	4.91	5.02	5.54
Median	<0.00020	<0.00020	<0.00020	<0.00020	0.0014	<0.0010	<0.0010	<0.0010	0.275	0.184	0.188	0.04	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	4.95	4.97	5.00	5.24
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	0.0012	<0.0010	<0.0010	<0.0010	0.077	0.078	0.027	<0.20	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	4.78	4.44	4.49	4.86
Maximum	<0.00020	0.00076	0.00022	<0.00020	0.0019	0.0017	0.0013	<0.0010	0.420	0.313	0.279	0.09	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	5.04	5.26	5.58	6.81
SD	-	0.00029	0.00006	-	0.0003	0.0005	0.0004	-	0.125	0.087	0.104	0.03	-	-	-	-	-	-	-	-	0.10	0.34	0.45	0.76
SE	-	0.00017	0.00004	-	0.0002	0.0003	0.0003	-	0.072	0.050	0.074	0.02	-	-	-	-	-	-	-	-	0.05	0.20	0.31	0.44
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	0	0	0	0	4	4	3	4
N >DL	0	1	1	0	4	1	1	0	4	4	3	3	0	0	0	0	-	-	-	-	4	4	3	4
% Detected	0	25	33	0	100	25	33	0	100	100	100	75	0	0	0	0	-	-	-	-	100	100	100	100

Table 5.3-3. - continued -

	Manganese				Mercury				Molybdenum				Nickel				Potassium				Rubidium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	0.00627	0.0116	0.0182	0.0137	<0.00010	<0.00010	<0.000020	<0.00010	0.00022	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	1.18	1.00	1.02	0.815	0.00160	0.00130	0.00132	0.00080
Median	0.00624	0.00732	0.0152	0.0165	<0.00010	<0.00010	<0.000020	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	1.21	1.00	1.09	0.805	0.00175	0.00129	0.00141	0.00081
Minimum	0.00501	0.00655	0.0130	0.00286	<0.000020	<0.000020	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	0.983	0.790	0.820	0.730	0.00088	0.00095	0.00112	0.00069
Maximum	0.00760	0.0252	0.0265	0.0190	<0.00010	<0.00010	<0.000020	<0.00010	0.00042	0.00038	<0.00020	0.00033	<0.0020	0.0035	<0.0020	0.0036	1.32	1.19	1.14	0.920	0.00202	0.00166	0.00143	0.00090
SD	0.00092	0.00787	0.0059	0.00646	-	-	-	-	0.00013	0.00012	-	0.00010	-	0.0011	-	0.0011	0.123	0.161	0.141	0.068	0.00046	0.00033	0.00014	0.00007
SE	0.00053	0.00455	0.0042	0.00373	-	-	-	-	0.00008	0.00007	-	0.00006	-	0.0006	-	0.0007	0.071	0.093	0.099	0.039	0.00026	0.00019	0.00010	0.00004
N	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	4	4	3	4	0	0	0	0	2	1	0	1	0	1	0	1	4	4	3	4	4	4	3	4
% Detected	100	100	100	100	0	0	0	0	50	25	0	25	0	25	0	25	100	100	100	100	100	100	100	100

Table 5.3-3. - continued -

	Selenium				Silicon				Silver				Sodium				Strontium				Tellurium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	2.75	2.13	2.24	1.56	0.0345	0.0312	0.0324	0.0297	<0.0010	<0.0010	<0.0010	<0.0010
Median	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	2.81	2.23	2.59	1.51	0.0346	0.0310	0.0348	0.0293	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	2.49	1.40	1.42	1.40	0.0324	0.0290	0.0252	0.0251	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	0.0011	<0.0010	<0.0010	<0.0010	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	2.88	2.68	2.71	1.81	0.0363	0.0340	0.0373	0.0350	<0.0010	<0.0010	<0.0010	<0.0010
SD	0.0003	-	-	-	-	-	-	-	-	-	-	-	0.15	0.56	0.58	0.16	0.0014	0.0021	0.0052	0.0035	-	-	-	-
SE	0.0002	-	-	-	-	-	-	-	-	-	-	-	0.09	0.32	0.41	0.09	0.0008	0.0012	0.0037	0.0020	-	-	-	-
N	4	4	3	4	0	0	0	0	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	1	0	0	0	-	-	-	-	0	0	0	0	4	4	3	4	4	4	3	4	0	0	0	0
% Detected	25	0	0	0	-	-	-	-	0	0	0	0	100	100	100	100	100	100	100	100	0	0	0	0

Table 5.3-3. - continued -

	Thallium				Thorium				Tin				Titanium				Tungsten				Uranium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.0010	0.00275	<0.00060	0.00293	0.0162	0.00683	0.00829	<0.00090	<0.00050	<0.00050	<0.00020	<0.00050	0.00014	0.00015	0.00017	0.00018
Median	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.0010	0.00070	<0.00060	<0.0010	0.0161	0.00654	0.00780	0.00095	<0.00050	<0.00050	<0.00020	<0.00050	0.00014	0.00015	0.00016	0.00018
Minimum	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.00060	<0.00060	<0.00060	<0.00060	0.00346	0.00263	0.00770	<0.00090	<0.00020	<0.00020	<0.00020	<0.00020	0.00014	0.00012	0.00014	0.00017
Maximum	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	<0.0010	0.00929	<0.00060	0.0106	0.0294	0.0116	0.00938	0.00106	<0.00050	<0.00050	<0.00020	<0.00050	0.00014	0.00018	0.00021	0.00020
SD	-	-	-	-	-	-	-	-	-	0.00379	-	0.00443	0.00963	0.00420	0.00077	0.00024	-	-	-	-	0.00000	0.00002	0.00003	0.00001
SE	-	-	-	-	-	-	-	-	-	0.00219	-	0.00256	0.00556	0.00242	0.00054	0.00014	-	-	-	-	0.00000	0.00001	0.00002	0.00001
N	4	4	3	4	0	0	0	0	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	0	0	0	0	-	-	-	-	0	2	0	1	4	4	3	3	0	0	0	0	4	4	3	4
% Detected	0	0	0	0	-	-	-	-	0	50	0	25	100	100	100	75	0	0	0	0	100	100	100	100

Table 5.3-3. - continued -

	Vanadium				Zinc				Zirconium			
	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU	PBL	NIL	LCR-LiCR	GAU
Mean	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.010	0.00040	0.00028	<0.00020	<0.00020
Median	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.010	0.00035	0.00020	<0.00020	<0.00020
Minimum	<0.0010	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.010	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.0012	<0.0010	<0.0010	<0.0010	<0.010	<0.010	<0.010	<0.010	0.00069	0.00050	<0.00020	<0.00020
SD	0.0003	-	-	-	-	-	-	-	0.00021	0.00013	-	-
SE	0.0002	-	-	-	-	-	-	-	0.00012	0.00008	-	-
N	4	4	3	4	4	4	3	4	4	4	3	4
N >DL	1	0	0	0	0	0	0	0	2	1	0	0
% Detected	25	0	0	0	0	0	0	0	50	25	0	0

Table 5.3-4. 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: 2009/2010. 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	0.00018-0.00026	0.0541-0.0821	0.0057-0.0089	0.3	0.00155-0.00295	0.000026
PBL	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**3**	0	0	0	0	0	**2**	0	0
	% Exceedances	**75**	0	0	0	0	0	**50**	0	0
NIL	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**2**	0	0	0	0	0	**1**	0	0
	% Exceedances	**50**	0	0	0	0	0	**25**	0	0
LCR-LiCR	N	**3**	3	3	3	3	3	3	3	3
	# Exceedances	**2**	0	0	0	0	0	0	0	0
	% Exceedances	**67**	0	0	0	0	0	0	0	0
GAU	N	4	4	4	4	4	4	4	4	3
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

Table 5.3-4. – continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.0323-0.0496	0.001	0.0001	0.0008	0.015	0.0741-0.1140	120	128-429
PBL	N	4	4	**4**	4	4	4	4	4	4
	# Exceedances	0	0	**1**[4]	0	0	0	0	0	0
	% Exceedances	0	0	**25**	0	0	0	0	0	0
NIL	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
LCR-LiCR	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
GAU	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 as the analytical detection limit was higher than the guideline.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 5.3-5. 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: 2009/2010.

		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
Partridge Breast Lake	Open-water season			0.015			
	Annual			0.018			
Northern Indian Lake	Open-water season			0.020			
	Annual				0.021		
Lower Churchill River	Open-water season			0.020			
	Annual			0.020[a]			
Gauer Lake	Open-water season			0.016			
	Annual			0.016			

[a] No sample was obtained in March 2010 at the Lower Churchill River.

Table 5.3-6. 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): 2009/2010.

		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
Partridge Breast Lake	Open-water season		0.29				
	Annual		0.33				
Northern Indian Lake	Open-water season		<0.20				
	Annual		0.27				
Gauer Lake	Open-water season		0.23				
	Annual		0.32				

Table 5.3-7. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Lower Churchill River Region and the OECD (1982) trophic categorization schemes for lakes: 2009/2010.

		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
Partridge Breast Lake	Open-water season		1.9				
	Annual		1.5				
Northern Indian Lake	Open-water season			2.9			
	Annual		2.4				
Gauer Lake	Open-water season			5.6			
	Annual			4.5			

Table 5.3-8. 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): 2009/2010.

		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		0.38				
	Annual		0.38[a]				

[a] No sample was obtained in March 2010 at the Lower Churchill River.

Table 5.3-9. 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): 2009/2010.

		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		2.9				
	Annual		2.9[a]				

[a] No sample was obtained in March 2010 at the Lower Churchill River.

Table 5.4-1. Community metrics for phytoplankton samples collected in the Lower Churchill River Region during the open-water season of 2009.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H`}$)	Evenness ($E^{H`}/S$)
Partridge Breast Lake	Spring	13	0.77	0.33	1.78	0.69	5.93	0.46
	Summer	11	0.60	0.23	1.36	0.57	3.91	0.36
	Fall	13	0.56	0.18	1.29	0.50	3.64	0.28
Northern Indian Lake	Spring	12	0.66	0.24	1.32	0.53	3.76	0.31
	Summer	12	0.76	0.35	1.71	0.69	5.53	0.46
	Fall	13	0.47	0.15	1.14	0.44	3.12	0.24
Lower Churchill River	Spring	22	0.88	0.37	2.39	0.77	10.90	0.50
	Summer	-	-		-	-	-	-
	Fall	17	0.30	0.08	0.83	0.29	2.28	0.13
Gauer Lake	Spring	20	0.73	0.19	1.83	0.61	6.22	0.31
	Summer	34	0.89	0.27	2.52	0.71	12.42	0.37
	Fall	37	0.83	0.16	2.25	0.62	9.46	0.26

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, 2009.

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
Partridge Breast Lake (2009)	Nearshore	15	2.8	1.1	3.6	--	1.51	11.0	--	shrubs, mixed forest	0	--
	Offshore	15	12.7	9.6	15.2	--	1.23	13.0	--	--	0	--
Northern Indian Lake (2009)	Nearshore	15	4.2	3.3	4.6	--	1.54	14.5	--	coniferous, shrubs	0	--
	Offshore	15	6.9	6.6	7.4	--	1.33	14.5	--	--	0	--
Churchill River (2009)	Rock Basket Sites	15	4.5	2.7	7.1	0.83	0.79	11.5	--	mixed forest	0	--
Gauer Lake (2009)	Nearshore	12	3.7	1.3	4.8	--	2.42	16.0	--	mixed forest	0	--
	Offshore	15	15.2	9.9	20.1	--	2.21	16.0	--	--	0	--

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, 2009.

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
Partridge Breast Lake (2009)	Nearshore	Mean	3	2.7	21.60	16.33	35.67	47.67	Clay, Silt
		SD	--	0.82	7.428	12.662	12.503	2.082	--
		SE	--	0.47	4.288	7.311	7.219	1.202	--
		Median	--	2.5	18.90	14.00	36.00	47.00	--
		Min	--	2.0	15.90	5.00	23.00	46.00	--
		Max	--	3.6	30.00	30.00	48.00	50.00	--
	Offshore	Mean	3	13.9	1.75	46.67	27.67	25.67	Sandy Loam
		SD	--	1.30	0.611	25.007	9.292	15.885	--
		SE	--	0.75	0.353	14.438	5.364	9.171	--
		Median	--	13.8	1.50	58.00	25.00	17.00	--
		Min	--	12.6	1.31	18.00	20.00	16.00	--
		Max	--	15.2	2.45	64.00	38.00	44.00	--
Northern Indian Lake (2009)	Nearshore	Mean	3	4.2	1.03	41.67	29.67	28.33	Clay Loam
		SD	--	0.06	0.217	5.508	7.095	1.528	--
		SE	--	0.03	0.125	3.180	4.096	0.882	--
		Median	--	4.2	0.91	42.00	31.00	28.00	--
		Min	--	4.2	0.90	36.00	22.00	27.00	--
		Max	--	4.3	1.28	47.00	36.00	30.00	--
	Offshore	Mean	3	6.9	1.58	34.00	50.67	15.67	Silt Loam
		SD	--	0.26	0.195	8.718	6.658	3.512	--
		SE	--	0.15	0.113	5.033	3.844	2.028	--
		Median	--	6.8	1.67	30.00	54.00	16.00	--
		Min	--	6.7	1.36	28.00	43.00	12.00	--
		Max	--	7.2	1.72	44.00	55.00	19.00	--
Gauer Lake (2009)	Nearshore	Mean	3	4.1	2.4	80.33	13.33	6.33	Sand
		SD	--	0.59	2.055	22.942	15.503	8.386	--
		SE	--	0.34	1.186	13.246	8.950	4.842	--
		Median	--	4.3	2.4	91.00	7.00	2.00	--
		Min	--	3.4	0.4	54.00	2.00	1.00	--
		Max	--	4.5	4.5	96.00	31.00	16.00	--
	Offshore	Mean	3	15.8	7.3	3.00	50.00	47.00	Silty Clay
		SD	--	2.57	0.218	1.000	7.550	8.185	--
		SE	--	1.48	0.126	0.577	4.359	4.726	--
		Median	--	16.9	7.4	3.00	51.00	45.00	--
		Min	--	12.9	7.1	2.00	42.00	40.00	--
		Max	--	17.7	7.5	4.00	57.00	56.00	--

Table 5.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Partridge Breast Lake within the Lower Churchill River Region for CAMPP, 2009.

	Partridge Breast Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	4250	2388.5	616.7	4545	433	9089
Oligochaeta	--	3976	2257.2	582.8	4328	346	8527
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	6	15.2	3.9	0	0	43
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	55	115.1	29.7	0	0	346
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	0.0	0.0	0	0	0
Gastropoda - unid	--	3	11.2	2.9	0	0	43
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	15.2	3.9	0	0	43
Lymnaeidae	--	12	30.5	7.9	0	0	87
Physidae	--	0	0.0	0.0	0	0	0
Planorbidae	--	3	11.2	2.9	0	0	43
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	--	4060	2316.1	598.0	4415	346	8873
Non-Insecta (%)	96	--	--	--	--	--	--
Oligochaeta	--	3976	2257.2	582.8	4328	346	8527
Oligochaeta (%)	94	--	--	--	--	--	--
Amphipoda	--	6	15.2	3.9	0	0	43
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	0	0.0	0.0	0	0	0
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	23	42.9	11.1	0	0	130
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

Table 5.5-3. – continued –

	Partridge Breast Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	11.2	2.9	0	0	43
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

Table 5.5-3. – continued –

	Partridge Breast Lake						
	Nearshore n=15						
	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	0.0	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)	--	6	22.4	5.8	0	0	87
Ceratopogonidae (larva)	--	6	15.2	3.9	0	0	43
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	61	65.0	16.8	43	0	173
Chironomidae (pupa)	--	23	42.9	11.1	0	0	130
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	58	77.9	20.1	43	0	260
Orthocladiinae	--	26	42.7	11.0	0	0	130
Tanypodinae	--	3	11.2	2.9	0	0	43
Culicidae	--	3	11.2	2.9	0	0	43
Dixidae	--	0	0.0	0.0	0	0	0
Dolichopodidae (pupa)	--	3	11.2	2.9	0	0	43
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	--	190	147.1	38.0	173	0	476
Insecta (%)	4	--	--	--	--	--	--

Table 5.5-3. – continued –

	Partridge Breast Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	170	146.7	37.9	130	0	476
Chironomidae (%)	4	--	--	--	--	--	--
Ephemeroptera	--	3	11.2	2.9	0	0	43
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	--	3	11.2	2.9	0	0	43
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.03	0.129	0.033	0.00	0.00	0.50
Genus analysis of Ephemeroptera	1 sp. (*Caenis)*						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	3	1.3	0.3	3	1	6
Simpson's Diversity Index (D)	--	0.13	0.103	0.027	0.12	0.00	0.34
Evenness (Simpson's Equitability E_D)	--	0.39	0.221	0.057	0.35	0.15	1.00
Shannon-Weaver Index (H)	--	0.31	0.232	0.060	0.29	0.00	0.84
Evenness (Shannon's Equitability E_H)	--	0.23	0.136	0.035	0.20	0.00	0.58
Hill's Effective Richness ($E^{H'}$)	--	1	0.4	0.1	1	1	2
Evenness ($E^{H'}/S$)	--	0.44	0.210	0.054	0.39	0.21	1.00

Table 5.5-3. – continued –

	Partridge Breast Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2005	1271.4	328.3	2164	87	4934
Oligochaeta	--	23	42.9	11.1	0	0	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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	1665	1068.2	275.8	1775	87	3895
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	--	141	170.4	44.0	87	0	606
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	--	1829	1217.3	314.3	1991	87	4631
Non-Insecta (%)	91	--	--	--	--	--	--
Oligochaeta	--	23	42.9	11.1	0	0	130
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	1665	1068.2	275.8	1775	87	3895
Amphipoda (%)	83	--	--	--	--	--	--
Bivalvia	--	141	170.4	44.0	87	0	606
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	--	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 5.5-3. – continued –

	Partridge Breast Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	14	35.3	9.1	0	0	130
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 5.5-3. – continued –

	Partridge Breast Lake						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Leptoceridae (pupa)	--	3	11.2	2.9	0	0	43
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)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	6	22.4	5.8	0	0	87
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	63	108.4	28.0	0	0	390
Orthocladiinae	--	6	22.4	5.8	0	0	87
Tanypodinae	--	78	98.4	25.4	43	0	303
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	--	176	242.9	62.7	87	0	866
Insecta (%)	9	--	--	--	--	--	--
Chironomidae	--	156	211.3	54.6	43	0	736
Chironomidae (%)	8	--	--	--	--	--	--
Ephemeroptera	--	14	35.3	9.1	0	0	130

Table 5.5-3. – continued –

	Partridge Breast Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	6	15.2	3.9	0	0	43
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	20	36.1	9.3	0	0	130
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.11	0.258	0.067	0.00	0.00	1.00
Genus analysis of Ephemeroptera							
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	3	1.1	0.3	3	1	5
Simpson's Diversity Index (D)	--	0.26	0.190	0.049	0.19	0.00	0.62
Evenness (Simpson's Equitability E_D)	--	0.50	0.227	0.058	0.41	0.26	1.00
Shannon-Weaver Index (H)	--	0.53	0.377	0.097	0.40	0.00	1.20
Evenness (Shannon's Equitability E_H)	--	0.39	0.219	0.057	0.43	0.00	0.74
Hill's Effective Richness ($E^{H'}$)	--	2	0.7	0.2	1	1	3
Evenness ($E^{H'}/S$)	--	0.58	0.198	0.051	0.53	0.36	1.00

Table 5.5-4. 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, 2009.

	Northern Indian Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	909	431.0	111.3	779	216	1948
Oligochaeta	--	49	56.4	14.6	43	0	130
Hirudinea	--	17	35.8	9.3	0	0	130
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	75	79.2	20.5	43	0	216
Hyalellidae	--	6	15.2	3.9	0	0	43
Diplostraca	--	3	11.2	2.9	0	0	43
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	--	20	27.7	7.2	0	0	87
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	17	35.8	9.3	0	0	130
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	17.9	4.6	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	--	196	102.0	26.3	173	43	390
Non-Insecta (%)	22	--	--	--	--	--	--
Oligochaeta	--	49	56.4	14.6	43	0	130
Oligochaeta (%)	5	--	--	--	--	--	--
Amphipoda	--	81	78.2	20.2	43	0	216
Amphipoda (%)	9	--	--	--	--	--	--
Bivalvia	--	20	27.7	7.2	0	0	87
Bivalvia (%)	2	--	--	--	--	--	--
Gastropoda	--	26	39.4	10.2	0	0	130
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

Table 5.5-4. – continued –

	Northern Indian Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	23	45.9	11.8	0	0	173
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	--	141	121.8	31.5	130	43	476
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

Table 5.5-4. – continued –

	Northern Indian Lake						
	Nearshore n=15						
	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	--	3	11.2	2.9	0	0	43
Trichoptera (pupa) - unid	--	3	11.2	2.9	0	0	43
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	15.2	3.9	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)	--	69	124.4	32.1	0	0	476
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)	--	17	31.9	8.2	0	0	87
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	248	141.2	36.5	260	43	476
Orthocladiinae	--	9	17.9	4.6	0	0	43
Tanypodinae	--	193	123.4	31.9	173	0	433
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	--	713	390.2	100.7	736	87	1688
Insecta (%)	78	--	--	--	--	--	--

Table 5.5-4. – continued –

	Northern Indian Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	467	222.0	57.3	519	43	822
Chironomidae (%)	51	--	--	--	--	--	--
Ephemeroptera	--	164	144.7	37.4	130	43	476
Ephemeroptera (%)	18	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	19.8	5.1	0	0	43
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	176	148.6	38.4	130	43	519
EPT (%)	19	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.43	0.309	0.080	0.28	0.08	1.00
Genus analysis of Ephemeroptera	2 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	6	1.4	0.4	6	3	8
Simpson's Diversity Index (D)	--	0.76	0.074	0.019	0.79	0.56	0.85
Evenness (Simpson's Equitability E_D)	--	0.67	0.100	0.026	0.66	0.52	0.83
Shannon-Weaver Index (H)	--	1.65	0.274	0.071	1.71	0.95	2.04
Evenness (Shannon's Equitability E_H)	--	0.87	0.050	0.013	0.87	0.78	0.95
Hill's Effective Richness ($E^{H'}$)	--	5	1.3	0.3	6	3	8
Evenness ($E^{H'}$/S)	--	0.78	0.078	0.020	0.79	0.65	0.91

Table 5.5-4. – continued –

	Northern Indian Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1979	599.8	154.9	2121	130	2597
Oligochaeta	--	66	86.4	22.3	43	0	303
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	987	382.0	98.6	1082	0	1515
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	--	231	136.5	35.3	216	43	519
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	11.2	2.9	0	0	43
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	--	23	36.1	9.3	0	0	87
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	--	1310	484.9	125.2	1428	43	1904
Non-Insecta (%)	66	--	--	--	--	--	--
Oligochaeta	--	66	86.4	22.3	43	0	303
Oligochaeta (%)	3	--	--	--	--	--	--
Amphipoda	--	987	382.0	98.6	1082	0	1515
Amphipoda (%)	50	--	--	--	--	--	--
Bivalvia	--	231	136.5	35.3	216	43	519
Bivalvia (%)	12	--	--	--	--	--	--
Gastropoda	--	26	39.4	10.2	0	0	87
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

Table 5.5-4. – continued –

	Northern Indian Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	179	120.1	31.0	173	0	390
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 5.5-4. – continued –

	Northern Indian Lake						
	Offshore n=15						
	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)	--	6	15.2	3.9	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)	--	20	32.2	8.3	0	0	87
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	6	15.2	3.9	0	0	43
Chironomidae (pupa)	--	6	15.2	3.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	101	87.6	22.6	87	0	260
Orthocladiinae	--	14	26.7	6.9	0	0	87
Tanypodinae	--	338	153.6	39.7	346	43	563
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	--	669	258.1	66.6	693	87	1125
Insecta (%)	34	--	--	--	--	--	--

Table 5.5-4. – continued –

	Northern Indian Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	465	202.0	52.2	433	43	779
Chironomidae (%)	23	--	--	--	--	--	--
Ephemeroptera	--	179	120.1	31.0	173	0	390
Ephemeroptera (%)	9	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	6	15.2	3.9	0	0	43
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	185	124.0	32.0	173	0	433
EPT (%)	9	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.50	0.381	0.098	0.33	0.00	1.17
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	9	5	1.4	0.4	6	3	8
Simpson's Diversity Index (D)	--	0.68	0.064	0.017	0.69	0.53	0.77
Evenness (Simpson's Equitability E_D)	--	0.51	0.178	0.046	0.45	0.31	1.01
Shannon-Weaver Index (H)	--	1.42	0.190	0.049	1.44	1.04	1.70
Evenness (Shannon’s Equitability E_H)	--	0.77	0.097	0.025	0.75	0.60	1.00
Hill's Effective Richness ($E^{H'}$)	--	4	0.8	0.2	4	3	5
Evenness ($E^{H'}$/S)	--	0.65	0.139	0.036	0.61	0.46	1.00

Table 5.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected in the Churchill River within the Lower Churchill River Region for CAMPP, 2009.

	Churchill River						
	Rock Basket, August n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	9396	7449.5	1923.4	7035	1262	23596
Oligochaeta	--	1571	4363.0	1126.5	63	0	17066
Hirudinea	--	158	267.9	69.2	32	0	1009
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	4	16.3	4.2	0	0	63
Hyalellidae	--	2	8.1	2.1	0	0	32
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidacea	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Acarina	--	6	17.7	4.6	0	0	63
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	3928	5650.2	1458.9	1514	0	17413
Gastropoda - unid	--	2	8.1	2.1	0	0	32
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	38	116.3	30.0	0	0	442
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	11	19.5	5.0	0	0	63
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	13	28.7	7.4	0	0	95
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	0	0.0	0.0	0	0	0
Non-Insecta	--	5733	6694.8	1728.6	1924	32	18233
Non-Insecta (%)	61	--	--	--	--	--	--
Oligochaeta	--	1571	4363.0	1126.5	63	0	17066
Oligochaeta (%)	17	--	--	--	--	--	--
Amphipoda	--	6	17.7	4.6	0	0	63
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	3928	5650.2	1458.9	1514	0	17413
Bivalvia (%)	42	--	--	--	--	--	--
Gastropoda	--	63	138.0	35.6	0	0	536
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	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	--	2	8.1	2.1	0	0	32
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
Coleoptera	--	0	0.0	0.0	0	0	0
Dytiscidae	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	21	40.7	10.5	0	0	126
Elmidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae	--	0	0.0	0.0	0	0	0

Table 5.5-5. – continued –

	Churchill River						
	Rock Basket, August n=15						
	Count	Mean	SD	SE	Median	Min	Max
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	2	8.1	2.1	0	0	32
Ephemeroptera - unid (larva)	--	4	16.3	4.2	0	0	63
Ephemeroptera - unid (pupa)	--	2	8.1	2.1	0	0	32
Baetidae - unid	--	2	8.1	2.1	0	0	32
Acerpenna	--	4	16.3	4.2	0	0	63
Baetis	--	4	16.3	4.2	0	0	63
Paracloeodes	--	0	0.0	0.0	0	0	0
Pseudocloeon	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis	--	2	8.1	2.1	0	0	32
Emphemerellidae - unid	--	23	65.8	17.0	0	0	252
Ephemerella	--	53	61.6	15.9	32	0	189
Eurylophella	--	0	0.0	0.0	0	0	0
Serratella	--	15	57.0	14.7	0	0	221
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	38	71.7	18.5	0	0	221
Hexagenia	--	0	0.0	0.0	0	0	0
Heptageniidae - unid	--	34	48.4	12.5	0	0	158
Heptagenia	--	6	17.7	4.6	0	0	63
Rhithrogena	--	0	0.0	0.0	0	0	0
Stenacron	--	2	8.1	2.1	0	0	32
Stenonema	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes	--	6	17.7	4.6	0	0	63
Leptophlebiidae - unid	--	29	81.3	21.0	0	0	315
Leptophlebia	--	0	0.0	0.0	0	0	0
Paraleptophlebia	--	21	56.8	14.7	0	0	189
Siphlonuridae	--	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
Nemouridae	--	2	8.1	2.1	0	0	32
Perlidae	--	6	17.7	4.6	0	0	63
Perlodidae	--	15	20.2	5.2	0	0	63
Pteronarcyidae	--	93	87.2	22.5	63	0	284
Trichoptera - unid (larva)	--	0	0.0	0.0	0	0	0
Trichoptera - unid (pupa)	--	32	58.4	15.1	0	0	189
Brachycentridae	--	11	19.5	5.0	0	0	63
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Hydropsychidae (larva)	--	1039	956.5	247.0	599	63	3470
Hydropsychidae (pupa)	--	8	22.2	5.7	0	0	63
Hydroptilidae	--	0	0.0	0.0	0	0	0
Lepidostomatidae (larva)	--	126	215.9	55.8	32	0	820
Lepidostomatidae (pupa)	--	0	0.0	0.0	0	0	0
Leptoceridae	--	84	126.0	32.5	32	0	505
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Philopotamidae	--	38	79.3	20.5	0	0	252
Phryganeidae	--	0	0.0	0.0	0	0	0
Polycentropodidae	--	19	28.7	7.4	0	0	95

Table 5.5-5. – continued –

	Churchill River						
	Rock Basket, August n=15						
	Count	Mean	SD	SE	Median	Min	Max
Diptera	--	0	0.0	0.0	0	0	0
Ceratopogonidae	--	21	30.8	7.9	0	0	95
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	13	23.2	6.0	0	0	63
Chironomidae (pupa)	--	164	168.7	43.6	126	0	536
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	545	387.5	100.1	505	32	1514
Orthocladiinae	--	494	339.9	87.8	379	32	1262
Tanypodinae	--	437	354.7	91.6	379	63	1577
Empididae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Simuliidae (adult)	--	0	0.0	0.0	0	0	0
Simuliidae (pupa)	--	19	26.1	6.7	0	0	63
Simuliidae (larva)	--	225	233.3	60.2	158	0	820
Tabanidae	--	2	8.1	2.1	0	0	32
Tipulidae	--	0	0.0	0.0	0	0	0
Insecta	--	3664	2399.3	619.5	2808	1041	9180
Insecta (%)	39	--	--	--	--	--	--
Chironomidae	--	1653	925.9	239.1	1388	442	3785
Chironomidae (%)	18	--	--	--	--	--	--
Ephemeroptera	--	246	203.1	52.4	189	0	568
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	116	103.7	26.8	95	0	347
Plecoptera (%)	1	--	--	--	--	--	--
Trichoptera	--	1356	1319.1	340.6	852	95	5237
Trichoptera (%)	14	--	--	--	--	--	--
EPT	--	1718	1495.1	386.0	1451	126	6151
EPT (%)	18	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.99	0.556	0.144	0.86	0.14	2.50
Genus analysis of Ephemeroptera	10 spp. (Dominant: *Ephemerella*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	33	13	4.1	1.1	15	5	18
Simpson's Diversity Index (D)	--	0.71	0.207	0.053	0.81	0.21	0.90
Evenness (Simpson's Equitability E_D)	--	0.30	0.169	0.044	0.29	0.07	0.62
Shannon-Weaver Index (H)	--	1.84	0.579	0.149	1.98	0.54	2.58
Evenness (Shannon's Equitability E_H)	--	0.65	0.202	0.052	0.71	0.22	0.88
Hill's Effective Richness ($E^{H'}$)	--	7	3.4	0.9	7	2	13
Evenness ($E^{H'}$/S)	--	0.42	0.200	0.052	0.42	0.12	0.77

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, 2009.

	Gauer Lake						
	Nearshore n=12						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	505	648.9	187.3	346	43	2424
Oligochaeta	--	133	215.6	62.2	43	0	736
Hirudinea	--	11	37.5	10.8	0	0	130
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	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	--	7	25.0	7.2	0	0	87
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	--	97	170.3	49.2	43	0	606
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	4	12.5	3.6	0	0	43
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	--	14	28.2	8.1	0	0	87
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	--	267	448.6	129.5	130	0	1645
Non-Insecta (%)	53	--	--	--	--	--	--
Oligochaeta	--	133	215.6	62.2	43	0	736
Oligochaeta (%)	26	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	97	170.3	49.2	43	0	606
Bivalvia (%)	19	--	--	--	--	--	--
Gastropoda	--	18	34.3	9.9	0	0	87
Gastropoda (%)	4	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	11	19.6	5.7	0	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

Table 5.5-6. – continued –

	Gauer Lake						
	Nearshore n=12						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	36	60.7	17.5	0	0	173
Hexagenia	--	11	19.6	5.7	0	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

Table 5.5-6. – continued –

	Gauer Lake						
	Nearshore n=12						
	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	--	4	12.5	3.6	0	0	43
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)	--	4	12.5	3.6	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)	--	18	34.3	9.9	0	0	87
Ceratopogonidae (adult)	--	2	4.6	1.3	0	0	13
Chaoboridae	--	2	4.7	1.3	0	0	13
Chironomidae (adult)	--	2	4.7	1.4	0	0	14
Chironomidae (pupa)	--	2	4.7	1.4	0	0	14
Chironomidae (larva)	--	2	4.8	1.4	0	0	14
Chironominae	--	2	4.8	1.4	0	0	14
Orthocladiinae	--	2	4.9	1.4	0	0	14
Tanypodinae	--	2	4.9	1.4	0	0	14
Culicidae	--	2	4.9	1.4	0	0	14
Dixidae	--	2	5.0	1.4	0	0	14
Dolichopodidae (pupa)	--	2	5.0	1.4	0	0	14
Empididae	--	2	5.1	1.5	0	0	15
Ephydridae	--	2	5.1	1.5	0	0	15
Muscidae	--	2	5.1	1.5	0	0	15
Sciomyzidae	--	2	5.2	1.5	0	0	15
Simuliidae	--	2	5.2	1.5	0	0	15
Stratiomyidae	--	2	5.2	1.5	0	0	15
Tabanidae	--	3	5.3	1.5	0	0	15
Tipulidae (larva)	--	3	5.3	1.5	0	0	15
Tipulidae (pupa)	--	3	5.4	1.5	0	0	16
Insecta	--	238	239.6	69.2	151	0	779
Insecta (%)	47	--	--	--	--	--	--

Table 5.5-6. – continued –

	Gauer Lake						
	Nearshore n=12						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	155	161.4	46.6	87	0	519
Chironomidae (%)	31	--	--	--	--	--	--
Ephemeroptera	--	47	56.8	16.4	43	0	173
Ephemeroptera (%)	9	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	7	25.0	7.2	0	0	87
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	54	71.8	20.7	43	0	216
EPT (%)	11	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.25	0.371	0.107	0.08	0.00	1.00
Genus analysis of Ephemeroptera	2 spp. (Dominant: *Ephemera*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	4	2.3	0.7	3	1	9
Simpson's Diversity Index (D)	--	0.59	0.217	0.063	0.64	0.00	0.80
Evenness (Simpson's Equitability E_D)	--	0.78	0.840	0.242	0.18	0.09	2.04
Shannon-Weaver Index (H)	--	1.08	0.542	0.157	1.10	0.00	1.83
Evenness (Shannon's Equitability E_H)	--	0.38	0.409	0.118	0.42	0.00	1.46
Hill's Effective Richness ($E^{H'}$)	--	3	1.6	0.5	3	1	6
Evenness ($E^{H'}$/S)	--	0.80	0.822	0.237	0.22	0.09	2.00

Table 5.5-6. – continued –

	Gauer Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2453	1260.7	325.5	2337	822	5064
Oligochaeta	--	603	427.1	110.3	476	216	1775
Hirudinea	--	12	19.8	5.1	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	3	11.2	2.9	0	0	43
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	--	491	507.0	130.9	433	0	1948
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	--	29	50.9	13.1	0	0	173
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	--	1137	884.1	228.3	1039	216	3203
Non-Insecta (%)	46	--	--	--	--	--	--
Oligochaeta	--	603	427.1	110.3	476	216	1775
Oligochaeta (%)	25	--	--	--	--	--	--
Amphipoda	--	3	11.2	2.9	0	0	43
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	491	507.0	130.9	433	0	1948
Bivalvia (%)	20	--	--	--	--	--	--
Gastropoda	--	29	50.9	13.1	0	0	173
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

Table 5.5-6. – continued –

	Gauer Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	3	11.2	2.9	0	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=15						
	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)	--	3	11.2	2.9	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)	--	9	17.9	4.6	0	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)	--	12	19.8	5.1	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1056	395.3	102.1	1125	476	1688
Orthocladiinae	--	3	11.2	2.9	0	0	43
Tanypodinae	--	231	198.1	51.2	173	0	563
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	--	1316	543.5	140.3	1342	519	2034
Insecta (%)	54	--	--	--	--	--	--
Chironomidae	--	1301	537.5	138.8	1342	519	1991
Chironomidae (%)	53	--	--	--	--	--	--
Ephemeroptera	--	3	11.2	2.9	0	0	43

Table 5.5-6. – continued –

	Gauer Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	11.2	2.9	0	0	43
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	6	15.2	3.9	0	0	43
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.01	0.018	0.005	0.00	0.00	0.06
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	9	4	1.1	0.3	4	2	6
Simpson's Diversity Index (D)	--	0.62	0.118	0.030	0.65	0.33	0.76
Evenness (Simpson's Equitability E_D)	--	0.58	0.133	0.034	0.54	0.36	0.83
Shannon-Weaver Index (H)	--	1.19	0.260	0.067	1.27	0.51	1.48
Evenness (Shannon's Equitability E_H)	--	0.75	0.087	0.023	0.74	0.62	0.92
Hill's Effective Richness ($E^{H'}$)	--	3	0.8	0.2	4	2	4
Evenness ($E^{H'}$/S)	--	0.68	0.112	0.029	0.66	0.50	0.88

Table 5.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Lower Churchill River System, 2009.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Partridge Breast Lake	GN-01	14	567957	6354808	26-Aug-09	24.33	7.8	5.9	12.0
Partridge Breast Lake	GN-02	14	567227	6356363	26-Aug-09	24.60	5.7	7.2	12.0
Partridge Breast Lake	GN-03	14	564465	6355790	26-Aug-09	24.58	6.3	9.5	12.0
Partridge Breast Lake	GN-04	14	560608	6357661	27-Aug-09	25.20	7.3	8.2	11.0
Partridge Breast Lake	GN-05	14	560996	6358412	27-Aug-09	26.90	7.1	5.1	11.5
Partridge Breast Lake	GN-06	14	561944	6357266	27-Aug-09	24.32	4.9	10.9	11.0
Partridge Breast Lake	GN-07	14	562352	6359394	28-Aug-09	23.32	6.5	6.3	12.0
Partridge Breast Lake	GN-08	14	560438	6359033	28-Aug-09	23.00	11.0	10.8	12.0
Partridge Breast Lake	GN-09	14	559841	6359379	28-Aug-09	22.78	7.5	10.0	12.0
Partridge Breast Lake	SN-01	14	567847	6354855	26-Aug-09	24.33	8.0	7.8	12.0
Partridge Breast Lake	SN-04	14	560586	6357650	27-Aug-09	25.20	5.4	7.3	11.0
Partridge Breast Lake	SN-07	14	562382	6359375	28-Aug-09	23.32	7.4	6.5	12.0
Northern Indian Lake	GN-01	14	598933	6350622	11-Aug-09	23.67	7.1	5.1	14.0
Northern Indian Lake	GN-02	14	603566	6349855	11-Aug-09	23.77	12.4	12.7	14.0
Northern Indian Lake	GN-03	14	606601	6350708	12-Aug-09	23.80	5.5	2.6	14.0
Northern Indian Lake	GN-04	14	600409	6350971	12-Aug-09	24.43	7.2	2.3	14.0
Northern Indian Lake	GN-05	14	605422	6356585	13-Aug-09	25.25	7.9	8.0	15.0
Northern Indian Lake	GN-06	14	608465	6353026	13-Aug-09	24.28	9.5	8.7	15.0
Northern Indian Lake	GN-07	14	606166	6359022	14-Aug-09	24.52	9.7	10.0	15.0
Northern Indian Lake	GN-08	14	606364	6360040	14-Aug-09	24.53	8.0	8.0	15.0
Northern Indian Lake	GN-09	14	605373	6366523	15-Aug-09	24.77	7.7	7.8	14.0
Northern Indian Lake	GN-10	14	606314	6363941	15-Aug-09	24.77	8.8	9.0	14.0
Northern Indian Lake	GN-12	14	607605	6363273	16-Aug-09	24.82	10.4	12.5	15.0
Northern Indian Lake	GN-14	14	607330	6361062	16-Aug-09	24.07	13.5	14.0	15.0
Northern Indian Lake	SN-03	14	606566	6350700	12-Aug-09	23.80	6.0	5.5	14.0
Northern Indian Lake	SN-05	14	605376	6356614	13-Aug-09	25.25	3.5	7.9	15.0
Northern Indian Lake	SN-09	14	605398	6366554	15-Aug-09	24.77	6.5	7.7	14.0
Northern Indian Lake	SN-12	14	607572	6363292	16-Aug-09	24.82	8.0	10.4	15.0

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	
Lower Churchill River	GN-01	15	357320	6376786	12-Aug-09	19.75	3.3	2.7	14.1
Lower Churchill River	GN-02	15	360494	6379373	12-Aug-09	20.88	9.0	6.4	15.0
Lower Churchill River	GN-03	15	358501	6376515	13-Aug-09	22.57	1.8	1.9	14.7
Lower Churchill River	GN-04	15	360667	6382230	13-Aug-09	24.82	4.1	5.0	14.7
Lower Churchill River	GN-05	15	359708	6382934	15-Aug-09	21.83	9.5	1.5	14.4
Lower Churchill River	GN-06	15	361087	6380670	15-Aug-09	21.80	4.4	5.5	14.4
Lower Churchill River	GN-07	15	359640	6377733	16-Aug-09	19.17	4.0	2.9	14.4
Lower Churchill River	GN-08	15	355645	6383872	14-Aug-09	21.13	2.5	2.3	14.4
Lower Churchill River	GN-09	15	360637	6381661	14-Aug-09	25.17	2.1	8.7	14.4
Lower Churchill River	SN-03	15	358501	6376515	13-Aug-09	22.57	1.7	1.8	14.7
Lower Churchill River	SN-05	15	359708	6382934	15-Aug-09	21.83	9.5	1.5	14.4
Lower Churchill River	SN-08	15	355645	6383872	14-Aug-09	21.13	2.5	2.3	14.4
Gauer Lake	GN-01	14	570865	6307811	24-Jul-09	23.25	6.6	2.3	16.0
Gauer Lake	GN-02	14	567193	6308674	24-Jul-09	24.00	3.0	8.9	16.0
Gauer Lake	GN-03	14	564412	6312314	25-Jul-09	22.00	1.4	2.7	17.0
Gauer Lake	GN-04	14	567909	6310496	23-Jul-09	16.92	5.9	1.7	14.0
Gauer Lake	GN-05	14	571301	6314698	27-Jul-09	18.58	23.6	24.4	16.0
Gauer Lake	GN-06	14	568145	6314312	26-Jul-09	28.50	3.3	5.9	17.0
Gauer Lake	GN-07	14	568509	6311651	25-Jul-09	23.00	15.1	8.4	15.0
Gauer Lake	GN-08	14	566554	6316951	27-Jul-09	19.83	3.5	2.4	16.0
Gauer Lake	GN-09	14	562528	6309951	26-Jul-09	26.08	1.7	2.1	19.0
Gauer Lake	SN-03	14	564412	6312314	25-Jul-09	22.00	1.4	2.7	17.0
Gauer Lake	SN-05	14	571301	6314698	27-Jul-09	18.58	23.6	24.4	16.0
Gauer Lake	SN-09	14	562528	6309951	26-Jul-09	26.08	1.7	2.1	19.0

Table 5.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Lower Churchill River Region waterbodies, 2009.

Family	Common Name	Scientific Name	ID Code
Acipenseridae	Lake Sturgeon	*Acipenser fulvescens*	LKST
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH
	Northern Pearl Dace	*Margariscus nachtriebi*	NPDC
	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
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Walleye	*Sander vitreus*	WALL

Table 5.6-3. Standard gang index gillnet relative abundance summaries from Lower Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake		Northern Indian Lake		Lower Churchill River		Gauer Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Silver Lamprey	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	35	17.07	-	-
Lake Chub	-	-	-	-	-	-	-	-
Northern Pearl Dace	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-
Longnose Sucker	3	0.49	5	0.61	2	0.98	16	2.83
White Sucker	162	26.64	219	26.81	17	8.29	171	30.27
Shorthead Redhorse	-	-	-	-	-	-	-	-
Northern Pike	175	28.78	135	16.52	36	17.56	80	14.16
Cisco	15	2.47	45	5.51	2	0.98	14	2.48
Lake Whitefish	79	12.99	117	14.32	62	30.24	105	18.58
Brook Trout	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-
Burbot	2	0.33	3	0.37	-	-	6	1.06
Yellow Perch	2	0.33	-	-	-	-	42	7.43
Walleye	170	27.96	293	35.86	51	24.88	131	23.19
Total	608	100	817	100	205	100	565	100

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

Table 5.6-4. Small mesh index gillnet relative abundance summaries from Lower Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake		Northern Indian Lake		Lower Churchill River		Gauer Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Silver Lamprey	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-
Lake Chub	5	1.36	4	0.80	-	-	1	0.37
Northern Pearl Dace	-	-	-	-	3	2.05	-	-
Emerald Shiner	53	14.36	57	11.47	1	0.68	-	-
Spottail Shiner	173	46.88	195	39.24	21	14.38	143	52.57
Longnose Dace	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	1	0.68	1	0.37
White Sucker	3	0.81	8	1.61	5	3.42	1	0.37
Shorthead Redhorse	-	-	-	-				
Northern Pike	10	2.71	24	4.83	1	0.68	18	6.62
Cisco	1	0.27	2	0.40	-	-	-	-
Lake Whitefish	19	5.15	9	1.81	7	4.79	4	1.47
Brook Trout	-	-	-	-	-	-	-	-
Troutperch	28	7.59	77	15.49	102	69.86	49	18.01
Burbot	-	-	-	-	-	-	-	-
Yellow Perch	62	16.80	31	6.24	-	-	23	8.46
Walleye	15	4.07	90	18.11	5	3.42	32	11.76
Total	369	100	497	100	146	100	272	100

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

Table 5.6-5. Standard gang index gillnet biomass summaries from Lower Churchill River Region waterbodies, 2009.

Species	Partridge Breast L.			Northern Indian L.			Lower Churchill R.			Gauer L.		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	35	102725	29.51	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	3950	0.64	5	10130	1.48	2	2690	0.77	16	14010	2.70
White Sucker	162	149844	24.11	219	172518	25.25	17	13890	3.99	171	200280	38.66
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	175	241740	38.90	135	192328	28.15	36	94489	27.15	80	105540	20.37
Cisco	15	6523	1.05	45	15762	2.31	2	560	0.16	14	4520	0.87
Lake Whitefish	79	60074	9.67	117	92949	13.60	62	70400	20.23	105	87206	16.83
Arctic Grayling	-	-	-	-	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	2	1440	0.23	3	4310	0.63	-	-	-	6	6650	1.28
Yellow Perch	2	161	0.03	-	-	-	-	-	-	42	8010	1.55
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	170	157680	25.37	293	195227	28.57	51	63290	18.18	131	91852	17.73
Total	608	621412	100	817	683224	100	205	348044	100	565	518068	100

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

Table 5.6-6. Small mesh index gillnet biomass summaries from Lower Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake			Northern Indian Lake			Lower Churchill River			Gauer Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	5	34	0.13	4	32	0.06	-	-	-	1	10	0.04
Northern Pearl Dace	-	-	-	-	-	-	3	20	0.37	-	-	-
Emerald Shiner	53	304	1.19	57	284	0.49	1	4	0.07	-	-	-
Spottail Shiner	173	979	3.82	195	803	1.38	21	126	2.36	143	600	2.20
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	15	0.28	1	520	1.91
White Sucker	3	655	2.56	8	388	0.67	5	80	1.50	1	15	0.06
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	10	13010	50.77	24	27790	47.89	1	140	2.62	18	14920	54.79
Cisco	1	20	0.08	2	81	0.14	-	-	-	-	-	-
Lake Whitefish	19	4555	17.78	9	1468	2.53	7	534	10.00	4	1750	6.43
Arctic Grayling	-	-	-	-	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	28	136	0.53	77	345	0.59	102	586	10.97	49	235	0.86
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	62	249	0.97	31	144	0.25	-	-	-	23	1100	4.04
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	15	5681	22.17	90	26698	46.00	5	3835	71.82	32	8080	29.67
Total	369	25623	100	497	58033	100	146	5340	100	272	27230	100

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

Table 5.6-7. 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 Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake (#sites=9)			Northern Indian Lake (#sites=12)			Lower Churchill River (#sites=9)			Gauer Lake (#sites=9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	35	3.4	4.77	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	0.3	0.60	5	0.4	0.76	2	0.2	0.39	16	1.7	2.49
White Sucker	162	15.3	11.13	219	15.6	9.21	17	1.8	1.32	171	18.1	11.04
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	175	16.7	5.49	135	9.7	7.10	36	3.8	3.72	80	8.3	3.48
Cisco	15	1.5	1.59	45	3.3	4.09	2	0.2	0.63	14	1.6	2.94
Lake Whitefish	79	7.6	5.64	117	8.5	8.31	62	6.5	5.43	105	11.5	5.79
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	2	0.2	0.39	3	0.2	0.38	-	-	-	6	0.7	1.86
Yellow Perch	2	0.2	0.39	-	-	-	-	-	-	42	4.1	7.53
Walleye	170	16.3	8.55	293	20.9	9.21	51	5.4	4.80	131	14.0	11.85
Total	608	58.1	14.91	817	58.6	13.41	205	21.2	14.49	565	59.9	26.13

#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 5.6-8. 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 Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake (#sites=3)			Northern Indian Lake (#sites=4)			Lower Churchill River (#sites=3)			Gauer Lake (#sites=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	5	1.6	1.97	4	1.0	1.12	-	-	-	1	0.3	0.54
Northern Pearl Dace	-	-	-	-	-	-	3	1.1	1.84	-	-	-
Emerald Shiner	53	17.9	21.82	57	13.8	19.52	1	0.4	0.66	-	-	-
Spottail Shiner	173	56.5	48.50	195	47.2	52.24	21	7.9	11.88	143	49.6	55.91
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	0.4	0.64	1	0.4	0.74
White Sucker	3	1.0	1.02	8	1.9	3.26	5	1.9	1.68	1	0.4	0.62
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	10	3.3	0.69	24	5.9	2.28	1	0.4	0.66	18	6.3	7.24
Cisco	1	0.3	0.55	2	0.5	0.56	-	-	-	-	-	-
Lake Whitefish	19	6.2	3.22	9	2.2	2.22	7	2.6	2.86	4	1.3	1.18
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	28	9.2	8.09	77	19.1	21.14	102	37.4	57.12	49	15.7	17.16
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	62	20.0	21.93	31	7.5	13.12	-	-	-	23	7.6	6.74
Walleye	15	4.8	6.65	90	21.8	13.34	5	1.8	0.68	32	10.8	9.63
Total	369	120.8	93.41	497	121.0	91.36	146	53.8	54.52	272	92.4	84.82

#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 5.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m /24 h) set in Lower Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake (#sites=9)			Northern Indian Lake (#sites=12)			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	-	-	-	-	-	-	35	10043	13259	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pearl Dace	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	378	857	5	731	1843	2	263	522	16	1443	1828
White Sucker	162	14168	11590	219	12324	8269	17	1477	950	171	21199	12364
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	175	23097	8600	135	13854	11375	36	10005	13431	80	11109	5665
Cisco	15	641	746	45	1145	1667	2	58	174	14	493	766
Lake Whitefish	79	5782	5823	117	6755	7436	62	7284	6006	105	9503	4884
Arctic Grayling	-	-	-	-	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	2	135	355	3	311	602	-	-	-	6	824	2404
Yellow Perch	2	16	31	-	-	-	-	-	-	42	779	1437
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	170	15051	8276	293	13894	8315	51	6636	6358	131	9731	8624
Total	608	59268	16139	817	49014	18858	205	35765	25357	565	55082	24063

#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 5.6-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m/24 h) set in Lower Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake (#sites=3)			Northern Indian Lake (#sites=4)			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	5	11	16	4	8	9	-	-	-	1	3	5
Northern Pearl Dace	-	-	-	-	-	-	3	7	12	-	-	-
Emerald Shiner	53	103	124	57	69	93	1	2	3	-	-	-
Spottail Shiner	173	320	283	195	195	204	21	48	71	143	209	239
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	6	10	1	224	388
White Sucker	3	225	387	8	94	178	5	30	28	1	5	9
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	10	4302	1463	24	6776	2082	1	53	92	18	5155	5589
Cisco	1	6	11	2	20	23	-	-	-	-	-	-
Lake Whitefish	19	1497	2421	9	352	472	7	202	342	4	596	569
Arctic Grayling	-	-	-	-	-	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	28	45	39	77	85	90	102	215	342	49	75	84
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	62	80	89	31	35	60	-	-	-	23	346	465
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	15	1822	1938	90	6470	2973	5	1402	416	32	2701	2349
Total	369	8410	3088	497	14103	4611	146	1963	600	272	9314	8292

#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 5.6-11. 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 Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake			Northern Indian Lake			Lower Churchill River			Gauer Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	175	586	90	135	584	120	36	666	148	80	563	112
Lake Whitefish	77	355	83	117	356	93	62	407	53	105	363	77
Walleye	170	429	60	293	376	76	51	475	69	131	390	63
Weight (g)												
Northern Pike	175	1381	677	135	1425	905	36	2625	2166	80	1319	735
Lake Whitefish	79	760	494	117	794	557	62	1135	452	105	831	489
Walleye	170	928	432	293	666	413	51	1241	453	131	701	314
Condition Factor (K)												
Northern Pike	175	0.64	0.06	135	0.63	0.06	36	0.72	0.12	80	0.67	0.07
Lake Whitefish	77	1.43	0.16	117	1.42	0.16	62	1.61	0.15	105	1.49	0.14
Walleye	170	1.10	0.08	293	1.10	0.08	51	1.10	0.09	131	1.09	0.09

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 5.6-12. 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 Churchill River Region waterbodies, 2009.

Species	Partridge Breast Lake			Northern Indian Lake			Lower Churchill River			Gauer Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	10	566	75	24	550	87	1	276	-	-	-	-
Lake Whitefish	6	351	66	4	273	91	2	254	-	-	-	-
Walleye	6	425	59	55	338	70	5	355	174	-	-	-
Weight (g)												
Northern Pike	10	1301	517	24	1158	618	1	140	-	18	829	223
Lake Whitefish	19	240	399	9	163	258	7	76	126	4	438	95
Walleye	15	379	524	90	297	332	5	767	714	32	253	179
Condition Factor (K)												
Northern Pike	10	0.69	0.05	24	0.65	0.05	1	0.67	-	-	-	-
Lake Whitefish	6	1.50	0.10	4	1.28	0.10	2	1.53	-	-	-	-
Walleye	6	1.15	0.05	55	1.08	0.10	5	1.03	0.14	-	-	-

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 5.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard index gill nets set in Lower Churchill River Region waterbodies, 2009.

Age	Year-Class	Partridge Breast L.		Northern Indian L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	3	3.80
3	2006	2	1.14	5	3.79	-	-	3	3.80
4	2005	9	5.14	16	12.12	-	-	6	7.59
5	2004	8	4.57	21	15.91	2	5.71	5	6.33
6	2003	43	24.57	23	17.42	4	11.43	11	13.92
7	2002	45	25.71	18	13.64	5	14.29	15	18.99
8	2001	26	14.86	18	13.64	6	17.14	20	25.32
9	2000	20	11.43	10	7.58	6	17.14	7	8.86
10	1999	12	6.86	8	6.06	1	2.86	5	6.33
11	1998	6	3.43	3	2.27	6	17.14	2	2.53
12	1997	2	1.14	2	1.52	-	-	-	-
13	1996	-	-	4	3.03	1	2.86	-	-
14	1995	2	1.14	2	1.52	-	-	2	2.53
15	1994	-	-	-	-	2	5.71	-	-
16	1993	-	-	1	0.76	-	-	-	-
17	1992	-	-	-	-	-	-	-	-
18	1991	-	-	1	0.76	1	2.86	-	-
19	1990	-	-	-	-	1	2.86	-	-
Total		175	100	132	100	35	100	79	100

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

Table 5.6-14. Age/Year-class frequency distributions (%) for Lake Whitefish captured in standard index gill nets set in Lower Churchill River Region waterbodies, 2009.

Age	Year-Class	Partridge Breast L.		Northern Indian L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-
2	2007	-	-	1	0.90	-	-	4	3.88
3	2006	6	8.00	9	8.11	1	1.67	12	11.65
4	2005	11	14.67	14	12.61	5	8.33	6	5.83
5	2004	11	14.67	7	6.31	6	10.00	7	6.80
6	2003	14	18.67	3	2.70	10	16.67	4	3.88
7	2002	8	10.67	15	13.51	9	15.00	10	9.71
8	2001	12	16.00	20	18.02	8	13.33	11	10.68
9	2000	2	2.67	10	9.01	12	20.00	11	10.68
10	1999	1	1.33	6	5.41	1	1.67	10	9.71
11	1998	3	4.00	3	2.70	4	6.67	4	3.88
12	1997	1	1.33	4	3.60	1	1.67	3	2.91
13	1996	1	1.33	2	1.80	-	-	1	0.97
14	1995	1	1.33	3	2.70	1	1.67	4	3.88
15	1994	3	4.00	3	2.70	1	1.67	4	3.88
16	1993	-	-	1	0.90	1	1.67	3	2.91
17	1992	1	1.33	1	0.90	-	-	4	3.88
18	1991	-	-	3	2.70	-	-	1	0.97
19	1990	-	-	2	1.80	-	-	-	-
20	1989	-	-	1	0.90	-	-	1	0.97
21	1988	-	-	-	-	-	-	-	-
22	1987	-	-	1	0.90	-	-	2	1.94
23	1986	-	-	-	-	-	-	1	0.97
24	1985	-	-	1	0.90	-	-	-	-
25	1984	-	-	1	0.90	-	-	-	-
Total		75	100	111	100	60	100	103	100

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

Table 5.6-15. Age/Year-class frequency distributions (%) for Walleye captured in standard index gill nets set in Lower Churchill River Region waterbodies, 2009.

Age	Year-Class	Partridge Breast L.		Northern Indian L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
2	2007	-	-	-	-	-	-	-	-
3	2006	1	0.59	-	-	-	-	2	1.59
4	2005	-	-	1	0.34	1	2.00	2	1.59
5	2004	1	0.59	1	0.34	-	-	4	3.17
6	2003	17	10.06	6	2.07	-	-	1	0.79
7	2002	25	14.79	38	13.10	2	4.00	7	5.56
8	2001	37	21.89	20	6.90	-	-	12	9.52
9	2000	40	23.67	69	23.79	1	2.00	16	12.70
10	1999	13	7.69	29	10.00	2	4.00	32	25.40
11	1998	2	1.18	25	8.62	7	14.00	8	6.35
12	1997	9	5.33	21	7.24	9	18.00	6	4.76
13	1996	14	8.28	17	5.86	9	18.00	12	9.52
14	1995	7	4.14	41	14.14	6	12.00	15	11.90
15	1994	-	-	3	1.03	2	4.00	7	5.56
16	1993	-	-	3	1.03	1	2.00	1	0.79
17	1992	-	-	-	-	-	-	-	-
18	1991	1	0.59	-	-	1	2.00	-	-
19	1990	-	-	2	0.69	1	2.00	1	0.79
20	1989	2	1.18	2	0.69	-	-	-	-
21	1988	-	-	2	0.69	2	4.00	-	-
22	1987	-	-	3	1.03	-	-	-	-
23	1986	-	-	2	0.69	1	2.00	-	-

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

Table 5.6-15. – continued –

Age	Year-Class	Partridge Breast L.		Northern Indian L.		Lower Churchill R.		Gauer L.	
		n	%	n	%	n	%	n	%
24	1985	-	-	-	-	2	4.00	-	-
25	1984	-	-	2	0.69	1	2.00	-	-
26	1983	-	-	2	0.69	1	2.00	-	-
27	1982	-	-	1	0.34	-	-	-	-
28	1981	-	-	-	-	1	2.00	-	-
Total		169	100	290	100	50	100	126	100

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

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, 2009.

		Partridge Breast Lake									Northern Indian 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-		-	-	-	5	353	29	5	295	72	5	0.66	0.06
4	2006	2	340	26	2	245	49	2	0.62	0.02	16	448	54	16	604	212	16	0.64	0.03
5	2005	9	442	65	9	576	217	9	0.65	0.06	21	528	45	21	954	221	21	0.64	0.04
6	2004	8	500	57	8	833	271	8	0.65	0.05	23	554	43	23	1056	275	23	0.61	0.07
7	2003	43	539	41	43	1020	271	43	0.64	0.06	18	605	38	18	1397	301	18	0.63	0.08
8	2002	45	583	57	45	1302	407	45	0.64	0.06	18	640	65	18	1676	532	18	0.63	0.06
9	2001	26	624	41	26	1538	293	26	0.63	0.06	10	682	35	10	1952	347	10	0.61	0.07
10	2000	20	621	56	20	1576	517	20	0.64	0.07	8	706	67	8	2416	901	8	0.66	0.07
11	1999	12	699	69	12	2345	788	12	0.67	0.06	3	694	37	3	2103	342	3	0.63	0.05
12	1998	6	725	71	6	2587	756	6	0.67	0.08	2	756	74	2	2780	1216	2	0.62	0.10
13	1997	2	733	127	2	2370	1344	2	0.57	0.04	4	776	58	4	3065	538	4	0.66	0.08
14	1996	-	-	-	-	-	-	-	-	-	2	819	129	2	3670	1541	2	0.65	0.03
15	1995	2	796	47	2	3545	573	2	0.70	0.01	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	1	828	-	1	4170	-	1	0.73	-
17	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	1	871	-	1	5360	-	1	0.81	-
19	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

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

Table 5.6-16. – continued –

Age	Year-Class	Lower Churchill River									Gauer 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	285	17	3	173	23	3	0.75	0.06
3	2006	1	276	-	1	140	-	1	0.67	-	3	327	18	3	253	42	3	0.72	0.02
4	2005	-	-	-	-	-	-	-	-	-	6	419	59	6	515	198	6	0.67	0.05
5	2004	2	434	16	2	560	-	2	0.69	0.08	5	485	21	5	794	119	5	0.69	0.03
6	2003	4	568	89	4	1265	726	4	0.64	0.04	11	545	37	11	1076	171	11	0.67	0.08
7	2002	5	549	80	5	1154	438	5	0.67	0.06	15	577	48	15	1296	371	15	0.66	0.06
8	2001	6	675	64	6	2248	646	6	0.71	0.06	20	605	35	20	1447	221	20	0.65	0.07
9	2000	6	630	67	6	1605	558	6	0.62	0.04	7	648	18	7	1780	257	7	0.65	0.05
10	1999	1	742	-	1	3060	-	1	0.75	-	5	702	36	5	2250	437	5	0.65	0.08
11	1998	6	761	77	6	3607	1336	6	0.78	0.10	2	634	80	2	1730	523	2	0.67	0.05
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	1	797	-	1	3730	-	1	0.74	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	2	831	36	2	4325	247	2	0.76	0.14
15	1994	2	883	69	2	6806	962	2	0.99	0.09	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	1	1002	-	1	7486	-	1	0.74	-	-	-	-	-	-	-	-	-	-
19	1990	1	949	-	1	9301	-	1	1.09	-	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor
n = number of fish measured (may not equal number of fish caught); 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, 2009.

		Partridge Breast Lake									Northern Indian 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	1	191	-	1	80	-	1	1.15	-
3	2006	5	224	24	6	151	54	5	1.27	0.09	9	219	15	9	132	26	9	1.24	0.03
4	2005	10	275	53	11	316	210	10	1.36	0.21	14	245	20	14	195	56	14	1.30	0.11
5	2004	11	295	42	11	365	170	11	1.32	0.11	7	277	46	7	308	167	7	1.32	0.12
6	2003	14	354	58	14	711	311	14	1.46	0.14	3	285	41	3	328	126	3	1.37	0.10
7	2002	8	393	40	8	990	306	8	1.58	0.13	15	353	37	15	637	206	15	1.40	0.08
8	2001	12	419	50	12	1166	397	12	1.51	0.10	20	396	24	20	959	181	20	1.53	0.12
9	2000	2	457	6	2	1495	64	2	1.57	0.12	10	401	24	10	986	205	10	1.52	0.20
10	1999	1	395	-	1	1000	-	1	1.62	-	6	433	19	6	1165	147	6	1.43	0.05
11	1998	3	428	23	3	1173	184	3	1.49	0.04	3	434	14	3	1177	68	3	1.45	0.18
12	1997	1	450	-	1	1350	-	1	1.48	-	4	443	39	4	1373	286	4	1.57	0.11
13	1996	1	435	-	1	1340	-	1	1.63	-	2	452	31	2	1515	276	2	1.63	0.04
14	1995	1	462	-	1	1560	-	1	1.58	-	3	459	27	3	1417	282	3	1.45	0.09
15	1994	3	456	35	3	1337	345	3	1.38	0.04	3	448	6	3	1303	50	3	1.45	0.07
16	1993	-	-	-	-	-	-	-	-	-	1	458	-	1	1610	-	1	1.68	-
17	1992	1	480	-	1	1730	-	1	1.56	-	1	475	-	1	1760	-	1	1.64	-
18	1991	-	-	-	-	-	-	-	-	-	3	460	18	3	1350	207	3	1.38	0.15
19	1990	-	-	-	-	-	-	-	-	-	2	489	65	2	1885	799	2	1.56	0.06
20	1989	-	-	-	-	-	-	-	-	-	1	508	-	1	1930	-	1	1.47	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	1	480	-	1	1350	-	1	1.22	-

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

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

Table 5.6-17. – continued –

Age	Year-Class	Partridge Breast Lake FL (mm)			Partridge Breast Lake W (g)			Partridge Breast Lake K			Northern Indian Lake FL (mm)			Northern Indian Lake W (g)			Northern Indian Lake K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	1	470	-	1	1300	-	1	1.25	-
25	1984	-	-	-	-	-	-	-	-	-	1	573	-	1	3070	-	1	1.63	-

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

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

Table 5.6-17. – continued –

Age	Year-Class	Lower Churchill River									Gauer 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	-	-	-	-	-	-	-	-	-	4	208	31	4	130	61	4	1.38	0.06
3	2006	2	293	80	2	475	389	2	1.64	0.17	12	246	24	12	204	58	12	1.34	0.13
4	2005	6	330	37	6	563	165	6	1.53	0.10	6	287	30	6	320	106	6	1.32	0.13
5	2004	6	350	20	6	732	145	6	1.70	0.15	7	302	27	7	424	127	7	1.50	0.09
6	2003	10	391	39	10	978	269	10	1.60	0.09	4	354	18	4	640	110	4	1.44	0.04
7	2002	9	396	38	9	1021	288	9	1.62	0.12	10	354	37	10	678	277	10	1.46	0.09
8	2001	8	417	28	8	1179	258	8	1.61	0.11	11	368	41	11	797	296	11	1.52	0.14
9	2000	12	438	39	12	1362	443	12	1.57	0.24	11	385	33	11	880	300	11	1.49	0.13
10	1999	1	453	-	1	1380	-	1	1.48	-	10	398	26	10	1003	194	10	1.57	0.08
11	1998	4	470	23	4	1635	336	4	1.56	0.09	4	411	33	4	1080	280	4	1.53	0.11
12	1997	1	452	-	1	1630	-	1	1.77	-	3	452	19	3	1463	212	3	1.58	0.07
13	1996	-	-	-	-	-	-	-	-	-	1	445	-	1	1450	-	1	1.65	-
14	1995	1	541	-	1	2690	-	1	1.70	-	4	431	36	4	1220	307	4	1.50	0.11
15	1994	1	476	-	1	1720	-	1	1.59	-	4	451	11	4	1623	217	4	1.76	0.12
16	1993	1	481	-	1	1650	-	1	1.48	-	3	452	24	3	1550	275	3	1.66	0.06
17	1992	-	-	-	-	-	-	-	-	-	4	433	20	4	1220	214	4	1.50	0.05
18	1991	-	-	-	-	-	-	-	-	-	1	495	-	1	1920	-	1	1.58	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	1	473	-	1	1710	-	1	1.62	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	2	461	11	2	1455	290	2	1.48	0.19
23	1986	-	-	-	-	-	-	-	-	-	1	458	-	1	1410	-	1	1.47	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	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 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, 2009.

		Partridge Breast Lake									Northern Indian 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	1	358	-	1	530	-	1	1.16	-	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-	1	221	-	1	108	-	1	1.00	-
5	2004	1	288	-	1	260	-	1	1.09	-	1	238	-	1	115	-	1	0.85	-
6	2003	17	363	22	17	527	98	17	1.09	0.05	6	274	27	6	225	77	6	1.06	0.10
7	2002	25	376	20	25	575	95	25	1.07	0.07	38	285	30	38	256	90	38	1.06	0.08
8	2001	37	409	44	37	777	265	37	1.09	0.08	20	317	39	20	370	139	20	1.12	0.06
9	2000	40	443	31	40	979	227	40	1.11	0.08	69	345	33	69	463	146	69	1.09	0.06
10	1999	13	454	29	13	1061	242	13	1.12	0.11	29	361	32	29	531	155	29	1.10	0.08
11	1998	2	503	1	2	1560	28	2	1.23	0.03	25	384	51	25	656	261	25	1.10	0.07
12	1997	9	469	38	9	1181	259	9	1.13	0.05	21	416	51	21	867	303	21	1.16	0.07
13	1996	14	501	49	14	1424	456	14	1.10	0.07	17	440	51	17	1021	318	17	1.16	0.05
14	1995	7	524	50	7	1697	419	7	1.16	0.08	41	451	40	41	1071	279	41	1.14	0.07
15	1994	-	-	-	-	-	-	-	-	-	3	475	52	3	1223	333	3	1.13	0.14
16	1993	-	-	-	-	-	-	-	-	-	3	485	35	3	1267	291	3	1.09	0.03
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	1	525	-	1	1520	-	1	1.05	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	2	518	110	2	1535	870	2	1.05	0.04
20	1989	2	565	128	2	1980	1584	2	0.96	0.21	2	467	15	2	1265	205	2	1.24	0.08
21	1988	-	-	-	-	-	-	-	-	-	2	463	4	2	1075	35	2	1.09	0.06
22	1987	-	-	-	-	-	-	-	-	-	3	527	56	3	1853	542	3	1.25	0.06

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

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

Table 5.6-18. – continued –

Age	Year-Class	Partridge Breast Lake									Northern Indian 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
23	1986	-	-	-	-	-	-	-	-	-	2	527	21	2	1630	396	2	1.10	0.14
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	2	541	13	2	1475	7	2	0.93	0.07
26	1983	-	-	-	-	-	-	-	-	-	2	512	30	2	1385	205	2	1.03	0.03
27	1982	-	-	-	-	-	-	-	-	-	1	534	-	1	1460	-	1	0.96	-
28	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 5.6-18. – continued –

Age	Year-Class	Lower Churchill River									Gauer 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	120	-	1	15	-	1	0.87	-	-	-	-	-	-	-	-	-	-
3	2006	1	229	-	1	110	-	1	0.92	-	2	228	11	2	115	7	2	0.98	0.08
4	2005	1	235	-	1	120	-	1	0.92	-	2	231	10	2	125	21	2	1.01	0.04
5	2004	-	-	-	-	-	-	-	-	-	4	247	18	4	152	37	4	1.00	0.12
6	2003	-	-	-	-	-	-	-	-	-	1	240	-	1	130	-	1	0.94	-
7	2002	2	321	16	2	340	42	2	1.03	0.03	7	327	17	7	394	55	7	1.12	0.06
8	2001	-	-	-	-	-	-	-	-	-	12	349	30	12	457	126	12	1.05	0.04
9	2000	1	402	-	1	640	-	1	0.99	-	16	365	28	16	540	128	16	1.09	0.06
10	1999	2	426	57	2	860	368	2	1.08	0.04	32	392	28	32	682	154	32	1.11	0.07
11	1998	7	442	32	7	961	177	7	1.11	0.08	8	404	14	8	725	167	8	1.09	0.21
12	1997	10	476	17	10	1201	107	10	1.11	0.08	6	425	12	6	853	94	6	1.11	0.07
13	1996	10	478	30	10	1267	289	10	1.14	0.08	12	445	26	12	1018	180	12	1.14	0.06
14	1995	6	498	40	6	1475	313	6	1.18	0.04	15	454	51	15	1047	322	15	1.10	0.12
15	1994	2	465	27	2	1255	332	2	1.23	0.12	7	438	33	7	927	252	7	1.08	0.05
16	1993	1	475	-	1	1110	-	1	1.04	-	1	417	-	1	750	-	1	1.03	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	2	505	43	2	1355	445	2	1.03	0.08	-	-	-	-	-	-	-	-	-
19	1990	1	577	-	1	2100	-	1	1.09	-	1	532	-	1	1400	-	1	0.93	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	2	495	44	2	1300	297	2	1.06	0.04	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

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

Table 5.6-18. – continued –

Age	Year-Class	Lower Churchill River									Gauer 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
23	1986	1	585	-	1	2250	-	1	1.12	-	-	-	-	-	-	-	-	-	-
24	1985	2	530	120	2	1610	834	2	1.05	0.15	-	-	-	-	-	-	-	-	-
25	1984	1	567	-	1	1600	-	1	0.88	-	-	-	-	-	-	-	-	-	-
26	1983	1	543	-	1	1570	-	1	0.98	-	-	-	-	-	-	-	-	-	-
27	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1981	1	564	-	1	1730	-	1	0.96	-	-	-	-	-	-	-	-	-	-

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

Table 5.6-19. Deformities, erosions, lesions, and tumours (DELTs) summary for select fish species captured in Lower Churchill River Region waterbodies, 2009.

Species	Deformities			Erosion			Lesions			Tumours			Total		
	n[1]	%[2]		n	%		n	%		n	%		$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Partridge Breast L.															
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	162	0	0.00
Northern Pike	1	0.57	-	-	-	-	1	0.57	-	-	-	-	175	2	1.14
Lake Whitefish	-	-	-	1	1.27	-	3	3.80	-	-	-	-	79	4	5.06
Walleye	1	0.59	-	-	-	-	-	-	-	1	0.59	-	170	2	1.18
Northern Indian L.															
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	3	1.37	-	-	-	-	219	3	1.37
Northern Pike	1	0.74	-	-	-	-	-	-	-	-	-	-	135	1	0.74
Lake Whitefish	-	-	-	-	-	-	4	3.42	-	-	-	-	117	4	3.42
Walleye	-	-	-	-	-	-	3	1.02	-	-	-	-	293	3	1.02
Lower Churchill R.															
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-	35	0	0.00
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	17	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-	36	0	0.00
Lake Whitefish	1	1.61	-	-	-	-	-	-	-	-	-	-	62	1	1.61
Walleye	2	3.92	-	-	-	-	-	-	-	1	1.96	-	51	3	5.88
Gauer L.															
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	2	1.17	-	-	-	-	-	-	-	-	-	-	171	2	1.17
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-	80	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	105	0	0.00
Walleye	-	-	-	-	-	-	-	-	-	-	-	-	131	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 ($n_{DELTs}/n_{Inspect} \times 100$)

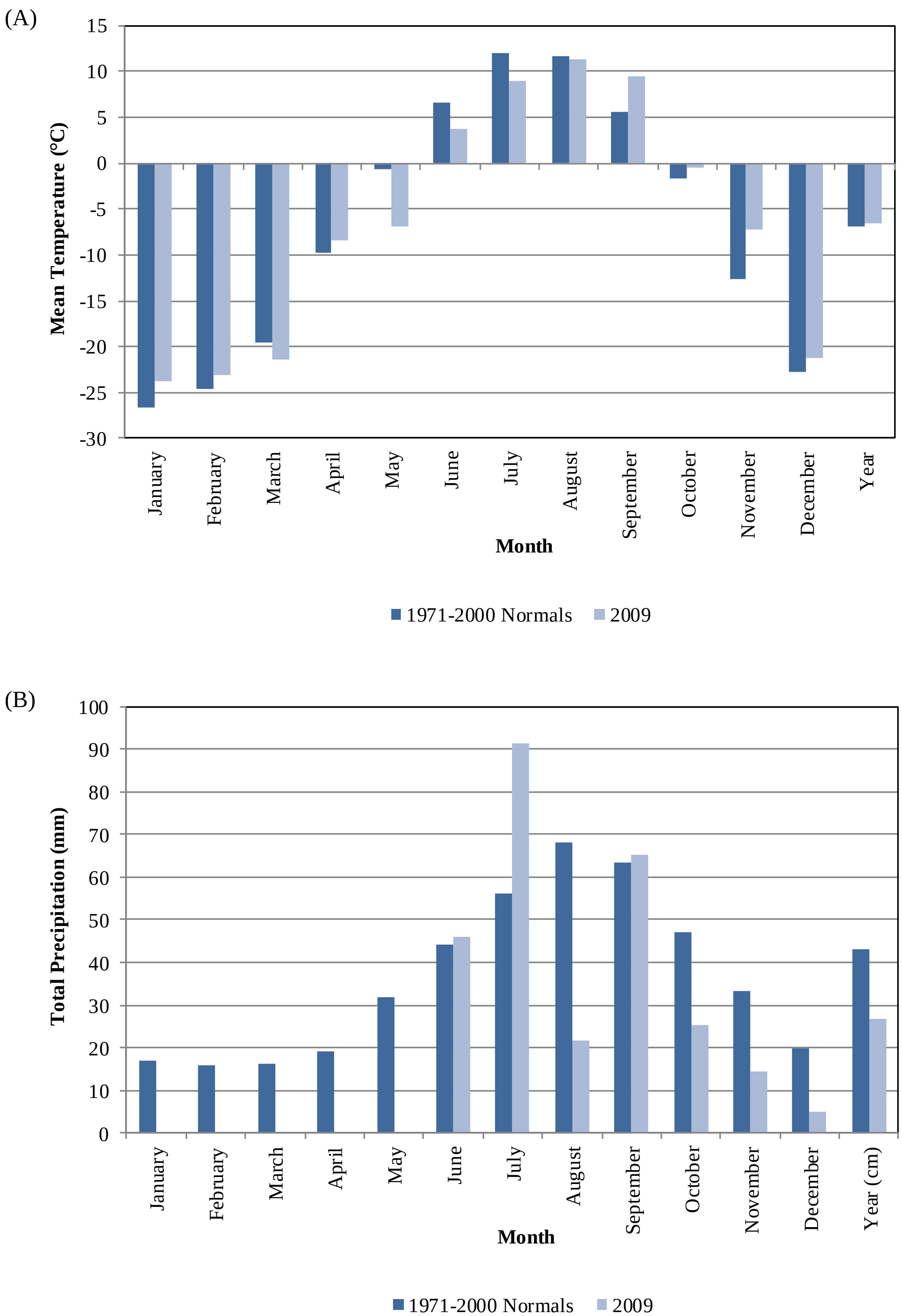


Figure 5.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), Churchill, MB.

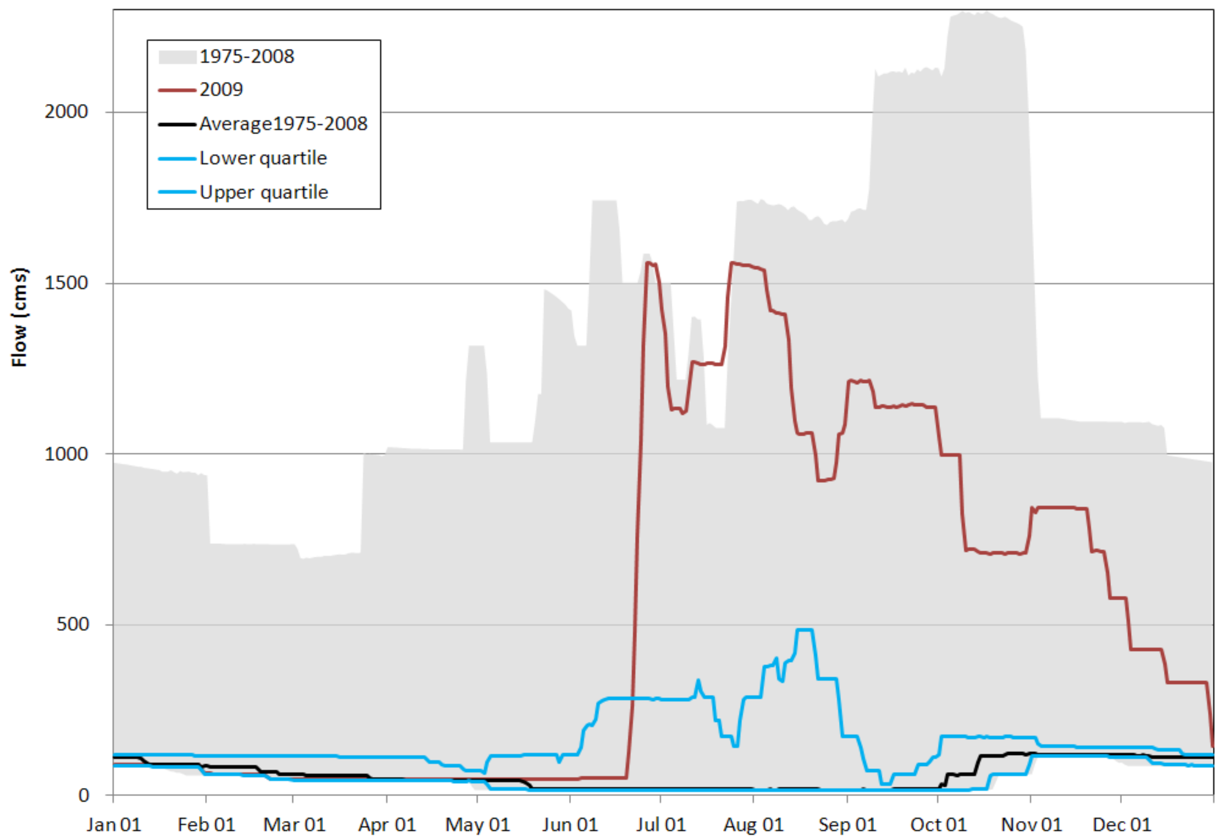


Figure 5.2-1. 2009 Missi Falls Control Structure (06EC702) flow.

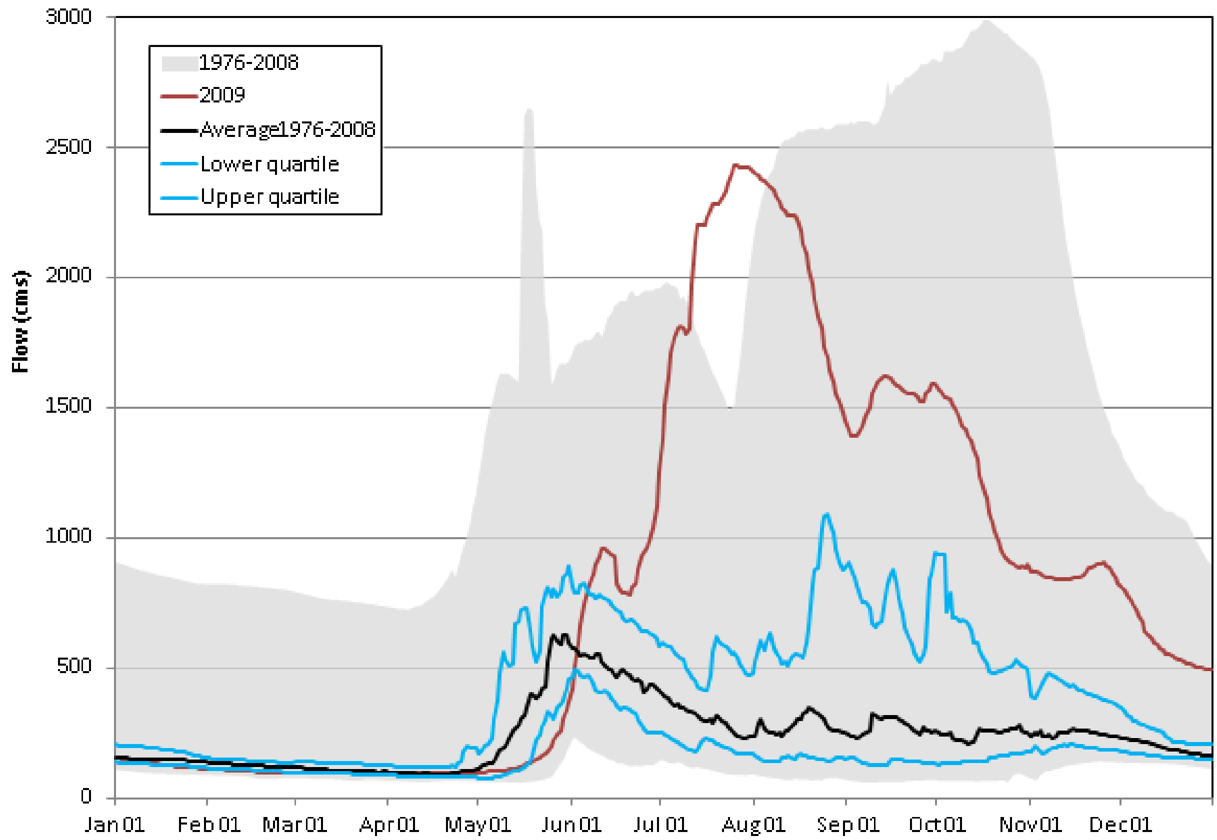


Figure 5.2-2. 2009 Churchill River above Red Head Rapids (06FD001) flow.

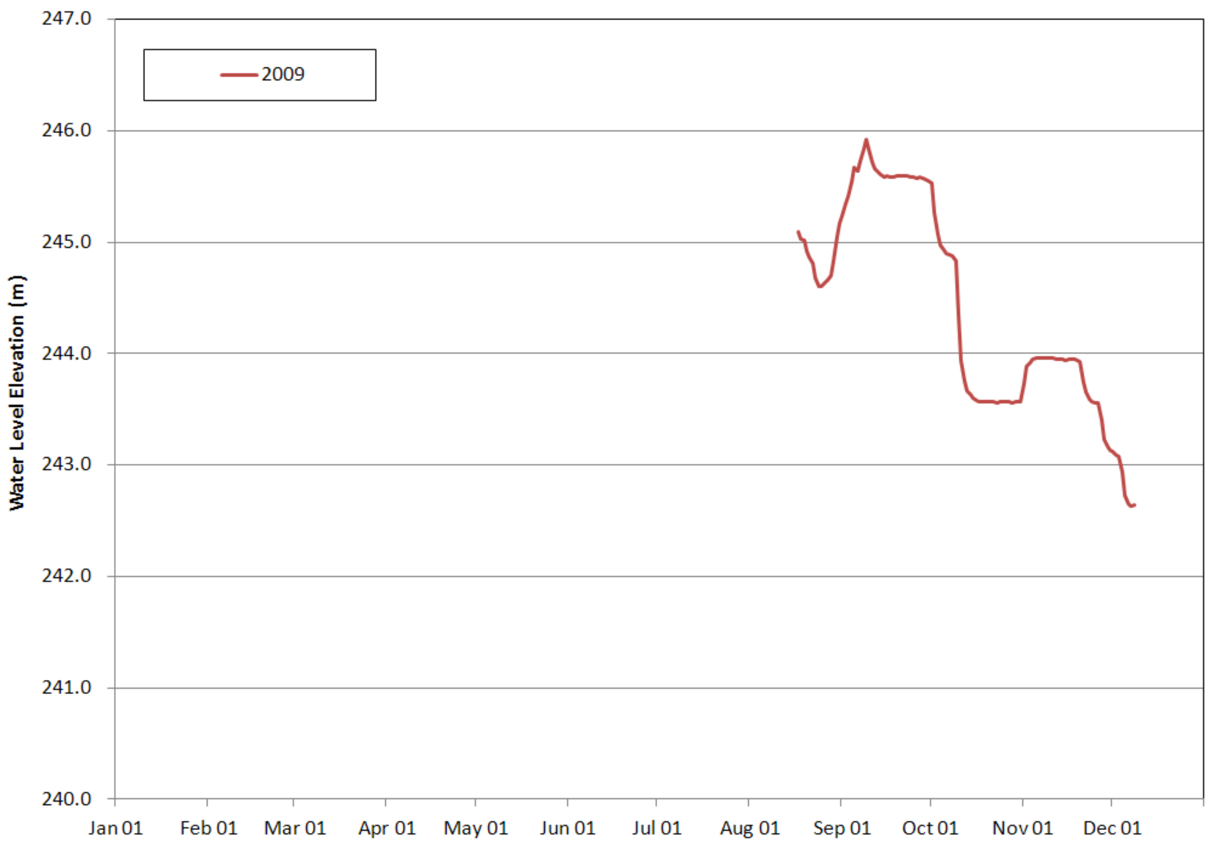


Figure 5.2-3. 2009 Partridge Breast Lake (06FA703) water level elevation.

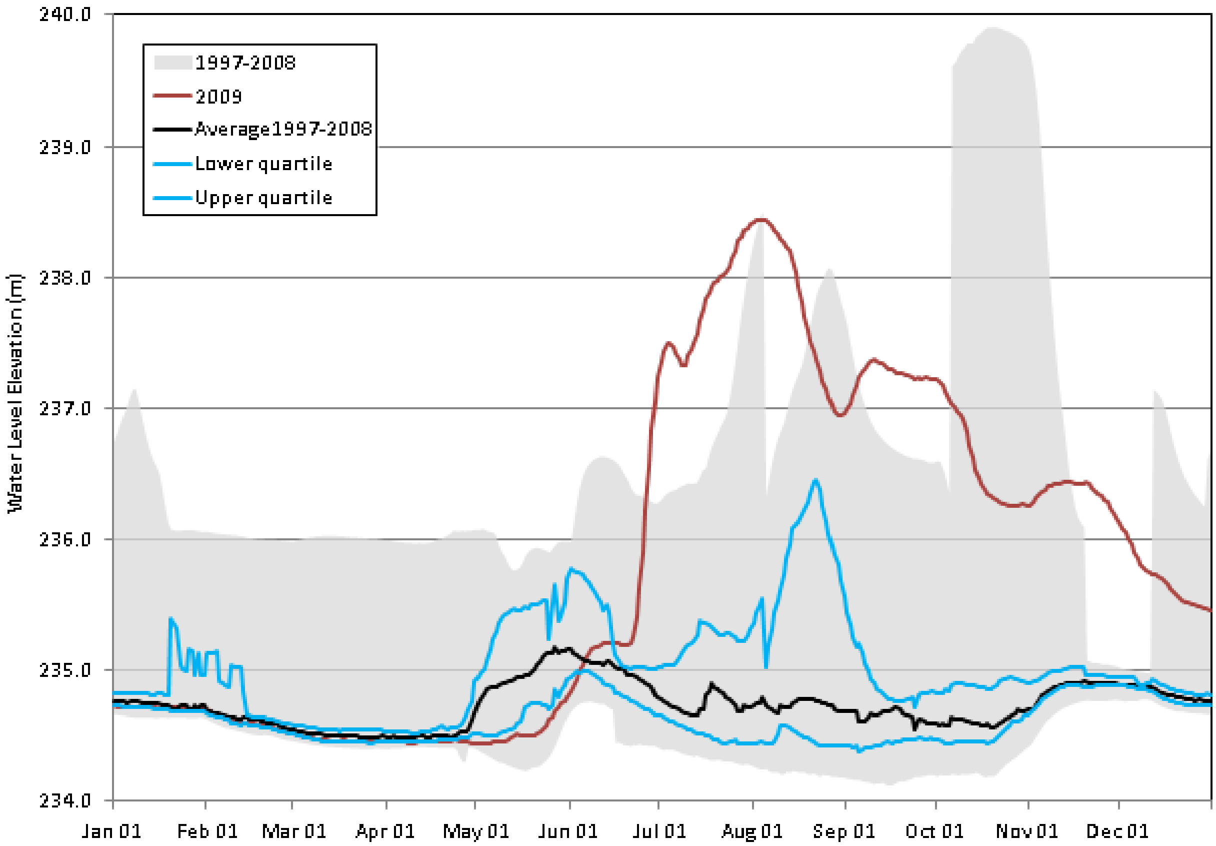


Figure 5.2-4. 2009 Northern Indian Lake (06FA701) water level elevation

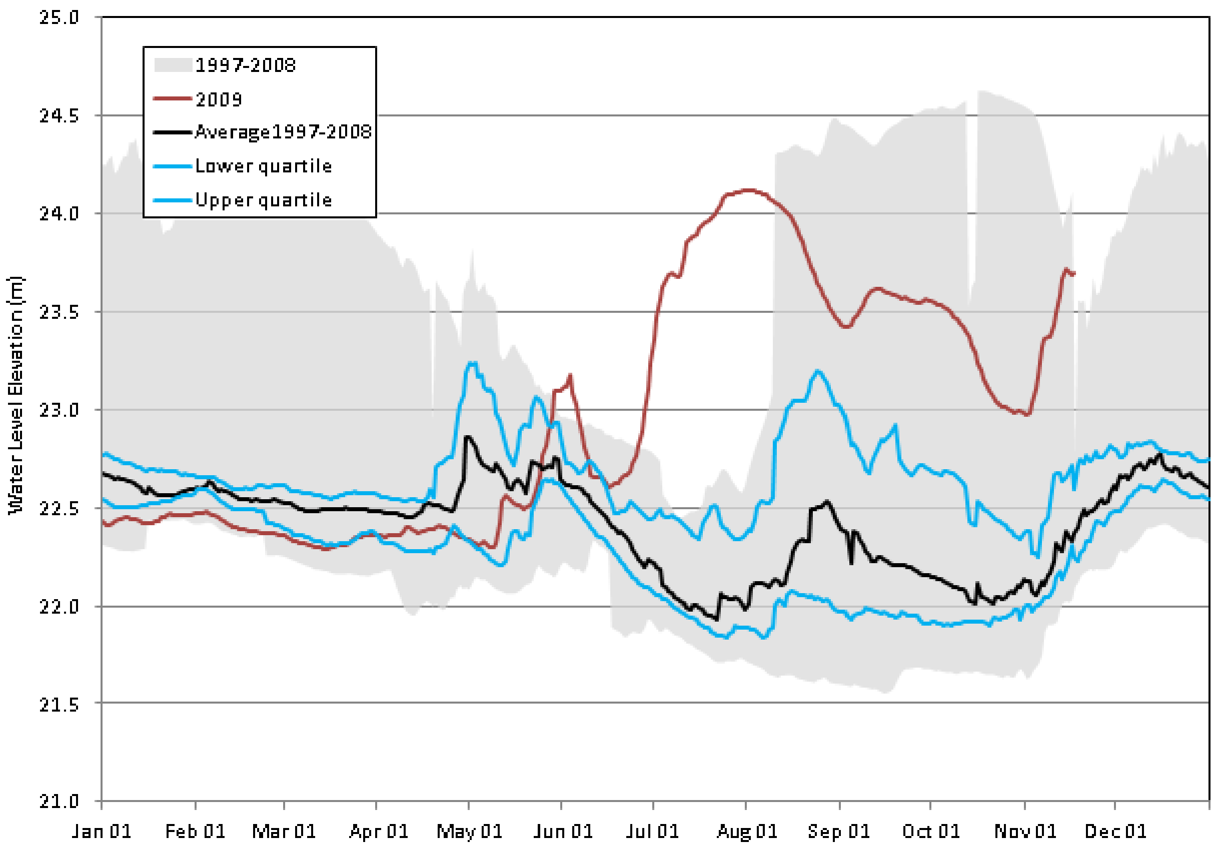


Figure 5.2-5. 2009 Churchill River above Swallow Rapids (06FD702) water level elevation.

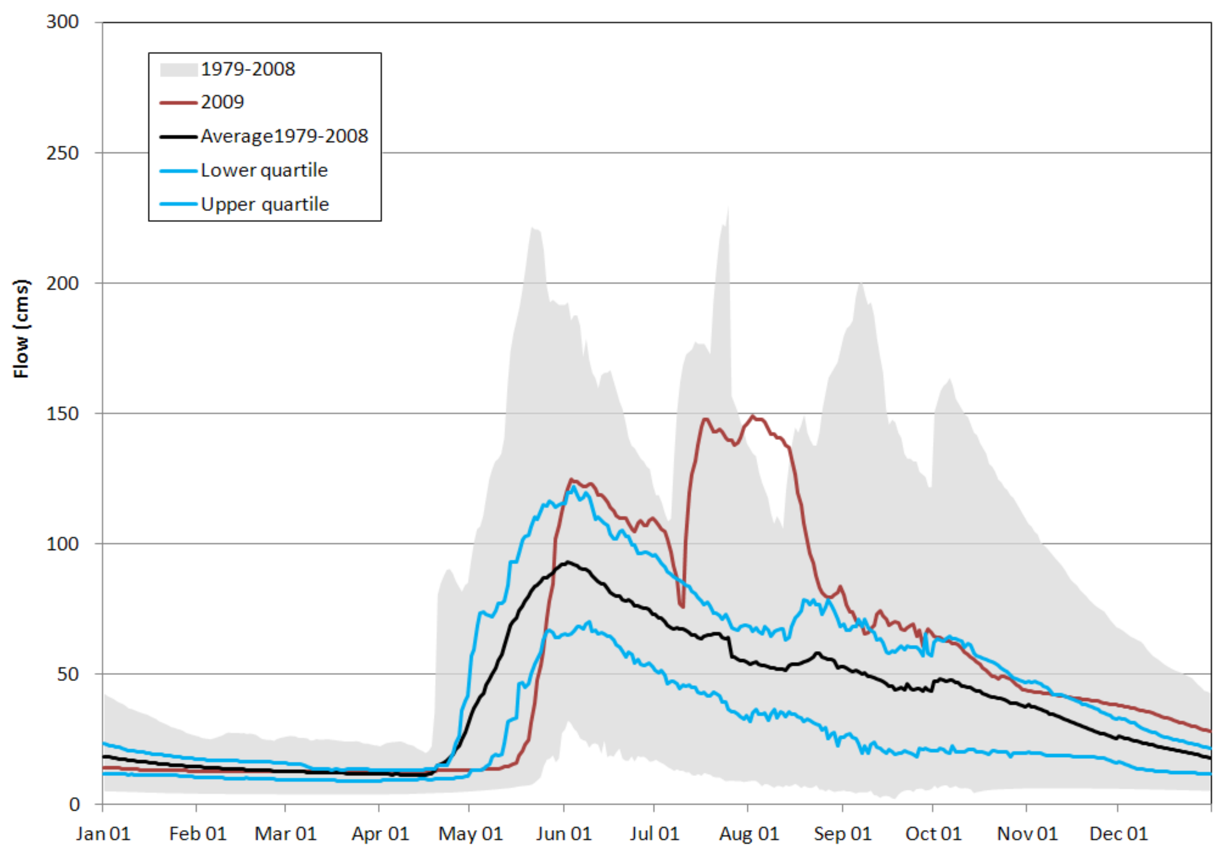


Figure 5.2-6. 2009 Gauer River (06FA001) flow.

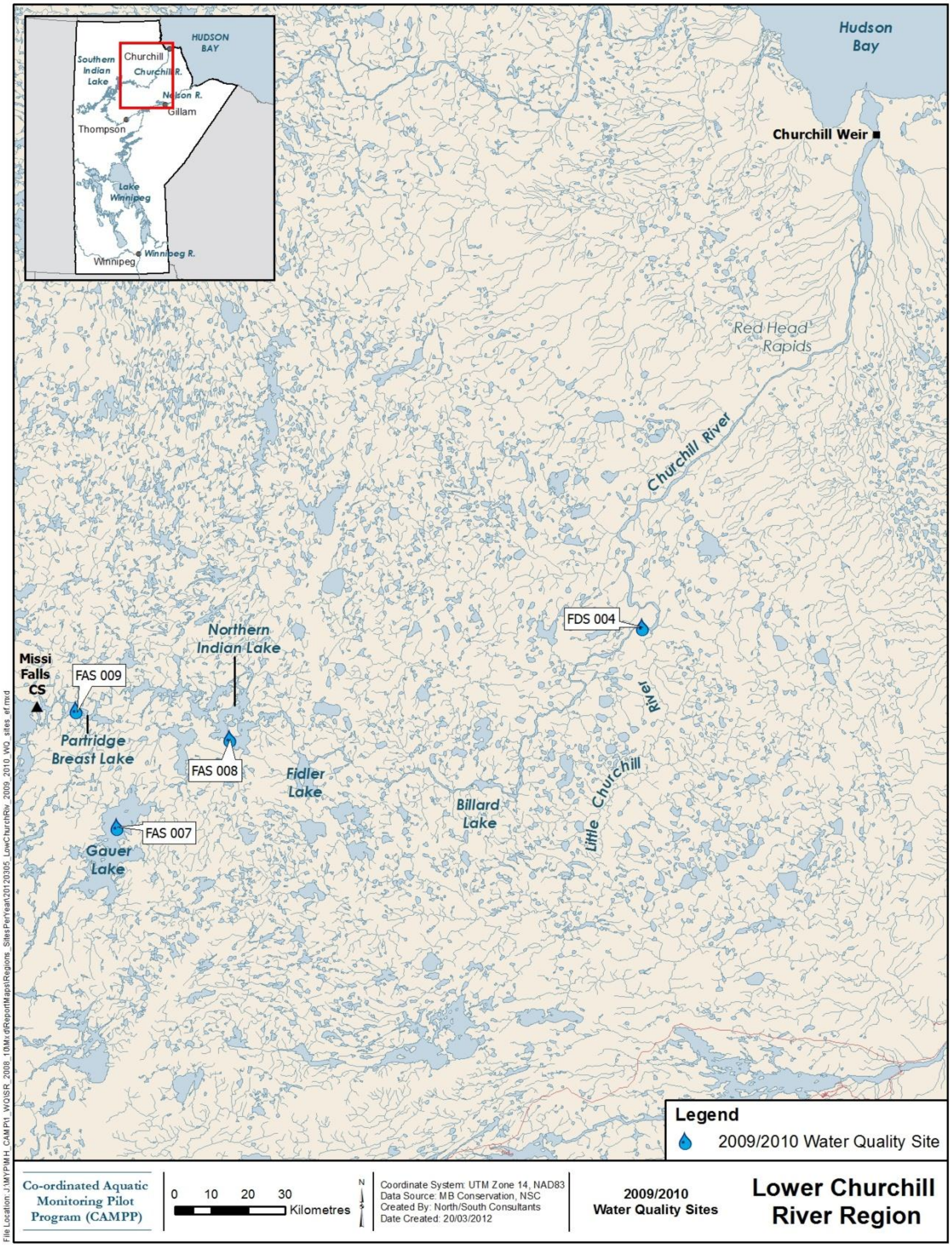


Figure 5.3-1. Water quality and phytoplankton monitoring sites in the Lower Churchill River Region: 2009/2010.

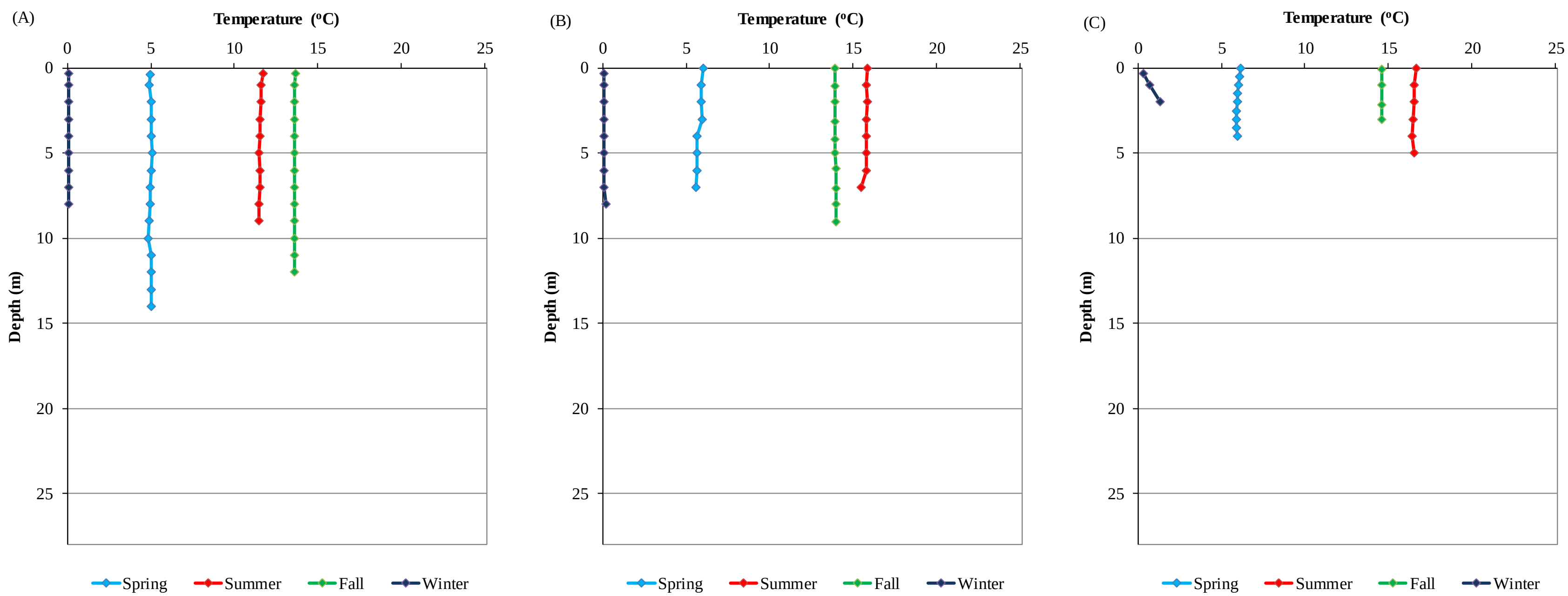


Figure 5.3-2. Water temperature profiles measured in the Lower Churchill River Region in 2009/2010: (A) Partridge Breast Lake; (B) Northern Indian Lake; and (C) Gauer Lake.

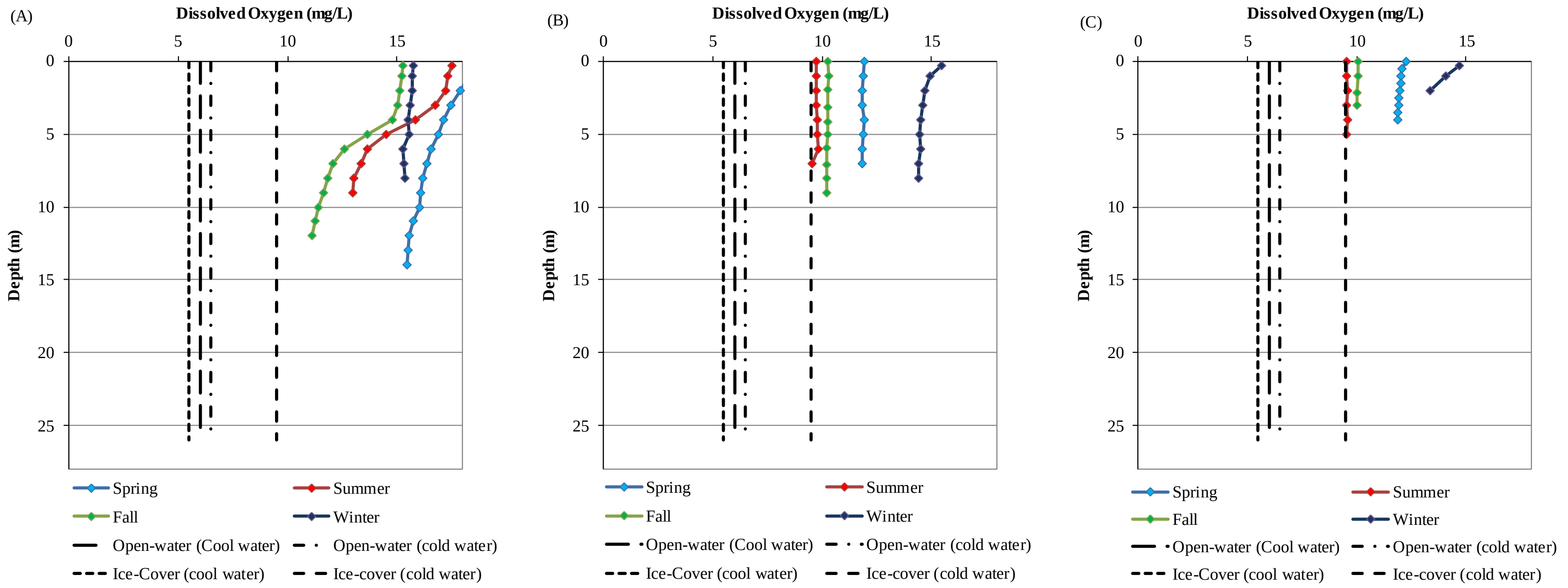


Figure 5.3-3. Dissolved oxygen depth profiles measured in the Lower Churchill River Region in 2009/2010: (A) Partridge Breast Lake; (B) Northern Indian Lake; and (C) Gauer Lake. Dashed lines represent selected MWQSOGs for PAL.

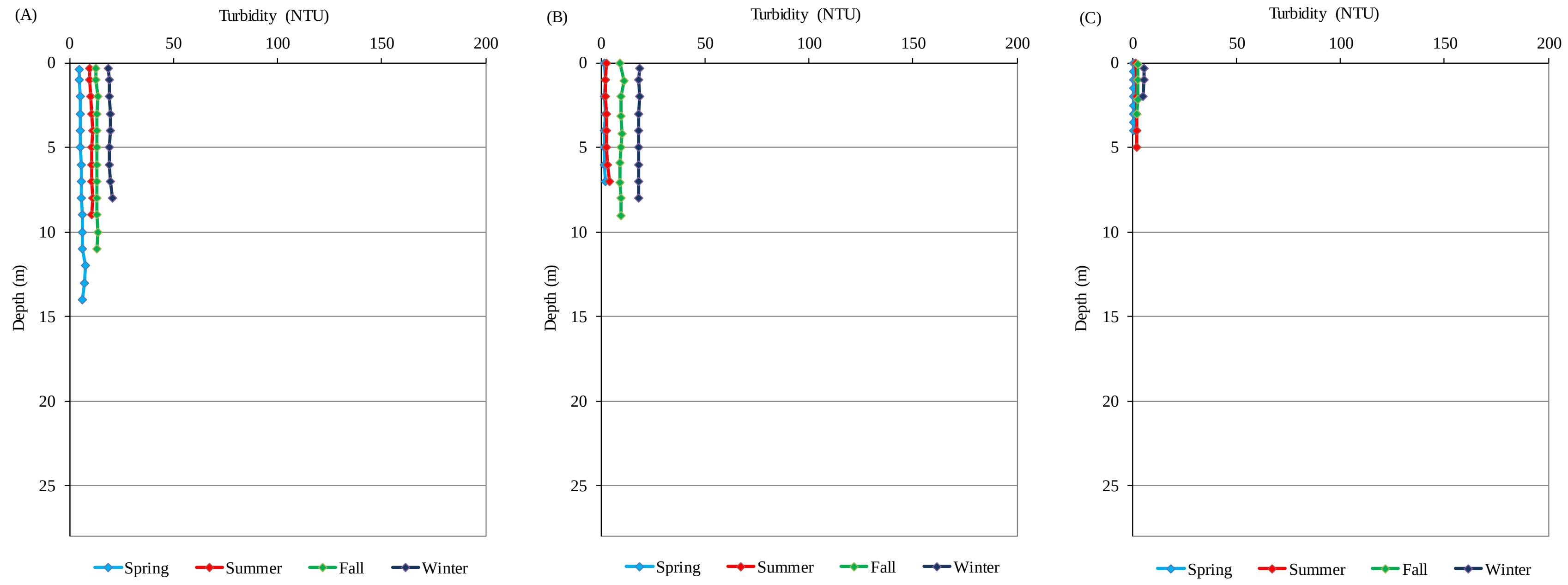


Figure 5.3-4. Turbidity depth profiles measured in the Lower Churchill River Region in 2009/2010: (A) Partridge Breast Lake; (B) Northern Indian Lake; and (C) Gauer Lake.

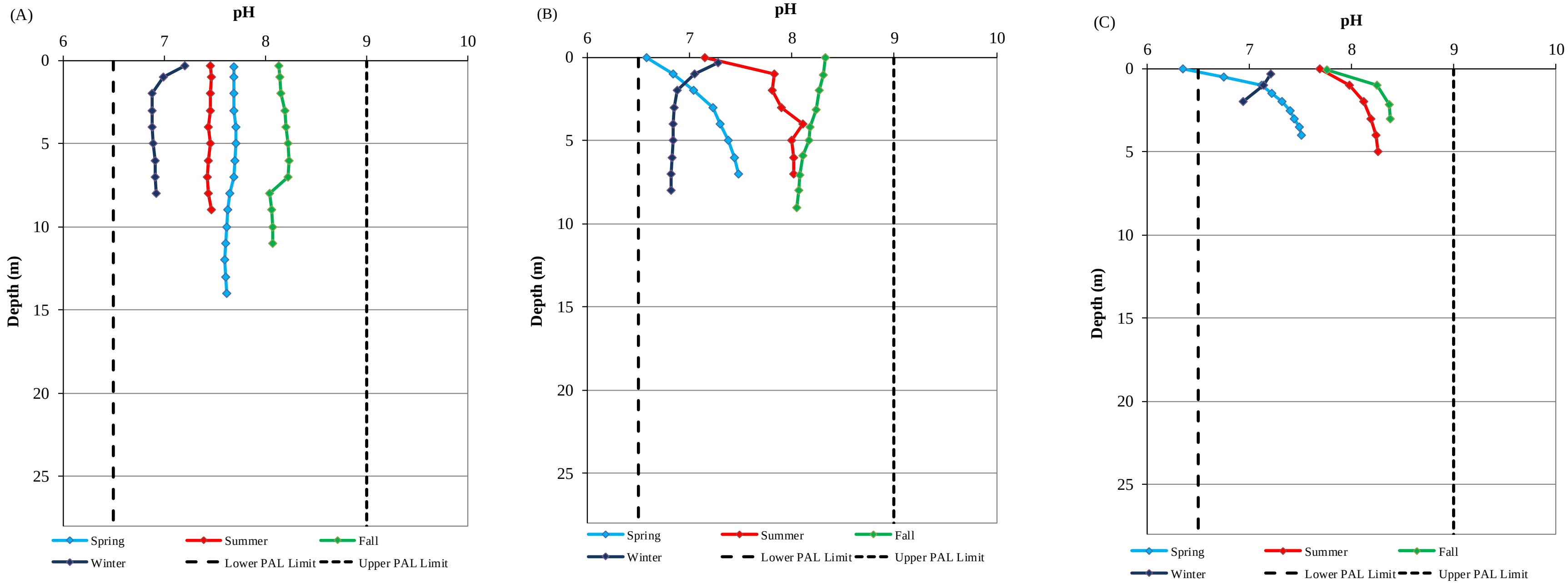
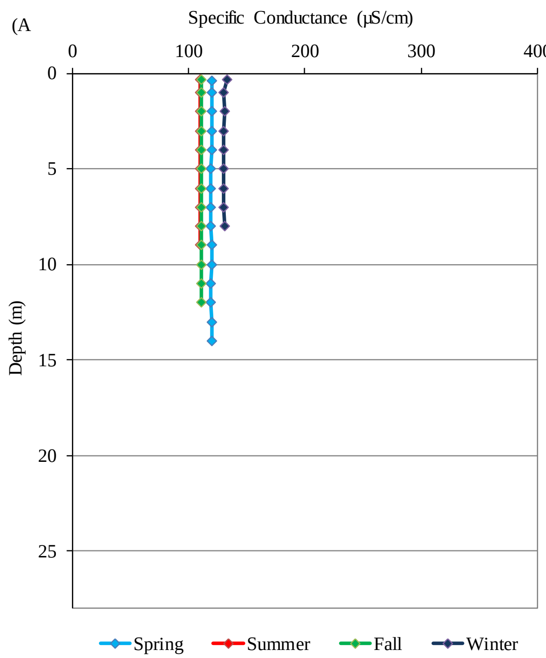
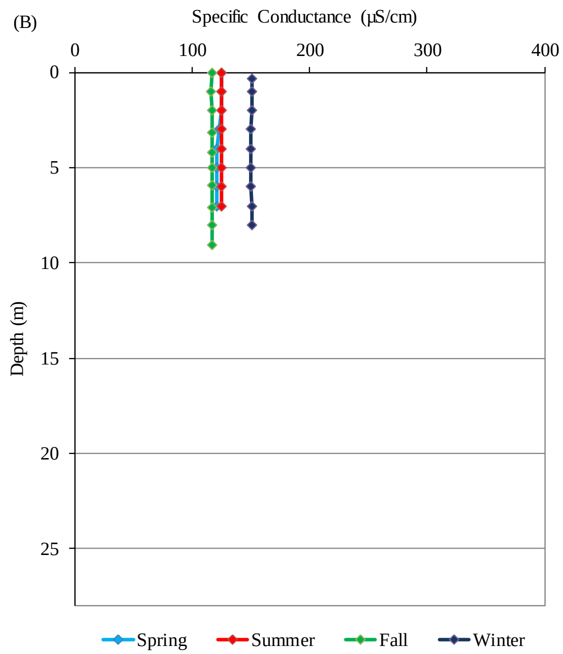


Figure 5.3-5. pH depth profiles measured in the Lower Churchill River Region in 2009/2010: (A) Partridge Breast Lake; (B) Northern Indian Lake; and (C) Gauer Lake. Dashed lines represent selected MWQSOGs for PAL.





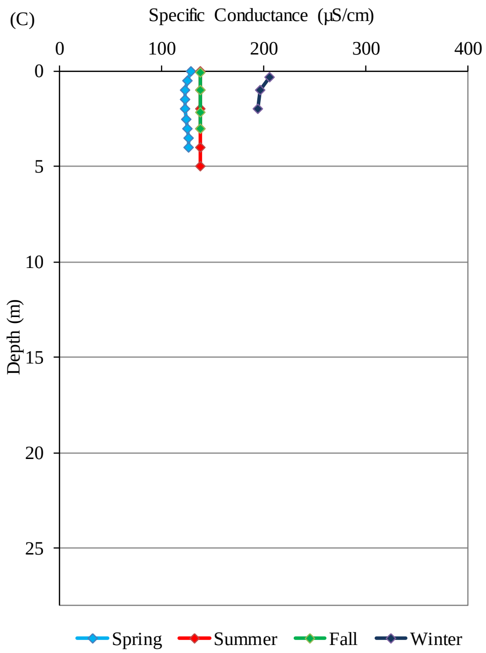


Figure 5.3-6. Specific conductance depth profiles measured in the Lower Churchill River Region in 2009/2010: (A) Partridge Breast Lake; (B) Northern Indian Lake; and (C) Gauer Lake.

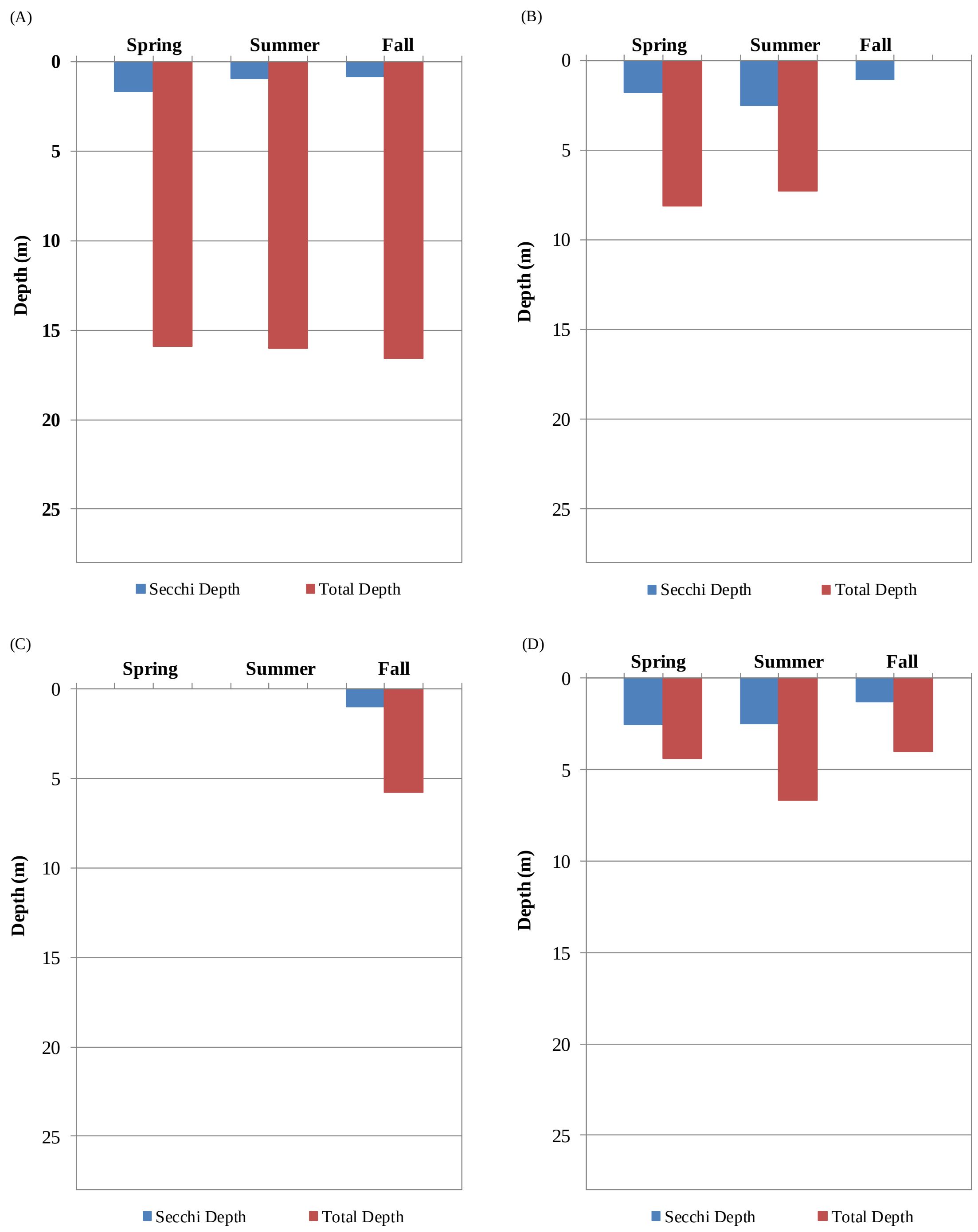


Figure 5.3-7. Secchi disk depths measured in the Lower Churchill River Region in 2009/2010: (A) Partridge Breast Lake; (B) Northern Indian Lake; (C) Lower Churchill River; and (D) Gauer Lake.

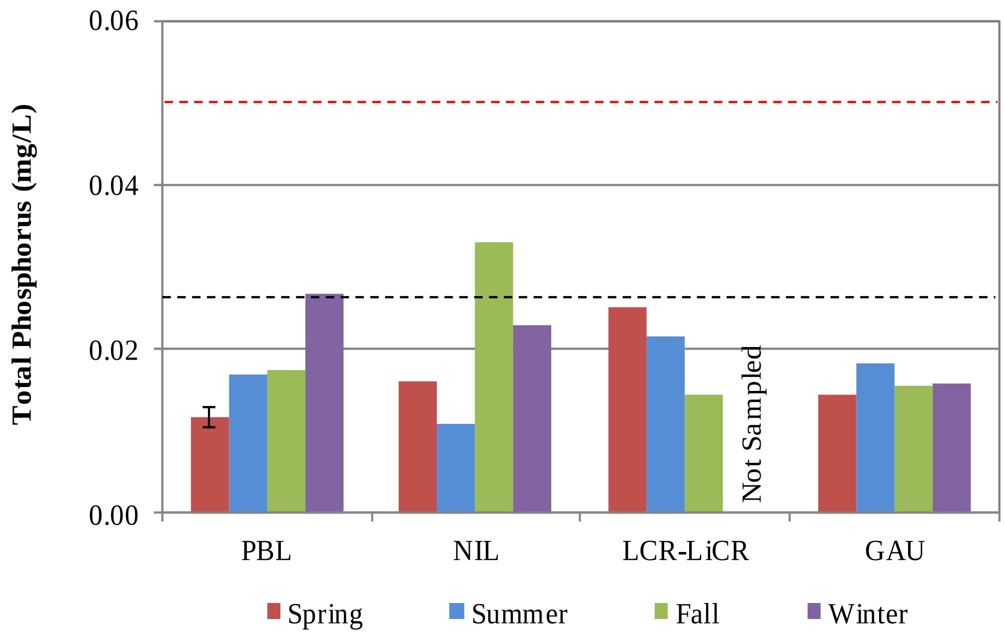


Figure 5.3-8. Total phosphorus measured in surface grabs in the Lower Churchill River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

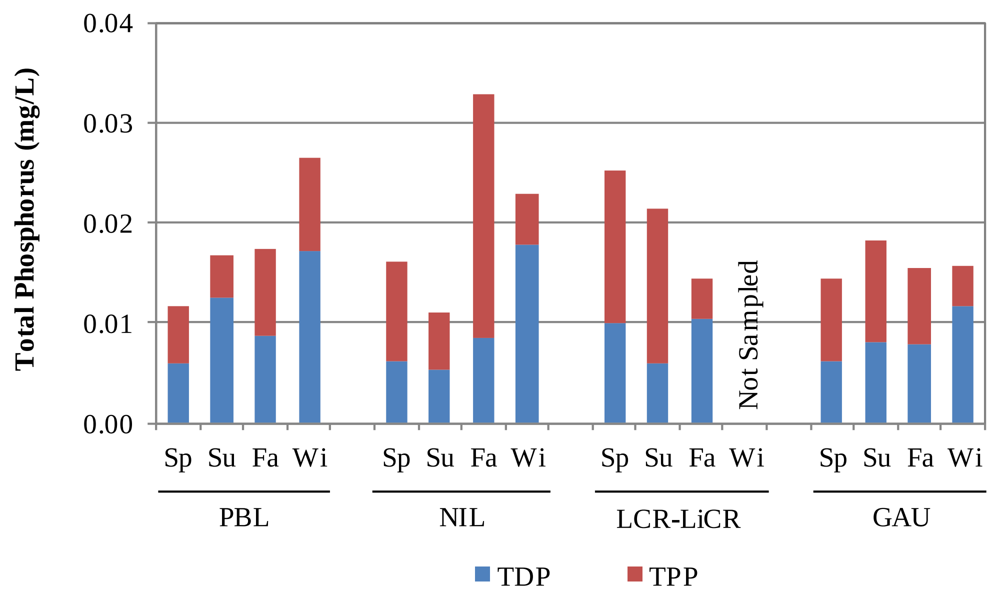


Figure 5.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Lower Churchill River Region: 2009/2010.

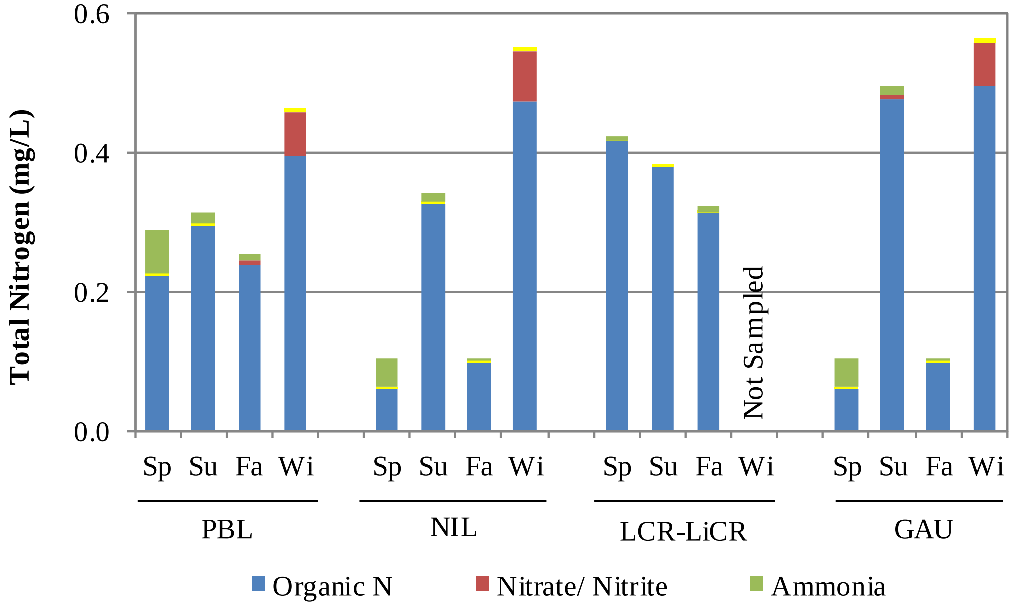
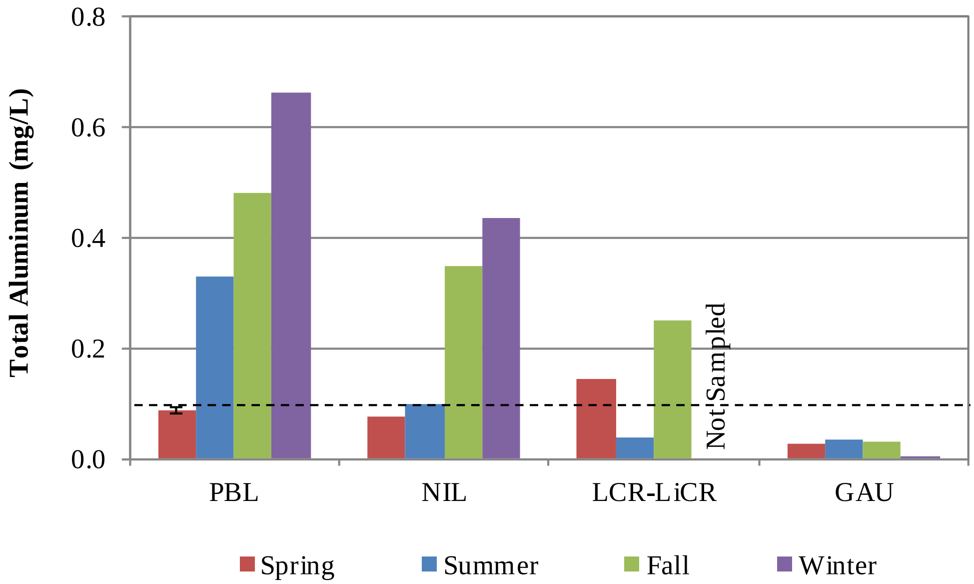


Figure 5.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Lower Churchill River Region: 2009/2010.

(A)



(B)

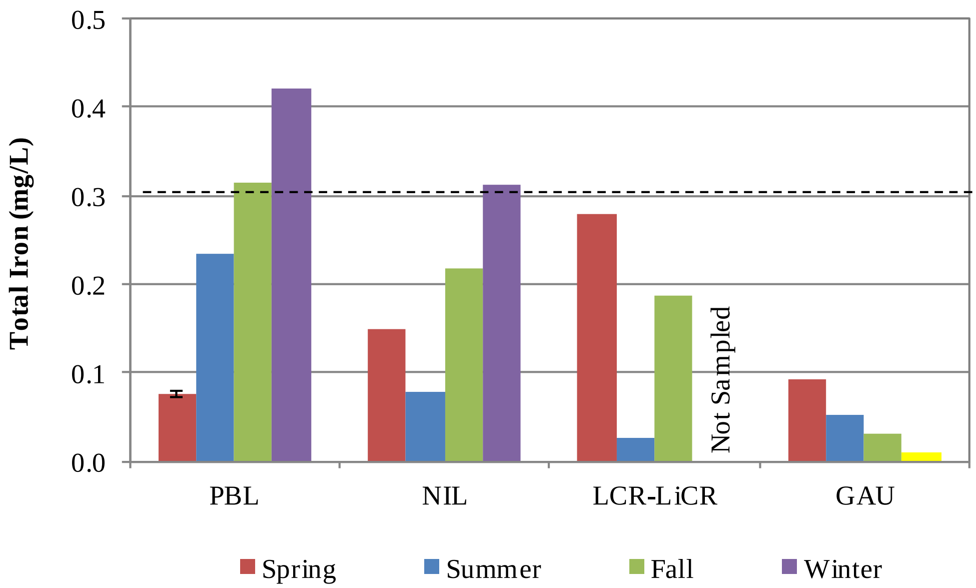


Figure 5.3-11. Total aluminum (A) and total iron (B) measured in surface grabs in the Lower Churchill River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

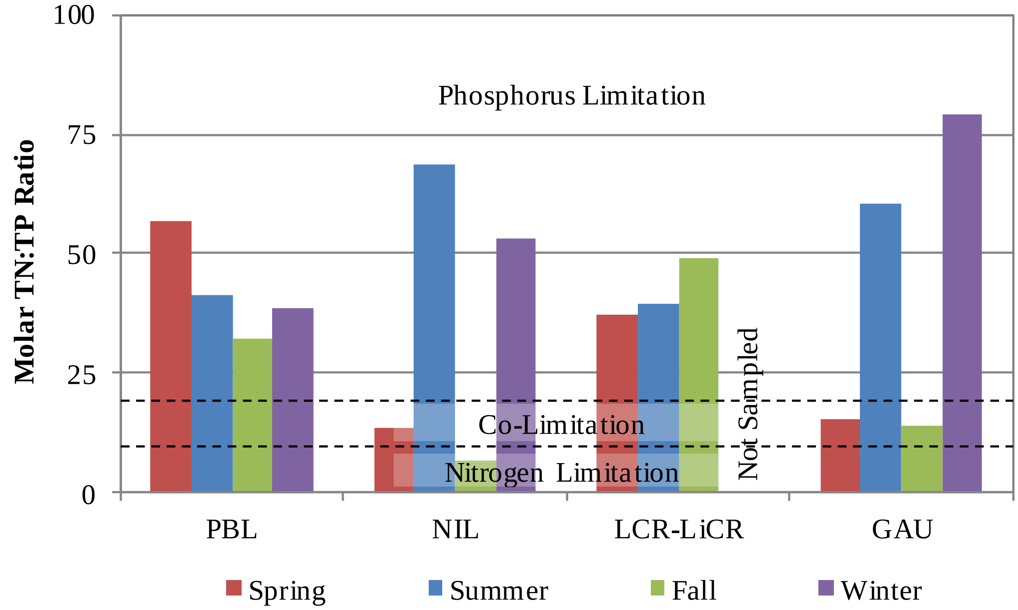


Figure 5.3-12. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Lower Churchill River Region: 2009/2010.

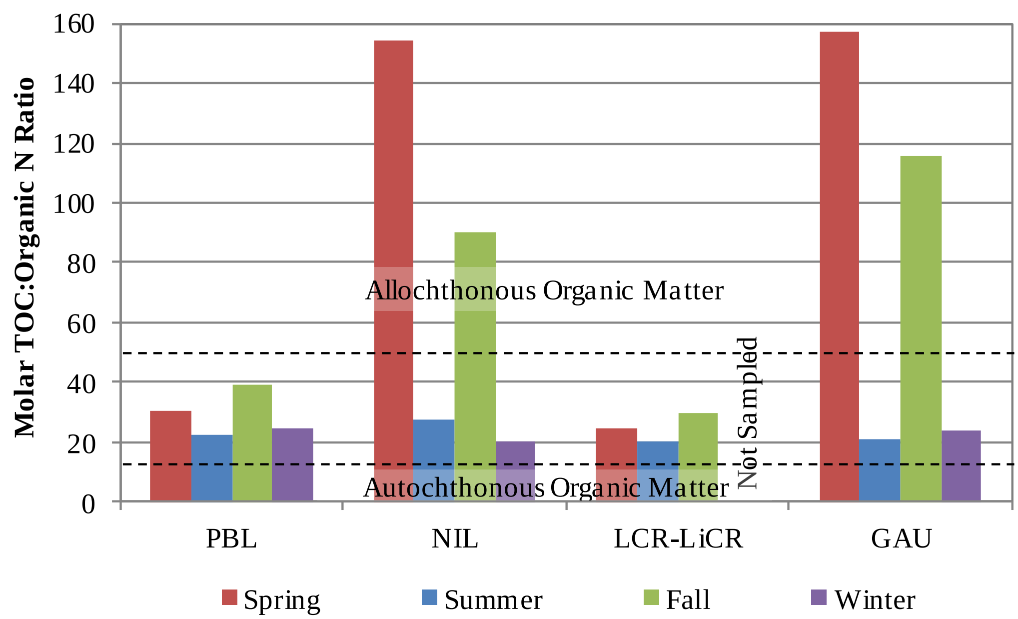
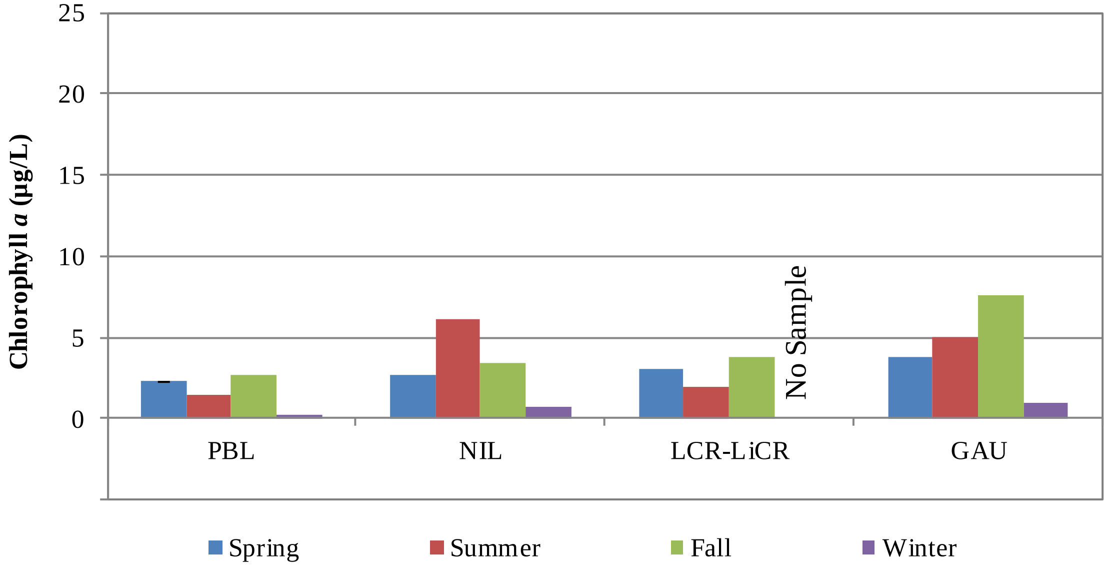


Figure 5.3-13. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Lower Churchill River Region: 2009/2010.

(A) Surface



(B) Euphotic

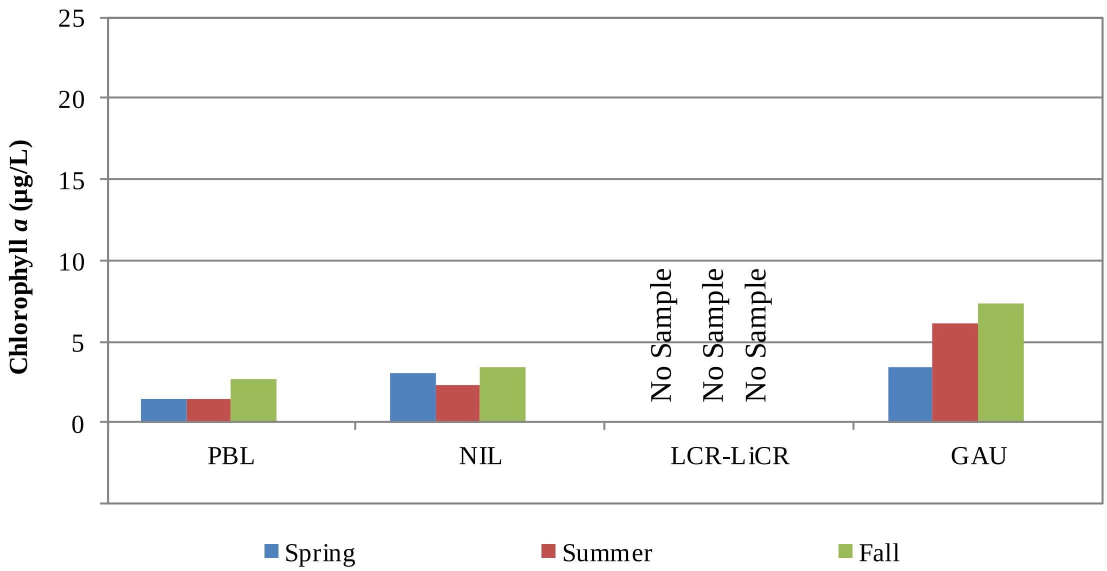


Figure 5.4-1. Chlorophyll *a* concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Lower Churchill River Region in 2009/2010.

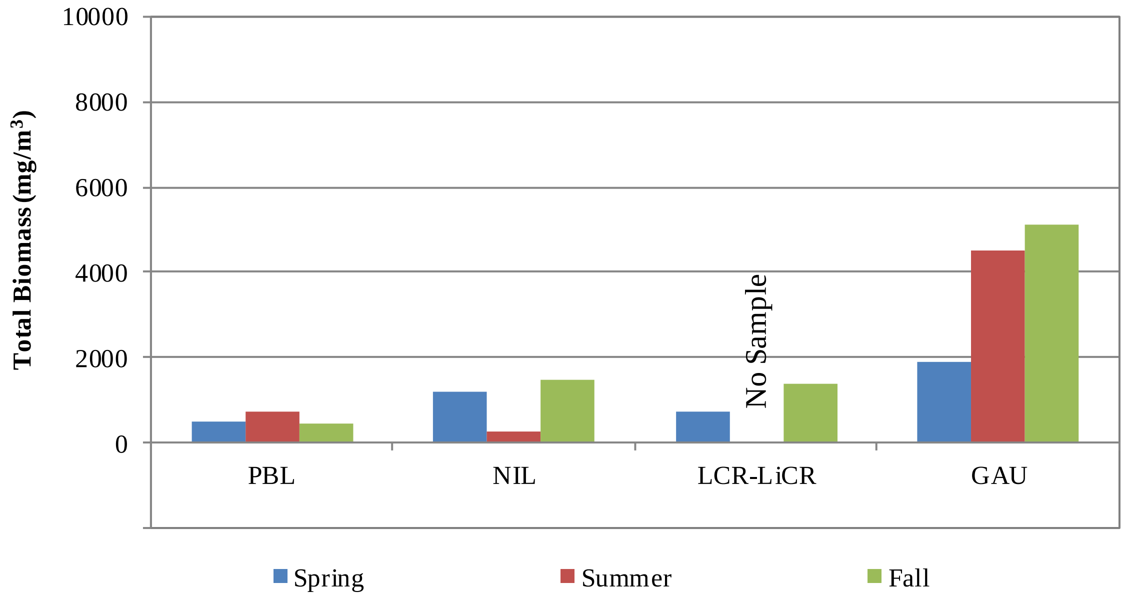


Figure 5.4-2. Phytoplankton biomass measured at sites in the Lower Churchill River Region in 2009/2010.

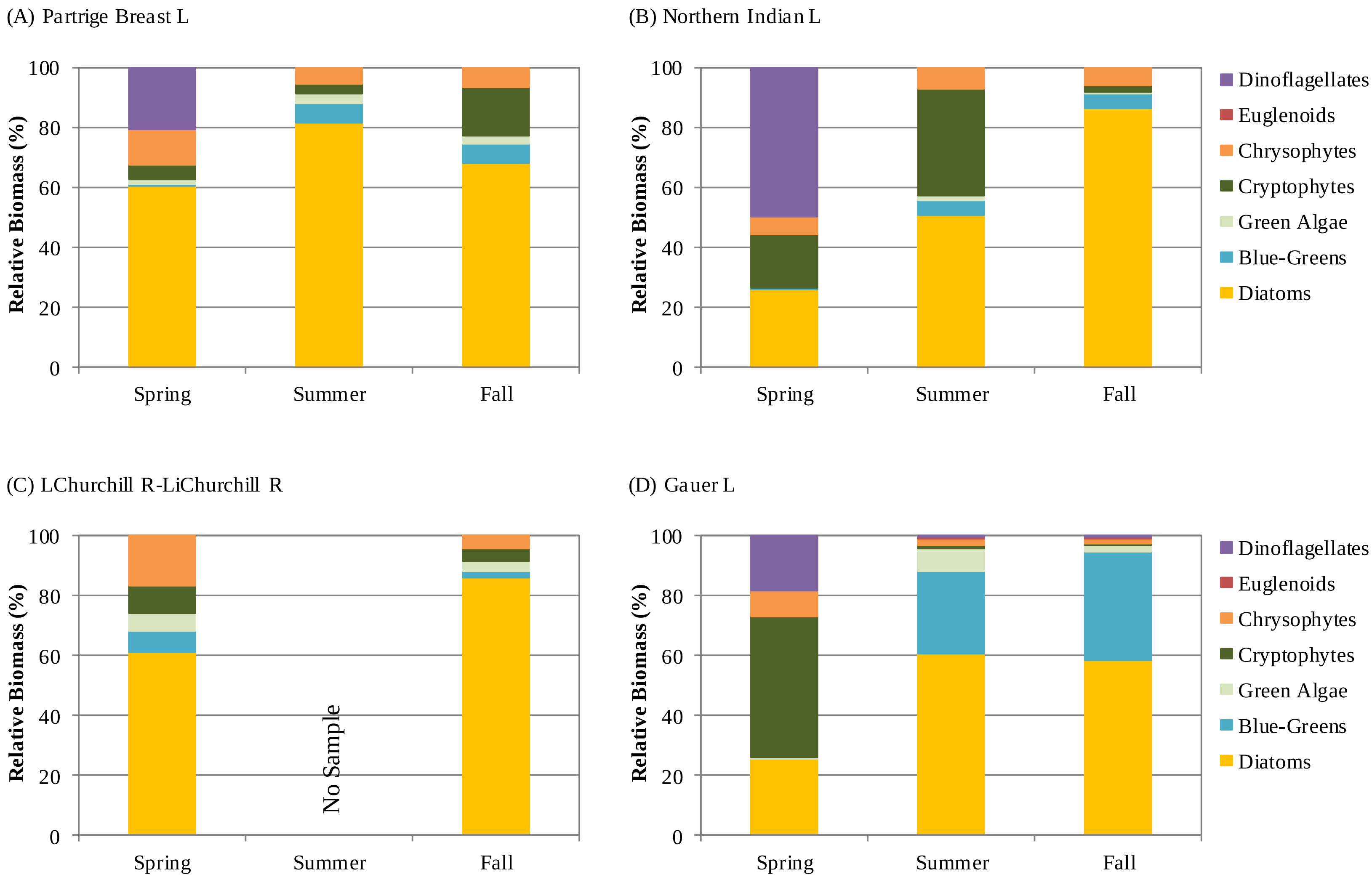


Figure 5.4-3. Phytoplankton community composition at sites in the Lower Churchill River Region in 2009.

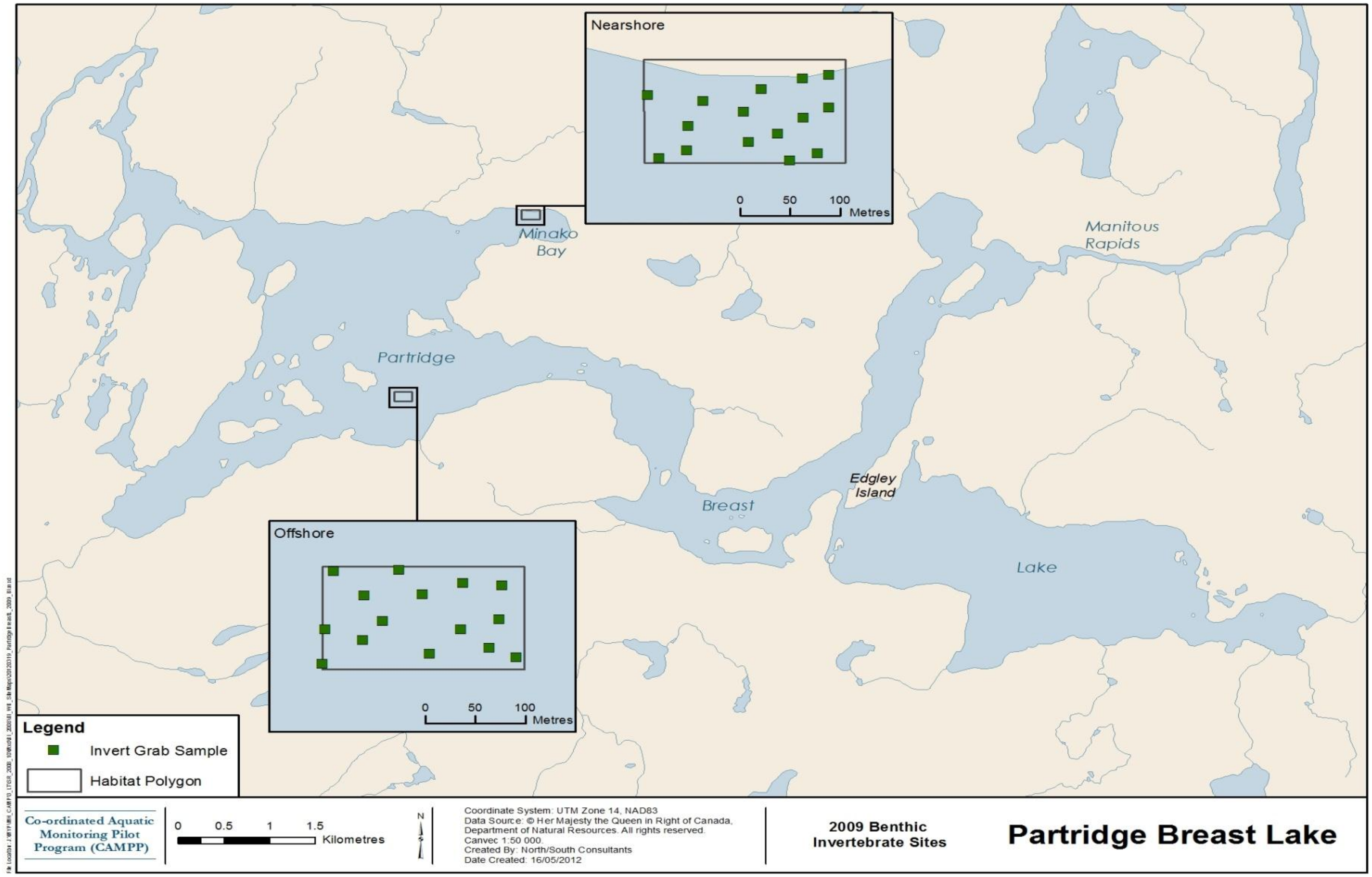


Figure 5.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Partridge Breast Lake within the Lower Churchill River Region, 2009.

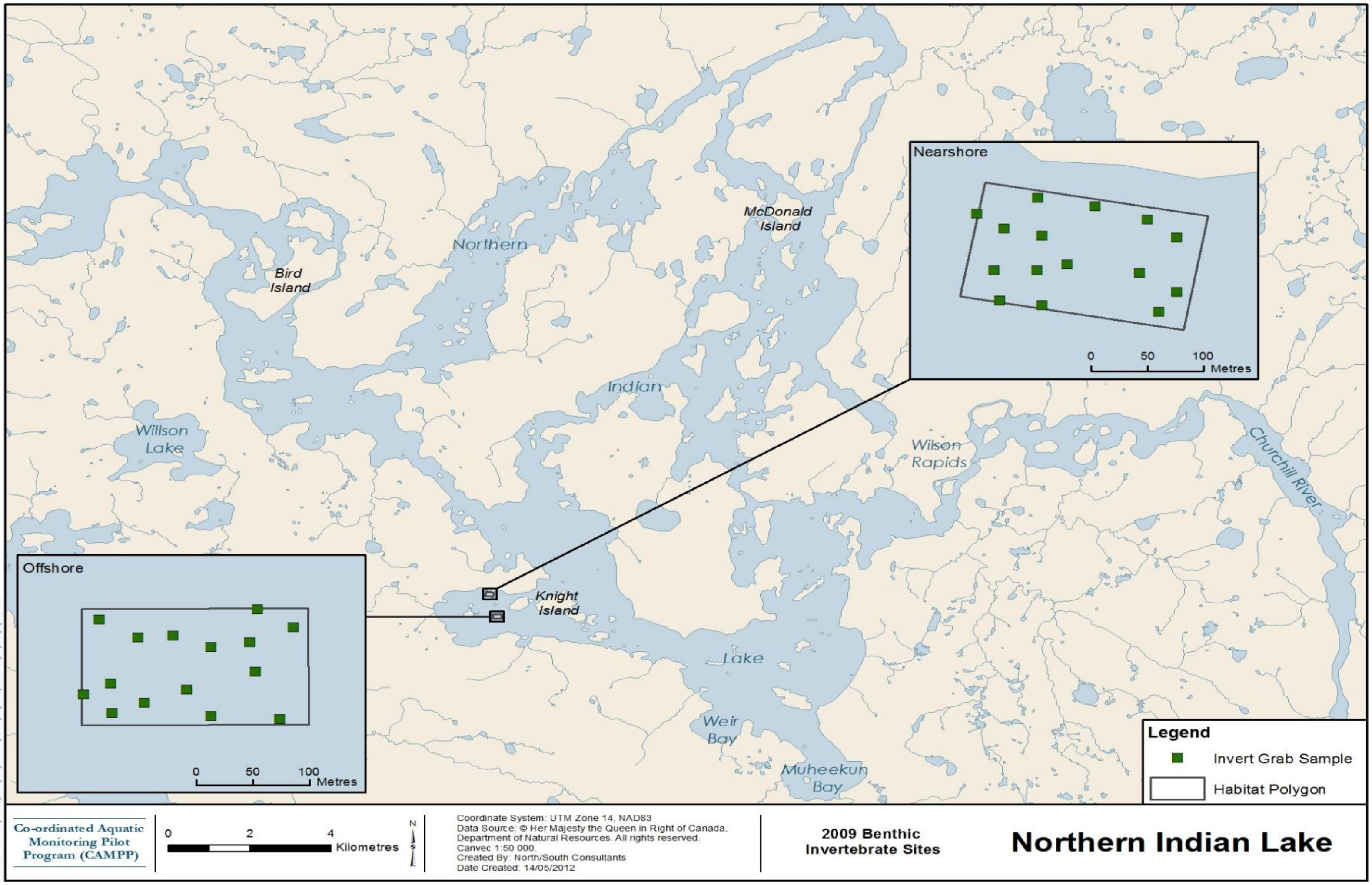


Figure 5.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Northern Indian Lake within the Lower Churchill River Region, 2009.

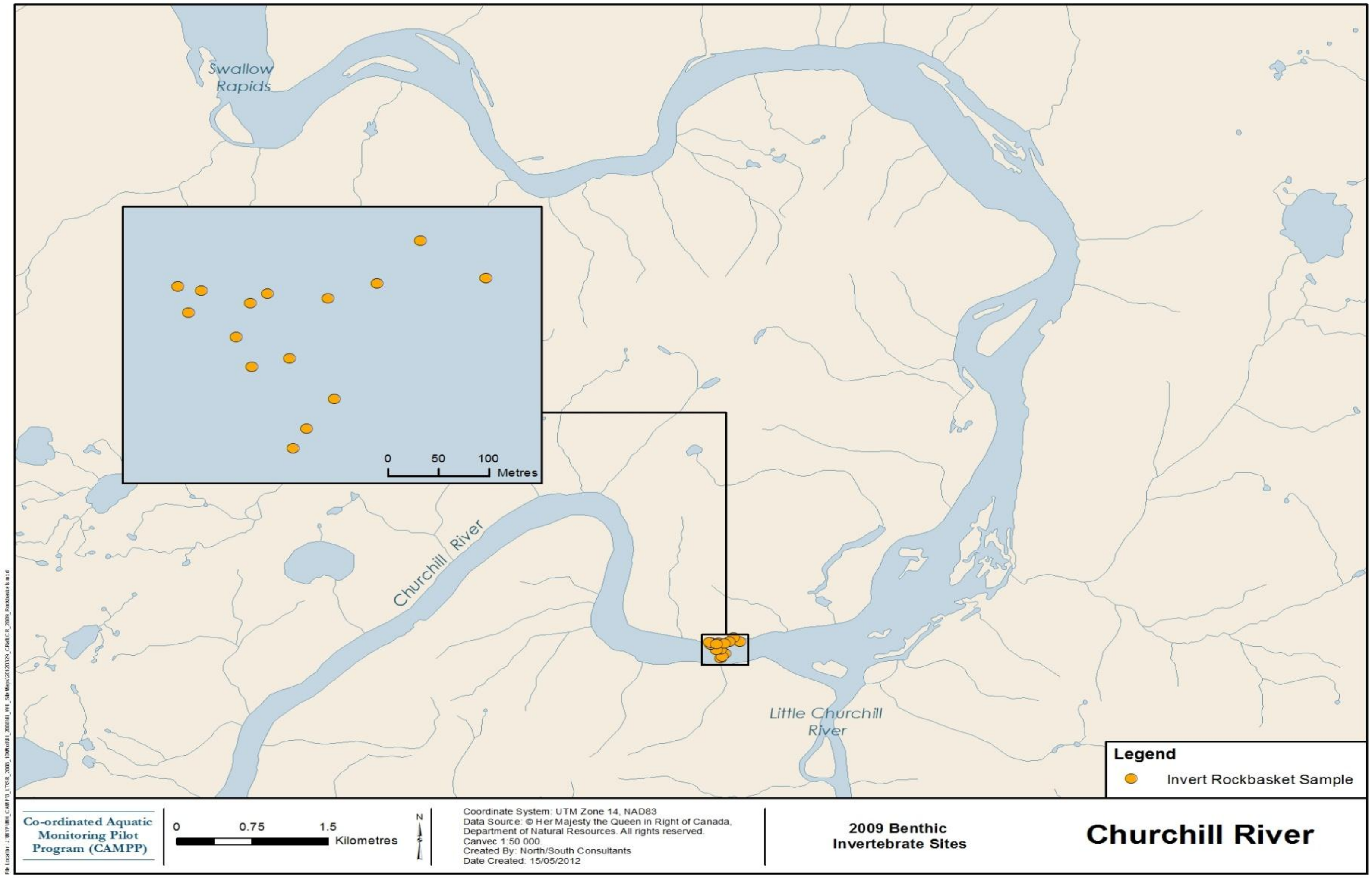


Figure 5.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Churchill River in the Lower Churchill River Region, 2009.

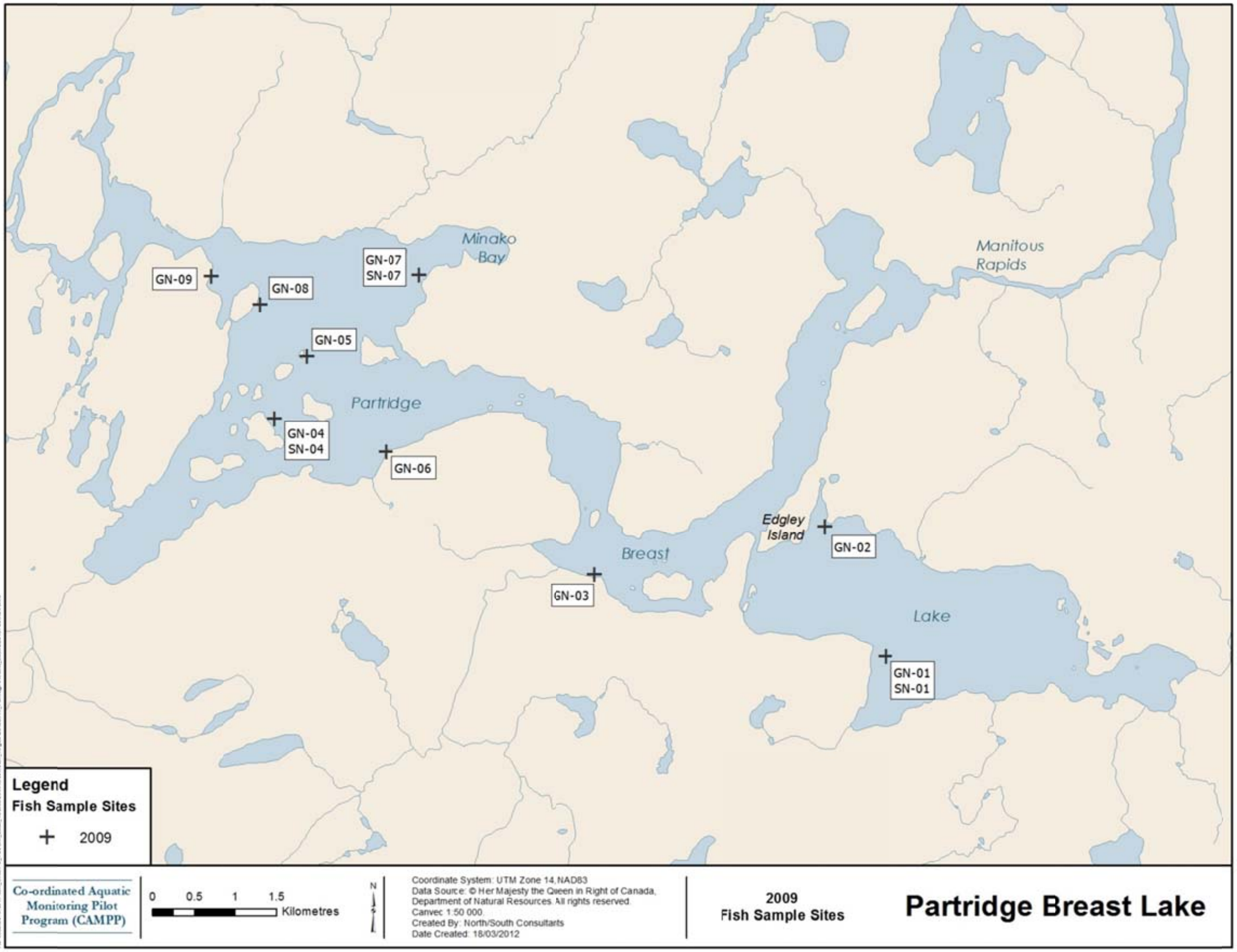


Figure 5.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Partridge Breast Lake, 2009.

