Manitoba/Manitoba Hydro

Coordinated Aquatic Monitoring Pilot Program (CAMPP):

Three Year Summary Report (2008-2010) - Volume 6

Results of the Three Year Program

Section 5.5: Churchill River Diversion Region

<u>VOLUME 6</u>

SECTION 5.5: CHURCHILL RIVER DIVERSION REGION

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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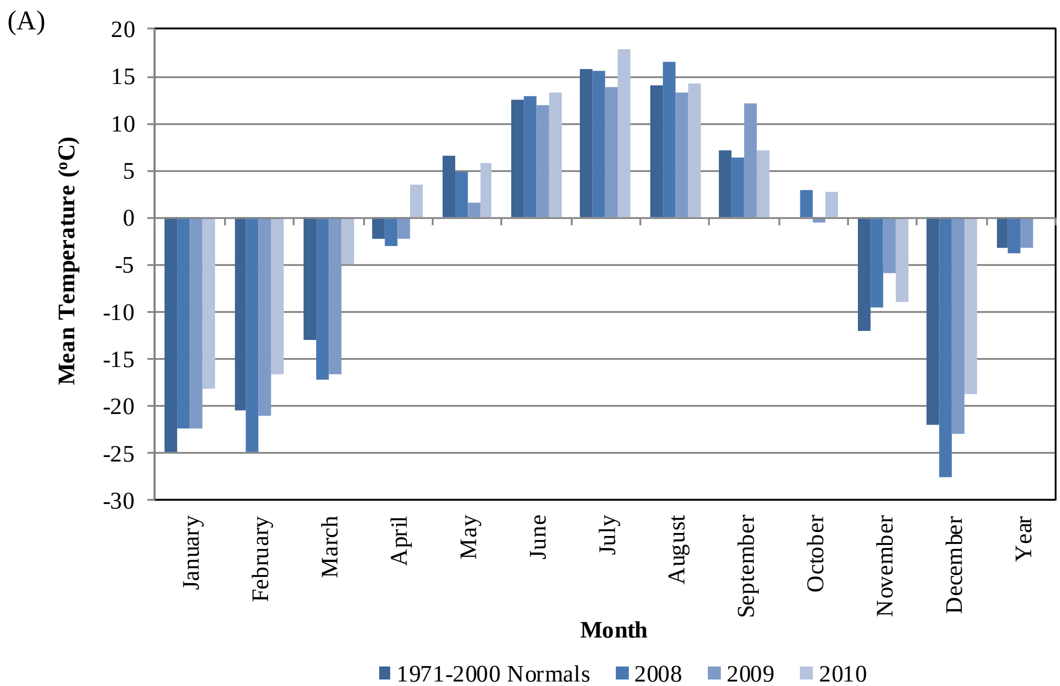
5.5 CHURCHILL RIVER DIVERSION REGION

The following presents the results of the Coordinated Aquatic Monitoring Pilot Program (CAMPP) conducted over the period of 2008/2009 through 2010/2011 in the Churchill River Diversion Region.

5.5.1 Climate

Annual mean temperatures measured at Thompson were lower than, similar to, and higher than the normal in 2008, 2009, and 2010, respectively (Figure 5.5.1-1). Mean temperatures in January, February, March, and April 2010, and September and November 2009 were noticeably higher than the normal, and temperatures in February, March, and December 2008 were noticeably lower than the normal. Considering the months of June to September, during which time monitoring was conducted in the open-water season, temperatures were notably above normal in August of 2008, September 2009, and July 2010.

Annual precipitation was similar to the annual normal in 2008 and 2009 and slightly higher than the normal in 2010 (Figure 5.5.1-1). In general, precipitation levels peaked in the summer months and were lower in the winter months. April, June, September, and November monthly precipitation normals were higher than total precipitation levels recorded for those same months in 2008, 2009, and 2010. Precipitation peaked in July 2008 at 151 mm, July 2009 at 146 mm, and August 2010 at 236 mm. Overall, for the June through September period, July-August 2008, July 2009, and in particular, August 2010 monthly precipitation was notably above normal.



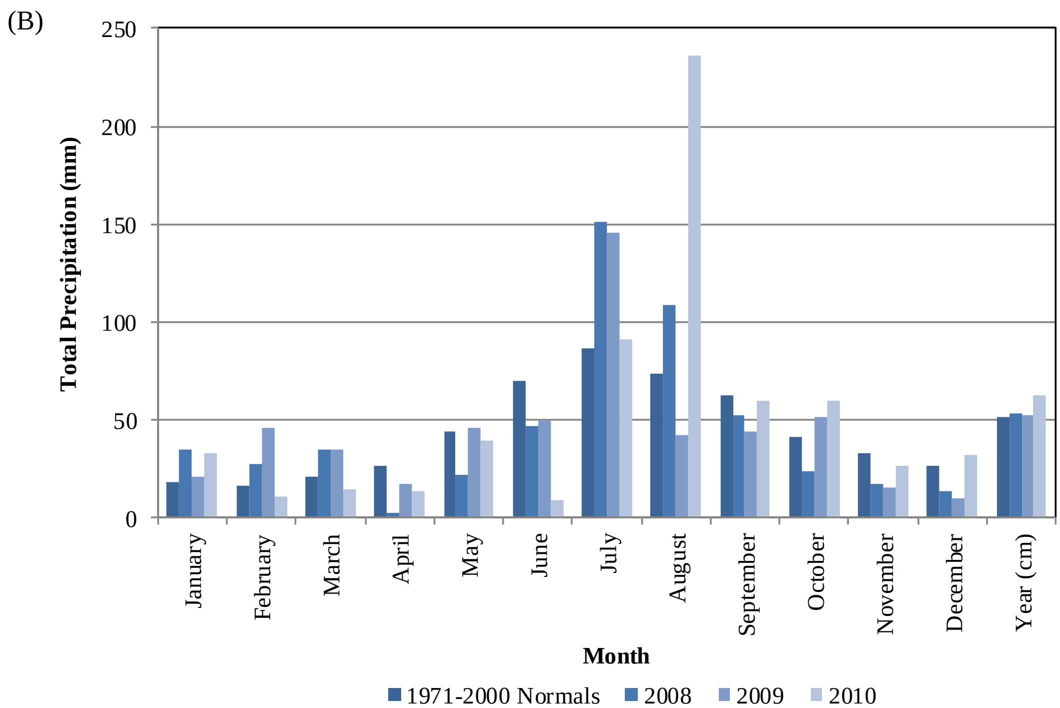


Figure 5.5.1-1. Monthly mean air temperature (A) and monthly total precipitation (B) for 2008-2010 compared to climate normals (1971-2000), Thompson, MB.

5.5.2 Hydrology

The Churchill River Diversion (CRD) 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. Water levels are monitored at all waterbodies incorporated into CAMPP in the Churchill River Diversion Region including Rat Lake, Notigi Lake (Notigi forebay), Threepoint Lake, Footprint Lake, Apussigamasi Lake, and Leftrook Lake. Flows for this region are monitored at the Notigi Control Structure.

Notigi CS flows in 2009 and 2010 were generally at the *Water Power Act* License maximum during the winter months, reaching the lower quartile from May through mid-September in 2009 and again from late July to September 2010 (Figure 5.5.2-1). Above average snowpack and precipitation in 2009 allowed the strong winter diversion flows and Southern Indian Lake to remain near its upper limit throughout the 2009/2010 winter. Notigi flows were lowered in the summer months because of very high Nelson River flows. Notigi flows were at the *Water Power Act* License maximum from January through mid-March 2011 before declining slowly to near the upper quartile by the end of March.

As a result of the high Southern Indian Lake levels, Rat Lake, which is located just downstream from Southern Indian Lake along the diversion route, reached record high water levels from February to late-May 2010. Water levels on Rat Lake also remained near or above the upper quartile for the rest of 2010 (Figure 5.5.2-2). In early 2011, Rat Lake water levels declined from the upper quartile in January down to slightly below average at the end of March.

In 2009, 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. Levels were near or above maximum levels from mid-June through mid-September. Although the Lake was again drawn down from mid-September through December 2009, water levels remained near upper quartile levels over this period (Figure 5.5.2-3). From January through March 2010 water levels remained steady, well above the upper quartile.

Water levels on Footprint Lake, Threepoint Lake, and Apussigamasi Lake generally followed a similar pattern to Notigi flows, peaking in the winter and reaching lowest levels during the summer (Figures 5.5.2-4 to 5.5.2-6). Specifically, Threepoint Lake water levels in 2009 followed the upper quartile trend from January until early May before dropping to near lower quartile levels for the summer and returning to upper quartile levels from October through the end of the year. Apussigamasi water levels appear to follow a similar trend although data are only available for a couple weeks in late-June early-July and from August to December 2009. In early 2010, Apussigamasi water levels declined from 188.5 to 187.5 from January to March although there are no other data available for comparison. In 2010, Footprint and Threepoint Lake water levels were above average from January to mid-July, and then dropped below the lower quartile for most of August before returning above average for the rest of the year. From January through March 2011, Footprint and Threepoint Lake water levels were both above the upper quartile at near record highs.

Leftrook Lake water levels were not monitored in 2009 when water quality and biological monitoring on this lake was initiated. Although Leftrook Lake water levels were monitored for June and part of July in 2010, due to the absence of historical water level data for this lake no interpretation of these data is possible (Figure 5.5.2-7).

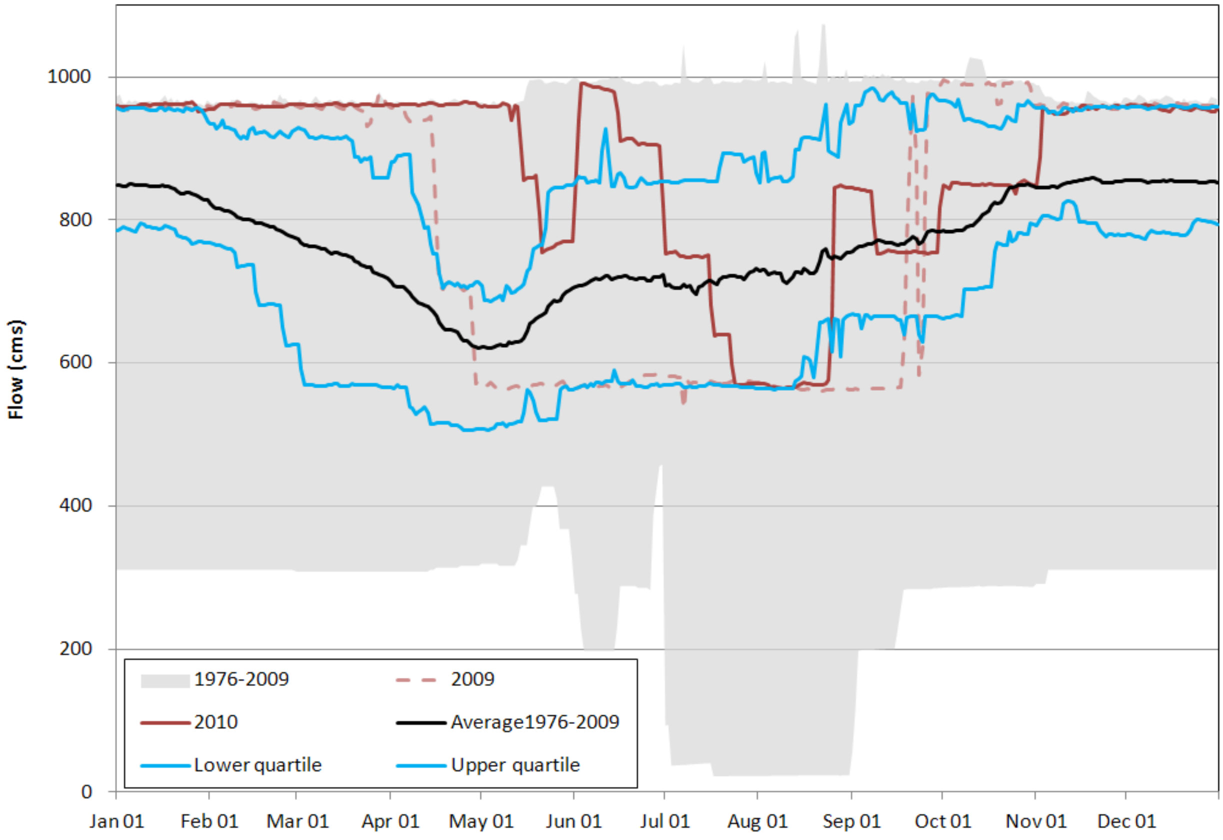


Figure 5.5.2-1. 2009-2010 Churchill River Diversion flow at the Notigi Control Structure.

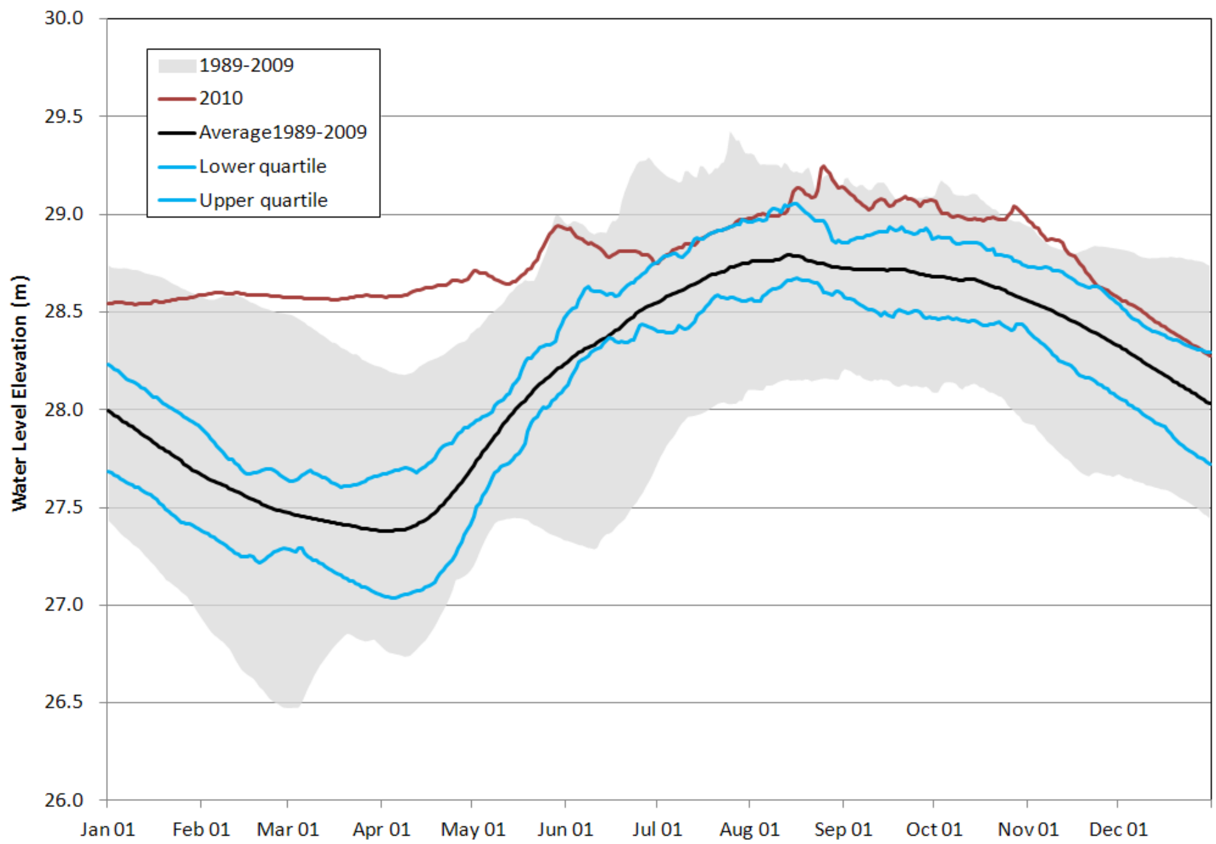


Figure 5.5.2-2. 2010 Rat Lake (05TFS004) water level elevation.

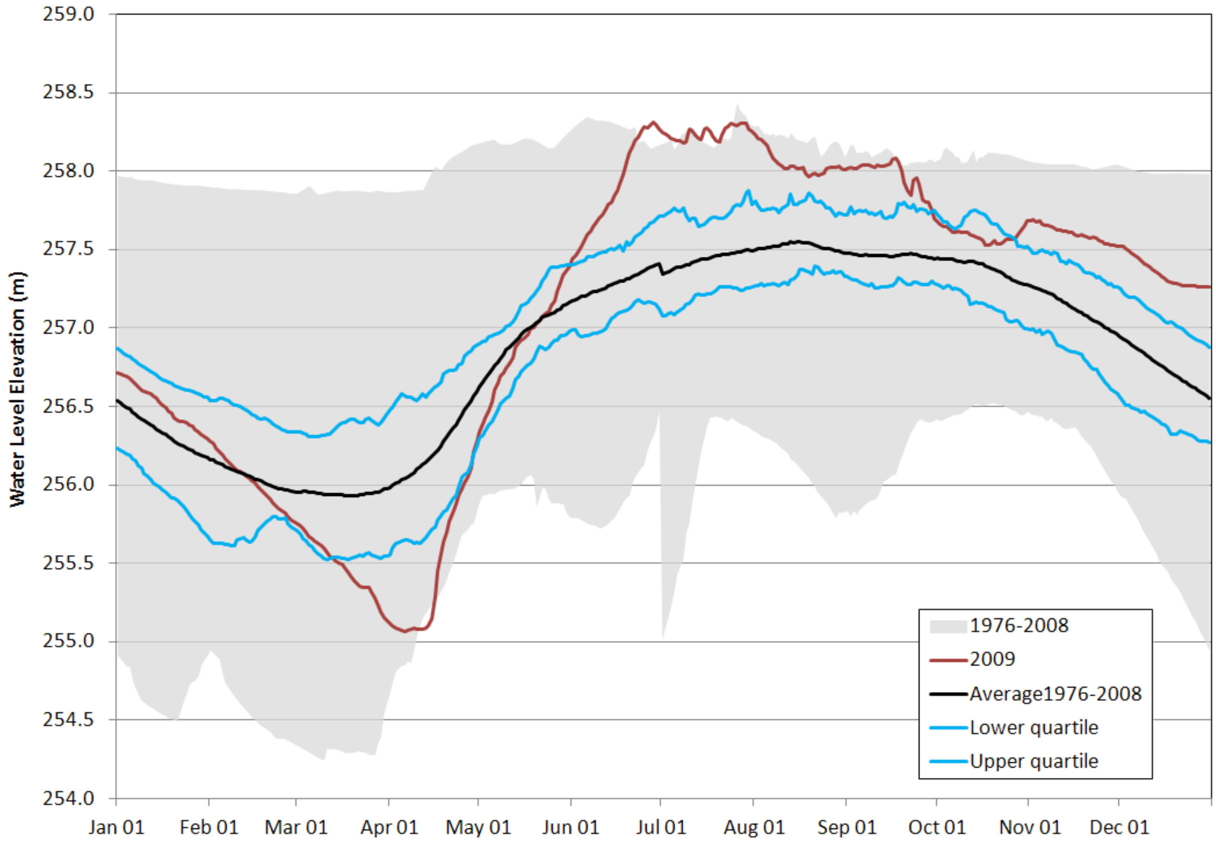


Figure 5.5.2-3. 2009 Notigi Control Structure Forebay water level elevation.

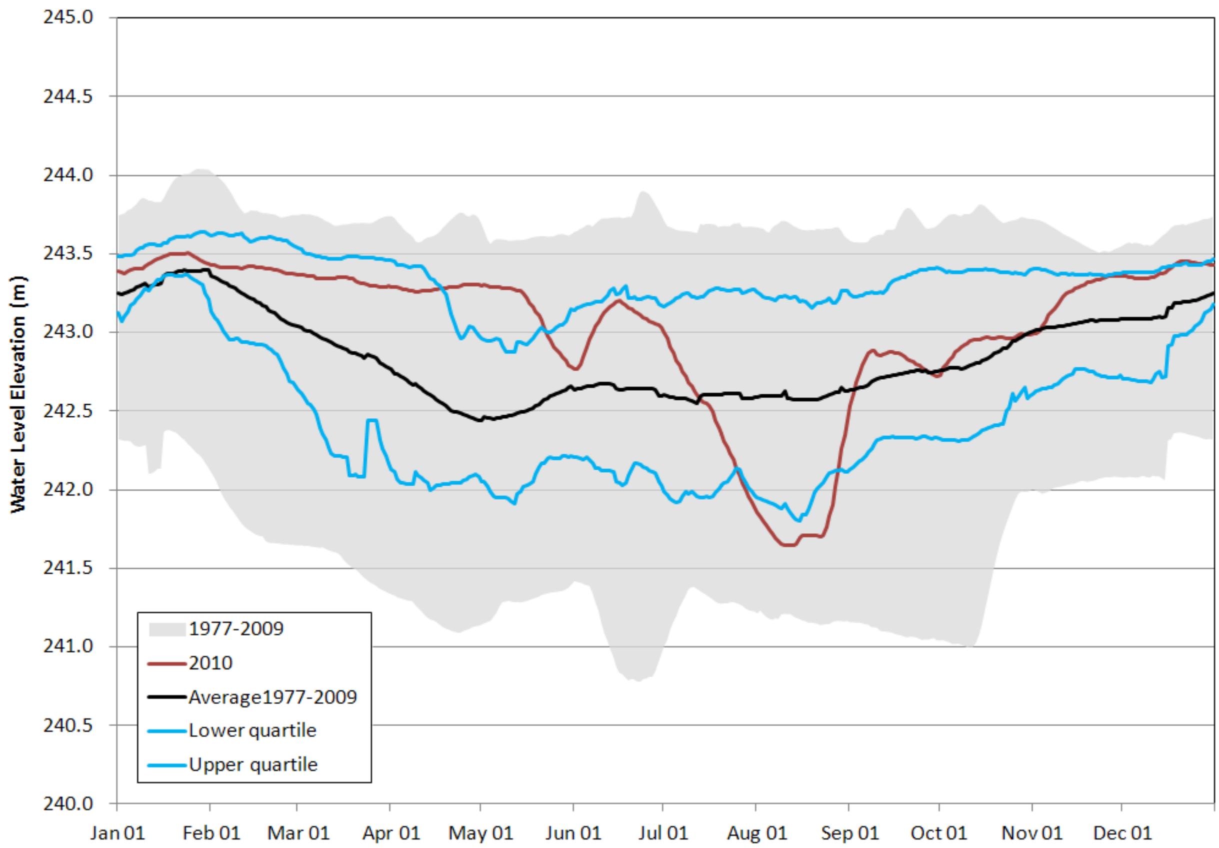


Figure 5.5.2-4. 2010 Footprint Lake (05TF001) water level elevation.

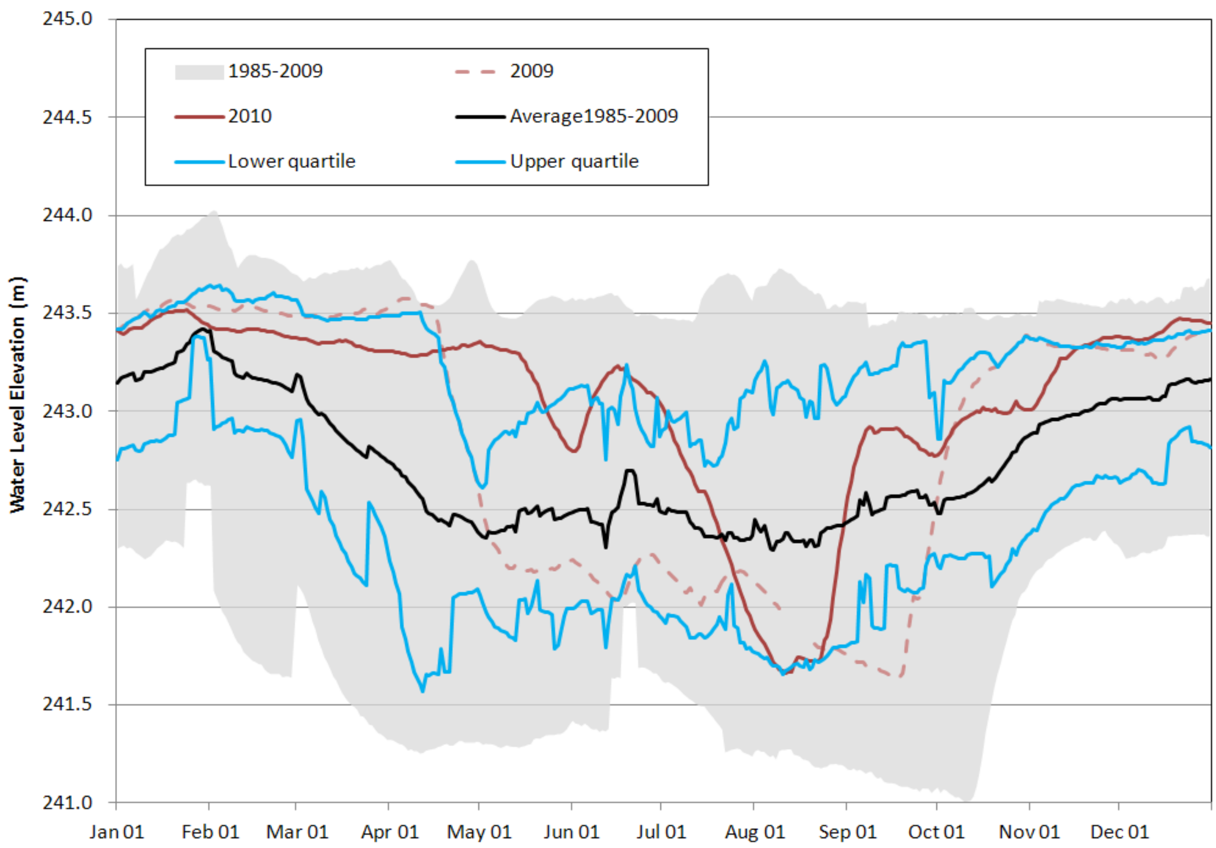


Figure 5.5.2-5. 2009-2010 Threepoint Lake (05TF003) water level elevation.

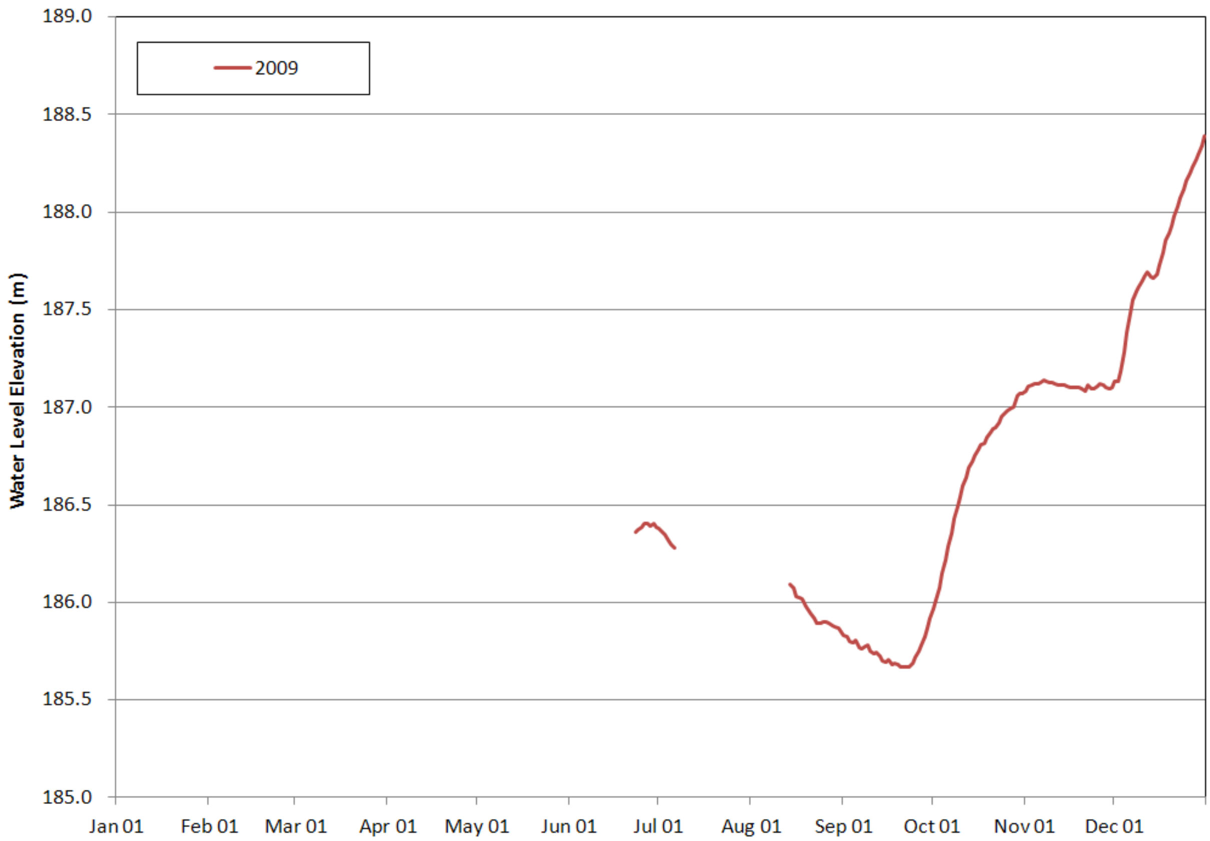


Figure 5.5.2-6. 2009 Apussigamasi Lake (05TG712) water level elevation.

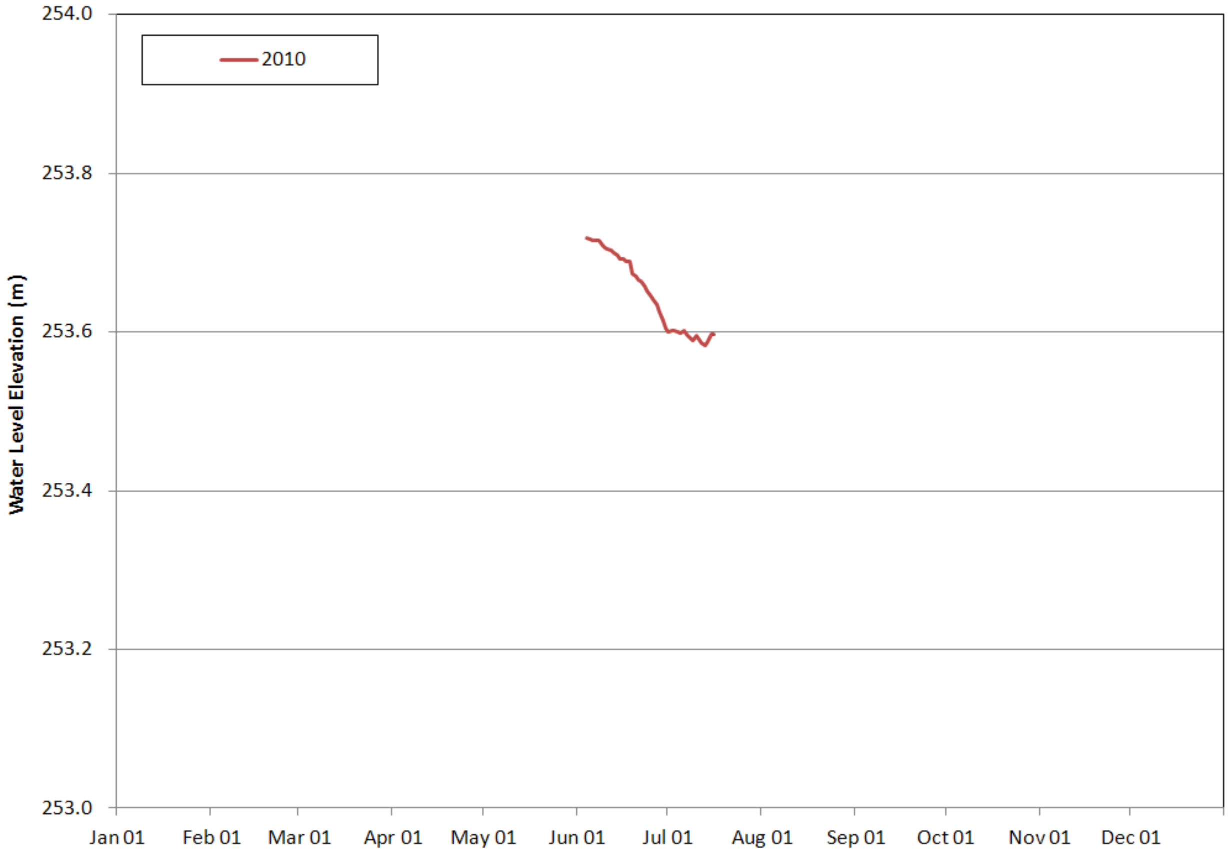


Figure 5.5.2-7. 2010 Leftrook Lake (05TF784) water level elevation.

5.5.3 Aquatic Habitat

An aquatic habitat survey was conducted in Apussigamasi Lake in 2011 under CAMPP. The results of this survey (bathymetry and substrate) are presented below.

5.5.3.1 Overview

Apussigamasi Lake is located along a reach of the Burntwood River whose origins are can be attributed to a large fault line that originates near Thompson, Manitoba and extends to Gull Rapids along the Nelson River to the northeast (Figure 5.5.3-1). The following sections describe the depth and substrate characteristics of the lake resulting from studies conducted in 2010 that produced a total of 2358.02 ha of mapped lake habitat. A brief summary of the general aquatic habitat characteristics follows.

5.5.3.2 Bathymetry

The deepest areas of the waterbody were found along the main channel of the Burntwood River, which runs directly through the centre of the lake (Figure 5.5.3-2). A maximum depth of 16.72 metres was found near this main channel, towards the north eastern outlet of the lake (Figure 5.5.3-2 to 5.5.3-6; Table 5.5.3-1). Depths within the lake were typically distributed between 4 and 8 metres (61%), with the average depth of the lake estimated at 4.89 m (Figure 5.5.3-7). The channelized or riverine portions of the lake, in addition to being the deepest parts of the lake, also contained the highest sloped areas, with the maximum slope of the lake bed being calculated at 77.46 %. Outside of the riverine areas of the lake, in areas such as the Central Kanutiministikwapisk Bay, it is generally flat, having a mean slope of 3.15%. Apussigamasi Lake contains a number of extensively flooded, shallow backwater inlets in low-lying tributary mouths, and has a total volume of 112,120,000 m^3.

5.5.3.3 Substrate

Apussigamasi Lake is dominated by silt/clay which contributes 1209.67 ha (51.3%) to the total substrate distribution, and clay which contributes 299.05 ha (12.68%) (Figure 5.5.3-8 to 5.5.3-11; Table 5.5.3-2). Prior to the Churchill River Diversion (CRD), the surface area of Apussigamasi Lake was smaller. Flooding related to the project caused low lying nearshore soils and vegetation to become flooded. Erosion of these flooded terrestrial materials has resulted in bottom types ranging from organic sediment, to woody organic debris and flooded tree stands, which accounted for 666.99 ha or 28.29 % of the bottom-types found within the lake. These flooded terrestrial substrates were typically found in the large backwater inlets located on the south side of the lake. The shorelines along the narrow riverine portions of the lake were dominated by bedrock and rock outcrops, explaining the occurrence of some rocky areas in the narrows of the channel. These hard substrates accounted for 133.77 ha or 5.67% of the total substrate distribution.

5.5.3.4 Aquatic Habitat Summary

Apussigamasi Lake has relatively low shoreline development and is small in relation to other CAMPP waterbodies. Its shape and geometry are mostly linear, following along a large fault line to the northeast. Its location on the Burntwood River provides it with areas of riverine lotic habitats in addition to its primarily lacustrine lentic habitats. Its' flooded terrestrial habitats are attributable to CRD, which has also increased the number of backwater inlet areas. It is not an extremely deep lake and most depth and high slope areas are found in the central channelized portion of the lake. Substrates are mainly fine throughout the lake, with the exception of the bedrock and fragmented bedrock and rock dominated shorelines. Macrophytes were not identified during surveys, however, lentic, soft-bottomed, shallow potential macrophyte habitats do exist within the lake.

Table 5.5.3-1. Summary of depth, slope, and volume statistics of Apussigamasi Lake resulting from aquatic habitat surveys and mapping conducted in 2010.

Water Body	Area (m^2)	Area (ha)	Maximum Depth (m)	Mean Depth (m)	Maximum Slope (%)	Mean Slope (%)	Volume (m^3)
Apussigamasi Lake	23,580,243	2,358.02	16.72	4.89	77.46	3.15	112,120,000

Table 5.5.3-2. Summary of the substrate distribution of Apussigamasi Lake resulting from aquatic habitat surveys and mapping conducted in 2010.

Substrate	Area ($m^{2)}$	Area (ha)	Total Area (%)
Bedrock	1,337,722	133.77	5.67
Silt/Clay	12,096,687	1209.67	51.30
Clay	2,990,471	299.05	12.68
Organic debris	6,669,950	666.99	28.29
unclassified	485,413	48.54	2.06
Total	23,580,243	2,358.02	100

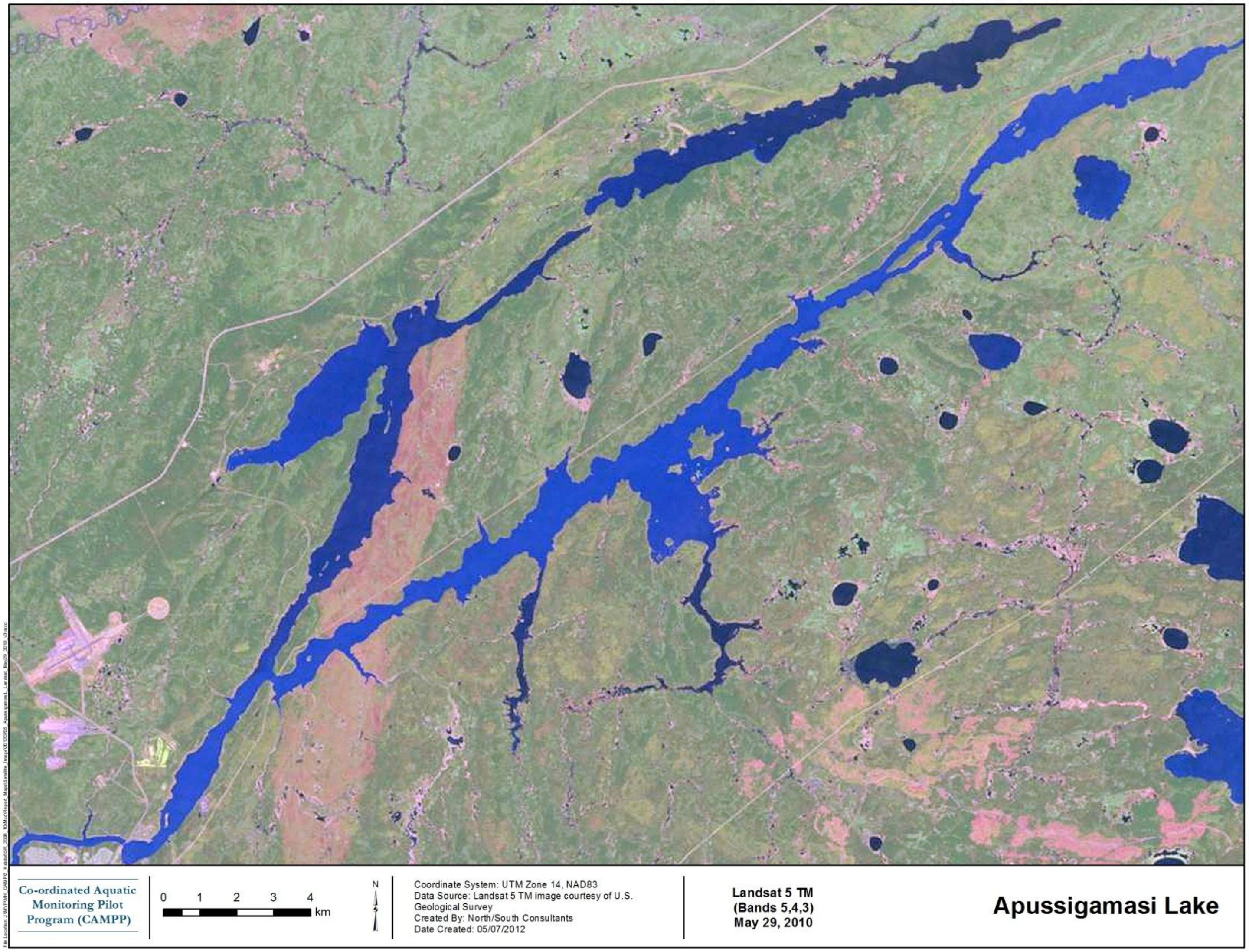


Figure 5.5.3-1. Landsat 5 TM false-colour composite image of Apussigamasi Lake acquired on May 29, 2010.

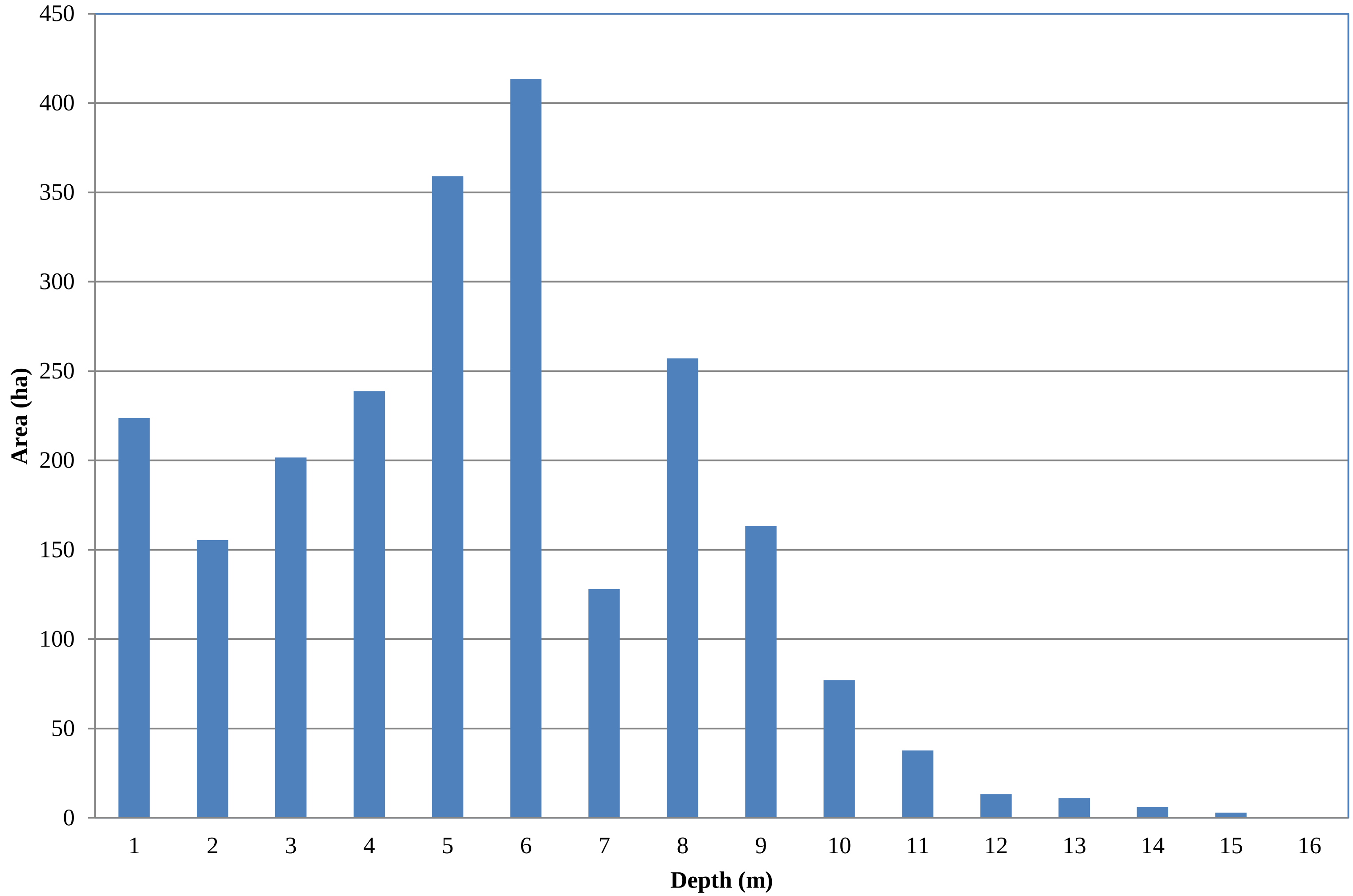


Figure 5.5.3-2. Histogram of depth distribution at 1 metre depth intervals for Apussigamasi Lake.

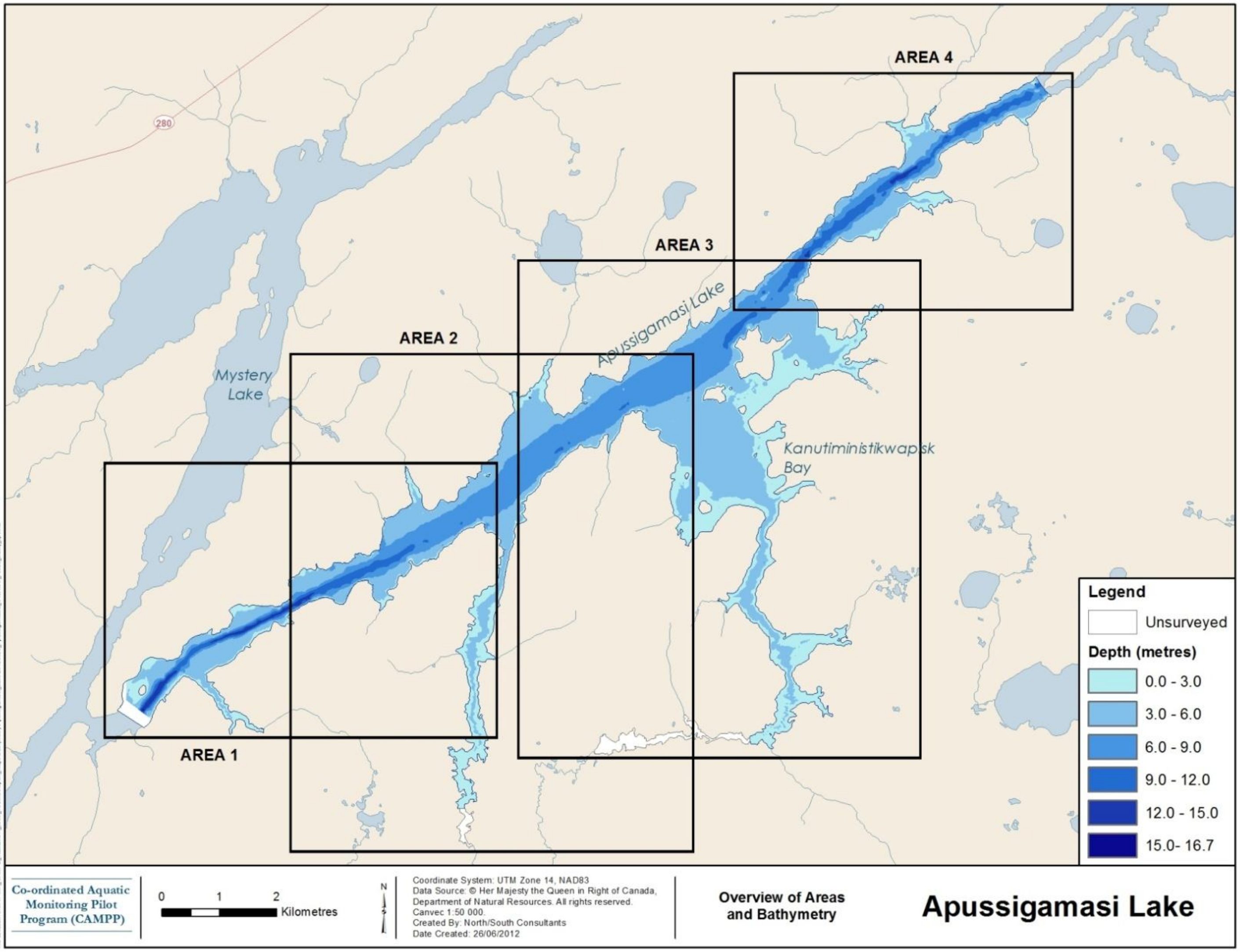


Figure 5.5.3-3. Overview bathymetric map of Apussigamasi Lake resulting from surveys conducted in 2010 (detail area maps follow).