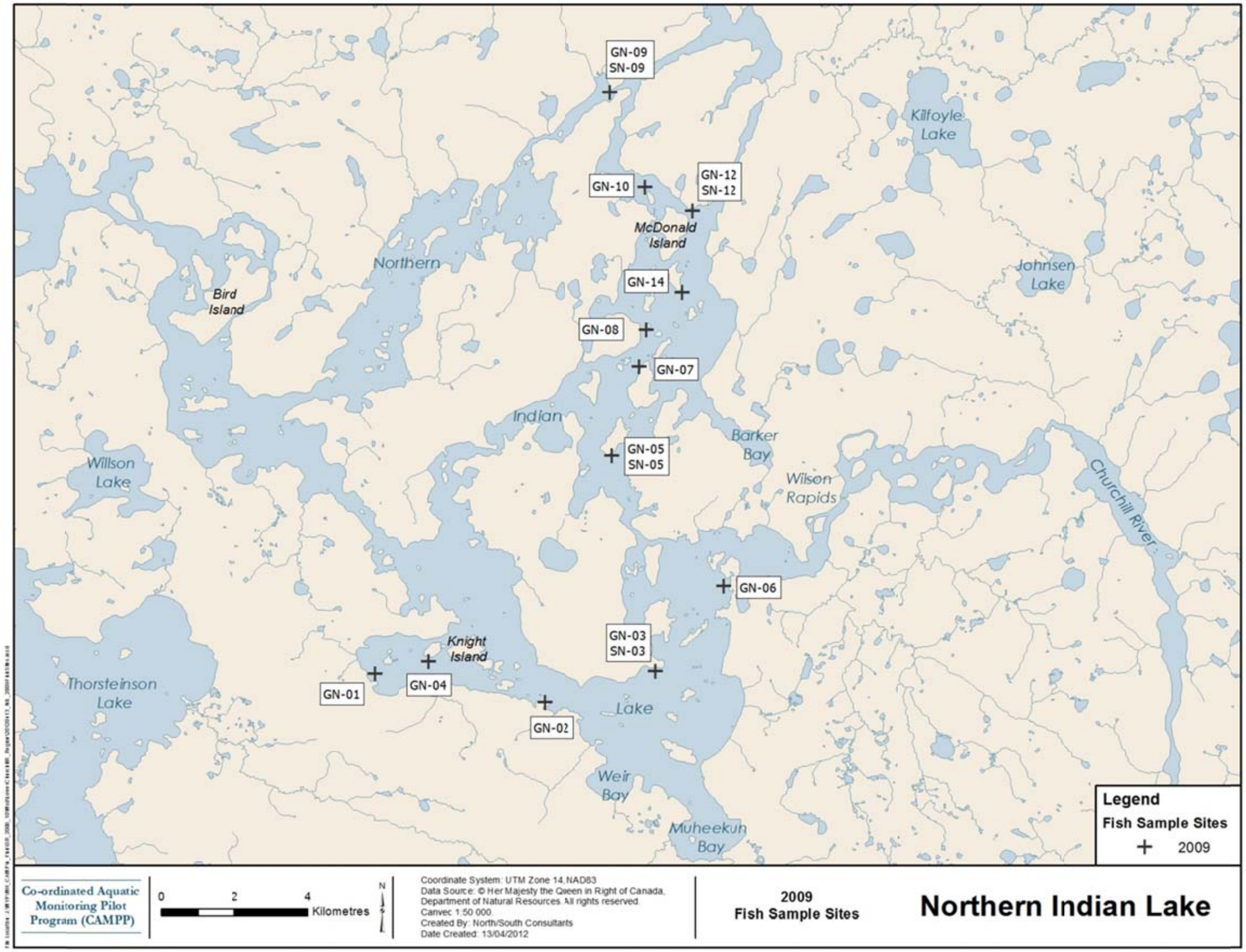


Figure 5.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Northern Indian Lake, 2009.

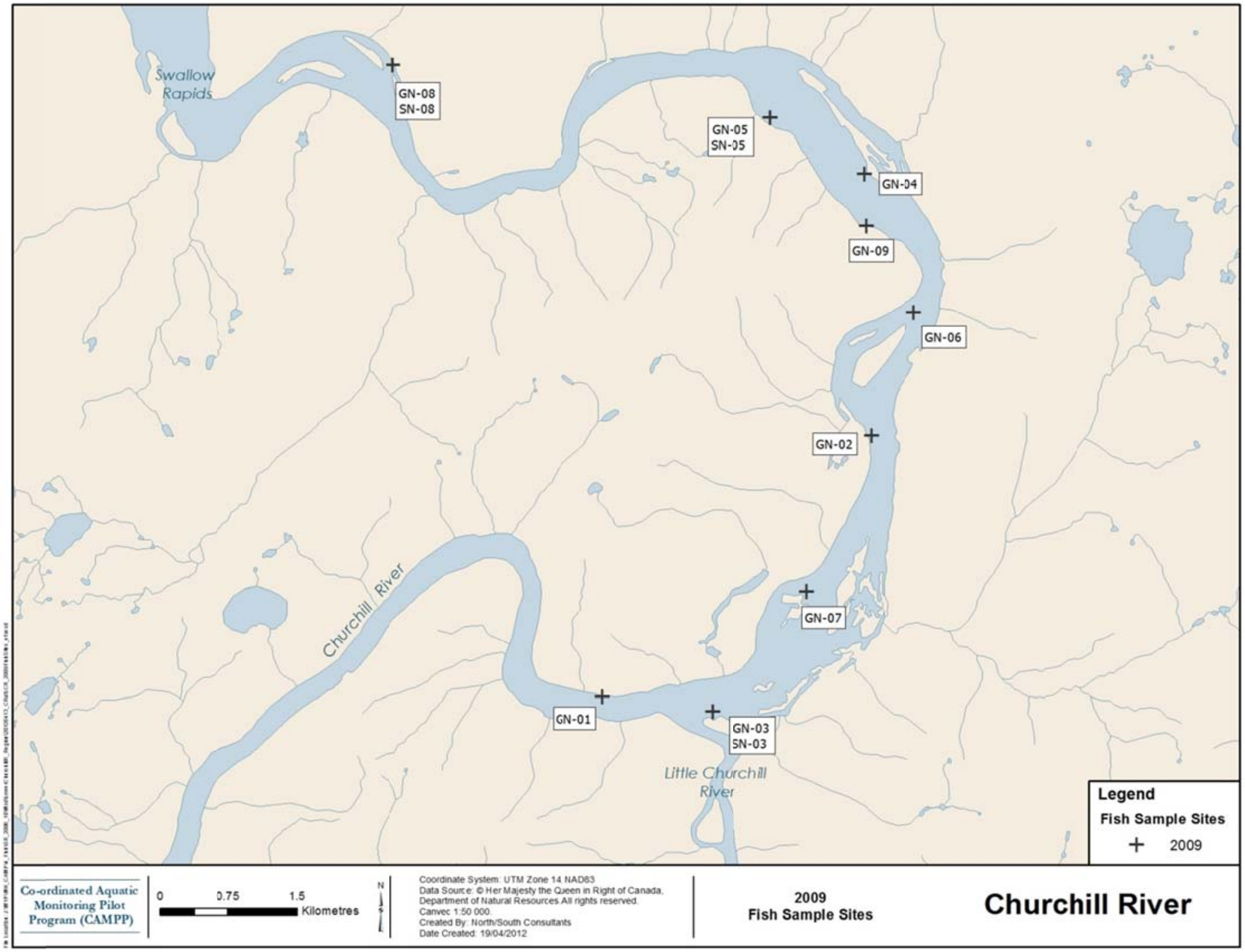


Figure 5.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Lower Churchill River, 2009.

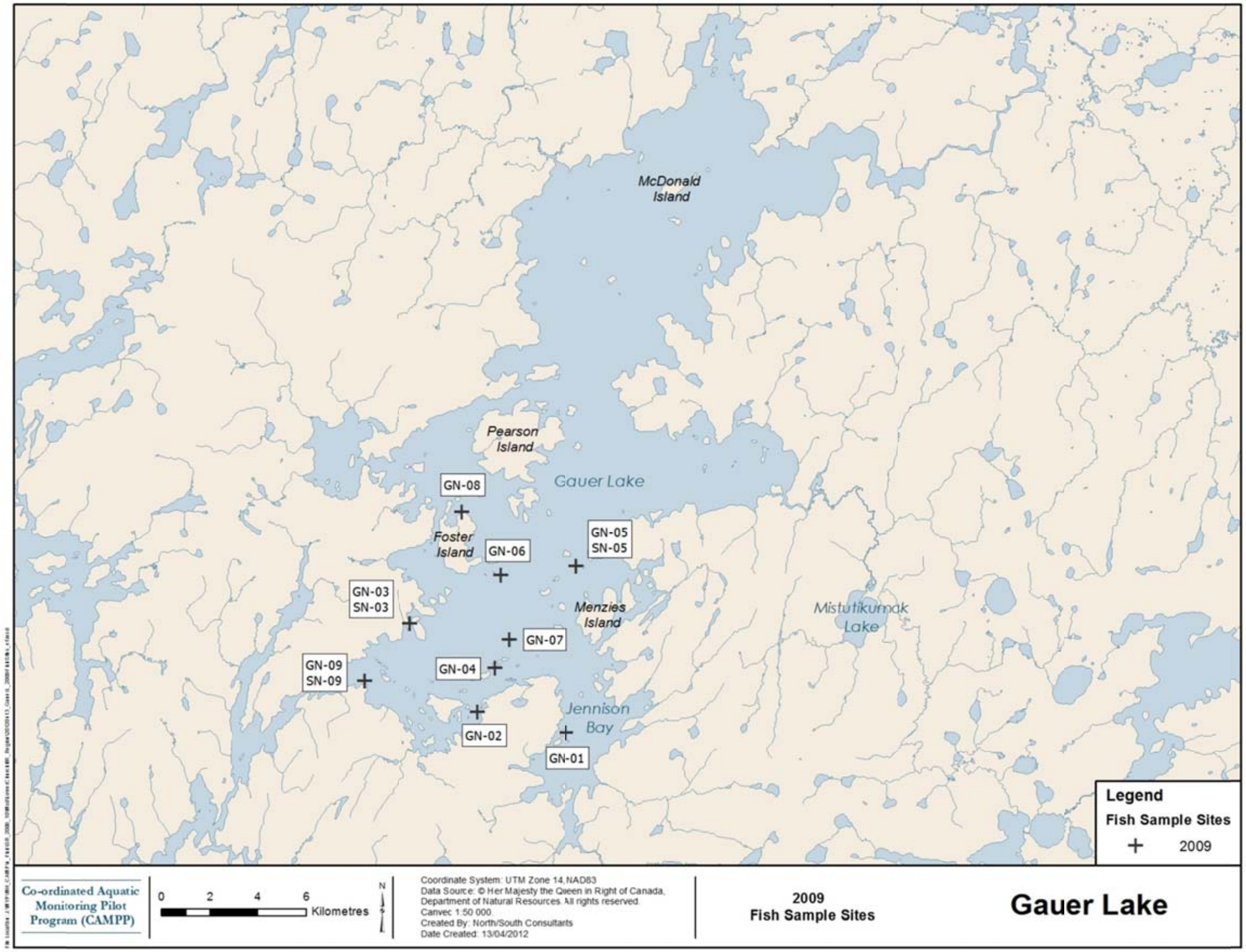


Figure 5.6-4. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Gauer Lake, 2009.

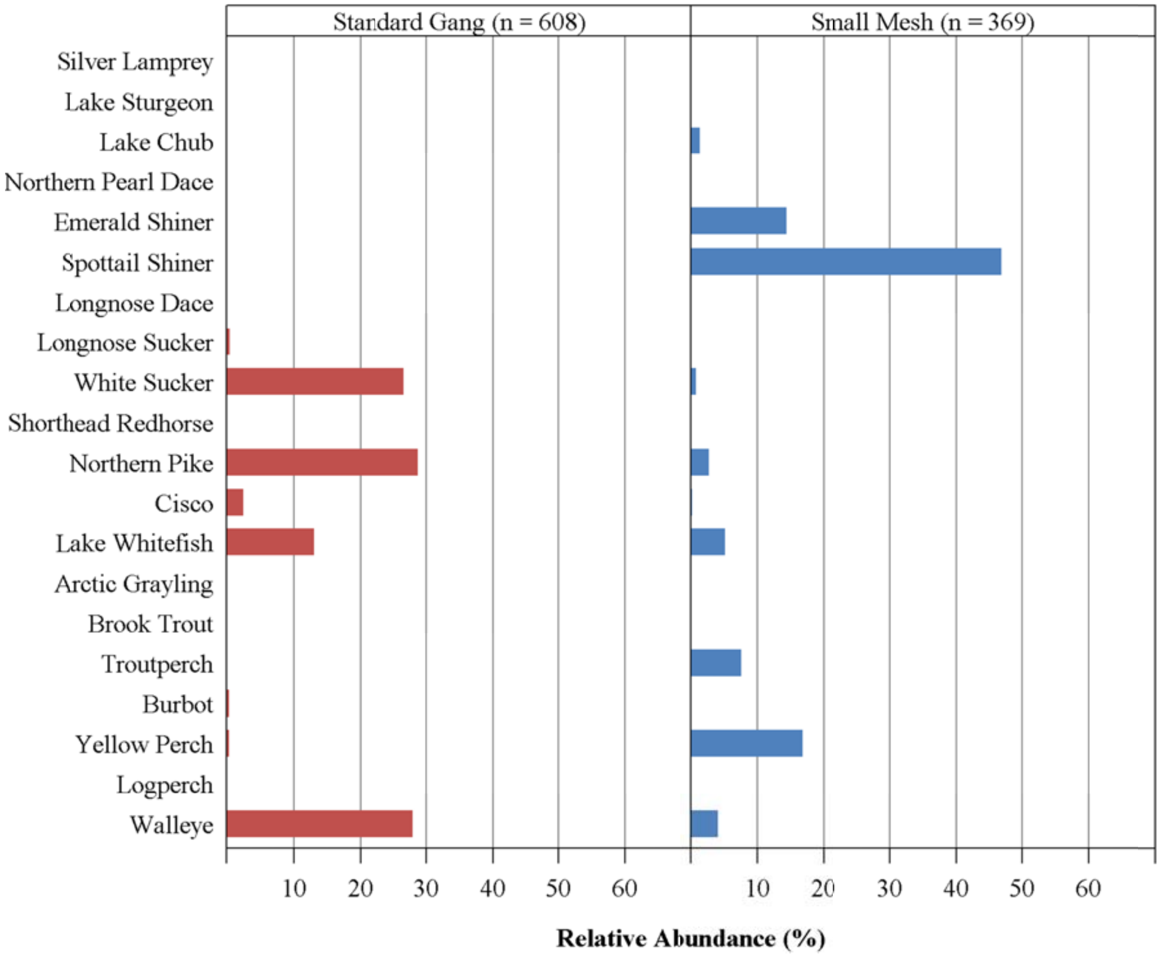


Figure 5.6-5. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Partridge Breast Lake, 2009.

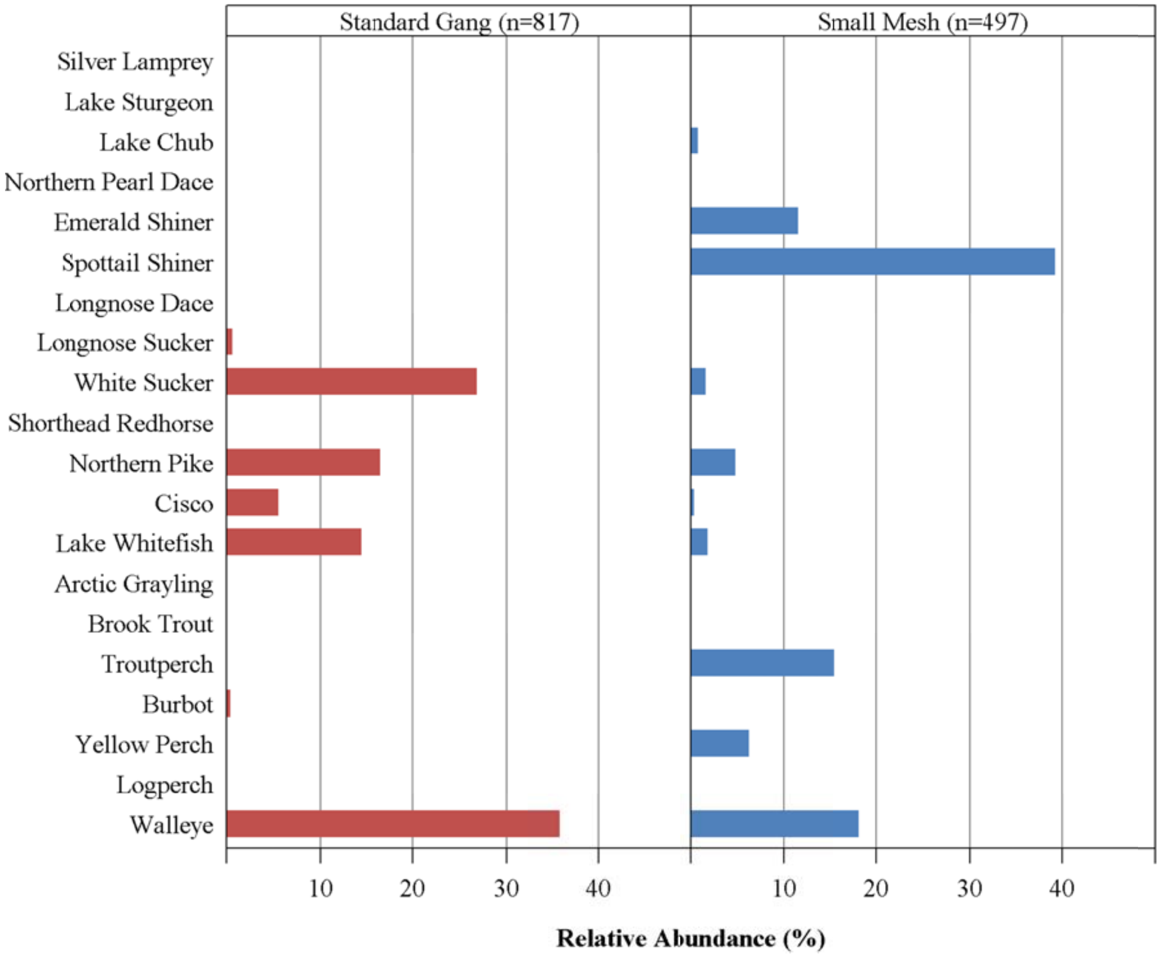


Figure 5.6-6. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Northern Indian Lake, 2009.

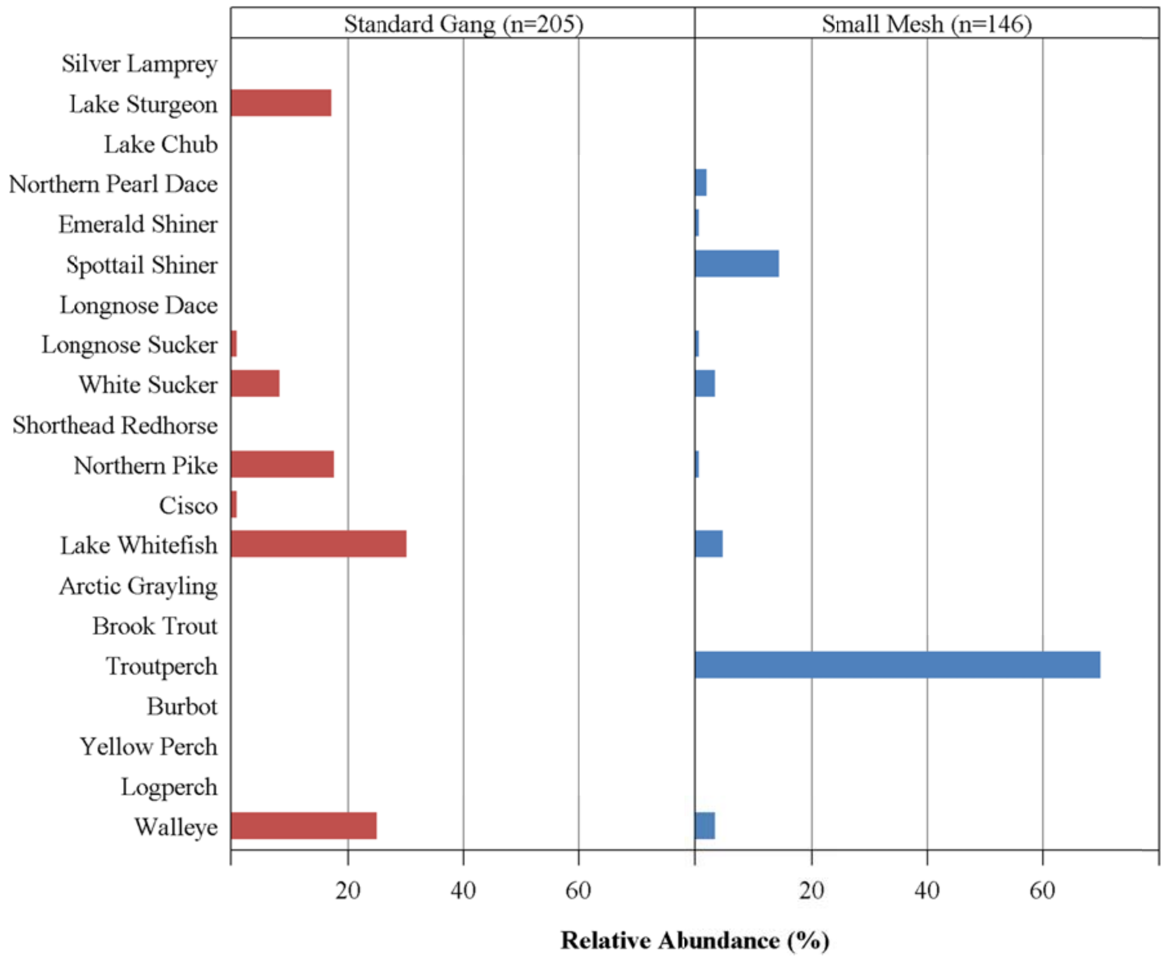


Figure 5.6-7. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in the Lower Churchill River, 2009.

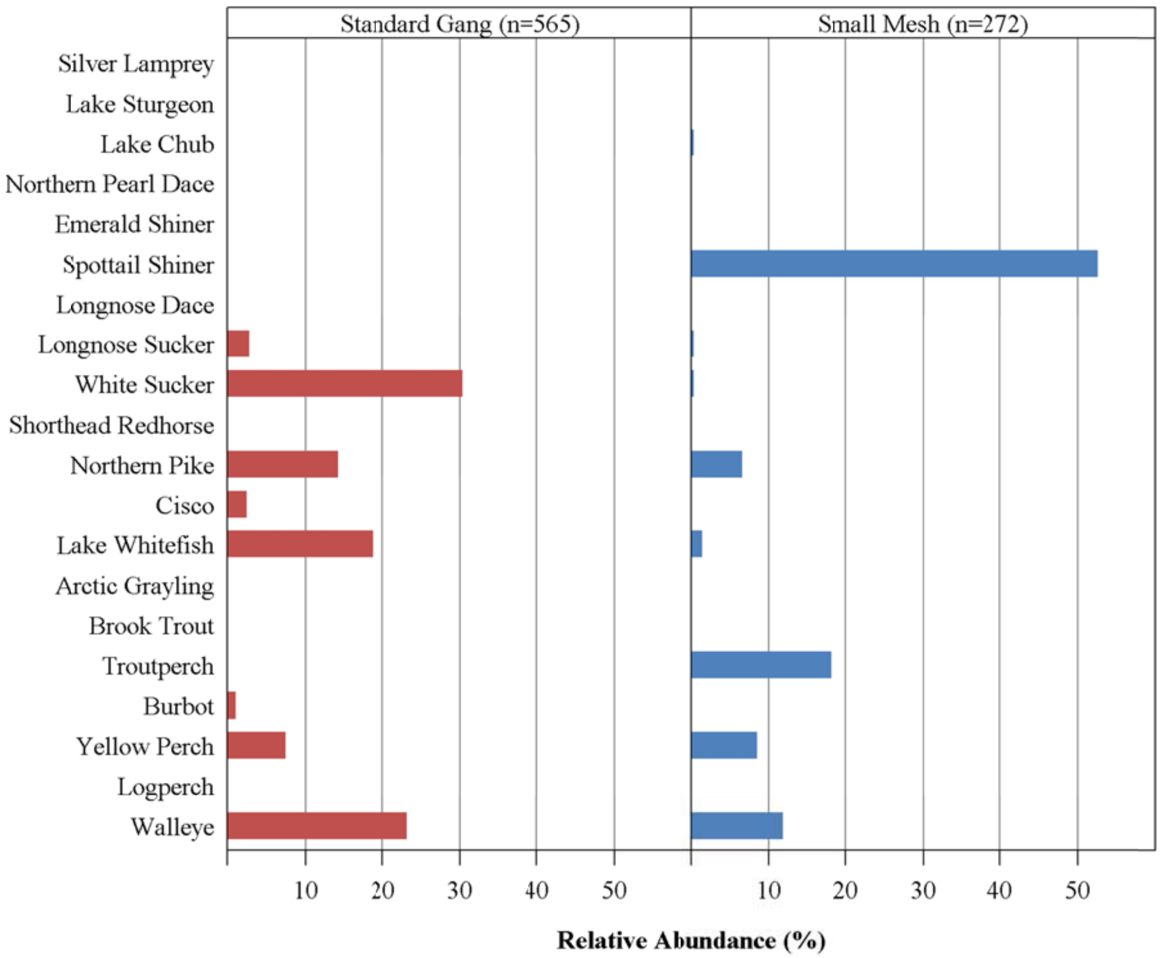


Figure 5.6-8. Relative abundance (%) distributions for fish species captured in standard gang and small mesh index gill nets set in Gauer Lake, 2009.

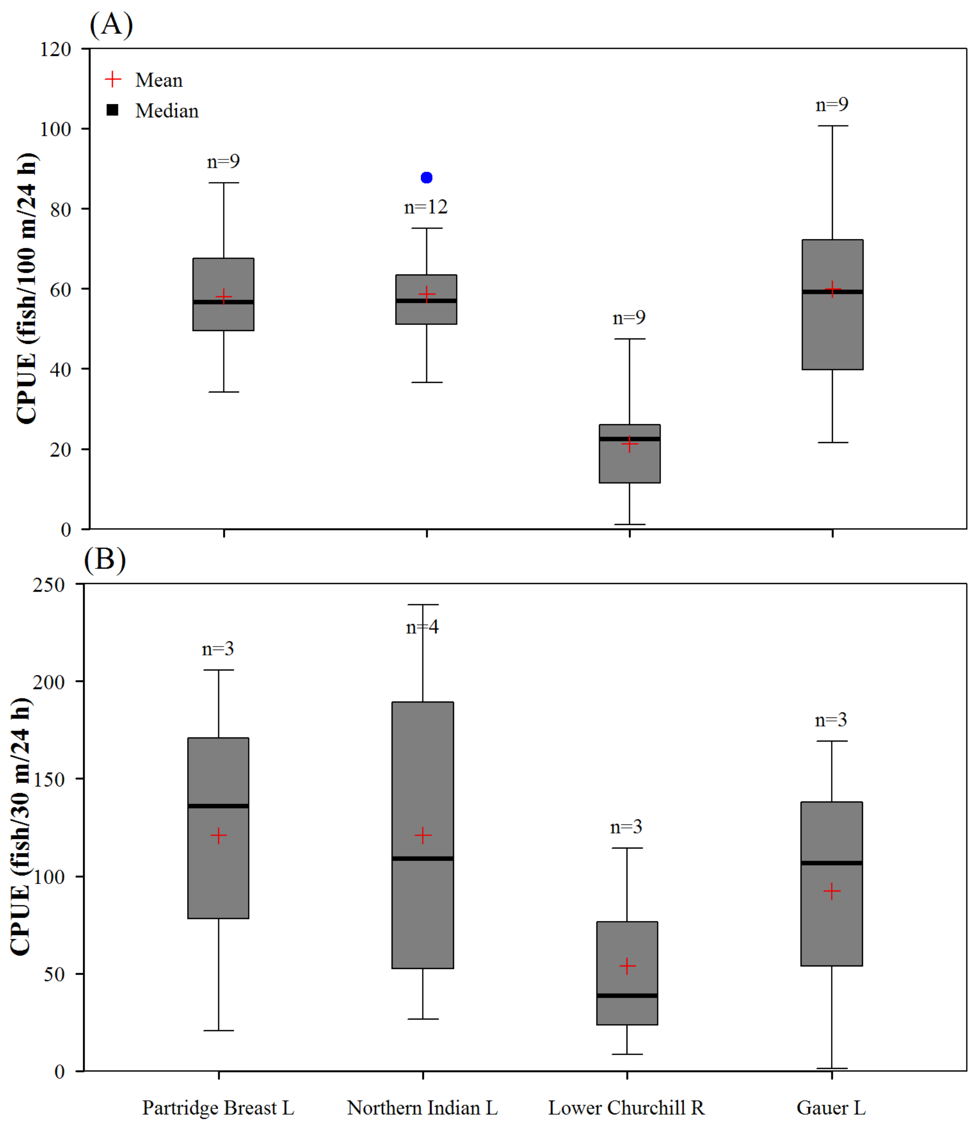


Figure 5.6-9. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang and (B) small index gill nets set in Lower Churchill River Region waterbodies, 2009.

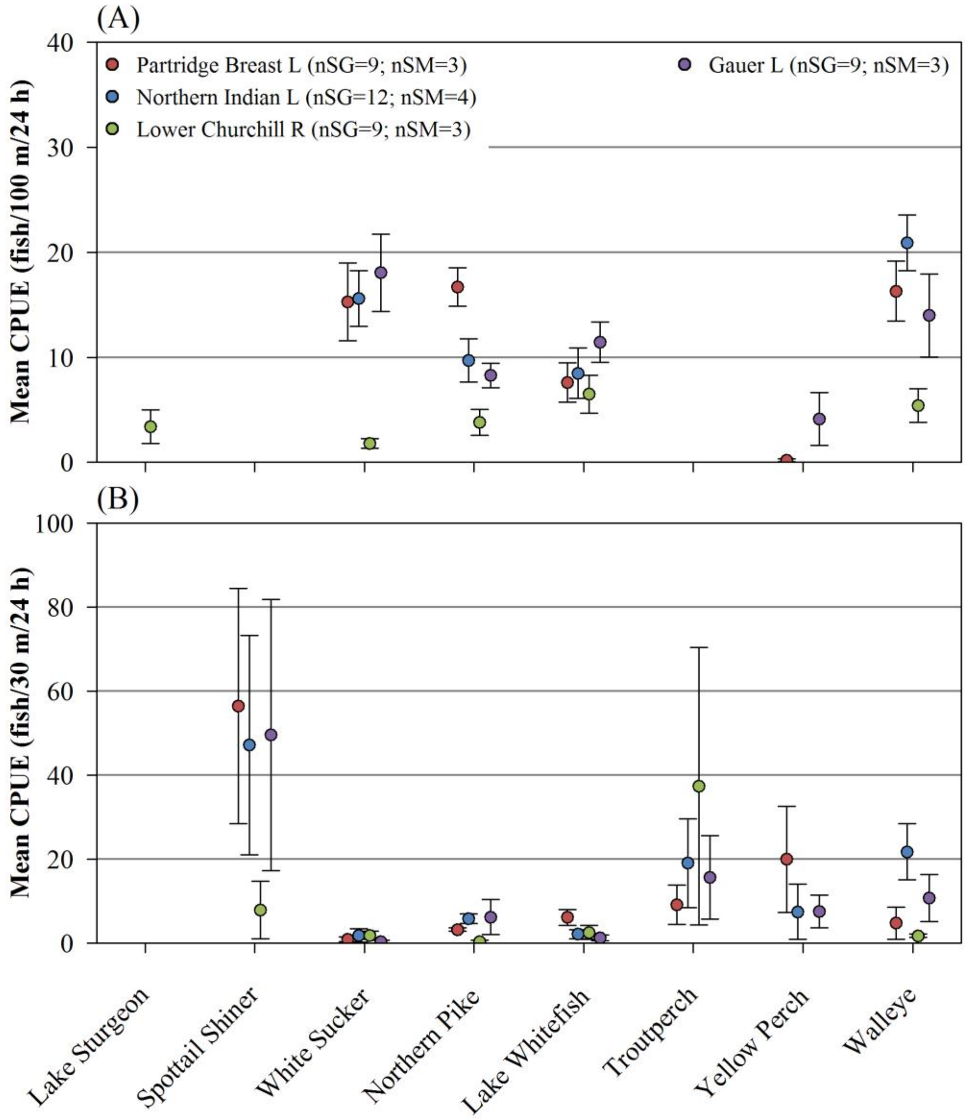


Figure 5.6-10. Mean (SE) CPUE for select species captured in (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Lower Churchill River Region waterbodies, 2009.

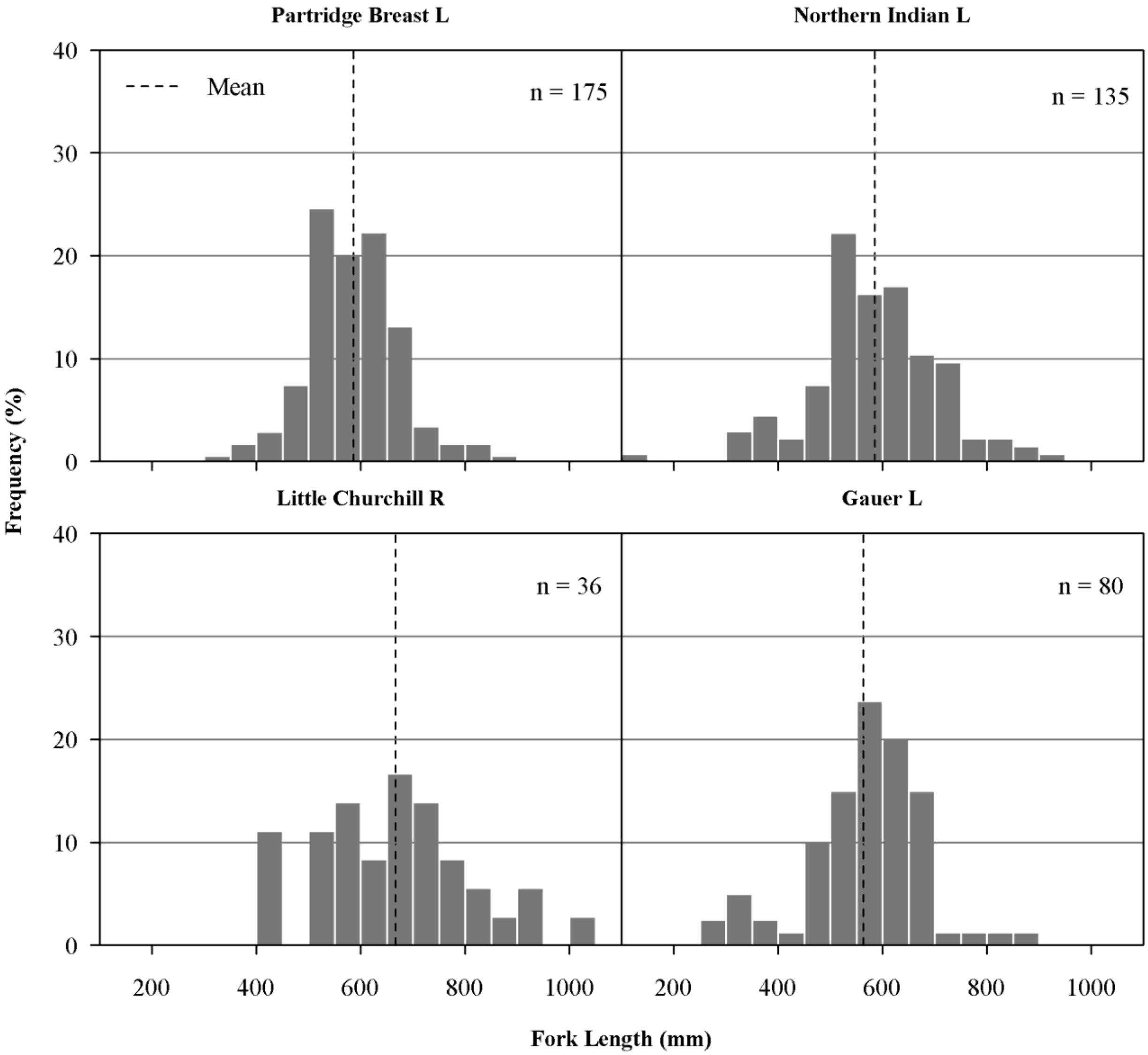


Figure 5.6-11. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2009.

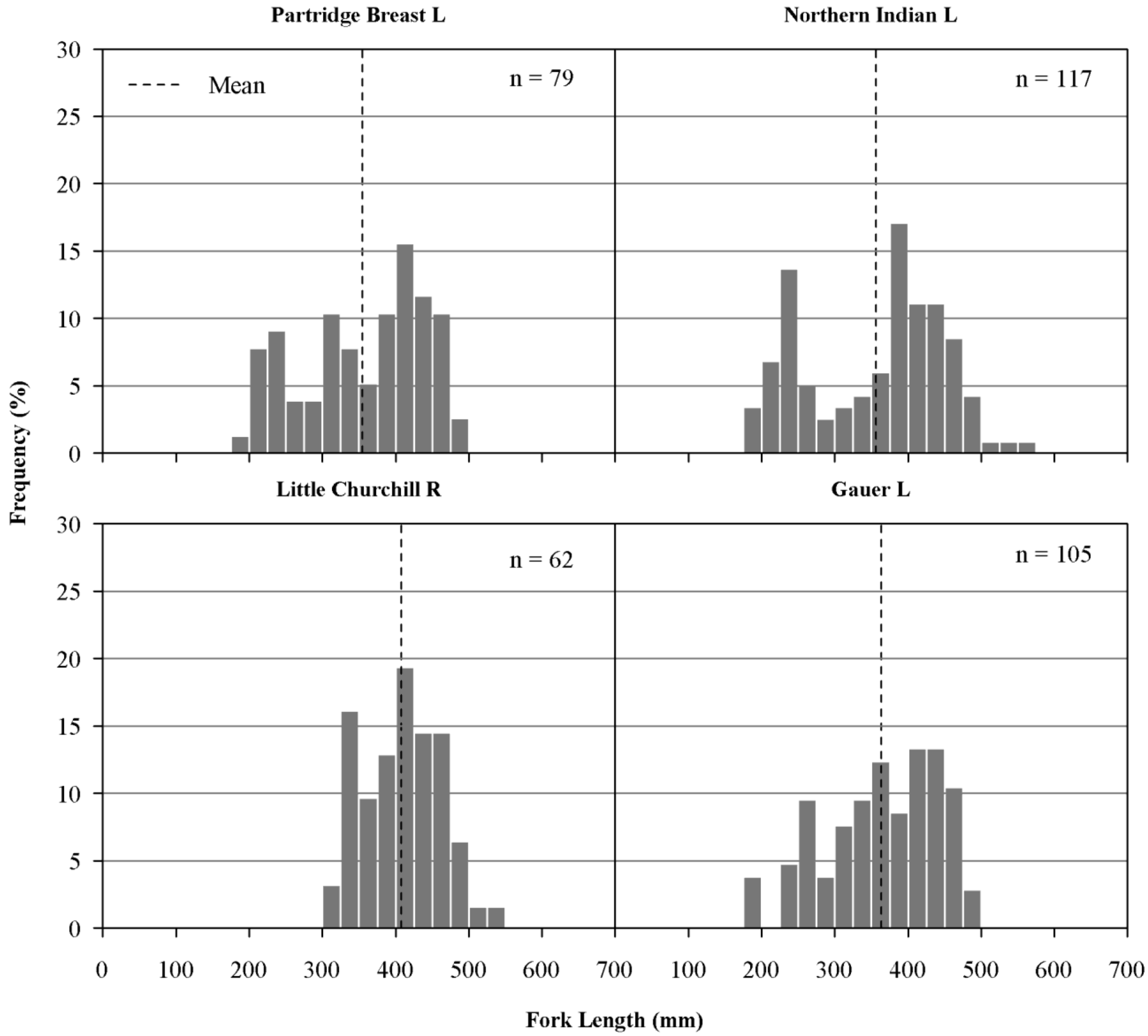


Figure 5.6-12. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2009.

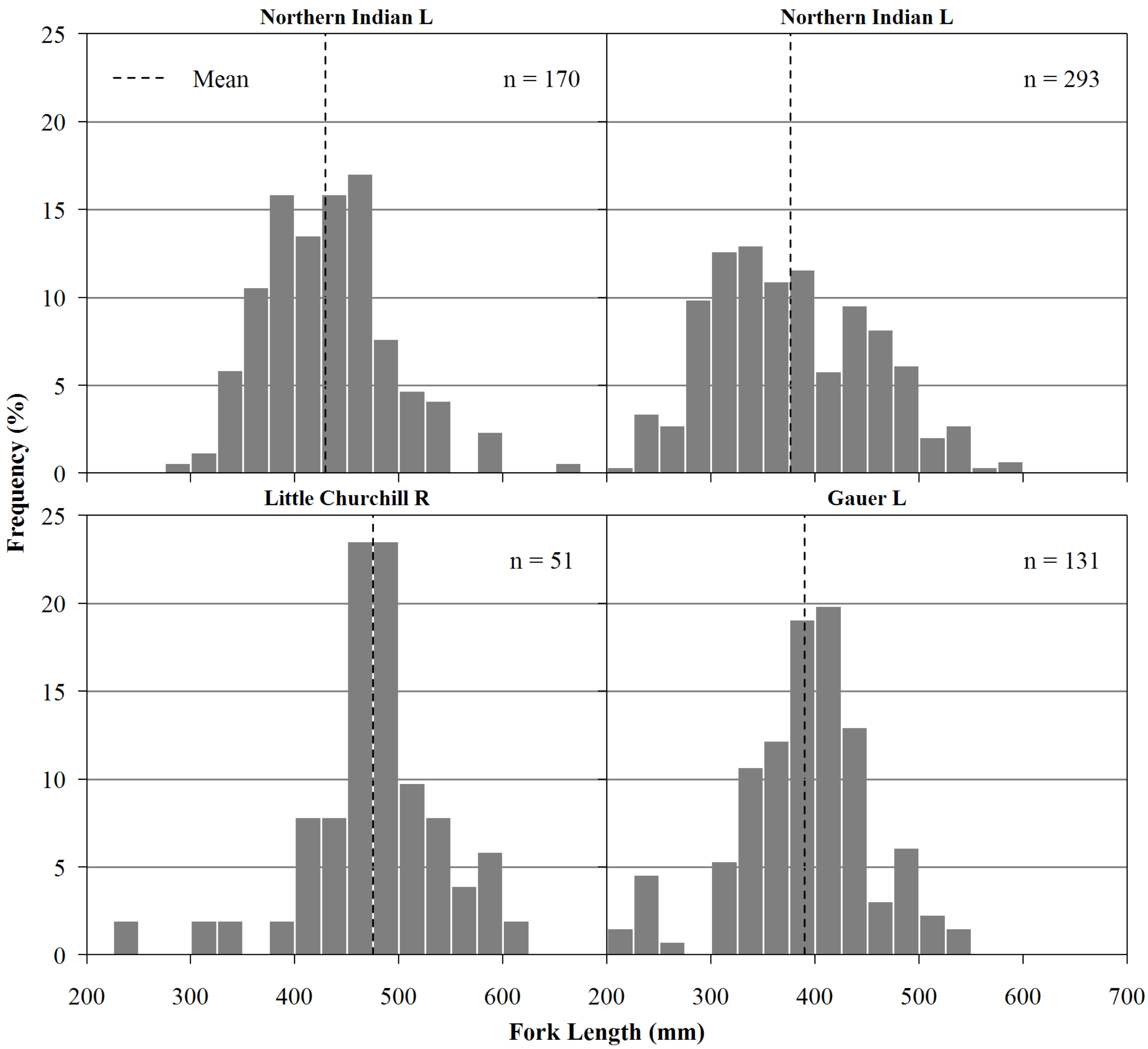


Figure 5.6-13. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Lower Churchill River Region waterbodies, 2009.

6.0 CHURCHILL RIVER DIVERSION REGION

The following provides an overview of the results of CAMPP for 2009/2010 for the Churchill River Diversion Region, by each major component. A 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 2009 were generally below the 1971-2000 temperature normals, particulary during the open-water sampling period (Figure 6.1-1). May exhibited the greatest difference compared to the normal, exhibiting an air temperature 4.9 °C below normal. Notable exceptions included September and November, when air temperatures were 4.9 °C and 6.2 °C above normal, respectively. Overall, the annual mean air temperature was equivalent to the normal.

The 1971-2000 normals for precipitation indicate a peak in July and relatively lower levels of precipitation during the winter, as measured at Thompson, MB (Figure 6.1-1). In 2009, the highest precipitation occurred in July (approximately 70% more than normal for that month), while June, August and September exhibited below normal precipitation. During the winter months, February received almost three times more precipitation than normal and November and December received notably less precipitation than normal (approximately 40%).

Overall, the comparisons to climate normals shows that 2009 was characterized by wetter winter months at the beginning of the year, a cooler spring and summer with an atypically wet July, a dryer late summer, a warmer and dryer early fall, and a dryer and overall warmer winter (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 River and the Burntwood River. 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. CAMPP monitoring in the Churchill River Diversion reach was initiated in 2009 on Notigi Lake, Threepoint Lake, and Apussigamasi Lake. Leftrook Lake is the off-system waterbody for this region.

Notigi CS flows in 2009 were at the Water Power Act License maximum from January to early-April and from October through December. Flows were near the lower quartile from May to October (Figure 6.2-1). Above average snowpack and precipitation allowed the high diversion flows during the winter, while diversion flows were at the lower quartile in the summer to pond water in Southern Indian Lake and to reduce pressure on a lower Nelson River system already in flood.

Water levels on Notigi Lake were drawn down between January and mid-April to provide water for hydroelectric generation during the winter months. Water levels then increased from mid-April to July to store water for the following winter. The lake was again drawn down from mid-September through December 2009 (Figure 6.2-2).

Threepoint Lake water level elevations generally followed a similar pattern to Notigi flows, peaking in the winter and reaching lowest levels during the summer (Figure 6.2-3). The water level gauge on Apussigamasi Lake was installed in 2009 as part of CAMPP and when available also followed a similar trend to Notigi flows (Figure 6.2-4).

Leftrook Lake water levels were not monitored in 2009.

6.3 WATER QUALITY

The following provides an overview of water quality conditions measured in the Churchill River Diversion Region in Year 2 of CAMPP. Waterbodies sampled included Notigi Lake-West (western area of the lake), Notigi Lake-East (eastern area of the lake), Threepoint Lake (near the outlet), Apussigamasi Lake (approximately 7 km downstream of Thompson), and an off-system lake (Leftrook Lake; Figure 6.3-1).

6.3.1 Routine Variables and Limnology

Results of the 2009/2010 water quality monitoring in the Churchill River Diversion Region for routine water quality variables are presented in Tables 6.3-1 and 6.3-2 and Figures 6.3-2 to 6.16.

6.3.1.1 On-system Waterbodies

Water quality of the on-system lakes in the Churchill River Diversion Region can be generally described as moderately nutrient-rich, moderately turbid, slightly alkaline, soft, and well-oxygenated. Notigi Lake-West and East were stratified in summer and spring, respectively (Figure 6.3-2); no stratification was observed in either Threepoint or Apussigamasi lakes. Some vertical variation in dissolved oxygen (DO) concentrations was observed at most sites and seasons in 2009/10 (Figure 6.3-3), although DO was consistently above the Manitoba Water

Quality Standards Objectives and Guidelines (MWQSOGs) for the protection of aquatic life (PAL) across all depths (Manitoba Water Stewardship [MWS] 2011; 5.5-9.5 mg/L depending on season). Other *in situ* variables, including turbidity, pH, and specific conductance, were relatively consistent across depth (Figures 6.3-4 to 6.3-6); one exception was that pH occasionally decreased with depth in Notigi Lake-East. *In situ* pH was below the MWQSOGs lower PAL limit (6.5-9.0) in Notigi Lake-East and Threepoint Lake in winter 2009. Secchi disk depths were slightly lower in Apussigamasi Lake as compared to the other on-system lakes (Figure 6.3-7).

Two and four, respectively, of the surface samples each collected from Threepoint and Apussigamasi lakes exceeded the Manitoba narrative guideline for total phosphorus (TP) of 0.025 mg/L for lakes, ponds, and reservoirs; TP concentrations in Notigi Lake were consistently within guidelines (MWS 2011; Figure 6.3-8). With the exception of pH as mentioned above, other routine water quality variables for which there are MWQSOGs, including ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

During the open-water season TP was typically composed of similar amounts of dissolved and particulate forms although there was some variation between waterbodies and seasons (Figure 6.3-9). In winter, the majority of the TP was in dissolved form. The majority of total nitrogen (TN) was consistently composed of organic nitrogen (Figure 6.3-10). Ammonia generally comprised the largest portion of the dissolved organic nitrogen (DIN) pool in the open-water season; however, concentrations and the relative proportion of TN represented by nitrate/nitrite were always higher in the ice-cover season.

Water samples collected at depth (1 m above the sediment-water interface) in Notigi-West in spring and Notigi-East in summer, when the lake was thermally stratified, indicated higher concentrations of some water quality variables in the hypolimnion than the epilimnion (Figures 6.3-11 to 6.3-14). Both dissolved and particulate forms of phosphorus as well as DIN were notably higher at depth in Notigi Lake-West, compared to the surface samples. Whereas only particuate forms of phosphorus were notably higher at the bottom in Notigi Lake-East. The TP concentration in the bottom sample collected in Notigi Lake-West exceeded the Manitoba narrative guideline for to TP of 0.025 mg/L for lakes, ponds, and reservoirs.

6.3.1.2 Off-system Waterbody

Leftrook Lake was moderately nutrient-rich, clear (i.e., high Secchi disk depths), slightly alkaline, moderately hard, and well-oxygenated during the open-water season but became hypoxic in the winter. During the winter, a warm layer of water was present below the surface

(Figure 6.3-2) and DO concentrations were below the MWQSOGs PAL objectives for cool and cold-water species (Figure 6.3-3).

With the exception of the bottom sample collected in winter (as discussed below), TP was within the Manitoba narrative guideline of 0.025 mg/L for lakes, ponds, and reservoirs (Figure 6.3-8). Other routine water quality variables for which there are MWQSOGs, including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

Like waterbodies along the Churchill River Diversion, TP was generally an equal mix of dissolved and particulate forms (Figure 6.3-9) and the majority of TN was composed of organic nitrogen (Figure 6.3-10) in Leftrook Lake. During the open-water season, ammonia comprised a larger portion of the DIN than nitrate/nitrite; the reverse was true under ice-cover.

Water samples collected at depth (1 m above the sediment-water interface) in Leftrook Lake in winter, when the lake was thermally stratified, indicated higher concentrations of some water quality variables in the hypolimnion than the epilimnion. DIN was notably higher at depth, largely due to elevated concentrations of nitrate/nitrite (Figure 6.3-15). TP was also higher at depth, due to higher concentrations of TDP (Figure 6.3-16), and exceeded the guideline for TP of 0.025 mg/L for lakes, ponds, and reservoirs (MWS 2011).

6.3.2 Metals and Major Ions

6.3.2.1 On-system Waterbodies

Summaries of metal concentrations and detection frequencies measured in the Churchill River Diversion Region in 2009/2010 are presented in Table 6.3-3. A number of metals were not detected along the Churchill River Diversion including beryllium, bismuth, boron, mercury, molybdenum, selenium, tellurium, thallium, tungsten, and zinc. Aluminum, barium, calcium, copper, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and titanium were consistently detected; the remaining metals were detected in some samples.

Aluminum exceeded the MWQSOG PAL guideline (0.100 mg/L) in 100% of surface samples collected along the Churchill River Diversion in 2009/2010 (Figure 6.3-17). Iron concentrations exceeded the MWQSOG PAL guideline (0.3 mg/L) in 25-100% of surface samples from Notigi-West, Threepoint, and Apussigamasi lakes (Figure 6.3-17). Additionally, one of the four samples analysed for silver in each Notigi-West and Notigi-East was at or near the analytical detection limit, which is equivalent to the PAL (0.0001 mg/L). Measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit.

In Notigi Lake-West and East, concentrations of total aluminum, iron, and manganese were generally higher in samples collected near the sediment-water interface than in surface grabs (Figure 6.3-18 and 6.3-19) in summer and spring, respectively, when the lakes were thermally stratified (Figure 6.3-2) and DO was lower at depth (Figure 6.3-3). Aluminum and iron concentrations exceeded the MWQSOGs PAL in the bottom samples from both Notigi Lake-West and Notigi Lake-East (Figure 6.3-18 and 6.3-19).

All other metals for which there are MWQSOGs for PAL were within objectives and guidelines at each of the sampling sites in 2009/2010 (Table 6.3-4).

Chloride concentrations were relatively low along the Churchill River Diversion (i.e., < 2.1 mg/L; Table 6.3-2) and well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 8.5 mg/L (Table 6.3-2), 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 6.3-4).

6.3.2.2 Off-system Waterbody

A number of metals were not detected in Leftrook Lake including arsenic, beryllium, bismuth, boron, cesium, chromium, cobalt, lead, mercury, nickel, selenium, silver, tellurium, thallium, tin, tungsten, vanadium, zinc, and zirconium. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and uranium were consistently detected; the remaining metals were detected in some samples.

All metals measured from surface samples collected in Leftrook Lake for which there are MWQSOGs for PAL were within objectives and guidelines in 2009/2010 (Table 6.3-4). Iron and manganese concentrations measured in samples collected near the sediment-water interface were higher than those measured in surface samples but iron did not exceed the MWQSOG PAL guideline (Figure 6.3-20).

Chloride concentrations were relatively low in Leftrook Lake (i.e., ≤ 1.4 mg/L; Table 6.3-2) and well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999;

updated to 2013). Sulphate concentrations were consistently less than 7.5 mg/L (Table 6.3-2), and fell on the lower range of concentrations reported across Canada (CCREM 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013; Table 6.3-4).

6.3.3 Trophic Status and Nutrient Ratios

6.3.3.1 On-system Waterbodies

In 2009/2010, Notigi L-West and Notigi L-East were classified as mesotrophic and Threepoint and Apussigamasi lakes were meso-eutrophic on the basis of TP (open-water mean; Table 6.3-5). TN trophic schemes for lakes classified Notigi L-West, Notigi L-East and Threepoint Lake as oligotrophic and Apussigamasi Lake as mesotrophic (open-water means; Table 6.3-6). In terms of chlorophyll *a* measured in 2009/2010, Notigi L-West and Threepoint Lake were oligotrophic and Notigi L-East and Apussigamasi Lake were mesotrophic (open-water means; Table 6.3-7).

On the basis of molar total nitrogen to total phosphorus molar ratios (TN:TP), all waterbodies sampled along the Churchill River Diversion in 2009/2010 were phosphorus limited during each sampling period (Figure 6.3-21). Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter at the four sites was a mixture of allochthonous and autochthonous sources (Figure 6.3-22).

6.3.3.2 Off-system Waterbody

In 2009/2010, Leftrook Lake was meso-eutrophic on the basis of TP and mesotrophic on the basis of TN and chlorophyll *a* (open-water means; Table 6.3-5 to 6.3-7). Similar to the sites along the diversion route, Leftrook Lake was phosphorus limited (Figure 6.3-21) and organic matter was derived from a combination of allocthonous and autochthonous sources (Figure 6.3-22).

6.3.4 Escherichia coli

6.3.4.1 On-system Waterbodies

E. coli was detected in one of four samples (1 CFU/100 mL) collected in Notigi Lake-West and in all four samples collected in Apussigamasi Lake (ranging from 49 to >200 CFU/100 mL); *E. coli* was not detected in Notigi Lake-East or Threepoint Lake in 2009/2010 (Table 6.3-2). The concentration measured in Apussigamasi Lake in winter was above the Manitoba water quality objective for primary recreation of 200 CFU/100 mL; however, this guideline only applies to the recreational season and is therefore not applicable. All other measurements were well below the objective. Apussigamasi Lake is downstream of Thompson and may be affected by point source discharges, including discharge of treated sewage effluent.

6.3.4.2 Off-system Waterbodies

E. coli was not detected in any water samples collected in Leftrook Lake and was well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL (Table 6.3-2).

6.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in the Churchill River Diversion Region in Year 2 of CAMPP. Waterbodies sampled included Notigi Lake-West (western area of the lake), Notigi Lake-East (eastern area of the lake), Threepoint Lake (near the outlet), Apussigamasi Lake (approximately 7 km downstream of Thompson), and an off-system lake (Leftrook Lake; Figure 6.3-1).

6.4.1 Chlorophyll a

Open-water season chlorophyll *a* concentrations in the Churchill River Diversion Region were low to moderate at waterbodies along the Rat/Burntwood River system and moderate to high at Leftrook Lake (Figure 6.4-1). Winter chlorophyll *a* concentrations were lower than those of the open-water season.

6.4.2 Community Composition and Biomass

Like chlorophyll a, phytoplankton biomass was lower in waterbodies along the Rat/Burntwood River system than in Leftrook Lake in 2009 (Figure 6.4-2). At Leftrook Lake, biomass was highest in fall whereas peak levels were generally noted in summer at the on-system sites.

In Notigi-West, Threepoint, and Apussigamasi lakes, the phytoplankton community was dominated by diatoms in the spring after which the relative abundance of this group declined through the open-water season while the relative biomass of cryptophytes and blue-greens increased (Figure 6.4-3). The community composition at Notigi Lake-East varied slightly from those of the other on-system sites in that cryptophytes dominated in summer, and chrysophytes were dominant in fall; additionally, euglenoids were fairly abundant at this location unlike the other sites sampled in the region.

Phytoplankton composition also differed at Leftrook Lake; diatoms were dominant in all seasons and comprised nearly the whole community in fall. During all seasons, the second-most dominant groups were blue-greens and green algae.

In 2009, phytoplankton species richness ranged from 11 to 23 at sites along the Churchill River Diversion and from 29 to 32 in Leftrook Lake (Table 6.4-1). Species diversity (Simpson's Diversity), heterogeneity (H), effective richness, and evenness (E_H and $E^{H'}/S$) were generally moderate to high in the region, but seasonal trends in these metrics varied across sites. At Notigi Lake-West, diversity and evenness of the phytoplankton community were lowest in summer and highest in spring; Notigi Lake-East also had the highest diversity in spring but the season with the lowest complexity varied across metrics. In contrast, community complexity was generally lowest in spring at Threepoint and Apussigamasi lakes and in fall at Leftrook Lake. The metrics showed that the communities at Apussigamasi and Leftrook lakes were similar during the other seasons but that complexity was greatest at Threepoint Lake in summer. Spatial trends also varied with the season: the communities at Threepoint and Apussigamasi lakes showed lower complexity than other sites during spring but Notigi Lake-West and Leftrook Lake consistently had the lowest metrics in summer and fall, respectively.

6.4.3 Bloom Monitoring

Chlorophyll *a* concentrations were above the bloom monitoring trigger of 10 µg/L at Leftrook Lake in fall 2009. Total phytoplankton biomass during this period was 8,141 mg/m^3 and the community was dominated by diatoms (Figure 6.4-3).

6.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 ubiquitous in the region in 2009. Additionally, *Microcystis* and *Oscillatoria*/*Planktothrix* were present in Leftrook Lake in 2009/2010.

Microcystin-LR was analysed during the bloom (i.e., when chlorophyll *a* exceeded 10 µg/L) in Leftrook Lake in fall 2009; microcystin-LR was not detected (i.e., < 0.2 µg/L).

6.4.5 Trophic Status

Based on mean chlorophyll *a* measured during the open-water season of 2009, Notigi-West and Threepoint lakes were oligotrophic whereas Notigi-East, Apussigamasi and Leftrook lakes were mesotrophic (Table 6.3-7). Trophic classifications based on annual mean chlorophyll *a* are generally consistent with the classification based on open-water season means; however, using annual means Notigi-East and Apussigamasi lakes would be oligotrophic similar to the other on-system lakes.

6.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Churchill River Diversion Region in 2009/2010; the second year of CAMPP. Waterbodies sampled included the on-system lakes Notigi, Threepoint, and Apussigamasi, and the off-system waterbody Leftrook Lake; (Figures 6.5-1 to 6.5-4). Threepoint and Leftrook lakes are sampled annually, and Notigi and Apussigamasi lakes are sampled on a rotational basis (i.e., once every three years) (Figures 6.5-1 to 6.5-4).

Fifteen BMI samples were collected in each of the nearshore and offshore habitat polygons of Notigi, Threepoint, Apussigamasi and Leftrook lakes using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted between 19 and 26 August 2009.

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 2009, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and for the offshore habitat water depths of greater than 5 m were targeted. In 2009, mean water depths sampled in the nearshore were: 2.8 m in Notigi Lake, 3.3 m in Threepoint Lake, 4.5 m in Apussigamasi Lake, and 4.5 m in Leftrook Lake. Mean water depths sampled in the offshore were: 14.2 m in Notigi Lake, 4.5 m in Threepoint Lake, 5.8 m in Apussigamasi Lake, and 9.0 m in Leftrook Lake, (Table 6.5-1).

Sediment samples were collected and analyzed for total organic carbon (TOC) and particle size analysis (PSA) to provide a general characterization of sediment type in each nearshore and offshore polygon (Table 6.5-2). Mean TOC was generally low in offshore samples from Notigi Lake (2.2%) and both nearshore and offshore samples from Threepoint (0.8 and 1.1%, respectively) and Apussigamasi (0.9 and 0.7%, respectively) lakes. Mean TOC was higher in the nearshore area of Notigi Lake (12.6%) and in both nearshore and offshore areas of Leftrook Lake (4.5% and 4.9%, respectively).

Clay comprised the majority of the sediment content collected from predominantly-wetted nearshore habitat in Notigi and Threepoint lakes while silt dominated the sediment in Apussigamasi and Leftrook lakes (Table 6.5-2). In offshore habitat, clay dominated in Notigi Lake, silt dominated in Apussigamasi Lake, and clay and silt were similarly represented in Threepoint and Leftrook lakes. Sand represented a small portion of the sediment in all lakes and both habitat types with the exception of the offshore habitat in Apussigamasi Lake.

6.5.2 Species Composition, Distribution, and Relative Abundance

6.5.2.1 Notigi Lake

Mean BMI density in benthic grab samples in the predominantly-wetted nearshore habitat of Notigi Lake was 684 individuals/m^2, with densities ranging from zero to 4,069 (Table 6.5-3). Overall, non-insects comprised 61% of the mean total BMI, with insects comprising the remaining amount (Table 6.5-3). Of the non-insects, the main groups were Oligochaeta (aquatic worms; comprised 43% of total mean BMI) and Bivalvia (clams; 11%). Hirudinea (leeches), Amphipoda (scuds), Diplostraca (clam shrimp) and Gastropoda (snails) were also represented, but to a much lesser extent (Table 6.5-3). Insects mainly consisted of Chironomidae (midges; 29% of total mean invertebrates;) and Ephemeroptera (mayflies; 8%); a small number of Ceratopogonidae (biting midges), Gyrinidae (whirligig beetles) and Tabanidae (deer flies and horse flies) were also found (Table 6.5-3). Mean BMI density of in offshore benthic grab samples was 517 individuals/m^2, with numbers ranging from 0 to 2,813 (Table 6.5-3). Overall, non-insects dominated the mean total BMI in this habitat at 83%, with insects comprising 17% (Table 6.5-3). Non-insects mainly consisted of Oligochaeta (72% of mean total invertebrates); Amphipoda (9%) and Bivalvia (1%) comprised the remaining non-insect portion (Table 6.5-3). Of the insects, the main group was Chironomidae (17%); a small number of Ceratopogonidae were also collected (Table 6.5-3).

Total EPT (abundance of Ephemeroptera, Plecoptera [stoneflies], and Trichoptera [caddisflies] combined) comprised 8% of the mean total nearshore BMI, and consisted of only mayflies. Genus analysis of the mayflies indicated that *Hexagenia* sp. (burrowing mayflies) were dominant in nearshore grab samples (Table 6.5-3). *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). *Caenis* (small square-gilled mayflies), were also present (Table 6.5-3). The ratio of EPT to Chironomidae (EPT:C) was 0.34 in the nearshore (Table 6.5-3) indicating chironomids dominated EPT in the insect community. EPT were not present in the offshore samples.

Overall taxonomic richness in the nearshore was 13 families, with richness values ranging from zero to eight within each sample (Table 6.5-3). Hill's Effective Richness (E^H) was three in the nearshore; Oligochaeta, Chironomidae, and Pisidiidae (fingernail clams) dominated the invertebrate community (Table 6.5-3). Total taxonomic richness in the offshore polygon was five families, with richness values ranging from zero to three within each sample (Table 6.5-3). Hill's Effective Richness (E^H) was two in the offshore. Oligochaeta dominated the invertebrate community in this habitat (Table 6.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.51 in the nearshore habitat and 0.31 in the offshore habitat (Table 6.5-3). Evenness (Simpson's Equitability [E_D]) values were 0.74 in the nearshore and 0.80 in the offshore.

6.5.2.2 Threepoint Lake

The mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Threepoint Lake was 886 individuals/m^2, with densities ranging from zero to 2,121 (Table 6.5-4). Overall, non-insects dominated the BMI community in abundance at 71%, with insects comprising 29% of the overall taxa. Of the non-insects, the main groups were Amphipoda (50% of the mean total BMI) and Bivalvia (20%) (Table 6.5-4). Insects mainly consisted of Ephemeroptera (17%) and Chironomidae (10%) with a small contribution from Sialidae (alderfly) and Ceratopogonidae (Table 6.5-4). The mean BMI density in the offshore habitat was 303 individuals/m^2, with densities ranging from zero to 1,904 (Table 6.5-4). Overall, insects and non-insects co-dominated the BMI community, with each comprising 50% of the overall taxa. Insects mainly consisted of Chironomidae (29%) and Ephemeroptera (17%), with small abundances of Sialidae and Ceratopogonidae also present. Of the non-insects, the main groups were Amphipoda (38%) and Bivalvia (11%) (Table 6.5-4).

Total EPT comprised 17% of the mean total BMI in both nearshore and offshore samples and consisted solely of mayflies (Table 6.5-4). In both habitat types, *Hexagenia* sp. was the only mayfly genus present, though it was more abundant in the nearshore habitat than the offshore habitat. The ratio of EPT:C was 1.38 in the nearshore indicating EPT were dominant over Chironomidae in this community. The offshore EPT:C ratio was 0.31 indicating Chironomidae were more-dominant than EPT in this insect community.

Overall taxonomic richness was nine in the nearshore polygon, with taxonomic richness values ranging from zero to six within each sample. Hill's Effective Richness (E^H) was three. The nearshore polygon was dominated by Haustoriidae. Within the offshore polygon, taxonomic richness was six, with taxonomic values ranging from zero to five (Table 6.5-4). Hill's Effective Richness (E^H) was two in the offshore. In the offshore, Haustoriidae and Chironomidae dominated the BMI community (Table 6.5-4).

Simpson's Diversity Index was similar in both habitat types: 0.50 in the nearshore and 0.44 in the offshore (Table 6.5-4). Evenness values were 0.52 in the nearshore and 0.74 in the offshore habitat (Table 6.5-4).

6.5.2.3 Apussigamasi Lake

The overall mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Apussigamasi Lake was 594 individuals/m^2, with densities ranging from 43 to 1,342 (Table 6.5-5). Overall, non-insects dominated the BMI community in abundance (59%), with insects comprising 41% of the overall taxa. Of the non-insects, Amphipoda comprised 46% of mean total BMI, followed by Bivalvia (8%), and Oligochaeta (2%). Insects mainly consisted of Ephemeroptera (20%) and Chironomidae (17%), with small numbers of Trichoptera, Ceratopogonidae, and Chaoboridae also present (Table 6.5-5).

The mean BMI density in the offshore habitat was 1,728 individuals/m^2, with densities ranging from 909 to 3,506 (Table 6.5-5). Overall, non-insects dominated the BMI community (87%), with insects comprising 13% of the overall taxa. Of the non-insects, the main groups were Amphipoda (55% of mean total invertebrates) and Bivalvia (32%). Insects mainly consisted of Chironomidae (9%) and Ephemeroptera (3%) (Table 6.5-5).

Total EPT comprised 22% and 4% of the total nearshore and offshore BMI sampled, respectively. In both habitats, Ephemeroptera accounted for the majority of EPT. Of the mayflies, *Hexagenia* sp. was the only genus in both nearshore and offshore grab samples (Table 6.5-5). The small number of Trichoptera consisted solely of Leptoceridae (long-horned caddisflies) in both the nearshore and offshore polygons. Plecoptera were not collected in either habitat. The ratio of EPT:C was 0.74 and 0.41 within the nearshore and offshore polygons, respectively (Table 6.5-5), indicating Chironomidae dominated EPT in the insect community in both habitats.

Overall taxonomic richness within the nearshore polygon was 11, ranging from one to six within each sample. Hill's Effective Richness (E^H) was three; Haustoriidae, Ephemeridae, and Chironomidae dominated the invertebrate community. Within the offshore polygon, taxonomic richness was eight, with richness values ranging from two to six within each sample. Hill's Effective Richness (E^H) was three in the offshore. Two families clearly dominated the offshore invertebrate community: Haustoriidae and Pisidiidae (Table 6.5-5).

Simpson's Diversity Index was 0.59 in the nearshore habitat and 0.46 in the offshore habitat (Table 6.5-5). Evenness values were 0.71 in the nearshore and 0.45 in the offshore (Table 6.5-5).

6.5.2.4 Leftrook Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Leftrook Lake was 3,431 individuals/m^2, with numbers ranging from 563 to 7,185 (Table 6.5-6).

Insects and non-insects co-dominated the BMI community in abundance, with insects comprising 47% of the overall taxa and non-insects comprising 53%. Of the non-insects, the main group was Bivalvia (51% of the mean total invertebrates sampled); Oligochaeta, Gastropoda, and Hirudinea were also present. Insects mainly consisted of Chironomidae (40%) and Ephemeroptera (6%) (Table 6.5-6). The mean BMI density in the offshore habitat was 3,261 individuals/m^2, with densities ranging from 1,645 to 5,324 (Table 6.5-6). Overall, non-insects dominated the BMI community (65%), with insects comprising 35% of the overall taxa. Of the non-insects, the main groups were Bivalvia (50%) and Oligochaeta (15%) (Table 6.5-6). Insects were dominated by Chironomidae (35%), with a limited number of Ephemeroptera also present (Table 6.5-6).

Overall, EPT was low in Leftrook Lake samples, comprising 6% and less than 1% of the BMI in nearshore and offshore samples, respectively. Similar to Threepoint Lake, neither Plecoptera nor Trichoptera were collected in either habitat. As well, *Hexagenia* sp. was the only genus of mayfly identified from the grab samples (Table 6.5-6). The ratio of EPT:C was 0.17 in the nearshore polygon and 0.01 in the offshore polygon (Table 6.5-6). Both ratios indicate chironomids dominated EPT in the insect communities, with insects in the offshore sample almost exclusively consisting of chironomids.

Overall taxonomic richness within the nearshore polygon was eight, ranging from two to six within each sample. Hill's Effective Richness (E^H) was three in the nearshore. Within the offshore polygon, taxonomic richness was six, ranging from three to four within each sample. Hill's Effective Richness (E^H) was also three in the offshore. In both the nearshore and offshore polygons, Pisidiidae and Chironomidae dominated the BMI community (Table 6.5-6).

Simpson's Diversity Index was 0.63 in the nearshore and 0.61 in the offshore polygon (Table 6.5-6). Evenness values were 0.58 in the nearshore and 0.60 in the offshore polygon (Table 6.5-6).

6.6 FISH COMMUNITY

6.6.1 Gill netting

In 2009, in the Churchill River Diversion Region, gill netting was conducted in Notigi Lake (10 –14 August), Threepoint Lake (15 – 19 August), Apussigamasi Lake (30 August – 2 September), and Leftrook Lake (28 – 31 July) (Figures 6.6-1 – 6.6-4).

In Notigi Lake, ten sites were sampled using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Table 6.6-1; Figure 6.6-1). Water temperature during the sampling period ranged from 17 – 19°C.

In Threepoint, Apussigamasi, and Leftrook lakes, nine standard index gill net sites, and three small mesh index gill net sites were sampled in each waterbody (Table 6.6-1; figures 6.6-2 – 6.6-4, respectively). During sampling, water temperature ranged from 14.0 – 17.0°C in Threepoint Lake, from 15.0 – 16.0°C in Apussigamasi Lake, and from 16.0 – 17.0°C in Leftrook Lake.

6.6.2 Species Composition

In 2009, 16 species of fish were captured in the Churchill River Diversion Region (Table 6.6-2).

6.6.2.1 Notigi Lake

In 2009, a total of 344 fish representing nine species were captured in standard gang index gill nets (Table 6.6-3) and a total of 111 fish representing 8 species were captured in small mesh index gill nets (Table 6.6-4). White Sucker represented half (n = 174; 50.58%) of the standard gang index gillnet catch (Table 6.6-3; Figure 6.6-5). In the small mesh index gillnet catch, Yellow Perch was the most common species captured (n = 32; 28.83%) followed by Walleye (n = 28; 25.23%) and Spottail Shiner (n = 23; 20.72%) (Table 6.6-4; Figure 6.6-5).

White Sucker represented the bulk of the biomass (63.06%) in the standard gang index gillnet catch (Table 6.6-5), and Walleye comprised the bulk of the biomass (77.23%) in the small mesh index gillnet catch (Table 6.6-6).

6.6.2.2 Threepoint Lake

A total of 411 fish representing 10 species were captured in standard gang index gill nets (Table 6.6-3) and a total of 355 fish representing 7 species were captured in small mesh index gill nets (Table 6.6-4). White Sucker represented 32.60% (n = 134) of the standard index gill net catch followed by Walleye (n = 105; 25.55%), Sauger (n= 61; 14.84%) and Northern Pike (n = 58; 14.11) (Table 6.6-3; Figure 6.6-5). In the small mesh index gillnet catch, Spottail Shiner (n = 187; 52.68%) and Emerald Shiner (n = 117; 32.96%) were the most common species captured (Table 6.6-4; Figure 6.6-5).

In terms of biomass, White Sucker represented 52.25% of the standard index gillnet catch, followed by Walleye (19.83%) and Northern Pike (12.34%) (Table 6.6-5). In the small mesh index gillnet catch, Sauger represented 38.40% of the biomass, followed by Northern Pike (26.42%), Spottail Shiner (14.92%) and Walleye (10.57%) (Table 6.6-6).

6.6.2.3 Apussigamasi Lake

In 2009, 465 fish representing 12 species were captured in standard gang index gill nets and 136 fish representing nine species were captured in small mesh index gill nets (tables 6.6-3 and 6.6-4, respectively).

In the standard gang index gillnet catch Walleye represented 35.48% (n = 165) of the total catch, followed by Sauger (n = 80; 17.20), and White Sucker (n = 77; 16.56) (Table 6.6-3; Figure 6.6-5). In small mesh index gill nets Sauger (n = 54; 39.71%) were the most abundant species followed by Spottail Shiner (n = 28; 20.59%), Walleye (n = 18; 13.24%), and Troutperch (n = 17; 12.50) (Table 6.6-4; Figure 6.6-5).

Walleye represented 26.14% of the biomass in the standard index gillnet catch, followed by White Sucker (21.14%), Lake Whitefish (18.28%), and Northern Pike (18.10%) (Table 6.6-5). In the small mesh index gillnet catch, Sauger composed 40.38% of the biomass, followed by Walleye (35.39%) and Northern Pike (13.25%) (Table 6.6-6).

6.6.2.4 Leftrook Lake

A total of 983 fish comprising seven species were captured in standard gang index gill nets and 329 fish comprising eight species were captured in small mesh index gill nets (tables 6.6-3 and 6.6-4, respectively).

The most common species captured in standard gang index gill nets were White Sucker (n = 356; 36.22%) and Walleye (n = 299; 30.42%) (Table 6.6-3; Figure 6.6-5). In the small mesh index gillnet catch, Walleye represented 43.47% (n = 143) of the total catch followed by Spottail Shiner (n = 85; 25.84%) and Troutperch (n = 55; 16.72%) (Table 6.6-4; Figure 6.6-5).

In terms of biomass, White Sucker represented 44.30% of the standard index gillnet catch, followed by Lake Whitefish (22.08%), and Walleye (19.74%) (Table 6.6-5). In the small mesh index gillnet catch, Walleye composed the bulk of the biomass (68.42%) (Table 6.6-6).

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

6.6.3.1 Notigi Lake

In 2009, mean CPUE for the standard gang index gillnet catch in Notigi Lake was 32.7 fish/100 m of net/24 h (Table 6.6-7; Figure 6.6-6). White Sucker had the highest CPUE (16.7) (Figure 6.6-7).

Total CPUE for small mesh index gill nets was 37.6 fish/30 m of net/24 h (Table 6.6-8; Figure 6.6-6). Yellow Perch had the highest CPUE (10.8) followed by Walleye (9.5) and Spottail Shiner (7.8) (Figure 6.6-7).

Mean BPUE for the standard gang index gillnet catch was 24,296 g/100 m of net/24 h (Table 6.6-9). White Sucker had the highest BPUE (15,431) followed by Walleye (2,650), and Northern Pike (2,443). Small mesh index gill nets produced a BPUE of 3,909 g/30 m of net/24 h (Table 6.6-10) with Walleye having the highest BPUE (3,014).

6.6.3.2 Threepoint Lake

In Threepoint Lake in 2009, standard index gill nets had an overall CPUE of 36.0 (Table 6.6-7; Figure 6.6-6) and small mesh index gill nets had a CPUE of 72.3 (Table 6.6-8; Figure 6.6-6).

In the standard index gill nets, White Sucker had the highest CPUE value (12.4) followed by Walleye (8.5) and Sauger (5.5) (Table 6.6-7; Figure 6.6-7). In the small mesh index gill nets, Spottail Shiner (32.5), Emerald Shiner (23.9) and Sauger (10.0) had the highest CPUE (Table 6.6-8; Figure 6.6-7).

Mean BPUE for the standard gang index gillnet catch was 24,610 (Table 6.6-9). White Sucker had the highest BPUE (13,460), followed by Walleye (4,603), Northern Pike (2,975) and Sauger (1,052). Mean total BPUE for the small mesh index gillnet catch was 1,602 (Table 6.6-10), which was predominantly comprised of Sauger (657) and Northern Pike (467).

6.6.3.3 Apussigamasi Lake

Standard gang index gill nets set in Apussigamasi Lake in 2009 had a CPUE of 44.5 (Table 6.6-7; Figure 6.6-6). Species with the highest CPUE were Walleye (15.6), Sauger (7.6), and White Sucker (7.5) (Figure 6.6-7).

Mean total CPUE from the small mesh index gillnets was 42.6 fish/30 m/24 h (Table 6.6-8; Figure 6.6-6). Sauger had the highest CPUE (16.9), followed by Spottail Shiner (8.8), Walleye (5.6) and Troutperch (5.3) (Figure 6.6-7).

In terms of BPUE, standard gang index gill nets produced 36,127 (Table 6.6-9). Species with the highest BPUE were: Walleye (9,282); White Sucker (7,709); Lake Whitefish (6,623); and Northern Pike (6,547). Mean BPUE for the small mesh index gillnet catch was 5,884 g/30 m/24 h (Table 6.6-10). Sauger had the highest BPUE value of 2,376 followed by Walleye (2,376).

6.6.3.4 Leftrook Lake

In 2009, the mean CPUE for the standard gang index gillnet catch in Leftrook Lake was 94.6 (Table 6.6-7; Figure 6.6-6). Species having the highest CPUE were White Sucker (33.8) and Walleye (29.1) (Figure 6.6-7).

Mean CPUE for the small mesh index gillnet catch was 114.3 (Table 6.6-8; Figure 6.6-6). Walleye had the highest CPUE (49.5), followed by Spottail Shiner (30.0) and Troutperch (18.9) (Figure 6.6-7).

Mean BPUE for the standard gang index gillnet catch was 73,010 (Table 6.6-9). White Sucker had the highest BPUE (32,172) followed by Lake Whitefish (16,472), and Walleye (14,254). Small mesh index gill nets produced a BPUE of 19,757 (Table 6.6-10) with Walleye having the highest BPUE (13,731).

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 2009 were measured for fork length (mm) and weight (g) (Table 6.6-11). 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 6.6-8, 6.6-9, and 6.6-10, respectively.

In general, with the exception of Apussigamasi and Leftrook lakes, 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 Notigi Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 399 mm, a mean weight of 803 g, and a mean condition factor of 0.64 (Table 6.6-11). In small mesh index gill nets, four Northern Pike were captured and bulk weighed (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 478 mm, a mean weight of 2,250 g, and a mean condition factor of 2.00 (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 377 mm, a mean weight of 744 g, and a mean condition factor of 1.08 (Table 6.6-11). In small mesh index gill nets 28 Walleye were captured and bulk weighed (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 412 mm, a mean weight of 1,326 g, and a mean condition factor of 0.68 (Table 6.6-11). In small mesh index gill nets, five Northern Pike were captured and bulk weighed (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 359 mm, a mean weight of 827 g, and a mean condition factor of 1.60 (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 349 mm, a mean weight of 533 g, and a mean condition factor of 1.10 (Table 6.6-11). In small mesh index gill nets, 4 Walleye were captured and bulk weighed (Table 6.6-12).

6.6.4.3 Apussigamasi Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 684 mm, a mean weight of 3,291 g, and a mean condition factor of 0.80 (Table 6.6-11). In small mesh index gill nets, Northern Pike had a mean fork length of 472 mm, a mean weight of 830 g, and mean condition factor of 0.68 (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 447 mm, a mean weight of 1,656 g, and a mean condition factor of 1.80 (Table 6.6-11). Lake Whitefish were not 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 364 mm, a mean weight of 687 g, and a mean condition factor of 1.11 (Table 6.6-11). In small mesh index gill nets, 14 of the 18 captured Walleye had a mean fork length of 343 mm, a mean weight of 440 g, and mean condition factor of 1.10 (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 476 mm, a mean weight of 1,052 g, and a mean condition factor of 0.60 (Table 6.6-11). In small mesh index gill nets, Northern Pike had a mean fork length of 453 mm, a mean weight of 613 g, and mean condition factor of 0.65 (Table 6.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 440 mm, a mean weight of 1,404 g, and a mean condition factor of 1.60 (Table 6.6-11). In small mesh index gill nets, Lake Whitefish had a mean fork length of 413 mm, a mean weight of 1,240 g, and mean condition factor of 1.62 (Table 6.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 359 mm, a mean weight of 573 g, and a mean condition factor of 1.03 (Table 6.6-11). In small mesh index gill nets, 94 of the 143 captured Walleye had a mean fork length of 325 mm, a mean weight of 402 g, and mean condition factor of 1.04 (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 2009.

Mean fork length- (mm), weight- (g) and condition factor-at age was also calculated for Northern Pike (Table 6.6-16), Lake Whitefish (Table 6.6-17), and Walleye (Table 6.6-18).

6.6.5.1 Notigi Lake

Age was determined for 56 Northern Pike captured in standard gang index gill nets set in Notigi Lake in 2009 (Table 6.6-13). A majority of the fish were either three (32.14%) or four years of age (28.57%).

A total of four Lake Whitefish captured in standard gang index gill nets were aged. Lake Whitefish were between the ages of 13 and 15 (Table 6.6-14).

Ages were determined for 43 Walleye captured in standard gang index gill nets. The majority of fish were age 4 through 10; with strong representation by 8-year old fish (20.93%) (Table 6.6-15).

6.6.5.2 Threepoint Lake

A total of 58 Northern Pike captured in standard gang index gill nets were aged. The majority of Northern Pike were 4 years of age (34.48%) with strong representation by ages 3 (20.69%) and 5 (10.34%) (Table 6.6-13).

Ages were determined for nine Lake Whitefish captured in standard gang index gill nets. Fish ranged between 3 and 15 years of age, with one fish aged at 30 years (Table 6.6-14).

A total of 98 Walleye were captured in standard gang index gill nets. Fish aged 4 through 16 composed the majority of the catch (Table 6.6-15).

6.6.5.3 Apussigamasi Lake

Ages were determined for 20 Northern Pike (Table 6.6-13), with ages ranging from 2 through 14.

A total of 38 Lake Whitefish captured in standard index gill nets were aged. Fish ages ranged from 4 through 33 (Table 6.6-14).

Ages were determined for 164 Walleye captured in standard gang index gill nets. The majority of Walleye (15.24%) were 8 years of age; however, fish aged 4 through 15 were well represented in the catch (Table 6.6-15).

6.6.5.4 Leftrook Lake

Ages were determined for a total of 108 Northern Pike captured in standard gang index gill nets set in Leftrook Lake in 2009 (Table 6.6-13). Northern Pike between the ages of 4 and 7 made up the majority of the catch.

A total of 115 Lake Whitefish captured in standard gang index gill nets were aged. Lake Whitefish ranged in age from 3 through 26, with the strongest representation of fish aged 10 (11.30%) and 15 (11.30%) (Table 6.6-14).

Ages were determined for 296 Walleye captured in standard gang index gill nets. Walleye ranged in age from 3 through 28, with 8-year old fish representing the strongest cohort (19.59%) (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 2009 were examined externally for DELTs (Table 6.6-19).

6.6.6.1 Notigi Lake

One White Sucker, out of 278 examined from the standard gang index gill nets, was documented as having an erosion.

6.6.6.2 Threepoint Lake

One Northern Pike out of the 518 fish captured in Threepoint Lake was documented as having a deformity.

6.6.6.3 Apussigamasi Lake

In Apussigamasi Lake, ten of the 305 fish captured in 2009 had DELTs. Tumours were documented on four fish, lesions on four fish, and deformities and erosions were each documented on one fish. Walleye accounted for the majority of DELTs, with four fish having tumours and two fish having lesions.

6.6.6.4 Leftrook Lake

Twelve of the 989 fish captured in Leftrook Lake in 2009 had DELTs. Seventy-five percent of the DELTs were deformities, with tumours making up the other 25%. DELTs were found on all four species.

SECTION 6: TABLES AND FIGURES

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Table 6.3-1. Summary statistics for *in situ* variables (near surface) measured in the Churchill River Diversion Region: 2009/2010.

	Temperature (°C)					*In situ* pH					DO (mg/L)				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	10.75	10.77	11.26	11.96	12.14	7.57	7.50	7.59	7.83	7.79	15.05	14.71	15.63	16.57	12.63
Median	13.56	13.32	14.45	15.62	15.53	7.60	7.66	7.89	7.83	8.00	13.96	13.97	16.00	16.91	13.95
Minimum	0.00	0.00	0.00	0.02	0.50	7.01	6.57	6.33	7.59	6.90	13.38	13.09	14.50	15.56	9.26
Maximum	15.90	16.44	16.15	16.56	17.00	8.05	8.11	8.24	8.06	8.25	17.80	17.80	16.38	17.24	14.67
SD	6.43	6.52	6.58	6.91	6.75	0.37	0.64	0.75	0.17	0.52	1.96	1.83	0.81	0.73	2.40
SE	3.71	3.76	3.80	3.99	3.89	0.21	0.37	0.43	0.10	0.30	1.39	1.06	0.57	0.51	1.70
N	4	4	4	4	4	4	4	4	4	4	3	4	3	3	3

	DO (% Saturation)					*In situ* Specific Conductance (µS/cm)					*In situ* Turbidity (NTU)				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	123	137	128	137	113	100	99	107	115	196	11.2	10.3	24.7	45.3	2.40
Median	120	143	134	144	116	99	101	108	113	177	11.2	10.5	30.1	55.2	2.10
Minimum	84	97	86	94	69	87	88	93	98	162	10.2	7.90	13.5	25.0	0.80
Maximum	167	166	159	169	149	115	106	119	135	269	12.3	12.3	30.6	55.8	4.30
SD	33	25	29	30	36	11	8	10	13	43	0.9	1.60	7.9	14.4	1.44
SE	19	14	17	17	21	6	4	6	8	25	0.6	0.92	5.6	10.2	1.02
N	4	4	4	4	4	4	4	4	4	4	3	4	3	3	3

Table 6.3-2. - continued -

	ORP (mV)					Secchi Disk Depth (m)					Calculated Euphotic Depth (m)					Estimated Euphotic Depth (m)				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	106	150	114	176	143	1.07	1.30	0.70	0.39	1.87	2.13	2.60	1.40	0.77	3.73	2.20	2.67	1.43	0.78	3.75
Median	98	155	107	133	132	1.00	1.30	0.60	0.35	1.90	2.00	2.60	1.20	0.70	3.80	2.00	2.50	1.30	0.75	4.00
Minimum	53	94	39	121	122	0.90	1.20	0.50	0.33	1.65	1.80	2.40	1.00	0.66	3.30	1.80	2.50	1.00	0.60	3.25
Maximum	176	198	201	317	185	1.30	1.40	1.00	0.48	2.05	2.60	2.80	2.00	0.95	4.10	2.80	3.00	2.00	1.00	4.00
SD	45	44	58	82	26	0.17	0.08	0.22	0.06	0.16	0.34	0.16	0.43	0.13	0.33	0.43	0.24	0.42	0.16	0.35
SE	26	26	33	47	15	0.12	0.06	0.15	0.05	0.12	0.24	0.12	0.31	0.09	0.23	0.31	0.17	0.30	0.12	0.25
N	4	4	4	4	4	3	3	3	3	3	3	3	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: 2009/2010.

	Total Alkalinity ($CaCO_3$ mg/L)					Bicarbonate Alkalinity (HCO_3 mg/L)					Carbonate Alkalinity (CO_3 mg/L)				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	47.4	48.0	49.5	55.1	99.9	57.9	58.6	60.4	67.3	121	<0.60	<0.60	<0.60	<0.60	0.86
Median	48.2	48.6	50.4	57.2	92.2	58.8	59.3	61.4	69.8	111	<0.60	<0.60	<0.60	<0.60	0.78
Minimum	41.2	41.8	42.5	47.0	90.4	50.2	51.0	51.9	57.3	108	<0.60	<0.60	<0.60	<0.60	<0.60
Maximum	52.2	53.1	54.6	59.1	125	63.7	64.8	66.7	72.1	153	<0.60	<0.60	<0.60	<0.60	1.57
SD	4.1	4.3	4.5	4.9	14.5	5.1	5.2	5.5	6.0	19	-	-	-	-	0.57
SE	2.4	2.5	2.6	2.8	8.4	2.9	3.0	3.2	3.4	11	-	-	-	-	0.33
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4	4	0	0	0	0	2
% Detected	100	100	100	100	100	100	100	100	100	100	0	0	0	0	50

	Ammonia (mg N/L)					Nitrate/Nitrite (mg N/L)				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.010	<0.010	<0.050	0.033	<0.010	0.0175	0.0164	0.0170	0.0252	0.0226
Median	<0.010	<0.010	<0.050	0.033	<0.010	0.0068	<0.0050	<0.0050	0.0112	<0.0050
Minimum	<0.010	<0.0030	<0.050	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Maximum	0.015	0.0161	<0.050	0.062	<0.010	0.0540	0.0580	0.0560	0.0760	0.0830
SD	0.004	0.0057	0.009	0.028	0.001	0.0214	0.0240	0.0226	0.0297	0.0349
SE	0.002	0.0033	0.005	0.016	0.001	0.0123	0.0139	0.0130	0.0172	0.0201
N	4	4	4	4	4	4	4	4	4	4
N >DL	3	2	3	3	3	2	1	2	3	1
% Detected	75	50	75	75	75	50	25	50	75	25

Table 6.3-2. - continued -

	Nitrate/Nitrite (mg N/L)					TKN (mg/L)					DIN (mg/L)[1]				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	0.0175	0.0164	0.0170	0.0252	0.0226	0.33	0.32	0.35	0.43	0.52	0.0254	0.0225	0.0276	0.0585	0.0276
Median	0.0068	<0.0050	<0.0050	0.0112	<0.0050	0.35	0.34	0.36	0.45	0.52	0.0165	0.0122	0.0115	0.0655	0.0081
Minimum	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.24	0.21	0.24	0.35	0.47	0.0096	<0.0050	0.0064	0.0221	0.0064
Maximum	0.0540	0.0580	0.0560	0.0760	0.0830	0.39	0.38	0.45	0.46	0.56	0.0590	0.0630	0.0810	0.0810	0.0880
SD	0.0214	0.0240	0.0226	0.0297	0.0349	0.06	0.07	0.08	0.05	0.04	0.0196	0.0242	0.0309	0.0220	0.0349
SE	0.0123	0.0139	0.0130	0.0172	0.0201	0.03	0.04	0.04	0.03	0.02	0.0113	0.0139	0.0179	0.0127	0.0201
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	2	1	2	3	1	4	4	4	4	4	-	-	-	-	-
% Detected	50	25	50	75	25	100	100	100	100	100	-	-	-	-	-

	Organic Nitrogen (mg/L)[1]					TN (mg/L)[1]				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	0.32	0.31	0.34	0.39	0.51	0.35	0.33	0.37	0.45	0.54
Median	0.34	0.33	0.35	0.39	0.51	0.35	0.34	0.39	0.45	0.52
Minimum	0.24	0.21	0.24	0.34	0.47	0.25	0.21	0.25	0.37	0.47
Maximum	0.39	0.38	0.44	0.46	0.56	0.44	0.44	0.45	0.54	0.64
SD	0.06	0.07	0.07	0.04	0.04	0.07	0.08	0.08	0.06	0.07
SE	0.03	0.04	0.04	0.02	0.02	0.04	0.05	0.05	0.03	0.04
N	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-

Table 6.3-2. - continued -

	TDP (mg/L)					TPP (mg/L)[1]					TP (mg/L)					TN:TP[1]					DIN:DP[1]				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	0.0100	0.0113	0.0109	0.0144	0.0115	0.0070	0.0065	0.0123	0.0193	0.0102	0.0170	0.0181	0.0233	0.0337	0.0216	46	40	35	31	55	5	3	5	9	5
Median	0.0084	0.0107	0.0099	0.0165	0.0124	0.0065	0.0065	0.0115	0.0183	0.0099	0.0155	0.0172	0.0240	0.0316	0.0220	46	44	34	30	54	5	3	3	9	2
Minimum	0.0068	0.0057	0.0076	0.0064	0.0070	0.0059	<0.0030	0.0089	0.0121	0.0086	0.0145	0.0170	0.0168	0.0277	0.0192	35	28	33	23	49	3	1	2	8	1
Maximum	0.0166	0.0181	0.0164	0.0181	0.0140	0.0091	0.0113	0.0173	0.0286	0.0123	0.0225	0.0211	0.0282	0.0438	0.0231	57	46	38	40	63	8	8	11	10	14
SD	0.0038	0.0051	0.0034	0.0047	0.0027	0.0013	0.0043	0.0035	0.0063	0.0014	0.0032	0.0017	0.0042	0.0062	0.0015	8	8	2	6	5	2	3	4	1	5
SE	0.0022	0.0029	0.0019	0.0027	0.0015	0.0007	0.0025	0.0020	0.0037	0.0008	0.0019	0.0010	0.0024	0.0036	0.0009	5	4	1	4	3	1	1	2	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	4
N >DL	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-
% Detected	100	100	100	100	100	100	75	100	100	100	100	100	100	100	100	-	-	-	-	-	-	-	-	-	-

Table 6.3-2. - continued -

	DIN:TP[1]					DOC (mg/L)					TOC (mg/L)					TIC (mg/L)					TOC:ON[1]				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	3	3	3	4	3	7.9	7.9	8.3	9.2	9.3	7.9	7.9	8.7	9.2	9.5	10.7	10.9	10.8	12.1	24.1	30	32	31	28	22
Median	2	2	1	4	1	8.1	8.0	8.5	9.1	9.3	8.0	7.9	8.7	9.1	9.5	10.3	10.8	10.9	12.7	22.4	28	28	30	28	22
Minimum	1	0	1	2	1	7.2	7.3	7.1	8.7	8.6	7.8	7.8	8.3	8.9	8.6	9.6	9.7	8.7	9.5	20.9	25	25	23	24	20
Maximum	6	7	7	6	9	8.3	8.1	9.0	9.9	10.0	8.0	8.1	9.1	9.8	10.4	12.6	12.2	12.7	13.6	30.6	39	45	41	31	23
SD	2	2	3	2	3	0.4	0.3	0.7	0.4	0.5	0.1	0.1	0.3	0.4	0.7	1.1	0.9	1.4	1.6	3.8	5	8	6	3	1
SE	1	1	2	1	2	0.2	0.2	0.4	0.3	0.3	0.0	0.1	0.2	0.2	0.4	0.7	0.5	0.8	0.9	2.2	3	5	4	2	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	4
N >DL	-	-	-	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-
% Detected	-	-	-	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	-	-	-	-	-

Table 6.3-2. - continued -

	TDS (mg/L)					Laboratory Conductivity (µmhos/cm)					TSS (mg/L)					Laboratory Turbidity (NTU)					True Colour (TCU)					Laboratory pH				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	69.0	71.5	80.5	94.0	124	98	100	102	118	191	<2.0	2.4	5.3	10.1	2.4	8.48	7.31	16.2	25.5	1.89	16.3	20.0	28.8	46.3	17.5	7.83	7.90	7.91	8.08	8.06
Median	70.0	73.0	83.0	96.0	115	98	101	103	121	176	<2.0	2.3	5.2	9.2	2.6	8.60	7.47	18.0	26.5	2.20	15.0	17.5	30.0	47.5	15.0	7.93	8.00	7.99	8.10	8.15
Minimum	62.0	62.0	70.0	80.0	112	90	91	92	103	168	<2.0	<2.0	<2.0	7.6	<2.0	6.90	6.00	8.74	14.1	0.64	15.0	15.0	15.0	20.0	10.0	7.45	7.45	7.51	7.90	7.53
Maximum	74.0	78.0	86.0	104	152	106	107	110	126	244	3.2	4.0	9.6	14.4	3.2	9.80	8.30	20.0	35.0	2.50	20.0	30.0	40.0	70.0	30.0	8.01	8.13	8.16	8.22	8.39
SD	4.6	6.2	6.2	9.2	17	6	6	7	9	31	0.9	1.4	3.1	2.6	0.8	1.07	0.94	4.60	8.4	0.73	2.2	6.1	8.9	19.8	8.3	0.22	0.26	0.24	0.11	0.32
SE	2.6	3.6	3.6	5.3	10	3	3	4	5	18	0.5	0.8	1.8	1.5	0.5	0.62	0.54	2.65	4.9	0.42	1.3	3.5	5.2	11.4	4.8	0.13	0.15	0.14	0.07	0.19
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
N >DL	4	4	4	4	4	4	4	4	4	4	2	2	3	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100	100	100	100	50	50	75	100	75	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 6.3-2. - continued -

	E. coli (CFU/100 mL)					Chlorophyll *a* (µg/L)					Hardness as $CaCO_3$ (mg/L)					Chloride (mg/L)					Sulphate (mg/L)				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<1	<1	<1	93	<1	1.86	1.98	1.87	2.07	5.15	46.6	48.3	49.2	59.3	102	1.26	1.24	1.07	1.62	0.98	5.58	6.00	6.35	5.80	5.83
Median	<1	<1	<1	62	<1	1.50	2.30	1.90	2.50	4.60	45.2	48.7	49.0	60.3	98.0	1.04	1.09	1.07	1.66	0.88	4.90	5.90	5.65	5.60	5.70
Minimum	<1	<1	<1	49	<1	0.22	0.21	0.28	0.19	1.49	41.5	43.4	41.1	53.2	82.9	0.94	0.98	0.93	1.45	0.74	4.10	3.90	4.00	4.20	4.50
Maximum	1	<1	<1	>200[2]	<1	4.20	3.10	3.40	3.10	9.90	54.6	52.3	57.5	63.6	130	2.03	1.82	1.23	1.72	1.42	8.40	8.30	10.1	7.80	7.40
SD	0	-	-	62	-	1.45	1.11	1.24	1.12	3.20	5.0	3.7	6.0	4.4	17.2	0.45	0.34	0.11	0.10	0.26	1.72	1.56	2.35	1.34	1.04
SE	0	-	-	36	-	0.84	0.64	0.72	0.65	1.85	2.9	2.1	3.5	2.5	9.9	0.26	0.19	0.06	0.06	0.15	0.99	0.90	1.35	0.77	0.60
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
N >DL	1	0	0	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
% Detected	25	0	0	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

[1] Calculated.

[2] A value of 200 CFU/100mL was used for calculation of summary statistics.

Table 6.3-3. Summary statistics for metals and major ions measured in the Churchill River Diversion Region: 2009/2010. Values are presented as mg/L.

	Aluminum					Antimony					Arsenic					Barium					Beryllium				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	0.278	0.312	0.547	0.992	0.036	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0132	0.0133	0.0154	0.0206	0.0130	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Median	0.256	0.309	0.445	0.693	0.034	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0130	0.0130	0.0149	0.0178	0.0121	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	0.213	0.291	0.418	0.421	0.013	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0123	0.0129	0.0140	0.0165	0.0110	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	0.387	0.338	0.881	2.16	0.062	0.00069	0.00058	<0.00050	<0.00050	0.00056	<0.00050	<0.00050	<0.00050	0.00062	<0.00050	0.0147	0.0141	0.0180	0.0305	0.0168	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
SD	0.066	0.021	0.194	0.694	0.021	0.00019	0.00014	-	-	0.00013	-	-	-	0.00016	-	0.0010	0.0005	0.0016	0.0058	0.0023	-	-	-	-	-
SE	0.038	0.012	0.112	0.401	0.012	0.00011	0.00008	-	-	0.00008	-	-	-	0.00009	-	0.0006	0.0003	0.0009	0.0033	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	4
N >DL	4	4	4	4	4	1	1	0	0	1	0	0	0	1	0	4	4	4	4	4	0	0	0	0	0
% Detected	100	100	100	100	100	25	25	0	0	25	0	0	0	25	0	100	100	100	100	100	0	0	0	0	0

Table 6.3-3. - continued -

	Beryllium					Bismuth					Boron					Cadmium					Calcium				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030	<0.030	<0.030	0.000010	0.000024	<0.000010	0.000016	0.000014	12.1	12.5	12.8	15.6	29.4
Median	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030	<0.030	<0.030	<0.000010	<0.000010	<0.000010	0.000016	<0.000010	11.9	12.7	12.9	15.8	28.0
Minimum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030	<0.030	<0.030	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	10.2	10.8	10.2	13.8	24.4
Maximum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030	<0.030	<0.030	0.000017	0.000080	0.000012	0.000027	0.000041	14.5	13.8	15.3	16.8	37.1
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000005	0.000032	0.000003	0.000011	0.000016	1.5	1.1	1.8	1.2	4.7
SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000003	0.000019	0.000002	0.000006	0.000009	0.9	0.6	1.1	0.7	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	4
N >DL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	2	1	4	4	4	4	4
% Detected	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	25	25	50	25	100	100	100	100	100

Table 6.3-3. - continued -

	Cesium					Chromium					Cobalt					Copper					Iron				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	0.0013	0.0011	0.0015	<0.0010	<0.00020	<0.00020	0.00028	0.00052	<0.00020	0.0012	0.0012	0.0016	0.0021	<0.0010	0.270	0.273	0.554	0.960	0.062
Median	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	0.0011	0.0011	<0.0010	<0.00020	<0.00020	0.00033	0.00044	<0.00020	0.0012	0.0013	0.0015	0.0020	<0.0010	0.284	0.272	0.526	0.711	0.054
Minimum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.00031	<0.00020	0.0010	0.0010	0.0012	0.0017	<0.0010	0.211	0.254	0.355	0.557	0.045
Maximum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0011	0.0035	0.0017	0.0032	<0.0010	0.00020	<0.00020	0.00036	0.00091	<0.00020	0.0015	0.0014	0.0024	0.0029	0.0014	0.301	0.293	0.810	1.86	0.094
SD	-	-	-	-	-	0.0003	0.0013	0.0006	0.0011	-	0.00004	-	0.00010	0.00023	-	0.0002	0.0001	0.0005	0.0005	0.0004	0.037	0.014	0.163	0.524	0.019
SE	-	-	-	-	-	0.0002	0.0008	0.0003	0.0006	-	0.00003	-	0.00006	0.00013	-	0.0001	0.0001	0.0003	0.0003	0.0002	0.021	0.008	0.094	0.303	0.011
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
N >DL	0	0	0	0	0	1	1	2	2	0	1	0	3	4	0	4	4	4	4	2	4	4	4	4	4
% Detected	0	0	0	0	0	25	25	50	50	0	25	0	75	100	0	100	100	100	100	50	100	100	100	100	100

Table 6.3-3. - continued -

	Iron					Lead					Lithium					Magnesium					Manganese				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	0.270	0.273	0.554	0.960	0.062	0.00059	0.00054	0.00054	0.00051	<0.00050	-	-	-	-	-	3.98	4.15	4.18	4.98	7.03	0.00685	0.00594	0.0130	0.0217	0.0286
Median	0.284	0.272	0.526	0.711	0.054	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	-	-	-	-	-	4.03	4.17	4.15	4.96	6.86	0.00698	0.00543	0.0147	0.0198	0.0324
Minimum	0.211	0.254	0.355	0.557	0.045	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	3.39	3.62	3.74	4.58	5.34	0.00536	0.00536	0.00739	0.0166	0.0106
Maximum	0.301	0.293	0.810	1.86	0.094	0.00137	0.00085	0.00095	0.00089	<0.00050	-	-	-	-	-	4.46	4.63	4.69	5.44	9.06	0.00808	0.00752	0.0152	0.0307	0.0392
SD	0.037	0.014	0.163	0.524	0.019	0.00046	0.00029	0.00030	0.00027	-	-	-	-	-	-	0.40	0.37	0.42	0.34	1.33	0.00097	0.00092	0.00325	0.0054	0.0118
SE	0.021	0.008	0.094	0.303	0.011	0.00027	0.00017	0.00018	0.00016	-	-	-	-	-	-	0.23	0.22	0.24	0.20	0.77	0.00056	0.00053	0.00187	0.0031	0.0068
N	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	2	2	2	2	0	-	-	-	-	-	4	4	4	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	50	50	50	50	0	-	-	-	-	-	100	100	100	100	100	100	100	100	100	100

Table 6.3-3. - continued -

	Mercury					Molybdenum					Nickel					Potassium					Rubidium				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	0.0028	<0.0020	1.19	1.23	1.25	1.50	1.23	0.00181	0.00185	0.00247	0.00348	0.00095
Median	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	0.0024	<0.0020	1.23	1.24	1.26	1.43	1.23	0.00178	0.00180	0.00230	0.00302	0.00094
Minimum	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	1.01	1.10	1.20	1.20	0.96	0.00158	0.00175	0.00202	0.00231	0.00089
Maximum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	0.00025	<0.0020	<0.0020	<0.0020	0.0044	<0.0020	1.30	1.33	1.30	1.96	1.52	0.00209	0.00203	0.00325	0.00556	0.00103
SD	-	-	-	-	-	-	-	-	-	0.00006	-	-	-	0.0009	-	0.11	0.08	0.04	0.28	0.20	0.00019	0.00011	0.00047	0.00126	0.00005
SE	-	-	-	-	-	-	-	-	-	0.00004	-	-	-	0.0005	-	0.06	0.05	0.02	0.16	0.11	0.00011	0.00006	0.00027	0.00073	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	4
N >DL	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	4	4	4	4	4	4	4	4	4	4
% Detected	0	0	0	0	0	0	0	0	0	25	0	0	0	100	0	100	100	100	100	100	100	100	100	100	100

Table 6.3-3. - continued –

	Selenium					Silicon					Silver					Sodium					Strontium				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	2.88	3.00	2.85	4.01	2.66	0.0345	0.0353	0.0353	0.0399	0.0488
Median	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	2.96	3.07	2.92	4.10	2.59	0.0347	0.0354	0.0356	0.0394	0.0459
Minimum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	2.48	2.63	2.54	3.19	2.10	0.0329	0.0334	0.0330	0.0363	0.0427
Maximum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	-	-	0.00012	0.00010	<0.00010	<0.00010	<0.00010	3.11	3.23	3.00	4.65	3.35	0.0355	0.0370	0.0370	0.0445	0.0607
SD	-	-	-	-	-	-	-	-	-	-	0.00003	0.00002	-	-	-	0.24	0.23	0.19	0.55	0.45	0.0011	0.0013	0.0015	0.0029	0.0071
SE	-	-	-	-	-	-	-	-	-	-	0.00002	0.00001	-	-	-	0.14	0.13	0.11	0.32	0.26	0.0006	0.0008	0.0009	0.0017	0.0041
N	4	4	4	4	4	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	0	0	0	0	-	-	-	-	-	1	1	0	0	0	4	4	4	4	4	4	4	4	4	4
% Detected	0	0	0	0	0	-	-	-	-	-	25	25	0	0	0	100	100	100	100	100	100	100	100	100	100

Table 6.3-3. - continued –

	Tellurium					Thallium					Thorium					Tin					Titanium				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	-	<0.00060	<0.00060	<0.0010	<0.0010	<0.0010	0.0122	0.0133	0.0253	0.0450	0.00116
Median	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	-	<0.00060	<0.00060	<0.0010	<0.0010	<0.0010	0.0121	0.0131	0.0223	0.0327	0.00096
Minimum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	-	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	0.0103	0.0113	0.0151	0.0212	<0.00090
Maximum	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	-	0.00130	0.00140	<0.0010	<0.0010	<0.0010	0.0143	0.0157	0.0416	0.0934	0.00229
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00043	0.00048	-	-	-	0.0016	0.0019	0.0099	0.0286	0.00077
SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00025	0.00028	-	-	-	0.0009	0.0011	0.0057	0.0165	0.00044
N	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4
N >DL	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	1	1	0	0	0	4	4	4	4	2
% Detected	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	25	25	0	0	0	100	100	100	100	50

Table 6.3-3. - continued –

	Tungsten					Uranium					Vanadium					Zinc					Zirconium				
	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT	NTG-W	NTG-E	3PT	APU	LEFT
Mean	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	0.00010	0.00011	0.00018	0.00028	<0.0010	<0.0010	0.0012	0.0021	<0.0010	<0.010	<0.010	<0.010	<0.010	<0.010	0.00042	0.00044	0.00079	0.00157	<0.00040
Median	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	0.00011	0.00013	0.00017	0.00027	<0.0010	<0.0010	0.0013	0.0016	<0.0010	<0.010	<0.010	<0.010	<0.010	<0.010	0.00048	0.00050	0.00078	0.00092	<0.00040
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00013	0.00020	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00040	<0.00040	0.00052	0.00089	<0.00040
Maximum	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00011	0.00013	0.00014	0.00024	0.00038	<0.0010	<0.0010	0.0017	0.0038	<0.0010	<0.010	<0.010	<0.010	<0.010	<0.010	0.00054	0.00055	0.00106	0.00353	<0.00040
SD	-	-	-	-	-	0.00003	0.00003	0.00004	0.00005	0.00007	-	-	0.0004	0.0010	-	-	-	-	-	-	0.00013	0.00014	0.00019	0.00113	-
SE	-	-	-	-	-	0.00002	0.00002	0.00002	0.00003	0.00004	-	-	0.0002	0.0006	-	-	-	-	-	-	0.00008	0.00008	0.00011	0.00066	-
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
N >DL	0	0	0	0	0	1	3	3	4	4	0	0	3	4	0	0	0	0	0	0	3	3	4	4	0
% Detected	0	0	0	0	0	25	75	75	100	100	0	0	75	100	0	0	0	0	0	0	75	75	100	100	0

Table 6.3-4. 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: 2009/2010. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury[1]
MWQSOGs PAL (mg/L)		0.100	0.15	1.5	0.00014 -0.00033	0.0416 -0.1068	0.0044 -0.0117	0.3	0.00103 -0.00444	0.000026
NTG-W	N	**4**	4	4	4	4	4	**4**	4	3
(surface)	# Exceedances	**4**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**25**	0	0
NTG-W	N	**1**	1	1	1	1	1	**1**	1	1
(bottom)	# Exceedances	**1**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**100**	0	0
NTG-E	N	**4**	4	4	4	4	4	4	4	3
(surface)	# Exceedances	**4**	0	0	0	0	0	0	0	0
	% Exceedances	**100**	0	0	0	0	0	0	0	0
NTG-E	N	1	1	1	1	1	1	1	1	1
(bottom)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
3PT	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**4**	0	0	0	0	0	**4**	0	0
	% Exceedances	**100**	0	0	0	0	0	**100**	0	0
APU	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**4**	0	0	0	0	0	**4**	0	0
	% Exceedances	**100**	0	0	0	0	0	**100**	0	0
LEFT	N	4	4	4	4	4	4	4	4	3
(surface)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
LEFT	N	1	1	1	1	1	1	1	1	0
(bottom)	# Exceedances	0	0	0	0	0	0	0	0	-
	% Exceedances	0	0	0	0	0	0	0	0	-

Table 6.3-4. – continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.0246 -0.0651	0.001	0.0001	0.0008	0.015	0.056-0.150	120	128-429
NTG-W (surface)	N	4	4	4	**4**	4	4	4	4	4
	# Exceedances	0	0	0	**1**	0	0	0	0	0
	% Exceedances	0	0	0	**25**	0	0	0	0	0
NTG-W (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
NTG-E (surface)	N	4	4	4	**4**	4	4	4	4	4
	# Exceedances	0	0	0	**1**[4]	0	0	0	0	0
	% Exceedances	0	0	0	**25**	0	0	0	0	0
NTG-E (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
3PT	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
APU	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
LEFT (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
LEFT (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]Comparisons to the current PAL guideline could not be made for samples collected in winter as the analytical detection limit was higher than the guideline.

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

[3]Comparison to the BCMOE guideline.

[4] Result was equal to the analytical detection limit which is equivalent to the MWQSOG PAL.

Table 6.3-5. Total phosphorus concentrations (open-water season and annual means) measured in the Churchill River Diversion Region and CCME (1999; updated to 2013) trophic categorization: 2009/2010.

		Trophic Status Based on TP (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
Notigi Lake-West	Open-water season			0.017			
	Annual			0.015			
Notigi Lake-East	Open-water season			0.018			
	Annual			0.017			
Threepoint Lake	Open-water season				0.023		
	Annual				0.023		
Apussigamasi Lake	Open-water season				0.034		
	Annual					0.035	
Leftrook Lake	Open-water season				0.021		
	Annual				0.022		

Table 6.3-6. 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): 2009/2010.

		Lake Trophic Status Based on TN (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
Notigi Lake-West	Open-water season		0.32				
	Annual			0.35			
Notigi Lake-East	Open-water season		0.30				
	Annual		0.33				
Threepoint Lake	Open-water season		0.35				
	Annual		0.35				
Apussigamasi Lake	Open-water season			0.42			
	Annual			0.45			
Leftrook Lake	Open-water season			0.50			
	Annual			0.54			

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: 2009/2010.

		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
Notigi Lake-West	Open-water season		2.4				
	Annual		1.9				
Notigi Lake-East	Open-water season			2.6			
	Annual		2.0				
Threepoint Lake	Open-water season		2.4				
	Annual		1.9				
Apussigamasi Lake	Open-water season			2.7			
	Annual		2.1				
Leftrook Lake	Open-water season			6.4			
	Annual			5.1			

Table 6.4-1. Community metrics for phytoplankton samples collected in the Churchill River Diversion Region during the open-water season of 2009.

Waterbody	Season	Species Richness	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H'}$)	Evenness ($E^{H'}/S$)
Notigi Lake-West	Spring	16	0.84	0.39	2.10	0.76	8.18	0.51
	Summer	17	0.69	0.19	1.64	0.58	5.16	0.30
	Fall	11	0.75	0.36	1.68	0.70	5.38	0.49
Notigi Lake-East	Spring	17	0.89	0.52	2.44	0.86	11.52	0.68
	Summer	18	0.82	0.30	2.14	0.74	8.47	0.47
	Fall	11	0.80	0.45	1.84	0.77	6.27	0.57
Threepoint Lake	Spring	23	0.75	0.17	1.95	0.62	7.03	0.31
	Summer	16	0.90	0.65	2.46	0.89	11.69	0.73
	Fall	14	0.80	0.37	1.93	0.73	6.90	0.49
Apussigamasi Lake	Spring	14	0.63	0.19	1.54	0.58	4.65	0.33
	Summer	16	0.81	0.33	1.99	0.72	7.29	0.46
	Fall	14	0.81	0.38	1.85	0.70	6.38	0.46
Leftrook Lake	Spring	29	0.88	0.28	2.49	0.74	12.10	0.42
	Summer	32	0.85	0.21	2.41	0.70	11.15	0.35
	Fall	32	0.28	0.04	0.83	0.24	2.28	0.07

Table 6.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Churchill River Diversion Region for CAMPP, 2009.

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
Notigi Lake (2009)	Nearshore	15	2.8	0.8	4.2	0.02	0.87	16.0	--	mixed forest	0	--
	Offshore	15	14.2	11.9	15.7	0.02	0.82	16.0	--	--	0	--
Threepoint Lake (2009)	Nearshore	15	3.3	0.3	3.8	0.05	0.40	14.5	--	coniferous	0	--
	Offshore	15	4.5	4.2	4.8	--	0.40	15.0	--	--	0	--
Apussigamasi Lake (2009)	Nearshore	15	4.5	4.1	4.7	0.04	0.40	15.0	--	mixed forest	0	--
	Offshore	15	5.8	5.1	6.9	0.17	0.35	16.0	--	--	0	--
Leftrook Lake (2009)	Nearshore	15	4.5	2.8	4.9	--	1.07	15.0	--	coniferous	0	--
	Offshore	15	9.0	7.9	10.8	--	1.49	16.0	--	--	0	--

Table 6.5-2. Sediment analysis (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, 2009.

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
Notigi Lake (2009)	Nearshore	Mean	3	2.9	12.63	7.67	42.00	50.67	silty clay
		SD	--	0.57	2.577	2.082	2.000	3.055	--
		SE	--	0.33	1.488	1.202	1.155	1.764	--
		Median	--	2.7	12.20	7.00	42.00	50.00	--
		Min	--	2.4	10.30	6.00	40.00	48.00	--
		Max	--	3.5	15.40	10.00	44.00	54.00	--
	Offshore	Mean	3	13.1	2.18	1.33	21.67	76.67	clay
		SD	--	1.66	0.972	0.577	6.351	7.506	--
		SE	--	0.96	0.561	0.333	3.667	4.333	--
		Median	--	12.4	1.72	1.00	18.00	81.00	--
		Min	--	11.9	1.53	1.00	18.00	68.00	--
		Max	--	15.0	3.30	2.00	29.00	81.00	--
Threepoint Lake (2009)	Nearshore	Mean	3	2.5	0.77	9.33	41.00	49.33	silty clay
		SD	--	1.92	0.356	7.506	13.077	8.622	--
		SE	--	1.11	0.206	4.333	7.550	4.978	--
		Median	--	3.4	0.87	9.00	47.00	51.00	--
		Min	--	0.3	0.37	2.00	26.00	40.00	--
		Max	--	3.8	1.06	17.00	50.00	57.00	--
	Offshore	Mean	3	4.4	1.14	0.67	50.00	49.67	silty clay
		SD	--	0.20	0.312	0.289	1.000	1.528	--
		SE	--	0.12	0.180	0.167	0.577	0.882	--
		Median	--	4.4	1.32	0.50	50.00	50.00	--
		Min	--	4.2	0.78	0.50	49.00	48.00	--
		Max	--	4.6	1.32	1.00	51.00	51.00	--
Apussigamasi Lake (2009)	Nearshore	Mean	3	4.5	0.90	1.33	70.33	28.33	silty clay loam
		SD	--	0.10	0.140	0.577	1.528	1.528	--
		SE	--	0.06	0.081	0.333	0.882	0.882	--
		Median	--	4.5	0.86	1.00	70.00	28.00	--
		Min	--	4.4	0.79	1.00	69.00	27.00	--
		Max	--	4.6	1.06	2.00	72.00	30.00	--
	Offshore	Mean	3	6.0	0.73	17.00	71.00	12.33	silty loam
		SD	--	0.40	0.064	8.718	8.660	0.577	--
		SE	--	0.23	0.037	5.033	5.000	0.333	--
		Median	--	6.2	0.69	21.00	66.00	12.00	--
		Min	--	5.5	0.69	7.00	66.00	12.00	--
		Max	--	6.2	0.80	23.00	81.00	13.00	--
Leftrook Lake (2009)	Nearshore	Mean	3	4.5	4.52	3.33	61.67	34.67	silty clay loam
		SD	--	0.06	0.351	2.309	8.021	5.859	--
		SE	--	0.03	0.203	1.333	4.631	3.383	--
		Median	--	4.5	4.55	2.00	61.00	37.00	--
		Min	--	4.5	4.16	2.00	54.00	28.00	--
		Max	--	4.6	4.86	6.00	70.00	39.00	--
	Offshore	Mean	3	8.6	4.92	1.00	51.00	48.33	silty clay
		SD	--	0.59	0.110	0.000	7.000	6.807	--
		SE	--	0.34	0.064	0.000	4.041	3.930	--
		Median	--	8.8	4.92	1.00	54.00	46.00	--
		Min	--	7.9	4.81	1.00	43.00	43.00	--
		Max	--	9.0	5.03	1.00	56.00	56.00	--

Table 6.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Notigi Lake within the Churchill River Diversion Region for CAMPP, 2009.

	Notigi Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	684	1038.0	268.0	346	0	4069
Oligochaeta	--	294	742.2	191.6	0	0	2770
Hirudinea	--	17	39.4	10.2	0	0	130
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	6	22.4	5.8	0	0	87
Hyalellidae	--	3	11.2	2.9	0	0	43
Diplostraca	--	9	24.3	6.3	0	0	87
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	--	78	105.0	27.1	43	0	346
Gastropoda - unid	--	3	11.2	2.9	0	0	43
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	22.4	5.8	0	0	87
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	--	416	751.1	193.9	130	0	2813
Non-Insecta (%)	61	--	--	--	--	--	--
Oligochaeta	--	294	742.2	191.6	0	0	2770
Oligochaeta (%)	43	--	--	--	--	--	--
Amphipoda	--	9	24.3	6.3	0	0	87
Amphipoda (%)	1	--	--	--	--	--	--
Bivalvia	--	78	105.0	27.1	43	0	346
Bivalvia (%)	11	--	--	--	--	--	--
Gastropoda	--	9	24.3	6.3	0	0	87
Gastopoda (%)	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 6.5-3. - continued -

	Notigi Lake						
	Nearshore n=15						
	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)	--	3	11.2	2.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	11.2	2.9	0	0	43
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	--	55	79.2	20.5	43	0	216
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 6.5-3. - continued -

	Notigi Lake						
	Nearshore n=15						
	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	0.0	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)	--	9	24.3	6.3	0	0	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)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	66	113.2	29.2	0	0	346
Orthocladiinae	--	17	27.4	7.1	0	0	87
Tanypodinae	--	110	263.2	68.0	43	0	1039
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	--	3	11.2	2.9	0	0	43
Tipulidae (larva)	--	0	0.0	0.0	0	0	0

Table 6.5-3. - continued -

	Notigi Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	268	336.1	86.8	216	0	1255
Insecta (%)	39	--	--	--	--	--	--
Chironomidae	--	196	336.4	86.9	87	0	1255
Chironomidae (%)	29	--	--	--	--	--	--
Ephemeroptera	--	58	79.6	20.5	43	0	216
Ephemeroptera (%)	8	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	58	79.6	20.5	43	0	216
EPT (%)	8	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.34	0.703	0.182	0.00	0.00	2.50
Genus analysis of Ephemeroptera	2 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	1	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	3	2.0	0.5	3	0	8
Simpson's Diversity Index (D)	--	0.51	0.312	0.080	0.53	0.00	0.85
Evenness (Simpson's Equitability E_D)	--	0.74	0.280	0.072	0.77	0.00	1.02
Shannon-Weaver Index (H)	--	1.00	0.700	0.181	0.90	0.00	2.07
Evenness (Shannon's Equitability E_H)	--	0.68	0.381	0.098	0.83	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	3	2.2	0.6	2	1	8
Evenness ($E^{H'}$/S)	--	0.80	0.265	0.069	0.87	0.00	1.00

Table 6.5-3. - continued -

	Notigi Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	517	710.4	183.4	303	0	2813
Oligochaeta	--	372	607.0	156.7	87	0	2207
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	49	108.4	28.0	0	0	390
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	--	6	15.2	3.9	0	0	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	--	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	--	427	628.7	162.3	173	0	2381
Non-Insecta (%)	83	--	--	--	--	--	--
Oligochaeta	--	372	607.0	156.7	87	0	2207
Oligochaeta (%)	72	--	--	--	--	--	--
Amphipoda	--	49	108.4	28.0	0	0	390
Amphipoda (%)	9	--	--	--	--	--	--
Bivalvia	--	6	15.2	3.9	0	0	43
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	--	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 6.5-3. - continued -

	Notigi Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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

Table 6.5-3. - continued -

	Notigi Lake						
	Offshore n=15						
	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	0.0	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	11.2	2.9	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	52	99.8	25.8	0	0	303
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	35	61.6	15.9	0	0	173
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 6.5-3. - continued -

	Notigi Lake						
	Offshore n=15						
	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	--	89	127.2	32.8	43	0	433
Insecta (%)	17	--	--	--	--	--	--
Chironomidae	--	87	128.8	33.3	43	0	433
Chironomidae (%)	17	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	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	0.0	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	1	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	5	2	0.9	0.2	2	0	3
Simpson's Diversity Index (D)	--	0.31	0.249	0.064	0.37	0.00	0.72
Evenness (Simpson's Equitability E_D)	--	0.80	0.301	0.078	0.96	0.00	1.02
Shannon-Weaver Index (H)	--	0.49	0.409	0.106	0.64	0.00	1.33
Evenness (Shannon's Equitability E_H)	--	0.55	0.436	0.113	0.55	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	2	0.8	0.2	2	1	4
Evenness ($E^{H'}$/S)	--	0.84	0.279	0.072	0.98	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, 2009.

	Threepoint Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	886	598.1	154.4	909	0	2121
Oligochaeta	--	12	34.6	8.9	0	0	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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	441	476.2	122.9	303	0	1688
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	3	11.2	2.9	0	0	43
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	--	173	174.7	45.1	130	0	649
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	11.2	2.9	0	0	43
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	--	632	504.4	130.2	563	0	1731
Non-Insecta (%)	71	--	--	--	--	--	--
Oligochaeta	--	12	34.6	8.9	0	0	130
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	441	476.2	122.9	303	0	1688
Amphipoda (%)	50	--	--	--	--	--	--
Bivalvia	--	173	174.7	45.1	130	0	649
Bivalvia (%)	20	--	--	--	--	--	--
Gastropoda	--	3	11.2	2.9	0	0	43
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	9	17.9	4.6	0	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

Table 6.5-4. - continued -

	Threepoint Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	150	181.3	46.8	130	0	693
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

Table 6.5-4. - continued -

	Threepoint Lake						
	Nearshore n=15						
	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	0.0	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	15.2	3.9	0	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)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	6	15.2	3.9	0	0	43
Orthocladiinae	--	3	11.2	2.9	0	0	43
Tanypodinae	--	78	65.8	17.0	87	0	173
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

Table 6.5-4. - continued -

	Threepoint Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	--	254	227.2	58.7	173	0	866
Insecta (%)	29	--	--	--	--	--	--
Chironomidae	--	89	77.5	20.0	87	0	260
Chironomidae (%)	10	--	--	--	--	--	--
Ephemeroptera	--	150	181.3	46.8	130	0	693
Ephemeroptera (%)	17	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	150	181.3	46.8	130	0	693
EPT (%)	17	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.38	1.655	0.427	1.00	0.00	5.33
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	2	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	9	4	1.8	0.5	4	0	6
Simpson's Diversity Index (D)	--	0.50	0.244	0.063	0.57	0.00	0.76
Evenness (Simpson's Equitability E_D)	--	0.52	0.271	0.070	0.54	0.00	0.83
Shannon-Weaver Index (H)	--	0.96	0.481	0.124	1.09	0.00	1.53
Evenness (Shannon’s Equitability E_H)	--	0.65	0.297	0.077	0.69	0.00	0.92
Hill's Effective Richness ($E^{H'}$)	--	3	1.1	0.3	3	1	5
Evenness ($E^{H'}$/S)	--	0.62	0.290	0.075	0.67	0.00	0.90

Table 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	303	471.3	121.7	216	0	1904
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	115	182.7	47.2	43	0	736
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	--	35	63.8	16.5	0	0	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	--	150	233.6	60.3	87	0	952
Non-Insecta (%)	50	--	--	--	--	--	--
Oligochaeta	--	0	0.0	0.0	0	0	0
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	115	182.7	47.2	43	0	736
Amphipoda (%)	38	--	--	--	--	--	--
Bivalvia	--	35	63.8	16.5	0	0	216
Bivalvia (%)	11	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	9	33.5	8.7	0	0	130
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 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	52	82.1	21.2	0	0	260
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 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=15						
	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)	--	6	22.4	5.8	0	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	9	33.5	8.7	0	0	130
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	78	113.6	29.3	43	0	433
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 6.5-4. - continued -

	Threepoint Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	153	242.6	62.6	87	0	952
Insecta (%)	50	--	--	--	--	--	--
Chironomidae	--	87	143.6	37.1	43	0	563
Chironomidae (%)	29	--	--	--	--	--	--
Ephemeroptera	--	52	82.1	21.2	0	0	260
Ephemeroptera (%)	17	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	52	82.1	21.2	0	0	260
EPT (%)	17	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.31	0.615	0.159	0.00	0.00	2.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	3	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	2	1.6	0.4	2	0	5
Simpson's Diversity Index (D)	--	0.44	0.292	0.075	0.50	0.00	0.76
Evenness (Simpson's Equitability E_D)	--	0.74	0.393	0.101	0.90	0.00	1.02
Shannon-Weaver Index (H)	--	0.73	0.543	0.140	0.69	0.00	1.59
Evenness (Shannon's Equitability E_H)	--	0.70	0.438	0.113	0.92	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	2	1.2	0.3	2	1	5
Evenness ($E^{H'}$/S)	--	0.76	0.397	0.103	0.95	0.00	1.00

Table 6.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Apussigamasi Lake within the Churchill River Diversion Region for CAMPP, 2009.

	Apussagamasi Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	594	411.1	106.1	563	43	1342
Oligochaeta	--	14	26.7	6.9	0	0	87
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	274	230.6	59.5	216	0	736
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	3	11.2	2.9	0	0	43
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	15.2	3.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	49	60.9	15.7	0	0	173
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	11.2	2.9	0	0	43
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	--	349	272.5	70.4	346	0	822
Non-Insecta (%)	59	--	--	--	--	--	--
Oligochaeta	--	14	26.7	6.9	0	0	87
Oligochaeta (%)	2	--	--	--	--	--	--
Amphipoda	--	274	230.6	59.5	216	0	736
Amphipoda (%)	46	--	--	--	--	--	--
Bivalvia	--	49	60.9	15.7	0	0	173
Bivalvia (%)	8	--	--	--	--	--	--
Gastropoda	--	3	11.2	2.9	0	0	43
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 6.5-5. - continued -

	Apussagamasi Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	118	110.3	28.5	87	0	390
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

Table 6.5-5. - continued -

	Apussagamasi Lake						
	Nearshore n=15						
	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	0.0	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	19.8	5.1	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)	--	6	15.2	3.9	0	0	43
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	6	15.2	3.9	0	0	43
Chironomidae (adult)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	6	22.4	5.8	0	0	87
Chironominae	--	61	69.0	17.8	43	0	216
Orthocladiinae	--	9	33.5	8.7	0	0	130
Tanypodinae	--	23	32.2	8.3	0	0	87
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	156.6	40.4	216	43	563

Table 6.5-5. - continued -

	Apussagamasi Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta (%)	41	--	--	--	--	--	--
Chironomidae	--	104	92.3	23.8	87	0	303
Chironomidae (%)	17	--	--	--	--	--	--
Ephemeroptera	--	118	110.3	28.5	87	0	390
Ephemeroptera (%)	20	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	19.8	5.1	0	0	43
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	130	115.7	29.9	130	0	390
EPT (%)	22	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.74	0.793	0.205	0.60	0.00	2.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	4	1.6	0.4	4	1	6
Simpson's Diversity Index (D)	--	0.59	0.200	0.052	0.63	0.00	0.80
Evenness (Simpson's Equitability E_D)	--	0.71	0.181	0.047	0.67	0.45	1.01
Shannon-Weaver Index (H)	--	1.14	0.485	0.125	1.24	0.00	1.81
Evenness (Shannon’s Equitability E_H)	--	0.79	0.233	0.060	0.84	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	3	1.4	0.4	3	1	6
Evenness ($E^{H'}$/S)	--	0.81	0.127	0.033	0.80	0.61	1.00

Table 6.5-5. - continued -

	Apussigamasi Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1728	774.5	200.0	1515	909	3506
Oligochaeta	--	3	11.2	2.9	0	0	43
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	955	343.7	88.7	952	346	1515
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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	545	865.9	223.6	216	43	3160
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	--	1506	786.1	203.0	1298	649	3506
Non-Insecta (%)	87	--	--	--	--	--	--
Oligochaeta	--	3	11.2	2.9	0	0	43
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	955	343.7	88.7	952	346	1515
Amphipoda (%)	55	--	--	--	--	--	--
Bivalvia	--	545	865.9	223.6	216	43	3160
Bivalvia (%)	32	--	--	--	--	--	--
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	--	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

Table 6.5-5. - continued -

	Apussigamasi Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	50.9	13.1	43	0	130
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 -

	Apussigamasi Lake						
	Offshore n=15						
	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)	--	6	15.2	3.9	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)	--	6	15.2	3.9	0	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)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	113	95.1	24.6	87	0	346
Orthocladiinae	--	17	31.9	8.2	0	0	87
Tanypodinae	--	20	27.7	7.2	0	0	87
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	--	222	134.8	34.8	260	0	433
Insecta (%)	13	--	--	--	--	--	--

Table 6.5-5. - continued -

	Apussigamasi Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	153	100.7	26.0	130	0	346
Chironomidae (%)	9	--	--	--	--	--	--
Ephemeroptera	--	58	50.9	13.1	43	0	130
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	6	15.2	3.9	0	0	43
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	63	51	13	43	0	130
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.41	0.401	0.104	0.25	0.00	1.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	4	1.1	0.3	4	2	6
Simpson's Diversity Index (D)	--	0.46	0.129	0.033	0.51	0.18	0.66
Evenness (Simpson's Equitability E_D)	--	0.45	0.139	0.036	0.41	0.29	0.71
Shannon-Weaver Index (H)	--	0.91	0.272	0.070	0.98	0.32	1.30
Evenness (Shannon's Equitability E_H)	--	0.61	0.103	0.027	0.61	0.40	0.81
Hill's Effective Richness ($E^{H'}$)	--	3	0.6	0.2	3	1	4
Evenness ($E^{H'}$/S)	--	0.57	0.124	0.032	0.55	0.44	0.79

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, 2009.

	Leftrook Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3431	1980.2	511.3	2943	563	7185
Oligochaeta	--	69	109.5	28.3	0	0	346
Hirudinea	--	9	17.9	4.6	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	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	--	1740	1284.4	331.6	1472	0	4328
Gastropoda - unid	--	3	11.2	2.9	0	0	43
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	--	14	31.3	8.1	0	0	87
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	--	1835	1364.1	352.2	1515	130	4588
Non-Insecta (%)	53	--	--	--	--	--	--
Oligochaeta	--	69	109.5	28.3	0	0	346
Oligochaeta (%)	2	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	1740	1284.4	331.6	1472	0	4328
Bivalvia (%)	51	--	--	--	--	--	--
Gastropoda	--	17	31.9	8.2	0	0	87
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	3	11.2	2.9	0	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

Table 6.5-6. - continued -

	Leftrook Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	3	11.2	2.9	0	0	43
Corixidae (adult)	--	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	--	211	157.6	40.7	216	0	606
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 6.5-6. - continued -

	Leftrook Lake						
	Nearshore n=15						
	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	0.0	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	15.2	3.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	886	438.9	113.3	779	216	1904
Orthocladiinae	--	3	11.2	2.9	0	0	43
Tanypodinae	--	485	342.8	88.5	390	87	1385
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 6.5-6. - continued -

	Leftrook Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	1596	748.4	193.2	1385	433	3506
Insecta (%)	47	--	--	--	--	--	--
Chironomidae	--	1379	720.0	185.9	1169	433	3289
Chironomidae (%)	40	--	--	--	--	--	--
Ephemeroptera	--	211	157.6	40.7	216	0	606
Ephemeroptera (%)	6	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	211	157.6	40.7	216	0	606
EPT (%)	6	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.17	0.149	0.039	0.12	0.00	0.47
Genus analysis of Ephemeroptera				1 sp. (*Hexagenia*)			
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	4	1.1	0.3	4	2	6
Simpson's Diversity Index (D)	--	0.63	0.065	0.017	0.64	0.52	0.72
Evenness (Simpson's Equitability E_D)	--	0.58	0.163	0.042	0.52	0.37	0.90
Shannon-Weaver Index (H)	--	1.19	0.132	0.034	1.21	0.93	1.37
Evenness (Shannon's Equitability E_H)	--	0.75	0.103	0.027	0.70	0.63	0.96
Hill's Effective Richness ($E^{H'}$)	--	3	0.4	0.1	3	3	4
Evenness ($E^{H'}$/S)	--	0.68	0.135	0.035	0.64	0.52	0.95

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3261	1282.5	331.1	3246	1645	5324
Oligochaeta	--	485	243.9	63.0	519	87	822
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
Crangonycitidae	--	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	11.2	2.9	0	0	43
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	--	1627	921.3	237.9	1428	303	3463
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	17.9	4.6	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	--	2124	1048.3	270.7	1991	476	3939
Non-Insecta (%)	65	--	--	--	--	--	--
Oligochaeta	--	485	243.9	63.0	519	87	822
Oligochaeta (%)	15	--	--	--	--	--	--
Amphipoda	--	3	11.2	2.9	0	0	43
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	1627	921.3	237.9	1428	303	3463
Bivalvia (%)	50	--	--	--	--	--	--
Gastropoda	--	9	17.9	4.6	0	0	43
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

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	24.3	6.3	0	0	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

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	918	384.4	99.3	822	390	1601
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	205	142.1	36.7	173	0	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	--	1137	440.0	113.6	1125	519	1991
Insecta (%)	35	--	--	--	--	--	--

Table 6.5-6. - continued -

	Leftrook Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	1128	426.7	110.2	1125	519	1948
Chironomidae (%)	35	--	--	--	--	--	--
Ephemeroptera	--	9	24.3	6.3	0	0	87
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	--	9	24.3	6.3	0	0	87
EPT (%)	0	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.01	0.015	0.004	0.00	0.00	0.05
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	3	0.5	0.1	3	3	4
Simpson's Diversity Index (D)	--	0.61	0.074	0.019	0.65	0.49	0.72
Evenness (Simpson's Equitability E_D)	--	0.60	0.134	0.035	0.60	0.42	0.90
Shannon-Weaver Index (H)	--	1.12	0.141	0.036	1.15	0.89	1.33
Evenness (Shannon's Equitability E_H)	--	0.76	0.098	0.025	0.77	0.63	0.96
Hill's Effective Richness ($E^{H'}$)	--	3	0.4	0.1	3	2	4
Evenness ($E^{H'}$/S)	--	0.70	0.113	0.029	0.71	0.56	0.95

Table 6.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Churchill River Diversion Region waterbodies, 2009.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Notigi Lake	GN-06	14	477660	6199351	10-Aug-09	17.92	15.7	4.4	18.0
Notigi Lake	GN-09	14	475259	6196757	10-Aug-09	17.73	5.5	11.7	18.0
Notigi Lake	GN-14	14	473053	6198140	11-Aug-09	23.25	5.1	5	18.0
Notigi Lake	GN-15	14	471340	6196839	11-Aug-09	23.75	4.6	2.8	19.0
Notigi Lake	GN-16	14	474402	6193182	13-Aug-09	22.92	6.4	1.9	18.0
Notigi Lake	GN-19	14	475507	6194289	12-Aug-09	23.08	3.4	3.8	19.0
Notigi Lake	GN-21	14	478036	6193176	14-Aug-09	23.00	4.2	5.8	17.0
Notigi Lake	GN-22	14	478529	6193107	14-Aug-09	22.58	23	24	17.0
Notigi Lake	GN-23	14	476396	6192984	13-Aug-09	23.50	1.9	1.6	19.0
Notigi Lake	GN-24	14	476058	6195573	12-Aug-09	22.80	20.2	22.3	17.0
Notigi Lake	SN-15	14	471340	6196839	11-Aug-09	23.75	4.6	2.8	19.0
Notigi Lake	SN-23	14	476396	6192984	13-Aug-09	23.50	1.9	1.6	19.0
Notigi Lake	SN-24	14	476058	6195573	12-Aug-09	22.80	20.2	22.3	17.0
Threepoint Lake	GN-01	14	504524	6175533	18-Aug-09	22.17	4.1	3.4	15.0
Threepoint Lake	GN-02	14	503777	6173256	16-Aug-09	48.25	3.8	0.9	16.0
Threepoint Lake	GN-04	14	501692	6174036	16-Aug-09	47.67	5.8	5.9	16.0
Threepoint Lake	GN-05	14	501586	6174659	15-Aug-09	21.22	6.2	6.1	17.0
Threepoint Lake	GN-06	14	500052	6174858	15-Aug-09	21.75	4.5	1.7	16.0
Threepoint Lake	GN-13	14	508609	6170673	19-Aug-09	23.50	2.4	3.9	15.0
Threepoint Lake	GN-15	14	507000	6169388	19-Aug-09	22.87	4.4	3.2	14.0
Threepoint Lake	GN-16	14	507537	6169677	19-Aug-09	23.67	4.8	4.5	15.0
Threepoint Lake	GN-17	14	505944	6174769	18-Aug-09	22.38	4.1	3.6	15.0
Threepoint Lake	SN-02	14	503911	6173274	19-Aug-09	48.25	3.8	0.9	16.0
Threepoint Lake	SN-15	14	506862	6169370	19-Aug-09	22.87	4.4	3.2	14.0
Threepoint Lake	SN-16	14	507503	6169809	19-Aug-09	23.67	4.8	4.5	15.0

Table 6.6-1. - continued -

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Apussigamasi Lake	GN01	14	582102	6186932	30-Aug-09	22.50	4.3	4.2	15.0
Apussigamasi Lake	GN02	14	582543	6186771	30-Aug-09	23.00	6.5	7.7	15.0
Apussigamasi Lake	GN03	14	589045	6191129	31-Aug-09	25.25	4.4	6.3	15.0
Apussigamasi Lake	GN04	14	589079	6190616	31-Aug-09	25.67	4.1	4.4	15.0
Apussigamasi Lake	GN05	14	587271	6189353	1-Sep-09	24.25	4.2	4	16.0
Apussigamasi Lake	GN06	14	587191	6188491	1-Sep-09	25.50	4.4	4.3	16.0
Apussigamasi Lake	GN07	14	585096	6188941	1-Sep-09	23.25	3.9	4	16.0
Apussigamasi Lake	GN08	14	584187	6188111	2-Sep-09	24.75	3.9	3.9	15.5
Apussigamasi Lake	GN09	14	583994	6187194	2-Sep-09	25.75	6.3	7.4	15.5
Apussigamasi Lake	SN03	14	589108	6191131	31-Aug-09	25.25	6.2	6.3	15.0
Apussigamasi Lake	SN06	14	587124	6188527	1-Sep-09	25.50	4	4.2	16.0
Apussigamasi Lake	SN09	14	583958	6187130	2-Sep-09	25.75	4.2	4	15.5
Leftrook Lake	GN-01	14	525846	6217158	30-Jul-09	24.82	4	6.3	17.0
Leftrook Lake	GN-02	14	525373	6216074	31-Jul-09	24.82	3.5	2.3	16.0
Leftrook Lake	GN-05	14	523426	6217475	31-Jul-09	23.03	4	2.7	16.0
Leftrook Lake	GN-08	14	524030	6213574	30-Jul-09	25.38	9.8	10.1	17.0
Leftrook Lake	GN-09	14	521582	6213736	30-Jul-09	26.18	4.4	3.6	17.0
Leftrook Lake	GN-10	14	518299	6210078	29-Jul-09	25.25	4.1	6.3	17.0
Leftrook Lake	GN-11	14	519799	6209109	28-Jul-09	22.87	12.7	7.3	17.0
Leftrook Lake	GN-12	14	517146	6213104	28-Jul-09	21.50	5.2	4.7	17.0
Leftrook Lake	GN-13	14	517898	6212949	29-Jul-09	24.73	9.4	8.4	17.0
Leftrook Lake	SN-05	14	523453	6217489	31-Jul-09	23.03	3.9	4	16.0
Leftrook Lake	SN-08	14	524004	6213611	30-Jul-09	25.38	8.8	9.8	17.0
Leftrook Lake	SN-12	14	517142	6213075	28-Jul-09	21.50	4.8	5.2	17.0

Table 6.6-2. Fish species list compiled from CAMPP standard gang and small mesh index gillnetting investigations conducted in Churchill River Diversion Region waterbodies, 2009.

Family	Common Name	Scientific Name	ID Code
Hiodontidae	Goldeye	*Hiodon alosoides*	GOLD
	Mooneye	*Hiodon tergisus*	MOON
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 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
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 waterbodies, 2009.

Species	Notigi Lake		Threepoint Lake		Apussigamasi Lake		Leftrook Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	22	4.73	-	-
Lake Chub	-	-	-	-	2	0.43	-	-
Emerald Shiner	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-
Longnose Sucker	5	1.45	2	0.49	14	3.01	-	-
White Sucker	174	50.58	134	32.60	77	16.56	356	36.22
Shorthead Redhorse	-	-	9	2.19	10	2.15	-	-
Northern Pike	56	16.28	58	14.11	22	4.73	108	10.99
Cisco	13	3.78	7	1.70	15	3.23	44	4.48
Lake Whitefish	4	1.16	9	2.19	41	8.82	118	12.00
Troutperch	-	-	-	-	-	-	-	-
Burbot	12	3.49	3	0.73	4	0.86	3	0.31
Yellow Perch	23	6.69	23	5.60	13	2.80	55	5.60
Sauger	13	3.78	61	14.84	80	17.20	-	-
Walleye	44	12.79	105	25.55	165	35.48	299	30.42
Total	344	100	411	100	465	100	983	100

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

Table 6.6-4. Small mesh index gillnet relative abundance summaries from Churchill River Diversion waterbodies, 2009.

Species	Notigi Lake		Threepoint Lake		Apussigamasi Lake		Leftrook Lake	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	1	0.74	-	-
Mooneye	-	-	-	-	7	5.15	-	-
Lake Chub	-	-	-	-	-	-	-	-
Emerald Shiner	6	5.41	117	32.96	6	4.41	21	6.38
Spottail Shiner	23	20.72	187	52.68	28	20.59	85	25.84
Longnose Sucker	-	-	-	-	-	-	-	-
White Sucker	-	-	-	1.13	-	-	2	0.61
Shorthead Redhorse	-	-	-	-	-	-	-	-
Northern Pike	4	3.60	5	1.41	3	2.21	18	5.47
Cisco	1	0.90	1	0.28	2	1.47	-	-
Lake Whitefish	-	-	-	-	-	-	4	1.22
Troutperch	10	9.01	10	2.82	17	12.50	55	16.72
Burbot	-	-	-	-	-	-	-	-
Yellow Perch	32	28.83	-	-	-	-	1	0.30
Sauger	7	6.31	31	8.73	54	39.71	-	-
Walleye	28	25.23	4	-	18	13.24	143	43.47
Total	111	100	355	100	136	100	329	100

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

Table 6.6-5. Standard gang index gillnet biomass summaries from Churchill River Diversion Region waterbodies, 2009.

Species	Notigi Lake			Threepoint Lake			Apussigamasi Lake			Leftrook Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	22	4358	1.16	-	-	-
Lake Chub	-	-	-	-	-	-	2	226	0.06	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	5	7280	2.87	2	4420	1.60	14	22810	6.07	-	-	-
White Sucker	174	160060	63.06	134	144360	52.25	77	79387	21.14	354	335016	44.30
Shorthead Redhorse	-	-	-	9	9560	3.46	10	9883	2.63	-	-	-
Northern Pike	56	25990	10.24	58	34100	12.34	22	67991	18.10	108	77250	10.21
Cisco	13	6748	2.66	7	3440	1.24	15	6737	1.79	44	15650	2.07
Lake Whitefish	4	9000	3.55	9	8050	2.91	41	68652	18.28	118	166970	22.08
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	12	10885	4.29	3	1710	0.62	4	1435	0.38	3	1990	0.26
Yellow Perch	23	3121	1.23	23	3955	1.43	13	2658	0.71	55	10130	1.34
Sauger	13	3460	1.36	61	11910	4.31	80	13275	3.53	-	-	-
Walleye	44	27260	10.74	105	54806	19.83	165	98181	26.14	299	149290	19.74
Total	344	253804	100	411	276311	100	465	375593	100	981	756296	100

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

Table 6.6-6. Small mesh index gillnet biomass summaries from Churchill River Diversion Region waterbodies, 2009.

Species	Notigi Lake			Threepoint Lake			Apussigamasi Lake			Leftrook Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	1	273	1.45	-	-	-
Mooneye	-	-	-	-	-	-	7	1479	7.87	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	6	25	0.22	117	370	6.52	6	26	0.14	21	63	0.11
Spottail Shiner	23	115	1.00	187	847	14.92	28	122	0.65	85	373	0.66
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	2	1100	1.93
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	4	760	6.58	5	1500	26.42	3	2490	13.25	18	11040	19.42
Cisco	1	400	3.46	1	80	1.41	2	39	0.21	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	4	4960	8.73
Troutperch	10	40	0.35	10	100	1.76	17	123	0.65	55	264	0.46
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	32	470	4.07	-	-	-	-	-	-	1	150	0.26
Sauger	7	820	7.10	31	2180	38.40	54	7585	40.38	-	-	-
Walleye	28	8920	77.23	4	600	10.57	18	6649	35.39	143	38898	68.42
Total	111	11550	100	355	5677	100	136	18786	100	329	56848	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = 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/24 h) set in Churchill River Diversion Region waterbodies, 2009.

Species	Notigi Lake (#site=10)			Threepoint Lake (#site=9)			Apussigamasi Lake (#site=9)			Leftrook Lake (#site=9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	22	2.2	3.21	-	-	-
Lake Chub	-	-	-	-	-	-	2	0.2	0.42	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	5	0.5	0.79	2	0.1	0.18	14	1.4	1.47	-	-	-
White Sucker	174	16.7	15.18	134	12.4	6.63	77	7.5	4.44	356	33.8	18.09
Shorthead Redhorse	-	-	-	9	0.7	1.02	10	1.0	1.38	-	-	-
Northern Pike	56	5.3	5.22	58	5.0	3.33	22	2.1	1.32	108	10.3	3.96
Cisco	13	1.2	2.21	7	0.6	0.78	15	1.4	1.71	44	4.4	5.85
Lake Whitefish	4	0.4	1.17	9	0.7	0.63	41	4.0	4.98	118	11.4	9.60
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	12	1.1	2.37	3	0.3	0.45	4	0.4	0.66	3	0.3	0.63
Yellow Perch	23	2.1	2.91	23	2.2	3.09	13	1.2	1.14	55	5.2	6.15
Sauger	13	1.2	1.42	61	5.5	3.75	80	7.6	3.84	-	-	-
Walleye	44	4.3	5.69	105	8.5	8.58	165	15.6	13.32	299	29.1	16.50
Total	344	32.7	21.91	411	36.0	14.94	465	44.5	19.68	983	94.6	27.18

#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 6.6-8. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Churchill River Diversion Region waterbodies, 2009.

Species	Notigi Lake (#site=3)			Threepoint Lake (#site=3)			Apussigamasi Lake (#site=3)			Leftrook Lake (#site=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Goldeye	-	-	-	-	-	-	1	0.3	0.54	-	-	-
Mooneye	-	-	-	-	-	-	7	2.2	1.96	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	6	2.1	1.77	117	23.9	21.58	6	1.9	2.49	21	7.3	12.63
Spottail Shiner	23	7.8	7.24	187	32.5	49.09	28	8.8	5.20	85	30.0	24.11
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	2	0.7	0.57
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	4	1.4	1.18	5	1.4	1.56	3	0.9	0.94	18	6.2	1.89
Cisco	1	0.4	0.61	1	0.3	0.61	2	0.6	1.09	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	4	1.3	1.44
Troutperch	10	3.4	3.59	10	2.9	2.79	17	5.3	1.42	55	18.9	5.72
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	32	10.8	15.29	-	-	-	-	-	-	1	0.3	0.61
Sauger	7	2.4	3.29	31	10.0	12.49	54	16.9	5.20	-	-	-
Walleye	28	9.5	10.93	4	1.4	2.34	18	5.6	3.34	143	49.5	12.31
Total	111	37.6	31.00	355	72.3	61.82	136	42.6	5.87	329	114.3	23.83

#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 6.6-9. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Churchill River Diversion Region waterbodies, 2009.

Species	Notigi Lake (#site=10)			Threepoint Lake (#site=9)			Apussigamasi Lake (#site=9)			Leftrook Lake (#site=9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	22	430	705	-	-	-
Lake Chub	-	-	-	-	-	-	2	23	46	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	5	699	1183	2	215	427	14	2263	2550	-	-	-
White Sucker	174	15431	13053	134	13460	7919	77	7709	4760	354	32172	15289
Shorthead Redhorse	-	-	-	9	737	1058	10	973	1482	-	-	-
Northern Pike	56	2443	2180	58	2975	2513	22	6547	4748	108	7481	2798
Cisco	13	642	1267	7	314	430	15	632	844	44	1472	6221
Lake Whitefish	4	829	2621	9	699	679	41	6623	7651	118	16472	17582
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	12	1006	2168	3	170	264	4	137	212	3	196	-
Yellow Perch	23	283	386	23	384	521	13	250	208	55	963	407
Sauger	13	313	367	61	1052	683	80	1257	674	-	-	-
Walleye	44	2650	3515	105	4603	5783	165	9282	6101	299	14254	3676
Total	344	24296	14732	411	24610	9639	465	36127	11511	981	73010	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/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 (fish/30 m/24 h) set in Churchill River Diversion Region waterbodies, 2009.

Species	Notigi Lake (#site=3)			Threepoint Lake (#site=3)			Apussigamasi Lake (#site=3)			Leftrook Lake (#site=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Goldeye	-	-	-	-	-	-	1	85	147	-	-	-
Mooneye	-	-	-	-	-	-	7	464	403	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	6	9	6	117	65	95	6	8	12	21	22	38
Spottail Shiner	23	39	41	187	155	201	28	38	24	85	131	108
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	2	359	338
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	4	257	226	5	467	713	3	779	867	18	3796	1797
Cisco	1	140	243	1	28	48	2	12	21	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	4	1576	2378
Troutperch	10	14	12	10	28	29	17	39	2	55	90	25
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	32	159	193	-	-	-	-	-	-	1	52	90
Sauger	7	278	310	31	657	749	54	2376	969	-	-	-
Walleye	28	3014	3256	4	203	351	18	2083	1001	143	13731	7535
Total	111	3909	3588	355	1602	1662	136	5884	2513	329	19757	6247

#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 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, 2009.

Species	Notigi Lake			Threepoint Lake			Apussigamasi Lake			Leftrook Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	56	399	85	58	412	99	22	684	191	108	476	49
Lake Whitefish	4	478	25	9	359	99	41	447	59	118	440	50
Walleye	44	377	68	105	349	69	165	364	63	299	359	43
Weight (g)												
Northern Pike	56	803	284	58	1326	443	22	3291	1989	108	1052	298
Lake Whitefish	4	2250	459	9	827	178	41	1656	837	118	1404	410
Walleye	44	744	238	105	533	287	165	687	359	299	573	157
Condition Factor (K)												
Northern Pike	56	0.64	0.09	58	0.68	0.10	22	0.80	0.09	108	0.60	0.07
Lake Whitefish	4	2.00	0.18	9	1.60	0.11	41	1.80	0.18	118	1.60	0.14
Walleye	44	1.08	0.12	105	1.10	0.15	165	1.11	0.10	299	1.03	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 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, 2009.

Species	Notigi Lake			Threepoint Lake			Apussigamasi Lake			Leftrook Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
Northern Pike	4	-	-	5	-	-	3	472	128	18	453	47
Lake Whitefish	-	-	-	-	-	-	-	-	-	4	413	73
Walleye	28	-	-	4	-	-	14	343	49	94	325	68
Weight (g)												
Northern Pike	4	-	-	5	-	-	3	830	645	18	613	166
Lake Whitefish	-	-	-	-	-	-	-	-	-	4	1240	568
Walleye	28	-	-	4	-	-	15	440	209	94	402	175
Condition Factor (K)												
Northern Pike	4	-	-	5	-	-	3	0.68	0.02	18	0.65	0.07
Lake Whitefish	-	-	-	-	-	-	-	-	-	4	1.62	0.17
Walleye	28	-	-	4	-	-	14	1.10	0.08	94	1.04	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 6.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009.

Age	Year-Class	Notigi L		Threepoint L		Apussigamasi L		Leftrook L	
		n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-
2	2007	4	7.14	1	1.72	2	10.00	2	1.85
3	2006	18	32.14	12	20.69	1	5.00	4	3.70
4	2005	16	28.57	20	34.48	1	5.00	10	9.26
5	2004	7	12.50	6	10.34	1	5.00	31	28.70
6	2003	4	7.14	5	8.62	-	-	25	23.15
7	2002	1	1.79	5	8.62	4	20.00	22	20.37
8	2001	4	7.14	5	8.62	2	10.00	4	3.70
9	2000	2	3.57	1	1.72	3	15.00	8	7.41
10	1999	-	-	2	3.45	3	15.00	1	0.93
11	1998	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	1	5.00	1	0.93
13	1996	-	-	1	1.72	1	5.00	-	-
14	1995	-	-	-	-	1	5.00	-	-
Total		56	100	58	100	20	100	108	100

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

Table 6.6-14. Age/year-class frequency distributions (%) for Lake Whitefish captured in standard index gill nets set in Churchill River Diversion Region waterbodies, 2009.

Age	Year-Class	Notigi L		Threepoint L		Apussigamasi L		Leftrook L	
		n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-
3	2006	-	-	1	11.11	-	-	4	3.48
4	2005	-	-	2	22.22	3	7.89	4	3.48
5	2004	-	-	-	-	2	5.26	-	-
6	2003	-	-	1	11.11	4	10.53	5	4.35
7	2002	-	-	-	-	1	2.63	5	4.35
8	2001	-	-	1	11.11	-	-	7	6.09
9	2000	-	-	1	11.11	3	7.89	10	8.70
10	1999	-	-	-	-	2	5.26	13	11.30
11	1998	-	-	-	-	2	5.26	-	-
12	1997	-	-	-	-	2	5.26	1	0.87
13	1996	1	25.00	-	-	1	2.63	2	1.74
14	1995	1	25.00	-	-	3	7.89	5	4.35
15	1994	2	50.00	2	22.22	2	5.26	13	11.30
16	1993	-	-	-	-	4	10.53	11	9.57
17	1992	-	-	-	-	-	-	2	1.74
18	1991	-	-	-	-	3	7.89	5	4.35
19	1990	-	-	-	-	-	-	2	1.74
20	1989	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	6	5.22
22	1987	-	-	-	-	-	-	5	4.35
23	1986	-	-	-	-	-	-	5	4.35
24	1985	-	-	-	-	-	-	3	2.61
25	1984	-	-	-	-	-	-	1	0.87
26	1983	-	-	-	-	1	2.63	6	5.22
27	1982	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	3	7.89	-	-
29	1980	-	-	-	-	1	2.63	-	-
30	1979	-	-	1	11.11	-	-	-	-
31	1978	-	-	-	-	-	-	-	-
32	1977	-	-	-	-	-	-	-	-
33	1976	-	-	-	-	1	2.63	-	-
Total		4	100	9	100	38	100	115	100

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

Table 6.6-15. Age/year-class frequency distributions (%) for Walleye captured in standard index gill nets set in Churchill River Diversion Region waterbodies, 2009.

Age	Year-Class	Notigi L		Threepoint L		Apussigamasi L		Leftrook L	
		n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	2	1.22	1	0.34
4	2005	3	6.98	3	3.06	7	4.27	9	3.04
5	2004	5	11.63	10	10.20	5	3.05	11	3.72
6	2003	6	13.95	6	6.12	3	1.83	3	1.01
7	2002	4	9.30	6	6.12	10	6.10	16	5.41
8	2001	9	20.93	12	12.24	25	15.24	58	19.59
9	2000	6	13.95	11	11.22	16	9.76	28	9.46
10	1999	6	13.95	3	3.06	9	5.49	26	8.78
11	1998	1	2.33	8	8.16	11	6.71	17	5.74
12	1997	1	2.33	10	10.20	14	8.54	28	9.46
13	1996	1	2.33	9	9.18	13	7.93	17	5.74
14	1995	1	2.33	7	7.14	20	12.20	16	5.41
15	1994	-	-	6	6.12	16	9.76	15	5.07
16	1993	-	-	3	3.06	1	0.61	14	4.73
17	1992	-	-	-	-	1	0.61	1	0.34
18	1991	-	-	-	-	2	1.22	4	1.35
19	1990	-	-	-	-	5	3.05	7	2.36
20	1989	-	-	4	4.08	3	1.83	3	1.01
21	1988	-	-	-	-	1	0.61	14	4.73
22	1987	-	-	-	-	-	-	3	1.01
23	1986	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	1	0.34
25	1984	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	2	0.68
27	1982	-	-			-	-	1	0.34
28	1981	-	-	-	-	-	-	1	0.34
Total		43	100	98	100	164	100	296	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, 2009.

Age	Year-Class	Notigi Lake									Threepoint 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	4	284	19	4	150	54	4	0.65	0.22	1	270	-	1	100	-	1	0.51	-
3	2006	18	341	27	18	266	80	18	0.65	0.10	12	315	27	12	228	62	12	0.72	0.10
4	2005	16	386	31	16	378	77	16	0.65	0.06	20	369	31	20	322	76	20	0.63	0.07
5	2004	7	441	49	7	539	150	7	0.62	0.05	6	402	23	6	403	63	6	0.62	0.06
6	2003	4	479	30	4	623	80	4	0.57	0.04	5	461	30	5	658	158	5	0.67	0.10
7	2002	1	487	-	1	770	-	1	0.67	-	5	515	48	5	1016	533	5	0.70	0.16
8	2001	4	579	37	4	1333	396	4	0.67	0.09	5	535	32	5	1176	269	5	0.76	0.07
9	2000	2	559	40	2	1100	311	2	0.62	0.04	1	675	-	1	2400	-	1	0.78	-
10	1999	-	-	-	-	-	-	-	-	-	2	582	1	2	1425	247	2	0.73	0.13
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	1	681	-	1	2910	-	1	0.92	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	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 6.6-16. - continued -

Age	Year-Class	Apussigamasi Lake FL (mm)			Apussigamasi Lake W (g)			Apussigamasi Lake K			Leftrook L FL (mm)			Leftrook L W (g)			Leftrook L K		
		n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	2	312	19	2	202	66	2	0.66	0.09	2	341	4	2	260	14	2	0.66	0.01
3	2006	1	396	-	1	348	-	1	0.56	-	4	376	36	4	405	131	4	0.75	0.07
4	2005	1	426	-	1	500	-	1	0.65	-	10	444	27	10	597	71	10	0.68	0.05
5	2004	1	545	-	1	1100	-	1	0.68	-	31	465	26	31	660	97	31	0.66	0.06
6	2003	-	-	-	-	-	-	-	-	-	25	480	20	25	694	75	25	0.63	0.07
7	2002	4	665	96	4	2290	1100	4	0.74	0.03	22	496	37	22	780	182	22	0.63	0.06
8	2001	2	736	68	2	3225	771	2	0.80	0.03	4	496	34	4	765	132	4	0.62	0.02
9	2000	3	802	35	3	4160	763	3	0.80	0.05	8	550	59	8	1164	526	8	0.66	0.09
10	1999	3	861	29	3	4993	240	3	0.78	0.05	1	548	-	1	790	-	1	0.48	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	1	796	-	1	4540	-	1	0.90	-	-	-	-	-	-	-	-	-	-
13	1996	1	990	-	1	7880	-	1	0.81	-	1	562	-	1	1000	-	1	0.56	-
14	1995	1	838	-	1	5230	-	1	0.89	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

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

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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, 2009.

Age	Year-Class	Notigi 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	1	178	-	1	100	-	1	1.77	-
4	2005	-	-	-	-	-	-	-	-	-	2	279	92	2	355	65	2	1.63	0.04
5	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	2003	-	-	-	-	-		-	-	-	1	336	-	1	600	-	1	1.58	-
7	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	2001	-	-	-	-	-	-	-	-	-	1	388	-	1	980	-	1	1.68	-
9	2000	-	-	-	-	-	-	-	-	-	1	436	-	1	1320	-	1	1.59	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	1	450	-	1	1810	-	1	1.99	-	-	-	-	-	-	-	-	-	-
14	1995	1	469	-	1	1900	-	1	1.84	-	-	-	-	-	-	-	-	-	-
15	1994	2	497	16	2	2645	64	2	2.17	-	2	433	32	2	1410	310	2	1.72	0.16
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	1979	-	-	-	-	-	-	-	-	-	1	470	-	1	1520	-	1	1.46	-

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	Apussigamasi Lake FL (mm)			Apussigamasi Lake W (g)			Apussigamasi Lake K			Leftrook Lake FL (mm)			Leftrook Lake W (g)			Leftrook Lake K		
		n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n	mean	SD
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	4	312	95	4	565	544	4	1.49	0.10
4	2005	3	331	58	3	647	332	3	1.66	0.15	4	338	41	4	628	249	4	1.53	0.17
5	2004	2	408	32	2	1145	177	2	1.70	0.13	-	-	-	-	-	-	-	-	-
6	2003	4	371	34	4	953	299	4	1.81	0.22	5	408	9	5	1060	82	5	1.57	0.13
7	2002	1	402	-	1	1230	-	1	1.89	-	5	396	42	5	1040	308	5	1.62	0.12
8	2001	-	-	-	-	-	-	-	-	-	7	435	11	7	1369	128	7	1.66	0.13
9	2000	3	411	40	3	1275	379	3	1.80	0.01	10	427	21	10	1266	222	10	1.61	0.10
10	1999	2	457	16	2	1820	170	2	1.91	0.03	13	438	8	13	1362	134	13	1.62	0.13
11	1998	2	469	30	2	1765	276	2	1.71	0.06	-	-	-	-	-	-	-	-	-
12	1997	2	492	47	2	2233	1071	2	1.81	0.37	1	445	-	1	1380	-	1	1.57	-
13	1996	1	513	-	1	2430	-	1	1.80	-	2	466	62	2	1515	587	2	1.46	0.00
14	1995	3	458	18	3	1553	155	3	1.62	0.13	5	460	18	5	1526	264	5	1.57	0.23
15	1994	2	445	1	2	1360	71	2	1.55	0.08	13	462	20	13	1583	254	13	1.59	0.11
16	1993	4	497	21	4	2428	264	4	1.98	0.17	11	453	20	11	1510	287	11	1.60	0.11
17	1992	-	-	-	-	-	-	-	-	-	2	472	19	2	1865	290	2	1.77	0.06
18	1991	3	508	38	3	2453	595	3	1.85	0.05	5	463	30	5	1696	369	5	1.69	0.07
19	1990	-	-	-	-	-	-	-	-	-	2	467	54	2	1630	523	2	1.58	0.04
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	6	483	20	6	1692	323	6	1.49	0.15
22	1987	-	-	-	-	-	-	-	-	-	5	477	22	5	1704	280	5	1.56	0.16
23	1986	-	-	-	-	-	-	-	-	-	5	473	26	5	1714	416	5	1.59	0.15
24	1985	-	-	-	-	-	-	-	-	-	3	481	46	3	1867	410	3	1.67	0.11
25	1984	-	-	-	-	-	-	-	-	-	1	476	-	1	2070	-	1	1.92	-
26	1983	1	487	-	1	1520	-	1	1.32	-	6	467	23	6	1515	348	6	1.47	0.15
27	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1981	3	496	14	3	2187	234	3	1.79	0.12	-	-	-	-	-	-	-	-	-
29	1980	1	466	-	1	1700	-	1	1.68	-	-	-	-	-	-	-	-	-	-
30	1979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	1978	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	1977	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	1976	1	445	-	1	1470	-	1	1.67	-	-	-	-	-	-	-	-	-	-

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, 2009.

Age	Year-Class	Notigi 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2005	3	246	19	3	187	31	3	1.27	0.28	3	240	27	3	125	48	3	0.89	0.17
5	2004	5	293	30	5	288	50	5	1.16	0.17	10	230	17	10	132	45	10	1.08	0.34
6	2003	6	347	16	6	413	59	6	0.99	0.06	6	274	31	6	225	113	6	1.03	0.22
7	2002	4	365	27	4	555	147	4	1.12	0.05	6	337	29	6	443	117	6	1.14	0.06
8	2001	9	405	25	9	710	136	9	1.06	0.06	12	317	26	12	357	114	12	1.09	0.12
9	2000	6	401	36	6	702	226	6	1.06	0.07	11	339	33	11	447	147	11	1.11	0.10
10	1999	6	439	32	6	918	197	6	1.07	0.04	3	354	18	3	450	56	3	1.01	0.05
11	1998	1	453	-	1	900	-	1	0.97	-	8	372	43	8	576	210	8	1.08	0.06
12	1997	1	509	-	1	1250	-	1	0.95	-	10	397	46	10	716	292	10	1.10	0.11
13	1996	1	451	-	1	1000	-	1	1.09	-	9	398	40	9	732	204	9	1.13	0.09
14	1995	1	463	-	1	1100	-	1	1.11	-	7	408	14	7	776	91	7	1.14	0.07
15	1994	-	-	-	-	-	-	-	-	-	6	409	37	6	753	225	6	1.07	0.07
16	1993	-	-	-	-	-	-	-	-	-	3	425	32	3	857	215	3	1.11	0.16
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	4	411	32	4	753	92	4	1.10	0.19
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	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. - continued -

Age	Year-Class	Apussigamasi 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	2006	2	209	13	2	93	25	2	1.00	0.08	1	231	-	1	120	-	1	0.97	-
4	2005	7	238	16	7	134	25	7	0.98	0.05	9	236	21	9	133	39	9	0.99	0.07
5	2004	5	241	21	5	147	43	5	1.02	0.03	11	268	17	11	196	44	11	1.00	0.06
6	2003	3	355	33	3	497	121	3	1.10	0.03	3	303	47	3	310	115	3	1.08	0.06
7	2002	10	317	32	10	355	85	10	1.11	0.09	16	338	15	16	407	65	16	1.05	0.07
8	2001	25	330	21	25	399	92	25	1.09	0.08	58	346	19	58	436	72	58	1.04	0.06
9	2000	16	354	35	16	476	150	16	1.04	0.07	28	352	20	28	453	74	28	1.03	0.06
10	1999	9	373	37	9	586	202	9	1.08	0.10	26	365	19	26	501	73	26	1.03	0.08
11	1998	11	363	32	11	567	177	11	1.15	0.13	17	373	24	17	534	99	17	1.02	0.07
12	1997	14	413	58	14	875	396	14	1.17	0.06	28	382	20	28	583	94	28	1.04	0.08
13	1996	13	404	31	13	776	238	13	1.15	0.11	17	374	21	17	568	84	17	1.08	0.10
14	1995	20	399	39	20	758	217	20	1.15	0.08	16	381	18	16	579	80	16	1.04	0.07
15	1994	16	404	45	16	772	277	16	1.14	0.11	15	383	13	15	611	63	15	1.09	0.08
16	1993	1	345	-	1	495	-	1	1.21	-	14	387	23	14	601	89	14	1.04	0.10
17	1992	1	396	-	1	755	-	1	1.22	-	1	395	-	1	600	-	1	0.97	-
18	1991	2	398	21	2	685	35	2	1.10	0.11	4	405	36	4	723	197	4	1.07	0.03
19	1990	5	400	22	5	767	130	5	1.19	0.02	7	401	17	7	619	76	7	0.96	0.04
20	1989	3	471	25	3	1180	148	3	1.12	0.04	3	379	11	3	540	72	3	1.00	0.16
21	1988	1	532	-	1	1890	-	1	1.26	-	14	415	35	14	699	173	14	0.96	0.09
22	1987	-	-	-	-	-	-	-	-	-	3	394	5	3	610	36	3	1.00	0.02
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	1	391	-	1	660	-	1	1.10	-
25	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	-	-	-	2	389	33	2	655	163	2	1.10	0.00
27	1982	-	-	-	-	-	-	-	-	-	1	421	-	1	880	-	1	1.18	-
28	1981	-	-	-	-	-	-	-	-	-	1	470	-	1	950	-	1	0.92	-

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

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

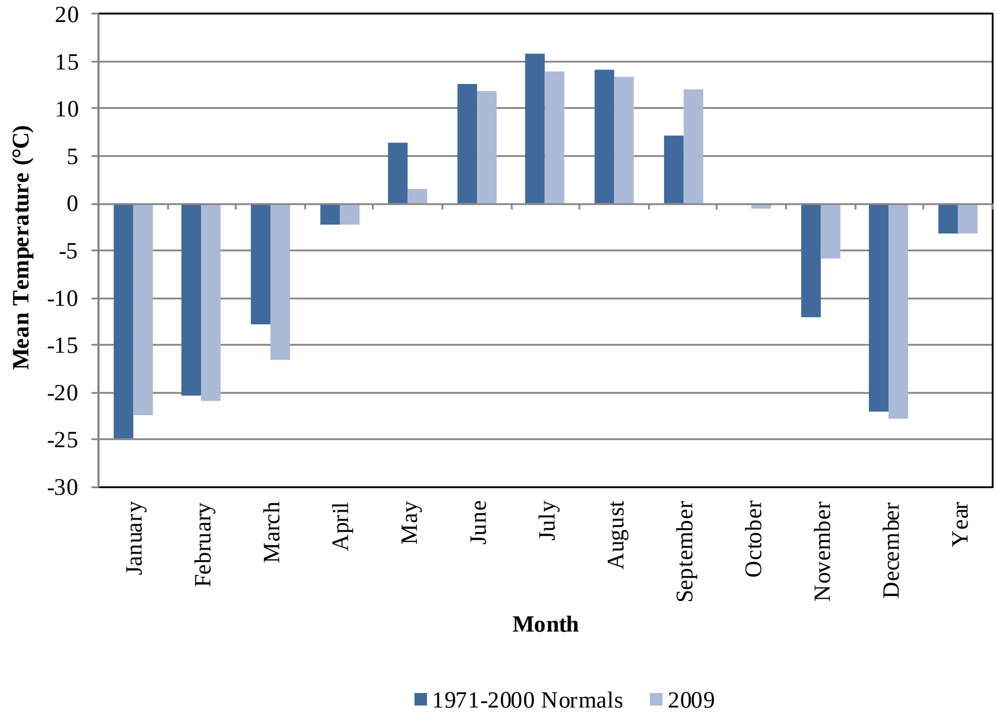
.

Table 6.6-19. Deformities, erosions, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Notigi Lake											
White Sucker	-	-	1	0.57	-	-	-	-	174	1	0.57
Northern Pike	-	-	-	-	-	-	-	-	56	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	4	0	0.00
Walleye	-	-	-	-	-	-	-	-	44	0	0.00
Threepoint Lake											
White Sucker	-	-	-	-	-	-	-	-	221	0	0.00
Northern Pike	1	1.11	-	-	-	-	-	-	90	1	1.11
Lake Whitefish	-	-	-	-	-	-	-	-	11	0	0.00
Walleye	-	-	-	-	-	-	-	-	196	0	0.00
Apussigamasi Lake											
White Sucker	1	1.30	1	1.30	-	-	-	-	77	2	2.60
Northern Pike	-	-	-	-	2	9.09	-	-	22	2	9.09
Lake Whitefish	-	-	-	-	-	-	-	-	41	0	0.00
Walleye	-	-	-	-	2	1.21	4	2.42	165	6	3.64
Leftrook Lake											
White Sucker	3	0.84	-	-	-	-	-	-	356	3	0.84
Northern Pike	3	2.78	-	-	-	-	-	-	108	3	2.78
Lake Whitefish	2	1.69	-	-	-	-	-	-	118	2	1.69
Walleye	1	0.25	-	-	-	-	3	0.74	407	4	0.98

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 ($n_{DELTs}/n_{Inspect}\times100$)

(A)



(B)

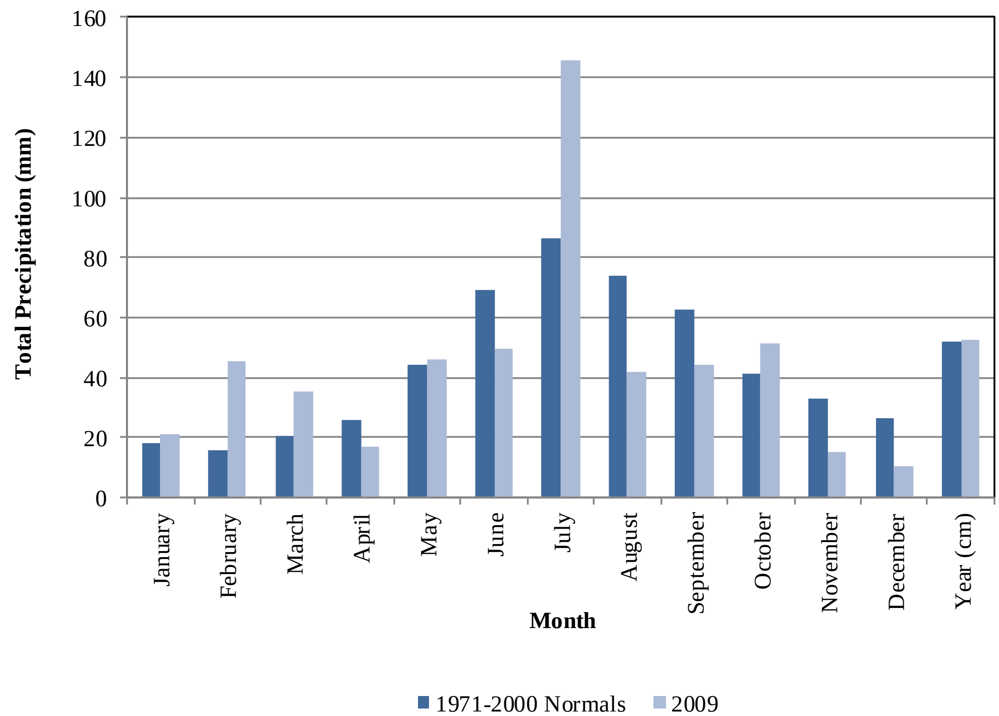


Figure 6.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), Thompson, MB.

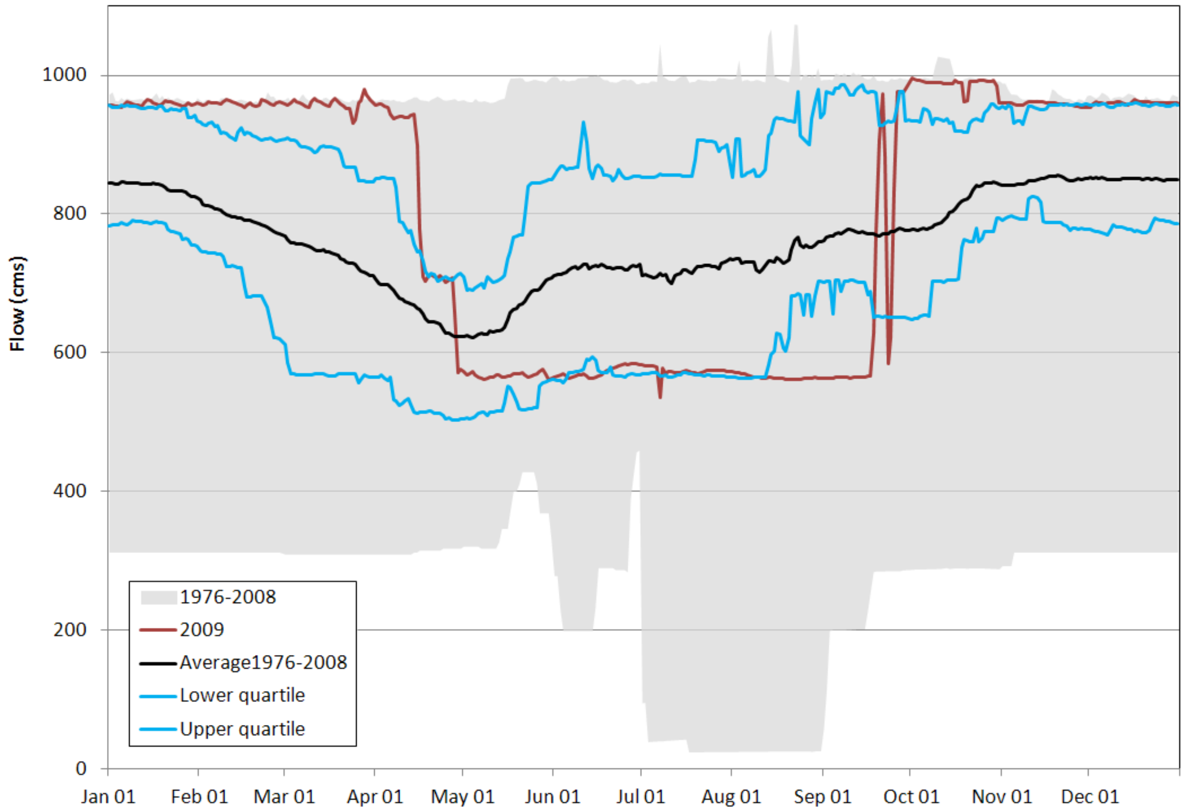


Figure 6.2-1. 2009 Churchill River Diversion flow at the Notigi Control Structure.

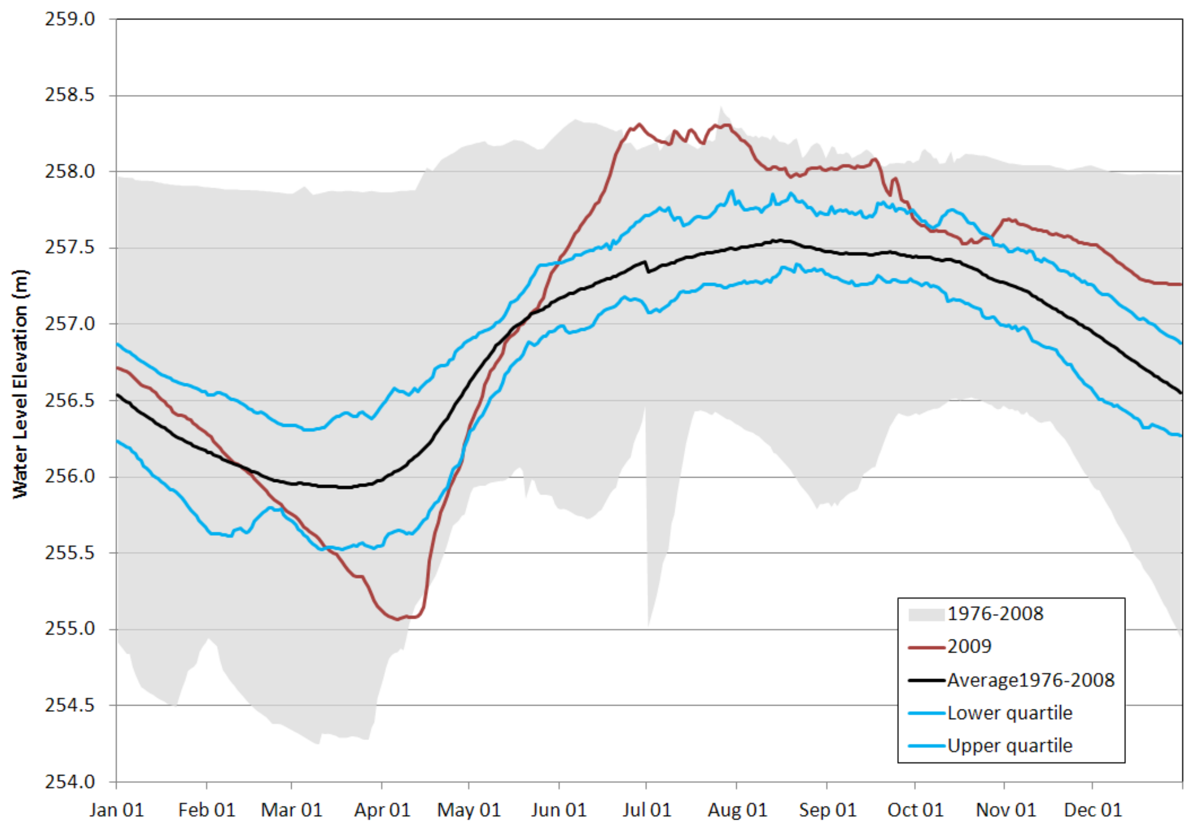


Figure 6.2-2. 2009 Notigi Control Structure Forebay water level elevation.

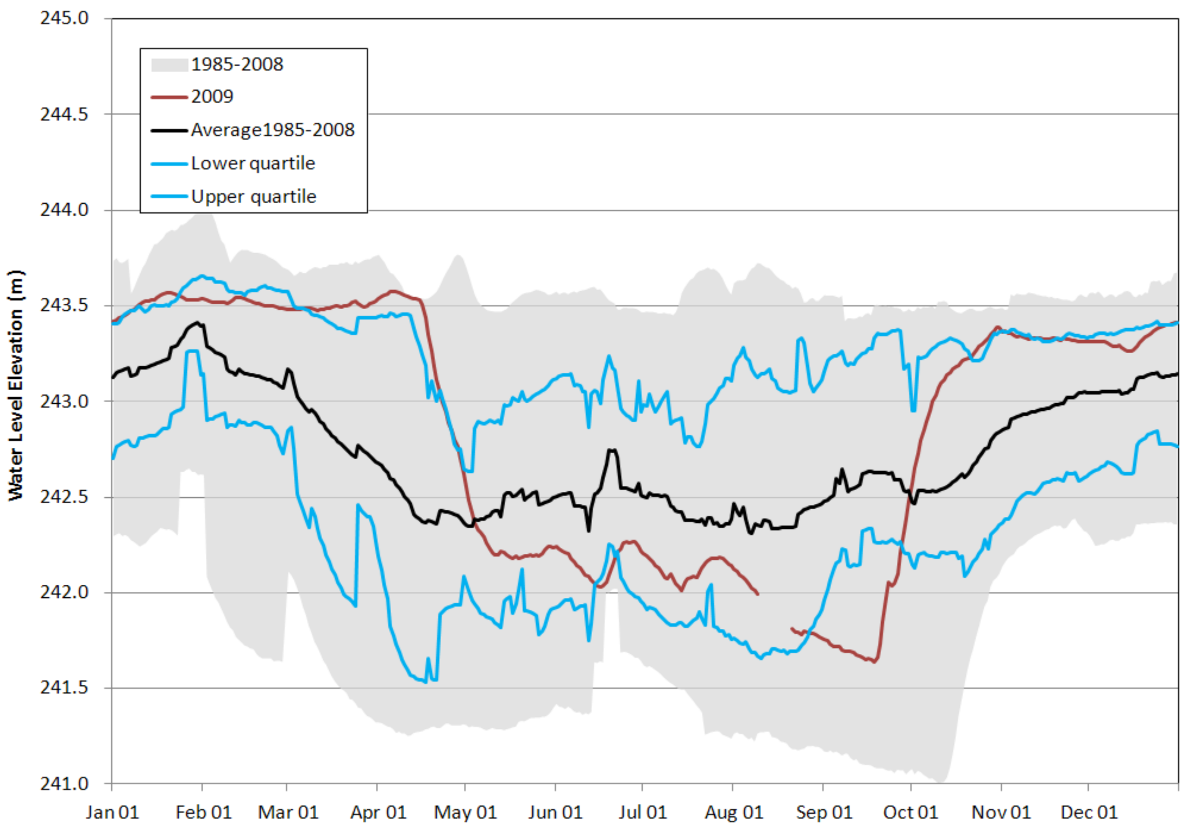


Figure 6.2-3. 2009 Threepoint Lake water level elevation (05TF003).

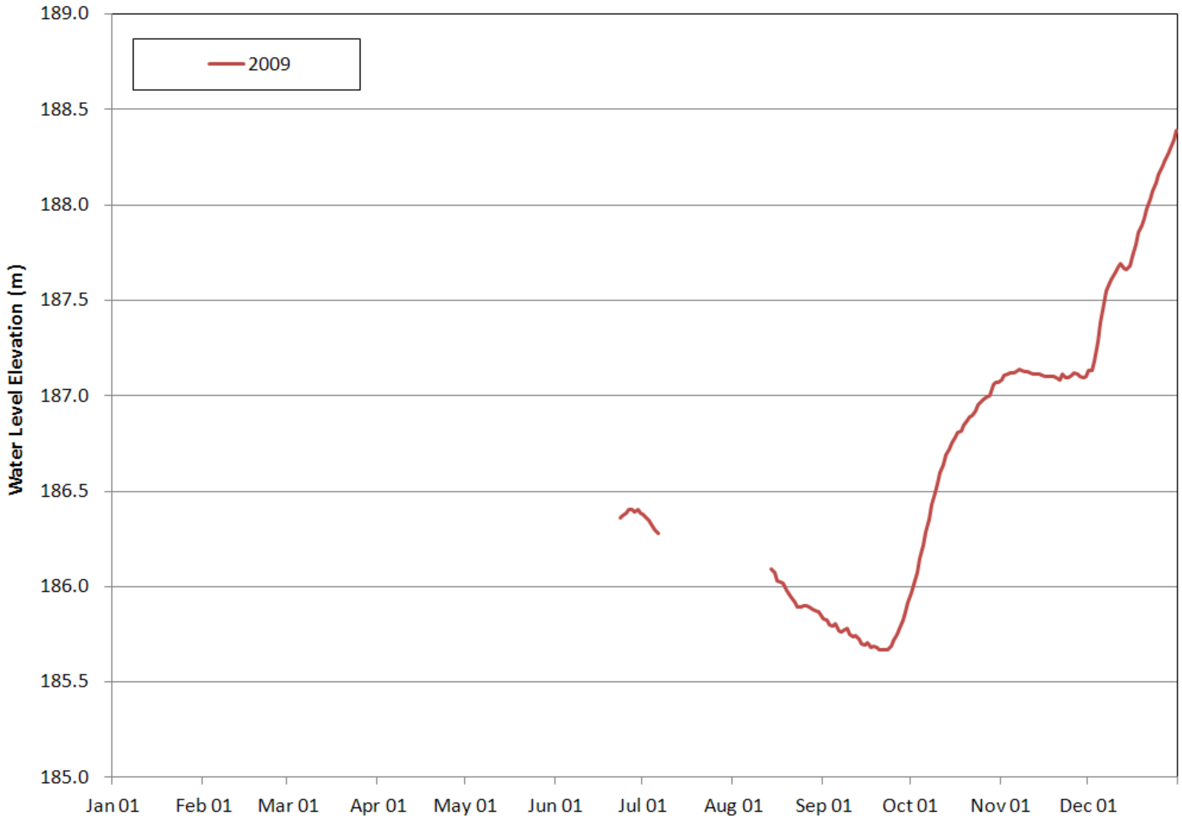


Figure 6.2-4. 2009 Apussigamisi Lake (05TG712) water level elevation

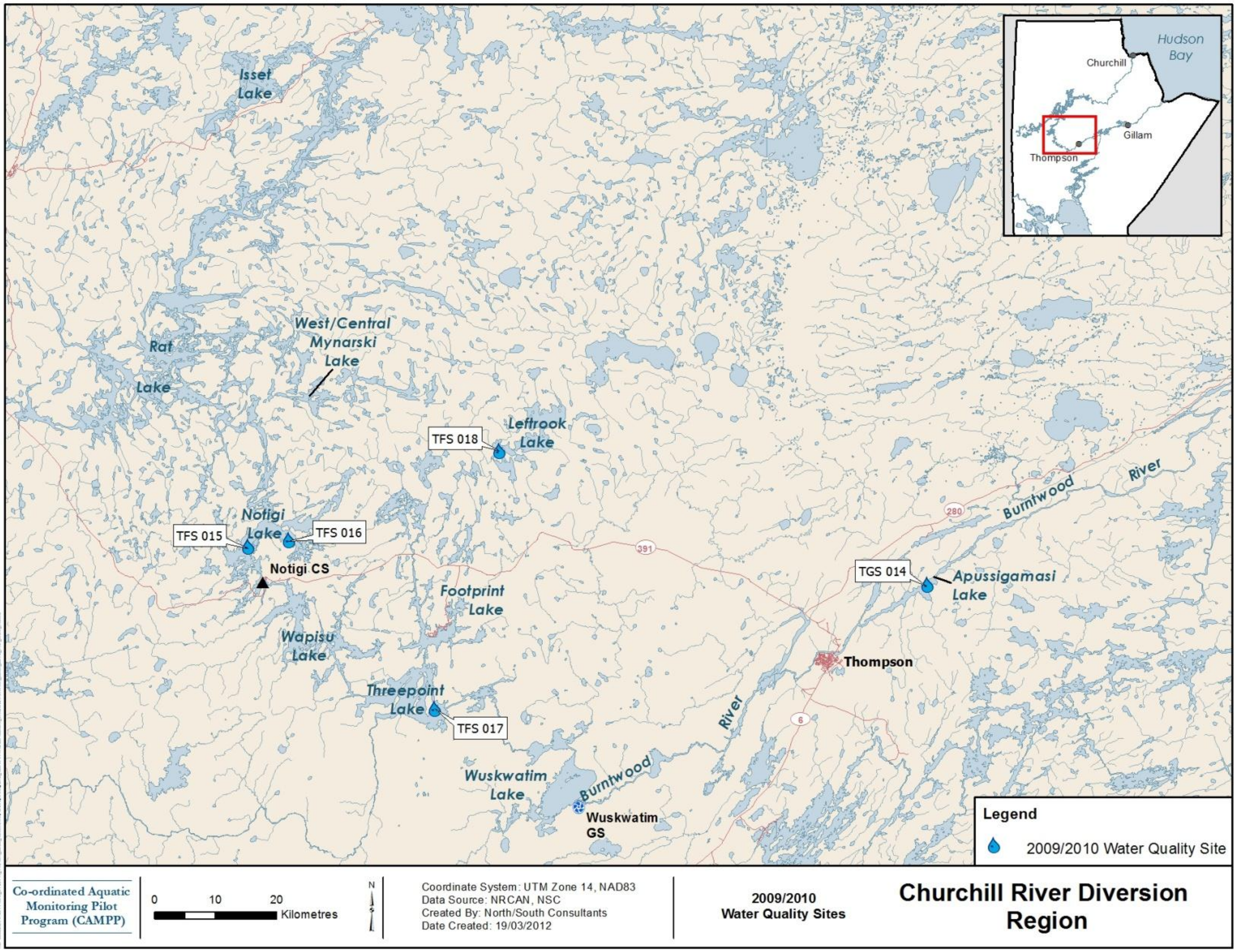


Figure 6.3-1. Water quality and phytoplankton monitoring sites in the Churchill River Diversion Region: 2009/2010.

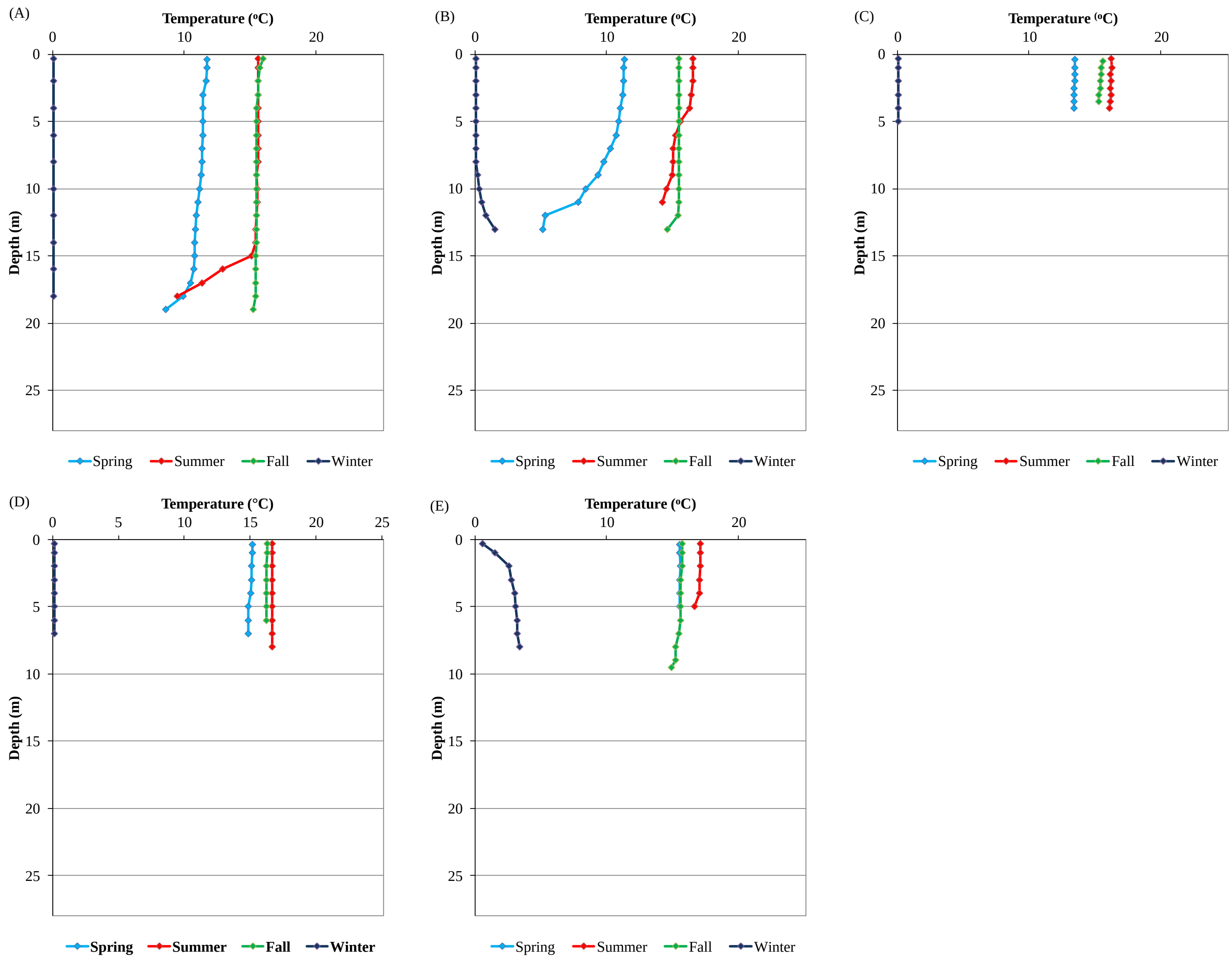


Figure 6.3-2. Water temperature profiles measured in the Churchill River Diversion Region in 2009/2010: (A) Notigi Lake-West; (B) Notigi Lake-East; (C) Threepoint Lake; (D) Apussigamasi Lake; and (E) Leftrook Lake.

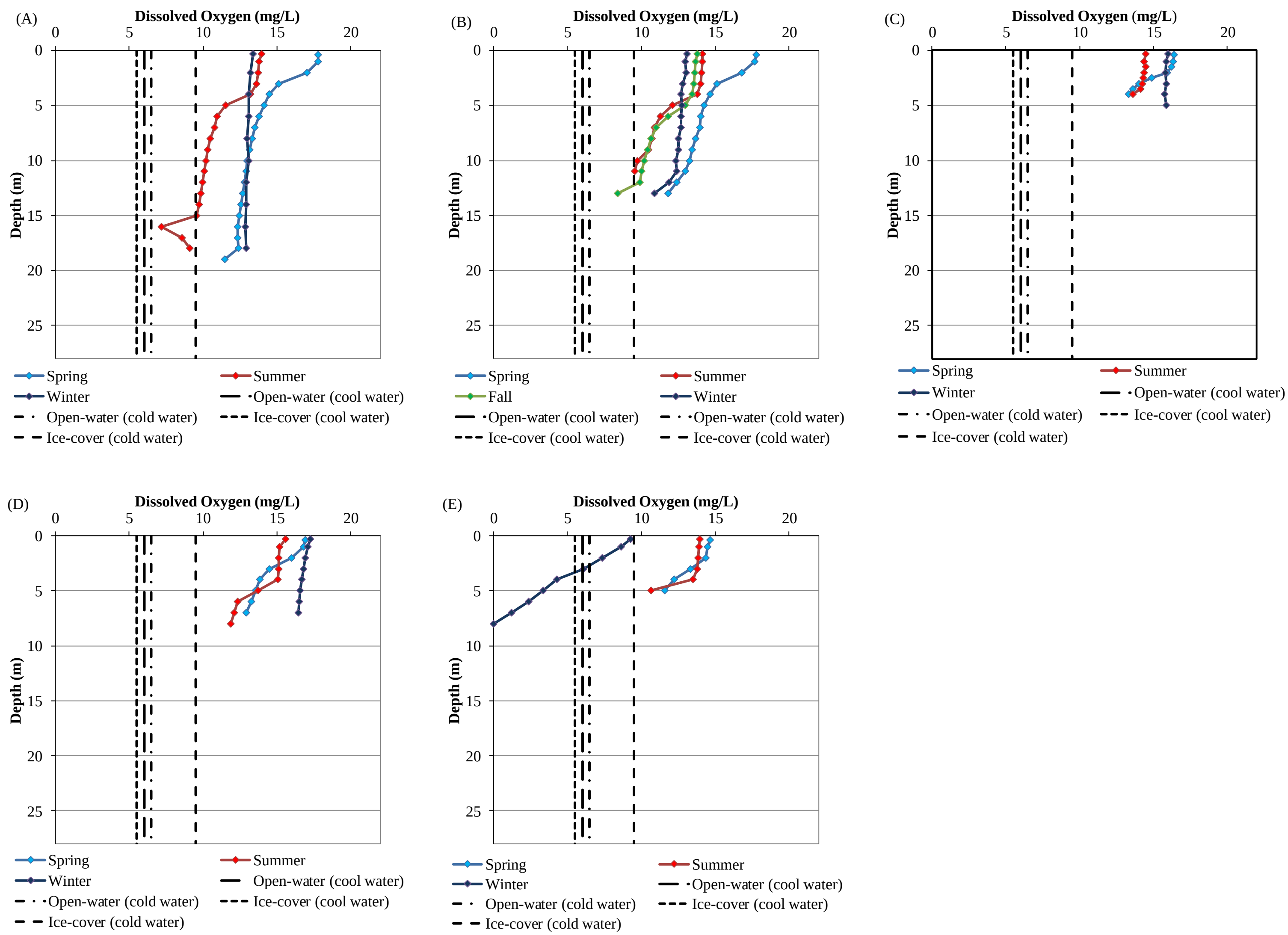


Figure 6.3-3. Dissolved oxygen depth profiles measured in the Churchill River Diversion Region in 2009/2010: (A) Notigi Lake-West; (B) Notigi Lake-East; (C) Threepoint Lake; (D) Apussigamasi Lake; and (E) Leftrook Lake. Dashed lines represent selected MWQSOGs for PAL.

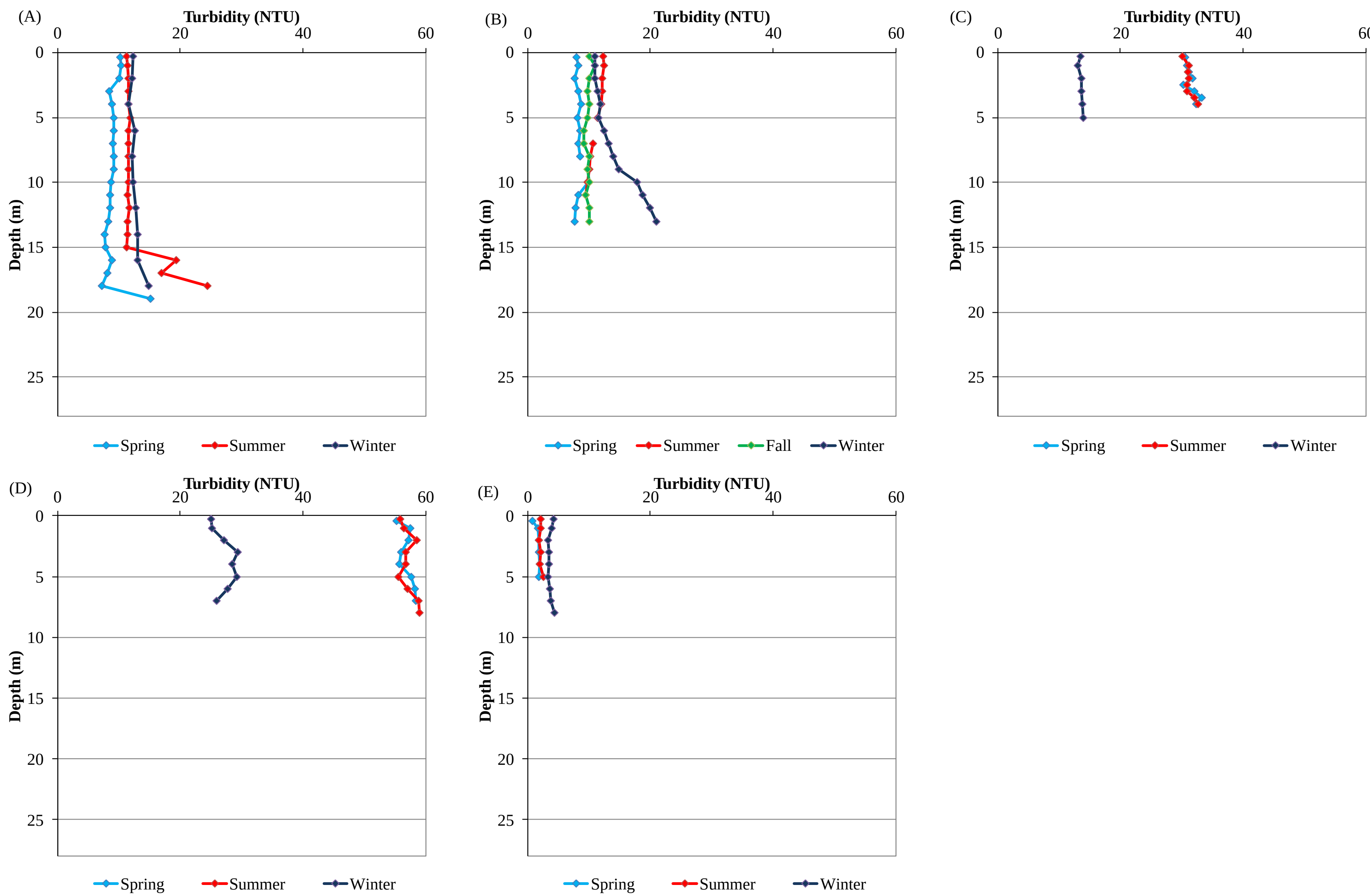


Figure 6.3-4. Turbidity depth profiles measured in the Churchill River Diversion Region in 2009/2010: (A) Notigi Lake-West; (B) Notigi Lake-East; (C) Threepoint Lake; (D) Apussigamasi Lake; and (E) Leftrook Lake.

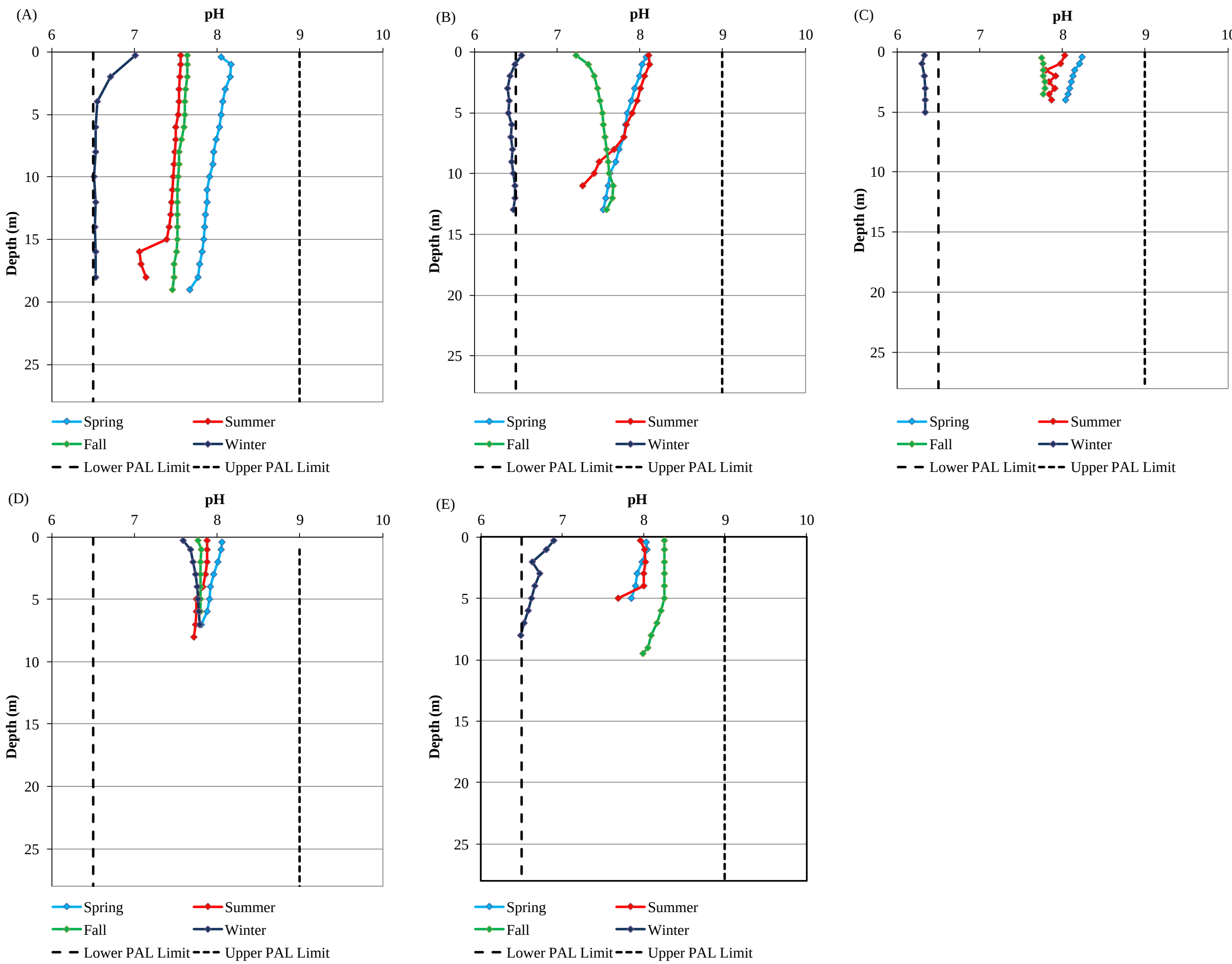


Figure 6.3-5. pH depth profiles measured in the Churchill River Diversion Region in 2009/2010: (A) Notigi Lake-West; (B) Notigi Lake-East; (C) Threepoint Lake; (D) Apussigamasi Lake; and (E) Leftrook Lake.

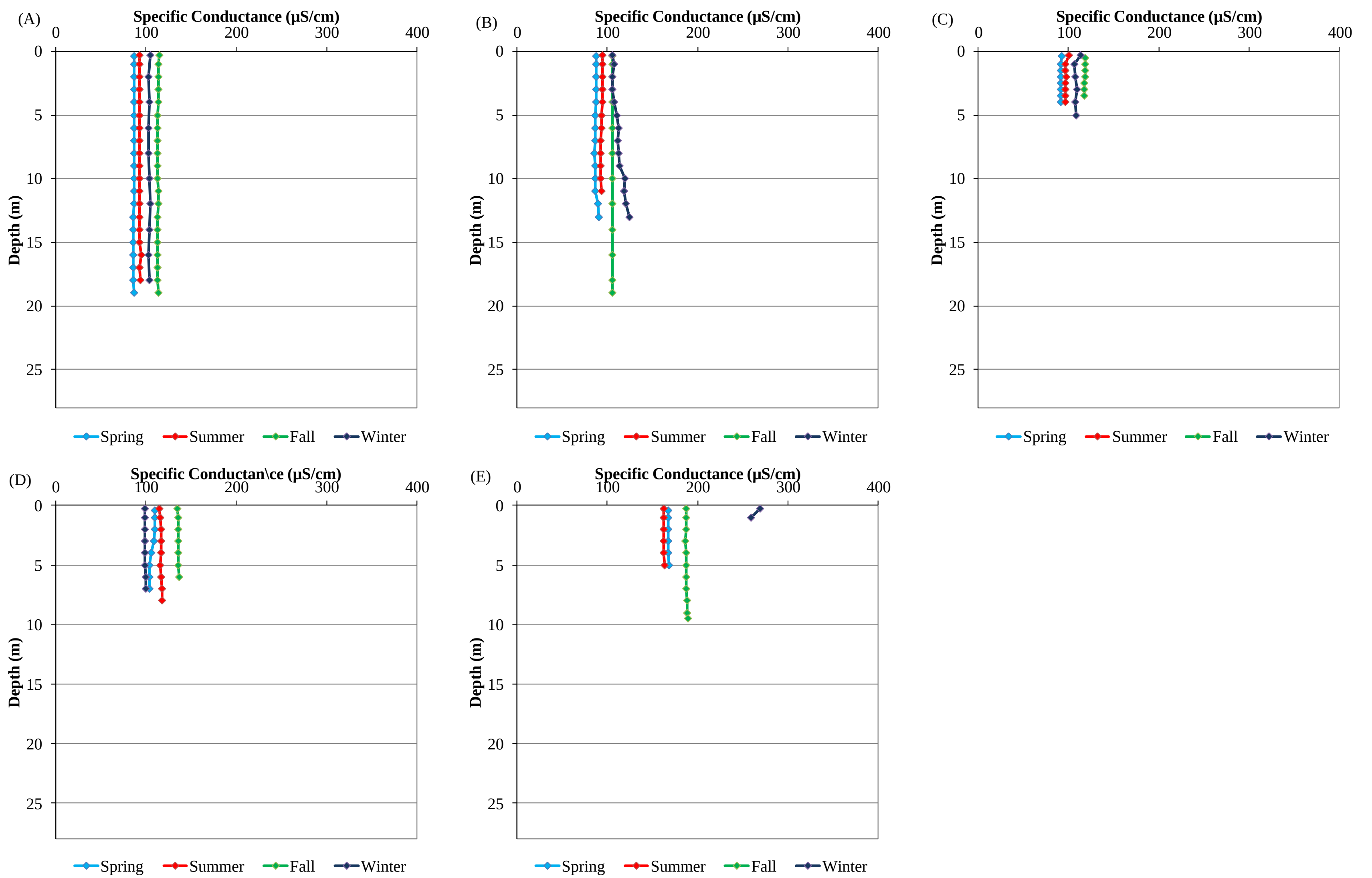


Figure 6.3-6. Specific conductance depth profiles measured in the Churchill River Diversion Region in 2009/2010: (A) Notigi Lake-West; (B) Notigi Lake-East; (C) Threepoint Lake; (D) Apussigamasi Lake; and (E) Leftrook Lake.

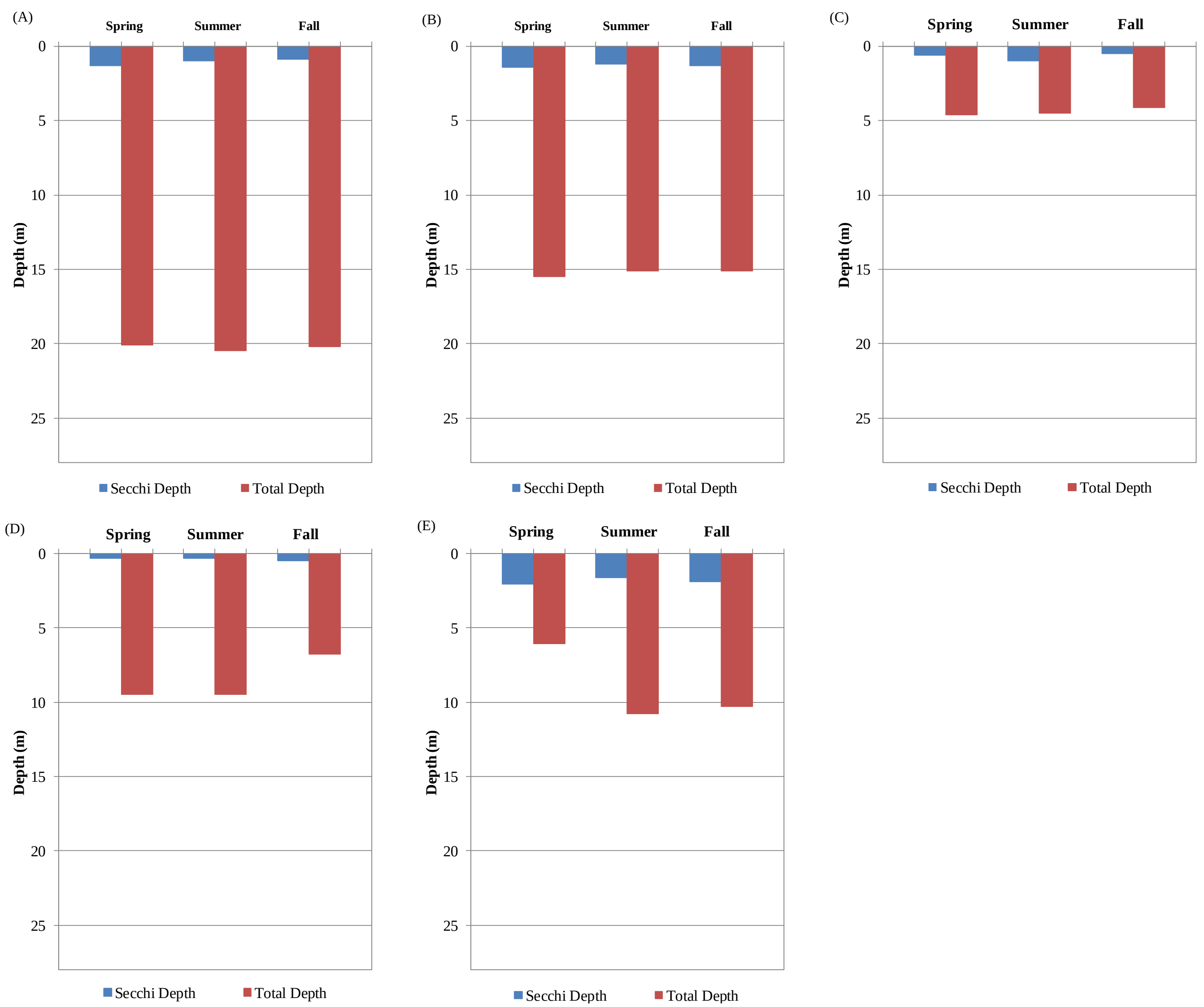


Figure 6.3-7. Secchi disk depths measured in the Churchill River Diversion Region in 2009/2010: (A) Notigi Lake-West; (B) Notigi Lake-East; (C) Threepoint Lake; (D) Apussigamasi Lake; and (E) Leftrook Lake.

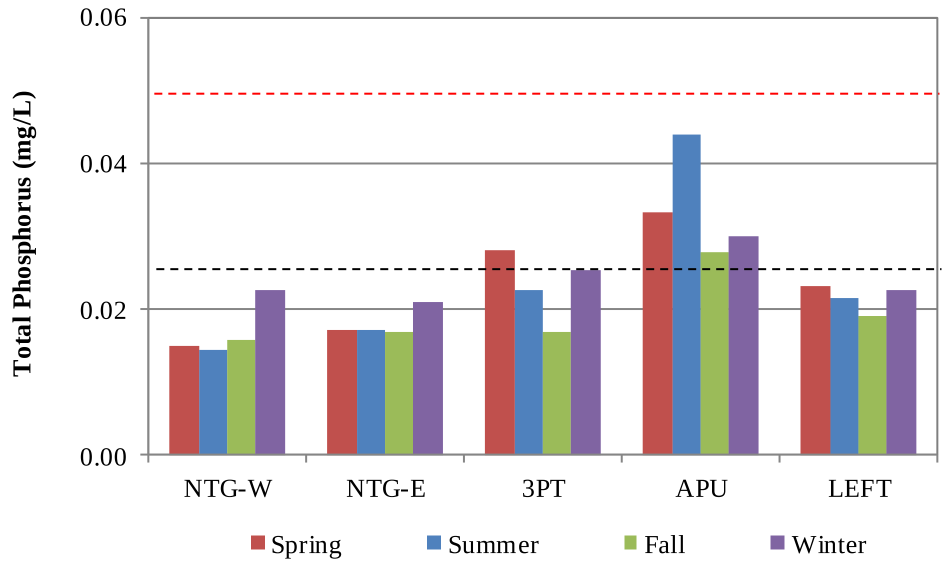


Figure 6.3-8. Total phosphorus measured in surface grabs in the Churchill River Diversion Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

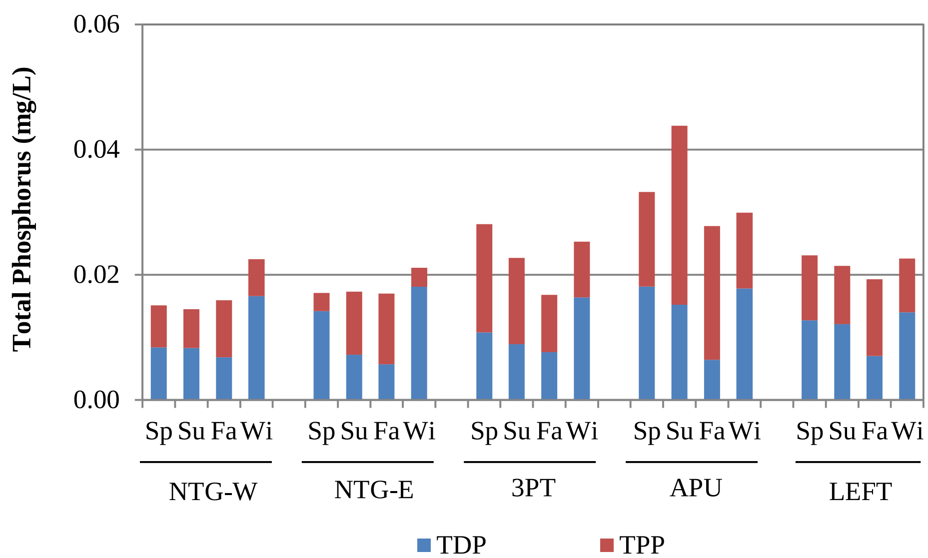


Figure 6.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Churchill River Diversion Region: 2009/2010.

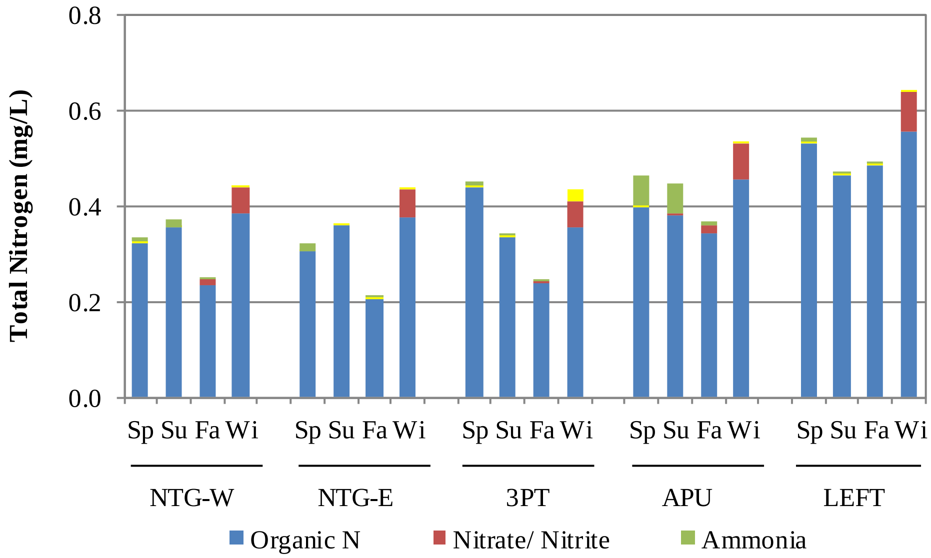


Figure 6.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Churchill River Diversion Region: 2009/2010. Yellow bars represent values that were below the analytical detection limit.

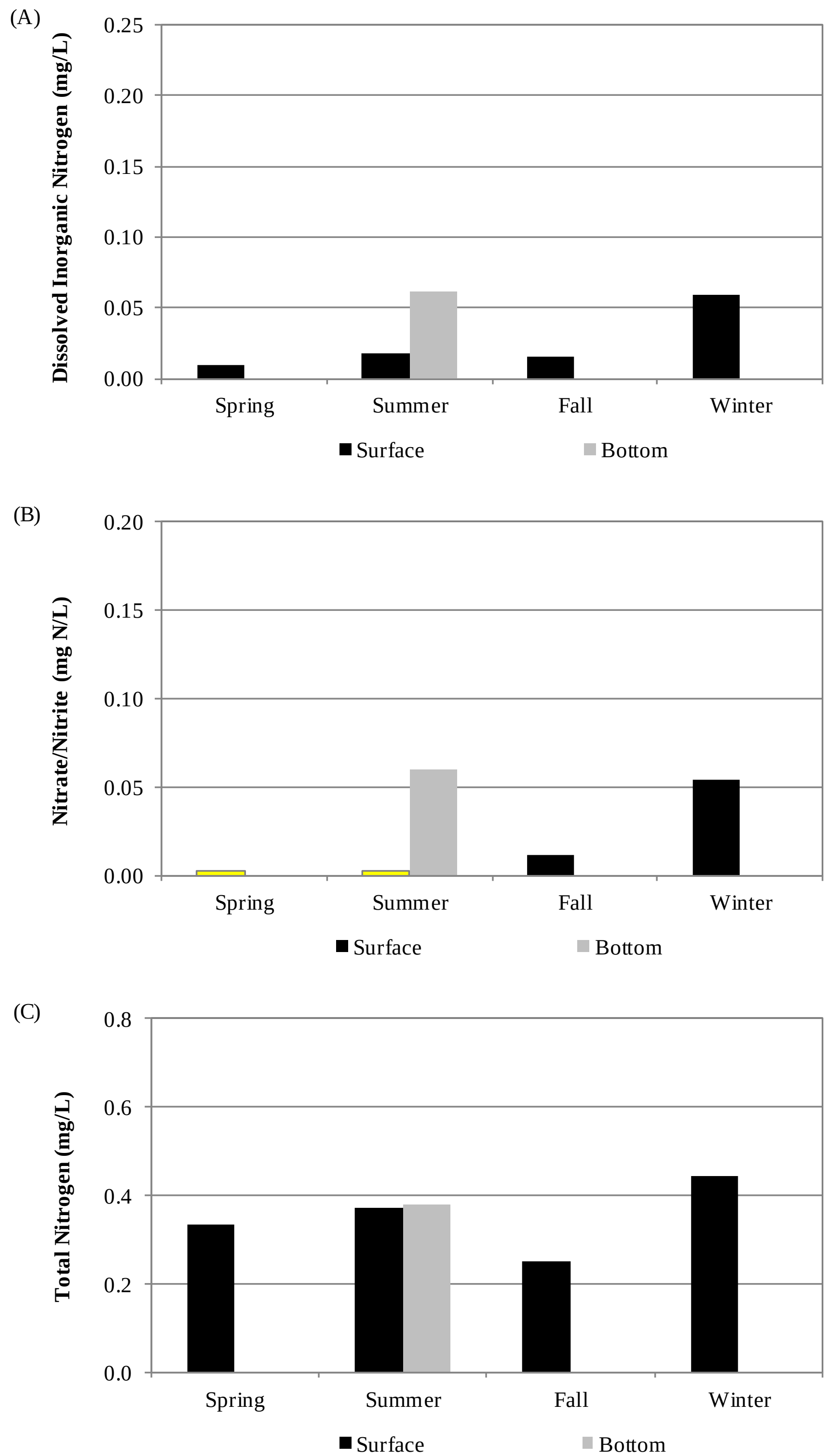


Figure 6.3-11. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Notigi Lake-West, 2009/2010. Yellow bars represent values that were below the analytical detection limit

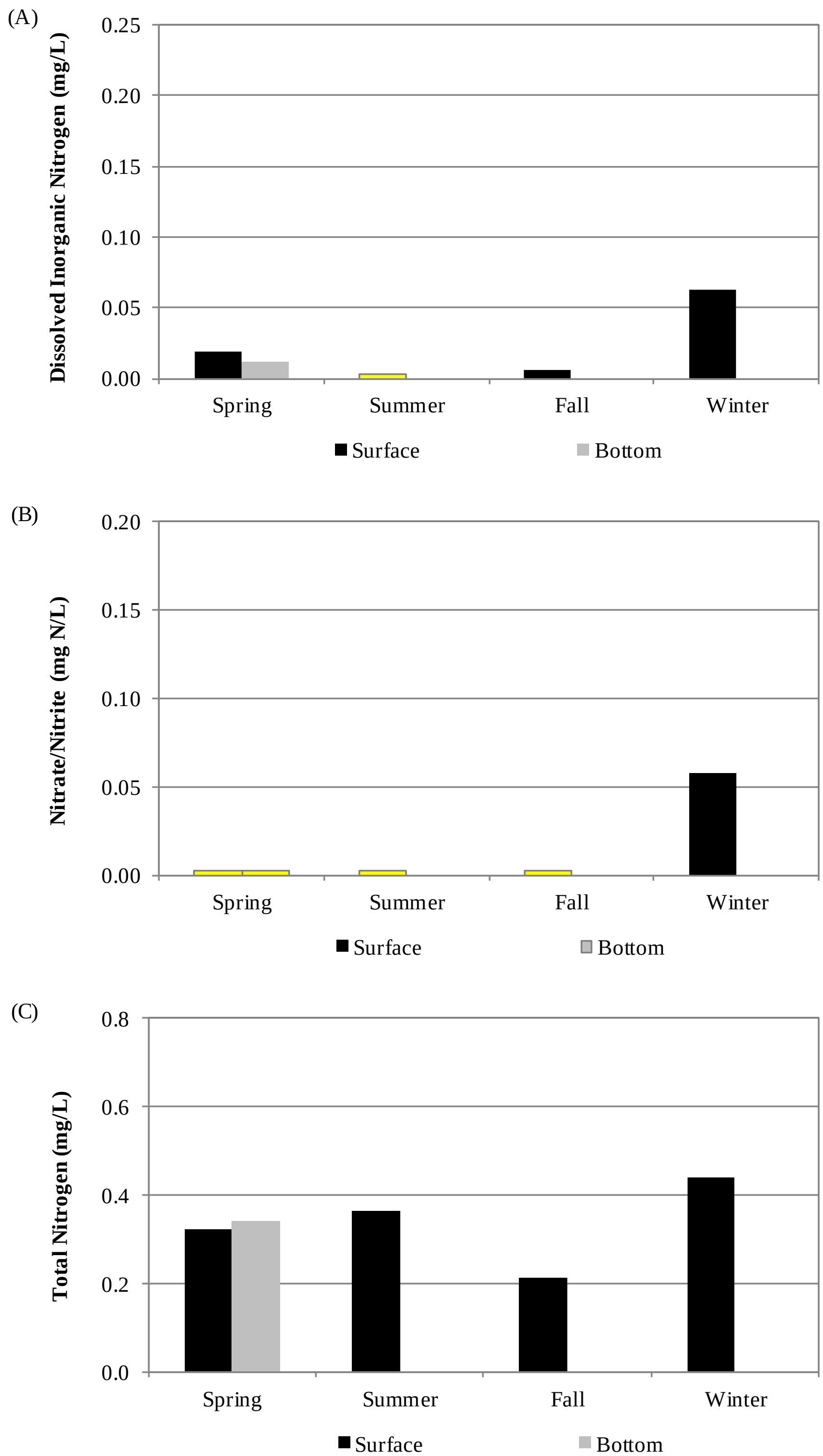


Figure 6.3-12. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Notigi Lake-East, 2009/2010. Yellow bars represent values that were below the analytical detection limit

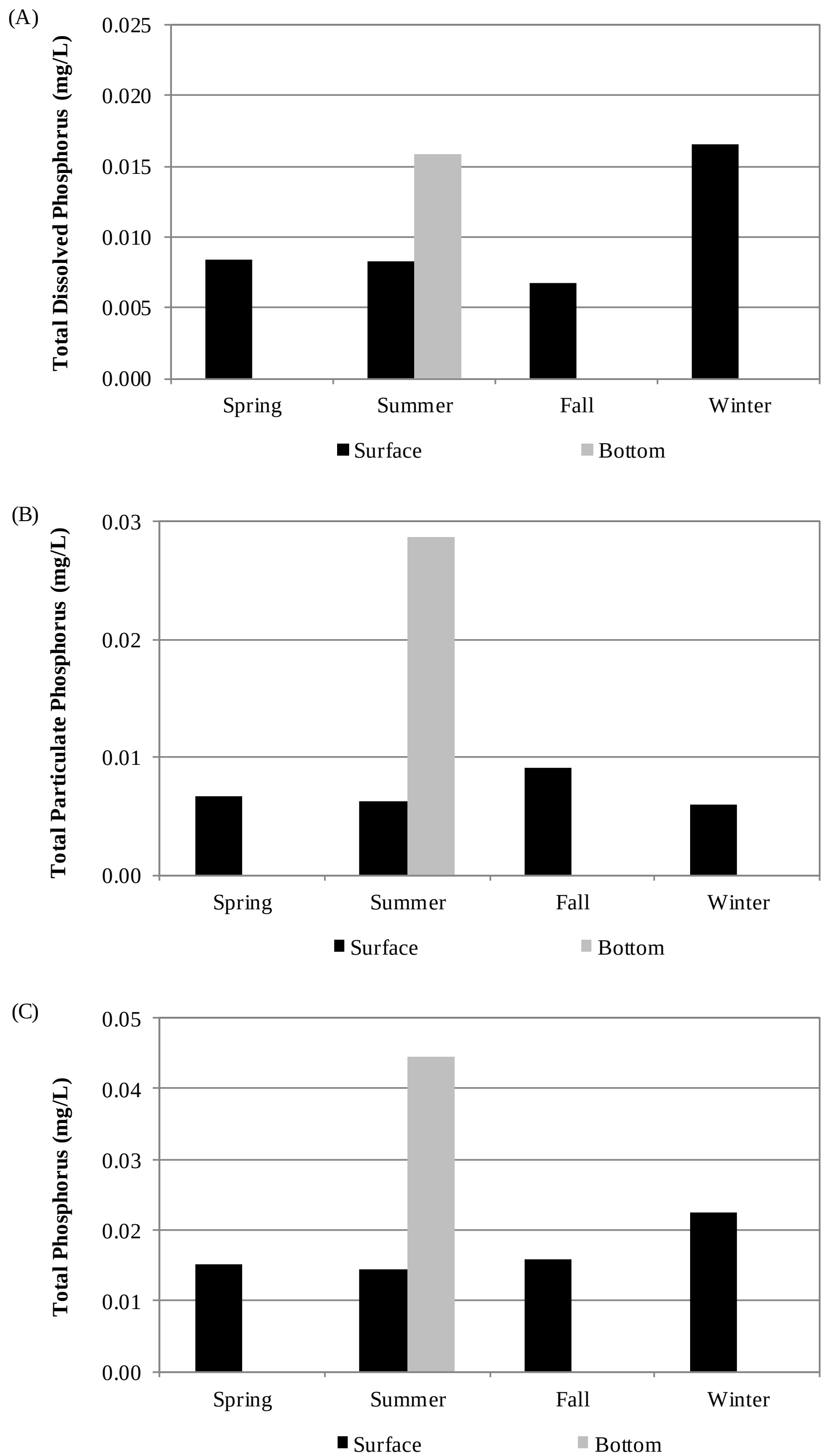


Figure 6.3-13. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Notigi Lake-West, 2009/2010.

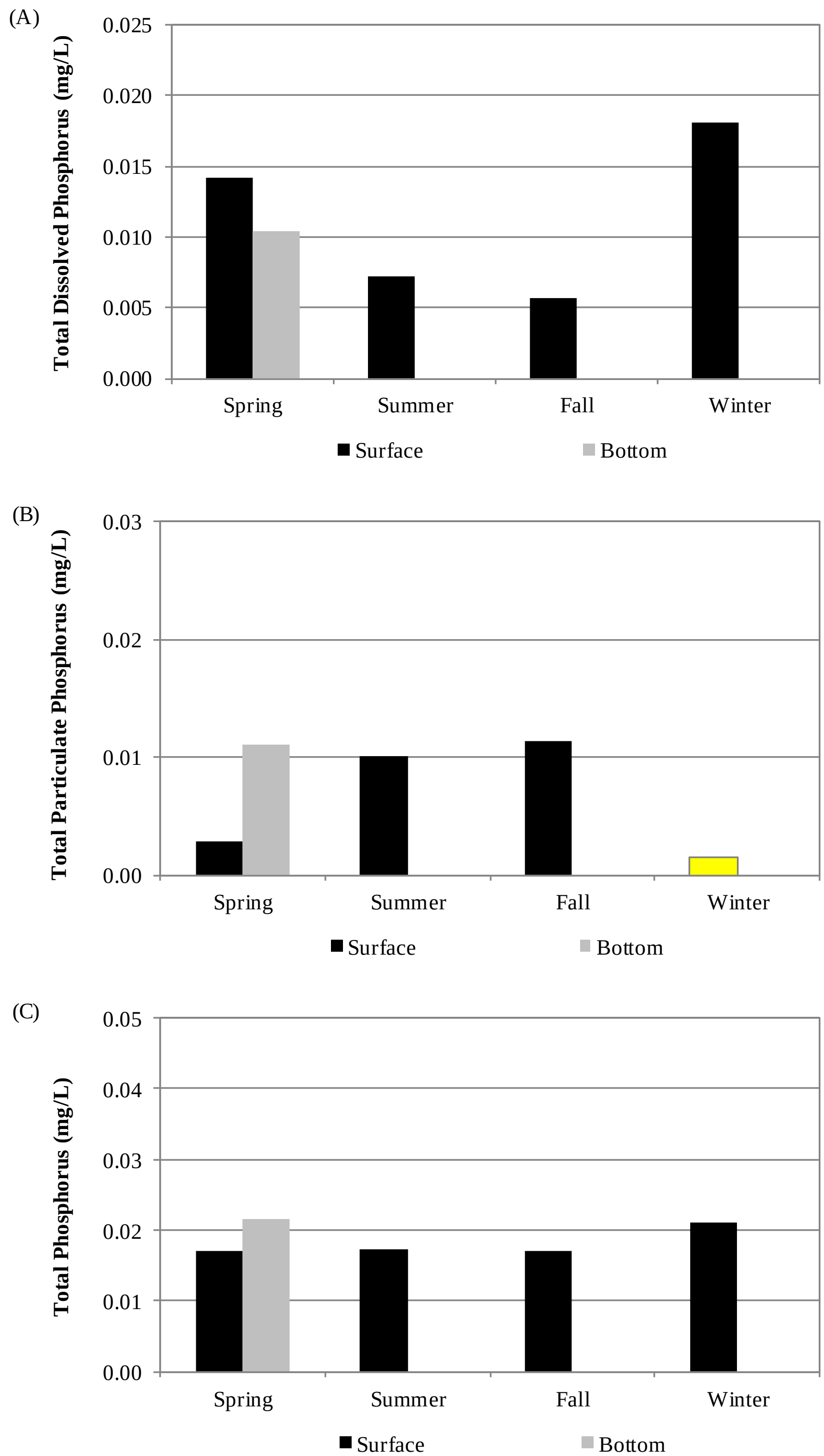


Figure 6.3-14. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Notigi Lake-East, 2009/2010. Yellow bars represent values that were below the analytical detection limit

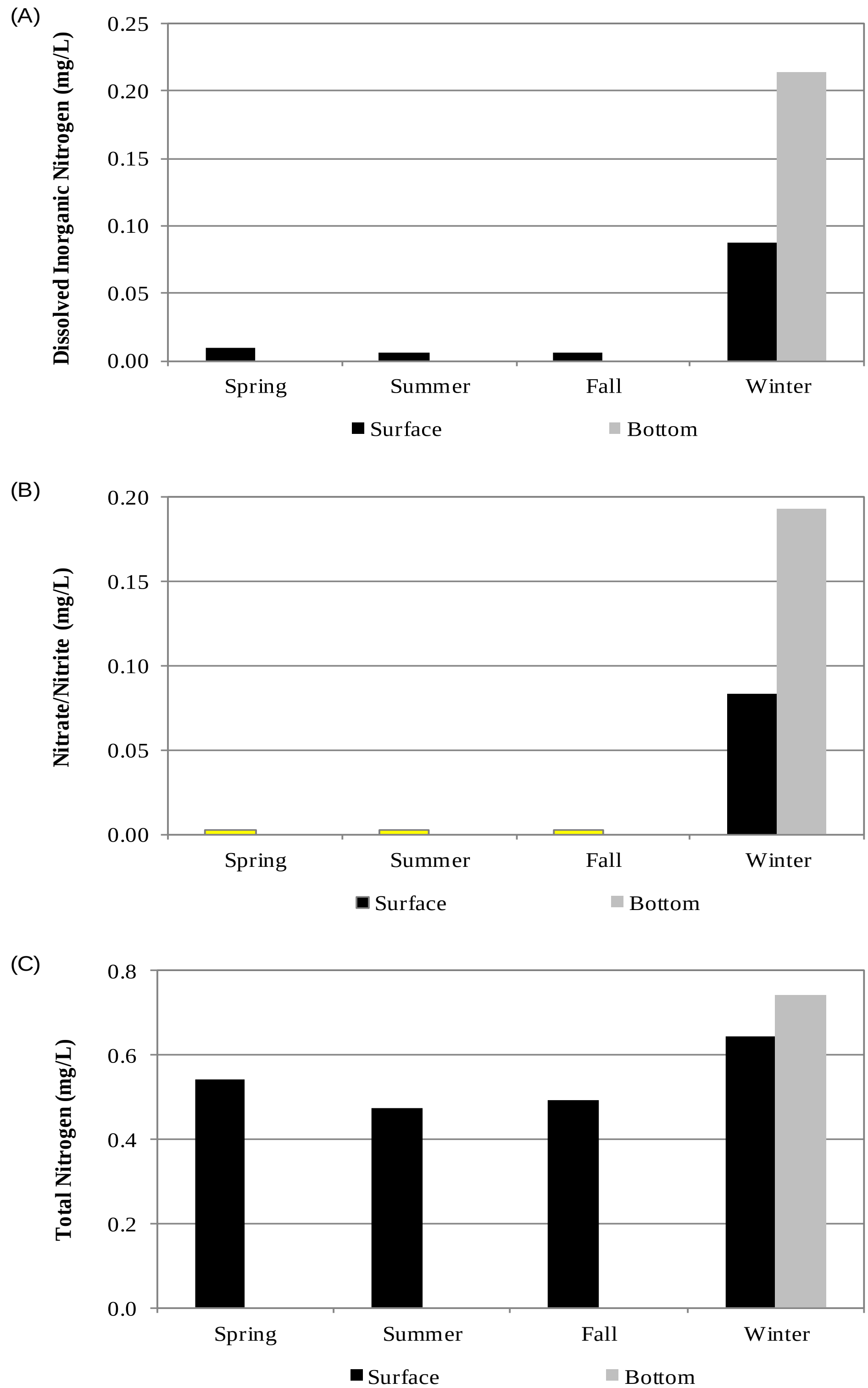


Figure 6.3-15. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Leftrook Lake, 2009/2010. Yellow bars represent values that were below the analytical detection limit

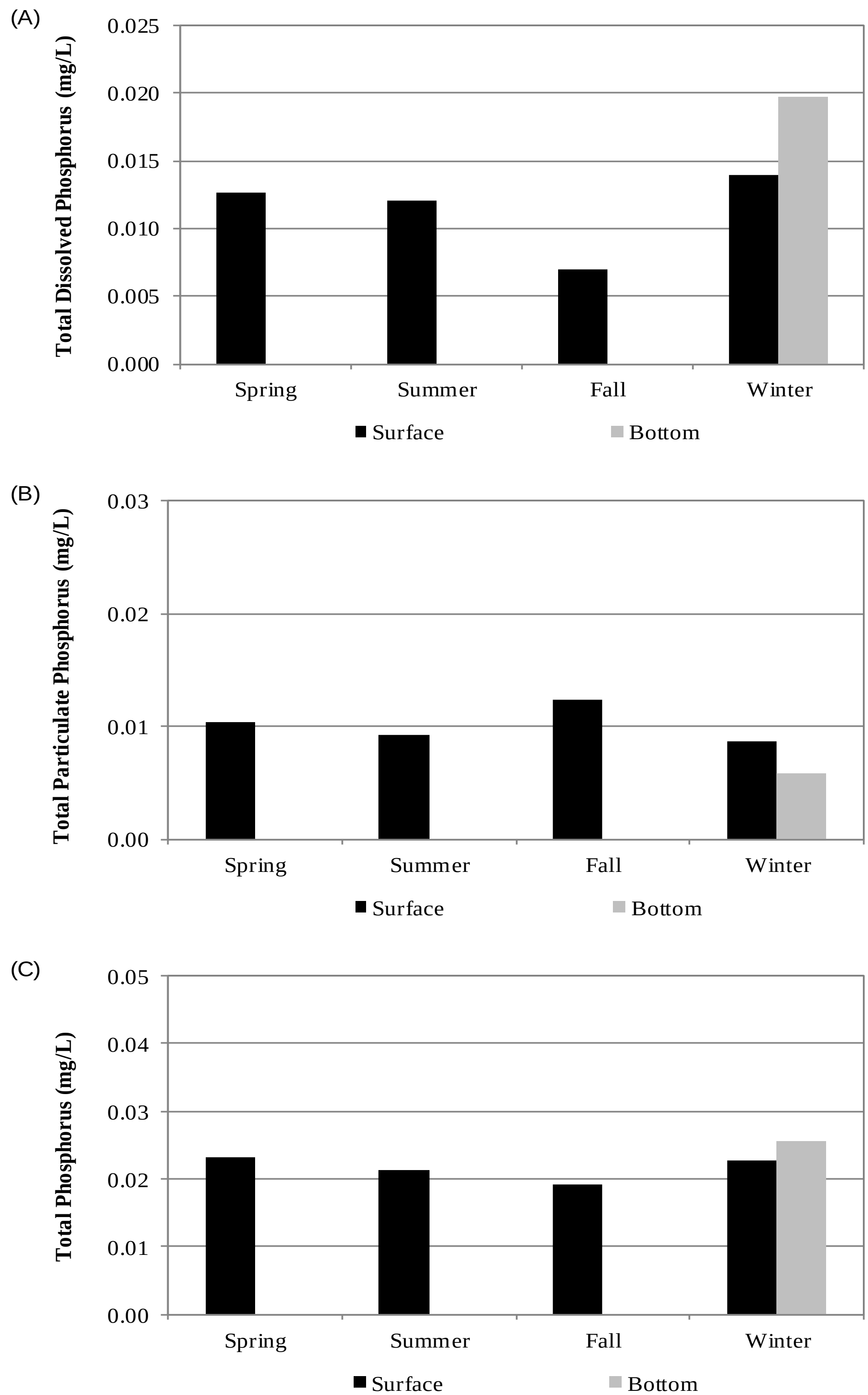


Figure 6.3-16. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Leftrook Lake, 2009/2010.

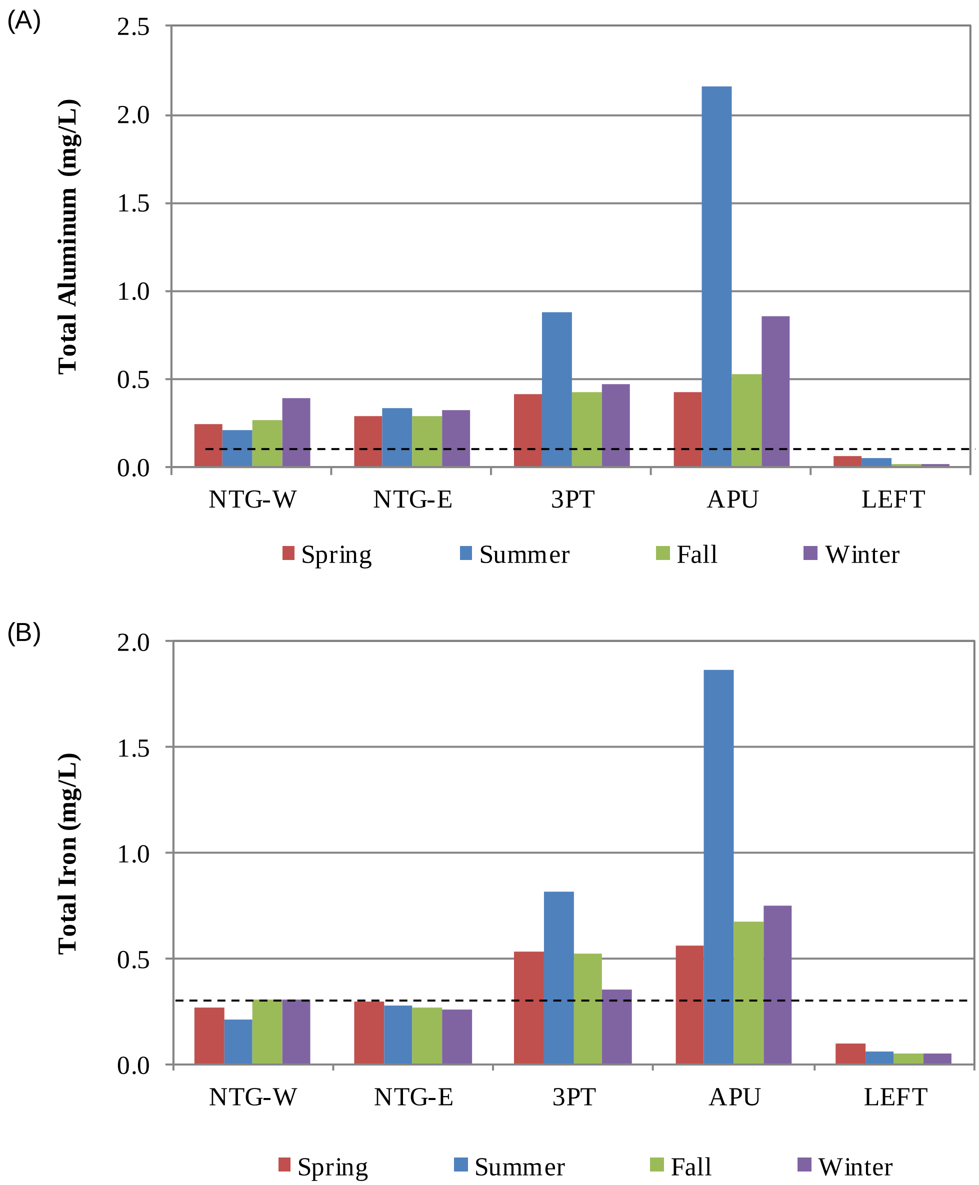


Figure 6.3-17. Total aluminum (A) and total iron (B) measured in surface grabs in the Churchill River Diversion Region, by sampling period and site: 2009/2010. The black dashed lines indicate the MWQSOGs for PAL for aluminum and iron.

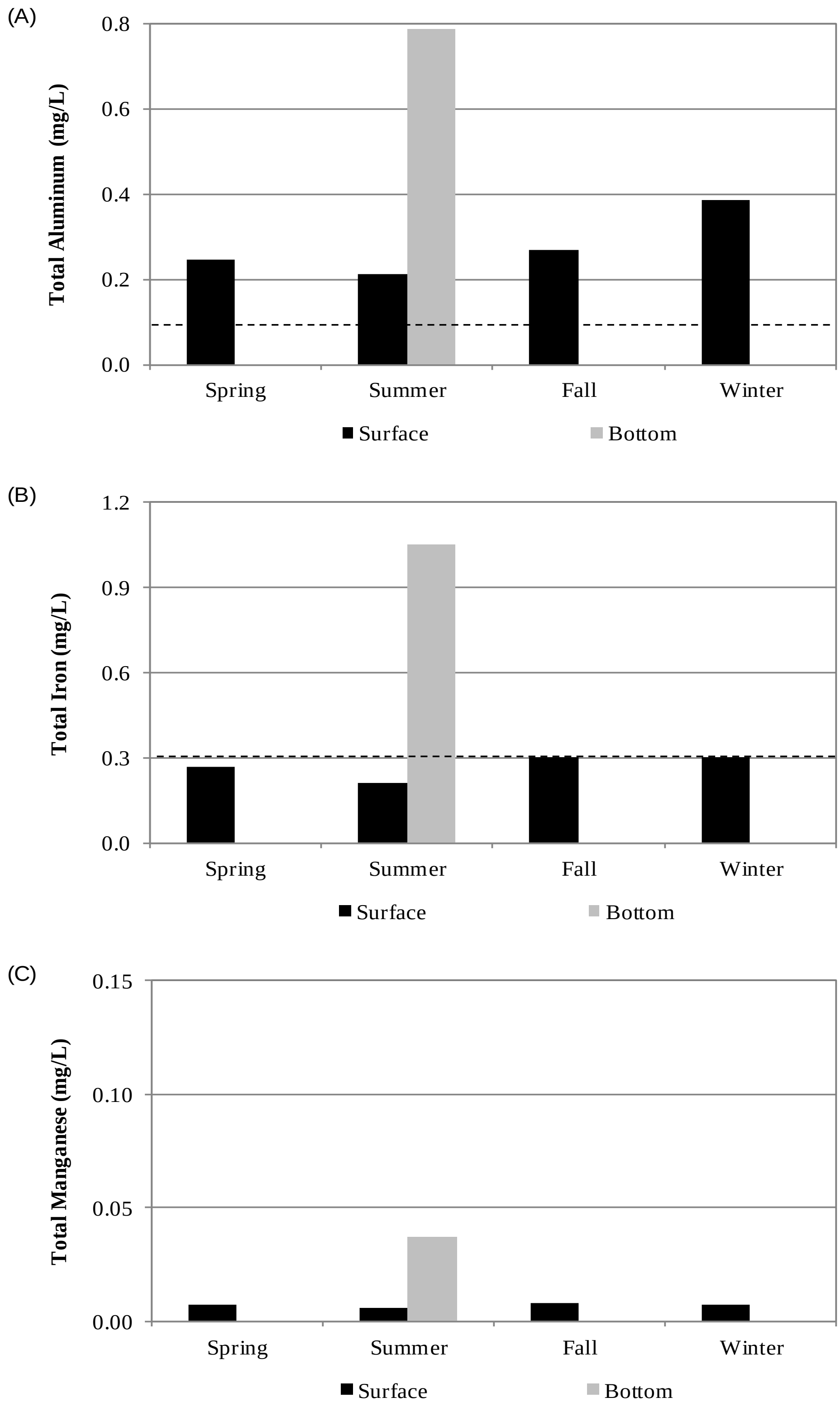


Figure 6.3-18. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Notigi Lake-West, 2009/2010. The black dashed line indicates the MWQSOGs for PAL for aluminum and iron.

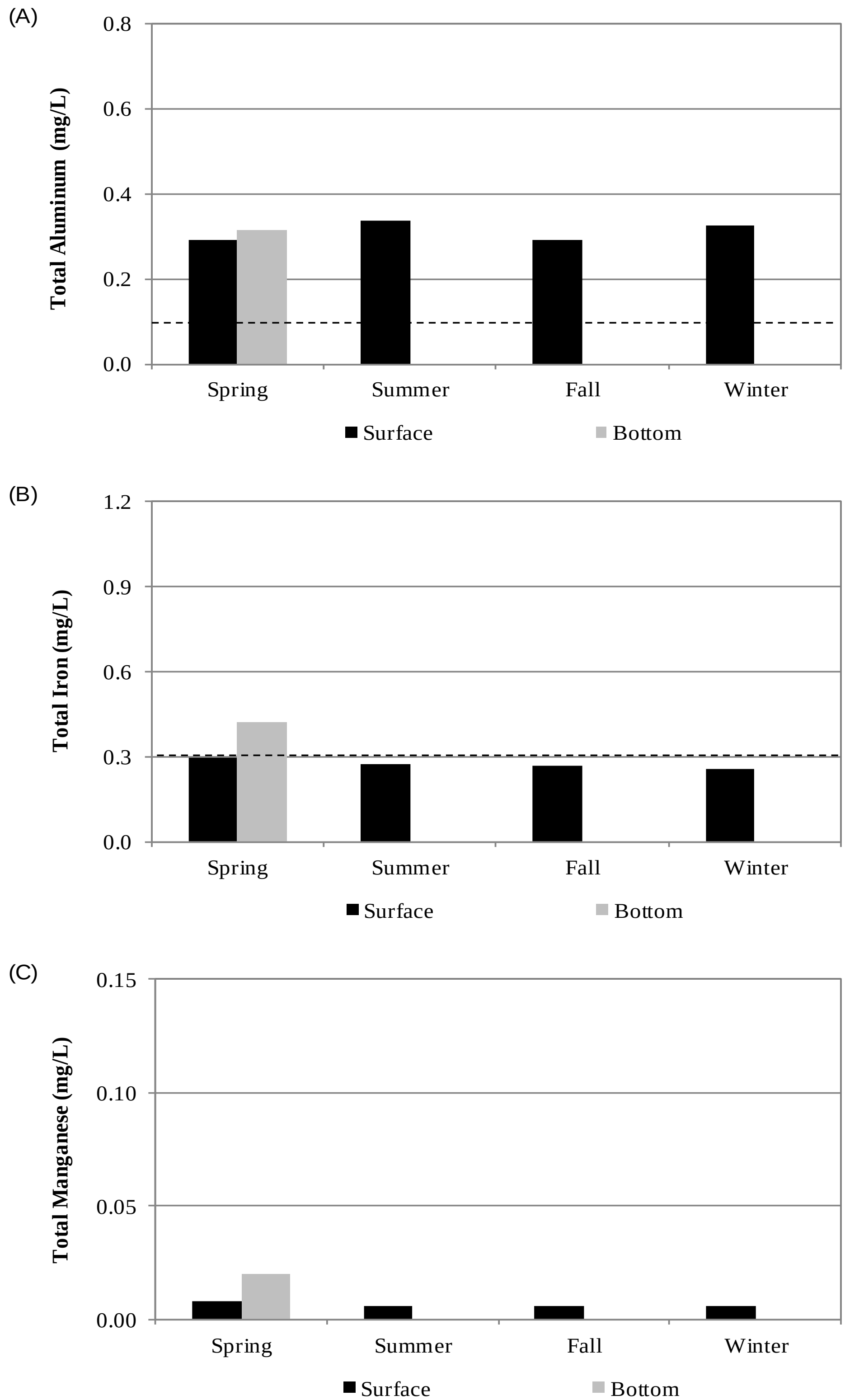


Figure 6.3-19. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Notigi Lake-East, 2009/2010. The black dashed lines indicate the MWQSOGs for PAL for aluminum and iron.

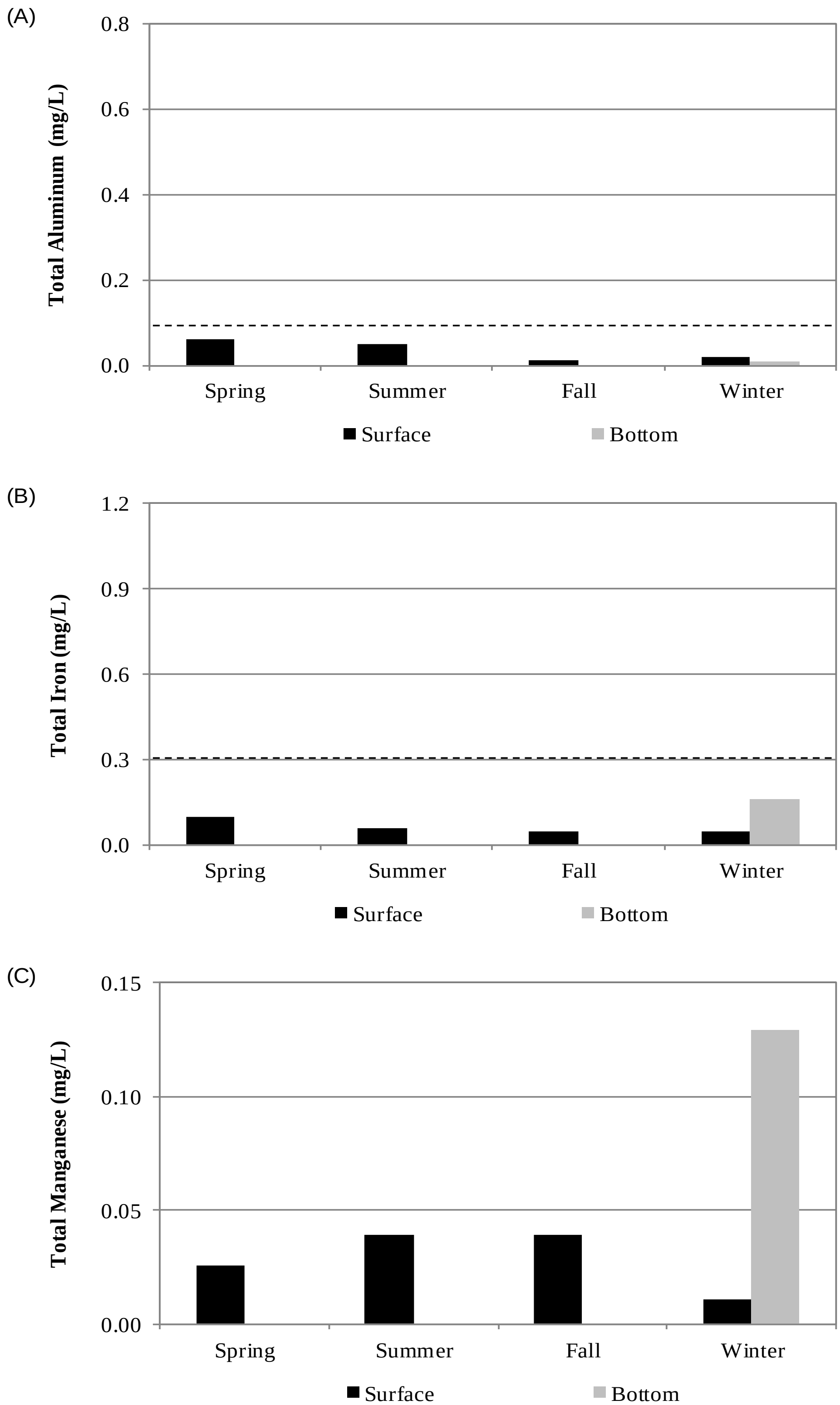


Figure 6.3-20. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Leftrook Lake, 2009/2010. The black dashed lines indicate the MWQSOGs for PAL for aluminum and iron.

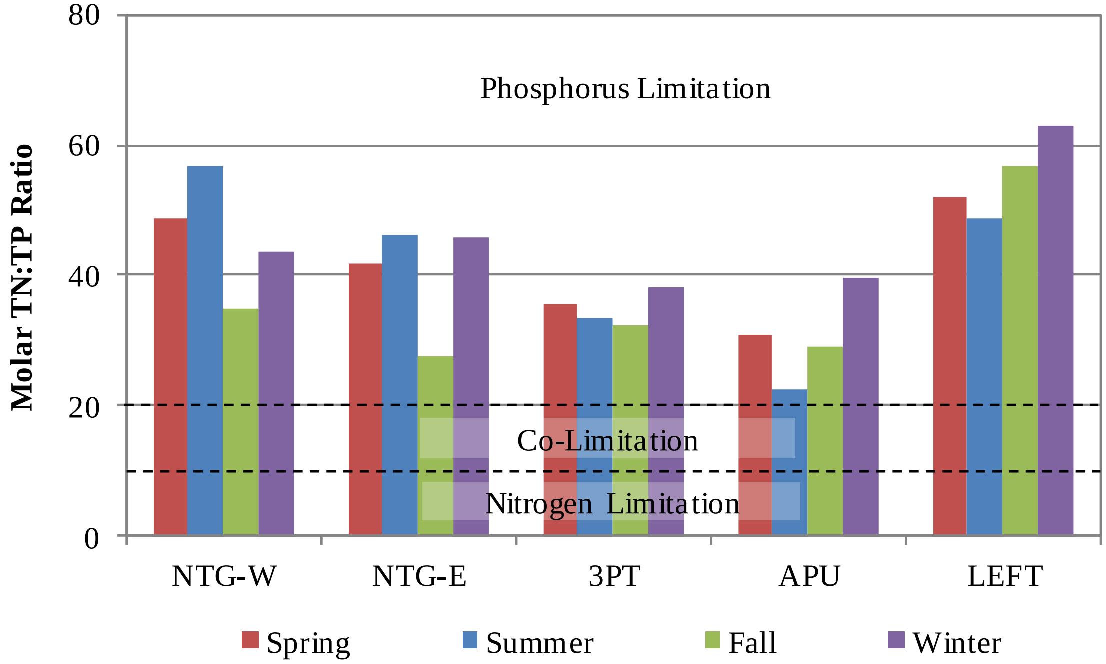


Figure 6.3-21. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Churchill River Diversion Region: 2009/2010.

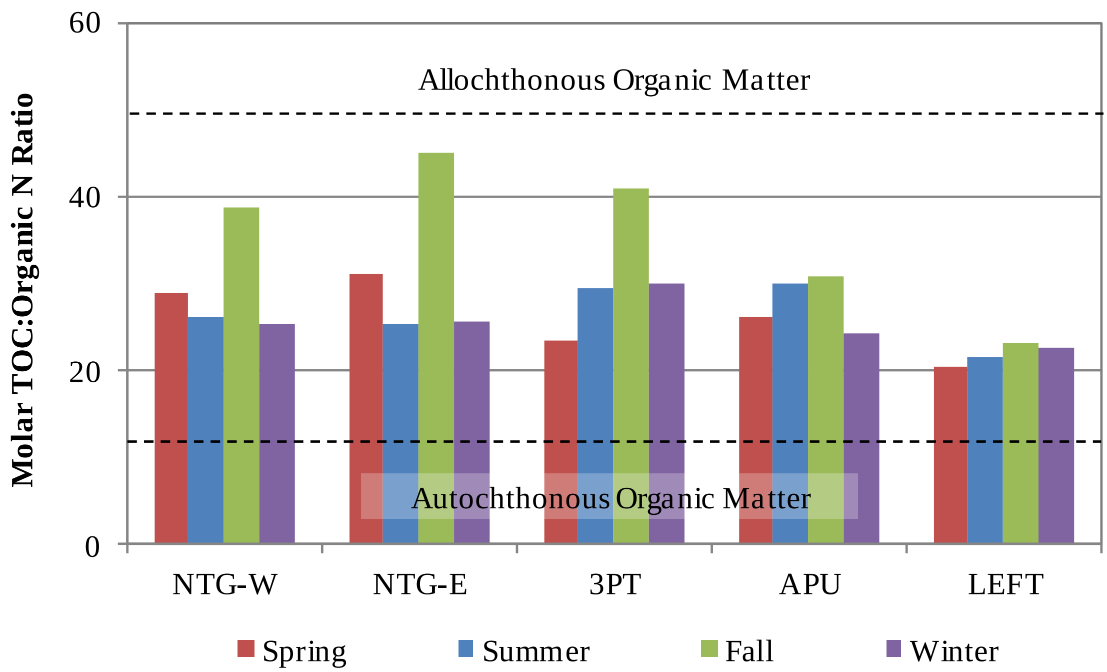
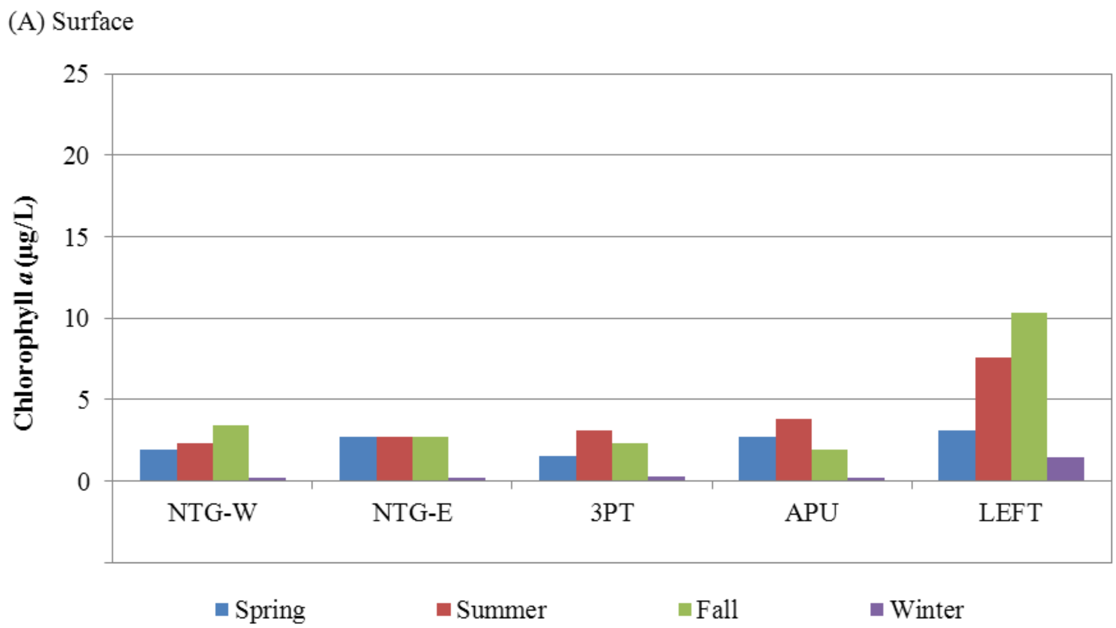


Figure 6.3-22. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Churchill River Diversion Region: 2009/2010.



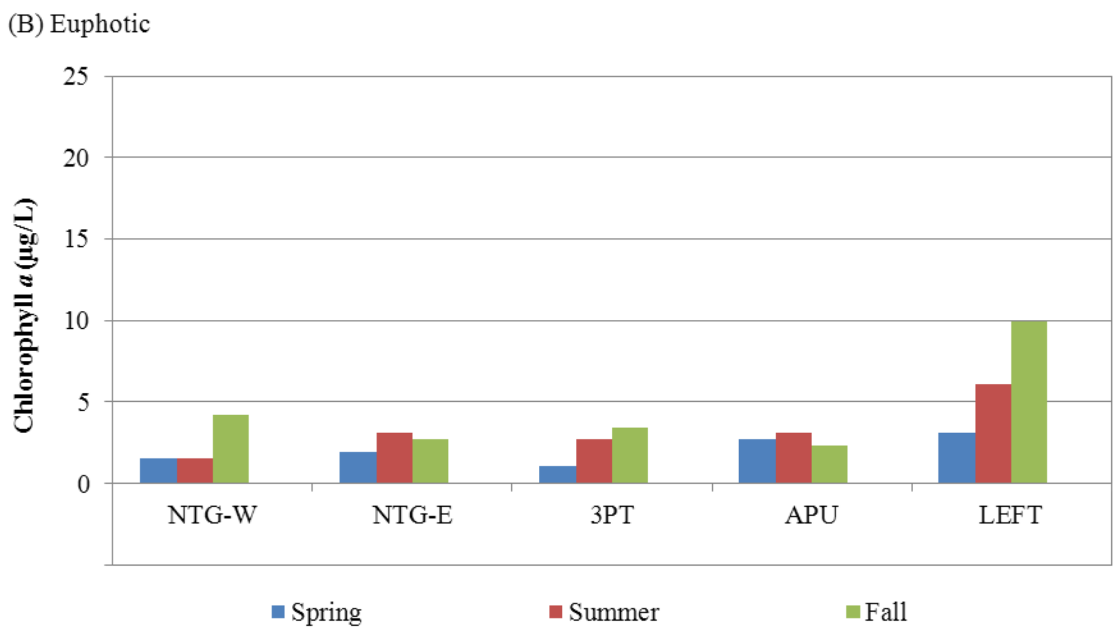


Figure 6.4-1. Chlorophyll *a* concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Churchill River Diversion Region in 2009/2010.

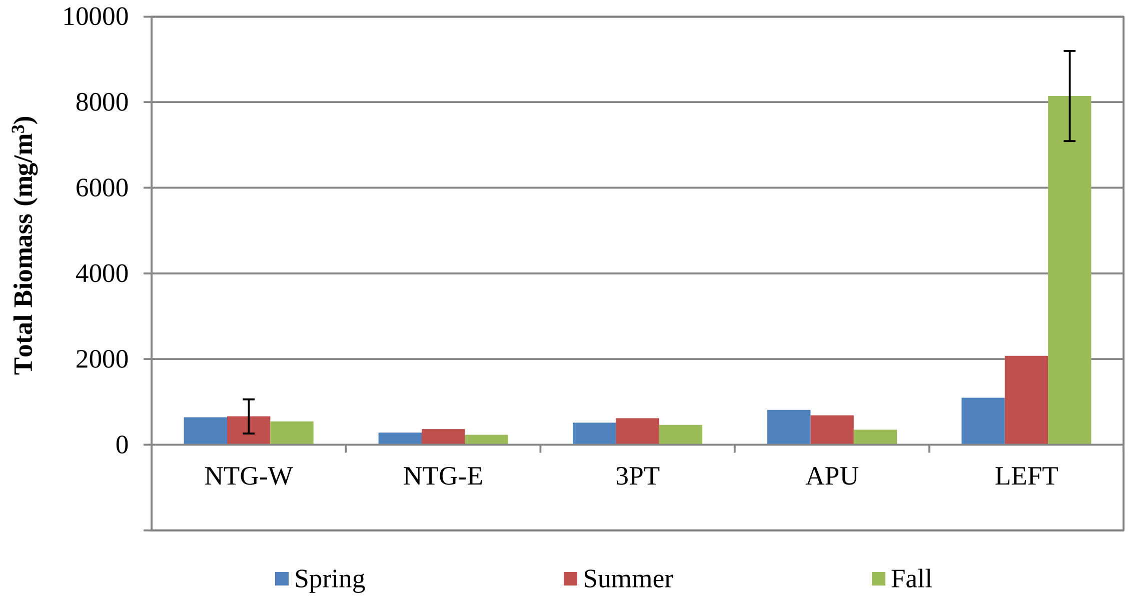


Figure 6.4-2. Phytoplankton biomass measured at sites in the Churchill River Diversion Region in 2009/2010. Error bars represent the standard error of samples analysed in duplicate for quality assurance.

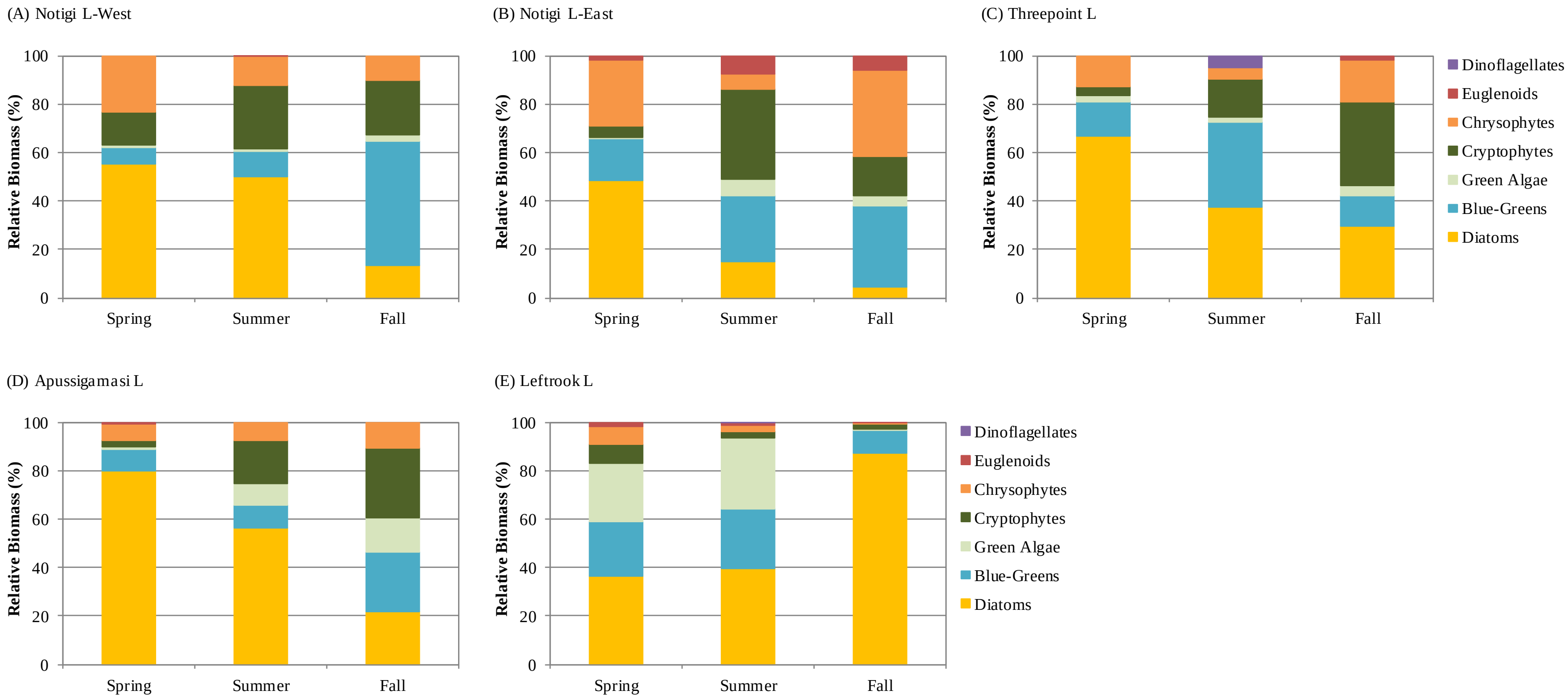


Figure 6.4-3. Phytoplankton community composition at sites in the Churchill River Diversion Region in 2009.

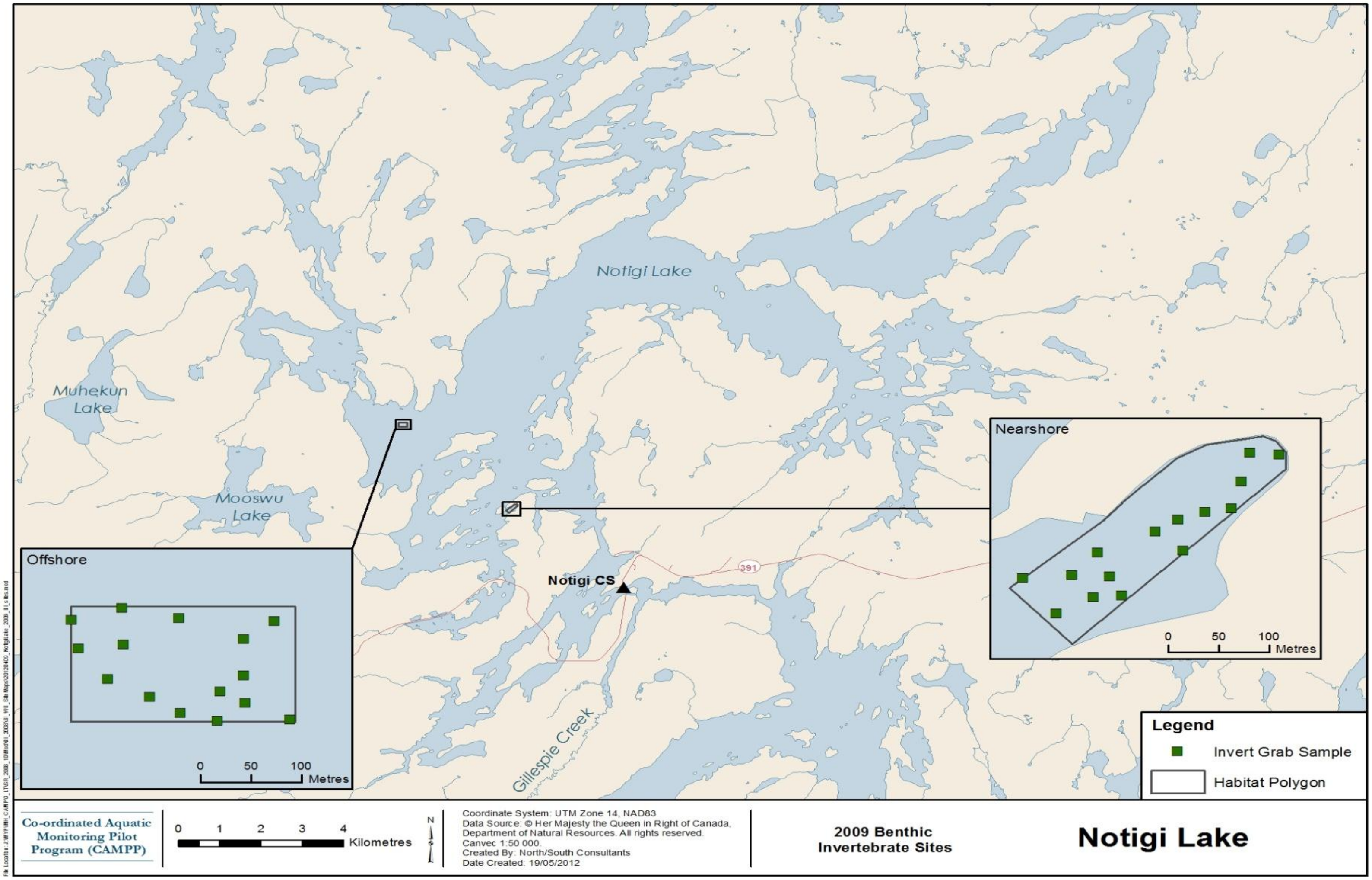


Figure 6.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Notigi Lake within the Churchill River Diversion Region, 2009.

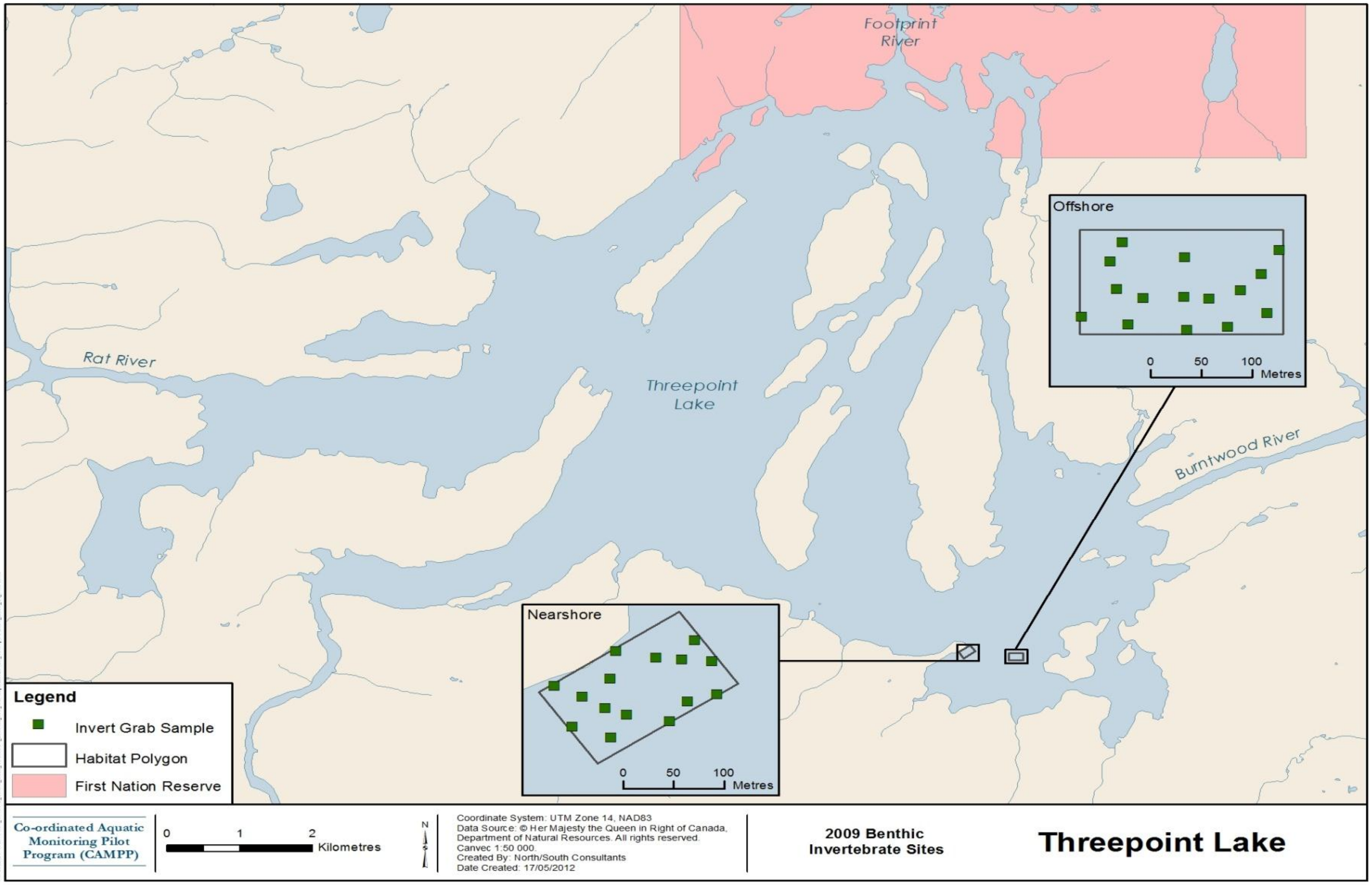


Figure 6.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Threepoint Lake within the Churchill River Diversion Region, 2009.

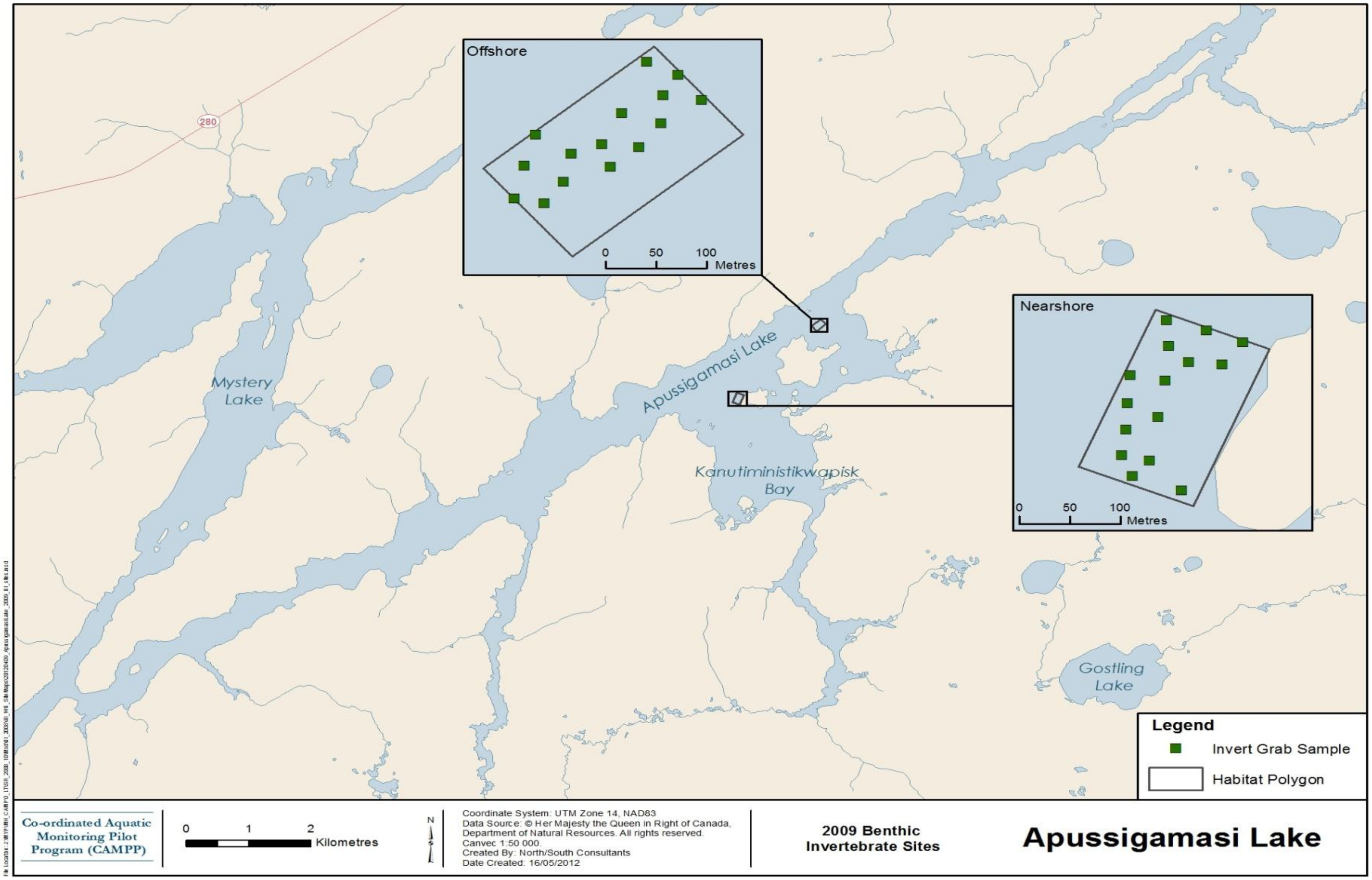


Figure 6.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Apussigamasi Lake within the Churchill River Diversion Region, 2009.

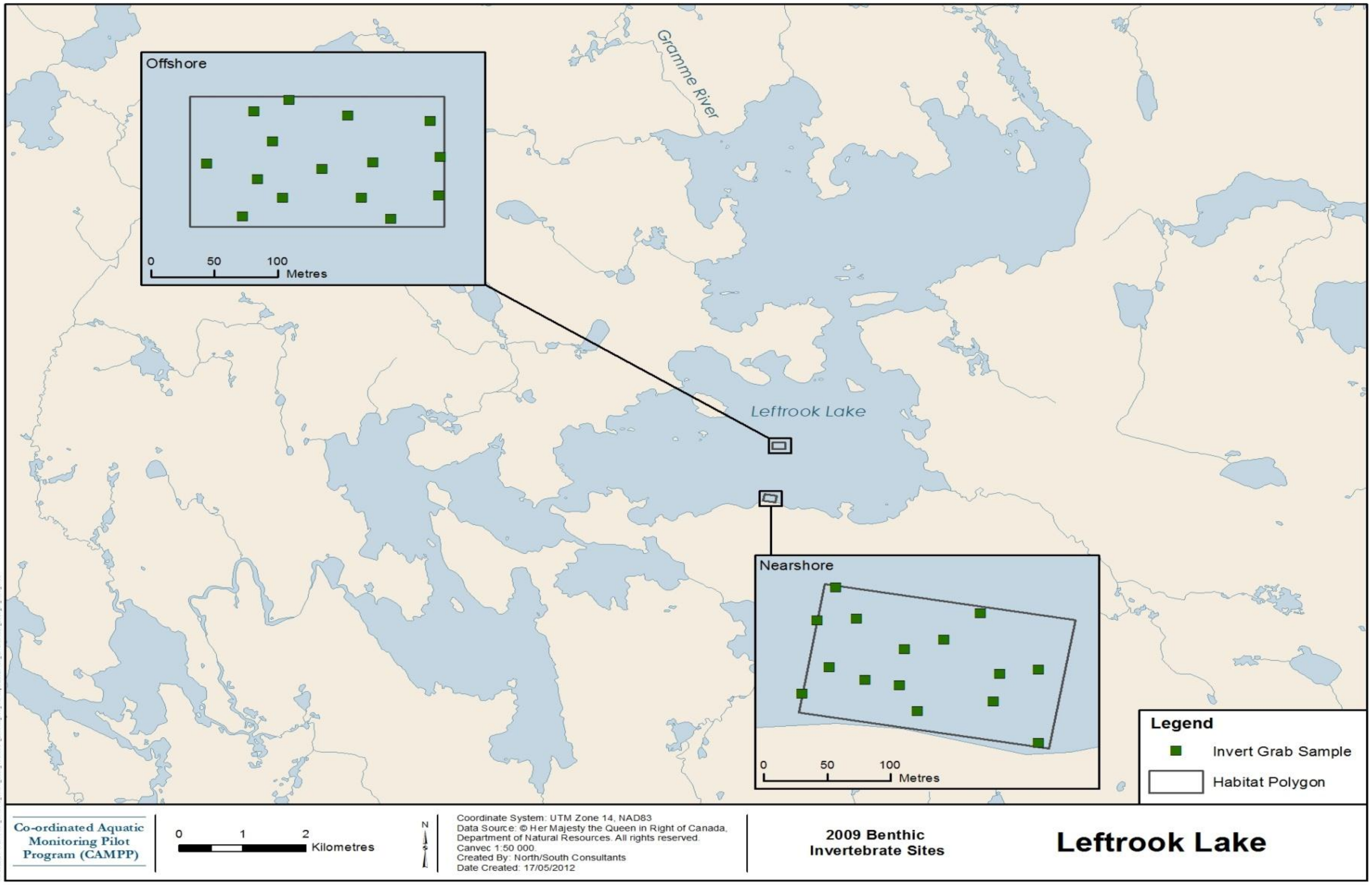


Figure 6.5-4. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Leftrook Lake within the Churchill River Diversion Region, 2009.

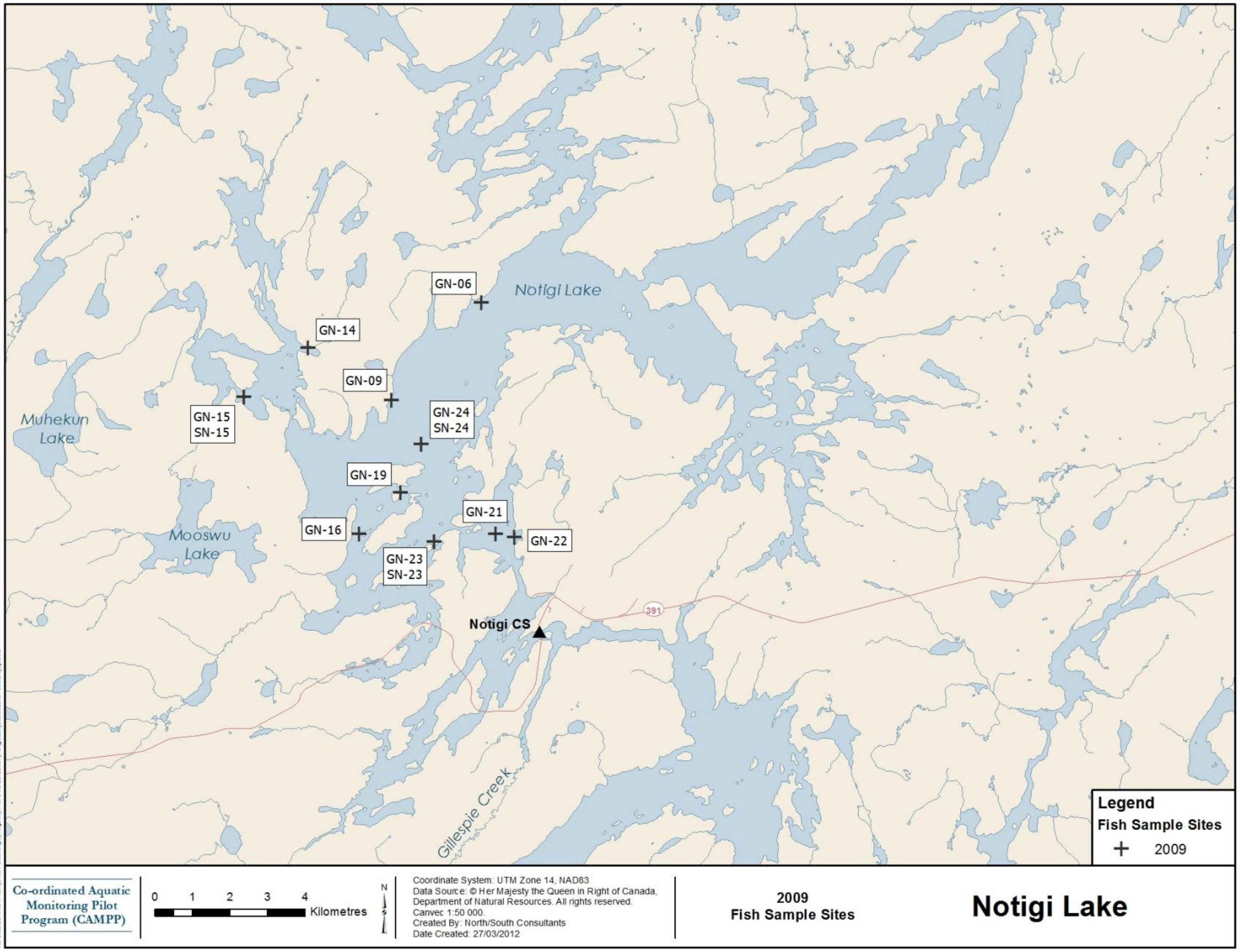


Figure 6.6-1. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Notigi Lake, 2009.

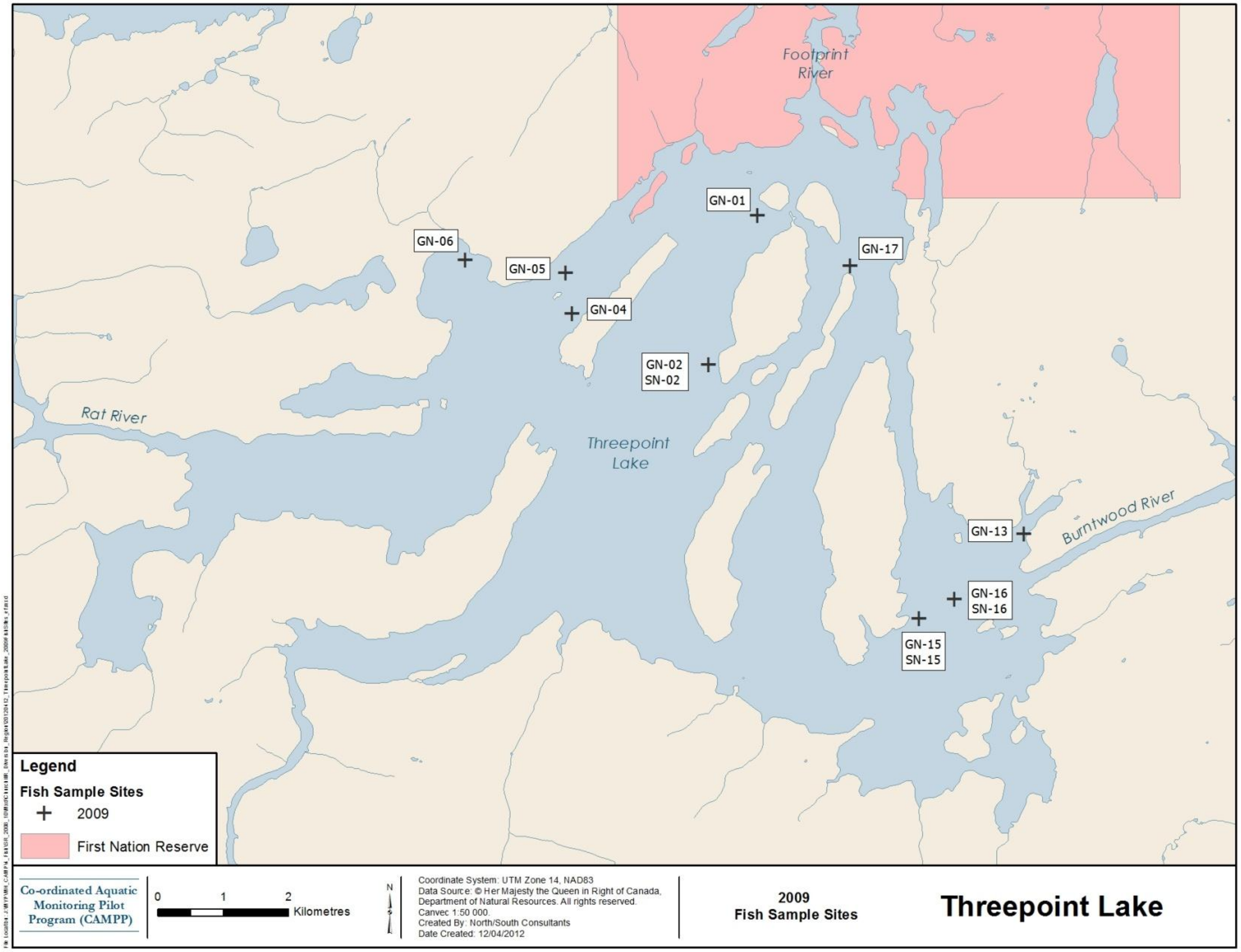


Figure 6.6-2. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Threepoint Lake, 2009.

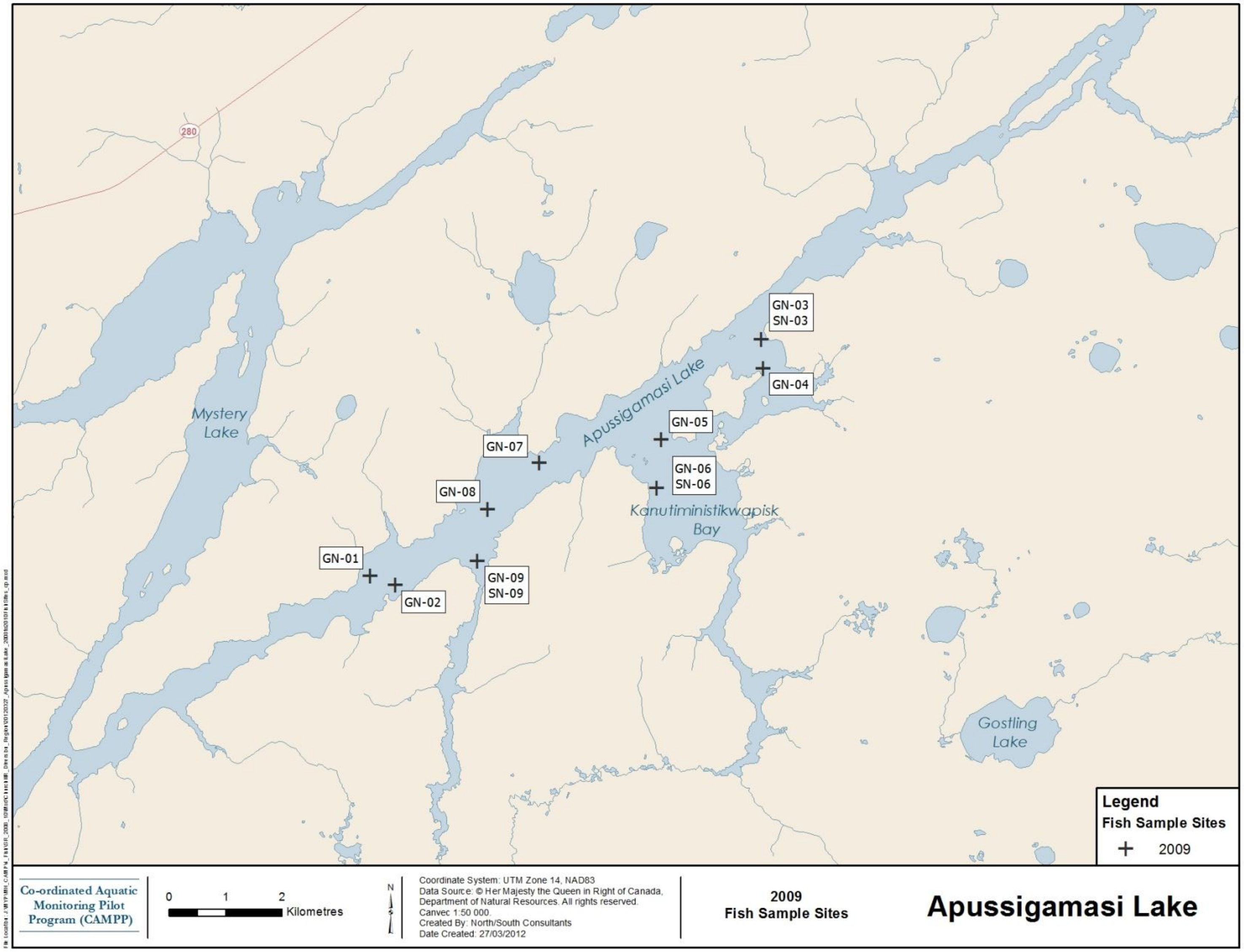


Figure 6.6-3. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Apussigamasi Lake, 2009.

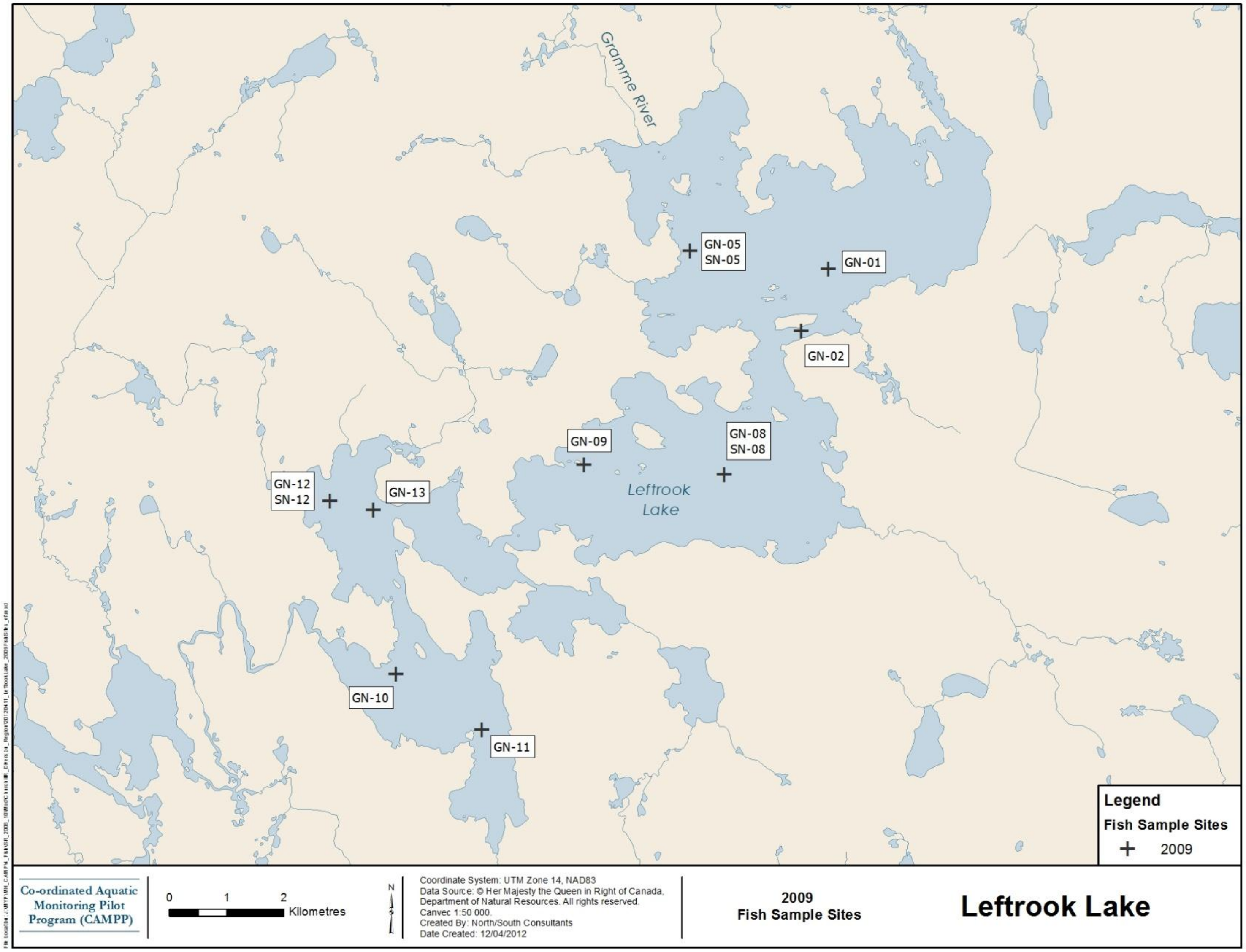


Figure 6.6-4. Map of standard gang (GN) and small mesh (SN) index gillnet sites sampled in Leftrook Lake, 2009.

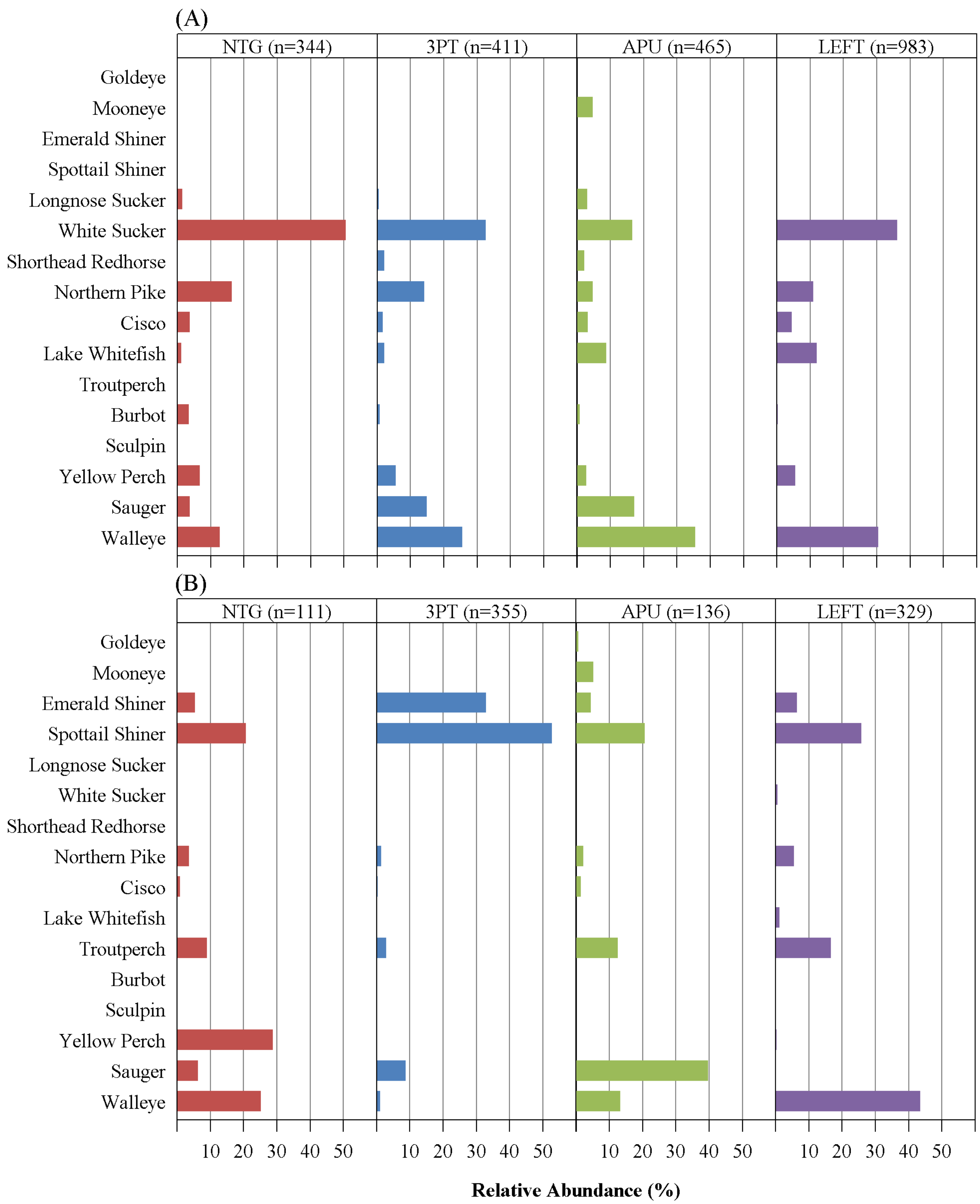


Figure 6.6-5. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009.

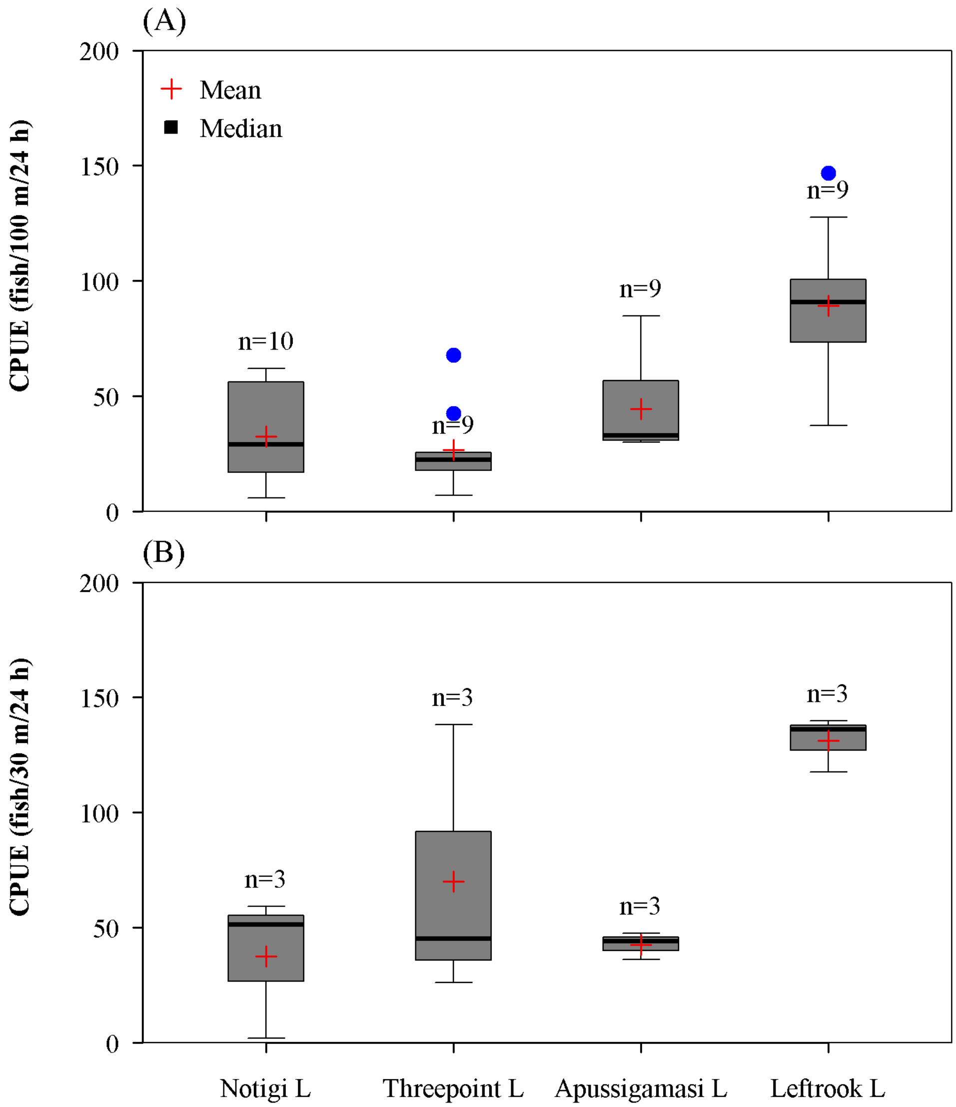


Figure 6.6-6. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009.

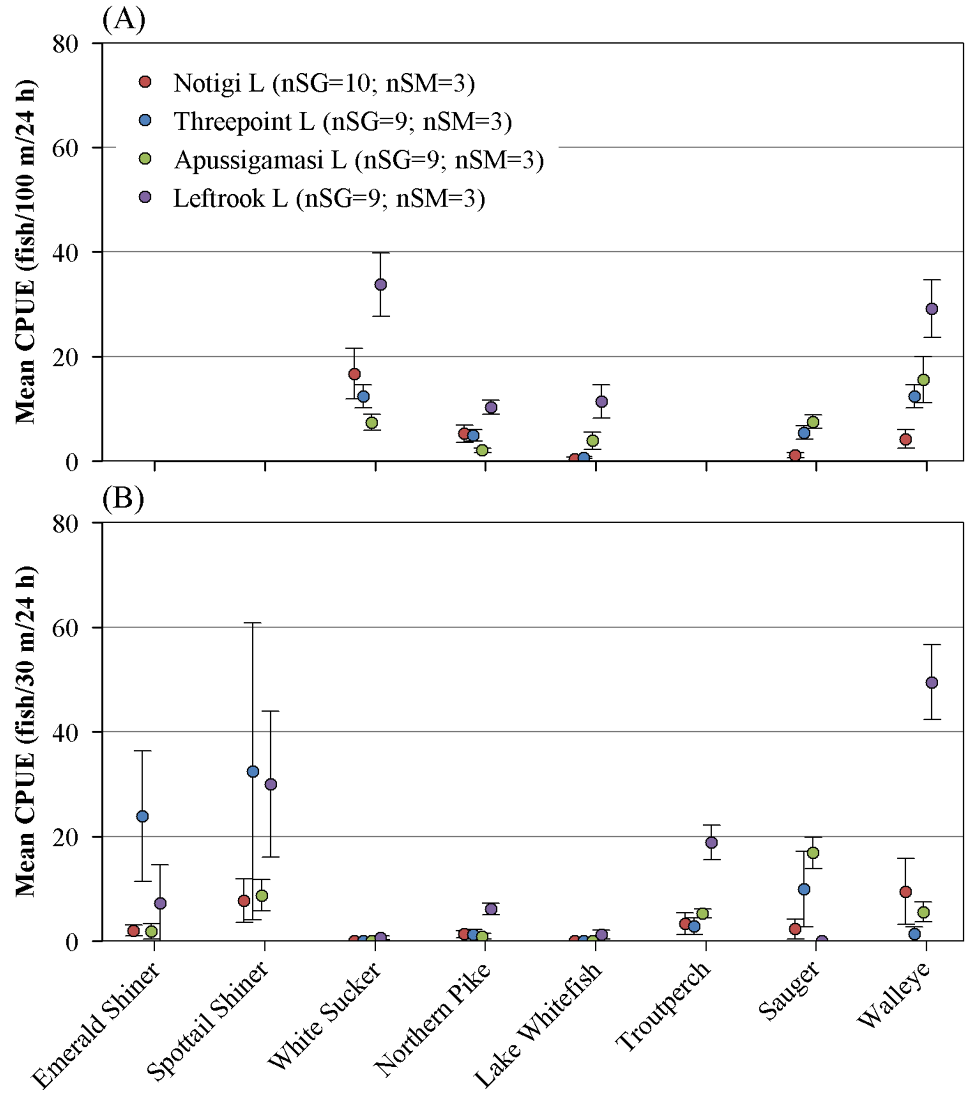


Figure 6.6-7. Mean (SE) CPUE for select species captured in (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Churchill River Diversion Region waterbodies, 2009.

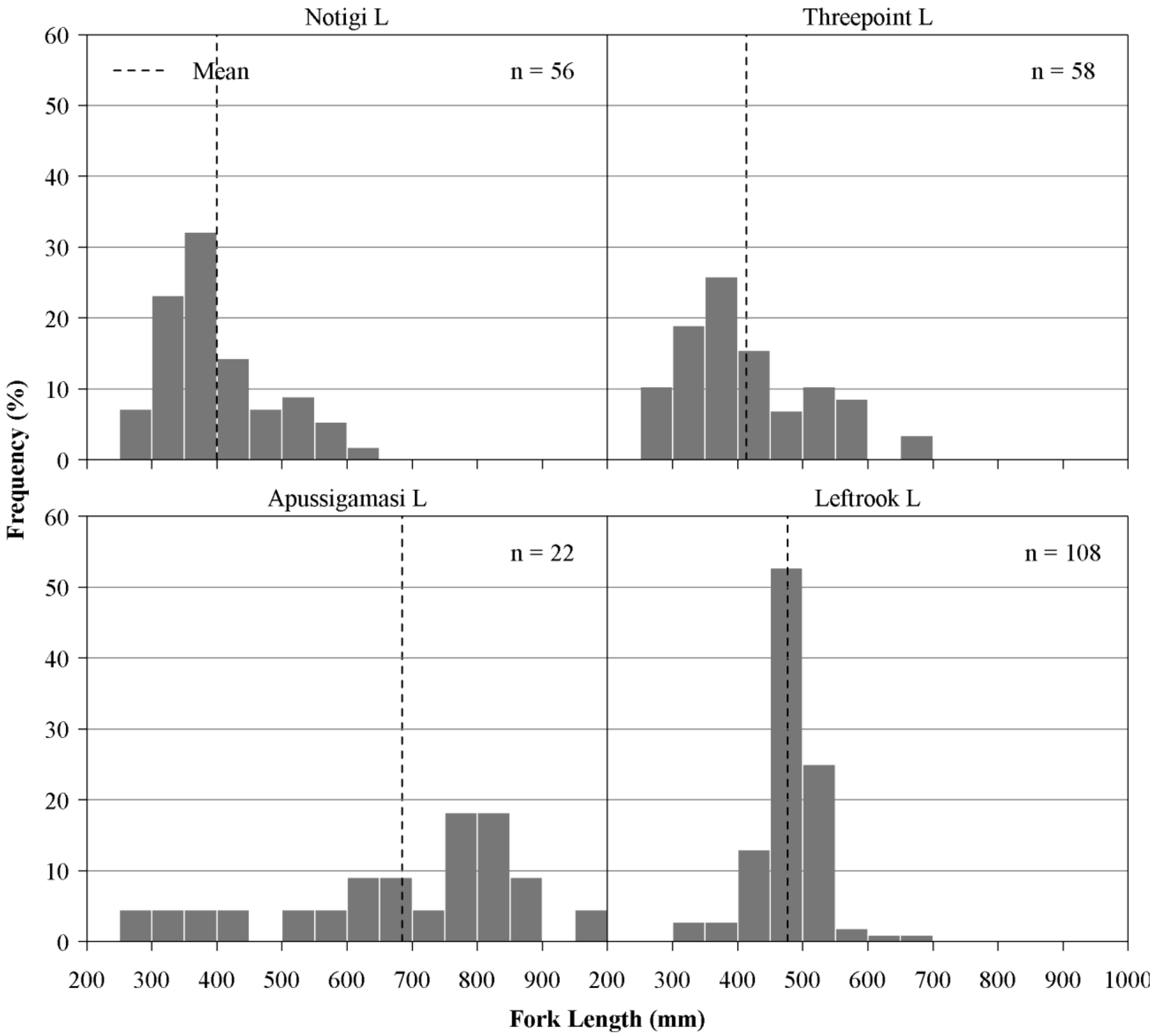


Figure 6.6-8. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009.