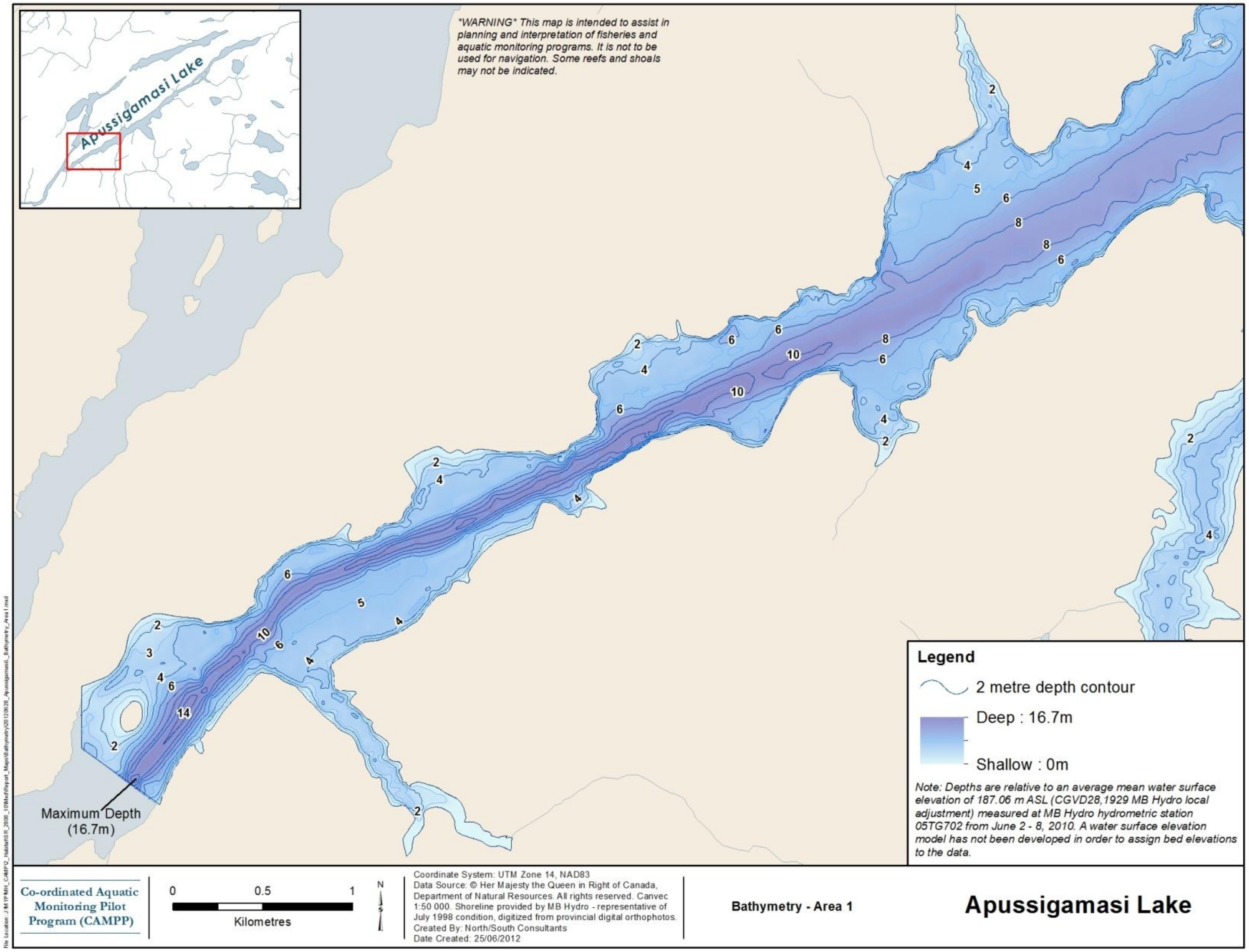


Figure 5.5.3-4. Bathymetric map of Apussigamasi Lake showing detail for Area 1.

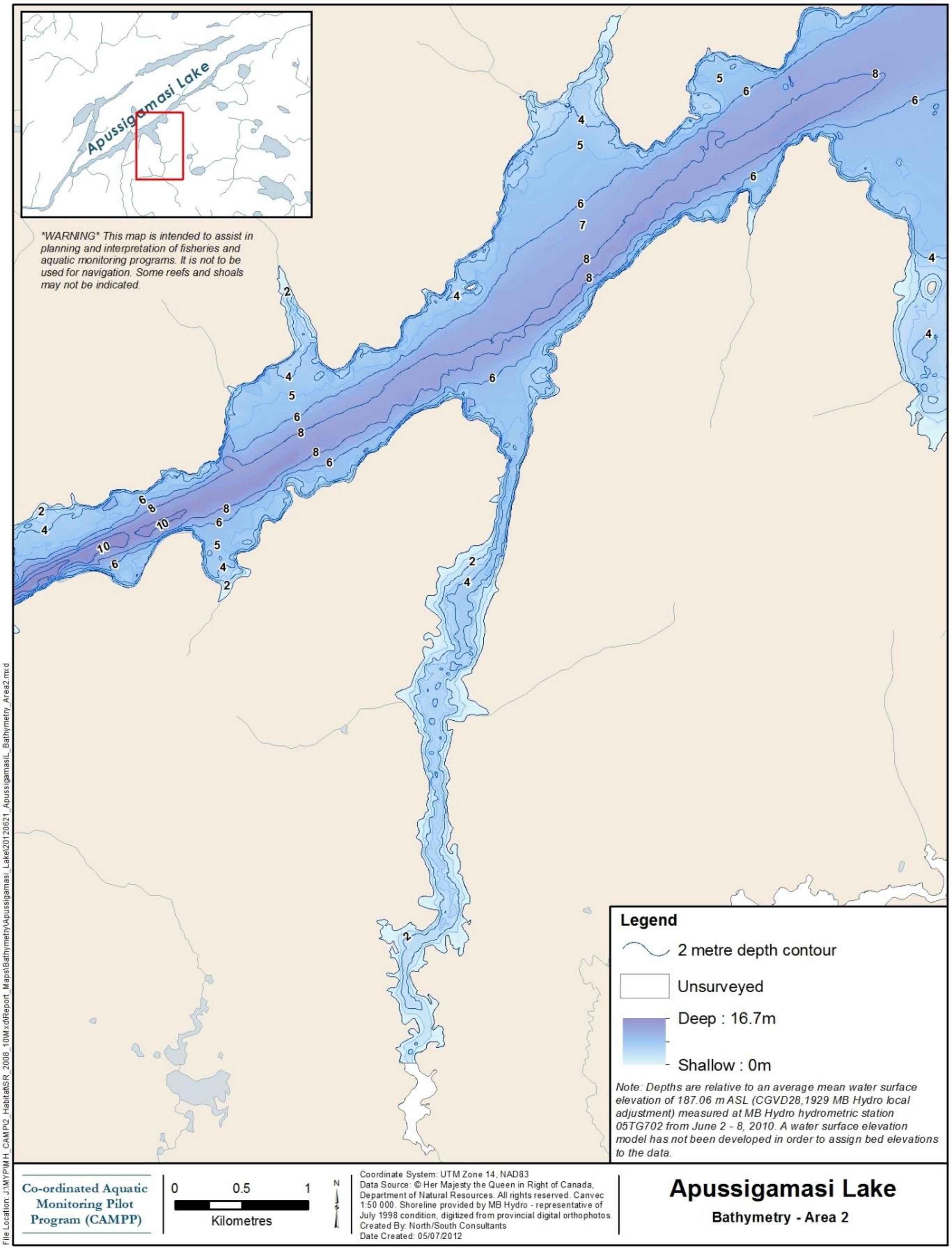


Figure 5.5.3-5. Bathymetric map of Apussigamasi Lake showing detail for Area 2.

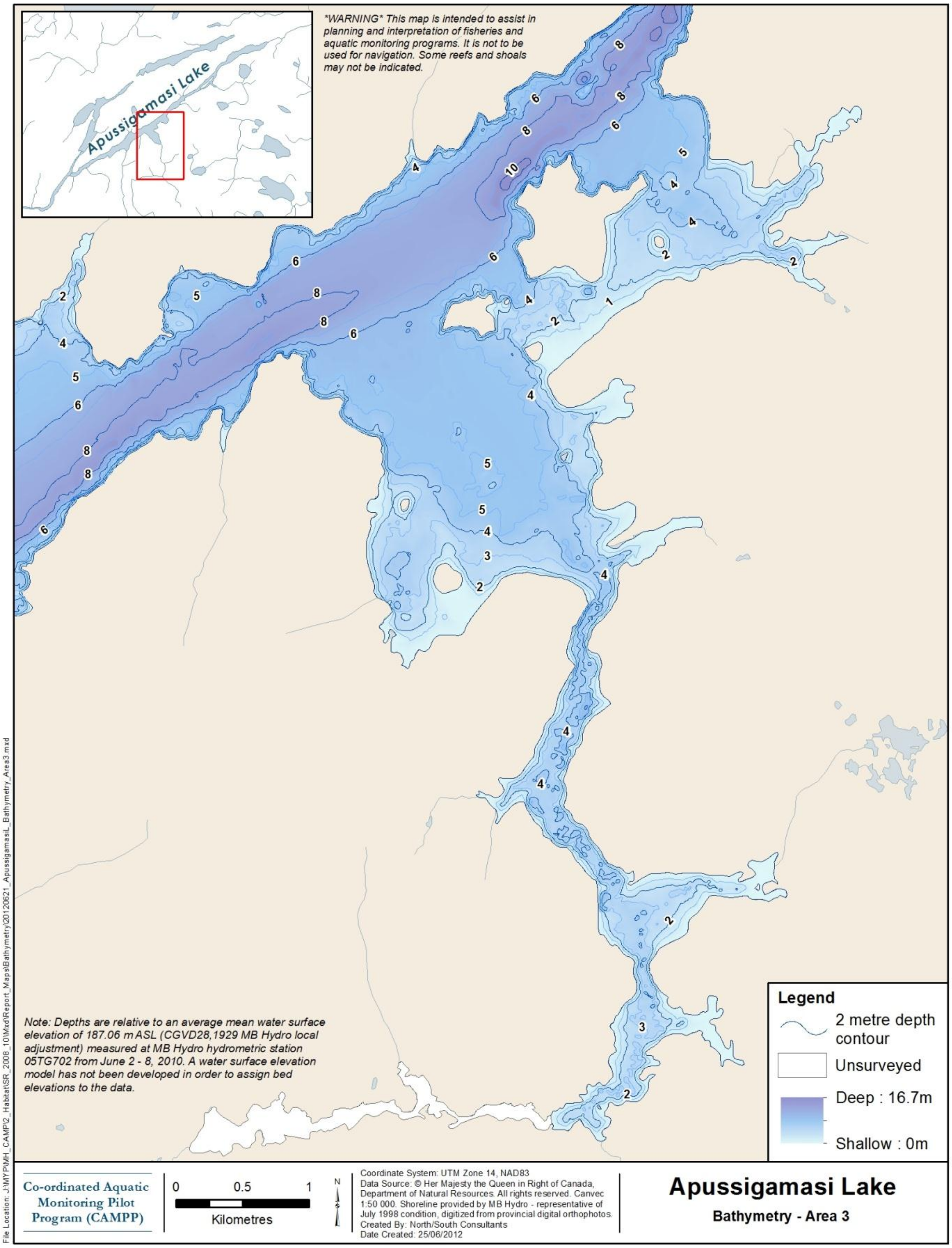


Figure 5.5.3-6. Bathymetric map of Apussigamasi Lake showing detail for Area 3.

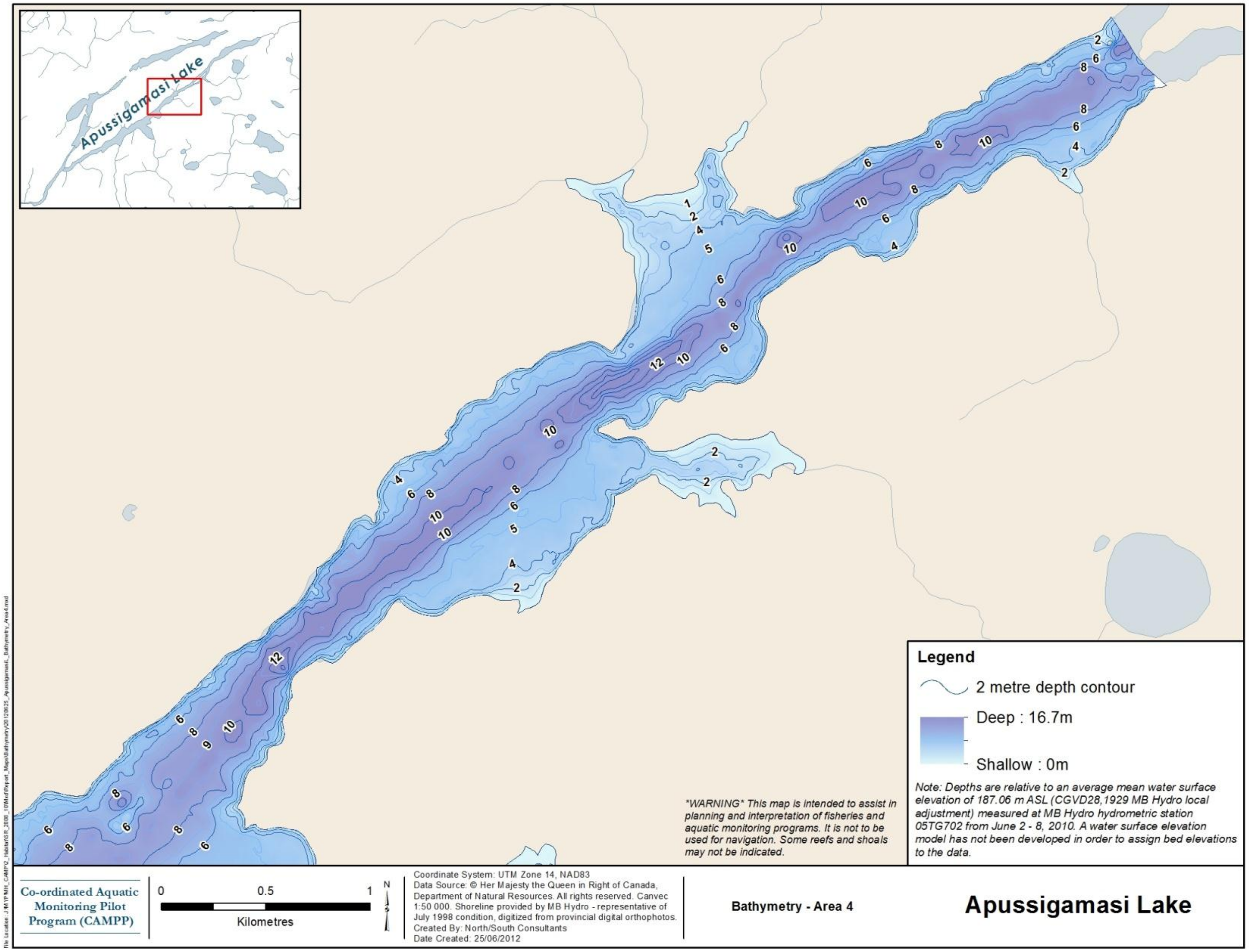


Figure 5.5.3-7. Bathymetric map of Apussigamasi Lake showing detail for Area 4.

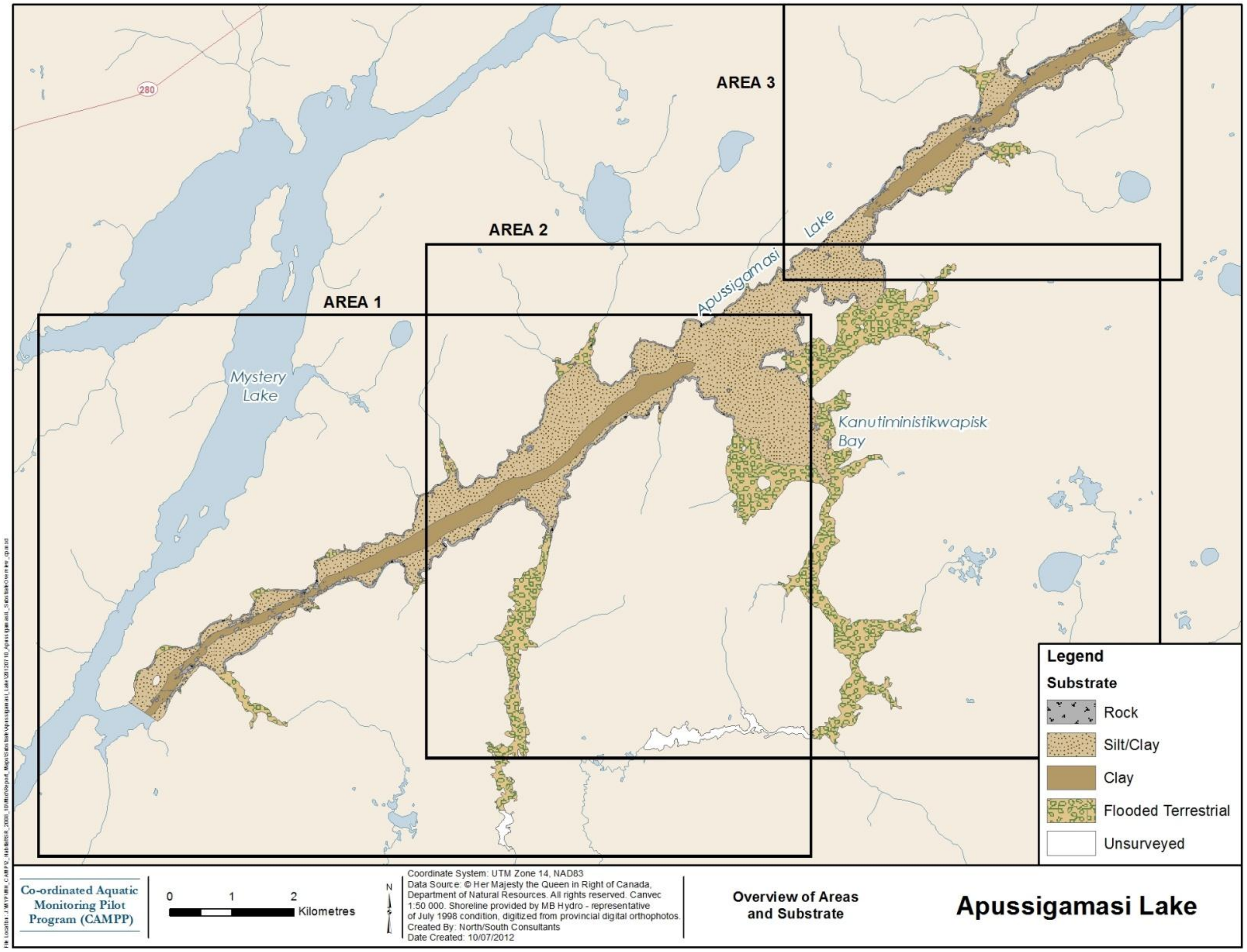


Figure 5.5.3-8. Overview substrate distribution map of Apussigamasi Lake resulting from surveys conducted in 2010 (detail area maps follow).

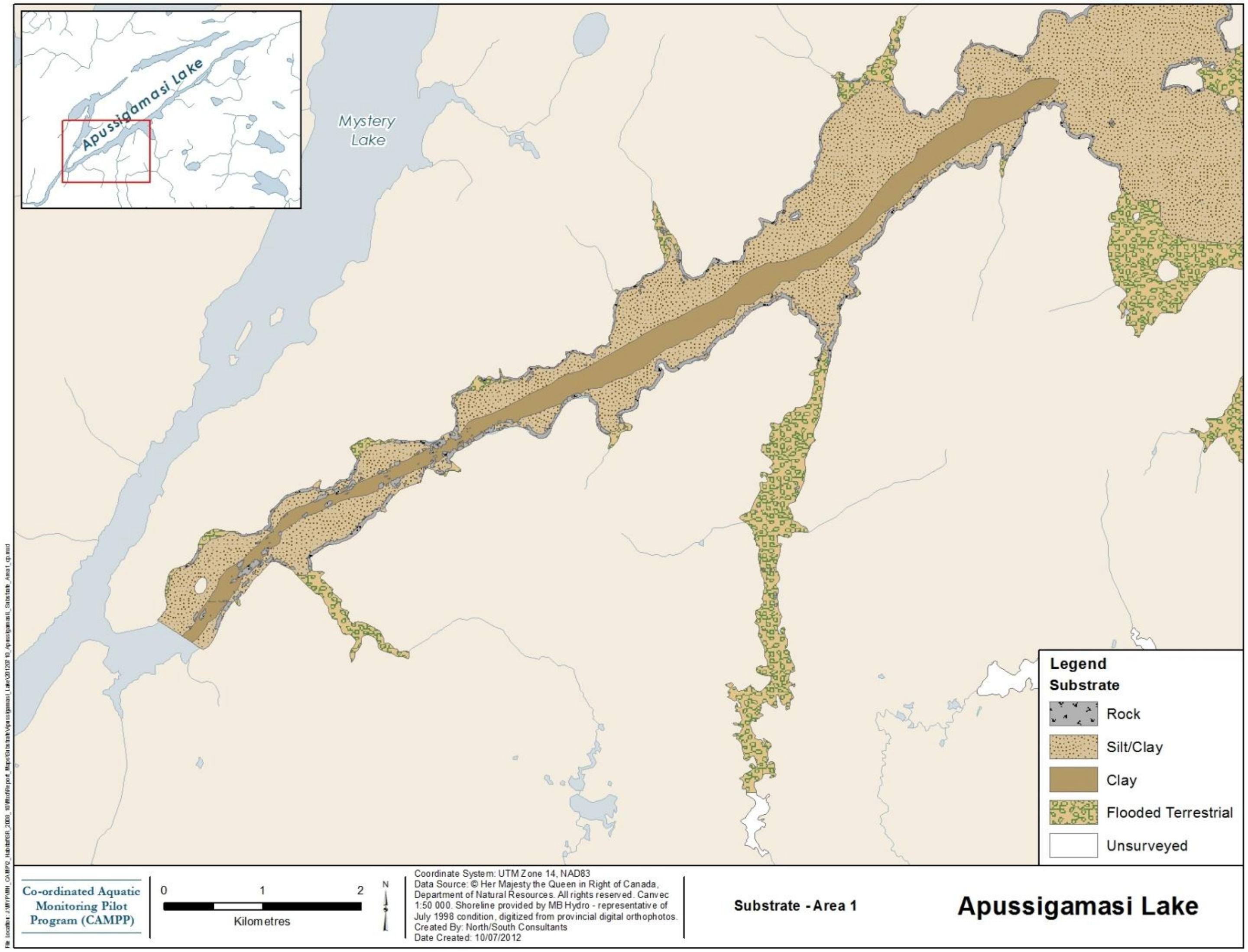


Figure 5.5.3-9. Substrate distribution map of Apussigamasi Lake showing detail for Area 1.

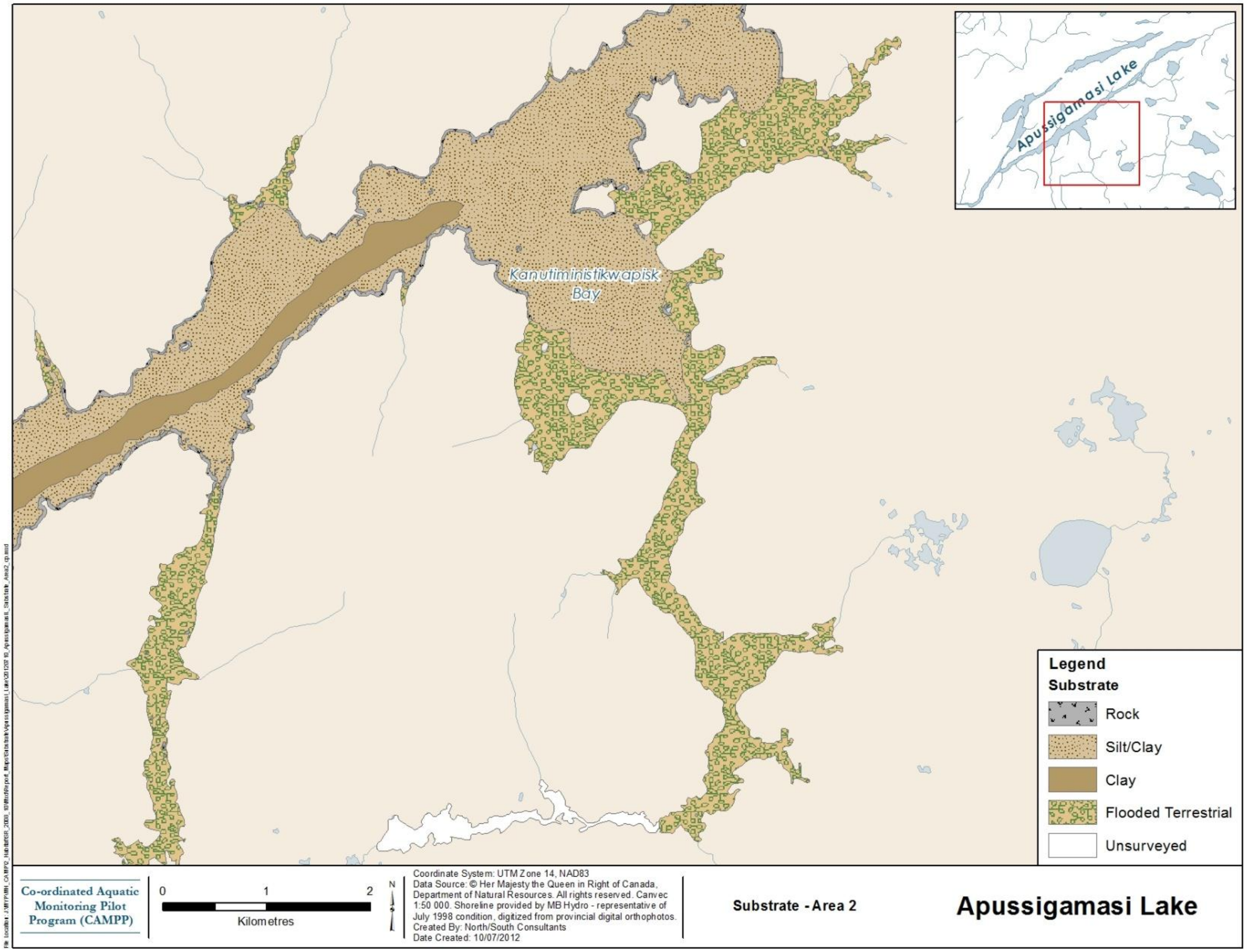


Figure 5.5.3-10. Substrate distribution map of Apussigamasi Lake showing detail for Area 2.

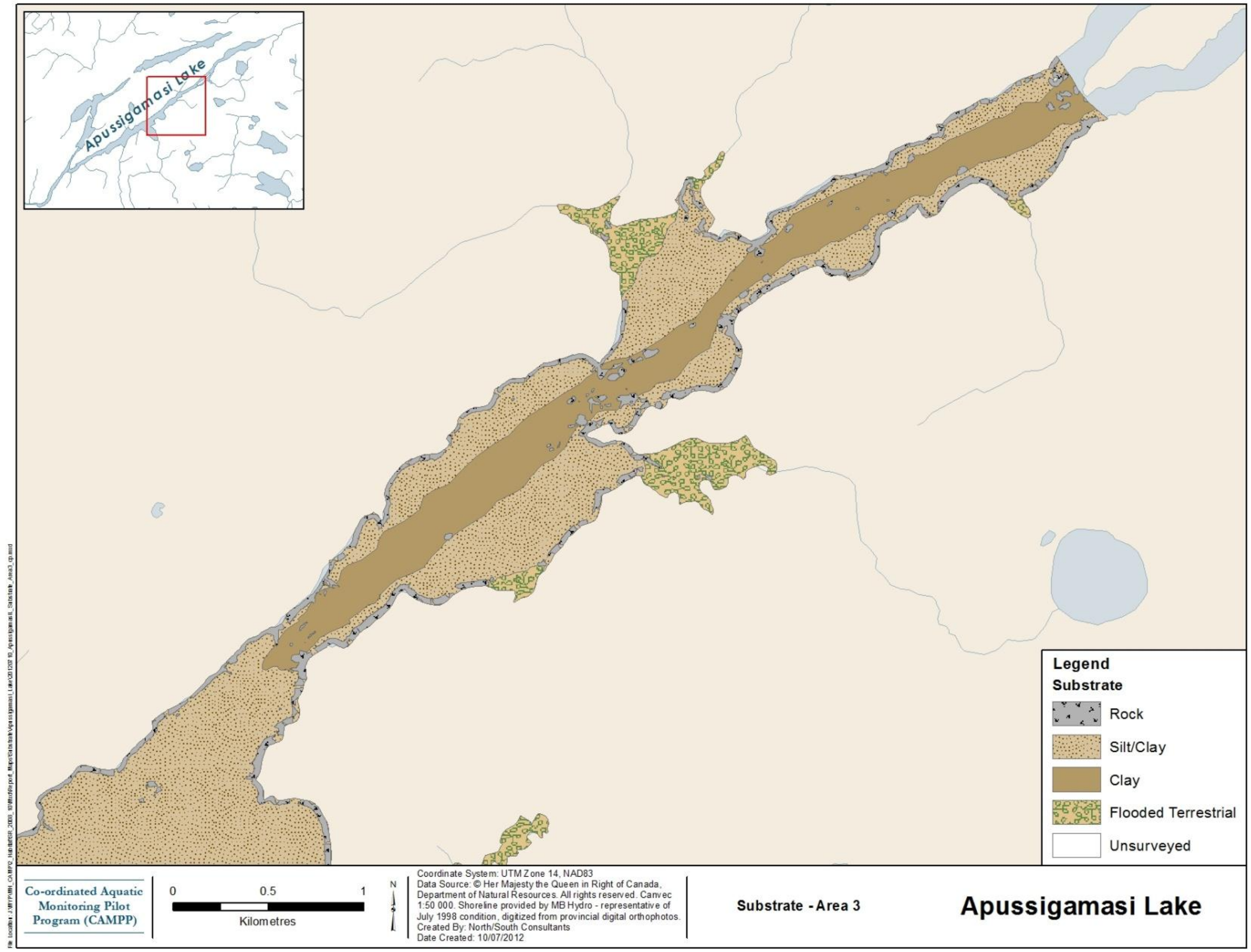


Figure 5.5.3-11. Substrate distribution map of Apussigamasi Lake showing detail for Area 3.

5.5.4 Water Quality

The following provides an overview of water quality conditions measured in the Churchill River Diversion (CRD) Region over the three year CAMPP program. Starting in 2009, waterbodies sampled annually included Threepoint Lake and an off-system reference lake (Leftrook Lake). Water quality was also measured at Notigi (East and West areas) and Apussigamasi lakes in 2009/2010, and at Rat and Footprint lakes in 2010/2011 (Figure 5.5.4-1). Sampling times relative to air temperature are presented in Figure 5.5.4-2.

Water quality is described below for waterbodies located on the Churchill River Diversion (on-system waterbodies) and Leftrook Lake (off-system waterbody), including results of statistical analyses conducted to evaluate seasonal variation, spatial differences, and temporal (i.e., interannual) differences. Water quality is also characterized through comparisons to Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL) to evaluate overall ecosystem health (Manitoba Water Stewardship [MWS] 2011).

Several water quality parameters frequently vary seasonally in north-temperate freshwater ecosystems, most notably between the open-water and the ice-cover seasons, in relation to changes in water temperature, biological productivity (e.g., algal abundance), and differences in physical conditions such as the presence of ice or variability in tributaries or inflows over the year. For example, concentrations of the inorganic forms of nitrogen which are readily used by primary producers are typically higher in winter due to relatively lower algal abundance. Dissolved oxygen (DO) concentrations also vary with water temperature as warmer water holds less oxygen than colder water and because ice cover may reduce or eliminate atmospheric re-aeration of surface waters. It is of interest to identify seasonal variability as it may affect aquatic biota and because it is important to consider when assessing differences or changes in water quality conditions over time. Statistical analyses of seasonal differences could not be conducted for the Churchill River Diversion Region as only two years of data were collected under CAMPP.

The primary objective of spatial comparisons (i.e., comparison between waterbodies) was to evaluate whether water quality conditions differ between on-system sites along the Churchill River Diversion. Comparisons were also made between the on-system waterbodies and the off-system waterbody (Leftrook Lake). Water quality would be expected to differ between on- and off-system waterbodies due to fundamental, inherent differences associated with the watersheds and waterbodies. The objective of the comparisons between the on- and off-system waterbodies was to formally identify differences between these areas to assist with interpretation of results of CAMP as the program continues.

Temporal comparisons were undertaken for each waterbody sampled annually in order to provide a preliminary assessment of temporal variability. As additional data are acquired, more formal trend analyses will be undertaken to evaluate potential longer-term changes.

Results of water quality monitoring conducted under CAMPP in the Churchill River Diversion Region were also compared to MWQSOGs for PAL to provide a snap-shot assessment of ecosystem health. These comparisons are not intended to identify cause associated with a water quality variable being outside of the MWQSOGs. In addition, as these comparisons were restricted to the two years of data collected under CAMPP, they do not address historical conditions in the waterbodies.

5.5.4.1 Overview

Water quality in on-system waterbodies of the Churchill River Diversion Region from Rat Lake to Apussigamasi Lake can generally be described as moderately nutrient-rich, slightly alkaline, soft, well-oxygenated, and with a low to very low water transparency. Notigi-West, Notigi-East, and Footprint lakes occasionally stratify during the open-water season whereas Rat, Threepoint, and Apussigamasi lakes do not. All sites other than Rat Lake also exhibited DO depletion across depth, and concentrations dropped below the MWQSOGs for PAL (MWS 2011) in Footprint Lake in one winter. Waterbodies are classified as mesotrophic to meso-eutrophic on the basis of TP concentrations.

Most routine or conventional water quality parameters and metals were within the MWQSOGs for PAL at all sites in the Churchill River Diversion Region. Exceptions included aluminum, iron, silver, DO, and TP. TP concentrations exceeded the Manitoba narrative nutrient guideline (0.025 mg/L) in 100% of samples collected in on-system waterbodies, except Notigi Lake (West and East sites) where the guideline was never exceeded. Aluminum consistently exceeded the PAL guideline (0.1 mg/L) in surface samples collected from on-system waterbodies whereas the frequency of exceedance of the PAL guideline for iron (0.3 mg/L) was variable across sites (0-100%).

Although statistical comparisons were not made due to limited data, water quality of Footprint Lake qualitatively differed from lakes located along the main flow of the Rat/Burntwood River system (i.e., “mainstem sites”). Qualitative comparison indicates that, on the basis of routine characteristics and some metals, water quality of Footprint Lake was more similar to Leftrook Lake than the other on-system waterbodies.

The off-system waterbody in the Churchill River Diversion Region, Leftrook Lake, is generally less coloured and clearer than on-system waterbodies. Nitrogen concentrations tend to be higher in Leftrook Lake than elsewhere in the region, and the trophic categorization of Leftrook Lake (meso-eutrophic to eutrophic) on the basis of TP is also slightly higher than that of other lakes. In contrast, a number of metals are present in lower concentrations in Leftrook Lake than on-system waterbodies. Differences in water quality between the on- and off-system waterbodies are not unexpected due to inherent differences in the lakes' drainage basins, morphometries, and hydrological conditions.

Several water quality variables exhibited differences between one or more sampling periods, most notably when comparing open-water sampling periods to the winter period. As is commonly observed in north temperate freshwater ecosystems that experience extensive ice-cover, nitrate/nitrite (a form of nitrogen readily taken up by algae) was higher and chlorophyll *a* (an indicator of algal abundance) was lower in winter. These seasonal differences reflect lower primary productivity under lower light and temperature conditions experienced under ice.

There were few and inconsistent differences in water quality conditions between the two sampling years when Threepoint and Leftrook lakes were monitored, indicating that water quality conditions in the Churchill River Diversion Region remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. Water levels in Threepoint Lake were also similar between 2009 and 2010; however, hydrologic conditions of Leftrook Lake were only studied in June and July 2010 and information is insufficient to evaluate potential effects of hydrology on water quality (see Section 5.5.2 for a discussion of hydrological conditions). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.5.4.2 Limnology and In Situ Variables

Water temperatures were generally near zero degrees Celsius in the ice-cover season and ranged up to approximately 20 ^{o}C over the study period in waterbodies of the Churchill River Diversion Region (Figures 5.5.4-3 to 5.5.4-5). The annual mean air temperatures at Thompson were similar to the 1971-2000 normal 2009 and above normal in 2010 (Figure 5.5.1-1). Monthly mean air temperature was notably above normal in September 2009.

Churchill River Diversion

Rat, Threepoint, and Apussigamasi lakes did not thermally stratify during the period of study (Figures 5.5.4-3 to 5.5.4-5) and DO concentrations were generally constant across depth at Rat Lake (Figure 5.5.4-6). Vertical variation in DO concentrations was observed in Threepoint and Apussigamasi lakes, however, with concentrations decreasing with depth in spring 2009, and spring and summer 2009, respectively (Figures 5.5.4-7 to Figure 5.5.4-8).

Footprint and Notigi lakes exhibited thermal stratification and vertical variation in DO concentrations during at least one season. Notigi Lake-East and Footprint lakes were thermally stratified during spring 2009 and 2010, respectively, and Notigi Lake-West stratified during summer 2009 (Figures 5.5.4-9 to 5.5.4-11). The depth of the epilimnion varied between sites, ranging from 6 m in Footprint Lake, to 11 and 15 m in Notigi Lake-East and -West, respectively. Notigi Lake was isothermal during all seasons other than those noted above, but DO concentrations decreased with depth during spring, summer, and fall sampling events at the two monitoring sites in the lake (Figures 5.5.4-12 to 5.5.4-13). In contrast, DO concentrations were generally constant across depth in Footprint Lake with the exception of winter 2010/2011 when temperatures also increased slightly at depth (Figures 5.5.4-14 and 5.5.4-10).

With one exception, DO concentrations measured along the Churchill River Diversion system were above the MWQSOGs for the protection of cool-water and cold-water aquatic life (Figures 5.5.4-6 to 5.5.4-8 and 5.5.4-12 to 5.5.4-14). The exception occurred under ice cover at Footprint Lake, when concentrations at depths below 9 m fell below the most stringent PAL objective (9.5 mg/L).

Other *in situ* variables including specific conductance (Figures 5.5.4-15 to 5.5.4-20), pH (Figures 5.5.4-21 to 5.5.4-26), and turbidity (Figures 5.5.4-27 to 5.5.4-32) were generally similar across depth in each of the on-system waterbodies. Exceptions included: specific conductance increased with depth in winter 2010 at Footprint Lake; pH occasionally decreased with depth, particularly at Notigi Lake-East in summer 2009; and, there were slight increases in turbidity in the lower portion of the water column during the open-water season at some sites. In winter 2009/2010, *in situ* pH was below the lower boundary of the MWQSOG PAL guideline (6.5 pH units) at Notigi-East and Threepoint lake sites and pH marginally exceeded the upper boundary of the PAL guideline (9.0 pH units) at Footprint Lake in summer 2010. Secchi disk depths of the on-system sites were variable and ranged between 0.3 and 1.4 m in the open-water season (Figures 5.5.4-33 to 5.5.4-38); water clarity of waterbodies along the CRD route would be classified as very low to low, based on the Swedish (Swedish EPA 2000) lake classification scheme.

Off-system Waterbody: Leftrook Lake

Limnological conditions of Leftrook Lake were generally similar to conditions in one or more of the on-system waterbodies. Like some on-system lakes, Leftrook Lake exhibited thermal stratification in spring 2010 and winter 2009/2010 (Figure 5.5.4-39); the lake was also nearly stratified in winter 2010/2011. Even during periods when the lake was isothermal, DO concentrations decreased with depth; notable vertical differences (i.e., change of > 3 mg/L DO between the surface and bottom depths) occurred in spring and summer 2009, spring 2010, and in both winters (2009/2010 and 2010/2011; Figure 5.5.4-40). During the open-water sampling events, DO concentrations at Leftrook Lake were generally above the MWQSOGs for the protection of cool-water and cold-water aquatic life. The exception occurred in spring 2010, when DO concentrations at depths below 7 m fell below the most stringent objectives for cool- and cold-water aquatic life (6.0 and 6.5 mg/L, respectively) and reached 2 mg/L in the deepest waters. Substantive DO depletion was also evident under ice cover, when concentrations were below the most stringent PAL objective (9.5 mg/L) across the majority of the water column. Hypoxia or anoxia occurred at depth in both winters when monitoring was conducted.

Other *in situ* variables including specific conductance (Figure 5.5.4-41) and turbidity (Figure 5.5.4-42) were generally similar across depth in Leftrook Lake whereas pH decreased slightly with depth, particularly in spring 2010 (Figure 5.5.4-43). pH measurements collected in summer 2010 were also at the upper range of the MWQSOG PAL guideline (9.0 pH units) throughout the water column. Secchi disk depths at Leftrook Lake were generally higher than the on-system sites, ranging between 0.8 to 2.7 m (Figure 5.5.4-44). Water clarity of Leftrook Lake would be classified as low based on the mean Secchi disk depth.

Seasonal Differences

As only two years of data are available in the Churchill River Diversion Region, seasonal differences could only be analysed qualitatively and only for the annual waterbodies (i.e., Threepoint and Leftrook lakes).

Seasonality of *in situ* parameters differed between Threepoint and Leftrook lakes and the magnitude of seasonal differences was often greater at Threepoint than Leftrook Lake. As is typical in north temperate lakes , DO (Figure 5.5.4-45) was highest in winter in Threepoint Lake when water inherently has a greater capacity to hold more DO at the lower water temperatures. Conversely, surface DO tended to be lower than expected in winter (though still above PAL objectives) in Leftrook Lake and the magnitude of DO depletion at depth was greatest in winter. In addition, Secchi disk depth was slightly higher in Leftrook Lake in spring compared to the other seasons (Figure 5.5.4-46).

In situ parameters that showed a similar seasonal pattern between Threepoint and Leftrook lakes were pH, which was highest in spring then declined through the seasons to reach the lowest levels during winter (Figure 5.5.4-47), and specific conductance, which was highest in winter in both lakes, but most notably in Leftrook Lake (Figure 5.5.4-48). pH often decreases in winter in ice-covered systems due to limited photosynthesis (a process that consumes carbon dioxide thus increasing pH) and due to the presence of ice cover which may prevent release of carbon dioxide to the atmosphere. Specific conductance frequently increases in winter in ice-covered lakes, most notably in closed systems, due to cryoconcentration – ice rejects solutes as it forms, thus increasing the conductivity of the water column.

Spatial Comparisons

As expected, several water quality variables differed significantly between Threepoint and Leftrook lakes, including *in situ* turbidity (Figure 5.5.4-49), specific conductance (Figure 5.5.4-50), and Secchi disk depth (Figure 5.5.4-51). Specifically, turbidity was lower and specific conductance and Secchi disk depth were higher in Leftrook Lake. Due to the smaller size of the drainage basin, clearer and more dilute (i.e., lower conductivity) conditions in the off-system lake are not unexpected.

While statistical analyses did not incorporate Rat, Notigi-West, Notigi-East, Footprint, or Apussigamasi lakes due to limited data (i.e., only one year of data), qualitative examination of the data indicate that some parameters may vary between sites. Threepoint and Apussigamasi lakes appear to have lower water clarity than the other lakes in the Churchill River Diversion Region (Figures 5.5.4-49 and 5.5.4-51) and Footprint Lake has a higher conductivity than the remaining lakes in the region (Figure 5.5.4-50). Statistical differences will be re-assessed in the future when additional data are acquired for this upstream waterbody.

Temporal Comparisons

None of the *in situ* water quality variables monitored in Threepoint or Leftrook lakes were statistically different between sampling years, indicating that these parameters remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. It is notable that water levels in Threepoint Lake were also similar between 2009 and 2010. Hydrologic conditions of Leftrook Lake were only studied in June and July 2010 and information is insufficient to evaluate potential effects of hydrology on water quality (see Section 5.5.2 for a discussion of hydrological conditions). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.5.4.3 Routine Laboratory Variables

Routine laboratory variables described below include nutrients, such as nitrogen and phosphorus, pH, alkalinity, total dissolved solids (TDS)/conductivity, total suspended solids (TSS), turbidity, and true colour.

Churchill River Diversion

All measurements of laboratory pH (Figure 5.5.4-52; MWQSOG: 6.5-9.0), ammonia (Figure 5.5.4-53; MWQSOGs vary with pH and temperature), and nitrate/nitrite (Figure 5.5.4-54; 2.93 mg N/L) were within MWQSOGs for PAL at all sites and sampling times in Churchill River Diversion Region lakes. Conversely, TP concentrations measured at most on-system lakes exceeded the Manitoba narrative guideline for TP for lakes, reservoirs and ponds (0.025 mg/L; Figure 5.5.4-55) in at least 50% of samples; the exception was Notigi Lake (West and East), where none of the surface samples exceeded the guideline. Acid sensitivity of all sites along the Churchill River Diversion system is classified as least to low based on pH, total alkalinity, and calcium and moderate based on TDS (Table 5.5.4-1).

Dissolved phosphorus (DP) and total particulate phosphorus (TPP) comprised nearly equal proportions of TP (Figure 5.5.4-56) and TN (Figure 5.5.4-57) was dominated by organic nitrogen at all on-system sites (Figure 5.5.4-58). Of the dissolved inorganic nitrogen (DIN) pool, on average, nitrate/nitrate was present in lower concentrations than ammonia at Footprint and Apussigamasi lakes, but concentrations of these two forms of inorganic nitrogen were generally similar at all other sites along the river system. Molar TN:TP ratios indicate that phosphorus limitation occurred at all sites during all sampling events (Figure 5.5.4-59).

Deep water samples (samples collected from 1 m above the sediment-water interface) collected during periods of thermal stratification in Notigi Lake-West and Notigi Lake–East in summer and spring 2009, respectively, indicate that TP and TPP were higher at depth than near the surface of the water column (Figures 5.5.4-60 and 5.5.4-61). DP, DIN, and nitrate/nitrite were also elevated in the hypolimnion of Notigi Lake-West in summer 2009 (Figures 5.5.4-62 and 5.5.4-63). In addition, relative to the near surface samples, DP was slightly higher and DIN and TN were lower in deep water samples collected in spring 2010 during stratification in Footprint Lake (Figures 5.5.4-64 and 5.5.4-65).

Concentrations of TP measured in the hypolimnion of Notigi Lake-West in summer 2009 exceeded the Manitoba narrative guideline for TP for lakes, reservoirs and ponds (0.025 mg/L) even though the surface waters were within the guideline; no other exceedances of the MWQSOGs for PAL were noted for deep water samples collected during the period of study.

Off-system Waterbody: Leftrook Lake

Consistent with the on-system waterbodies, all measurements of pH (laboratory), ammonia, and nitrate/nitrite collected in Leftrook Lake were within MWQSOGs for PAL (Figures 5.5.4-52 to 5.5.4-54). Although 25% of surface water samples had TP concentrations in excess of the

Manitoba narrative guideline for TP for lakes, reservoirs and ponds (0.025 mg/L), this was a lower frequency than found for the majority on-system waterbodies but a higher frequency than observed in Notigi Lake (Figure 5.5.4-55).

On average, dissolved and particulate fractions of phosphorus were roughly equal in Leftrook Lake, though the relative contribution of these forms of phosphorus varied through time (Figure 5.5.4-56). As observed at most of the on-system sites, TN at Leftrook Lake was dominated by organic nitrogen and the DIN pool was composed of similar concentrations of nitrate/nitrite and ammonia (Figures 5.5.4-57 and 5.5.4-58). Molar TN:TP ratios indicate that phosphorus limitation occurred during all sampling events (Figure 5.5.4-59). Acid sensitivity of Leftrook Lake is classified as least based on pH, total alkalinity, and calcium and moderate based on TDS (Table 5.5.4-1).

Water samples collected at depth (1 m above the sediment-water interface) in Leftrook Lake during thermal stratification in winter 2009/2010 indicated that DP, TP, DIN, nitrate/nitrite, and TN were higher at depth than near the surface (Figure 5.5.4-66 and 5.5.4-67). The lake was also stratified in spring 2010; however, concentrations of routine parameters measured at this time were generally similar between the epilimnion and hypolimnion. The TP concentration measured in the deep water sample collected in winter 2009/2010 exceeded the Manitoba narrative guideline for TP for lakes, reservoirs and ponds (0.025 mg/L); no other guidelines for routine parameters were exceeded in these samples.

Seasonal Differences

Though data are insufficient to perform statistical tests, most of the routine water quality parameters appear to be similar between seasons in both Threepoint and Leftrook lakes. Variables for which seasonal differences appear to be substantive in both lakes include ammonia (Figure 5.5.4-68), nitrate/nitrite (Figure 5.5.4-69), DIN (Figure 5.5.4-70), dissolved phosphorous (Figure 5.5.4-71), and chlorophyll *a* (Figure 5.5.4-72). Ammonia concentrations in Threepoint and Leftrook lakes were more variable, but higher on average, in spring compared to the other seasons, when concentrations in surface waters were consistently low. Nitrate/nitrite and DIN exhibited the most obvious seasonal differences in each waterbody, and along with DP and chlorophyll *a*, varied specifically in relation to the ice-cover season. Specifically, nitrate/nitrite, DIN, and DP were higher and chlorophyll *a* was lower in winter, relative to one or more of the other sampling periods.

Spatial Comparisons

Similar to the *in situ* water quality conditions, statistical differences between Threepoint and Leftrook lakes were observed for a number of routine water quality variables. Many water quality variables were significantly higher in Leftrook Lake than in Threepoint Lake, including total alkalinity (Figure 5.5.4-73), bicarbonate alkalinity (Figure 5.5.4-74), total Kjeldahl nitrogen (TKN; Figure 5.5.4-75), organic nitrogen (Figure 5.5.4-76), TN (Figure 5.5.4-57), total organic carbon (TOC; Figure 5.5.4-77), total inorganic carbon (Figure 5.5.4-78), and TDS (Figure 5.5.4-79). Only one routine water quality variable - TSS - was significantly lower in Leftrook Lake than in Threepoint Lake (Figure 5.5.4-80). As previously discussed, differences in water quality between the on- and off-system waterbodies would be expected due to inherent differences in the lakes' drainage basins, morphometries, and hydrological conditions.

Although statistical analyses did not incorporate Rat, Notigi (East and West), Footprint, or Apussigamasi lakes due to limited data (i.e., only one year of data), a number of variables qualitatively indicated potential changes in water quality conditions from upstream to downstream. Specifically, several water quality parameters appear to increase in lakes with distance downstream, including: TDS (Figure 5.5.4-79); TSS (Figure 5.5.4-80); TOC (Figure 5.5.4-77); dissolved organic carbon (Figure 5.5.4-81); particulate phosphorous (Figure 5.5.4-82); TP (Figure 5.5.4-55); TKN (Figure 5.5.4-75); organic nitrogen (Figure 5.5.4-76); and TN (Figure 5.5.4-57). In particular, water quality in Apussigamasi Lake appears to differ from other upstream on-system waterbodies.

Some water quality conditions (e.g., alkalinity, TN, TDS) of Footprint Lake were more similar to the off-system waterbody (i.e., Leftrook Lake) than sites located on the main flow of the Rat/Burntwood River system (Figure 5.5.4-1). Statistical differences will be re-assessed in the future when additional data are acquired for this waterbody.

Temporal Comparisons

None of the routine water quality variables monitored in the Threepoint or Leftrook Lakes were statistically different between sampling years, indicating that these parameters remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. It is notable that water levels in Threepoint Lake were also similar between 2009 and 2010. Hydrological conditions of Leftrook Lake were only studied in June and July 2010 and information is insufficient to evaluate potential effects of hydrology on water quality (see Section 5.5.2 for a discussion of hydrological conditions). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.5.4.4 Trophic Status

Churchill River Diversion

With the exception of Notigi Lake, waterbodies along the Churchill River Diversion system are classified as meso-eutrophic on the basis of TP concentrations (Table 5.5.4-2); Notigi Lake-West and –East contain slightly lower concentrations of TP and are both classified as mesotrophic. Application of trophic categorization schemes for lakes based on chlorophyll *a* yielded somewhat lower trophic categorizations (Table 5.5.4-3), with the on-system sites being classified as oligotrophic to mesotrophic. Rat, Notigi, and Threepoint lakes are classified as oligotrophic on the basis of TN concentrations while Footprint and Apussigamasi lakes are mesotrophic (Table 5.5.4-4). Neither TP nor TN was significantly related to chlorophyll *a* in Threepoint Lake (i.e., the annual site with multiple years of data), suggesting other factors may be important in governing phytoplankton production (Figure 5.5.4-83). However, the lack of a correlation may alternatively reflect the relatively limited number of data points.

Off-system Waterbody: Leftrook Lake

The trophic status of Leftrook Lake was generally higher than Rat, Notigi, and Threepoint lakes and was similar to Apussigamasi and Footprint lakes. Leftrook Lake is classified as meso-eutrophic to eutrophic on the basis of mean open-water TP concentrations (Table 5.5.4-2), mesotrophic to eutrophic on the basis of chlorophyll *a* concentrations (Table 5.5.4-3), and mesotrophic on the basis of TN concentrations (Table 5.5.4-4). Unlike Threepoint Lake, both TP and TN were significantly and strongly positively correlated to chlorophyll *a* in Leftrook Lake (Figure 5.5.4-84).

5.5.4.5 Escherichia coli

Churchill River Diversion

E. coli was not detected in Rat Lake or Notigi Lake-East over the study period but was detected at varying frequencies at each of the other on-system sites (Table 5.5.4-5). *E. coli* was detected once in either spring or fall at Notigi-West, Threepoint, and Footprint lakes and was detected at Apussigamasi Lake during all sampling periods. The concentration measured in Apussigamasi Lake in winter 2010 was above the Manitoba water quality objective for primary recreation of 200 colony forming units (CFU)/100 mL; however, this guideline only applies to the recreational season and is therefore not applicable. Apussigamasi Lake is downstream of Thompson and may be affected by point source discharges, including discharge of treated sewage effluent. All other measurements were well below the primary recreation objective.

Off-system Waterbody: Leftrook Lake

Similar to Rat Lake and Notigi Lake-East, *E. coli* was not detected in Leftrook Lake over the study period (Table 5.5.4-5). As such, all measurements were well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

5.5.4.6 Metals and Major Ions

Churchill River Diversion

The dominant cation in the Rat/Burntwood River system is calcium, followed by magnesium (Figure 5.5.4-85), and hardness measurements indicate that waters in lakes located along the main flow of the Rat/Burntwood river system are soft (Figure 5.5.4-86). Like the off-system lake, Footprint Lake, which is located off of the main flow of the Rat/Burntwood River system, is moderately hard. Chloride concentrations are very low along the Churchill River Diversion system (i.e., < 2.0 mg/L; Figure 5.5.4-87), 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 are also well below the CCME PAL guideline of 120 mg/L for long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 15 mg/L, averaged less than 6 mg/L across sites (Figure 5.5.4-87), 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).

Of the 38 metals/metalloids measured at sites along the Churchill River Diversion system, only eight were never detected in surface waters (beryllium, bismuth, mercury, selenium, tellurium, thallium, tungsten, and zinc; Table 5.5.4-6). Metals that were consistently detected at all sites and times included: aluminum; barium; calcium; copper; iron; magnesium; manganese; potassium; rubidium; silicon; sodium; strontium; and titanium. The remaining metals were detected at varying frequencies, although antimony, cesium, silver, and tin were detected in less than 30% of samples in each waterbody.

All but three metals were present in concentrations below the MWQSOGs for PAL at all on-system sites during all sampling times; the exceptions included aluminum, iron, and silver (Table 5.5.4-7). All surface samples collected from the on-system lakes exceeded the PAL guideline of 0.1 mg/L for aluminum (Figure 5.5.4-88). Iron also exceeded the PAL guideline (0.3 mg/L; Figure 5.5.4-89) in 25-100% of samples collected along the Churchill River Diversion, with the exception of Notigi Lake-East where all samples were below the PAL guideline. Additionally, one surface sample collected from Notigi Lake-West was marginally above the PAL for silver (0.0001 mg/L) and one sample from Notigi Lake East was at the guideline. However, measurements that are at or near analytical detection limits (DLs) are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the guideline is at or near the DL.

The analytical DLs for mercury varied over the study period and were frequently above the current MWQSOG PAL guideline (0.000026 mg/L). Therefore comparison of analytical results to the PAL guideline is problematic; however, mercury was never detected at any of the sites along the Churchill River Diversion over the two year study period. Additionally, the lowest analytical DL (0.00002 mg/L) is less than the PAL guideline; therefore, mercury was below the PAL guideline in the samples analysed at the lowest DL.

As observed for some forms of nutrients, concentrations of total aluminum, iron, and manganese were higher in samples collected near the sediment-water interface relative to surface grabs collected from Notigi Lake-West and –East in summer and spring 2009, respectively (Figures 5.5.4-90 and 5.5.4-91), when the lake was thermally stratified (Figures 5.5.4-11 and Figure 5.5.4-9). Aluminum and iron concentrations were nearly four times higher in hypolimnetic samples relative to epilimnetic samples in Notigi Lake-West in summer 2009 when the thermocline was deep. Aluminum and iron were above the PAL guidelines in these bottom samples.

In contrast, metal concentrations measured in hypolimnetic samples collected from Footprint Lake in spring 2010 during a period of stratification were similar to those found for surface water samples (Figure 5.5.4-92) even though stratification was fairly pronounced (Figure 5.5.4-10). These metals are commonly elevated in freshwater ecosystems at depth under stratification and/or low DO concentrations.

<u>Off-system Waterbody: Leftrook Lake</u>

As is the case for sites along the Churchill River Diversion, the dominant cation in Leftrook Lake is calcium, followed by magnesium (Figure 5.5.4-85), and hardness measurements indicate that waters are moderately hard (Figure 5.5.4-86). Chloride concentrations are extremely low in the lake (i.e., < 1.0 mg/L; Figure 5.5.4-87), which is consistent with concentrations reported elsewhere in the "unimpacted Canadian shield region of central Canada" (CCME 1999, updated to 2013). Concentrations of chloride are also well below the CCME PAL guideline of 120 mg/L for long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 8 mg/L, averaged less than 5 mg/L over the period of study (Figure 5.5.4-

87), fell on the lower range of concentrations reported across Canada (CCREM 1987), and were well below the BCMOE PAL guideline (Meays and Nordin 2013)..

Of the 38 metals/metalloids measured in Leftrook Lake, a number were never detected (beryllium, bismuth, boron, cesium, chromium, cobalt, mercury, nickel, selenium, silver, tellurium, thallium, thorium, tungsten, zinc, and zirconium; Table 5.5.4-6). Metals that were consistently detected during all sampling periods included: aluminum; barium; calcium; iron; magnesium; manganese; potassium; rubidium; silicon; sodium; strontium; and uranium. The remaining metals were detected at varying frequencies, although antimony, cadmium, lead, and tin were detected in less than 30% of samples.

In contrast to on-system sites, all metals measured in Leftrook Lake during the CAMPP study period were present in concentrations below the MWQSOGs for PAL (Table 5.5.4-7). The analytical DLs for mercury varied over the study period and were frequently above the current MWQSOG PAL guideline (0.000026 mg/L). Considering only the results of analyses where the analytical DL was sufficiently low to facilitate this comparison, all measurements from were below the current MWQSOG PAL.

During stratification of Leftrook Lake in winter 2009/2010, concentrations of total iron and manganese were higher in samples collected near the sediment-water interface relative to surface grabs (Figure 5.5.4-93); this commonly occurs in freshwater ecosystems at depth under stratification and/or low DO concentrations. In contrast, strong, deep stratification of Leftrook Lake occurred in spring 2010 (Figure 5.5.4-39) but no difference in metal concentrations were observed between epilimnetic and hypolimnetic samples. Neither of these bottom samples had metal concentrations above the MWQSOG PAL (Table 5.5.4-7).

Seasonal Differences

Data are insufficient to perform statistical tests of seasonal differences in this region. Qualitative evaluation of the data indicates that seasonality of metals was generally different between Threepoint and Leftrook lakes. At Threepoint Lake, total barium (Figure 5.5.4-94) and rubidium (Figure 5.5.4-95) concentrations were lower in spring than summer or fall, and hardness (Figure 5.5.4-96), total calcium (Figure 5.5.4-97), and magnesium (Figure 5.5.4-98) concentrations were higher in fall than any other season. In contrast, seasonality at Leftrook Lake was largely related to differences between the open-water and ice-cover season, as hardness (Figure 5.5.4-96), barium (Figure 5.5.4-94), calcium (Figure 5.5.4-97), magnesium (Figure 5.5.4-98), potassium (Figure 5.5.4-99), sodium (Figure 5.5.4-100), and strontium (Figure 5.5.4-101) were all higher in winter than any other season.

Spatial Comparisons

Similar to other water quality variables discussed above, a number of metals were significantly different between Threepoint and Leftrook lakes. Threepoint Lake was characterized by significantly higher concentrations of: aluminum (Figure 5.5.4-88); barium (Figure 5.5.4-102); copper (Figure 5.5.4-103); iron (Figure 5.5.4-89); lead (Figure 5.5.4-104); rubidium (Figure 5.5.4-105); thorium (Figure 5.5.4-106); titanium (Figure 5.5.4-107); vanadium (Figure 5.5.4-108); and zirconium (Figure 5.5.4-109). In contrast, calcium (Figure 5.5.4-110), magnesium (Figure 5.5.4-111), manganese (Figure 5.5.4-112), strontium (Figure 5.5.4-113), and uranium (Figure 5.5.4-114) were lower in Threepoint Lake than Leftrook Lake. Leftrook Lake was also harder (i.e., higher hardness) than Threepoint Lake (Figure 5.5.4-86).

While statistical analyses did not incorporate Rat, Notigi-West, Notigi-East, Footprint, or Apussigamasi lakes due to limited data, qualitative examination of the data indicate some additional spatial differences. Hardness (Figure 5.5.4-86), calcium (Figure 5.5.4-110), magnesium (Figure 5.5.4-111), strontium (Figure 5.5.4-113), and uranium (Figure 5.5.4-114) concentrations in Footprint Lake were more similar to those measured in Leftrook Lake than the on-system lakes located directly on the Rat/Burntwood River system. Additionally, copper concentrations increased with distance downstream on the Rat/Burntwood River system (Figure 5.5.4-103).

Temporal Comparisons

Statistical comparisons between sampling years for annual waterbodies (Threepoint and Leftrook lakes) revealed almost no significant differences between 2009 and 2010, although water levels in Threepoint Lake were also similar between 2009 and 2010. The hydrology of Leftrook Lake was only monitored during a brief period in 2010 and data are insufficient to evaluate potential effects of hydrology on water quality (see Section 5.5.2 for a discussion of hydrological conditions). The only interannual differences observed for metals and major ions were: arsenic was significantly higher in 2010 in both waterbodies (Figure 5.5.4-115); and sulphate concentrations were higher in 2009 than 2010 in Leftrook Lake (Figure 5.5.4-116).

The lack of consistent year-to-year differences indicates that water quality conditions in the Churchill River Diversion Region remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

Table 5.5.4-1. Saffran and Trew (1996) categorization of acid sensitivity of aquatic ecosystems and sensitivity ranking for the Churchill River Diversion Region.

Parameter	Units	Acid Sensitivity										
		High	Moderate	Low	Least	Rat Lake	Notigi L-West	Notigi L-East	Threepoint Lake	Footprint Lake	Apussigamasi Lake	Leftrook Lake
pH	-	<6.5	6.6-7.0	7.1-7.5	>7.5	Least	Least	Least	Least	Least	Least	Least
Total Alkalinity (as $CaCO_3$)	mg/L	0-10	11-20	21-40	>40	Least	Least	Least	Least	Least	Least	Least
Calcium	mg/L	0-4	5-8	9-25	>25	Low	Low	Low	Low	Low	Low	Least
Total Dissolved Solids	mg/L	0-50	51-200	201-500	>500	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Table 5.5.4-2. Total phosphorus concentrations (open-water season and annual means) measured in the Churchill River Diversion Region and CCME (1999; updated to 2013) trophic categorization: 2008-2010.

Waterbody	Period	Trophic Status Based on TP (mg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic	
		< 0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100	
Rat Lake	Open-water season				0.022			2010
	Annual				0.022			2010/2011
Notigi Lake-West	Open-water season			0.017				2009
	Annual			0.015				2009/2010
Notigi Lake-East	Open-water season			0.018				2009
	Annual			0.017				2009/2010
Threepoint Lake	Open-water season				0.023			2009
	Annual				0.023			2009/2010
	Open-water season				0.028			2010
	Annual				0.028			2010/2011
	Open-water season				0.026			2009-2010
	Annual				0.025			2009/2010 - 2010/2011
Footprint Lake	Open-water season				0.026			2010
	Annual				0.026			2010/2011
Apussigamasi Lake	Open-water season				0.034			2009
	Annual				0.035			2009-2010
Leftrook Lake	Open-water season				0.021			2009
	Annual				0.022			2009/2010
	Open-water season					0.036		2010
	Annual				0.031			2010/2011
	Open-water season				0.026			2009-2010
	Annual				0.029			2009/2010 - 2010/2011

Table 5.5.4-3. 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: 2008/2009-2010/2011.

Waterbody	Period	Lake Trophic Status Based on Chlorophyll *a* (µg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic	
		-	< 2.5	2.5 - 8	-	8 - 25	> 25	
Rat Lake	Open-water season		1.6					2010
	Annual		1.3					2010/2011
Notigi Lake-West	Open-water season		2.4					2009
	Annual		1.9					2009/2010
Notigi Lake-East	Open-water season			2.6				2009
	Annual		2.0					2009/2010
Threepoint Lake	Open-water season		2.4					2009
	Annual		1.9					2009/2010
	Open-water season		1.4					2010
	Annual		1.1					2010/2011
	Open-water season		1.9					2009-2010
	Annual		1.5					2009/2010 - 2010/2011
Footprint Lake	Open-water season			3.3				2010
	Annual			2.6				2010/2011
Apussigamasi Lake	Open-water season			2.7				2009
	Annual		2.1					2009/2010
Leftrook Lake	Open-water season			6.4				2009
	Annual			5.1				2009/2010
	Open-water season					9.1		2010
	Annual			6.9				2010/2011
	Open-water season			7.7				2009-2010
	Annual			6.0				2009/2010 - 2010/2011

Table 5.5.4-4. 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): 2008/2009-2010/2011.

Waterbody	Period	Lake Trophic Status Based on TN (mg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic	
		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2	
Rat Lake	Open-water season		0.30					2010
	Annual		0.32					2010/2011
Notigi Lake-West	Open-water season		0.32					2009
	Annual			0.35				2009/2010
Notigi Lake-East	Open-water season		0.30					2009
	Annual		0.33					2009/2010
Threepoint Lake	Open-water season		0.35					2009
	Annual		0.35					2009/2010
	Open-water season		0.32					2010
	Annual		0.32					2010/2011
	Open-water season		0.35					2009-2010
	Annual		0.34					2009/2010 - 2010/2011
Footprint Lake	Open-water season			0.61				2010
	Annual			0.54				2010/2011
Apussigamasi Lake	Open-water season			0.42				2009
	Annual			0.45				2009/2010
Leftrook Lake	Open-water season			0.50				2009
	Annual			0.54				2009/2010
	Open-water season			0.61				2010
	Annual			0.59				2010/2011
	Open-water season			0.56				2009-2010
	Annual			0.56				2009/2010 - 2010/2011

Table 5.5.4-5. Detection frequency and summary statistics for *E. coli* (CFU/100 mL) measured in the Churchill River Diversion Region.

Waterbody	Sample Years	# Detected	n	% Detected	Mean	Median	Max
Rat Lake	2010	0	4	0	<1	<1	<1
Notigi Lake-West	2009	1	4	25	<1	<1	1
Notigi Lake-East	2009	0	4	0	<1	<1	<1
Threepoint Lake	2009-2010	1	8	13	<1	<1	2
Footprint Lake	2010	1	4	25	<1	<1	1
Apussigamasi Lake	2009	4	4	100	93	62	>200[1]
Leftrook Lake	2009-2010	0	8	0	<1	<1	<1

Table 5.5.4-6. Frequency of detection of total metals and major ions measured in the Churchill River Diversion Region: 2008-2010. Values in bold indicate annual sites where detection frequencies ≥30%.

Waterbody	Years		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chloride-Dissolved	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel
Rat Lake	2010	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	0	4	4	0	0	1	1	4	0	4	0	2	4	4	4	3	4	4	0	1	0
		% Detected	**100**	0	**100**	**100**	0	0	25	25	**100**	0	**100**	0	**50**	**100**	**100**	**100**	**75**	**100**	**100**	0	25	0
Notigi Lake - West -Surface	2009	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	4	4	4	4	4
		# Detected	4	1	0	4	0	0	0	2	4	0	4	1	1	4	4	2	0	4	4	0	0	0
		% Detected	**100**	25	0	**100**	0	0	0	**50**	**100**	0	**100**	25	25	**100**	**100**	**50**	-	**100**	**100**	0	0	0
Notigi Lake - West -Bottom	2009	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
		# Detected	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	0	0	1
		% Detected	**100**	0	0	**100**	0	0	0	0	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	-	**100**	**100**	0	0	**100**
Notigi Lake - East -Surface	2009	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	4	4	4	4	4
		# Detected	4	1	0	4	0	0	0	1	4	0	4	1	0	4	4	2	0	4	4	0	0	0
		% Detected	**100**	25	0	**100**	0	0	0	25	**100**	0	**100**	25	0	**100**	**100**	**50**	-	**100**	**100**	0	0	0
Notigi Lake - East -Bottom	2009	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
		# Detected	1	0	0	1	0	0	0	1	1	0	1	1	0	1	1	0	0	1	1	0	0	0
		% Detected	**100**	0	0	**100**	0	0	0	**100**	**100**	0	**100**	**100**	0	**100**	**100**	0	-	**100**	**100**	0	0	0
Threepoint Lake	2009-2010	n	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	4	8	8	8	8	8
		# Detected	8	1	4	8	0	0	1	4	8	1	8	4	6	8	8	6	4	8	8	0	0	0
		% Detected	**100**	13	**50**	**100**	0	0	13	**50**	**100**	13	**100**	**50**	**75**	**100**	**100**	**75**	**100**	**100**	**100**	0	0	0
Footprint Lake -Surface	2010	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	0	4	4	0	0	2	1	4	1	4	1	1	4	4	4	3	4	4	0	3	0
		% Detected	**100**	0	**100**	**100**	0	0	**50**	25	**100**	25	**100**	25	25	**100**	**100**	**100**	**75**	**100**	**100**	0	**75**	0
Footprint Lake -Bottom	2010	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	0	1	1	0	0	0	0	1	0	1	0	0	1	1	1	0	1	1	0	0	0
		% Detected	**100**	0	**100**	**100**	0	0	0	0	**100**	0	**100**	0	0	**100**	**100**	**100**	0	**100**	**100**	0	0	0
Apussigamasi Lake	2009	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	4	4	4	4	4
		# Detected	4	0	1	4	0	0	0	2	4	1	4	2	4	4	4	2	0	4	4	0	0	4
		% Detected	**100**	0	25	**100**	0	0	0	**50**	**100**	25	**100**	**50**	**100**	**100**	**100**	**50**	-	**100**	**100**	0	0	**100**
Leftrook Lake -Surface	2009-2010	n	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	4	8	8	8	8	8
		# Detected	8	1	4	8	0	0	0	2	8	0	8	0	0	6	8	2	2	8	8	0	3	0
		% Detected	**100**	13	**50**	**100**	0	0	0	25	**100**	0	**100**	0	0	**75**	**100**	25	**50**	**100**	**100**	0	**38**	0
Leftrook Lake -Bottom	2009-2010	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
		# Detected	2	0	1	2	0	0	0	0	2	0	2	0	0	1	2	1	1	2	2	0	0	0
		% Detected	**100**	0	**50**	**100**	0	0	0	0	**100**	0	**100**	0	0	**50**	**100**	**50**	**100**	**100**	**100**	0	0	0

Table 5.5.4-6. continued.

Waterbody	Years		Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Sulphate-Dissolved	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Rat Lake	2010	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	4	0	4	4	4	0	0	3	1	4	0	1	4	0	4
		% Detected	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	**75**	25	**100**	0	25	**100**	0	**100**
Notigi Lake - West -Surface	2009	n	4	4	4	0	4	4	4	4	4	4	0	4	4	4	4	4	4	4
		# Detected	4	4	0	0	1	4	4	4	0	0	0	1	4	0	1	0	0	3
		% Detected	**100**	**100**	0	-	25	**100**	**100**	**100**	0	0	-	25	**100**	0	25	0	0	**75**
Notigi Lake - West -Bottom	2009	n	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1
		# Detected	1	1	0	0	0	1	1	1	0	0	0	0	1	0	1	1	0	1
		% Detected	**100**	**100**	0	-	0	**100**	**100**	**100**	0	0	-	0	**100**	0	**100**	**100**	0	**100**
Notigi Lake - East -Surface	2009	n	4	4	4	0	4	4	4	4	4	4	0	4	4	4	4	4	4	4
		# Detected	4	4	0	0	1	4	4	4	0	0	0	1	4	0	3	0	0	3
		% Detected	**100**	**100**	0	-	25	**100**	**100**	**100**	0	0	-	25	**100**	0	**75**	0	0	**75**
Notigi Lake - East -Bottom	2009	n	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1
		# Detected	1	1	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	0
		% Detected	**100**	**100**	0	-	0	**100**	**100**	**100**	0	0	-	0	**100**	0	**100**	0	0	0
Threepoint Lake	2009-2010	n	8	8	8	4	8	8	8	8	8	8	4	8	8	8	8	8	8	8
		# Detected	8	8	0	4	0	8	8	8	0	0	4	1	8	0	5	7	0	8
		% Detected	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	**100**	13	**100**	0	**63**	**88**	0	**100**
Footprint Lake -Surface	2010	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	4	0	4	0	4	4	4	0	0	4	1	4	0	4	4	0	4
		% Detected	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	**100**	25	**100**	0	**100**	**100**	0	**100**
Footprint Lake -Bottom	2010	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		# Detected	1	1	0	1	0	1	1	1	0	0	0	0	1	0	1	1	0	0
		% Detected	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	0	0	**100**	0	**100**	**100**	0	0
Apussigamasi Lake	2009	n	4	4	4	0	4	4	4	4	4	4	0	4	4	4	4	4	4	4
		# Detected	4	4	0	0	0	4	4	4	0	0	0	0	4	0	4	4	0	4
		% Detected	**100**	**100**	0	-	0	**100**	**100**	**100**	0	0	-	0	**100**	0	**100**	**100**	0	**100**
Leftrook Lake -Surface	2009-2010	n	8	8	8	4	8	8	8	8	8	8	4	8	8	8	8	8	8	8
		# Detected	8	8	0	4	0	8	8	8	0	0	0	1	6	0	8	4	0	0
		% Detected	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	0	13	**75**	0	**100**	**50**	0	0
Leftrook Lake -Bottom	2009-2010	n	2	2	2	1	2	2	2	2	2	2	1	2	2	2	2	2	2	2
		# Detected	2	2	0	1	0	2	2	2	0	0	0	1	1	0	2	1	0	0
		% Detected	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	0	**50**	**50**	0	**100**	**50**	0	0

Table 5.5.4-7. Frequency of exceedances of MWQSOGs for PAL for total metals measured in the Churchill River Diversion Region: 2008-2010. Values in bold indicate exceedances occurred at a given site.

Waterbody	Years		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury [1]	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc
		MWQSOGs PAL (mg/L)	0.1	0.15	1.5	0.00013-0.00035	0.0394-0.116	0.0041-0.0127	0.3	0.00094-0.00502	0.000026	0.073	0.0232-0.0706	0.001	0.0001	0.0008	0.015	0.0533-0.162
Rat Lake	2010	n	4	4	4	4	4	4	4	4	0	4	4	4	4	4	4	4
-Surface		# Exceedances	4	0	0	0	0	0	3	0	-	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**75**	0	-	0	0	0	0	0	0	0
Notigi Lake-West	2009	n	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4
-Surface		# Exceedances	4	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**25**	0	0	0	0	0	**25**	0	0	0
Notigi Lake-West	2009	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
-Bottom		# Exceedances	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**100**	0	0	0	0	0	0	0	0	0
Notigi Lake-East	2009	n	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4
-Surface		# Exceedances	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		% Exceedances	**100**	0	0	0	0	0	0	0	0	0	0	0	**25**	0	0	0
Notigi Lake-East	2009	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
-Bottom		# Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		% Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Threepoint Lake	2009-2010	n	8	8	8	8	8	8	8	8	3	8	8	8	8	8	8	8
-Surface		# Exceedances	8	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**100**	0	0	0	0	0	0	0	0	0
Footprint Lake	2010	n	4	4	4	4	4	4	4	4	0	4	4	4	4	4	4	4
-Surface		# Exceedances	4	0	0	0	0	0	1	0	-	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**25**	0	-	0	0	0	0	0	0	0
Footprint Lake	2010	n	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
-Bottom		# Exceedances	1	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
Apussigamasi Lake	2009	n	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4
-Surface		# Exceedances	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**100**	0	0	0	0	0	0	0	0	0
Leftrook Lake	2009-2010	n	8	8	8	8	8	8	8	8	3	8	8	8	8	8	8	8
-Surface		# Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		% Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leftrook Lake	2009-2010	n	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
-Bottom		# Exceedances	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
		% Exceedances	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0

[1]includes only water quality samples with an analytical detection limit of less than 0.000026 mg/L.

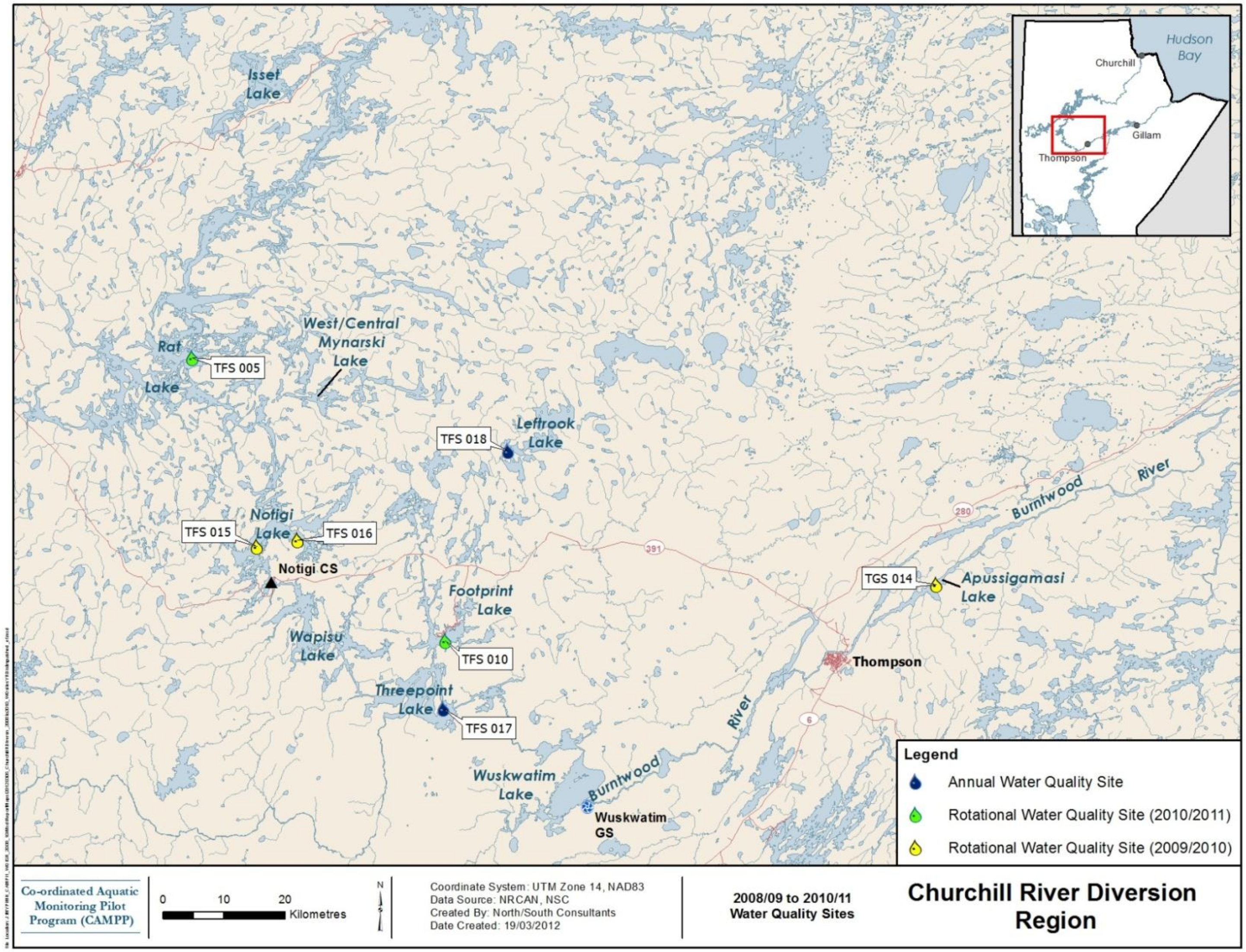


Figure 5.5.4-1. Water quality and phytoplankton monitoring sites in the Churchill River Diversion Region.

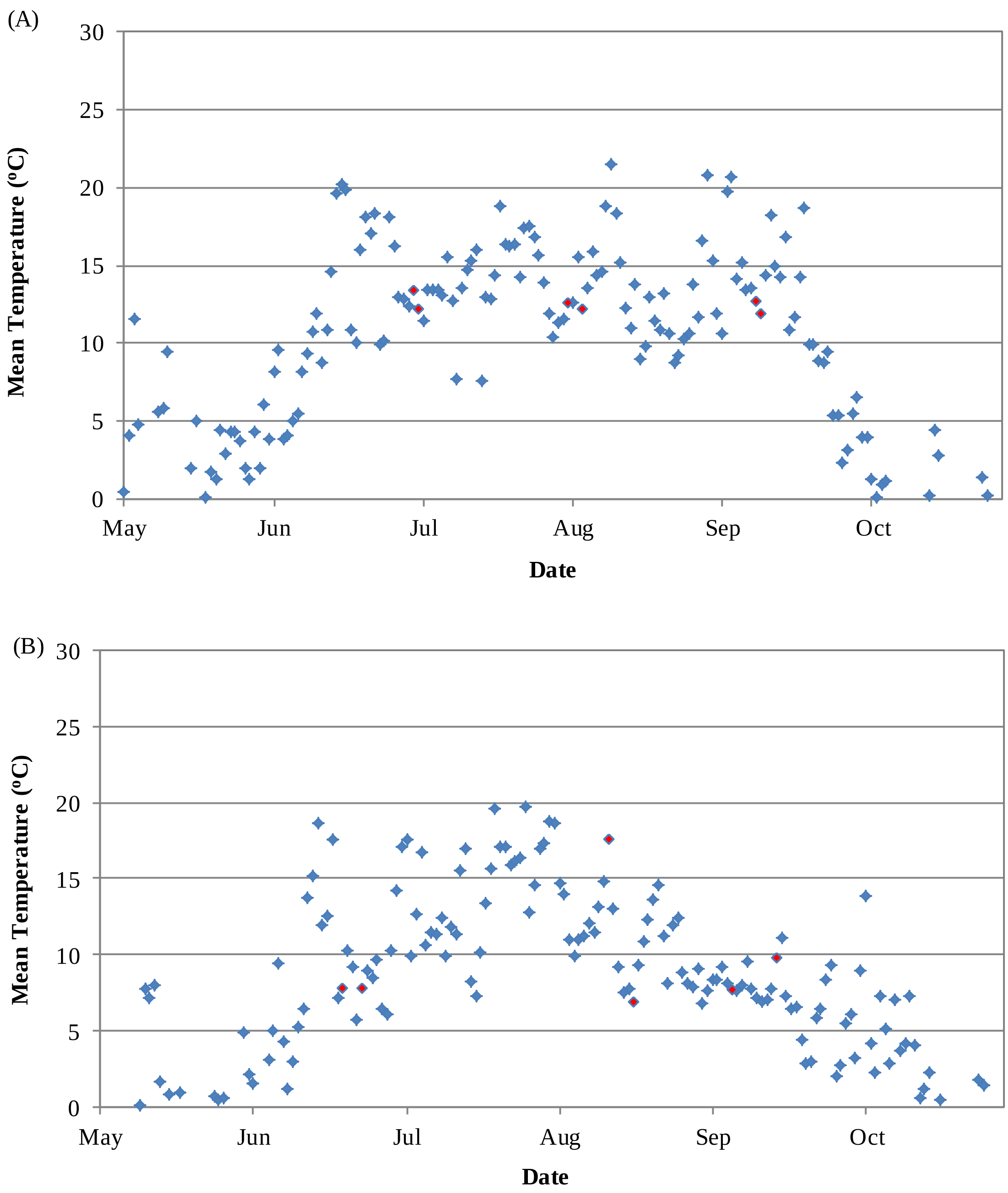


Figure 5.5.4-2. Mean daily air temperatures and water quality sampling dates (indicated in red) for the Churchill River Diversion Region: (A) 2009; and (B) 2010.

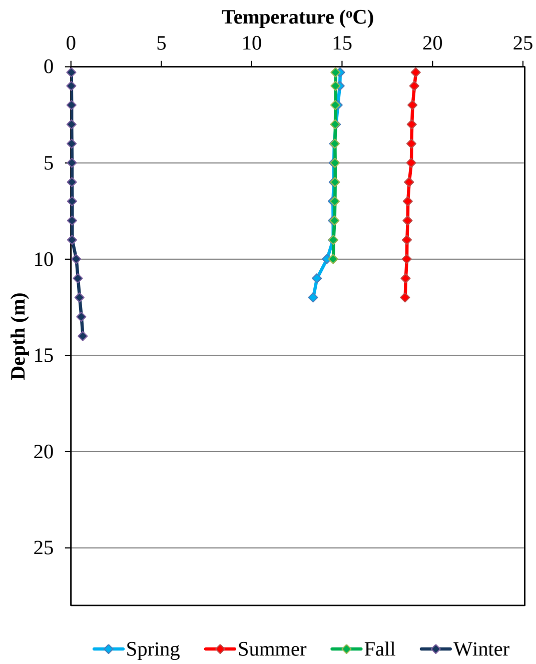


Figure 5.5.4-3. Water temperature profile measured in Rat Lake 2010/2011.

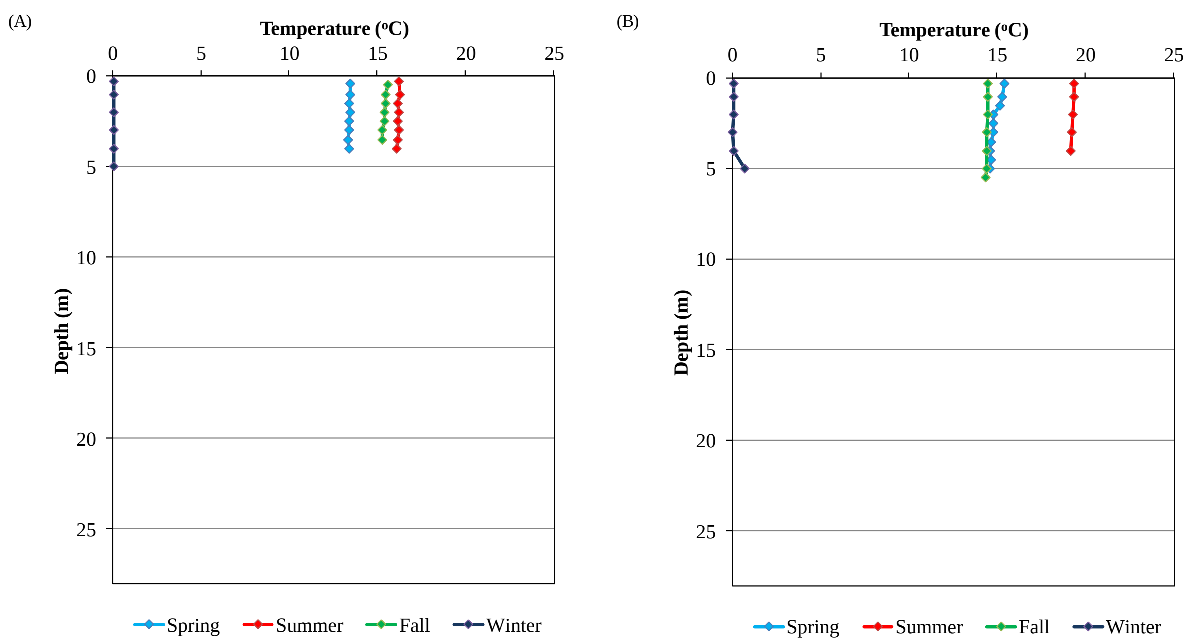


Figure 5.5.4-4. Water temperature profile measured in Threepoint Lake: (A) 2009/2010 and (B) 2010/2011.

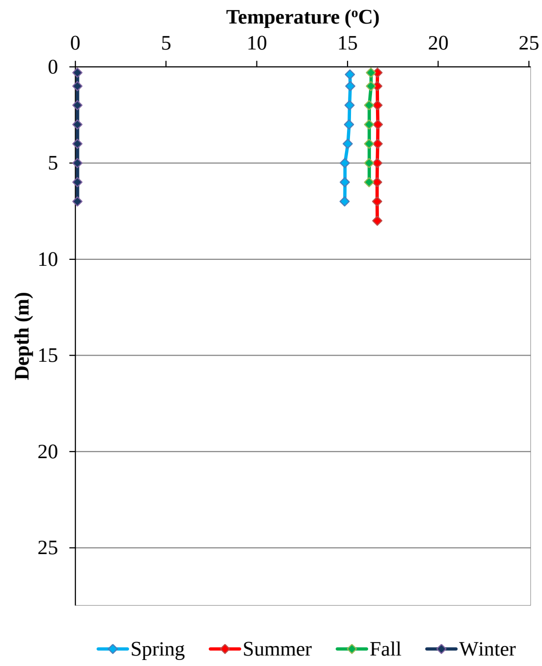


Figure 5.5.4-5. Water temperature profile measured in Apussigamasi Lake 2009/2010.

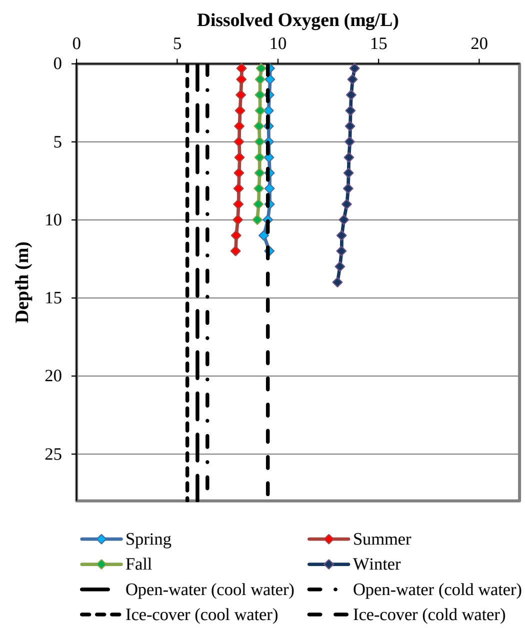


Figure 5.5.4-6. Dissolved oxygen depth profiles measured in Rat Lake 2010/2011.

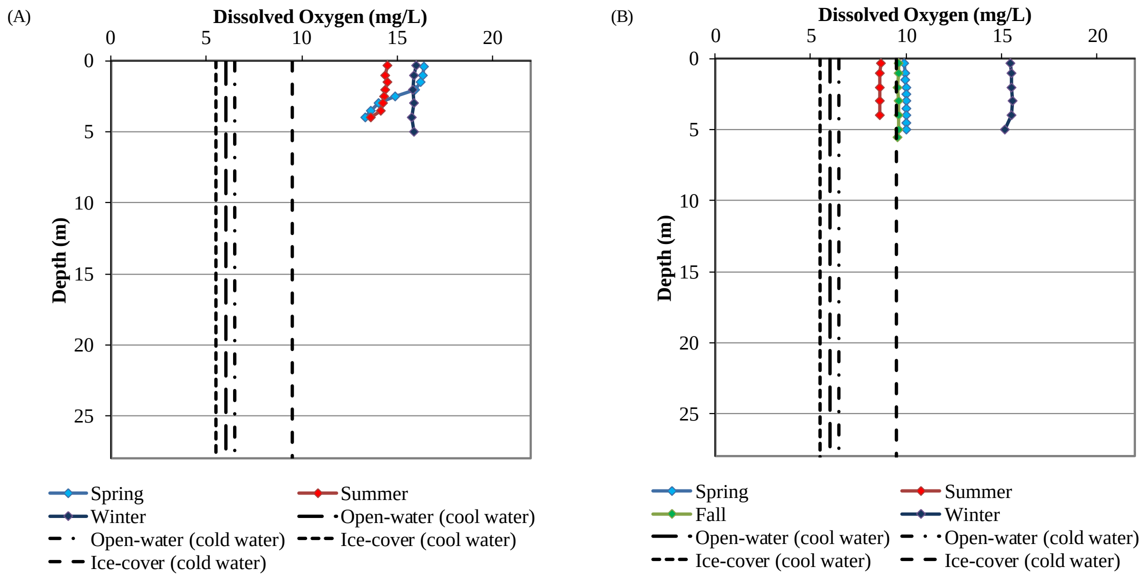


Figure 5.5.4-7. Dissolved oxygen depth profiles measured in Threepoint Lake: (A) 2009/2010 and (B) 2010/2011.

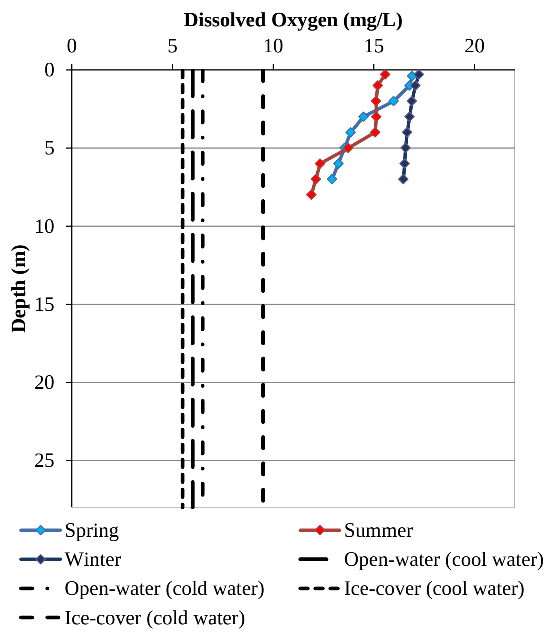


Figure 5.5.4-8. Dissolved oxygen depth profiles measured in Apussigamasi Lake 2009/2010.