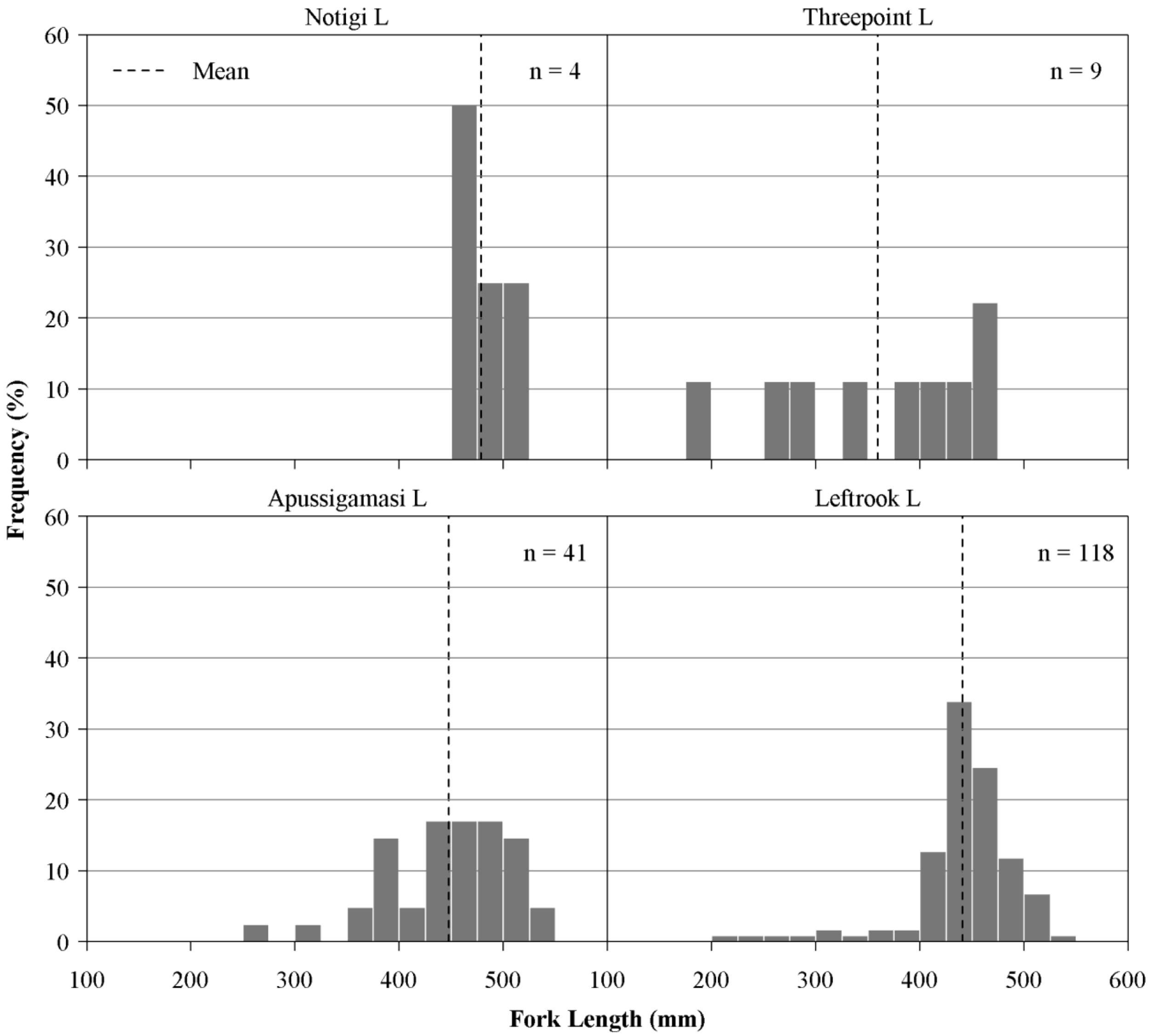


Figure 6.6-9. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009.

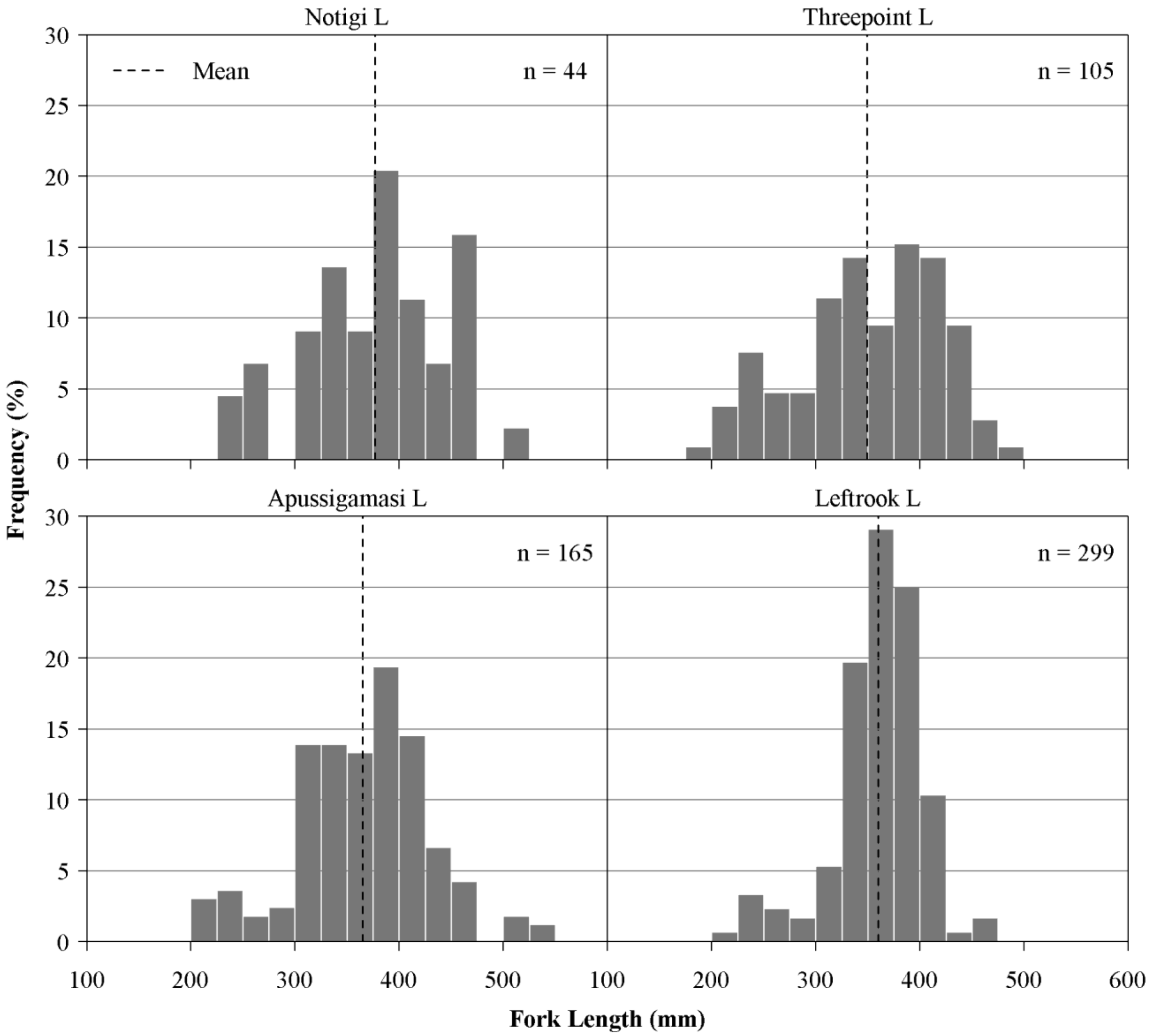


Figure 6.6-10. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009.

7.0 UPPER NELSON RIVER REGION

The following provides an overview of the results of CAMPP for 2009/2010 for the Upper Nelson River Region, by each major component. A 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 2009 were slightly below normal compared to the 1971-2000 temperature normals over the open-water sampling period, with the notable exception of September when air temperatures were 5.8 ^{o}C above normal (Figure 7.1-1). The air temperatures in was also exceptionally high in November, at 7.5 ^{o}C above the normal. Overall, the annual mean air temperature was approximately 0.4 ^{o}C above the normal.

The 1971-2000 normals for precipitation Norway House indicate a peak in July with secondary peaks in June and August with lower precipitation levels during the winter months (Figure 7.1-1). In 2009, the highest precipitation occurred in July (more than two times the normal for that month). Below normal precipitation occurred in the May, June, November and December. Notably, November received 11% of the normal precipitation for that month. Most precipitation data for October 2009 was and total precipitation values likely represent underestimates of actual precipitation for October and 2009.

Overall the comparison to climate normals shows that 2009 was characterized by cooler spring and summer with a dryer than normal spring and a wet July (Figure 7.1-1). The winter months were generally cooler (except November), with above normal precipitation from January to April and below normal precipitation in November and December.

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. CAMPP monitoring occurs on Playgreen Lake, which is the first lake downstream from Lake Winnipeg. Monitoring also occurs on Cross Lake, which is directly downstream from Jenpeg. Setting Lake is the off-system waterbody for this region.

Upper Nelson River flows at the Kelsey GS in 2009 were at or above the upper quartile for the entire year with flows reaching record highs in late August to early September (Figure 7.2-1).

High flows were driven by above average snowpack in the Red River and Winnipeg River drainage basins, which led to high Lake Winnipeg water levels and discharge being maximized at Jenpeg from May through August 2009.

Playgreen Lake water levels were near or above the upper quartile for all of 2009 (Figure 7.2-2), while Cross Lake water levels were above the upper quartile for almost all of 2009 (Figure 7.2-3).

Setting Lake water levels varied from a low in mid-April to a high in early-August before dropping back down, following almost the exact level as in 2008 from November to the end of the year (Figure 7.2-4).

7.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 2 of CAMPP in the Upper Nelson River Region. Waterbodies sampled included: Playgreen Lake (near Norway House); Cross Lake (near the community); and, an off-system site, Setting Lake (Figure 7.3-1).

7.3.1 Routine Variables and Limnology

Results of the 2009/2010 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 waterbodies along the upper Nelson River can generally be described as moderate to nutrient-rich, slightly alkaline, moderately hard to hard, and well-oxygenated. Playgreen and Cross lakes did not thermally stratify (Figure 7.3-2) and maintained dissolved oxygen (DO) concentrations above all Manitoba Water Quality Standards Objectives and Guidelines (MWQSOGs; Manitoba Water Stewardship [MWS] 2011) for the protection of aquatic life (PAL; 5.5-9.5 mg/L depending on season) in 2009/2010 (Figure 7.3-3). All other *in situ* variables, including turbidity, pH, and specific conductance were generally relatively consistent across depth (Figures 7.3-4 to 7.3-6). Secchi disk depths generally ranged between 0.5 m and 1.5 m during the open-water season in lakes in the region (Figure 7.3-7). *In situ* profiles were not taken in fall due to a malfunctioning water quality meter.

Total phosphorus (TP) exceeded the Manitoba narrative guideline for lakes, reservoirs and ponds (0.025 mg/L) in all four samples from Cross Lake and in three of the four samples collected from Playgreen Lake (Figure 8.3-8). Other routine water quality variables for which there are

MWQSOGs, including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

During the open-water season, the majority of TP was in particulate form in Playgreen Lake; however, the relative proportions of dissolved and particulate forms varied by season in Cross Lake such that in spring dissolved and particulate forms were present in near equal amounts, in summer the majority of TP was in dissolved form, and in fall the majority of TP was in particulate form (Figure 7.3-9). Under ice-cover, the majority of TP was in dissolved form at both waterbodies. The majority of total nitrogen (TN) was consistently composed of organic nitrogen (Figure 7.3-10). During the open-water season, nitrate/nitrite and ammonia generally contributed near equal amounts to the dissolved inorganic nitrogen (DIN); however, the concentrations and proportion of DIN that was nitrate/nitrite was higher in winter.

7.3.1.2 Off-system Waterbody

The water quality of Setting Lake differed from that of the upper Nelson River; Setting Lake was generally more coloured, softer, and clearer than lakes along the upper Nelson River. Unlike the on-system waterbodies, Setting Lake was thermally stratified in spring and summer 2009/2010 (Figure 7.3-2); additionally a warm layer of water was present below the surface in winter. In summer and winter, DO was depleted at depth such that it dropped below the MWQSOGs for cool and cold-water species (5.5 to 9.5 mg/L depending on season), Similar to on-system lakes, other *in situ* variables, including turbidity, pH, and specific conductance, were generally relatively consistent throughout the water column (Figure 7.3-4 to 7.3-6). Secchi disk depths were at the higher range of those measured on-system and ranged from 1.3 to 1.5 m (Figure 7.3-7). *In situ* profiles were not taken in fall due to a malfunctioning water quality meter.

TP exceeded the Manitoba narrative guideline for lakes, reservoirs and ponds (0.025 mg/L) in one of four samples from Setting Lake (winter; Figure 8.3-8). Other routine water quality variables for which there are MWQSOGs, including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

The majority of TP in Setting Lake was in particulate form during the open-water season; conversely, in winter the majority of TP was in dissolved form (Figure 7.3-9). Similar to the sites along the upper Nelson River, the majority of TN in Setting Lake was organic nitrogen (Figure 7.3-10). During the open-water season, on average ammonia contributed a larger amount to DIN than nitrate/nitrite; however, the concentrations and proportion of DIN that was nitrate/nitrite was higher in the ice-covered season.

Water samples collected at depth (1 m above the sediment-water interface) in Setting Lake in spring and summer, when the lake was thermally stratified, indicated higher concentrations of some water quality variables in the hypolimnion than the epilimnion. DIN and TN were notably higher at depth, largely due to elevated concentrations of nitrate/nitrite (Figure 7.3-11). TP was also substantively higher at depth in summer, due to higher concentrations of both dissolved and particulate phosphorus (Figure 7.3-12).

7.3.2 Metals and Major Ions

7.3.2.1 On-system Waterbodies

A summary of metal concentrations measured and detection frequencies for the Upper Nelson River Region in 2009/2010 is presented in Table 7.3-3.

Beryllium, bismuth, cesium, mercury, selenium, silver, and tellurium were not detected along the upper Nelson River in 2009/2010. Several metals were consistently detected including aluminum, arsenic, barium, calcium, copper, iron, magnesium, manganese, molybdenum, potassium, rubidium, sodium, strontium, titanium, uranium, and vanadium. The remaining metals were detected in some samples.

Aluminum consistently exceeded the MWQSOG PAL (0.100 mg/L) in both Playgreen and Cross lakes; and iron exceeded the MWQSOG PAL (0.3 mg/L) in 25% of samples from each lake (Figure 7.3-13). The analytical detection limits for mercury was above the current MWQSOG PAL guideline (0.000026 mg/L) in winter. Therefore comparison of analytical results to the PAL guideline could not be undertaken for all samples. Considering only the results of analyses where the analytical detection limit was sufficiently low to facilitate this comparison (i.e., open-water season), mercury concentrations were consistently below the MWQSOG PAL (0.000026 mg/L). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in surface samples collected from the upper Nelson River in 2009/2010 (Table 7.3-4).

Chloride concentrations in along the upper Nelson River (< 23 mg/L) were on the lower range of those reported for the central and western regions of Canada (< 1 mg/L to approximately 500 mg/L; Canadian Council of Resource and Environment Ministers [CCREM] 1987; Table 7.3-2), and were all well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013; Table 7.3-4). Sulphate concentrations were less than 34 mg/L (Table 7.3-2), and fell on the lower range of concentrations reported across Canada (< 1 mg/L to approximately 3,000 mg/L; 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 7.3-4).

7.3.2.2 Off-system Waterbody

A number of metals were not detected in Setting Lake including beryllium, bismuth, boron, cesium, lead, mercury, nickel, selenium, silver, tellurium, thallium, vanadium, zinc, and zirconium. Aluminum, arsenic, barium, calcium, iron, magnesium, manganese, potassium, rubidium, sodium, strontium, and titanium were consistently detected. The remaining metals were detected in some samples.

Aluminum exceeded the MWQSOG PAL (0.100 mg/L) in all four samples collected in Setting Lake in 2009/2010 (Figure 7.3-13). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in surface samples collected from Setting Lake in 2009/2010 (Table 7.3-4).

Concentrations of total aluminum, iron, and manganese were higher near the sediment-water interface (i.e., bottom samples) than at the surface (Figure 7.3-14) in spring and summer when the lake was thermally stratified; this difference was more apparent in summer. In bottom samples, aluminum concentrations exceeded the MWQSOG PAL (0.100 mg/L) in both spring and summer and iron exceeded the MWQSOG PAL (0.3 mg/L) in summer. All other metals for which there are MWQSOGs for PAL were within the objectives and guidelines in the bottom samples collected in Setting Lake in 2009/2010 (Table 7.3-4).

Chloride and sulphate concentrations in Setting Lake were lower than those measured in the upper Nelson River (Table 7.3-2). Chloride concentrations were well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013; Table 7.3-4).

7.3.3 Trophic Status and Nutrient Ratios

7.3.3.1 On-system Waterbodies

In 2009/2010, Playgreen Lake was eutophic and Cross Lake was mesotrophic based on mean open-water TP concentrations (Table 7.3-5); however, both lakes were considered mesotrophic based on both TN and chlorophyll *a* (open-water means; Tables 7.3-6 and 7.3-7).

On the basis of molar TN:TP ratios (Figure 7.3-15), Playgreen Lake was phosphorus limited during spring, summer and winter, but nitrogen limited in fall; and, Cross Lake was nitrogen and phosphorus co-limited in spring and winter, but phosphorus limited in summer and fall. Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter in the waterbodies along the upper Nelson River was a mixture of allochthonous and autochthonous sources (Figure 7.3-16).

7.3.3.2 Off-system Waterbody

In 2009/2010, Setting Lake was classified as mesotrophic based on TP, TN and chlorophyll *a* (open-water means; Tables 7.3-5 to 7.3-7). Based on TN:TP molar ratos, Setting Lake was phosphorus limited in the open-water season and nitrogen and phosphorus co-limited in the winter (Figure 7.3-15). Similar to the on-system lakes, organic matter in Setting Lake was composed of both allochthonous and autochthonous sources in 2009/2010 (Figure 7-3.16).

7.3.4 Escherichia coli

7.3.4.1 On-system Waterbodies

E. coli was detected in two of four samples collected in Playgreen Lake and in one of four samples collected in Cross Lake (Table 7.3-2). All measurements were low (≤3 CFU/100 mL) and well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

7.3.4.2 Off-system Waterbodies

E. coli was detected in two of four samples collected in Setting Lake in 2009/2010 (Table 7.3-2). All measurements were low (≤1 CFU/100 mL) and well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

7.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 2 of CAMPP in the Upper Nelson River Region. Waterbodies sampled included Playgreen Lake and Cross Lake (near the community), and an off-system lake (Setting Lake; Figure 7.3-1).

7.4.1 Chlorophyll a

Open-water season chlorophyll *a* concentrations in the Upper Nelson River Region were moderate to high (Figure 7.4-1), and were slightly higher at Playgreen Lake than at the other waterbodies in the region. Chlorophyll *a* concentrations measured near the surface of the lakes were comparable to those measured over the euphotic zone. Winter concentrations at all sites were lower than those measured during the open-water season.

7.4.2 Community Composition and Biomass

Phytoplankton biomass measured during the open-water season was low to moderate, and varied between the waterbodies in the Upper Nelson River Region. Biomass in Cross Lake was consistently lower than the other waterbodies in the region (Figure 7.4-2.). Seasonality of phytoplankton biomass in the region also varied across waterbodies. In Cross and Setting lakes, peak biomass occurred in summer whereas the greatest abundance of phytoplankton in Playgreen Lake occurred in spring; biomass was lowest in fall at all sites.

The phytoplankton communities in sites sampled along the upper Nelson River in 2009 were generally dominated by diatoms throughout the open-water season (Figure 7.4-3). There were two exceptions to this trend. In Playgreen Lake, the summer phytoplankton community was co-dominated by blue-green algae and diatoms, and in Setting Lake, the spring community was dominated by cryptophytes. Chrysophytes, cryptophytes, and/or green algae were prevalent in Cross and Setting lakes during all seasons; and, blue-green algae were present in moderate abundance in Setting Lake. Blue-green algae and green algae were the next-most common taxa in Playgreen Lake in fall.

Metrics describing the phytoplankton communities showed that diversity, heterogeneity, evenness, and species effective richness were generally similar across seasons at Playgreen, Cross, and Setting lakes in 2009 (Table 7.4-1). Spatially, the community metrics tended to be highest at Cross Lake during all seasons while community complexity was lower at either Playgreen or Setting lakes, depending on the season.

7.4.3 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L at Playgreen Lake in fall 2009. Total phytoplankton biomass during this period was 1,762 mg/m^3 and the community was dominated by diatoms although green and blue-green algae were also abundant (Figure 7.4-3).

7.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 ubiquitous in the region in 2009, and *Planktothrix* was present at Setting Lake.

Microcystin-LR was not measured for this region in 2009.

7.4.5 Trophic Status

In terms of chlorophyll *a* concentrations, Playgreen, Cross, and Setting lakes are all categorized as mesotrophic in 2009/2010 (Table 7.3-6).

7.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Upper Nelson River Region in 2009/2010; the second year of CAMPP. Areas sampled included the on-system waterbodies Playgreen and Cross lakes and the off-system waterbody Setting Lake (Figures 7.5-1 to 7.5-3). Cross and Setting lakes are sampled annually, and Playgreen Lake is sampled on a rotational basis (i.e., once every three years).

Fifteen BMI samples were collected in each of the nearshore and offshore habitat polygons of Playgreen, Cross, and Setting lakes using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted between 26 and 30 August 2009.

7.5.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons (where applicable) at each waterbody (Table 7.5-1).

In 2009, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and for the offshore habitat water depths of greater than 5 m were targeted. In 2009, mean water depths sampled in the nearshore were: 1.5 m in Playgreen Lake, 4.3 m in Cross Lake, and 2.0 m in Setting Lake. Mean water depths sampled in the offshore were: 8.6 m in Playgreen Lake, 6.9 m in Cross Lake, and 22.4 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 nearshore and offshore polygon. The habitat polygons sampled in the Upper Nelson River Region generally had low mean organic carbon in the sediments (Table 7.5-2). Mean TOC was highest at Playgreen Lake nearshore (3.8%), and lowest at the Playgreen Lake offshore (0.8%) (Table 7.5-2). Mean TOC was similar in the nearshore and offshore sites of both Cross Lake and Setting Lake, with mean values ranging from 2.4% to 3.3%.

Silt comprised the majority of the sediments collected from predominantly wetted nearshore polygons in all waterbodies except Playgreen Lake, where silt and clay were similarly represented (Table 7.5-2). Sand followed by silt comprised the majority of sediments collected from the offshore polygon in Playgreen Lake, while silt dominated offshore sediments in Cross Lake. Silt and clay co-dominated in the Setting Lake offshore sediment samples (Table 7.5-2).

7.5.2 Species Composition, Distribution, and Relative Abundance

7.5.2.1 Playgreen Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Playgreen Lake was 6,686 individuals/m^2, with densities ranging from 2,640 to 14,327 (Table 7.5-3). Overall, non-insects and insects were similar in abundance within the BMI community, with non-insects comprising 49% of the mean total BMI, and insects comprising 51% (Table 7.5-3). Of the non-insects, the main groups were Oligochaeta (17%), Bivalvia 13%), Amphipoda (12%), and Gastropoda (6%); Hirudinea (leeches) and Acari (mites) were also present. Insects mainly consisted of Chironomidae (49% of the mean total BMI); a small number of Trichoptera, Ephemeroptera, Ceratopogonidae, and Hemiptera (true bugs) were also found (Table 7.5-3). Mean BMI density in offshore benthic grab samples was 6,267 individuals/m^2, with numbers ranging from 2,640 to 13,418 (Table 7.5-3). Overall, non-insects dominated the BMI community (76% of the mean total BMI), with insects comprising 24% of the overall taxa (Table 7.5-3). Non-insects mainly consisted of Bivalvia (39% of the mean total BMI), Amphipoda (16%), Oligochaeta (12%); Hirudinea and Gastropoda were also present. Of the insects, the main group was Chironomidae (12% of the mean total BMI); a smaller number of Ephemeroptera (7%), Trichoptera (5%), and Ceratopogonidae were also collected (Table 7.5-3).

Total EPT comprised 2% of the nearshore BMI community, and consisted of Trichoptera and Ephemeroptera (Table 7.5-3). Genus analysis of the mayflies indicated that *Hexagenia* sp. was the most abundant of the mayflies collected in nearshore grab samples.. Although Plecoptera were not collected, Trichoptera were collected in small numbers (Table 7.5-3). In the offshore polygon, total EPT comprised 12% of the mean total BMI, with the prevalence being within Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant within the mayflies in offshore samples (Table 7.5-3). Trichoptera were also collected in small numbers. Plecoptera were not present in samples. The ratio of EPT:C was 0.05 in the nearshore polygon and 1.18 in the offshore polygon (Table 7.5-3). The nearshore ratio indicates Chironomidae strongly dominated the EPT. The offshore ratio indicates a more balanced community with respect to the numbers of EPT and Chironomidae.

Taxonomic richness in the nearshore was 20 families, with richness values ranging from six to 13 within each sample (Table 7.5-3). Hill's Effective Richness (E^H) was five; Chironomidae, Oligochaeta, and Pisidiidae were the most dominant taxa (Table 7.5-3). Taxonomic richness in the offshore polygon was 16 families, with richness values ranging from six to 10 within each sample (Table 7.5-3). Hill's Effective Richness (E^H) was five; Pisidiidae, Haustoriidae, and Oligochaeta were the most dominant taxa in the offshore polygon (Table 7.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.68 and 0.72 in the nearshore and offshore polygons, respectively (Table 7.5-3). Evenness (Simpson's Equitability [E_D]) was 0.36 in the nearshore polygon and 0.41 in the offshore polygon (Table 7.5-3).

7.5.2.2 Cross Lake

The mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Cross Lake was 1,019 individuals/m^2, with densities ranging from 519 to 1,558 (Table 7.5-4). Overall, insects dominated the BMI community in abundance (77% of the mean total BMI), with non-insects comprising 23% of the overall taxa. Insects mainly consisted of Ephemeroptera (63% of the mean BMI) and Chironomidae (10%); a small number of Megaloptera were also found (Table 7.5-4). Of the non-insects, the main group was Bivalvia (16%), though Oligochaeta and Amphipoda were also present (Table 7.5-4). The mean BMI density in the offshore habitat was 1,082 individuals/m^2, with densities ranging from zero to 2,467 (Table 7.5-4). Overall, insects dominated the BMI e community (92% of the mean total BMI), with non-insects comprising 8% of the overall taxa. Insects consisted of Ephemeroptera (54%) and Chironomidae (38%; Table 7.5-4). Of the non-insects, the main groups were Oligochaeta (3%), Bivalvia (3%), and Amphipoda (2%); Hirudinea was also present.

Total EPT comprised 63% and 54% of the mean total BMI community in the nearshore and offshore polygons, respectively and consisted solely of mayflies (Table 7.5-4). Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was singly dominant in both habitats. Neither Trichoptera nor Plecoptera were collected from either nearshore or offshore habitats. The ratio of EPT:C was 8.78 in the nearshore and 2.11 in the offshore (Table 7.5-4). Both the nearshore and offshore ratios indicate that EPT were dominant in abundance over Chironomidae, especially in the nearshore habitat.

Taxonomic richness in both the nearshore and offshore polygons was six families and Hill's Effective Richness (E^H) was three in both habitats (Table 7.5-4). Taxonomic richness values ranged from three to five within the nearshore polygon, and between zero and six within the offshore polygon. The nearshore was mainly dominated by Ephemeridae; in the offshore, Ephemeridae and Chironomidae were most abundant (Table 7.5-4).

Simpson's Diversity Index (D) was 0.52 in the nearshore polygon and 0.56 in the offshore polygon (Table 7.5-4). Evenness (Simpson's Equitability [E_D]) values were 0.47 in the nearshore polygon and 0.50 in the offshore polygon (Table 7.5-4).

7.5.2.3 Setting Lake

The overall mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Setting Lake was 2,583 individuals/m^2, with densities ranging from 952 to 5,237 (Table 7.5-5). Overall, non-insects dominated the BMI community in abundance (78% of the mean total BMI), with insects comprising 22% of the overall taxa. Of the non-insects, the main group was Amphipoda (65% of the mean total BMI) though Bivalvia, Oligochaeta, Gastropoda, Hirudinea, and Mysidae (mysid shrimp) were also present. Insects mainly consisted of Chironomidae (17%); small numbers of Ephemeroptera (3%), Megaloptera, Leptoceridae, Ceratopogonidae, and Trichoptera were also present (Table 7.5-5). The mean BMI density in the offshore habitat was 1,887 individuals/m^2, with densities ranging from 1,039 to 3,679 (Table 7.5-5). Overall, insects dominated the BMI community (62% of the mean total BMI), with non-insects comprising 38% of the overall taxa. Insects consisted solely of Chironomidae (Table 7.5-5). Of the non-insects, the main groups were Oligochaeta (22% of the mean total BMI) and Bivalvia (15%); Mysidae and Amphipoda were also present.

Total EPT comprised 4% of the mean total nearshore BMI, with the prevalence being within the Ephemeroptera. Genus analysis of the mayflies indicated that *Hexagenia* sp. was the only genus present in nearshore grab samples (Table 7.5-5). Trichoptera were collected in small numbers and no Plecoptera were collected in nearshore samples. The ratio of EPT:C was 0.40 (Table 7.5-5). This ratio indicates that Chironomidae were dominant in abundance over EPT in the nearshore community. No EPT groups were present in the offshore invertebrate community.

Taxonomic richness within the nearshore polygon was 15 families, with richness values ranging from three to ten within each sample. Hill's Effective Richness (E^H) was four; Haustoriidae was the most dominant family. Within the offshore polygon, taxonomic richness was five with richness values ranging from three to five within each sample. Hill's Effective Richness (E^H) was three with Chironomidae the most notable family (Table 7.5-5).

Simpson's Diversity Index (D) was 0.53 in the nearshore and 0.56 in the offshore polygon (Table 7.5-5). Evenness (Simpson's Equitability [E_D]) values were 0.36 in the nearshore polygon and 0.56 in the offshore polygon (Table 7.5-5).

7.6 FISH COMMUNITY

7.6.1 Gill netting

Gill netting was conducted in the Upper Nelson River Region in 2009 in Playgreen Lake (8 – 15 June), Cross Lake (18 – 22 August) and Setting Lake (2 – 12 September) (Table 7.6-1).

In Playgreen Lake, 17 sites were sampled using standard gang index gill nets and five 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 6.3 – 11.4°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 7.6-2). Water temperature during the sampling period ranged from 15 – 16°C.

In Setting Lake, 14 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 7.6-3). During sampling, water temperature ranged from 15.0 – 16.5°C.

7.6.2 Species Composition

In 2009, 17 species of fish were captured in the Upper Nelson River Region (Table 7.6-2).

7.6.2.1 Playgreen Lake

A total of 1,062 fish, representing 11 species, were captured in standard gang index gill nets (Table 7.6-3) and a total of 414 fish, representing 10 species, were captured in small mesh index gill nets (Table 7.6-4). In the standard gang index gillnet catch, White Sucker (n = 396 fish; 37.29%) were most common, followed by Northern Pike (n = 174 fish; 16.38%) and Yellow Perch (n = 170 fish; 16.01%) (Table 7.6-3; Figure 7.6-4). In the small mesh index gillnet catch, Spottail Shiner (n = 197 fish; 47.58%) were most abundant, followed by Yellow Perch (n = 81 fish; 19.57%) and Rainbow Smelt (n = 53 fish; 12.80%) (Table 7.6-4; Figure 7.6-4).

Northern Pike (41.42%) and White Sucker (30.51%) accounted for the majority of the biomass in the standard gang index gillnet catch (Table 7.6-5). In the small mesh index gillnet catch, Northern Pike represented 68.76% of the biomass, followed by Walleye (13.16%) (Table 7.6-6).

7.6.2.2 Cross Lake

A total of 393 fish, representing nine species, were captured in standard gang index gill nets (Table 7.6-3) and a total of 416 fish, representing 10 species, were captured in small mesh index gill nets (Table 7.6-4). Northern Pike were most abundant in the standard gang index gillnet catch (n = 107 fish; 27.23%) followed by Walleye (n = 102 fish; 25.95%) and White Sucker (n = 57 fish; 14.50%) (Table 7.6-3; Figure 7.6-4). In the small mesh index gillnet catch, Yellow Perch was the most common species captured (n = 197 fish; 47.36%), followed by Spottail Shiner (n = 170 fish; 40.87%) (Table 7.6-4; Figure 7.6-4).

In terms of biomass, Northern Pike represented 42.08% of the standard gang index gillnet catch, followed by Walleye (25.84%) and White Sucker (17.49%) (Table 7.6-5). In the small mesh index gillnet catch, Northern Pike represented 44.30% of the biomass, followed by Yellow Perch (30.02%) and Sauger (17.57%) (Table 7.6-6).

7.6.2.3 Setting Lake

A total of 1,120 fish, representing 10 species, were captured in standard gang index gill nets (Table 7.6-3). Walleye were most abundant (n = 274 fish; 24.46%), followed by Cisco (n = 235 fish; 20.98%), Sauger (n = 229 fish; 20.45%), and White Sucker (n = 188 fish; 16.79%) (Table 7.6-3; Figure 7.6-4). In small mesh index gill nets, a total of 65 fish were captured, representing seven species. The majority of the catch consisted of Spottail Shiner (n = 24 fish; 36.92%) and Sauger (n = 24 fish; 36.92%) (Table 7.6-4; Figure 7.6-4).

In terms of biomass, White Sucker represented 30.08% of the standard gang index gillnet catch, followed by Walleye (24.32%) (Table 7.6-5). The biomass in the small mesh index gillnet catch consisted primarily of Sauger (57.72%) and Northern Pike (31.83%) (Table 7.6-6).

7.6.3 Catch-Per-Unit-Effort (CPUE) and Biomass-Per-Unit-Effort (BPUE)

7.6.3.1 Playgreen Lake

The mean CPUE for the standard gang index gillnet catch was 59.6 fish/100 m/24 h (Table 7.6-7; Figure 7.6-5). White Sucker had the highest CPUE (22.9), followed by Northern Pike (10.0), Yellow Perch (9.4), and Walleye (8.1) (Table 7.6-7; Figure 7.6-6).

In small mesh index gill nets, the mean CPUE was 96.3 fish/30 m/24 h (Table 7.6-8; Figure 7.6-5). Spottail Shiner had the highest CPUE (46.2), followed by Yellow Perch (18.7) (Table 7.6-8; Figure 7.6-6).

The BPUE for the standard gang index gillnet catch was 44,507 g/100 m/24 h) (Table 7.6-9). Species with the highest BPUE were Northern Pike (18,544) and White Sucker (13,932). Small mesh index gill nets produced a BPUE of 3,777 g/30 m/24 h (Table 7.6-10). Northern Pike had the highest BPUE (2,639), followed by Walleye (458).

7.6.3.2 Cross Lake

In 2009, the mean CPUE for the standard gang index gillnet catch was 31.3 fish/100 m/24 h (Table 7.6-7; Figure 7.6-5). Northern Pike had the highest species-specific CPUE (8.5) followed by Walleye (8.0) (Figure 7.6-6).

Mean CPUE for the small mesh index gillnet catch was 112.7 fish/30 m/24 h (Table 7.6-8; Figure 7.6-5). Yellow Perch had the highest species-specific CPUE (52.7), followed by Spottail Shiner (46.5) (Figure 7.6-6).

Mean BPUE for the standard gang index gillnet catch was 24,084 g/100 m/24 h (Table 7.6-9). Northern Pike had the highest BPUE (10,191), followed by Walleye (6,130) and White Sucker (4,255). Small mesh index gill nets produced a BPUE of 2,494 g/30 m/24 h (Table 7.6-10). Northern Pike (1,116) had the highest BPUE, followed by Yellow Perch (742) and Sauger (429).

7.6.3.3 Setting Lake

The mean CPUE for the standard gang index gillnet catch in 2009 was 67.8 fish/100 m/24 h (Table 7.6-7; Figure 7.6-5). Walleye had the highest CPUE (16.6), followed by Cisco (14.2), and Sauger (13.9) (Figure 7.6-6).

In small mesh index gill nets, the mean CPUE was 21.1 fish/30 m/24 h (Table 7.6-8; Figure 7.6-5). Species having the highest CPUE were Spottail Shiner (7.8) and Sauger (7.8) (Figure 7.6-6).

Mean BPUE for the standard gang index gillnet catch was 29,145 g/100 m/24 h (Table 7.6-9). White Sucker had the highest BPUE (8,757), followed by Walleye (7,066). Small mesh index gill nets produced a BPUE of 2,678 g/30 m/24 h (Table 7.6-10), with Sauger having the highest BPUE (1,542).

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 2009 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 and Walleye are illustrated for each waterbody in figures 7.6-7 and 7.6-8, respectively. An insufficient number of Lake Whitefish were captured to generate a length frequency histogram analysis. Fish captured in small mesh index gill nets were not measured for fork length and were bulk weighed (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 605 mm, a mean weight of 3,634 g, and a mean condition factor of 0.83.

Lake Whitefish captured in standard gangs had a mean fork length of 426 mm, a mean weight of 1,445 g, and a mean condition factor of 1.63. No Lake Whitefish were captured in small mesh gangs.

Walleye captured in standard gang index gill nets had a mean fork length of 413 mm, a mean weight of 975 g, and a mean condition factor of 1.29 (Table 7.6-11).

7.6.4.2 Cross Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 556 mm, a mean weight of 1,481 g, and a mean condition factor of 0.77. No Lake Whitefish were captured in standard gang or small mesh index gill nets.

Walleye captured in standard gang index gill nets had a mean fork length of 415 mm, a mean weight of 954 g, and a mean condition factor of 1.22 (Table 7.6-11).

7.6.4.3 Setting Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 498 mm, a mean weight of 946 g, and a mean condition factor of 0.70.

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 369 mm, a mean weight of 792 g, and a mean condition factor of 1.38.

Walleye captured in standard gang index gill nets had a mean fork length of 349 mm, a mean weight of 530 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, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies during 2009 (Table 7.6-13).

Mean fork length (mm), weight (g), and condition factor are also presented, by cohort, for Northern Pike (Table 7.6-14), Lake Whitefish (Table 7.6-15), and Walleye (Table 7.6-16).

7.6.5.1 Playgreen Lake

Age was determined for 91 Northern Pike captured in standard gang index gill nets (Table 7.6-13). There was good representation of fish aged 3 – 13 years, with the majority of fish aged 7 years (20.88%).

Ten of the Lake Whitefish captured in standard gang index gill nets ranged in age from 3 – 16 years.

Almost half (43.66%) of the 142 Walleye that were aged were 7 years old (Table 7.6-13). Five and six year-old fish were poorly represented in the catch.

7.6.5.2 Cross Lake

Age was determined for 103 Northern Pike captured in standard gang index gill nets set in 2009 (Table 7.6-13). Approximately half of these fish were 4 (24.27%) and 5 (22.33%) years of age.

No Lake Whitefish were captured in standard gang index gill nets in Cross Lake in 2009.

Age was determined for 97 Walleye captured in standard gang index gill nets (Table 7.6-13). The majority of these fish were 7 and 8 years of age (20.62% and 30.93%, respectively). Ten year-old Walleye were not represented in the catch.

7.6.5.3 Setting Lake

A total of 69 Northern Pike captured in standard gangs in 2009 were aged (Table 7.6-13). There was a good representation of fish aged 4 – 13, with almost have of the fish aged 5 and 6 years old (20.29% and 24.64%, respectively).

Five of the Lake Whitefish captured in standard gang index gill nets ranged in age from 2 – 7 years (Table 7.6-13).

Ages were determined for 273 Walleye (Table 7.6-13). The majority of Walleye in the sample were 4, 6, and 7 years of age. There was poor representation of 5 year-old fish.

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 2009 were examined externally for DELTs (Table 7.6-17).

7.6.6.1 Playgreen Lake

None of the fish captured in Setting Lake in standard gang index gill nets in 2009 were documented with DELTs.

7.6.6.2 Cross Lake

DELTs were documented for one fish captured in standard gang index gill nets set in 2009. One White Sucker displayed erosion, representing 1.75% of the White Sucker catch.

7.6.6.3 Setting Lake

None of the fish captured in Setting Lake in standard gang index gill nets in 2009 were documented with DELTs.

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Table 7.3-1. Summary statistics for *in situ* variables (near surface) measured in the Upper Nelson River Region: 2009/2010.

	Temperature (°C)			*In situ* pH			DO (mg/L)			DO (% saturation)			*In situ* Specific Conductance (µS/cm)			*In situ* Turbidity (NTU)			ORP (mV)		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	10.37	13.81	10.83	8.29	7.90	7.83	11.66	10.32	11.13	115	98	102	317	316	154	12.77	12.13	14.95	129	116	125
Median	12.94	17.69	13.85	8.34	8.26	7.61	11.52	9.21	11.40	103	98	98	329	317	154	11.40	10.20	14.95	104	95	125
Minimum	0.06	0.02	0.31	8.16	7.14	7.56	9.00	8.96	9.04	100	94	96	289	312	141	4.90	8.80	5.10	99	90	92
Maximum	18.10	19.85	18.33	8.37	8.30	8.31	14.61	12.78	12.94	141	101	112	334	319	168	22.00	17.40	24.80	184	163	158
SD	9.29	9.25	9.38	0.11	0.66	0.42	2.85	2.14	1.96	23	3	9	25	4	14	8.63	4.61	13.93	48	41	47
SE	5.36	4.63	5.42	0.07	0.38	0.24	1.42	1.23	1.13	13	2	5	14	2	8	4.98	2.66	9.85	28	24	33
N	3	4	3	3	3	3	4	3	3	3	3	3	3	3	3	3	3	2	3	3	2

Table 7.3-2. - continued -

	Secchi Disk Depth (m)			Estimated Euphotic Depth (m)			Calculated Euphotic Depth (m)		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	0.81	1.15	1.42	1.7	2.0	2.9	1.6	2.3	2.8
Median	0.90	1.45	1.50	1.8	1.9	3.0	1.8	2.9	3.0
Minimum	0.60	0.52	1.25	1.2	1.0	2.6	1.2	1.0	2.5
Maximum	0.92	1.48	1.51	2.0	3.0	3.0	1.8	3.0	3.0
SD	0.18	0.55	0.15	0.4	1.0	0.2	0.4	1.1	0.3
SE	0.10	0.32	0.09	0.2	0.6	0.1	0.2	0.6	0.2
N	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: 2009/2010.

	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)		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	99	98	74	118	120	91	1.23	<0.60	<0.60	<0.40	<0.40	<0.40	<0.010	0.0067	0.0101	0.0258	0.0274	0.0239	0.42	0.45	0.50
Median	99	99	73	118	121	89	1.46	<0.60	<0.60	<0.40	<0.40	<0.40	<0.010	0.0066	0.0065	0.0149	<0.0050	0.0071	0.49	0.46	0.52
Minimum	98	93	68	116	114	82	<0.60	<0.60	<0.60	<0.40	<0.40	<0.40	<0.0030	<0.0030	<0.0030	<0.0050	<0.0050	<0.0050	<0.20	0.30	0.33
Maximum	99	101	84	121	123	102	1.70	<0.60	<0.60	<0.40	<0.40	<0.40	<0.010	0.0119	0.0260	0.0710	0.1020	0.0790	0.61	0.58	0.64
SD	1	3	7	2	4	8	0.65	-	-	-	-	-	0.0030	0.0044	0.0109	0.0314	0.0498	0.0370	0.22	0.13	0.16
SE	0	2	3	1	2	4	0.32	-	-	-	-	-	0.0015	0.0022	0.0055	0.0157	0.0249	0.0185	0.11	0.07	0.08
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	3	0	0	0	0	0	2	2	2	3	1	2	3	4	4
% Detected	100	100	100	100	100	100	75	0	0	0	0	0	50	50	50	75	25	50	75	100	100

Table 7.3-2. - 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]		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	0.0833	0.0340	0.0340	0.45	0.44	0.49	0.54	0.48	0.53	0.0191	0.0379	0.0278	0.0217	0.0151	0.0119	0.0408	0.0530	0.0398	28	26	42
Median	0.0775	0.0126	0.0208	0.52	0.46	0.52	0.64	0.48	0.53	0.0148	0.0202	0.0077	0.0200	0.0161	0.0128	0.0432	0.0322	0.0225	29	25	42
Minimum	<0.0050	<0.0050	0.0104	<0.20	0.29	0.30	<0.0050	0.30	0.33	0.0096	0.0052	0.0026	0.0039	0.0059	0.0039	0.0242	0.0275	0.0168	4	12	16
Maximum	0.1740	0.1070	0.0840	0.69	0.57	0.64	0.76	0.64	0.72	0.0371	0.106	0.0933	0.0429	0.0223	0.0181	0.0525	0.120	0.0972	51	41	69
SD	0.0697	0.0488	0.0343	0.26	0.13	0.17	0.31	0.16	0.18	0.0124	0.0461	0.0437	0.0173	0.0070	0.0060	0.0120	0.0447	0.0384	19	13	24
SE	0.0349	0.0244	0.0171	0.13	0.07	0.08	0.16	0.08	0.09	0.0062	0.0231	0.0219	0.0087	0.0035	0.0030	0.0060	0.0224	0.0192	9	6	12
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	4	4	4	4	4	4	4	4	4	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	100	100	100	100	100	100	100	100	100	-	-	-

Table 7.3-2. - continued -

	DIN:DP[1]			DIN:TP[1]			DOC (mg/L)			TOC (mg/L)			TIC (mg/L)			TOC:ON[1]			TOC:TN[1]		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	3	2	7	2	1	2	8.5	9.3	14.4	8.6	9.3	14.5	23.0	22.9	16.7	42	26	37	40	25	35
Median	4	2	6	2	1	2	8.5	9.3	14.4	8.4	9.2	14.8	23.2	22.9	15.9	21	26	36	18	24	35
Minimum	1	1	2	0	0	1	7.7	8.7	12.5	8.1	8.9	13.0	21.8	22.2	15.4	16	19	28	15	17	24
Maximum	6	3	11	5	2	3	9.5	9.9	16.3	9.5	9.8	15.5	23.8	23.8	19.6	112	36	50	108	34	46
SD	3	1	5	2	1	1	0.8	0.5	1.6	0.6	0.4	1.0	0.8	0.7	2.0	47	8	11	45	9	10
SE	1	0	2	1	0	0	0.4	0.3	0.8	0.3	0.2	0.5	0.4	0.3	1.0	23	4	5	23	4	5
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	100	100	100	100	100	100	100	100	100	-	-	-	-	-	-

Table 7.3-2. - continued -

	TDS (mg/L)			Laboratory Conductivity (µmhos/cm)			TSS (mg/L)			Laboratory Turbidity (NTU)			True Colour (TCU)			Laboratory pH			*E. coli* (CFU/100 mL)		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	199	184	105	317	307	152	11.2	5.6	2.7	9.78	7.63	3.52	20.0	26.3	40.0	8.22	8.25	8.10	1	<1	<1
Median	200	184	107	312	309	149	12.8	5.6	2.8	10.0	6.75	3.55	17.5	20.0	42.5	8.36	8.27	8.09	1	<1	<1
Minimum	184	178	94.0	309	294	134	<2.0	2.4	<2.0	4.12	5.00	1.48	15.0	15.0	25.0	7.77	8.14	8.06	<1	<1	<1
Maximum	210	190	112	335	315	175	18.2	8.8	4.0	15.0	12.0	5.50	30.0	50.0	50.0	8.39	8.30	8.17	3	1	1
SD	11	5	8.5	12	10	17	7.3	2.6	1.2	4.52	3.08	1.64	7.1	16.0	10.8	0.30	0.07	0.05	1	0	0
SE	6	3	4.2	6	5	9	3.6	1.3	0.6	2.26	1.54	0.82	3.5	8.0	5.4	0.15	0.04	0.02	1	0	0
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	3	4	3	4	4	4	4	4	4	4	4	4	2	1	2
% Detected	100	100	100	100	100	100	75	100	75	100	100	100	100	100	100	100	100	100	50	25	50

Table 7.3-2. - continued -

	Chlorophyll *a* (µg/L)			Hardness as $CaCO_3$ (mg/L)			Chloride (mg/L)			Sulphate (mg/L)		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	5.8	4.3	3.4	126	121	83.0	16.7	15.4	2.72	31.4	29.3	8.84
Median	5.5	4.4	3.3	128	121	80.7	19.8	18.2	2.68	31.5	29.0	8.45
Minimum	1.3	0.7	0.3	114	116	77.0	5.23	4.90	1.86	29.5	28.3	6.20
Maximum	11.1	7.6	6.9	136	126	93.6	22.1	20.4	3.68	33.2	30.9	12.3
SD	4.8	2.9	2.9	9	5	7.5	7.79	7.08	0.91	1.6	1.3	2.51
SE	2.4	1.4	1.5	4	3	3.8	3.89	3.54	0.46	0.8	0.6	1.26
N	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100	100	100	100	100	100

[1] Calculated.

Table 7.3-3. Summary statistics for metals and major ions measured in the Upper Nelson River Region: 2009/2010. Values are presented as mg/L.

	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			Boron		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	0.339	0.354	0.184	<0.00050	<0.00050	<0.00050	0.00155	0.00144	0.00084	0.0349	0.0361	0.0103	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.022	0.023	<0.030
Median	0.328	0.340	0.168	<0.00050	<0.00050	<0.00050	0.00155	0.00137	0.00076	0.0350	0.0360	0.0104	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Minimum	0.240	0.205	0.108	<0.00050	<0.00050	<0.00050	0.00139	0.00127	0.00069	0.0318	0.0318	0.00967	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.030	<0.030	<0.030
Maximum	0.460	0.530	0.293	0.00062	0.00095	0.00065	0.00171	0.00174	0.00116	0.0380	0.0404	0.0108	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.043	0.045	<0.030
SD	0.096	0.140	0.078	0.00019	0.00035	0.00020	0.00014	0.00021	0.00021	0.0028	0.0037	0.00047	-	-	-	-	-	-	0.014	0.015	-
SE	0.048	0.070	0.039	0.00009	0.00018	0.00010	0.00007	0.00011	0.00011	0.0014	0.0019	0.00023	-	-	-	-	-	-	0.007	0.008	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	1	1	1	4	4	4	4	4	4	0	0	0	0	0	0	1	1	0
% Detected	100	100	100	25	25	25	100	100	100	100	100	100	0	0	0	0	0	0	25	25	0

Table 7.3-3. - continued -

	Cadmium			Calcium			Cesium			Chromium			Cobalt			Copper			Iron		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	0.000013	0.000036	<0.000010	28.6	28.0	19.5	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00021	0.00021	<0.00020	0.0018	0.0019	0.0011	0.237	0.234	0.130
Median	<0.000010	0.000018	<0.000010	29.1	28.2	19.0	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	0.00022	<0.00020	<0.00020	0.0018	0.0019	0.0012	0.253	0.230	0.100
Minimum	<0.000010	<0.000010	<0.000010	26.7	26.6	17.5	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	0.0016	0.0015	<0.0010	0.117	0.104	0.082
Maximum	0.000035	0.000102	0.000011	29.6	29.1	22.5	<0.00010	<0.00010	<0.00010	<0.0010	0.0012	0.0013	0.00029	0.00040	0.00027	0.0022	0.0023	0.0014	0.327	0.374	0.238
SD	0.000015	0.000045	0.000003	1.3	1.2	2.1	-	-	-	0.0000	0.0004	0.0004	0.00008	0.00014	0.00009	0.0003	0.0004	0.0004	0.091	0.122	0.072
SE	0.000008	0.000022	0.000002	0.6	0.6	1.1	-	-	-	0.0000	0.0002	0.0002	0.00004	0.00007	0.00004	0.0001	0.0002	0.0002	0.045	0.061	0.036
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	1	3	1	4	4	4	0	0	0	0	1	2	3	2	1	4	4	3	4	4	4
% Detected	25	75	25	100	100	100	0	0	0	0	25	50	75	50	25	100	100	75	100	100	100

Table 7.3-3. - continued -

	Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	<0.00050	0.00091	<0.00050	-	-	-	12.6	12.5	7.93	0.0225	0.0118	0.00693	<0.00010	<0.00010	<0.00010	0.00072	0.00076	0.00033	<0.0020	<0.0020	<0.0020
Median	<0.00050	<0.00050	<0.00050	-	-	-	12.9	12.5	7.94	0.0223	0.00993	0.00649	<0.00010	<0.00010	<0.00010	0.00073	0.00075	<0.00020	<0.0020	<0.0020	<0.0020
Minimum	<0.00050	<0.00050	<0.00050	-	-	-	11.5	11.9	6.76	0.0168	0.00789	0.00453	<0.000020	<0.000020	<0.000020	0.00068	0.00073	<0.00020	<0.0020	<0.0020	<0.0020
Maximum	<0.00050	0.00288	<0.00050	-	-	-	13.1	13.0	9.10	0.0286	0.0196	0.0102	<0.00010	<0.00010	<0.00010	0.00077	0.00080	0.00102	0.0021	0.0022	<0.0020
SD	-	0.00132	-	-	-	-	0.8	0.5	1.08	0.0053	0.00527	0.00249	-	-	-	0.00004	0.00003	0.00046	0.0006	0.0006	-
SE	-	0.00066	-	-	-	-	0.4	0.3	0.54	0.0027	0.00263	0.00125	-	-	-	0.00002	0.00002	0.00023	0.0003	0.0003	-
N	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	1	0	-	-	-	4	4	4	4	4	4	0	0	0	4	4	1	1	1	0
% Detected	0	25	0	-	-	-	100	100	100	100	100	100	0	0	0	100	100	25	25	25	0

Table 7.3-3. - continued -

	Potassium			Rubidium			Selenium			Silicon			Silver			Sodium			Strontium		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	2.93	2.87	0.99	0.00192	0.00210	0.00129	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	19.7	18.0	3.43	0.108	0.107	0.0383
Median	2.94	2.92	1.01	0.00190	0.00201	0.00128	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	18.9	17.3	3.44	0.109	0.110	0.0376
Minimum	2.63	2.54	0.80	0.00168	0.00185	0.00120	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	18.0	16.7	2.89	0.103	0.0944	0.0331
Maximum	3.22	3.12	1.13	0.00218	0.00253	0.00139	<0.0010	<0.0010	<0.0010	-	-	-	<0.00010	<0.00010	<0.00010	23.2	20.8	3.97	0.112	0.112	0.0449
SD	0.25	0.25	0.15	0.00022	0.00031	0.00008	-	-	-	-	-	-	-	-	-	2.4	1.9	0.51	0.004	0.0082	0.0050
SE	0.13	0.12	0.08	0.00011	0.00016	0.00004	-	-	-	-	-	-	-	-	-	1.2	1.0	0.26	0.002	0.0041	0.0025
N	4	4	4	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	0	0	0	-	-	-	0	0	0	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	0	0	0	-	-	-	0	0	0	100	100	100	100	100	100

Table 7.3-3. - continued -

	Tellurium			Thallium			Thorium			Tin			Titanium			Tungsten			Uranium		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.0010	0.00112	<0.0010	0.0124	0.0124	0.00474	<0.00020	0.00097	0.00053	0.00070	0.00067	<0.00010
Median	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.0010	0.00103	<0.00060	0.0129	0.0114	0.00413	<0.00020	<0.00020	<0.00020	0.00072	0.00069	<0.00010
Minimum	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	-	-	-	<0.00060	<0.00060	<0.00060	0.00664	0.00634	0.00180	<0.00020	<0.00020	<0.00020	0.00057	0.00051	<0.00010
Maximum	<0.0010	<0.0010	<0.0010	0.00012	<0.00010	<0.00010	-	-	-	<0.0010	0.00210	0.00181	0.0173	0.0204	0.00889	0.00036	0.00356	0.00181	0.00080	0.00078	0.00013
SD	-	-	-	0.00004	-	-	-	-	-	-	0.00095	0.00073	0.00472	0.00595	0.00298	0.00013	0.00173	0.00086	0.00010	0.00011	0.00004
SE	-	-	-	0.00002	-	-	-	-	-	-	0.00048	0.00036	0.00236	0.00297	0.00149	0.00007	0.00087	0.00043	0.00005	0.00006	0.00002
N	4	4	4	4	4	4	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	0	0	0	1	0	0	-	-	-	0	2	1	4	4	4	1	1	1	4	4	1
% Detected	0	0	0	25	0	0	-	-	-	0	50	25	100	100	100	25	25	25	100	100	25

Table 7.3-3. - continued -

	Vanadium			Zinc			Zirconium		
	PLAYG	CROSS	SET	PLAYG	CROSS	SET	PLAYG	CROSS	SET
Mean	0.0014	0.0015	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Median	0.0015	0.0014	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Minimum	0.0011	0.0012	<0.0010	<0.010	<0.010	<0.010	<0.00040	<0.00040	<0.00040
Maximum	0.0016	0.0018	<0.0010	<0.010	0.014	<0.010	<0.00040	0.00062	<0.00040
SD	0.0002	0.0003	-	-	0.005	-	-	0.00021	-
SE	0.0001	0.0001	-	-	0.002	-	-	0.00011	-
N	4	4	4	4	4	4	4	4	4
N >DL	4	4	0	0	1	0	0	1	0
% Detected	100	100	0	0	25	0	0	25	0

Table 7.3-4. 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: 2009/2010. 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	0.00022-0.00034	0.0696-0.111	0.0075-0.0121	0.3	0.00228-0.00471	0.000026
PLAY	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**4**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**25**	0	0
CROSS	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**4**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**25**	0	0
SET (Surface)	N	**4**	4	4	4	4	4	4	4	3
	# Exceedances	**4**	0	0	0	0	0	0	0	0
	% Exceedances	**100**	0	0	0	0	0	0	0	0
SET (Bottom)	N	**2**	2	2	2	2	2	**2**	2	2
	# Exceedances	**2**	0	0	0	0	0	**1**	0	0
	% Exceedances	**100**	0	0	0	0	0	**50**	0	0

Table 7.3-4. – continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride[2]	Sulphate[3]
MWQSOGs PAL (mg/L)		0.073	0.0418-0.0677	0.001	0.0001	0.0008	0.015	0.096-0.155	120	128-429
PLAY	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	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
SET (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
SET (Bottom)	N	2	2	2	2	2	2	2	2	2
	# 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 for samples collected in winter as the analytical detection limit was higher than the guideline.

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

[3]Comparison to the BCMOE guideline.

Table 7.3-5. Total phosphorus concentrations (open-water season and annual means) measured in the Upper Nelson River Region and CCME (1999; updated to 2013) trophic categorization: 2009/2010.

		Trophic Status Based on TP (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
Playgreen Lake	Open-water season					0.041	
	Annual					0.041	
Cross Lake	Open-water season				0.031		
	Annual					0.053	
Setting Lake	Open-water season				0.021		
	Annual					0.040	

Table 7.3-6. Total nitrogen concentrations (open-water season and annual means) measured in the Upper Nelson River Region and comparison to a trophic categorization scheme (Nürnberg 1996) for lakes: 2009/2010.

		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
Playgreen Lake	Open-water season			0.54			
	Annual			0.54			
Cross Lake	Open-water season			0.42			
	Annual			0.48			
Setting Lake	Open-water season			0.46			
	Annual			0.53			

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: 2009/2010.

		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
Playgreen Lake	Open-water season			7.33			
	Annual			5.83			
Cross Lake	Open-water season			5.47			
	Annual			4.27			
Setting Lake	Open-water season			4.47			
	Annual			3.42			

Table 7.4-1. Community metrics for phytoplankton samples collected in the Upper Nelson River Region during the open-water season of 2009.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($e^{H`}$)	Evenness ($e^{H`}/S$)
Playgreen Lake	Spring	18	0.78	0.25	1.87	0.65	6.48	0.36
	Summer	13	0.81	0.41	1.91	0.75	6.78	0.52
	Fall	19	0.75	0.21	1.77	0.60	5.84	0.31
Cross Lake	Spring	26	0.91	0.41	2.59	0.79	13.32	0.51
	Summer	22	0.86	0.33	2.38	0.77	10.80	0.49
	Fall	22	0.85	0.30	2.21	0.72	9.14	0.42
Setting Lake	Spring	20	0.75	0.20	1.98	0.66	7.24	0.36
	Summer	22	0.74	0.17	1.80	0.58	6.07	0.28
	Fall	18	0.79	0.27	2.02	0.70	7.54	0.42

Table 7.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Upper Nelson River Region for CAMPP, 2009.

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)			(%)	
Playgreen Lake (2009)	Nearshore	15	1.5	1.1	1.6	--	0.78	16.0	--	shrubs, mixed forest	0	--
	Offshore	15	8.6	5.1	12.6	--	1.05	16.0	--	--	--	--
Cross Lake (2009)	Nearshore	15	4.3	3.5	4.9	--	0.50	14.0	--	mixed forest, shrubs	0	--
	Offshore	15	6.9	4.8	9.1	--	0.50	16.0	--	--	--	--
Setting Lake (2009)	Nearshore	15	2.0	1.3	2.8	--	0.95	17.0	--	aquatic veg, coniferous	0	--
	Offshore	15	22.4	20.7	23.3	--	1.60	16.0	--	--	--	--

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, 2009.

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
Playgreen Lake (2009)	Nearshore	Mean	3	1.4	3.75	18.67	39.00	42.67	Silty Clay
		SD	--	0.26	2.759	12.741	14.000	18.339	--
		SE	--	0.15	1.593	7.356	8.083	10.588	--
		Median	--	1.5	2.86	25.00	39.00	49.00	--
		Min	--	1.1	1.54	4.00	25.00	22.00	--
		Max	--	1.6	6.84	27.00	53.00	57.00	--
	Offshore	Mean	3	9.2	0.81	49.33	44.33	7.00	Sandy Loam
		SD	--	0.87	0.087	19.425	16.623	2.646	--
		SE	--	0.50	0.050	11.215	9.597	1.528	--
		Median	--	9.6	0.76	54.00	42.00	6.00	--
		Min	--	8.2	0.76	28.00	29.00	5.00	--
		Max	--	9.8	0.91	66.00	62.00	10.00	--
Cross Lake (2009)	Nearshore	Mean	3	4.3	2.85	2.67	68.33	29.00	Silty Clay Loam
		SD	--	0.51	0.153	2.887	2.517	1.732	--
		SE	--	0.30	0.088	1.667	1.453	1.000	--
		Median	--	4.4	2.91	1.00	68.00	28.00	--
		Min	--	3.7	2.68	1.00	66.00	28.00	--
		Max	--	4.7	2.97	6.00	71.00	31.00	--
	Offshore	Mean	3	7.4	2.37	7.00	69.67	23.67	Silt, Loam
		SD	--	2.15	0.108	3.606	5.033	1.155	--
		SE	--	1.24	0.062	2.082	2.906	0.667	--
		Median	--	8.2	2.32	8.00	69.00	23.00	--
		Min	--	5.0	2.29	3.00	65.00	23.00	--
		Max	--	9.1	2.49	10.00	75.00	25.00	--
Setting Lake (2009)	Nearshore	Mean	3	1.6	3.13	4.33	61.67	34.00	Silt, Loam
		SD	--	0.32	0.293	3.055	21.455	24.269	--
		SE	--	0.19	0.169	1.764	12.387	14.012	--
		Median	--	1.5	3.03	5.00	72.00	21.00	--
		Min	--	1.4	2.90	1.00	37.00	19.00	--
		Max	--	2.0	3.46	7.00	76.00	62.00	--
	Offshore	Mean	3	22.2	3.31	2.67	48.33	49.00	Clay
		SD	--	0.46	0.738	2.887	20.551	23.431	--
		SE	--	0.26	0.426	1.667	11.865	13.528	--
		Median	--	22.3	2.94	1.00	38.00	61.00	--
		Min	--	21.7	2.83	1.00	35.00	22.00	--
		Max	--	22.6	4.16	6.00	72.00	64.00	--

Table 7.5-3. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Playgreen Lake within the Upper Nelson River Region for CAMPP, 2009.

	Playgreen Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	6686	3668.3	947.2	5410	2640	14327
Oligochaeta	--	1111	904.9	233.6	952	43	3203
Hirudinea	--	124	89.4	23.1	87	0	303
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	563	522.7	135.0	476	43	2164
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	219	232.2	60.0	130	0	693
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	--	12	30.5	7.9	0	0	87
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	860	662.7	171.1	649	87	2121
Gastropoda - unid	--	87	230.8	59.6	0	0	866
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	115	297.5	76.8	0	0	1169
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	17	35.8	9.3	0	0	130
Planorbidae	--	58	77.9	20.1	43	0	260
Valvatidae	--	98	266.0	68.7	0	0	952
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	--	3264	2046.4	528.4	2337	1039	8094
Non-Insecta (%)	49	--	--	--	--	--	--
Oligochaeta	--	1111	904.9	233.6	952	43	3203
Oligochaeta (%)	17	--	--	--	--	--	--
Amphipoda	--	782	652.6	168.5	649	43	2467
Amphipoda (%)	12	--	--	--	--	--	--
Bivalvia	--	860	662.7	171.1	649	87	2121
Bivalvia (%)	13	--	--	--	--	--	--
Gastropoda	--	375	641.1	165.5	130	0	2381
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	--	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 7.5-3. – continued –

	Playgreen Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	12	34.6	8.9	0	0	130
Corixidae (adult)	--	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	11.2	2.9	0	0	43
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	11.2	2.9	0	0	43
Hexagenia	--	35	89.9	23.2	0	0	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

Table 7.5-3. – continued –

	Playgreen Lake						
	Nearshore n=15						
	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)	--	32	57.8	14.9	0	0	173
Leptoceridae (pupa)	--	0	0.0	0.0	0	0	0
Limnephilidae	--	6	15.2	3.9	0	0	43
Molannidae	--	38	78.2	20.2	0	0	303
Phryganeidae	--	6	15.2	3.9	0	0	43
Polycentropodidae	--	3	11.2	2.9	0	0	43
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)	--	23	39.6	10.2	0	0	130
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	26.7	6.9	0	0	87
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	3148	2652.0	684.8	2424	822	10085
Orthocladiinae	--	9	24.3	6.3	0	0	87
Tanypodinae	--	92	184.3	47.6	0	0	649
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	--	3422	2687.3	693.9	2640	995	10345
Insecta (%)	51	--	--	--	--	--	--
Chironomidae	--	3264	2637.0	680.9	2597	866	10085

Table 7.5-3. – continued –

	Playgreen Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae (%)	49	--	--	--	--	--	--
Ephemeroptera	--	40	91.8	23.7	0	0	346
Ephemeroptera (%)	1	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	84	134.4	34.7	43	0	519
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	124	173.0	44.7	43	0	563
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.05	0.068	0.018	0.02	0.00	0.18
Genus analysis of Ephemeroptera				3 spp. (*Hexagenia*)			
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	20	9	2.5	0.6	10	6	13
Simpson's Diversity Index (D)	--	0.68	0.124	0.032	0.71	0.37	0.82
Evenness (Simpson's Equitability E_D)	--	0.36	0.135	0.035	0.35	0.12	0.60
Shannon-Weaver Index (H)	--	1.52	0.294	0.076	1.58	0.92	2.01
Evenness (Shannon's Equitability E_H)	--	0.66	0.116	0.030	0.68	0.36	0.81
Hill's Effective Richness ($E^{H'}$)	--	5	1.341	0.346	4.87	2.52	7.45
Evenness ($E^{H'}$/S)	--	0.48	0.132	0.034	0.50	0.19	0.70

Table 7.5-3. – continued –

	Playgreen Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	6267	2774.7	716.4	5410	2640	13418
Oligochaeta	--	779	854.9	220.7	346	43	3030
Hirudinea	--	519	741.8	191.5	303	43	2943
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	3	11.2	2.9	0	0	43
Haustoriidae	--	961	765.3	197.6	779	87	2727
Hyalellidae	--	66	117.8	30.4	0	0	390
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	--	17	39.4	10.2	0	0	130
Pisidiidae	--	2435	2324.3	600.1	1991	87	10171
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	22.4	5.8	0	0	87
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	22.4	5.8	0	0	87
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	--	4793	2645.9	683.2	4025	1991	12206
Non-Insecta (%)	76	--	--	--	--	--	--
Oligochaeta	--	779	854.9	220.7	346	43	3030
Oligochaeta (%)	12	--	--	--	--	--	--
Amphipoda	--	1030	783.4	202.3	1039	130	2813
Amphipoda (%)	16	--	--	--	--	--	--
Bivalvia	--	2453	2325.3	600.4	1991	87	10171
Bivalvia (%)	39	--	--	--	--	--	--
Gastropoda	--	12	30.5	7.9	0	0	87
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

Table 7.5-3. – continued –

	Playgreen Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	453	190.0	49.1	390	173	866
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 7.5-3. – continued –

	Playgreen Lake						
	Offshore n=15						
	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	--	136	248.0	64.0	87	0	952
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	--	17	45.7	11.8	0	0	173
Phryganeidae	--	3	11.2	2.9	0	0	43
Polycentropodidae	--	133	153.9	39.7	130	0	563
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	15.2	3.9	0	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)	--	6	15.2	3.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	603	391.8	101.2	563	173	1601
Orthocladiinae	--	66	56.4	14.6	43	0	173
Tanypodinae	--	52	73.5	19.0	43	0	260
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	--	1474	593.1	153.1	1255	563	3030
Insecta (%)	24	--	--	--	--	--	--

Table 7.5-3. – continued –

	Playgreen Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	727	350.6	90.5	736	260	1601
Chironomidae (%)	12	--	--	--	--	--	--
Ephemeroptera	--	453	190.0	49.1	390	173	866
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	289	394.5	101.9	130	0	1515
Trichoptera (%)	5	--	--	--	--	--	--
EPT	--	742	424.0	109.5	693	260	1904
EPT (%)	12	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	1.18	0.663	0.171	1.17	0.32	2.29
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	16	8	1.5	0.4	9	6	10
Simpson's Diversity Index (D)	--	0.72	0.117	0.030	0.75	0.41	0.87
Evenness (Simpson's Equitability E_D)	--	0.41	0.112	0.029	0.41	0.15	0.64
Shannon-Weaver Index (H)	--	1.64	0.298	0.077	1.71	0.92	2.18
Evenness (Shannon’s Equitability E_H)	--	0.72	0.115	0.030	0.73	0.38	0.88
Hill's Effective Richness ($E^{H'}$)	--	5	1.439	0.371	5.53	2.51	8.83
Evenness ($E^{H'}$/S)	--	0.54	0.117	0.030	0.55	0.23	0.74

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, 2009.

	Cross Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1019	302.5	78.1	995	519	1558
Oligochaeta	--	40	62.2	16.1	0	0	216
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	23	39.6	10.2	0	0	130
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	--	167	204.2	52.7	87	0	822
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	--	231	211.2	54.5	130	87	909
Non-Insecta (%)	23	--	--	--	--	--	--
Oligochaeta	--	40	62.2	16.1	0	0	216
Oligochaeta (%)	4	--	--	--	--	--	--
Amphipoda	--	23	39.6	10.2	0	0	130
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	167	204.2	52.7	87	0	822
Bivalvia (%)	16	--	--	--	--	--	--
Gastropoda	--	0	0.0	0.0	0	0	0
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	35	40.7	10.5	43	0	130
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 7.5-4. – continued –

	Cross Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	646	301.0	77.7	606	260	1385
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

Table 7.5-4. – continued –

	Cross Lake						
	Nearshore n=15						
	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	0.0	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)	--	3	11.2	2.9	0	0	43
Chironominae	--	63	42.9	11.1	87	0	130
Orthocladiinae	--	9	24.3	6.3	0	0	87
Tanypodinae	--	32	30.5	7.9	43	0	87
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	--	788	285.3	73.7	779	390	1428
Insecta (%)	77	--	--	--	--	--	--

Table 7.5-4. – continued –

	Cross Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	107	53.9	13.9	87	43	216
Chironomidae (%)	10	--	--	--	--	--	--
Ephemeroptera	--	646	301.0	77.7	606	260	1385
Ephemeroptera (%)	63	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	646	301.0	77.7	606	260	1385
EPT (%)	63	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	8.78	8.834	2.281	5.00	3.00	32.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	4	0.7	0.2	4	3	5
Simpson's Diversity Index (D)	--	0.52	0.156	0.040	0.58	0.20	0.68
Evenness (Simpson's Equitability E_D)	--	0.47	0.108	0.028	0.48	0.32	0.66
Shannon-Weaver Index (H)	--	1.03	0.307	0.079	1.12	0.41	1.41
Evenness (Shannon's Equitability E_H)	--	0.66	0.152	0.039	0.70	0.33	0.84
Hill's Effective Richness ($E^{H'}$)	--	3	0.799	0.206	3.06	1.50	4.09
Evenness ($E^{H'}$/S)	--	0.61	0.115	0.030	0.63	0.40	0.78

Table 7.5-4. – continued –

	Cross Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1082	663.5	171.3	1039	0	2467
Oligochaeta	--	29	53.4	13.8	0	0	173
Hirudinea	--	3	11.2	2.9	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	23	36.1	9.3	0	0	130
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	--	29	76.1	19.7	0	0	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	--	84	133.4	34.4	43	0	390
Non-Insecta (%)	8	--	--	--	--	--	--
Oligochaeta	--	29	53.4	13.8	0	0	173
Oligochaeta (%)	3	--	--	--	--	--	--
Amphipoda	--	23	36.1	9.3	0	0	130
Amphipoda (%)	2	--	--	--	--	--	--
Bivalvia	--	29	76.1	19.7	0	0	216
Bivalvia (%)	3	--	--	--	--	--	--
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	--	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

Table 7.5-4. – continued –

	Cross Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	589	367.6	94.9	649	0	1385
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 7.5-4. – continued –

	Cross Lake						
	Offshore n=15						
	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)	--	17	31.9	8.2	0	0	87
Chironomidae (larva)	--	9	17.9	4.6	0	0	43
Chironominae	--	265	408.0	105.3	216	0	1688
Orthocladiinae	--	49	63.1	16.3	43	0	216
Tanypodinae	--	69	69.0	17.8	43	0	173
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	--	998	632.4	163.3	995	0	2424
Insecta (%)	92	--	--	--	--	--	--

Table 7.5-4. – continued –

	Cross Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	410	452.1	116.7	303	0	1904
Chironomidae (%)	38	--	--	--	--	--	--
Ephemeroptera	--	589	367.6	94.9	649	0	1385
Ephemeroptera (%)	54	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT		589	367.6	94.9	649	0	1385
EPT (%)	54	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.11	1.585	0.409	2.00	0.00	6.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	3	1.4	0.4	3	0	6
Simpson's Diversity Index (D)	--	0.56	0.171	0.044	0.56	0.26	1.00
Evenness (Simpson's Equitability E_D)	--	0.50	0.216	0.056	0.45	0.00	0.81
Shannon-Weaver Index (H)	--	0.95	0.397	0.103	0.92	0.00	1.46
Evenness (Shannon's Equitability E_H)	--	0.66	0.216	0.056	0.71	0.00	0.90
Hill's Effective Richness ($E^{H'}$)	--	3	1.136	0.293	2.50	0.00	4.31
Evenness ($E^{H'}$/S)	--	0.62	0.220	0.057	0.59	0.00	0.89

Table 7.5-5. 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, 2009.

	Setting Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2583	1076.3	277.9	2251	952	5237
Oligochaeta	--	136	145.3	37.5	87	0	390
Hirudinea	--	6	15.2	3.9	0	0	43
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	12	44.7	11.5	0	0	173
Haustoriidae	--	1613	1257.8	324.8	1731	0	4285
Hyalellidae	--	61	79.8	20.6	0	0	216
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	6	15.2	3.9	0	0	43
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	--	147	97.9	25.3	173	0	346
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	23	36.1	9.3	0	0	130
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	36.1	9.3	0	0	130
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	1205.0	311.1	1904	433	4891
Non-Insecta (%)	78	--	--	--	--	--	--
Oligochaeta	--	136	145.3	37.5	87	0	390
Oligochaeta (%)	5	--	--	--	--	--	--
Amphipoda	--	1685	1208.5	312.0	1731	130	4285
Amphipoda (%)	65	--	--	--	--	--	--
Bivalvia	--	147	97.9	25.3	173	0	346
Bivalvia (%)	6	--	--	--	--	--	--
Gastropoda	--	43	56.7	14.6	0	0	173
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	12	25.7	6.6	0	0	87
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 7.5-5. – continued –

	Setting Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	89	68.4	17.7	87	0	216
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

Table 7.5-5. – continued –

	Setting Lake						
	Nearshore n=15						
	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	--	6	22.4	5.8	0	0	87
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	15.2	3.9	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)	--	9	17.9	4.6	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	3	11.2	2.9	0	0	43
Chironominae	--	121	67.8	17.5	130	0	216
Orthocladiinae	--	9	17.9	4.6	0	0	43
Tanypodinae	--	306	319.9	82.6	130	0	995
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	352.9	91.1	390	173	1298

Table 7.5-5. – continued –

	Setting Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta (%)	22	--	--	--	--	--	--
Chironomidae	--	439	343.9	88.8	303	130	1169
Chironomidae (%)	17	--	--	--	--	--	--
Ephemeroptera	--	89	68.4	17.7	87	0	216
Ephemeroptera (%)	3	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	12	25.7	6.6	0	0	87
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	101	79.6	20.5	87	0	260
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.40	0.499	0.129	0.22	0.00	1.67
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	15	6	2.1	0.5	6	3	10
Simpson's Diversity Index (D)	--	0.53	0.225	0.058	0.46	0.14	0.84
Evenness (Simpson's Equitability E_D)	--	0.36	0.135	0.035	0.33	0.18	0.67
Shannon-Weaver Index (H)	--	1.22	0.537	0.139	1.07	0.36	2.12
Evenness (Shannon's Equitability E_H)	--	0.60	0.204	0.053	0.53	0.22	0.86
Hill's Effective Richness ($E^{H'}$)	--	4	2.084	0.538	2.91	1.44	8.36
Evenness ($E^{H'}$/S)	--	0.49	0.159	0.041	0.46	0.27	0.78

Table 7.5-5. – continued –

	Setting Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1887	709.3	183.1	1775	1039	3679
Oligochaeta	--	416	285.1	73.6	390	87	1212
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
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	3	11.2	2.9	0	0	43
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidae	--	20	27.7	7.2	0	0	87
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	--	283	169.9	43.9	260	43	736
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	--	721	326.2	84.2	649	346	1472
Non-Insecta (%)	38	--	--	--	--	--	--
Oligochaeta	--	416	285.1	73.6	390	87	1212
Oligochaeta (%)	22	--	--	--	--	--	--
Amphipoda	--	3	11.2	2.9	0	0	43
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	283	169.9	43.9	260	43	736
Bivalvia (%)	15	--	--	--	--	--	--
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	--	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

Table 7.5-5. – continued –

	Setting Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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

Table 7.5-5. – continued –

	Setting Lake						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1114	410.8	106.1	952	519	2164
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	46	41.6	10.7	43	0	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	--	1166	427.4	110.3	995	519	2207
Insecta (%)	62	--	--	--	--	--	--

Table 7.5-5. – continued –

	Setting Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	1166	427.4	110.3	995	519	2207
Chironomidae (%)	62	--	--	--	--	--	--
Ephemeroptera	--	0	0.0	0.0	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	0.0	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)	5	3	0.6	0.2	3	3	5
Simpson's Diversity Index (D)	--	0.56	0.065	0.017	0.55	0.43	0.64
Evenness (Simpson's Equitability E_D)	--	0.56	0.123	0.032	0.54	0.43	0.90
Shannon-Weaver Index (H)	--	1.01	0.154	0.040	1.02	0.73	1.27
Evenness (Shannon's Equitability E_H)	--	0.72	0.079	0.020	0.71	0.61	0.95
Hill's Effective Richness ($E^{H'}$)	--	3	0.422	0.109	2.77	2.08	3.57
Evenness ($E^{H'}$/S)	--	0.67	0.104	0.027	0.68	0.53	0.94

Table 7.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in the Upper Nelson River Region, 2009.

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	570186	5961634	8-Jun-09	20.58	1.8	2.3	-
Playgreen Lake	GN-02	14	570519	5958487	8-Jun-09	20.38	3.3	5.8	-
Playgreen Lake	GN-03	14	563133	5961596	8-Jun-09	20.75	3.0	2.8	-
Playgreen Lake	GN-04	14	559008	5965489	10-Jun-09	21.83	2.8	2.6	-
Playgreen Lake	GN-05	14	559906	5969507	10-Jun-09	22.42	2.9	3.1	-
Playgreen Lake	GN-06	14	561236	5972171	10-Jun-09	22.02	2.3	2.2	-
Playgreen Lake	GN-07	14	560870	5973983	10-Jun-09	20.33	2.4	1.6	9.0
Playgreen Lake	GN-08	14	553774	5968626	9-Jun-09	23.67	2.4	2.4	7.7
Playgreen Lake	GN-09	14	553976	5972516	9-Jun-09	25.33	9.1	6.2	6.3
Playgreen Lake	GN-11	14	549032	5977904	12-Jun-09	20.38	3.1	3.4	-
Playgreen Lake	GN-13	14	546056	5985763	12-Jun-09	20.75	3.7	4.0	8.7
Playgreen Lake	GN-14	14	548927	5988295	12-Jun-09	21.50	3.1	2.8	6.9
Playgreen Lake	GN-15	14	568785	6022469	14-Jun-09	22.02	9.8	4.6	-
Playgreen Lake	GN-16	14	566413	6018228	14-Jun-09	22.42	2.7	1.2	11.2
Playgreen Lake	GN-17	14	570387	6015828	14-Jun-09	21.83	2.9	2.8	11.4
Playgreen Lake	GN-18	14	562809	6013307	14-Jun-09	22.00	4.5	3.6	9.8
Playgreen Lake	GN-19	14	546408	5976926	12-Jun-09	20.58	3.1	3.2	8.7
Playgreen Lake	SN-03	14	563133	5961596	8-Jun-09	20.75	3.0	2.8	-
Playgreen Lake	SN-04	14	559008	5965489	10-Jun-09	21.83	2.8	2.6	-
Playgreen Lake	SN-07	14	560870	5973983	10-Jun-09	20.33	2.4	1.6	9.0
Playgreen Lake	SN-13	14	546056	5985763	12-Jun-09	20.75	3.7	4.0	8.7
Playgreen Lake	SN-16	14	566413	6018228	14-Jun-09	22.42	2.7	1.2	11.2

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-01	14	570296	6042516	20-Aug-09	21.92	8.0	6.3	16.0
Cross Lake	GN-02	14	569556	6042694	20-Aug-09	22.17	8.1	8.4	16.0
Cross Lake	GN-03	14	570218	6043637	21-Aug-09	22.50	4.8	4.2	16.0
Cross Lake	GN-12	14	560286	6050175	19-Aug-09	21.08	4.7	3.3	15.0
Cross Lake	GN-13	14	562666	6053099	19-Aug-09	20.58	4.1	4.1	15.0
Cross Lake	GN-14	14	561586	6053545	19-Aug-09	20.92	4.5	4.3	15.0
Cross Lake	GN-15	14	573042	6060837	18-Aug-09	23.00	2.9	3.0	15.0
Cross Lake	GN-16	14	574695	6058819	18-Aug-09	23.92	3.4	3.5	15.0
Cross Lake	GN-19	14	591313	6066831	18-Aug-09	21.33	3.7	3.8	15.0
Cross Lake	SN-03	14	570208	6043753	21-Aug-09	22.50	5.1	4.8	16.0
Cross Lake	SN-09	14	560862	6044971	20-Aug-09	21.42	3.3	3.4	15.0
Cross Lake	SN-12	14	560110	6050155	19-Aug-09	21.08	4.7	4.7	15.0
Cross Lake	SN-15	14	573034	6060680	18-Aug-09	23.00	2.9	2.8	15.0
Setting Lake	GN-01	14	512135	6076808	02-Sep-09	24.50	8.4	6.1	15.0
Setting Lake	GN-02	14	514970	6078909	02-Sep-09	24.58	9.6	5.6	15.8
Setting Lake	GN-03	14	515883	6084260	03-Sep-09	24.50	10.1	5.4	16.2
Setting Lake	GN-05	14	518232	6087694	03-Sep-09	24.67	13.4	13.9	16.5
Setting Lake	GN-09	14	522935	6094348	08-Sep-09	24.67	18.7	18.7	-
Setting Lake	GN-10	14	524897	6098339	09-Sep-09	23.50	6.0	5.5	-
Setting Lake	GN-11	14	526230	6101015	10-Sep-09	25.50	5.7	5.4	-
Setting Lake	GN-12	14	526915	6105299	10-Sep-09	24.33	7.8	7.1	-
Setting Lake	GN-13	14	528078	6105706	11-Sep-09	25.00	4.6	7.2	-
Setting Lake	GN-14	14	530472	6105746	11-Sep-09	26.33	3.3	4.8	-
Setting Lake	GN-18	14	525449	6098359	09-Sep-09	25.00	7.1	14.1	-
Setting Lake	GN-19	14	526941	6098359	10-Sep-09	25.00	17.9	8.1	-
Setting Lake	GN-20	14	524218	6096244	09-Sep-09	24.50	11.4	14.6	-
Setting Lake	GN-21	14	519436	6088799	08-Sep-09	24.50	5.8	6.9	15.8
Setting Lake	SN-03	14	515883	6084260	03-Sep-09	24.50	10.1	5.4	-
Setting Lake	SN-09	14	522935	6094348	08-Sep-09	24.67	18.7	18.7	-
Setting Lake	SN-19	14	526941	6098359	10-Sep-09	25.00	17.9	8.1	-

Table 7.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Upper Nelson River Region waterbodies, 2009.

Family	Species	Scientific Name	ID Code
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
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
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Logperch	*Percina caprodes*	LGPR
	Sauger	*Sander canadensis*	SAUG
	Walleye	*Sander vitreus*	WALL

Table 7.6-3. Standard gang index gillnet relative abundance summaries from Upper Nelson River Region waterbodies, 2009.

Species	Playgreen Lake		Cross Lake		Setting Lake	
	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	1	0.25	-	-
Emerald Shiner	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-
Longnose Sucker	3	0.28	-	-	67	5.98
White Sucker	396	37.29	57	14.50	188	16.79
Shorthead Redhorse	5	0.47	33	8.40	7	0.63
Northern Pike	174	16.38	107	27.23	69	6.16
Rainbow Smelt	14	1.32	3	0.76	-	-
Cisco	26	2.45	5	1.27	235	20.98
Lake Whitefish	11	1.04	-	-	6	0.54
Troutperch	-	-	-	-	-	-
Burbot	1	0.09	-	-	2	0.18
Slimy Sculpin	-	-	-	-	-	-
Yellow Perch	170	16.01	42	10.69	43	3.84
Logperch	-	-	-	-	-	-
Sauger	118	11.11	43	10.94	229	20.45
Walleye	144	13.56	102	25.95	274	24.46
Total	1062	100	393	100	1120	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, 2009.

Species	Playgreen Lake		Cross Lake		Setting Lake	
	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-
Emerald Shiner	30	7.25	17	4.09	-	-
Spottail Shiner	197	47.58	170	40.87	24	36.92
Longnose Sucker	-	-	-	-	-	-
White Sucker	2	0.48	8	1.92	-	-
Shorthead Redhorse	-	-	-	-	-	-
Northern Pike	5	1.21	3	0.72	2	3.08
Rainbow Smelt	53	12.80	11	2.64	-	-
Cisco	-	-	-	-	6	9.23
Lake Whitefish	-	-	-	-	-	-
Troutperch	38	9.18	7	1.68	4	6.15
Burbot	-	-	-	-	-	-
Slimy Sculpin	5	1.21	1	0.24	-	-
Yellow Perch	81	19.57	197	47.36	2	3.08
Logperch	1	0.24	-	-	-	-
Sauger	-	-	1	0.24	24	36.92
Walleye	2	0.48	1	0.24	3	4.62
Total	414	100	416	100	65	100

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

Table 7.6-5. Standard gang index gillnet biomass (g) summaries from Upper Nelson River waterbodies, 2009.

Species	Playgreen Lake			Cross Lake			Setting Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	1	390	0.10	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	3910	0.40	-	-	-	67	62650	10.42
White Sucker	396	299770	30.51	57	65890	17.49	188	180890	30.08
Shorthead Redhorse	5	4200	0.43	33	27380	7.27	7	6010	1.00
Northern Pike	174	407000	41.42	107	158520	42.08	69	65738	10.93
Rainbow Smelt	14	140	0.01	3	33	0.01	-	-	-
Cisco	26	22640	2.30	5	6170	1.64	235	71950	11.96
Lake Whitefish	11	15890	1.62	-	-	-	6	4750	0.79
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	1	2750	0.28	-	-	-	2	970	0.16
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	170	21629	2.20	42	7020	1.86	43	6950	1.16
Logperch	-	-	-	-	-	-	-	-	-
Sauger	118	64250	6.54	43	13940	3.70	229	55250	9.19
Walleye	144	140450	14.29	102	97330	25.84	274	146228	24.32
Total	1062	982629	100	287	376673	100	1120	601385	100

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

Table 7.6-6. Small mesh index gillnet biomass summaries from Upper Nelson River waterbodies, 2009.

Species	Playgreen Lake			Cross Lake			Setting Lake		
	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-
Emerald Shiner	3	143	0.88	17	73	0.80	-	-	-
Spottail Shiner	197	1059	6.51	170	451	4.92	24	100	1.22
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	2	39	0.24	8	60	0.65	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	5	11180	68.76	3	4060	44.30	2	2620	31.83
Rainbow Smelt	53	452	2.78	11	94	1.03	-	-	-
Cisco	-	-	-	-	-	-	6	50	0.61
Lake Whitefish	-	-	-	-	-	-	-	-	-
Troutperch	38	332	2.04	7	48	0.52	4	30	0.36
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	15	0.09	1	4	0.04	-	-	-
Yellow Perch	81	889	5.47	197	2751	30.02	2	20	0.24
Logperch	1	10	0.06	-	-	-	-	-	-
Sauger	-	-	-	1	1610	17.57	24	4750	57.72
Walleye	2	2140	13.16	1	14	0.15	3	660	8.02
Total	414	16259	100	416	9165	100	65	8230	100

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

Table 7.6-7. 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 Nelson River Region waterbodies, 2009.

Species	Playgreen Lake (# sites=17)			Cross Lake (# sites=12)			Setting Lake (# sites=14)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Goldeye	-	-	-	1	0.1	0.25	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	0.2	0.54	-	-	-	67	4.0	6.72
White Sucker	396	22.9	28.33	57	4.6	6.11	188	11.4	6.32
Shorthead Redhorse	5	0.3	0.74	33	2.7	4.15	7	0.4	0.66
Northern Pike	174	10.0	11.01	107	8.5	4.97	69	4.2	4.12
Rainbow Smelt	14	0.8	2.43	3	0.2	0.83	-	-	-
Cisco	26	1.5	3.71	5	0.4	1.42	235	14.2	14.85
Lake Whitefish	11	0.6	0.87	-	-	-	6	0.4	0.83
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	1	0.1	0.25	-	-	-	2	0.1	0.31
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	170	9.4	15.87	42	3.4	2.25	43	2.6	2.95
Logperch	-	-	-	-	-	-	-	-	-
Sauger	118	5.9	21.19	43	3.4	3.41	229	13.9	14.36
Walleye	144	8.1	14.93	102	8.0	5.38	274	16.6	17.19
Total	1062	59.6	51.93	393	31.3	12.30	1120	67.8	18.13

#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) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Upper Nelson River Region waterbodies, 2009.

Species	Playgreen Lake (#sites=5)			Cross Lake (# sites=4)			Setting Lake (# sites=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-
Emerald Shiner	30	7.0	15.71	17	4.7	5.57	-	-	-
Spottail Shiner	197	46.2	103.40	170	46.5	44.79	24	7.8	11.92
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	2	0.5	1.02	8	2.2	3.17	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	5	1.2	2.64	3	0.8	1.07	2	0.7	1.13
Rainbow Smelt	53	12.1	27.11	11	3.1	4.03	-	-	-
Cisco	-	-	-	-	-	-	6	1.9	3.33
Lake Whitefish	-	-	-	-	-	-	-	-	-
Troutperch	38	8.7	19.50	7	2.0	3.98	4	1.3	2.22
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	1.2	2.59	1	0.3	0.53	-	-	-
Yellow Perch	81	18.7	41.87	197	52.7	80.50	2	0.7	1.13
Logperch	1	0.2	0.48	-	-	-	-	-	-
Sauger	-	-	-	1	0.3	0.53	24	7.8	6.08
Walleye	2	0.4	0.96	1	0.3	0.56	3	1.0	1.70
Total	414	96.3	96.28	416	112.7	114.16	65	21.1	8.91

#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) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Upper Nelson River Region waterbodies, 2009.

Species	Playgreen Lake (# sites=17)			Cross Lake (# sites=12)			Setting Lake (# sites=14)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Goldeye	-	-	-	1	23	79	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	186	621	-	-	-	67	3024	4964
White Sucker	396	13932	18363	57	4255	6863	188	8757	4934
Shorthead Redhorse	5	189	492	33	1759	2859	7	296	464
Northern Pike	174	18544	20499	107	10191	7711	69	3207	2952
Rainbow Smelt	14	7	20	3	2	7	-	-	-
Cisco	26	1009	2591	5	405	1401	235	3500	4055
Lake Whitefish	11	712	1096	-	-	-	6	236	563
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	1	132	544	-	-	-	2	47	128
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	170	966	1285	42	441	402	43	333	384
Logperch	-	-	-	-	-	-	-	-	-
Sauger	118	2536	9499	43	879	839	229	2680	2964
Walleye	144	6294	12411	102	6130	3853	274	7066	6849
Total	1062	44507	39705	287	24084	12043	1120	29145	7467

#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 Upper Nelson River Region waterbodies, 2009.

Species	Playgreen Lake (# sites=5)			Cross Lake (# sites=4)			Setting Lake (# sites=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-
Emerald Shiner	3	34	69	17	20	22	-	-	-
Spottail Shiner	197	247	453	170	126	192	24	33	41
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	2	9	12	8	17	23	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-
Northern Pike	5	2639	5901	3	1116	1367	2	856	1482
Rainbow Smelt	53	103	95	11	26	29	-	-	-
Cisco	-	-	-	-	-	-	6	16	28
Lake Whitefish	-	-	-	-	-	-	-	-	-
Troutperch	38	76	75	7	14	27	4	10	17
Burbot	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	4	6	1	1	2	-	-	-
Yellow Perch	81	205	346	197	742	971	2	7	11
Logperch	1	2	5	-	-	-	-	-	-
Sauger	-	-	-	1	429	859	24	1542	920
Walleye	2	458	1025	1	4	8	3	216	373
Total	414	3777	6634	416	2494	2760	65	2678	2179

#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) for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River waterbodies, 2009.

Species	Playgreen Lake			Cross Lake			Setting Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length									
Northern Pike	91	605	104	103	556	111	69	498	89
Lake Whitefish	11	426	91	-	-	-	6	369	81
Walleye	144	413	64	102	415	87	274	349	55
Weight									
Northern Pike	112	3634	5301	107	1481	1120	68	946	614
Lake Whitefish	11	1445	757	-	-	-	6	792	481
Walleye	144	975	413	102	954	609	272	530	236
Condition Factor									
Northern Pike	91	0.83	0.08	103	0.77	0.10	68	0.70	0.07
Lake Whitefish	11	1.63	0.18	-	-	-	6	1.38	0.13
Walleye	144	1.29	0.10	102	1.22	0.14	272	1.15	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 7.6-12. Summary of mean fork length (mm), weight (g), and condition factor for Northern Pike, Lake Whitefish, and Walleye captured in small mesh index gill nets set in Upper Nelson River waterbodies, 2009.

Species	Playgreen Lake			Cross Lake			Setting Lake		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length									
Northern Pike	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-
Weight									
Northern Pike	5	2236	-	3	1353	-	2	1310	-
Lake Whitefish	-	-	-	-	-	-	-	-	-
Walleye	2	1070	-	1	14	-	3	220	-
Condition Factor									
Northern Pike	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-

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, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2009.

Age	Year-Class	Northern Pike						Lake Whitefish						Walleye					
		Playgreen L		Cross L		Setting L		Playgreen L		Cross L		Setting L		Playgreen L		Cross L		Setting L	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	2	1.94	1	1.45	-	-	-	-	1	20.00	3	2.11	1	1.03	5	1.83
3	2006	5	5.49	17	16.50	-	-	2	20.00	-	-	1	20.00	6	4.23	3	3.09	14	5.13
4	2005	5	5.49	25	24.27	11	15.94	-	-	-	-	1	20.00	30	21.13	13	13.40	59	21.61
5	2004	18	19.78	23	22.33	14	20.29	1	10.00	-	-	1	20.00	5	3.52	10	10.31	12	4.40
6	2003	14	15.38	16	15.53	17	24.64	1	10.00	-	-	-	-	2	1.41	13	13.40	56	20.51
7	2002	19	20.88	8	7.77	8	11.59	-	-	-	-	1	20.00	62	43.66	20	20.62	96	35.16
8	2001	13	14.29	5	4.85	6	8.70	-	-	-	-	-	-	25	17.61	30	30.93	25	9.16
9	2000	6	6.59	3	2.91	4	5.80	-	-	-	-	-	-	3	2.11	5	5.15	3	1.10
10	1999	5	5.49	2	1.94	2	2.90	-	-	-	-	-	-	3	2.11	-	-	1	0.37
11	1998	2	2.20	-	-	1	1.45	-	-	-	-	-	-	1	0.70	2	2.06	-	-
12	1997	3	3.30	2	1.94	2	2.90	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	1	1.10	-	-	2	2.90	1	10.00	-	-	-	-	-	-	-	-	1	0.37
14	1995	-	-	-	-	-	-	2	20.00	-	-	-	-	2	1.41	-	-	1	0.37
15	1994	-	-	-	-	1	1.45	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	3	30.00	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		91	100	103	100	69	100	10	100	-	-	5	100	142	100	97	100	273	100

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

Table 7.6-14. Mean fork length- (mm), weight- (g) and condition factor- (k) at-age for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2009.

Age	Year-Class	Playgreen Lake									Cross Lake									Setting 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	2	370	40	2	375	120	2	0.73	0.00	1	324	-	1	260	-	1	0.76	-
3	2006	5	406	81	5	594	283	5	0.83	0.10	17	457	51	17	728	196	17	0.75	0.07	-	-	-	-	-	-	-	-	-
4	2005	5	492	73	5	1016	457	5	0.81	0.02	25	508	59	25	1030	349	25	0.76	0.09	11	434	64	11	572	231	11	0.68	0.06
5	2004	18	539	60	18	1329	350	18	0.84	0.11	23	555	42	23	1356	391	23	0.77	0.09	14	467	44	14	748	199	14	0.72	0.07
6	2003	14	603	39	14	1829	304	14	0.83	0.06	16	580	45	16	1500	471	16	0.75	0.11	17	485	64	16	798	386	16	0.68	0.06
7	2002	19	637	64	19	2196	898	19	0.81	0.08	8	619	114	8	2096	1057	8	0.84	0.18	8	511	43	8	921	152	8	0.69	0.08
8	2001	13	649	103	13	2529	1108	13	0.87	0.09	5	657	120	5	2522	1155	5	0.82	0.04	6	486	67	6	882	361	6	0.74	0.07
9	2000	6	663	51	6	2465	704	6	0.83	0.09	3	783	42	3	3750	541	3	0.78	0.03	4	573	115	4	1328	589	4	0.69	0.11
10	1999	5	724	114	5	3370	1726	5	0.83	0.06	2	835	16	2	4460	707	2	0.77	0.08	2	637	21	2	1910	325	2	0.74	0.05
11	1998	2	684	28	2	2770	325	2	0.87	0.01	-	-	-	-	-	-	-	-	-	1	560	-	1	1250	-	1	0.71	-
12	1997	3	707	31	3	2963	294	3	0.84	0.06	2	865	87	2	5960	2178	2	0.90	0.06	2	609	69	2	1625	389	2	0.72	0.07
13	1996	1	838	-	1	5040	-	1	0.86	-	-	-	-	-	-	-	-	-	-	2	663	78	2	2060	863	2	0.69	0.05
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	788	-	1	4150	-	1	0.85	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	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 7.6-15. Mean fork length- (mm), weight- (g) and condition factor- (k) at-age for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2009.

Age	Year-Class	Playgreen Lake									Cross Lake									Setting 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	298	-	1	350	-	1	1.32	-
3	2006	2	330	79	2	565	431	2	1.39	0.18	-	-	-	-	-	-	-	-	-	1	382	-	1	730	-	1	1.31	-
4	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	394	-	1	830	-	1	1.36	-
5	2004	1	418	-	1	1370	-	1	1.88	-	-	-	-	-	-	-	-	-	-	1	410	-	1	1130	-	1	1.64	-
6	2003	1	398	-	1	1020	-	1	1.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	478	-	1	1500	-	1	1.37	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	1	508	-	1	2470	-	1	1.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	2	475	4	2	1825	163	2	1.71	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	3	498	17	3	2003	164	3	1.62	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	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 7.6-16. 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, 2009.

Age	Year-Class	Playgreen Lake									Cross Lake									Setting 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	3	202	13	3	110	10	3	1.34	0.14	1	332	-	1	270	-	1	0.74	-	5	196	18	5	84	34	5	1.07	0.20
3	2006	6	289	27	6	320	71	6	1.30	0.07	3	285	22	3	290	72	3	1.23	0.08	14	258	13	14	186	44	14	1.08	0.13
4	2005	30	355	20	30	589	131	30	1.30	0.10	13	338	37	13	476	170	13	1.18	0.13	59	300	28	58	295	73	58	1.09	0.09
5	2004	5	360	21	5	616	83	5	1.31	0.06	10	349	42	10	543	200	10	1.23	0.14	12	307	30	12	325	112	12	1.09	0.08
6	2003	2	459	27	2	1360	127	2	1.41	0.11	13	413	79	13	904	465	13	1.23	0.13	56	362	32	56	571	156	56	1.18	0.06
7	2002	62	443	29	62	1134	242	62	1.29	0.09	20	431	33	20	997	216	20	1.23	0.09	96	386	30	95	687	164	95	1.18	0.08
8	2001	25	447	24	25	1139	196	25	1.26	0.08	30	448	31	30	1143	262	30	1.26	0.10	25	394	25	25	730	129	25	1.19	0.08
9	2000	3	479	15	3	1410	62	3	1.28	0.07	5	482	31	5	1430	375	5	1.25	0.07	3	399	3	3	750	50	3	1.18	0.08
10	1999	3	454	29	3	1130	193	3	1.21	0.16	-	-	-	-	-	-	-	-	-	1	378	-	1	640	-	1	1.18	-
11	1998	1	476	-	1	1430	-	1	1.33	-	2	817	13	2	4090	1032	2	0.75	0.16	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	382	-	1	650	-	1	1.17	-
14	1995	2	553	44	2	2590	764	2	1.51	0.09	-	-	-	-	-	-	-	-	-	1	434	-	1	940	-	1	1.15	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		142			142			142			97			97			97			273			271			271		

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

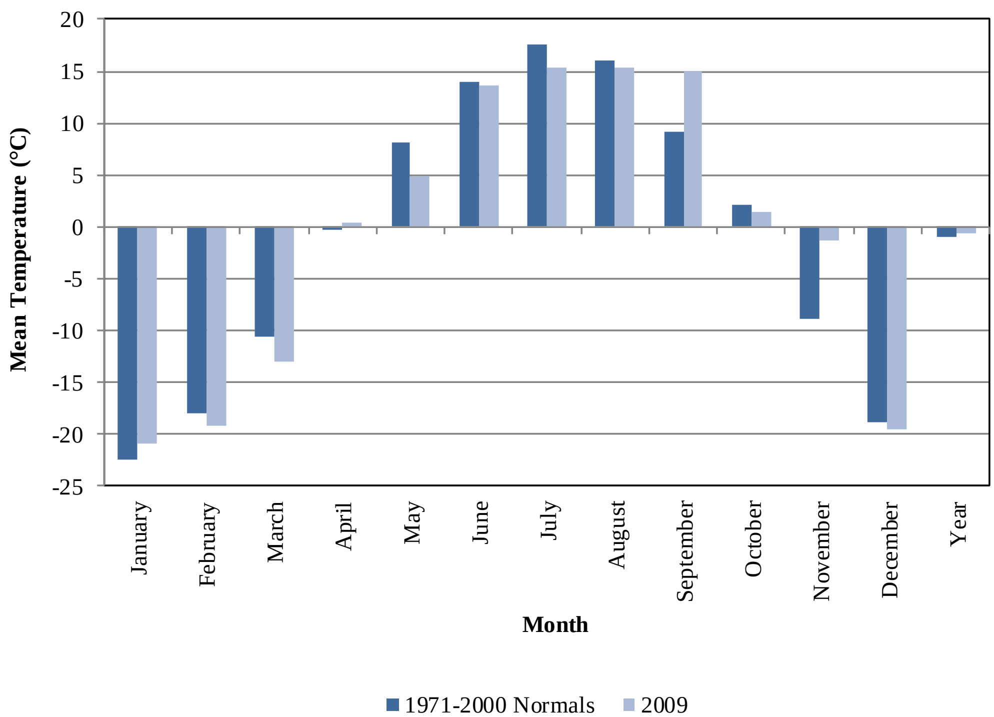
n = number of fish measured (may not equal number of fish caught); SD = standard deviation

Table 7.6-17. Deformities, erosion, lesions, and tumours (DELTs) on select fish species captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2009.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Playgreen Lake											
White Sucker	-	-	-	-	-	-	-	-	396	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	174	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	11	0	0.00
Sauger	-	-	-	-	-	-	-	-	118	0	0.00
Walleye	-	-	-	-	-	-	-	-	144	0	0.00
Cross Lake											
White Sucker	-	-	1	1.75	-	-	-	-	57	1	1.75
Northern Pike	-	-	-	-	-	-	-	-	107	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	43	0	0.00
Walleye	-	-	-	-	-	-	-	-	102	0	0.00
Setting Lake											
White Sucker	-	-	-	-	-	-	-	-	188	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	69	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	6	0	0.00
Sauger	-	-	-	-	-	-	-	-	229	0	0.00
Walleye	-	-	-	-	-	-	-	-	274	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 deformities, erosions, lesions or tumours
$\%_{DELTS}$ = total percentage of fish inspected for DELTs with DELTs ($n_{DELTS}/n_{Inspect}$ x100)

(A)



(B)

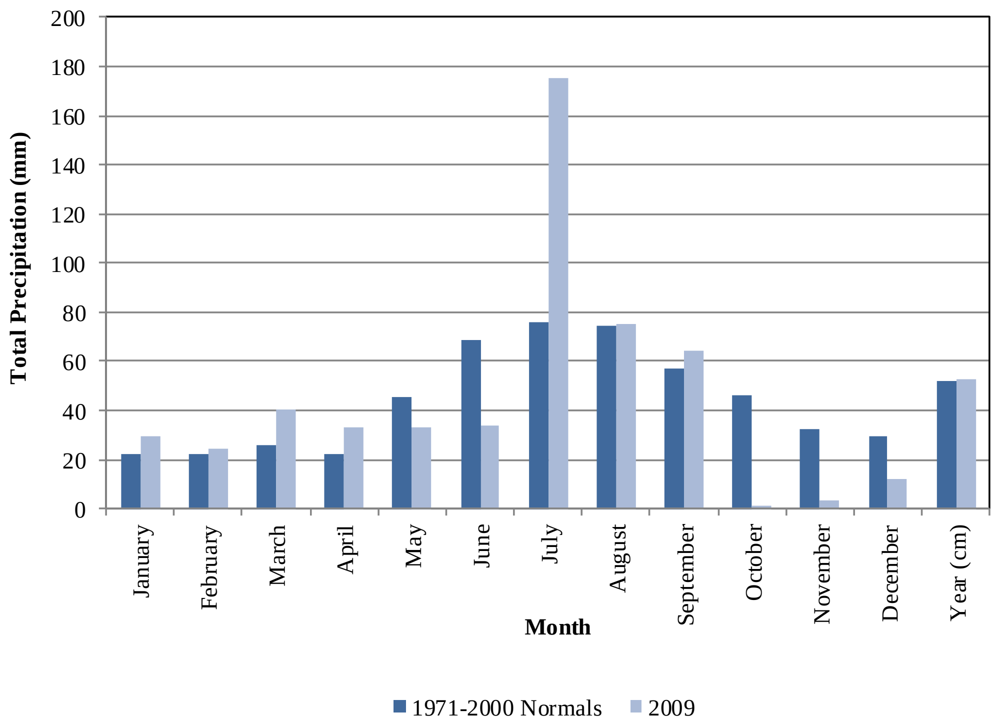


Figure 7.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), Norway House, MB. October precipitation data is based on an incomplete data set.

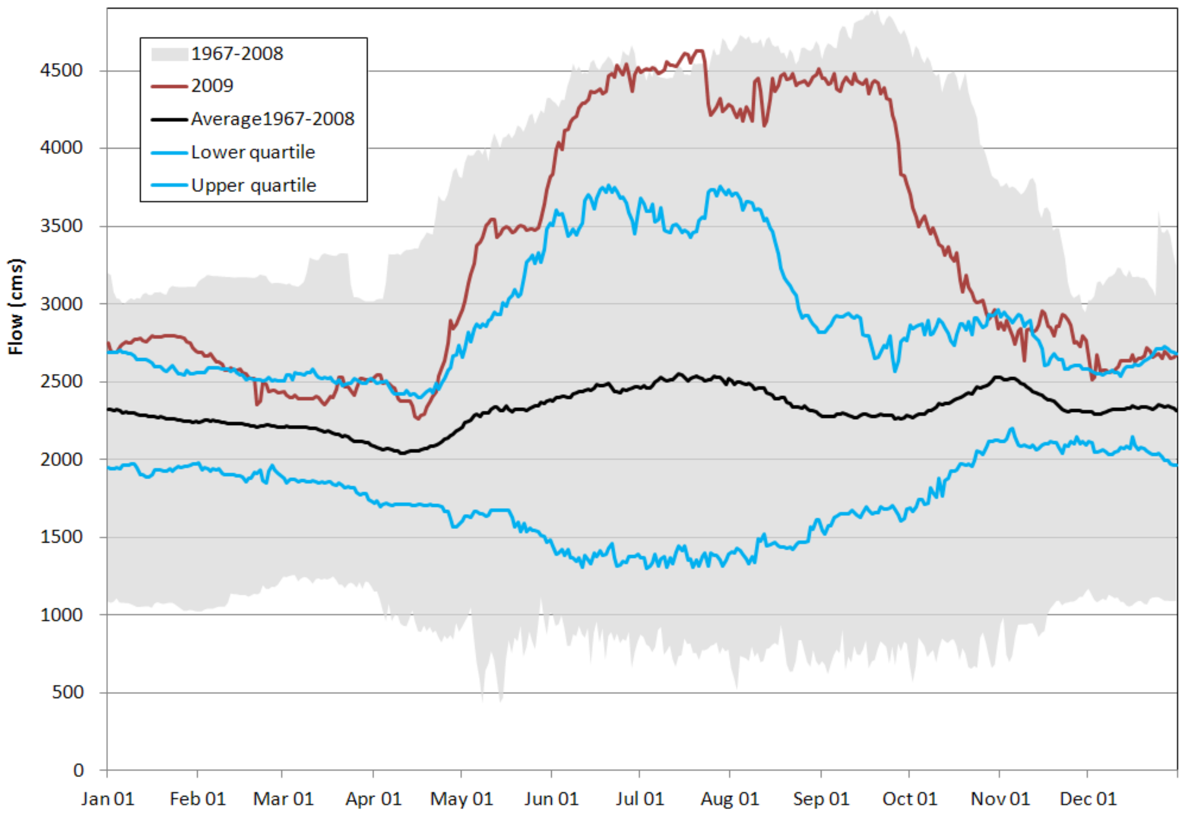


Figure 7.2-1. 2009 Kelsey Generating Station outflow

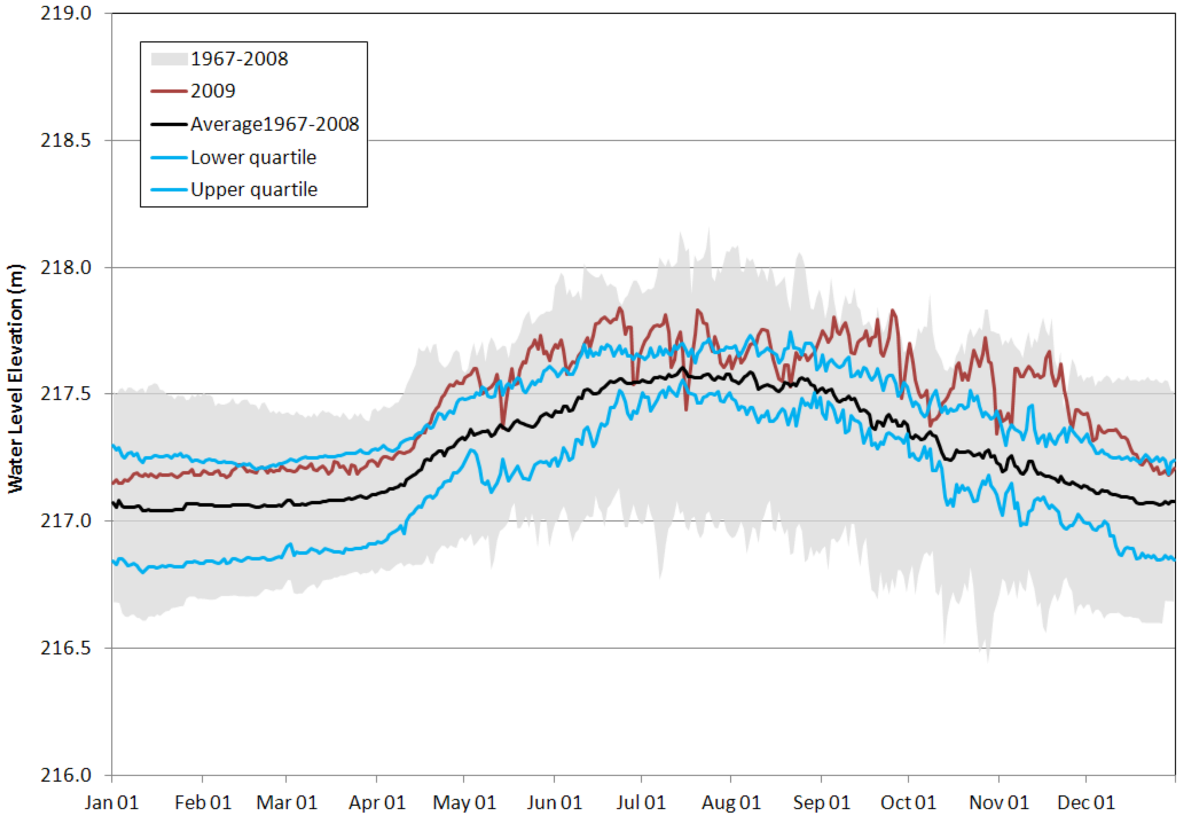


Figure 7.2-2. 2009 Playgreen Lake (05UB005) water level elevation.

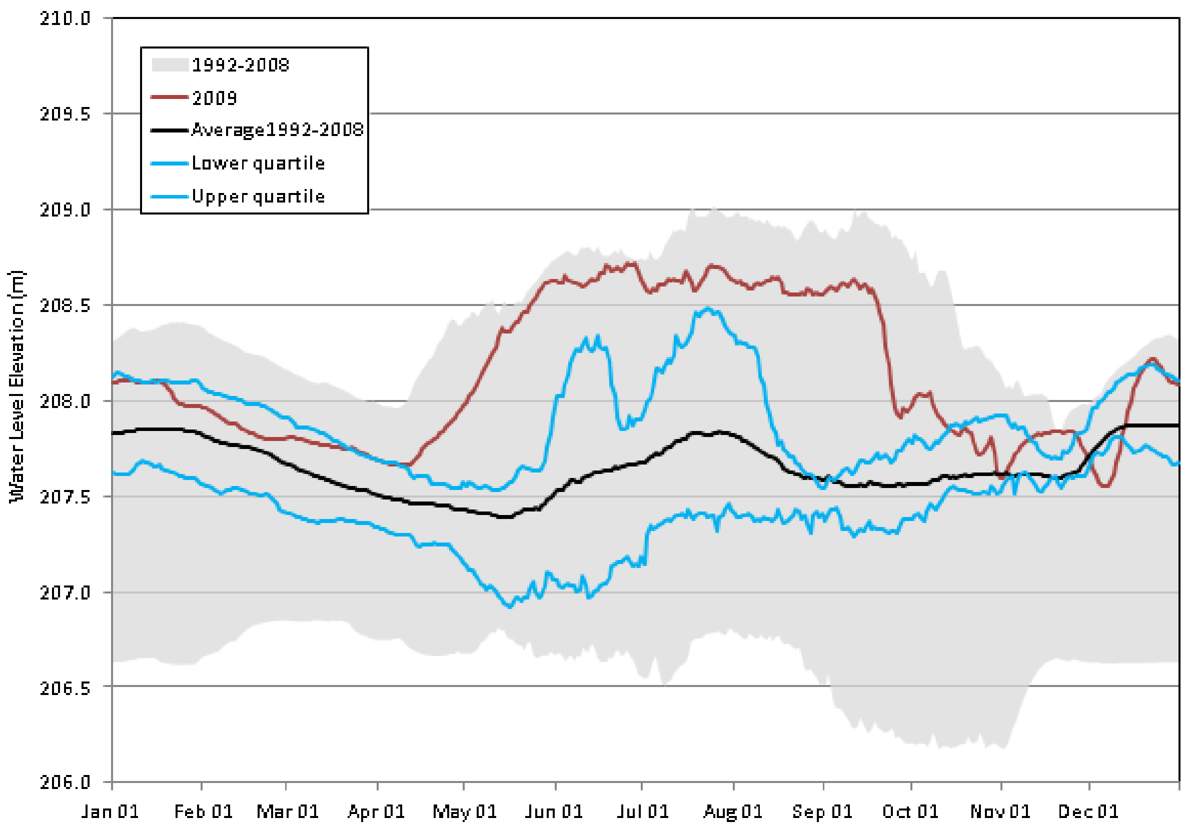


Figure 7.2-4. 2009 Cross Lake (05UD001) water level elevation.

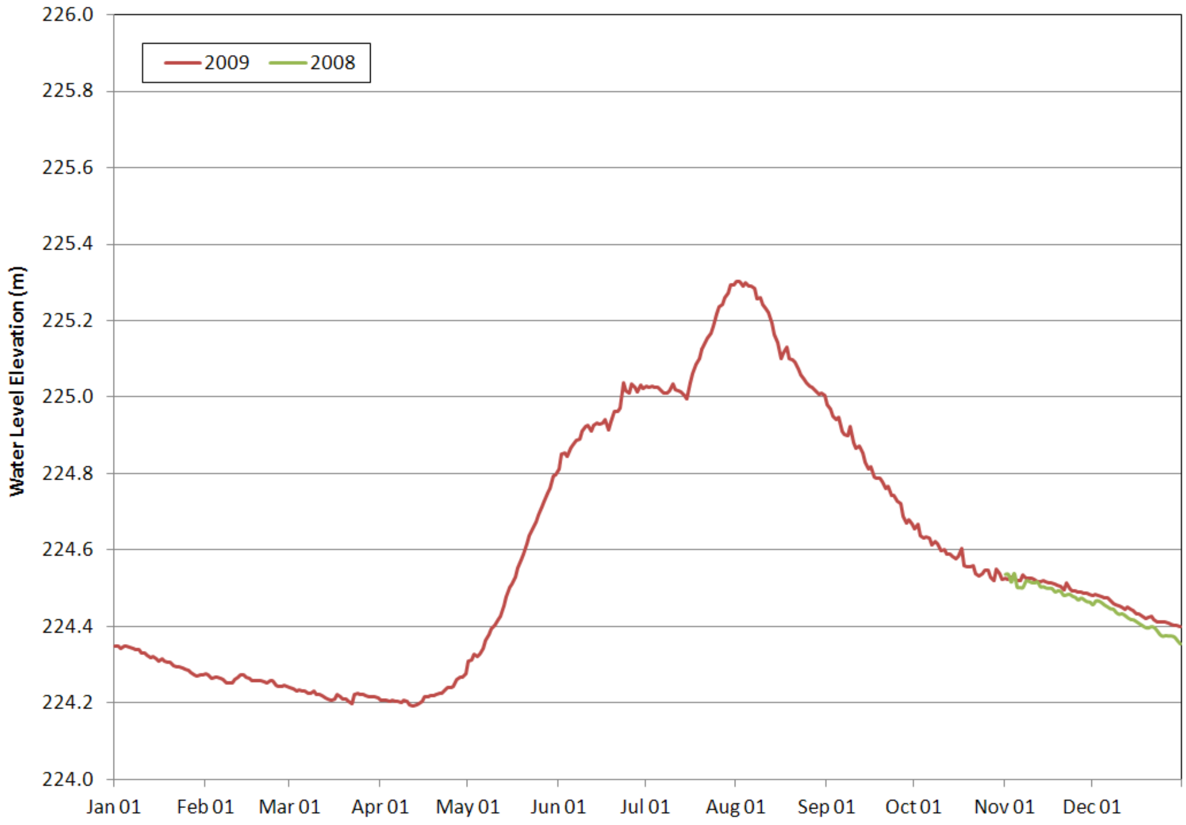


Figure 7.2-3. 2009 Setting Lake (05TC701) water level elevation.

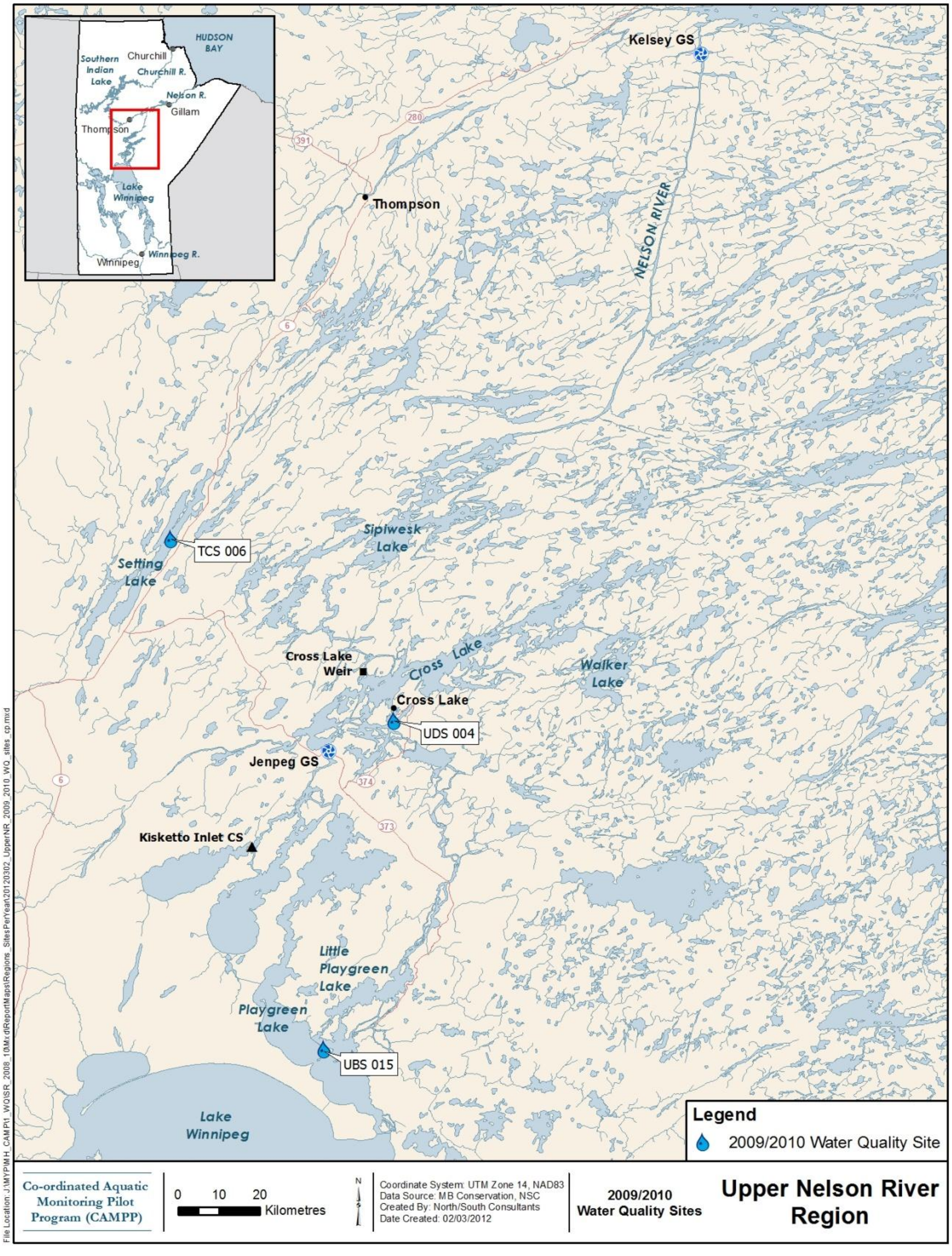


Figure 7.3-1. Water quality and phytoplankton monitoring sites in the Upper Nelson River Region: 2009/2010.

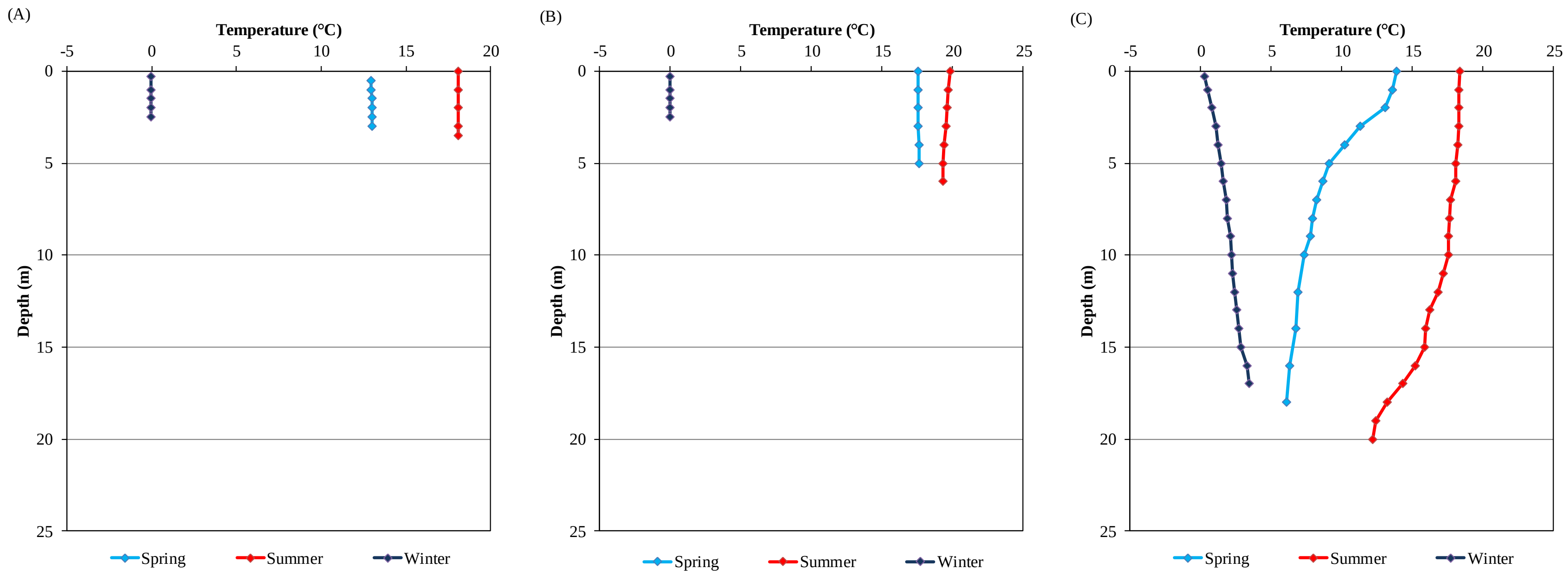


Figure 7.3-2. Water temperature profiles measured in the Upper Nelson River Region in 2009/2010: (A) Playgreen Lake; (B) Cross Lake; and (C) Setting Lake.

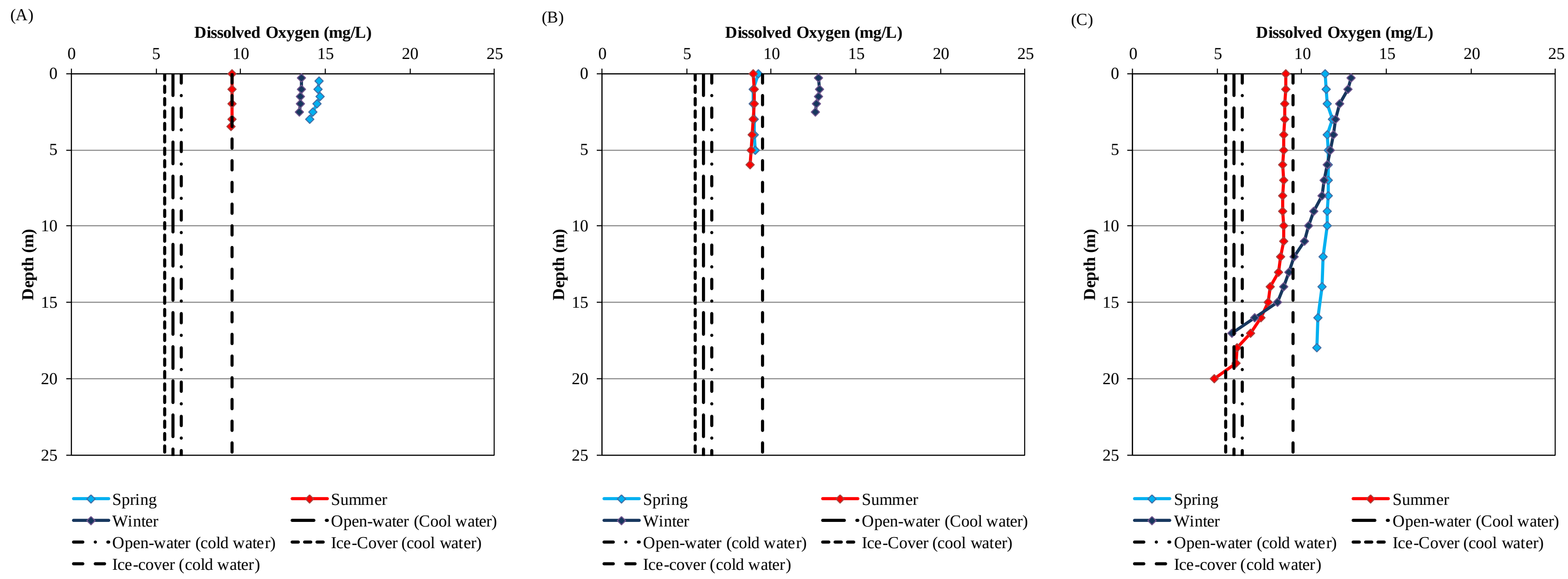


Figure 7.3-3. Dissolved oxygen depth profiles measured in the Upper Nelson River Region in 2009/2010: (A) Playgreen Lake; (B) Cross Lake; and (C) Setting Lake. Dashed lines represent selected MWQSOGs for PAL.

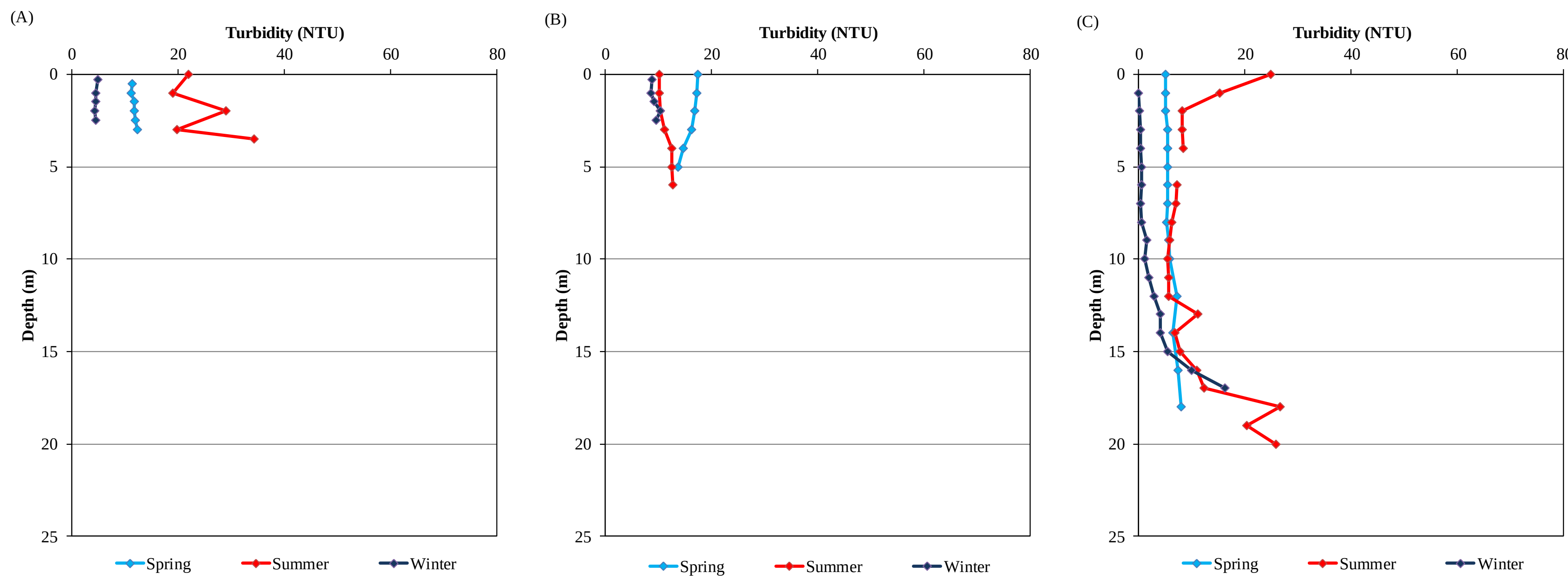


Figure 7.3-4. Turbidity depth profiles measured in the Upper Nelson River Region in 2009/2010: (A) Playgreen Lake; (B) Cross Lake; and (C) Setting Lake.

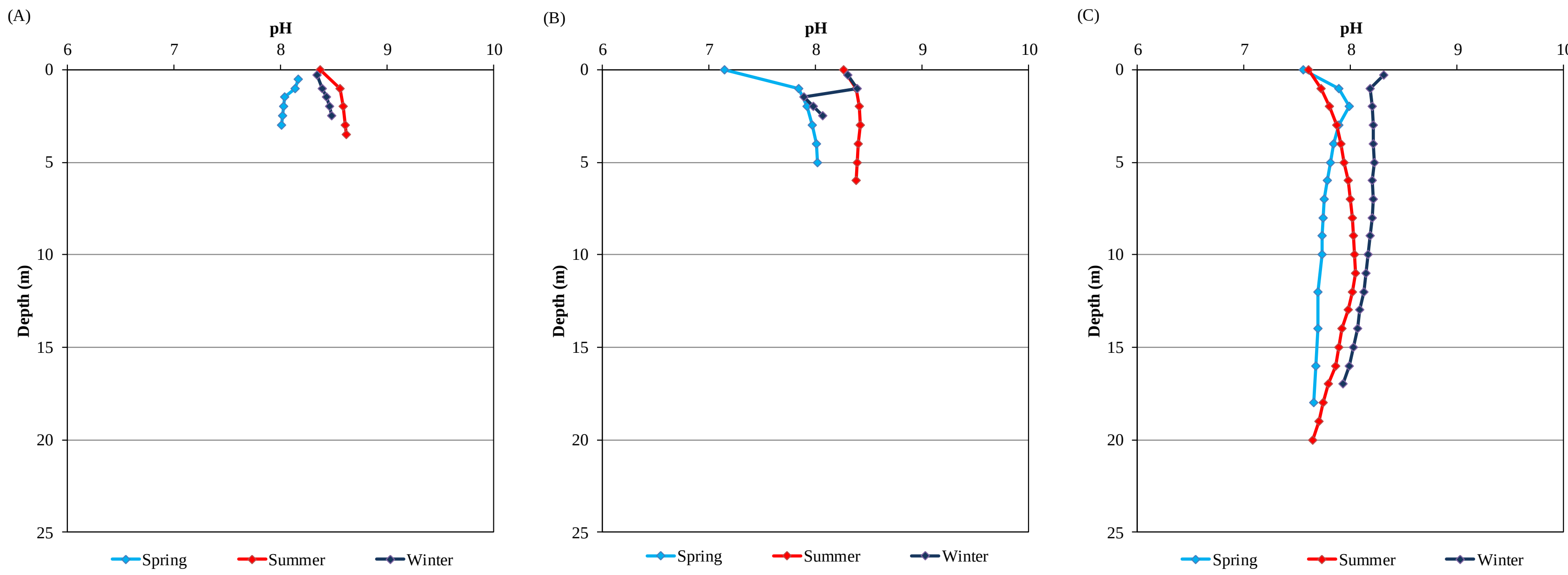


Figure 7.3-5. pH depth profiles measured in the Upper Nelson River Region in 2009/2010: (A) Playgreen Lake; (B) Cross Lake; and (C) Setting Lake.

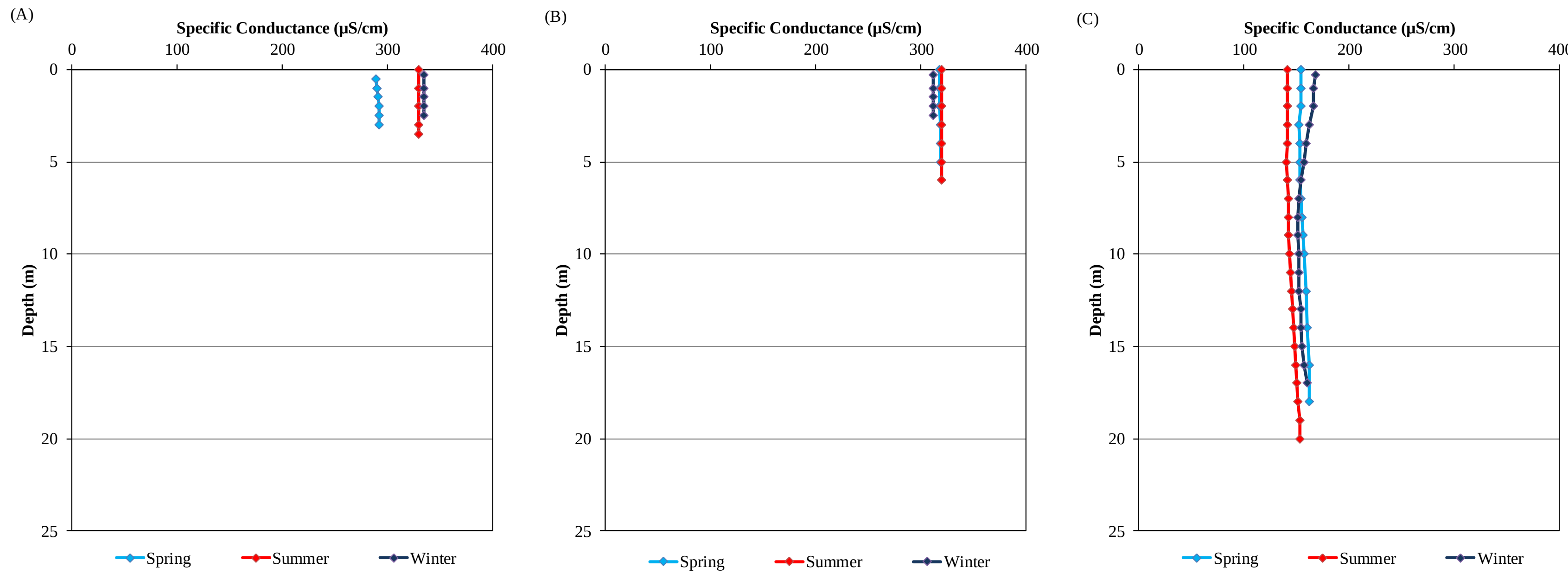


Figure 7.3-6. Specific conductance depth profiles measured in the Upper Nelson River Region in 2009/2010: (A) Playgreen Lake; (B) Cross Lake; and (C) Setting Lake.

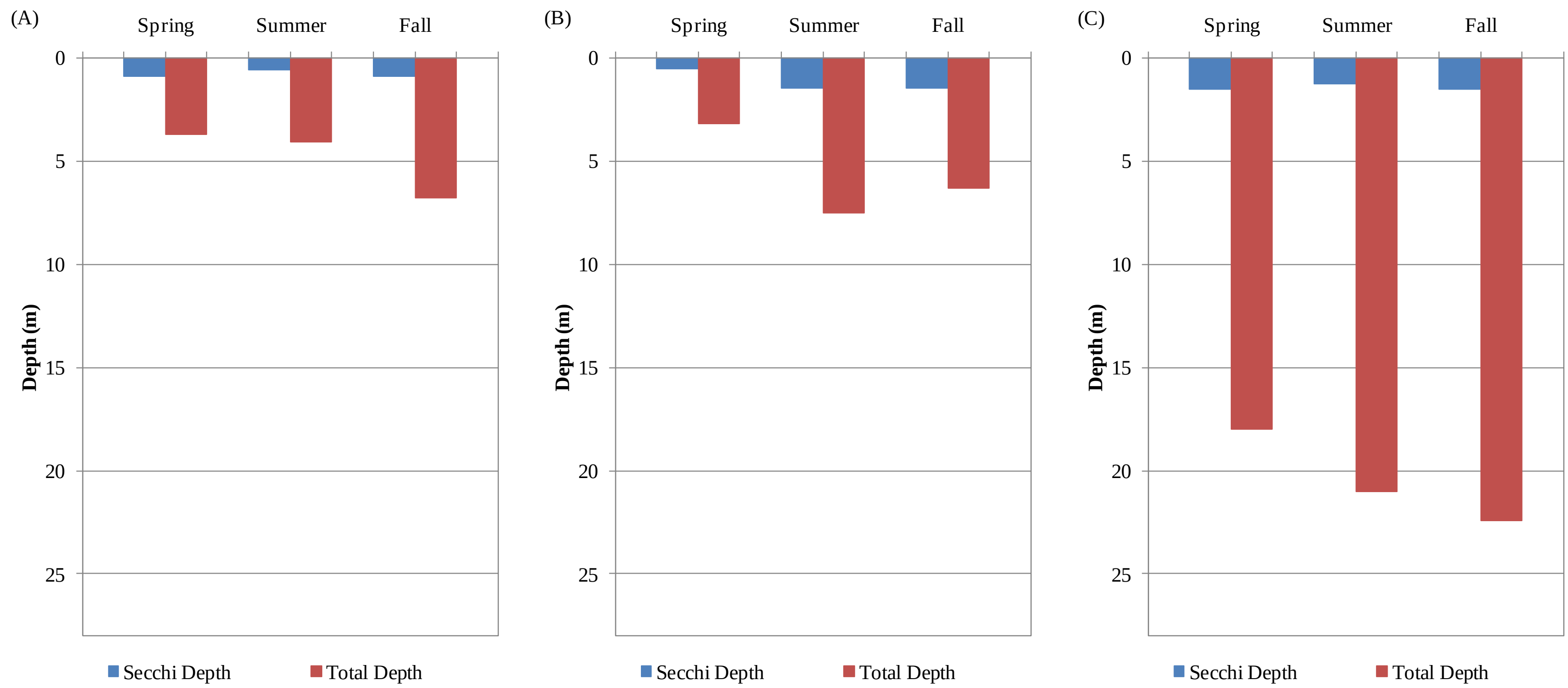


Figure 7.3-7. Secchi disk depths measured in the Upper Nelson River Region in 2009/2010: (A) Playgreen Lake; (B) Cross Lake; and (C) Setting Lake.

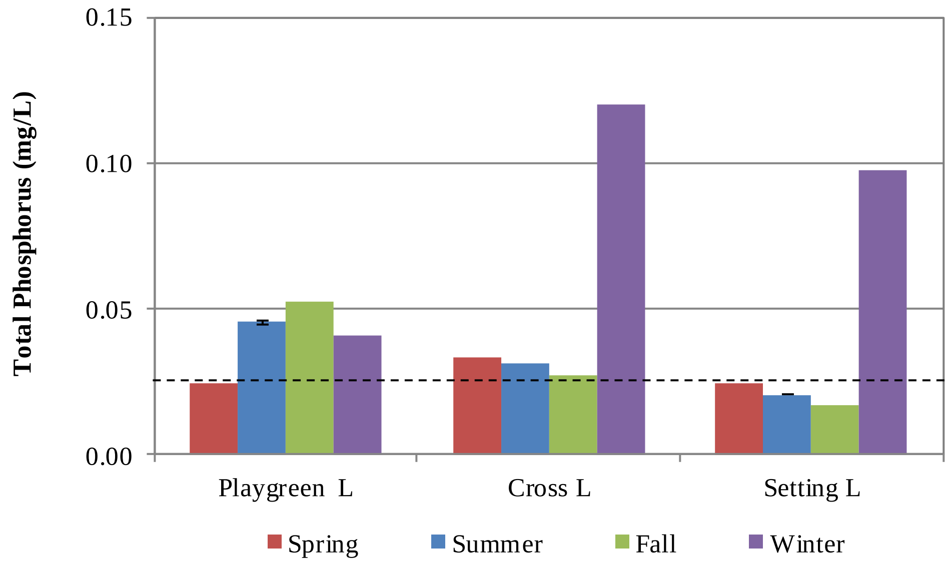


Figure 7.3-8. Total phosphorus measured in surface grabs in the Upper Nelson River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

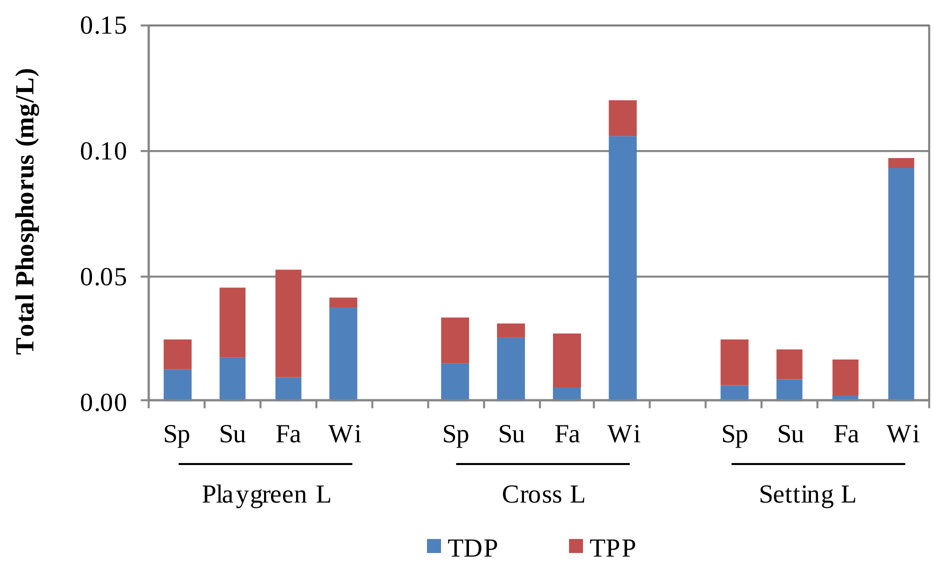


Figure 7.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Upper Nelson River Region: 2009/2010.

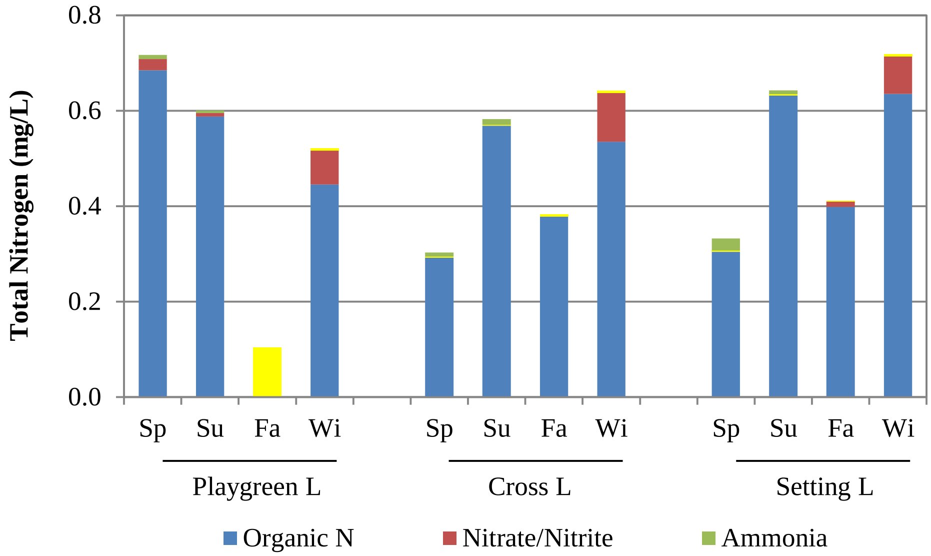


Figure 7.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Upper Nelson River Region: 2009/2010. Yellow bars represent values that were below the analytical detection limit.

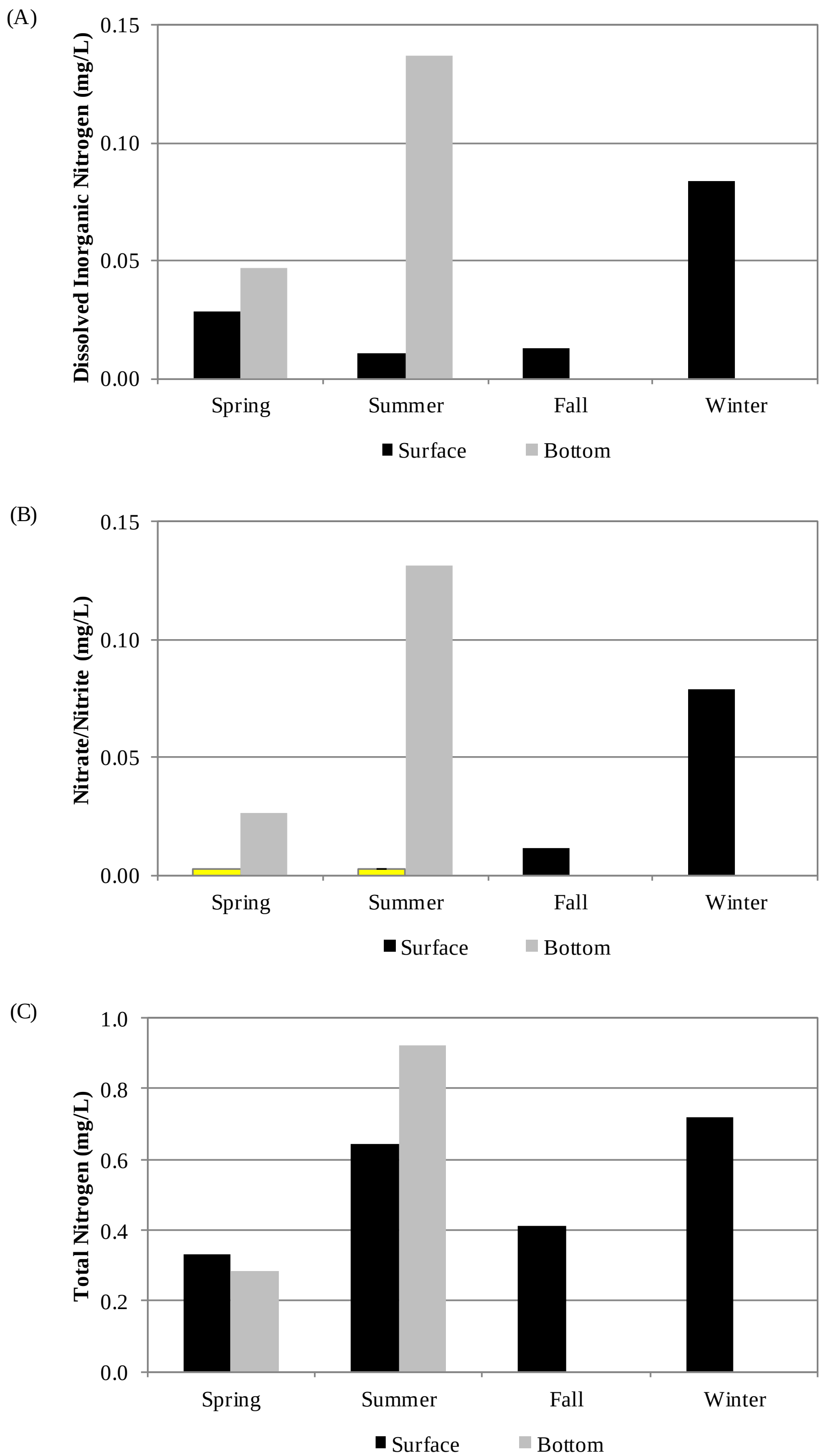
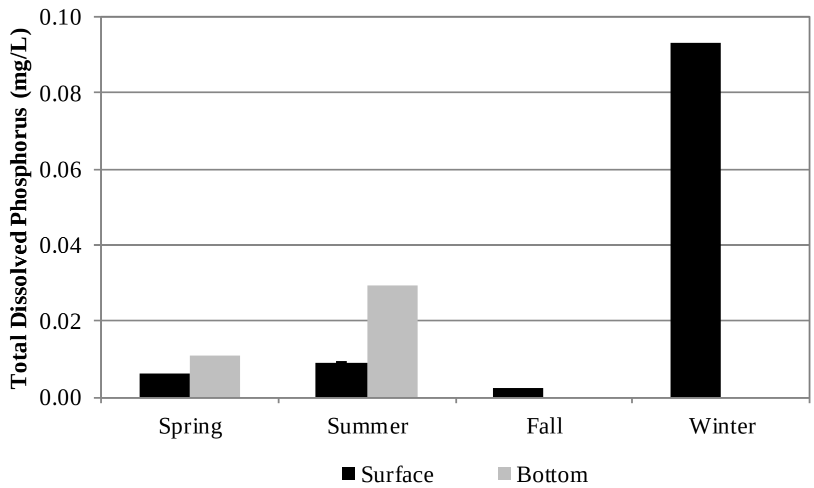
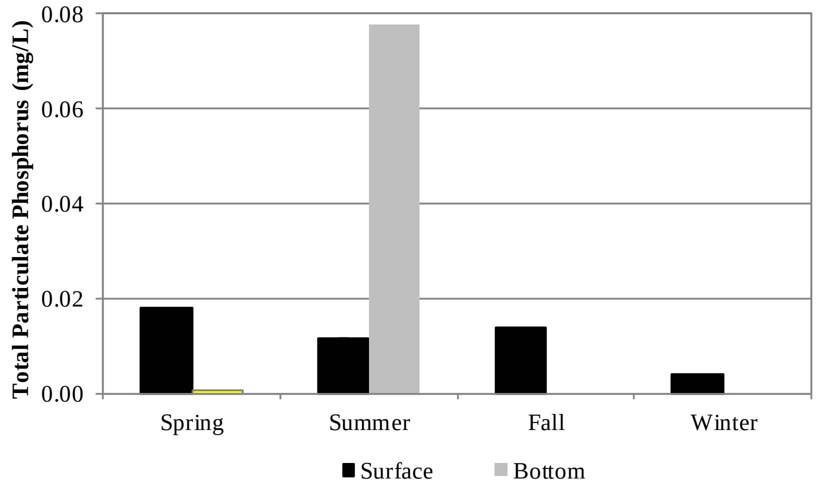


Figure 7.3-11. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Setting Lake, 2009/2010. Yellow bars represent values that were below the analytical detection limit.

(A)



(B)



(C)

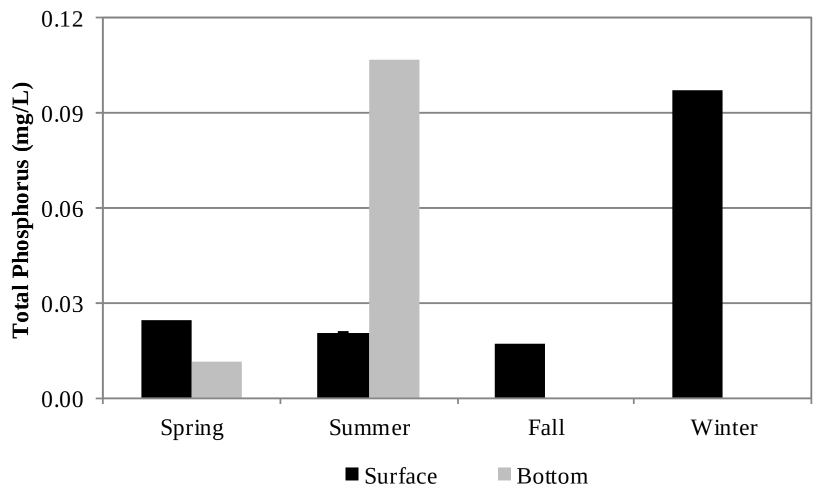


Figure 7.3-12. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Setting Lake, 2009/2010.

(A)

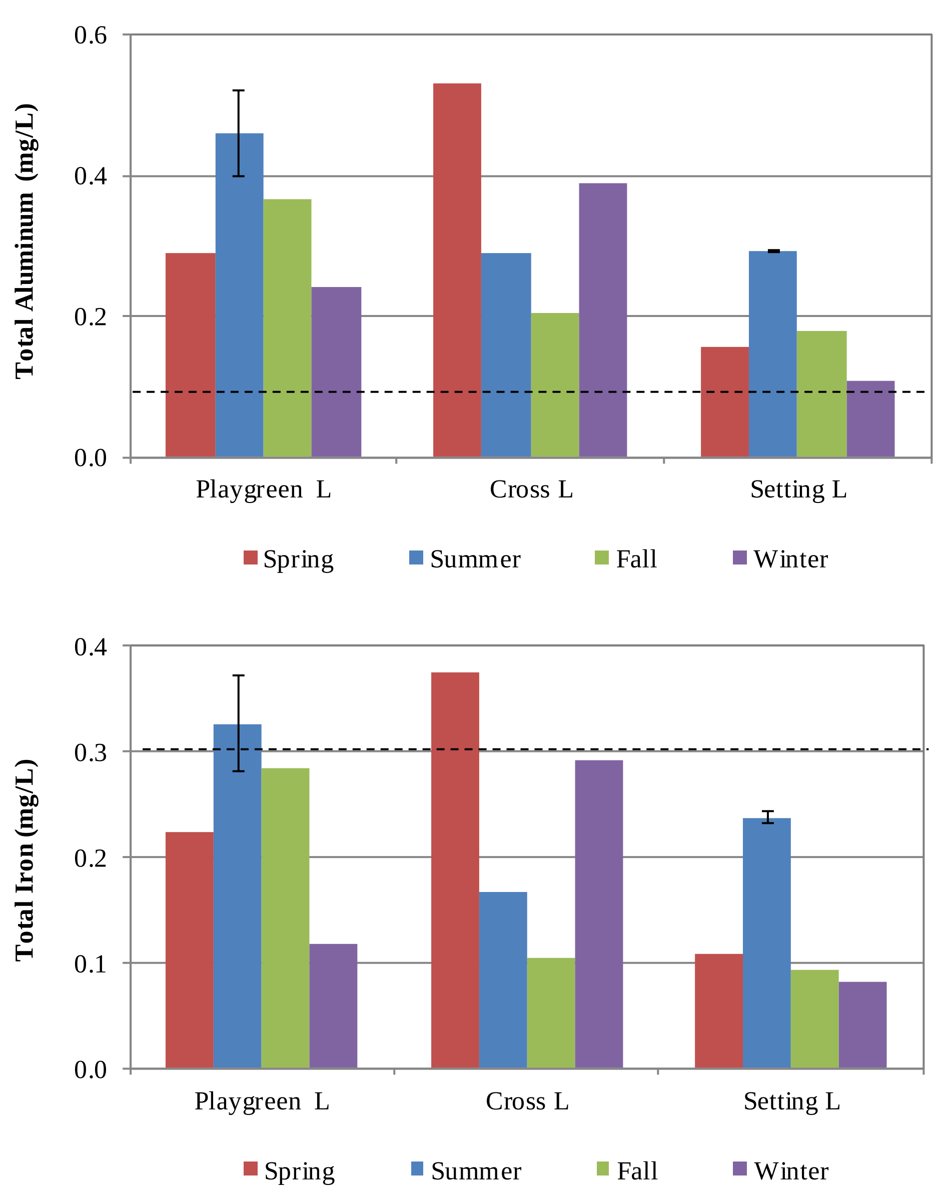


Figure 7.3-13. Total aluminum (A) and total iron (B) measured in surface grabs in the Upper Nelson River Region, by sampling period and site: 2009/2010. The black dashed lines indicate the MWQSOGs for PAL for aluminum and iron.