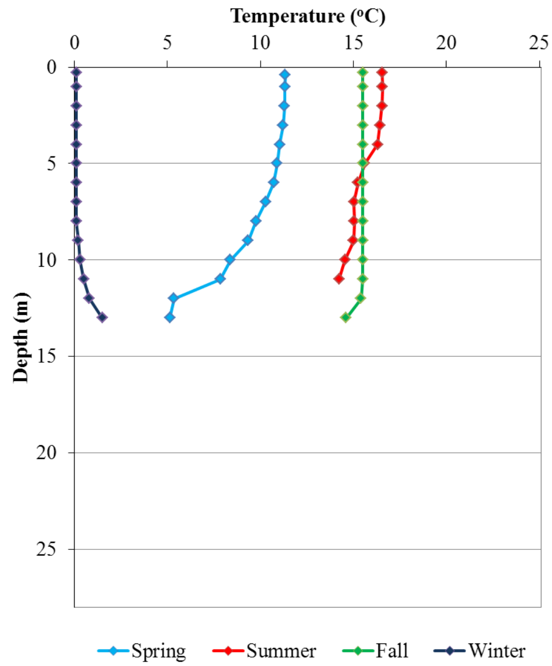


Figure 5.5.4-9. Water temperature profile measured in Notigi Lake-East 2009/2010.

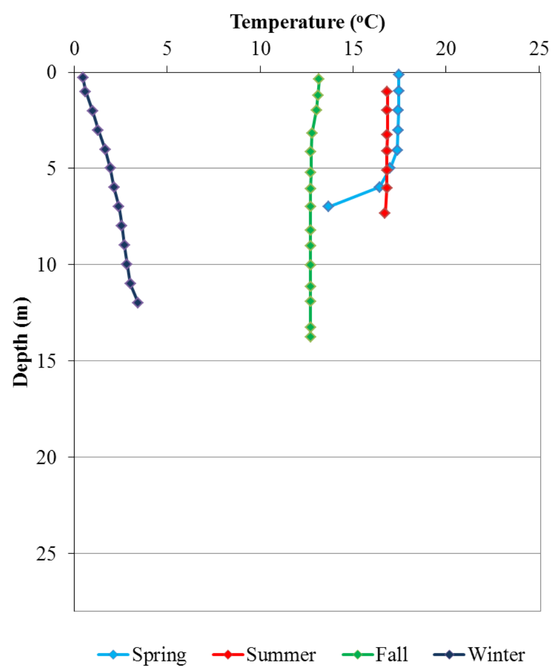


Figure 5.5.4-10. Water temperature profile measured in Footprint Lake 2010/2011.

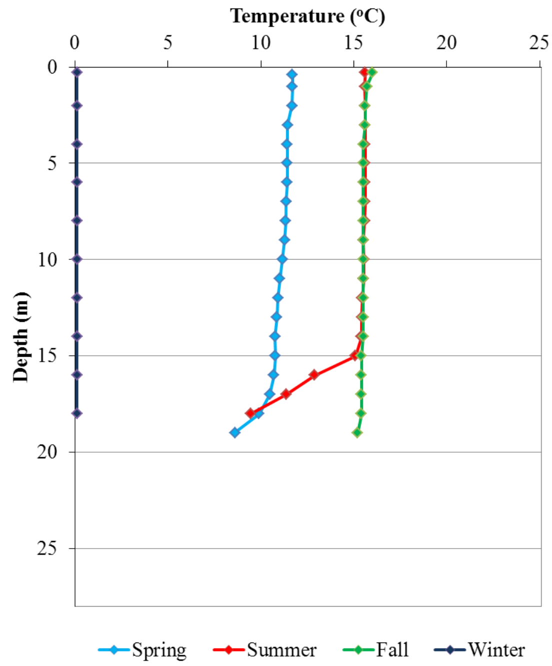


Figure 5.5.4-11. Water temperature profile measured in Notigi Lake-West 2009/2010.

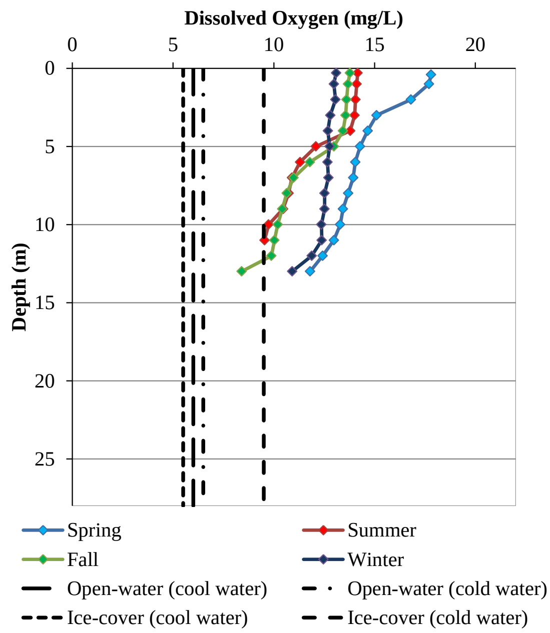


Figure 5.5.4-12. Dissolved oxygen depth profiles measured in Notigi-East in 2009/2010.

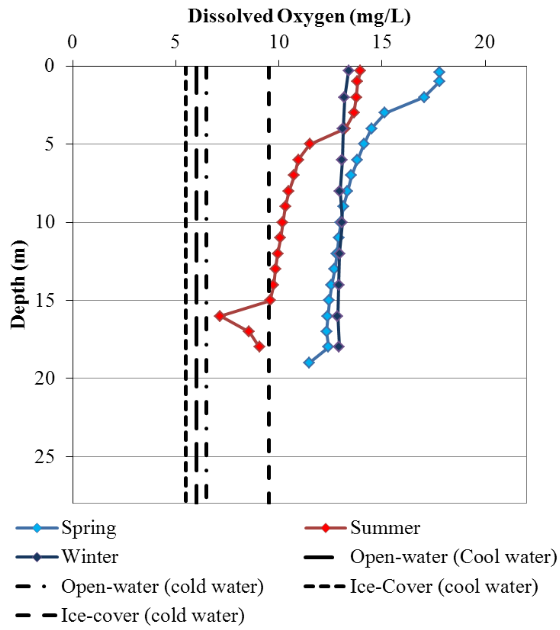


Figure 5.5.4-13. Dissolved oxygen depth profiles measured in Notigi-West in 2009/2010.

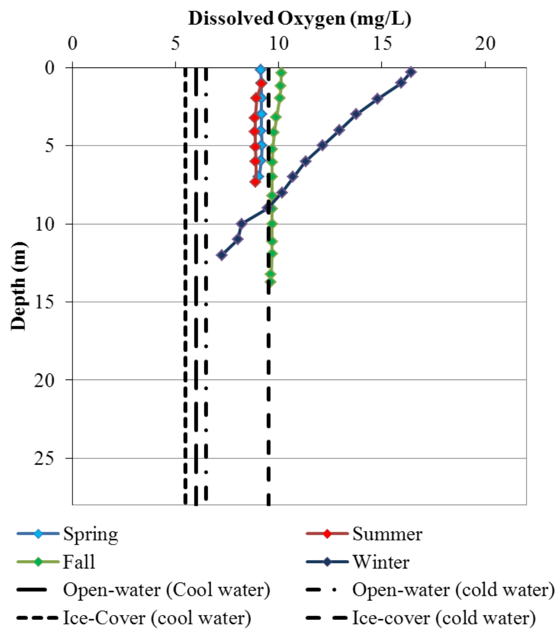


Figure 5.5.4-14. Dissolved oxygen depth profiles measured in Footprint Lake 2010/2011.

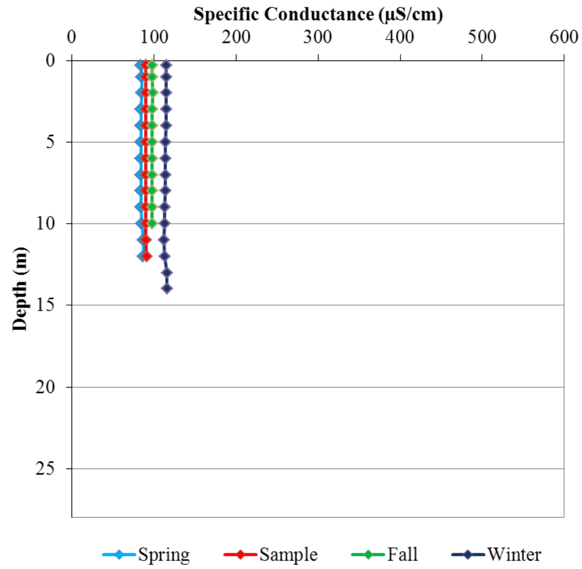


Figure 5.5.4-15. Specific conductance depth profiles measured in Rat Lake 2010/2011.

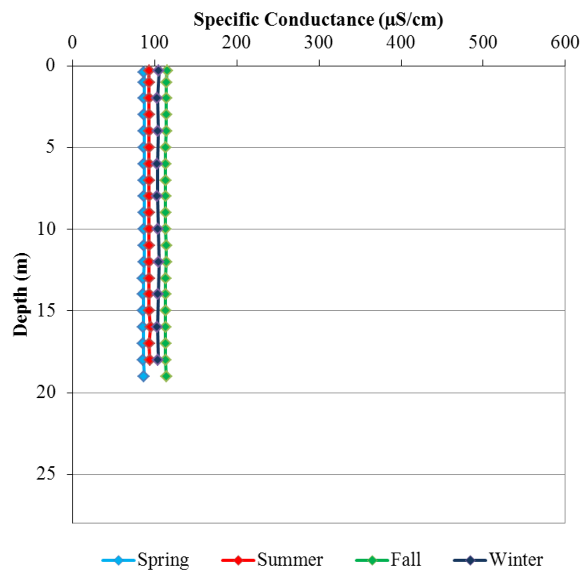


Figure 5.5.4-16. Specific conductance depth profiles measured in Notigi-West 2009/2010.

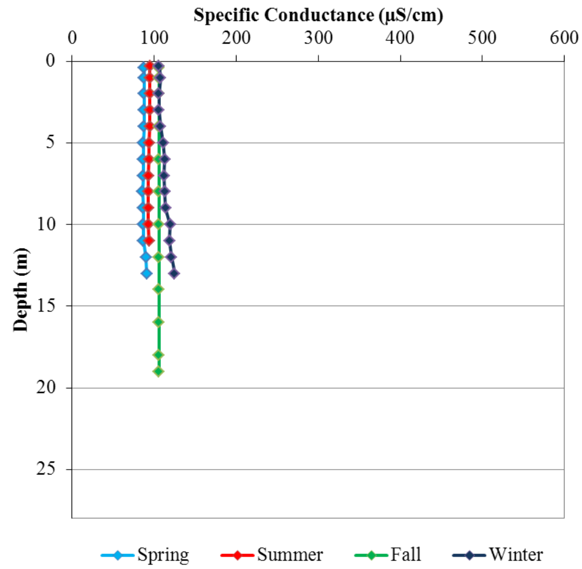
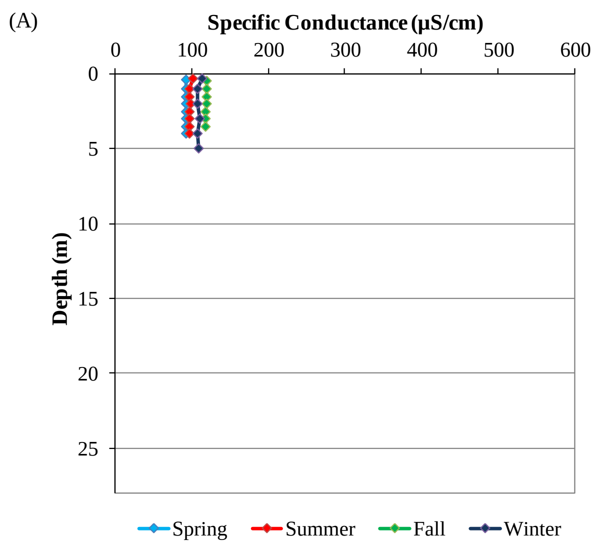


Figure 5.5.4-17. Specific conductance depth profiles measured in Notigi-East 2009/2010.



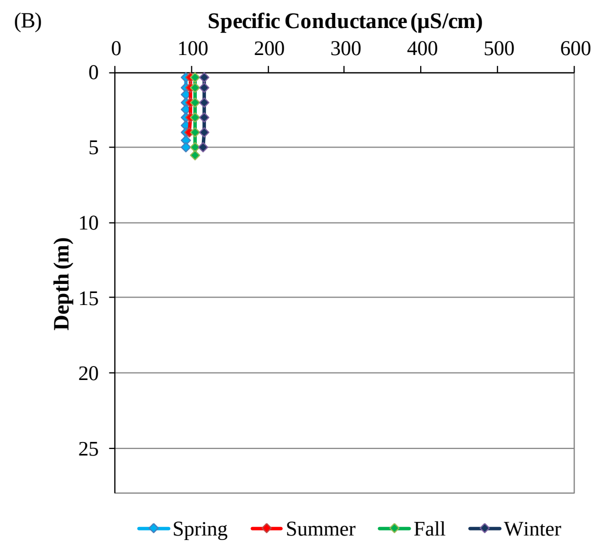


Figure 5.5.4-18. Specific conductance depth profiles measured in Threepoint Lake: (A) 2009/2010 and (B) 2010/2011.

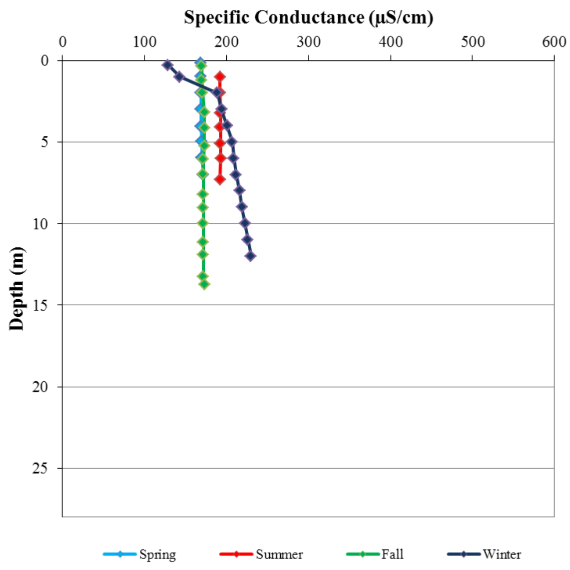


Figure 5.5.4-19. Specific conductance depth profiles measured in Footprint Lake 2010/2011.

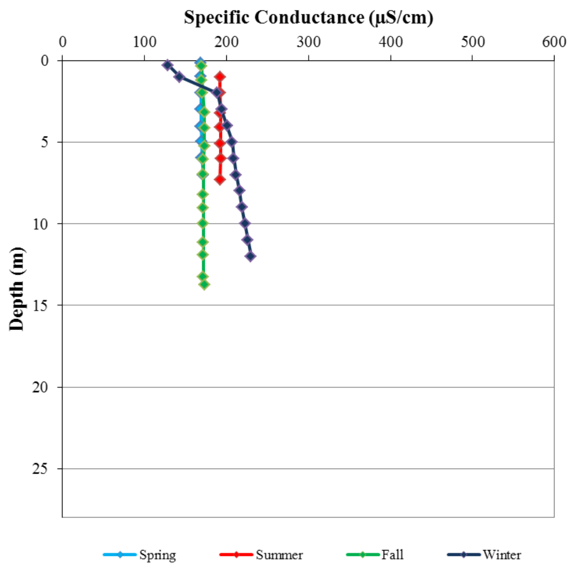


Figure 5.5.4-20. Specific conductance depth profiles measured in Apussigamasi Lake 2009/2010.

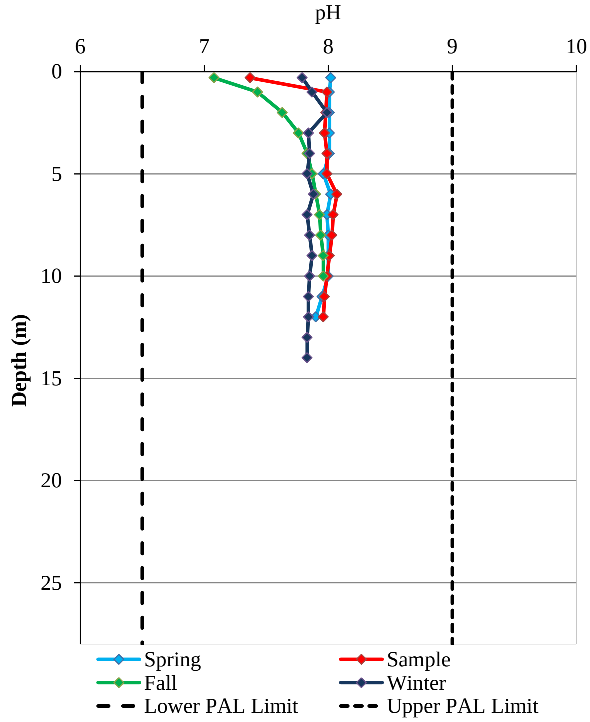


Figure 5.5.4-21. pH depth profiles measured at Rat Lake 2010/2011.

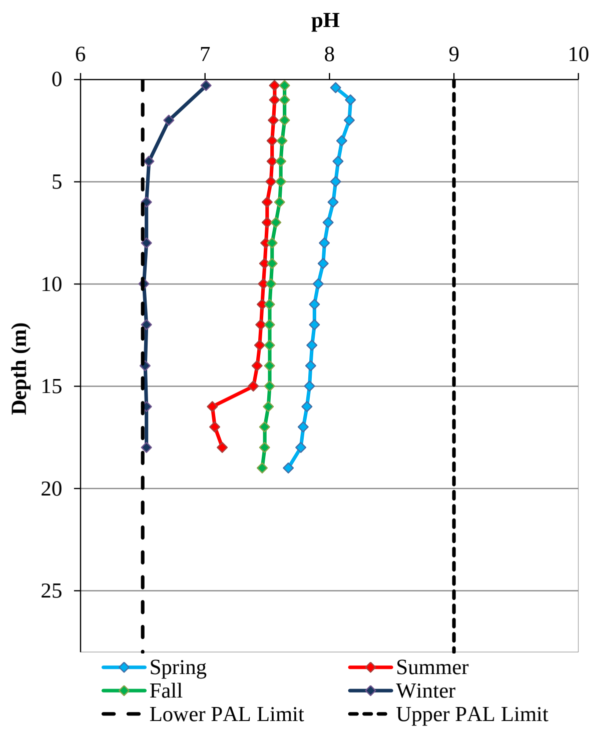


Figure 5.5.4-22. pH depth profiles measured at Notigi-West 2009/2010.

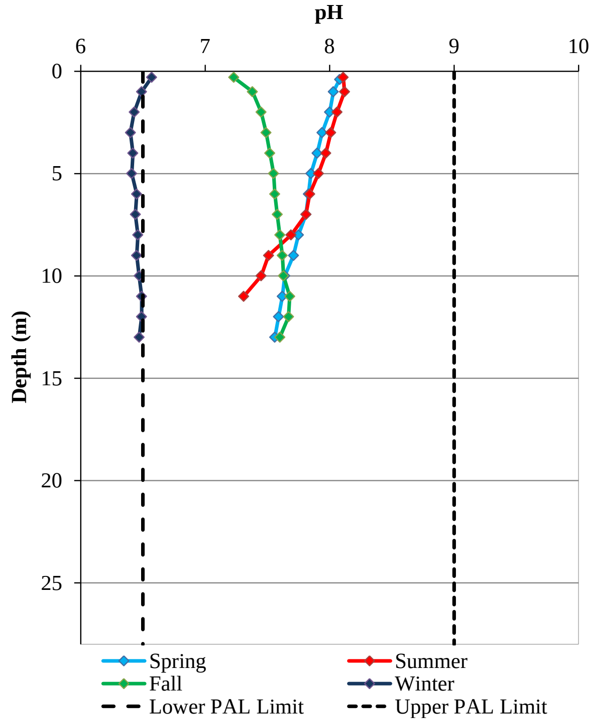


Figure 5.5.4-23. pH depth profiles measured at Notigi-East 2009/2010.

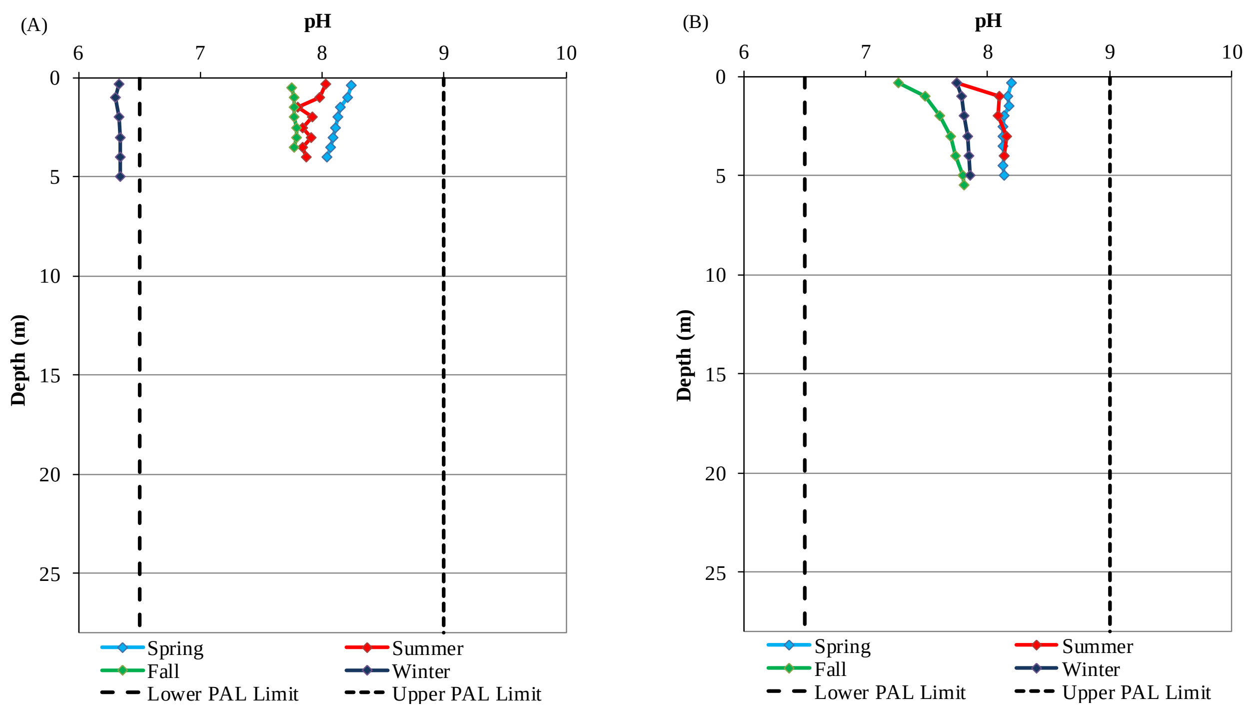


Figure 5.5.4-24. pH depth profiles measured at Threepoint Lake: (A) 2009/2010 and (B) 2010/2011.

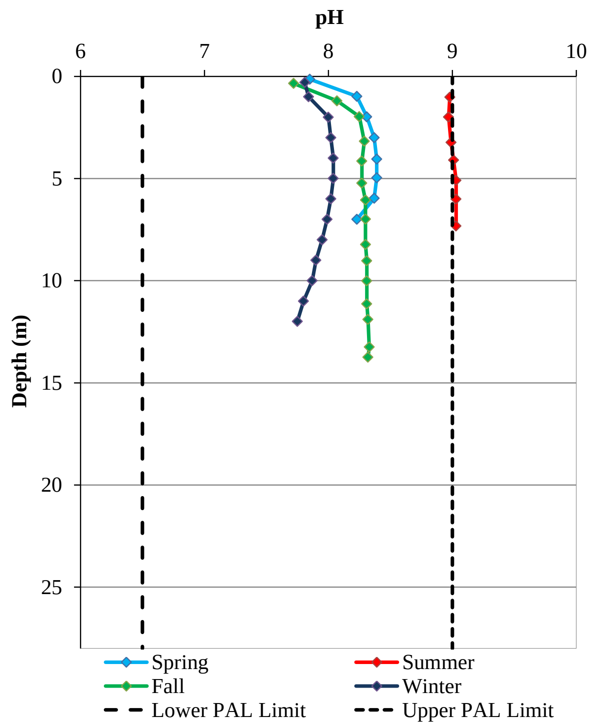


Figure 5.5.4-25. pH depth profiles measured at in Footprint Lake 2010/2011.

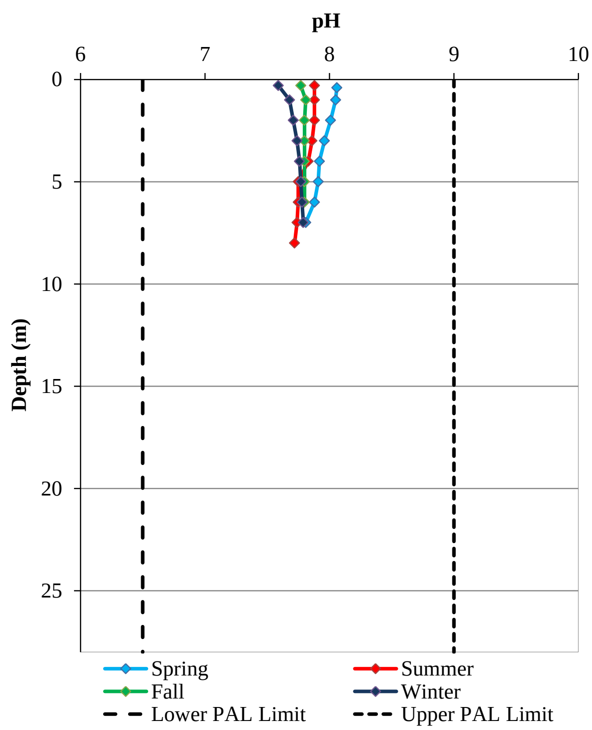


Figure 5.5.4-26. pH depth profiles measured at Apussigamasi Lake 2009/2010.

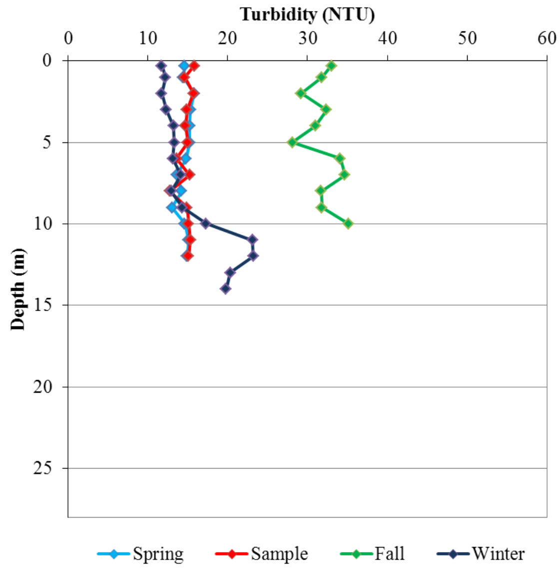


Figure 5.5.4-27. Turbidity depth profiles measured in Rat Lake 2010/2011.

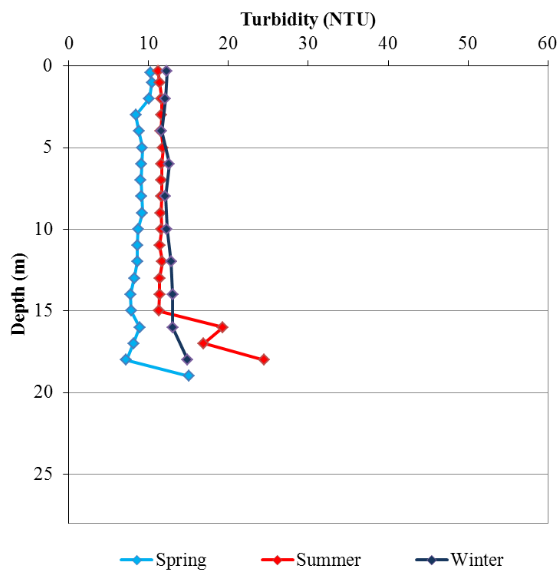


Figure 5.5.4-28. Turbidity depth profiles measured in Notigi-West 2009/2010.

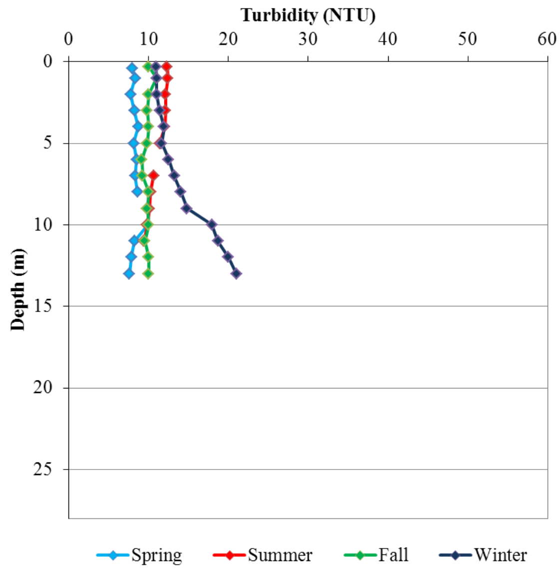


Figure 5.5.4-29. Turbidity depth profiles measured in Notigi-East 2009/2010.

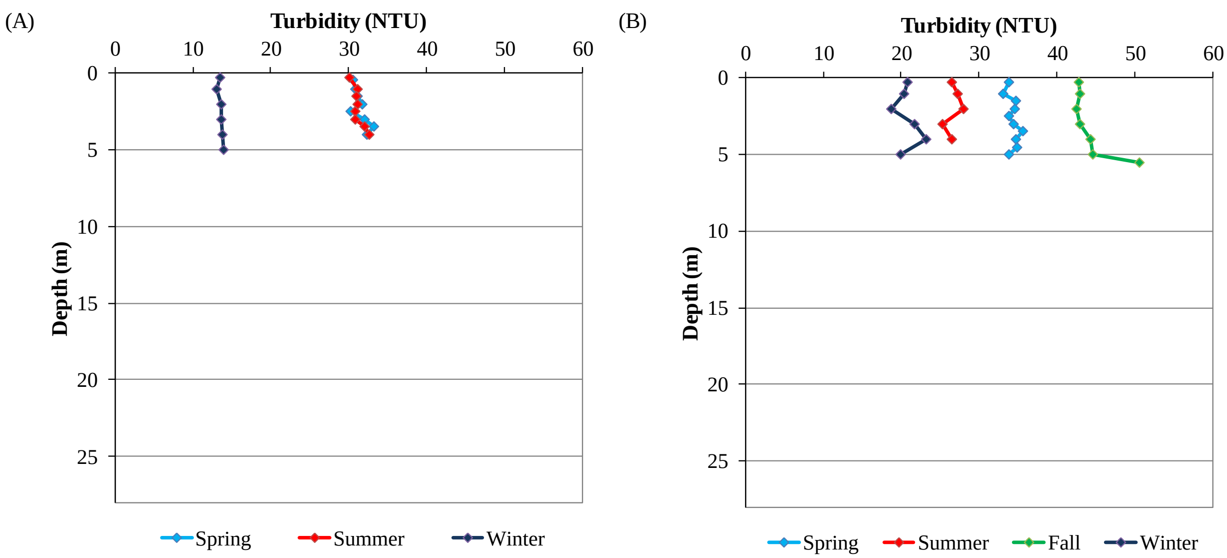


Figure 5.5.4-30. Turbidity depth profiles measured in Threepoint Lake: (A) 2009/2010 and (B) 2010/2011.

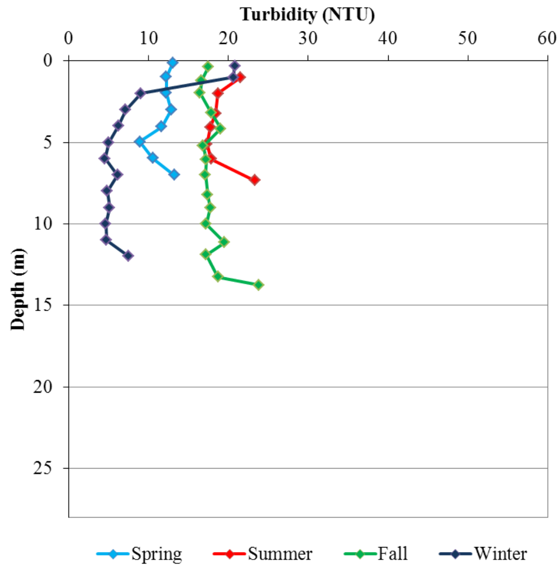


Figure 5.5.4-31. Turbidity depth profiles measured in Footprint Lake 2010/2011.

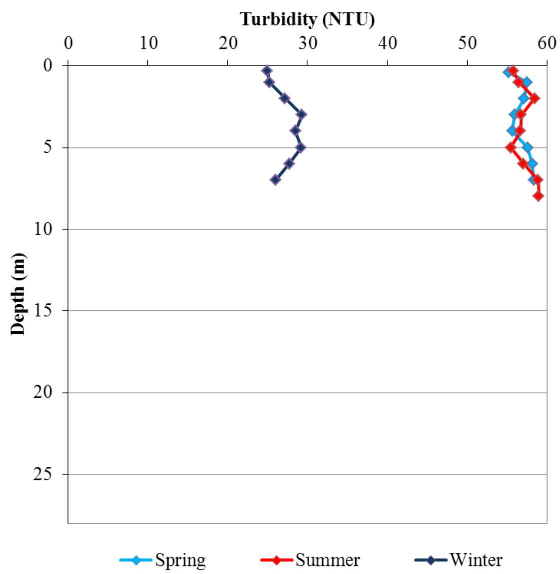


Figure 5.5.4-32. Turbidity depth profiles measured in Apussigamasi Lake 2009/2010.

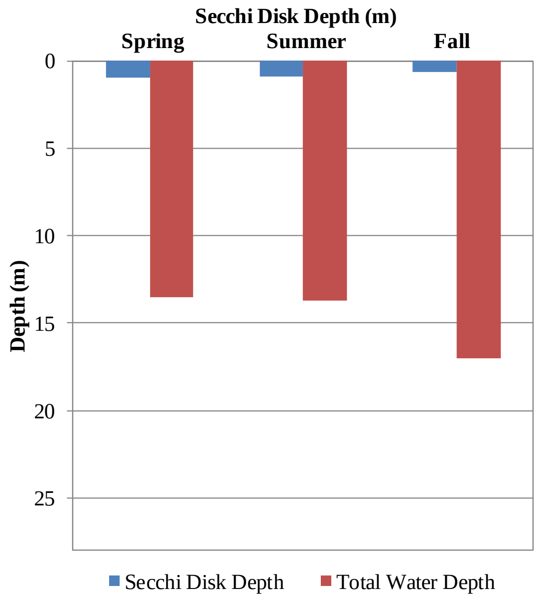


Figure 5.5.4-33. Secchi disk depths measured in Rat Lake 2010/2011.

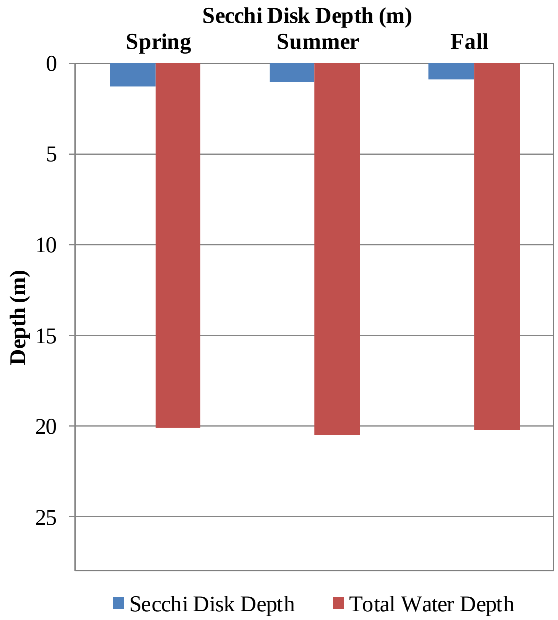


Figure 5.5.4-34. Secchi disk depths measured in Notigi-West 2009/2010.

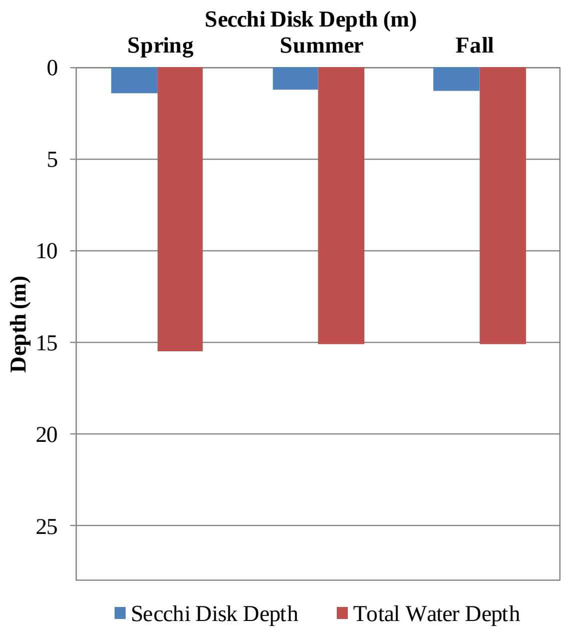


Figure 5.5.4-35. Secchi disk depths measured in Notigi-East 2009/2010.

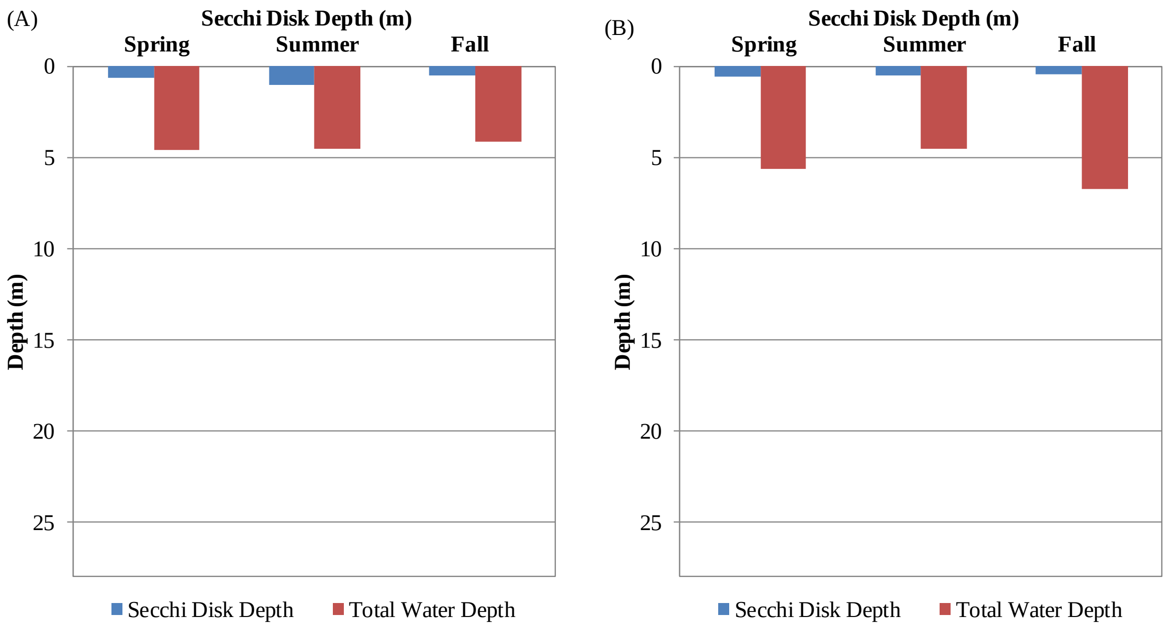


Figure 5.5.4-36. Secchi disk depths measured in Threepoint Lake: (A) 2009/2010 and (B) 2010/2011.

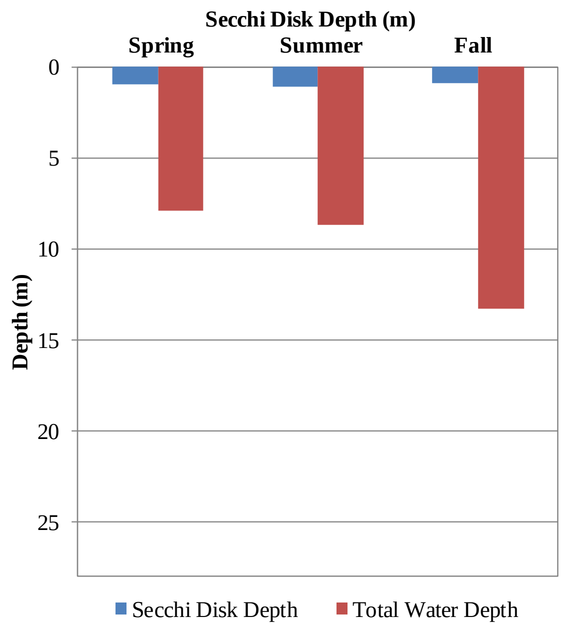


Figure 5.5.4-37. Secchi disk depths measured in Footprint Lake 2010/2011.

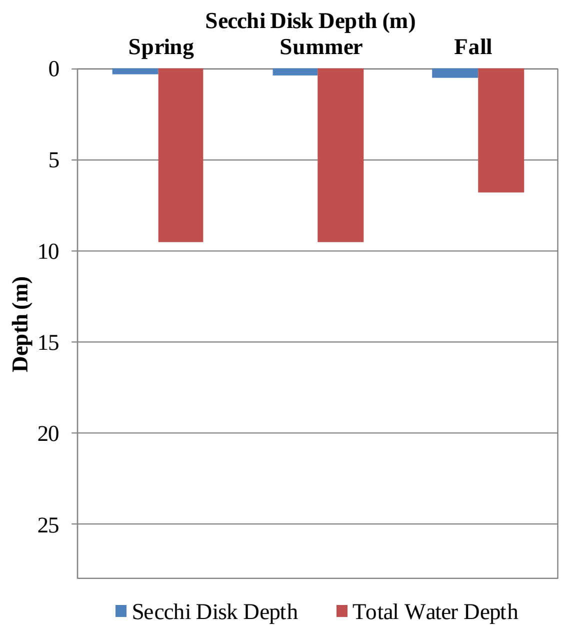


Figure 5.5.4-38. Secchi disk depths measured in Apussigamasi Lake 2009/2010.

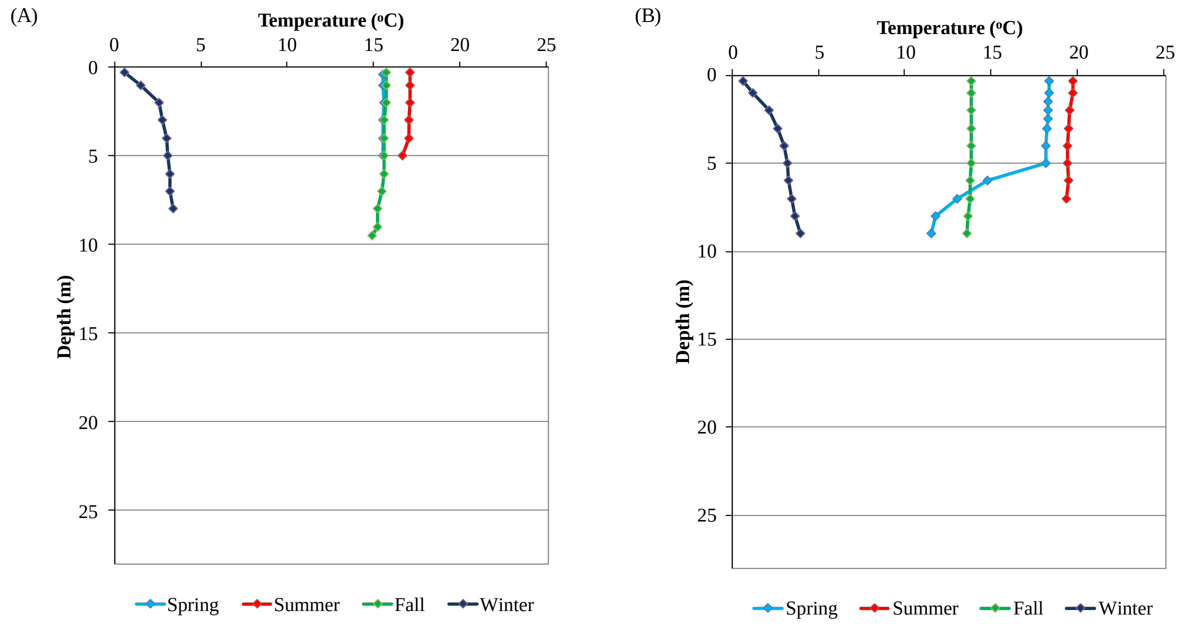


Figure 5.5.4-39. Water temperature profile measured in Leftrook Lake: (A) 2009/2010 and (B) 2010/2011.

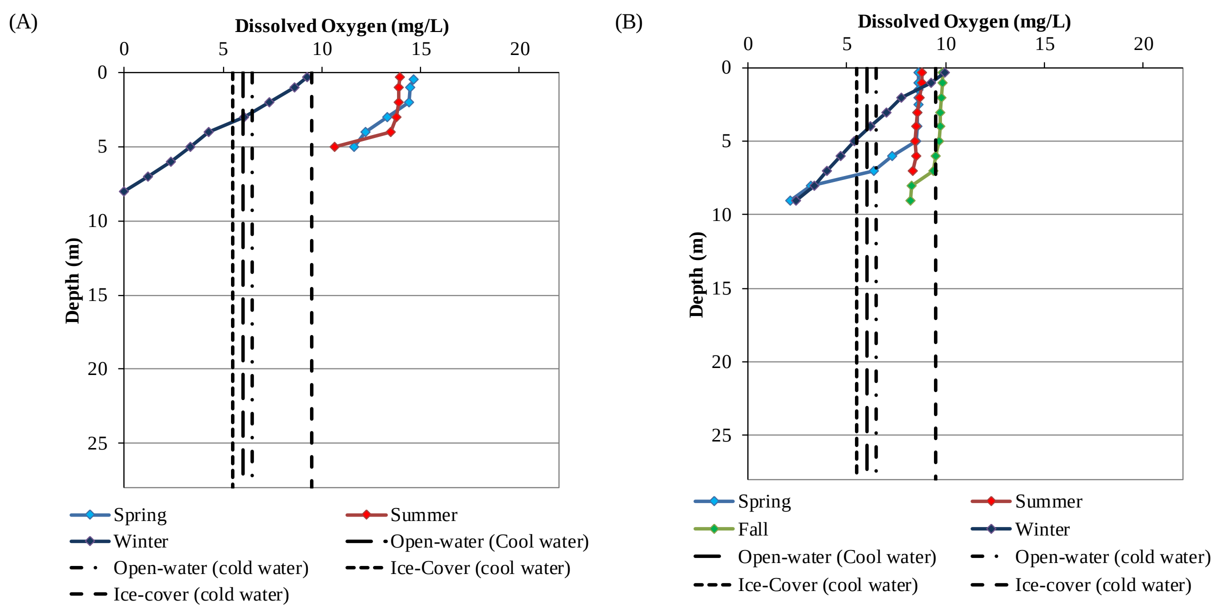
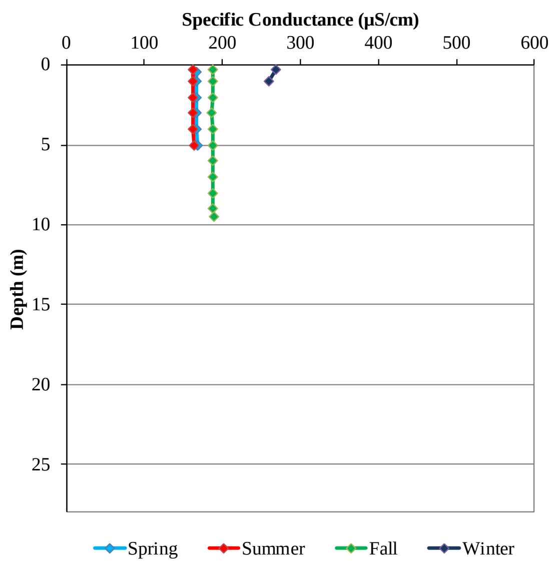


Figure 5.5.4-40. Dissolved oxygen depth profiles measured in Leftrook Lake: (A) 2009/2010 and (B) 2010/2011.

(A)



(B)

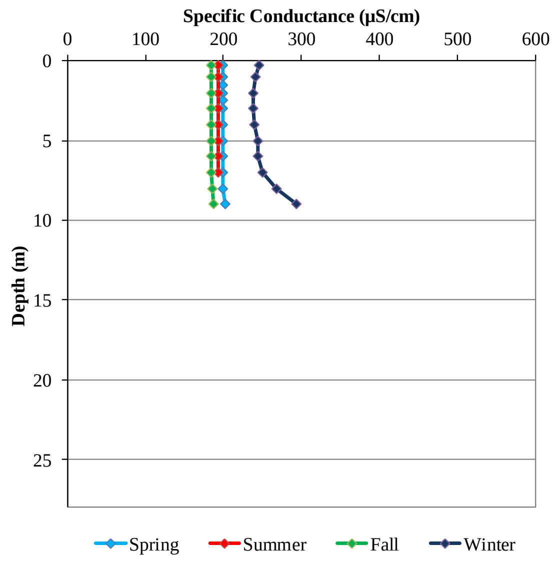
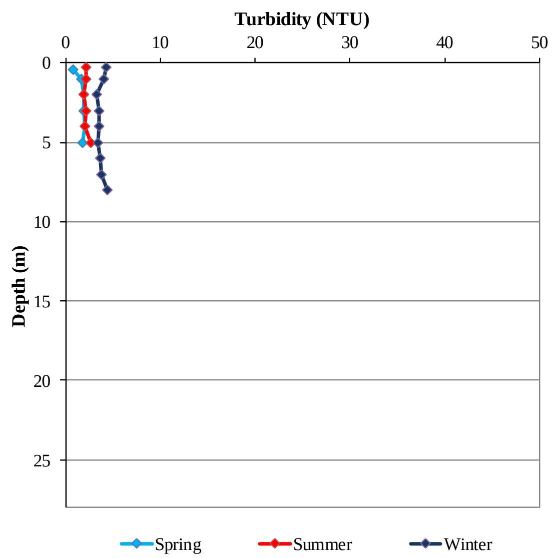


Figure 5.5.4-41. Specific conductance depth profiles measured in Leftrook Lake: (A) 2009/2010 and (B) 2010/2011.

(A)



(B)

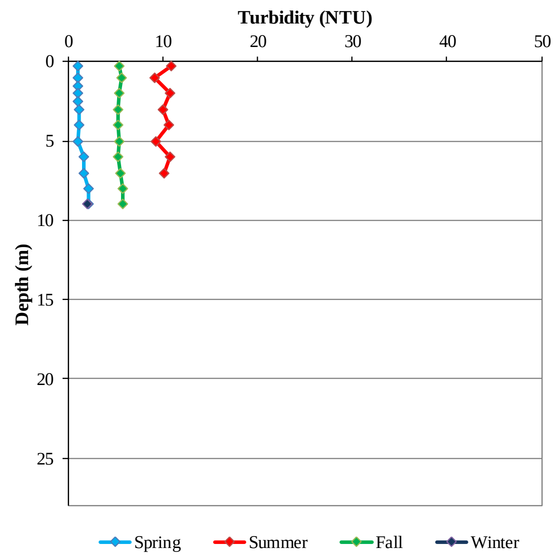


Figure 5.5.4-42. Turbidity depth profiles measured in Leftrook Lake: (A) 2009/2010 and (B) 2010/2011.

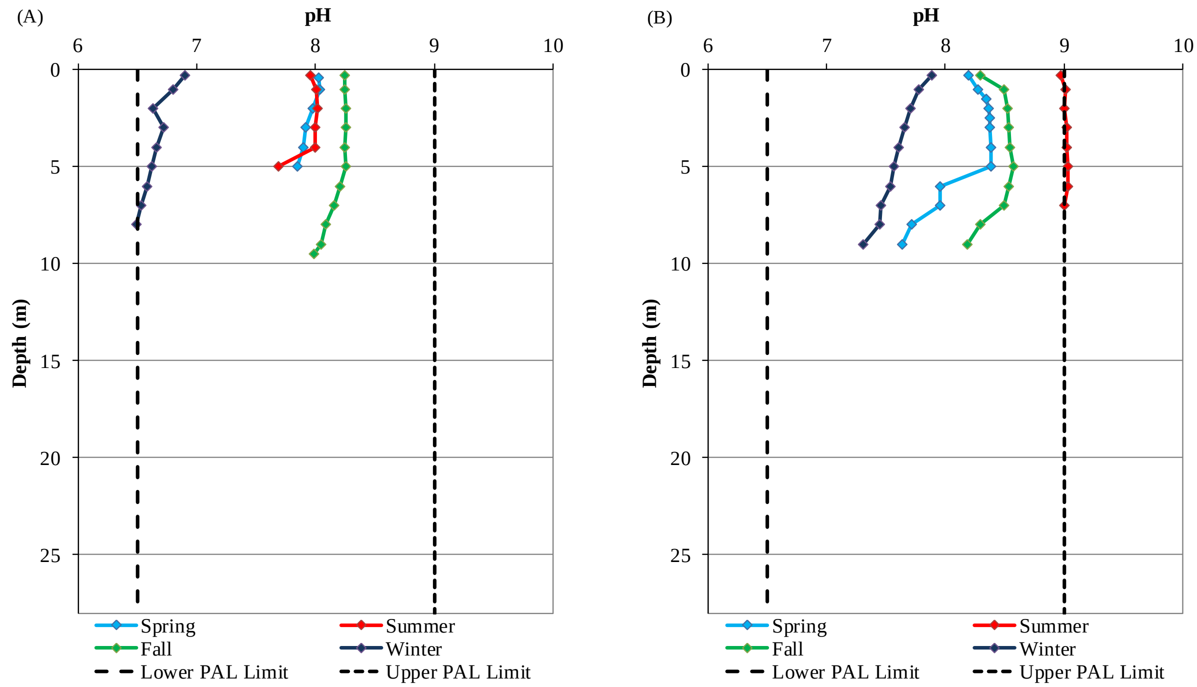


Figure 5.5.4-43. pH depth profiles measured at Leftrook Lake: (A) 2009/2010 and (B) 2010/2011.

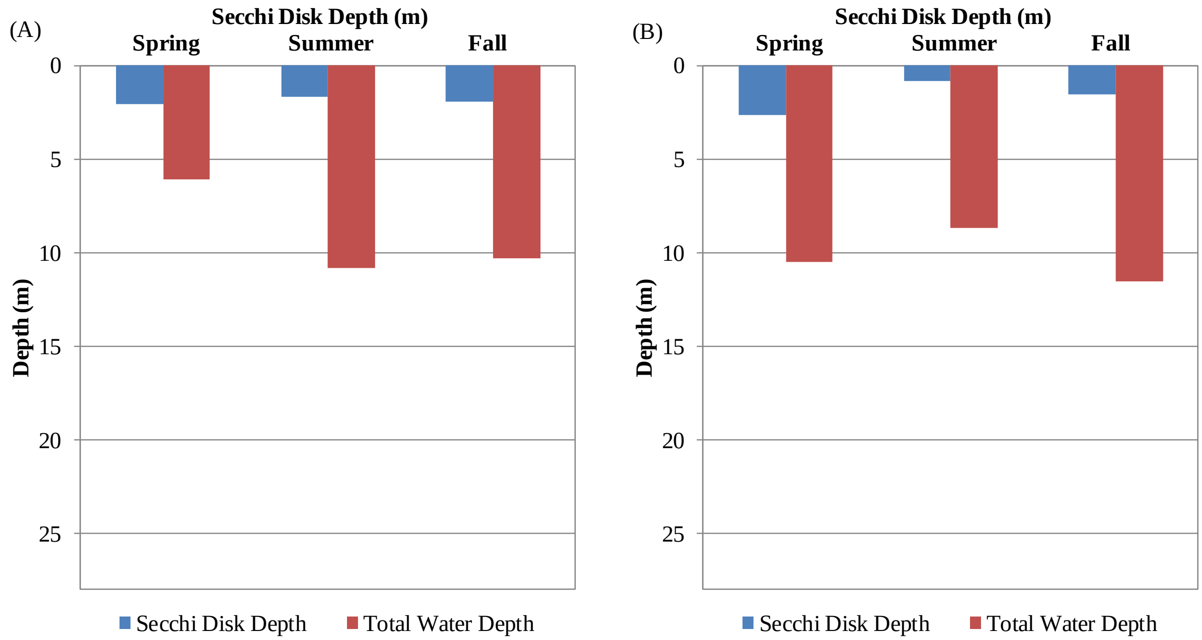


Figure 5.5.4-44. Secchi disk depths measured in Leftrook Lake: (A) 2009/2010 and (B) 2010/2011.

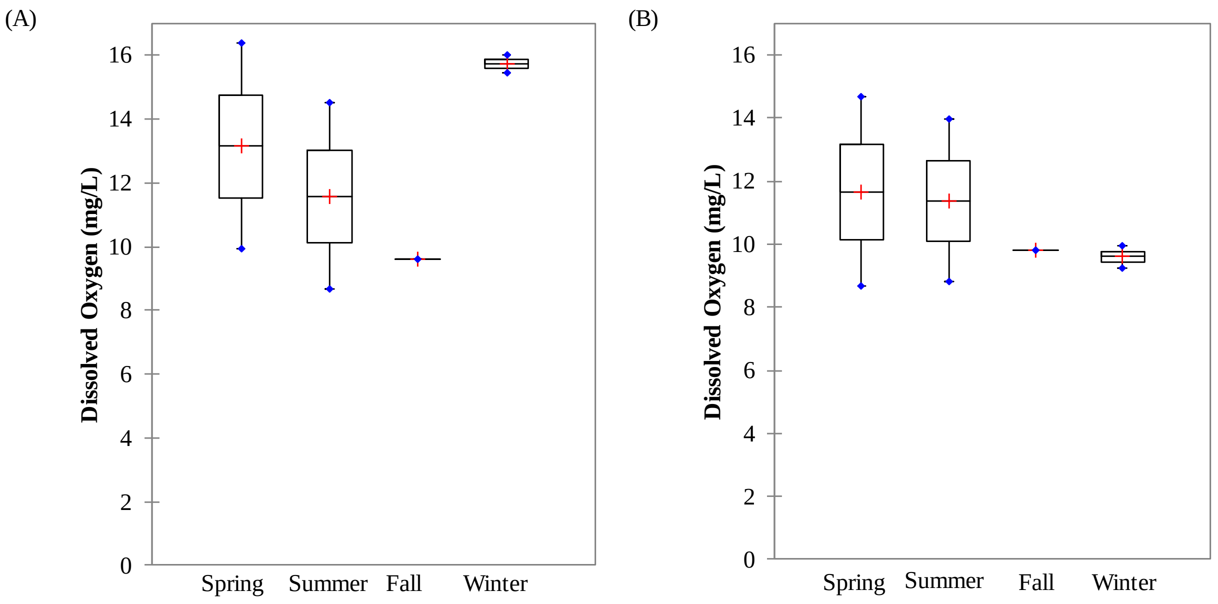


Figure 5.5.4-45. Dissolved oxygen in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

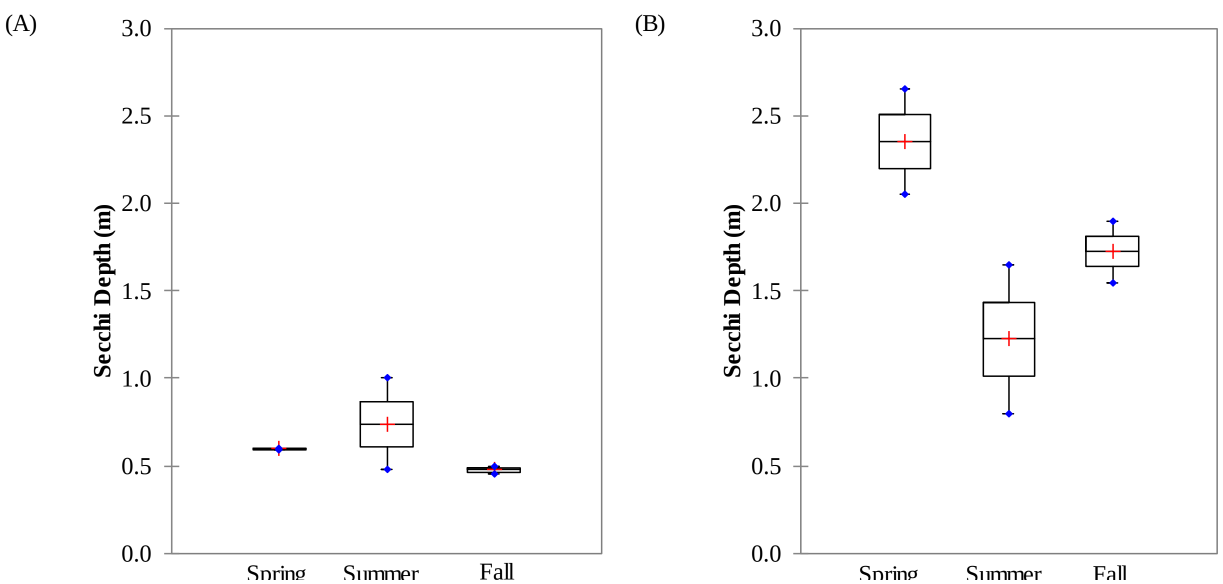


Figure 5.5.4-46. Secchi disk depth in the Churchill River Diversion Region by season (open-water season only): (A) Threepoint Lake and (B) Leftrook Lake.

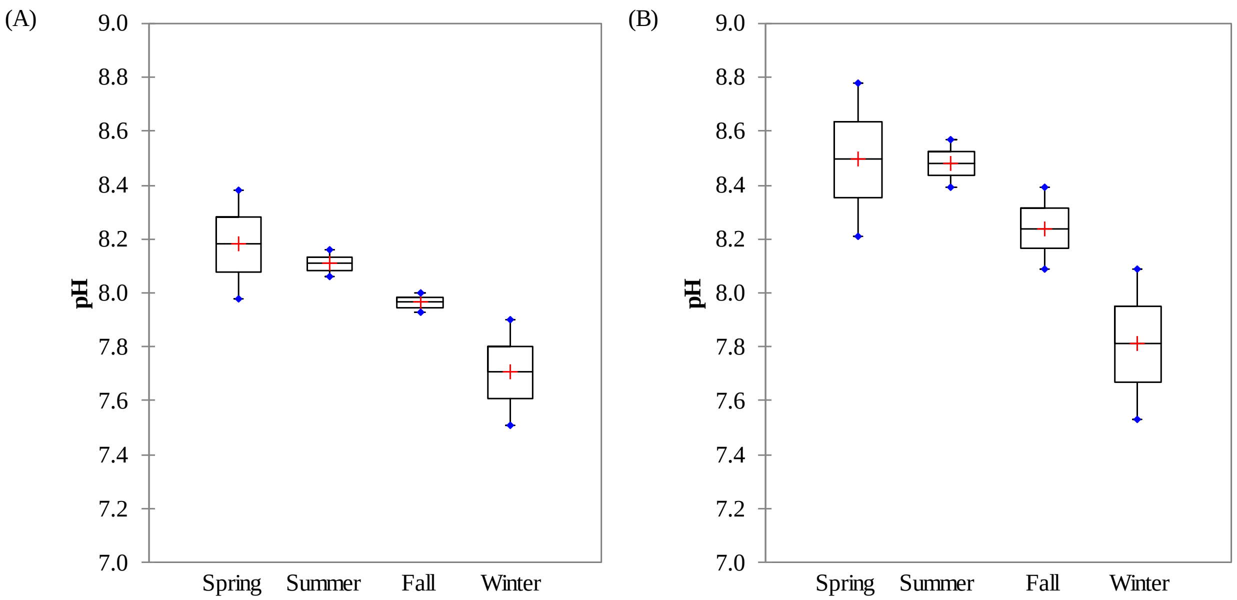


Figure 5.5.4-47. *In situ* pH in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

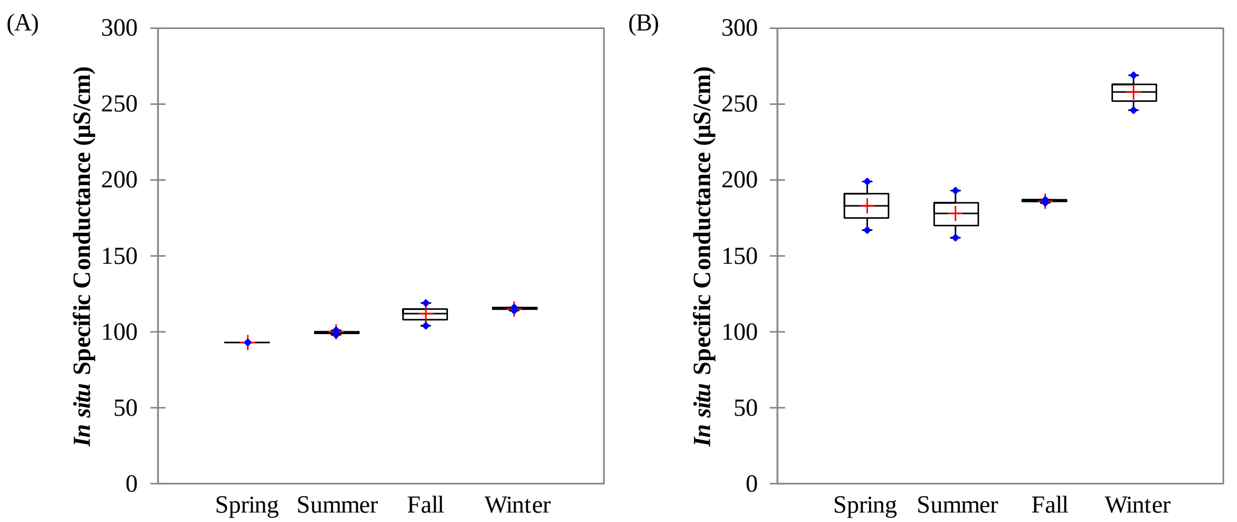


Figure 5.5.4-48. *In situ* specific conductance in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

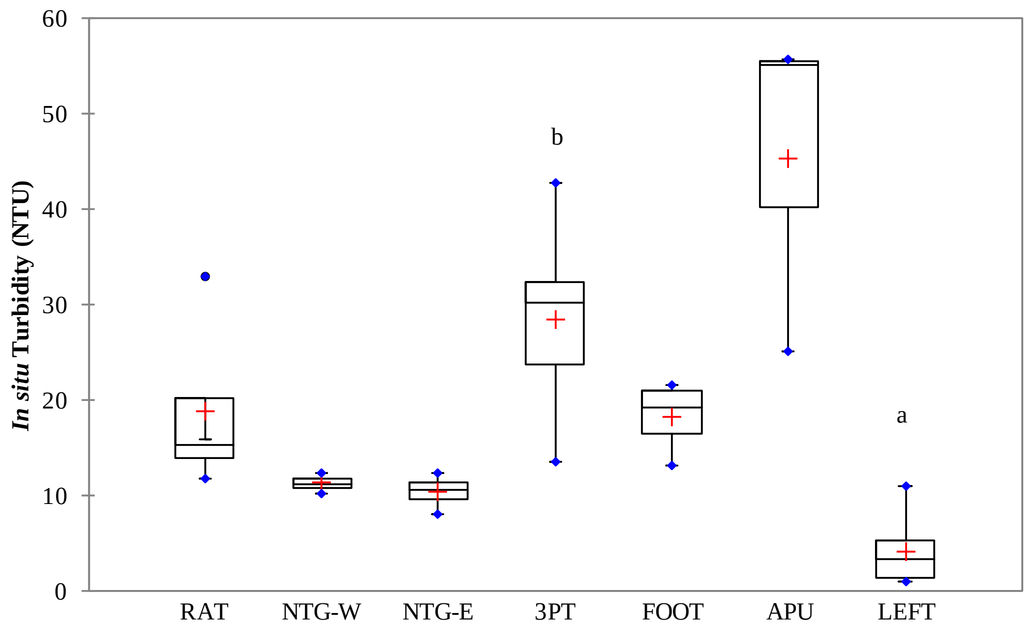


Figure 5.5.4-49. *In situ* turbidity in the Churchill River Diversion Region 2009-2010: Statistically significant spatial differences are denoted with different superscripts.

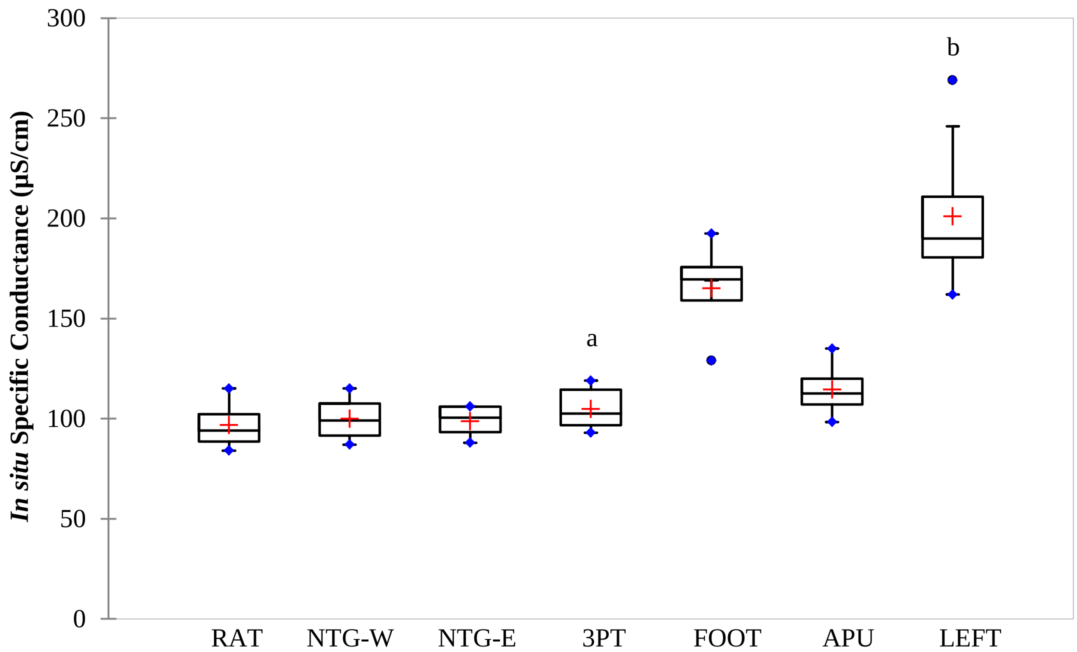


Figure 5.5.4-50. *In situ* specific conductance in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

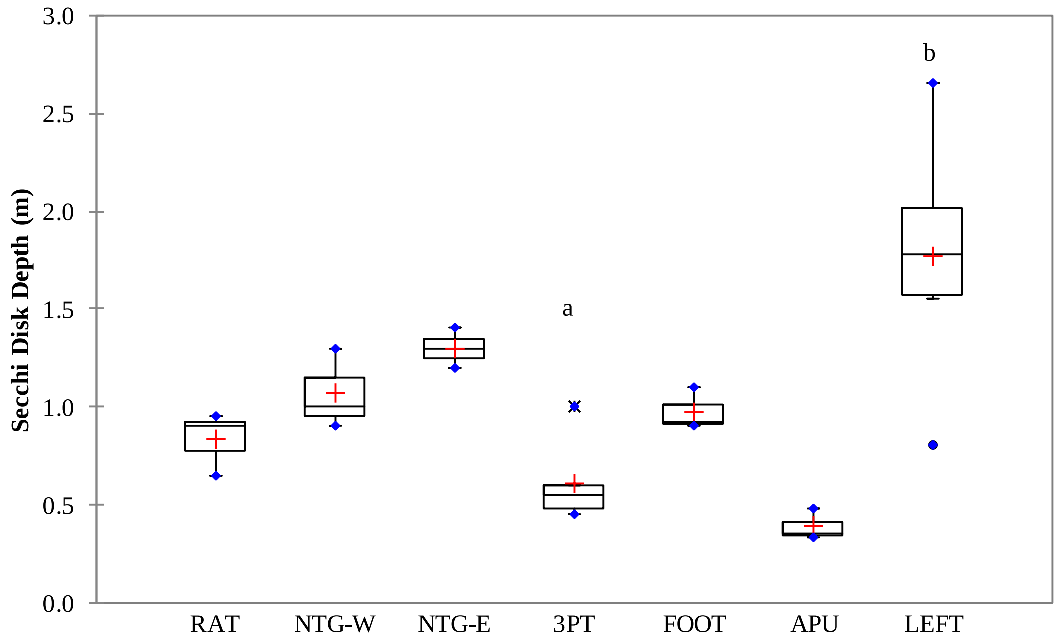


Figure 5.5.4-51. Secchi disk depths (open-water season only) in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

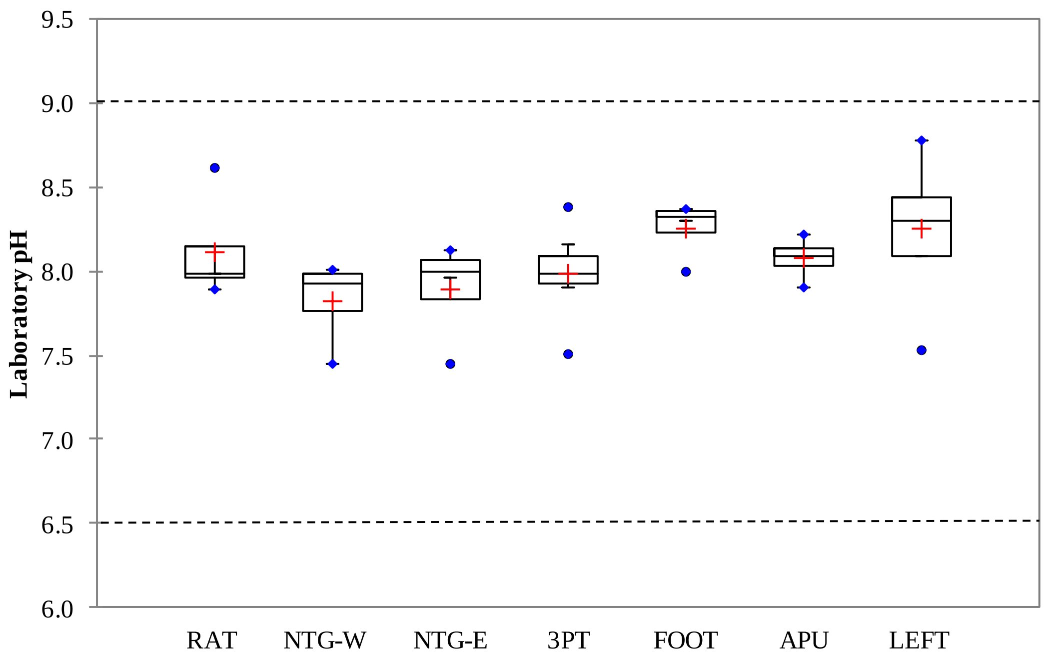


Figure 5.5.4-52. Laboratory pH in the Churchill River Diversion Region: 2008-2010. Area between the dashed lines indicates the MWQSOG PAL guideline (6.5-9). No significant differences were found between annual waterbodies.

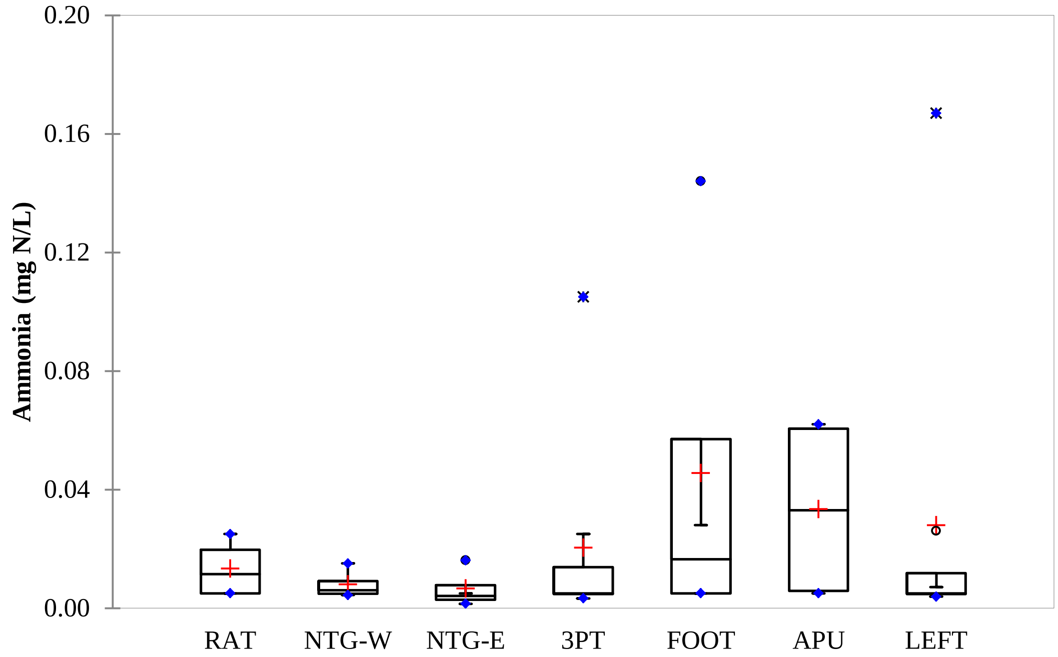


Figure 5.5.4-53. Ammonia in the Saskatchewan River Region: 2008-2010. The most stringent site-specific PAL objective is 0.49 mg N/L. No significant differences were found between annual waterbodies.

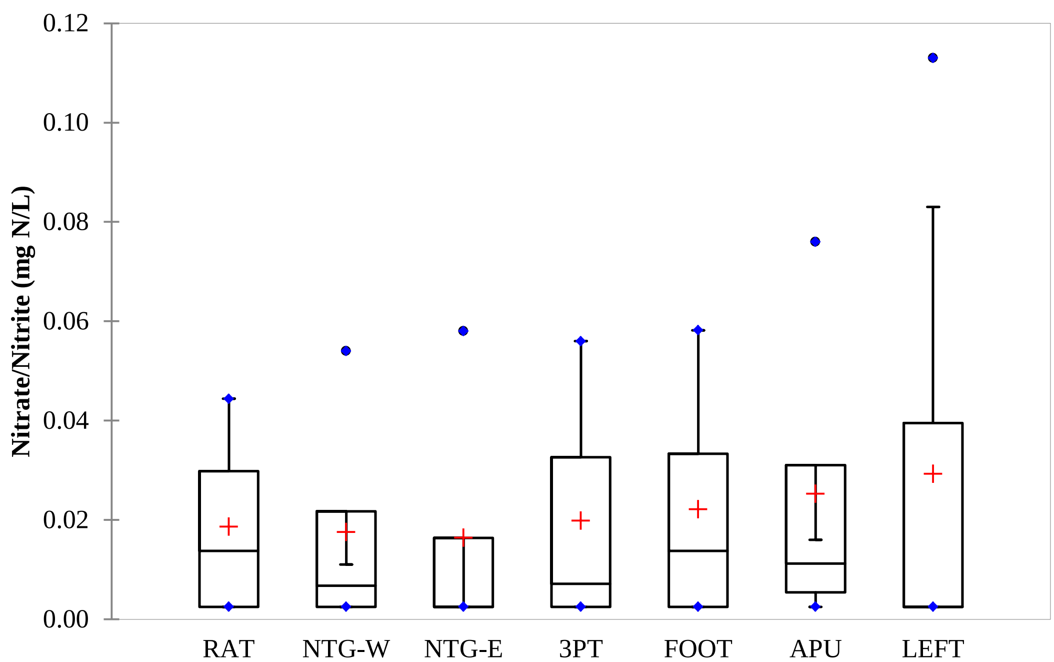


Figure 5.5.4-54. Nitrate/nitrite in the Churchill River Diversion Region: 2008-2010. The MWQSOG PAL guideline is 2.93 mg N/L. No significant differences were found between annual waterbodies.

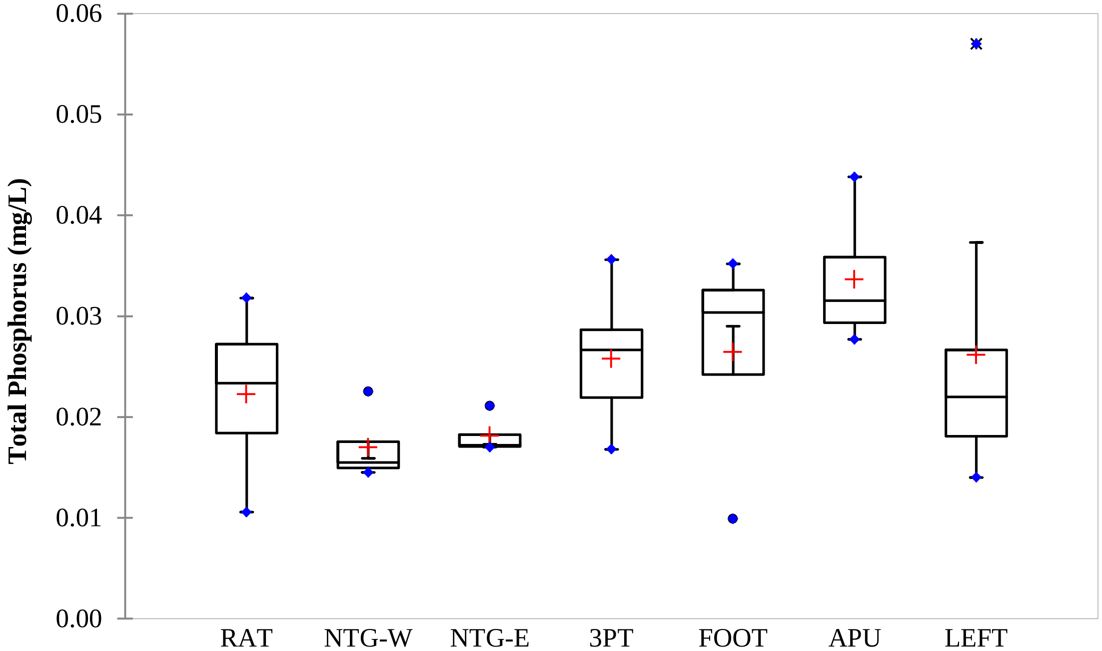


Figure 5.5.4-55. Total phosphorus in the Churchill River Diversion Region: 2009-2010. The black dashed line represents the Manitoba narrative guideline for lakes, ponds, and reservoirs. No significant differences were found between annual waterbodies.

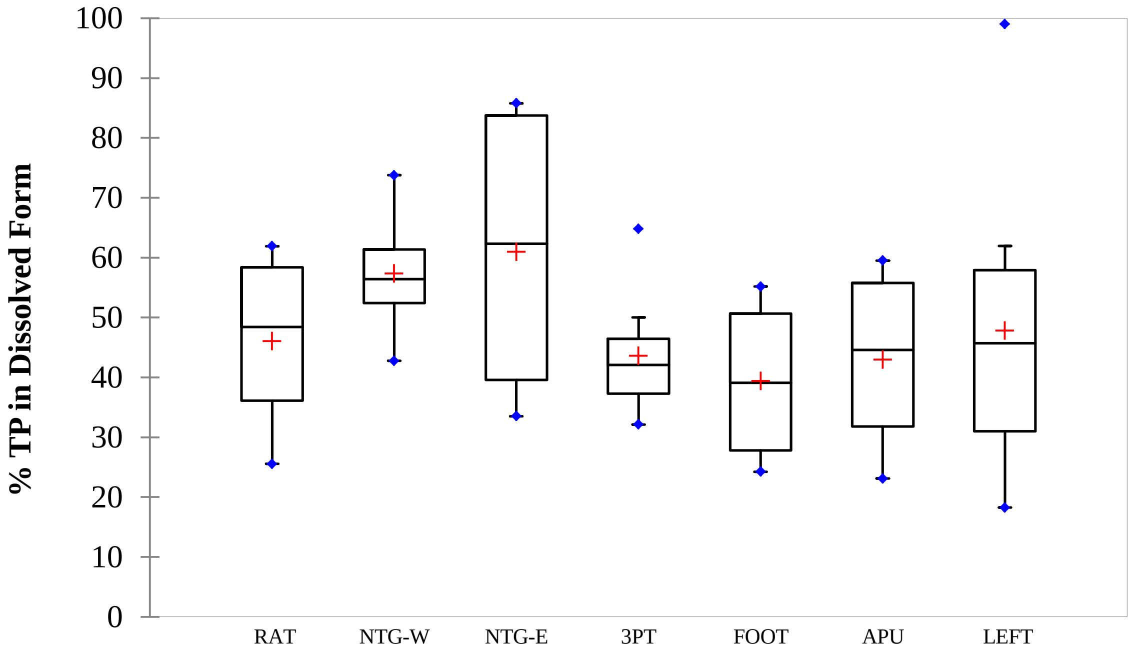


Figure 5.5.4-56. Fraction of total phosphorus in dissolved form in the Churchill River Diversion Region: 2009-2010.

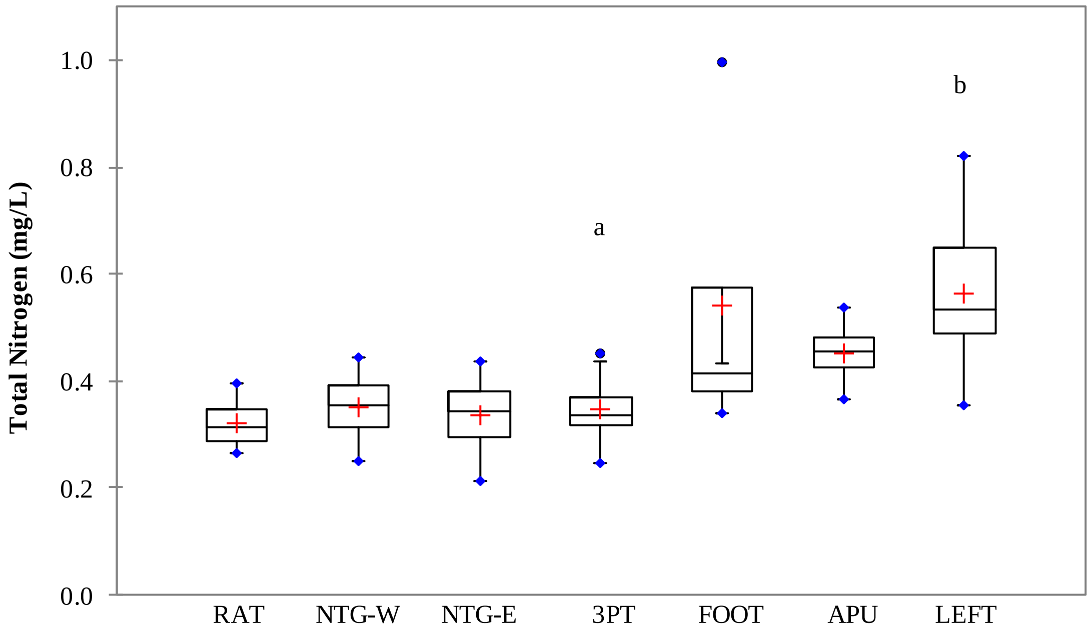


Figure 5.5.4-57. Total nitrogen in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

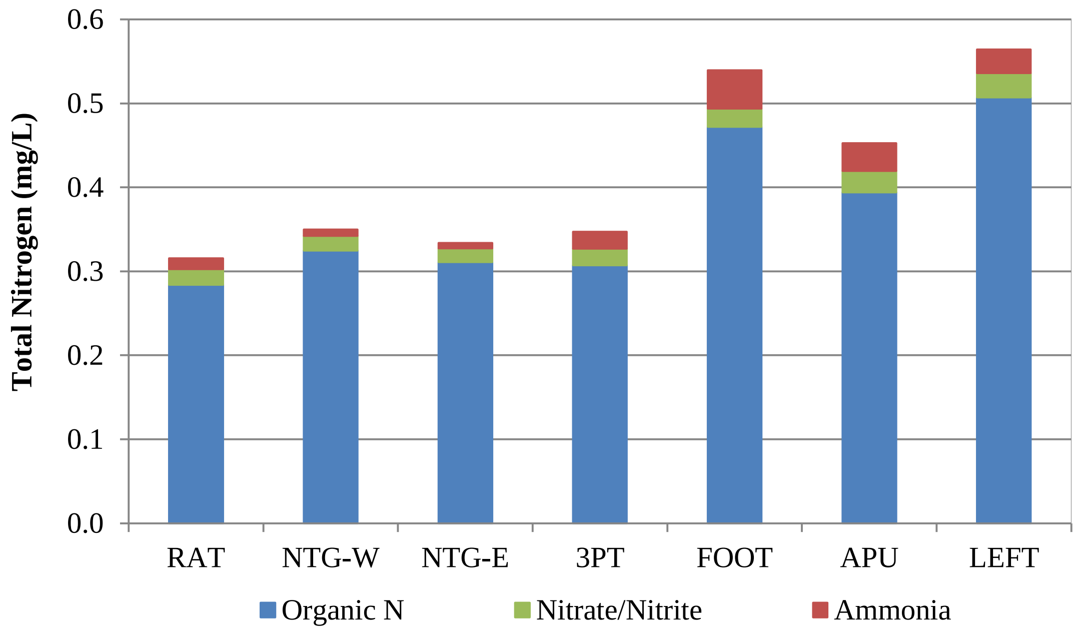


Figure 5.5.4-58. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Churchill River Diversion Region: 2009-2010.

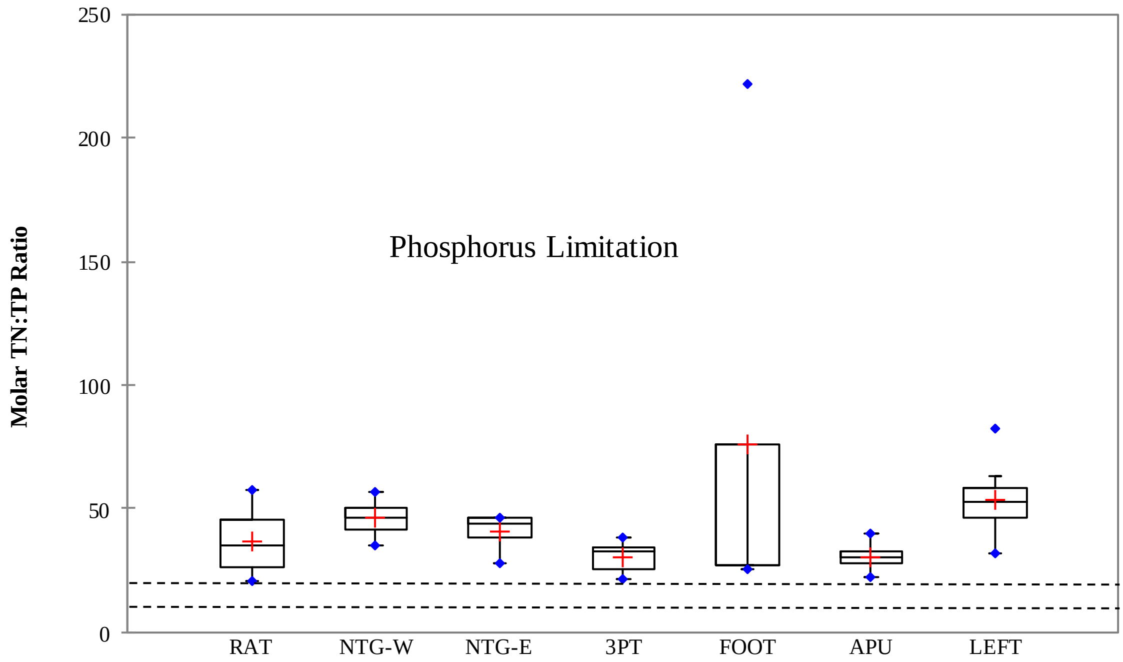


Figure 5.5.4-59. Total nitrogen to total phosphorus molar ratios in the Churchill River Diversion Region: 2009-2010. (<10 Nitrogen limitation, 10-20 Co-limitation, >20 Phosphorus limitation).

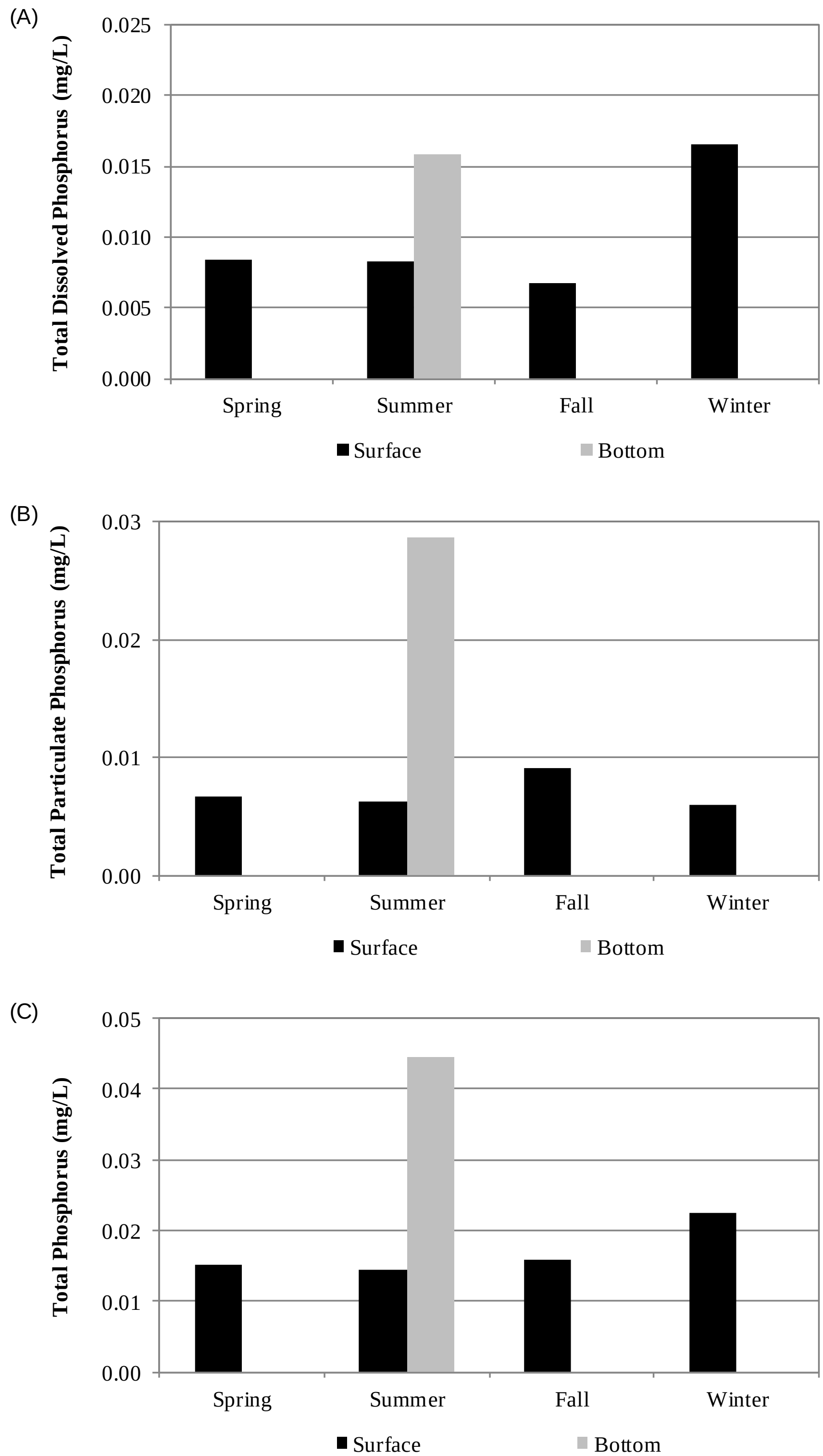


Figure 5.5.4-60. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Notigi Lake-West, 2009/2010.