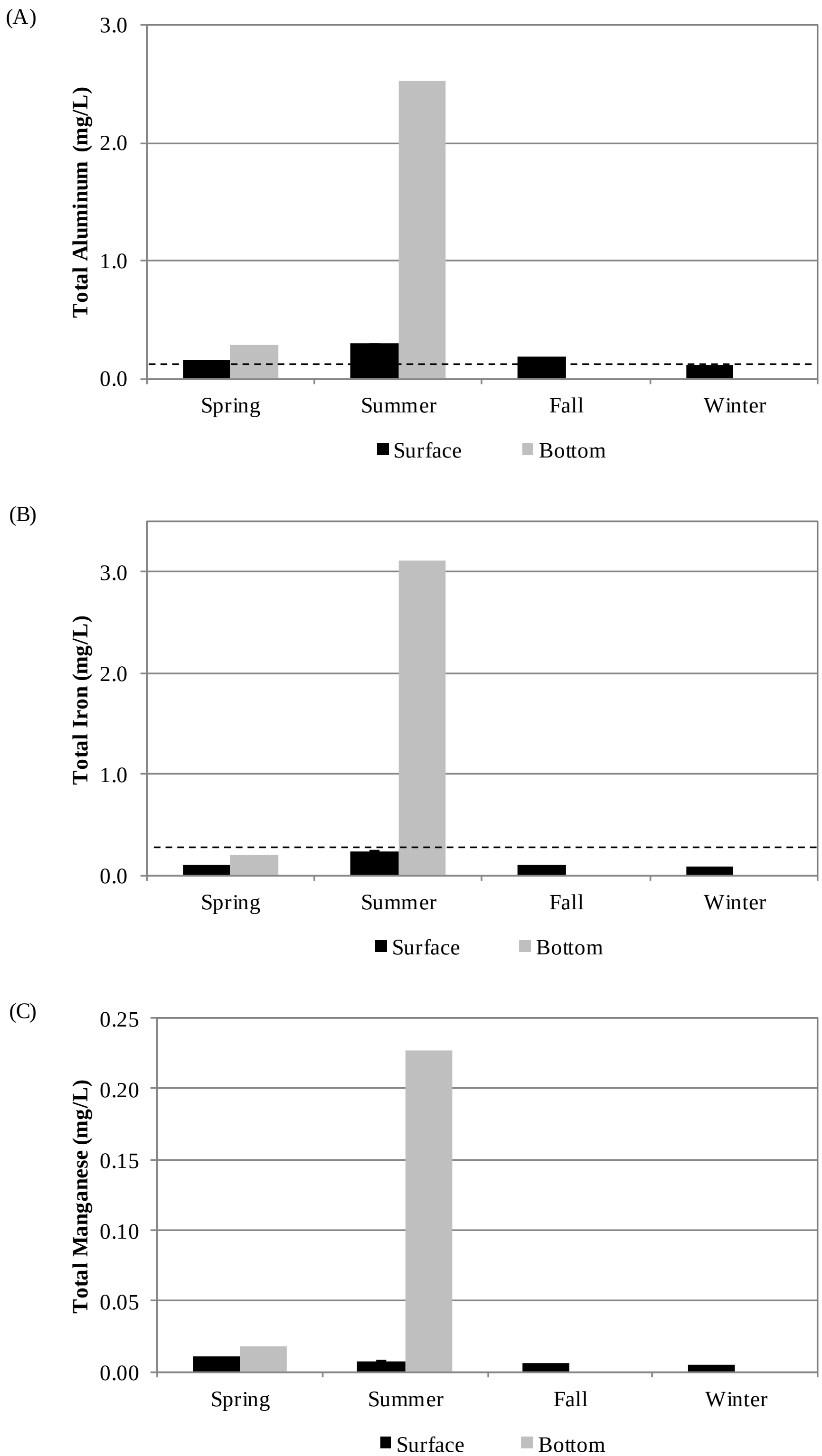


Figure 7.3-14. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Setting Lake, 2009/2010. The black dashed lines indicate the MWQSOGs for PAL for aluminum and iron.

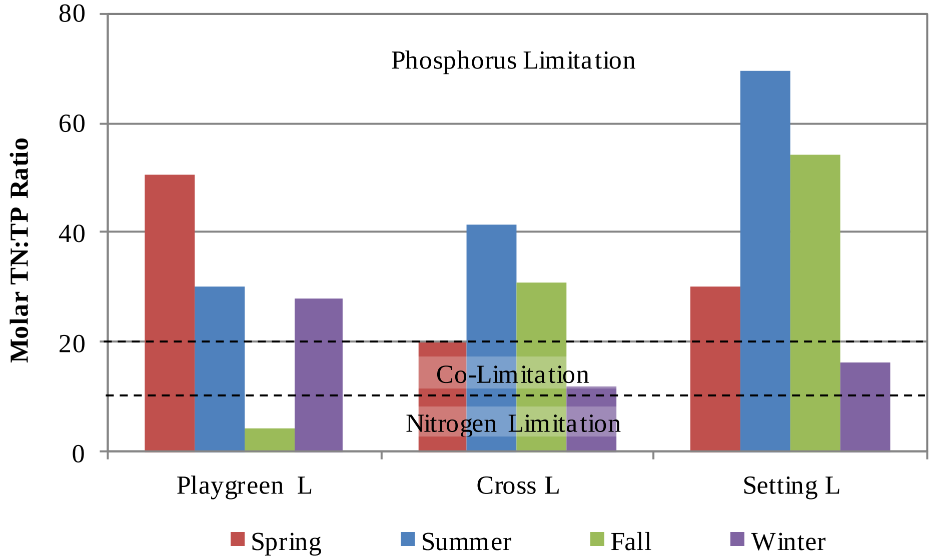


Figure 7.3-15. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Upper Nelson River Region: 2009/2010.

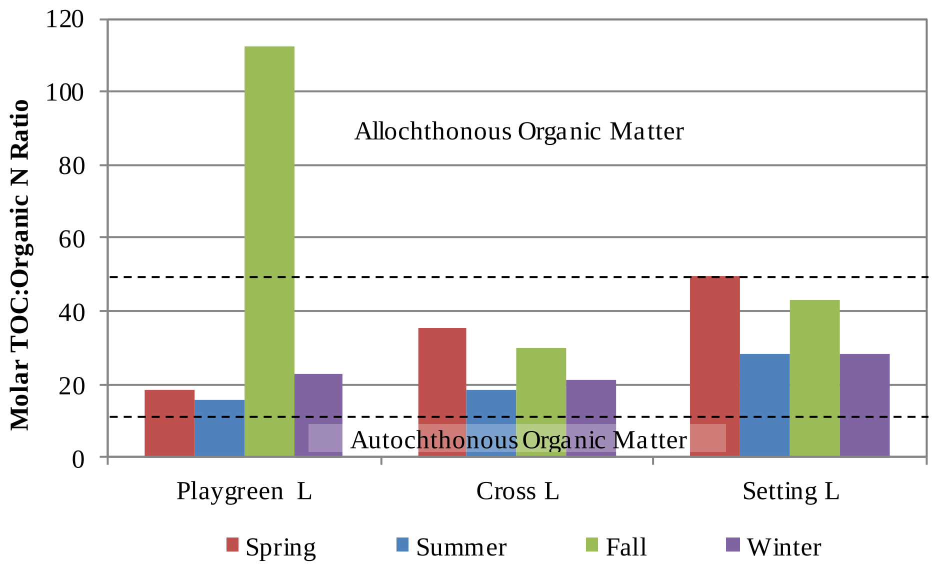
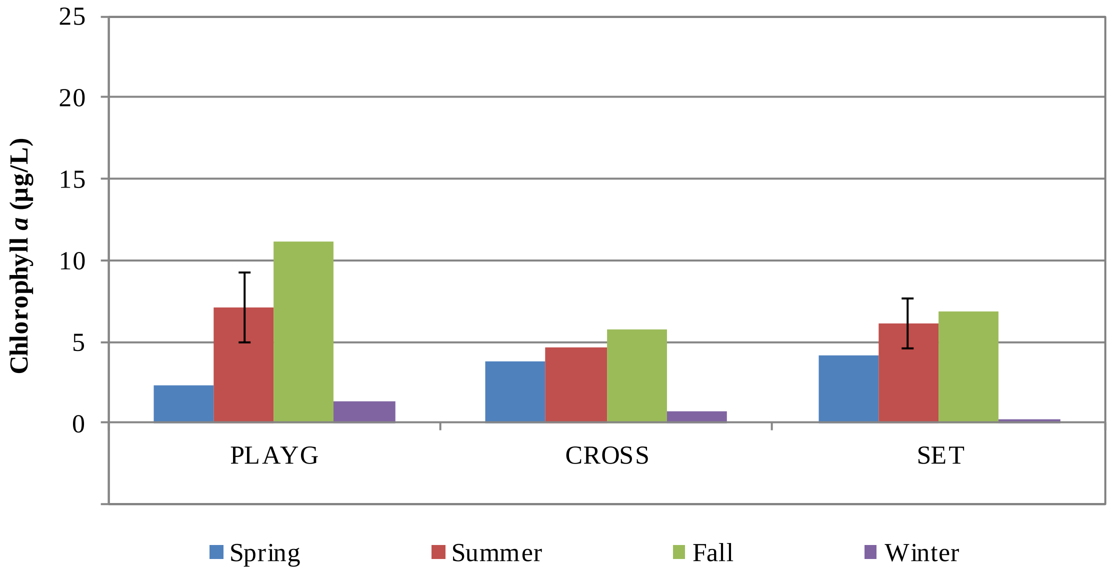


Figure 7.3-16. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Upper Nelson River Region: 2009/2010.

(A) Surface



(B) Euphotic

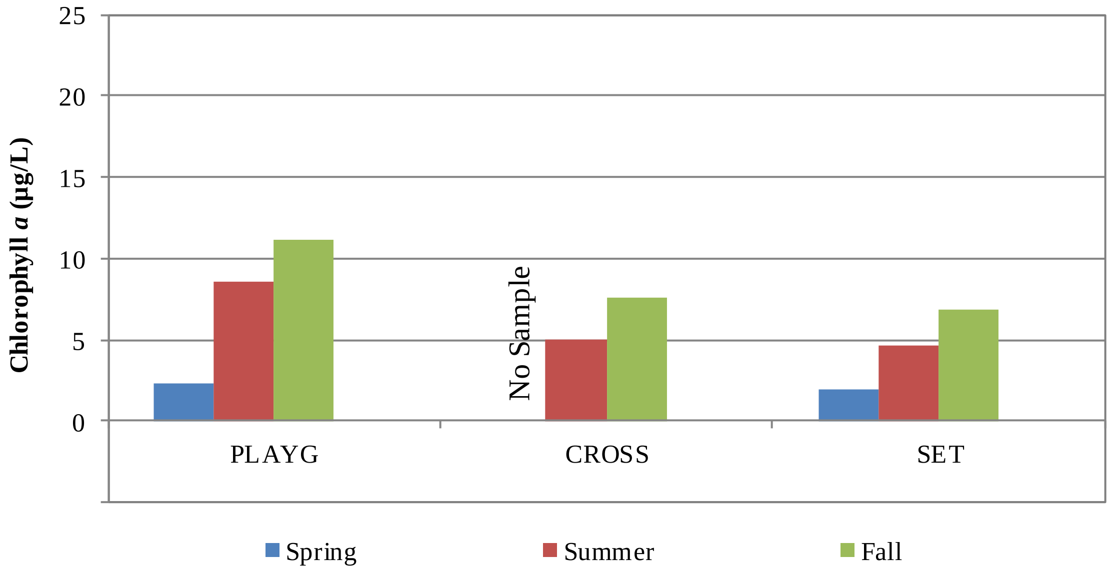


Figure 7.4-1. Chlorophyll *a* concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Upper Nelson River Region in 2009/2010. Error bars represent the standard error of triplicate samples

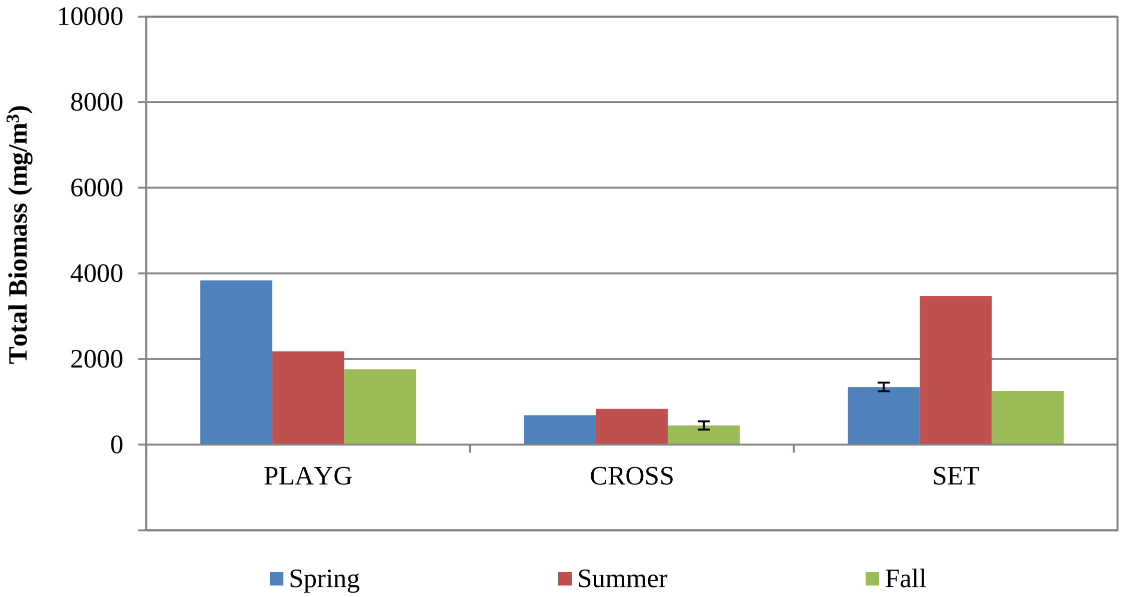


Figure 7.4-2. Phytoplankton biomass measured at sites in the Upper Nelson River Region in 2009. Error bars represent the standard error of samples analysed in duplicate for quality assurance.

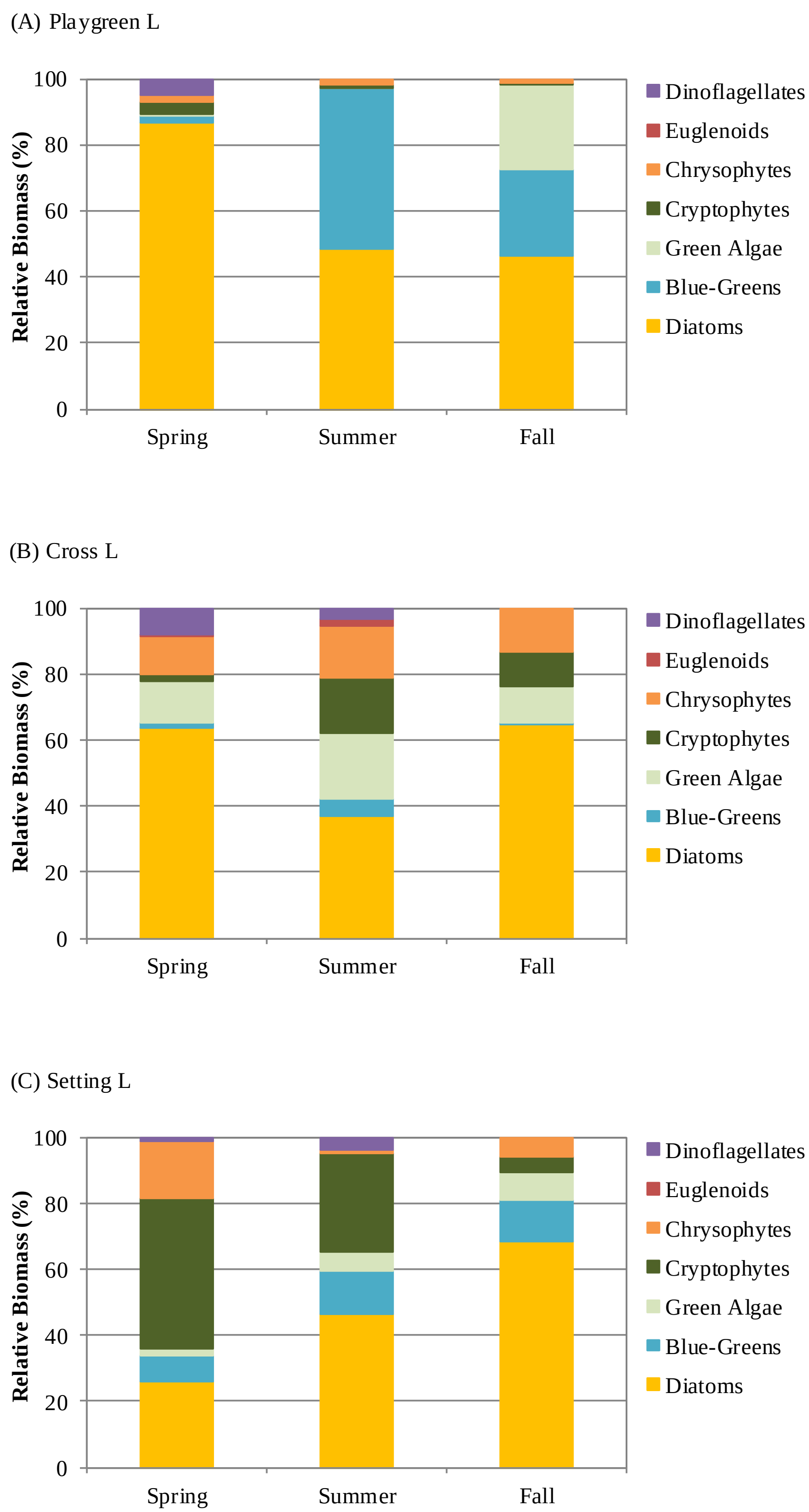


Figure 7.4-3. Phytoplankton community composition at sites in the Upper Nelson River Region in 2009.

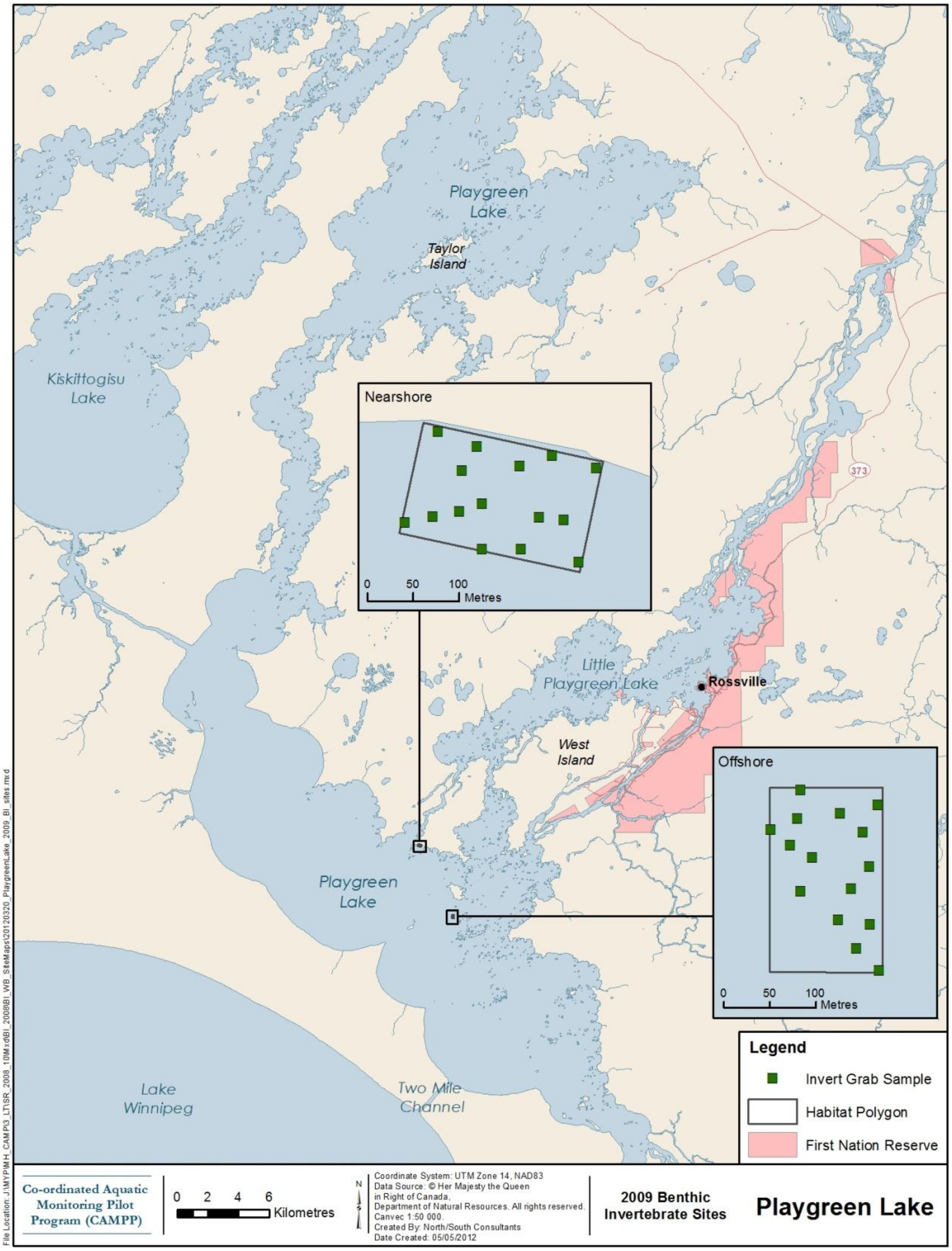


Figure 7.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Playgreen Lake in the Upper Nelson River Region, 2009.

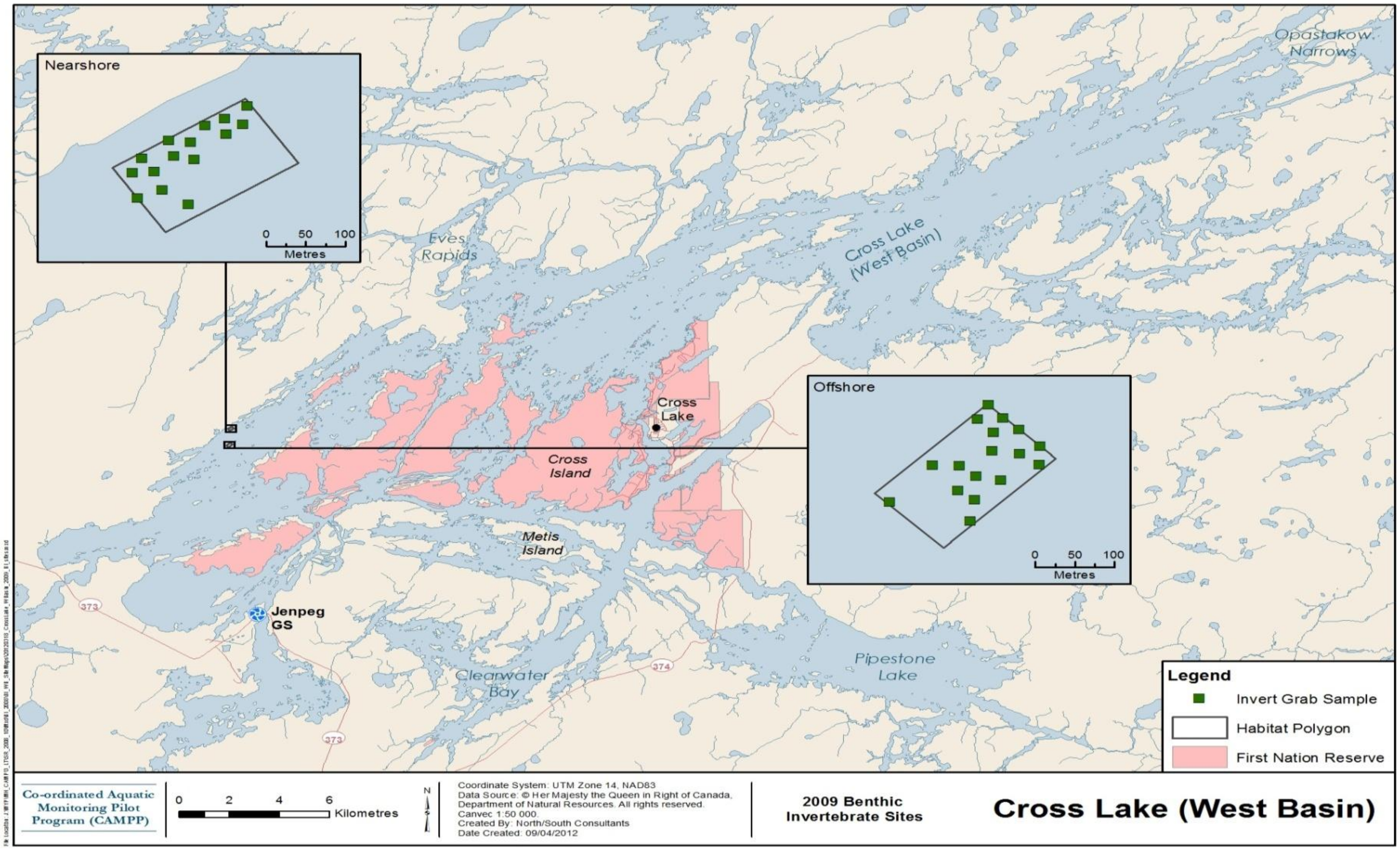


Figure 7.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Cross Lake in the Upper Nelson River Region, 2009.

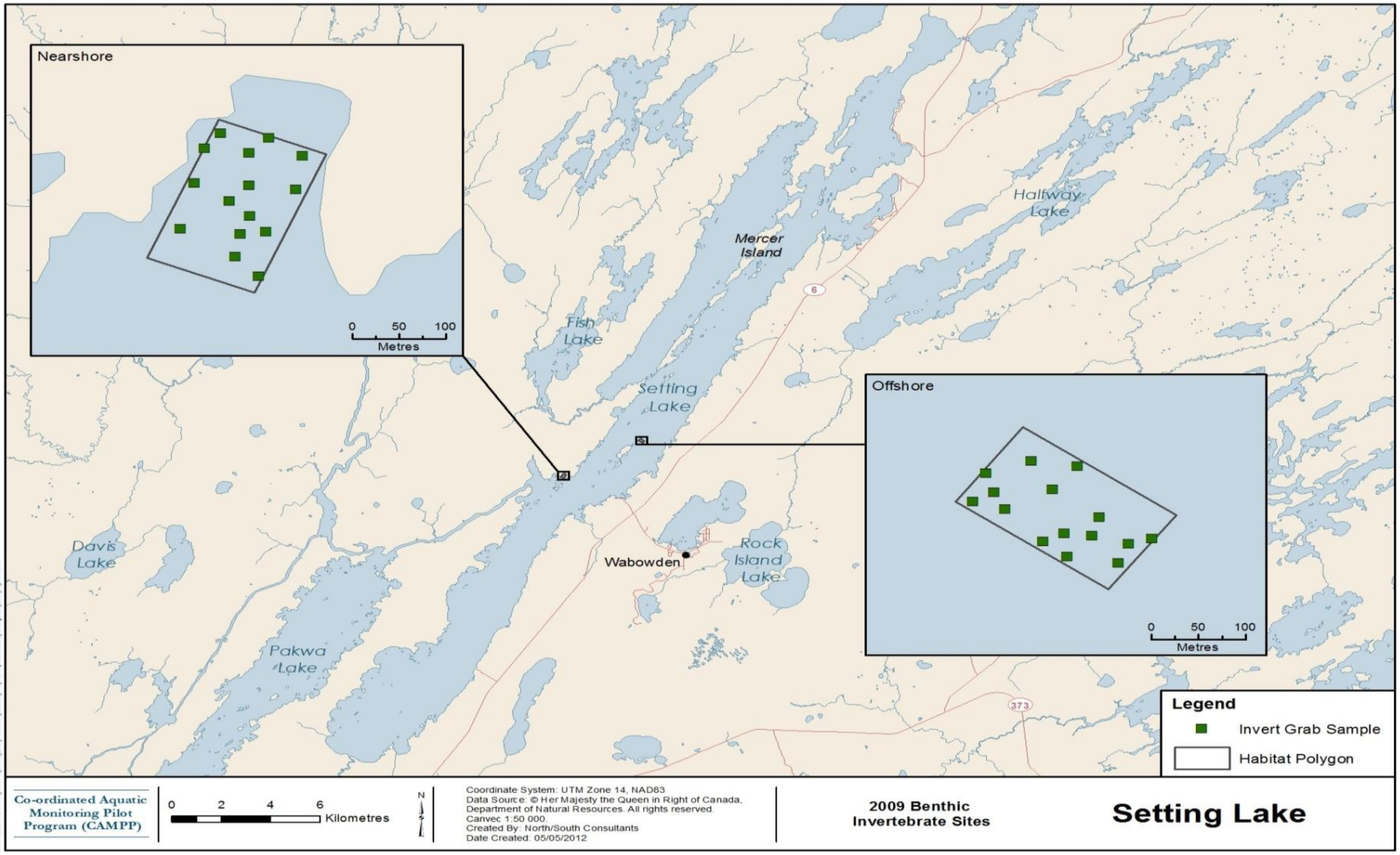


Figure 7.5-3. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Setting Lake in the Upper Nelson River Region, 2009.

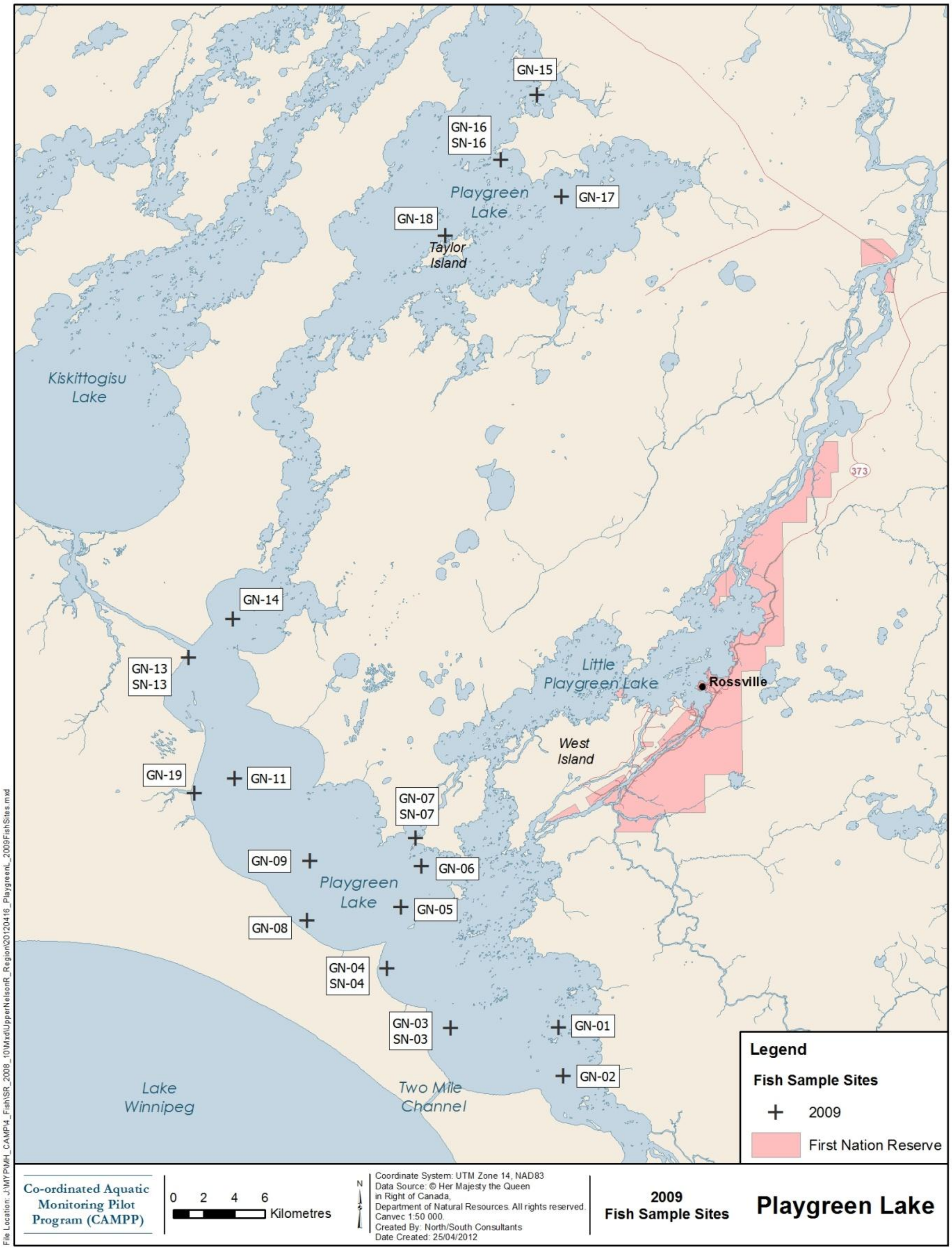


Figure 7.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Playgreen Lake, 2009.

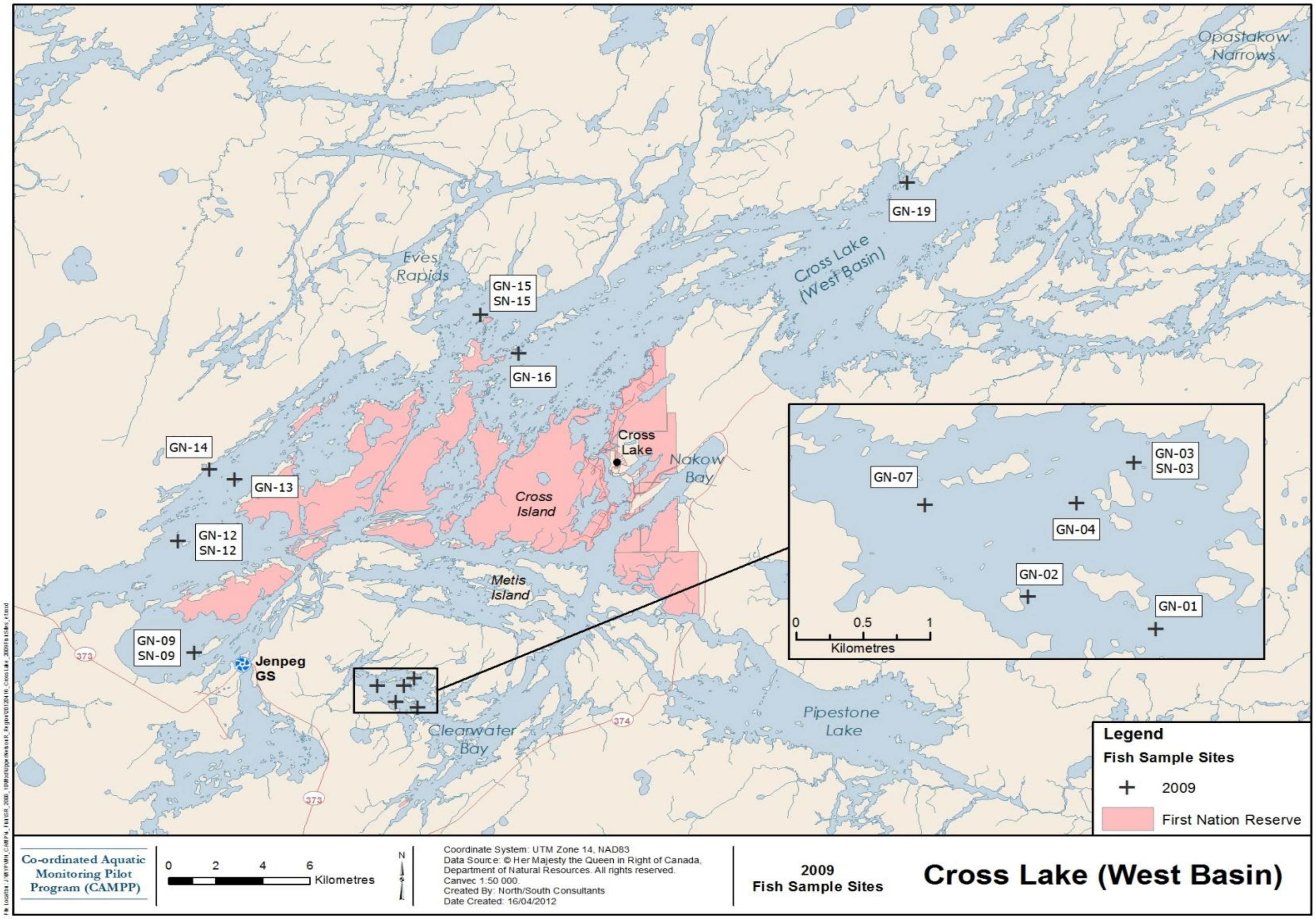


Figure 7.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Cross Lake, 2009.

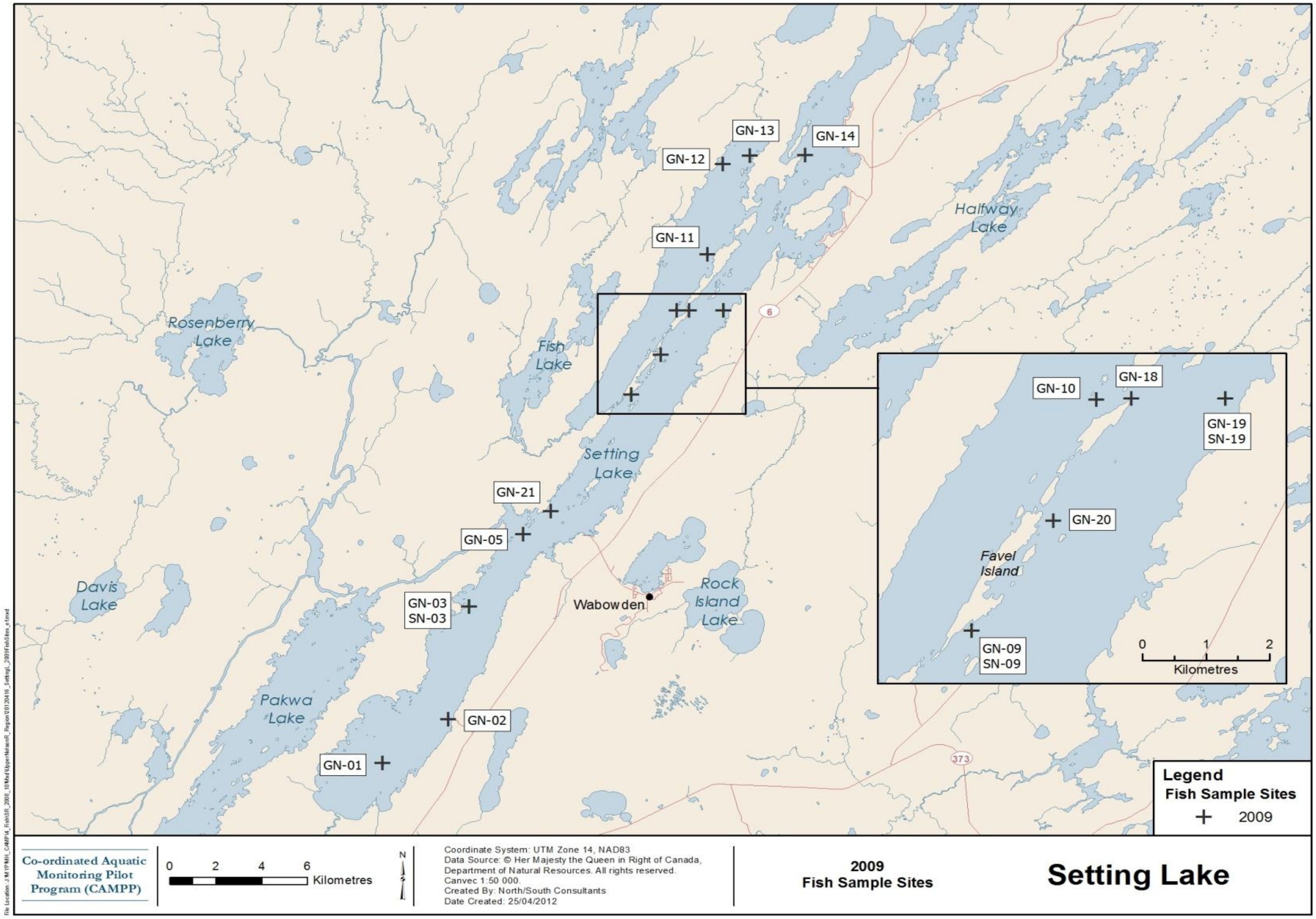


Figure 7.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Setting Lake, 2009.

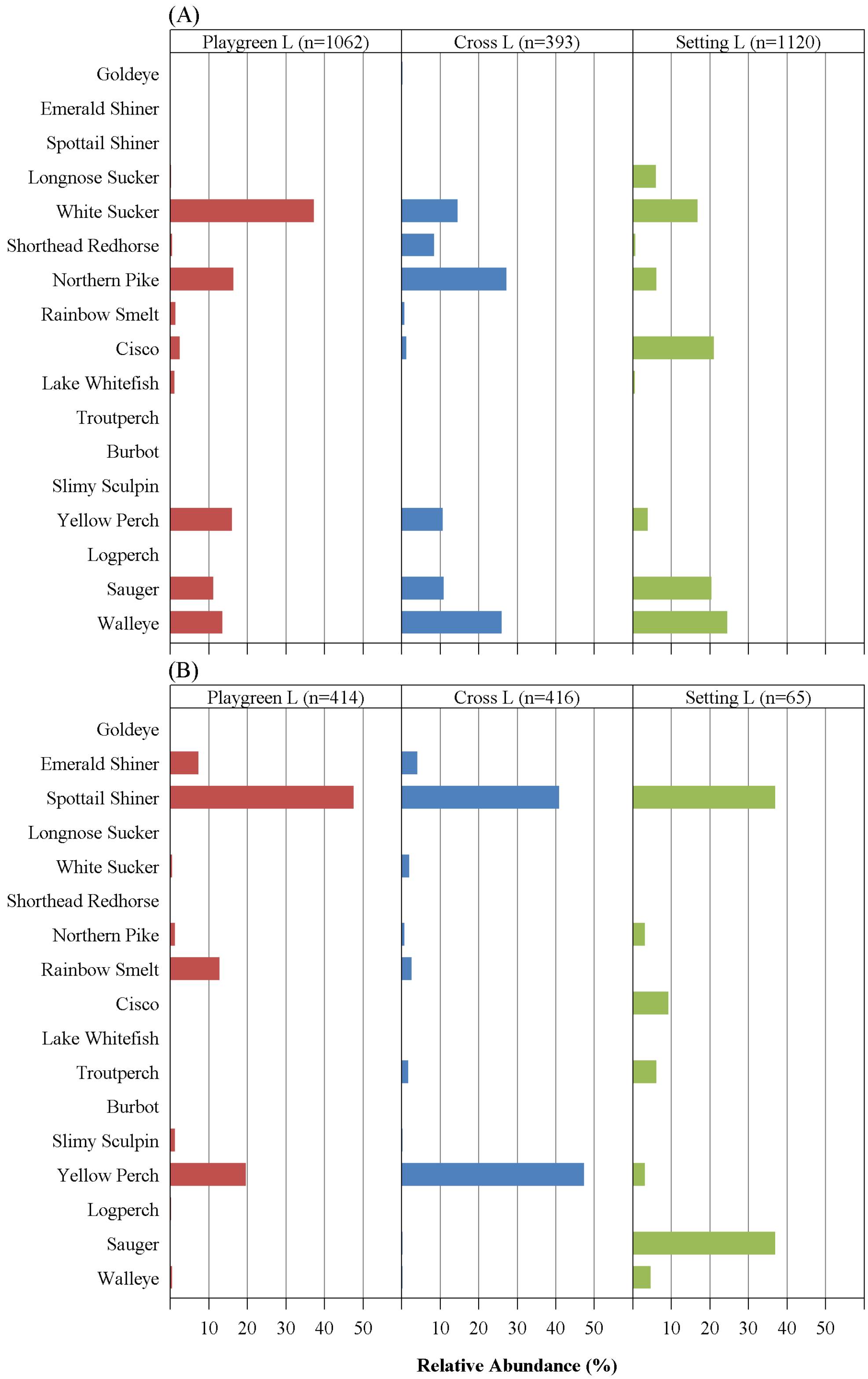


Figure 7.6-4. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2009.

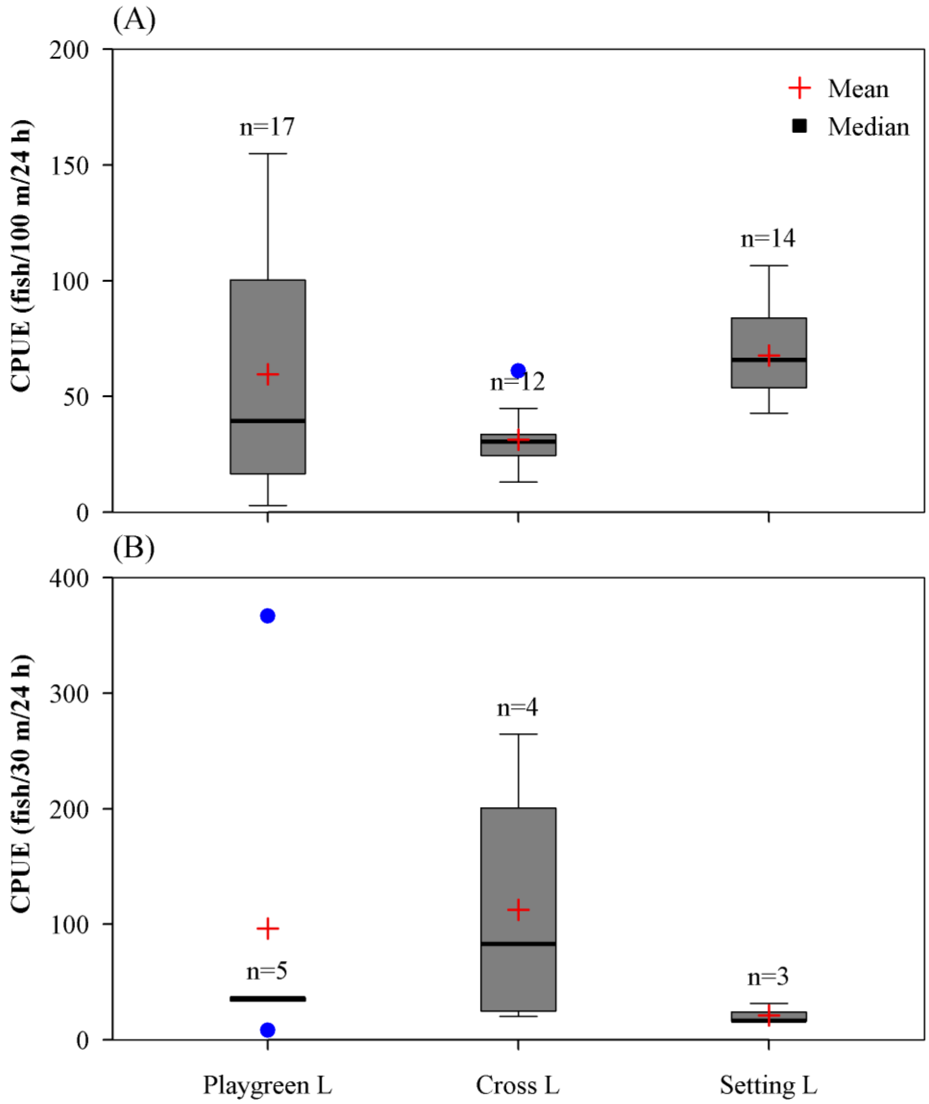


Figure 7.6-5. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2009.

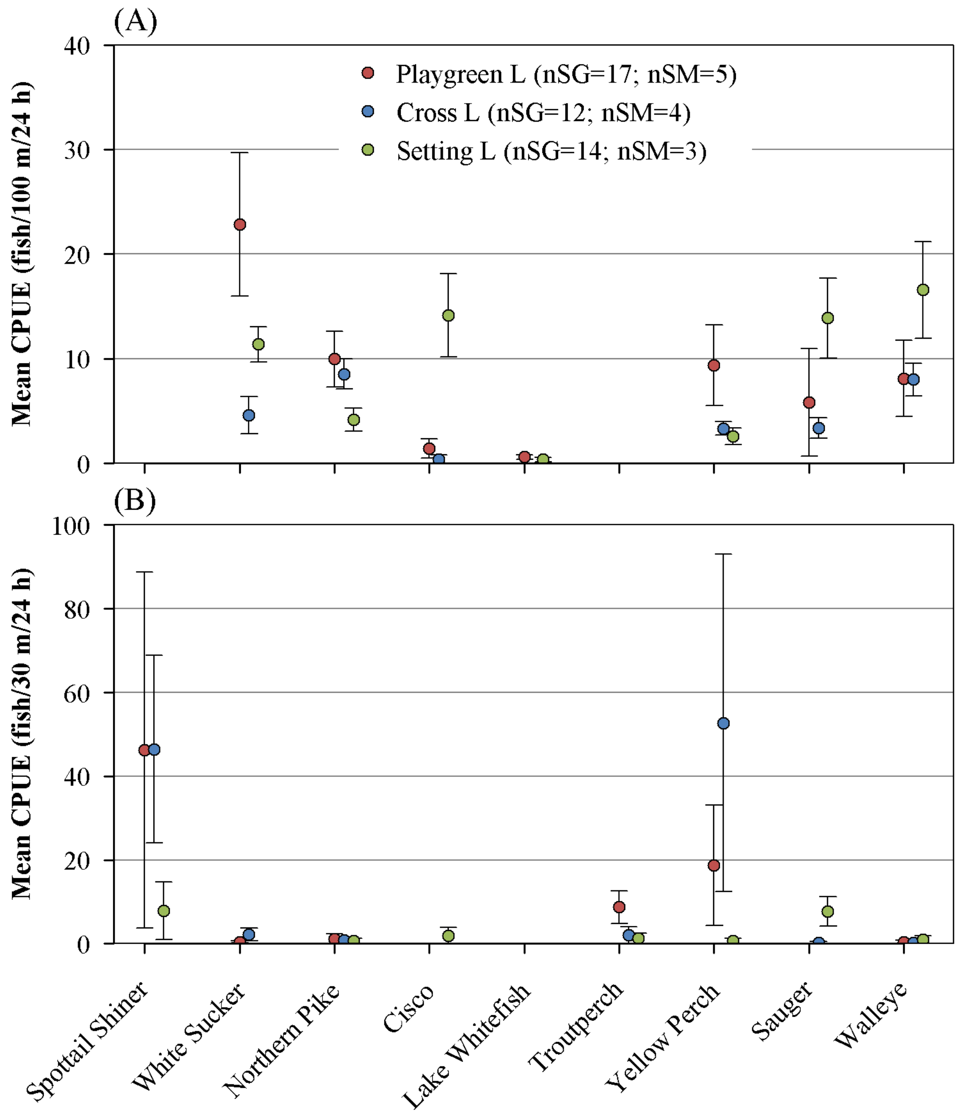


Figure 7.6-6. Mean (SE) CPUE calculated for select fish species captured in (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Upper Nelson River Region waterbodies, 2009.

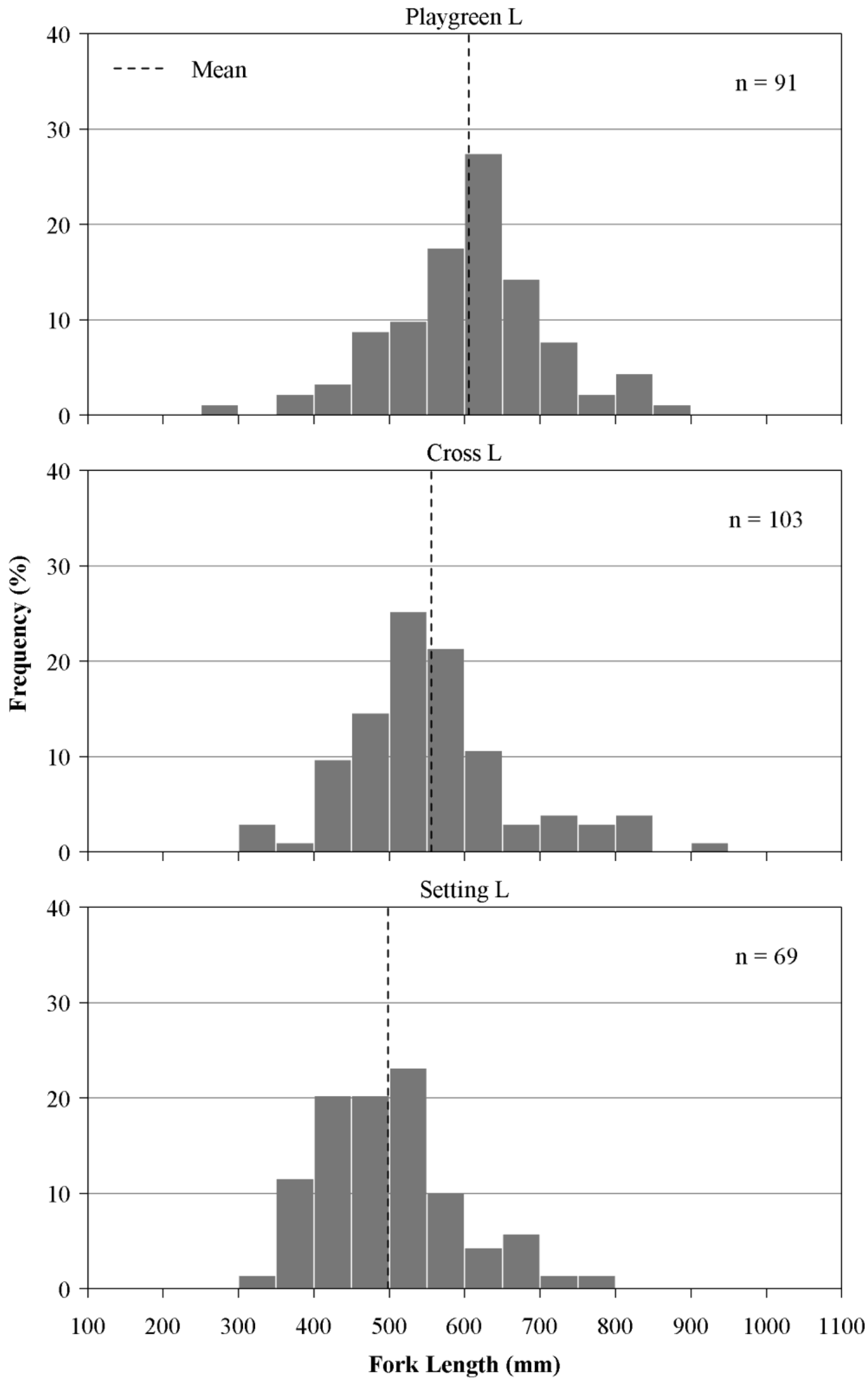


Figure 7.6-7. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2009.

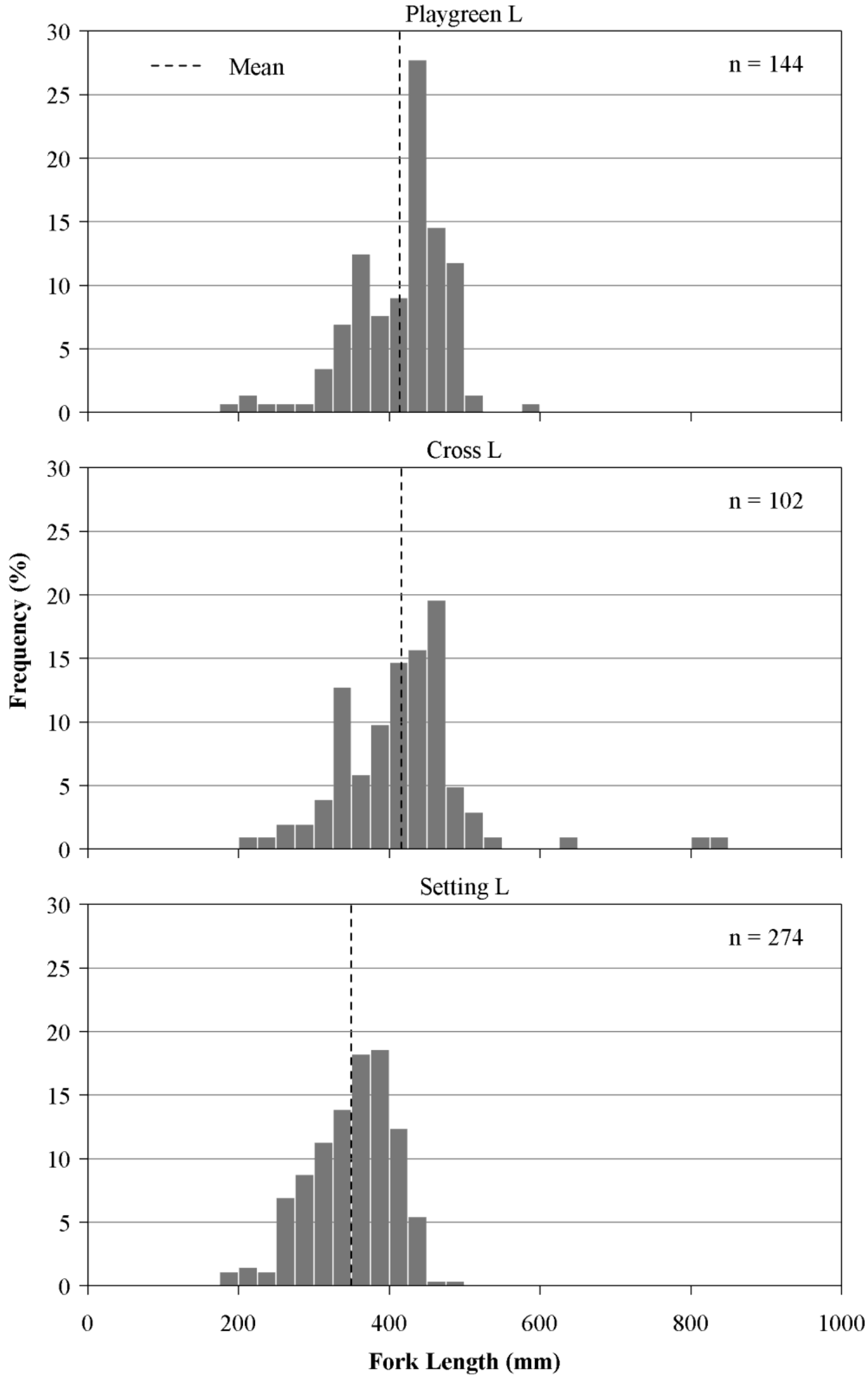


Figure 7.6-8. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2009.

8.0 LOWER NELSON RIVER REGION

The following provides an overview of the results of CAMPP for 2009/2010 for the Lower Nelson River Region, by each major component. A 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 2009 were generally similar to the 1971-2000 temperature normals (Figure 8.1-1). Notable exceptions include May, where the air temperature was 5.8 ^{o}C below normal, and November where the air temperature was 6.1 ^{o}C above normal. The annual mean air temperature was 0.4 ^{o}C above the normal.

The 1971-2000 normals for precipitation indicate a peak in July with a secondary peak in August (Figure 8.1-1). In 2009, precipitation was highest in July followed by June and notably below normal in February, August and December (less than half the normals for those months).

Overall, the comparison to climate normals shows that 2009 was characterized by a cooler spring and summer, a warmer fall, and a warmer and a drier than average winter (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. In 2009, CAMPP monitoring occurred at the confluence of the Burntwood River and Split Lake, in Split Lake, in the North and South basins of Stephens Lake, and in the lower Nelson River downstream from the Limestone Generating Station (GS). Assean Lake and the Hayes River were monitored as the off-system waterbodies for this region.

Lower Nelson River flows in 2009 were near the upper quartile for most of the year and reached record highs in June and July (Figure 8.2-1). Record high flows were the result of above average snowpack in the drainage basins of all major tributaries to the Nelson River. Relative water levels downstream of the Limestone GS can be inferred based on lower Nelson River Flows.

Water levels on Split Lake were near the upper quartile during the winter months and well above the upper quartile during the summer months of 2009 (Figure 8.2-2). The high water levels were caused by above average inflows as a result of high snowpack in the Churchill, Nelson, Saskatchewan, and Winnipeg river drainage basins.

2009 water levels on Stephens Lake generally varied between the lower and upper quartile during the winter months and remained near the upper license limit during the summer months (Figure 8.2-3).

Water level monitoring on Assean Lake was initiated in August 2009 in support of CAMPP (Figure 8.2-4).

When the record is available in 2009, Hayes River flows were generally close to average except for a short record in July indicating that flows were above average, likely as a result of an above average snowpack (Figure 8.2-5).

8.3 WATER QUALITY

The following provides an overview of water quality conditions measured in Year 2 of CAMPP in the Lower Nelson River Region. Waterbodies sampled included (Figure 8.3-1): the Burntwood River (at the inlet of Split Lake), Split Lake (near the community), Stephens Lake-South (in the south-western region of the lake), Stephens Lake-North (in the North Arm of the lake), and the lower Nelson River (approximately 40 km downstream of the Limestone Generating Station [GS]); as well as, two off-system waterbodies, the Hayes River and Assean Lake. Additionally, the Limestone Forebay was sampled in winter as an alternate site for the lower Nelson River site which could not be sampled in winter.

8.3.1 Routine Variables and Limnology

Results of the 2009/2010 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 8.3-12.

8.3.1.1 On-system Waterbodies

Water quality of 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 nor the Limestone Forebay were thermally stratified in 2009/2010, although Stephens Lake-North did develop a slight vertical difference in dissolved oxygen (DO) concentrations in winter. Depth profiles were not collected at all sampling times in the riverine sites due to high velocities.

With one exception, DO concentrations exceeded the Manitoba Water Quality Standards Objectives and Guidelines (MWQSOGs; MWS 2011; Table 8.3-1 and Figure 8.3-3) for the protection of aquatic life (PAL) across depth over the monitoring period. The exception was Split Lake where a surface DO concentration of 4.1 mg/L was measured during the summer sampling period; DO was not measured at depth. This value is below the instantaneous minimum for the protection of cool-water aquatic life (5.0 mg/L) and near that for the protection of cold-water aquatic life (4.0 mg/L). This value is considered suspect and may be a result of sampling error as DO in Split Lake was well above the most-stringent MWQSOGs for PAL at all other times sampled in 2009/2010 and water quality monitoring conducted for the proposed Keeyask GS found that DO throughout Split Lake was always above the DO objectives in 2009 (Savard et al. 2010).

All other *in situ* variables, including turbidity, pH, and specific conductance were relatively consistent across depth (Figures 8.3-4 to 8.3-6). Secchi disk depths ranged between 0.4 m and 1.4 m during the open-water season in lakes in the region (Figure 8.3-7).

Total phosphorus (TP) exceeded the Manitoba narrative guideline for lakes, reservoirs and ponds (0.025 mg/L) at all applicable waterbodies (i.e, Split and Stephens lakes, Burntwood River at the inlet to Split Lake, and the Limestone Forebay) on at least one occasion (Figure 8.3-8). A lower frequency of exceedance occurred in Stephens Lake-North (25%), than for the Burntwood River and lakes/reservoirs along the mainstem of the lower Nelson River (75-100% exceedance). TP was within the MWQSOGs for rivers and streams (0.050 mg/L) in the lower Nelson River downstream of the Limestone Forebay at all times in 2009. With the exception of DO and TP as noted above, other routine water quality variables for which there are MWQSOGs, including pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in 2009/2010.

During the open-water season, the majority of TP (Figure 8.3-9) in the Burntwood River was in particulate form; in Split Lake and the lower Nelson River, TP was present in approximately equal amounts as particulate and dissolved forms; and, in Stephens Lake the contribution of dissolved and particulate forms varied by site and season. During the winter, the majority of TP was consistently in dissolved form at all sites. The majority of total nitrogen (TN) was composed of organic nitrogen (Figure 8.3-10) at all sites and sampling periods. During the open-water season, nitrate/nitrite and ammonia generally contributed near equal amounts to the dissolved inorganic nitrogen (DIN); however, the concentrations and proportion of DIN that was nitrate/nitrite was higher in the ice-covered season.

Water samples collected at depth (1 m above the sediment-water interface) in Stephens Lake-North, as part of the regular sampling program at this site (i.e., the waterbody was not thermally stratified), indicated that water quality was generally consistent across depth. There were however some differences in nitrogen between surface and bottom in spring and summer, as follows: in spring and summer, DIN was higher at depth due to elevated concentrations of ammonia; and, in summer, TN was lower at depth (Figures 8.3-11 and 8.3-12).

8.3.1.2 Off-system Waterbodies

Like the lower Nelson River, water quality of the Hayes River and Assean Lake was moderate to nutrient-rich, alkaline, moderately hard, and well-oxygenated; however, the off-system waterbodies had lower turbidity than the Burntwood River or sites located along the main flow of the lower Nelson River. Like the on-system lakes, Assean Lake was isothermal and well-oxygenated with consistent turbidity, pH, and specific conductance, across depth (Figures 8.3-2 to 8.3-6). Secchi disk depth in Assean Lake ranged from 0.4 m to 1.15 m (Figure 8.3-7). All routine variables for which there are MWQSOGs for PAL, including DO (5.5-9.5 mg/L depending on season), TP (0.25 mg/L for lakes, reservoirs and ponds; and, 0.050 mg/L for rivers and streams), pH (6.5-9.0), ammonia (objectives are site specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L) were within MWQSOGs for PAL in the off-system waterbodies in 2009/2010.

TP measured in Assean Lake during the open-water season was present in approximately equal amounts as particulate and dissolved forms, whereas in the Hayes River, TP was primarily in particulate form (Figure 8.3-9). During the ice-cover season, the majority of TP measured in the Hayes River and Assean Lake was in dissolved form. Similar to the on-system waterbodies in the region, the majority of TN was composed of organic nitrogen (Figure 8.3-10) in the Hayes River and Assean Lake. In contrast to the on-system sites, ammonia typically comprised a larger portion of the DIN than nitrate/nitrite during the open-water season in both off-system waterbodies. Concentrations and the relative proportion of DIN represented by nitrate/nitrite were higher in the ice-cover season.

8.3.2 Metals and Major Ions

8.3.2.1 On-system Waterbodies

A summary of metal concentrations and detection frequencies for the Lower Nelson River Region in 2009/2010 is presented in Table 8.3-3. Beryllium, bismuth, selenium, tellurium, thallium, tungsten, and zinc were not detected for the Burntwood River or sites along the mainstem of the lower Nelson River during any sampling period. Several metals were consistently detected including aluminum, barium, calcium, copper, iron, lithium (when analysed), magnesium, manganese, potassium, rubidium, sodium, strontium, titanium, uranium, and zirconium. The remaining metals were detected in some samples.

All samples collected from the on-system sites exceeded the MWQSOG PAL for aluminum (0.100 mg/L) and iron exceeded the MWQSOG PAL (0.3 mg/L) in 25-75 % of samples from each of the on-system sites (Table 8.3-13). One of the four samples analysed for silver in the Burntwood River was at the analytical detection limit, which is equivalent to the PAL (0.0001 mg/L). Measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidance that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit.

The analytical detection limits for mercury varied between sites and sampling periods in 2009/2010 and were occassionally above the current MWQSOG PAL guideline (0.000026 mg/L). Therefore comparison of analytical results to the PAL guideline could not be undertaken for all samples. Considering only the results of analyses where the analytical detection limit was sufficiently low to facilitate this comparison, one measurement from the Burntwood River (0.00008 mg/L) was above the current MWQSOG PAL (Table 8.3-4).

All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in samples collected from on-system waterbodies in the Lower Nelson River Region in 2009/2010 (Table 8.3-4). In Stephens Lake-North (where bottom samples were collected), metal concentrations at depth were similar to those measured near the surface (e.g. Figure 8.3-14).

Chloride concentrations were low (i.e., <9 mg/L) in the Burntwood River and although somewhat higher (i.e., <22 mg/L) in the lower Nelson River they were on the lower range of those reported for the central and western regions of Canada (<1 mg/L to approximately 500 mg/L; Canadian Council of Resource and Environment Ministers [CCREM] 1987; Table 8.3-2). Chloride concentrations were well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Similarly, sulphate concentrations were slightly higher in the lower Nelson River (<31 mg/L) than in the Burntwood River (<11.2 mg/L; Table 8.3-2). 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 8.3-4).

8.3.2.2 Off-system Waterbodies

A number of metals were not detected in the Hayes River or Assean Lake, including: beryllium; bismuth; boron; cesium; chromium; mercury; nickel; selenium; tellurium; thallium; tin; and zinc. Aluminum, barium, calcium, magnesium, manganese, potassium, rubidium, sodium, strontium and titanium were consistently detected and the remaining metals were detected in some samples.

Similar to the Burntwood River and sites along the mainstem of the lower Nelson River, aluminum exceeded the MWQSOG PAL (0.100 mg/L) in 50 and 75% of samples from the Hayes River and Assean Lake, respectively; and, iron exceeded the MWQSOG PAL (0.3 mg/L) in 50% of samples from each of the waterbodies (Figure 8.3-13). Additionally, silver exceeded the MWQSOG PAL (0.0001 mg/L) in one of four samples collected from the Hayes River in 2009/2010 (Table 8.3-4). All other metals for which there are MWQSOGs for PAL were within objectives and guidelines in samples collected from the Hayes River and Assean Lake in 2009/2010 (Table 8.3-4).

Chloride and sulphate concentrations in the Hayes River and Assean Lake were lower than those measured in the lower Nelson River (Table 8.3-2). Chloride concentrations were well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013); and while there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the BCMOE guidelines, which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013; Table 7.3-4).

8.3.3 Trophic Status and Nutrient Ratios

8.3.3.1 On-system Waterbodies

In 2009/2010, lakes and reservoirs sampled along the lower Nelson River were eutrophic on the basis of mean open-water TP concentrations (Table 8.3-5); the exception was Stephens Lake-North, which was mesotrophic. Conversely, all lakes/reservoirs were mesotrophic on the basis of mean open-water TN (Table 8.3-6) and mesotrophic (Split Lake and Stephens Lake-South) or oligotrophic (Stephens Lake-North) on the basis of chlorophyll *a* (Table 8.3-7). River sites (the Burntwood River and the lower Nelson River) were also eutrophic on the basis of TP (Table 8.3-5) but were oligotrophic on the basis of TN (Table 8.3-8) and chlorophyll *a* (Table 8.3-9).

On the basis of molar TN:TP ratios (Figure 8.3-15), the Burntwood River and sites located along the lower Nelson River were phosphorus limited during most sampling periods; however, the Burntwood River and Split Lake were co-limited by nitrogen and phosphorus in spring. Examination of total organic carbon to organic nitrogen molar ratios (TOC:ON) indicates that organic matter in these waterbodies originated from a mixture of allochthonous and autochthonous sources (Figure 8.3-16).

8.3.3.2 Off-system Waterbodies

In 2009/2010, trophic status of the off-system waterbodies was somewhat lower than the on-system lake and river sites. Assean Lake was mesotrophic/meso-eutrophic based on mean open-water TP (Table 8.3-5), mesotrophic based on TN (Table 8.3-6), and oligotrophic based on chlorophyll *a* (Table 8.3-7). The Hayes River was meso-eutrophic based on TP (Table 8.3-5) but was oligotrophic based on TN (Table 8.3-8) and chlorophyll *a* (Table 8.3-9).

Similar to the Burntwood River and the sites along the lower Nelson River, the Hayes River and Assean Lake were phosphorus limited on the basis of molar TN:TP ratios and organic matter, was from a mixture of allochthonous and autochthonous sources based on TOC:ON molar ratio..

8.3.4 Escherichia coli

8.3.4.1 On-system Waterbodies

In 2009/2010, *E. coli* was detected in most samples collected from the Burntwood River and sites along the lower Nelson River (Table 8.3-2). *E. coli* typically ranged from <1 to 13 CFU/100 mL, although a concentration of >200 CFU/100 mL was recorded for the Burntwood River in winter. *E. coli* was above the Manitoba water quality objective for primary recreation of 200 CFU/100 mL in the Burntwood River in March 2010; however, this objective only applies to the recreational season and would therefore not be applicable. All other measurements were well below the objective.

8.3.4.2 Off-system Waterbodies

E. coli was detected in two of four samples collected in Assean Lake and in all four samples collected from the Hayes River (Table 8.3-2). All measurements were low (≤6 CFU/100 mL) and well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

8.4 PHYTOPLANKTON

The following provides an overview of the phytoplankton community measured in Year 2 of CAMPP in the Lower Nelson River Region. Waterbodies sampled included: the Burntwood River (at the inlet to Split Lake), Split Lake (near the community), Stephens Lake-South, Stephens Lake-North, the lower Nelson River (located approximately 40 km downstream of the Limestone Generating Station during the open-water season and in the Limestone Forebay during winter); and, two off-system waterbodies, the Hayes River and 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 generally similar across sites. Winter chlorophyll *a* concentrations were lower than those of the open-water season at all sites in the region.

8.4.2 Community Composition and Biomass

Phytoplankton biomass was measured in the Hayes River and Assean Lake in 2009, and was consistently low at both sites (Figure 8.4-2). Biomass was lowest in spring at both sites and was highest in summer at Assean Lake; biomass was not analysed at the Hayes River in summer.

Phytoplankton communities were similar between the Hayes River and Assean Lake despite the different environments. In spring, diatoms and chrysophytes were dominant in the river and along with green algae, were also abundant at Assean Lake (Figure 8.4-3). In summer, green and blue-green algae co-dominated the assemblage at Assean Lake (no data are available for the Hayes River in summer). In fall, the phytoplankton communities of the two waterbodies consisted primarily of blue-green algae, green algae and diatoms; blue-green algae dominated in the Hayes River, however, the three groups were more or less equally abundant in Assean Lake.

Diversity and effective richness in at the Hayes River and Assean Lake were relatively high in 2009/2010 (Table 8.4-1). Overall, metrics describing the phytoplankton community indicated that the assemblages in both waterbodies were slightly more complex in the fall than in either the spring or summer.

8.4.3 Bloom Monitoring

Chlorophyll *a* concentrations in the region were always below the bloom monitoring trigger of 10 µg/L in 2009/2010.

8.4.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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 in both the Hayes River and Assean Lake in 2009/2010.

Microcystin-LR was not measured for the region in 2009 as the chlorophyll *a* concentration was consistently below the 10 µg/L trigger.

8.4.5 Trophic Status

Based on mean 2009/2010 chlorophyll *a* concentrations (open-water and annual seasons), Split Lake and Stephens Lake-North were mesotrophic and Stephen Lake-South and Assean Lake were oligotrophic following the classification scheme for lakes (OECD 1982; Table 8.3-7).

According to chlorophyll *a* trophic categories for rivers (Dodds et al. 1998), the Burntwood, lower Nelson and Hayes rivers were oligotrophic (Table 8.3-9).

8.5 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Lower Nelson River Region in 2009/2010; the second year of CAMPP. On-system waterbodies sampled included Split Lake, Stephens Lake-South, Stephens Lake-North and the lower Nelson River (d/s of Limestone Forebay). Off-system waterbodies included the Hayes River and Assean Lake (Figures 8.5-1 to 8.5-5). Split Lake, the lower Nelson River (d/s of Limestone Forebay), the Hayes River, and Assean Lake are sampled annually; Stephens Lake-South and Stephens Lake-North are sampled rotationally (i.e., once every three years).

Twenty BMI samples were collected using rock baskets in the lower Nelson River (d/s of Limestone Forebay) and 18 samples were collected from the Hayes River. Fifteen samples were collected in each of the nearshore and offshore habitat polygons of Split Lake, Stephens Lake-South, Stephens Lake-North, and Assean Lake using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted between 03 July and 28 August 2009.

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).

Rock baskets were set in predominantly-wetted nearshore areas with water depths of less than 5 m. No baskets were set in offshore habitat (i.e., in water depths greater than 5 m). In 2009, mean water depths sampled were 3.2 m in the lower Nelson River and 3.5 m in the Hayes River (Table 8.5-1). Sediment samples were not collected from either river.

In lacustrine waterbodies, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and offshore habitat was defined by water depths greater than 5 m. In 2009, the mean sampling water depth in nearshore habitat was 2.6 m in Split Lake, 2.9 m in Stephens Lake-South, 3.2 m in Stephens Lake-North, and 1.9 m in Assean Lake (Table 8.5-1). Mean water depths in offshore areas were 8.6, 14.7, 10.6, and 15.8 m for Split Lake, Stephens Lake-South, Stephens Lake-North, and Assean Lake, respectively.

Sediment samples were collected from lacustrine waterbodies and analyzed for TOC and PSA to provide a general characterization of sediment type in each nearshore and offshore polygon (Table 8.5-2). Mean TOC was higher in nearshore samples than offshore samples in Split Lake, Stephens Lake-South, and Stephens Lake-North (3.1, 7.7, and 6.8% versus 1.0, 1.6, and 1.2%, respectively). Assean Lake had very similar TOC in the nearshore and offshore (2.0%) (Table 8.5-2).

Silt, followed by clay, comprised the majority of the sediments collected from each habitat type in all waterbodies sampled, with the exception of the offshore habitats in Stephens Lake-North and Assean Lake, where clay dominated the sediment sampled. Sand represented a small portion of the sediment in all lakes and both habitat types and was notably high in offshore sediments from Split Lake (Table 8.5-2).

8.5.2 Species Composition, Distribution, and Relative Abundance

8.5.2.1 Split Lake

Mean BMI density in benthic grab samples in the nearshore habitat of Split Lake was 375 individuals/m^2, with densities ranging from 43 to 1,601 (Table 8.5-3). Overall, insects dominated the BMI community, comprising 80% of the mean total BMI; non-insects comprised the remaining 20% (Table 8.5-3). Insects mainly consisted of Chironomidae (37% of the mean total BMI) and Ephemeroptera (35%); Megaloptera (dobsonflies, alderflies, and fishflies) and a small number of Trichoptera and Ceratopogonidae were also identified (Table 8.5-3).Of the non-insects, Gastropoda were the most abundant (11%); Bivalvia (4%), Oligochaeta (3%), and smaller abundances of Diplostraca (clam shrimp) and Hirudinea were also present. Mean BMI density in offshore benthic grab samples was 4,963 individuals/m^2, with densities ranging from 1,212 to 8,137 (Table 8.5-3). Overall, non-insects dominated the BMI community at 68% of the mean total BMI (Table 8.5-3). Amphipoda dominated the non-insect portion, comprising 48% of the mean total BMI, followed by Bivalvia (17%) and Gastropoda (2%); smaller numbers of Oligochaeta and Hirudinea were also present (Table 8.5-3). Insects mainly consisted of Ephemeroptera (comprised 29% of the mean total BMI), with a small number of Trichoptera (2%), Chironomidae (1%), and Megaloptera also present (Table 8.5-3).

Total EPT comprised 35% of the mean total nearshore BMI community, and consisted primarily of mayflies. One mayfly family was represented in the nearshore samples, Ephemeridae, and one genus was identified, *Hexagenia*. *Hexagenia* 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 represented by the family Leptoceridae (long-horned caddisflies) and Plecoptera were absent (Table 8.5-3). In the offshore polygon, overall EPT comprised 30% of the mean total BMI. Similar to the nearshore habitat, the offshore samples were represented by only one family and genus of Ephemeroptera, Ephemeridae and *Hexagenia* sp., respectively. Trichoptera were represented by two families, Hydropsychidae and Polycentropodidae and Plecoptera were absent. The ratio of EPT:C in the nearshore habitat was 0.36 indicating Chironomidae were dominant over EPT in the insect community (Table 8.5-3). In the offshore mean EPT:C was relatively high at 13.10 due to the small proportion of Chironomidae in the samples; EPT dominated Chironomidae in this habitat (Table 8.5-3). Taxonomic richness in the nearshore was ten families with richness values ranging from one to five within each sample (Table 8.5-3). Hill's Effective Richness (E^H) was three with Chironomidae and Ephemeridae notably dominating this habitat (Table 8.5-3). Taxonomic richness in the offshore polygon was 11, with richness values ranging from four to eight within each sample (Table 8.5-3). Hill's Effective Richness (E^H) was three; Haustoriidae, Ephemeridae, and Pisidiidae dominated the community (Table 8.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.51 and 0.61 in the nearshore and offshore polygons, respectively (Table 8.5-3). Evenness (Simpson's Equitability [E_D]) was 0.85 in the nearshore habitat and 0.46 in the offshore habitat Table 8.5-3).

8.5.2.2 Stephens Lake-South

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Stephens Lake-South was 1,653 individuals/m^2, with densities ranging from 346 to 2,900 (Table 8.5-4). Insects dominated the benthic community in this habitat, comprising 93% of the mean total BMI (Table 8.5-4). The insect portion was primarily Ephemeroptera (81% of the mean total BMI) followed by Chironomidae (10%) and Trichoptera (2%); Hemiptera and Megaloptera were also minimally represented (Table 8.5-4). Of the non-insects, the main group was Amphipoda (4%), followed by Gastropoda (2%) and Oligochaeta (1%); Bivalvia, Diplostraca, and Acari were also present (Table 8.5-4). Mean BMI density in offshore benthic grab samples was 7,794 individuals/m^2 and ranged from 2,900 to 16,015 (Table 8.5-4). Non-insects comprised 63% of the total mean BMI; Amphipoda was the main group (61% of total mean BMI) followed by Bivalvia (1%) and Oligochaeta (1%). Hirudinea and Acari were also present (Table 8.5-4). Insects in the offshore were mostly comprised of Ephemeroptera (23%) and Chironomidae (13%); Trichoptera and Ceratopogonidae were also present.

Total EPT was 83% of the mean total BMI in the nearshore, with the prevalence being within the mayflies. Two families of Ephemeroptera were present, Ephemeridae and Baetidae, with genus analysis indicating that *Hexagenia* sp. was most abundant out of three genera identified. Dipseudopsidae was the only Trichoptera family represented (Table 8.5-4). Mean total EPT in the offshore habitat was 23% of the mean total BMI (Table 8.5-4). Ephemeridae was the only Ephemeroptera family represented and *Hexagenia* sp. the only genus identified. Trichoptera was represented by Leptoceridae. No Plecoptera were present in nearshore or offshore samples

(Table 8.5-4). The EPT:C ratio was 9.32 and 2.08 in nearshore and offshore polygons, respectively, indicating ETP dominated Chironomidae in both habitats, with a greater predominance in the nearshore.

Nearshore taxonomic richness was 15 with values ranging from one to eight within each sample (Table 8.5-4). Hill's Effective Richness (E^H) was two with Ephemeridae notably dominating the community. Overall taxonomic richness in the offshore polygon was nine and ranged from three to seven within each sample (Table 8.5-4). Hill's Effective Richness (E^H) was three with Haustoriidae and Ephemeridae most prevalent in this habitat.

The mean index of diversity (Simpson's Diversity Index [D]) was 0.36 and 0.55 in the nearshore and offshore polygons, respectively (Table 8.5-4). Evenness (Simpson's Equitability [E_D]) was 0.45 and 0.38 in the nearshore and offshore, respectively (Table 8.5-4).

8.5.2.3 Stephens Lake-North

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Stephens Lake-North was 765 individuals/m^2, with densities ranging from 260 to 1,731 (Table 8.5-5). Non-insects and insects co-dominated the benthic community in this habitat, each comprising 50% of the mean total BMI (Table 8.5-5). The insect portion was dominated by Chironomidae and Ephemeroptera (25% and 17% of the mean total BMI, respectively); smaller numbers of Trichoptera (3%), Megaloptera, and Ceratopogonidae were also present. Non-insect were mostly comprised of Oligochaeta (23% of the mean total BMI), followed by Bivalvia (18%), and Amphipoda (6%); smaller numbers of Acari and Gastropoda were also present (Table 8.5-5). Mean BMI density in offshore benthic grab samples was 1,570 individuals/m^2, with numbers ranging from 736 to 2,857 (Table 8.5-5). Insects dominated the benthic community in this habitat, comprising 81% of the mean total BMI; non-insects comprised the remaining 19% (Table 8.5-5). Insects mainly consisted of Chironomidae, which comprised 80% of the mean total BMI. Ephemeroptera (1%) was the only other insect group represented in offshore samples. Oligochaeta comprised 17% of the mean total BMI; smaller numbers of Bivalvia and Amphipoda were also present (Table 8.5-5).

Total EPT in the nearshore habitat was 20%, with the prevalence being within the mayflies (Table 8.5-5). Ephemeridae and Caenidae were the only Ephemeroptera families identified; genus analysis found *Hexagenia* sp. was the dominant genus of three identified (Table 8.5-5). Of the Trichoptera, Dipseudopsidae and Polycentropodidae were both present. Plecoptera were not present in nearshore samples. In the offshore, EPT was 1% of the mean total BMI, consisting solely of Ephemeroptera; neither Trichoptera nor Plecoptera were present. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was also dominant in offshore samples; no other genera were present. The mean ratio of EPT:C was 0.96 in the nearshore polygon, indicating an almost balanced community with respect to these insect groups. The EPT:C ratio was 0.02 in the offshore, indicating Chironomidae were dominant over EPT in this insect community (Table 8.5-5).

Taxonomic richness was 14 in the nearshore and ranged from three to eight within each sample (Table 8.5-5). Hill's Effective Richness (E^H) was five; Chironomidae, Oligochaeta, Pisidiidae, and Ephemeridae were notably dominant in the community. Taxonomic richness in the offshore polygon was five and ranged from two to four within each sample (Table 8.5-5). Two families dominated the BMI community in this habitat (most notably, Chironomidae).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.73 and 0.40 in the nearshore and offshore polygons, respectively (Table 8.5-5). Evenness (Simpson's Equitability [E_D]) values were 0.70 in the nearshore habitat and 0.47 in the offshore habitat (Table 8.5-5).

8.5.2.4 Lower Nelson River (d/s of Limestone Forebay)

Mean BMI density from rock baskets in the nearshore habitat of the lower Nelson River was 33,418 individuals/m^2, with densities ranging from 8,517 to 99,590 (Table 8.5-6). Insects comprised over 99% of the BMI community, with Trichoptera comprising 94% of the mean total BMI; Chironomidae (5%) and smaller numbers of other Diptera, Ephemeroptera, and Plecoptera were also present (Table 8.5-6). Non-insects were considerably less common; the main groups were Oligochaeta and Bivalvia, with smaller numbers of Gastropoda and Amphipoda also present (Table 8.5-6).

Total EPT comprised 94% of the mean total BMI community sampled. Larva from the family Hydropsychidae accounted for most of the Trichoptera captured by the rock baskets; Lepidostomatidae and Leptoceridae were also present. Baetidae and Heptageniidae were the two Ephemeroptera families present in the samples; genus analysis indicated *Baetis* sp. was the most common Ephemeroptera genus of three identified. *Baetis* sp. is a ubiquitous group with general habitat requirements, commonly found in lotic depositional substrate and lentic-littoral environments (Merritt and Cummins 1996). Perlodidae was the most abundant Plecoptera family captured; Pteronarcyidae and Perlidae were also present. Mean EPT:C in the nearshore samples was high at 61.70, reflecting the dominance of Trichoptera in the rock basket samples (Table 8.5-6).

A total of 17 taxa were identified from the Nelson River with richness values ranging from two to 12 (Table 8.5-6). Mean invertebrate diversity (Simpson's Diversity Index [D]) was 0.10 (Table 8.5-6). Evenness (Simpson's Equitability [E_D]) was 0.20 (Table 8.5-6).

8.5.2.5 Hayes River

Mean BMI density from rock baskets in the nearshore habitat of the Hayes River was 2,213 individuals/m^2, with densities ranging from 63 to 9,432 (Table 8.5-7). Overall, insects dominated the BMI community, comprising 76% of the mean total abundance (Table 8.5-7). Among the insects, the main group was Trichoptera (28% of the mean total BMI), followed by Chironomidae (19%), and Simuliidae (blackflies; 13%); Ceratopogonidae, Plecoptera, Ephemeroptera, Coleoptera, and Tipulidae (crane flies) were also present. Non-insects, comprising 24% of the overall BMI community, mainly consisted of Oligochaeta (23%); Bivalvia, Gastropoda, and Hirudinea were also present (Table 8.5-7).

Total EPT comprised 35% of the mean total BMI, with Trichoptera being the most abundant group. The family Hydropsychidae represented most of the Trichoptera collected in the rock baskets; Polycentropodidae, Philopotamidae, Phryganeidae, Molannidae, and unidentified Trichoptera were also present (Table 8.5-7). Ephemerellidae was the most common Ephemeroptera family and genus analysis indicated *Serratella* sp. was the most dominant of the five identified. *Serratella* sp. is a ubiquitous group with general habitat requirements, commonly found in lotic erosional and depositional environments (Merritt and Cummins 1996). Caenidae, Baetidae, Heptageniidae, and Leptophlebiidae were also represented. Pteronarcyidae was the most common Plecoptera family captured; Perlodidae, Chloroperlidae, and Perlidae were also present. Mean EPT:C was 2.47, which indicated EPT were dominant over Chironomidae in the insect community (Table 8.5-7).

Taxonomic richness was 24, and ranged from two to 13 taxa on a per basket basis. Hill’s Effective Richness (E^H) was five with Hydropsychidae, Oligochaeta, Chironomidae, and Simuliidae notably dominating the community (Table 8.5-7). Simpson’s Diversity Index (D) was 0.70 and evenness (Simpson’s Equitability [E_D]) was 0.43.

8.5.2.6 Assean Lake

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Assean Lake was 3,310 individuals/m^2, with densities ranging from 952 to 5,930 (Table 8.5-8). Insects dominated the BMI community in this habitat, comprising 76% of the mean total BMI; non-insects comprised the remaining 24% (Table 8.5-8). The insect portion was dominated by Chironomidae (67% of mean total invertebrates sampled); Megaloptera, Ephemeroptera, Ceratopogonidae, Coleoptera, Odonata (0.09%), and unidentified Diptera were also present (Table 8.5-8). Of the non-insects, the main groups were Bivalvia, Oligochaeta, and Amphipoda (9%, 7%, and 6% of mean total BMI, respectively); smaller numbers of Gastropoda, Diplostraca, and Hirudinea were also present (Table 8.5-8). Mean BMI density in offshore benthic grab samples was 467 individuals/m^2 and ranged from zero to 1,645 (Table 8.5-8). Non-insects (52% of the mean total BMI) and insects (48%) co-dominated the benthic community in this habitat (Table 8.5-8). Bivalvia and Oligochaeta made up most of the non-insect portion, comprising 29% and 21% of the mean total BMI, respectively; small numbers of Gastropoda and Hirudinea were also present (Table 8.5-8). Insects were dominated by Chironomidae (46% of the mean total BMI), with a small proportion of Ephemeroptera (2%) also present.

The total proportion of EPT in both the nearshore and offshore was 2%, consisting solely of Ephemeroptera in each habitat. Genus analysis identified both *Ephemera* sp. and *Hexagenia* sp. as being dominant in the nearshore habitat, while only *Hexagenia* sp. was dominant in the offshore habitat. *Ephemera* sp. is a ubiquitous group with general habitat requirements, commonly found in depositional substrate consisting of sand-gravel in both lentic and lotic environments (Merritt and Cummins 1996). Caenidae and Ephemerellidae were also present in the nearshore samples. The mean ratio of EPT:C was 0.06 and 0.10 in nearshore and offshore polygons, respectively, indicating Chironomidae were dominant over EPT in both habitats.

Overall taxonomic richness in the nearshore was 20 with richness values ranging from five to 11 within each sample (Table 8.5-8). Hill's Effective Richness (E^H) was five with Chironomidae most notably dominating the BMI community. Taxonomic richness in the offshore polygon was six and ranged from zero to four within each sample (Table 8.5-8). Hill's Effective Richness (E^H) was three; Chironomidae, Pisidiidae, and Oligochaeta were dominant groups (Table 8.5-8).

Simpson's Diversity Index (D) was 0.62 and 0.63 in the nearshore and offshore polygons, respectively (Table 8.5-8). Mean evenness values were 0.32 in the nearshore and 0.76 in the offshore based on Simpson's Equitability (E_D) (Table 8.5-8).

8.6 FISH COMMUNITY

8.6.1 Gill netting

In 2009, in the Lower Nelson River Region, gill netting was conducted in Split Lake (18 – 28 August), Stephens Lake – South (3 – 17 September), Stephens Lake – North (7 – 12 September), and the lower Nelson River mainstem (4 – 9 August). Gill netting was also conducted in two off-system waterbodies including the Hayes River (23 - 28 July) and Assean Lake (24 – 27 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 12 - 16°C in Split Lake.

In each of Stephens Lake – South and Stephens Lake – North, 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; Figure 8.6-2). During sampling water temperature ranged from 14 - 16°C in both areas of Stephens Lake.

In the lower Nelson River mainstem, 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 8.6-3). During sampling, water temperature ranged from 16 – 18°C in the Nelson River.

In both the Hayes River and Assean Lake, 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 8.6-4 and 8.6-5). During the sampling period, water temperatures ranged from 19 - 20°C in the Hayes River and 12 - 14°C in Assean Lake.

8.6.2 Species Composition

In 2009, 22 species of fish were captured in Lower Nelson River Region waterbodies (Table 8.6-2).

8.6.2.1 Split Lake

A total of 465 fish representing twelve species were captured in standard gang index gill nets (Table 8.6-3) and 296 fish representing 11 species in small mesh index gill nets (Table 8.6-4).

Walleye represented 40.65% (n = 189 fish) of the standard gang index gillnet catch, followed by White Sucker (n = 97 fish; 20.86%), and Sauger (n = 68 fish; 14.62%) (Table 8.6-3; Figure 8.6-6). Rainbow Smelt (n = 104 fish; 35.14%) and Spottail Shiner (n = 86 fish; 29.05%) were the most common species captured in small mesh index gill nets (Table 8.6-4; Figure 8.6-7).

The total biomass for the standard gang index gillnet catch was 417,658 g. Walleye represented the largest proportion of the total biomass (37.08%), followed by White Sucker (25.10%) and Northern Pike (18.83%) (Table 8.6-5). The total biomass for the small mesh index gillnet catch was 7,906 g, with the majority represented by Northern Pike (62.74%) (Table 8.6-6).

8.6.2.2 Stephens Lake - South

A total of 328 fish representing eight species were captured in standard gang index gill nets and 130 fish representing seven species were captured in small mesh index gill nets set in Stephens Lake – South (tables 8.6-3 and 8.6-4, respectively).

Walleye (n = 177 fish; 53.96%) was the most common species captured in standard gang index gill nets, followed by Northern Pike (n = 74 fish; 22.56%) (Table 8.6-3; Figure 8.6-6). In small mesh index gill nets, Rainbow Smelt (n = 45 fish; 34.62%) and Troutperch (n = 41 fish; 31.54%) were the two most common species captured, followed by Spottail Shiner (n = 31 fish; 23.85%) (Table 8.6-4; Figure 8.6-7).

The total biomass for the standard gang index gillnet catch was 415,602 g (Table 8.6-5). Walleye (58.39%) represented most of the biomass in the standard gang index gill net catch, followed by Northern Pike (28.00%). The total biomass for the small mesh index gillnet catch was 4,372 g with the majority represented by Sauger (48.72%) and Walleye (34.31%) (Table 8.6-6).

8.6.2.3 Stephens Lake - North

A total of 198 fish representing six species were captured in standard gang index gill nets (Table 8.6-3) and 206 fish representing eight species were captured in small mesh index gill nets set in Stephens Lake – North (Table 8.6-4).

The most common species captured in standard gang index gill nets were Walleye (n = 97 fish; 48.99%) and Northern Pike (n = 77 fish; 38.89%) (Table 8.6-3; Figure 8.6-6). In small mesh index gill nets, Spottail Shiner (n = 87 fish; 42.23%) was the most common species captured, followed by Rainbow Smelt (n = 66 fish; 32.04%) (Table 8.6-4; Figure 8.6-7).

The total biomass for the standard gang and small mesh index gillnet catch was 279,466 g and 15,439 g, respectively (tables 8.6-5 and 8.6-6). Walleye and Northern Pike represented the majority of biomass in both standard gang (47.73% and 40.94%, respectively) and small mesh index gill nets (69.23% and 22.61%, respectively).

8.6.2.4 Lower Nelson River

A total of 362 fish representing ten species were captured in standard gang index gill nets (Table 8.6-3). Longnose Sucker were most abundant (n = 125 fish; 34.53%), followed by Northern Pike (n = 82 fish; 22.65%) and Walleye (n = 58 fish; 16.02%) (Table 8.6-3; Figure 8.6-6).

In small mesh index gill nets, a total of 110 fish representing nine species were captured. Troutperch (n = 25 fish; 22.73%) and Lake Chub (n = 22 fish; 20.0%) were most common, followed by Rainbow Smelt (n = 16 fish; 14.55%) and White Sucker (n = 14 fish; 12.73%) (Table 8.6-4; Figure 8.6-7).

The total biomass for the standard gang index gillnet catch was 412,654 g. Most biomass was represented by Northern Pike (40.70%), followed by Longnose Sucker (16.40%), Lake Sturgeon (14.90%) and Walleye (14.35%) (Table 8.6-5). The total biomass for the small mesh index gillnet catch was 1,141 g with the majority represented by Lake Chub (31.64%) (Table 8.6-6).

8.6.2.5 Hayes River

In 2009, relatively few fish were captured in the Hayes River compared to waterbodies sampled on the lower Nelson River system. In the Hayes River, a total of 56 fish were captured in standard gang index gillnets (Table 8.6-3; Figure 8.6-6) and only three fish were captured in small mesh index gillnets (Table 8.6-4; Figure 8.6-7). Walleye, Lake Sturgeon, and Longnose Sucker comprised the majority of the standard gang index gillnet catch.

The total biomass captured in standard gang index gill nets was 46,010 g (Table 8.6-5) with the majority of biomass represented by Walleye (37.47%), Lake Sturgeon (26.82%), and White Sucker (11.26%).

8.6.2.6 Assean Lake

A total of 449 fish representing six species were captured in standard gang index gill nets set in Assean Lake. Walleye was the most common species captured (n = 237 fish; 52.78%), followed by White Sucker (n = 70 fish; 15.59%) and Northern Pike (n = 66 fish; 14.70%) (Table 8.6-3; Figure 8.6-6). In small mesh index gill nets, 198 fish representing nine species were captured. Spottail Shiner was the most common species captured (n = 96 fish; 48.48%), followed by Walleye (n = 55 fish; 27.78%) (Table 8.6-4; Figure 8.6-7).

The total biomass for the standard gang index gillnet catch was 313,025 g. Most of the biomass in the standard gang index gill net catch consisted of Walleye (41.34%), followed by Northern Pike (28.13%) and White Sucker (21.18%) (Table 8.6-5). The total biomass for small mesh index gill nets was 21,790 g, with Walleye representing the majority (73.89%) of this value (Table 8.6-6).

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

8.6.3.1 Split Lake

In 2009, the mean CPUE for the standard gang index gillnet catch in Split Lake was 31.7 fish/100 m of net/24 h (Table 8.6-7; Figure 8.6-8). Walleye had the highest CPUE (13.0) followed by White Sucker (6.6), Sauger (4.5) and Northern Pike (4.0) (Table 8.6-7; Figure 8.6-9).

The mean CPUE for the small mesh index gillnet catch was 68.4 fish /30 m of net/24 h (Table 8.6-8; Figure 8.6-8). Rainbow Smelt had the highest CPUE (24.1), followed by Spottail Shiner (19.7) (Table 8.6-8; Figure 8.6-9).

The mean BPUE for the standard gang index gillnet catch was 28,634 g/100 m of net/24 h (Table 8.6-9). BPUE was highest for Walleye (10,658), followed by White Sucker (7,115) and Northern Pike (5,513). Mean BPUE for the small mesh index gillnet catch was 1,799 g/30 m of net/24 h with Northern Pike having the highest BPUE value (1,127) (Table 8.6-10).

8.6.3.2 Stephens Lake - South

The mean CPUE for the standard gang index gillnet catch in Stephens Lake – South was 31.7 (Table 8.6-7; Figure 8.6-8). Walleye had the highest CPUE (17.0) followed by Northern Pike (7.1) (Table 8.6-7; Figure 8.6-9).

In the small mesh index gillnet catch, the mean CPUE was 43.6 (Table 8.6-8; Figure 8.6-8). Rainbow Smelt had the highest CPUE (15.4), followed Troutperch (13.6) and Spottail Shiner (10.3) (Table 8.6-8; Figure 8.6-9).

The mean BPUE for the standard gang index gillnet catch was 40,027 g with Walleye having the highest BPUE value (23,327) followed by Northern Pike (11,130) (Table 8.6-9). In small mesh index gill nets, mean BPUE was 1,477 g (Table 8.6-10). Sauger (677) and Walleye (550) had the highest BPUE in the small mesh index gillnet catch.

8.6.3.3 Stephens Lake – North

In Stephens Lake – North, the mean CPUE for the standard gang index gillnet catch was 19.2 (Table 8.6-7; Figure 8.6-8). Walleye had the highest CPUE (9.6), followed by Northern Pike (7.3) (Table 8.6-7; Figure 8.6-9).

The mean CPUE for the small mesh index gillnet catch was 66.7 (Table 8.6-8; Figure 8.6-8). Spottail Shiner had the highest CPUE (27.6), followed by Rainbow Smelt (21.3) and Emerald Shiner (11.6) (Table 8.6-8; Figure 8.6-9).

The mean BPUE for the standard gang index gillnet catch was 27,199 g (Table 8.6-9). Walleye (13,241) had the highest BPUE, followed by Northern Pike (10,830). The mean BPUE in the small mesh index gill net catch was 5,022 g with Walleye having the highest BPUE value (3,524) (Table 8.6-10).

8.6.3.4 Lower Nelson River

In the lower Nelson River mainstem, the mean CPUE for the standard gang index gillnet catch was 32.0 (Table 8.6-7; Figure 8.6-8). Longnose Sucker had the highest mean CPUE (11.2), followed by Northern Pike (6.9) (Table 8.6-7).

Small mesh index gill nets had a mean CPUE of 39.1 (Table 8.6-8; Figure 8.6-8). Lake Chub (8.8) and Troutperch (8.6) had the highest overall CPUEs (Table 8.6-8).

Standard gang index gill nets had a mean BPUE of 36,027 g (Table 8.6-9) with Northern Pike having the highest BPUE value (14,274). The mean BPUE for the small mesh index gill net catch was 415 g (Table 8.6-10). Lake Chub (145) had the highest mean BPUE value in small mesh index gill nets.

8.6.3.5 Hayes River

In the Hayes River in 2009, the overall mean CPUE for standard gang index gillnets was 5.9 (Table 8.6-7; Figure 8.6-8). For the small mesh index gillnet catch, the overall mean CPUE was 1.2 fish/30 m/24 h (Table 8.6-8; Figure 8.6-8).

Walleye and Lake Sturgeon had the highest CPUE values of 1.6 for the standard gang index gillnet catch (Table 8.6-7) whereas no fish were captured in high numbers in small mesh index gill nets (Table 8.6-8).

Mean BPUE for the standard gang index gillnet catch was 4,790 g (Table 8.6-9), with Walleye (1,749) and Lake Sturgeon (1,362) having the highest BPUE values.

8.6.3.6 Assean Lake

In Assean Lake, the mean CPUE in standard gang index gill nets was 42.7 (Table 8.6-7; Figure 8.6-8) with Walleye having the highest CPUE of 22.9 (Figure 8.6-9). Mean CPUE in small mesh index gill nets was 69.6 (Table 8.6-8; Figure 8.6-8) with Spottail Shiner (34.3) and Walleye (19.2) having the highest values (Figure 8.6-9).

Mean BPUE for the standard gang index gill net catch was 29,836 g (Table 8.6-9). Walleye (12,543) had the highest BPUE in the catch, followed by Northern Pike (8,365). Mean BPUE for the small mesh index gill net catch was 7,849 g with Walleye (5,805) 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 2009 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 8.6-10 – 8.6-15.

With the exception of Stephens Lake, limited information exists for fish captured in small mesh index gill nets (Table 8.6-12).

8.6.4.1 Split Lake

Northern Pike captured in standard gang index gill nets had a mean fork length of 532 mm, a mean weight of 1,356 g, and a mean condition factor of 0.76 (Table 8.6-11). In small mesh index gill nets, six Northern Pike were captured and bulk weighed (Table 8.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 498 mm, a mean weight of 2,435 g, and a mean condition factor of 1.94 (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 384 mm, a mean weight of 819 g, and a mean condition factor of 1.32 (Table 8.6-11). In small mesh index gill nets, three Walleye were captured and bulk weighed (Table 8.6-12).

8.6.4.2 Stephens Lake - South

Northern Pike captured in standard gang index gill nets had a mean fork length of 558 mm, a mean weight of 1,573 g, and a mean condition factor of 0.76 (Table 8.6-11). Northern Pike were not captured in small mesh index gill nets.

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 486 mm, a mean weight of 2,528 g, and a mean condition factor of 2.04 (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 446 mm, a mean weight of 1,371 g, and a mean condition factor of 1.40 (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).

8.6.4.3 Stephens Lake - North

Northern Pike captured in standard gang index gill nets set in Stephens Lake - North had a mean fork length of 559 mm, a mean weight of 1,486 g, and a mean condition factor of 0.74 (Table 8.6-11). Fork length and weight were measured for three 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 475 mm, a mean weight of 2,169 g, and a mean condition factor of 1.92 (Table 8.6-11). Fork length and weight were measured for one Lake Whitefish captured in a small mesh index gill net (Table 8.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 444 mm, a mean weight of 1,375 g, and a mean condition factor of 1.40 (Table 8.6-11). In the small mesh index gillnet catch, Walleye had a mean fork length of 366 mm, a mean weight of 891 g, and a mean condition factor of 1.39 (Table 8.6-12).

8.6.4.4 Lower Nelson River

Northern Pike captured in standard gang index gill nets set in the lower Nelson River mainstem had a mean fork length of 631 mm, a mean weight of 2,048 g, and a mean condition factor of 0.74 (Table 8.6-11). Northern Pike were not captured in small mesh index gill nets.

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 423 mm, a mean weight of 1,221 g, and a mean condition factor of 1.57 (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 423 mm, a mean weight of 1,021 g, and a mean condition factor of 1.28 (Table 8.6-11). Fork length and weight were measured for seven Walleye captured in small mesh index gill nets (Table 8.6-12).

8.6.4.5 Hayes River

Only two Northern Pike and one Lake Whitefish were captured in standard gang index gillnets (Table 8.6-11). The sixteen captured Walleye had a mean fork length of 439 mm, a mean weight of 1,078 g, and a mean condition factor of 1.11 (Table 8.6-11). None of these species were captured in small mesh index gill nets (Table 8.6-12).

8.6.4.6 Assean Lake

Northern Pike captured in standard gang index gill nets set in Assean Lake had a mean fork length of 544 mm, a mean weight of 1,334 g, and a mean condition factor of 0.65 (Table 8.6-11). Six Northern Pike were captured in small mesh index gill nets and bulk weight (Table 8.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 323 mm, a mean weight of 641 g, and a mean condition factor of 1.58 (Table 8.6-11). Two Lake Whitefish were captured in small mesh index gill nets and bulk weighed (Table 8.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 353 mm, a mean weight of 546 g, and a mean condition factor of 1.12 (Table 8.6-11). Walleye were not captured in small mesh index gill nets (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 2009.

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 54 Northern Pike captured in standard gang index gill nets set in Split Lake in 2009 (Table 8.6-13). Among these fish, 20.37% were six years old, while five-year old fish represented 16.67% of aged Northern Pike.

Ages were determined for ten Lake Whitefish captured in Split Lake in 2009. Lake Whitefish ages ranged from seven to 20 years (Table 8.6-14). Due to small sample size, trends in cohort strength could not be determined.

Ages were determined for 184 Walleye captured in standard gang index gill nets (Table 8.6-15). Five to eight-year old Walleye were well represented, with seven-year old fish captured in the highest numbers (n = 57; 30.98%).

8.6.5.2 Stephens Lake - South

Age was determined for 72 Northern Pike captured in standard gang index gill nets set in Stephens Lake – South in 2009 (Table 8.6-13). Northern Pike ranged from 2 – 17 years of age, with 5-year old fish most abundant in the sample.

Ages were determined for six Lake Whitefish captured in Stephens Lake - South. Lake Whitefish ages ranged from five to 19 years (Table 8.6-14). Due to small sample size, trends in cohort strength could not be determined.

Ages were determined for 177 Walleye captured in Stephens Lake – South (Table 8.6-15). With the exception of two age classes (24 and 29 year olds) Walleye aged 2 through thirty were represented in the sample. Seven-, eight-, and 13-year old Walleye were well represented, comprising 23.16%, 16.95% and 13.56% of aged fish, respectively.

8.6.5.3 Stephens Lake - North

A total of 77 Northern Pike captured in Stephens Lake - North were aged (Table 8.6-13). Northern Pike aged 4 and 5 years comprised 19.48% and 22.08% of aged fish, respectively.

Ages were determined for nine Lake Whitefish. Lake Whitefish ages ranged from seven to 26 years (Table 8.6-14). Due to small sample size, trends in cohort strength could not be determined.

Ages were determined for 96 Walleye captured in Stephens Lake – North (Table 8.6-15). Captured Walleye ranged from 3 – 29 years, with the majority of cohorts represented in the sample. Walleye aged 7 – 9 years, as well as 13-year old Walleye were particularly well represented in the sample.

8.6.5.4 Lower Nelson River

Ages were determined for 82 Northern Pike captured in the lower Nelson River mainstem (Table 8.6-13). Four to eight-year old Northern Pike were particularly well represented in the sample.

Ages were determined for 21 Lake Whitefish. Due to small sample size, trends in cohort strength could not be determined (Table 8.6-14).

Ages were determined for 54 Walleye. The majority of Walleye in the aged sample were seven-years old (48.15%) (Table 8.6-15).

8.6.5.5 Hayes River

Few Northern Pike, Lake Whitefish, and Walleye were captured in the Hayes River in 2009 (tables 8.6-13, 8.6-14, and 8.6-15, respectively). Trends in cohort strength cannot be determined.

8.6.5.6 Assean Lake

Ages were determined for 66 Northern Pike captured in Assean Lake in 2009 (Table 8.6-13). Five-, six- and seven-year olds were well represented, comprising 18.18%, 16.67% and 19.70% of aged Northern Pike, respectively.

Ages were determined for 39 Lake Whitefish captured in Assean Lake (Table 8.6-14). Most ranged from three to seven years of age. Four-year olds were the strongest cohort, representing 35.90% of aged Lake Whitefish.

Ages were determined for 227 Walleye. Most fish were seven to 12 years old, with eight- and nine-year old fish representing the largest proportion of the catch (15.86% and 18.94%, respectively).

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 2009 were examined externally for DELTs (Table 8.6-19).

8.6.6.1 Split Lake

In Split Lake, DELTs were documented on six of 354 examined fish (Table 8.6-19). DELTs were documented on one White Sucker, one Lake Whitefish, and four Walleye.

8.6.6.2 Stephens Lake - South

In Stephens Lake - South, DELTs were documented on seven of 272 examined fish, including two White Sucker, two Northern Pike, and three Walleye.

8.6.6.3 Stephens Lake – North

In Stephens Lake – North, DELTs were documented on four of 192 fish, including two Northern Pike and two Walleye.

8.6.6.4 Lower Nelson River

In the lower Nelson River mainstem, DELTs were documented on seven of 192 fish, including one Lake Sturgeon (4.55%), two White Sucker (6.45%), two Northern Pike (2.44%) and two Walleye (3.45%).

8.6.6.5 Hayes River

Three of the 40 fish captured in the Hayes River were determined to have DELTs. All three fish were White Sucker.

8.6.6.6 Assean Lake

In Assean Lake, 413 fish were examined externally for DELTs. No DELTs were documented.

8.7 FISH MERCURY

The following provides an overview of fish mercury concentrations measured in Year 2 of CAMPP in the Lower Nelson River Region. The only waterbody sampled from the region was Stephens Lake-South. Standard nets were set from 4-5 and 14-17 September at 24 sites and small mesh nets were set at seven sites (Figure 8.7-1). Fish for mercury analysis were obtained from 18 standard nets and six small mesh nets.

8.7.1 Species comparisons

A total of 79 fish were analyzed for mercury. No 1-year old Yellow Perch and only seven Lake Whitefish were caught from Stephens Lake (Tables 8.7-1 and Figure 8.7-2). Northern Pike and Walleye were captured with their target sample size of 36 fish.

A significant positive relationship between mercury concentration and fish length existed for all three species sampled (Figure 8.7-2), indicating that standardization of concentrations was necessary for comparative purposes. Standardized mercury concentrations of Northern Pike and Walleye were within approximately 15% of arithmetic concentrations (Table 8.7-1). However, the standard concentration for Lake Whitefish was less than one third of the arithmetic concentration, largely owing to the fact that the mean length of the seven fish analyzed exceeded the standard length of 350 mm by more than a third (Table 8.7-2).

The two piscivorous species, Northern Pike and Walleye had almost identical arithmetic mercury concentrations, whereas the concentration of Lake Whitefish was slightly more than half that of the piscivores, which is unusually high for Manitoba waterbodies. Together with the small sample size, the data suggests that the mean mercury concentration measured for Lake Whitefish did not accurately represent the population mean in Stephens Lake-South.

8.7.2 Comparison to consumption guidelines

At 0.26 parts per million (ppm), standardized mean concentrations of Northern Pike and Walleye from Stephens Lake-South slightly exceeded the 0.2 ppm guideline for human consumption (see section 4.8.2.3; Figure 8.7-3). The standardized mean concentration of Lake Whitefish was approximately one fourth of the above guideline value.

Based on individual concentrations, 29% of the Lake Whitefish, 50% of the Northern Pike, and 69% of the Walleye had mercury levels above 0.2 ppm (Figure 8.7-2). Almost 20% of the Northern Pike and 10% of the Walleye also had mercury concentrations in excess of 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 standards relating to human health, every fish captured in Stephens Lake-South and analysed for total mercury had concentrations above the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; update to 2013; MWS 2011).

SECTION 8: TABLES AND FIGURES

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Table 8.3-1. Summary statistics for *in situ* variables (near surface) measured in the Lower Nelson River Region: 2009/2010.

	Temperature (°C)							*In situ* pH						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	11.35	12.63	11.52	10.32	11.70	11.23	11.76	7.74	7.98	7.83	7.97	7.91	7.99	8.17
Median	13.95	15.65	14.25	12.55	14.55	14.20	15.28	7.81	7.98	7.85	8.04	7.88	8.04	8.12
Minimum	0.01	0.02	0.07	0.27	0.00	0.00	0.75	7.40	7.98	7.63	7.56	7.76	7.68	8.01
Maximum	17.50	19.20	17.50	15.90	17.70	16.53	15.73	7.92	7.98	8.00	8.25	8.11	8.20	8.42
SD	6.71	7.51	6.75	6.23	7.95	6.56	6.36	0.20	-	0.15	0.25	0.15	0.19	0.16
SE	3.87	4.34	3.90	3.60	3.98	3.79	3.67	0.11	-	0.09	0.15	0.07	0.11	0.09
N	4	4	4	4	4	4	4	4	1	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	DO (mg/L)							DO Saturation (%)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	12.06	9.27	11.20	11.68	12.12	14.22	14.83	110	114	102	103	110	131	139
Median	12.66	8.75	10.37	11.02	11.71	14.61	14.83	120	114	104	103	107	143	144
Minimum	7.36	4.10	8.75	8.66	9.84	12.21	14.39	71	114	86	88	97	88	114
Maximum	15.55	15.49	15.30	16.03	15.22	15.43	15.27	131	114	112	118	128	150	154
SD	2.96	4.09	2.60	3.06	2.62	1.31	0.42	23	-	11	15	14	25	15
SE	1.71	2.36	1.50	1.76	1.31	0.75	0.24	13	-	6	8	7	14	9
N	4	4	4	4	4	4	4	4	1	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8.3-1. - continued -

	In situ Specific Conductance (µS/cm)							*In situ* Turbidity (NTU)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	130	286	302	278	290	136	222	128	16.1	50.9	21.8	63.3	15.8	14.9
Median	136	286	307	275	303	139	201	150	16.1	54.9	21.1	64.6	11.2	10.2
Minimum	104	286	267	269	227	118	174	34.5	16.1	19.0	4.0	28.0	0.7	0.0
Maximum	143	286	326	292	329	148	315	200	16.1	75.0	41.0	96.0	35.4	39.4
SD	16	-	23	8	45	11	56	69.3	-	22.5	13.1	33.8	14.5	14.7
SE	9	-	13	5	22	6	32	49.0	-	13.0	7.6	16.9	10.3	8.5
N	4	4	4	4	4	4	4	4	1	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	ORP (mV)							Secchi Disk Depth (m)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	139	208	195	197	183	176	144	-	-	0.43	1.09	-	-	0.73
Median	139	208	195	197	183	154	151	-	-	0.40	1.20	-	-	0.65
Minimum	139	208	195	197	183	123	87	-	-	0.40	0.67	-	-	0.40
Maximum	139	208	195	197	183	272	188	-	-	0.50	1.40	-	-	1.15
SD	-	-	-	-	-	66	42	-	-	0.06	0.38	-	-	0.38
SE	-	-	-	-	-	33	21	-	-	0.03	0.22	-	-	0.22
N	1	1	1	1	1	3	4	0	0	3	3	0	0	3
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8.3-1. - continued -

	Calculated Euphotic Depth (m)							Estimated Euphotic Depth (m)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	-	-	0.87	2.18	-	-	1.47	-	-	-	-	-	-	1.52
Median	-	-	0.80	2.40	-	-	1.30	-	-	-	-	-	-	1.50
Minimum	-	-	0.80	1.34	-	-	0.80	-	-	-	-	-	-	0.80
Maximum	-	-	1.00	2.80	-	-	2.30	-	-	-	-	-	-	2.25
SD	-	-	0.12	0.75	-	-	0.76	-	-	-	-	-	-	0.73
SE	-	-	0.07	0.44	-	-	0.44	-	-	-	-	-	-	0.42
N	0	0	3	3	0	0	3	0	0	0	0	0	0	3
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8.3-2. Summary statistics for routine laboratory variables measured in the Lower Nelson River Region: 2009/2010.

	Total Alkalinity ($CaCO_3$ mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	60.3	102	98.0	107	99.1	77.7	123
Median	62.8	105	100	108	101	73.5	112
Minimum	50.0	87.1	87.3	102	88.2	69.0	101
Maximum	65.7	111	104	111	106	95.0	166
SD	6.1	9.1	6.9	3	8.0	10.4	26
SE	3.5	5.2	4.0	2	4.0	6.0	15
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100

	Bicarbonate Alkalinity (HCO_3 mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	73.6	122	117	128	119	94.2	147
Median	76.7	125	120	128	122	88.3	134
Minimum	61.0	106	106	124	108	84.2	118
Maximum	80.2	132	124	132	126	116	202
SD	7.4	9.9	7.5	2.9	8	12.8	32.7
SE	4.3	5.7	4.3	1.7	4	7.4	18.9
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100

	Carbonate Alkalinity (CO_3 mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.60	1.07	1.24	1.50	0.99	<0.60	1.45
Median	<0.60	1.28	1.54	1.64	0.68	<0.60	1.27
Minimum	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
Maximum	<0.60	1.44	1.58	2.42	2.29	*1.31*	2.97
SD	-	0.45	0.54	0.81	0.94	0.44	1.18
SE	-	0.26	0.31	0.47	0.47	0.25	0.68
N	4	4	4	4	4	4	4
N >DL	0	3	3	3	2	1	2
% Detected	0	75	75	75	50	25	50

	Ammonia (mg N/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0069	<0.010	0.014	<0.010	<0.010	0.015	0.030
Median	0.0056	<0.010	0.015	<0.010	<0.010	0.016	0.028
Minimum	<0.0030	<0.0030	<0.010	<0.010	<0.0030	<0.010	<0.010
Maximum	0.0150	0.0079	0.020	0.016	<0.010	0.025	0.060
SD	0.0050	0.0023	0.006	0.005	-	0.007	0.023
SE	0.0029	0.0013	0.003	0.003	-	0.004	0.013
N	4	4	4	4	4	4	4
N >DL	2	2	3	3	1	3	3
% Detected	50	50	75	75	25	75	75

Table 8.3-2. - continued -

	Nitrate/Nitrite (mg N/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0286	0.0219	0.0470	0.0387	0.0485	0.0295	0.0191
Median	0.0194	0.0205	0.0275	0.0067	0.0260	<0.0050	<0.0050
Minimum	<0.0050	0.0075	0.0100	<0.0050	<0.0050	<0.0050	<0.0050
Maximum	0.0730	0.0390	0.123	0.139	0.1397	0.108	0.0690
SD	0.0276	0.0113	0.0445	0.0579	0.0619	0.0453	-
SE	0.0159	0.0065	0.0257	0.0335	0.0309	0.0262	-
N	4	4	4	4	4	4	4
N >DL	3	4	4	3	3	2	1
% Detected	75	100	100	75	75	50	25

	TKN (mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.55	0.43	0.48	0.41	0.48	0.48	0.47
Median	0.48	0.46	0.49	0.37	0.48	0.48	0.48
Minimum	0.25	0.26	0.40	0.33	0.43	0.38	0.42
Maximum	1.00	0.55	0.55	0.55	0.52	0.56	0.50
SD	0.28	0.11	0.05	0.09	0.04	0.06	0.03
SE	0.16	0.07	0.03	0.05	0.02	0.04	0.02
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100

	DIN (mg/L)[1]						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0351	0.0270	0.0605	0.0458	0.0513	0.0450	0.0496
Median	0.0300	0.0252	0.0421	0.0150	0.0291	0.0245	0.0550
Minimum	<0.0050	0.0136	0.0300	0.0090	<0.0050	0.0178	0.0145
Maximum	0.0780	0.0440	0.128	0.144	0.1447	0.113	0.0740
SD	0.0275	0.0110	0.0393	0.0568	0.0635	0.0394	0.0224
SE	0.0159	0.0063	0.0227	0.0328	0.0318	0.0228	0.0129
N	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-

	Organic Nitrogen (mg/L)[1]						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.55	0.43	0.47	0.40	0.47	0.46	0.44
Median	0.47	0.46	0.48	0.36	0.48	0.47	0.43
Minimum	0.25	0.25	0.39	0.33	0.43	0.37	0.41
Maximum	0.99	0.55	0.53	0.55	0.52	0.54	0.50
SD	0.28	0.11	0.05	0.09	0.04	0.06	0.03
SE	0.16	0.07	0.03	0.05	0.02	0.03	0.02
N	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-

Table 8.3-2. - continued -

	TN (mg/L)[1]						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.58	0.45	0.53	0.44	0.53	0.50	0.49
Median	0.52	0.48	0.54	0.38	0.50	0.53	0.48
Minimum	0.25	0.27	0.43	0.34	0.45	0.39	0.42
Maximum	1.03	0.59	0.61	0.69	0.66	0.58	0.57
SD	0.28	0.12	0.07	0.14	0.09	0.08	0.05
SE	0.16	0.07	0.04	0.08	0.05	0.04	0.03
N	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-
% Detected	-	-	-	-	-	-	-

	TDP (mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0136	0.0144	0.0255	0.0131	0.0222	0.0083	0.0122
Median	0.0139	0.0148	0.0274	0.0084	0.0198	0.0083	0.0124
Minimum	0.0057	0.0114	0.0116	0.0027	0.0107	0.0054	0.0066
Maximum	0.0208	0.0165	0.0354	0.0327	0.0384	0.0110	0.0174
SD	0.0054	0.0020	0.0096	0.0116	0.0116	0.0026	0.0039
SE	0.0031	0.0012	0.0055	0.0067	0.0058	0.0015	0.0023
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100

	TPP (mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0271	0.0171	0.0151	0.0099	0.0193	0.0145	0.0074
Median	0.0290	0.0186	0.0166	0.0115	0.0208	0.0115	0.0079
Minimum	0.0102	0.0042	0.0071	0.0015	0.0123	<0.003	<0.003
Maximum	0.0403	0.0271	0.0202	0.0151	0.0232	0.0333	0.0122
SD	0.0136	0.0095	0.0060	0.0062	0.0050	0.0139	0.0045
SE	0.0068	0.0048	0.0030	0.0031	0.0025	0.0070	0.0022
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	3	3
% Detected	100	100	100	100	100	75	75

	TP (mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0407	0.0315	0.0406	0.0230	0.0414	0.0227	0.0195
Median	0.0419	0.0325	0.0411	0.0175	0.0406	0.0173	0.0195
Minimum	0.0310	0.0202	0.0306	0.0090	0.0339	0.0124	0.0157
Maximum	0.0479	0.0406	0.0495	0.0478	0.0507	0.0439	0.0234
SD	0.0068	0.0077	0.0067	0.0148	0.0071	0.0128	0.0028
SE	0.0039	0.0044	0.0039	0.0085	0.0036	0.0074	0.0016
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100

Table 8.3-2. - continued -

	TN:TP[1]							DIN:DP[1]							DIN:TP[1]							DOC (mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	33	35	29	53	28	62	56	5	4	5	6	4	11	8	2	2	3	3	2	7	6	10.1	8.5	8.4	8.5	8.7	10.9	11.9
Median	30	28	29	45	29	59	56	5	4	5	6	3	8	9	2	1	2	3	2	3	6	10.3	8.5	8.4	8.3	8.5	10.9	11.9
Minimum	12	20	24	32	23	28	46	1	3	3	3	1	6	5	0	1	2	1	0	1	2	8.3	8.5	8.0	8.0	8.2	8.3	10.9
Maximum	60	65	36	92	31	102	67	8	6	8	10	8	23	10	6	5	6	7	6	20	9	11.5	8.5	8.8	9.5	9.5	13.4	12.8
SD	17	18	5	23	3	27	8	3	1	2	3	3	7	2	2	2	2	2	3	8	3	1.3	-	0.3	0.6	0.6	1.8	0.7
SE	10	10	3	13	2	16	5	2	1	1	1	2	4	1	1	1	1	1	1	4	1	0.8	-	0.2	0.3	0.3	1.0	0.4
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	4	4	4	4	4
% Detected	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	100	100	100	100	100	100

Table 8.3-2. - continued -

	TOC (mg/L)							TIC (mg/L)							TOC:ON[1]							TOC:TN[1]						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	10.4	8.4	8.5	8.5	8.7	10.6	11.9	10	23.4	20.2	23.4	20.2	17.8	28.6	29	25	21	26	21	27	32	27	23	19	24	20	25	29
Median	10.6	8.4	8.4	8.4	8.8	10.4	12.1	10	24.2	20.2	23.4	20.2	16.3	25.6	25	22	21	25	21	27	31	23	20	18	24	20	26	29
Minimum	8.8	7.9	8.2	7.5	7.9	8.5	10.9	10	19.6	20.2	23.4	20.2	15.7	23.6	11	19	18	21	20	21	30	11	17	17	16	16	17	26
Maximum	11.6	8.8	8.8	9.7	9.3	13.3	12.7	10	25.7	20.2	23.4	20.2	22.9	39.4	54	37	25	31	23	33	35	54	35	23	30	22	32	31
SD	1.2	0.4	0.2	0.8	0.6	1.7	0.8	-	2.8	-	-	-	3.4	7.3	16	7	3	4	2	4	2	16	7	3	5	3	5	2
SE	0.7	0.2	0.1	0.5	0.3	1.0	0.4	-	1.4	-	-	-	1.7	3.7	9	4	2	2	1	2	1	9	4	1	3	1	3	1
N	4	4	4	4	4	4	4	1	4	1	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	1	4	1	1	1	4	4	-	-	-	-	4	-	-	-	-	-	-	4	-	-
% Detected	100	100	100	100	100	100	100	100	100	100	100	100	100	100	-	-	-	-	100	-	-	-	-	-	-	100	-	-

Table 8.3-2. - continued -

	TDS (mg/L)							Laboratory Conductivity (μmhos/cm)							TSS (mg/L)							Laboratory Turbidity (NTU)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	104	199	204	182	196	111	156	123	307	288	266	290	150	227	22.3	8.1	13.0	5.1	17.5	16.5	8.0	39.9	15.5	22.5	9.35	24.8	9.40	10.8
Median	99.0	198	203	179	195	113	147	127	314	290	259	288	142	207	23.0	7.5	13.4	4.2	14.2	9.8	6.2	40.0	15.5	22.0	9.15	23.6	5.85	11.4
Minimum	88.0	180	184	178	187	88.0	137	107	274	269	254	270	132	187	10.0	<5.0	10.0	3.6	13.5	<2.0	<2.0	19.6	11.1	21.0	5.50	22.0	0.91	0.43
Maximum	128	220	224	190	208	128	194	132	328	305	292	313	184	307	33.2	15.0	15.2	8.4	28.0	45.2	18.4	60.0	20.0	25.0	13.6	30.0	25.0	20.0
SD	15.0	17	15	5	10	17.1	22	10	20	15	15	20	21	48	10.4	4.6	2.1	1.9	7.0	17.3	6.4	14.7	3.17	1.50	3.51	3.7	9.29	7.93
SE	8.7	10	9	3	5	9.8	13	6	12	9	9	10	12	28	6.0	2.6	1.2	1.1	3.5	10.0	3.7	8.50	1.83	0.87	2.03	1.9	5.37	4.58
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
N >DL	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	3	3	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	75	100	100	100	75	75	100	100	100	100	100	100	100

Table 8.3-2. - continued -

	True Colour (TCU)							Laboratory pH						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	36.3	26.3	30.0	21.3	32.5	31.3	27.1	8.08	8.27	8.17	8.20	8.28	8.16	8.35
Median	30.0	22.5	27.5	20.0	30.0	30.0	26.7	8.12	8.35	8.22	8.21	8.32	8.25	8.36
Minimum	5.0	20.0	15.0	15.0	20.0	15.0	15.0	7.91	8.05	7.88	7.94	8.06	7.77	8.20
Maximum	80.0	40.0	50.0	30.0	50.0	50.0	40.0	8.18	8.35	8.37	8.43	8.41	8.37	8.47
SD	28.1	8.2	13.7	5.4	15.0	14.3	10.6	0.10	0.13	0.20	0.19	0.15	0.23	0.11
SE	16.3	4.7	7.9	3.1	7.5	8.3	6.1	0.06	0.07	0.11	0.11	0.08	0.13	0.06
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100	100	100	100	100	100	100	100

	E. coli (CFU/100mL)							Chlorophyll *a* (μg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	>200	<10	4.0	1.0	5.3	3.3	<1.0	1.84	4.02	3.30	1.07	3.33	2.12	1.91
Median	>200	<10	4.0	1.0	5.3	3.0	<1.0	1.90	4.94	3.65	1.10	3.25	2.50	1.70
Minimum	>200	<10	4.0	1.0	5.3	1.0	<1.0	0.18	0.85	0.62	0.20	0.72	0.38	1.16
Maximum	>200	13	4.0	1.0	5.3	6.0	1.2	3.40	5.35	5.30	1.90	6.10	3.10	3.10
SD	-	5	-	-	-	2.2	0.3	1.27	1.85	1.74	0.60	2.20	1.12	0.73
SE	-	3	-	-	-	1.1	0.2	0.74	1.07	1.00	0.35	1.10	0.64	0.42
N	1	3	1	1	1	4	4	4	4	4	4	4	4	4
N >DL	1	1	1	1	4	4	2	4	4	4	4	4	4	4
% Detected	100	33	100	100	400	100	50	100	100	100	100	100	100	100

Table 8.3-2. - continued -

	Hardness as $CaCO_3$ (mg/L)							Chloride (mg/L)							Sulphate (mg/L)						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	69.2	124	124	124	124	91.4	133	<9.0	16.1	19.0	15.0	19.6	1.3	1.4	<9.0	23.5	21.3	11.2	20.9	5.8	6.3
Median	70.3	126	126	124	123	89.2	126	<9.0	20.6	19.4	13.8	19.8	1.4	1.3	<9.0	28.8	21.0	9.4	21.3	5.7	6.5
Minimum	54.3	108	108	118	113	85.3	103	<9.0	1.6	17.6	13.6	18.5	1.0	1.1	<9.0	5.9	20.3	<9.0	18.7	3.1	4.6
Maximum	82.0	137	134	130	137	102	176	<9.0	21.7	19.5	18.7	20.6	1.7	1.8	11.1	30.5	23.0	21.6	22.5	8.7	7.7
SD	9.9	10	10	6	10	6.6	27	1.3	8.4	0.8	2.2	0.9	0.3	0.3	3.1	10.2	1.1	6.3	1.8	2.1	1.1
SE	5.7	6	6	3	5	3.8	16	0.8	4.8	0.5	1.3	0.4	0.2	0.2	2.2	5.9	0.6	3.6	0.9	1.2	0.6
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	1	4	4	4	4	4	4	2	4	4	3	4	4	4
% Detected	100	100	100	100	100	100	100	25	100	100	100	100	100	100	67	100	100	75	100	100	100

[1] Calculated.

Table 8.3-3. Summary statistics for metals and major ions measured in the Lower Nelson River Region: 2009/2010. Values are presented as mg/L.

	Aluminum							Antimony						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	1.48	0.406	0.783	0.472	0.558	0.189	0.274	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Median	1.56	0.331	0.609	0.507	0.498	0.154	0.257	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Minimum	0.323	0.265	0.244	0.155	0.286	0.021	0.019	<0.00050	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Maximum	2.46	0.697	1.67	0.721	0.950	0.425	0.564	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	0.00073	0.00062
SD	0.824	0.170	0.559	0.250	0.325	0.156	0.194	-	-	-	-	-	-	-
SE	0.476	0.098	0.323	0.144	0.163	0.090	0.112	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	1	0	0	0	0	1	1
% Detected	100	100	100	100	100	100	100	25	0	0	0	0	25	25

	Arsenic						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.00050	0.00130	0.00116	0.00077	0.00114	<0.00050	0.00060
Median	<0.00050	0.00130	0.00120	0.00063	0.00116	<0.00050	0.00062
Minimum	<0.00050	0.00117	0.00086	0.00052	0.00102	<0.00050	<0.00050
Maximum	0.00064	0.00141	0.00139	0.00131	0.00121	0.00058	0.00090
SD	0.00017	0.00009	0.00019	0.00031	0.00009	0.00016	0.00023
SE	0.00010	0.00005	0.00011	0.00018	0.00004	0.00009	0.00013
N	4	4	4	4	4	4	4
N >DL	2	4	4	4	4	2	3
% Detected	50	100	100	100	100	50	75

Table 8.3-3. - continued -

	Barium							Beryllium							Bismuth						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0229	0.0381	0.0353	0.0220	0.03469	0.00948	0.0147	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Median	0.0243	0.0402	0.0350	0.0208	0.03700	0.00942	0.0146	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Minimum	0.0139	0.0272	0.0296	0.0174	0.02617	0.00898	0.0127	<0.0010	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.0291	0.0447	0.0417	0.0292	0.03860	0.0101	0.0168	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
SD	0.0060	0.0067	0.0049	0.0045	0.00574	0.00042	0.0015	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE	0.0035	0.0039	0.0028	0.0026	0.00287	0.00024	0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Detected	100	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8.3-3. - continued -

	Boron							Cadmium							Calcium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.000010	0.000010	<0.000010	<0.000010	<0.000010	0.000011	0.000012	18.2	25.5	29.6	33.0	30.2	27.7	41.3
Median	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	18.8	25.5	30.0	33.2	30.0	27.4	38.8
Minimum	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	14.0	25.5	25.6	29.6	27.1	25.5	31.9
Maximum	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.000011	0.000020	0.000010	0.000012	0.000015	0.000024	0.000032	21.4	25.5	32.9	35.8	33.7	30.6	55.8
SD	-	0.005	-	-	-	-	-	-	0.000006	-	-	-	0.000008	-	2.7	-	2.6	2.4	2.7	1.9	8.8
SE	-	0.003	-	-	-	-	-	-	0.000004	-	-	-	0.000004	-	1.6	-	1.5	1.4	1.4	1.1	5.1
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4	4	4	4
N >DL	0	3	0	0	0	0	0	1	2	1	1	1	2	1	4	1	4	4	4	4	4
% Detected	0	75	0	0	0	0	0	25	50	25	25	25	50	25	100	100	100	100	100	100	100

Table 8.3-3. - continued -

	Cesium							Chromium							Cobalt						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0023	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.00070	0.00026	0.00054	0.00040	0.00035	<0.00020	0.00023
Median	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0024	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00076	0.00027	0.00053	0.00033	0.00034	<0.00020	0.00022
Minimum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	0.00029	<0.00010	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	0.0034	0.0013	0.0021	0.0014	0.0013	<0.0010	<0.0010	0.00117	0.00039	0.00099	0.00084	0.00062	0.00045	0.00039
SD	0.00009	-	-	-	-	-	-	0.0008	-	0.0007	-	0.0005	-	-	0.00042	0.00011	0.00035	0.00028	0.00021	-	0.00013
SE	0.00005	-	-	-	-	-	-	0.0005	-	0.0004	-	0.0002	-	-	0.00024	0.00006	0.00020	0.00016	0.00011	-	0.00008
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	3	0	1	0	0	0	0	4	1	2	1	2	0	0	3	3	3	3	3	1	2
% Detected	75	0	25	0	0	0	0	100	25	50	25	50	0	0	75	75	75	75	75	25	50

Table 8.3-3. - continued -

	Copper							Iron							Lead						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0023	0.0017	0.0024	0.0017	0.0020	<0.0010	0.0020	1.33	0.319	0.648	0.331	0.527	0.342	0.271	0.00089	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Median	0.0024	0.0018	0.0023	0.0015	0.0020	<0.0010	0.0019	1.50	0.257	0.551	0.341	0.494	0.313	0.299	0.00090	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Minimum	0.0015	0.0016	0.0018	0.0013	0.0018	<0.0010	0.0017	0.303	0.209	0.249	0.127	0.246	0.075	<0.020	0.00060	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Maximum	0.0029	0.0018	0.0031	0.0026	0.0022	0.0010	0.0024	2.04	0.555	1.24	0.516	0.873	0.665	0.476	0.00118	0.00045	0.00058	<0.00050	<0.00050	0.00054	0.00069
SD	0.0005	0.0001	0.0005	0.0005	0.0002	-	0.0002	0.728	0.137	0.373	0.173	0.270	0.228	0.184	0.00021	0.00008	-	-	-	-	-
SE	0.0003	0.0000	0.0003	0.0003	0.0001	-	0.0001	0.421	0.079	0.215	0.100	0.135	0.132	0.106	0.00012	0.00005	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	1	4	4	4	4	4	4	4	3	4	3	1	0	0	1	1
% Detected	100	100	100	100	100	25	100	100	100	100	100	100	100	75	100	75	25	0	0	25	25

Table 8.3-3. - continued -

	Lithium							Magnesium							Manganese						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	-	0.0115	-	-	-	-	-	5.76	12.4	12.0	10.1	11.8	5.35	7.19	0.0306	0.0120	0.0174	0.0131	0.0172	0.0288	0.0130
Median	-	0.0108	-	-	-	-	-	5.69	12.4	12.4	10.1	11.7	5.20	7.06	0.0331	0.0121	0.0165	0.0108	0.0166	0.0294	0.0138
Minimum	-	0.0103	-	-	-	-	-	4.71	10.8	10.6	9.36	11.0	4.90	5.66	0.0144	0.00960	0.0153	0.00428	0.0158	0.00339	0.00458
Maximum	-	0.0134	-	-	-	-	-	6.96	13.9	12.7	10.8	13.0	6.11	8.99	0.0418	0.0144	0.0214	0.0268	0.0200	0.0530	0.0197
SD	-	0.0017	-	-	-	-	-	0.80	1.10	0.84	0.55	0.9	0.46	1.19	0.0115	0.00195	0.0023	0.00843	0.0020	0.0186	0.00591
SE	-	0.0010	-	-	-	-	-	0.46	0.63	0.48	0.32	0.4	0.26	0.69	0.0066	0.00112	0.0014	0.00487	0.0010	0.0108	0.00341
N	0	3	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	3	-	-	-	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4
% Detected	-	100	-	-	-	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 8.3-3. - continued -

	Mercury							Molybdenum							Nickel						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	0.00069	0.00066	0.00047	0.00052	<0.00020	<0.00020	0.0028	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Median	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	0.00071	0.00067	0.00046	0.00051	<0.00020	<0.00020	0.0031	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Minimum	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00020	0.00057	0.00058	0.00042	0.00044	<0.00020	<0.00020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Maximum	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00021	0.00078	0.00070	0.00055	0.00062	0.00027	<0.00020	0.0039	<0.0020	0.0024	<0.0020	0.0022	<0.0020	<0.0020
SD	-	-	-	-	-	-	-	-	0.00008	0.00005	0.00005	0.00008	-	-	0.0012	-	0.0006	-	0.0007	-	-
SE	-	-	-	-	-	-	-	-	0.00005	0.00003	0.00003	0.00004	-	-	0.0007	-	0.0004	-	0.0003	-	-
N	4	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	1	0	0	0	0	0	0	1	4	4	4	4	1	0	3	0	2	0	2	0	0
% Detected	25	0	0	0	0	0	0	25	100	100	100	100	25	0	75	0	50	0	50	0	0

Table 8.3-3. - continued -

	Potassium							Rubidium							Selenium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	1.55	2.89	2.86	2.06	2.76	0.568	0.862	0.00418	0.00217	0.00299	0.00166	0.00238	0.00112	0.00116	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Median	1.59	2.85	2.84	1.90	2.78	0.510	0.853	0.00453	0.00204	0.00277	0.00157	0.00233	0.00107	0.00114	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	1.28	2.68	2.63	1.76	2.46	0.450	0.730	0.00181	0.00184	0.00181	0.00113	0.00152	0.00088	0.00076	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Maximum	1.74	3.17	3.11	2.68	3.00	0.800	1.01	0.00584	0.00275	0.00460	0.00236	0.00334	0.00146	0.00162	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
SD	0.19	0.18	0.21	0.36	0.23	0.139	0.103	0.00163	0.00035	0.00102	0.00054	0.00080	0.00021	0.00031	-	-	-	-	-	-	-
SE	0.11	0.10	0.12	0.21	0.11	0.080	0.059	0.00094	0.00020	0.00059	0.00031	0.00040	0.00012	0.00018	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	0	0
% Detected	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	0	0	0	0	0

Table 8.3-3. - continued -

	Silicon							Silver							Sodium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	3.52	18.3	17.6	11.9	16.8	1.96	2.42
Median	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	3.41	18.4	17.6	10.7	16.8	1.84	2.38
Minimum	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	3.11	17.3	16.1	10.3	15.4	1.75	1.81
Maximum	-	-	-	-	-	-	-	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	0.00041	<0.00010	4.15	19.2	18.9	15.8	18.4	2.42	3.10
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.39	0.80	1.01	2.28	1.3	0.27	0.46
SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22	0.46	0.59	1.32	0.7	0.15	0.27
N	0	0	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	-	-	-	-	-	-	-	1	0	0	0	0	1	0	4	4	4	4	4	4	4
% Detected	-	-	-	-	-	-	-	25	0	0	0	0	25	0	100	100	100	100	100	100	100

Table 8.3-3. - continued -

	Strontium							Tellurium							Thallium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0403	0.113	0.114	0.0902	0.105	0.0341	0.0510	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Median	0.0404	0.117	0.115	0.0911	0.103	0.0352	0.0478	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Minimum	0.0363	0.0838	0.0894	0.0767	0.0797	0.0288	0.0391	<0.0010	<0.00020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Maximum	0.0440	0.133	0.137	0.102	0.133	0.0373	0.0692	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
SD	0.0029	0.0181	0.0204	0.0090	0.0225	0.0032	0.0112	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SE	0.0017	0.0105	0.0118	0.0052	0.0113	0.0018	0.0064	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Detected	100	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8.3-3. - continued -

	Thorium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	-	0.0001	-	-	-	-	-
Median	-	0.0001	-	-	-	-	-
Minimum	-	<0.0001	-	-	-	-	-
Maximum	-	0.0002	-	-	-	-	-
SD	-	0.00009	-	-	-	-	-
SE	-	0.00005	-	-	-	-	-
N	0	3	0	0	0	0	0
N >DL	-	2	-	-	-	-	-
% Detected	-	67	-	-	-	-	-

	Tin						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.0010	0.00173	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Median	<0.0010	0.00100	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Minimum	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060
Maximum	<0.0010	0.00462	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
SD	-	0.00176	-	-	-	-	-
SE	-	0.00102	-	-	-	-	-
N	4	4	4	4	4	4	4
N >DL	0	2	0	0	0	0	0
% Detected	0	50	0	0	0	0	0

	Titanium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0631	0.0166	0.0318	0.0155	0.0241	0.0103	0.0107
Median	0.0704	0.0133	0.0267	0.0156	0.0220	0.00776	0.0111
Minimum	0.0122	0.00873	0.0100	0.00653	0.0107	0.00239	0.00045
Maximum	0.0996	0.0312	0.0639	0.0244	0.0418	0.0234	0.0203
SD	0.0366	0.00862	0.0205	0.00758	0.0142	0.00844	0.00737
SE	0.0211	0.00498	0.0118	0.00438	0.0071	0.00487	0.00425
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	4	4
% Detected	100	100	100	100	100	100	100

Table 8.3-3. - continued -

	Tungsten						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020	0.00032	<0.00050
Median	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020	<0.00020	<0.00050
Minimum	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Maximum	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00082	<0.00050
SD	-	-	-	-	-	0.00030	-
SE	-	-	-	-	-	0.00017	-
N	4	4	4	4	4	4	4
N >DL	0	0	0	0	0	1	0
% Detected	0	0	0	0	0	25	0

	Uranium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.00020	0.00067	0.00062	0.00047	0.00063	0.00011	0.00026
Median	0.00022	0.00066	0.00062	0.00045	0.00065	0.00012	0.00025
Minimum	0.00012	0.00054	0.00058	0.00040	0.00054	<0.00010	0.00021
Maximum	0.00024	0.00084	0.00065	0.00059	0.00067	0.00016	0.00033
SD	0.00005	0.00011	0.00003	0.00007	0.00006	0.00004	0.00004
SE	0.00003	0.00006	0.00002	0.00004	0.00003	0.00002	0.00003
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	3	4
% Detected	100	100	100	100	100	75	100

	Vanadium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.0026	0.0016	0.0021	0.0013	0.0018	<0.0010	<0.0010
Median	0.0028	0.0015	0.0019	0.0014	0.0017	<0.0010	<0.0010
Minimum	<0.0010	0.0011	0.0013	<0.0010	0.0012	<0.0010	<0.0010
Maximum	0.0042	0.0022	0.0034	0.0020	0.0025	0.0015	0.0014
SD	0.0015	0.0004	0.0008	0.0006	0.0006	-	0.0004
SE	0.0008	0.0002	0.0005	0.0003	0.0003	-	0.0002
N	4	4	4	4	4	4	4
N >DL	3	4	4	3	4	1	2
% Detected	75	100	100	75	100	25	50

Table 8.3-3. - continued -

	Zinc						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Median	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Minimum	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010
Maximum	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
SD	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-
N	4	4	4	4	4	4	4
N >DL	0	0	0	0	0	0	0
% Detected	0	0	0	0	0	0	0

	Zirconium						
	BURNT	SPLIT	STL-S	STL-N	LNR	HAYES	ASSN
Mean	0.00177	0.00086	0.00118	0.00061	0.00071	<0.00040	0.00061
Median	0.00192	0.00058	0.00085	0.00060	0.00070	<0.00040	0.00063
Minimum	0.00065	0.00052	0.00055	0.00042	0.00050	<0.00040	<0.00040
Maximum	0.00259	0.00177	0.00248	0.00083	0.00095	0.00079	0.00100
SD	0.00075	0.00052	0.00076	0.00019	0.00019	-	0.00029
SE	0.00044	0.00030	0.00044	0.00011	0.00009	-	0.00017
N	4	4	4	4	4	4	4
N >DL	4	4	4	4	4	1	3
% Detected	100	100	100	100	100	25	75

Table 8.3-4. 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: 2009/2010. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury[1]
MWQSOGs PAL		0.100	0.15	1.5	0.00017-0.00041	0.052-0.137	0.0053-0.0151	0.3	0.00146-0.00653	0.000026
Burntwood R	N	**4**	4	4	4	4	4	**4**	4	**3**
	# Exceedances	**4**	0	0	0	0	0	**4**	0	**1**
	% Exceedance	**100**	0	0	0	0	0	**100**	0	**25**
Split L	N	**4**	4	4	4	4	4	**4**	4	0
	# Exceedances	**4**	0	0	0	0	0	**1**	0	-
	% Exceedance	**100**	0	0	0	0	0	**25**	0	-
Stephens L-South	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**4**	0	0	0	0	0	**3**	0	0
	% Exceedance	**100**	0	0	0	0	0	**75**	0	0
Stephens L-North	N	**4**	4	4	4	4	4	**4**	4	3
(surface)	# Exceedances	**4**	0	0	0	0	0	**2**	0	0
	% Exceedance	**100**	0	0	0	0	0	**50**	0	0
Stephens L-North	N	**3**	3	3	3	3	3	**3**	3	3
(bottom)	# Exceedances	**3**	0	0	0	0	0	**1**	0	0
	% Exceedance	**100**	0	0	0	0	0	**33**	0	0
Lower Nelson R	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**4**	0	0	0	0	0	**3**	0	0
	% Exceedance	**100**	0	0	0	0	0	**75**	0	0
Hayes R	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**2**	0	0	0	0	0	**2**	0	0
	% Exceedance	**50**	0	0	0	0	0	**50**	0	0
Assean L	N	**4**	4	4	4	4	4	**4**	4	3
	# Exceedances	**3**	0	0	0	0	0	**2**	0	0
	% Exceedance	**75**	0	0	0	0	0	**50**	0	0

Table 8.3-4. – continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride²	Sulphate³
MWQSOGs PAL		0.073	0.031-0.084	0.001	0.0001	0.0008	0.015	0.071-0.193	120	128-429
Burntwood R	N	4	4	4	**4**	4	4	4	4	4
	# Exceedances	0	0	0	**1**	0	0	0	0	0
	% Exceedance	0	0	0	**25**	0	0	0	0	0
Split L	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
Stephens L-South	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
Stephens L-North	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
Stephens L-North	N	3	3	3	3	3	3	3	3	3
(bottom)	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedance	0	0	0	0	0	0	0	0	0
Lower Nelson R	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
Hayes R	N	4	4	4	**4**	4	4	4	4	4
	# Exceedances	0	0	0	**1**	0	0	0	0	0
	% Exceedance	0	0	0	**25**	0	0	0	0	0
Assean L	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

[1]Comparisons to the current PAL guideline could not be made for some samples as the analytical detection limit was higher than the guideline.
[2]Comparison to the long-term CCME PAL guideline.
[3]Comparison to the BCMOE guideline.

Table 8.3-5. Total phosphorus concentrations (open-water season and annual means) measured in the Lower Nelson River Region and CCME (1999; updated to 2013) trophic categorization: 2009/2010.

		Trophic Status Based on Total Phosphorus (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
Burntwood River	Open-water season					0.044	
	Annual					0.041	
Split Lake	Open-water season					0.035	
	Annual				0.031		
Stephens Lake-South	Open-water season					0.038	
	Annual					0.041	
Stephens Lake-North	Open-water season			0.015			
	Annual				0.023		
Lower Nelson River	Open-water season					0.038	
	Annual					0.041	
Hayes River	Open-water season				0.026		
	Annual				0.023		
Assean Lake	Open-water season				0.020		
	Annual				0.020		

Table 8.3-6. 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): 2009/2010.

		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
Split Lake	Open-water season			0.41			
	Annual			0.45			
Stephens Lake-South	Open-water season			0.53			
	Annual			0.50			
Stephens Lake-North	Open-water season			0.44			
	Annual			0.36			
Assean Lake	Open-water season			0.46			
	Annual			0.49			

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: 2009/2010.

		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
Split Lake	Open-water season			5.1			
	Annual			4.0			
Stephens Lake-South	Open-water season			4.2			
	Annual			3.3			
Stephens Lake-North	Open-water season		1.4				
	Annual		1.1				
Assean Lake	Open-water season		2.2				
	Annual		1.9				

Table 8.3-8. 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): 2009/2010.

		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	-
Burntwood River	Open-water season		0.62				
	Annual		0.58				
Lower Nelson River	Open-water season		0.48				
	Annual		0.53				
Hayes River	Open-water season		0.48				
	Annual		0.50				

Table 8.3-9. 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): 2009/2010.

		River Trophic Status Based on Chlorophyll *a* (µg/L)					
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic
Trophic Categories		-	<10	10-30	-	>30	-
Burntwood River	Open-water season		2.4				
	Annual		1.9				
Lower Nelson River	Open-water season		4.2				
	Annual		3.3				
Hayes River	Open-water season		2.7				
	Annual		2.1				

Table 8.4-1. Community metrics for phytoplankton samples collected in the Lower Nelson River Region during the open-water season of 2009.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H`}$)	Evenness ($E^{H`}/S$)
Hayes River	Spring	14	0.79	0.34	1.96	0.74	7.07	0.50
	Summer	-	-	-	-	-	-	-
	Fall	29	0.90	0.36	2.69	0.80	14.66	0.51
Assean Lake	Spring	12	0.85	0.55	2.09	0.84	8.08	0.67
	Summer	19	0.81	0.28	2.01	0.68	7.45	0.39
	Fall	17	0.90	0.60	2.46	0.87	11.76	0.69

Table 8.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Lower Nelson River Region for the CAMPP, 2009.

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)			(%)	
Split Lake (2009)	Nearshore	15	2.6	2.0	2.9	0.02	0.32	15.0	--	coniferous, shrubs	0	--
	Offshore	15	8.6	6.6	10.5	0.12	0.32	17.0	--	--	0	--
Stephens Lake-South (2009)	Nearshore	15	2.9	1.6	4.0	0.01	0.45	16.0	--	coniferous	0	--
	Offshore	15	14.7	13.6	16.2	0.07	0.45	16.5	--	--	0	--
Stephens Lake-North (2009)	Nearshore	15	3.2	1.6	4.0	0.05	0.90	15.0	--	coniferous	0	--
	Offshore	15	10.6	10.1	11.6	0.05	1.00	16.0	--	--	0	--
Lower Nelson River (2009)	Rock Baskets	20	3.2	1.0	6.5	1.14	0.35	14.0	--	shrubs, mixed forest	0	--
Hayes River (2009)	Rock Baskets	18	3.5	1.5	5.4	0.77	1.05	13.0	--	grass, shrub	0	--
Assean Lake (2009)	Nearshore	15	1.9	1.2	2.8	0.09	0.90	--	--	coniferous	0	--
	Offshore	15	15.8	8.7	18.9	0.32	1.50	16.5	--	--	0	--

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, 2009.

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 (2009)	Nearshore	Mean	3	2.4	3.06	5.67	52.00	42.00	Silt, Clay
		SD	--	0.35	0.140	0.577	3.606	3.606	--
		SE	--	0.20	0.081	0.333	2.082	2.082	--
		Median	--	2.4	3.06	6.00	53.00	41.00	--
		Min	--	2.0	2.92	5.00	48.00	39.00	--
		Max	--	2.7	3.20	6.00	55.00	46.00	--
	Offshore	Mean	3	9.0	0.98	19.00	53.33	28.00	Silt Loam
		SD	--	1.97	0.290	7.000	7.024	1.732	--
		SE	--	1.13	0.168	4.041	4.055	1.000	--
		Median	--	9.8	0.97	16.00	54.00	27.00	--
		Min	--	6.8	0.70	14.00	46.00	27.00	--
		Max	--	10.5	1.28	27.00	60.00	30.00	--
Stephens Lake-South (2009)	Nearshore	Mean	3	3.7	7.67	0.83	59.33	40.33	Silty Clay Loam
		SD	--	0.30	1.930	0.289	2.082	2.517	--
		SE	--	0.17	1.115	0.167	1.202	1.453	--
		Median	--	3.7	7.62	1.00	60.00	40.00	--
		Min	--	3.4	5.76	0.50	57.00	38.00	--
		Max	--	4.0	9.62	1.00	61.00	43.00	--
	Offshore	Mean	3	14.9	1.62	0.50	57.67	42.00	Silty Clay
		SD	--	1.10	0.200	0.000	2.082	2.646	--
		SE	--	0.63	0.115	0.000	1.202	1.528	--
		Median	--	14.3	1.62	0.50	57.00	43.00	--
		Min	--	14.3	1.42	0.50	56.00	39.00	--
		Max	--	16.2	1.82	0.50	60.00	44.00	--
Stephens Lake-North (2009)	Nearshore	Mean	3	3.1	6.77	8.33	59.33	32.33	Silty Clay Loam
		SD	--	0.46	6.068	7.506	4.041	3.512	--
		SE	--	0.26	3.503	4.333	2.333	2.028	--
		Median	--	3.0	4.20	8.00	60.00	32.00	--
		Min	--	2.7	2.41	1.00	55.00	29.00	--
		Max	--	3.6	13.70	16.00	63.00	36.00	--
	Offshore	Mean	3	10.6	1.17	0.67	46.00	53.33	Silty Clay
		SD	--	0.21	0.185	0.289	2.000	2.517	--
		SE	--	0.12	0.107	0.167	1.155	1.453	--
		Median	--	10.7	1.17	0.50	46.00	53.00	--
		Min	--	10.4	0.98	0.50	44.00	51.00	--
		Max	--	10.8	1.35	1.00	48.00	56.00	--

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
Assean Lake (2009)	Nearshore	Mean	3	2.2	1.92	2.33	80.67	17.33	Silt Loam
		SD	--	0.51	0.090	1.528	0.577	1.155	--
		SE	--	0.30	0.052	0.882	0.333	0.667	--
		Median	--	2.1	1.92	2.00	81.00	18.00	--
		Min	--	1.8	1.83	1.00	80.00	16.00	--
		Max	--	2.8	2.01	4.00	81.00	18.00	--
	Offshore	Mean	3	16.6	1.96	0.50	43.00	56.67	Silty Clay
		SD	--	2.30	0.084	0.000	2.646	2.309	--
		SE	--	1.33	0.048	0.000	1.528	1.333	--
		Median	--	16.6	1.92	0.50	42.00	58.00	--
		Min	--	14.3	1.91	0.50	41.00	54.00	--
		Max	--	18.9	2.06	0.50	46.00	58.00	--

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, 2009.

	Split Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	375	445.5	115.0	260	43	1601
Oligochaeta	--	12	25.7	6.6	0	0	87
Hirudinea	--	3	11.2	2.9	0	0	43
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	--	6	15.2	3.9	0	0	43
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	26.7	6.9	0	0	87
Gastropoda - unid	--	35	54.7	14.1	0	0	130
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	6	22.4	5.8	0	0	87
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	--	75	62.2	16.1	87	0	173
Non-Insecta (%)	20	--	--	--	--	--	--
Oligochaeta	--	12	25.7	6.6	0	0	87
Oligochaeta (%)	3	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	14	26.7	6.9	0	0	87
Bivalvia (%)	4	--	--	--	--	--	--
Gastropoda	--	40	55.4	14.3	0	0	130
Gastropoda (%)	11	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	26	27.4	7.1	43	0	87
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 8.5-3. – continued –

	Split Lake						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	130	141.7	36.6	87	0	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

Table 8.5-3. – continued –

	Split Lake						
	Nearshore n=15						
	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)	--	3	11.2	2.9	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)	--	3	11.2	2.9	0	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)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	87	190.8	49.3	0	0	693
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	52	138.0	35.6	0	0	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	--	300	435.7	112.5	130	43	1558
Insecta (%)	80	--	--	--	--	--	--
Chironomidae	--	139	327.7	84.6	0	0	1212

Table 8.5-3. – continued –

	Split Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae (%)	37	--	--	--	--	--	--
Ephemeroptera	--	130	141.7	36.6	87	0	519
Ephemeroptera (%)	35	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	3	11.2	2.9	0	0	43
Trichoptera (%)	1	--	--	--	--	--	--
EPT	--	133	144.9	37.4	87	0	519
EPT (%)	35	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.36	0.605	0.156	0.00	0.00	2.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	3	1.4	0.4	3	1	5
Simpson's Diversity Index (D)	--	0.51	0.279	0.072	0.63	0.00	0.78
Evenness (Simpson's Equitability E_D)	--	0.85	0.168	0.043	0.90	0.52	1.02
Shannon-Weaver Index (H)	--	0.90	0.541	0.140	1.04	0.00	1.56
Evenness (Shannon's Equitability E_H)	--	0.72	0.382	0.099	0.92	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	3	1.2	0.3	3	1	5
Evenness ($E^{H'}$/S)	--	0.90	0.124	0.032	0.94	0.62	1.00

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	4963	1999.5	516.3	5021	1212	8137
Oligochaeta	--	23	39.6	10.2	0	0	130
Hirudinea	--	3	11.2	2.9	0	0	43
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	--	2381	1199.5	309.7	2207	649	5194
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	15.2	3.9	0	0	43
Pisidiidae	--	834	596.0	153.9	822	130	2164
Gastropoda - unid	--	3	11.2	2.9	0	0	43
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	115	261.1	67.4	0	0	866
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	--	3364	1405.0	362.8	3722	866	5497
Non-Insecta (%)	68	--	--	--	--	--	--
Oligochaeta	--	23	39.6	10.2	0	0	130
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	2381	1199.5	309.7	2207	649	5194
Amphipoda (%)	48	--	--	--	--	--	--
Bivalvia	--	840	603.3	155.8	822	130	2207
Bivalvia (%)	17	--	--	--	--	--	--
Gastropoda	--	118	259.9	67.1	0	0	866
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	43	40.1	10.3	43	0	130
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

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	1423	928.7	239.8	1385	173	2684
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 8.5-3. – continued –

	Split Lake						
	Offshore n=15						
	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	--	61	96.5	24.9	0	0	303
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	--	17	35.8	9.3	0	0	130
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	--	32	62.2	16.1	0	0	216
Orthocladiinae	--	17	21.9	5.7	0	0	43
Tanypodinae	--	6	15.2	3.9	0	0	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	--	1599	993.9	256.6	1558	260	2857
Insecta (%)	32	--	--	--	--	--	--

Table 8.5-3. – continued –

	Split Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	55	79.2	20.5	43	0	303
Chironomidae (%)	1	--	--	--	--	--	--
Ephemeroptera	--	1423	928.7	239.8	1385	173	2684
Ephemeroptera (%)	29	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	78	113.6	29.3	43	0	303
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	1500	970.0	250.5	1385	260	2813
EPT (%)	30	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	13.10	16.599	4.286	7.00	0.00	56.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	6	1.5	0.4	6	4	8
Simpson's Diversity Index (D)	--	0.61	0.081	0.021	0.63	0.40	0.70
Evenness (Simpson's Equitability E_D)	--	0.46	0.115	0.030	0.45	0.33	0.68
Shannon-Weaver Index (H)	--	1.16	0.194	0.050	1.15	0.74	1.40
Evenness (Shannon’s Equitability E_H)	--	0.66	0.093	0.024	0.66	0.46	0.79
Hill's Effective Richness ($E^{H'}$)	--	3	0.6	0.2	3	2	4
Evenness ($E^{H'}$/S)	--	0.55	0.115	0.030	0.53	0.42	0.75

Table 8.5-4. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Stephens Lake-South within the Lower Nelson River Region for the CAMPP, 2009.