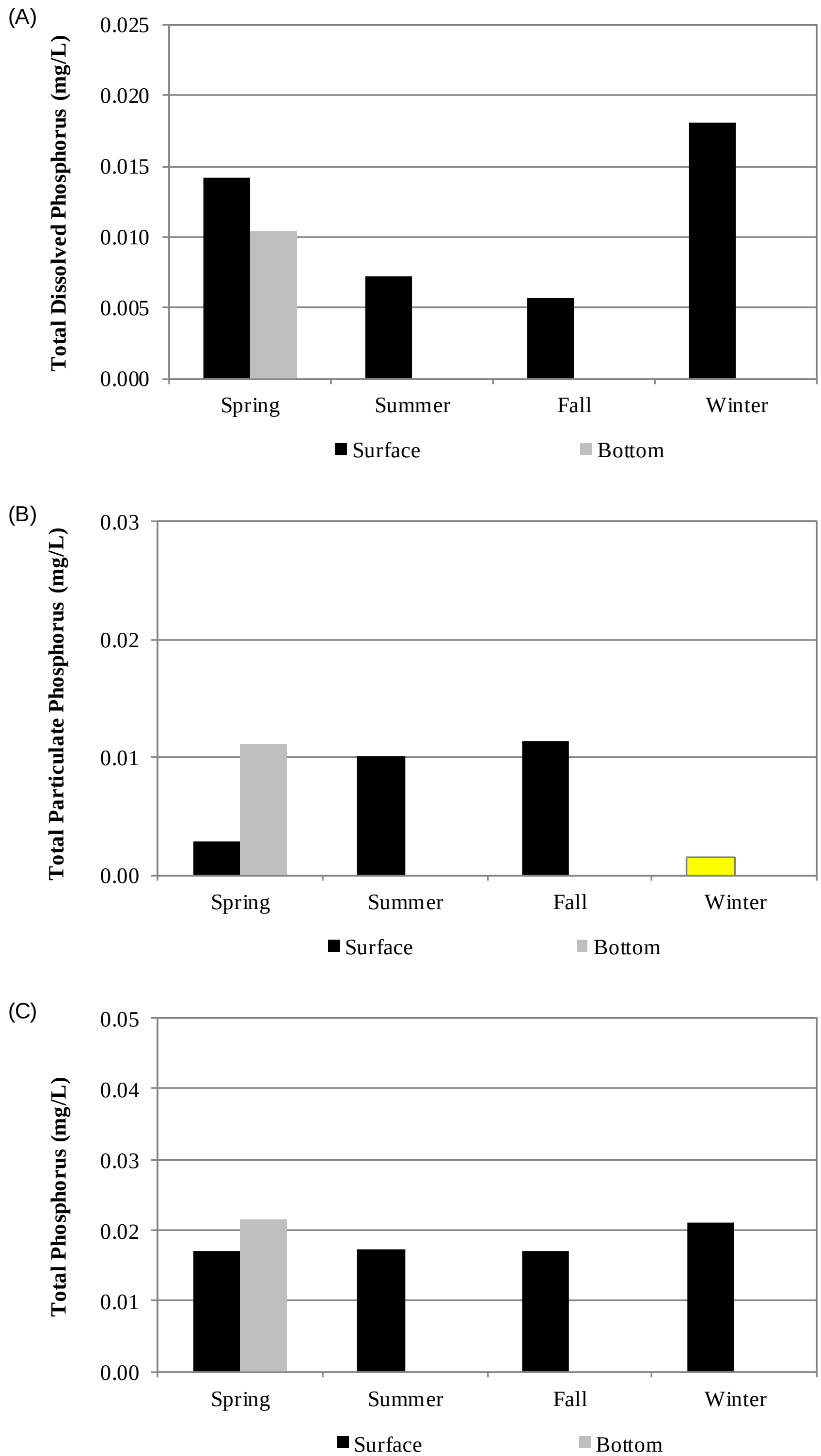


Figure 5.5.4-61. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Notigi Lake-East, 2009/2010. Values in yellow were below the analytical detection limit.

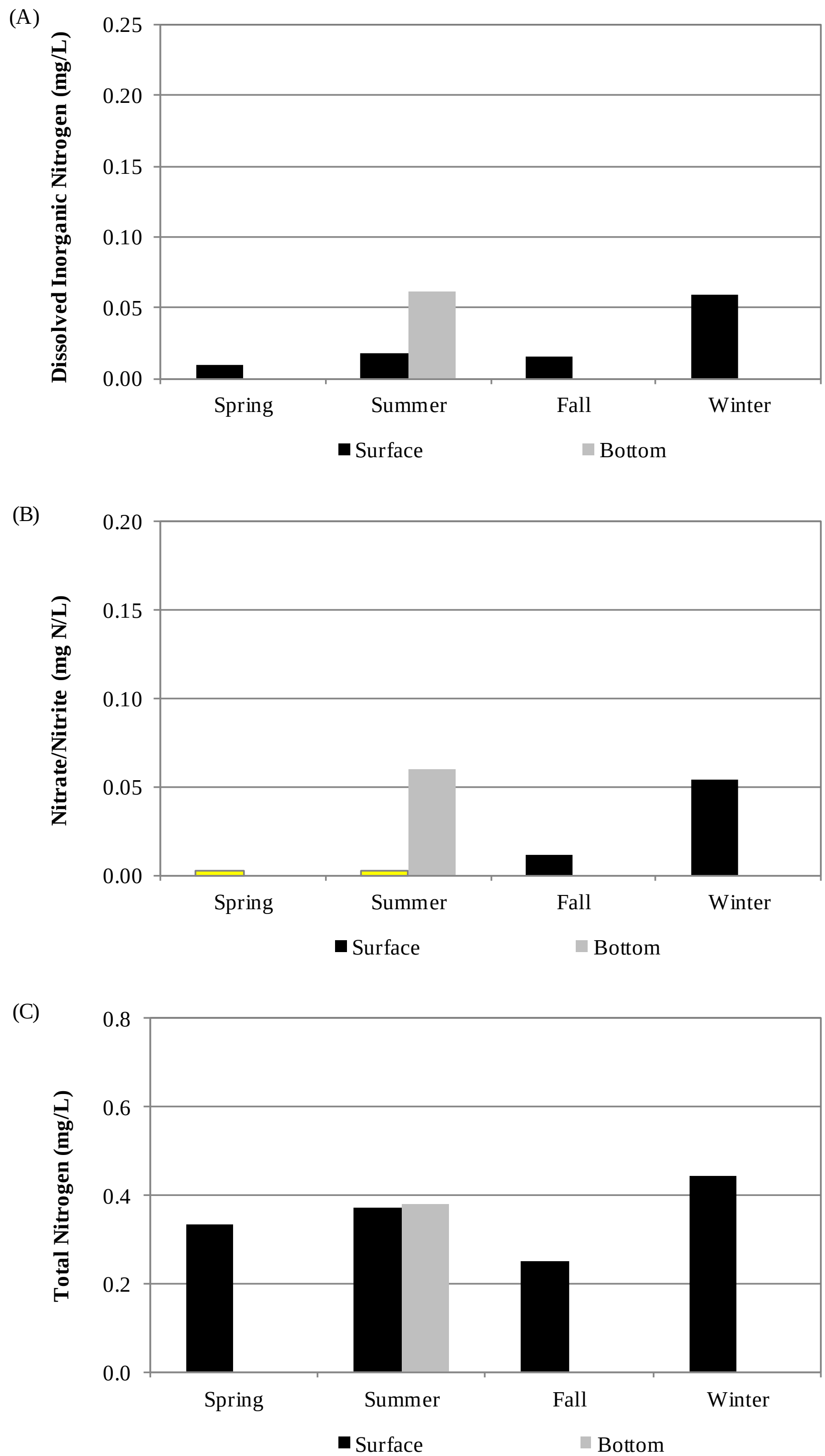


Figure 5.5.4-62. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Notigi Lake-West, 20009/2010. Values in yellow were below the analytical detection limit.

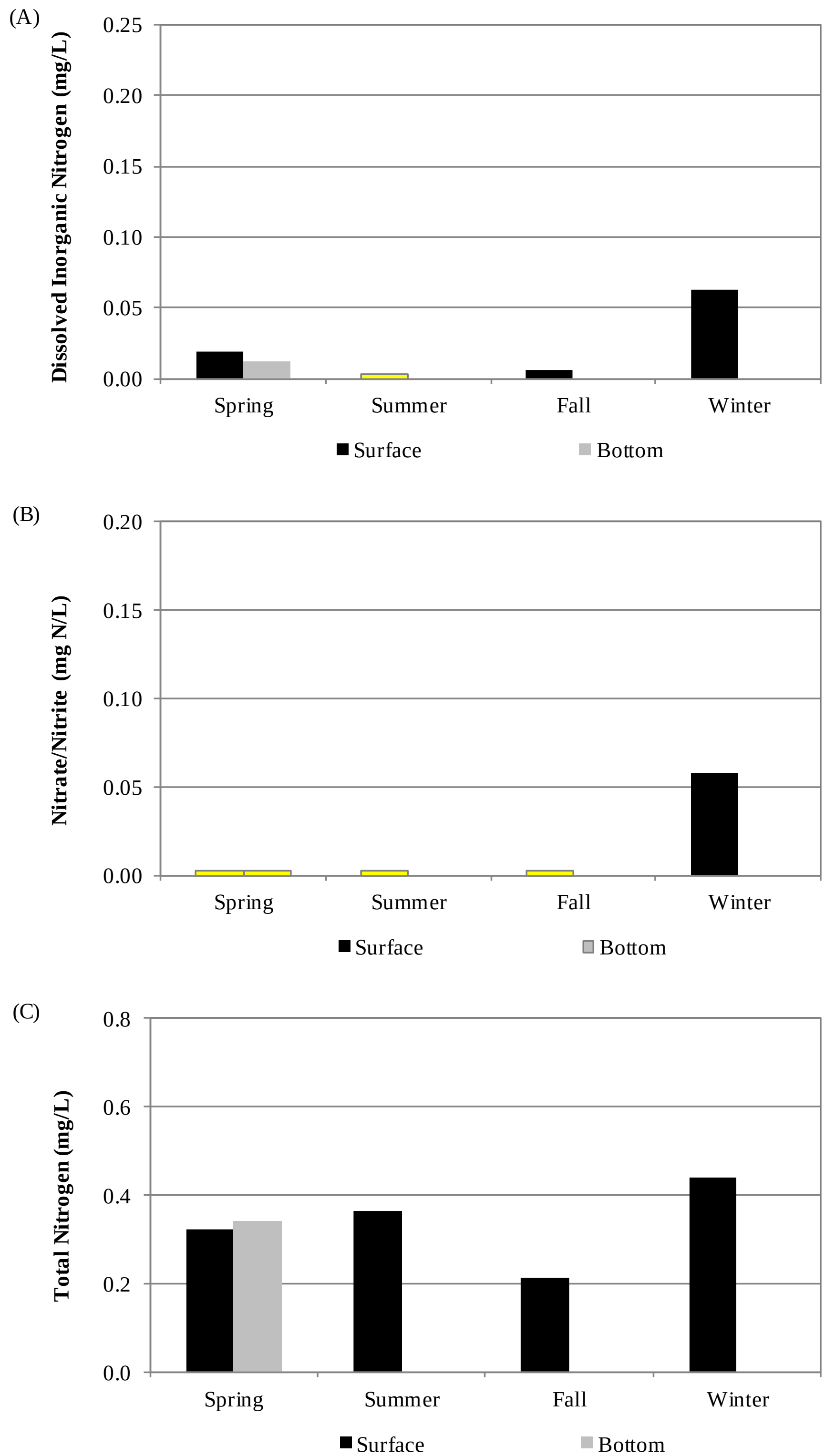


Figure 5.5.4-63. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Notigi Lake-East, 20009/2010. Values in yellow were below the analytical detection limit.

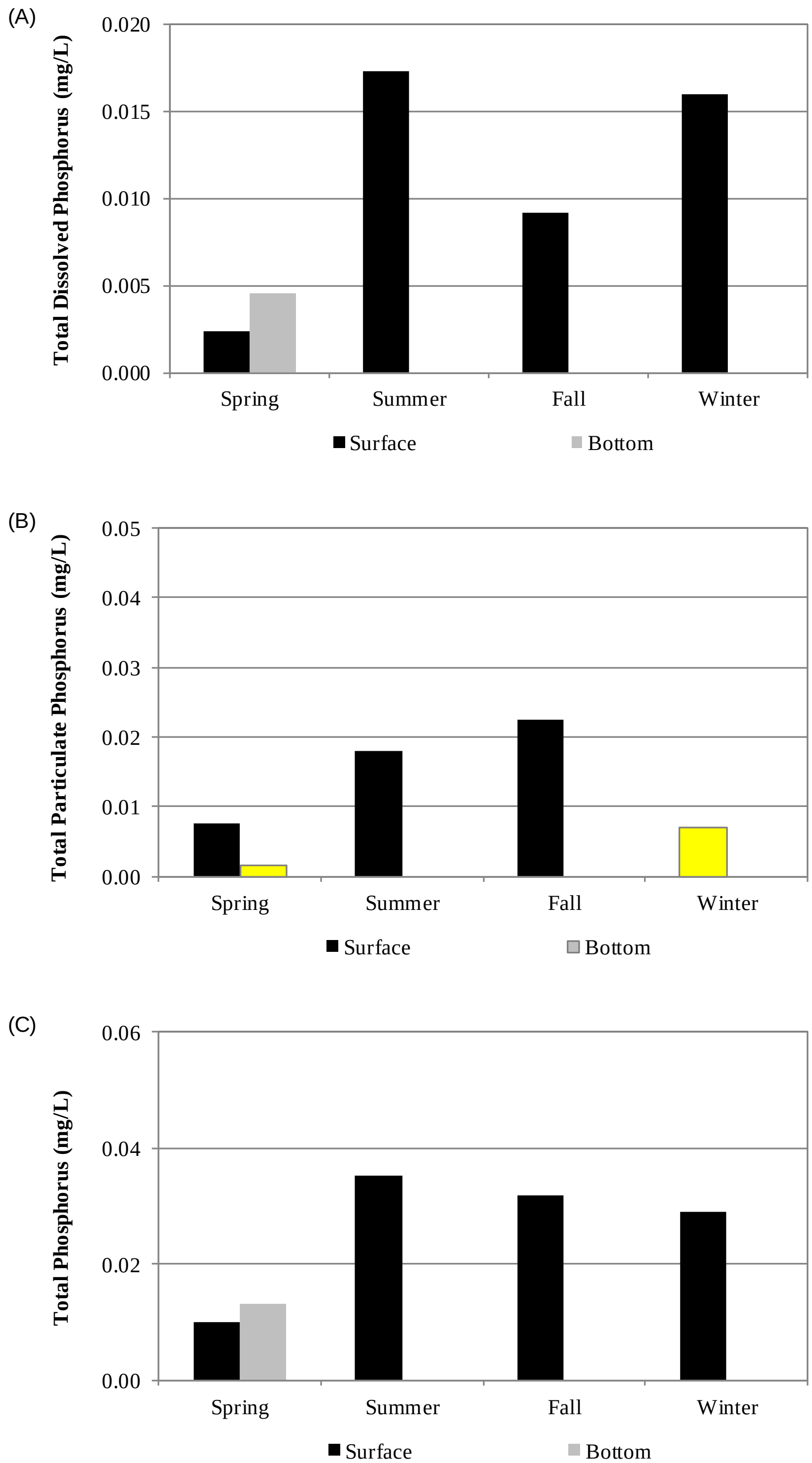


Figure 5.5.4-64. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Footprint Lake, 2010/2011. Values in yellow were below the analytical detection limit.

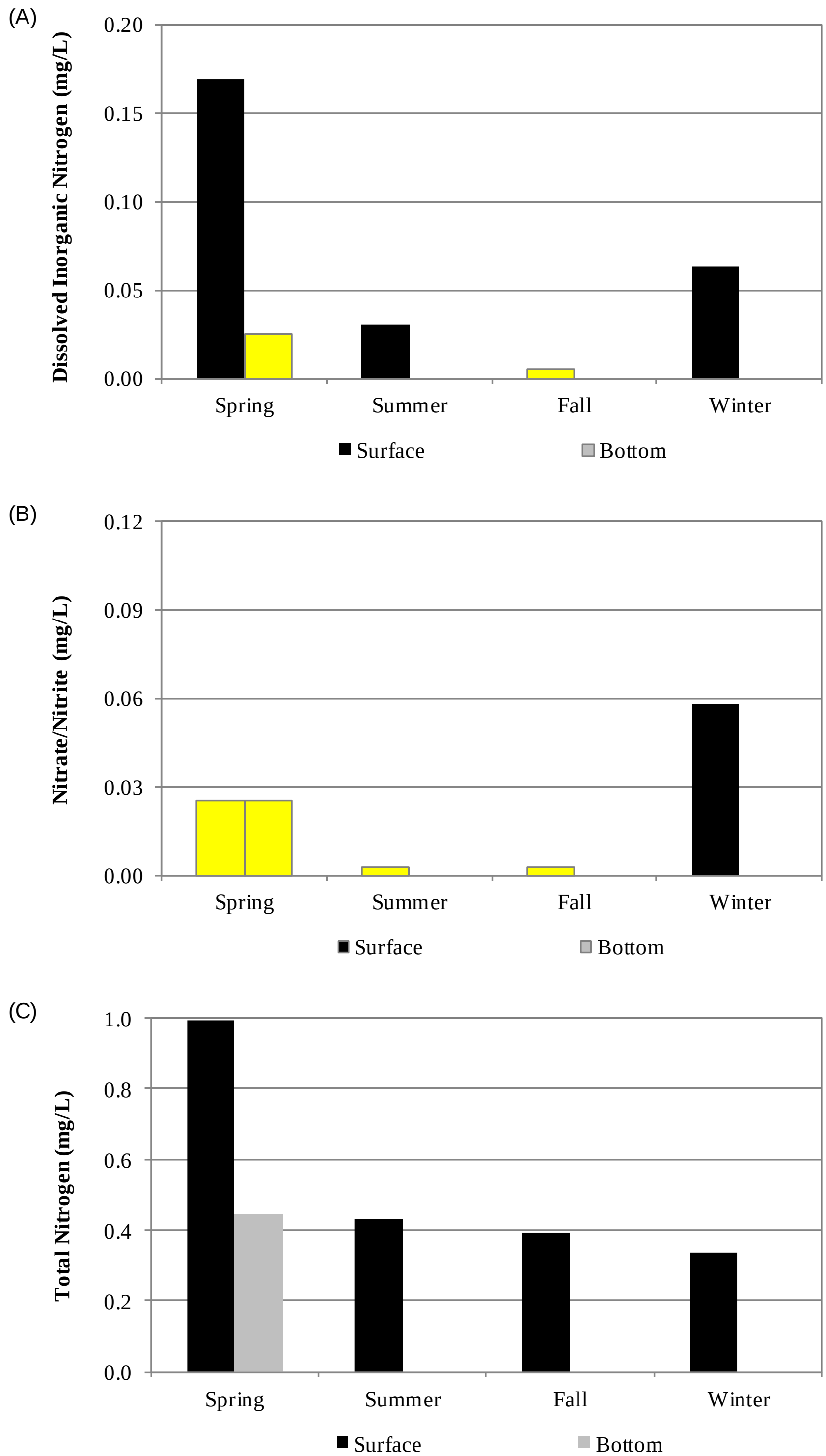


Figure 5.5.4-65. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Footprint, 2010/2011. Values in yellow were below the analytical detection limit.

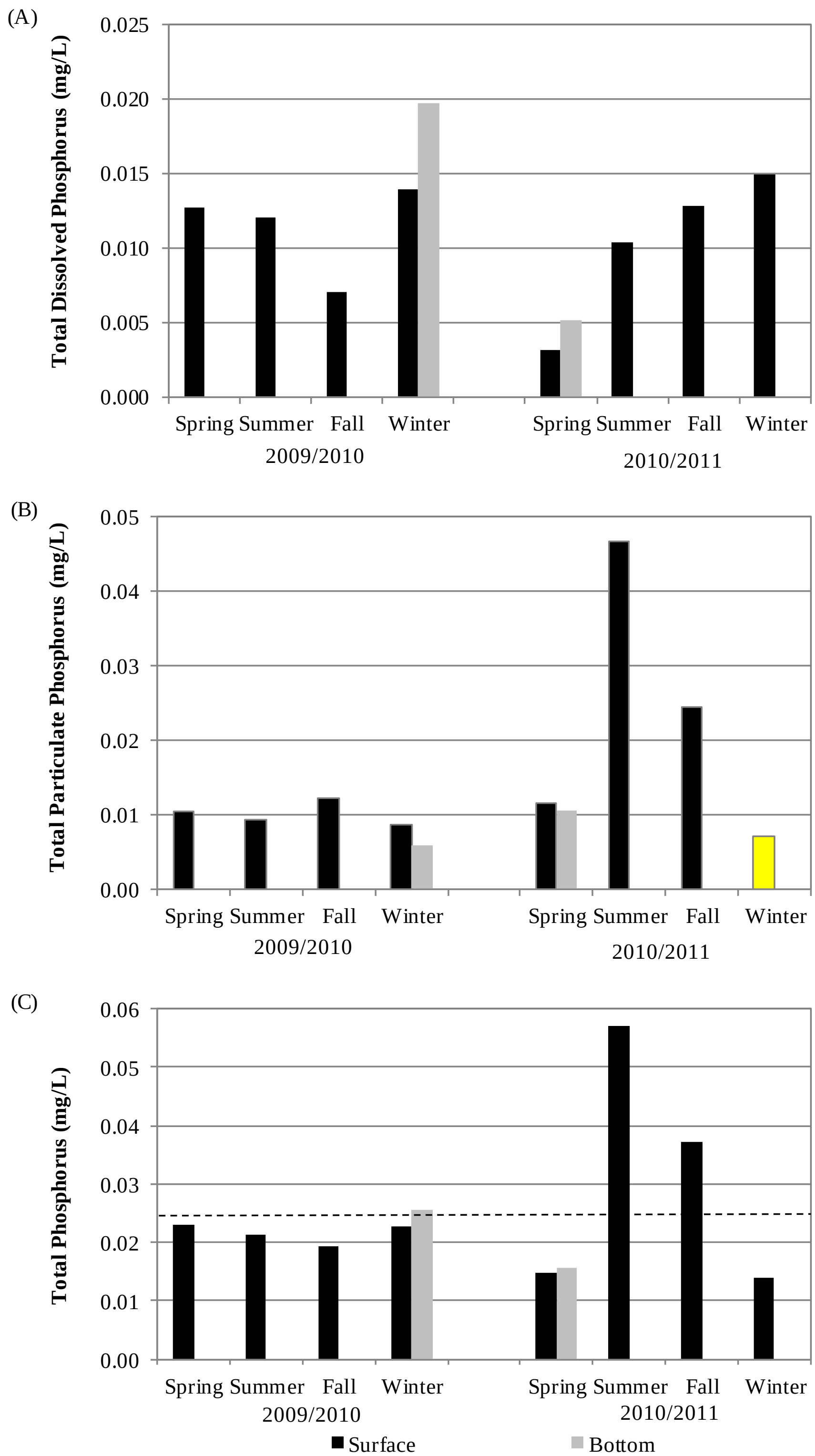


Figure 5.5.4-66. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Leftrook Lake, 2009/2010 and 2010/2011. Values in yellow were below the analytical detection limit.

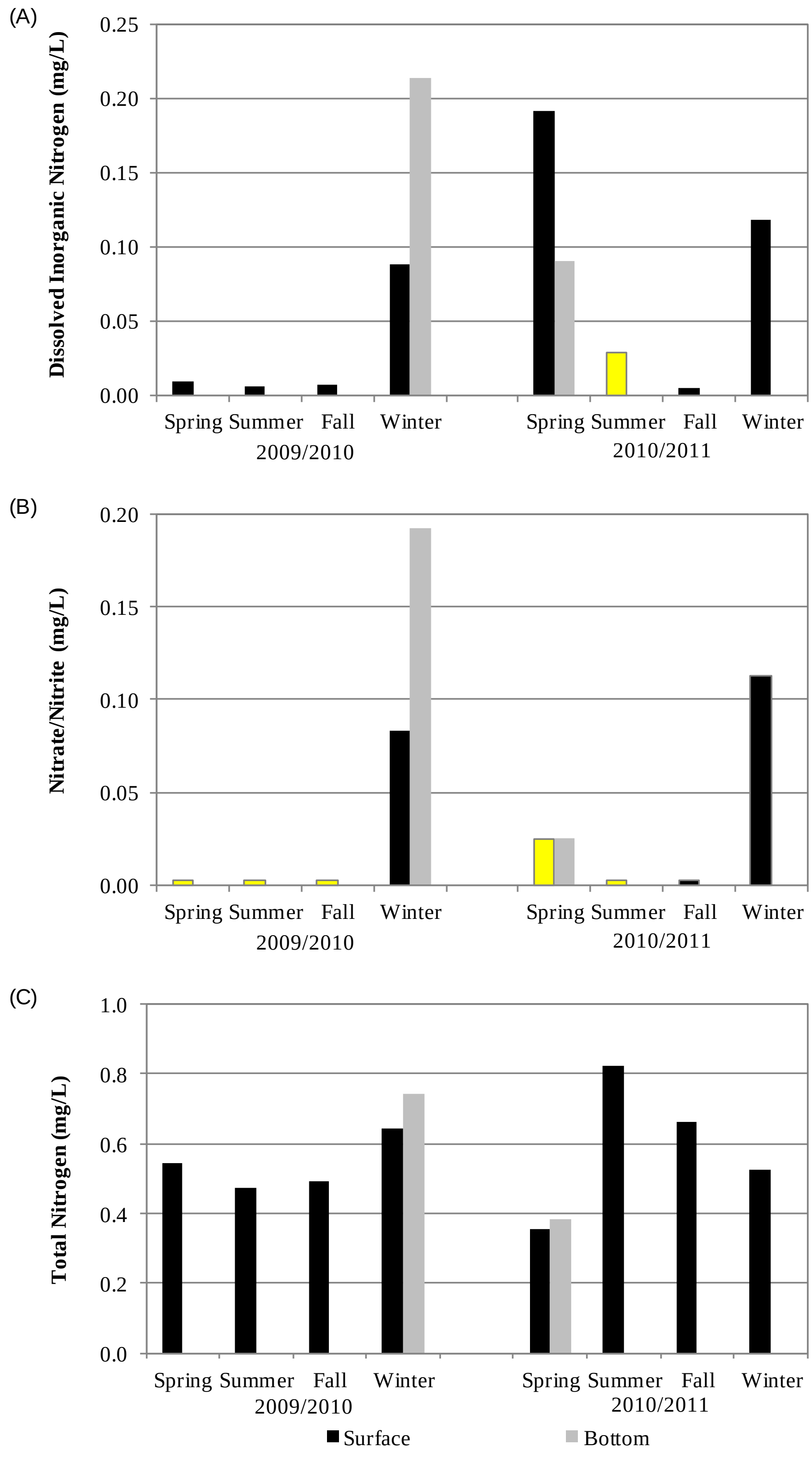


Figure 5.5.4-67. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Leftrook Lake, 2009/2010 and 2010/2011. Values in yellow were below the analytical detection limit.

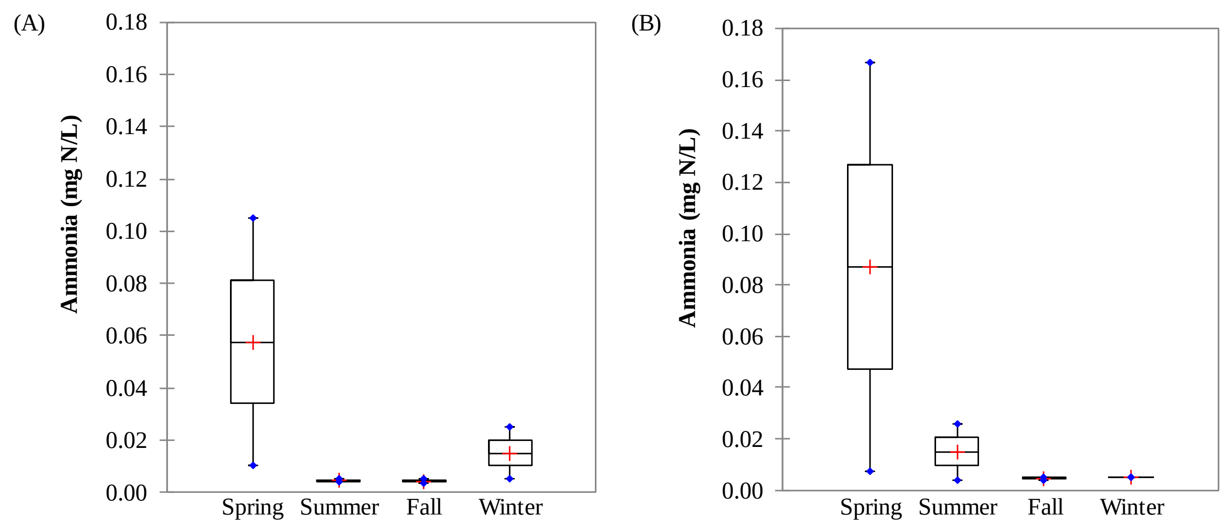


Figure 5.5.4-68. Ammonia in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

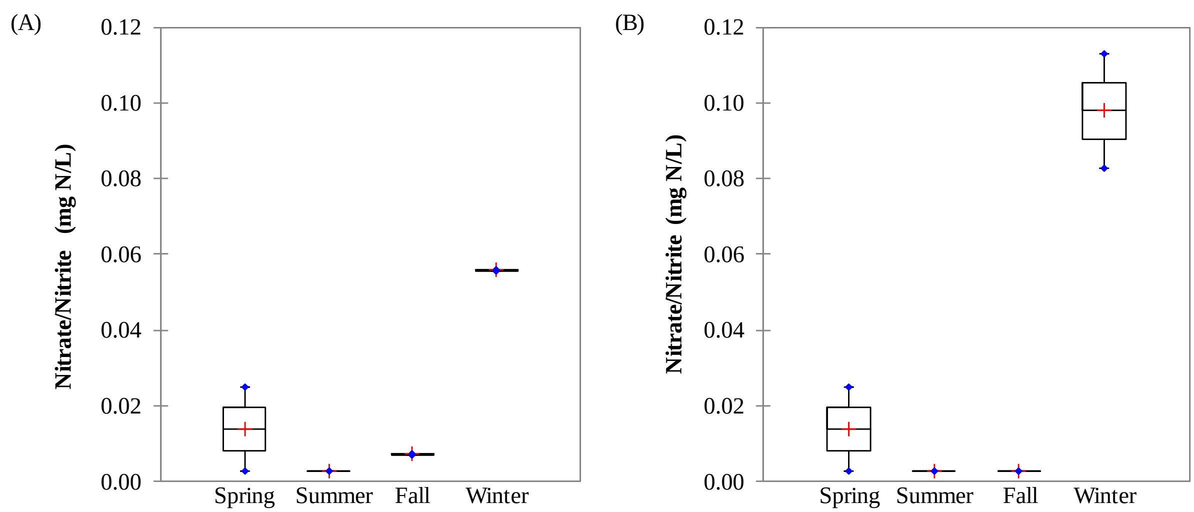


Figure 5.5.4-69. Nitrate/nitrite in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

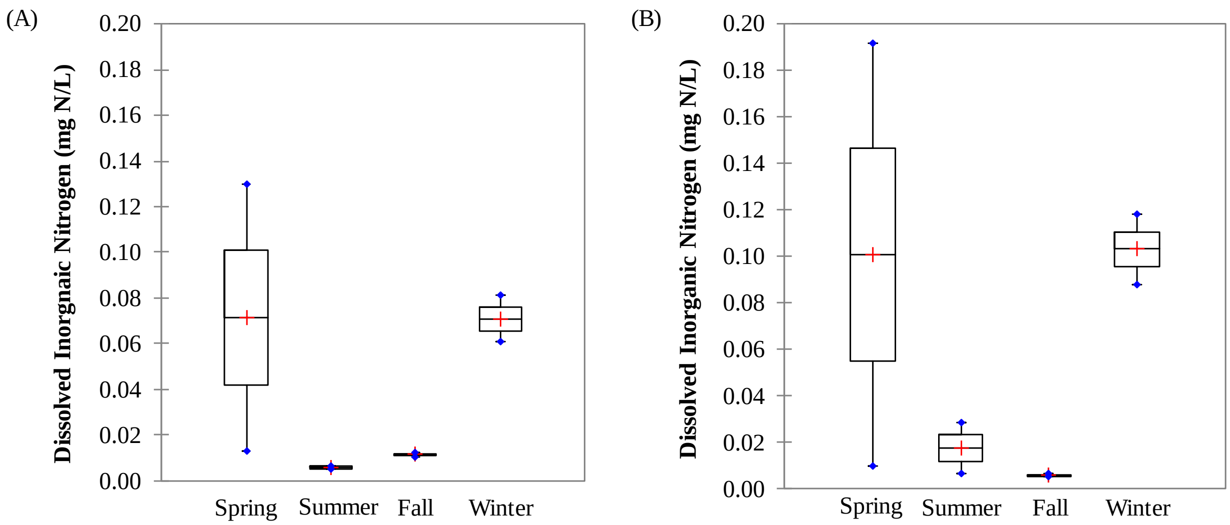


Figure 5.5.4-70. Dissolved inorganic nitrogen in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

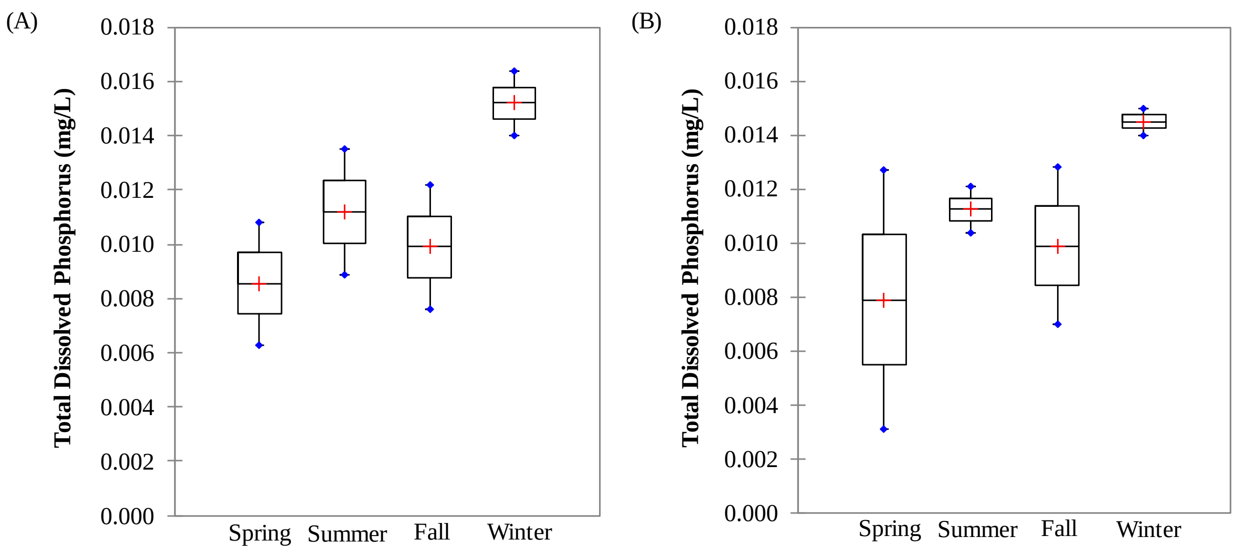


Figure 5.5.4-71. Total dissolved phosphorus in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

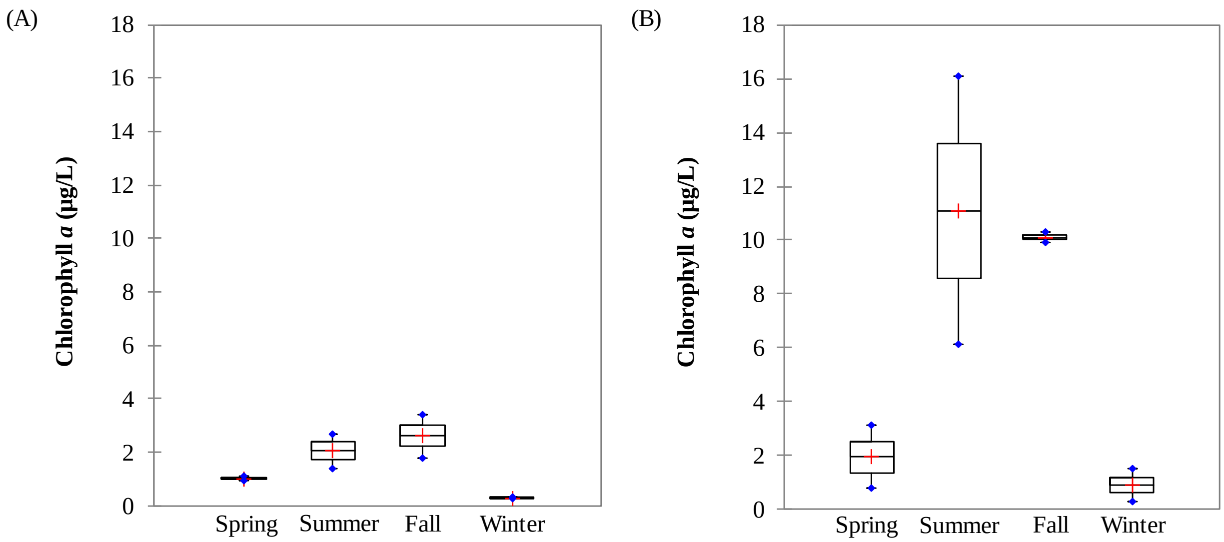


Figure 5.5.4-72. Chlorophyll *a* in the Churchill River Diversion Region by season: in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake.

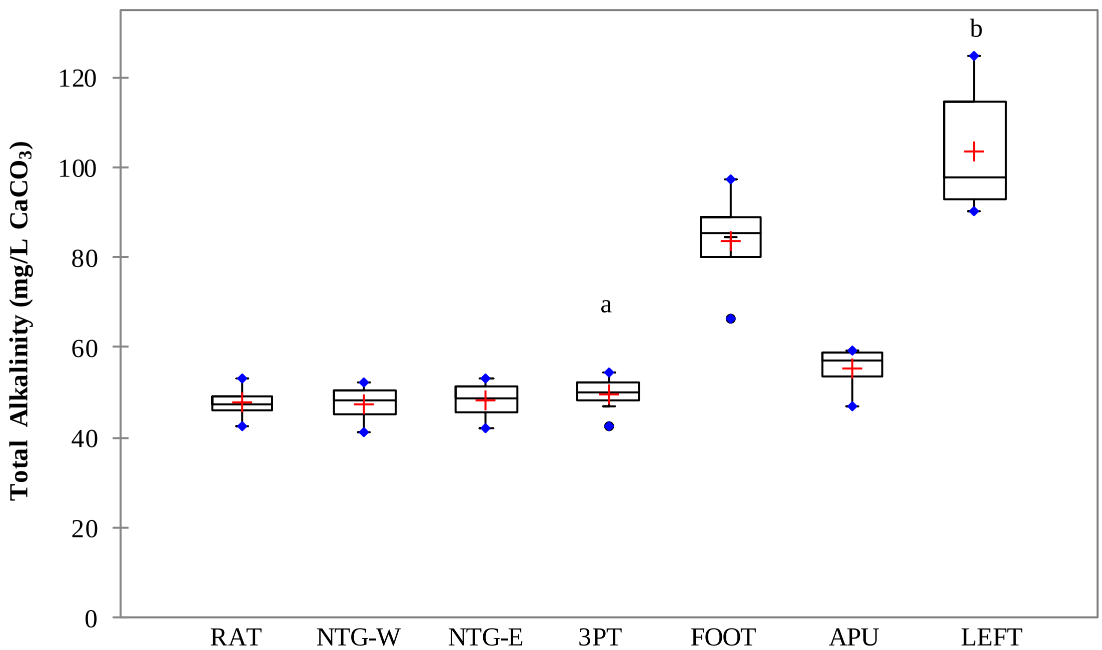


Figure 5.5.4-73. Total alkalinity in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

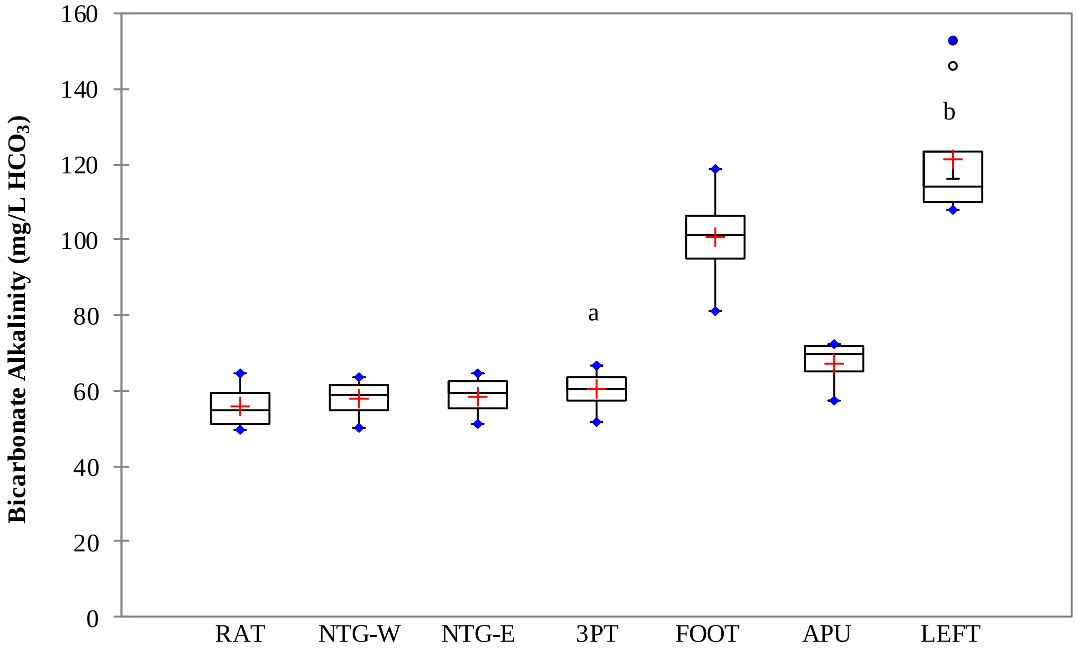


Figure 5.5.4-74. Bicarbonate alkalinity in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

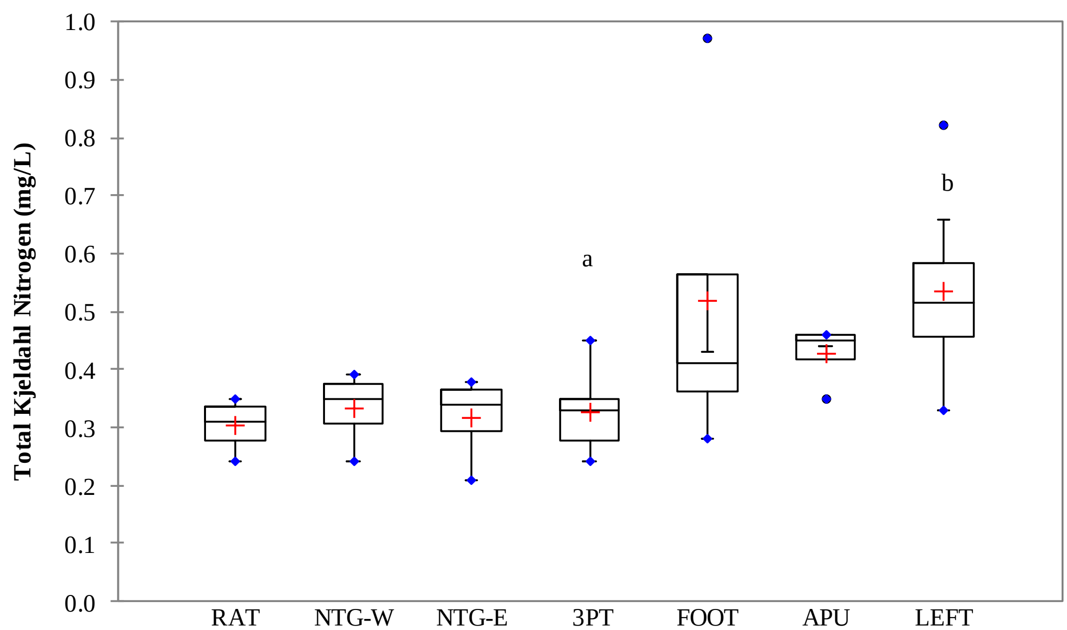


Figure 5.5.4-75. Total Kjeldahl nitrogen in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

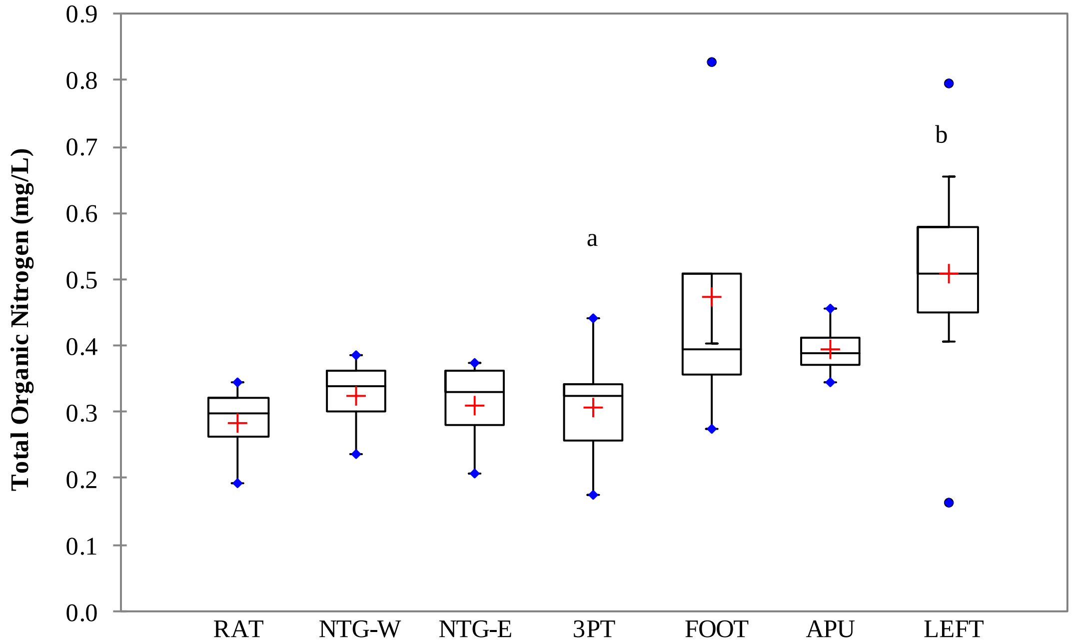


Figure 5.5.4-76. Organic nitrogen in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