	Stephens Lake-South						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1653	868.9	224.4	1558	346	2900
Oligochaeta	--	17	39.4	10.2	0	0	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	--	3	11.2	2.9	0	0	43
Haustoriidae	--	3	11.2	2.9	0	0	43
Hyalellidae	--	55	177.3	45.8	0	0	693
Diplostraca	--	3	11.2	2.9	0	0	43
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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	6	15.2	3.9	0	0	43
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	17	48.5	12.5	0	0	173
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	9	33.5	8.7	0	0	130
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	--	115	266.6	68.8	43	0	1039
Non-Insecta (%)	7	--	--	--	--	--	--
Oligochaeta	--	17	39.4	10.2	0	0	130
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	61	187.8	48.5	0	0	736
Amphipoda (%)	4	--	--	--	--	--	--
Bivalvia	--	6	15.2	3.9	0	0	43
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	26	56.2	14.5	0	0	173
Gastropoda (%)	2	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	3	11.2	2.9	0	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

Table 8.5-4. – continued –

	Stephens Lake-South						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	9	24.3	6.3	0	0	87
Corixidae (adult)	--	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	--	6	15.2	3.9	0	0	43
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	--	29	53.4	13.8	0	0	173
Hexagenia	--	1298	863.0	222.8	1212	87	2640
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 8.5-4. – continued –

	Stephens Lake-South						
	Nearshore n=15						
	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	--	35	46.8	12.1	0	0	130
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	--	52	59.4	15.3	43	0	173
Orthocladiinae	--	14	26.7	6.9	0	0	87
Tanypodinae	--	92	102.0	26.3	43	0	303
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 8.5-4. – continued –

	Stephens Lake-South						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	1538	924.4	238.7	1515	303	2900
Insecta (%)	93	--	--	--	--	--	--
Chironomidae	--	159	139.5	36.0	130	0	476
Chironomidae (%)	10	--	--	--	--	--	--
Ephemeroptera	--	1333	838.0	216.4	1255	130	2684
Ephemeroptera (%)	81	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	35	46.8	12.1	0	0	130
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	1368	842.7	217.6	1255	216	2684
EPT (%)	83	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	9.32	15.215	3.928	6.00	0.00	62.00
Genus analysis of Ephemeroptera	3 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	15	4	2.0	0.5	3	1	8
Simpson's Diversity Index (D)	--	0.36	0.206	0.053	0.29	0.00	0.72
Evenness (Simpson's Equitability E_D)	--	0.45	0.225	0.058	0.35	0.23	1.00
Shannon-Weaver Index (H)	--	0.74	0.432	0.112	0.63	0.00	1.74
Evenness (Shannon's Equitability E_H)	--	0.49	0.252	0.065	0.43	0.00	0.89
Hill's Effective Richness ($E^{H'}$)	--	2	1.1	0.3	2	1	6
Evenness ($E^{H'}/S$)	--	0.55	0.209	0.054	0.45	0.35	1.00

Table 8.5-4. – continued –

	Stephens Lake-South						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	7794	3237.2	835.8	7098	2900	16015
Oligochaeta	--	81	103.3	26.7	43	0	303
Hirudinea	--	3	11.2	2.9	0	0	43
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	--	4755	2462.3	635.8	4155	1298	11080
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	11.2	2.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	101	139.5	36.0	87	0	476
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	--	4943	2428.9	627.1	4415	1558	11080
Non-Insecta (%)	63	--	--	--	--	--	--
Oligochaeta	--	81	103.3	26.7	43	0	303
Oligochaeta (%)	1	--	--	--	--	--	--
Amphipoda	--	4755	2462.3	635.8	4155	1298	11080
Amphipoda (%)	61	--	--	--	--	--	--
Bivalvia	--	101	139.5	36.0	87	0	476
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	--	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 8.5-4. – continued –

	Stephens Lake-South						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	1795	766.9	198.0	1731	606	3116
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 –

	Stephens Lake-South						
	Offshore n=15						
	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)	--	23	32.2	8.3	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	--	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)	--	14	35.3	9.1	0	0	130
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	9	24.3	6.3	0	0	87
Chironomidae (pupa)	--	6	22.4	5.8	0	0	87
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	130	98.2	25.3	87	0	346
Orthocladiinae	--	23	27.7	7.2	0	0	87
Tanypodinae	--	851	486.0	125.5	866	260	1731
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	--	2851	1190.3	307.3	2770	909	4934
Insecta (%)	37	--	--	--	--	--	--
Chironomidae	--	1019	581.6	150.2	952	303	2078
Chironomidae (%)	13	--	--	--	--	--	--
Ephemeroptera	--	1795	766.9	198.0	1731	606	3116

Table 8.5-4. – continued –

	Stephens Lake-South						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Ephemeroptera (%)	23	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	23	32.2	8.3	0	0	87
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	1818	776.0	200.4	1731	606	3203
EPT (%)	23	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.08	0.865	0.223	2.00	0.86	4.20
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	9	5	1.4	0.4	4	3	7
Simpson's Diversity Index (D)	--	0.55	0.110	0.028	0.54	0.35	0.74
Evenness (Simpson's Equitability E_D)	--	0.38	0.078	0.020	0.40	0.25	0.54
Shannon-Weaver Index (H)	--	1.07	0.253	0.065	0.96	0.66	1.55
Evenness (Shannon's Equitability E_H)	--	0.58	0.086	0.022	0.58	0.46	0.72
Hill's Effective Richness ($E^{H'}$)	--	3	0.8	0.2	3	2	5
Evenness ($E^{H'}$/S)	--	0.47	0.080	0.021	0.48	0.35	0.64

Table 8.5-5. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore and offshore sites in Stephens Lake-North within the Lower Nelson River Region for the CAMPP, 2009.

	Stephens Lake-North						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	765	444.3	114.7	649	260	1731
Oligochaeta	--	179	259.6	67.0	87	0	1039
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	--	12	44.7	11.5	0	0	173
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	38	81.6	21.1	0	0	260
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	15.2	3.9	0	0	43
Bivalvia - unid	--	0	0.0	0.0	0	0	0
Unionidae	--	0	0.0	0.0	0	0	0
Pisidiidae	--	141	217.9	56.3	43	0	649
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	3	11.2	2.9	0	0	43
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	11.2	2.9	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	--	381	430.1	111.1	130	43	1212
Non-Insecta (%)	50	--	--	--	--	--	--
Oligochaeta	--	179	259.6	67.0	87	0	1039
Oligochaeta (%)	23	--	--	--	--	--	--
Amphipoda	--	49	104.6	27.0	0	0	303
Amphipoda (%)	6	--	--	--	--	--	--
Bivalvia	--	141	217.9	56.3	43	0	649
Bivalvia (%)	18	--	--	--	--	--	--
Gastropoda	--	6	15.2	3.9	0	0	43
Gastropoda (%)	1	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	23	32.2	8.3	0	0	87
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 8.5-5. – continued –

	Stephens Lake-North						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	9	17.9	4.6	0	0	43
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	11.2	2.9	0	0	43
Hexagenia	--	118	110.3	28.5	87	0	303
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 8.5-5. – continued –

	Stephens Lake-North						
	Nearshore n=15						
	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	--	20	48.7	12.6	0	0	173
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	--	6	15.2	3.9	0	0	43
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	19.8	5.1	0	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)	--	3	11.2	2.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	55	88.8	22.9	43	0	346
Orthocladiinae	--	17	27.4	7.1	0	0	87
Tanypodinae	--	118	80.9	20.9	130	0	260
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 8.5-5. – continued –

	Stephens Lake-North						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Insecta	--	384	202.9	52.4	346	130	693
Insecta (%)	50	--	--	--	--	--	--
Chironomidae	--	193	123.4	31.9	173	43	519
Chironomidae (%)	25	--	--	--	--	--	--
Ephemeroptera	--	130	109.7	28.3	87	0	303
Ephemeroptera (%)	17	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	26	51.2	13.2	0	0	173
Trichoptera (%)	3	--	--	--	--	--	--
EPT	--	156	132.7	34.3	130	0	476
EPT (%)	20	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.96	0.894	0.231	1.00	0.00	3.00
Genus analysis of Ephemeroptera	3 spp. (Dominant: *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	14	5	1	0.4	5.0	3	8
Simpson's Diversity Index (D)	--	0.73	0.081	0.021	0.72	0.59	0.85
Evenness (Simpson's Equitability E_D)	--	0.70	0.185	0.048	0.71	0.41	1.04
Shannon-Weaver Index (H)	--	1.49	0.276	0.071	1.55	0.96	1.99
Evenness (Shannon’s Equitability E_H)	--	0.86	0.091	0.023	0.88	0.67	1.00
Hill's Effective Richness ($E^{H'}$)	--	5	1	0.3	4.7	3	7
Evenness ($E^{H'}$/S)	--	0.80	0.134	0.035	0.82	0.55	1.00

Table 8.5-5. – continued –

	Stephens Lake-North						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	1570	667.0	172.2	1645	736	2857
Oligochaeta	--	274	296.6	76.6	173	43	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	--	3	11.2	2.9	0	0	43
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	--	17	21.9	5.7	0	0	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	--	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	--	294	297.7	76.9	216	43	1082
Non-Insecta (%)	19	--	--	--	--	--	--
Oligochaeta	--	274	296.6	76.6	173	43	1082
Oligochaeta (%)	17	--	--	--	--	--	--
Amphipoda	--	3	11.2	2.9	0	0	43
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	17	21.9	5.7	0	0	43
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	--	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 8.5-5. – continued –

	Stephens Lake-North						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	27.7	7.2	0	0	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 8.5-5. – continued –

	Stephens Lake-North						
	Offshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	0	0.0	0.0	0	0	0
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1157	515.4	133.1	1298	303	1948
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	92	79.9	20.6	87	0	303
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	--	1275	506.0	130.7	1428	519	1991
Insecta (%)	81	--	--	--	--	--	--
Chironomidae	--	1252	499.3	128.9	1428	476	1991
Chironomidae (%)	80	--	--	--	--	--	--
Ephemeroptera	--	23	27.7	7.2	0	0	87

Table 8.5-5. – continued –

	Stephens Lake-North						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
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	27.7	7.2	0	0	87
EPT (%)	1	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.02	0.027	0.007	0.00	0.00	0.09
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	5	3	0.6	0.2	3	2	4
Simpson's Diversity Index (D)	--	0.40	0.155	0.040	0.40	0.17	0.66
Evenness (Simpson's Equitability E_D)	--	0.47	0.171	0.044	0.45	0.30	0.98
Shannon-Weaver Index (H)	--	0.75	0.249	0.064	0.72	0.39	1.26
Evenness (Shannon's Equitability E_H)	--	0.56	0.186	0.048	0.56	0.28	0.99
Hill's Effective Richness ($E^{H'}$)	--	2	0.6	0.1	2	1	4
Evenness ($E^{H'}$/S)	--	0.57	0.158	0.041	0.55	0.37	0.99

Table 8.5-6. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore (rock baskets) sites in the Lower Nelson River (downstream of Limestone Forebay) within the Lower Nelson River Region for the CAMPP, 2009.

	Lower Nelson River						
	Rock Basket, August n=20						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	33418	25300.7	5657.4	24543	8517	99590
Oligochaeta	--	69	184.1	41.2	0	0	757
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
Gammaridae	--	0	0.0	0.0	0	0	0
Haustoriidae	--	2	7.1	1.6	0	0	32
Hyalellidae	--	0	0.0	0.0	0	0	0
Diplostraca	--	0	0.0	0.0	0	0	0
Mysidacea	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Acarina	--	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	--	33	65.1	14.6	0	0	252
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	13	56.4	12.6	0	0	252
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
Non-Insecta	--	117	293.8	65.7	0	0	1262
Non-Insecta (%)	0	--	--	--	--	--	--
Oligochaeta	--	69	184.1	41.2	0	0	757
Oligochaeta (%)	0	--	--	--	--	--	--
Amphipoda	--	2	7.1	1.6	0	0	32
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	33	65.1	14.6	0	0	252
Bivalvia (%)	0	--	--	--	--	--	--
Gastropoda	--	13	56.4	12.6	0	0	252
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	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
Coleoptera	--	0	0.0	0.0	0	0	0
Dytiscidae	--	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

Table 8.5-6. – continued –

	Lower Nelson River						
	Rock Basket, August n=20						
	Count	Mean	SD	SE	Median	Min	Max
Haliplidae	--	0	0.0	0.0	0	0	0
Hydrophilidae (adult)	--	0	0.0	0.0	0	0	0
Hemiptera	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid (larva)	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid (pupa)	--	0	0.0	0.0	0	0	0
Baetidae - unid	--	0	0.0	0.0	0	0	0
Acerpenna sp.	--	16	34.7	7.8	0	0	126
Baetis sp.	--	28	65.5	14.6	0	0	252
Paracloeodes sp.	--	0	0.0	0.0	0	0	0
Pseudocloeon sp.	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis sp.	--	0	0.0	0.0	0	0	0
Emphemerellidae - unid	--	0	0.0	0.0	0	0	0
Ephemerella sp.	--	0	0.0	0.0	0	0	0
Eurylophella sp.	--	0	0.0	0.0	0	0	0
Serratella sp.	--	0	0.0	0.0	0	0	0
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera sp.	--	0	0.0	0.0	0	0	0
Hexagenia sp.	--	0	0.0	0.0	0	0	0
Heptageniidae - unid	--	27	77.5	17.3	0	0	252
Heptagenia sp.	--	0	0.0	0.0	0	0	0
Rhithrogena	--	2	7.1	1.6	0	0	32
Stenacron sp.	--	0	0.0	0.0	0	0	0
Stenonema sp.	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes sp.	--	0	0.0	0.0	0	0	0
Leptophlebiidae - unid	--	0	0.0	0.0	0	0	0
Leptophlebia sp.	--	0	0.0	0.0	0	0	0
Paraleptophlebia sp.	--	0	0.0	0.0	0	0	0
Siphlonuridae	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	6	28.2	6.3	0	0	126
Chloroperlidae	--	0	0.0	0.0	0	0	0
Nemouridae	--	0	0.0	0.0	0	0	0
Perlidae	--	11	21.2	4.7	0	0	63
Perlodidae	--	30	58.3	13.0	0	0	189
Pteronarcyidae	--	14	21.7	4.8	0	0	63
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
Hydropsychidae (larva)	--	31298	23649.6	5288.2	23659	8454	91893
Hydropsychidae (pupa)	--	0	0.0	0.0	0	0	0
Hydroptilidae	--	0	0.0	0.0	0	0	0
Lepidostomatidae (larva)	--	27	77.5	17.3	0	0	252
Lepidostomatidae (pupa)	--	0	0.0	0.0	0	0	0
Leptoceridae	--	19	58.3	13.0	0	0	252
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	0	0.0	0.0	0	0	0
Philopotamidae	--	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

Table 8.5-6. – continued –

	Lower Nelson River						
	Rock Basket, August n=20						
	Count	Mean	SD	SE	Median	Min	Max
Diptera	--	0	0.0	0.0	0	0	0
Ceratopogonidae	--	76	203.3	45.4	0	0	883
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	32	63.9	14.3	0	0	252
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1016	1318.9	294.9	315	0	4795
Orthocladiinae	--	544	643.2	143.8	284	0	2303
Tanypodinae	--	39	98.6	22.1	0	0	379
Empididae	--	3	14.1	3.2	0	0	63
Muscidae	--	0	0.0	0.0	0	0	0
Simuliidae (adult)	--	3	14.1	3.2	0	0	63
Simuliidae (pupa)	--	5	15.4	3.5	0	0	63
Simuliidae (larva)	--	101	123.1	27.5	95	0	505
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae	--	5	21.2	4.7	0	0	95
Insecta	--	33301	25095.5	5611.5	24511	8517	98328
Insecta (%)	100	--	--	--	--	--	--
Chironomidae	--	1631	1707.1	381.7	773	63	5678
Chironomidae (%)	5	--	--	--	--	--	--
Ephemeroptera	--	73	89.9	20.1	47	0	252
Ephemeroptera (%)	0	--	--	--	--	--	--
Plecoptera	--	62	94.6	21.2	32	0	379
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	31344	23745.9	5309.7	23707	8454	92397
Trichoptera (%)	94	--	--	--	--	--	--
EPT	--	31478	23839.0	5330.6	23722	8454	92776
EPT (%)	94	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	61.70	63.151	14.121	35.41	5.44	219.50
Genus analysis of Ephemeroptera		3 spp. (Dominant: *Baetis*)					
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	17	6	2.7	0.6	5	2	12
Simpson's Diversity Index (D)	--	0.10	0.091	0.020	0.07	0.01	0.29
Evenness (Simpson's Equitability E_D)	--	0.20	0.121	0.027	0.17	0.08	0.51
Shannon-Weaver Index (H)	--	0.27	0.194	0.043	0.21	0.03	0.63
Evenness (Shannon's Equitability E_H)	--	0.13	0.078	0.017	0.11	0.05	0.29
Hill's Effective Richness ($E^{H'}$)	--	1	0.3	0.1	1	1	2
Evenness ($E^{H'}/S$)	--	0.23	0.117	0.026	0.19	0.11	0.52

Table 8.5-7. Summary statistics and taxonomic results of benthic invertebrate samples collected at nearshore (rock baskets) sites in the Hayes River within the Lower Nelson River Region for the CAMPP, 2009.

	Hayes River						
	Rock Basket, August n=18						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	2213	2189.0	516.0	1719	63	9432
Oligochaeta	--	517	1848.7	435.7	0	0	7886
Hirudinea	--	2	7.4	1.8	0	0	32
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	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
Mysidacea	--	0	0.0	0.0	0	0	0
Decapoda	--	0	0.0	0.0	0	0	0
Acarina	--	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	--	12	30.9	7.3	0	0	126
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	--	4	14.9	3.5	0	0	63
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
Non-Insecta	--	535	1844.9	434.9	32	0	7886
Non-Insecta (%)	24	--	--	--	--	--	--
Oligochaeta	--	517	1848.7	435.7	0	0	7886
Oligochaeta (%)	23	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	12	30.9	7.3	0	0	126
Bivalvia (%)	1	--	--	--	--	--	--
Gastropoda	--	4	14.9	3.5	0	0	63
Gastropoda (%)	0	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	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
Coleoptera	--	0	0.0	0.0	0	0	0
Dytiscidae	--	0	0.0	0.0	0	0	0
Elmidae (larva)	--	2	7.4	1.8	0	0	32
Elmidae (adult)	--	7	20.4	4.8	0	0	63
Haliplidae	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Hayes River						
	Rock Basket, August n=18						
	Count	Mean	SD	SE	Median	Min	Max
Hydrophilidae (adult)	--	2	7.4	1.8	0	0	32
Hemiptera	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid (larva)	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid (pupa)	--	0	0.0	0.0	0	0	0
Baetidae - unid	--	0	0.0	0.0	0	0	0
Acerpenna sp.	--	4	10.2	2.4	0	0	32
Baetis sp.	--	0	0.0	0.0	0	0	0
Paracloeodes sp.	--	0	0.0	0.0	0	0	0
Pseudocloeon sp.	--	0	0.0	0.0	0	0	0
Caenidae	--	0	0.0	0.0	0	0	0
Caenis sp.	--	11	18.7	4.4	0	0	63
Ephemerellidae - unid	--	0	0.0	0.0	0	0	0
Ephemerella sp.	--	0	0.0	0.0	0	0	0
Eurylophella sp.	--	0	0.0	0.0	0	0	0
Serratella sp.	--	33	45.2	10.7	16	0	158
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera sp.	--	0	0.0	0.0	0	0	0
Hexagenia sp.	--	0	0.0	0.0	0	0	0
Heptageniidae - unid	--	2	7.4	1.8	0	0	32
Heptagenia sp.	--	0	0.0	0.0	0	0	0
Rhithrogena	--	0	0.0	0.0	0	0	0
Stenacron sp.	--	0	0.0	0.0	0	0	0
Stenonema sp.	--	0	0.0	0.0	0	0	0
Leptohyphidae	--	0	0.0	0.0	0	0	0
Tricorythodes sp.	--	0	0.0	0.0	0	0	0
Leptophlebiidae - unid	--	0	0.0	0.0	0	0	0
Leptophlebia sp.	--	0	0.0	0.0	0	0	0
Paraleptophlebia sp.	--	2	7.4	1.8	0	0	32
Siphlonuridae	--	0	0.0	0.0	0	0	0
Plecoptera - unid	--	0	0.0	0.0	0	0	0
Chloroperlidae	--	4	14.9	3.5	0	0	63
Nemouridae	--	0	0.0	0.0	0	0	0
Perlidae	--	2	7.4	1.8	0	0	32
Perlodidae	--	35	32.3	7.6	32	0	126
Pteronarcyidae	--	70	123.2	29.0	32	0	505
Trichoptera (larva) - unid	--	0	0.0	0.0	0	0	0
Trichoptera (pupa) - unid	--	2	7.4	1.8	0	0	32
Brachycentridae	--	0	0.0	0.0	0	0	0
Dipseudopsidae	--	0	0.0	0.0	0	0	0
Hydropsychidae (larva)	--	535	261.1	61.6	568	0	1041
Hydropsychidae (pupa)	--	0	0.0	0.0	0	0	0
Hydroptilidae	--	0	0.0	0.0	0	0	0
Lepidostomatidae (larva)	--	0	0.0	0.0	0	0	0
Lepidostomatidae (pupa)	--	0	0.0	0.0	0	0	0
Leptoceridae	--	0	0.0	0.0	0	0	0
Limnephilidae	--	0	0.0	0.0	0	0	0
Molannidae	--	2	7.4	1.8	0	0	32
Philopotamidae	--	26	40.8	9.6	0	0	158
Phryganeidae	--	4	14.9	3.5	0	0	63
Polycentropodidae	--	53	98.6	23.2	16	0	315
Diptera	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Hayes River						
	Rock Basket, August n=18						
	Count	Mean	SD	SE	Median	Min	Max
Ceratopogonidae	--	174	644.4	151.9	0	0	2744
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	0	0.0	0.0	0	0	0
Chironomidae (pupa)	--	35	38.8	9.2	32	0	158
Chironomidae (larva)	--	4	14.9	3.5	0	0	63
Chironominae	--	147	171.1	40.3	95	0	662
Orthocladiinae	--	149	231.3	54.5	79	0	1009
Tanypodinae	--	93	82.7	19.5	79	0	221
Empididae	--	0	0.0	0.0	0	0	0
Muscidae	--	0	0.0	0.0	0	0	0
Simuliidae (adult)	--	0	0.0	0.0	0	0	0
Simuliidae (pupa)	--	5	16.2	3.8	0	0	63
Simuliidae (larva)	--	275	263.0	62.0	221	0	852
Tabanidae	--	0	0.0	0.0	0	0	0
Tipulidae	--	5	16.2	3.8	0	0	63
Insecta	--	1679	1231.9	290.4	1593	32	5994
Insecta (%)	76	--	--	--	--	--	--
Chironomidae	--	428	428.2	100.9	379	0	1987
Chironomidae (%)	19	--	--	--	--	--	--
Ephemeroptera	--	51	56.4	13.3	32	0	158
Ephemeroptera (%)	2	--	--	--	--	--	--
Plecoptera	--	110	131.7	31.1	47	0	505
Plecoptera (%)	5	--	--	--	--	--	--
Trichoptera	--	620	283.2	66.7	599	0	1356
Trichoptera (%)	28	--	--	--	--	--	--
EPT	--	782	356.3	84.0	868	0	1546
EPT (%)	35	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	2.47	1.592	0.356	2.38	0.00	6.13
Genus analysis of Ephemeroptera	5 spp. (Dominant: *Serratella*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	24	8	2.6	0.6	8	2	13
Simpson's Diversity Index (D)	--	0.70	0.134	0.030	0.74	0.30	0.87
Evenness (Simpson's Equitability E_D)	--	0.43	0.183	0.043	0.41	0.14	1.02
Shannon-Weaver Index (H)	--	1.62	0.416	0.093	1.69	0.69	2.33
Evenness (Shannon's Equitability E_H)	--	0.74	0.134	0.032	0.73	0.33	1.00
Hill's Effective Richness ($E^{H'}$)	--	5	2.0	0.4	5	2	10
Evenness ($E^{H'}$/S)	--	0.57	0.161	0.038	0.56	0.21	1.00

Table 8.5-8. 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, 2009.

	Assean Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	3310	1415.5	365.5	2640	952	5930
Oligochaeta	--	225	215.3	55.6	130	0	693
Hirudinea	--	3	11.2	2.9	0	0	43
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	--	32	62.2	16.1	0	0	216
Haustoriidae	--	14	26.7	6.9	0	0	87
Hyalellidae	--	144	177.5	45.8	43	0	433
Diplostraca	--	9	17.9	4.6	0	0	43
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	--	297	230.7	59.6	346	0	866
Gastropoda - unid	--	6	15.2	3.9	0	0	43
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	12	34.6	8.9	0	0	130
Lymnaeidae	--	20	36.1	9.3	0	0	87
Physidae	--	35	67.8	17.5	0	0	216
Planorbidae	--	0	0.0	0.0	0	0	0
Valvatidae	--	12	25.7	6.6	0	0	87
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	441.6	114.0	693	173	1558
Non-Insecta (%)	24	--	--	--	--	--	--
Oligochaeta	--	225	215.3	55.6	130	0	693
Oligochaeta (%)	7	--	--	--	--	--	--
Amphipoda	--	190	214.4	55.4	87	0	649
Amphipoda (%)	6	--	--	--	--	--	--
Bivalvia	--	297	230.7	59.6	346	0	866
Bivalvia (%)	9	--	--	--	--	--	--
Gastropoda	--	84	106.6	27.5	43	0	390
Gastropoda (%)	3	--	--	--	--	--	--
Megaloptera	--	0	0.0	0.0	0	0	0
Sialidae	--	156	79.8	20.6	173	0	303
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	--	3	11.2	2.9	0	0	43
Lepidoptera	--	0	0.0	0.0	0	0	0

Table 8.5-7. – continued –

	Assean Lake						
	Nearshore n=15						
	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)	--	3	11.2	2.9	0	0	43
Gyrinidae (adult)	--	0	0.0	0.0	0	0	0
Haliplidae (larva)	--	6	15.2	3.9	0	0	43
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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	9	24.3	6.3	0	0	87
Ephemerellidae	--	0	0.0	0.0	0	0	0
Eurylophella	--	3	11.2	2.9	0	0	43
Ephemeridae	--	0	0.0	0.0	0	0	0
Ephemera	--	46	68.4	17.7	43	0	260
Hexagenia	--	20	32.2	8.3	0	0	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

Table 8.5-7. – continued –

	Assean Lake						
	Nearshore n=15						
	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	--	3	11.2	2.9	0	0	43
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	31.9	8.2	0	0	87
Ceratopogonidae (adult)	--	0	0.0	0.0	0	0	0
Chaoboridae	--	0	0.0	0.0	0	0	0
Chironomidae (adult)	--	3	11.2	2.9	0	0	43
Chironomidae (pupa)	--	52	46.8	12.1	43	0	130
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	1910	1236.9	319.4	1515	606	4458
Orthocladiinae	--	12	25.7	6.6	0	0	87
Tanypodinae	--	251	171.0	44.1	216	43	606
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	--	2502	1353.0	349.3	1904	779	5367
Insecta (%)	76	--	--	--	--	--	--
Chironomidae	--	2228	1381.6	356.7	1731	736	5194

Table 8.5-7. – continued –

	Assean Lake						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae (%)	67	--	--	--	--	--	--
Ephemeroptera	--	78	78.8	20.3	87	0	260
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	--	78	78.8	20.3	87	0	260
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.06	0.078	0.020	0.02	0.00	0.21
Genus analysis of Ephemeroptera	4 spp. (Dominant: *Ephemera* + *Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	20	8	2.1	0.5	8	5	11
Simpson's Diversity Index (D)	--	0.62	0.154	0.040	0.58	0.41	0.83
Evenness (Simpson's Equitability E_D)	--	0.32	0.126	0.033	0.30	0.17	0.51
Shannon-Weaver Index (H)	--	1.47	0.383	0.099	1.40	0.92	2.06
Evenness (Shannon's Equitability E_H)	--	0.64	0.136	0.035	0.65	0.43	0.82
Hill's Effective Richness ($E^{H'}$)	--	5	1.8	0.5	4	2	8
Evenness ($E^{H'}$/S)	--	0.46	0.139	0.036	0.48	0.27	0.64

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	467	446.9	115.4	260	0	1645
Oligochaeta	--	98	106.6	27.5	87	0	346
Hirudinea	--	3	11.2	2.9	0	0	43
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	--	136	248.6	64.2	43	0	822
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	15.2	3.9	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	--	242	281.4	72.6	130	0	952
Non-Insecta (%)	52	--	--	--	--	--	--
Oligochaeta	--	98	106.6	27.5	87	0	346
Oligochaeta (%)	21	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	136	248.6	64.2	43	0	822
Bivalvia (%)	29	--	--	--	--	--	--
Gastropoda	--	6	15.2	3.9	0	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	--	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

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	--	12	25.7	6.6	0	0	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

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=15						
	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)	--	6	15.2	3.9	0	0	43
Chironomidae (larva)	--	0	0.0	0.0	0	0	0
Chironominae	--	133	151.2	39.0	87	0	519
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	75	68.4	17.7	43	0	173
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	--	225	204.5	52.8	173	0	693
Insecta (%)	48	--	--	--	--	--	--

Table 8.5-7. – continued –

	Assean Lake						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	214	207.9	53.7	130	0	693
Chironomidae (%)	46	--	--	--	--	--	--
Ephemeroptera	--	12	25.7	6.6	0	0	87
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	--	12	25.7	6.6	0	0	87
EPT (%)	2	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.10	0.267	0.069	0.00	0.00	1.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	1	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	6	3	1.1	0.3	3	0	4
Simpson's Diversity Index (D)	--	0.63	0.182	0.047	0.64	0.00	0.75
Evenness (Simpson's Equitability E_D)	--	0.76	0.262	0.068	0.86	0.00	1.00
Shannon-Weaver Index (H)	--	1.13	0.343	0.089	1.21	0.00	1.39
Evenness (Shannon's Equitability E_H)	--	0.85	0.248	0.064	0.94	0.00	1.00
Hill's Effective Richness ($E^{H'}$)	--	3	0.8	0.2	3	1	4
Evenness ($E^{H'}/S$)	--	0.82	0.253	0.065	0.92	0.00	1.00

Table 8.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Lower Nelson River Region waterbodies, 2009.

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	316492	6237800	27-Aug-09	26.00	3.2	4.5	14.0
Split Lake	GN-05	14	673559	6236207	22-Aug-09	27.00	2.8	3.7	16.0
Split Lake	GN-06	14	673487	6233791	21-Aug-09	27.17	2.4	3.9	16.0
Split Lake	GN-13	14	669910	6221792	20-Aug-09	25.50	4.6	5.8	16.0
Split Lake	GN-15	14	657459	6221683	18-Aug-09	25.33	4.5	3.0	12.0
Split Lake	GN-18	14	669466	6225217	19-Aug-09	22.50	3.4	3.9	16.0
Split Lake	GN-20	14	682951	6236532	27-Aug-09	24.63	10.2	8.3	14.0
Split Lake	GN-21	14	675199	6233925	21-Aug-09	26.17	7.1	9.7	16.0
Split Lake	GN-22	14	677869	6232988	22-Aug-09	27.50	12.8	13.9	16.0
Split Lake	GN-26	14	670725	6225619	19-Aug-09	21.83	12.3	8.8	16.0
Split Lake	GN-28	14	657810	6221887	18-Aug-09	26.17	8.0	14.4	12.0
Split Lake	GN-29	14	670742	6221973	20-Aug-09	26.08	9.4	9.0	16.0
Split Lake	SN-03	15	316404	6237958	27-Aug-09	26.00	3.2	4.5	14.0
Split Lake	SN-06	14	673641	6233840	21-Aug-09	27.17	2.4	3.9	16.0
Split Lake	SN-20	14	683125	6236598	27-Aug-09	24.63	10.2	8.3	14.0
Split Lake	SN-26	14	670854	6225508	19-Aug-09	21.83	12.3	8.8	16.0
Stephens Lake-South	GN-13	15	397669	6249302	13-Sep-09	24.17	23.3	4.2	16.0
Stephens Lake-South	GN-14	15	397005	6248157	13-Sep-09	25.57	3.4	3.7	16.0
Stephens Lake-South	GN-15	15	397389	6251227	14-Sep-09	23.65	7.8	5.1	16.0
Stephens Lake-South	GN-16	15	395049	6252194	15-Sep-09	25.57	2.0	2.8	14.0
Stephens Lake-South	GN-17	15	392830	6246993	13-Sep-09	25.87	1.9	2.7	16.0
Stephens Lake-South	GN-22	15	387318	6246252	16-Sep-09	21.83	2.7	2.1	15.5
Stephens Lake-South	GN-30	15	368047	6246983	3-Sep-09	23.17	2.4	1.8	16.0
Stephens Lake-South	GN-32	15	369421	6247610	3-Sep-09	22.92	14.1	13.6	16.0
Stephens Lake-South	GN-33	15	370979	6246147	4-Sep-09	25.02	1.6	1.8	15.0
Stephens Lake-South	SN-14	15	396959	6248155	13-Sep-09	25.17	3.2	3.4	16.0
Stephens Lake-South	SN-22	15	387342	6246217	16-Sep-09	21.83	2.7	2.9	15.5
Stephens Lake-South	SN-32	15	369342	6247374	3-Sep-09	22.92	14.1	14.7	16.0
Stephens Lake-North	GN-01	15	359072	6265735	9-Sep-09	24.50	8.4	3.6	15.0
Stephens Lake-North	GN-02	15	358236	6264487	9-Sep-09	24.92	5.9	7.1	15.0
Stephens Lake-North	GN-04	15	362483	6264772	8-Sep-09	25.33	2.2	2.3	15.0
Stephens Lake-North	GN-05	15	359695	6262150	8-Sep-09	24.22	1.9	2.4	15.0
Stephens Lake-North	GN-09	15	364630	6259308	10-Sep-09	25.40	6.7	3.6	14.0
Stephens Lake-North	GN-26	15	369332	6252009	11-Sep-09	22.17	3.0	5.6	16.0
Stephens Lake-North	GN-31	15	367225	6248992	7-Sep-09	25.08	2.0	3.4	15.0
Stephens Lake-North	GN-34	15	368355	6249515	11-Sep-09	23.50	1.5	2.9	16.0
Stephens Lake-North	GN-35	15	370445	6249859	7-Sep-09	25.75	2.4	2.0	15.0
Stephens Lake-North	SN-04	15	362435	6264757	8-Sep-09	25.95	2.2	2.3	15.0
Stephens Lake-North	SN-09	15	364646	6259347	10-Sep-09	26.17	4.0	6.7	14.0
Stephens Lake-North	SN-34	15	368309	6249519	11-Sep-09	23.50	1.4	1.2	16.0

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	
Lower Nelson River	GN-01	15	443342	6271647	4-Aug-09	17.67	1.6	1.4	18.0
Lower Nelson River	GN-02	15	446438	6274299	4-Aug-09	18.25	3.5	1.3	18.0
Lower Nelson River	GN-03	15	445236	6273113	5-Aug-09	21.58	1.4	1.9	16.0
Lower Nelson River	GN-04	15	448025	6276627	5-Aug-09	22.67	1.5	3.0	16.0
Lower Nelson River	GN-05	15	447986	6277985	6-Aug-09	20.48	1.2	1.5	16.0
Lower Nelson River	GN-06	15	469755	6300802	6-Aug-09	18.62	4.1	1.8	17.0
Lower Nelson River	GN-07	15	468658	6298711	6-Aug-09	18.92	2.9	3.8	17.0
Lower Nelson River	GN-08	15	468165	6297143	7-Aug-09	22.70	1.0	3.0	17.0
Lower Nelson River	GN-09	15	462380	6290315	7-Aug-09	19.25	2.5	0.8	17.0
Lower Nelson River	GN-10	15	459744	6288723	7-Aug-09	23.93	6.9	2.6	17.0
Lower Nelson River	GN-11	15	461720	6290695	8-Aug-09	18.55	3.7	1.3	17.0
Lower Nelson River	GN-12	15	458077	6288020	8-Aug-09	14.68	2.8	4.0	17.0
Lower Nelson River	SN-03	15	445142	6272972	5-Aug-09	22.67	1.5	1.9	16.0
Lower Nelson River	SN-07	15	468643	6298696	6-Aug-09	19.00	1.4	2.9	17.0
Lower Nelson River	SN-09	15	462447	6290403	7-Aug-09	19.25	4.2	2.5	17.0
Lower Nelson River	SN-12	15	458048	6288003	8-Aug-09	14.83	1.8	2.8	17.0
Hayes River	GN-01	15	520063	6285866	23-Jul-09	18.97	1.4	2.5	20.0
Hayes River	GN-02	15	518546	6286221	23-Jul-09	20.80	3.3	1.1	20.0
Hayes River	GN-03	15	518457	6287073	24-Jul-09	24.90	1.6	3.0	20.0
Hayes River	GN-04	15	518670	6289393	24-Jul-09	23.82	1.4	1.5	20.0
Hayes River	GN-05	15	518657	6290826	25-Jul-09	23.17	1.0	1.3	19.5
Hayes River	GN-06	15	519938	6292346	25-Jul-09	22.25	1.9	2.0	19.5
Hayes River	GN-07	15	520309	6285048	26-Jul-09	25.25	3.5	3.6	19.0
Hayes River	GN-08	15	520066	6283803	26-Jul-09	24.58	3.3	3.1	19.0
Hayes River	GN-09	15	520848	6280210	27-Jul-09	22.52	2.8	2.2	19.0
Hayes River	SN-01	15	520179	6285734	23-Jul-09	20.68	1.5	1.2	20.0
Hayes River	SN-06	15	520053	6292440	25-Jul-09	21.65	2.6	3.0	19.5
Hayes River	SN-09	15	520719	6280464	27-Jul-09	22.18	2.7	2.4	19.0
Assean Lake	GN-01	14	659325	6234906	25-Aug-09	22.87	11.0	11.0	12.0
Assean Lake	GN-03	14	656723	6231966	25-Aug-09	23.58	2.7	3.0	12.0
Assean Lake	GN-04	14	659763	6231527	25-Aug-09	20.63	4.4	4.8	12.0
Assean Lake	GN-05	14	654404	6232902	26-Aug-09	24.98	5.8	6.5	12.0
Assean Lake	GN-06	14	654376	6228594	26-Aug-09	23.73	1.7	2.3	12.0
Assean Lake	GN-07	14	654215	6232630	26-Aug-09	26.38	5.4	2.9	12.0
Assean Lake	GN-08	14	664661	6238272	24-Aug-09	24.38	6.7	7.1	14.0
Assean Lake	GN-09	14	671128	6242106	24-Aug-09	27.47	2.2	4.4	14.0
Assean Lake	GN-10	14	673918	6245012	24-Aug-09	27.25	6.6	6.7	14.0
Assean Lake	SN-04	14	659937	6231583	25-Aug-09	20.63	4.4	4.8	12.0
Assean Lake	SN-06	14	654517	6228495	26-Aug-09	23.73	1.7	2.3	12.0
Assean Lake	SN-08	14	664782	6238387	24-Aug-09	24.38	6.7	7.1	14.0

Table 8.6-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Lower Nelson River Region waterbodies, 2009.

Family	Common Name	Scientific Name	ID Code
Petromyzontidae	Silver Lamprey	*Ichthyomyzon unicuspis*	SLLM
Acipenseridae	Lake Sturgeon	*Acipenser fulvescens*	LKST
Hiondontidae	Mooneye	*Hiodon tergisus*	MOON
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH
	Common Carp	*Cyprinus carpio*	CARP
	Emerald Shiner	*Notropis atherinoides*	EMSH
	Spottail Shiner	*Notropis heterolepis*	SPSH
	Longnose Dace	*Rhinichthys cataractae*	LNDC
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
Cottidae	Slimy Sculpin	*Cottus cognatus*	SLSC
Percidae	Yellow Perch	*Perca flavescens*	YLPR
	Sauger	*Sander canadensis*	SAUG
	Walleye	*Sander vitreus*	WALL

Table 8.6-3. Standard gang index gillnet relative abundance summaries from Lower Nelson River Region waterbodies, 2009.

Species	Split L		Stephens L - South		Stephens L - North		Lower Nelson R		Hayes R		Assean L	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Silver Lamprey	-	-	-	-	-	-	-	-	1	1.79	-	-
Lake Sturgeon	-	-	-	-	-	-	22	6.08	14	25.00	-	-
Mooneye	8	1.72	12	3.66	-	-	12	3.31	-	-	-	-
Common Carp	-	-	-	-	1	0.51	-	-	-	-	-	-
Longnose Sucker	10	2.15	-	-	-	-	125	34.53	10	17.86	-	-
White Sucker	97	20.86	15	4.57	5	2.53	31	8.56	7	12.50	70	15.59
Shorthead Redhorse	3	0.65	-	-	-	-	-	-	3	5.36	-	-
Northern Pike	58	12.47	74	22.56	77	38.89	82	22.65	2	3.57	66	14.70
Rainbow Smelt	9	1.94	12	3.66	8	4.04	8	2.21	-	-	-	-
Cisco	2	0.43	-	-	-	-	1	0.28	-	-	31	6.90
Lake Whitefish	10	2.15	6	1.83	10	5.05	21	5.80	1	1.79	40	8.91
Brook Trout	-	-	-	-	-	-	-	-	2	3.57	-	-
Troutperch	-	-	1	0.30	-	-	-	-	-	-	-	-
Burbot	9	1.94	-	-	-	-	2	0.55	-	-	-	-
Yellow Perch	2	0.43	-	-	-	-	-	-	-	-	5	1.11
Sauger	68	14.62	31	9.45	-	-	-	-	-	-	-	-
Walleye	189	40.65	177	53.96	97	48.99	58	16.02	16	28.57	237	52.78
Total	465	100	328	100	198	100	362	100	56	100	449	100

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

Table 8.6-4. Small mesh index gillnet relative abundance summaries from Lower Nelson River Region waterbodies, 2009.

Species	Split L		Stephens L - South		Stephens L - North		Lower Nelson R		Hayes R		Assean L	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Sturgeon	-	-	-	-	-	-	-	-	1	33.33	-	-
Lake Chub	14	4.73	-	-	-	-	22	20.00	1	33.33	-	-
Emerald Shiner	29	9.80	-	-	34	16.50	8	7.27	-	-	7	3.54
Spottail Shiner	86	29.05	31	23.85	87	42.23	8	7.27	-	-	96	48.48
Longnose Dace	-	-	-	-	-	-	-	-	1	33.33	-	-
Longnose Sucker	-	-	-	-	-	-	3	2.73	-	-	-	-
White Sucker	2	0.68	4	3.08	-	-	14	12.73	-	-	10	5.05
Northern Pike	6	2.03	-	-	3	1.46	-	-	-	-	6	3.03
Rainbow Smelt	104	35.14	45	34.62	66	32.04	16	14.55	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	1	0.51
Lake Whitefish	-	-	-	-	1	0.49	-	-	-	-	2	1.01
Troutperch	42	14.19	41	31.54	1	0.49	25	22.73	-	-	7	3.54
Slimy Sculpin	7	2.36	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	0.68	3	2.31	2	0.97	7	6.36	-	-	14	7.07
Sauger	1	0.34	5	3.85	-	-	-	-	-	-	-	-
Walleye	3	1.01	1	0.77	12	5.83	7	6.36	-	-	55	27.78
Total	296	100	130	100	206	100	110	100	3	100	198	100

Table 8.6-5. Standard gang index gillnet biomass summaries from Lower Nelson River Region waterbodies, 2009.

Species	Split L			Stephens L - South			Stephens L - North			Lower Nelson R			Hayes R			Assean L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-	1	20	0.04	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-	22	61485	14.9	14	12340	26.82	-	-	-
Mooneye	8	2050	0.49	12	4600	1.11	-	-	-	12	3910	0.95	-	-	-	-	-	-
Common Carp	-	-	-		-	-	1	3310	1.18	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	11475	2.75		-	-	-	-	-	125	67660	16.4	10	2690	5.85	-	-	-
White Sucker	97	104845	25.10	15	17590	4.23	5	6593	2.36	31	25350	6.14	7	5180	11.26	70	66296	21.18
Shorthead Redhorse	3	975	0.23		-	-	-	-	-	-	-	-	3	1610	3.50	-	-	-
Northern Pike	58	78625	18.83	74	116385	28	77	114400	40.94	82	167957	40.7	2	3840	8.35	66	88055	28.13
Rainbow Smelt	9	63	0.02	11	75	0.02	8	71	0.03	8	66	0.02	-	-	-	-	-	-
Cisco	2	1200	0.29		-	-	-	-	-	1	190	0.05	-	-	-	31	2990	0.96
Lake Whitefish	10	24350	5.83	6	15170	3.65	10	21690	7.76	21	25638	6.21	1	730	1.59	40	25653	8.2
Brook Trout	-	-	-		-	-	-	-	-	-	-	-	2	2360	5.13	-	-	-
Troutperch	-	-	-	1	8	0	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	2650	0.63		-	-	-	-	-	2	1180	0.29	-	-	-	-	-	-
Yellow Perch	2	375	0.09		-	-	-	-	-	-	-	-	-	-	-	5	635	0.2
Sauger	68	36170	8.66	31	19090	4.59	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	189	154880	37.08	177	242684	58.39	97	133402	47.73	58	59218	14.35	16	17240	37.47	237	129396	41.34
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	465	417658	100	327	415602	100	198	279466	100	362	412654	100	56	46010	100	449	313025	100

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

Table 8.6-6. Small mesh index gillnet biomass summaries from Lower Nelson River Region waterbodies, 2009.

Species	Split L			Stephens L - South			Stephens L - North			Lower Nelson R			Hayes R			Assean L		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-	1	470	86.88	-	-	-
Lake Chub	14	154	1.95	-	-	-	-	-	-	22	361	31.64	1	39	7.21	-	-	-
Emerald Shiner	29	126	1.59	-	-	-	34	155	1.004	8	41	3.593	-	-	-	7	20	0.09
Spottail Shiner	86	411	5.2	31	146	3.34	87	418	2.707	8	17	1.49	-	-	-	96	542	2.49
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-	1	32	5.91	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	3	57	4.996	-	-	-	-	-	-
White Sucker	2	23	0.29	4	33	0.75	-	-	-	14	162	14.2	-	-	-	10	69	0.32
Northern Pike	6	4960	62.74	-	-	-	3	3490	22.61	-	-	-	-	-	-	6	4710	21.62
Rainbow Smelt	104	817	10.33	45	363	8.3	66	638	4.132	16	107	9.378	-	-	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	29	0.13
Lake Whitefish	-	-	-	-	-	-	1	36	0.233	-	-	-	-	-	-	2	160	0.73
Troutperch	42	273	3.45	41	164	3.75	1	3	0.019	25	148	12.97	-	-	-	7	37	0.17
Slimy Sculpin	7	22	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	43	0.54	3	36	0.82	2	10	0.065	7	60	5.259	-	-	-	14	123	0.56
Sauger	1	900	11.38	5	2130	48.72	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	3	177	2.24	1	1500	34.31	12	10689	69.23	7	188	16.48	-	-	-	55	16100	73.89
Total	296	7906	100	130	4372	100	206	15439	100	110	1141	100	3	541	100	198	21790	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = 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, 2009.

Species	Split L (# sites = 12)			Stephens L - South (# sites = 9)			Stephens L - North (# sites = 9)			Lower Nelson R (# sites = 12)			Hayes R (# sites = 9)			Assean L (# sites = 9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-	-	-	-	1	0.1	0.30	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-	22	2.0	1.78	14	1.6	3.60	-	-	-
Mooneye	8	0.6	1.34	12	1.2	3.62	-	-	-	12	1.3	2.55	-	-	-	-	-	-
Common Carp	-	-	-	-	-	-	1	0.1	0.30	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	0.7	1.35	-	-	-	-	-	-	125	11.2	10.49	10	1.0	1.05	-	-	-
White Sucker	97	6.6	4.70	15	1.5	2.04	5	0.5	0.62	31	2.6	3.29	7	0.7	0.75	70	6.5	5.10
Shorthead Redhorse	3	0.2	0.51	-	-	-	-	-	-	-	-	-	3	0.3	0.69	-	-	-
Northern Pike	58	4.0	3.67	74	7.1	6.43	77	7.3	3.61	82	6.9	9.56	2	0.2	0.42	66	6.2	3.65
Rainbow Smelt	9	0.6	0.95	12	1.2	1.49	8	0.8	0.90	8	0.7	2.52	-	-	-	-	-	-
Cisco	2	0.1	0.31	-	-	-	-	-	-	1	0.1	0.27	-	-	-	31	2.8	4.23
Lake Whitefish	10	0.7	0.90	6	0.6	0.83	10	1.0	1.56	21	1.8	2.08	1	0.1	0.30	40	3.8	5.12
Brook Trout	-	-	-	-	-	-	-	-	-	-	-	-	2	0.2	0.60	-	-	-
Troutperch	-	-	-	1	0.1	0.32	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	0.6	1.29	-	-	-	-	-	-	2	0.2	0.39	-	-	-	-	-	-
Yellow Perch	2	0.1	0.33	-	-	-	-	-	-	-	-	-	-	-	-	5	0.5	0.60
Sauger	68	4.5	6.11	31	3.1	8.14	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	189	13.0	20.42	177	17.0	23.16	97	9.6	11.05	58	5.2	6.79	16	1.6	1.65	237	22.9	23.08
Total	465	31.7	20.15	328	31.7	25.36	198	19.2	12.17	362	32.0	12.13	56	5.9	6.33	449	42.7	19.36

#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, 2009.

Species	Split Lake (# sites = 4)			Stephens Lake-South (# sites = 3)			Stephens Lake-North (# sites = 3)			Lower Nelson River (# sites = 4)			Hayes River (# sites = 3)			Assean Lake (# sites = 3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	0.68	-	-	-
Lake Chub	14	3.2	6.46	-	-	-	-	-	-	22	8.8	16.79	1	0.4	0.68	-	-	-
Emerald Shiner	29	6.8	12.14	-	-	-	34	11.6	20.05	8	3.2	6.47	-	-	-	7	2.3	3.98
Spottail Shiner	86	19.7	32.24	31	10.3	10.03	87	27.6	19.71	8	2.5	3.53	-	-	-	96	34.3	14.12
Longnose Dace	-	-	-	-	-	-	-	-	-	-	-	-	1	0.4	0.68	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	3	1.2	2.43	-	-	-	-	-	-
White Sucker	2	0.5	0.92	4	1.3	2.20	-	-	-	14	4.9	4.09	-	-	-	10	3.5	3.45
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	6	1.3	1.70	-	-	-	3	1.0	0.06	-	-	-	-	-	-	6	2.1	1.04
Rainbow Smelt	104	24.1	14.91	45	15.4	13.36	66	21.3	14.39	16	5.5	6.70	-	-	-	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3	0.57
Lake Whitefish	-	-	-	-	-	-	1	0.3	0.53	-	-	-	-	-	-	2	0.7	1.17
Troutperch	42	9.7	8.92	41	13.6	12.66	1	0.3	0.59	25	8.6	7.38	-	-	-	7	2.3	2.06
Slimy Sculpin	7	1.7	2.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	0.5	0.92	3	1.1	1.10	2	0.6	1.07	7	2.2	4.36	-	-	-	14	4.9	0.95
Sauger	1	0.2	0.44	5	1.6	2.75	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	3	0.7	0.89	1	0.4	0.63	12	4.0	3.77	7	2.2	4.36	-	-	-	55	19.2	17.58
Total	296	68.4	56.66	130	43.6	38.23	206	66.7	44.29	110	39.1	39.16	3	1.2	2.01	198	69.6	23.53

#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/30 m/24 h) set in Lower Nelson River Region waterbodies, 2009.

Species	Split L (# sites = 12)			Stephens L - South (# sites = 9)			Stephens Lake-North (# sites = 9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	-	-	-	-	-	-
Lake Sturgeon	-	-	-	-	-	-	-	-	-
Mooneye	8	141	338	12	463	1390	-	-	-
Common Carp	-	-	-	-	-	-	1	329	986
Longnose Sucker	10	812	1636	-	-	-	-	-	-
White Sucker	97	7115	4296	15	1707	2126	5	651	935
Shorthead Redhorse	3	66	166	-	-	-	-	-	-
Northern Pike	58	5513	4033	74	11130	9223	77	10830	7974
Rainbow Smelt	9	4	7	11	5	7	8	7	9
Cisco	2	79	225	-	-	-	-	-	-
Lake Whitefish	10	1646	2246	6	1473	2082	10	2142	3371
Brook Trout	-	-	-	-	-	-	-	-	-
Troutperch	-	-	-	1	1	3	-	-	-
Burbot	9	185	353	-	-	-	-	-	-
Yellow Perch	2	27	67	-	-	-	-	-	-
Sauger	68	2388	3137	31	1920	4865	-	-	-
Walleye	189	10658	18372	177	23327	30477	97	13241	15298
Total	465	28634	17118	327	40027	33628	198	27199	19241

#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 8.6-9. Continued.

Species	Lower Nelson R (# sites= 12)			Hayes R (# sites = 9)			Assean L (# sites = 9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Silver Lamprey	-	-	-	1	2	6	-	-	-
Lake Sturgeon	22	5542	6694	14	1362	2728	-	-	-
Mooneye	12	408	834	-	-	-	-	-	-
Common Carp	-	-	-	-	-	-	-	-	-
Longnose Sucker	125	6000	5942	10	269	282	-	-	-
White Sucker	31	2125	2870	7	523	595	70	6146	5452
Shorthead Redhorse	-	-	-	3	171	409	-	-	-
Northern Pike	82	14274	22096	2	400	795	66	8365	3832
Rainbow Smelt	8	6	21	-	-	-	-	-	-
Cisco	1	15	51	-	-	-	31	273	410
Lake Whitefish	21	2229	2717	1	77	230	40	2448	3766
Brook Trout	-	-	-	2	238	713	-	-	-
Troutperch	-	-	-	-	-	-	-	-	-
Burbot	2	99	237	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	5	61	77
Sauger	-	-	-	-	-	-	-	-	-
Walleye	58	5328	7200	16	1749	1686	237	12543	13323
Total	362	36027	22834	56	4790	5006	449	29836	11568

#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 (g/30 m/24 h) set in Lower Nelson River Region waterbodies, 2009.

Species	Split L (# sites = 4)			Stephens L - South (# sites = 3)			Stephens Lake-North (# sites = 3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Sturgeon	-	-	-	-	-	-	-	-	-
Lake Chub	14	36	71	-	-	-	-	-	-
Emerald Shiner	29	29	53	-	-	-	34	53	91
Spottail Shiner	86	94	156	31	49	48	87	131	121
Longnose Dace	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-
White Sucker	2	5	11	4	10	18	-	-	-
Northern Pike	6	1127	1409	-	-	-	3	1093	768
Rainbow Smelt	104	189	123	45	123	107	66	205	122
Cisco	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	1	11	19
Troutperch	42	63	54	41	55	46	1	1	2
Slimy Sculpin	7	5	9	-	-	-	-	-	-
Yellow Perch	2	10	20	3	13	15	2	3	5
Sauger	1	199	397	5	677	1173	-	-	-
Walleye	3	42	50	1	550	952	12	3524	3371
Total	296	1799	1869	130	1477	1291	206	5022	3169

#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 8.6-10. – continued –

Species	Lower Nelson R (# sites = 4)			Hayes R (# sites = 3)			Assean L (# sites = 3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Sturgeon	-	-	-	1	182	315	-	-	-
Lake Chub	22	145	281	1	15	26	-	-	-
Emerald Shiner	8	17	33	-	-	-	7	7	11
Spottail Shiner	8	5	6	-	-	-	96	194	90
Longnose Dace	-	-	-	1	12	21	-	-	-
Longnose Sucker	3	23	46	-	-	-	-	-	-
White Sucker	14	59	59	-	-	-	10	25	21
Northern Pike	-	-	-	-	-	-	6	1700	1336
Rainbow Smelt	16	38	44	-	-	-	-	-	-
Cisco	-	-	-	-	-	-	1	10	16
Lake Whitefish	-	-	-	-	-	-	2	54	93
Troutperch	25	51	40	-	-	-	7	12	16
Slimy Sculpin	-	-	-	-	-	-	-	-	-
Yellow Perch	7	19	37	-	-	-	14	42	20
Sauger	-	-	-	-	-	-	-	-	-
Walleye	7	59	117	-	-	-	55	5805	5238
Total	110	415	469	3	209	362	198	7849	5218

#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, 2009.

Species	Split L			Stephens L – South			Stephens L – North			Lower Nelson R			Hayes R			Assean L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)																		
Northern Pike	58	532	134	74	558	148	77	559	129	82	631	119	2	642	30	66	544	156
Lake Whitefish	10	498	40	6	486	82	10	475	64	21	423	34	1	364	-	40	323	74
Walleye	189	384	68	177	446	80	97	444	87	58	423	55	16	439	99	237	353	68
Weight (g)																		
Northern Pike	58	1356	1040	74	1573	1186	77	1486	1208	82	2048	1144	2	1920	311	66	1334	1354
Lake Whitefish	10	2435	585	6	2528	1193	10	2169	763	21	1221	347	1	730	-	40	641	545
Walleye	189	819	424	177	1371	682	97	1375	756	58	1021	372	16	1078	779	237	546	271
Condition Factor (K)																		
Northern Pike	58	0.76	0.07	74	0.76	0.08	77	0.74	0.10	82	0.74	0.09	2	0.72	0.02	66	0.65	0.08
Lake Whitefish	10	1.94	0.14	6	2.04	0.17	10	1.92	0.22	21	1.57	0.15	1	1.51	-	40	1.58	0.17
Walleye	189	1.32	0.12	177	1.40	0.10	97	1.40	0.11	58	1.28	0.10	16	1.11	0.12	237	1.12	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 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, 2009.

Species	Split L			Stephens L – South			Stephens L – North			Lower Nelson R			Hayes R			Assean L		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)																		
Northern Pike	-	-	-	-	-	-	3	530	143	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	1	133	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	1	483	-	12	366	124	7	132	32	-	-	-	-	-	-
Weight (g)																		
Northern Pike	6	827	-	-	-	-	3	1163	849	-	-	-	-	-	-	6	785	-
Lake Whitefish	-	-	-	-	-	-	1	36	-	-	-	-	-	-	-	2	80	-
Walleye	3	59	-	1	1500	-	12	891	542	7	27	23	-	-	-	-	-	-
Condition Factor (K)																		
Northern Pike	-	-	-	-	-	-	3	0.71	0.07	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	1	1.53	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	1	1.33	-	12	1.39	0.12	7	1.01	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 8.6-13. Age/year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2009.

Age	Year-Class	Split Lake		Stephens Lake South		Stephens Lake North		Lower Nelson River		Hayes River		Assean Lake	
		n	%	n	%	n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	1	1.85	4	5.56	1	1.30	2	2.44	-	-	3	4.55
3	2006	4	7.41	3	4.17	5	6.49	1	1.22	-	-	7	10.61
4	2005	6	11.11	7	9.72	15	19.48	11	13.41	-	-	3	4.55
5	2004	9	16.67	18	25.00	17	22.08	9	10.98	-	-	12	18.18
6	2003	11	20.37	8	11.11	7	9.09	17	20.73	-	-	11	16.67
7	2002	5	9.26	8	11.11	9	11.69	13	15.85	1	50.00	13	19.70
8	2001	4	7.41	9	12.50	8	10.39	14	17.07	-	-	2	3.03
9	2000	6	11.11	3	4.17	6	7.79	7	8.54	1	50.00	3	4.55
10	1999	3	5.56	4	5.56	2	2.60	3	3.66	-	-	5	7.58
11	1998	2	3.70	1	1.39	2	2.60	2	2.44	-	-	2	3.03
12	1997	2	3.70	4	5.56	2	2.60	2	2.44	-	-	2	3.03
13	1996	-	-	-	-	-	-	-	-	-	-	1	1.52
14	1995	1	1.85	1	1.39	1	1.30	1	1.22	-	-	-	-
15	1994	-	-	1	1.39	1	1.30	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	1	1.52
17	1992	-	-	1	1.39	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	1	1.30	-	-	-	-	1	1.52
Total		54	100	72	100	77	100	82	100	2	100	66	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, 2009.

Age	Year-Class	Split Lake		Stephens Lake South		Stephens Lake North		Lower Nelson River		Hayes River		Assean Lake	
		n	%	n	%	n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	-	4	10.26
4	2005	-	-	-	-	-	-	-	-	-	-	14	35.90
5	2004	-	-	1	16.67	-	-	-	-	-	-	9	23.08
6	2003	-	-	-	-	-	-	1	4.76	-	-	6	15.38
7	2002	1	10.00	-	-	1	11.11	-	-	-	-	3	7.69
8	2001	-	-	-	-	1	11.11	2	9.52	-	-	-	-
9	2000	-	-	1	16.67	-	-	1	4.76	-	-	-	-
10	1999	-	-	-	-	1	11.11	5	23.81	1	100.00	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	2	20.00	1	16.67	1	11.11	4	19.05	-	-	-	-
13	1996	1	10.00	-	-	-	-	3	14.29	-	-	-	-
14	1995	1	10.00	1	16.67	-	-	2	9.52	-	-	-	-
15	1994	-	-	-	-	1	11.11	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	3	7.69
17	1992	1	10.00	1	16.67	1	11.11	2	9.52	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	1	16.67	1	11.11	-	-	-	-	-	-
20	1989	4	40.00	-	-	-	-	1	4.76	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	1	11.11	-	-	-	-	-	-
26	1983	-	-	-	-	1	11.11	-	-	-	-	-	-
Total		10	100	6	100	9	100	21	100	1	100	39	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, 2009.

Age	Year-Class	Split Lake		Stephens Lake South		Stephens Lake North		Lower Nelson River		Hayes River		Assean Lake	
		n	%	n	%	n	%	n	%	n	%	n	%
1	2008	-	-	-	-	-	-	-	-	-	-	1	0.44
2	2007	1	0.54	1	0.56	-	-	-	-	-	-	1	0.44
3	2006	8	4.35	5	2.82	2	2.08	-	-	-	-	4	1.76
4	2005	10	5.43	3	1.69	1	1.04	-	-	-	-	20	8.81
5	2004	17	9.24	2	1.13	3	3.13	3	5.56	-	-	5	2.20
6	2003	19	10.33	9	5.08	2	2.08	4	7.41	3	20.00	5	2.20
7	2002	57	30.98	41	23.16	11	11.46	26	48.15	1	6.67	24	10.57
8	2001	36	19.57	30	16.95	18	18.75	5	9.26	1	6.67	36	15.86
9	2000	14	7.61	5	2.82	10	10.42	8	14.81	-	-	43	18.94
10	1999	3	1.63	4	2.26	2	2.08	2	3.70	-	-	27	11.89
11	1998	-	-	3	1.69	3	3.13	-	-	3	20.00	21	9.25
12	1997	4	2.17	4	2.26	8	8.33	2	3.70	4	26.67	25	11.01
13	1996	3	1.63	24	13.56	14	14.58	-	-	1	6.67	5	2.20
14	1995	2	1.09	7	3.95	6	6.25	3	5.56	-	-	6	2.64
15	1994	4	2.17	8	4.52	3	3.13	-	-	-	-	3	1.32
16	1993	1	0.54	3	1.69	1	1.04	-	-	-	-	-	-
17	1992	2	1.09	1	0.56	-	-	-	-	-	-	-	-
18	1991	1	0.54	1	0.56	1	1.04	1	1.85	-	-	-	-
19	1990	-	-	1	0.56	1	1.04	-	-	-	-	1	0.44
20	1989	-	-	4	2.26	-	-	-	-	-	-	-	-
21	1988	1	0.54	2	1.13	1	1.04	-	-	1	6.67	-	-
22	1987	1	0.54	4	2.26	1	1.04	-	-	-	-	-	-
23	1986	-	-	4	2.26	1	1.04	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	1	0.56	1	1.04	-	-	1	6.67	-	-
26	1983	-	-	5	2.82	3	3.13	-	-	-	-	-	-
27	1982	-	-	2	1.13	2	2.08	-	-	-	-	-	-
28	1981	-	-	2	1.13	-	-	-	-	-	-	-	-
29	1980	-	-	-	-	1	1.04	-	-	-	-	-	-
30	1979	-	-	1	0.56	-	-	-	-	-	-	-	-
Total		184	100	177	100	96	100	54	100	15	100	227	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, 2009.

Age	Year-Class	Split L									Stephens L - South								
		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	262	-	1	150	-	1	0.83	-	4	275	13	4	160	27	4	0.76	0.05
3	2006	4	370	15	4	400	41	4	0.79	0.05	3	318	23	3	233	61	3	0.72	0.11
4	2005	6	432	11	6	592	38	6	0.74	0.04	7	460	17	7	737	88	7	0.75	0.03
5	2004	9	460	40	9	761	145	9	0.78	0.10	18	469	31	18	809	144	18	0.78	0.08
6	2003	11	494	35	11	932	243	11	0.76	0.06	8	572	26	8	1348	193	8	0.72	0.04
7	2002	5	560	56	5	1380	497	5	0.76	0.03	8	582	29	8	1504	262	8	0.76	0.08
8	2001	4	637	43	4	1925	457	4	0.74	0.04	9	652	62	9	2059	491	9	0.74	0.10
9	2000	6	692	61	6	2388	872	6	0.69	0.12	3	638	45	3	1953	737	3	0.73	0.11
10	1999	3	729	56	3	2835	688	3	0.72	0.04	4	748	54	4	3358	653	4	0.80	0.15
11	1998	2	781	71	2	3700	1131	2	0.77	0.02	1	785	-	1	3820	-	1	0.79	-
12	1997	2	691	129	2	2895	1351	2	0.86	0.06	4	803	36	4	4070	161	4	0.79	0.09
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	1	735	-	1	3500	-	1	0.88	-	1	825	-	1	3640	-	1	0.65	-
15	1994	-	-	-	-	-	-	-	-	-	1	795	-	1	4520	-	1	0.90	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	1	919	-	1	4540	-	1	0.58	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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	Stephens L - North									Lower Nelson R								
		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	277	-	1	250	-	1	1.18	-	2	346	52	2	395	191	2	0.91	0.04
3	2006	5	388	23	5	464	66	5	0.79	0.10	1	497	-	1	800	-	1	0.65	-
4	2005	15	472	48	15	843	272	15	0.78	0.06	11	481	51	11	907	252	11	0.80	0.10
5	2004	17	493	35	17	886	183	17	0.73	0.05	9	559	80	9	1372	555	9	0.75	0.05
6	2003	7	560	57	7	1340	449	7	0.74	0.05	17	604	44	17	1561	444	17	0.70	0.09
7	2002	9	586	40	9	1454	404	9	0.71	0.06	13	662	61	13	2174	637	13	0.73	0.07
8	2001	8	623	74	8	1715	507	8	0.70	0.11	14	706	64	14	2649	729	14	0.73	0.07
9	2000	6	674	30	6	2170	319	6	0.71	0.10	7	742	81	7	3041	930	7	0.72	0.06
10	1999	2	691	30	2	1915	870	2	0.57	0.19	3	703	64	3	2597	1079	3	0.72	0.14
11	1998	2	749	18	2	3125	35	2	0.75	0.05	2	810	14	2	4050	113	2	0.77	0.06
12	1997	2	828	138	2	3810	1711	2	0.65	0.03	2	843	16	2	4205	7	2	0.71	0.04
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	1	921	-	1	6920	-	1	0.89	-	1	845	-	1	6577	-	1	1.09	-
15	1994	1	745	-	1	3500	-	1	0.85	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	1	975	-	1	6800	-	1	0.73	-	-	-	-	-	-	-	-	-	-

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	Hayes R									Assean 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	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	3	310	7	3	207	12	3	0.70	0.08
3	2006	-	-	-	-	-	-	-	-	-	7	362	24	7	309	46	7	0.65	0.05
4	2005	-	-	-	-	-	-	-	-	-	3	397	89	3	430	252	3	0.65	0.15
5	2004	-	-	-	-	-	-	-	-	-	12	456	51	12	636	190	12	0.66	0.08
6	2003	-	-	-	-	-	-	-	-	-	11	523	50	11	890	262	11	0.61	0.06
7	2002	1	621	-	1	1700	-	1	0.71	-	13	572	48	13	1205	330	13	0.63	0.05
8	2001	-	-	-	-	-	-	-	-	-	2	663	119	2	2255	1549	2	0.70	0.14
9	2000	1	663	-	1	2140	-	1	0.73	-	3	655	100	3	2083	1121	3	0.69	0.06
10	1999	-	-	-	-	-	-	-	-	-	5	713	72	5	2422	923	5	0.65	0.14
11	1998	-	-	-	-	-	-	-	-	-	2	706	37	2	2485	375	2	0.71	0.01
12	1997	-	-	-	-	-	-	-	-	-	2	722	1	2	2375	35	2	0.63	0.01
13	1996	-	-	-	-	-	-	-	-	-	1	900	-	1	5400	-	1	0.74	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	1	882	-	1	5150	-	1	0.75	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	1	1080	-	1	7750	-	1	0.62	-

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, 2009.

Age	Year-Class	Split Lake									Stephens Lake-South								
		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	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-	1	360	-	1	830	-	1	1.78	-
6	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	1	433	-	1	1350	-	1	1.66	-	-	-	-	-	-	-	-	-	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	1	484	-	1	2300	-	1	2.03	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	2	471	28	2	2025	247	2	1.95	0.11	1	494	-	1	2500	-	1	2.07	-
13	1996	1	474	-	1	2250	-	1	2.11	-	-	-	-	-	-	-	-	-	-
14	1995	1	540	-	1	2800	-	1	1.78	-	1	560	-	1	3950	-	1	2.25	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	1	525	-	1	3000	-	1	2.07	-	1	435	-	1	1790	-	1	2.17	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	1	582	-	1	3800	-	1	1.93	-
20	1989	4	517	33	4	2725	479	4	1.96	0.07	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	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 8.6-17. – continued –

Age	Year-Class	Stephens Lake-North									Lower Nelson River								
		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	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	2003	-	-	-	-	-	-	-	-	-	1	350	-	1	550	-	1	1.28	-
7	2002	1	380	-	1	910	-	1	1.66	-	-	-	-	-	-	-	-	-	-
8	2001	1	350	-	1	700	-	1	1.63	-	2	393	29	2	930	212	2	1.53	0.01
9	2000	-	-	-	-	-	-	-	-	-	1	395	-	1	960	-	1	1.56	-
10	1999	1	520	-	1	2760	-	1	1.96	-	5	403	15	5	996	170	5	1.51	0.17
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	1	490	-	1	2400	-	1	2.04	-	4	432	32	4	1392	355	4	1.70	0.17
13	1996	-	-	-	-	-	-	-	-	-	3	455	1	3	1490	60.0	3	1.58	0.05
14	1995	-	-	-	-	-	-	-	-	-	2	448	8	2	1495	205	2	1.66	0.13
15	1994	1	500	-	1	2400	-	1	1.92	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	1	532	-	1	2630	-	1	1.75	-	2	451	41	2	1425	530	2	1.52	0.16
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	1	540	-	1	2930	-	1	1.86	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	1	450	-	1	1410	-	1	1.55	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	1	515	-	1	2600	-	1	1.90	-	-	-	-	-	-	-	-	-	-
26	1983	1	448	-	1	2010	-	1	2.24	-	-	-	-	-	-	-	-	-	-

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	Hayes River FL (mm)			Hayes River W (g)			Hayes River K			Assean Lake FL (mm)			Assean Lake W (g)			Assean Lake K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	4	237	31	4	223	71	4	1.66	0.30
4	2005	-	-	-	-	-	-	-	-	-	14	276	29	14	325	99	14	1.50	0.11
5	2004	-	-	-	-	-	-	-	-	-	9	320	26	9	515	125	9	1.55	0.17
6	2003	-	-	-	-	-	-	-	-	-	6	367	38	6	846	310	6	1.65	0.12
7	2002	-	-	-	-	-	-	-	-	-	3	400	29	3	1075	261	3	1.66	0.18
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1999	1	364	-	1	730	-	1	1.51	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	3	501	14	3	2233	104	3	1.78	0.10
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	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 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, 2009.

Age	Year-Class	Split Lake									Stephens Lake-South								
		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	269	-	1	225	-	1	1.16	-	1	205	-	1	96.0	-	1	1.11	-
3	2006	8	236	17	8	181	29	8	1.38	0.13	5	230	15	5	158	31	5	1.30	0.13
4	2005	10	286	52	10	329	173	10	1.28	0.08	3	247	31	3	207	89	3	1.33	0.14
5	2004	17	324	27	17	439	111	17	1.27	0.07	2	345	71	2	600	339	2	1.38	0.03
6	2003	19	386	38	19	772	235	19	1.31	0.09	9	388	29	9	830	217	9	1.39	0.06
7	2002	57	402	46	57	923	298	57	1.35	0.12	41	406	26	41	931	177	41	1.38	0.08
8	2001	36	421	39	36	1024	279	36	1.34	0.10	30	421	27	30	1059	201	30	1.41	0.09
9	2000	14	410	29	14	990	199	14	1.42	0.08	5	432	14	5	1138	188	5	1.40	0.14
10	1999	3	432	28	3	1058	253	3	1.29	0.11	4	484	24	4	1588	194	4	1.40	0.09
11	1998	-	-	-	-	-	-	-	-	-	3	451	49	3	1270	405	3	1.35	0.07
12	1997	4	433	63	4	1053	539	4	1.23	0.19	4	508	48	4	1788	433	4	1.35	0.07
13	1996	3	462	167	3	1633	1715	3	1.27	0.12	24	505	43	24	1899	482	24	1.45	0.09
14	1995	2	380	14	2	638	88	2	1.16	0.03	7	511	45	7	1856	531	7	1.35	0.13
15	1994	4	426	81	4	1013	763	4	1.16	0.15	8	483	25	8	1679	271	8	1.48	0.09
16	1993	1	402	-	1	750	-	1	1.15	-	3	514	47	3	1963	490	3	1.43	0.04
17	1992	2	382	12	2	575	106	2	1.03	0.10	1	631	-	1	3580	-	1	1.42	-
18	1991	1	382	-	1	650	-	1	1.17	-	1	485	-	1	1710	-	1	1.50	-
19	1990	-	-	-	-	-	-	-	-	-	1	503	-	1	2050	-	1	1.61	-
20	1989	-	-	-	-	-	-	-	-	-	4	553	43	4	2568	675	4	1.49	0.06
21	1988	1	405	-	1	850	-	1	1.28	-	2	503	53	2	1925	530	2	1.50	0.06

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	Split Lake FL (mm) n	Split Lake FL (mm) Mean	Split Lake FL (mm) SD	Split Lake W (g) n	Split Lake W (g) Mean	Split Lake W (g) SD	Split Lake K n	Split Lake K Mean	Split Lake K SD	Stephens Lake-South FL (mm) n	Stephens Lake-South FL (mm) Mean	Stephens Lake-South FL (mm) SD	Stephens Lake-South W (g) n	Stephens Lake-South W (g) Mean	Stephens Lake-South W (g) SD	Stephens Lake-South K n	Stephens Lake-South K Mean	Stephens Lake-South K SD
22	1987	1	464	-	1	1450	-	1	1.45	-	4	533	67	4	2218	656	4	1.44	0.11
23	1986	-	-	-	-	-	-	-	-	-	4	519	56	4	1905	608	4	1.34	0.20
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	1	415	-	1	1100	-	1	1.54	-
26	1983	-	-	-	-	-	-	-	-	-	5	549	50	5	2376	529	5	1.42	0.14
27	1982	-	-	-	-	-	-	-	-	-	2	548	11	2	2470	42	2	1.51	0.11
28	1981	-	-	-	-	-	-	-	-	-	2	543	10	2	2370	184	2	1.48	0.04
29	1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	1979	-	-	-	-	-	-	-	-	-	1	440	-	1	1050	-	1	1.23	-

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	Stephens Lake-North									Lower Nelson River								
		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	2006	2	265	64	2	221	141	2	1.11	0.05	-	-	-	-	-	-	-	-	-
4	2005	1	127	-	1	31.0	-	1	1.51	-	2	328	32	2	435	92	2	1.24	0.09
5	2004	3	297	22	3	353	95	3	1.33	0.11	3	371	50	3	713	345	3	1.32	0.17
6	2003	2	315	7	2	415	92	2	1.32	0.21	4	378	57	4	723	314	4	1.29	0.13
7	2002	11	390	27	11	815	150	11	1.36	0.07	26	422	36	26	1005	256	26	1.31	0.07
8	2001	18	405	39	18	932	301	18	1.37	0.11	5	434	103	5	1160	680	5	1.26	0.11
9	2000	10	403	44	10	953	364	10	1.39	0.11	8	441	46	8	1160	402	8	1.29	0.13
10	1999	2	474	16	2	1490	14	2	1.41	0.16	2	459	12	2	1230	14	2	1.28	0.08
11	1998	3	463	17	3	1370	157	3	1.37	0.03	-	-	-	-	-	-	-	-	-
12	1997	8	486	52	8	1753	589	8	1.49	0.13	2	501	28	2	1480	184	2	1.18	0.05
13	1996	14	506	40	14	1903	460	14	1.44	0.06	-	-	-	-	-	-	-	-	-
14	1995	6	505	43	6	1997	493	6	1.53	0.11	3	479	35	3	1317	312	3	1.18	0.04
15	1994	3	478	57	3	1587	529	3	1.42	0.03	-	-	-	-	-	-	-	-	-
16	1993	1	543	-	1	2160	-	1	1.35	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	1	470	-	1	1500	-	1	1.44	-	1	386	-	1	650	-	1	1.13	-
19	1990	1	475	-	1	1550	-	1	1.45	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	1	520	-	1	1930	-	1	1.37	-	-	-	-	-	-	-	-	-	-

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	Stephens Lake-North									Lower Nelson River								
		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
22	1987	1	575	-	1	2320	-	1	1.22	-	-	-	-	-	-	-	-	-	-
23	1986	1	492	-	1	1710	-	1	1.44	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	1	465	-	1	1400	-	1	1.39	-	-	-	-	-	-	-	-	-	-
26	1983	3	554	107	3	2587	1480	3	1.42	0.05	-	-	-	-	-	-	-	-	-
27	1982	2	618	11	2	3140	156	2	1.33	-	-	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1980	1	510	-	1	2000	-	1	1.51	-	-	-	-	-	-	-	-	-	-
30	1979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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	Hayes River FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Assean Lake FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	1	127	-	1	30.0	-	1	1.46	-
2	2007	-	-	-	-	-	-	-	-	-	1	206	-	1	120	-	1	1.37	-
3	2006	-	-	-	-	-	-	-	-	-	4	224	10	4	115	30	4	1.00	0.11
4	2005	-	-	-	-	-	-	-	-	-	20	223	10	20	122	26	20	1.10	0.15
5	2004	-	-	-	-	-	-	-	-	-	5	226	17	5	131	38	5	1.12	0.17
6	2003	3	360	21	3	510	26	3	1.10	0.13	5	309	42	5	334	117	5	1.10	0.14
7	2002	1	267	-	1	210	-	1	1.10	-	24	333	26	24	413	92	24	1.10	0.09
8	2001	1	390	-	1	680	-	1	1.15	-	36	346	32	36	475	139	36	1.12	0.09
9	2000	-	-	-	-	-	-	-	-	-	43	367	34	43	581	164	43	1.14	0.09
10	1999	-	-	-	-	-	-	-	-	-	27	378	33	27	628	172	27	1.14	0.07
11	1998	3	466	29	3	1023	200	3	1.00	0.01	21	401	28	21	734	145	21	1.13	0.12
12	1997	4	439	36	4	923	225	4	1.07	0.05	25	417	33	25	817	212	25	1.11	0.07
13	1996	1	567	-	1	1900	-	1	1.04	-	5	407	47	5	789	245	5	1.15	0.06
14	1995	-	-	-	-	-	-	-	-	-	6	445	32	6	979	175	6	1.10	0.04
15	1994	-	-	-	-	-	-	-	-	-	3	425	30	3	965	278	3	1.23	0.10
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	1	482	-	1	1300	-	1	1.16	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	1	610	-	1	2800	-	1	1.23	-	-	-	-	-	-	-	-	-	-

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	Hayes River FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Assean Lake FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
22	1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	1984	1	617	-	1	2800	-	1	1.19	-	-	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	1979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2009.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Split L											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	1	1.03	-	-	-	-	97	1	1.03
Northern Pike	-	-	-	-	-	-	-	-	58	-	-
Lake Whitefish	-	-	1	-	-	-	-	-	10	1	10.00
Walleye	2	1.06	1	-	-	-	1	0.53	189	4	2.12
Stephens L - South											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	2	13.33	-	-	-	-	15	2	13.33
Northern Pike	-	-	2	2.70	-	-	-	-	74	2	2.70
Lake Whitefish	-	-	-	-	-	-	-	-	6	0	-
Walleye	1	0.56	-	-	-	-	2	1.13	177	3	1.69
Stephens L - North											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	5	-	-
Northern Pike	-	-	1	1.30	-	-	1	1.30	77	2	2.60
Lake Whitefish	-	-	-	-	-	-	-	-	10	-	-
Walleye	1	1.03	-	-	-	-	1	1.03	97	2	2.06
Lower Nelson R											
Lake Sturgeon	-	-	-	-	-	-	1	4.55	22	1	4.55
White Sucker	1	3.23	-	-	-	-	1	3.23	31	2	6.45
Northern Pike	2	2.44	-	-	-	-	-	-	82	2	2.44
Lake Whitefish	-	-	-	-	-	-	-	-	21	-	-
Walleye	-	-	-	-	1	1.72	1	1.72	58	2	3.45
Hayes R											
Lake Sturgeon	-	-	-	-	-	-	-	-	14	-	-
White Sucker	1	14.29	1	14.29	1	14.29	-	-	7	3	42.86
Northern Pike	-	-	-	-	-	-	-	-	2	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	1	-	-
Walleye	-	-	-	-	-	-	-	-	16	-	-

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 8.6-19. – continued –

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Assean L											
Lake Sturgeon	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	70	-	-
Northern Pike	-	-	-	-	-	-	-	-	66	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	40	-	-
Walleye	-	-	-	-	-	-	-	-	237	-	-

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 8.7-1. Mean arithmetic (± standard error, SE) and standardized (95% confidence limits, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, and Walleye from Stephens Lake-South in 2009.

Species	n	Arithmetic	SE	Standard	95% CL
Northern Pike	36	0.293	0.042	0.260	0.229 - 0.296
Walleye	36	0.315	0.030	0.262	0.236 - 0.291
Lake Whitefish	7	0.159	0.029	0.046	0.026 - 0.084

Table 8.7-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from Stephens Lake-South in 2009.

Species	n	Length (mm)	Weight (g)	K	Age (years)
Northern Pike	36	526.4 ± 32.5	1500.9 ± 227.0	0.75 ± 0.02	6.8 ± 0.7
Walleye	36	419.2 ± 18.5	1241.5 ± 142.7	1.37 ± 0.02	11.5 ± 1.2
Lake Whitefish	7	483.0 ± 28.3	2410.0 ± 428.4	1.99 ± 0.08	12.0 ± 1.9

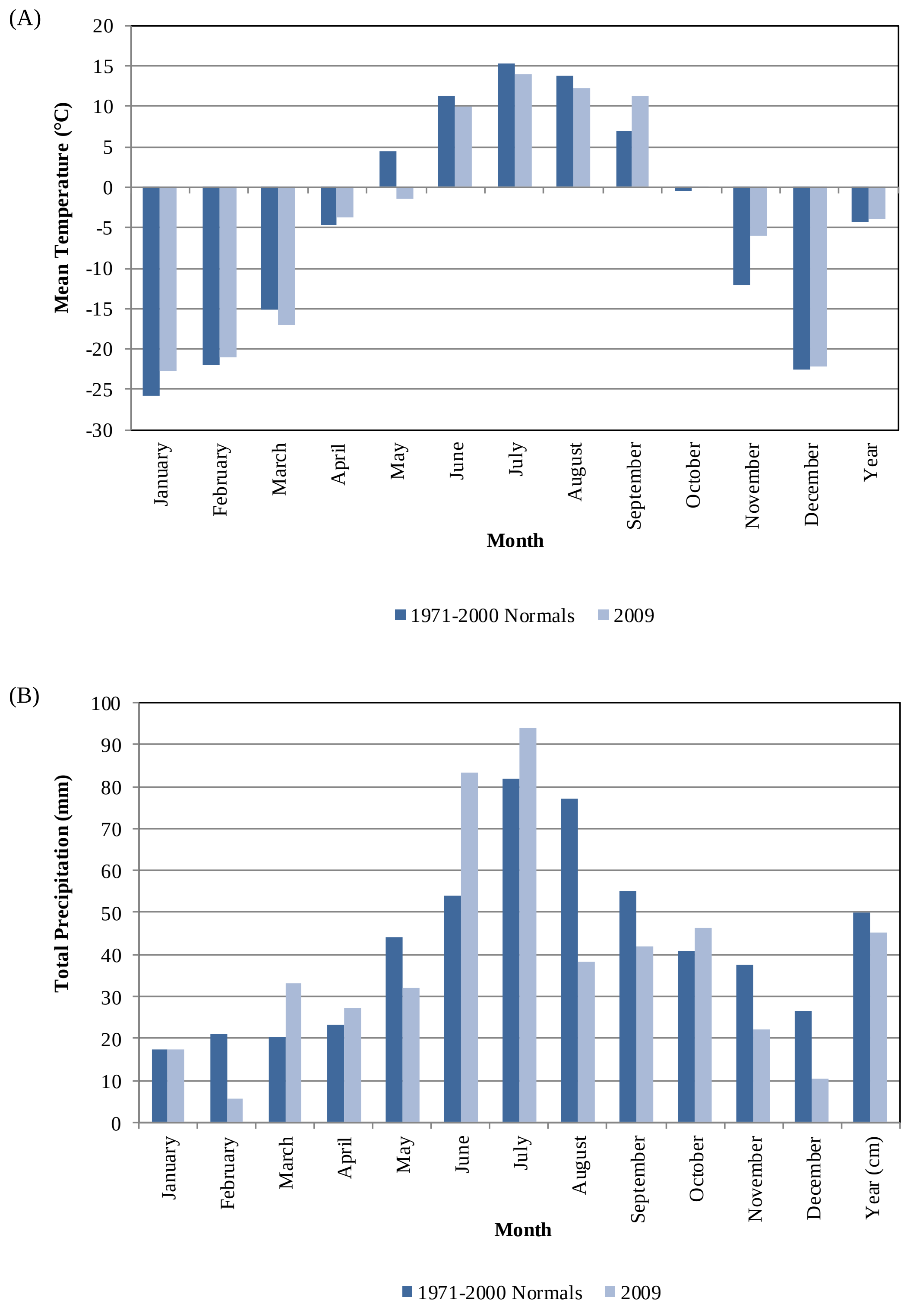


Figure 8.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), Gillam, MB.

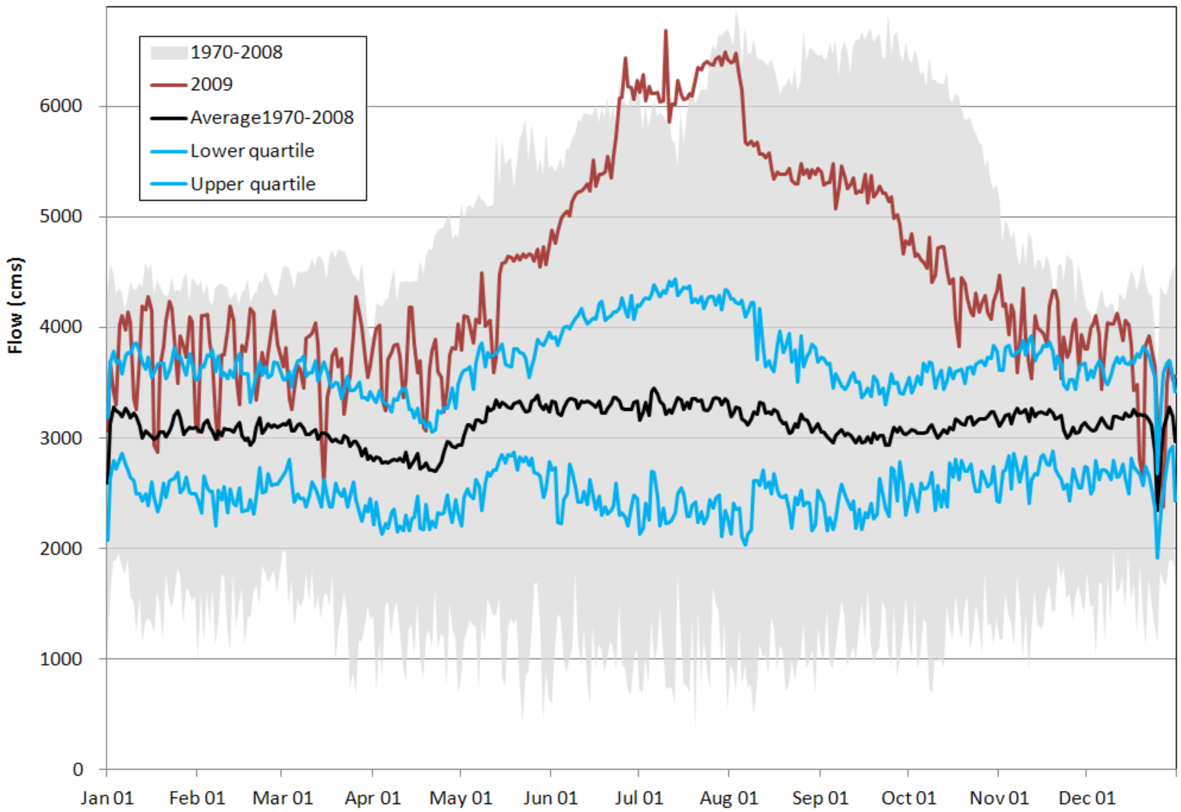


Figure 8.2-1. 2009 Kettle Generating Station outflow.

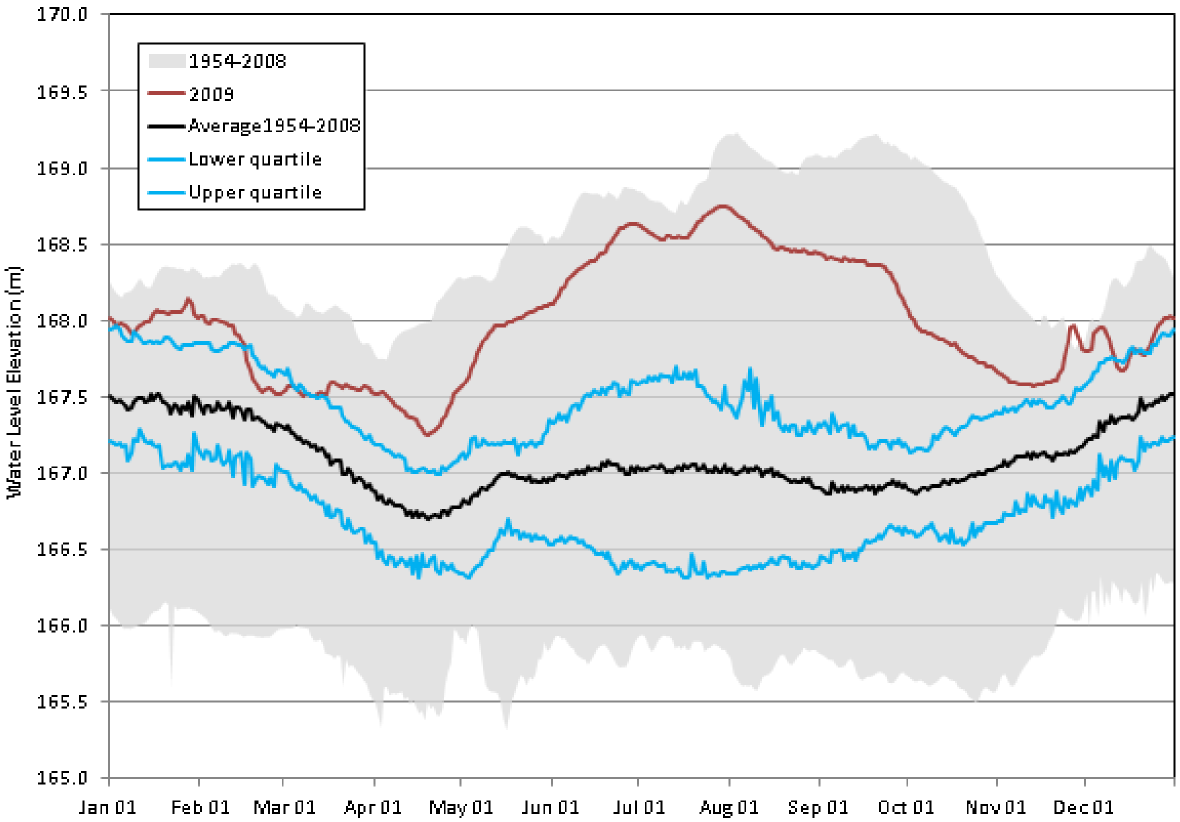


Figure 8.2-2. 2009 Split Lake (05UF003) water level elevation

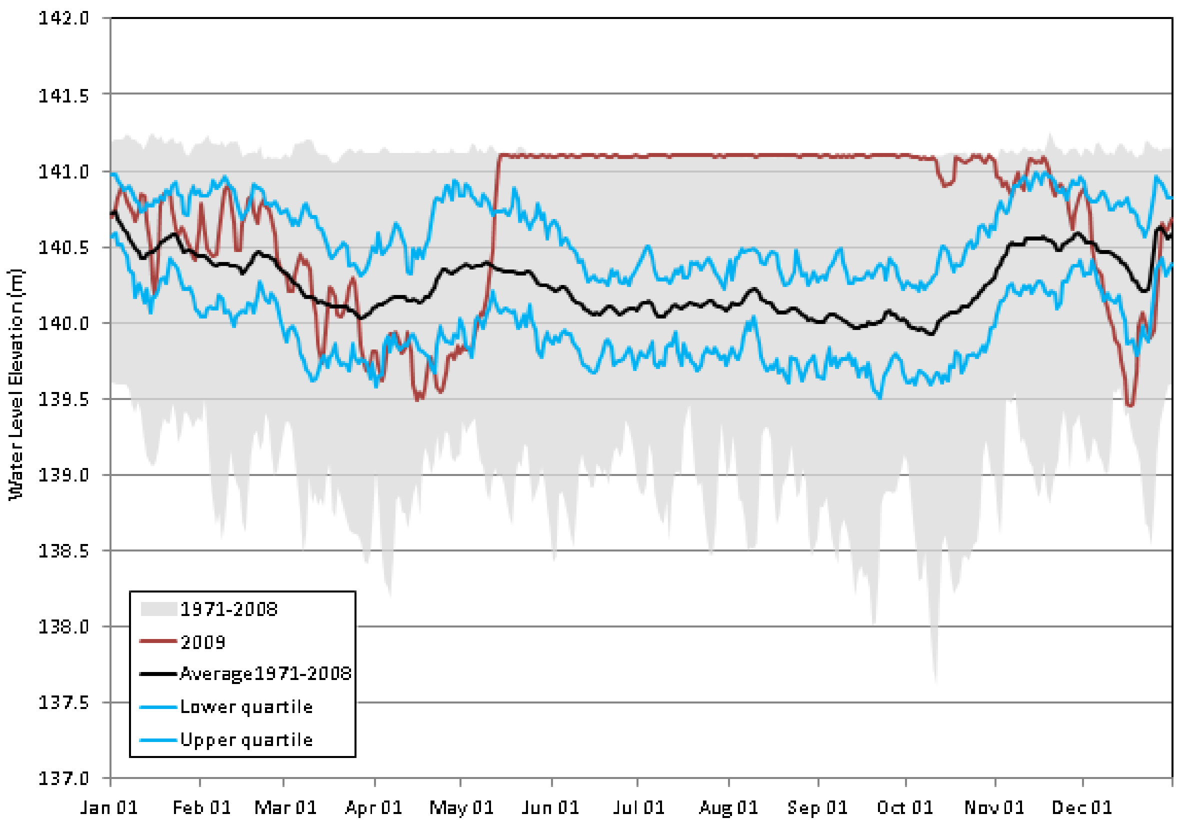


Figure 8.2-3. 2009 Kettle Generating Station Forebay (Stephens Lake; 05UF006) water level elevation.

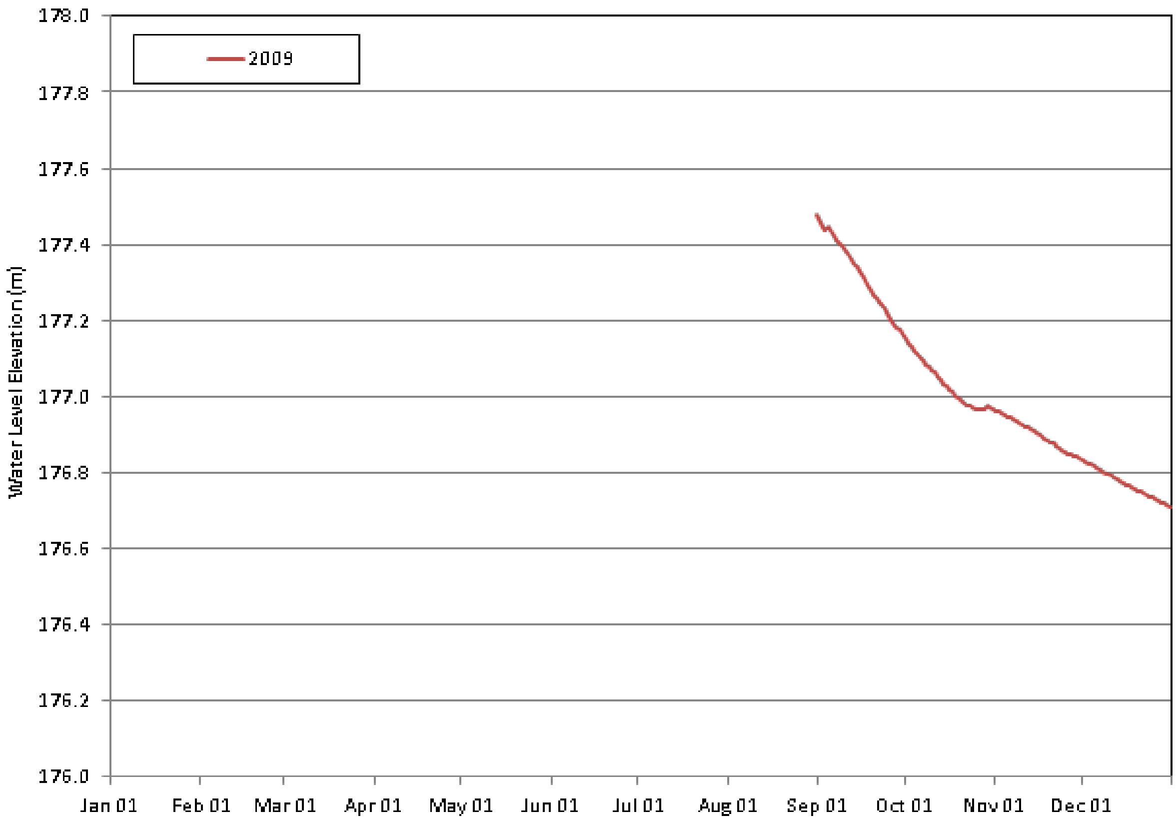


Figure 8.2-4. 2009 Assean Lake (05UF605) water level elevation.

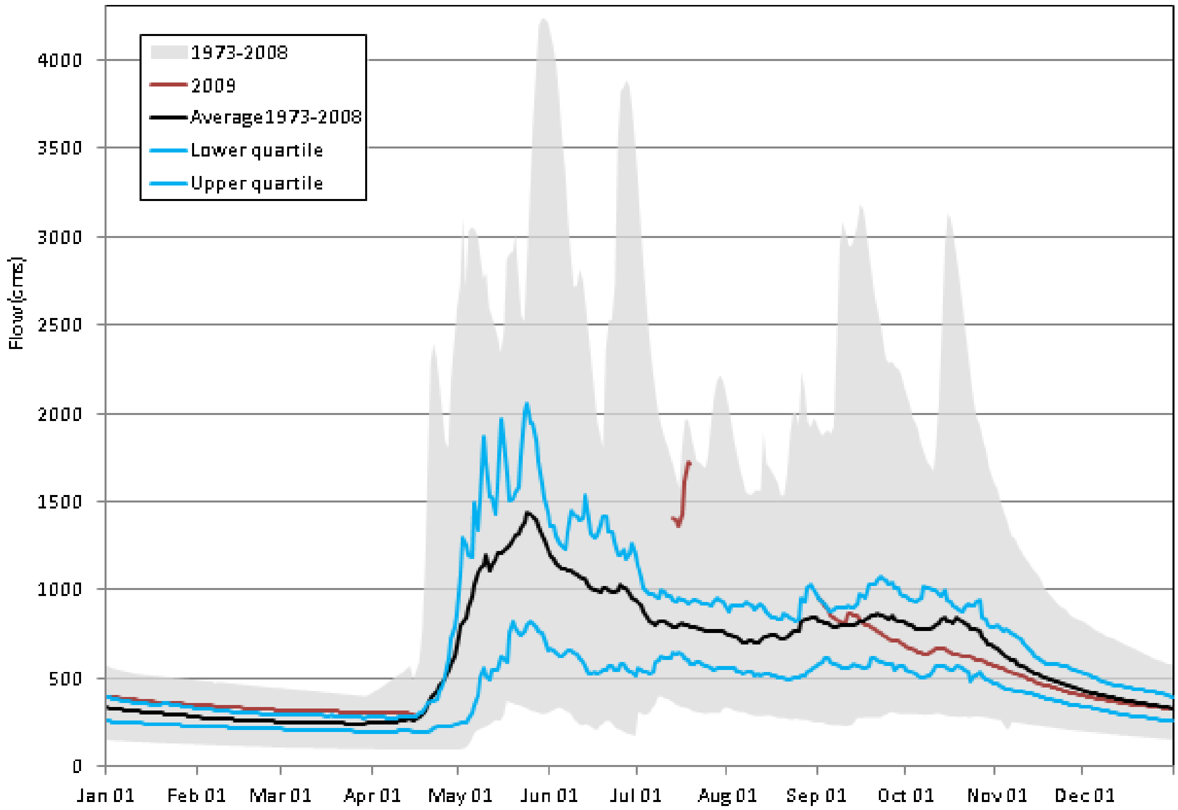


Figure 8.2-5. 2009 Hayes River (05AB001) flow.

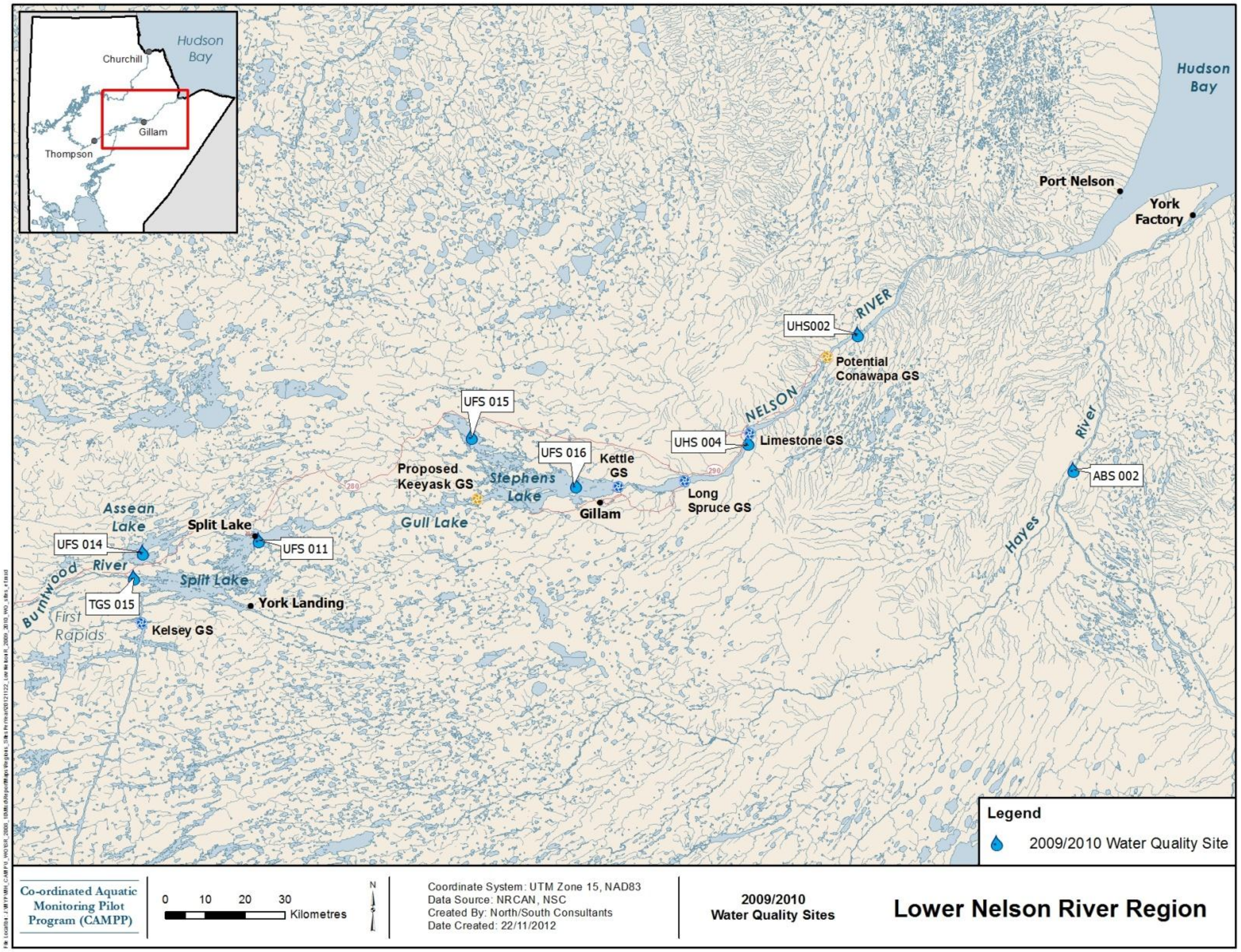


Figure 8.3-1. Water quality and phytoplankton monitoring sites in the Lower Nelson River Region: 2009/2010.

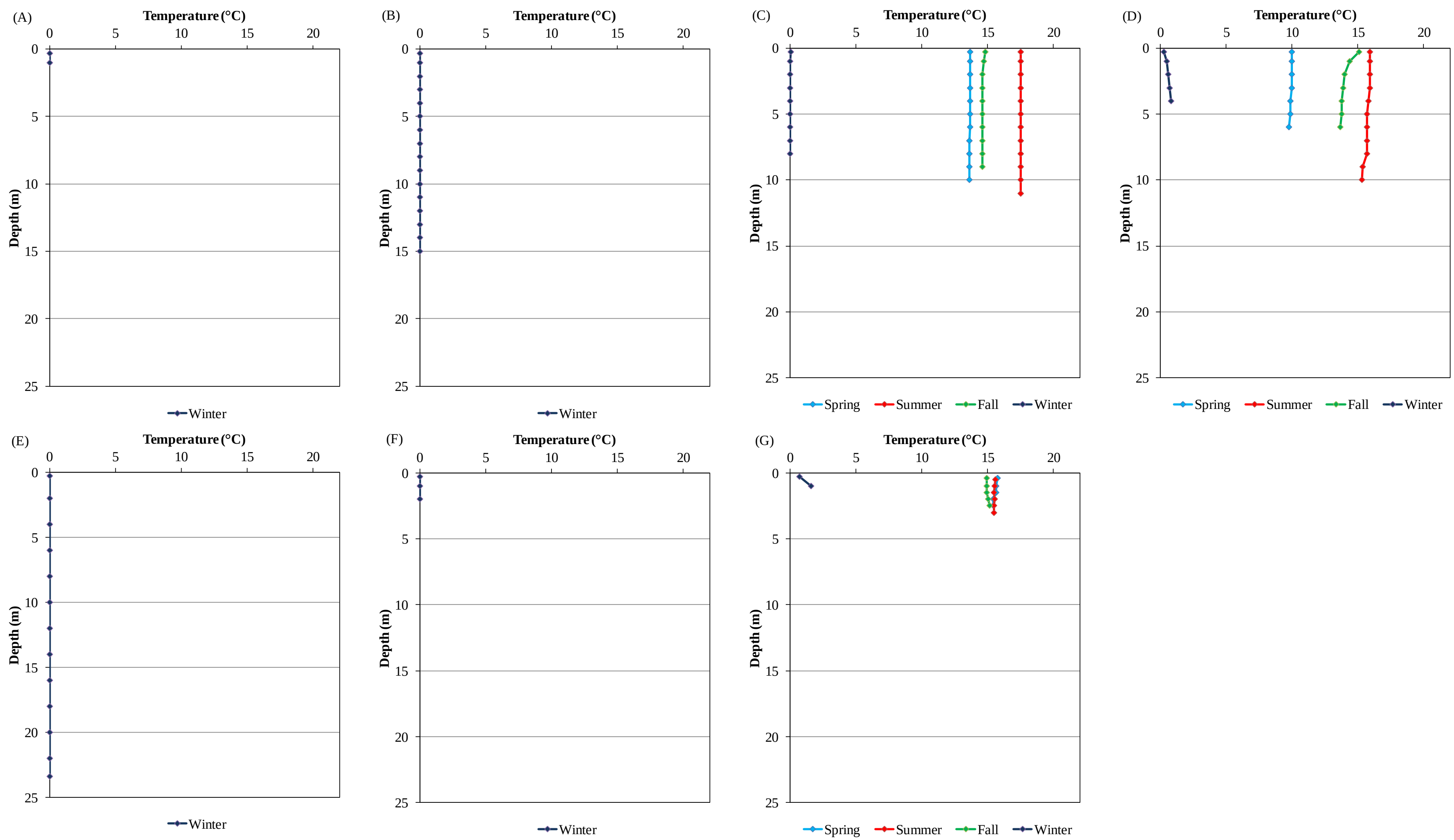


Figure 8.3-2. Water temperature profiles measured in the Lower Nelson River Region in 2009/2010: (A) Burntwood River; (B) Split Lake; (C) Stephens Lake-South; (D) Stephens Lake-North; (E) Limestone Forebay; (F) Hayes River; and (G) Assean Lake.

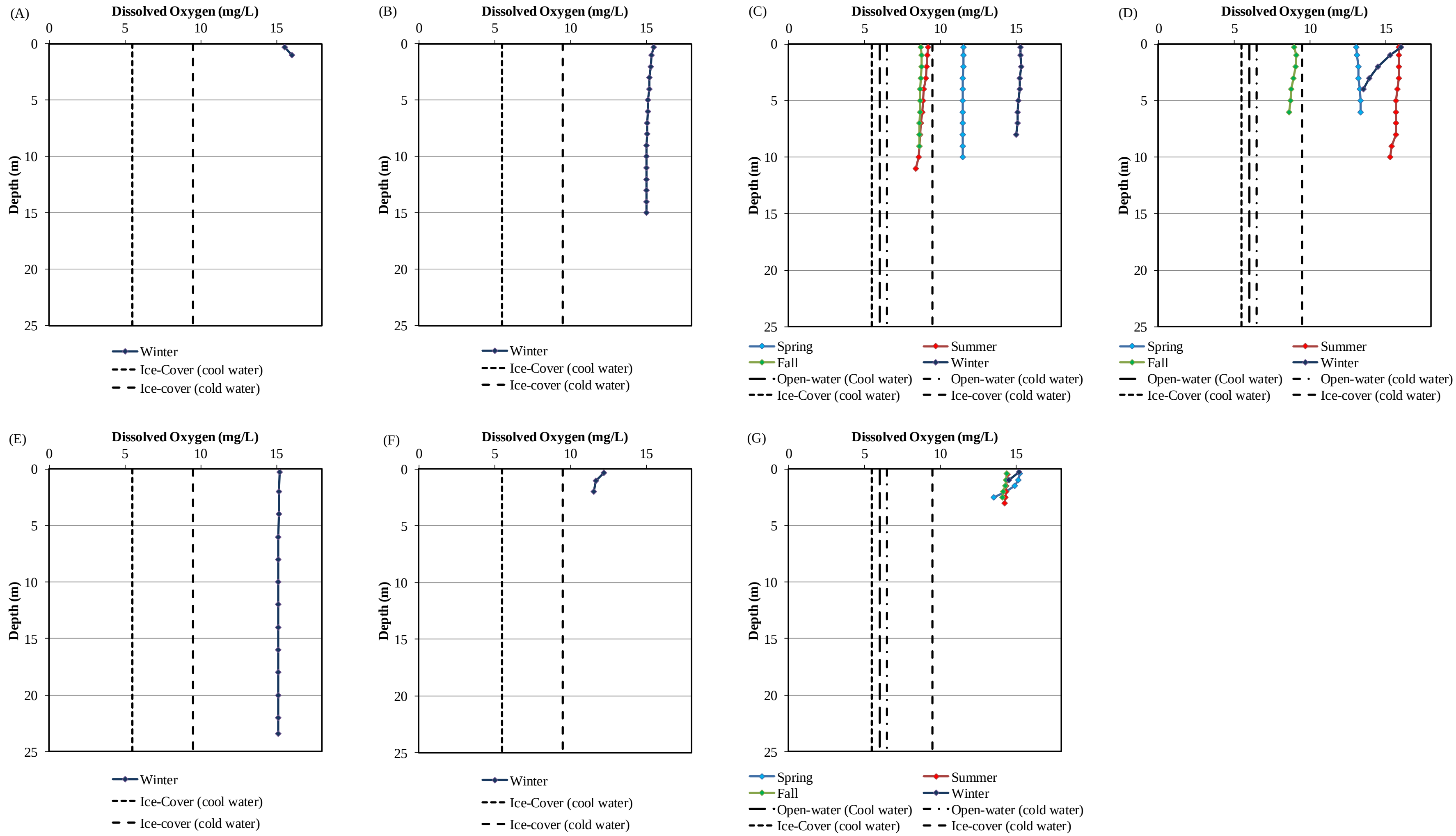


Figure 8.3-3. Dissolved oxygen depth profiles measured in the Lower Nelson River Region in 2009/2010: (A) Burntwood River; (B) Split Lake; (C) Stephens Lake-South; (D) Stephens Lake-North; (E) Limestone Forebay; (F) Hayes River; and (G) Assean Lake. Dashed lines represent selected MWQSOGs for PAL.

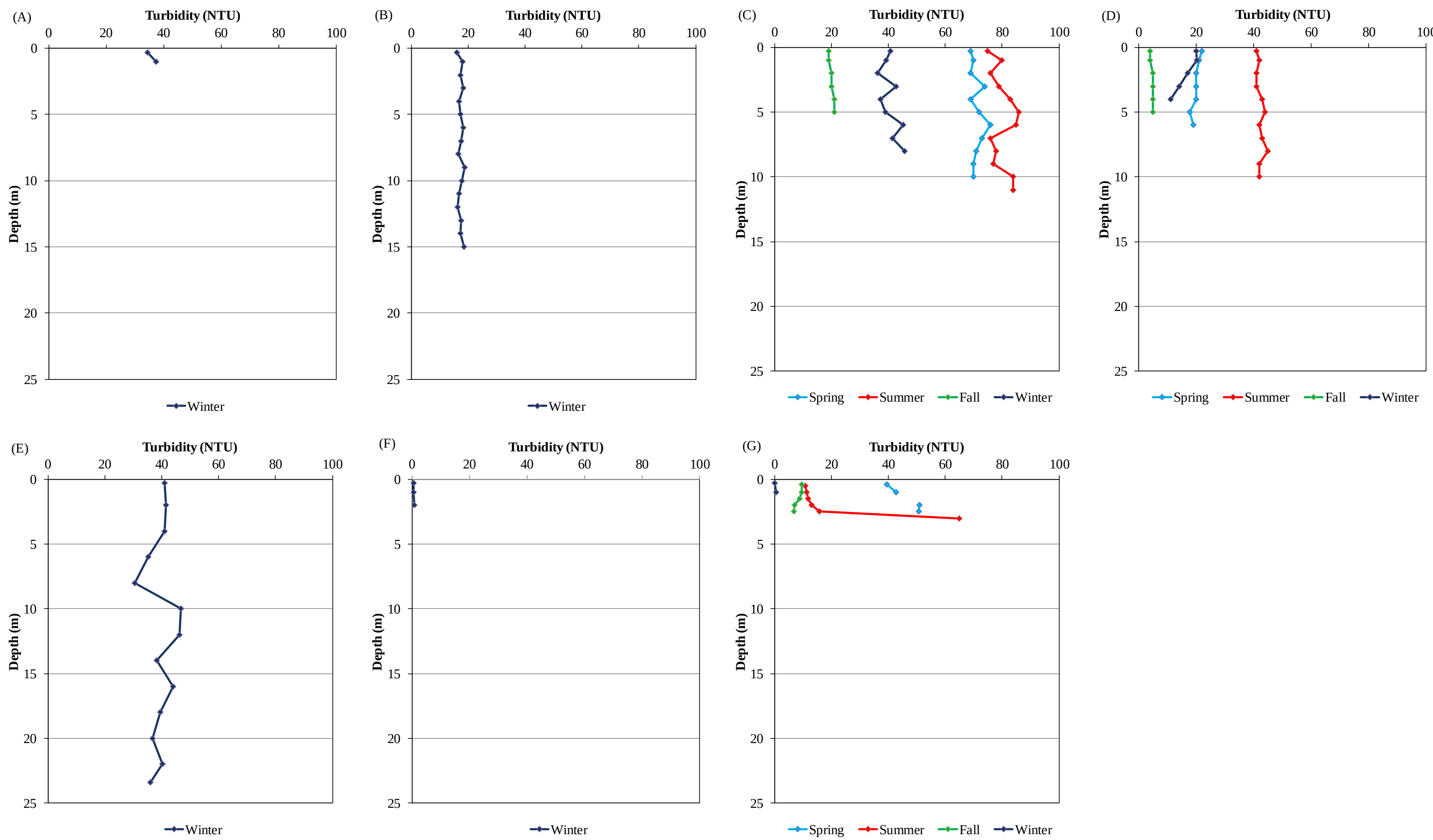


Figure 8.3-4. Turbidity depth profiles measured in the Lower Nelson River Region in 2009/2010: (A) Burntwood River; (B) Split Lake; (C) Stephens Lake-South; (D) Stephens Lake-North; (E) Limestone Forebay; (F) Hayes River; and (G) Assean Lake.

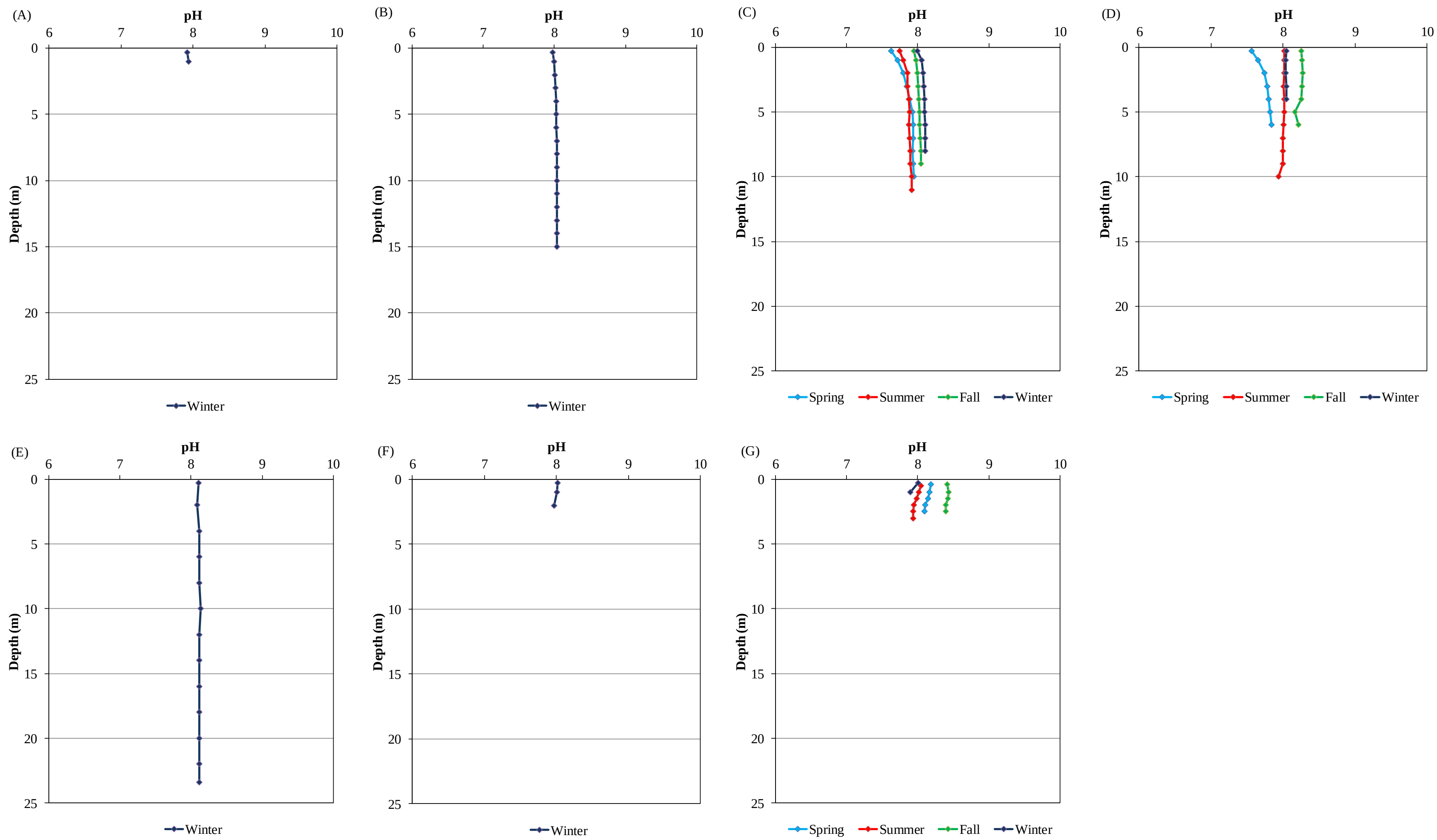


Figure 8.3-5. pH depth profiles measured in the Lower Nelson River Region in 2009/2010: (A) Burntwood River; (B) Split Lake; (C) Stephens Lake-South; (D) Stephens Lake-North; (E) Limestone Forebay; (F) Hayes River; and (G) Assean Lake.

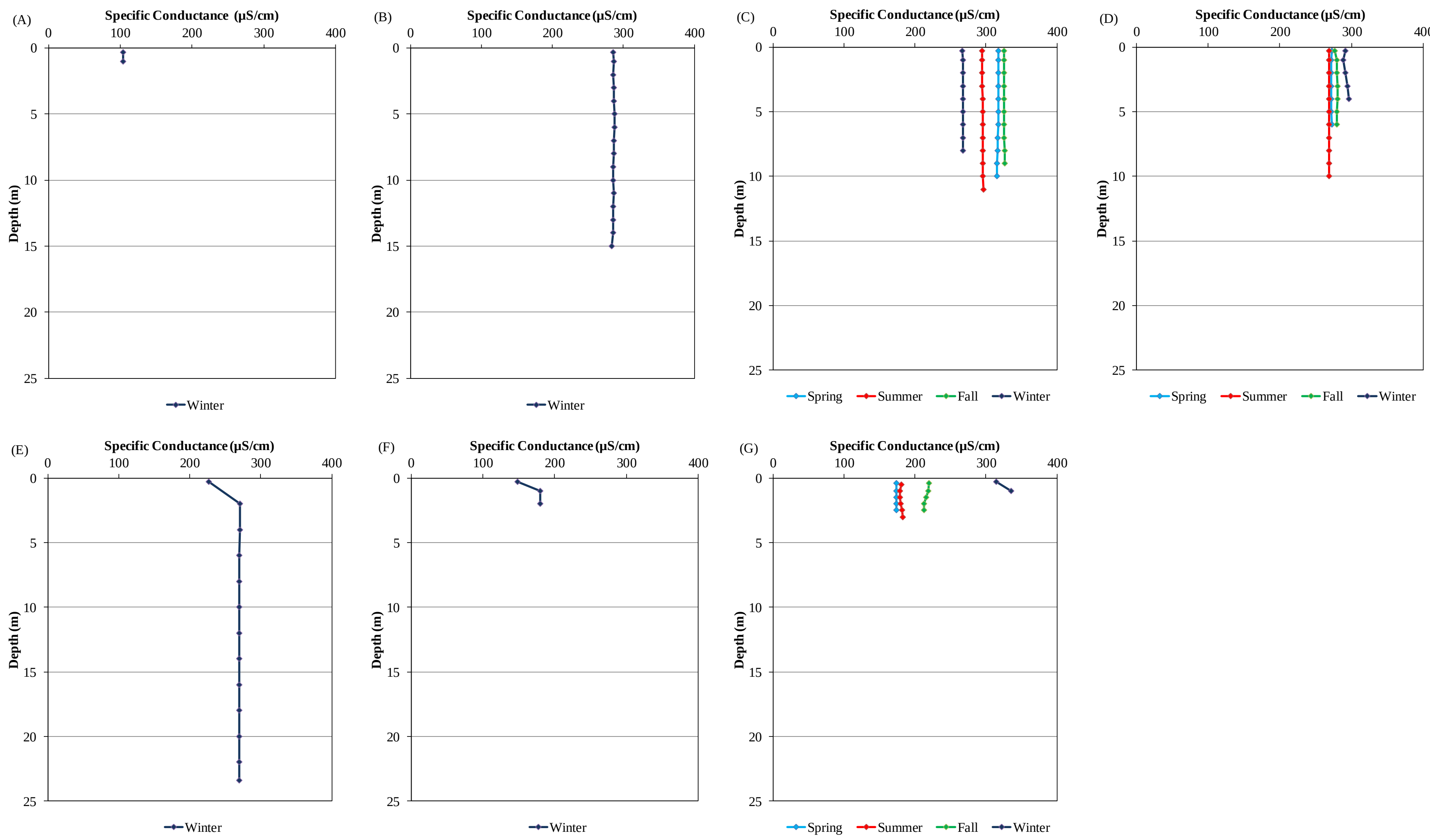


Figure 8.3-6. Specific conductance depth profiles measured in the Lower Nelson River Region in 2009/2010: (A) Burntwood River; (B) Split Lake; (C) Stephens Lake-South; (D) Stephens Lake-North; (E) Limestone Forebay; (F) Hayes River; and (G) Assean Lake.

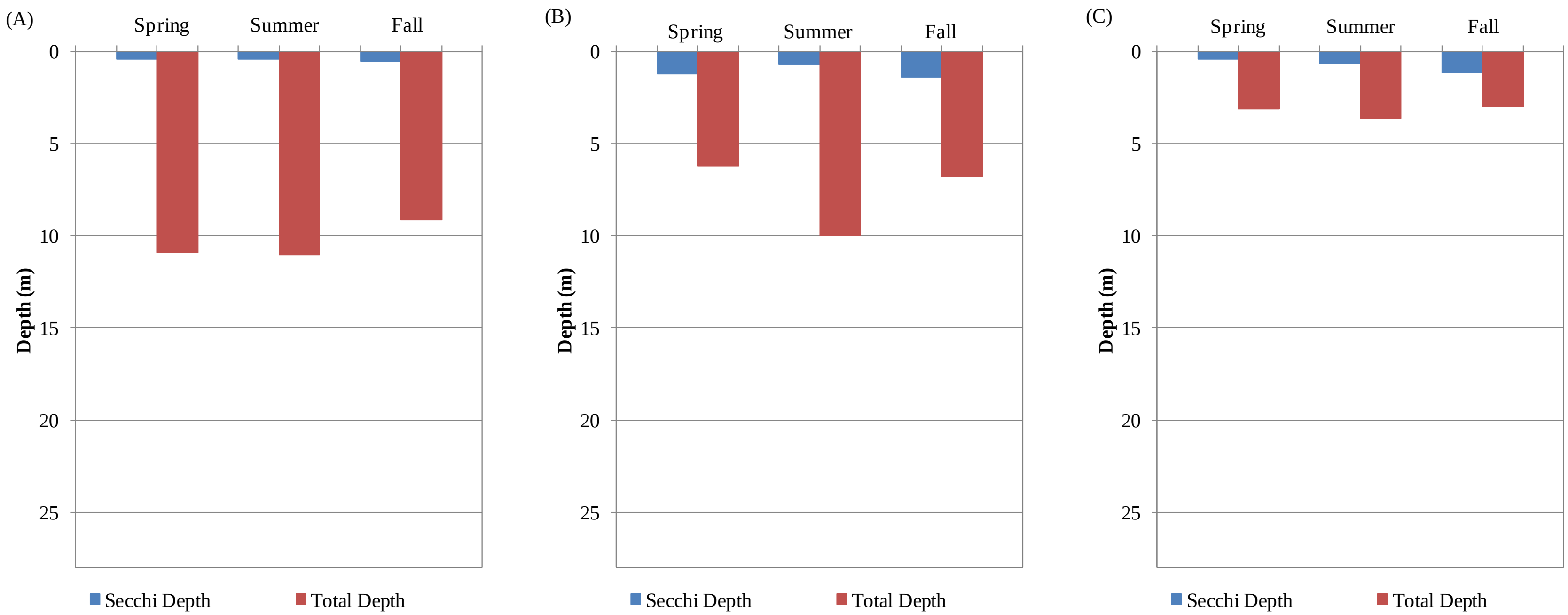


Figure 8.3-7. Secchi disk depths measured in the Lower Nelson River Region in 2009/2010: (A) Stephens Lake-South; (B) Stephens Lake-North; (C) Assean Lake.

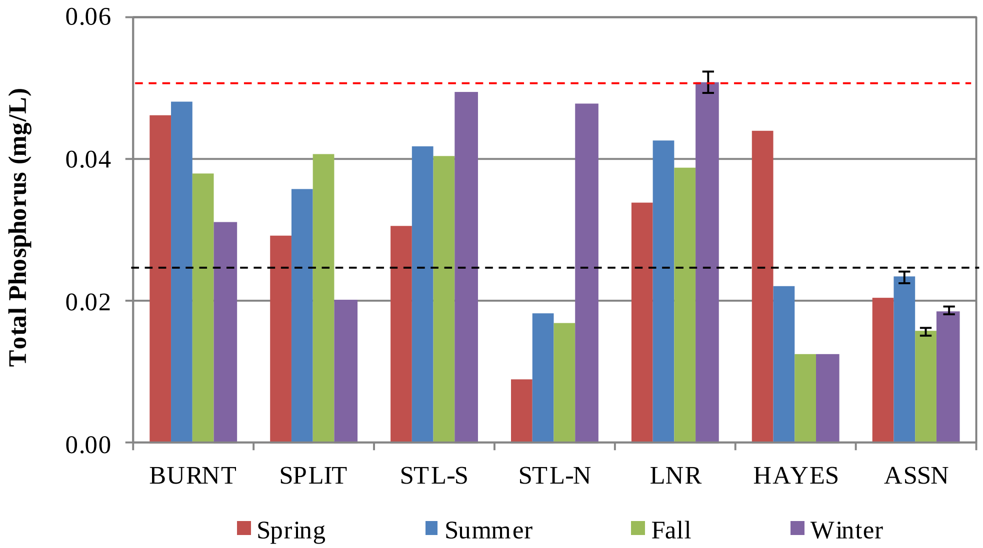


Figure 8.3-8. Total phosphorus measured in surface grabs in the Lower Nelson River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies; the red dashed line indicates the guideline for streams and rivers.

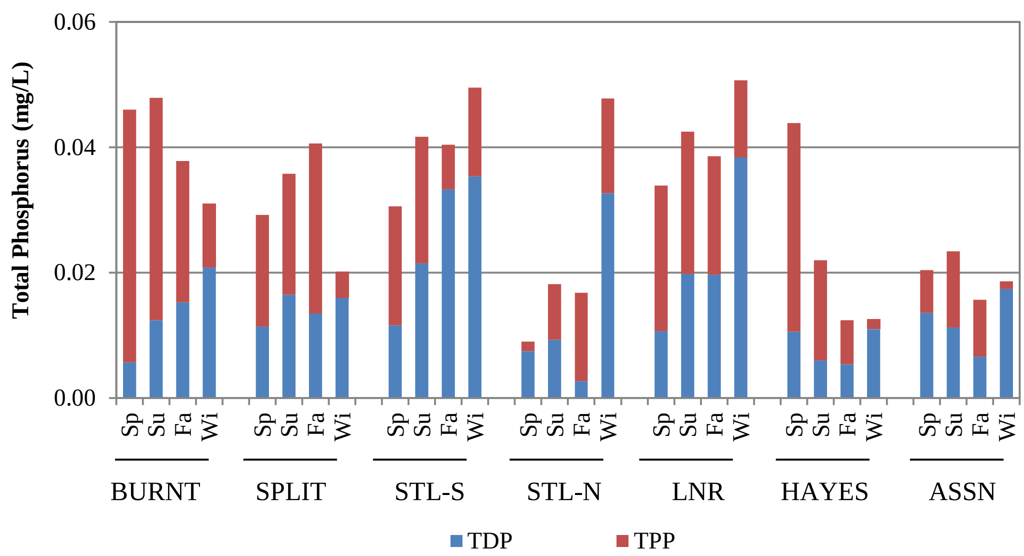


Figure 8.3-9. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in the Lower Nelson River Region: 2009/2010.

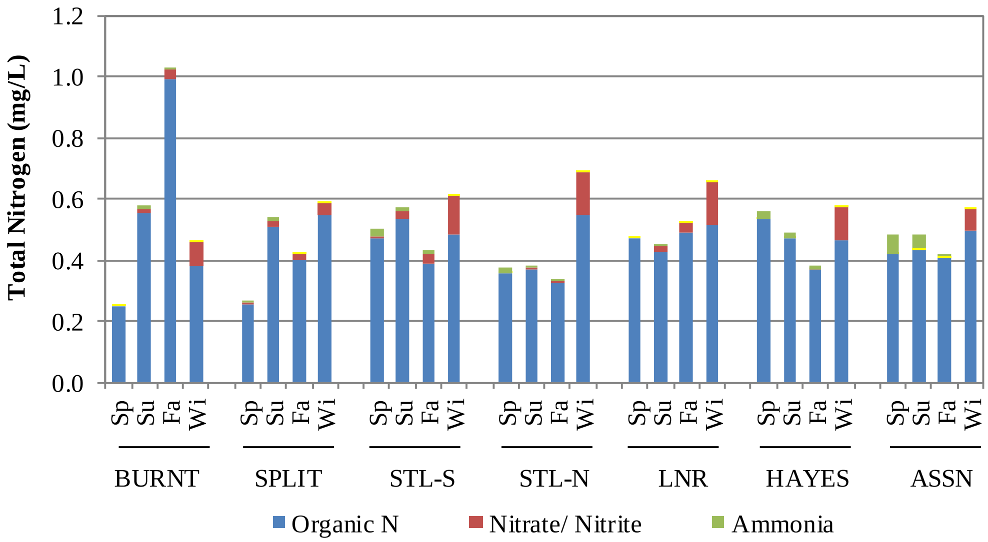


Figure 8.3-10. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Lower Nelson River Region: 2009/2010. Yellow bars represent values that were below the analytical detection limit.

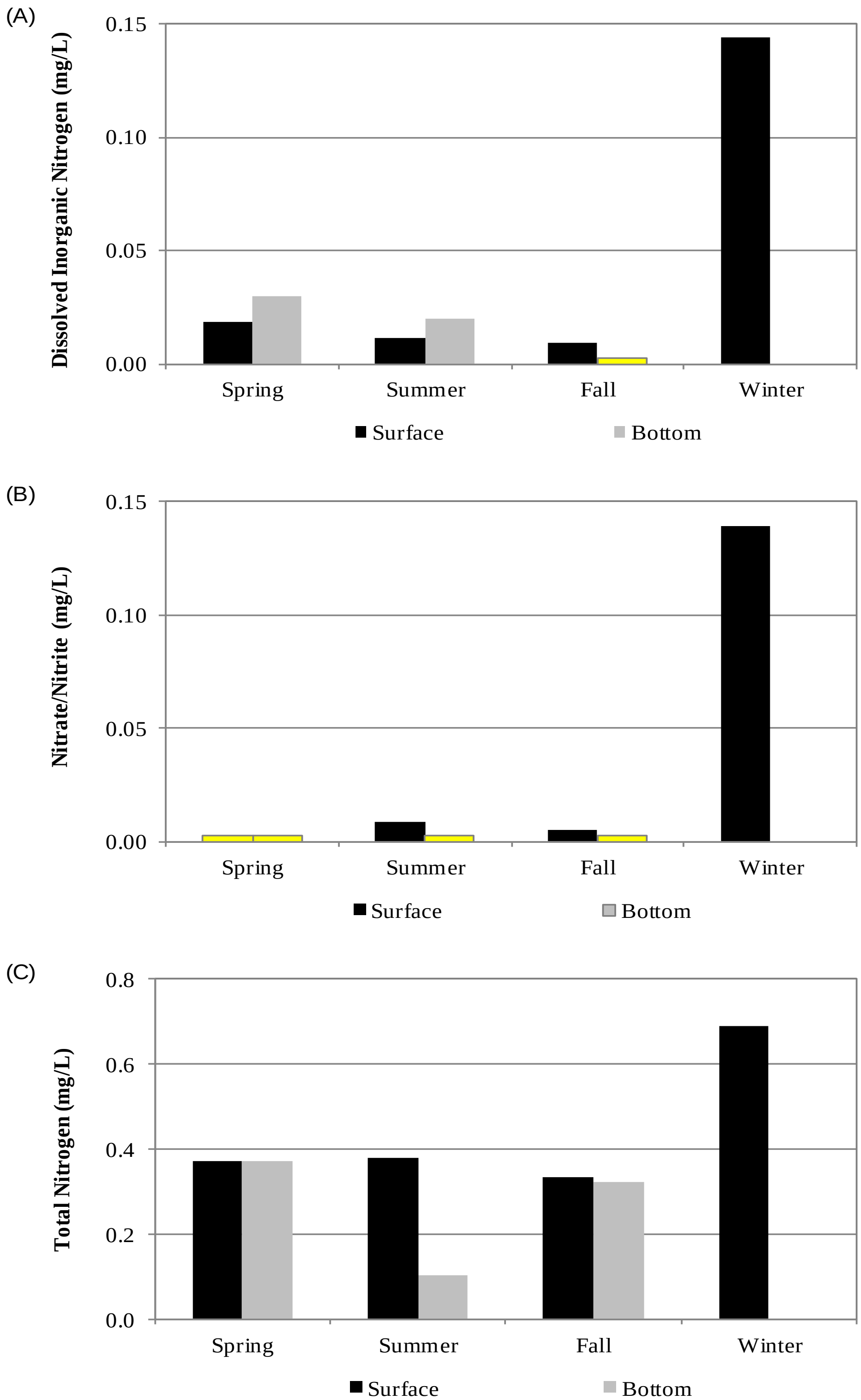


Figure 8.3-11. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Stephens Lake-North, 2009/2010. Yellow bars represent values that were below the analytical detection limit.

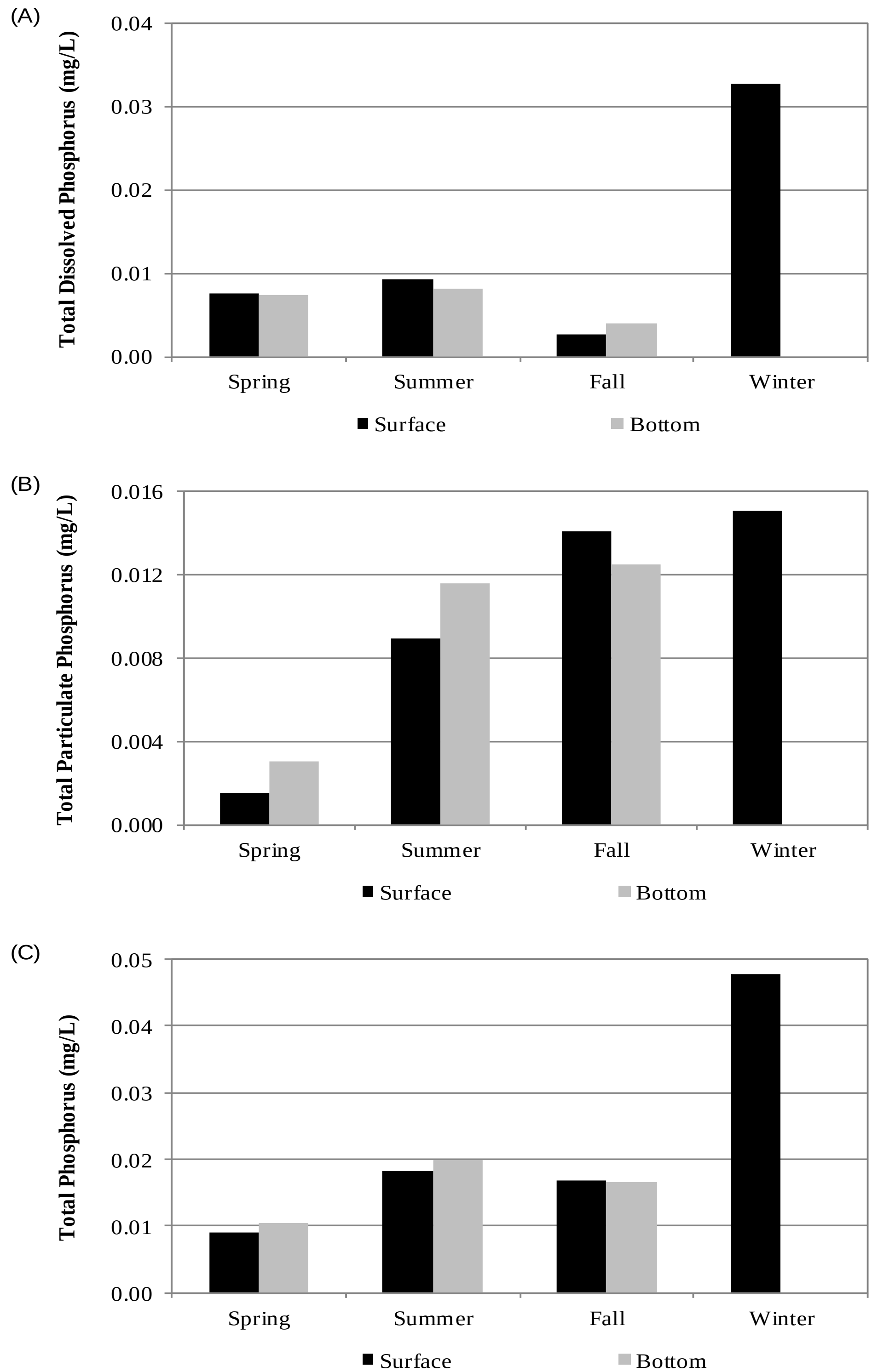


Figure 8.3-12. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Stephens Lake-North, 2009/2010.

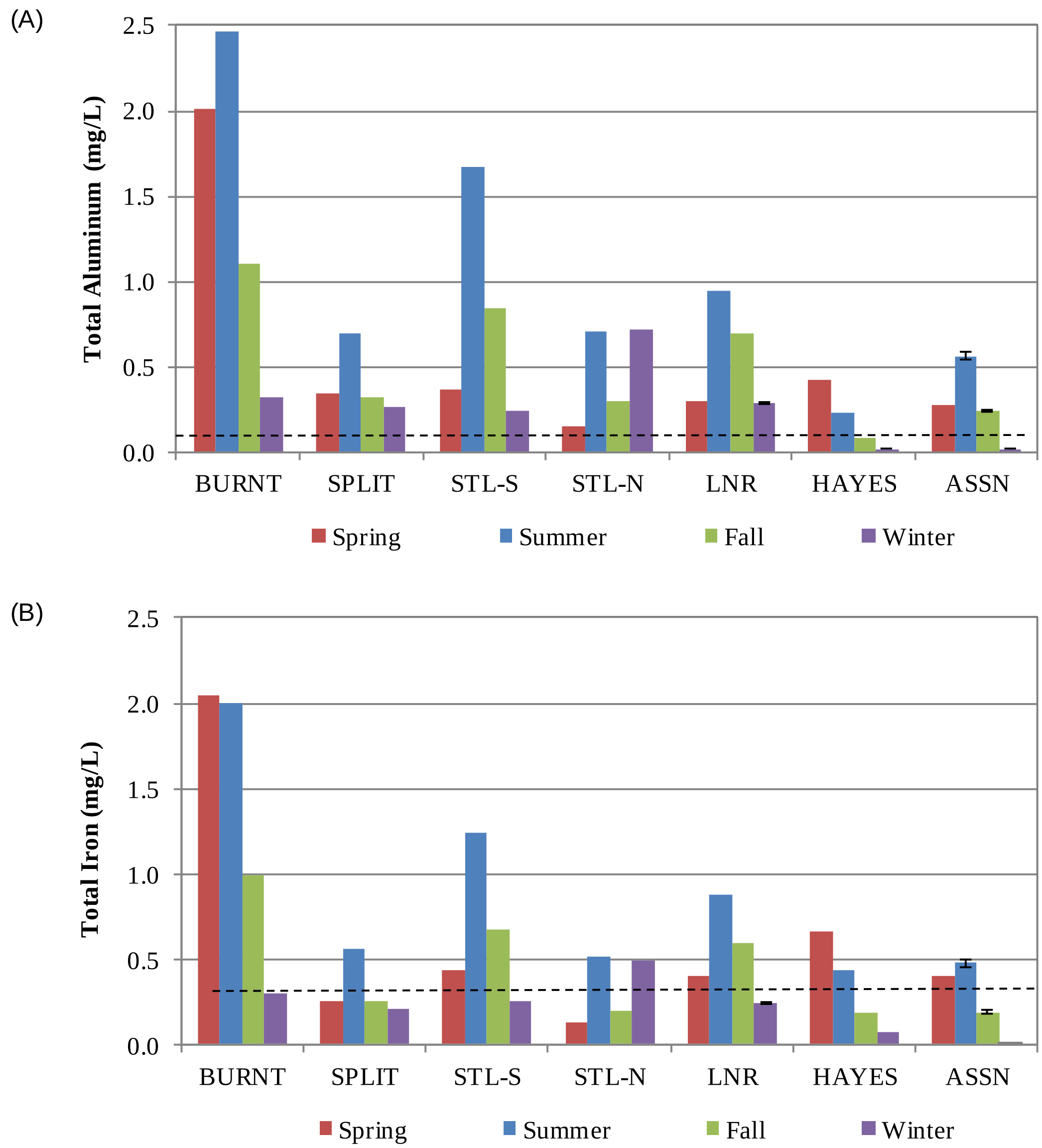


Figure 8.3-13. Total aluminum (A) and total iron (B) measured in surface grabs in the Lower Nelson River Region, by sampling period and site: 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

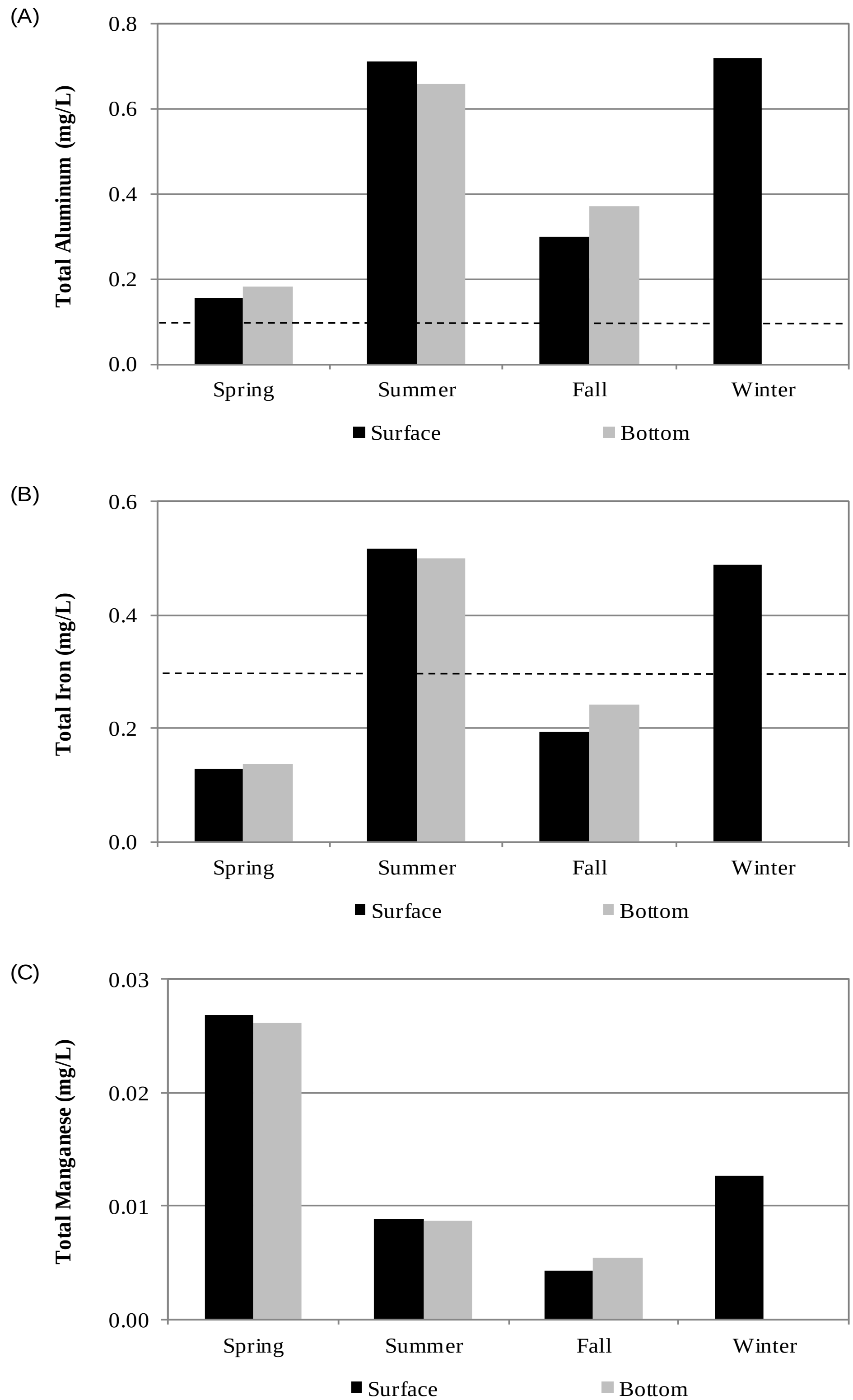


Figure 8.3-14. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Stephens Lake-North, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

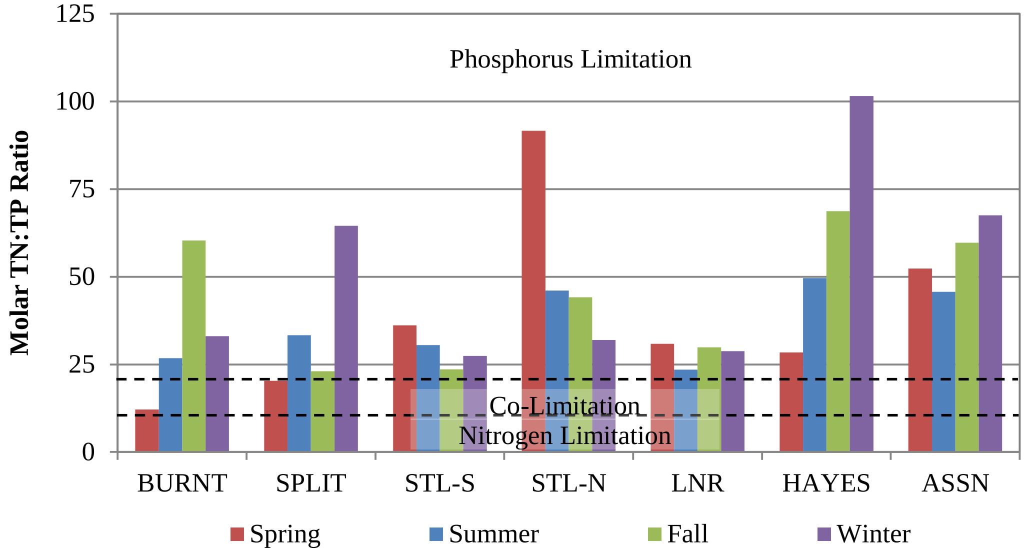


Figure 8.3-15. Total nitrogen to total phosphorus molar ratios (TN:TP) in the Lower Nelson River Region: 2009/2010.

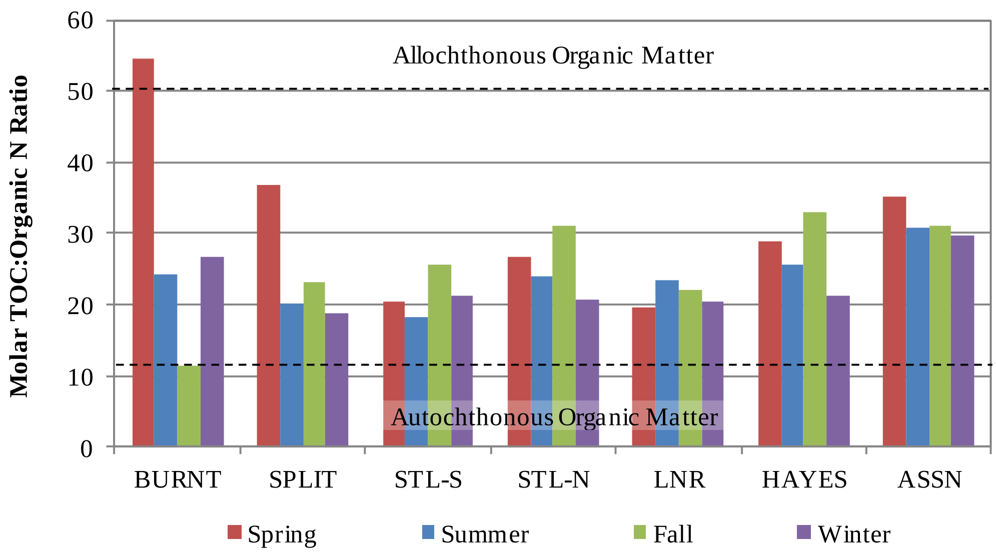


Figure 8.3-16. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios in the Lower Nelson River Region: 2009/2010.

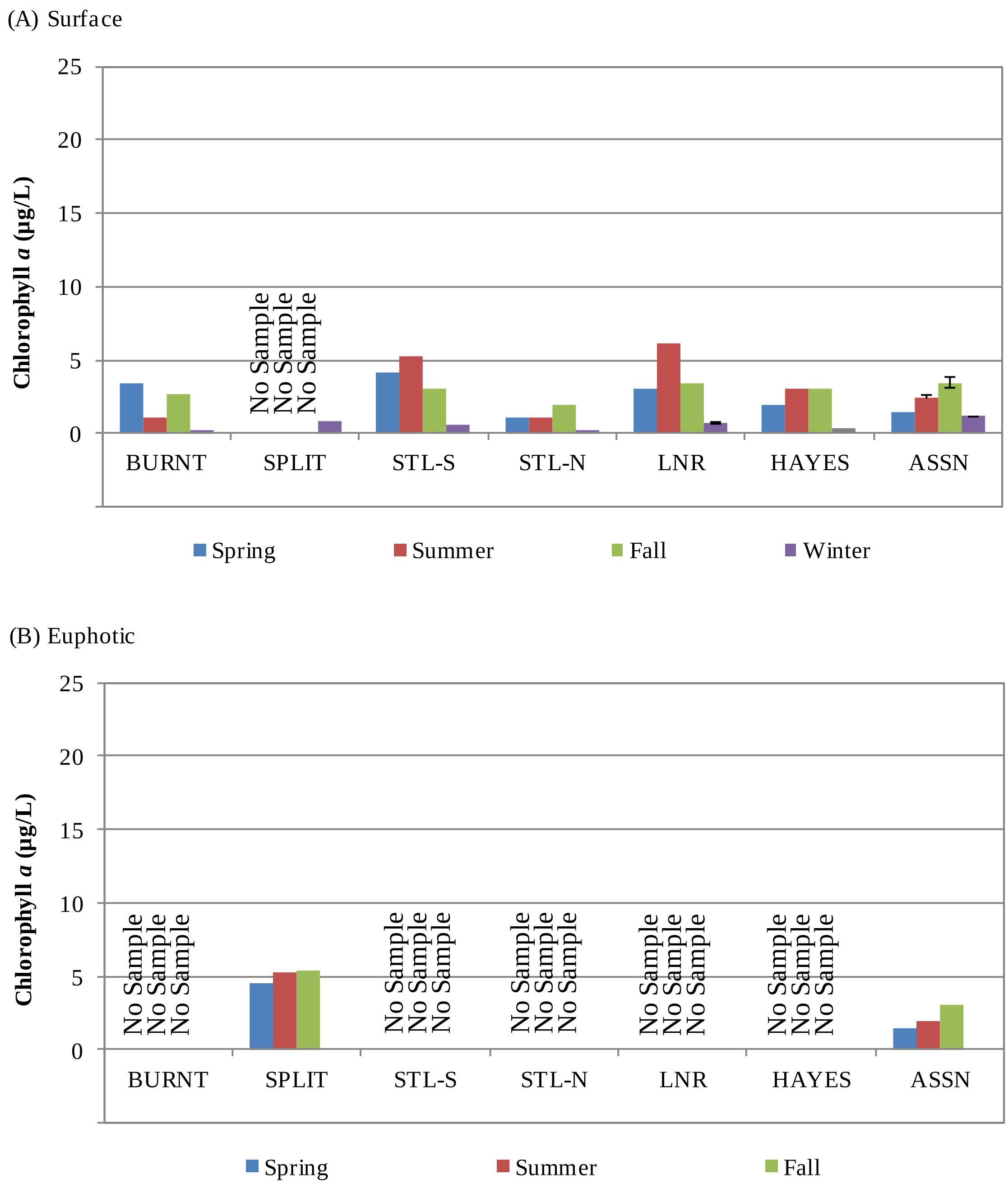


Figure 8.4-1. Chlorophyll a concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Lower Nelson River Region in 2009/2010. Error bars represent the standard error of triplicate samples

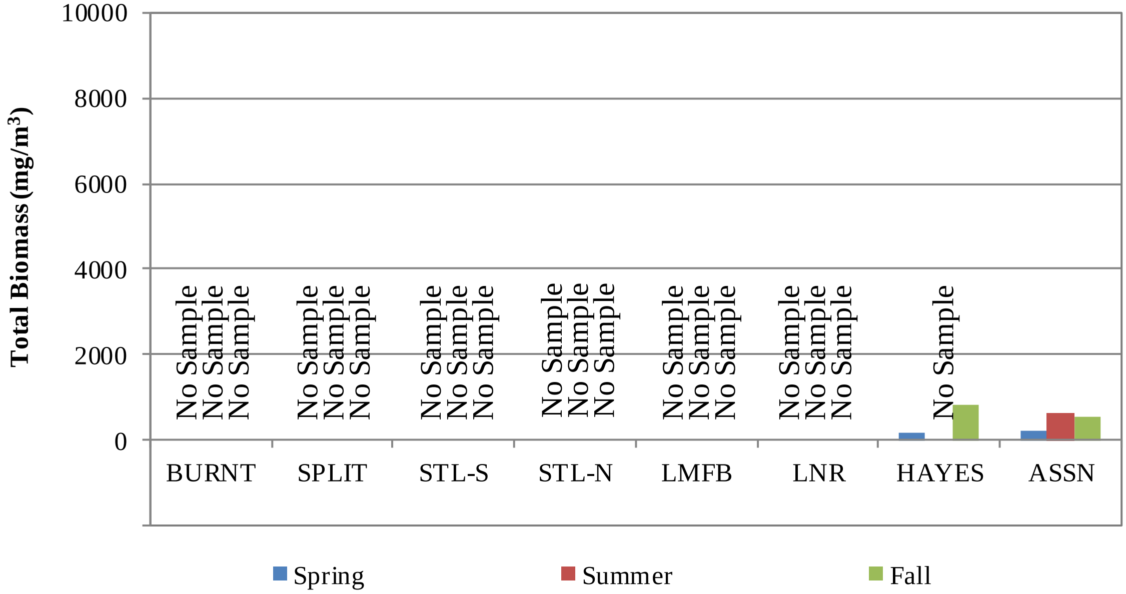
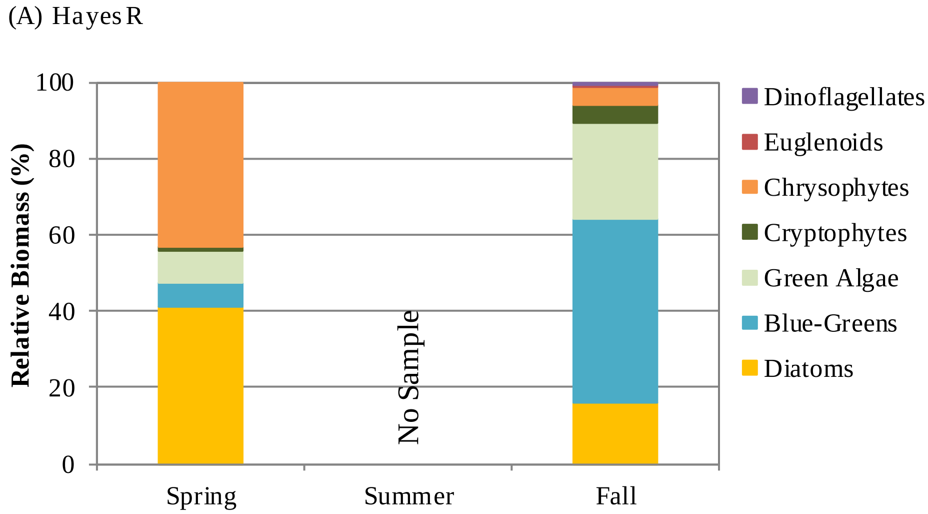


Figure 8.4-2. Phytoplankton biomass measured at sites in the Lower Nelson River Region in 2009.



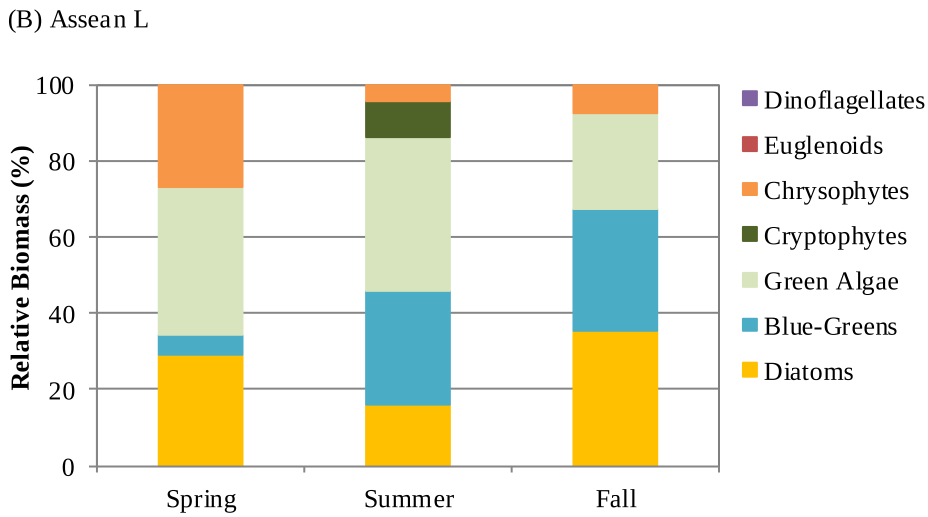


Figure 8.4-3. Phytoplankton community composition at sites in the Lower Nelson River Region in 2009.

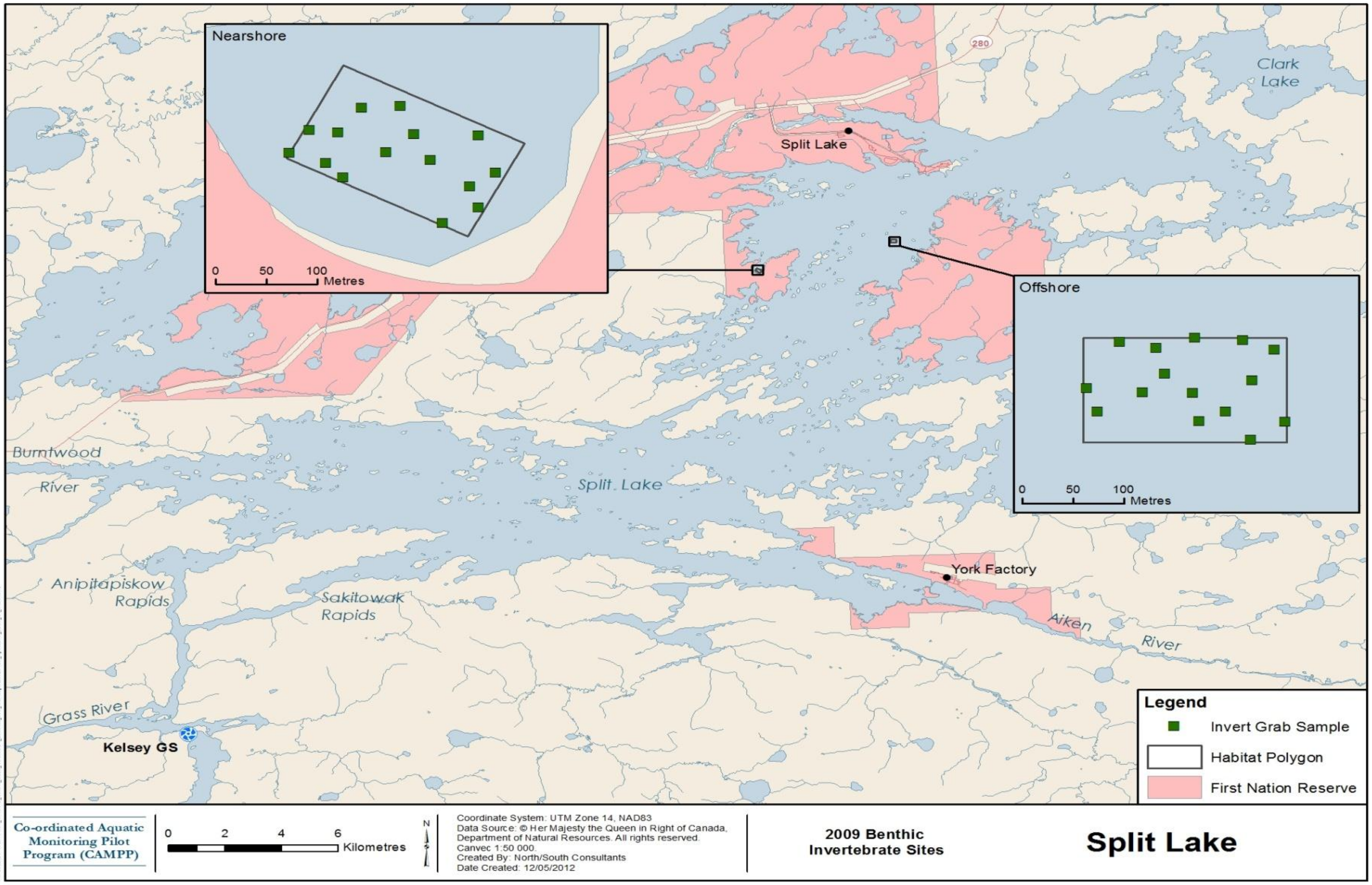


Figure 8.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Split Lake in the Lower Nelson River Region, 2009.

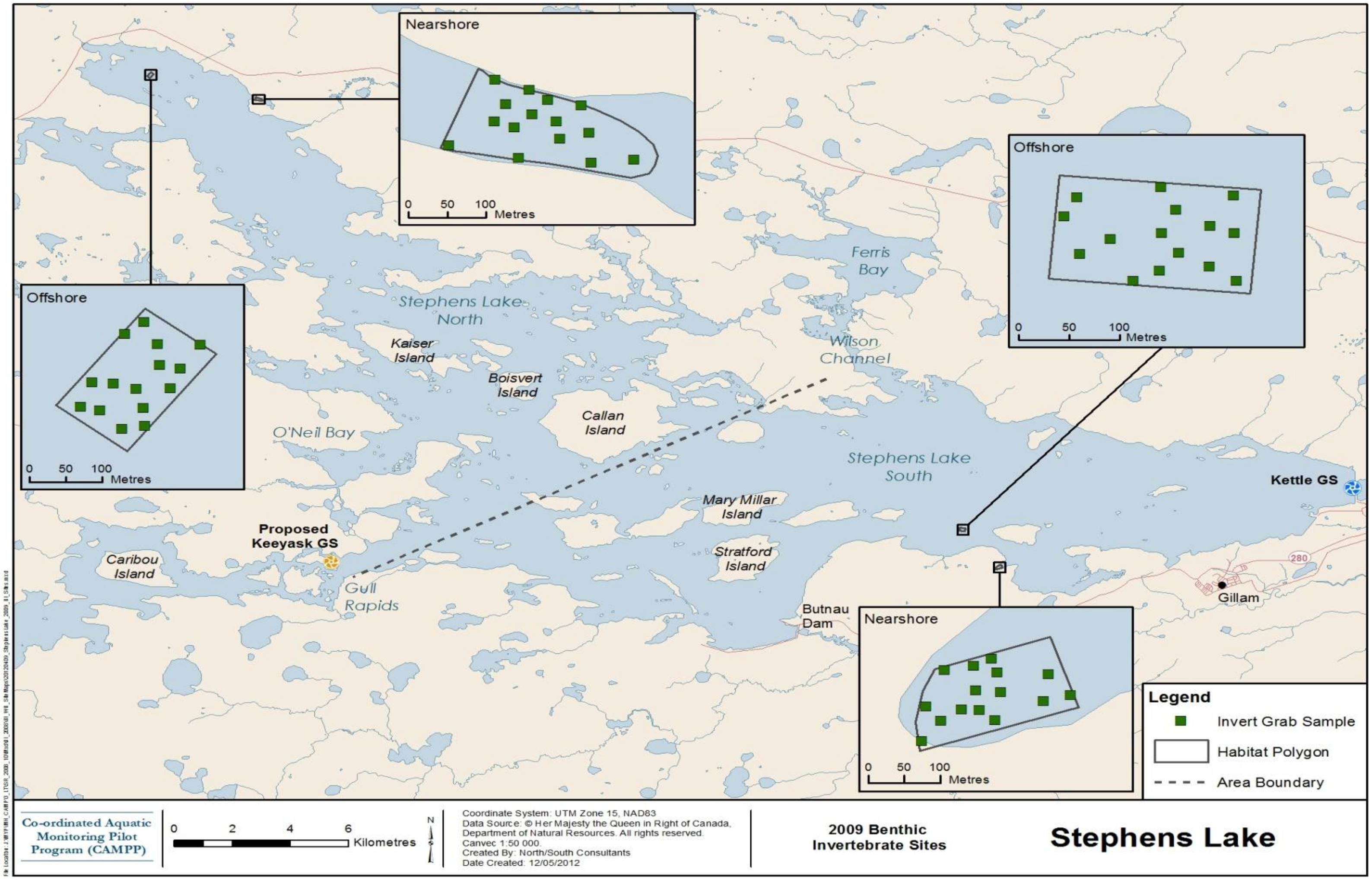


Figure 8.5-2. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Stephens Lake in the Lower Nelson River Region, 2009.

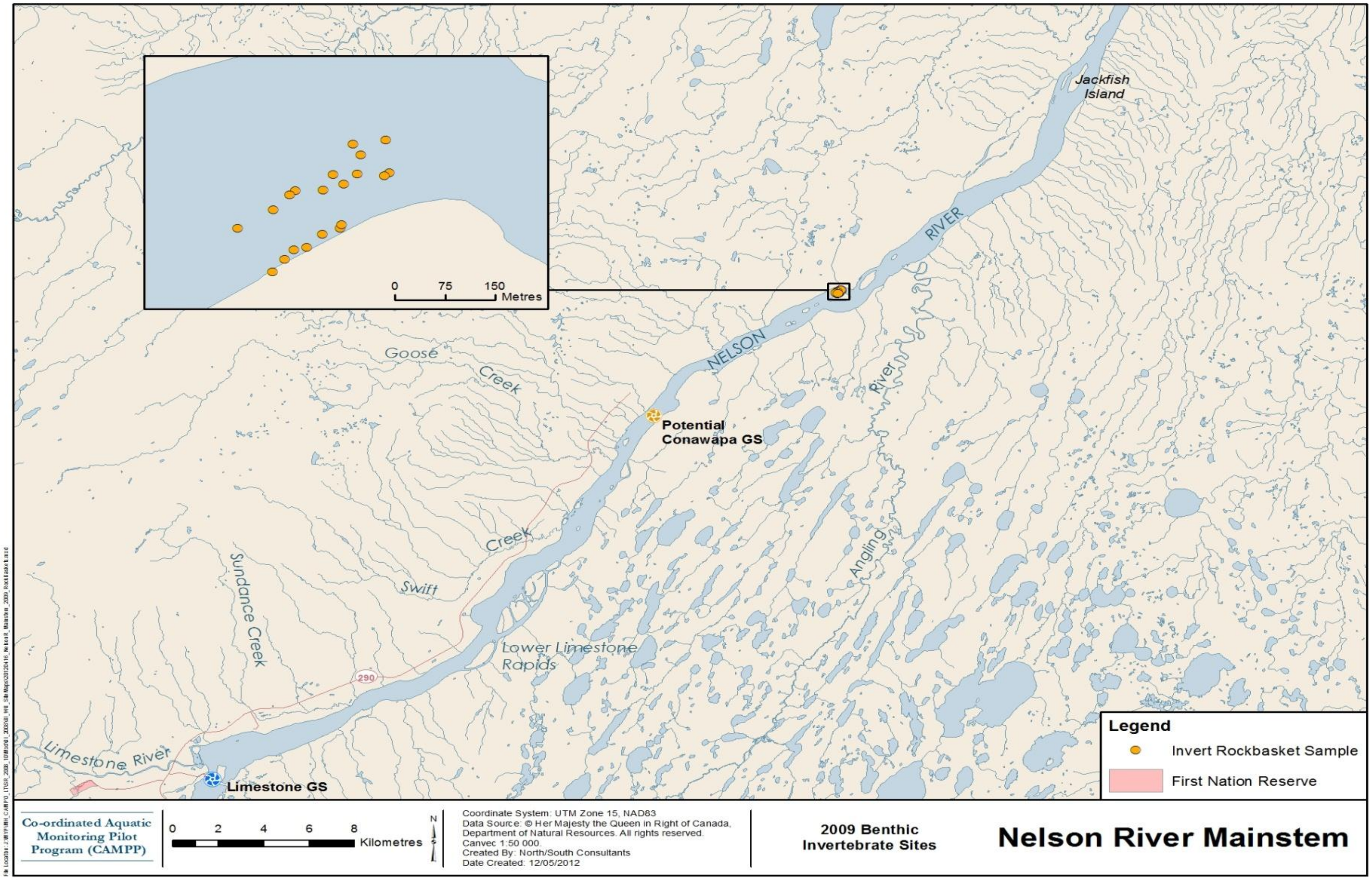


Figure 8.5-3. Randomly-selected benthic invertebrate sampling sites in the nearshore polygon in the Lower Nelson River (downstream of Limestone Forebay) in the Lower Nelson River Region, 2009.

Figure 8.5-4. Randomly-selected benthic invertebrate sampling sites in the nearshore polygon in the Hayes River in the Lower Nelson River Region, 2009.

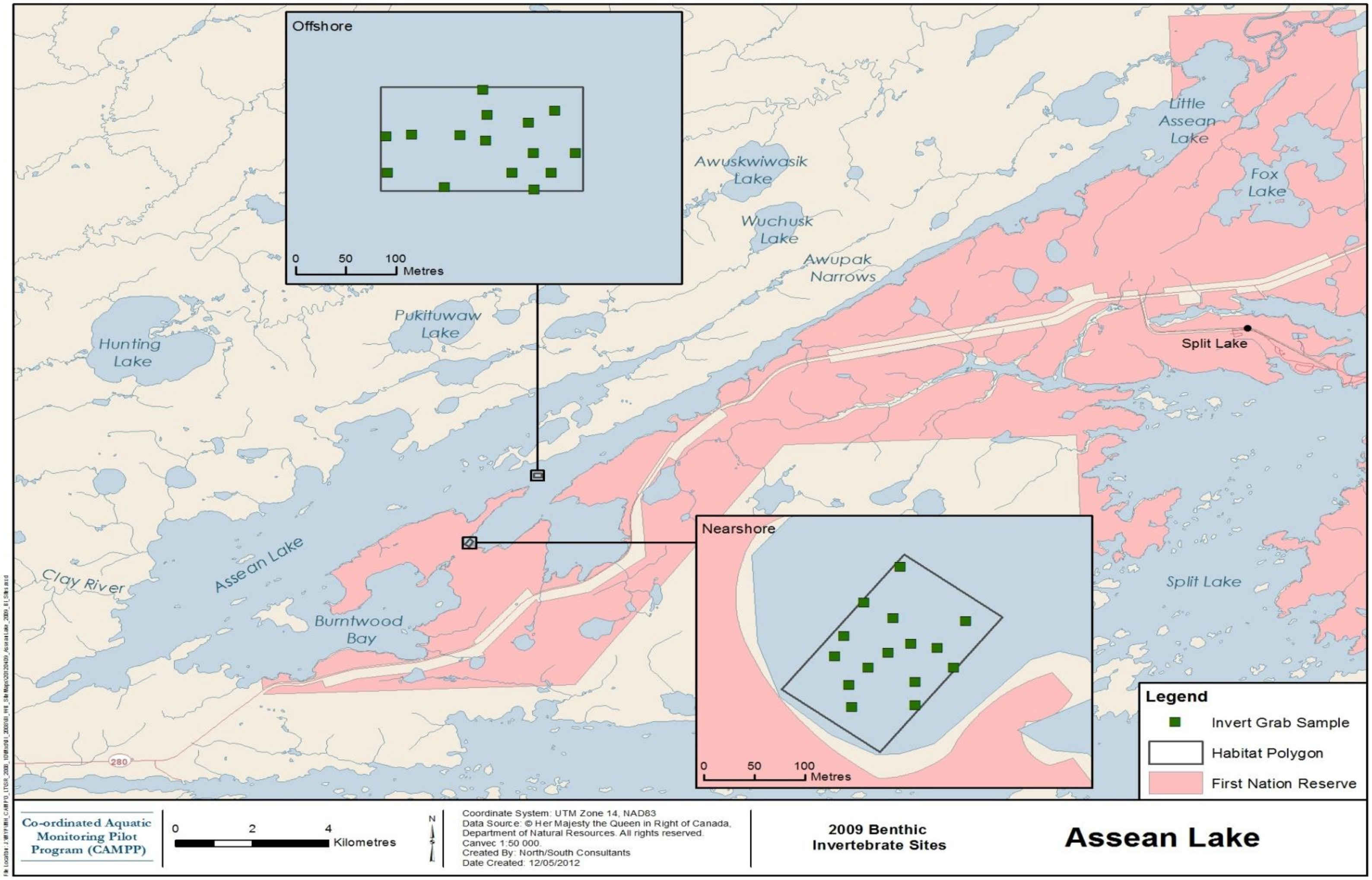


Figure 8.5-5. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Assean Lake in the Lower Nelson River Region, 2009.

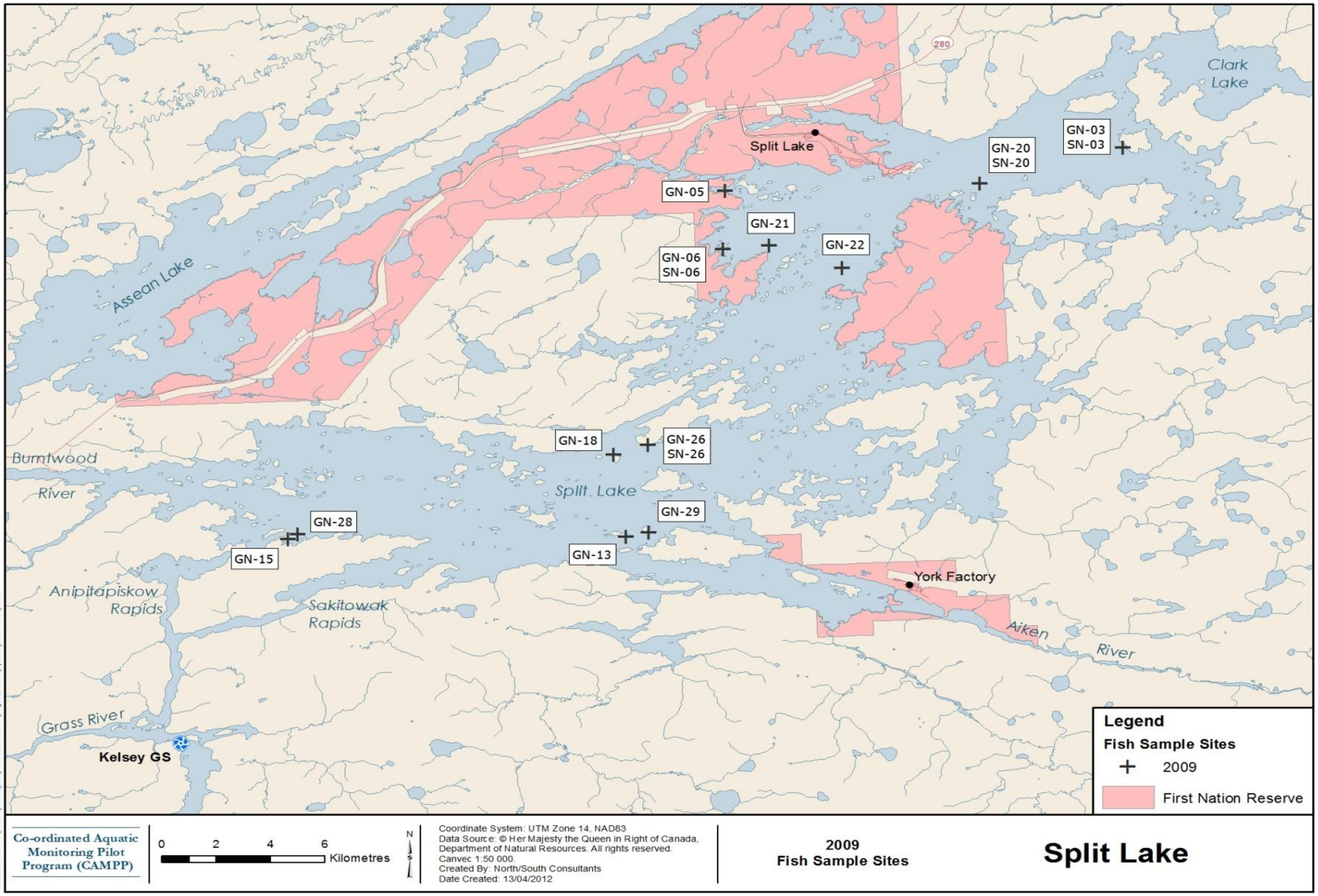


Figure 8.6-1. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Split Lake, 2009.

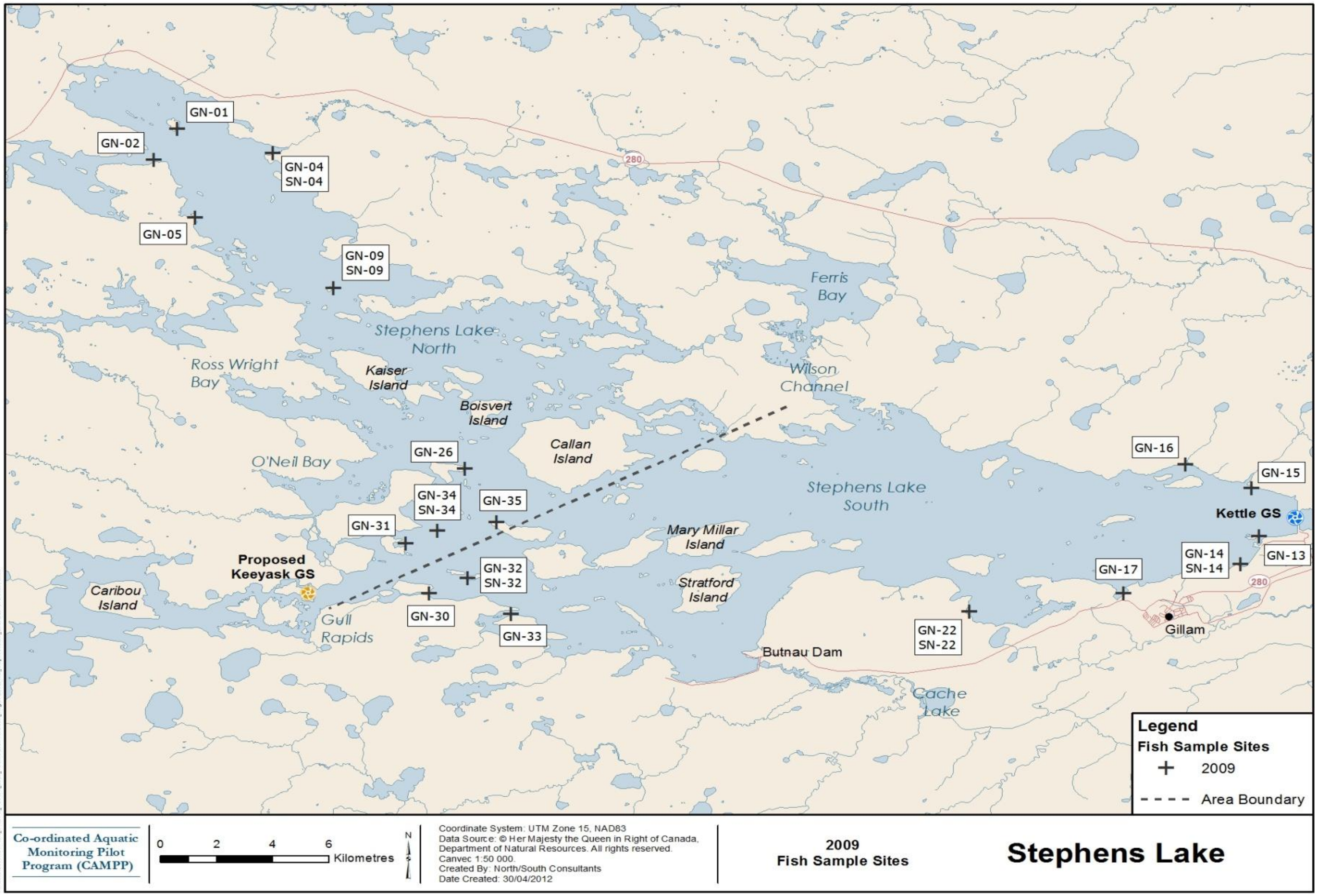


Figure 8.6-2. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Stephens Lake, 2009.

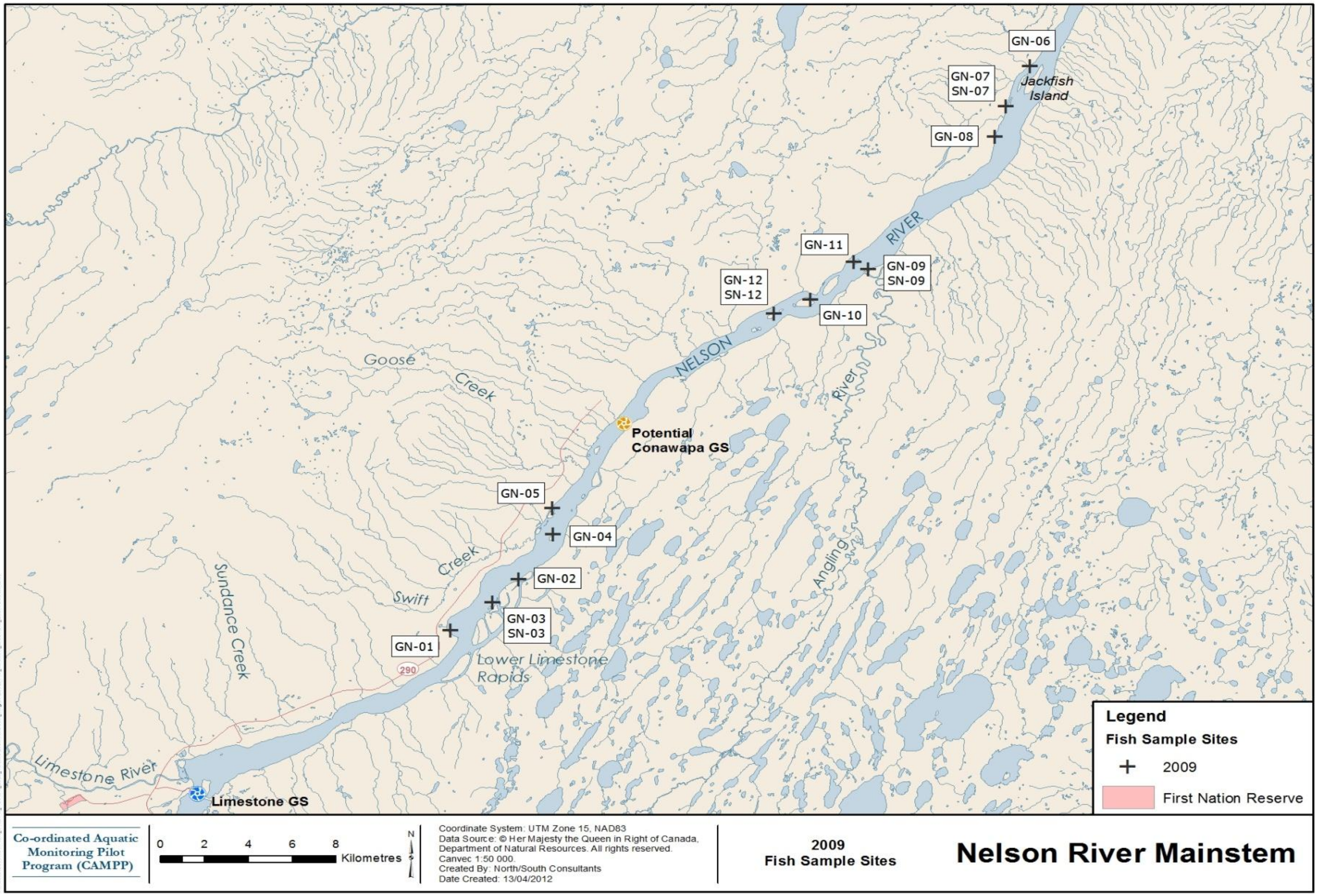


Figure 8.6-3. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Nelson River mainstem, 2009.

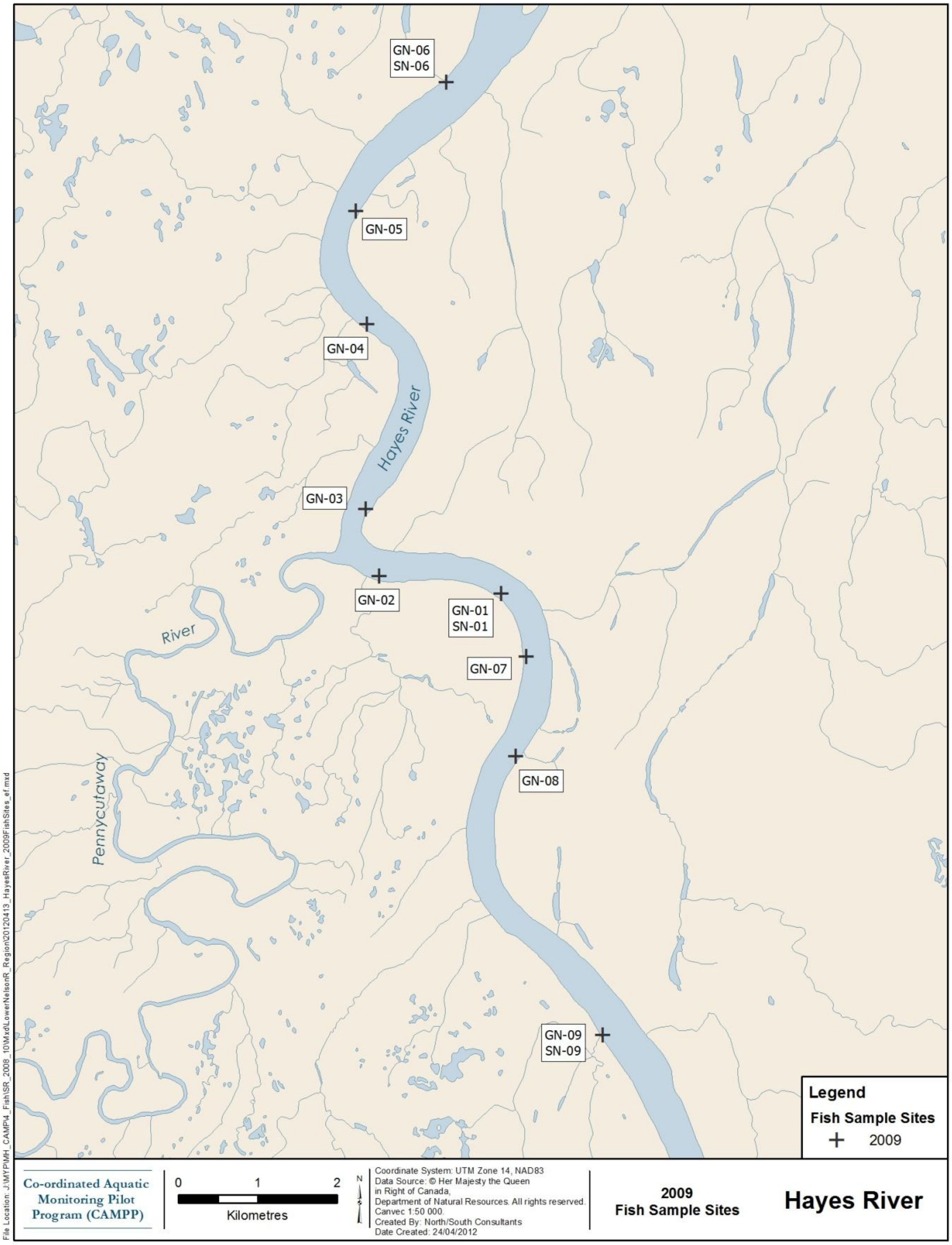


Figure 8.6-4. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in the Hayes River, 2009.

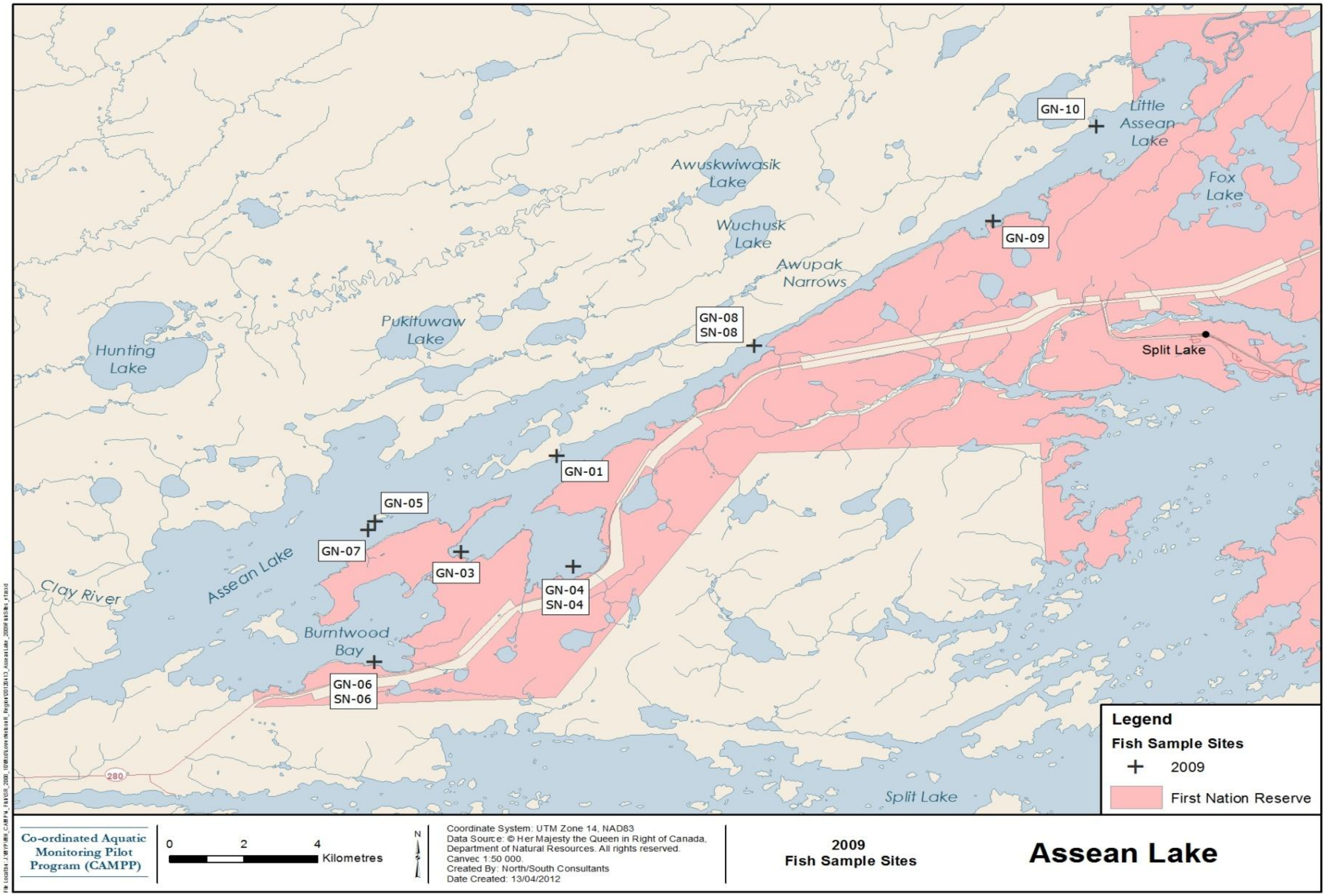


Figure 8.6-5. Map depicting standard gang (GN) and small mesh (SM) index gillnet sites sampled in Assean Lake, 2009.

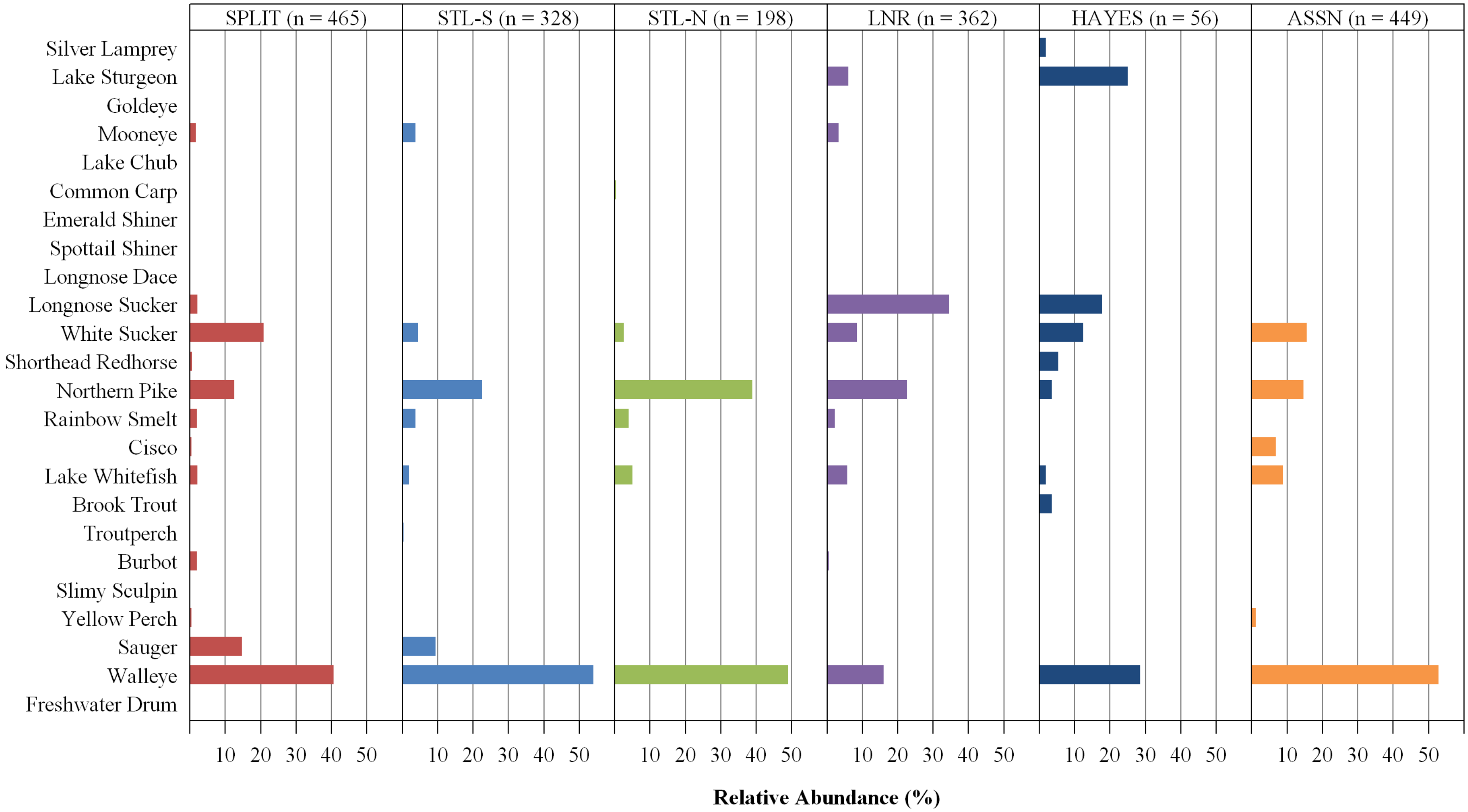


Figure 8.6-6. Relative abundance (%) distributions for fish species captured in standard gang index gill nets set in Lower Nelson River Region waterbodies, 2009.

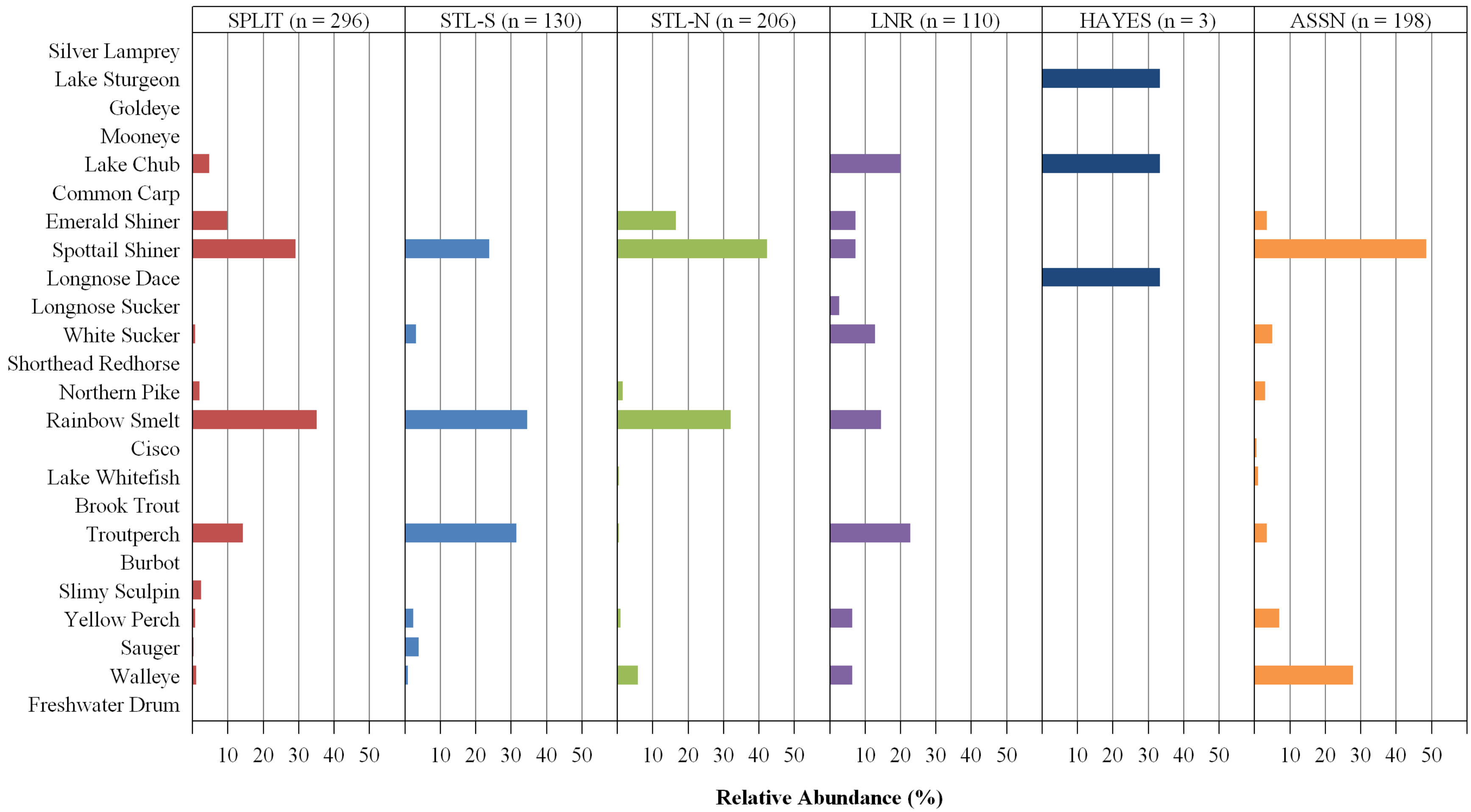


Figure 8.6-7. Relative abundance (%) distributions for fish species captured in small mesh index gill nets set in Lower Nelson River Region waterbodies, 2009.

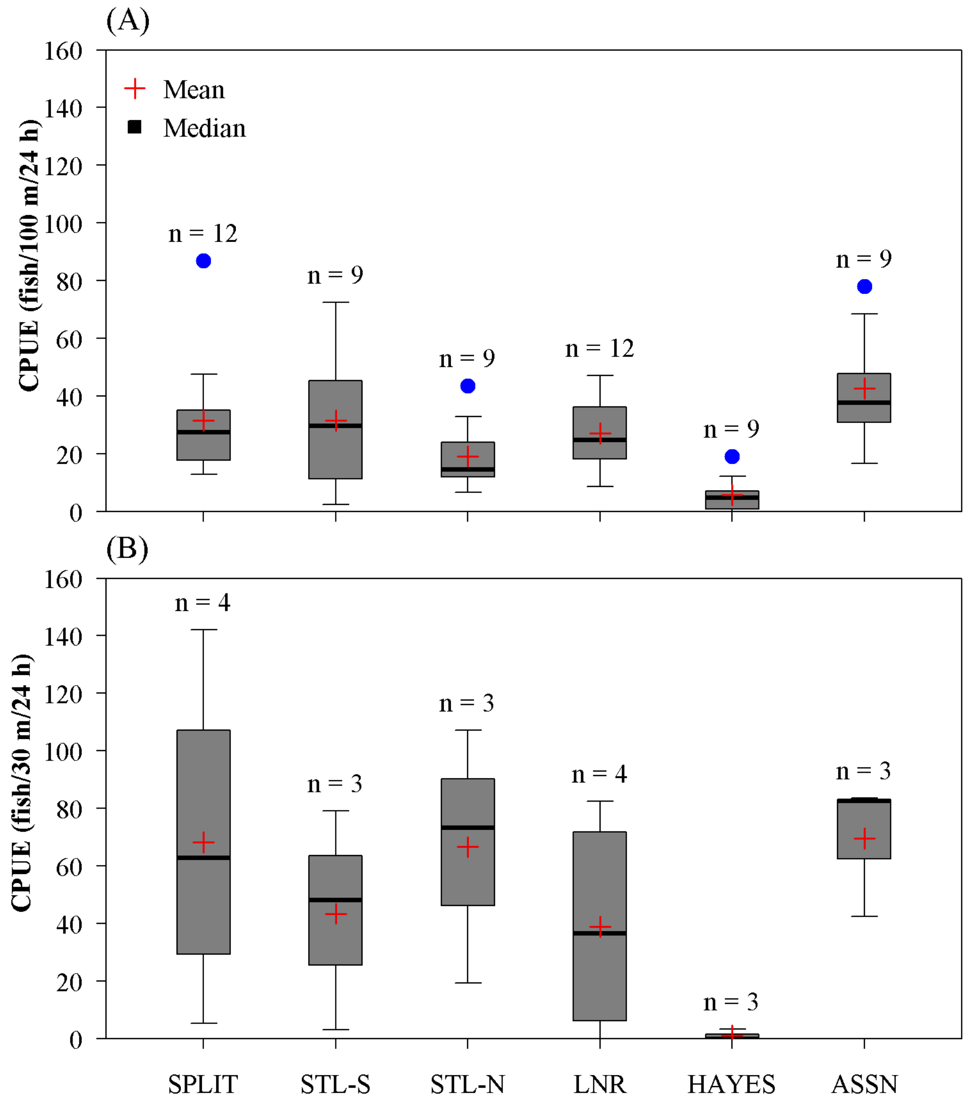


Figure 8.6-8. Mean and median (range) total CPUE calculated for fish captured in (A) standard gang (fish/100 m/24 h) and (B) small mesh (fish/30 m/24 h) index gill nets set in Lower Nelson River Region waterbodies, 2009.

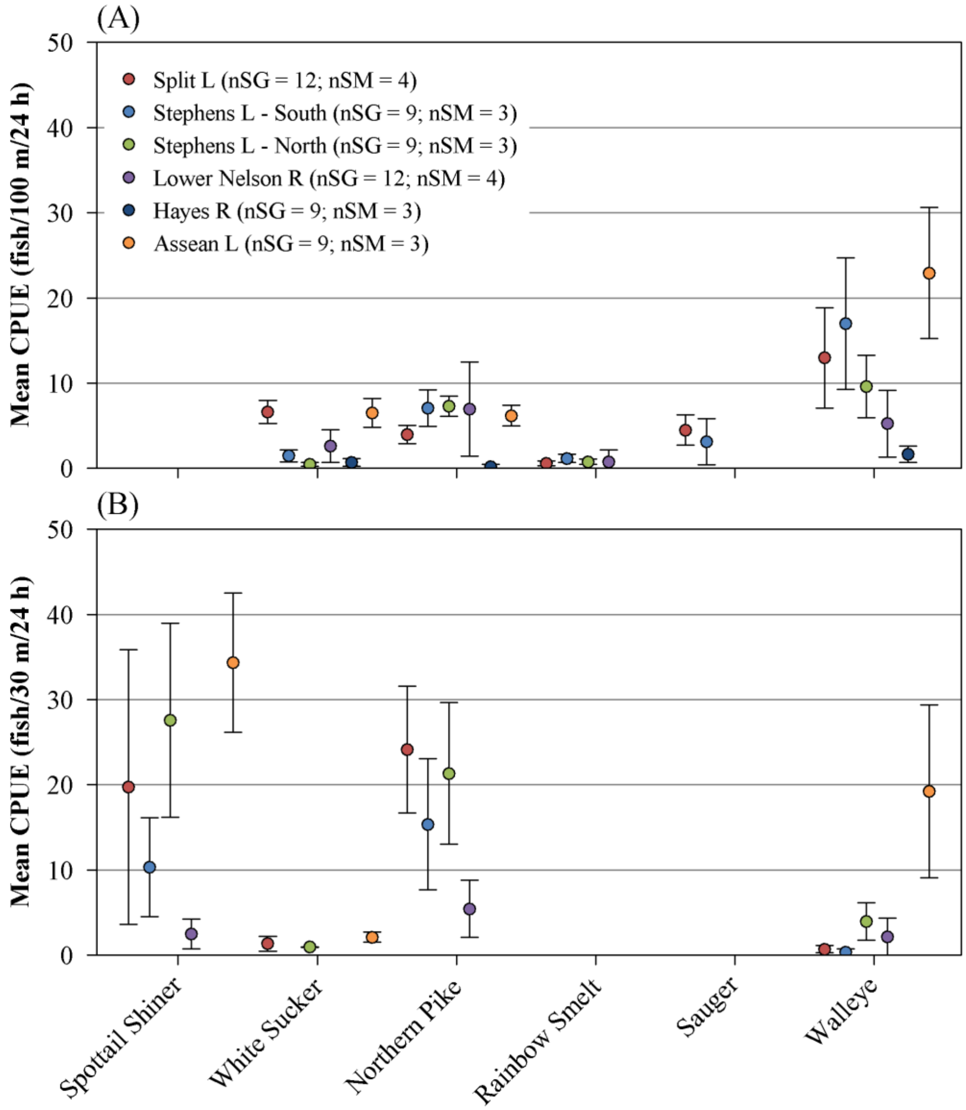


Figure 8.6-9. Mean CPUE (SE) for select fish species calculated from (A) standard gang (SG) and (B) small mesh (SM) index gill nets set in Lower Nelson River Region waterbodies, 2009.

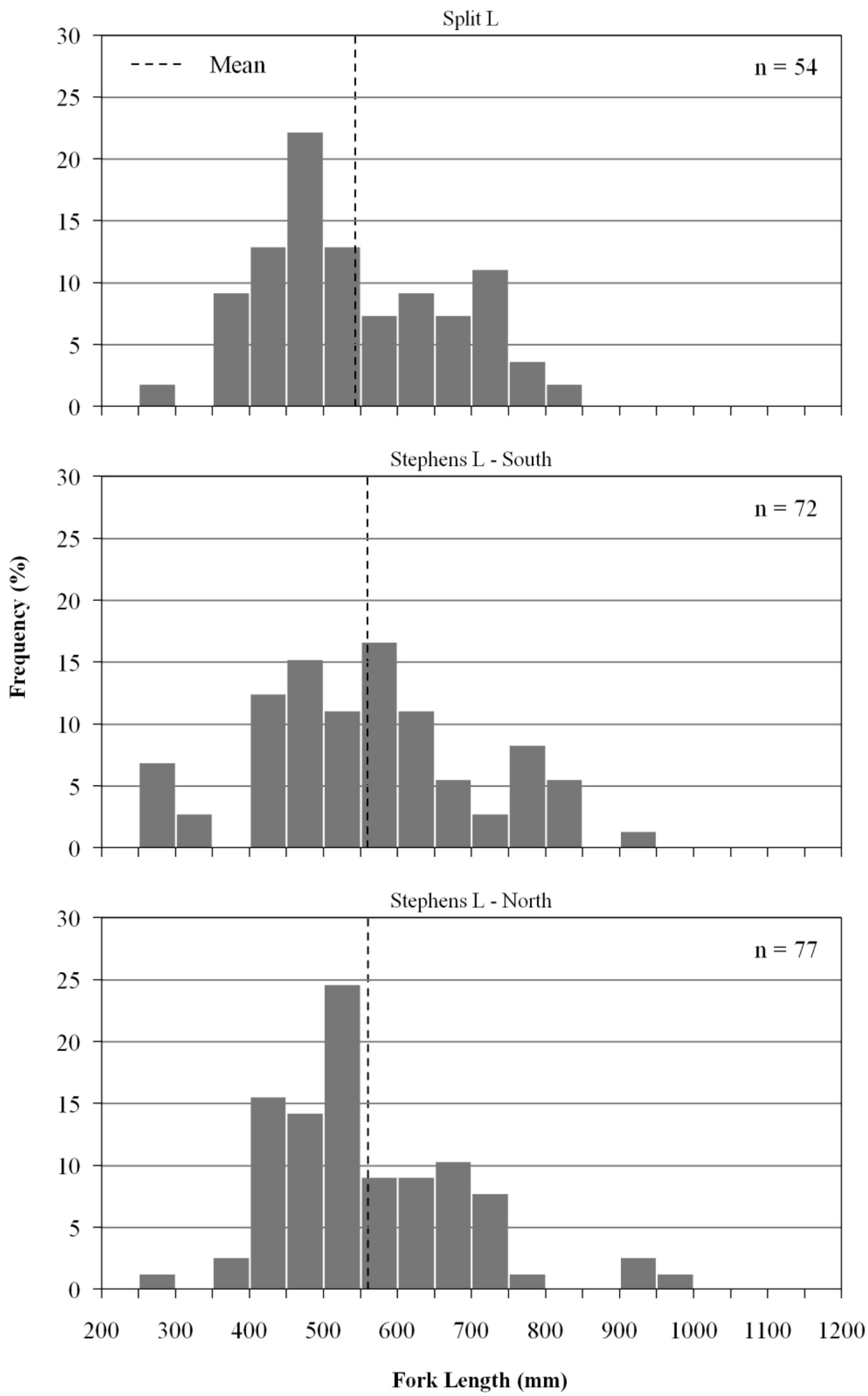


Figure 8.6-10. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Split Lake, Stephens Lake - South and Stephens Lake - North, 2009.

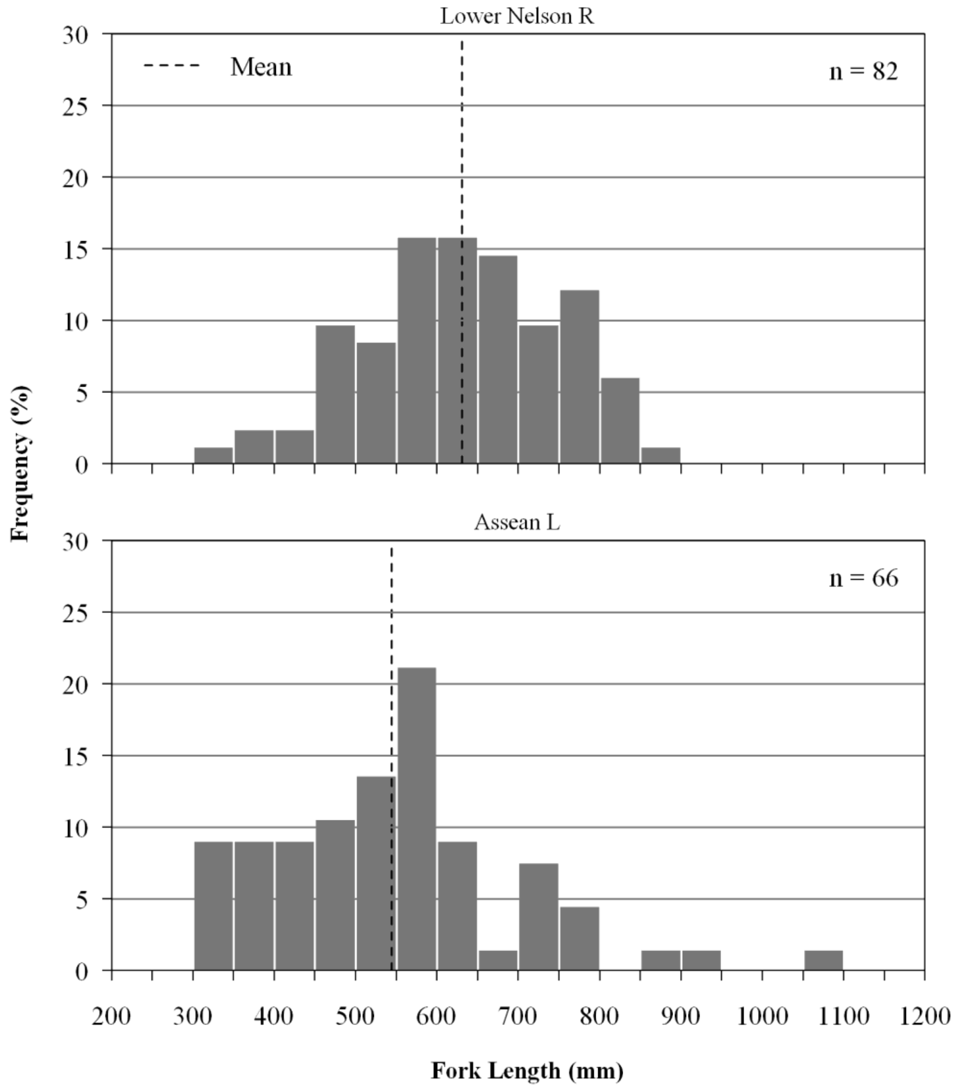


Figure 8.6-11. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in the Lower Nelson River mainstem and Assean Lake, 2009.

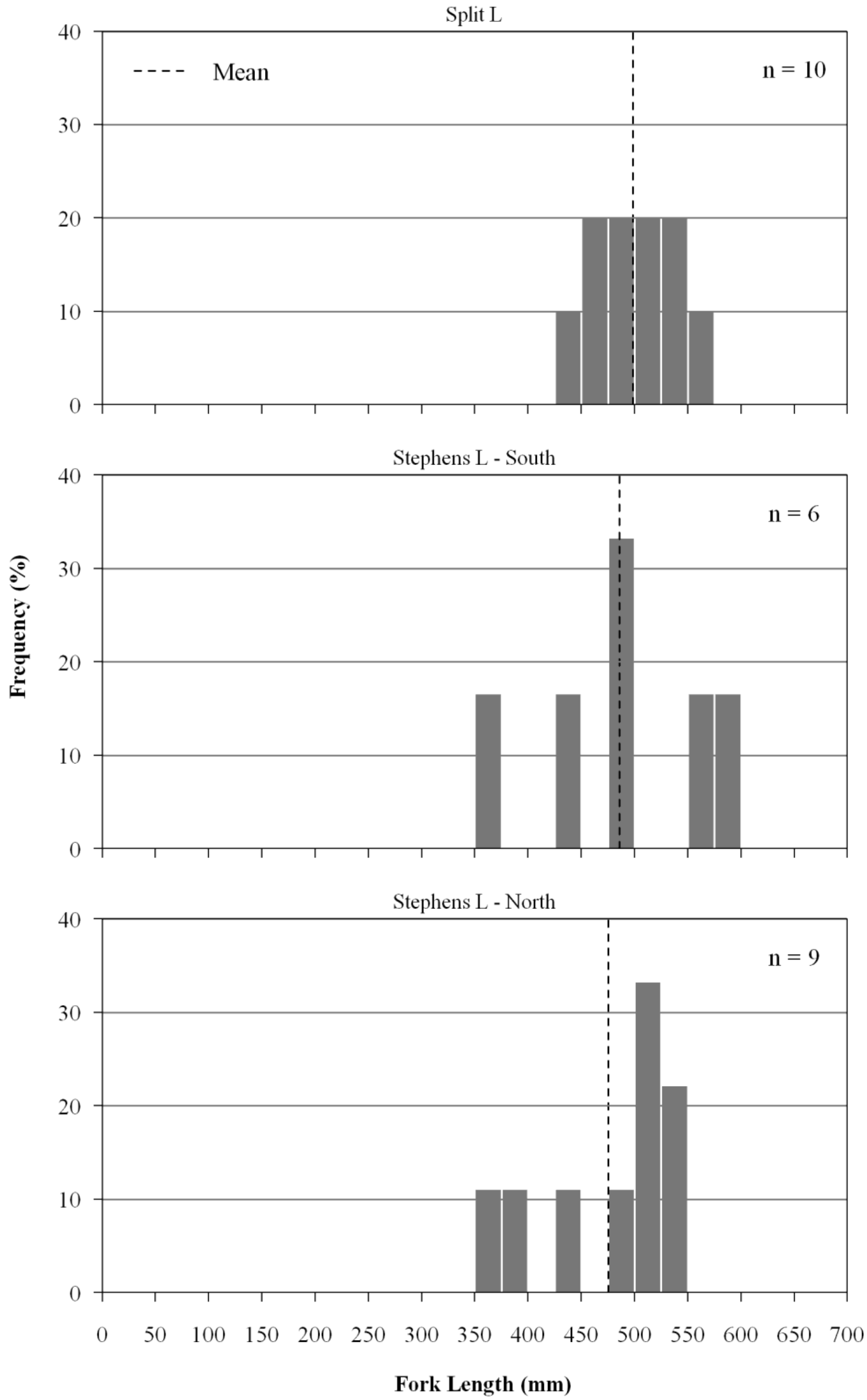


Figure 8.6-12. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Split Lake, Stephens Lake – South, and Stephens Lake - North, 2009.

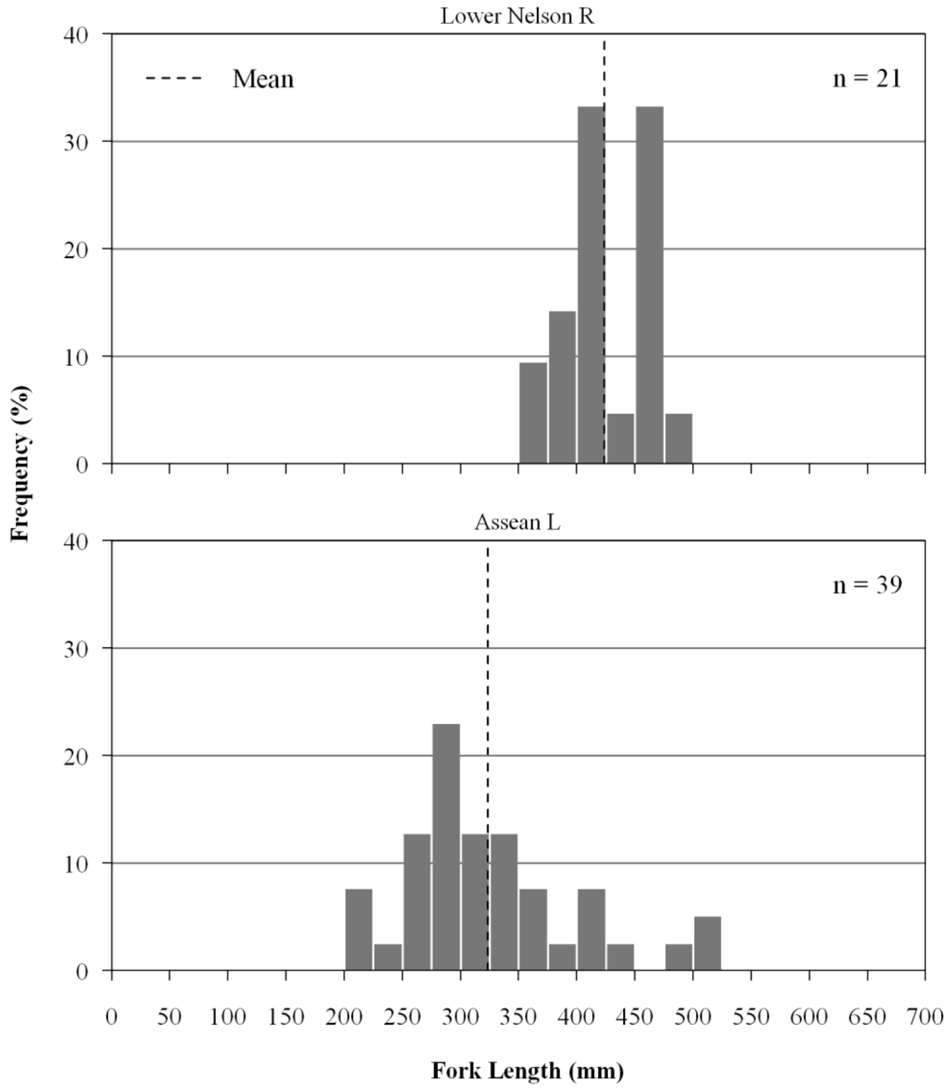


Figure 8.6-13. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in the Lower Nelson River mainstem and Assean Lake, 2009.

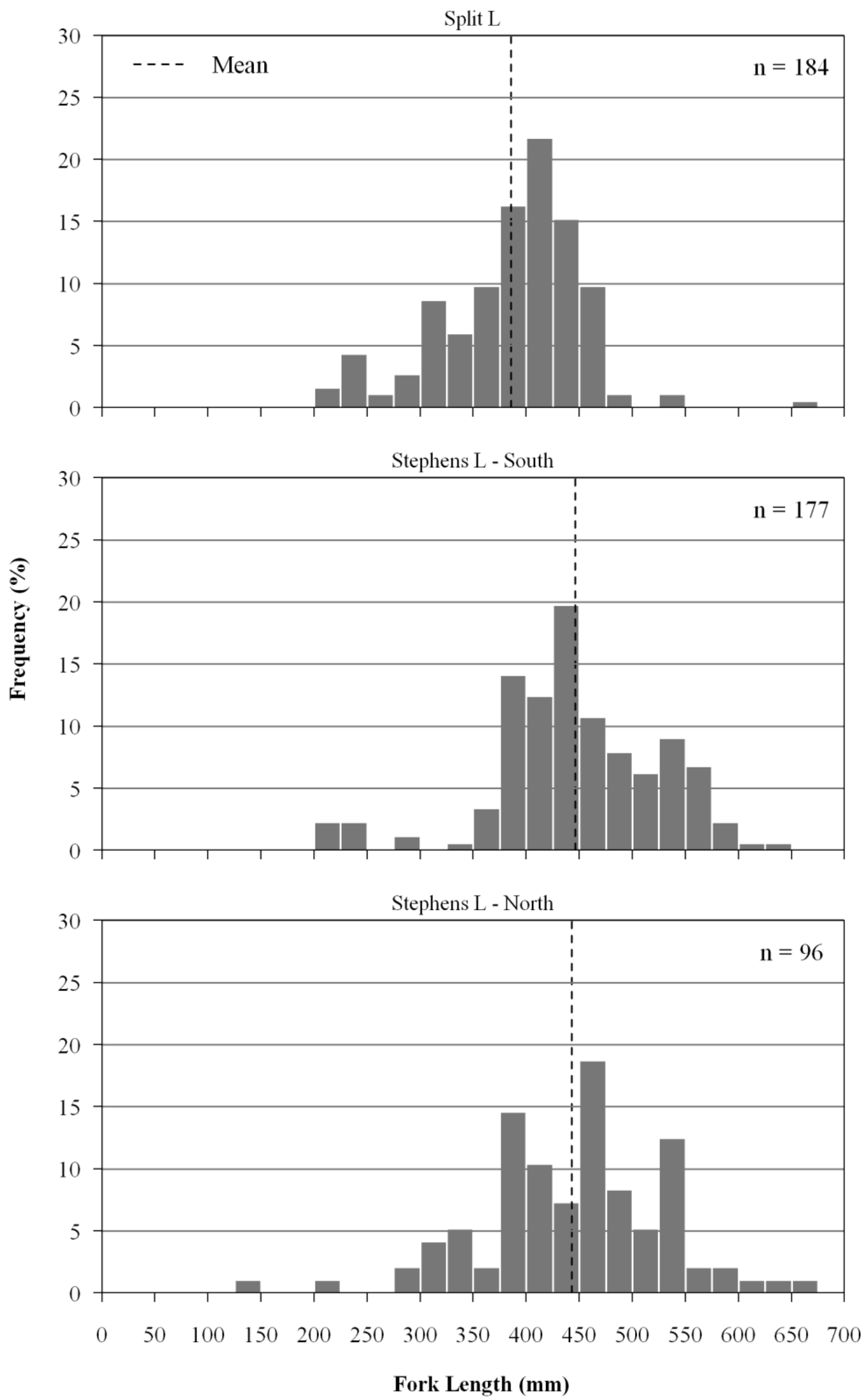


Figure 8.6-14. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Split Lake, Stephens Lake – South and Stephen's Lake - North, 2009.

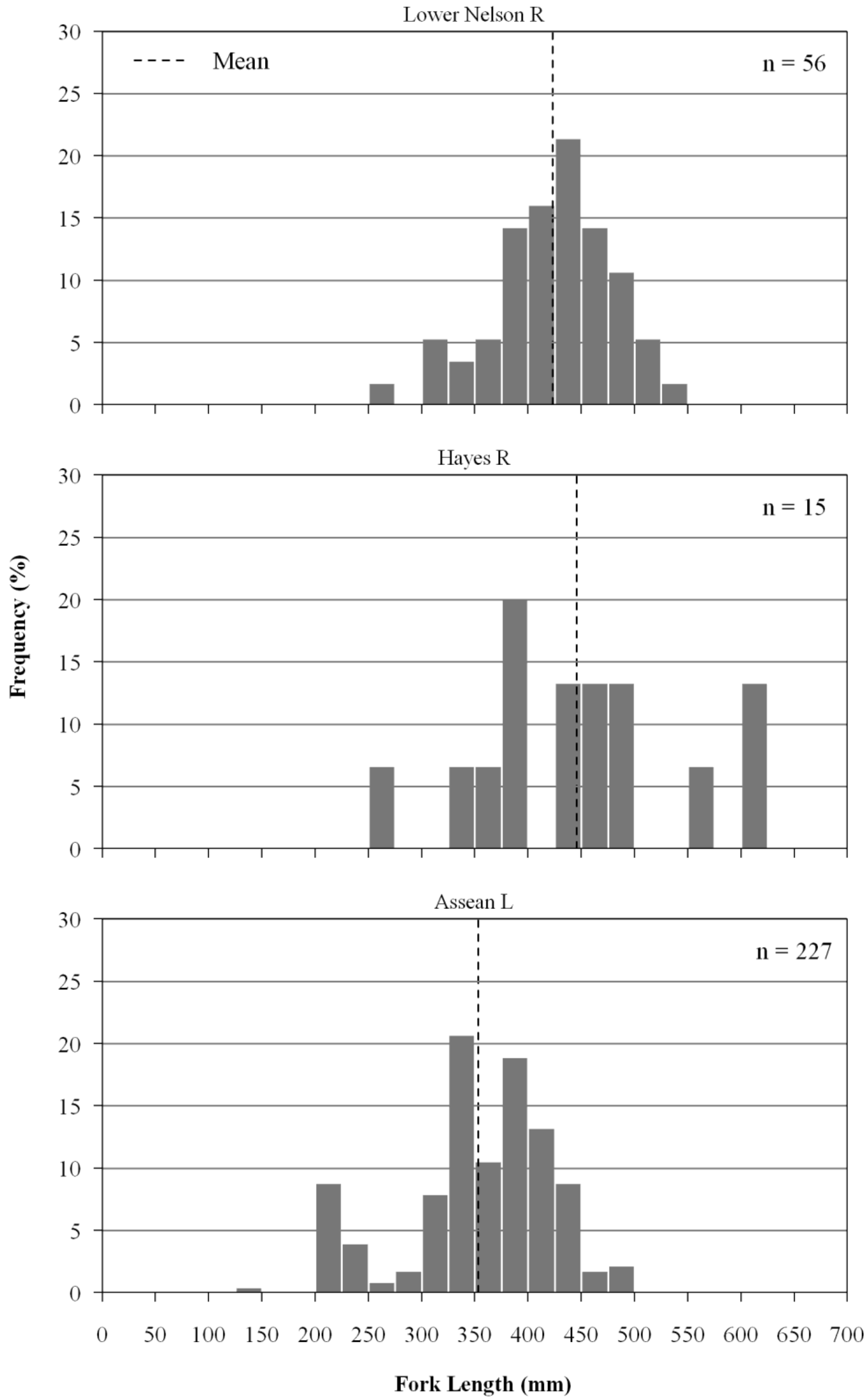


Figure 8.6-15. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in the Lower Nelson River mainstem, Hayes River and Assean Lake, 2009.

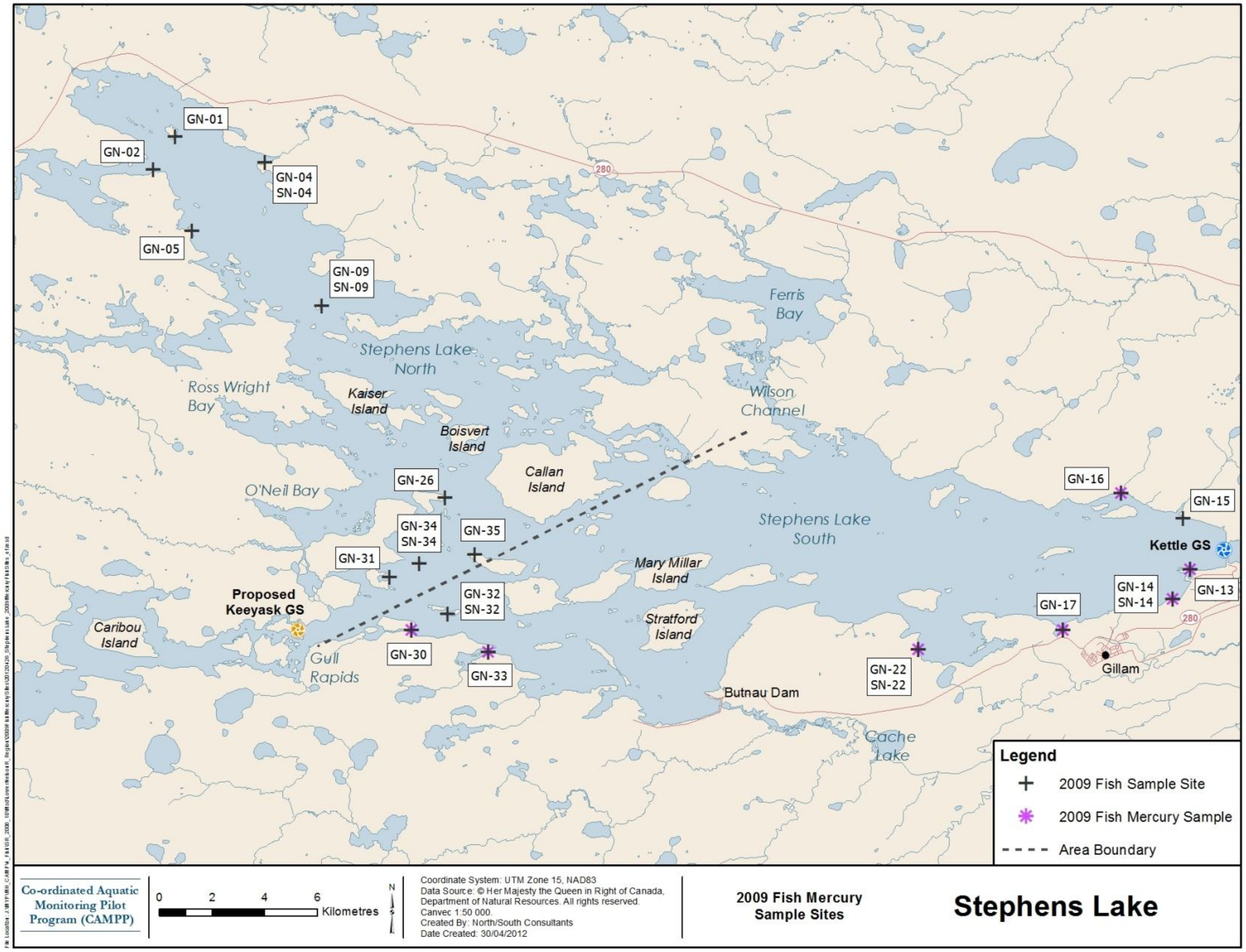


Figure 8.7-1. Fish sampling sites in Lake Winnipeg at Mossy Bay, indicating sites where fish were collected for mercury analysis.

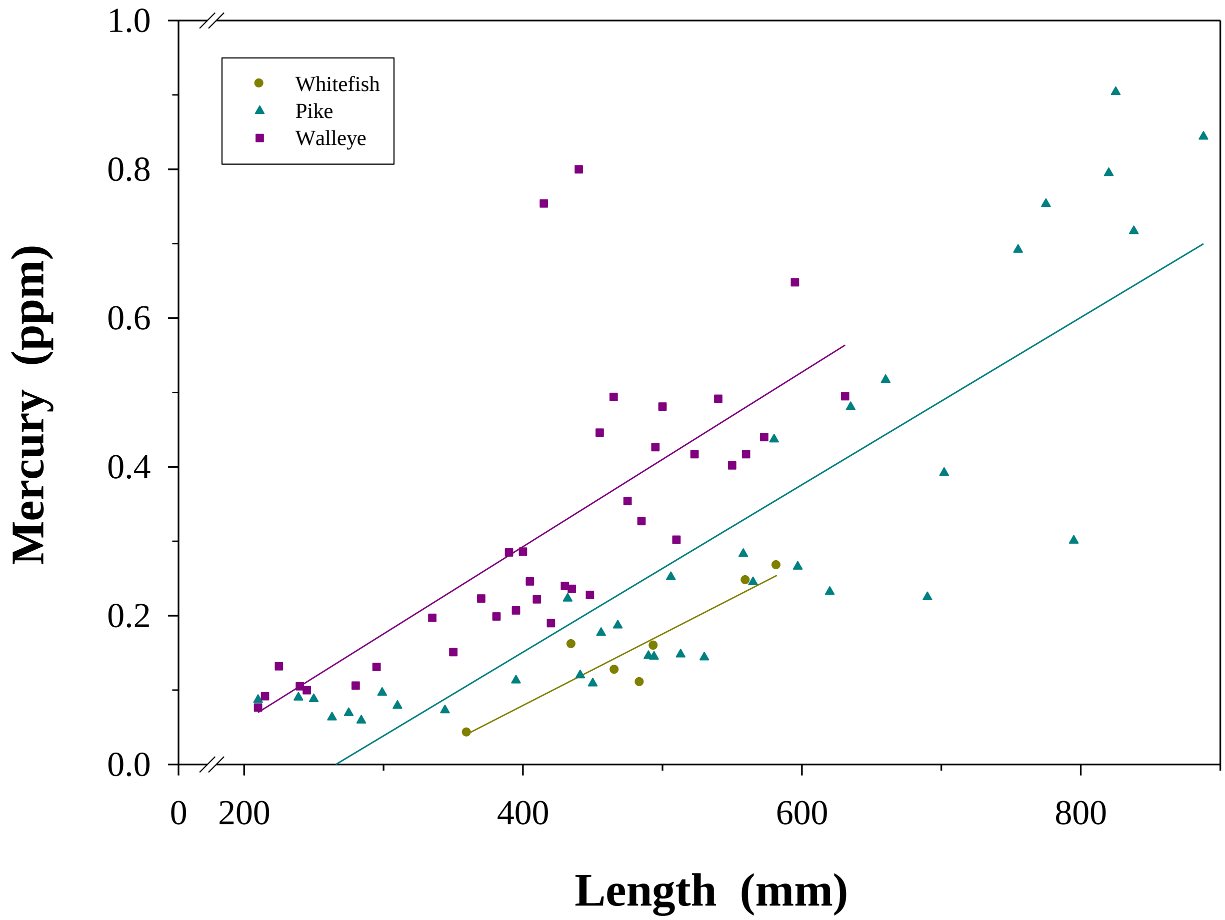


Figure 8.7-2. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye captured from Stephens Lake-South in 2009. Significant linear regression lines are shown.

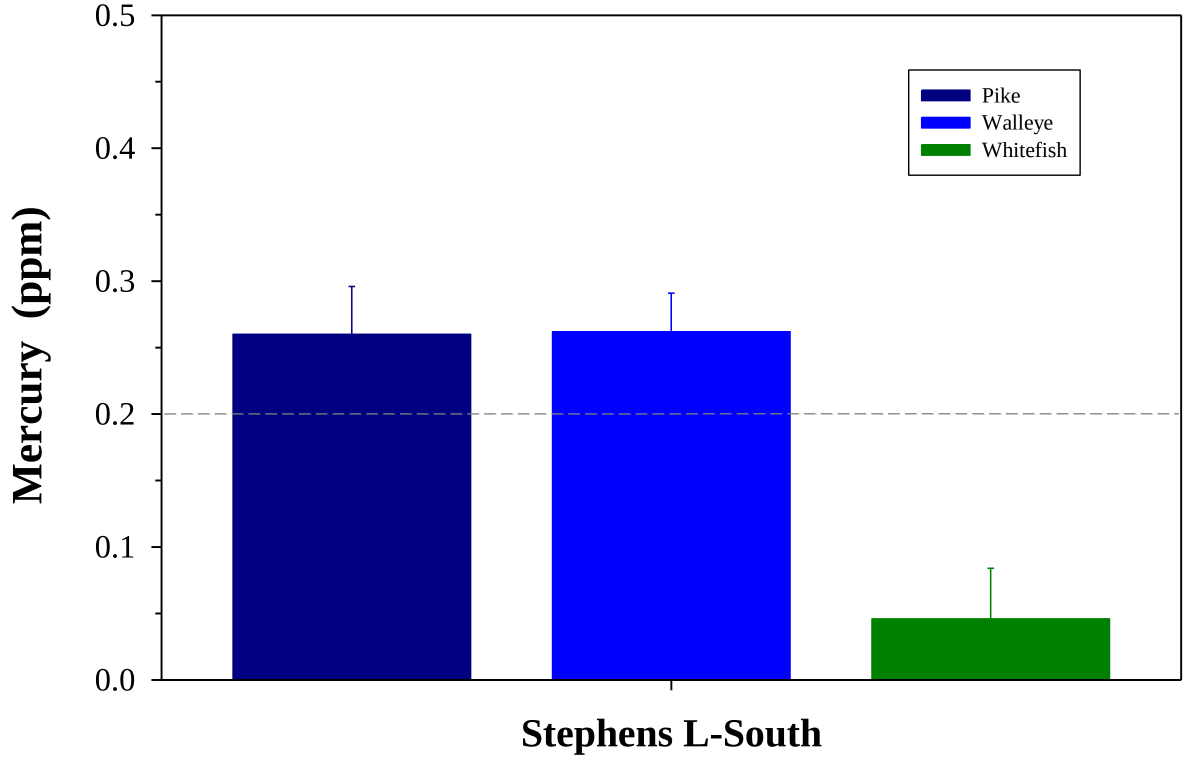


Figure 8.7-3. Standardized mean (+95% CL) mercury concentrations of Northern Pike, Walleye, and Lake Whitefish from Stephens Lake-South in 2009. The stippled line indicates the 0.2 ppm guideline for human consumption.

9.0 LAKE WINNIPEG REGION

The following provides an overview of the results of CAMPP for 2009/2010, by each major component, for Lake Winnipegosis (the off-system waterbody). Information collected on the fish community in Lake Winnipeg is also included. A 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; climatological data for the Grand Rapids area is described in Section 3.1. Data were not available for Cowan, MB in 2009.

Mean monthly air temperatures measured in Arborg in 2009 were generally similar to the 1971-2000 temperature normals throughout the year (Figure 9.1-1). Notable exceptions include September, when air temperature was approximately 6.4 °C warmer than normal, and November when air temperature was approximately 7.7 °C cooler than normal. The annual mean air temperature was 0.8 above the normal.

Normals for precipitation indicate peaks in August followed by secondary peaks in June and July (Figure 9.1-1). In 2009, June and August both exhibited above normal precipitation at approximately 121 mm each. Precipitation in March was also notably greater than normal (approximately two times the normal for that month). In September, precipitation was approximately 16% of the normal for that month. Overall, total annual precipitation was slightly (<10%) above normal.

Based on comparisons to climate normals, 2009 was characterized by slightly warmer temperatures early in the year followed by a cooler spring with an atypically wet March, a cooler wetter summer, a notably warmer and dryer September, and a cooler and dryer late fall and winter (Figure 9.1-1).

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, Saskatchewan, and Red rivers. Water levels are also influenced by outflows which have been regulated by the Jenpeg Generating Station since 1976 for power production, flood control, and drought support. Other inflows come from smaller rivers such as the Dauphin, Berens, and Poplar rivers. Lake

Winnipegosis is the off-system waterbody and is located within the Lake Winnipeg drainage basin, draining through Lake Manitoba into Lake Winnipeg.

Water levels on Lake Winnipeg started the year near the upper quartile and rose above the upper quartile for most of the year due a very high snowpack in most of the drainage basin. In accordance with the Lake Winnipeg Water Power Act licence, outflow at Jenpeg was maximized for much of the summer as water levels exceeded 217.93 m (Figure 9.2-1).

Water levels on Lake Winnipegosis were near the upper quartile for almost all of 2009 (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 2 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 is presented herein. Five sampling sites were monitored in Lake Winnipegosis under CAMPP in 2009/2010 (Figure 9.3-1). Sampling could not be completed at Site 3 in spring 2009 due to inclement weather.

9.8.1 Routine Variables and Limnology

Results of the 2009/2010 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 9.3-18.

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, each of the five sites sampled in Lake Winnipegosis in 2009/2010 stratified in the ice-cover season (Figure 9.3-2). All sites were well-oxygenated in spring, summer, and fall but dissolved oxygen (DO) depletion was evident at depth in winter, concurrent with thermal stratification, at all sites. DO was below the Manitoba chronic water quality objective for the protection of cold-water aquatic life (9.5 mg/L; Manitoba Water Stewardship [MWS] 2011) at depth in winter at all five sites; DO was also below the chronic water quality objective for cool-water aquatic life (5.5 mg/L) at depth in winter at all sites exception Site 1 (Figure 9.3-2). DO was less than 4 mg/L at depth at Sites 3 to 5 and was less than 2 mg/L at Site 5 at depth (Figure 9.3-2).

Other *in situ* variables, including turbidity, pH, and specific conductance, were relatively consistent across depth (Figures 9.3-3 and 9.3-4), though specific conductance increased and pH decreased somewhat at depth in winter at most sites. Secchi disk depths were similar across sites and ranged from approximately 1 m to more than 2 m in the open-water season (Figure 9.3-5). *In* *situ* turbidity data are not available for Site 2 in fall 2009 due to malfunctioning of the turbidity sensor.

Total phosphorus (TP) was higher at Site 1 than the other four sampling sites in 2009/2010 and 75% of samples from Site 1 exceeded the Manitoba narrative guideline for TP of 0.025 mg/L for lakes, ponds, and reservoirs (MWS 2011; Figure 9.3-6); TP was consistently within the narrative guideline at the remaining sites in 2009/2010. Other routine water quality variables for which there are Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL), including pH (laboratory; 6.5-9.0), ammonia (objectives are site-specific based on pH and temperature), and nitrate/nitrite (2.93 mg N/L), were within PAL objectives and guidelines in 2009/2010. *In situ* pH slightly exceeded the upper end of the PAL guideline (6.5-9.0) in fall 2009 at Sites 3 and 5.

The majority of TP was in dissolved form in winter and the lowest dissolved fraction occurred in fall in 2009/2010 (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 in Lake Winnipegosis in 2009/2010, though the relative concentrations of these forms of DIN varied over time and sampling sites. TN concentrations were highest in winter at sites 2 through 5 in 2009/2010 (note: Site 3 could not be sampled in spring 2009 due to inclement weather); concentrations were more consistent across sampling periods at Site 1 (Figure 9.3-8).

Water samples collected at depth (1 m above the sediment-water interface) in winter 2009 when the lake was thermally stratified, indicated DIN and nitrate/nitrite were higher at depth relative to near the surface of the water column, most notably at Site 3 through 5 (Figures 9.3-9 to 9.3-13); TN was also higher at depth relative to the surface in winter at all sites excepting Site 1. Smaller differences were noted for phosphorus parameters measured at depth relative to the near surface at most sites in winter, though TPP and TP were slightly higher at depth at all sites (Figures 9.3-14 to 9.3-18).

9.8.2 Metals and Major Ions

Summaries of metal concentrations and detection frequencies measured in Lake Winnipegosis in 2009/2010 are presented in Table 9.3-3. Only seven metals were not detected in at least one sample from one sampling site including beryllium, bismuth, cesium, copper, mercury, zinc, and zirconium. Arsenic, barium, boron, calcium, iron, magnesium, manganese, molybdenum, potassium, rubidium, sodium, strontium, and uranium were consistently detected, whereas the remaining metals were detected in some samples.

In contrast to most of the other CAMPP waterbodies, aluminum and iron were consistently within PAL guidelines (0.1 mg/L for aluminum and 0.3 mg/L for iron) at any site or sampling time in Lake Winnipegosis in 2009/2010 (Table 9.3-4, Figure 9.3-19). Selenium was detected in 25 to 50% of samples collected and silver was detected in 25% of samples from sites 1 and 2 in the lake in 2009/2010. The analytical DLs for selenium (0.001 mg/L) and silver (0.0001 mg/L) are equivalent to the Manitoba PAL guidelines (MWS 2011). Measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the analytical detection limit.

Concentrations of aluminum and iron were similar in surficial and deep (1 m from the sediment-water interface) water samples collected in winter under thermally stratified conditions; conversely, manganese was notably higher at depth during the ice-cover season at all sites (Figures 9.3-20 to 9.3-24).

Both chloride and sulphate were consistently detected in Lake Winnipegosis in 2009/2010. On average, chloride and sulphate were lowest at Site 1 and highest at Sites 4 and 5 (Table 9.3-2). Concentrations of chloride ranged from 188 mg/L to 351 mg/L and fell within the lower range (71-3,793 mg/L) reported for the Interior Plains Region of southern Manitoba (CCME 1999; updated to 2013) but were higher than other CAMPP waterbodies. All measurements of chloride 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. Sulphate concentrations ranged from 43.2 mg/L to 75.9 mg/L; 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 waters ranging from soft to very hard (Meays and Nordin 2013; Table 7.3-4).

9.8.3 Trophic Status and Nutrient Ratios

Sites on Lake Winnipegosis were mesotrophic to eutrophic on the basis of open-water season mean TP concentrations in 2009 (Table 9.3-5). Similarly, all but Site 1 were mesotrophic on the basis of chlorophyll *a* measured in the open-water season of 2009 (Table 9.3-6); Site 1 was characterized by a higher open-water season mean concentration of chlorophyll *a* and is classified as eutrophic (Table 9.3-6). Trophic status based on TN concentrations ranged from mesotrophic (Sites 2 and 3) to eutrophic (Sites 1, 3, and 5; Table 9.3-7).

Molar TN:TP ratios indicate all sites sampled in Lake Winnipegosis in 2009/2010 were strongly phosphorus limited (Figure 9.3-25). Excepting Site 2, TN:TP ratios were highest in winter 2009. Examination of total organic carbon to organic nitrogen molar ratios indicates that organic matter at each site was a mixture of allochthonous and autochthonous sources in all sampling periods (Figure 9.3-26).

9.8.4 Escherichia coli

E. coli was not detected at any site during the four sampling periods in 2009/2010 (Table 9.3-2). Concentrations were less than 1 CFU/100 mL in all samples and 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 Year 2 of CAMPP in the Lake Winnipeg Region. In 2009, five sites in the off-system lake, Lake Winnipegosis, were sampled (Figure 9.1-1).

9.9.1 Chlorophyll a

Open-water season chlorophyll *a* concentrations in Lake Winnipegosis were moderate at Sites 3, 4 and 5; moderate to high at Site 2, and high at Site 1 (Figure 9.4-1). Chlorophyll *a* concentrations measured near the surface were consistently comparable to those measured for the euphotic zone. Winter chlorophyll *a* concentrations were lower than those of the open-water season, indicating that productivity was low under-ice.

9.9.2 Community Composition and Biomass

In 2009/2010, phytoplankton total biomass varied between the sites in Lake Winnipegosis with no consistent seasonal or spatial patterns (Figure 9.4-2).

The phytoplankton community of Lake Winnipegosis was typically dominated by blue-green algae during the open-water season of 2009 (Figure 9.4-3). The only exception to this occurred in spring at Site 4 when the community was dominated by diatoms. Green algae and diatoms were consistently the next-most dominant species at all sites in the lake, regardless of season.

Phytoplankton species richness ranged from 31 to 48 in Lake Winnipegosis in 2009 (Table 9.4-1). Metrics describing the phytoplankton community were lowest in summer at Sites 2 and 5 while the most complex assemblages at Sites 1 and 4 occurred during this season (Table 9.4-1). Similarly, community metrics at Site 4 were lowest in fall, but highest at Site 5 during this period. Community complexity at Site 3 was similar between seasons.

9.9.3 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L at Site 1 in summer and fall 2009. Total phytoplankton biomass during these periods was 38,101 mg/m^3 and 7,451 mg/m^3, respectively and the community was dominated by blue-green algae during both periods (Figure 9.4-3).

9.9.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver 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* was ubiquitous in the region in 2009, *Aphanizomenon* was present at all sites except Site 4, and *Microcystis* and *Oscillatoria*/*Planktothrix* were present at all sites except Site 3.

Microcystin-LR was not detected (i.e., < 0.2 µg/L) during either of the phytoplankton blooms that occurred at Site 1 in 2009.

9.9.5 Trophic Status

According to the Organization for Economic Cooperation and Development (OECD 1982) classification scheme for lakes, Lake Winnipegosis Site 1 was eutrophic while Sites 2 to 5 were mesotrophic based on mean chlorophyll *a* measured during the open-water and annual seasons of 2009/2010 (Table 9.3-6).

9.10 BENTHIC MACROINVERTEBRATES

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled in the Lake Winnipeg Region in 2009/2010; the second 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).

Fifteen BMI samples were collected in each of the nearshore and offshore habitat polygons using a benthic grab sampler (Ekman or petite Ponar). Sampling was conducted on 01 September 2009.

9.10.1 Supporting Information

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons in Lake Winnipegosis (Table 9.5-1).

In 2009, water depth criteria for nearshore habitat was defined as less than 3 to 5 m (the predominantly wetted portion of the nearshore environment), and for the offshore habitat water depths of greater than 5 m were targeted. In 2009, mean water depths sampled in the nearshore and offshore habitats of Lake Winnipegosis were 1.4 and 7.6 m, respectively (Table 9.5-1).

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 was 1.7 in the nearshore habitat and 2.4 in the offshore habitat.

Sand comprised the majority of the sediment collected from the nearshore and offshore habitats in Lake Winnipegosis (Table 9.5-2). Silt was the next most abundant sediment in each habitat, followed by clay.

9.10.2 Species Composition, Distribution, and Relative Abundance

Mean BMI density in benthic grab samples in the predominantly wetted nearshore habitat of Lake Winnipegosis was 5,099 individuals/m^2, with densities ranging from 1,212 to 14,110 (Table 9.5-3). Non-insects dominated the BMI community in abundance (89% of the mean total BMI), with insects comprising 11% of the overall taxa (Table 9.5-3). Of the non-insects, the main group was Amphipoda (80% of the mean total BMI). Oligochaeta (5%), Bivalvia (2%), Gastropoda (snails; 1%), and smaller numbers of Hirudinea (leeches) and Hydrozoa (hydra-like animals) were also present. Insects mainly consisted of Chironomidae (7%), a small number of Ephemeroptera (2%) and Trichoptera (2%), and a trace number of Plecoptera (Table 9.5-3). Mean BMI in offshore benthic grab samples was 566 individuals/m^2, with numbers ranging from 173 to 1,039 (Table 9.5-3). Insects dominated the BMI community (91% of the mean total BMI), with non-insects comprising 9% of the overall taxa (Table 9.5-3). Insects mainly consisted of Chironomidae (85% of the mean total invertebrates sampled); a small number of Ephemeroptera (7%) were also collected (Table 9.5-3). Of the non-insects, taxa present included Bivalvia (5%) and Oligochaeta (4%) (Table 9.5-3).

Total EPT comprised 4% of the mean total nearshore BMI with Ephemeroptera and Trichoptera dominating these groups. A small number of Plecoptera were also present. Genus analysis of Ephemeroptera indicated that both *Hexagenia* sp. and *Ephemera* sp. were dominant in nearshore grab samples (Table 9.5-3). Similar to *Hexagenia* sp., *Ephemera* sp. is a ubiquitous group with general habitat requirements, commonly found in depositional substrate consisting of sand-gravel in both lentic and lotic environments (Merritt and Cummins 1996). Genera of Baetidae and Caenidae were also present in trace amounts (Table 9.5-3). Trichoptera were collected in small numbers (2%) and were comprised of Polycentropodidae and Leptoceridae (Table 9.5-3). In the offshore polygon, total EPT comprised 7% of the BMI, consisting solely of

Ephemeroptera. Genus analysis of the Ephemeroptera indicated that *Hexagenia* sp. was dominant in offshore samples (Table 9.5-3). The EPT:C ratio was 0.83 in the nearshore polygon and 0.16 in the offshore polygon (Table 9.5-3). The ratios indicate that chironomids dominated EPT in both habitats, especially in the offshore polygon.

Taxonomic richness in the nearshore was 17 families, with richness values ranging from three to 13 within each sample (Table 9.5-3). Hill's Effective Richness (E^H) was three; Hyalellidae notably dominated this community (Table 9.5-3). Taxonomic richness in the offshore polygon was four families, with richness values ranging from one to four within each sample (Table 9.5-3). Hill's Effective Richness (E^H) was three with Chironomidae dominating this community (Table 9.5-3).

The mean index of diversity (Simpson's Diversity Index [D]) was 0.43 and 0.50 in the nearshore and offshore polygons, respectively (Table 9.5-3). Evenness (Simpson's Equitability [E_D]) was 0.30 in the nearshore polygon and 0.70 in the offshore polygon (Table 9.5-3).

9.11 FISH COMMUNITY

9.11.1 Gillnetting

Gillnetting was conducted in the Lake Winnipeg Region in 2009 in three areas of Lake Winnipeg, Sturgeon Bay (13 – 15 July), near Grand Rapids (22 – 25 June), and Mossy Bay (8 – 15 July), as well as in Lake Winnipegosis (9 – 17 September) (Table 9.6-1).

In Sturgeon Bay, seven 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 during the sampling period was 19°C (Table 9.6-1).

Nine sites were sampled in Lake Winnipeg near Grand Rapids using standard gang index gill nets and three sites were sampled using small mesh index gill nets (Figure 9.6-2). Water temperature during the sampling period ranged from 14.0 – 15.0°C (Table 9.6-1).

In Mossy Bay, 10 sites were sampled with standard gang index gill nets and two sites were sampled with small mesh index gill nets (Figure 9.6-3). During sampling, water temperature ranged from 14.2 – 16.2°C (Table 9.6-1).

In Lake Winnipegosis, 12 sites were sampled using standard gang index gill nets and five sites were sampled using small mesh index gill nets (Figure 9.6-4). Water temperature during the sampling period ranged from 18.5 – 21.0°C (Table 9.6-1).

9.11.2 Species Composition

In 2009, 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 281 fish, representing eight species, was captured in standard gang index gill nets and an additional 554 fish, representing six species, was captured in small mesh index gill nets (tables 9.6-3 and 9.6-4). Walleye represented 48.04% of the standard gang index gillnet catch, followed by Yellow Perch (25.27%) and Shorthead Redhorse (13.52%) (Table 9.6-3; Figure 9.6-5). Yellow perch was the most common species in small mesh gill nets, accounting for 81.77% of the catch (Table 9.6-4; Figure 9.6-5).

Walleye (62.69%) and Shorthead Sucker (17.52%) accounted for the majority of the biomass in the standard gang catch (Table 9.6-5). In the small mesh catch, Yellow Perch represented 86.25% of the biomass (Table 9.6-6).

9.11.2.2 Grand Rapids (Lake Winnipeg)

A total of 815 fish, representing nine species, was captured in standard gang index gill nets and a total of 1,512 fish, representing six species, was captured in small mesh index gill nets (Table 9.6-3). Yellow Perch (35.34%) and Walleye (35.21%) were the most frequently captured species in standard gangs (Table 9.6-3; Figure 9.6-5). In the small mesh index gillnet catch, Troutperch was the most common species captured (57.87%), followed by Rainbow Smelt (19.3%) and Yellow Perch (16.47%) (Table 9.6-4; Figure 9.6-5).

Walleye represented almost half (45.65%) of the biomass in the standard gang catch, followed by White Sucker (27.20%) (Table 9.6-5). In the small mesh catch, Troutperch represented 44.83% of the biomass, followed by Walleye (21.43%) (Table 9.6-6).

9.11.2.3 Mossy Bay (Lake Winnipeg)

A total of 790 fish, representing 10 species, were captured in standard gang index gill nets (Table 9.6-3). Walleye (43.92%) and Yellow Perch (35.82%) were the most frequently captured species (Table 9.6-3; Figure 9.6-5). In small mesh index gill nets, a total of 343 fish were captured, representing seven species. The majority of the catch consisted of Rainbow Smelt (57.43%) and Troutperch (25.66%) (Table 9.6-4; Figure 9.6-5).

In terms of biomass, Walleye represented 72.41% of the standard gang index gillnet catch (Table 9.6-5). The biomass in the small mesh catch consisted primarily of Yellow Perch (35.73%) and Rainbow Smelt (32.58%) (Table 9.6-6).

9.11.2.4 Lake Winnipegosis

A total of 435 fish, representing 10 species, was captured in standard gang index gill nets and a total of 1,131 fish, representing 12 species, was captured in small mesh index gill nets (tables 9.6-3 and 9.6-4). White Sucker represented 52.87% of the standard gang index gillnet catch, followed by Walleye (16.32%) (Table 9.6-3; Figure 9.6-5). In the small mesh index gillnet catch, Yellow Perch was the most common species captured (59.59%), followed by Spottail Shiner (24.05%) (Table 9.6-4; Figure 9.6-5).

White Sucker represented over half (55.78%) of the biomass in the standard gang catch, followed by Walleye (12.37%) and Northern Pike (10.80%) (Table 9.6-5). In the small mesh catch, Yellow Perch (38.70%) and Freshwater Drum (31.05) accounted for the majority of the biomass, (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)

The mean CPUE for the standard gang index gillnet catch was 45.79 fish/100 m/24 h (Table 9.6-7; Figure 9.6-6). Walleye had the highest CPUE (22.34), followed by Yellow Perch (10.71) (Figure 9.6-7).

In small mesh gill nets the mean CPUE was 342.13 fish/30 m/24 h (Table 9.6-8; Figure 9.6-6). Yellow Perch had the highest species-specific CPUE (279.75) (Figure 9.6-7).

The BPUE for the standard gang index gillnet catch was 18,403 g/100 m/24 h) (Table 9.6-9). Walleye had the highest species-specific BPUE (11,537 g). Small mesh index gill nets produced a BPUE of 4,537 g (Table 9.6-10). Yellow Perch represented the majority of the biomass (2,635 g).

9.11.3.2 Grand Rapids (Lake Winnipeg)

In 2009, the mean CPUE for the standard gang index gillnet catch was 115.48 (Table 9.6-7; Figure 9.6-6). Walleye and Yellow Perch had the highest species-specific CPUE (41.81 and 39.18) (Figure 9.6-7).

Mean CPUE for the small mesh index gillnet catch was 628.71 (Table 9.6-8; Figure 9.6-6). Troutperch had the highest species-specific CPUE (355.87) followed by Rainbow Smelt (138.86) (Figure 9.6-7).

Mean BPUE for the standard gang index gillnet catch was 55,291 g (Table 9.6-9). Walleye had the highest BPUE (25,238), followed by White Sucker (15,040). Small mesh index gill nets produced a BPUE of 2,895 g (Table 9.6-10). Troutperch had the highest BPUE (3,288 g), followed by Walleye (2,320).

9.11.3.3 Mossy Bay (Lake Winnipeg)

In 2009, the mean CPUE for the standard gang index gillnet catch was 77.09 (Table 9.6-7; Figure 9.6-6). Walleye had the highest species-specific CPUE (35.97) followed by Yellow Perch (26.2) (Figure 9.6-7).

Mean CPUE for the small mesh index gillnet catch was 206.20 (Table 9.6-8; Figure 9.6-6). Rainbow Smelt had the highest species-specific CPUE (118.12) followed by Troutperch (53.29) (Figure 9.6-7).

Mean BPUE for the standard gang index gillnet catch was 49,197 g (Table 9.6-9). Walleye had the highest BPUE (35,622 g), followed by Yellow Perch (5,006) and White Sucker (4,636). Small mesh index gill nets produced a BPUE of 3,299 g (Table 9.6-10). Yellow Perch and Rainbow Smelt (1,179 and 1,075 g) contributed the majority of the biomass.

9.11.3.4 Lake Winnipegosis

The mean CPUE for the standard gang index gill nets set in 2009 was 40.15 (Table 9.6-7; Figure 9.6-6). White Sucker had the highest CPUE (21.63) (Figure 9.6-7).

In small mesh index gill nets, the mean CPUE was 249.21 (Table 9.6-8; Figure 9.6-6). Species having the highest CPUE were Yellow Perch (145.70) and Spottail Shiner (58.51) (Figure 9.6-7).

Mean BPUE for the standard gang index gillnet catch was 32,251 g (Table 9.6-9). White Sucker had the highest BPUE (17,990 g), followed by Walleye (3,990) and Northern Pike (3,482). Small mesh index gill nets produced a BPUE of 4,033 g (Table 9.6-10), with Yellow Perch having the highest BPUE (1,561).

9.11.4 Size and Condition

With few exceptions, Northern Pike, Lake Whitefish, Sauger, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies in 2009 were measured for fork length (mm) and weight (g) (Table 9.6-11). Walleye captured in small mesh gangs set in Grand Rapids and Sturgeon Bay were also measured for fork length and weighed individually. 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 in were not measured for fork length and were bulk weighed (Table 9.6-12). Northern Pike captured in standard gangs set in Sturgeon Bay and Mossy Bay and Sauger from Mossy Bay were only bulk weighed.

9.11.4.1 Sturgeon Bay (Lake Winnipeg)

Northern Pike captured in standard gang index gill nets had a mean weight of 375 g, but were not measured for fork length (Table 9.6-11). No Northern Pike were captured in small mesh gangs.

Lake Whitefish and Sauger were not captured in Sturgeon Bay.

Walleye captured in standard gang index gill nets had a mean fork length of 344 mm, a mean weight of 514 g, and a mean condition factor of 1.18 (Table 9.6-11). Those captured in small mesh gangs had a mean length of 158 mm, a mean weight of 90 g, and a mean condition factor of 1.00 (Table 9.6-12).

9.11.4.2 Grand Rapids (Lake Winnipeg)

Northern Pike captured in standard gang index gill nets had a mean weight of 3,925 g, but were not measured for fork length (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 399 mm, a mean weight of 1,095 g, and a mean condition factor of 1.58 (Table 9.6-11). No Lake Whitefish were captured in small mesh gangs.

Sauger captured in standard gang index gill nets had a mean fork length of 377 mm, a mean weight of 635 g, and a mean condition factor of 1.18 (Table 9.6-11). No Sauger were captured in small mesh gangs.

Walleye captured in standard gang index gill nets had a mean fork length of 360 mm, a mean weight of 603 g, and a mean condition factor of 1.22 (Table 9.6-11). Those captured in small mesh gangs had a mean length of 151 mm, a mean weight of 53 g, and a mean condition of 1.12 (Table 9.6-12).

9.11.4.3 Mossy Bay (Lake Winnipeg)

Northern Pike were not captured in Mossy Bay.

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 337 mm, a mean weight of 740 g, and a mean condition factor of 1.51 (Table 9.6-11). No Lake Whitefish were captured in small mesh gangs.

Sauger captured in standard gang index gill nets had a mean weight of 555 g, but were not measured for fork length (Table 9.6-11). Those captured in the small mesh gangs weighed 15 g (Table 9.6-12).

Walleye captured in standard gang index gill nets had a mean fork length of 407 mm, a mean weight of 994 g, and a mean condition factor of 1.32 (Table 9.6-11). Those captured in the small mesh gangs weighed 44 g (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 567 mm, a mean weight of 1,413 g, and a mean condition factor of 0.76 (Table 9.6-11). The Northern Pike captured in small mesh gangs weighed 1,180 g (Table 9.6-12).

Lake Whitefish captured in standard gang index gill nets had a mean fork length of 257 mm, a mean weight of 329 g, and a mean condition factor of 1.45 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 22 g (Table 9.6-12).

Sauger were not captured in either standard or small mesh gangs.

Walleye captured in standard gang index gill nets had a mean fork length of 354 mm, a mean weight of 586 g, and a mean condition factor of 1.09 (Table 9.6-11). Those captured in small mesh gangs had a mean weight of 26 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 2009 (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 gangs in 2009 were aged.

No Lake Whitefish or Sauger were captured in standard gangs.

Approximately half (50.37%) of the 135 Walleye that were aged were 3 years old (Table 9.6-13). Four year-old fish were also well represented in the catch (37.78%).

9.11.5.2 Grand Rapids (Lake Winnipeg)

None of the Northern Pike captured in standard gangs in 2009 were aged.

Age was determined for 26 Lake Whitefish captured in standard gang index gill nets set in 2009 (Table 9.6-13). The majority of these fish were 4 (19.23%) and 5 (30.77%) years of age. The oldest Lake Whitefish captured was 21 years old.

The two Sauger captured were aged 5 and 7 years (Table 9.6-13).

Age was determined for 286 Walleye captured in standard gang index gill nets (Table 9.6-13). The majority of these fish were 4 years of age (72.38%).

9.11.5.3 Mossy Bay (Lake Winnipeg)

No Northern Pike were captured in standard gangs.

Age was determined for 15 Lake Whitefish captured in standard gang index gill nets set in 2009 (Table 9.6-13). Fish aged 2 (33.33%), 4 (20.00%), and 5 (20.00%) years were well represented in the catch. The oldest Lake Whitefish captured was 19 years old.

None of the Sauger captured in standard gangs in 2009 were aged.

Age was determined for 346 Walleye captured in standard gang index gill nets (Table 9.6-13). Almost half of these fish were 4 years of age (44.51%, respectively). The oldest Walleye captured was 16 years old.

9.11.5.4 Lake Winnipegosis

A total of 26 Northern Pike captured in standard gangs in 2009 were aged (Table 9.6-13). Almost half of these fish (46.15%) was aged 3 years.

Twenty-three Lake Whitefish captured in standard gang index gill nets ranged in age from 1 – 8 years (Table 9.6-13). The majority of these fish were aged 1 year.

No Sauger were captured in standard gangs set in 2009.

The age of 71 Walleye was determined (Table 9.6-13). The majority of Walleye aged were 2 or 3 years (40.85, and 28.17%, respectively).

9.11.6 Deformities, Erosion, Lesions and Tumours (DELTs)

Fish captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies in 2009 were examined externally for DELTs (Table 9.6-18). None of the Northern Pike, Lake Whitefish, Sauger, Walleye, or White Sucker captured in 2009 was documented with DELTs.

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Table 9.3-1. Summary statistics for *in situ* variables (near surface) measured in Lake Winnipegosis: 2009/2010.

	Temperature (°C)					*In situ* pH					DO (mg/L)					DO saturation (% saturation)					*In situ* Specific Conductance (µS/cm)				
	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	14.19	13.61	12.76	14.58	15.15	8.74	8.60	8.86	8.77	8.70	12.93	13.27	13.68	12.93	12.67	129	117	132	129	128	1021	1162	1228	1363	1274
Median	18.62	17.72	18.63	19.09	19.78	8.73	8.64	8.86	8.82	8.64	12.62	13.54	13.48	12.88	12.46	124	116	139	130	129	978	1142	1194	1317	1190
Min	0.16	0.02	-0.03	0.05	0.10	8.56	8.25	8.62	8.66	8.40	11.20	12.25	12.57	11.44	11.31	102	89	111	108	107	934	1070	1109	1273	1114
Max	19.38	19.00	19.68	20.09	20.92	8.94	8.85	9.11	8.84	9.11	15.30	14.02	15.00	14.52	14.46	165	145	146	148	147	1194	1296	1381	1545	1600
SD	9.36	9.09	11.09	9.70	10.05	0.16	0.29	0.25	0.10	0.30	1.93	0.92	1.23	1.37	1.45	27	25	18	17	17	122	107	139	127	225
SE	4.68	4.55	6.40	4.85	5.02	0.08	0.14	0.14	0.06	0.15	0.96	0.53	0.71	0.69	0.72	13	13	11	9	8	61	53	80	63	112
n	4	4	3	4	4	4	4	3	3	4	4	3	3	4	4	4	4	3	4	4	4	4	3	4	4

Table 9.3-1. – continued –

	In situ Turbidity (NTU)					ORP (mV)					Secchi Disk Depth (m)					Calculated Euphotic Depth (m)					Estimated Euphotic Depth (m)				
	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	4.9	2.5	5.2	3.2	5.5	93	94	105	102	127	1.39	1.91	1.35	1.66	1.14	2.78	3.82	2.70	3.32	2.28	2.8	3.7	2.7	3.3	2.3
Median	5.4	3.1	5.2	4.2	6.2	96	93	107	108	118	1.27	1.83	1.35	1.70	1.15	2.54	3.65	2.70	3.40	2.30	2.5	3.6	2.7	3.5	2.3
Min	2.0	0.0	4.5	0.0	0.1	84	88	93	71	101	1.20	1.65	1.30	1.53	1.02	2.40	3.30	2.60	3.06	2.04	2.5	3.0	2.5	3.0	2.0
Max	6.9	4.0	5.8	4.3	9.5	97	101	114	123	172	1.70	2.25	1.40	1.75	1.25	3.40	4.50	2.80	3.50	2.50	3.5	4.5	2.8	3.5	2.5
SD	2.1	1.8	0.9	2.1	4.0	6	7	11	22	31	0.27	0.31	0.07	0.12	0.12	0.54	0.62	0.14	0.23	0.23	0.6	0.8	0.2	0.3	0.3
SE	1.0	0.9	0.6	1.1	2.0	3	3	6	11	16	0.16	0.18	0.05	0.07	0.07	0.31	0.36	0.10	0.13	0.13	0.3	0.4	0.2	0.2	0.1
n	4	4	2	4	4	4	4	3	4	4	3	3	2	3	3	3	3	2	3	3	3	3	2	3	3

Table 9.3-2. Summary statistics for routine laboratory variables measured in Lake Winnipegosis: 2009/2010.

	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)				
	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	187	181	177	171	173	215	210	204	197	203	6.0	5.3	5.9	5.5	4.2	<0.4	<0.4	<0.4	<0.4	<0.4	0.0245	0.0193	0.0123	0.0262	0.0357
Median	183	177	171	167	165	209	205	194	191	193	6.1	5.2	6.4	5.9	4.5	<0.4	<0.4	<0.4	<0.4	<0.4	0.0280	0.0181	0.0093	0.0098	0.0117
Min	179	175	168	161	158	203	201	192	185	182	2.6	3.7	4.5	3.7	2.5	<0.4	<0.4	<0.4	<0.4	<0.4	0.0111	0.0071	0.0046	0.0071	0.0046
Max	202	195	193	187	205	241	231	227	221	242	9.2	7.3	6.8	6.4	5.5	<0.4	<0.4	<0.4	<0.4	<0.4	0.0310	0.0340	0.0230	0.0780	0.1150
SD	10	9	14	11	22	17	14	19	16	27	2.7	1.9	1.3	1.2	1.5	-	-	-	-	-	0.0091	0.0128	0.0096	0.0346	0.0530
SE	5	5	8	6	11	9	7	11	8	13	1.3	0.9	0.7	0.6	0.7	-	-	-	-	-	0.0045	0.0064	0.0055	0.0173	0.0265
n	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

Table 9.3-2. – continued –

	Nitrate/Nitrite (mg N/L)					TKN (mg/L)					DIN (mg/L) [1]					Organic nitrogen (mg/L) [1]					TN (mg/L) [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	0.019	0.012	0.011	0.019	0.023	0.72	0.62	0.64	0.71	0.76	0.044	0.031	0.024	0.045	0.058	0.70	0.60	0.63	0.69	0.73	0.74	0.63	0.65	0.73	0.79
Median	0.007	0.010	<0.005	0.015	0.025	0.72	0.66	0.59	0.70	0.75	0.035	0.027	0.012	0.024	0.035	0.69	0.64	0.59	0.69	0.73	0.75	0.67	0.59	0.71	0.76
Min	<0.005	<0.005	<0.005	<0.005	<0.005	0.69	0.44	0.59	0.64	0.66	0.014	0.013	0.007	0.010	0.011	0.67	0.43	0.58	0.63	0.66	0.69	0.45	0.59	0.64	0.69
Max	0.060	0.024	0.029	0.044	0.038	0.76	0.73	0.75	0.82	0.90	0.091	0.058	0.052	0.122	0.153	0.73	0.70	0.72	0.74	0.79	0.77	0.75	0.78	0.86	0.94
SD	0.027	0.009	0.015	0.019	0.015	0.03	0.13	0.09	0.08	0.10	0.033	0.022	0.024	0.052	0.064	0.03	0.12	0.08	0.06	0.06	0.03	0.13	0.11	0.10	0.11
SE	0.014	0.005	0.009	0.009	0.008	0.02	0.06	0.05	0.04	0.05	0.017	0.011	0.014	0.026	0.032	0.01	0.06	0.05	0.03	0.03	0.02	0.07	0.06	0.05	0.06
n	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

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	0.010	0.011	0.007	0.009	0.009	0.023	0.009	0.010	0.008	0.011	0.033	0.020	0.017	0.016	0.021	54	72	87	99	86	8.9	5.7	6.2	10.1	20.8	2.6	3.4	3.2	5.9	6.3
Median	0.012	0.012	0.004	0.010	0.012	0.024	0.008	0.013	0.007	0.009	0.035	0.021	0.017	0.016	0.021	46	75	77	94	80	7.4	5.7	6.2	9.1	14.4	1.9	3.3	1.4	3.2	3.7
Min	0.005	0.010	0.004	0.004	0.001	0.005	0.006	0.003	0.003	0.003	0.019	0.016	0.015	0.015	0.017	39	42	71	87	66	2.4	2.4	3.7	1.9	5.4	1.0	1.3	0.9	1.3	1.0
Max	0.014	0.013	0.013	0.012	0.014	0.038	0.012	0.014	0.013	0.023	0.043	0.023	0.018	0.017	0.024	84	96	112	122	119	18.3	8.8	8.8	20.4	49.1	5.8	5.7	7.3	15.9	16.7
SD	0.004	0.001	0.005	0.004	0.006	0.014	0.003	0.006	0.004	0.009	0.011	0.003	0.002	0.001	0.003	21	24	22	16	23	6.7	3.6	2.5	7.7	19.9	2.2	2.4	3.5	6.8	7.1
SE	0.002	0.001	0.003	0.002	0.003	0.007	0.001	0.004	0.002	0.005	0.005	0.002	0.001	0.000	0.001	10	12	13	8	11	3.4	1.8	1.5	3.8	10.0	1.1	1.2	2.0	3.4	3.5
n	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	4	3	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	12.0	12.3	12.2	11.6	11.5	13.7	12.6	13.0	12.5	12.0	44.0	43.1	42.1	40.3	41.1	23	25	24	21	19	22	24	24	20	18
Median	12.0	12.0	11.7	11.5	11.6	12.5	12.7	13.2	12.5	11.9	43.1	42.0	40.1	39.2	39.0	21	23	24	21	20	20	22	24	20	18
Min	11.1	11.0	11.5	11.1	10.9	11.6	12.3	12.1	11.6	11.0	41.4	41.7	39.5	37.7	37.2	20	21	21	20	17	19	20	20	18	16
Max	12.8	14.2	13.5	12.4	11.8	18.2	12.8	13.8	13.3	13.3	48.5	46.7	46.7	45.1	49.3	30	34	28	24	21	28	33	27	24	20
SD	0.8	1.4	1.1	0.6	0.4	3.0	0.2	0.9	0.7	1.1	3.1	2.4	4.0	3.3	5.5	5	6	3	2	1	4	6	4	3	2
SE	0.4	0.7	0.6	0.3	0.2	1.5	0.1	0.5	0.4	0.5	1.6	1.2	2.3	1.6	2.8	2	3	2	1	1	2	3	2	1	1
n	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

Table 9.3-2. – continued –

	TDS (mg/L)					Laboratory Conductivity (µmhos/cm)					TSS (mg/L)				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	634	689	721	811	759	1025	1153	1218	1365	1268	4.8	3.2	3.5	3.5	5.7
Median	614	677	690	796	710	987	1115	1150	1320	1185	4.4	3.4	4.0	2.9	6.4
Min	598	652	682	772	698	968	1100	1140	1310	1140	2.8	<2	<2	<2	<2
Max	708	748	791	878	918	1160	1280	1363	1510	1560	7.6	4.8	5.6	7.2	8.8
SD	51	42	61	46	106	91	85	126	97	197	2.0	1.7	2.3	3.0	3.4
SE	25	21	35	23	53	45	43	73	49	98	1.0	0.8	1.3	1.5	1.7
n	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4

	Laboratory Turbidity (NTU)					True Colour (TCU)				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	3.19	2.41	3.33	3.03	4.27	17.5	8.8	5.0	5.6	8.8
Median	3.55	2.55	4.20	3.50	4.65	17.5	7.5	5.0	5.0	7.5
Min	0.67	0.45	0.58	0.83	0.77	10.0	5.0	5.0	<5	5.0
Max	5.00	4.10	5.20	4.30	7.00	25.0	15.0	5.0	10.0	15.0
SD	1.82	1.56	2.43	1.52	2.60	8.7	4.8	0.0	3.1	4.8
SE	0.91	0.78	1.40	0.76	1.30	4.3	2.4	0.0	1.6	2.4
n	4	4	3	4	4	4	4	3	4	4

Table 9.3-2. – continued –

	Laboratory pH					*E. coli* (CFU/100 mL)					Chlorophyll *a* (µg/L)				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	8.49	8.47	8.49	8.50	8.42	<1	<1	<1	<1	<1	10.97	4.61	3.39	3.65	3.88
Median	8.52	8.49	8.54	8.54	8.46	<1	<1	<1	<1	<1	11.05	4.20	3.80	3.51	3.85
Min	8.24	8.33	8.32	8.30	8.26	<1	<1	<1	<1	<1	1.58	0.85	1.36	1.50	2.11
Max	8.69	8.57	8.61	8.61	8.52	<1	<1	<1	<1	<1	20.20	9.20	5.00	6.10	5.70
SD	0.19	0.11	0.15	0.13	0.12	-	-	-	-	-	7.66	3.44	1.86	2.39	1.59
SE	0.09	0.05	0.09	0.07	0.06	-	-	-	-	-	3.83	1.72	1.07	1.19	0.79
n	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4

	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
Mean	231	222	220	249	244	200	243	261	303	269	51.1	51.6	53.2	58.6	63.7
Median	226	223	226	250	228	193	237	252	295	250	45.2	52.7	50.2	57.3	60.7
Min	190	181	168	228	220	188	223	238	271	223	43.2	45.8	48.9	54.6	57.5
Max	281	261	265	268	300	226	274	292	350	351	70.7	55.3	60.5	65.0	75.9
SD	38	34	49	21	38	18	22	28	34	56	13.2	4.1	6.3	4.6	8.4
SE	19	17	28	11	19	9	11	16	17	28	6.6	2.1	3.7	2.3	4.2
n	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4

[1] Calculated.

Table 9.3-3. Summary statistics for metals and major ions measured in Lake Winnipegosis: 2009/2010. Values are presented as mg/L.

	Aluminum					Antimony					Arsenic				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	0.0137	0.0113	0.0149	0.0143	0.0257	0.0006	0.00051	<0.0005	0.00052	<0.0005	0.00162	0.00181	0.00201	0.00225	0.00225
Median	0.0103	0.012	0.0185	0.012	0.0172	0.00057	<0.0005	<0.0005	<0.0005	<0.0005	0.00155	0.00181	0.00216	0.00223	0.00229
Min	0.0059	<0.005	<0.005	<0.005	0.0051	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00148	0.00166	0.0016	0.00187	0.00179
Max	0.0283	0.0188	0.0237	0.0309	0.0632	0.00101	0.00083	0.00068	0.00085	0.00081	0.0019	0.00198	0.00227	0.00267	0.00264
SD	0.0106	0.0081	0.011	0.012	0.0257	0.0004	0.0003	-	0.00031	-	0.0002	0.00017	0.00036	0.00033	0.00043
SE	0.0053	0.004	0.0064	0.006	0.0128	0.0002	0.00015	-	0.00016	-	0.0001	0.00009	0.00021	0.00017	0.00022
n	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4
n>DL	4	3	2	3	4	2	2	1	2	2	4	4	3	4	4
% Detections	100	75	67	75	100	50	50	33	50	50	100	100	100	100	100

	Barium					Beryllium				
	Site1	Site2	Site3	Site4	Site5	Site1	Site2	Site3	Site4	Site5
Mean	0.0379	0.0366	0.0379	0.0389	0.0399	<0.001	<0.001	<0.001	<0.001	<0.001
Median	0.0376	0.0379	0.0409	0.0411	0.0411	<0.001	<0.001	<0.001	<0.001	<0.001
Min	0.0322	0.0308	0.0296	0.0307	0.0307	<0.001	<0.001	<0.001	<0.001	<0.001
Max	0.0442	0.04	0.0433	0.0426	0.0466	<0.001	<0.001	<0.001	<0.001	<0.001
SD	0.0052	0.004	0.0073	0.0056	0.0067	-	-	-	-	-
SE	0.0026	0.002	0.0042	0.0028	0.0033	-	-	-	-	-
n	4	4	3	4	4	4	4	3	4	4
n>DL	4	4	3	4	4	0	0	0	0	0
% Detections	100	100	100	100	100	0	0	0	0	0

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	0.058	0.072	0.072	0.081	0.097	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	55.5	50.9	48.5	52.5	49.9	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Median	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.059	0.076	0.077	0.081	0.101	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	54.2	51.5	49.8	51.1	47	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Min	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.044	0.05	0.049	0.063	0.061	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	47.9	43.6	39.7	48.8	45.9	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Max	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.071	0.087	0.089	0.098	0.124	0.000019	0.000015	0.000012	0.000012	0.000011	65.8	57	56	58.8	59.8	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
SD	-	-	-	-	-	0.012	0.017	0.02	0.017	0.028	-	-	-	0.000004	-	7.5	5.6	8.2	4.7	6.6	-	-	-	-	-
SE	-	-	-	-	-	0.006	0.009	0.012	0.008	0.014	-	-	-	0.000002	-	3.7	2.8	4.8	2.3	3.3	-	-	-	-	-
n	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
n>DL	0	0	0	0	0	4	4	3	4	4	1	2	1	2	1	4	4	3	4	4	0	0	0	0	0
% Detections	0	0	0	0	0	100	100	100	100	100	25	50	33	50	25	100	100	100	100	100	0	0	0	0	0

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	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.02	<0.02	0.023	<0.0005	0.00052	<0.0005	<0.0005	<0.0005
Median	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Min	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Max	0.0017	0.0021	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	0.00025	0.00021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.02	0.029	0.063	<0.0005	0.00134	<0.0005	<0.0005	<0.0005
SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.027	-	0.00055	-	-	-
SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.013	-	0.00027	-	-	-
n	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
n>DL	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	4	4	3	4	4	0	1	0	0	0
% Detections	25	25	0	0	0	0	0	0	25	25	0	0	0	0	0	100	100	100	100	100	0	25	0	0	0

Table 9.3-3. - continued -

	Magnesium					Manganese					Mercury					Molybdenum					Nickel				
	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	22.3	23.1	24	28.6	29	0.0346	0.0091	0.0047	0.0097	0.0147	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00182	0.00169	0.00179	0.00178	0.0021	<0.002	<0.002	<0.002	<0.002	<0.002
Median	21.9	22.9	24.8	28.1	27	0.0362	0.0105	0.0062	0.0111	0.015	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00166	0.00167	0.00183	0.00181	0.00219	<0.002	<0.002	<0.002	<0.002	<0.002
Min	17	17.6	16.8	25.8	25.3	0.0236	0.0039	0.0016	0.0037	0.011	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00143	0.00135	0.00131	0.00137	0.00158	<0.002	<0.002	<0.002	<0.002	<0.002
Max	28.4	28.9	30.4	32.5	36.5	0.0423	0.0115	0.0065	0.0131	0.0178	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00252	0.00208	0.00223	0.00213	0.00243	0.0025	0.0021	<0.002	<0.002	<0.002
SD	4.7	4.8	6.9	3	5.1	0.0082	0.0036	0.0028	0.0042	0.0033	-	-	-	-	-	0.00049	0.00031	0.00046	0.00031	0.00037	-	-	-	-	-
SE	2.3	2.4	4	1.5	2.6	0.0041	0.0018	0.0016	0.0021	0.0016	-	-	-	-	-	0.00024	0.00015	0.00027	0.00016	0.00018	-	-	-	-	-
n	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
n>DL	4	4	3	4	4	4	4	3	4	4	0	0	0	0	0	4	4	3	4	4	1	1	0	0	0
% Detections	100	100	100	100	100	100	100	100	100	100	0	0	0	0	0	100	100	100	100	100	25	25	0	0	0

Table 9.3-3. - continued -

	Potassium					Rubidium					Selenium					Silver					Sodium				
	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	7.56	7.81	7.89	9.26	8.85	0.00358	0.00366	0.0039	0.00416	0.00392	<0.001	<0.001	<0.001	<0.001	0.0011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	124	151	175	181	166
Median	7.57	7.98	8.28	9.12	8.2	0.00362	0.0038	0.00415	0.0043	0.00394	<0.001	<0.001	<0.001	<0.001	0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	125	152	172	182	159
Min	6.03	5.99	5.7	8.6	7.69	0.00315	0.00312	0.00304	0.00337	0.00308	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	116	147	148	165	147
Max	9.08	9.28	9.69	10.2	11.3	0.00394	0.00393	0.00451	0.00466	0.00471	0.0012	0.0013	0.0013	0.0014	0.0018	0.00012	0.00019	<0.0001	<0.0001	<0.0001	129	155	205	196	197
SD	1.25	1.36	2.02	0.7	1.66	0.00035	0.00037	0.00077	0.00059	0.00069	-	-	-	0.0005	0.0007	-	-	-	-	-	6	4	29	14	22
SE	0.63	0.68	1.17	0.35	0.83	0.00017	0.00018	0.00044	0.00029	0.00034	-	-	-	0.0002	0.0003	-	-	-	-	-	3	2	17	7	11
n	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
n>DL	4	4	3	4	4	4	4	3	4	4	1	1	1	2	2	1	1	0	0	0	4	4	3	4	4
% Detections	100	100	100	100	100	100	100	100	100	100	25	25	33	50	50	25	25	0	0	0	100	100	100	100	100

Table 9.3-3. - continued -

	Strontium					Tellurium					Thallium					Tin					Titanium				
	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	0.237	0.257	0.268	0.293	0.282	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00081	0.00062	0.0008	0.00114	0.00134
Median	0.229	0.256	0.263	0.287	0.267	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00081	0.00045	0.00045	0.00127	0.0012
Min	0.22	0.235	0.23	0.269	0.244	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	0.00045	0.00045	0.00045	0.00045	0.00094
Max	0.271	0.283	0.311	0.33	0.348	<0.001	<0.001	<0.001	0.0012	<0.001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.001	<0.001	<0.001	0.00098	<0.001	0.00118	0.00113	0.0015	0.00159	0.00202
SD	0.023	0.023	0.041	0.027	0.046	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00042	0.00034	0.00061	0.0005	0.00047
SE	0.012	0.012	0.023	0.013	0.023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00021	0.00017	0.00035	0.00025	0.00024
n	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
n>DL	4	4	3	4	4	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	2	1	1	3	4
% Detections	100	100	100	100	100	0	0	0	25	0	0	0	0	25	25	0	0	0	25	0	50	25	33	75	100

Table 9.3-3. - continued -

	Tungsten					Uranium					Vanadium					Zinc					Zirconium				
	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	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00123	0.00107	0.00118	0.00118	0.00149	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Median	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00116	0.00109	0.00125	0.00124	0.00149	<0.001	<0.001	<0.001	0.0011	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Min	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00112	0.00082	0.00096	0.00095	0.00134	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Max	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00148	0.00129	0.00134	0.00127	0.00162	<0.001	0.0013	0.0011	0.0011	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	<0.0004	<0.0004	<0.0004	<0.0004
SD	-	-	-	-	-	0.00017	0.0002	0.0002	0.00015	0.00014	-	-	-	0.0003	0.0003	-	-	-	-	-	0.0002	-	-	-	-
SE	-	-	-	-	-	0.00009	0.0001	0.00012	0.00008	0.00007	-	-	-	0.0002	0.0002	-	-	-	-	-	0.0001	-	-	-	-
n	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
n>DL	0	1	0	0	0	4	4	3	4	4	0	2	1	3	3	0	0	0	0	0	1	0	0	0	0
% Detections	0	25	0	0	0	100	100	100	100	100	0	50	33	75	75	0	0	0	0	0	25	0	0	0	0

Table 9.3-4. 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: 2009/2010. Values in bold indicate exceedances occurred at a given site.

		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury
	MWQSOGs PAL	0.1	0.15	1.5	0.00040-0.00061	0.132-0.212	0.015-0.024	0.3	0.0062-0.0129	0.000026
Lake Winnipegosis-Site 1	N	4	4	4	4	4	4	4	4	3
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lake Winnipegosis-Site 2	N	4	4	4	4	4	4	4	4	3
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lake Winnipegosis-Site 3	N	3	3	3	3	3	3	3	3	2
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lake Winnipegosis-Site 4	N	4	4	4	4	4	4	4	4	3
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0
Lake Winnipegosis-Site 5	N	4	4	4	4	4	4	4	4	3
	# Exceedances	0	0	0	0	0	0	0	0	0
	% Exceedances	0	0	0	0	0	0	0	0	0

Table 9.3-4. – continued –

		Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc	Chloride [2]	Sulphate [3]
	MWQSOGs PAL	0.073	0.0810-0.132	0.001	0.0001	0.0008	0.015	0.186-0.304	120	128-429
Lake Winnipegosis-Site 1	N	4	4	**4**	**4**	4	4	4	**4**	4
	# Exceedances	0	0	**1**	**1**	0	0	0	**4**	0
	% Exceedances	0	0	**25**	**25**	0	0	0	**100**	0
Lake Winnipegosis-Site 2	N	4	4	**4**	**4**	4	4	4	**4**	4
	# Exceedances	0	0	**1**	**1**	0	0	0	**4**	0
	% Exceedances	0	0	**25**	**25**	0	0	0	**100**	0
Lake Winnipegosis-Site 3	N	3	3	**3**	3	3	3	3	**3**	3
	# Exceedances	0	0	**1**	0	0	0	0	**3**	0
	% Exceedances	0	0	**25**	0	0	0	0	**100**	0
Lake Winnipegosis-Site 4	N	4	4	**4**	4	4	4	4	**4**	4
	# Exceedances	0	0	**2**	0	0	0	0	**4**	0
	% Exceedances	0	0	**50**	0	0	0	0	**100**	0
Lake Winnipegosis-Site 5	N	4	4	**4**	4	4	4	4	**4**	4
	# Exceedances	0	0	**2**	0	0	0	0	**4**	0
	% Exceedances	0	0	**50**	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 winter.
[2] Comparison to the long-term CCME PAL guideline.
[3] Comparison to the BCMOE guideline.

Table 9.3-5. Total phosphorus concentrations (annual and open-water season means) measured in Lake Winnipegosis and CCME (1999; updated to 2013) trophic categorization: 2009/2010.

		Trophic Status Based on TP (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 9.3-6. Chlorophyll *a* concentrations (annual and open-water season means) measured in Lake Winnipegosis and the OECD (1982) trophic categorization scheme for lakes. Chlorophyll *a* concentrations represent euphotic zone samples for the open-water season and surface grabs for the ice-cover season.

		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
Lake Winnipegosis-Site 1	Open-water season					14.1	
	Annual					11.0	
Lake Winnipegosis-Site 2	Open-water			5.87			
	Annual			4.61			
Lake Winnipegosis-Site 3	Open-water season			4.40			
	Annual			3.39			
Lake Winnipegosis-Site 4	Open-water			4.30			
	Annual mean			3.65			
Lake Winnipegosis-Site 5	Open-water season			4.47			
	Annual			3.88			

Table 9.3-7. 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): 2009/10.

		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					0.74	
	Annual					0.74	
Lake Winnipegosis-Site 2	Open-water season			0.59			
	Annual			0.63			
Lake Winnipegosis-Site 3	Open-water season			0.59			
	Annual			0.65			
Lake Winnipegosis-Site 4	Open-water season					0.69	
	Annual					0.73	
Lake Winnipegosis-Site 5	Open-water season					0.73	
	Annual					0.79	

Table 9.4-1. Community metrics for phytoplankton samples collected in the Lake Winnipeg Region during the open-water season of 2009.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness ($E^{H`}$)	Evenness ($E^{H`}/S$)
Lake Winnipegosis-Site 1	Spring	29	0.80	0.18	1.97	0.59	7.17	0.25
	Summer	39	0.87	0.20	2.38	0.65	10.80	0.28
	Fall	38	0.76	0.11	2.11	0.58	8.25	0.22
Lake Winnipegosis-Site 2	Spring	27	0.87	0.28	2.53	0.77	12.52	0.46
	Summer	29	0.74	0.13	1.97	0.59	7.18	0.25
	Fall	36	0.90	0.27	2.65	0.74	14.22	0.39
Lake Winnipegosis-Site 3	Spring	-	-		-	-	-	-
	Summer	31	0.84	0.20	2.31	0.67	10.05	0.32
	Fall	34	0.88	0.25	2.53	0.72	12.59	0.37
Lake Winnipegosis-Site 4	Spring	36	0.80	0.14	2.25	0.63	9.47	0.26
	Summer	44	0.90	0.22	2.65	0.70	14.11	0.32
	Fall	33	0.67	0.09	1.75	0.50	5.73	0.17
Lake Winnipegosis-Site 5	Spring	48	0.84	0.13	2.55	0.66	12.75	0.27
	Summer	40	0.79	0.12	2.32	0.63	10.20	0.25
	Fall	36	0.89	0.26	2.65	0.74	14.11	0.39

Table 9.5-1. Habitat and physical characteristics recorded at near and offshore benthic invertebrate sites in the Lake Winnipeg Region for CAMPP, 2009.

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 (2009)	Nearshore	15	1.4	1.1	1.7	--	1.00	18.0	--	reeds, shrubs, mixed forest	0	--
	Offshore	15	7.6	7.5	7.8	--	0.95	18.0	--	--	0	--

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, 2009.

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 (2009)	Nearshore	Mean	3	1.3	1.73	89.00	7.00	3.00	Sand, Loam
		SD	--	0.12	0.552	5.292	4.359	1.000	--
		SE	--	0.07	0.319	3.055	2.517	0.577	--
		Median	--	1.4	1.68	87.00	9.00	3.00	--
		Min	--	1.2	1.21	85.00	2.00	2.00	--
		Max	--	1.4	2.31	95.00	10.00	4.00	--
	Offshore	Mean	3	7.6	2.42	73.67	19.00	7.00	Sandy Loam
		SD	--	0.00	0.081	4.509	3.606	3.000	--
		SE	--	0.00	0.047	2.603	2.082	1.732	--
		Median	--	7.6	2.46	74.00	20.00	7.00	--
		Min	--	7.6	2.33	69.00	15.00	4.00	--
		Max	--	7.6	2.48	78.00	22.00	10.00	--

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, 2009.

	Lake Winnipegosis						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	5099	4413.4	1139.5	3246	1212	14110
Oligochaeta	--	274	184.8	47.7	260	0	606
Hirudinea	--	9	24.3	6.3	0	0	87
Ostracoda	--	0	0.0	0.0	0	0	0
Amphipoda - unid	--	0	0.0	0.0	0	0	0
Crangonycitidae	--	0	0.0	0.0	0	0	0
Gammaridae	--	6	22.4	5.8	0	0	87
Haustoriidae	--	0	0.0	0.0	0	0	0
Hyalellidae	--	4089	4061.4	1048.7	2554	649	12162
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	--	110	177.6	45.9	0	0	649
Gastropoda - unid	--	0	0.0	0.0	0	0	0
Ancylidae	--	0	0.0	0.0	0	0	0
Hydrobiidae	--	52	83.7	21.6	0	0	260
Lymnaeidae	--	0	0.0	0.0	0	0	0
Physidae	--	6	22.4	5.8	0	0	87
Planorbidae	--	3	11.2	2.9	0	0	43
Valvatidae	--	3	11.2	2.9	0	0	43
Platyhelminthes	--	0	0.0	0.0	0	0	0
Hydrozoa	--	9	17.9	4.6	0	0	43
Collembola	--	0	0.0	0.0	0	0	0
Non-Insecta	--	4559	4289.9	1107.6	2813	1039	13677
Non-Insecta (%)	89	--	--	--	--	--	--
Oligochaeta	--	274	184.8	47.7	260	0	606
Oligochaeta (%)	5	--	--	--	--	--	--
Amphipoda	--	4095	4073.7	1051.8	2554	649	12249
Amphipoda (%)	80	--	--	--	--	--	--
Bivalvia	--	110	177.6	45.9	0	0	649
Bivalvia (%)	2	--	--	--	--	--	--
Gastropoda	--	63	118.9	30.7	0	0	433
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 9.5-3. – continued –

	Lake Winnipegosis						
	Nearshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	0	0.0	0.0	0	0	0
Ephemeroptera - unid	--	0	0.0	0.0	0	0	0
Baetidae	--	3	11.2	2.9	0	0	43
Acentrella	--	0	0.0	0.0	0	0	0
Baetis	--	0	0.0	0.0	0	0	0
Callibaetis	--	6	22.4	5.8	0	0	87
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	--	20	32.2	8.3	0	0	87
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	--	38	69.1	17.9	0	0	260
Hexagenia	--	40	72.2	18.6	0	0	260
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 9.5-3. – continued –

	Lake Winnipegosis						
	Nearshore n=15						
	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	--	3	11.2	2.9	0	0	43
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	26.7	6.9	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	--	84	96.0	24.8	43	0	346
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	--	274	211.2	54.5	260	0	736
Orthocladiinae	--	6	15.2	3.9	0	0	43
Tanypodinae	--	52	86.9	22.4	0	0	303
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 9.5-3. – continued –

	Lake Winnipegosis						
	Nearshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Tipulidae (pupa)	--	0	0.0	0.0	0	0	0
Insecta	--	540	344.3	88.9	433	87	1342
Insecta (%)	11	--	--	--	--	--	--
Chironomidae	--	332	209.9	54.2	303	43	736
Chironomidae (%)	7	--	--	--	--	--	--
Ephemeroptera	--	107	115.5	29.8	87	0	346
Ephemeroptera (%)	2	--	--	--	--	--	--
Plecoptera	--	3	11.2	2.9	0	0	43
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	98	104.1	26.9	87	0	346
Trichoptera (%)	2	--	--	--	--	--	--
EPT	--	208	190.9	49.3	130	0	606
EPT (%)	4	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.83	0.830	0.214	0.50	0.00	3.00
Genus analysis of Ephemeroptera	5 spp. (Dominant: *Hexagenia* + *Ephemera*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	17	7	2.4	0.6	6	3	13
Simpson's Diversity Index (D)	--	0.43	0.182	0.047	0.45	0.09	0.79
Evenness (Simpson's Equitability E_D)	--	0.30	0.119	0.031	0.29	0.09	0.50
Shannon-Weaver Index (H)	--	0.95	0.402	0.104	0.89	0.26	1.90
Evenness (Shannon's Equitability E_H)	--	0.50	0.185	0.048	0.50	0.14	0.83
Hill's Effective Richness ($E^{H'}$)	--	3	1.3	0.3	2	1	7
Evenness ($E^{H'}$/S)	--	0.41	0.156	0.040	0.42	0.14	0.67

Table 9.5-3. – continued –

	Lake Winnipegosis						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Total Invertebrates	--	566	232.8	60.1	563	173	1039
Oligochaeta	--	20	39.6	10.2	0	0	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
Crangonycitidae	--	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	--	29	35.3	9.1	43	0	130
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	--	49	60.9	15.7	43	0	173
Non-Insecta (%)	9	--	--	--	--	--	--
Oligochaeta	--	20	39.6	10.2	0	0	130
Oligochaeta (%)	4	--	--	--	--	--	--
Amphipoda	--	0	0.0	0.0	0	0	0
Amphipoda (%)	0	--	--	--	--	--	--
Bivalvia	--	29	35.3	9.1	43	0	130
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	--	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

Table 9.5-3. – continued –

	Lake Winnipegosis						
	Offshore n=15						
	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	--	0	0.0	0.0	0	0	0
Corixidae (larva)	--	0	0.0	0.0	0	0	0
Corixidae (adult)	--	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	32.2	8.3	43	0	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

Table 9.5-3. – continued –

	Lake Winnipegosis						
	Offshore n=15						
	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	--	355	188.1	48.6	303	43	779
Orthocladiinae	--	0	0.0	0.0	0	0	0
Tanypodinae	--	124	78.2	20.2	130	0	260
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	--	517	221.0	57.1	519	130	995
Insecta (%)	91	--	--	--	--	--	--

Table 9.5-3. – continued –

	Lake Winnipegosis						
	Offshore n=15						
	Count	Mean	SD	SE	Median	Min	Max
Chironomidae	--	479	220.4	56.9	519	87	909
Chironomidae (%)	85	--	--	--	--	--	--
Ephemeroptera	--	38	32.2	8.3	43	0	87
Ephemeroptera (%)	7	--	--	--	--	--	--
Plecoptera	--	0	0.0	0.0	0	0	0
Plecoptera (%)	0	--	--	--	--	--	--
Trichoptera	--	0	0.0	0.0	0	0	0
Trichoptera (%)	0	--	--	--	--	--	--
EPT	--	38	32.2	8.3	43	0	87
EPT (%)	7	--	--	--	--	--	--
EPT:CHIRONOMIDAE (EPT:C)	--	0.16	0.265	0.068	0.08	0.00	1.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)						
Samples with no aquatic invertebrates	0	--	--	--	--	--	--
Samples with only Oligochaeta +/or Chironomidae	3	--	--	--	--	--	--
Taxonomic Richness (Family-level)	4	2	1.0	0.3	2	1	4
Simpson's Diversity Index (D)	--	0.50	0.181	0.047	0.53	0.00	0.75
Evenness (Simpson's Equitability E_D)	--	0.70	0.169	0.044	0.69	0.42	1.00
Shannon-Weaver Index (H)	--	0.89	0.347	0.090	0.90	0.00	1.47
Evenness (Shannon’s Equitability E_H)	--	0.73	0.229	0.059	0.78	0.00	0.95
Hill's Effective Richness ($E^{H'}$)	--	3	0.8	0.2	2	1	4
Evenness ($E^{H'}$/S)	--	0.79	0.126	0.032	0.79	0.56	1.00

Table 9.6-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Lake Winnipeg Region waterbodies, 2009.

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-03	14	569105	5754498	13-Jul-09	16.78	2.6	2.6	19.0
Lake Winnipeg - Sturgeon Bay	GN-04	14	567662	5755029	14-Jul-09	19.67	3.9	3.3	19.0
Lake Winnipeg - Sturgeon Bay	GN-06	14	566025	5760232	14-Jul-09	21.03	6.1	6.1	19.0
Lake Winnipeg - Sturgeon Bay	GN-07	14	565625	5761790	14-Jul-09	22.40	5.8	5.5	19.0
Lake Winnipeg - Sturgeon Bay	GN-14	14	568846	5755025	13-Jul-09	16.03	2.7	3.5	19.0
Lake Winnipeg - Sturgeon Bay	GN-15	14	569594	5754897	14-Jul-09	18.55	4.1	3.6	19.0
Lake Winnipeg - Sturgeon Bay	GN-16	14	569639	5755134	13-Jul-09	15.78	4.4	4.7	19.0
Lake Winnipeg - Sturgeon Bay	SN-06	14	566025	5760232	14-Jul-09	21.03	6.1	6.1	19.0
Lake Winnipeg - Sturgeon Bay	SN-16	14	569639	5755134	13-Jul-09	15.78	4.4	4.7	19.0
Lake Winnipeg - Grand Rapids	GN-02	14	492253	5910440	22-Jun-09	14.33	6.2	5.9	15.0
Lake Winnipeg - Grand Rapids	GN-03	14	492245	5907841	22-Jun-09	16.83	6.5	5.9	15.0
Lake Winnipeg - Grand Rapids	GN-04	14	486101	5906369	23-Jun-09	18.75	5.7	5.7	15.0
Lake Winnipeg - Grand Rapids	GN-05	14	485680	5906078	23-Jun-09	19.67	5.4	5.2	15.0
Lake Winnipeg - Grand Rapids	GN-06	14	485401	5905874	23-Jun-09	25.42	5.1	4.6	15.0
Lake Winnipeg - Grand Rapids	GN-08	14	485361	5902686	24-Jun-09	11.50	4.8	5.7	14.0
Lake Winnipeg - Grand Rapids	GN-09	14	484964	5902333	24-Jun-09	13.60	3.0	3.6	14.0
Lake Winnipeg - Grand Rapids	GN-11	14	485690	5903834	24-Jun-09	15.00	4.9	6.3	14.0
Lake Winnipeg - Grand Rapids	GN-12	14	491649	5909170	22-Jun-09	15.33	6.5	6.9	15.0
Lake Winnipeg - Grand Rapids	SN-06	14	485401	5905874	23-Jun-09	25.42	5.1	4.6	15.0
Lake Winnipeg - Grand Rapids	SN-11	14	485690	5903834	24-Jun-09	15.00	4.9	6.3	14.0
Lake Winnipeg - Grand Rapids	SN-12	14	491649	5909170	22-Jun-09	15.33	6.5	6.9	15.0
Lake Winnipeg - Mossy Bay	GN-02	14	563747	5950196	11-Jul-09	19.52	4.0	2.7	14.6
Lake Winnipeg - Mossy Bay	GN-04	14	560403	5952514	11-Jul-09	20.43	8.5	9.0	15.2
Lake Winnipeg - Mossy Bay	GN-05	14	562750	5952300	8-Jul-09	46.80	5.9	6.1	15.6
Lake Winnipeg - Mossy Bay	GN-06	14	561219	5954359	12-Jul-09	18.73	5.9	5.6	15.7
Lake Winnipeg - Mossy Bay	GN-07	14	559295	5954065	12-Jul-09	19.37	7.9	7.9	16.2
Lake Winnipeg - Mossy Bay	GN-09	14	557736	5955603	13-Jul-09	20.75	7.9	7.6	16.1
Lake Winnipeg - Mossy Bay	GN-10	14	558264	5957258	14-Jul-09	19.17	-	-	15.4
Lake Winnipeg - Mossy Bay	GN-11	14	556011	5956798	14-Jul-09	20.33	7.9	8.0	15.7
Lake Winnipeg - Mossy Bay	GN-13	14	559651	5956166	13-Jul-09	19.80	5.2	5.0	15.6
Lake Winnipeg - Mossy Bay	GN-33	14	561871	5954870	8-Jul-09	47.15	3.8	4.4	15.2
Lake Winnipeg - Mossy Bay	SN-07	14	559295	5954065	12-Jul-09	19.37	7.9	7.9	16.2
Lake Winnipeg - Mossy Bay	SN-11	14	556011	5956798	14-Jul-09	20.33	7.9	8.0	15.7

Table 9.6-1. – continued –

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Lake Winnipegosis	GN-01	14	438945	5724831	14-Sep-09	20.33	1.8	3.7	19.0
Lake Winnipegosis	GN-02	14	442466	5732785	14-Sep-09	20.62	2.7	4.3	19.0
Lake Winnipegosis	GN-04	14	425618	5789040	15-Sep-09	17.60	1.4	2.1	18.5
Lake Winnipegosis	GN-06	14	426705	5775537	15-Sep-09	21.65	5.2	6.4	19.5
Lake Winnipegosis	GN-07	14	415243	5861608	9-Sep-09	17.08	1.5	2.1	19.6
Lake Winnipegosis	GN-08	14	412322	5859511	9-Sep-09	17.27	1.0	4.9	19.1
Lake Winnipegosis	GN-09	14	423627	5851444	9-Sep-09	15.58	1.0	3.0	19.0
Lake Winnipegosis	GN-10	14	429979	5853230	9-Sep-09	15.35	2.0	3.0	19.0
Lake Winnipegosis	GN-11	14	366706	5864052	16-Sep-09	23.45	3.4	3.3	18.5
Lake Winnipegosis	GN-12	14	371100	5852172	16-Sep-09	23.72	1.0	4.3	18.5
Lake Winnipegosis	GN-13	14	428315	5745312	16-Sep-09	18.50	2.1	3.1	21.0
Lake Winnipegosis	GN-14	14	436359	5793112	15-Sep-09	16.02	2.7	3.7	20.0
Lake Winnipegosis	SN-08	14	412322	5859511	9-Sep-09	17.27	1.0	4.9	19.1
Lake Winnipegosis	SN-11	14	366706	5864052	16-Sep-09	23.45	3.4	3.3	18.5
Lake Winnipegosis	SN-02	14	442492	5735063	14-Sep-09	20.62	2.7	4.3	19.0
Lake Winnipegosis	SN-04	14	425618	5789040	15-Sep-09	17.60	1.4	2.1	18.5
Lake Winnipegosis	SN-09	14	423627	5851444	9-Sep-09	15.58	1.0	3.0	19.0

Table 9.6-2. Fish species (common and scientific names) list compiled from CAMPP standard gang index and small mesh index gillnetting investigations conducted in Lake Winnipeg Region waterbodies, 2009.

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, 2009.

Species	Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Common Carp	-	-	-	-	-	-	13	2.99
Common Shiner	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	26	3.19	27	3.42	-	-
White Sucker	7	2.49	166	20.37	51	6.46	230	52.87
Shorthead Redhorse	38	13.52	-	-	2	0.25	19	4.37
Brown Bullhead	-	-	-	-	-	-	8	1.84
Northern Pike	25	8.90	2	0.25	-	-	26	5.98
Rainbow Smelt	2	0.71	-	-	38	4.81	-	-
Cisco	-	-	15	1.84	3	0.38	9	2.07
Lake Whitefish	-	-	27	3.31	17	2.15	23	5.29
Troutperch	-	-	-	-	-	-	-	-
Burbot	-	-	2	0.25	-	-	-	-
White Bass	1	0.36	-	-	-	-	-	-
Yellow Perch	71	25.27	288	35.34	283	35.82	21	4.83
Logperch	-	-	-	-	-	-	-	-
Sauger	-	-	2	0.25	20	2.53	-	-
Walleye	135	48.04	287	35.21	347	43.92	71	16.32
Freshwater Drum	2	0.71	-	-	2	0.25	15	3.45
Total	281	100	815	100	790	100	435	100

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

Table 9-6.4. Small mesh index gillnet relative abundance summaries from Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay		Grand Rapids		Mossy Bay		Lake Winnipegosis	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Common Carp	-	-	-	-	-	-	-	-
Common Shiner	-	-	-	-	-	-	4	0.35
Emerald Shiner	-	-	-	-	-	-	32	2.83
Spottail Shiner	36	6.50	5	0.33	-	-	272	24.05
Longnose Sucker	-	-	-	-	1	0.29	-	-
White Sucker	-	-	1	0.07	-	-	20	1.77
Shorthead Redhorse	-	-	-	-	-	-	-	-
Brown Bullhead	-	-	-	-	-	-	1	0.09
Northern Pike	-	-	-	-	-	-	1	0.09
Rainbow Smelt	1	0.18	296	19.58	197	57.43	-	-
Cisco	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	13	1.15
Troutperch	29	5.23	875	57.87	88	25.66	49	4.33
Burbot	-	-	-	-	-	-	-	-
White Bass	-	-	-	-	-	-	-	-
Yellow Perch	453	81.77	249	16.47	22	6.41	674	59.59
Logperch	30	5.42	-	-	13	3.79	33	2.92
Sauger	-	-	-	-	2	0.58	-	-
Walleye	5	0.90	86	5.69	20	5.83	29	2.56
Freshwater Drum	-	-	-	-	-	-	3	0.27
Total	554	100	1512	100	343	100	1131	100

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

Table 9.6-5. Standard gang index gillnet biomass summaries from Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Common Carp	-	-	-	-	-	-	-	-	-	13	23198	5.99
Common Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	26	20873	4.19	27	18808	3.82	-	-	-
White Sucker	7	6037	4.69	166	135363	27.20	51	46355	9.42	230	215885	55.78
Shorthead Redhorse	38	22569	17.52	-	-	-	2	1466	0.30	19	14430	3.73
Brown Bullhead	-	-	-	-	-	-	-	-	-	8	1490	0.38
Northern Pike	25	11173	8.67	2	11668	2.34	-	-	-	26	41779	10.80
Rainbow Smelt	2	506	0.39	-	-	-	38	339	0.07	-	-	-
Cisco	-	-	-	15	6808	1.37	3	584	0.12	9	815	0.21
Lake Whitefish	-	-	-	26	37355	7.51	17	8542	1.74	23	8131	2.10
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	2	3400	0.68	-	-	-	-	-	-
White Bass	1	79	0.06	-	-	-	-	-	-	-	-	-
Yellow Perch	71	5991	4.65	288	53224	10.70	283	50065	10.18	21	2006	0.52
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	2	1789	0.36	20	8588	1.75	-	-	-
Walleye	135	80756	62.69	287	227143	45.65	347	356216	72.41	71	47876	12.37
Freshwater Drum	2	1712	1.33	-	-	-	2	1009	0.21	15	31406	8.11
Total	281	128822	100.00	1511	22004	100.00	790	491972	100.00	435	387013	100.00

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

Table 9.6-6. Small mesh index gillnet biomass summaries from Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-
Common Shiner	-	-	-	-	-	-	-	-	-	4	42	0.21
Emerald Shiner	-	-	-	-	-	-	-	-	-	32	213	1.05
Spottail Shiner	36	251	3.04	5	48	0.22	-	-	-	272	1545	7.66
Longnose Sucker	-	-	-	-	-	-	1	83	1.25	-	-	-
White Sucker	-	-	-	1	96	0.44	-	-	-	20	353	1.75
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Brown Bullhead	-	-	-	-	-	-	-	-	-	1	524	2.60
Northern Pike	-	-	-	-	-	-	-	-	-	1	1373	6.81
Rainbow Smelt	1	11	0.14	296	3487	15.85	197	2150	32.58	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	13	297	1.47
Troutperch	29	274	3.31	875	9864	44.83	88	898	13.60	49	511	2.54
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
White Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	453	7132	86.25	249	3795	17.25	22	2358	35.73	674	7805	38.70
Logperch	30	160	1.93	-	-	-	13	30	0.45	33	360	1.79
Sauger	-	-	-	-	-	-	2	37	0.56	-	-	-
Walleye	4	441	5.33	85	4714	21.43	20	1044	15.82	29	881	4.37
Freshwater Drum	-	-	-	-	-	-	-	-	-	3	6262	31.05
Total	553	8269	100.00	1511	22004	100.00	343	6598	100.00	1131	20165	100.00

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = 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, 2009.

Species	Sturgeon Bay (# sites=7)			Grand Rapids (# sites=9)			Mossy Bay (#sites=10)			Lake Winnipegosis (#sites=12)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	13	1.15	1.65
Common Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	26	3.88	4.09	27	2.84	3.58	-	-	-
White Sucker	7	1.07	1.15	166	23.22	8.74	51	5.26	5.21	230	21.63	9.46
Shorthead Redhorse	38	6.55	4.70	-	-	-	2	0.21	0.45	19	1.79	1.79
Brown Bullhead	-	-	-	-	-	-	-	-	-	8	0.72	1.55
Northern Pike	25	4.22	4.24	2	0.33	0.66	-	-	-	26	2.45	2.23
Rainbow Smelt	2	0.38	1.01	-	-	-	38	3.52	5.69	-	-	-
Cisco	-	-	-	15	2.16	3.69	3	0.32	0.51	9	0.81	1.77
Lake Whitefish	-	-	-	27	4.27	4.83	17	1.00	1.68	23	1.89	3.08
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	2	0.31	0.63	-	-	-	-	-	-
White Bass	1	0.19	0.50	-	-	-	-	-	-	-	-	-
Yellow Perch	71	10.71	6.95	288	39.18	32.95	283	26.12	16.03	21	1.77	2.21
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	2	0.33	0.67	20	1.70	1.81	-	-	-
Walleye	135	22.34	14.14	287	41.81	12.23	347	35.97	27.26	71	6.56	5.80
Freshwater Drum	2	0.34	0.58	-	-	-	2	0.15	0.34	15	1.37	3.07
Total	281	45.79	16.87	815	115.48	34.69	790	77.09	35.53	435	40.15	10.87

#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, 2009.