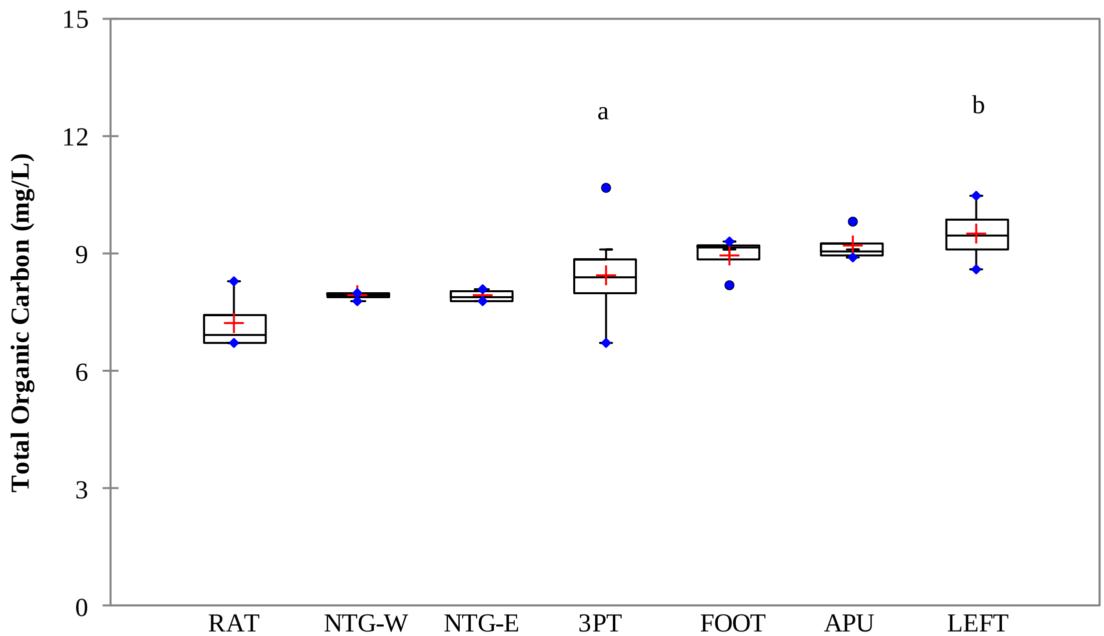


Figure 5.5.4-77. Total organic carbon in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

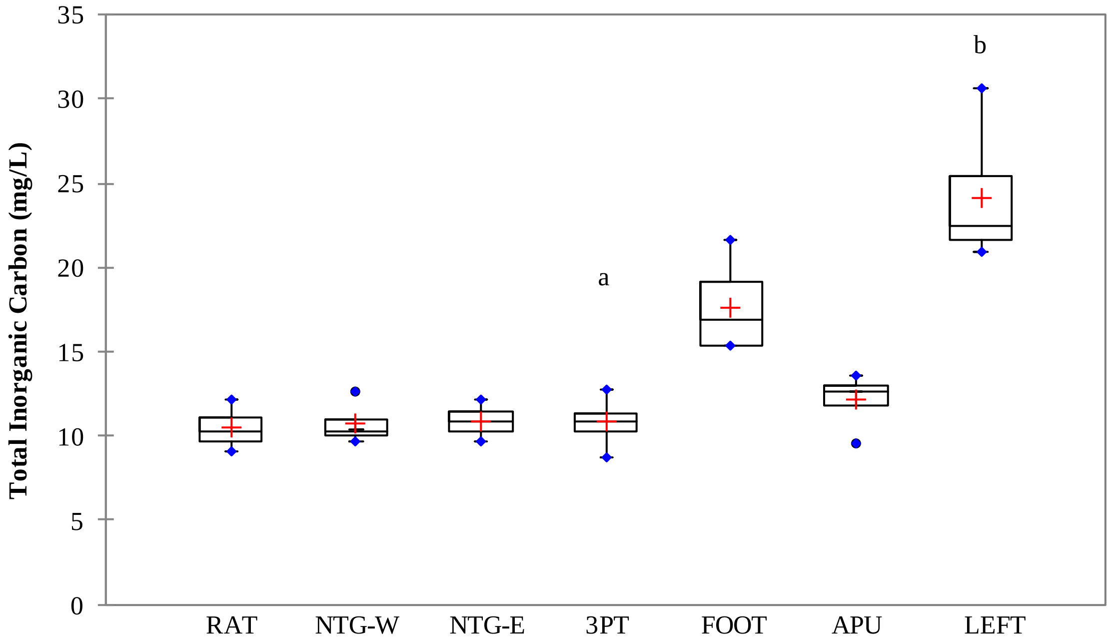


Figure 5.5.4-78. Total inorganic carbon in in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

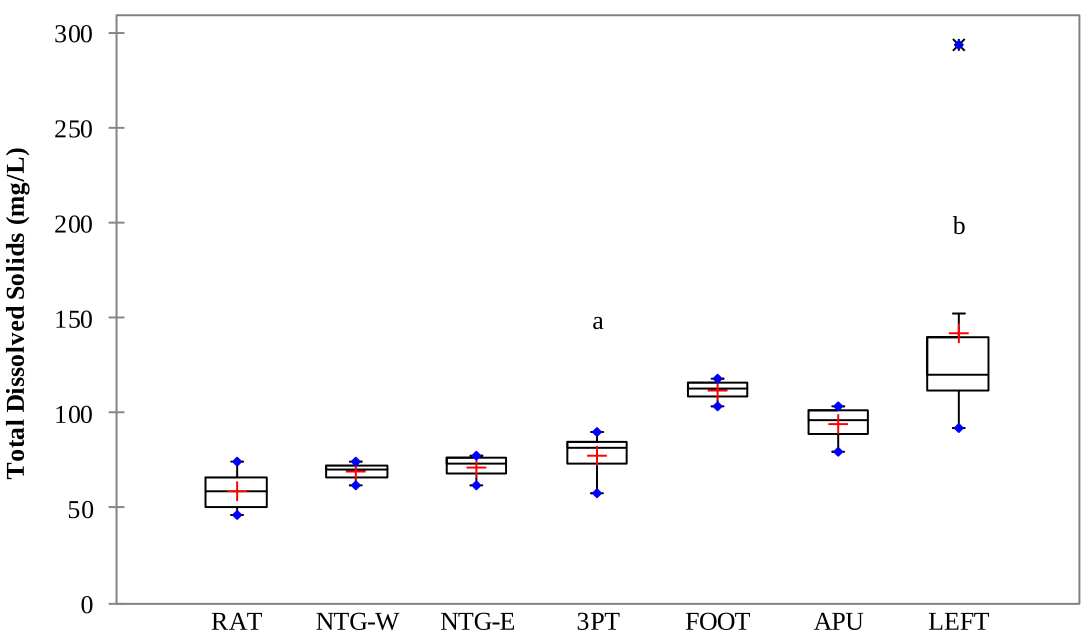


Figure 5.5.4-79. Total dissolved solids in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

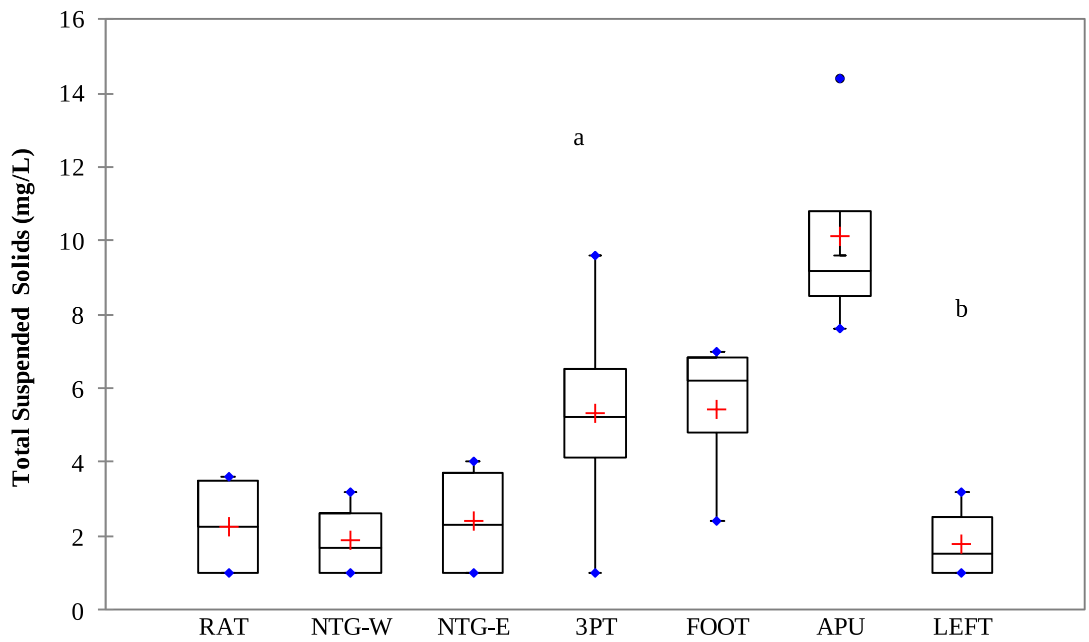


Figure 5.5.4-80. Total suspended solids in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

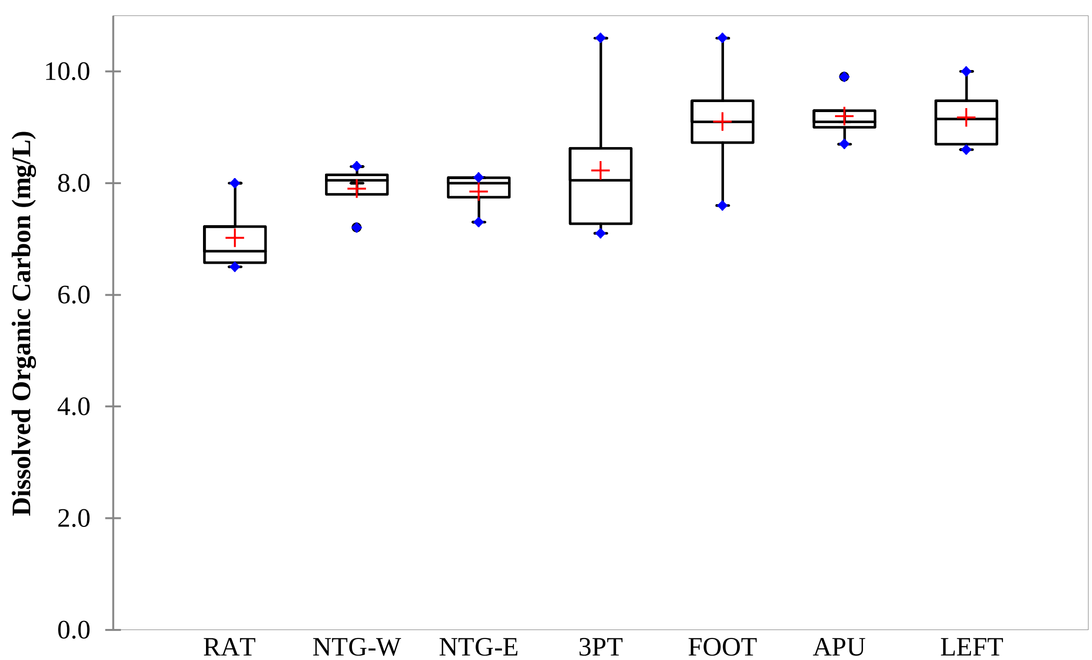


Figure 5.5.4-81. Dissolved organic carbon in the Churchill River Diversion Region: 2009-2010. No significant differences were found between annual waterbodies.

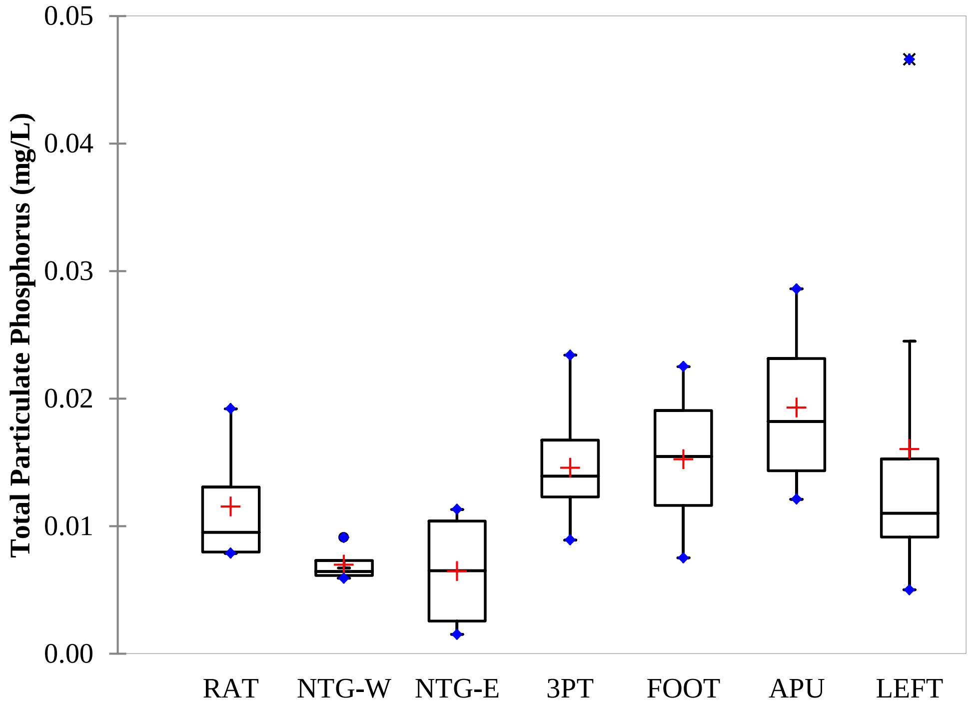


Figure 5.5.4-82. Total particulate phosphorus in the Churchill River Diversion Region: 2009-2010. No significant differences were found between annual waterbodies.

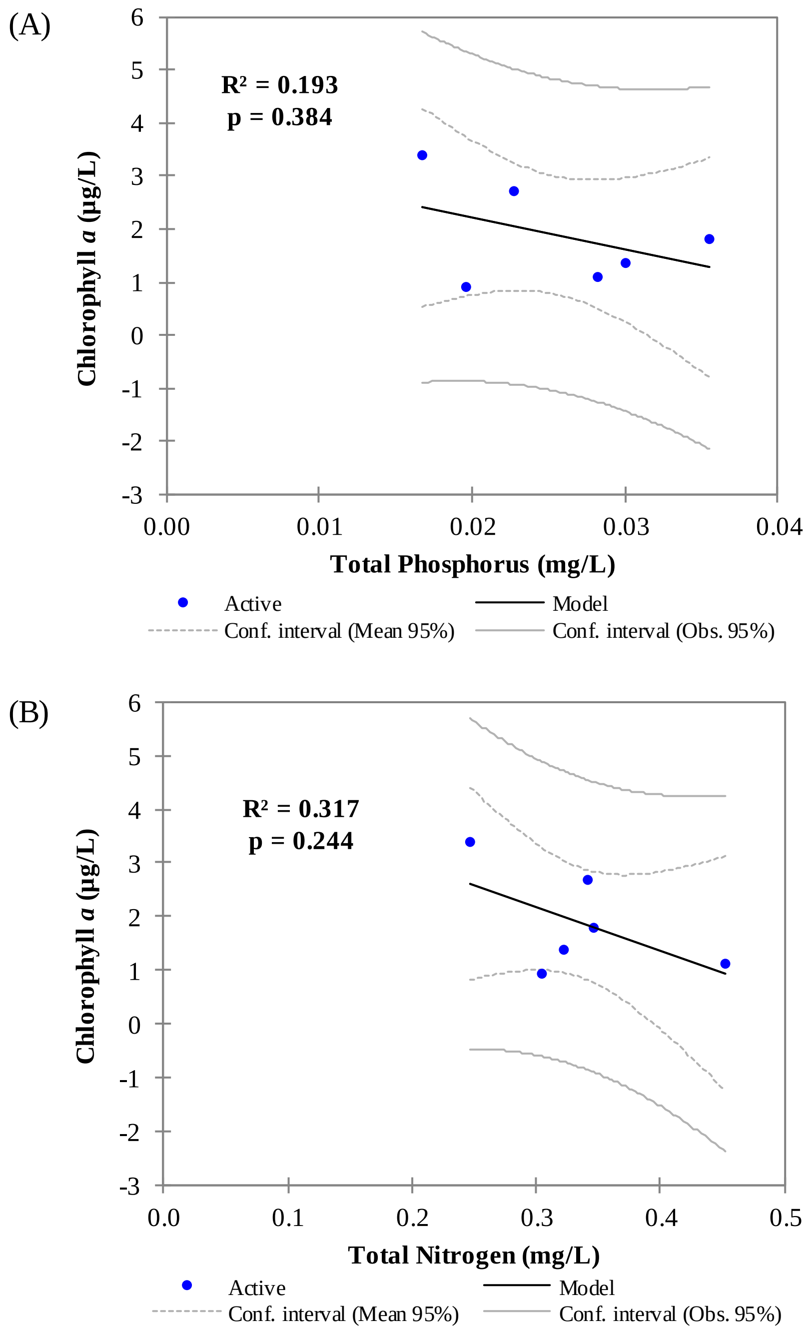


Figure 5.5.4-83. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Threepoint Lake: open-water seasons 2008-2010.

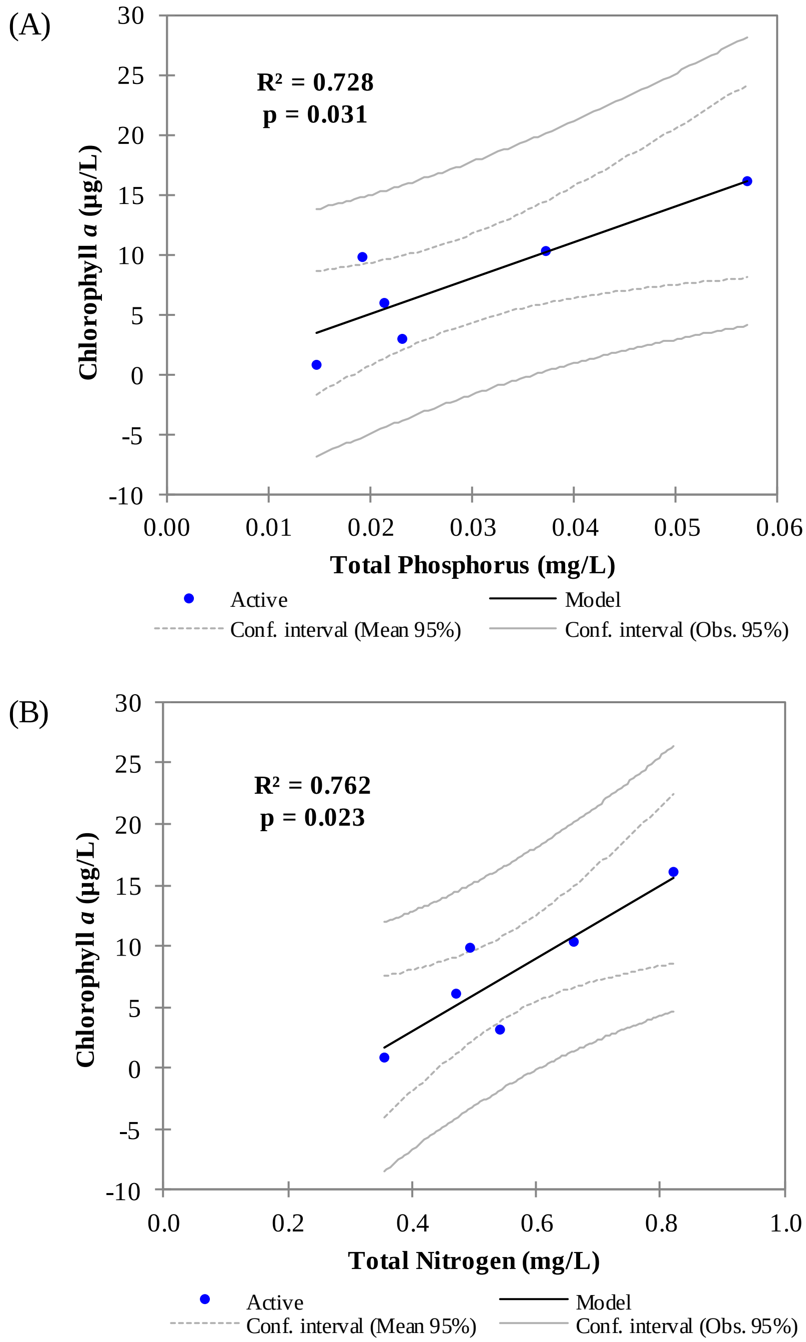


Figure 5.5.4-84. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Leftrook Lake: open-water seasons 2008-2010.

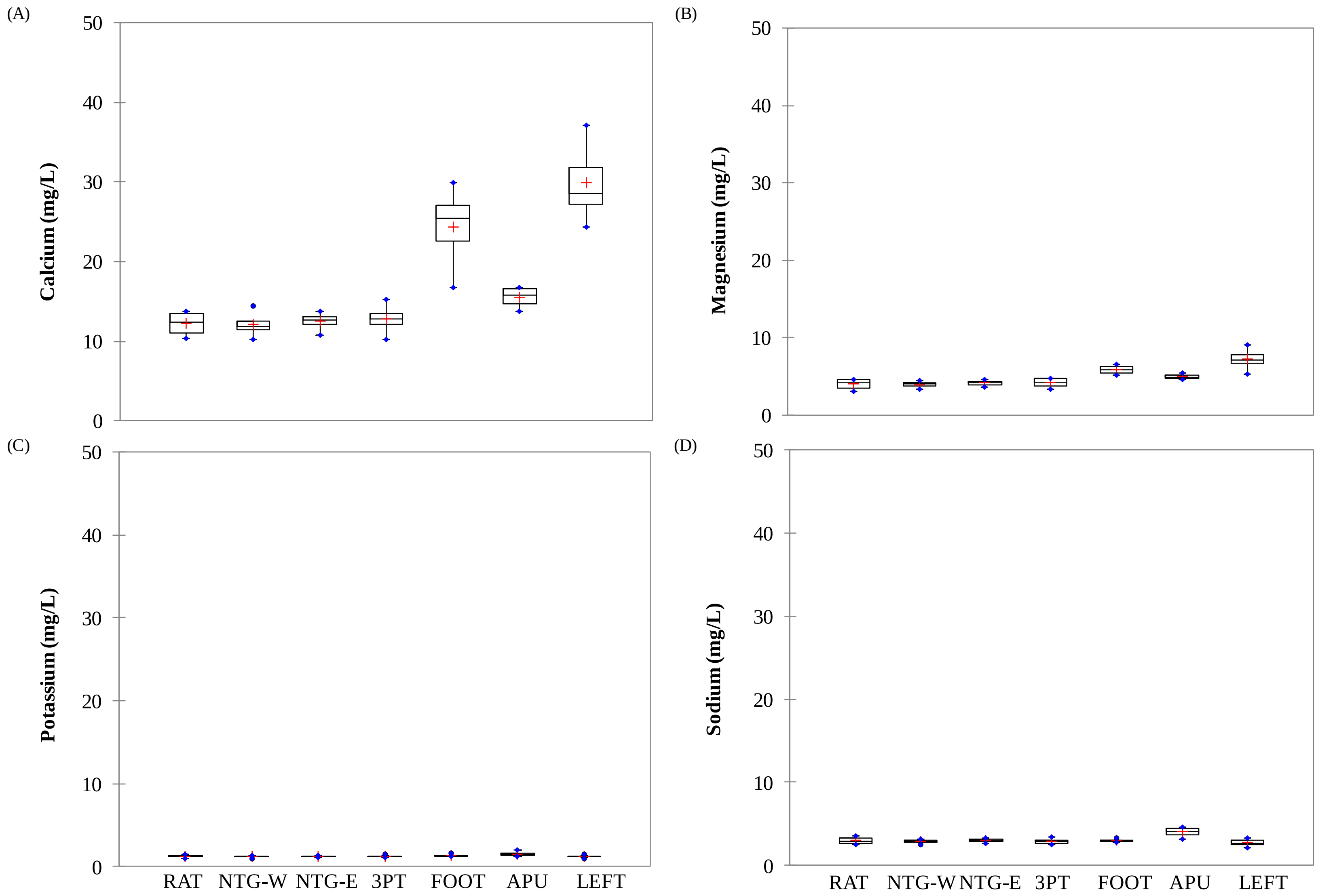


Figure 5.5.4-85. Concentrations of (A) calcium, (B) magnesium, (C) potassium, and (D) sodium measured in the Churchill River Diversion Region by waterbody.

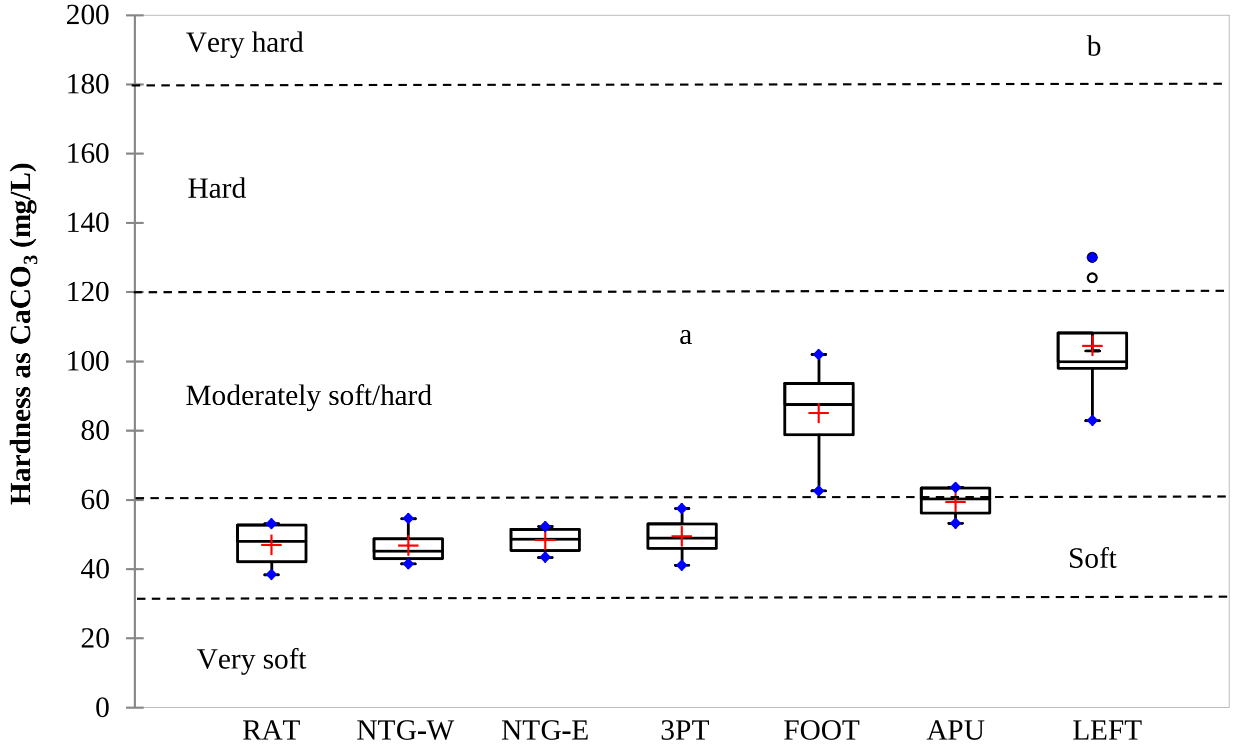


Figure 5.5.4-86. Hardness in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

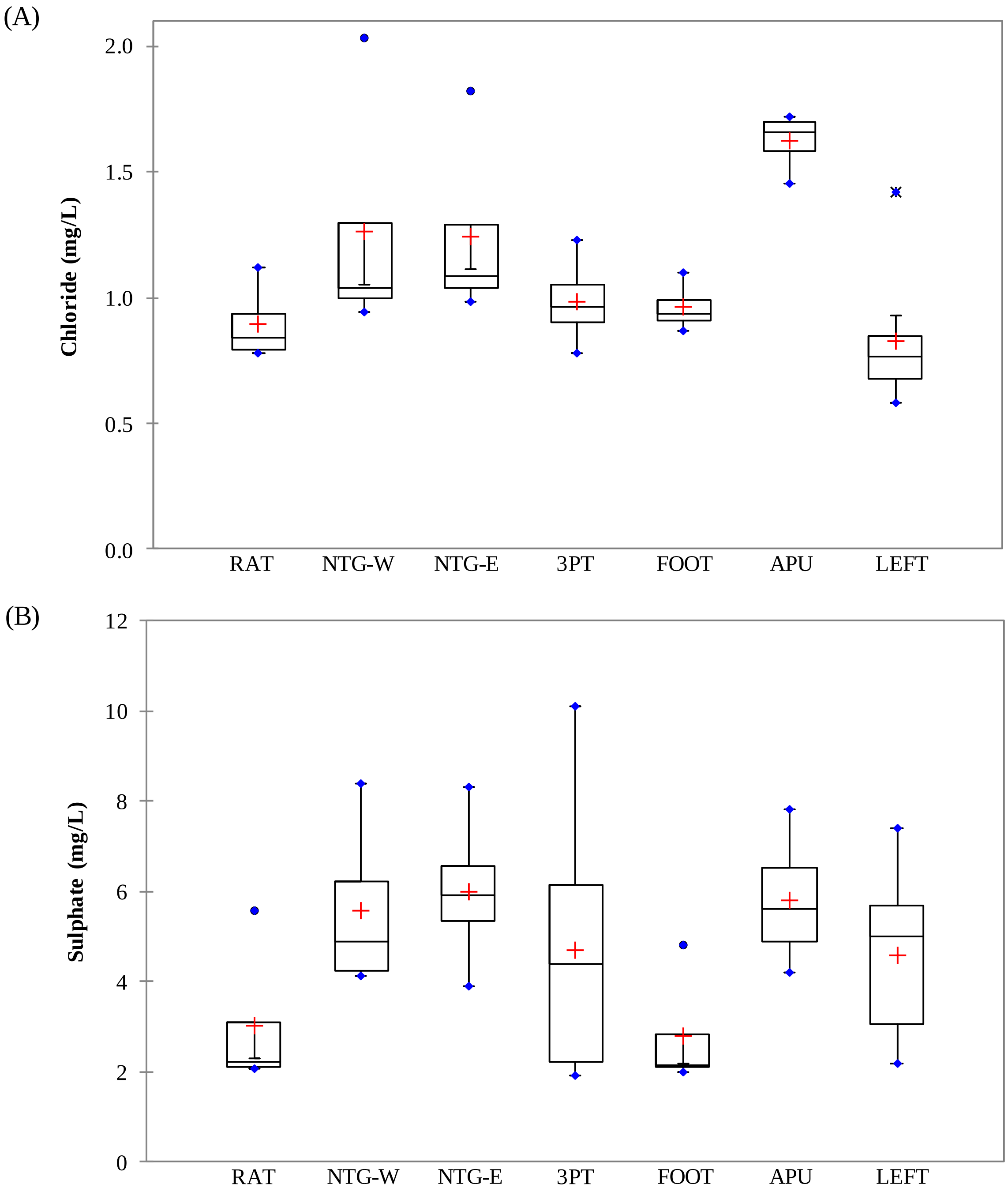


Figure 5.5.4-87. Concentrations of (A) chloride and (B) sulphate measured in the Churchill River Diversion Region by waterbody.

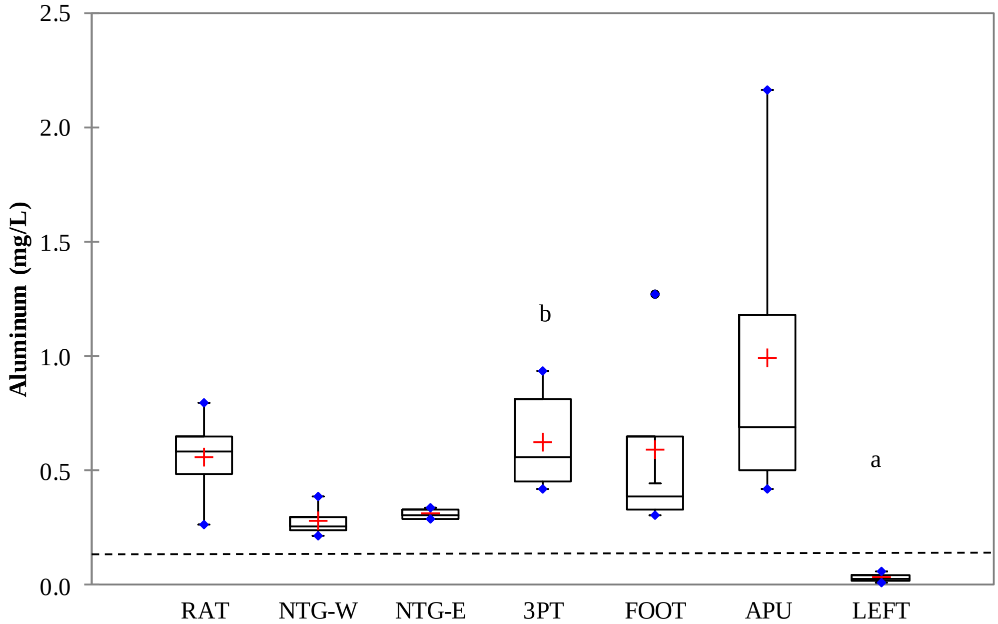


Figure 5.5.4-88. Aluminum measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts. The dashed line represents the Manitoba PAL guideline.

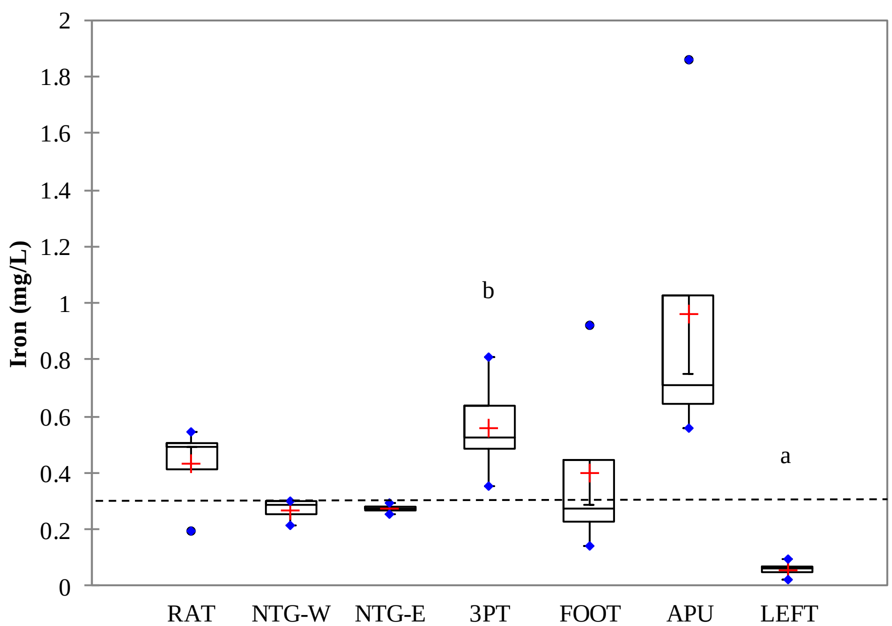


Figure 5.5.4-89. Iron measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts. The dashed line represents the Manitoba PAL guideline.

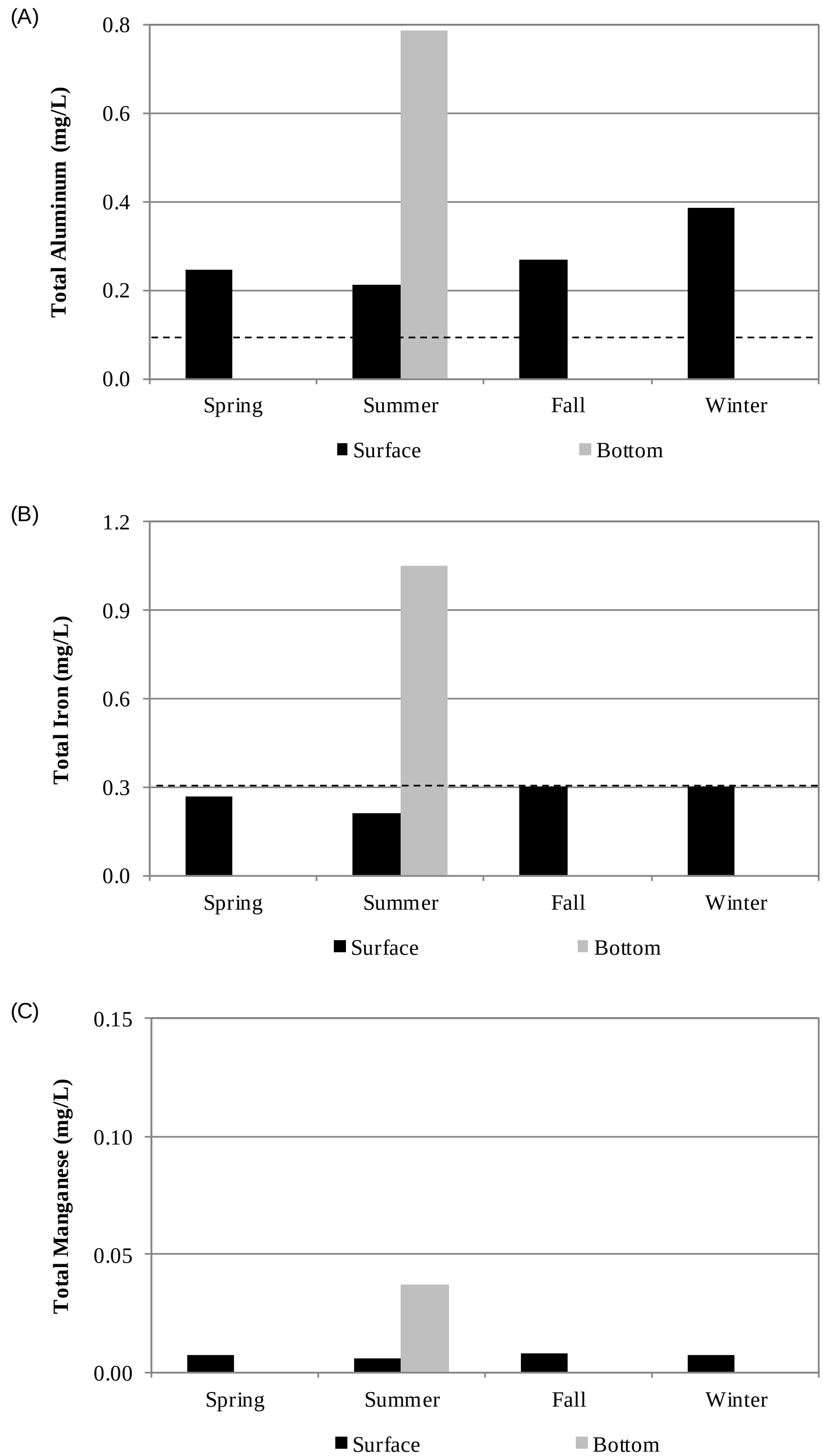


Figure 5.5.4-90. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Notigi Lake-West, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

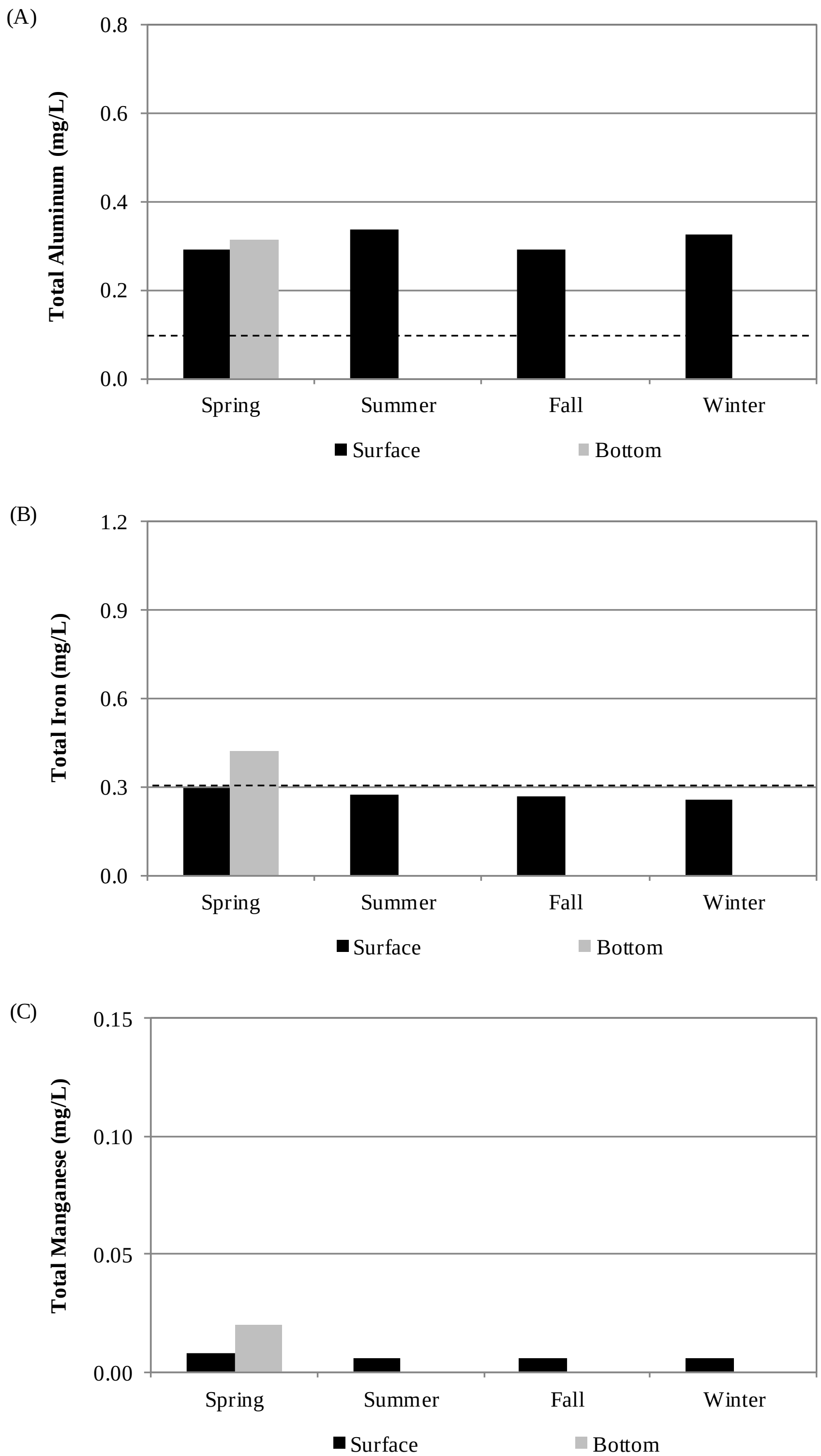


Figure 5.5.4-91. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Notigi Lake-East, 2009/2010. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

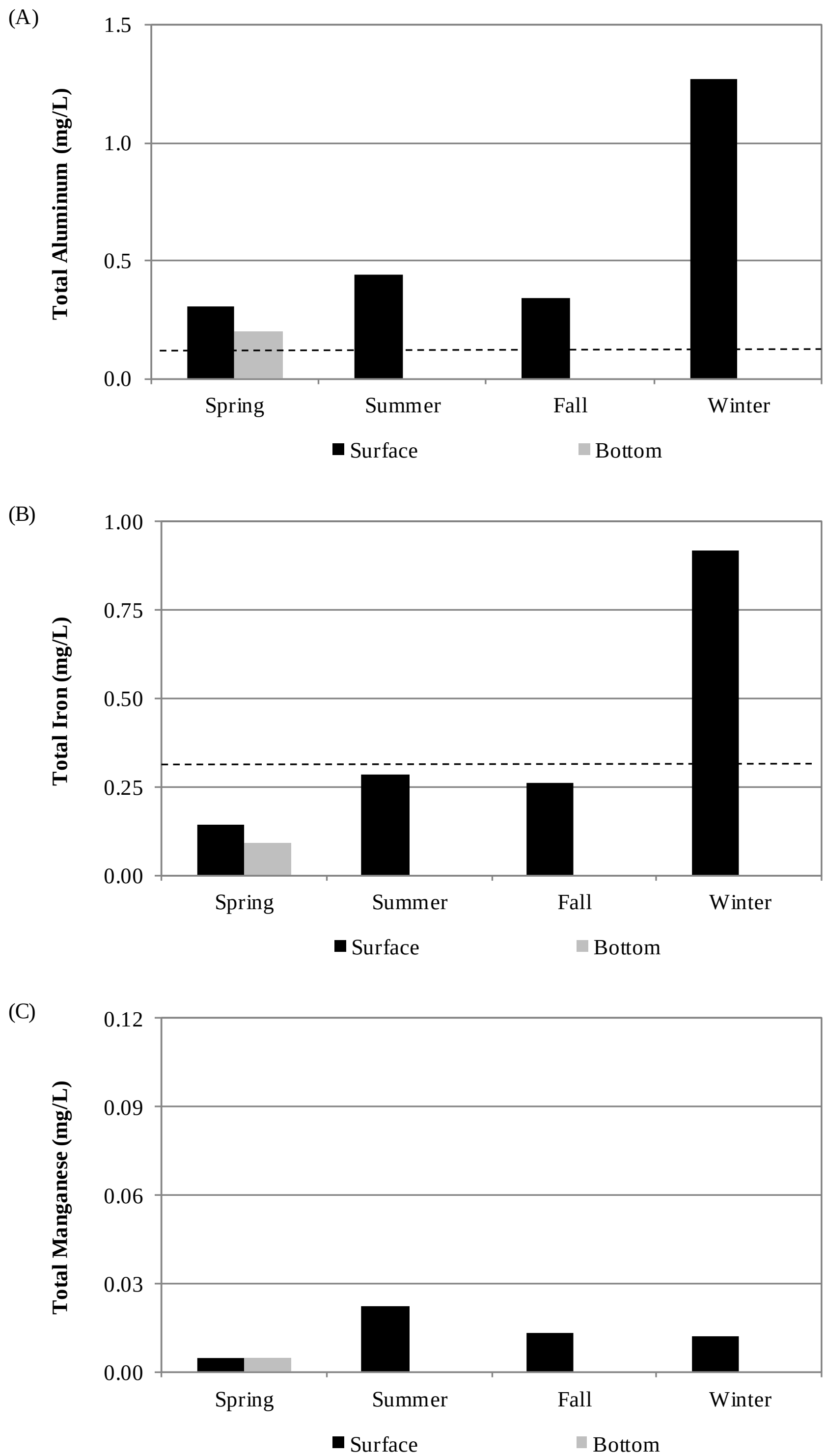


Figure 5.5.4-92. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Footprint Lake, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

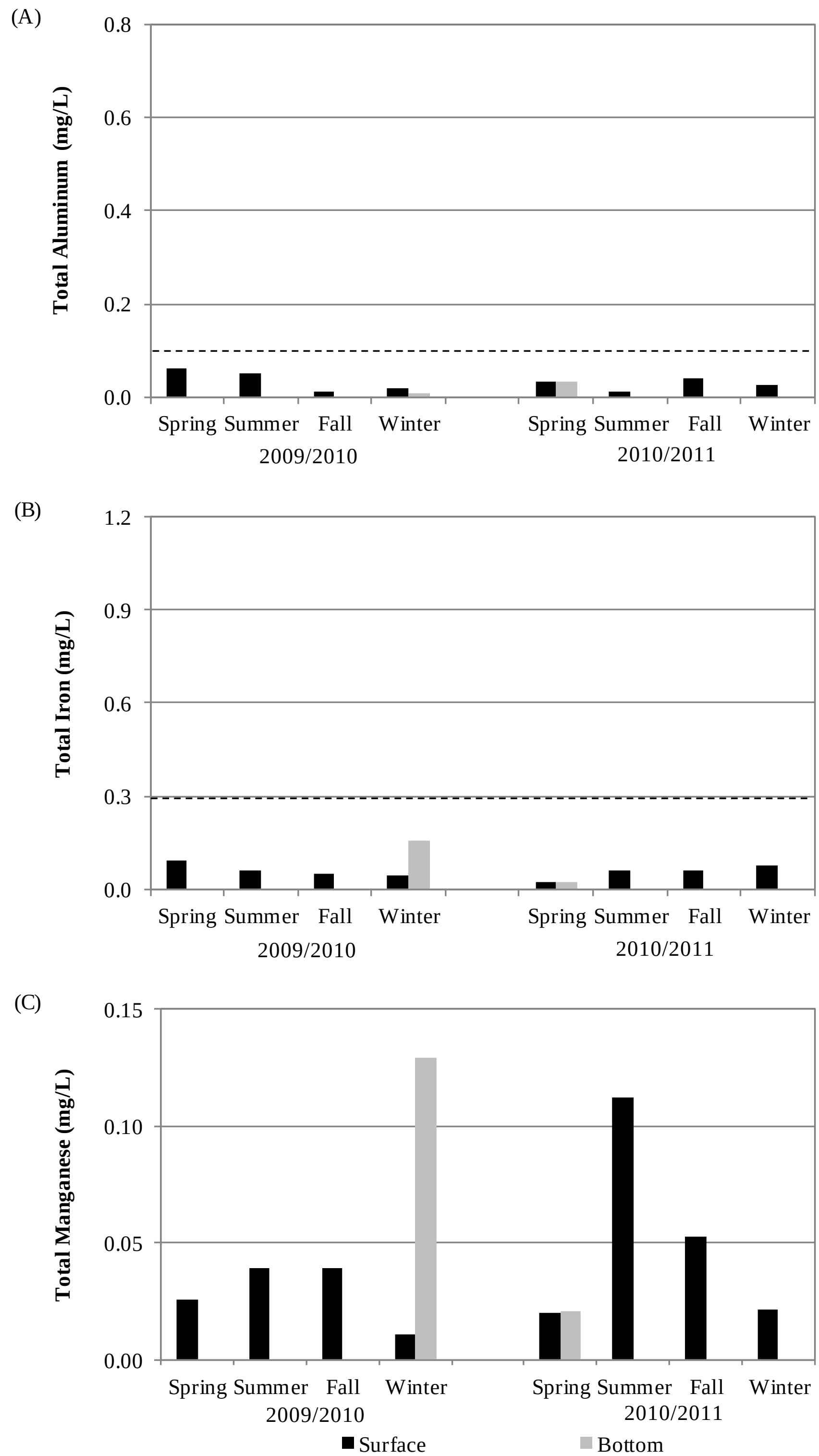


Figure 5.5.4-93. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Leftrook Lake, 2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

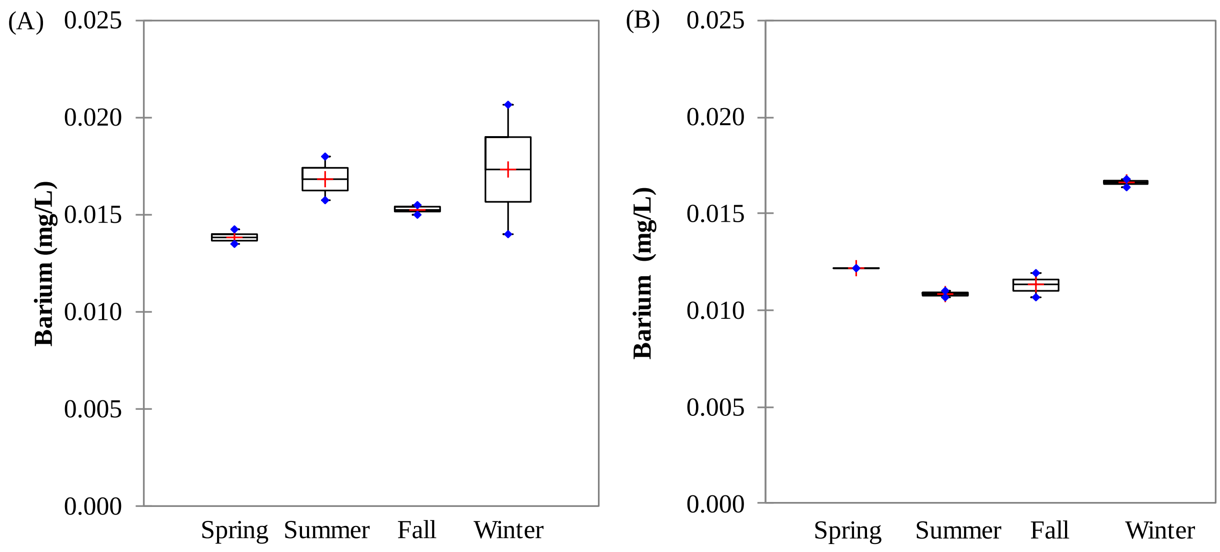


Figure 5.5.4-94. Concentrations of barium measured in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake. Statistical analyses were not conducted as data were too limited.