Species	Sturgeon Bay (# sites=2)			Grand Rapids (# sites=3)			Mossy Bay (#sites=2)			Lake Winnipegosis (#sites=5)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-
Common Shiner	-	-	-	-	-	-	-	-	-	4	1.11	2.49
Emerald Shiner	-	-	-	-	-	-	-	-	-	32	7.51	10.56
Spottail Shiner	36	22.63	8.34	5	2.66	1.93	-	-	-	272	58.51	95.61
Longnose Sucker	-	-	-	-	-	-	1	0.59	0.83	-	-	-
White Sucker	-	-	-	1	0.53	0.53	-	-	-	20	4.20	8.55
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Brown Bullhead	-	-	-	-	-	-	-	-	-	1	0.23	0.52
Northern Pike	-	-	-	-	-	-	-	-	-	1	0.23	0.52
Rainbow Smelt	1	0.57	0.81	296	138.86	37.92	197	118.12	56.66	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	13	2.66	5.95
Troutperch	29	17.69	12.11	875	355.87	56.81	88	53.29	5.24	49	12.31	14.31
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
White Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	453	279.75	154.73	249	98.93	25.08	22	13.25	2.97	674	145.70	239.19
Logperch	30	18.45	11.03	-	-	-	13	7.82	2.30	33	9.14	15.21
Sauger	-	-	-	-	-	-	2	1.24	1.75	-	-	-
Walleye	5	3.04	2.15	86	31.86	15.79	20	11.89	11.56	29	6.91	13.07
Freshwater Drum	-	-	-	-	-	-	-	-	-	3	0.70	1.56
Total	554	342.13	189.17	1512	628.71	61.27	343	206.20	67.33	1131	249.21	339.36

#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 Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay (# sites=7)			Grand Rapids (# sites=9)			Mossy Bay (# sites=10)			Lake Winnipegosis (# sites=12)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	13	1933	2767
Common Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	26	2319	2752	27	1881	2299	-	-	-
White Sucker	7	862	853	166	15040	5289	51	4636	5221	230	17990	9031
Shorthead Redhorse	38	3224	2428	-	-	-	2	147	413	19	1202	1326
Brown Bullhead	-	-	-	-	-	-	-	-	-	8	124	260
Northern Pike	25	1596	2021	2	1296	2880	-	-	-	26	3482	3231
Rainbow Smelt	2	72	191	-	-	-	38	34	57	-	-	-
Cisco	-	-	-	15	756	1333	3	58	101	9	68	139
Lake Whitefish	-	-	-	27	4639	5245	17	854	1294	23	678	955
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	2	378	865	-	-	-	-	-	-
White Bass	1	11	30	-	-	-	-	-	-	-	-	-
Yellow Perch	71	856	480	288	5914	5155	283	5006	3186	21	167	224
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	2	199	395	20	859	922	-	-	-
Walleye	135	11537	7854	287	25238	7796	347	35622	27111	71	3990	2656
Freshwater Drum	2	245	433	-	-	-	2	101	226	15	2617	5603
Total	281	18403	10616	815	55291	14117	790	49197	31969	435	32251	14845

#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/24h) set in Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay (# sites=2)			Grand Rapids (# sites=3)			Mossy Bay (# sites=2)			Lake Winnipegosis (# sites=5)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Common Carp	-	-	-	-	-	-	-	-	-	-	-	-
Common Shiner	-	-	-	-	-	-	-	-	-	4	8	19
Emerald Shiner	-	-	-	-	-	-	-	-	-	32	43	63
Spottail Shiner	36	126	16	5	16	16	-	-	-	272	309	480
Longnose Sucker	-	-	-	-	-	-	1	41	58	-	-	-
White Sucker	-	-	-	1	32	55	-	-	-	20	71	149
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Brown Bullhead	-	-	-	-	-	-	-	-	-	1	105	234
Northern Pike	-	-	-	-	-	-	-	-	-	1	275	614
Rainbow Smelt	1	6	8	296	1162	533	197	1075	416	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	13	59	133
Troutperch	29	137	65	875	3288	810	88	449	84	49	102	119
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
White Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	453	3566	2139	249	1265	514	22	1179	1066	674	1561	2226
Logperch	30	80	48	-	-	-	13	15	14	33	72	117
Sauger	-	-	-	-	-	-	2	19	26	-	-	-
Walleye	5	265	250	86	2320	1339	20	522	598	29	176	370
Freshwater Drum	-	-	-	-	-	-	-	-	-	3	1252	2800
Total	554	4178	2027	1512	7821	2895	343	3299	118	1131	4033	4378

#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) calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
Lake Whitefish	-	-	-	27	399	53	17	337	91	23	257	80
Northern Pike	-	-	-	-	-	-	-	-	-	26	567	53
Sauger	-	-	-	2	377	38	-	-	-	-	-	-
Walleye	135	344	48	287	360	46	347	407	78	71	354	84
Weight												
Lake Whitefish	-	-	-	26	1095	453	17	740	542	23	329	345
Northern Pike	25	375	-	2	3925	2581	-	-	-	26	1413	429
Sauger	-	-	-	2	635	163	20	555	-	-	-	-
Walleye	135	514	229	287	603	251	347	994	530	71	586	477
Condition Factor												
Lake Whitefish	-	-	-	26	1.58	0.21	17	1.51	0.25	23	1.45	0.17
Northern Pike	-	-	-	-	-	-	-	-	-	26	0.76	0.07
Sauger	-	-	-	2	1.18	0.05	-	-	-	-	-	-
Walleye	135	1.18	0.09	287	1.22	0.09	347	1.32	0.10	71	1.09	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 calculated for Northern Pike, Lake Whitefish, and Walleye captured in small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2009.

Species	Sturgeon Bay			Grand Rapids			Mossy Bay			Lake Winnipegosis		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	5	158	83	54	151	70	-	-	-	-	-	-
Weight												
Lake Whitefish	-	-	-	-	-	-	-	-	-	13	22	-
Northern Pike	-	-	-	-	-	-	-	-	-	1	1180	-
Sauger	-	-	-	-	-	-	2	15		-	-	-
Walleye	4	90	133	85	53	-	20	44	-	29	26	-
Condition Factor												
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	4	1.00	0.12	53	1.12	0.18	-	-	-	-	-	-

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, and Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2009.

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	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	52.17
2	2007	-	-	-	-	-	-	4	15.38	-	-	-	-	5	33.33	2	8.70
3	2006	-	-	-	-	-	-	12	46.15	-	-	1	3.85	1	6.67	1	4.35
4	2005	-	-	-	-	-	-	6	23.08	-	-	5	19.23	3	20.00	5	21.74
5	2004	-	-	-	-	-	-	3	11.54	-	-	8	30.77	3	20.00	2	8.70
6	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	1	3.85	-	-	1	3.85	1	6.67	-	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4.35
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	3	11.54	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	3	11.54	1	6.67	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	1	6.67	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-
Total		-	-	-	-	-	-	26	100.00	-	-	26	100	15	100	23	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	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.41
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	11.27
2	2007	-	-	-	-	-	-	-	-	10	7.41	6	2.10	11	3.18	29	40.85
3	2006	-	-	-	-	-	-	-	-	68	50.37	34	11.89	33	9.54	20	28.17
4	2005	-	-	-	-	-	-	-	-	51	37.78	207	72.38	154	44.51	5	7.04
5	2004	-	-	1	50.00	-	-	-	-	5	3.70	24	8.39	13	3.76	7	9.86
6	2003	-	-	-	-	-	-	-	-	-	-	9	3.15	36	10.40	1	1.41
7	2002	-	-	1	50.00	-	-	-	-	-	-	4	1.40	19	5.49	-	-
8	2001	-	-	-	-	-	-	-	-	-	-	2	0.70	71	20.52	-	-
9	2000	-	-	-	-	-	-	-	-	1	0.74	-	-	5	1.45	-	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	1	0.29	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	2	0.58	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	1	0.29	-	-
17	1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		-	-	2	100.00	-	-	-	-	135	100.00	286	100.00	346	100.00	71	100.00

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, 2009.

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	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	4	556	18	4	1298	146	4	1	0
3	2006	-	-	-	-	-	-	-	-	-	12	544	13	12	1215	99	12	1	0
4	2005	-	-	-	-	-	-	-	-	-	6	584	27	6	1600	214	6	1	0
5	2004	-	-	-	-	-	-	-	-	-	3	619	28	3	1913	163	3	1	0
6	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	-	-	-	1	616	-	1	1630	-	1	1	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		-			-			-			26	-	-	26	-	-	26	-	-

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, 2009.

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	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	1	258	-	1	250	-	1	1.46	-
4	2005	-	-	-	-	-	-	-	-	-	5	357	13	5	674	91	5	1.44	0.06
5	2004	-	-	-	-	-	-	-	-	-	8	384	11	8	926	98	8	1.60	0.05
6	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	-	-	-	1	462	-	1	1520	-	1	1.54	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	1	448	-	1	1740	-	1	1.94	-
14	1995	-	-	-	-	-	-	-	-	-	1	438	-	1	1170	-	1	1.39	-
15	1994	-	-	-	-	-	-	-	-	-	3	442	6	3	1383	148	3	1.60	0.17
16	1993	-	-	-	-	-	-	-	-	-	1	430	-	1	1150	-	1	1.45	-
17	1992	-	-	-	-	-	-	-	-	-	3	447	25	3	1457	283	3	1.59	0.07
18	1991	-	-	-	-	-	-	-	-	-	1	444	-	1	1870	-	1	2.14	-
19	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	1	440	-	1	1470	-	1	1.73	-
Total		-			-			-			26			26			26		

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	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2008	-	-	-							12	194	2	12	106	3	12	1.46	0.02
2	2007	5	234	4	5	176	23	5	1.34	0.14	2	254	34	2	225	105	2	1.26	0.13
3	2006	1	238	-	1	180	-	1	1.34	-	1	272	-	1	280	-	1	1.39	-
4	2005	3	377	9	3	857	93	3	1.59	0.08	5	338	26	5	608	165	5	1.42	0.12
5	2004	3	362	64	3	890	370	3	1.50	0.15	2	341	9	2	640	10	2	1.63	0.16
6	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	1	412	-	1	1280	-	1	1.83	-	-	-	-	-	-	-	-	-	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	1	428	-	1	1250	-	1	1.59	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	1992	1	414	-	1	1000	-	1	1.41	-	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1990	1	466	-	1	1830	-	1	1.81	-	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		15			15			15			23			23			23		

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, 2009.

		Sturgeon Bay									Grand Rapids								
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
0	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-	1	350	-	1	520	-	1	1.21	-
6	2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	-	-	-	1	404	-	1	750	-	1	1.14	-
8	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		-			-			-			2			2			2		

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, 2009.

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	2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2008	4	122	13	4	-	4	4	-	0.08	27	108	3	27	-	1	27	-	0.04
2	2007	10	246	7	10	164	16	10	1.07	0.03	26	165	7	26	53	6	26	1.05	0.03
3	2006	69	326	3	69	410	11	69	1.17	0.01	39	305	4	39	333	17	39	1.14	0.01
4	2005	51	379	4	51	679	23	51	1.22	0.01	209	363	2	209	598	9	209	1.23	0.01
5	2004	5	382	17	5	676	101	5	1.18	0.06	24	377	4	24	669	26	24	1.24	0.01
6	2003	-	-	-	-	-	-	-	-	-	9	473	6	9	1353	77	9	1.27	0.03
7	2002	-	-	-	-	-	-	-	-	-	4	459	21	4	1325	195	4	1.34	0.03
8	2001	-	-	-	-	-	-	-	-	-	2	494	10	2	1485	25	2	1.24	0.10
9	2000	1	534	-	1	1720	-	1	1.13	-	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		140			140			140			340			340			340		

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 –

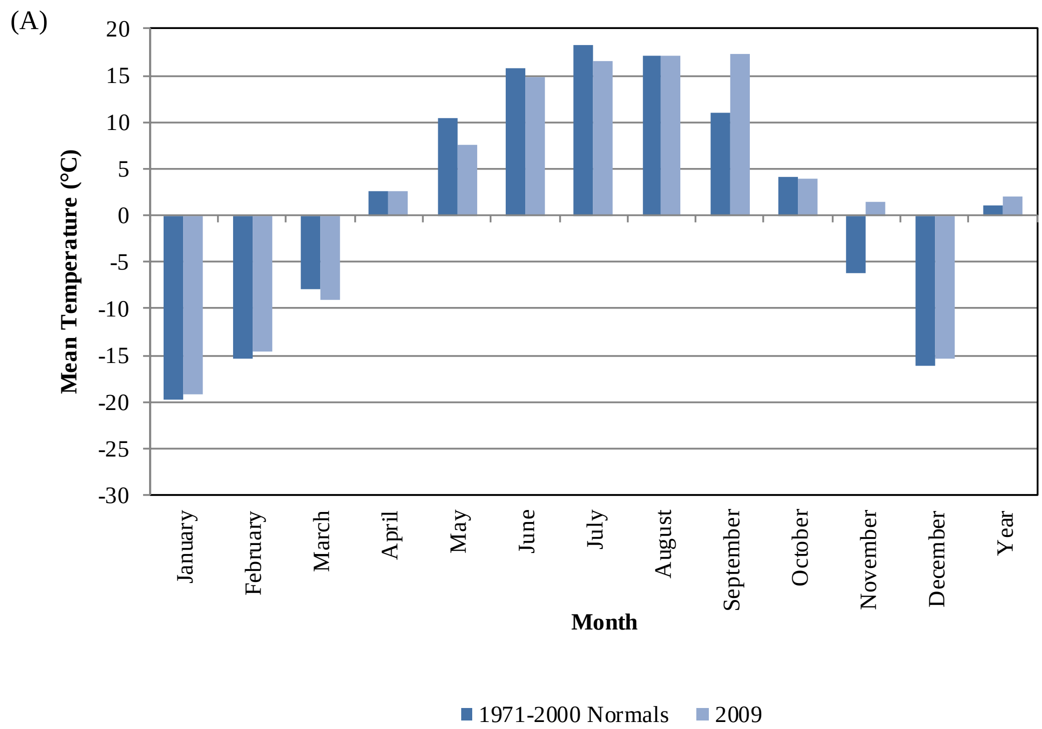
Age	Year-Class	Mossy Bay FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD	Lake Winnipegosis FL (mm) n	Mean	SD	W (g) n	Mean	SD	K n	Mean	SD
0	2009	-	-	-	-	-	-	-	-	-	1	142	-	1	20	-	1	0.70	-
1	2008	-	-	-	-	-	-	-	-	-	8	249	4	8	163	12	8	1.06	0.07
2	2007	11	221	3	11	122	5	11	1.13	0.03	29	313	4	29	341	16	29	1.09	0.02
3	2006	33	307	4	33	382	17	33	1.28	0.02	20	383	6	20	620	34	20	1.09	0.02
4	2005	154	372	2	154	703	12	154	1.34	0.01	5	425	23	5	864	173	5	1.08	0.03
5	2004	13	398	9	13	865	60	13	1.34	0.01	7	515	13	7	1637	103	7	1.19	0.03
6	2003	36	462	4	36	1387	40	36	1.40	0.02	1	550	-	1	2200	-	1	1.32	-
7	2002	19	494	6	19	1619	71	19	1.33	0.02	-	-	-	-	-	-	-	-	-
8	2001	71	498	5	71	1641	40	71	1.30	0.01	-	-	-	-	-	-	-	-	-
9	2000	5	508	7	5	1730	77	5	1.32	0.04	-	-	-	-	-	-	-	-	-
10	1999	1	522	-	1	1910	-	1	1.34	-	-	-	-	-	-	-	-	-	-
11	1998	2	458	8	2	1145	115	2	1.19	0.06	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	1993	1	476	-	1	1430	-	1	1.33	-	-	-	-	-	-	-	-	-	-
Total		346			346			346			71			71			71		

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, 2009.

Species	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Sturgeon Bay											
White Sucker	-	-	-	-	-	-	-	-	7	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	25	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	-	0	0.00
Sauger	-	-	-	-	-	-	-	-	-	0	0.00
Walleye	-	-	-	-	-	-	-	-	135	0	0.00
Grand Rapids											
White Sucker	-	-	-	-	-	-	-	-	166	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	2	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	27	0	0.00
Sauger	-	-	-	-	-	-	-	-	2	0	0.00
Walleye	-	-	-	-	-	-	-	-	287	0	0.00
Mossy Bay											
White Sucker	-	-	-	-	-	-	-	-	51	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	-	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	17	0	0.00
Sauger	-	-	-	-	-	-	-	-	20	0	0.00
Walleye	-	-	-	-	-	-	-	-	347	0	0.00
Lake Winnipegosis											
White Sucker	-	-	-	-	-	-	-	-	230	0	0.00
Northern Pike	-	-	-	-	-	-	-	-	26	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	23	0	0.00
Sauger	-	-	-	-	-	-	-	-	-	0	0.00
Walleye	-	-	-	-	-	-	-	-	71	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)



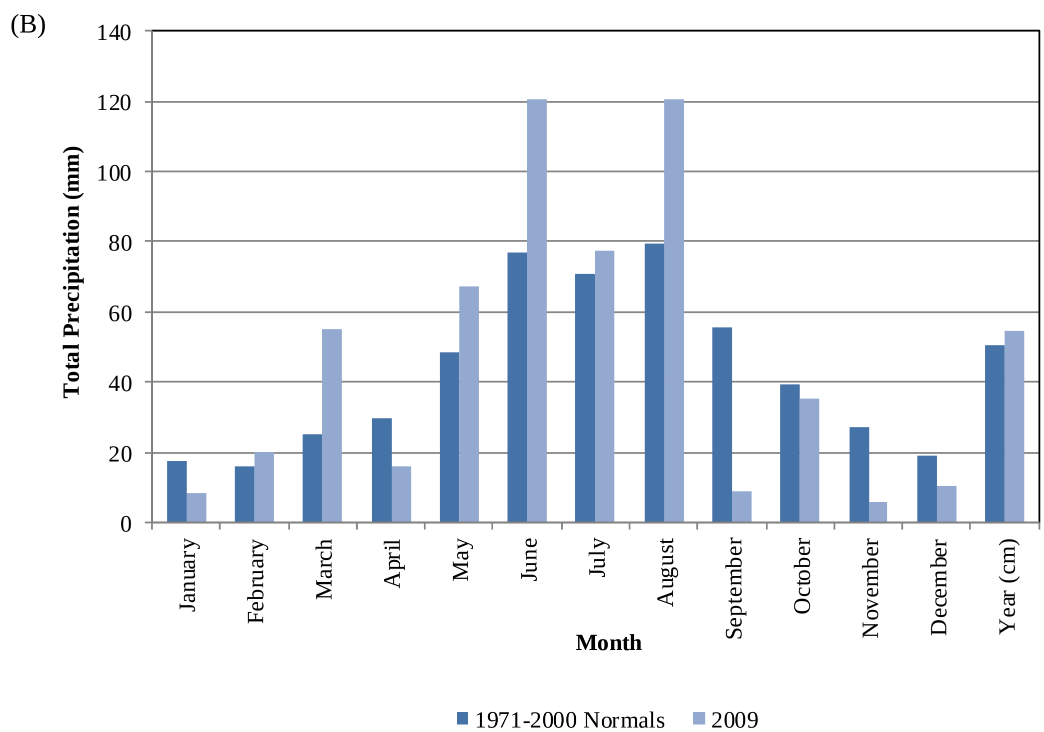


Figure 9.1-1. Monthly mean air temperature and monthly total precipitation for 2009 compared to climate normals (1971-2000), Arborg, MB.

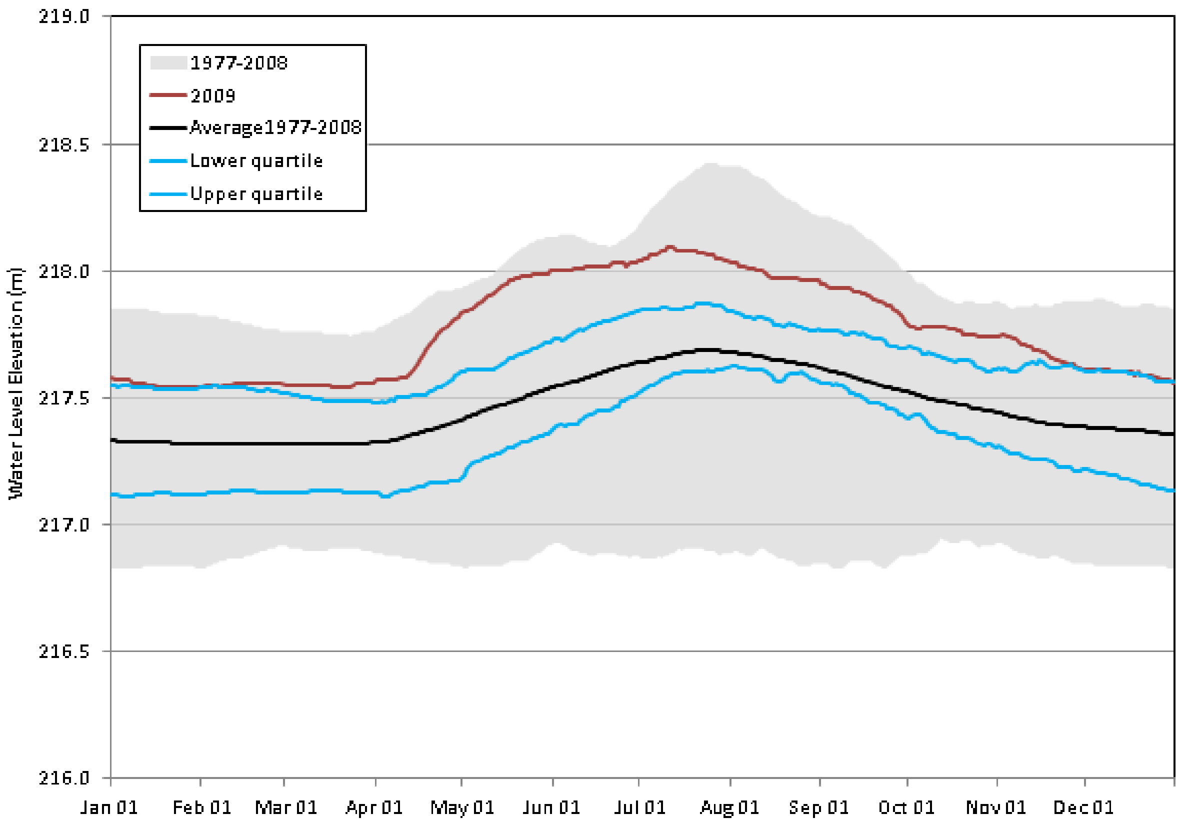


Figure 9.2-1. 2009 Lake Winnipeg water level elevation.

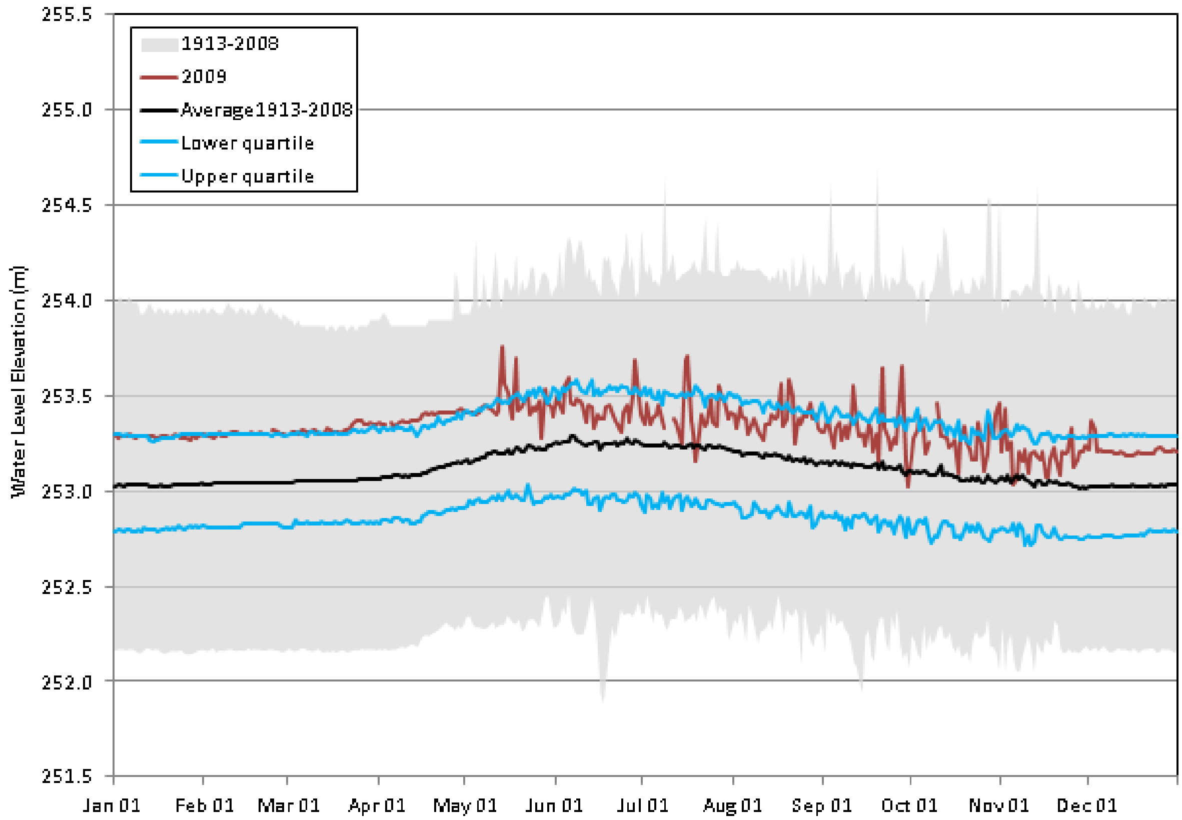


Figure 9.2-2. 2009 Lake Winnipegosis (05LH001) water level elevation.

Figure 9.3-1. Water quality and phytoplankton monitoring sites in Lake Winnipegosis: 2009/2010.

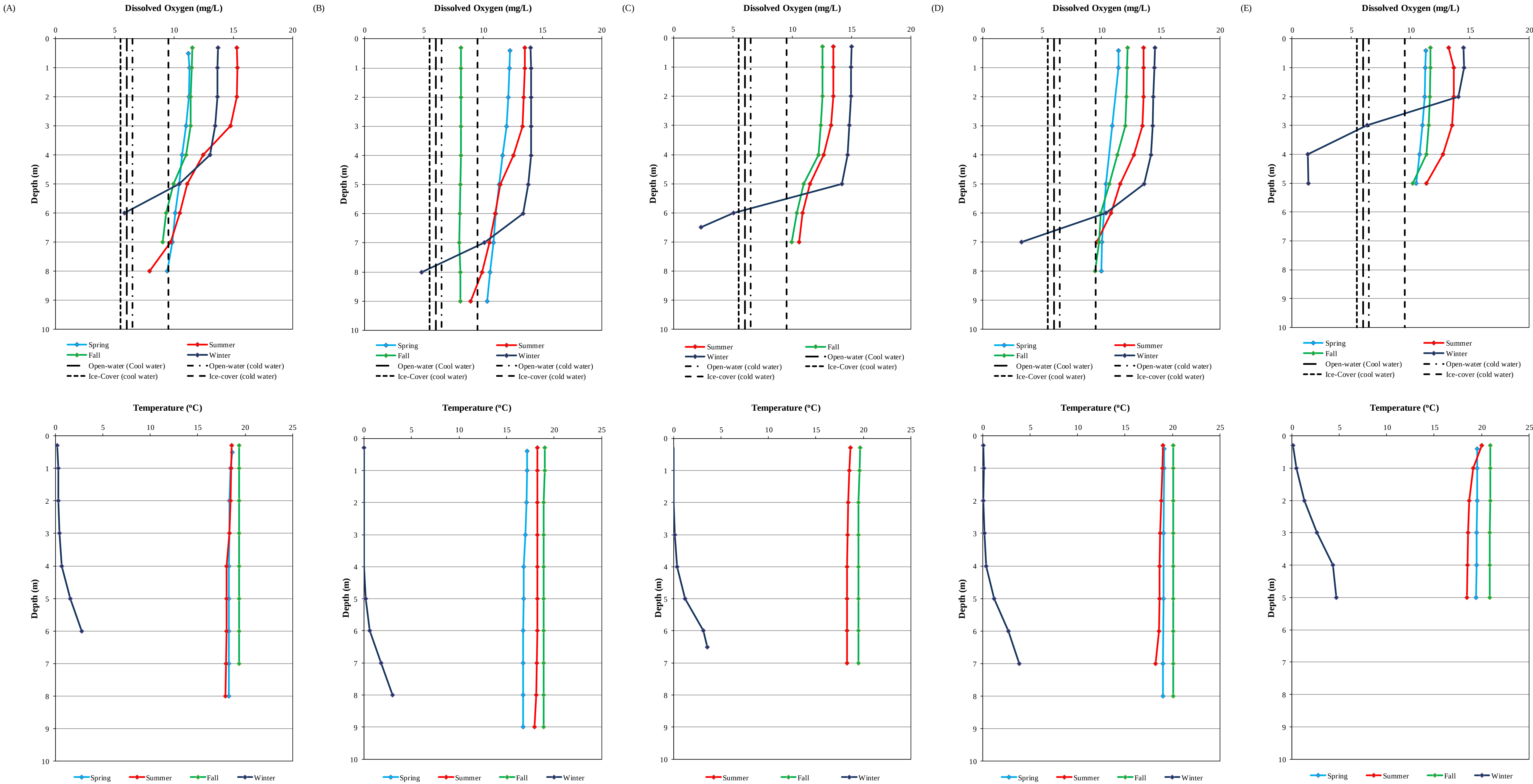


Figure 9.3-2. Dissolved oxygen and water temperature profiles measured in Lake Winnipegosis in 2009/2010: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Dashed lines represent selected MWQSOGs for PAL. Note: spring sampling was not completed at Site 3 due to inclement weather conditions.

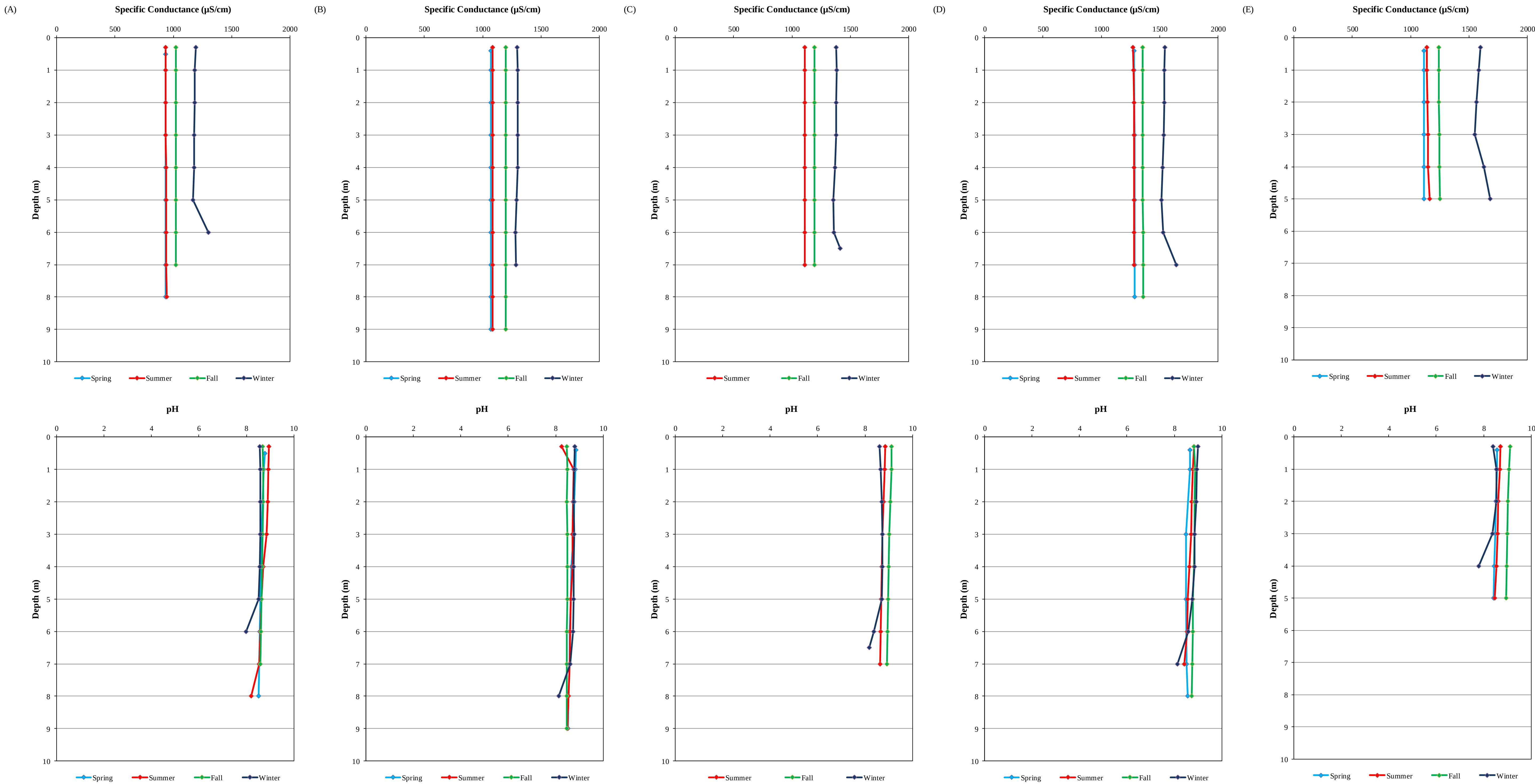


Figure 9.3-3. Specific conductance and pH profiles measured in Lake Winnipegosis in 2009/2010: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Note: spring sampling was not completed at Site 3 due to inclement weather conditions.

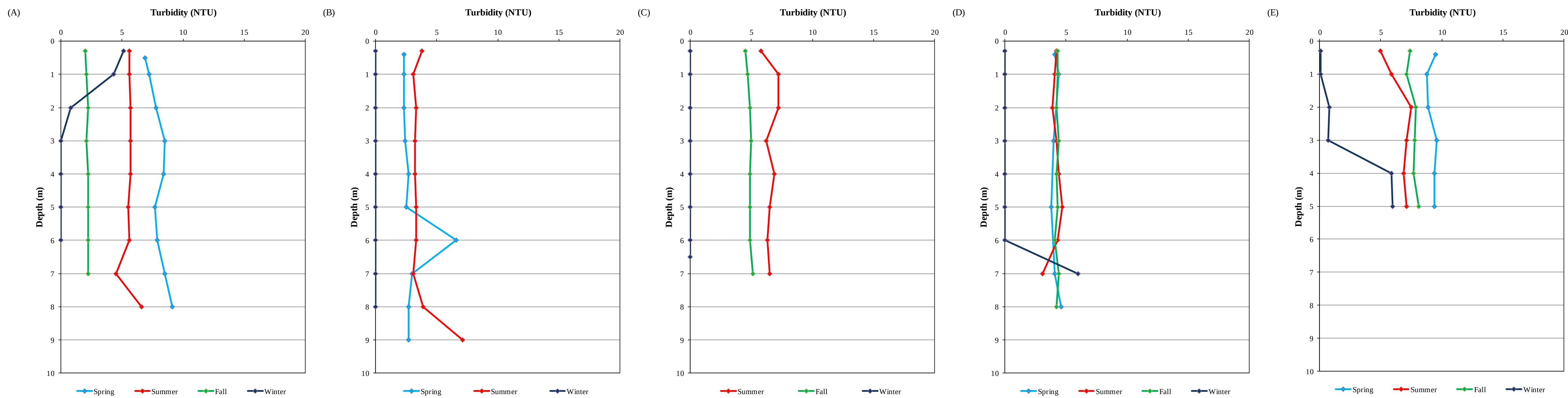


Figure 9.3-4. Turbidity depth profiles measured in Lake Winnipegosis in 2009/2010: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Note: spring sampling was not completed at Site 3 due to inclement weather conditions. Turbidity was not measured in fall at Site 2 due to meter malfunction.

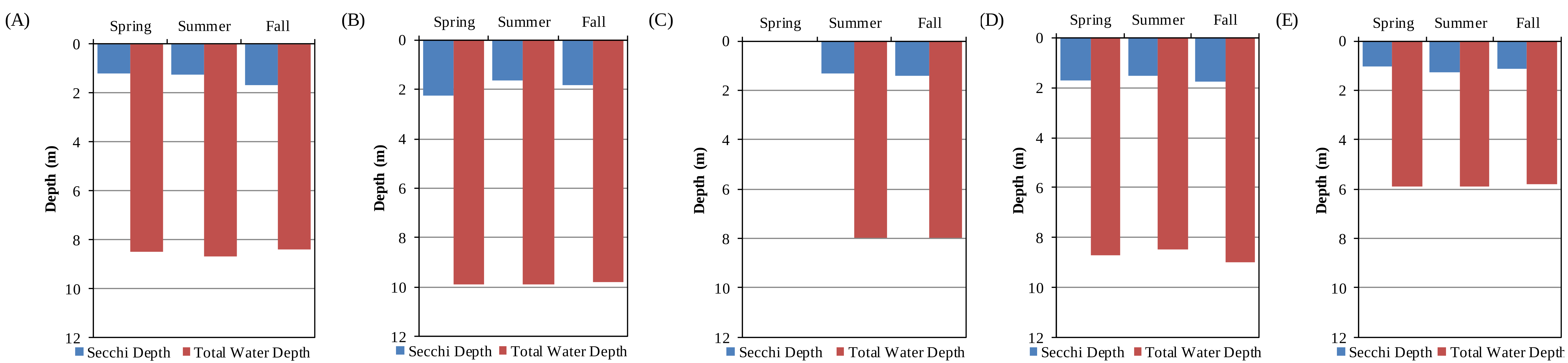


Figure 9.3-5. Secchi disk depths measured in Lake Winnipegosis in 2009/2010: (A) Site 1; (B) Site 2; and (C) Site 3; (D) Site 4; and (E) Site 5. Note: spring sampling was not completed at Site 3 due to inclement weather conditions.

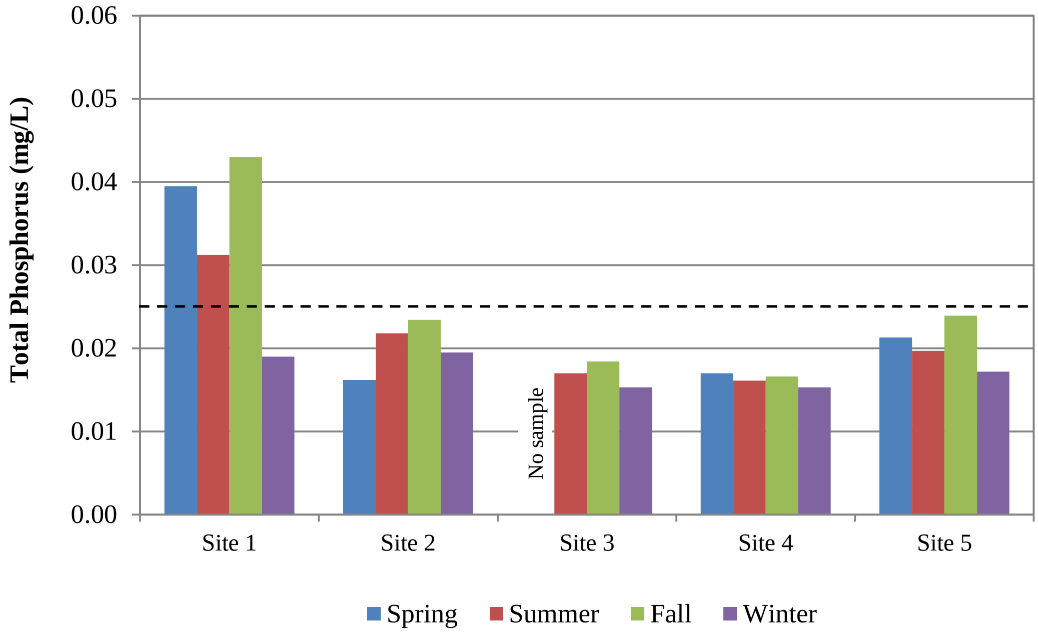


Figure 9.3-6. Total phosphorus measured in surface grabs in Lake Winnipegosis, by sampling period and site: 2009/2010. The black dashed line indicates the MB narrative guideline for lakes, ponds, and reservoirs and streams near the point of entry to these waterbodies.

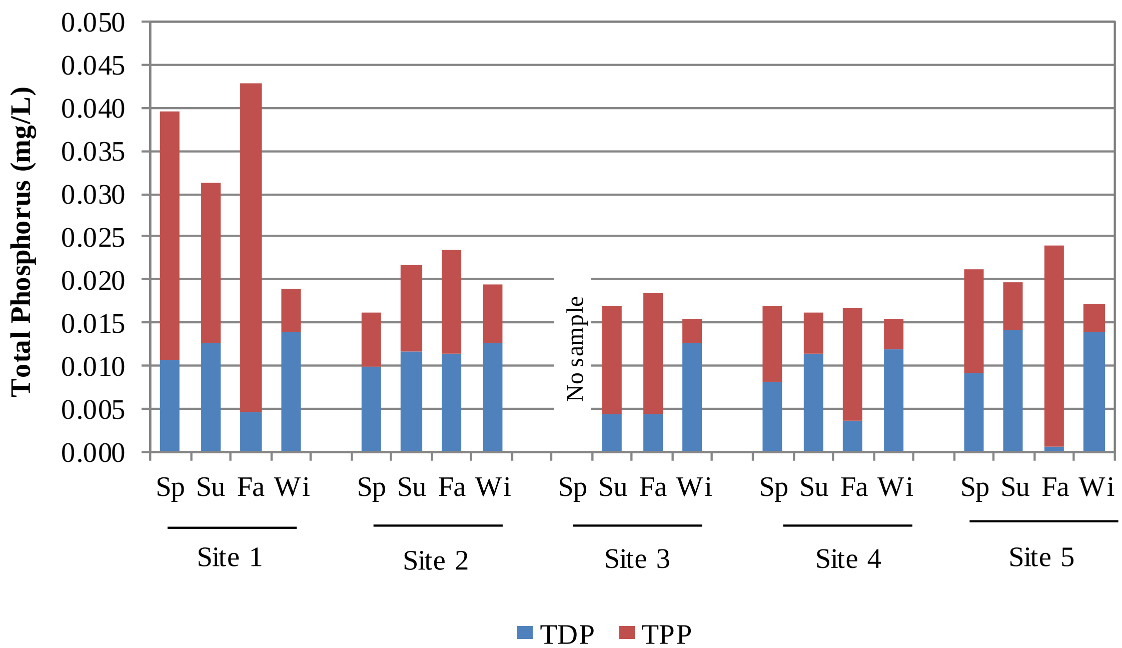


Figure 9.3-7. Particulate (TPP) and dissolved (TDP) phosphorus fractions measured in Lake Winnipegosis: 2009/2010.

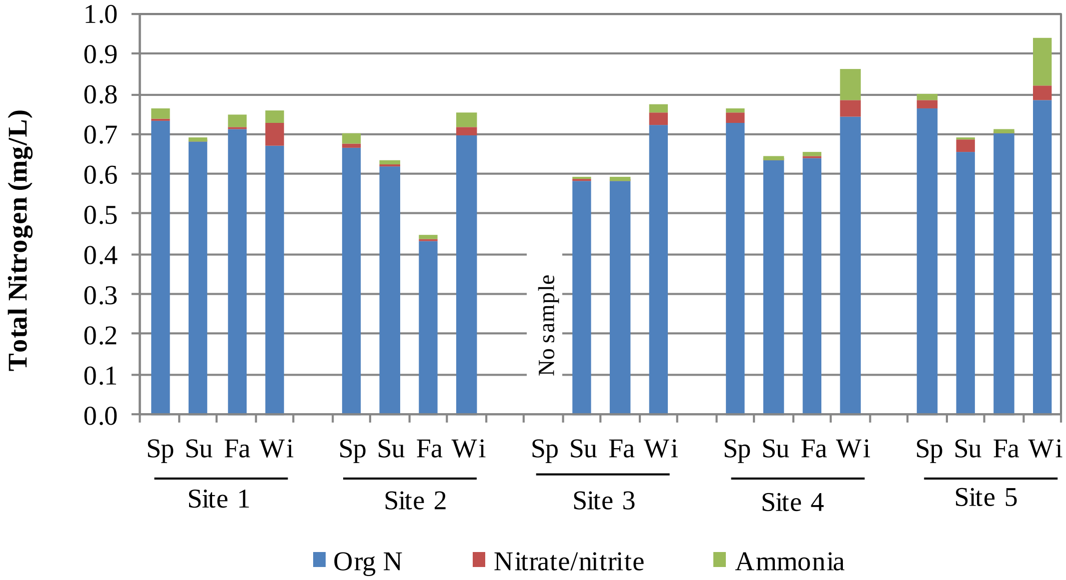


Figure 9.3-8. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in Lake Winnipegosis: 2009/2010.

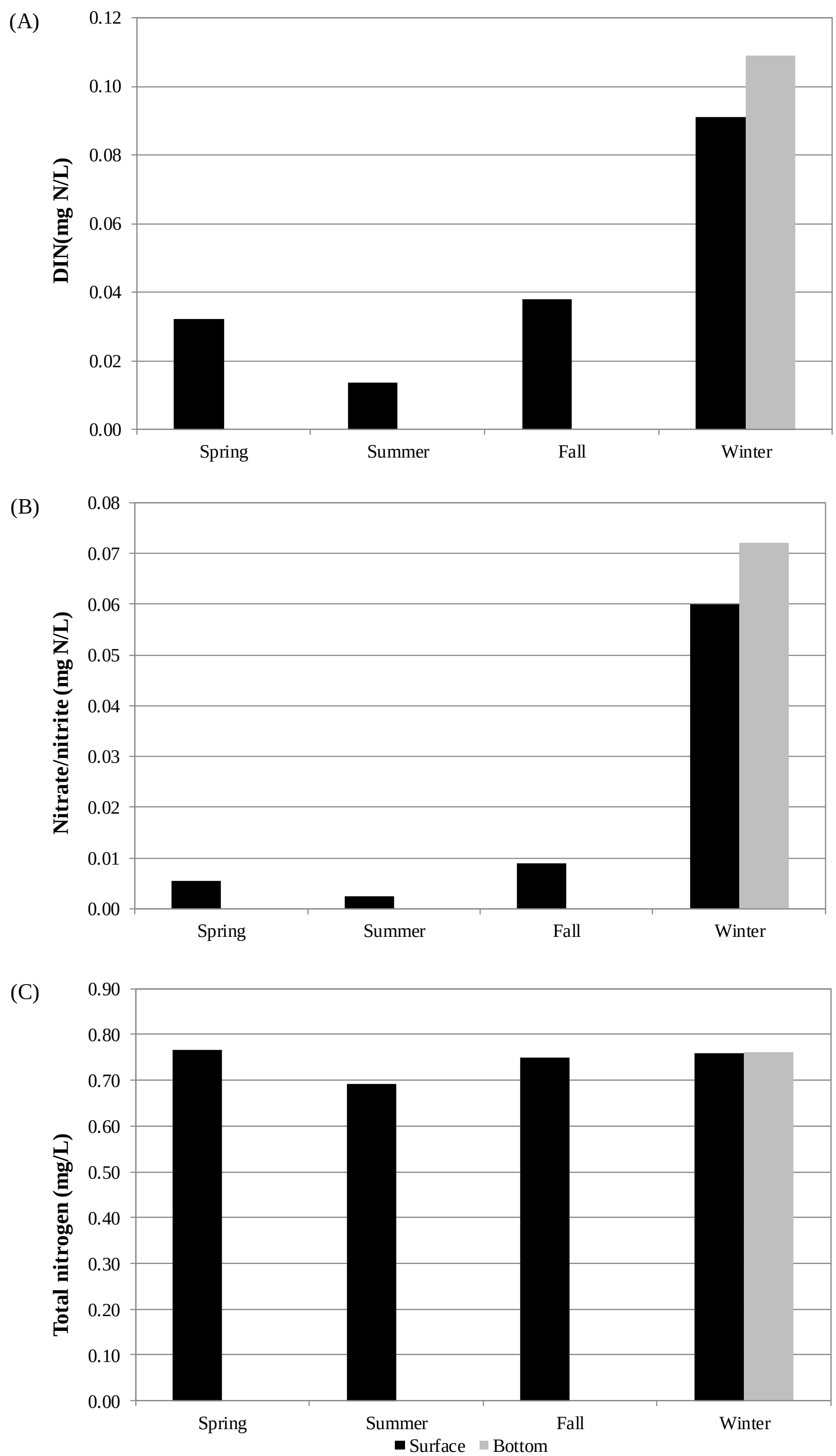


Figure 9.3-9. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 1, 2009/2010.

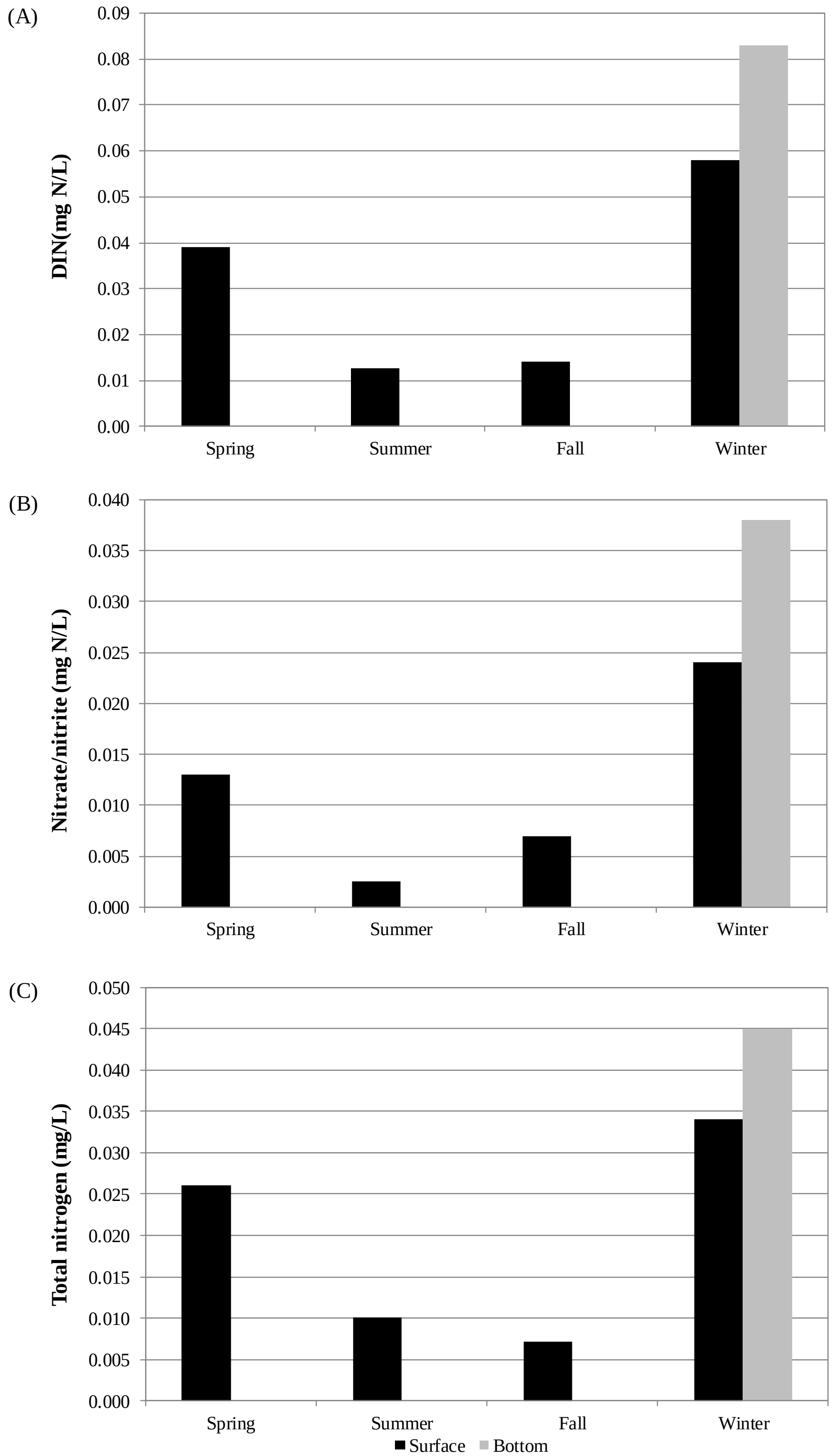


Figure 9.3-10. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 2, 2009/2010.

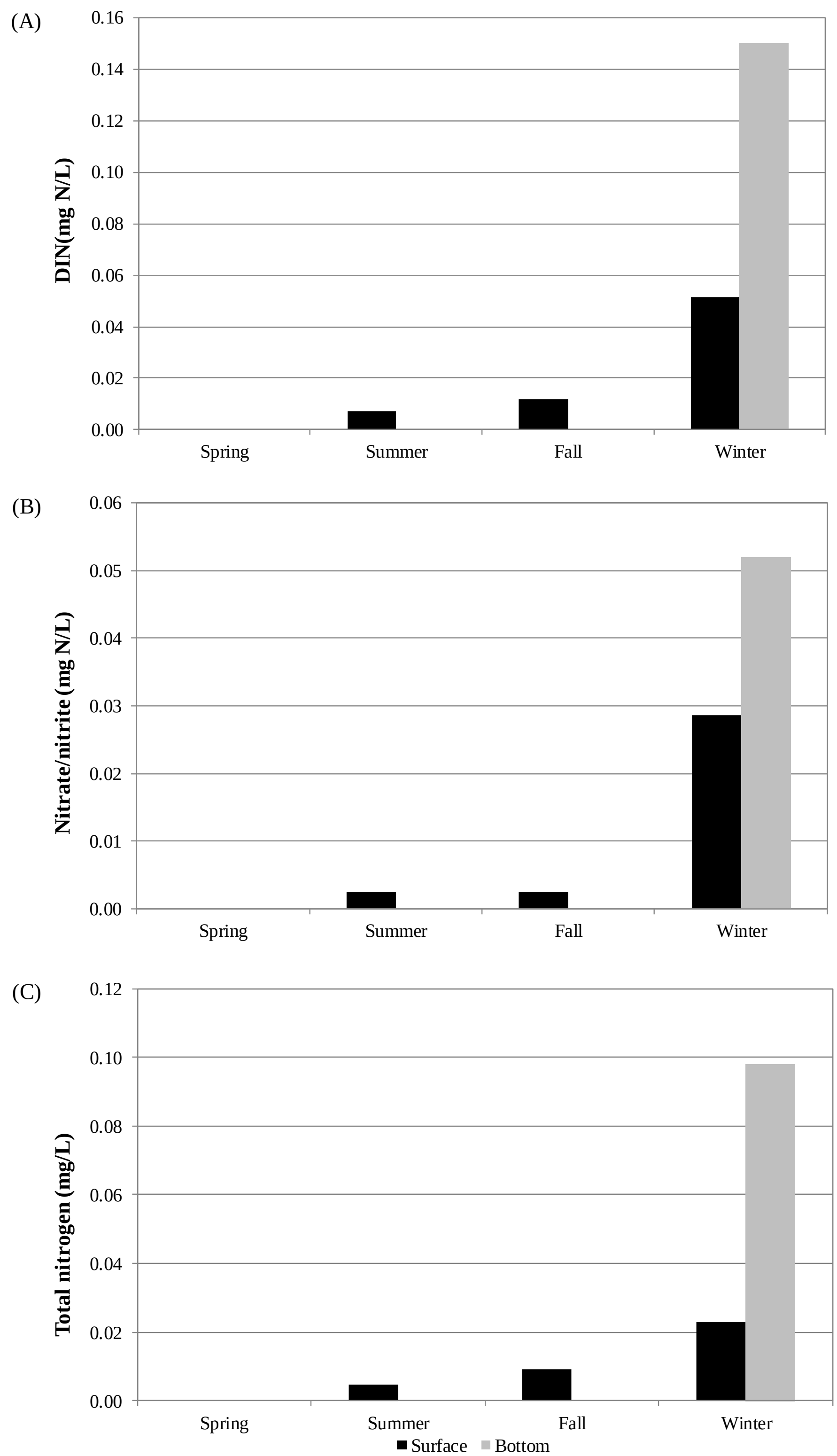


Figure 9.3-11. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 3, 2009/2010.

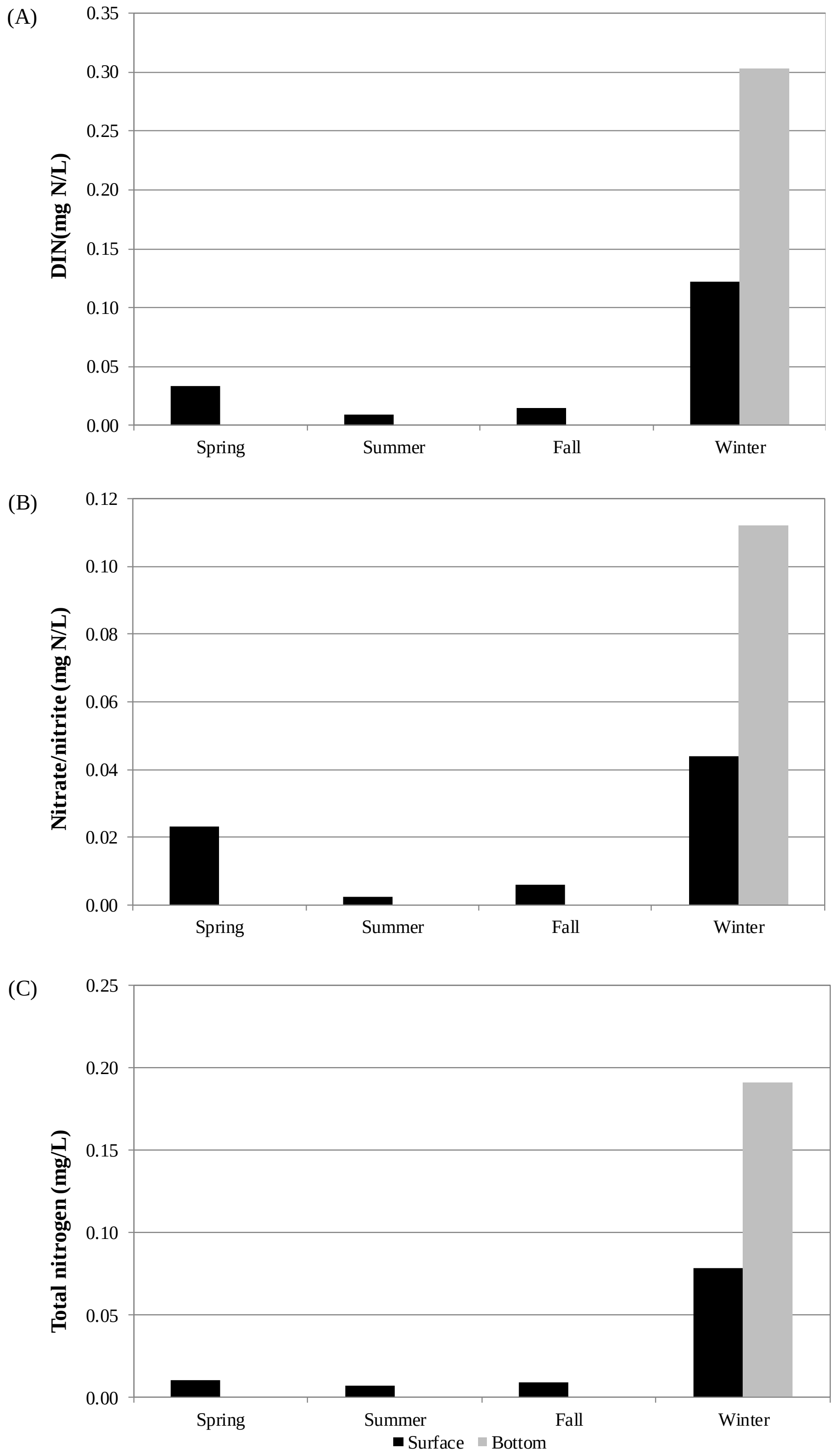


Figure 9.3-12. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 4, 2009/2010.

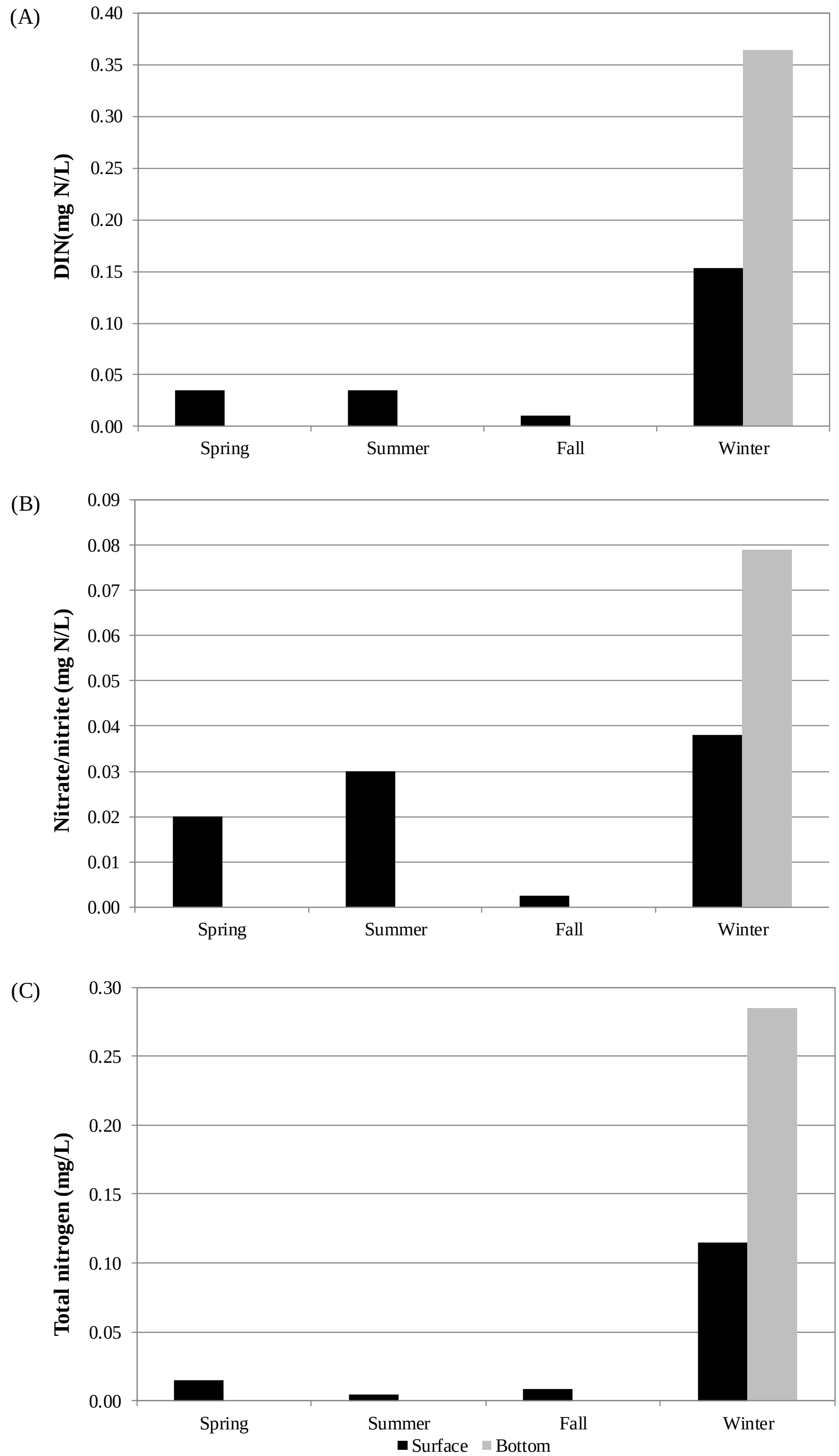


Figure 9.3-13. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 5, 2009/2010.

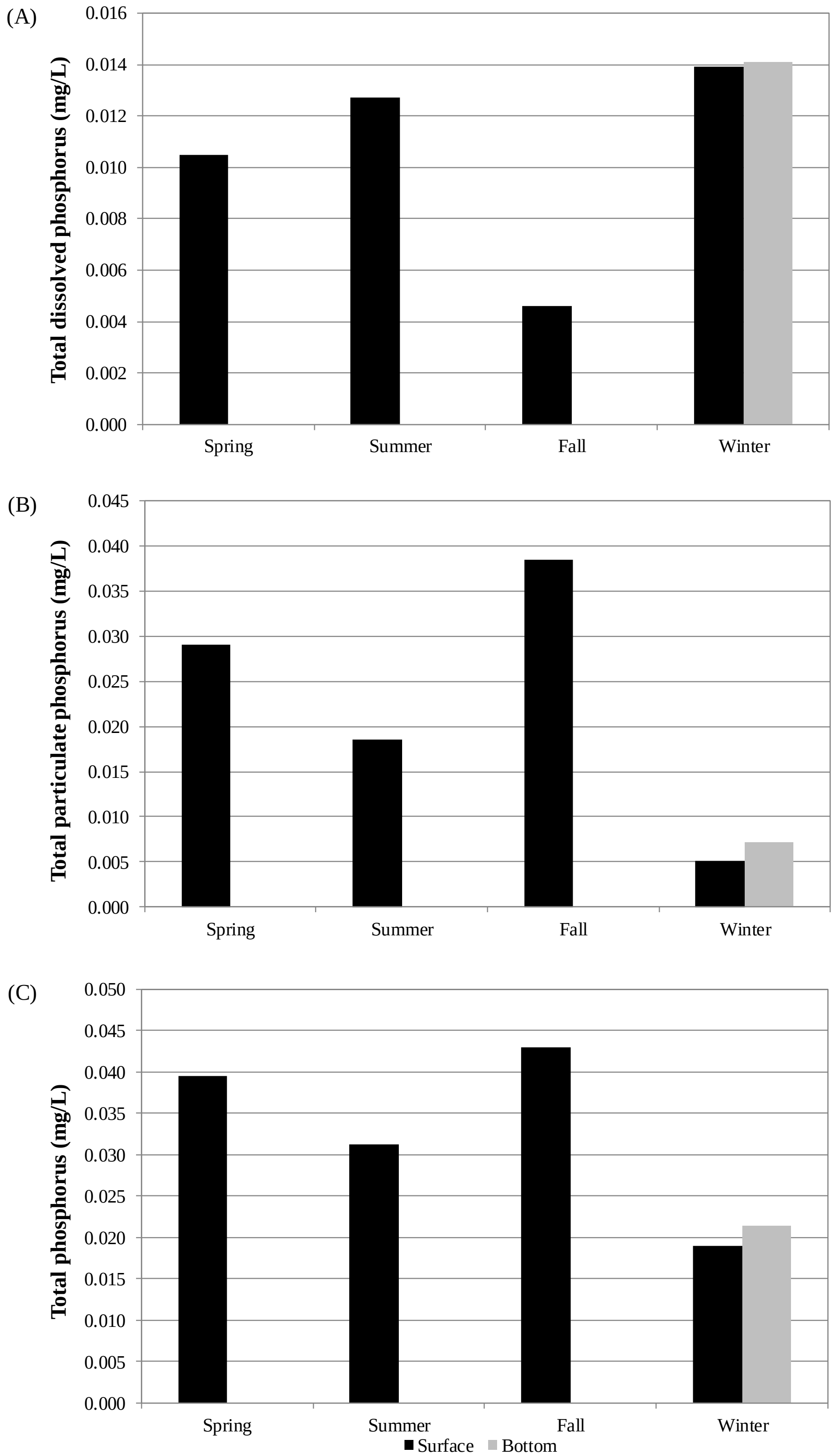


Figure 9.3-14. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 1, 2009/2010.

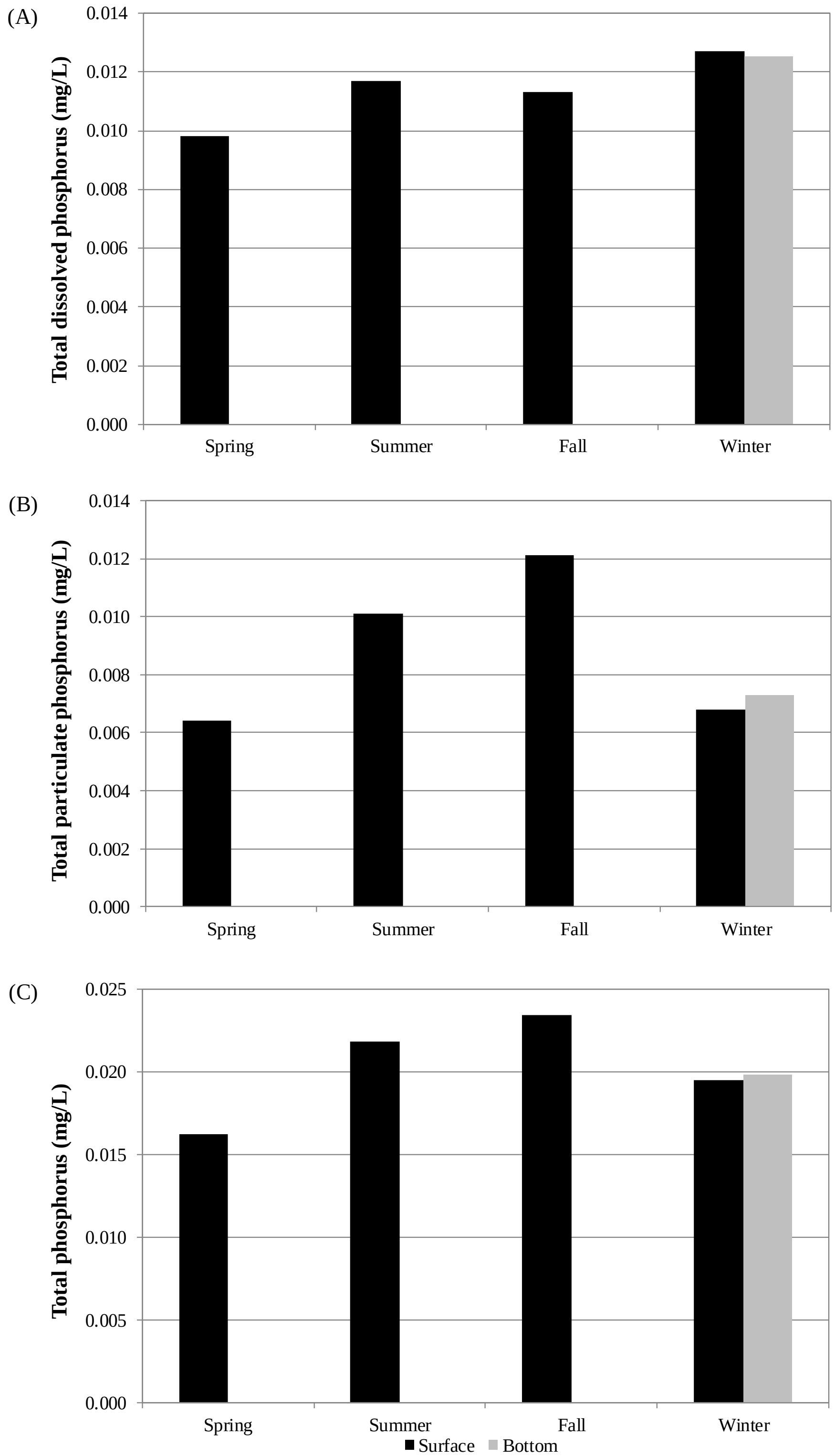


Figure 9.3-15. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 2, 2009/2010.

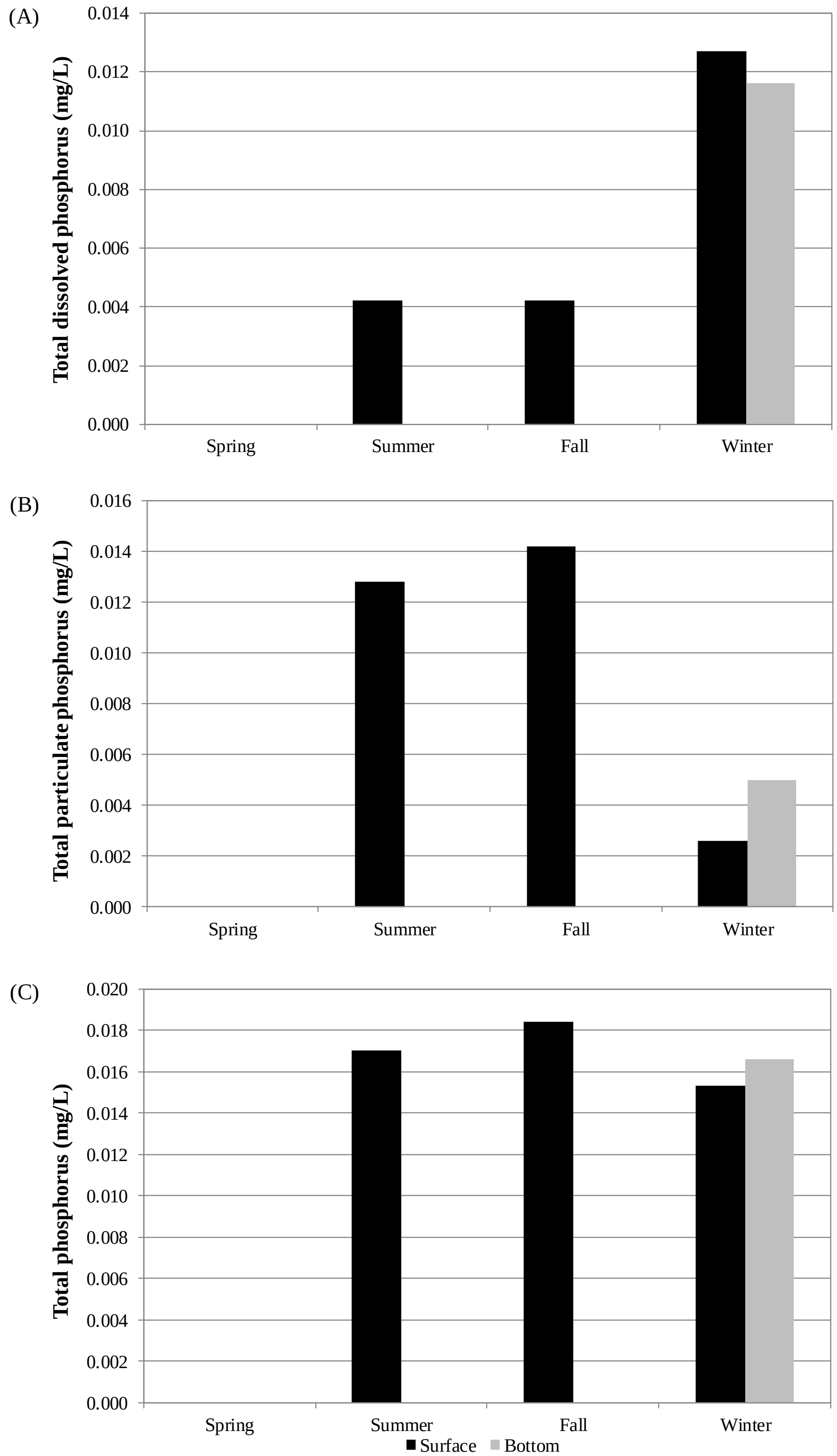


Figure 9.3-16. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 3, 2009/2010.

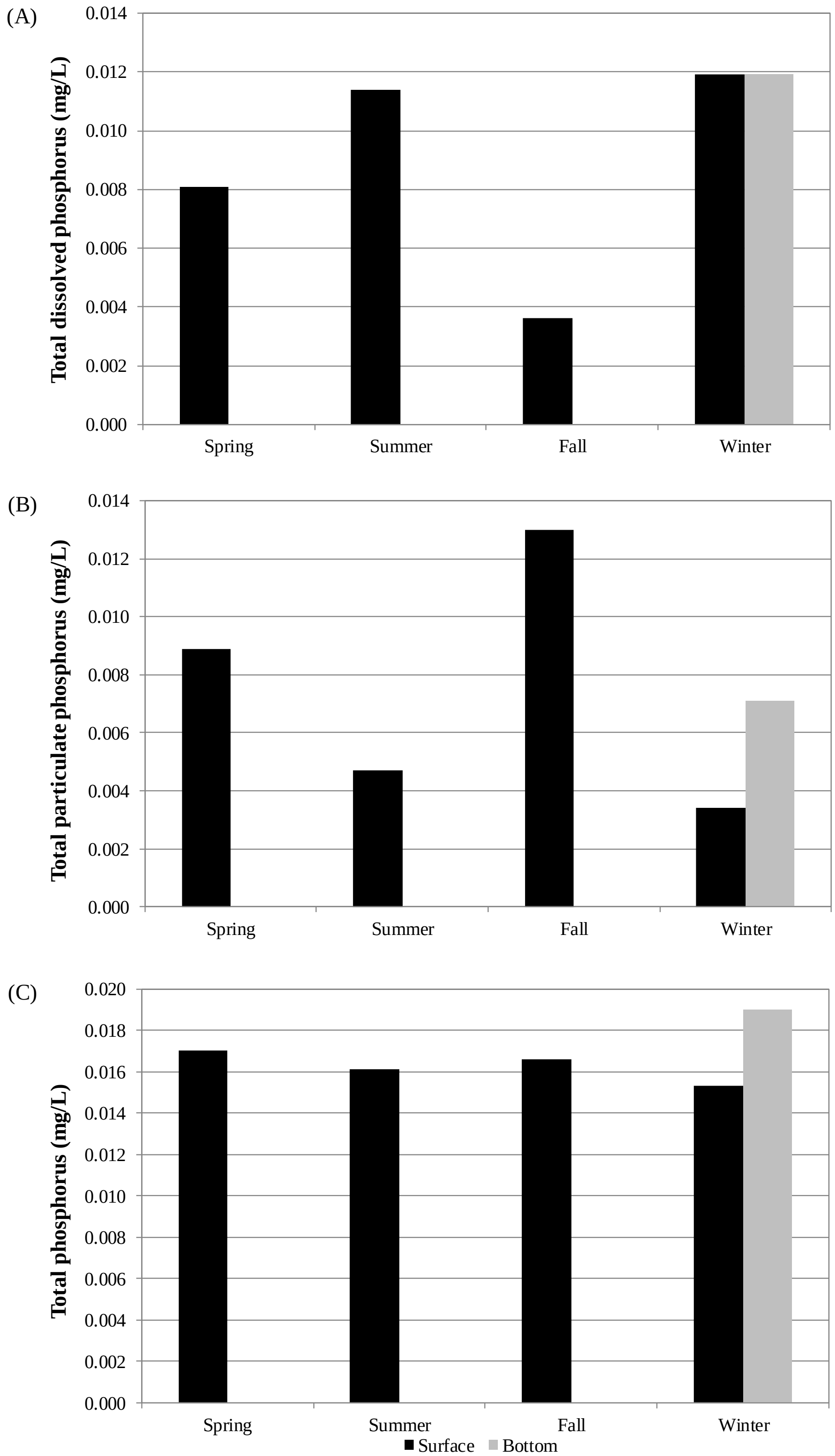


Figure 9.3-17. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 4, 2009/2010.

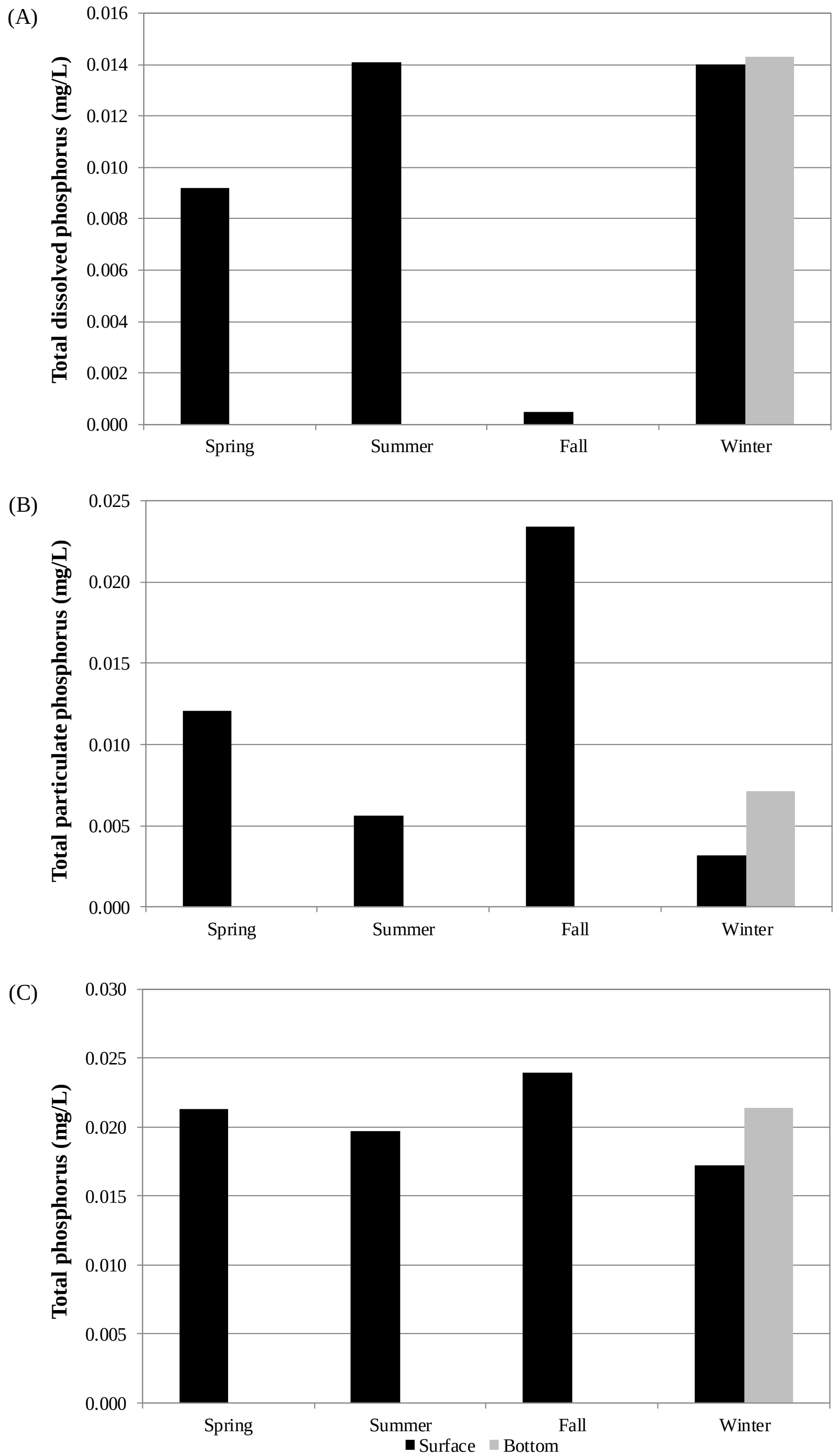


Figure 9.3-18. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 5, 2009/2010.

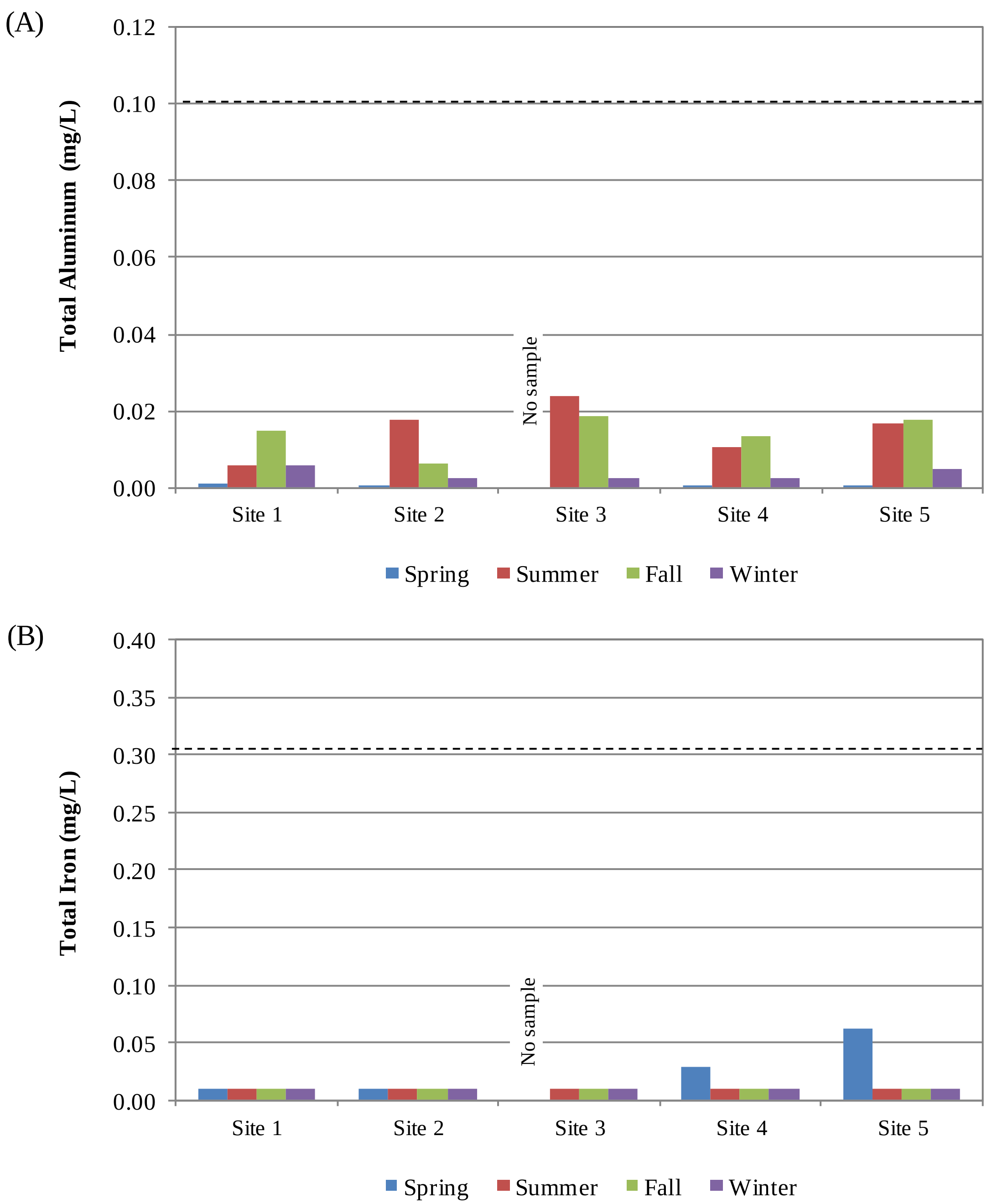


Figure 9.3-19. Total aluminum (A) and total iron (B) measured in surface grabs in Lake Winnipegosis, by sampling period and site: 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

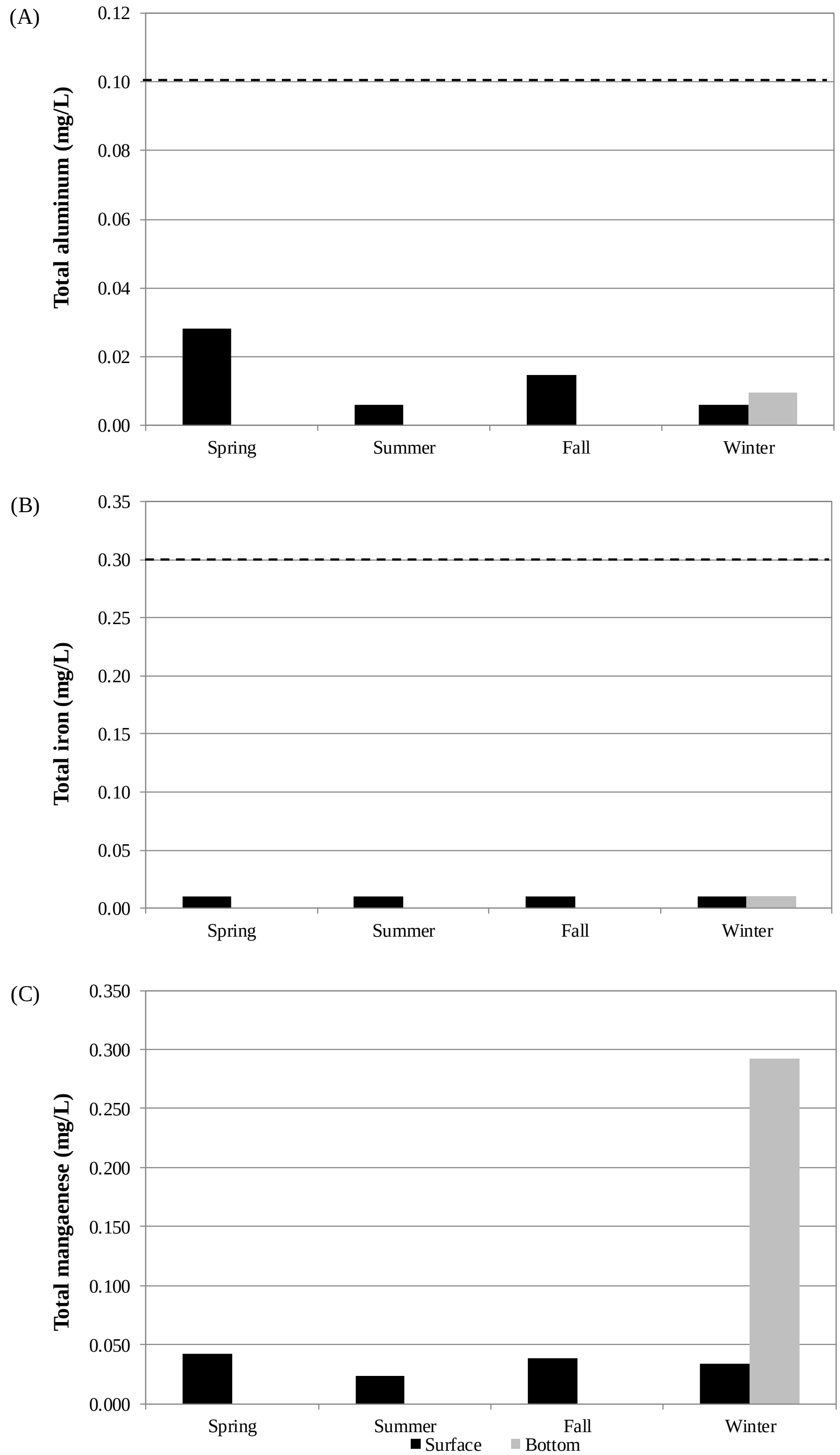


Figure 9.3-20. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 1, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

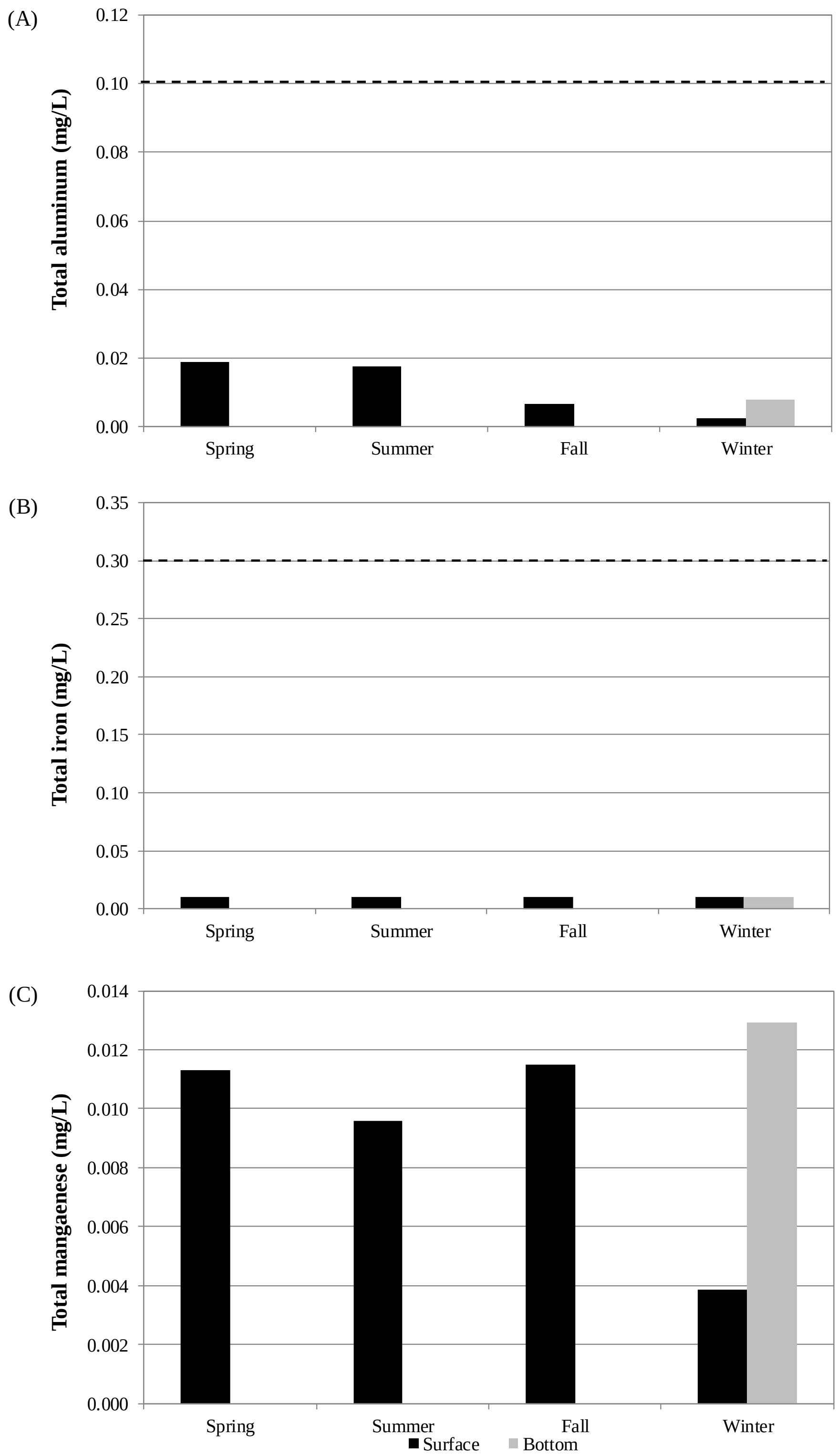


Figure 9.3-21. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 2, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

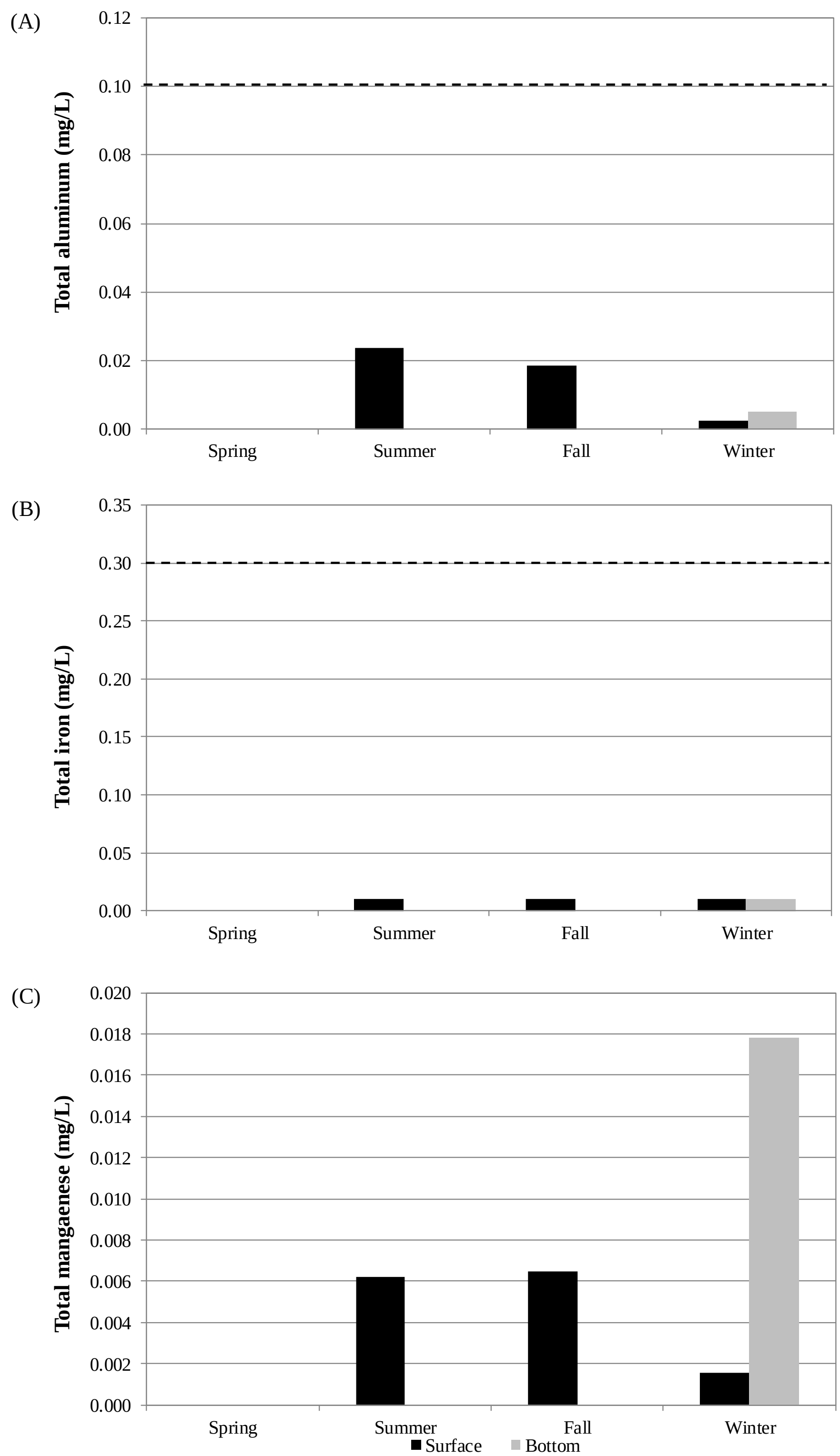


Figure 9.3-22. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 3, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

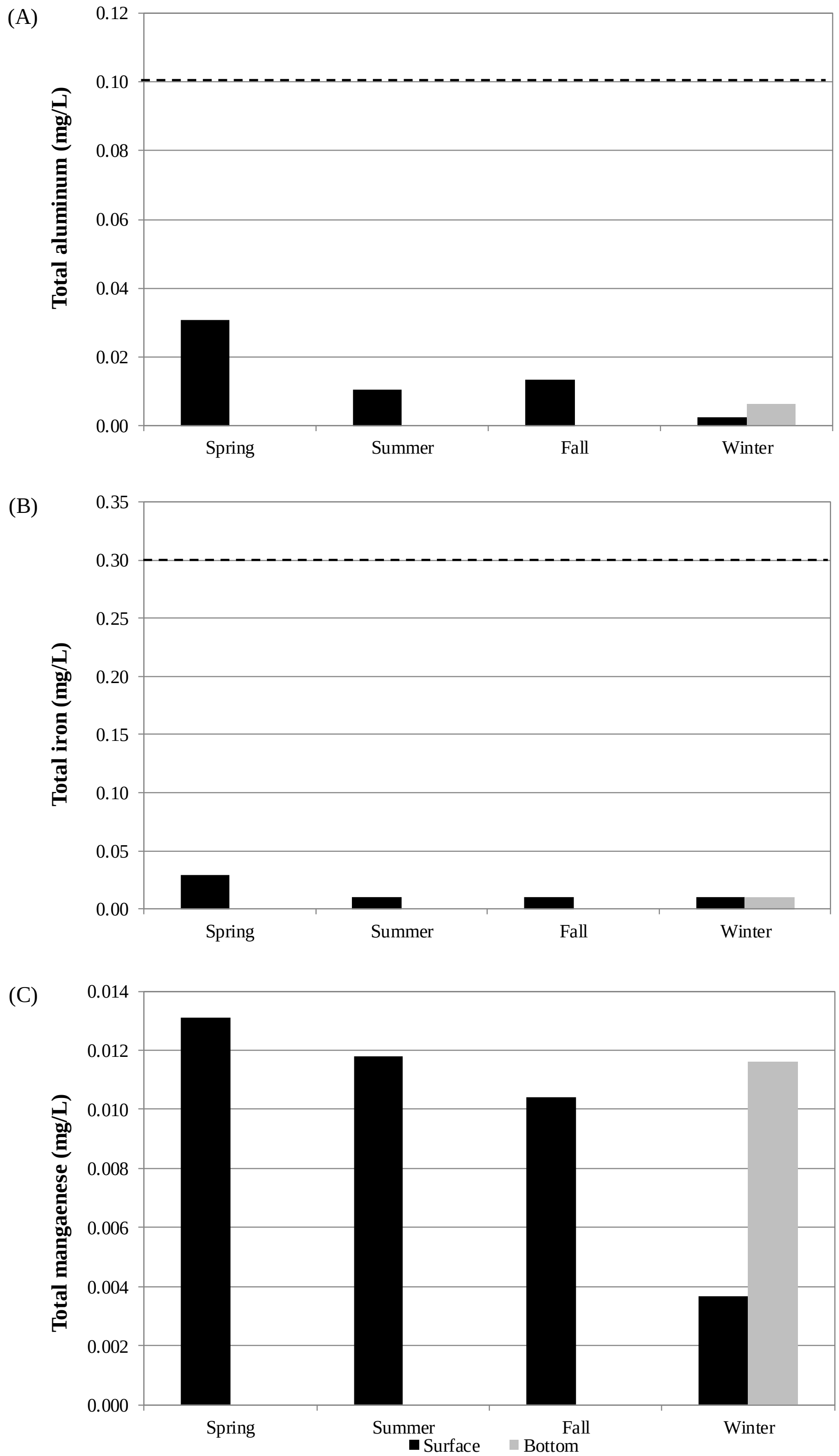


Figure 9.3-23. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 4, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

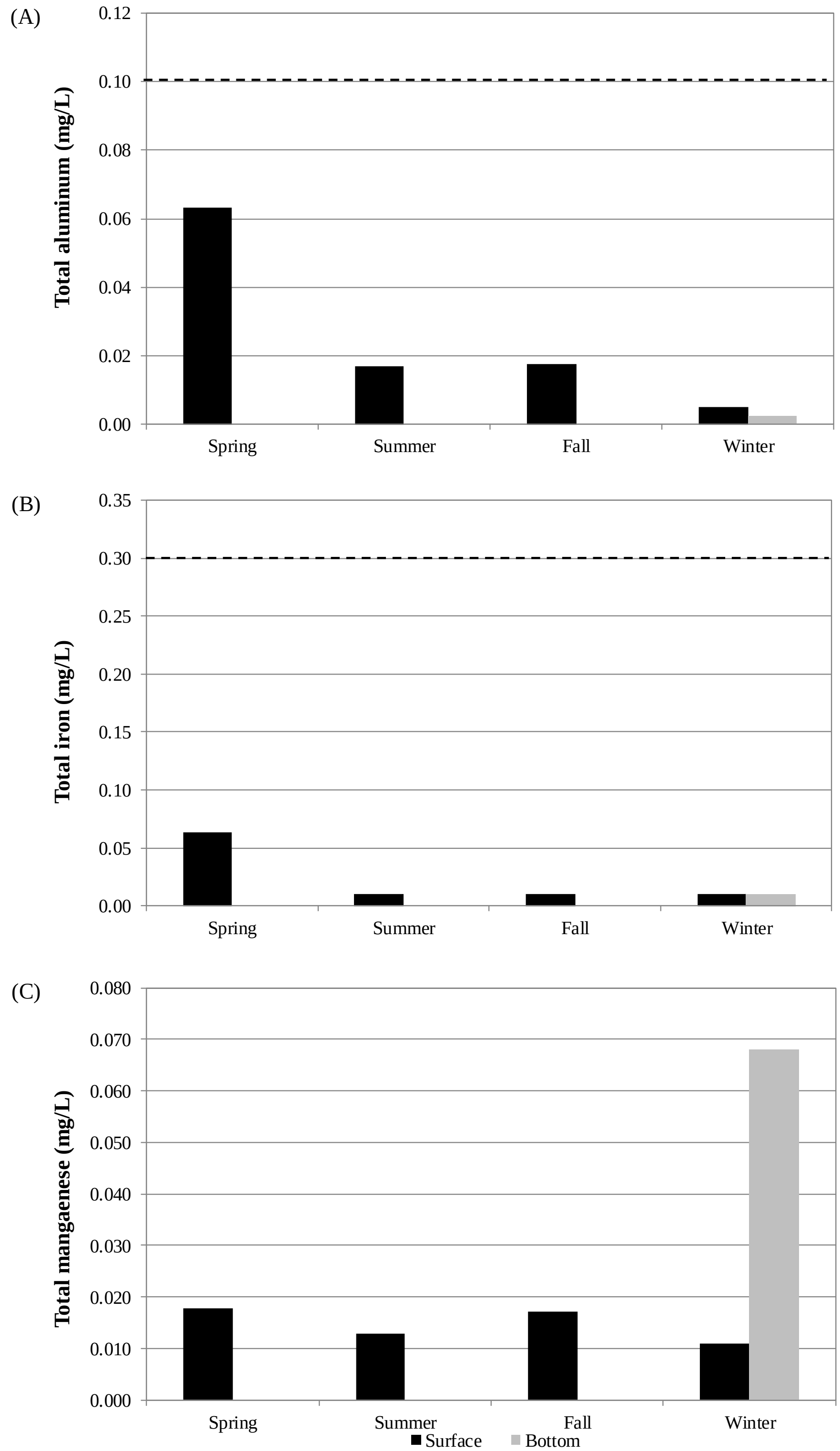


Figure 9.3-24. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Lake Winnipegosis, Site 5, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

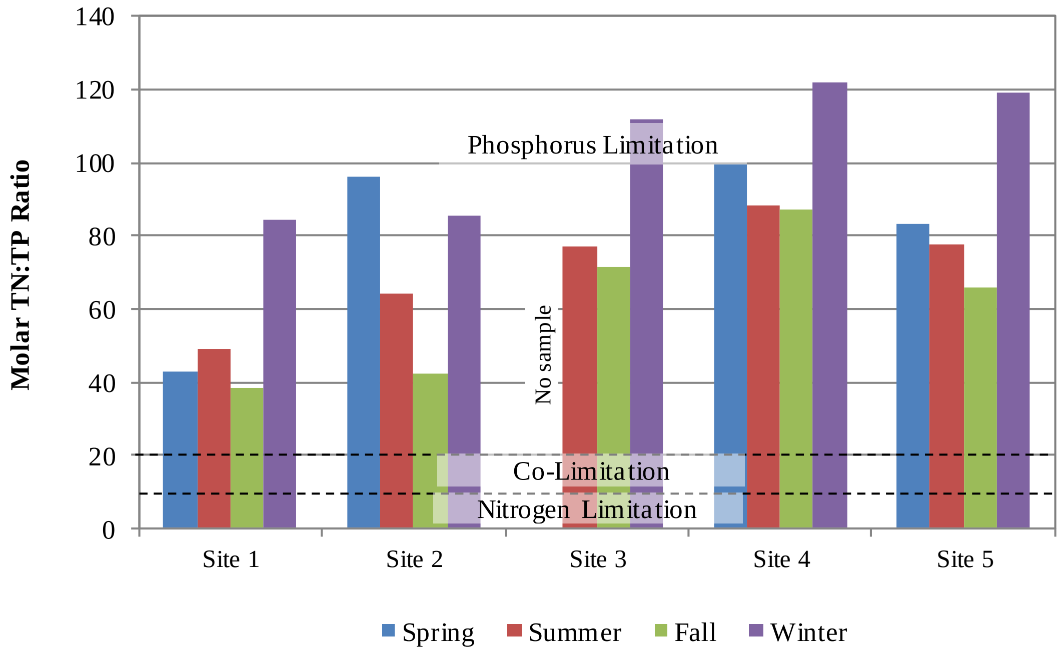


Figure 9.3-25. Total nitrogen to total phosphorus molar ratios (TN:TP) in Lake Winnipegosis: 2009/2010.

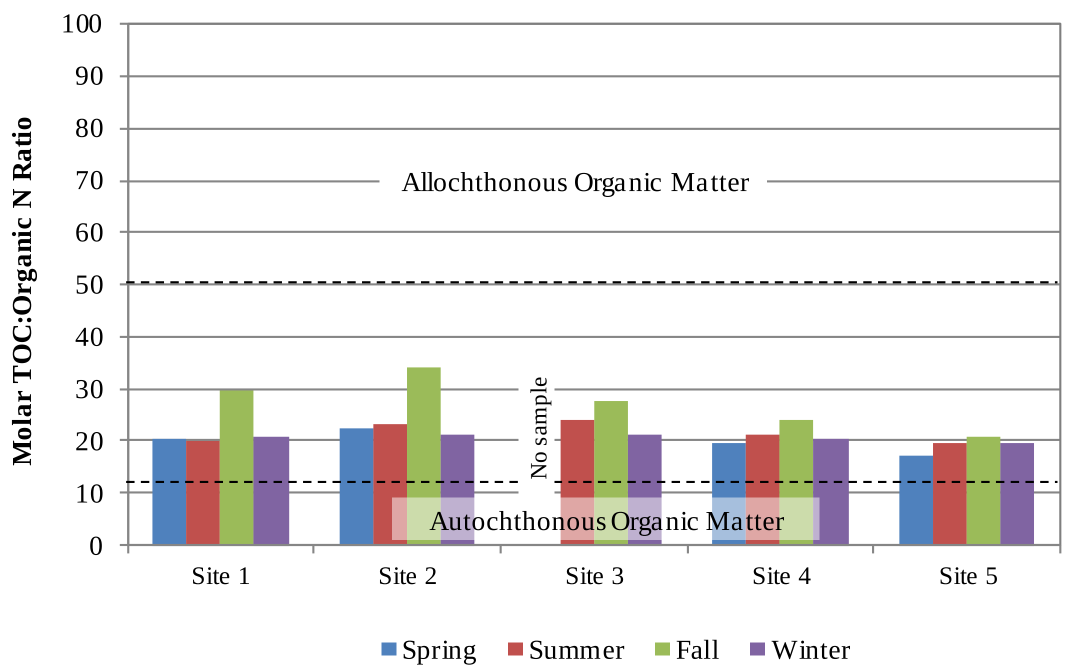
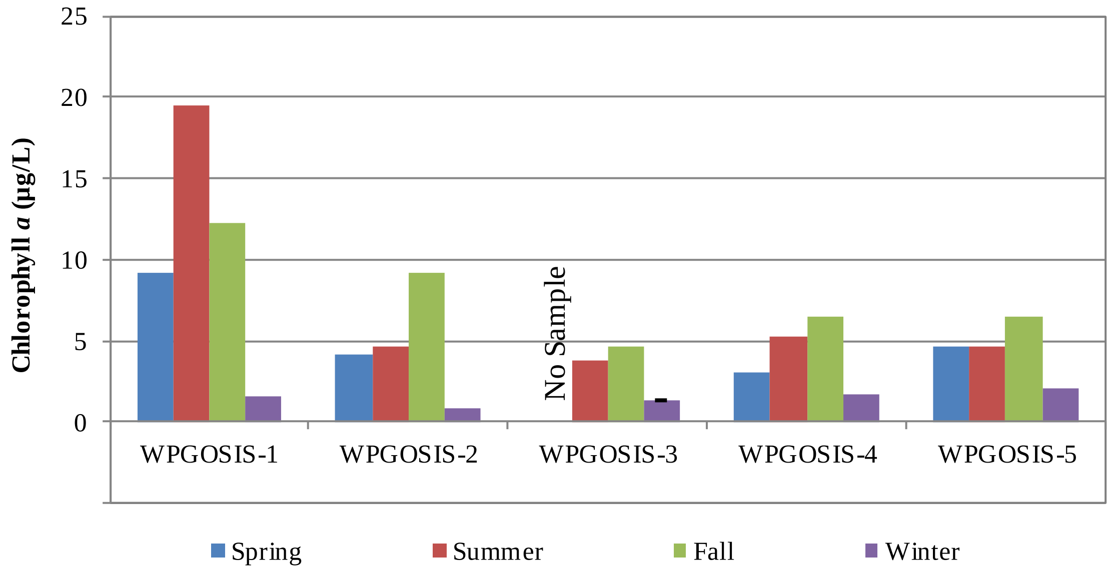


Figure 9.3-26. Total organic carbon to organic nitrogen (TOC:Organic N) molar ratios ratios in Lake Winnipegosis: 2009/2010.

(A) Surface



(B) Euphotic

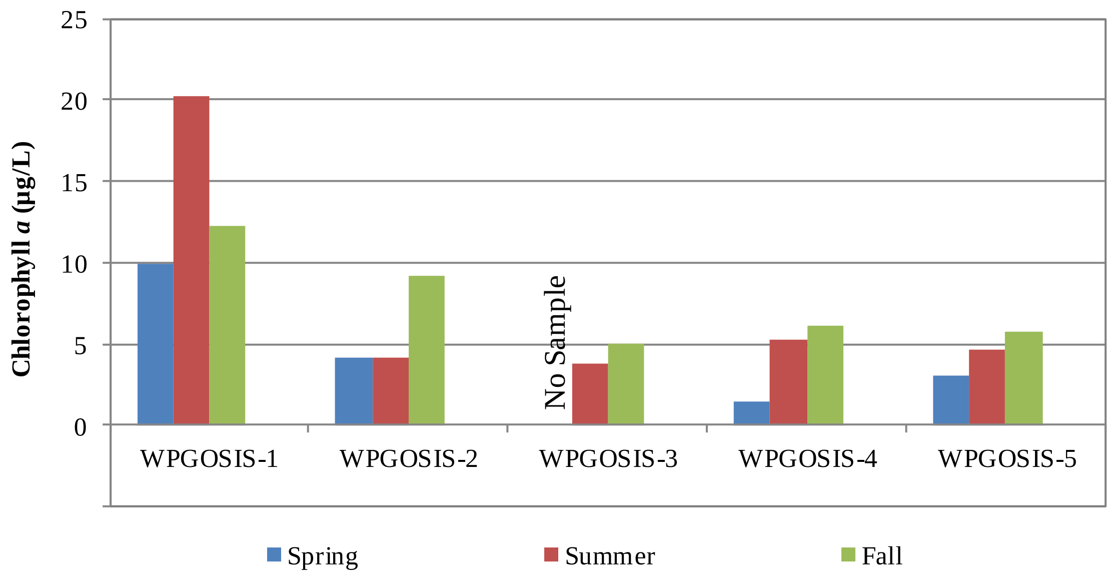


Figure 9.4-1. Chlorophyll a concentrations measured (A) near the surface, and (B) within the euphotic zone at sites in the Lake Winnipeg Region in 2009/2010. Error bars represent the standard error of triplicate samples.

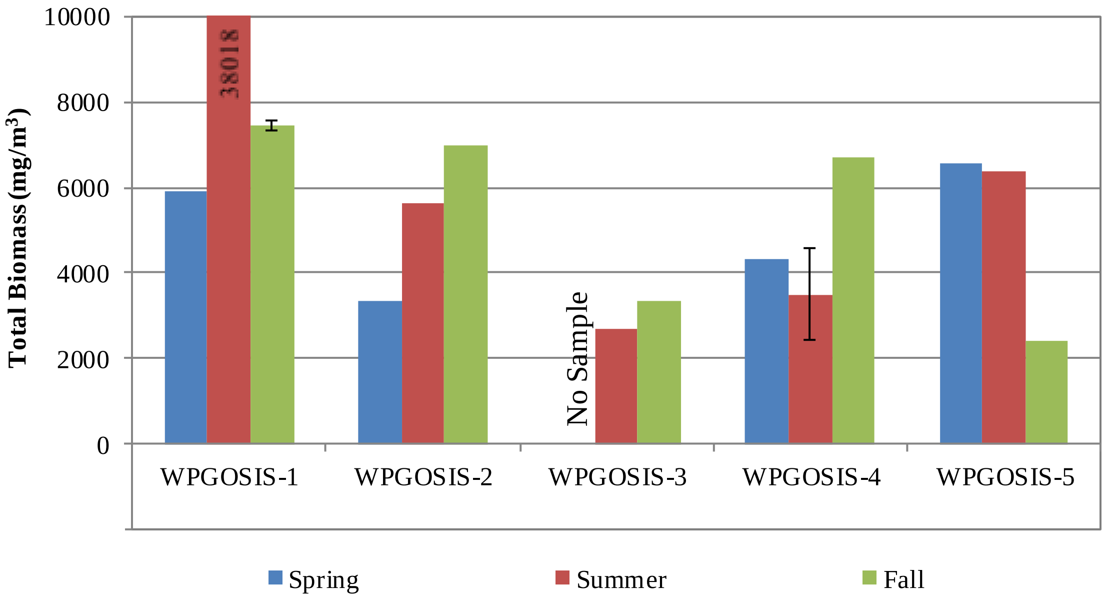


Figure 9.4-2. Phytoplankton biomass measured at sites in the Lake Winnipeg Region in 2009. Error bars represent the standard error of samples analysed in duplicate for quality assurance.

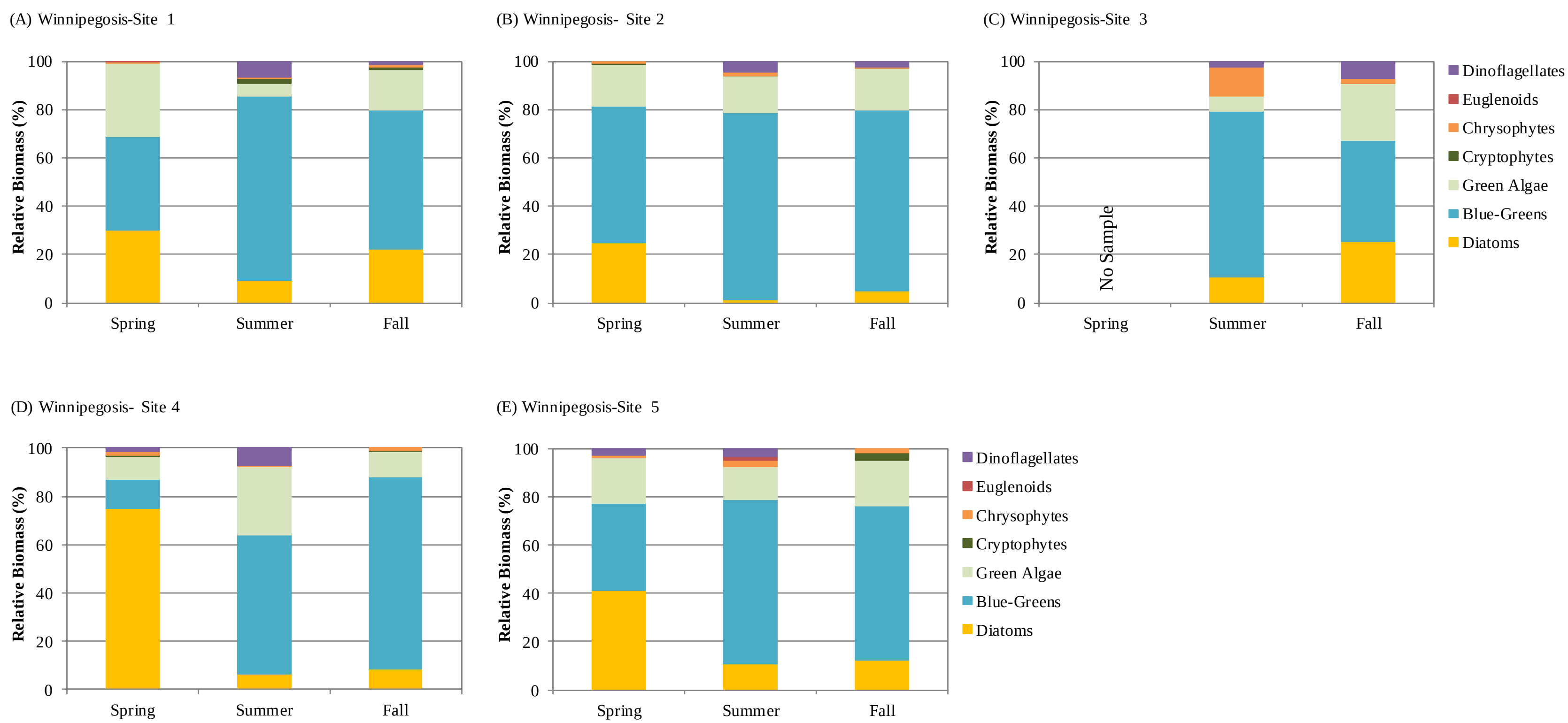


Figure 9.4-3. Phytoplankton community composition at sites in the Lake Winnipeg Region in 2009.

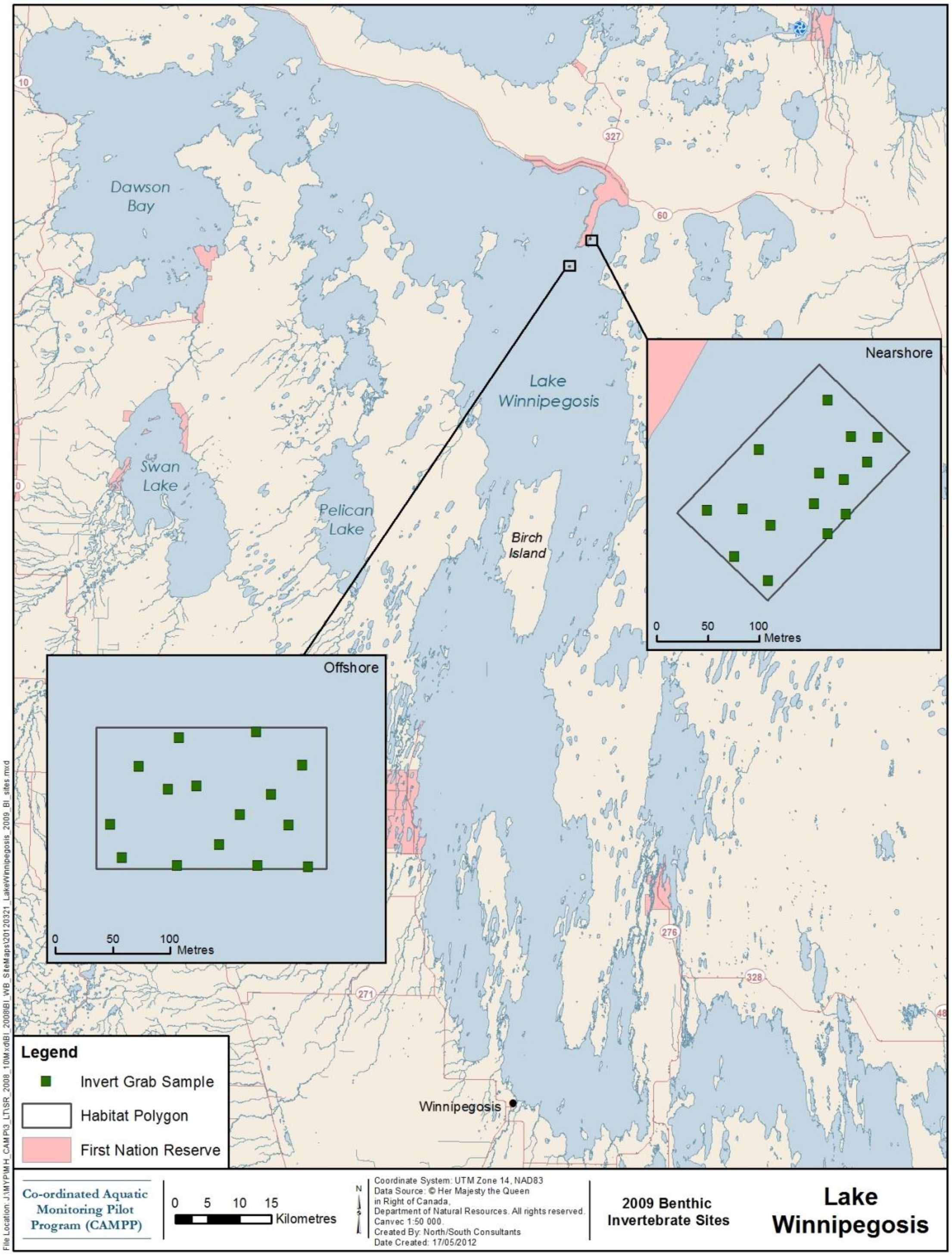


Figure 9.5-1. Randomly-selected benthic invertebrate sampling sites in nearshore and offshore polygons in Lake Winnipegosis within the Lake Winnipeg Region, 2009.

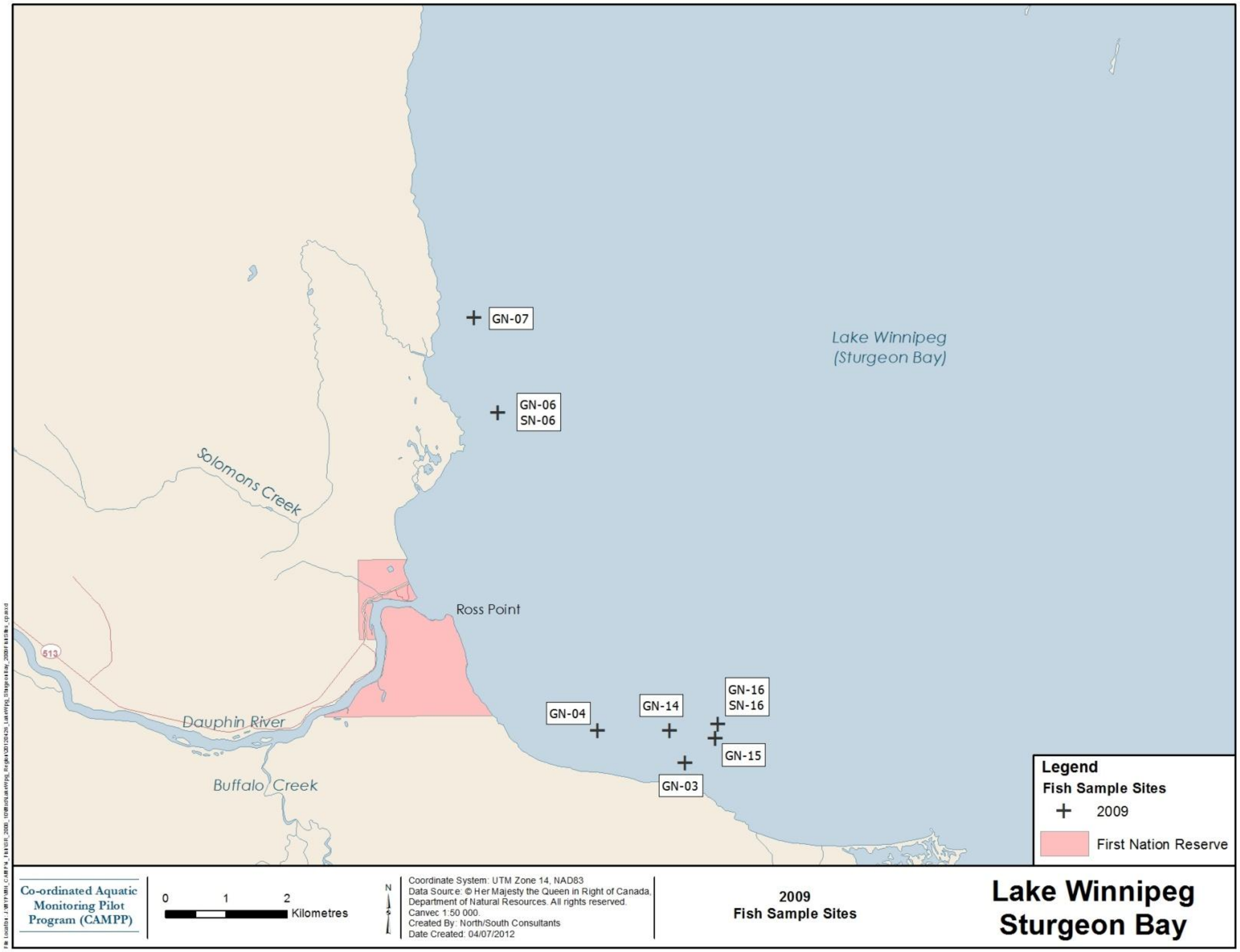


Figure 9.6-1. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Sturgeon Bay of Lake Winnipeg, 2009.

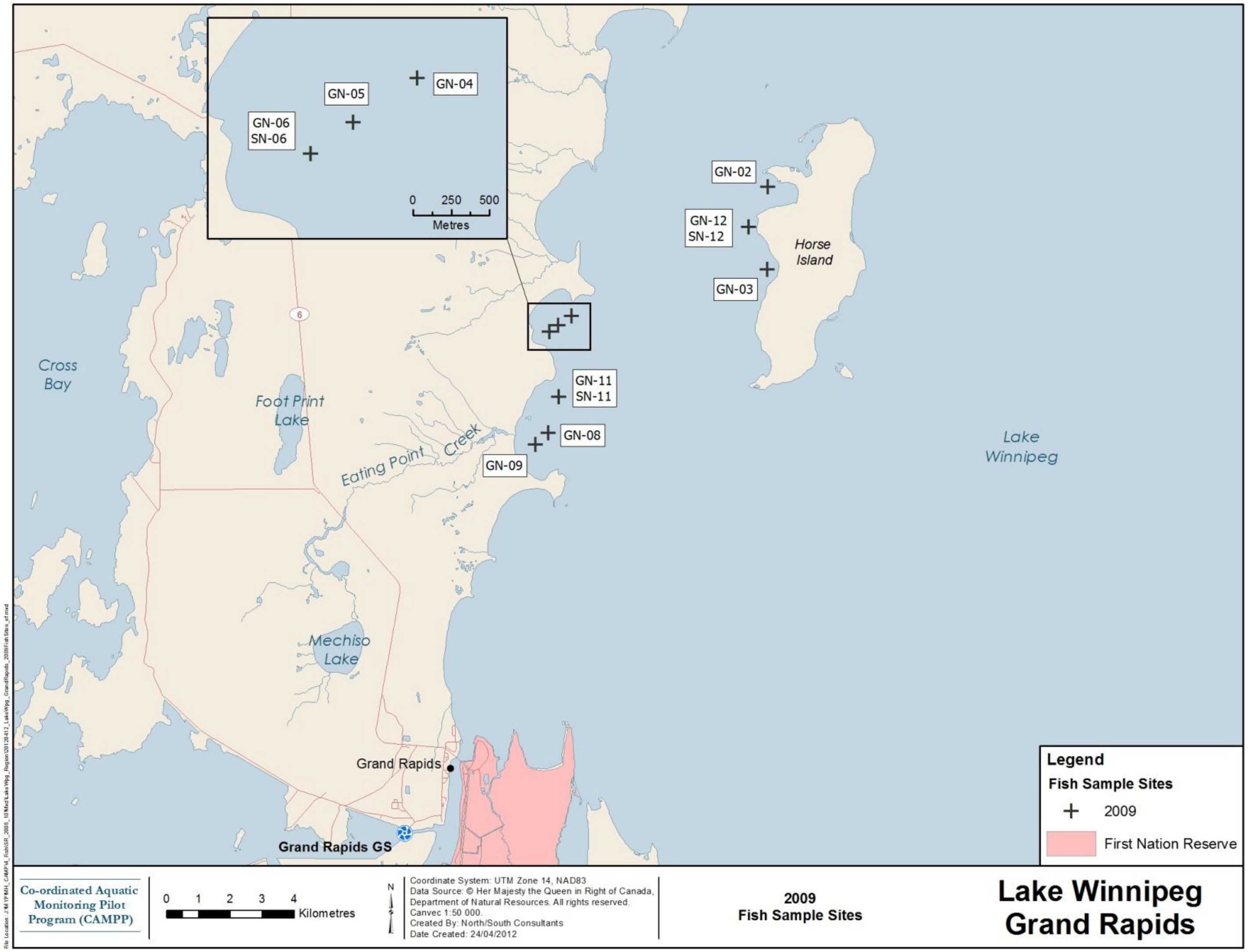


Figure 9.6-2. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Lake Winnipeg near Grand Rapids, 2009.

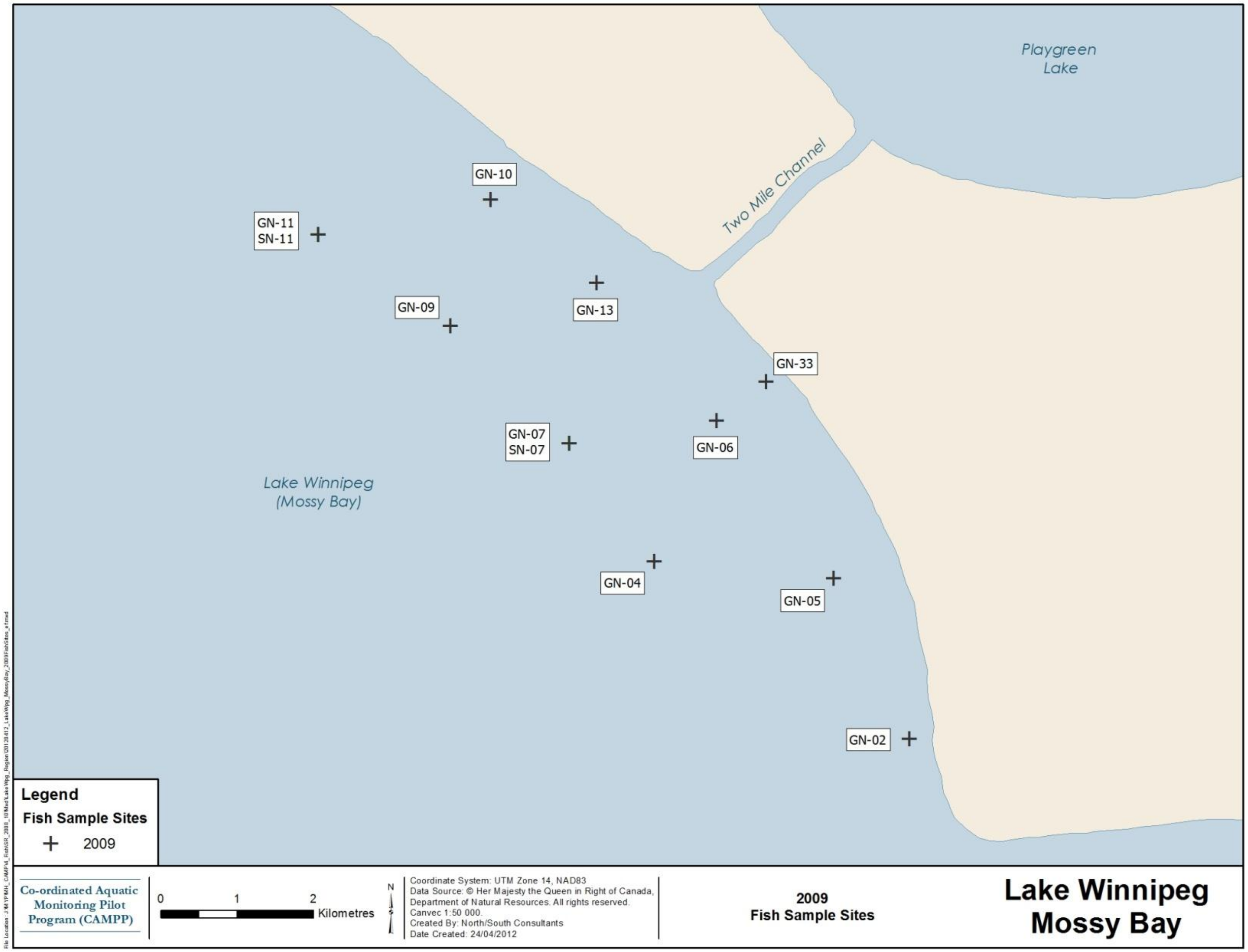


Figure 9.6-3. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Mossy Bay of Lake Winnipeg, 2009.

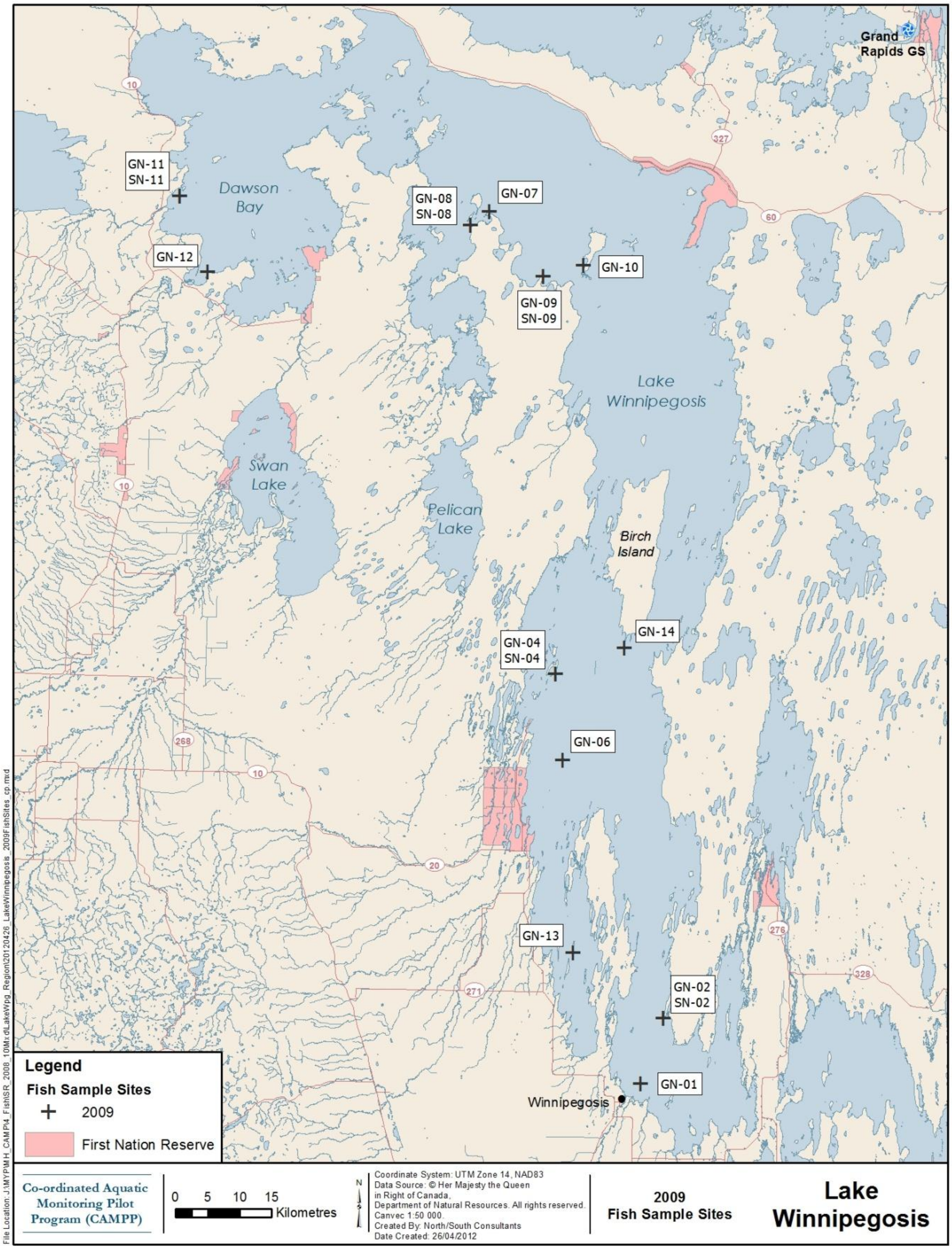


Figure 9.6-4. Map of standard gang (GN-) and small mesh (SN-) index gillnet sites sampled in Lake Winnipegosis, 2009.

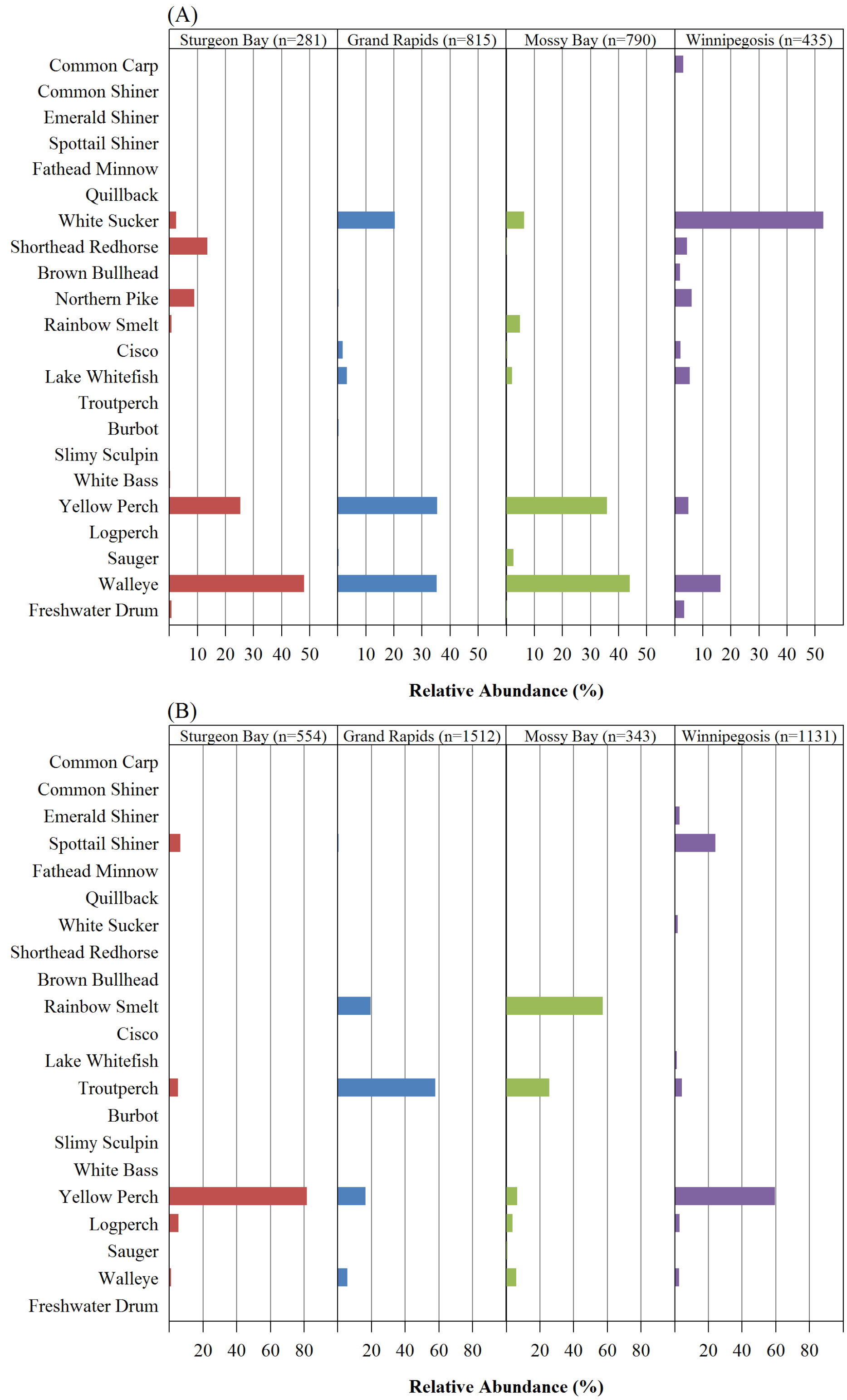


Figure 9.6-5. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2009.

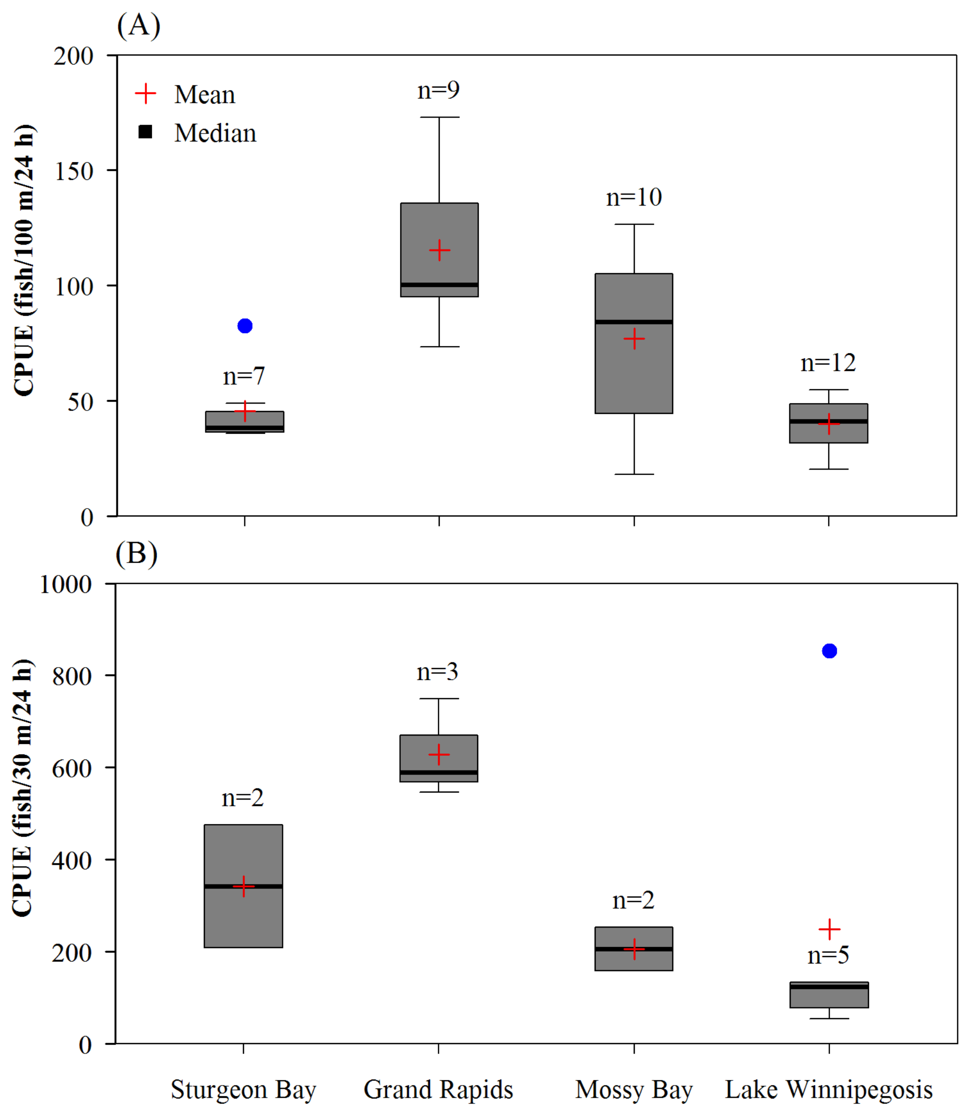


Figure 9.6-6. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2009.

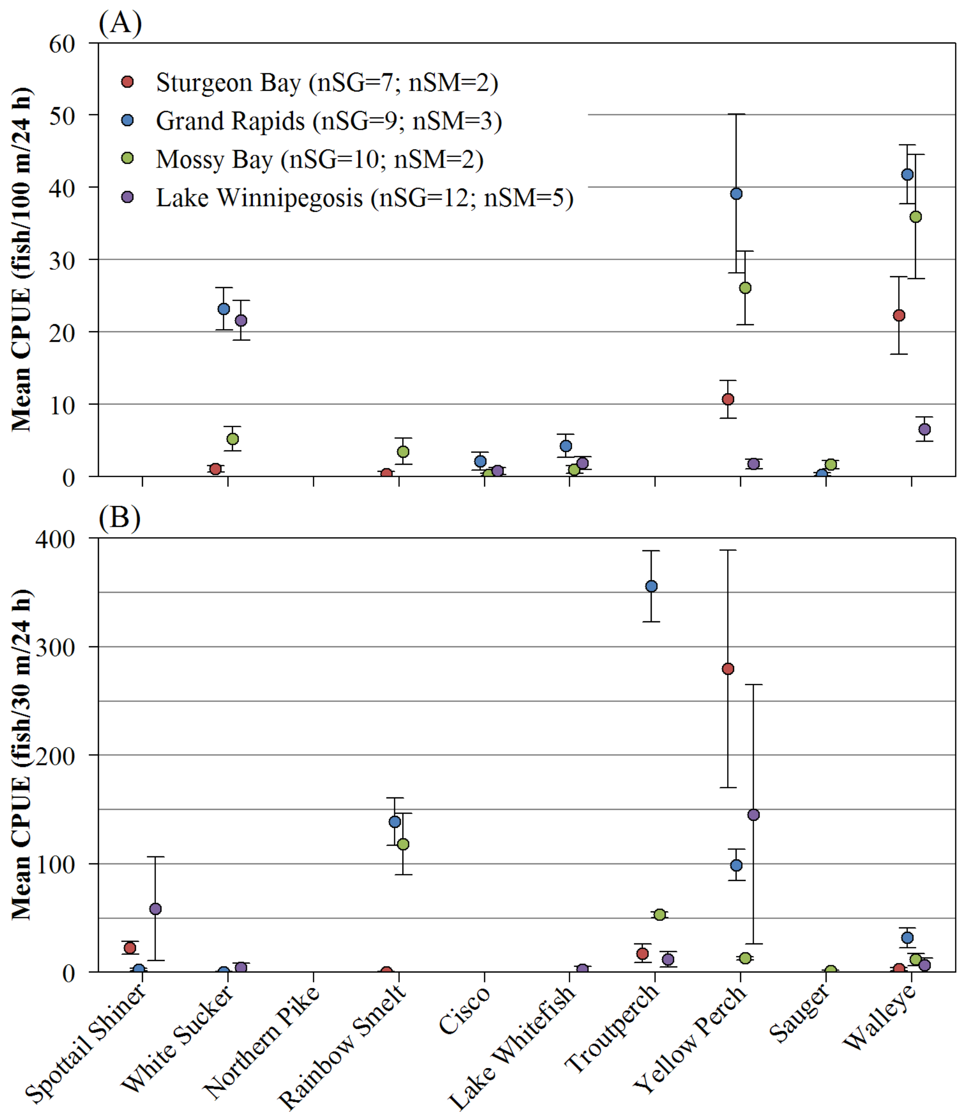


Figure 9.6-7. Mean (SE) CPUE calculated for select fish species captured in (A) standard gang and (B) small mesh index gill nets set in Lake Winnipeg Region waterbodies, 2009.

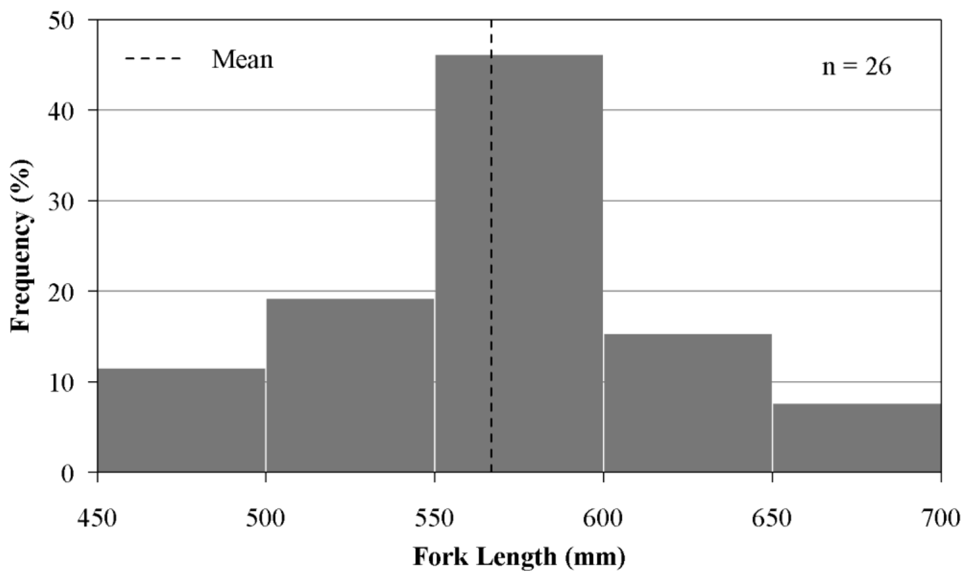


Figure 9.6-8. Fork length frequency histogram for Northern Pike captured in standard gang index gill nets set in Lake Winnipegosis, 2009.

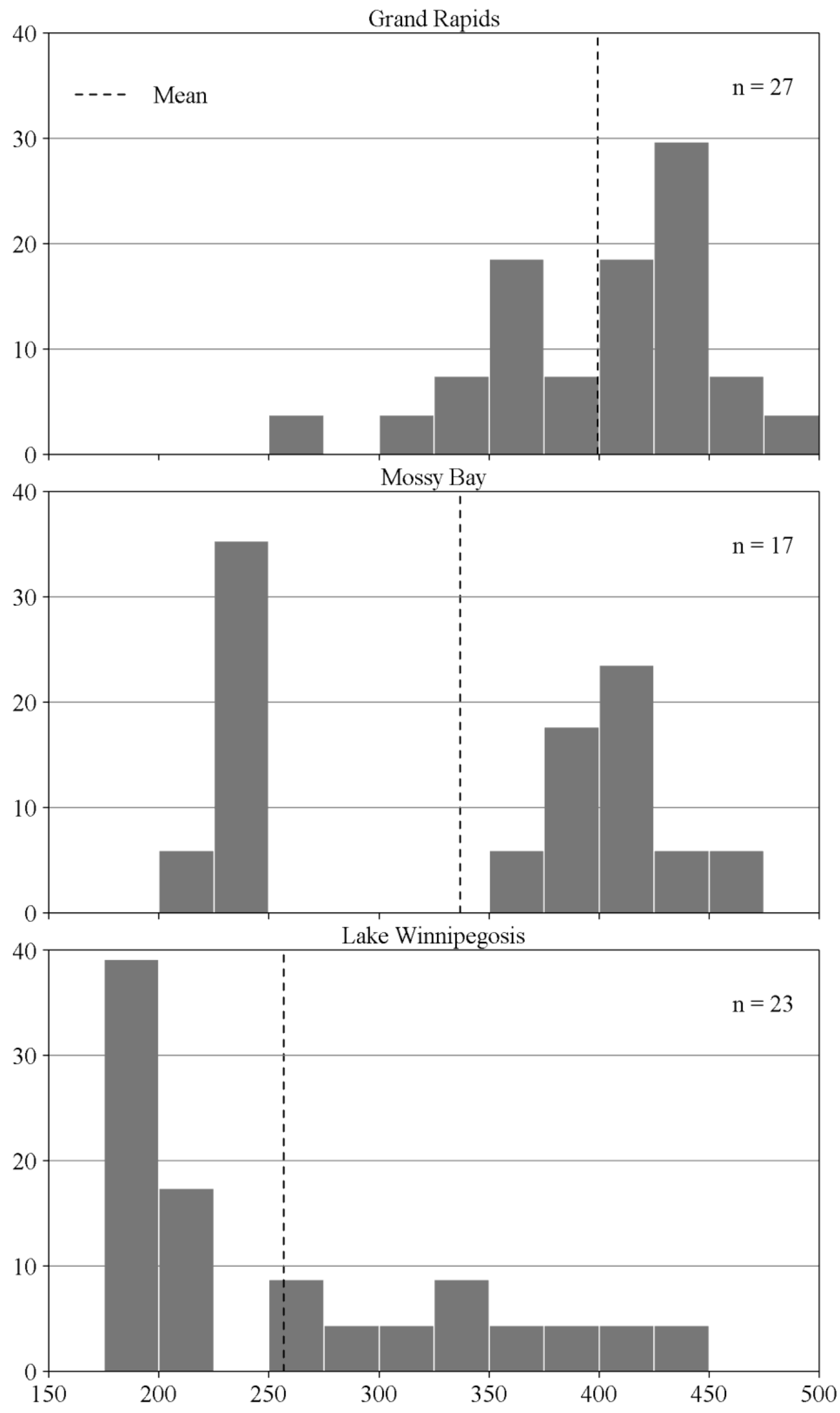


Figure 9.6-9. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2009.

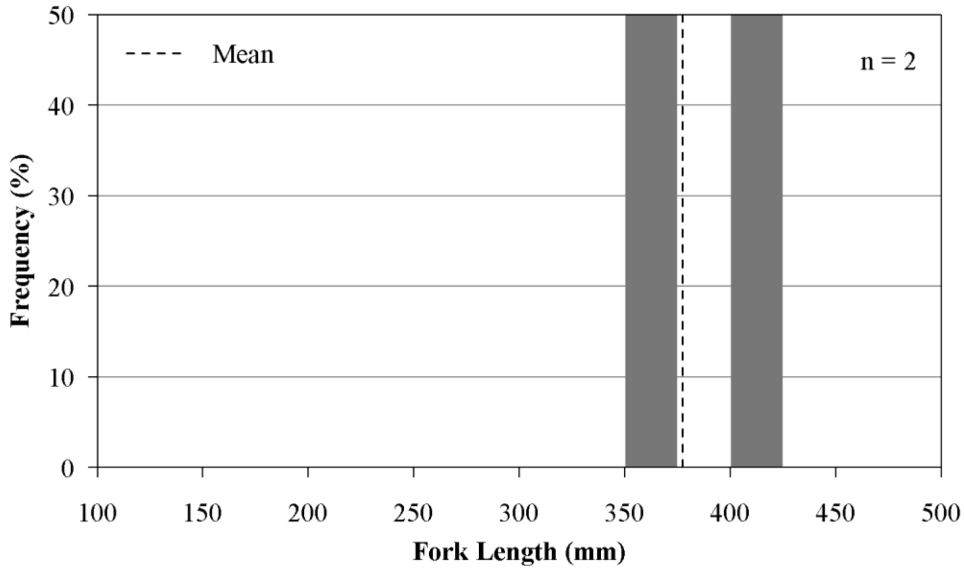


Figure 9.6-10. Fork length frequency histogram for Sauger captured in standard gang index gill nets set in Lake Winnipeg near Grand Rapids, 2009.

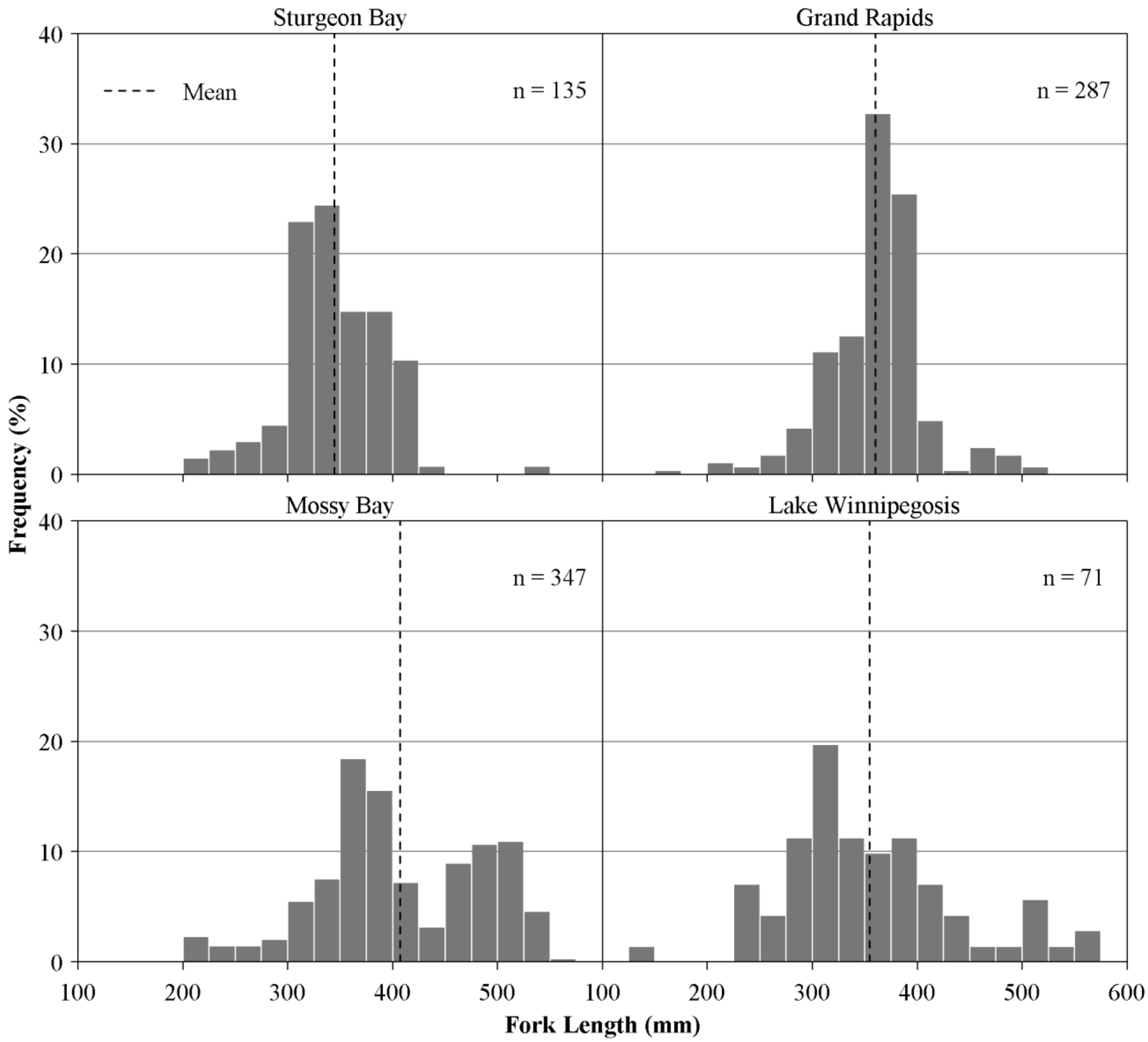


Figure 9.6-11. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Lake Winnipeg Region waterbodies, 2009.

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