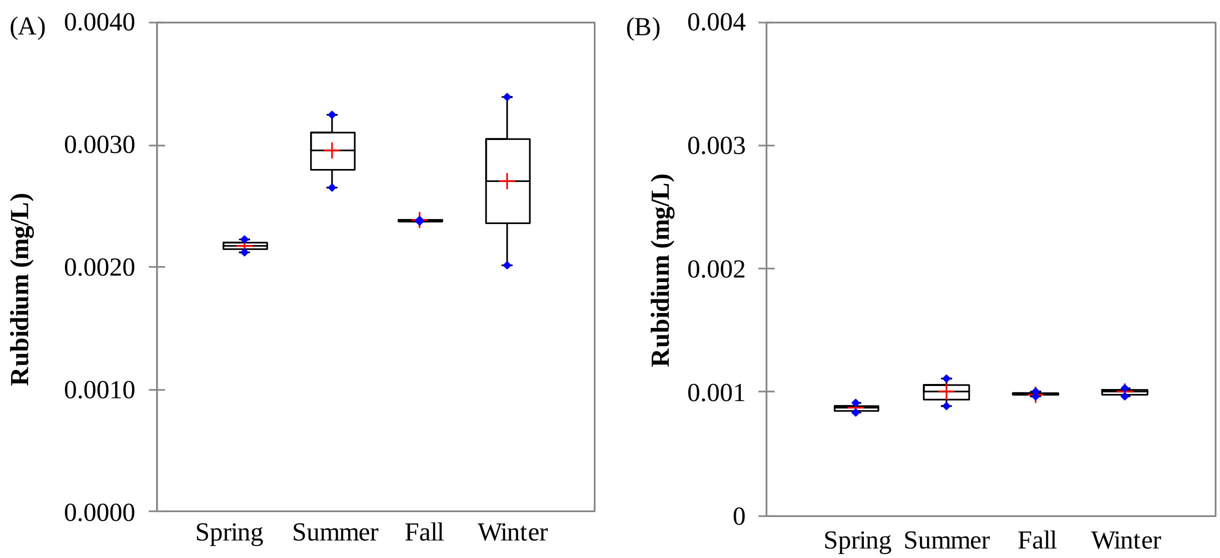


Figure 5.5.4-95. Concentrations of rubidium measured in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake. Statistical analyses were not conducted as data were too limited.

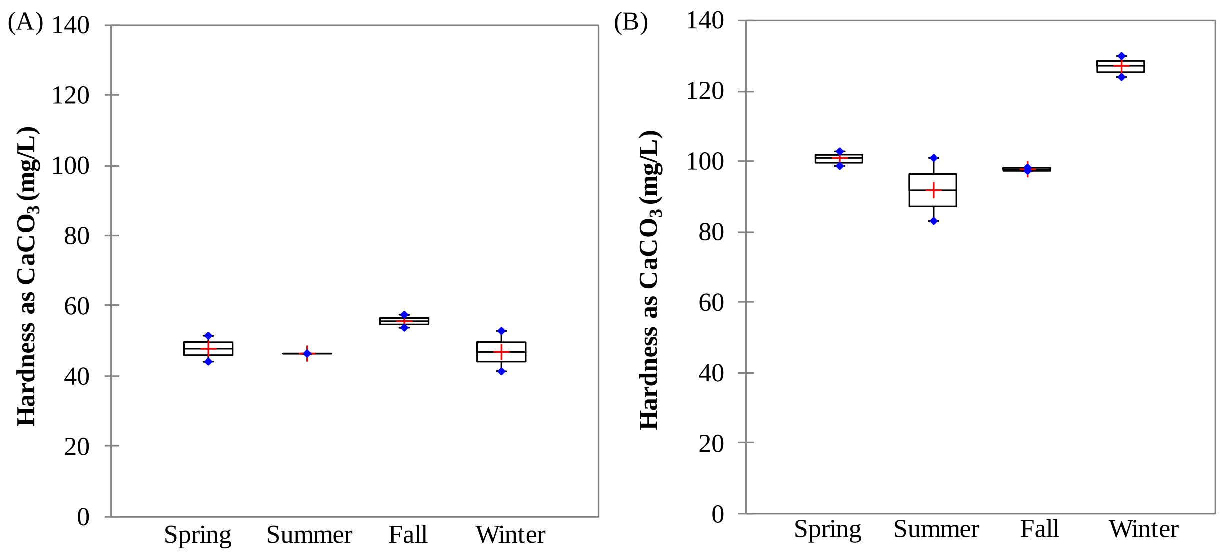


Figure 5.5.4-96. Hardness measured in the Churchill River Diversion Region by season: (A) Threepoint Lake and (B) Leftrook Lake (note the different scales on the y-axes). Statistical analyses were not conducted as data were too limited.

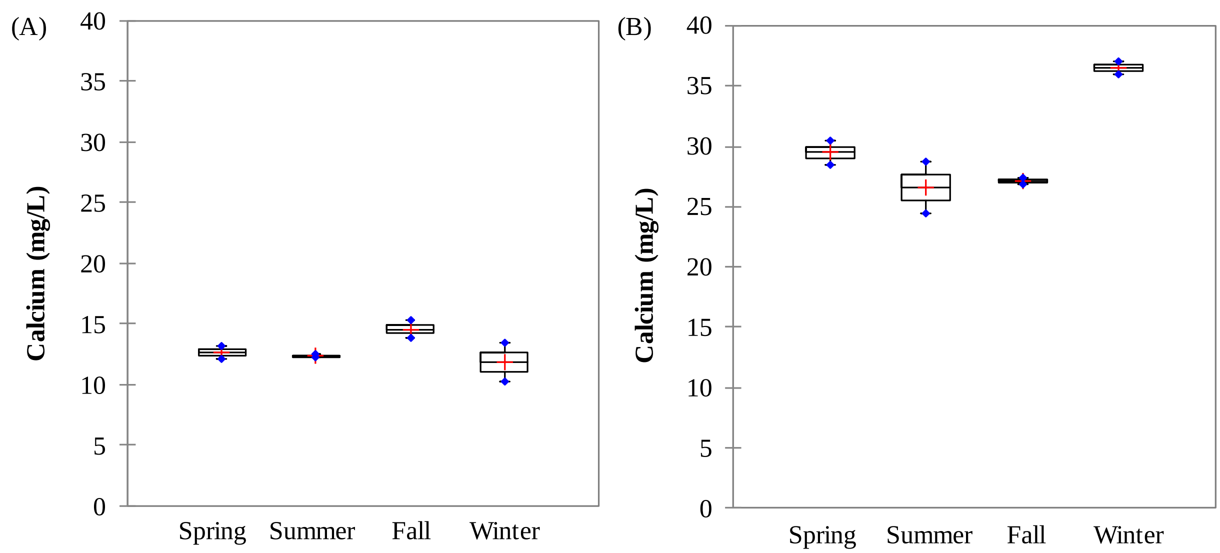


Figure 5.5.4-97. Calcium measured in the Churchill River Diversion Region by season by season: (A) Threepoint Lake and (B) Leftrook Lake (note the different scales on the y-axes). Statistical analyses were not conducted as data were too limited.

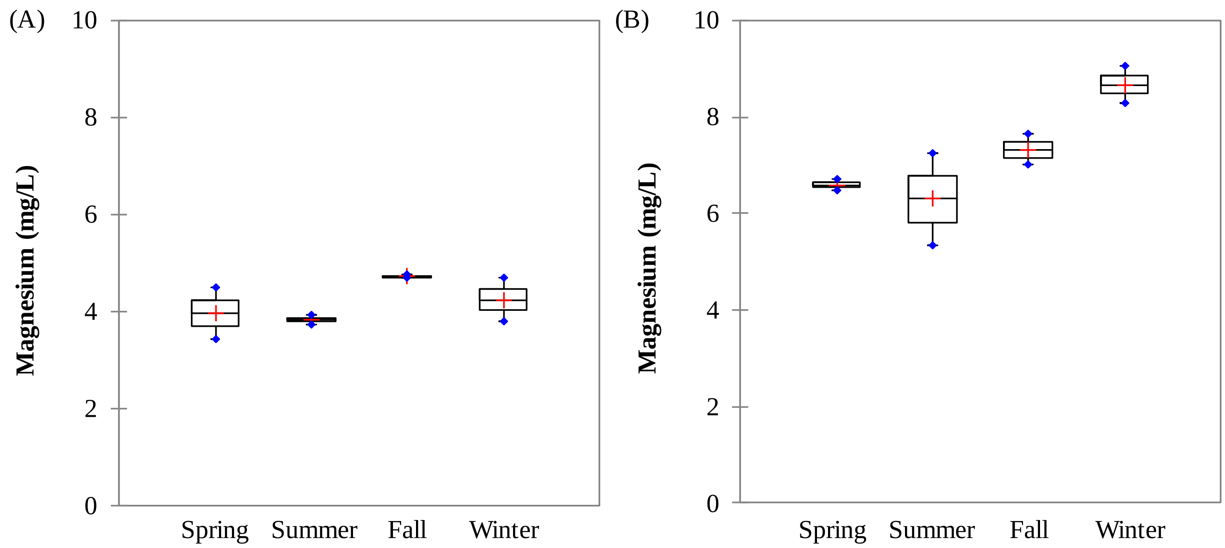


Figure 5.5.4-98. Magnesium measured in the Churchill River Diversion Region by season by season: (A) Threepoint Lake and (B) Leftrook Lake (note the different scales on the y-axes). Statistical analyses were not conducted as data were too limited.

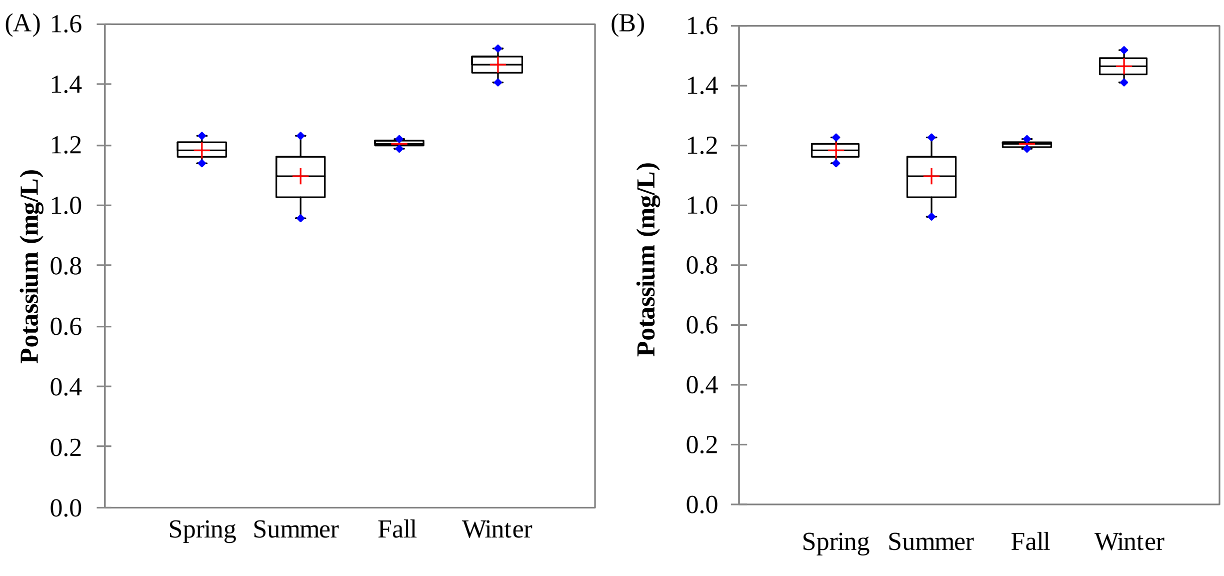


Figure 5.5.4-99. Potassium measured in the Churchill River Diversion Region by season by season: (A) Threepoint Lake and (B) Leftrook Lake. Statistical analyses were not conducted as data were too limited.

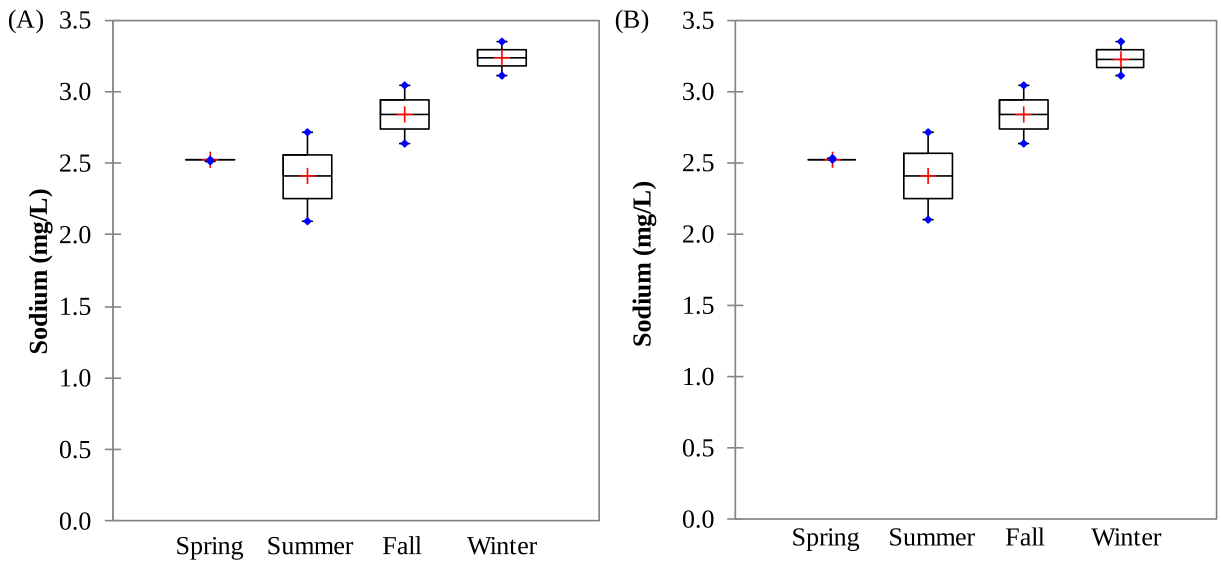


Figure 5.5.4-100. Sodium measured in the Churchill River Diversion Region by season by season: (A) Threepoint Lake and (B) Leftrook Lake. Statistical analyses were not conducted as data were too limited.

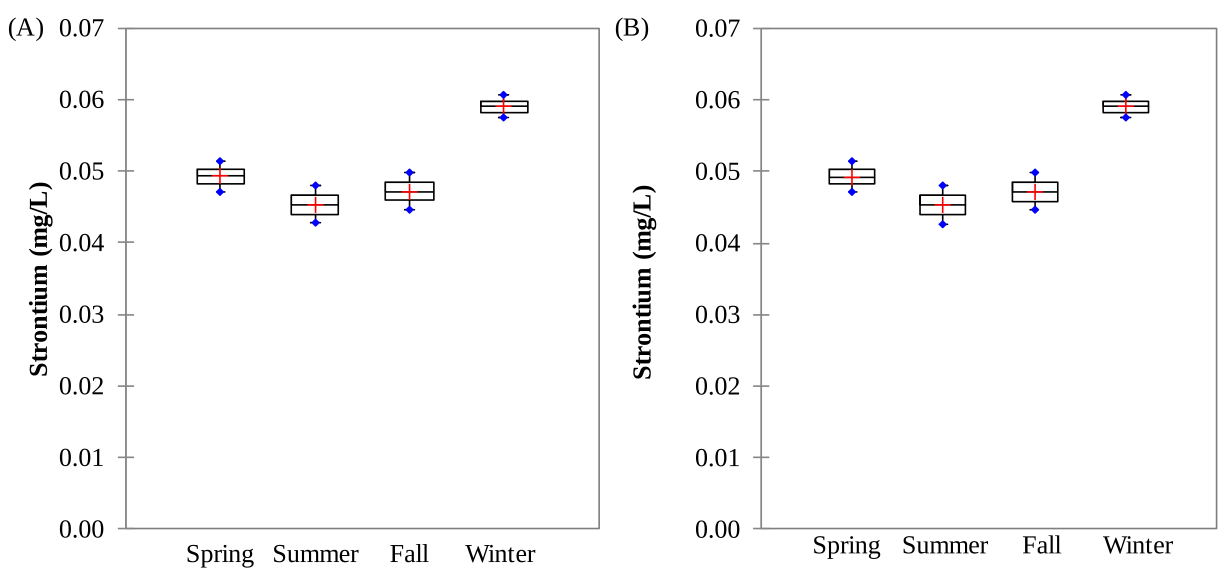


Figure 5.5.4-101. Strontium measured in the Churchill River Diversion Region by season by season: (A) Threepoint Lake and (B) Leftrook Lake. Statistical analyses were not conducted as data were too limited.

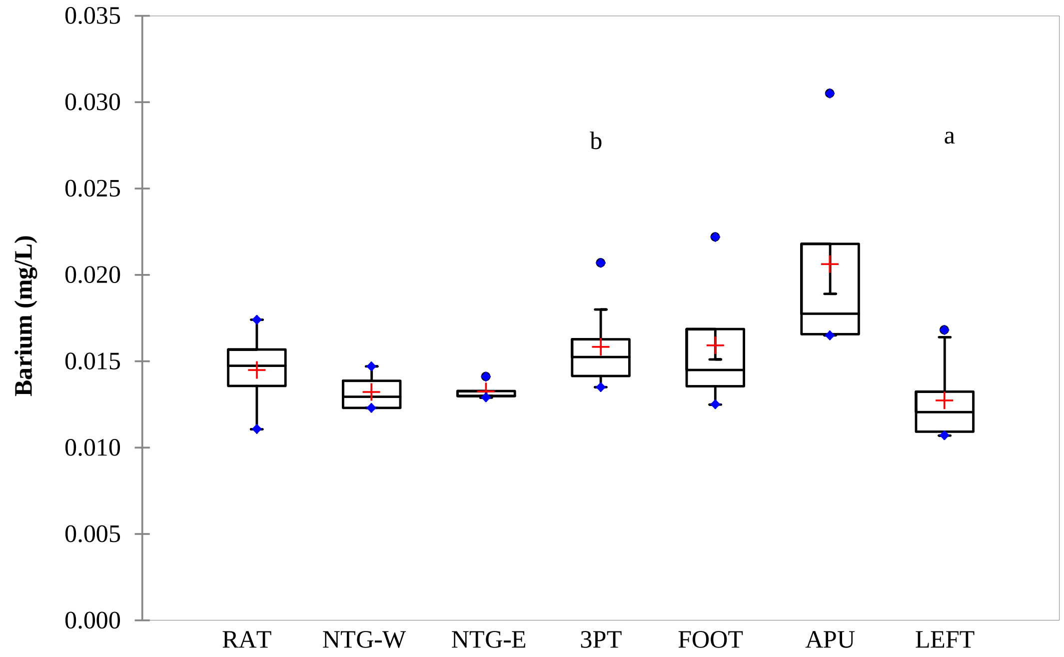


Figure 5.5.4-102. Barium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

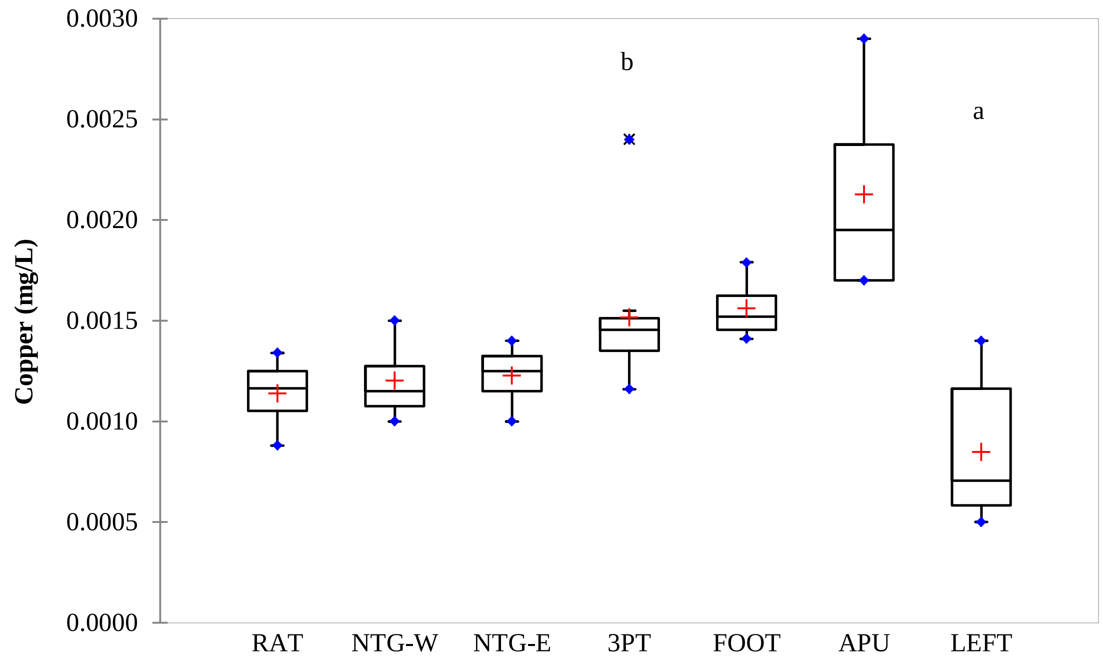


Figure 5.5.4-103. Copper measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

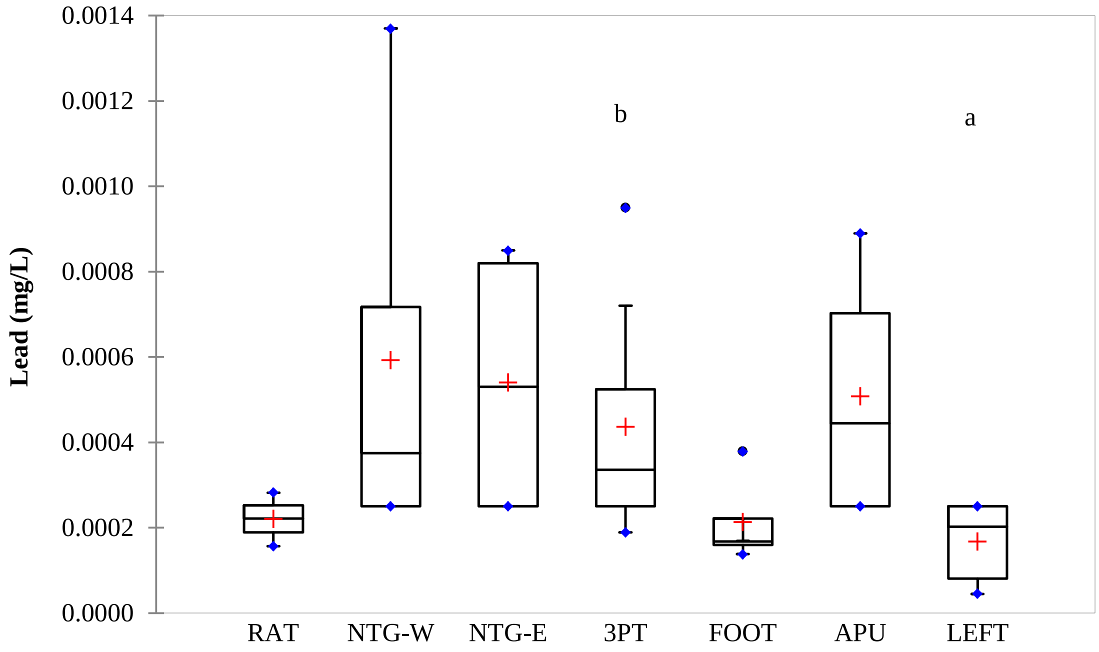


Figure 5.5.4-104. Lead measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

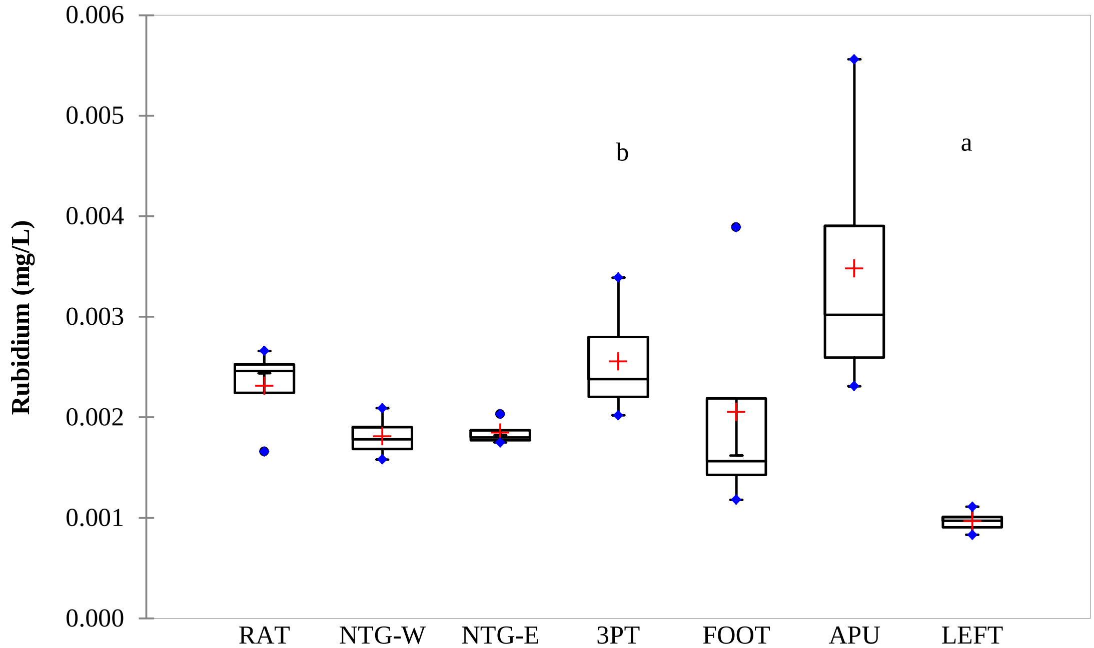


Figure 5.5.4-105. Rubidium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

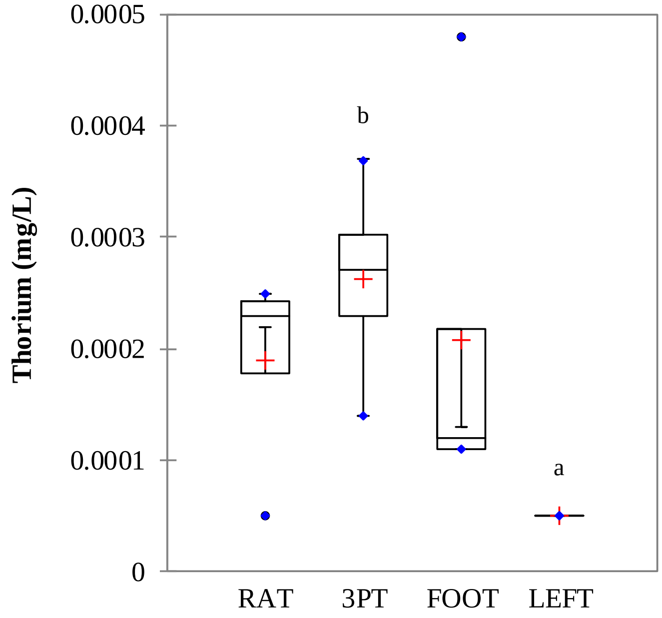


Figure 5.5.4-106. Thorium measured in the Churchill River Diversion Region: 2009-2010 (this parameter was not analysed at Notigi Lake-East or West, or Apussigamasi Lake).

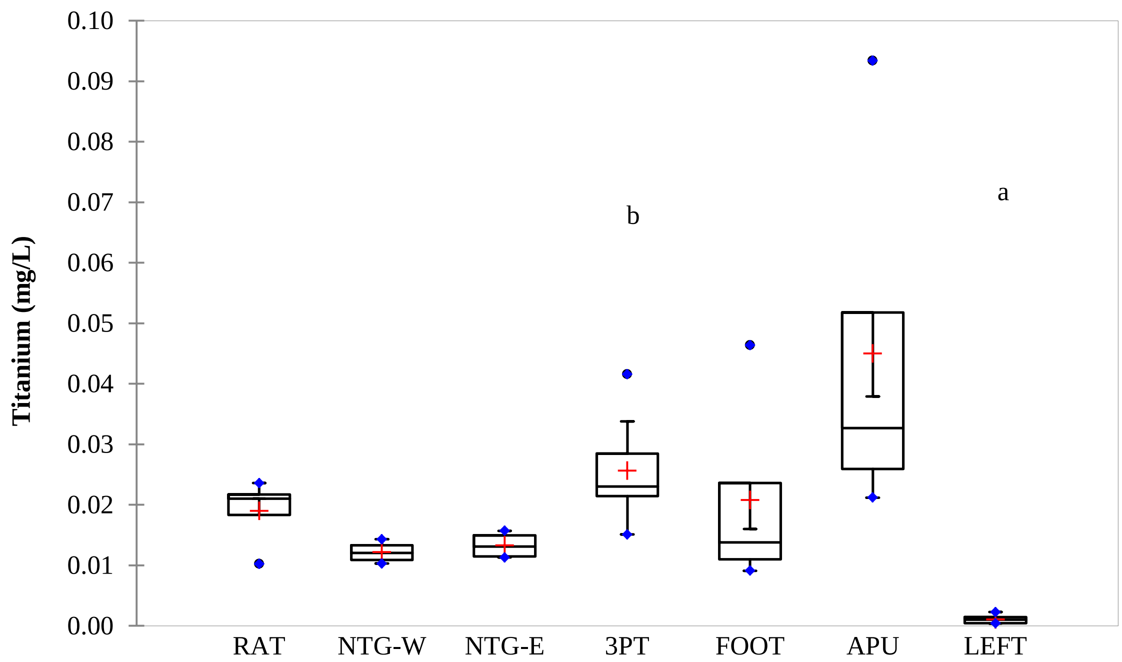


Figure 5.5.4-107. Titanium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

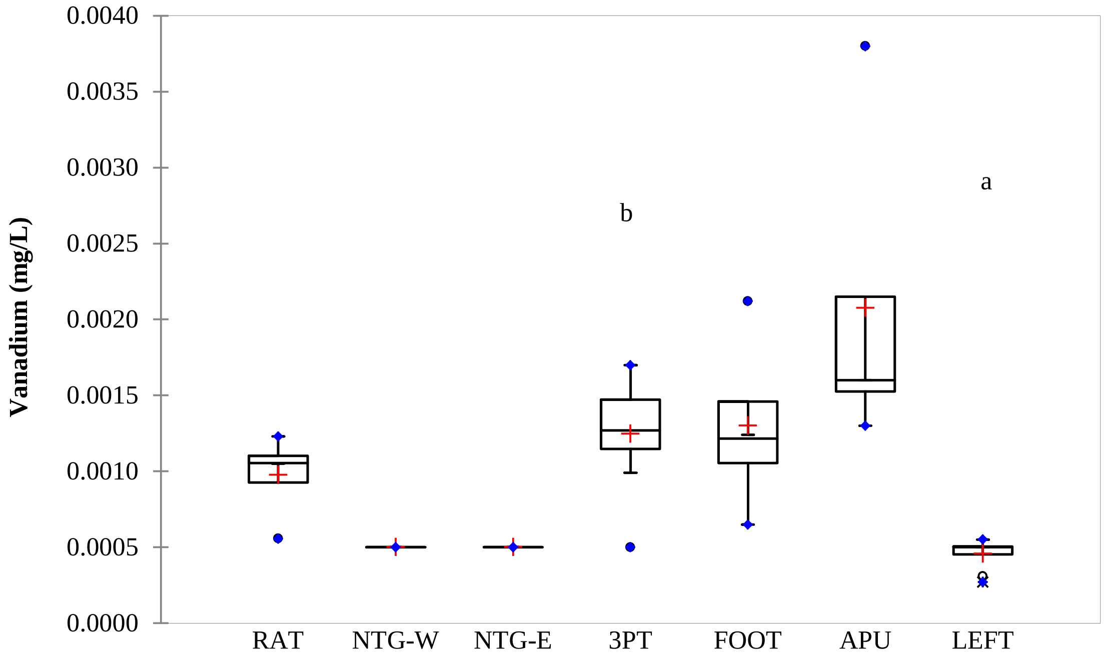


Figure 5.5.4-108. Vanadium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

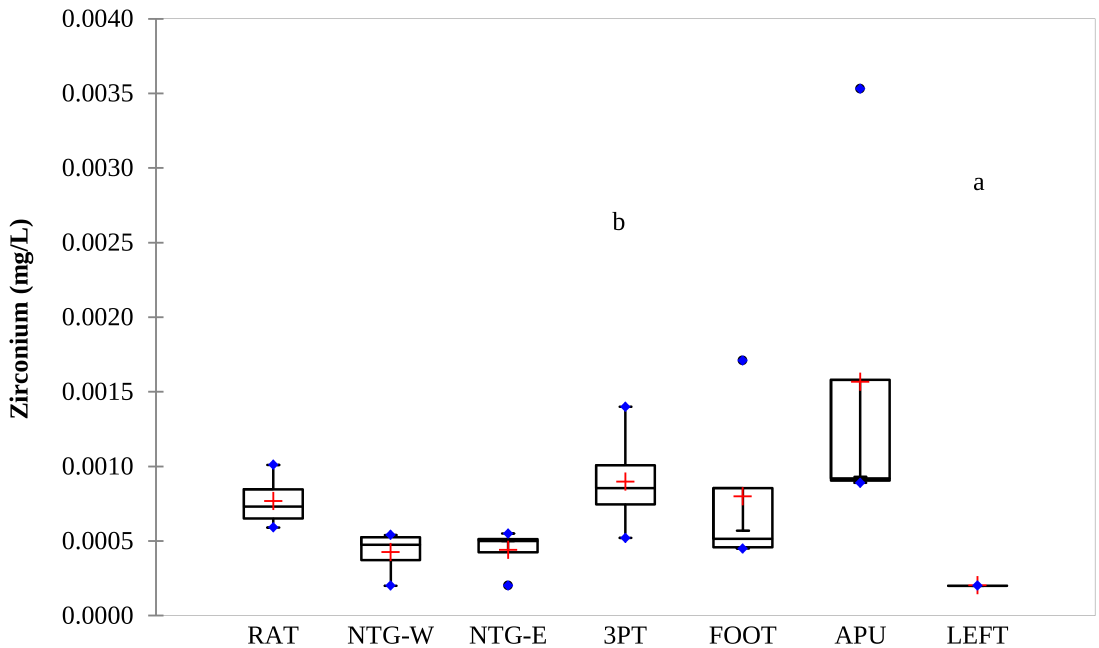


Figure 5.5.4-109. Zirconium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

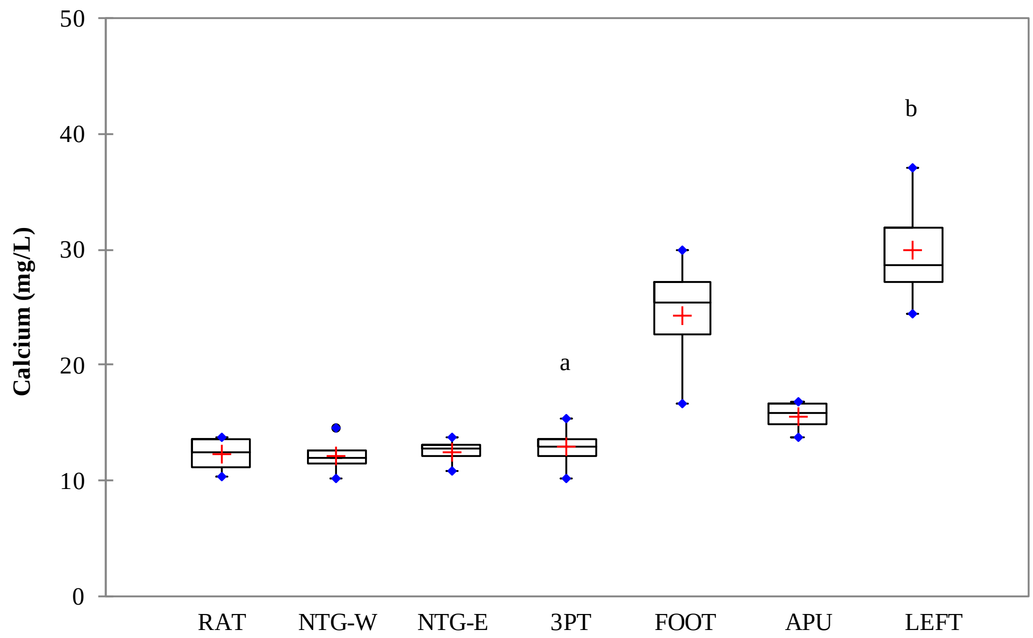


Figure 5.5.4-110. Calcium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

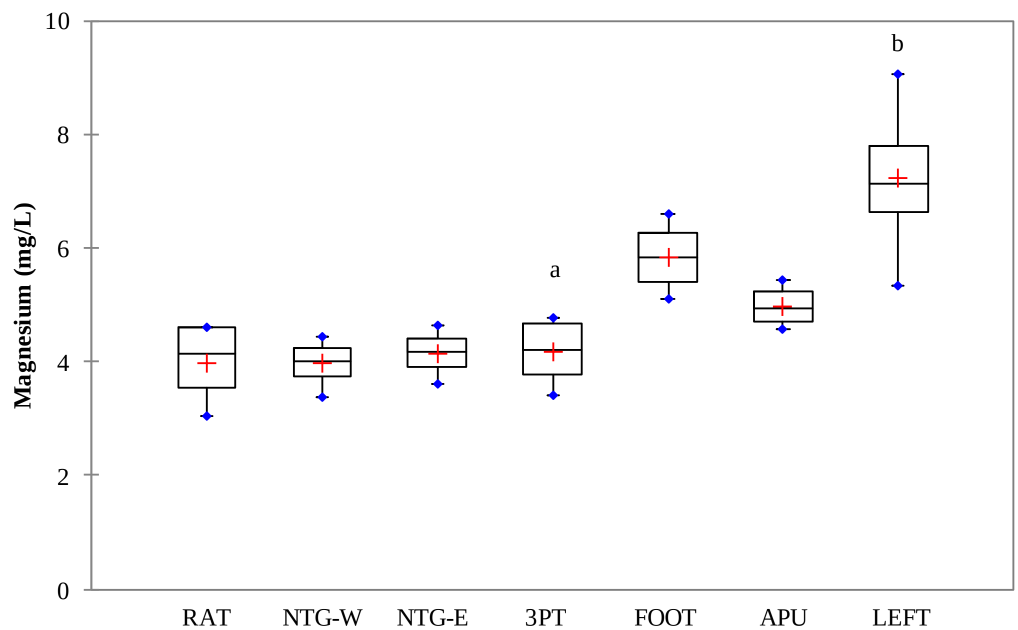


Figure 5.5.4-111. Magnesium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

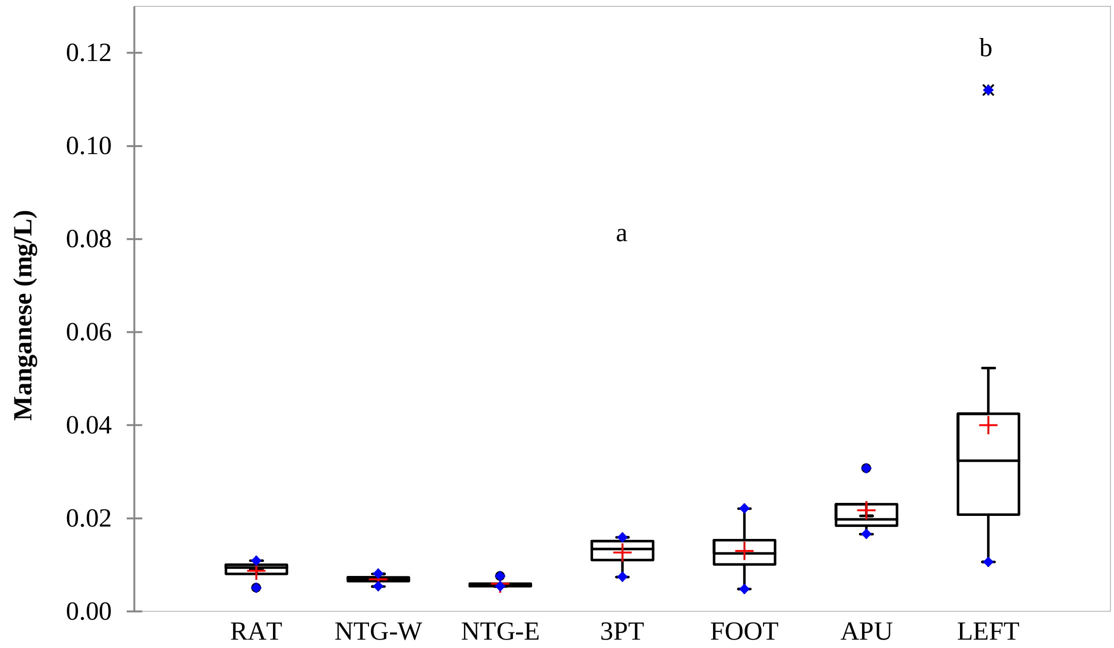


Figure 5.5.4-112. Manganese measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

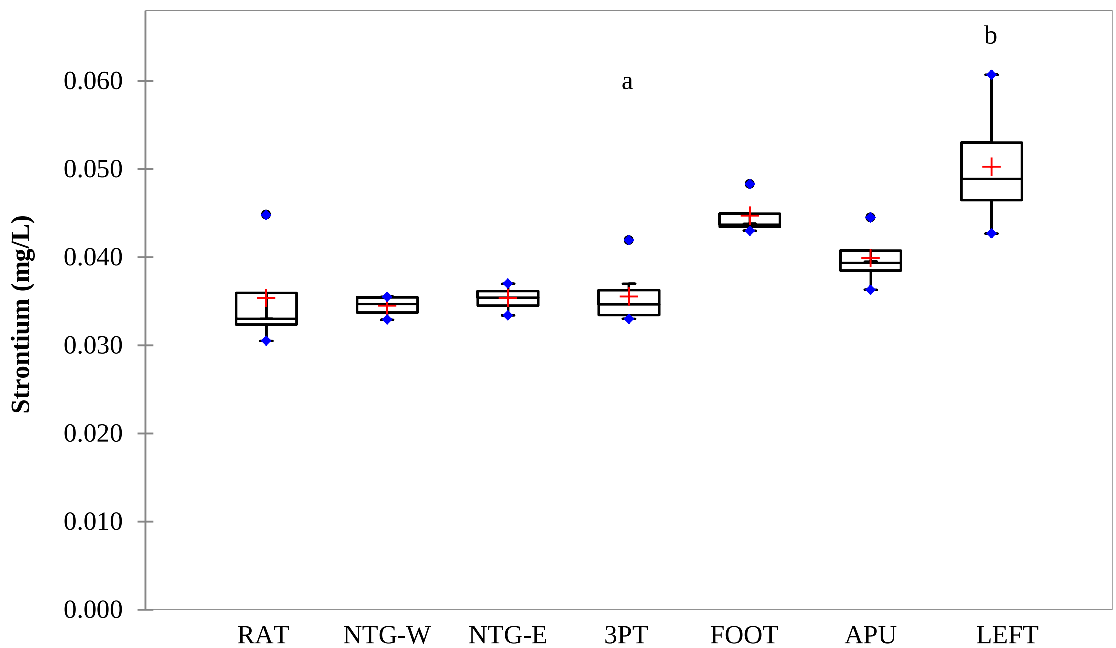


Figure 5.5.4-113. Strontium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.

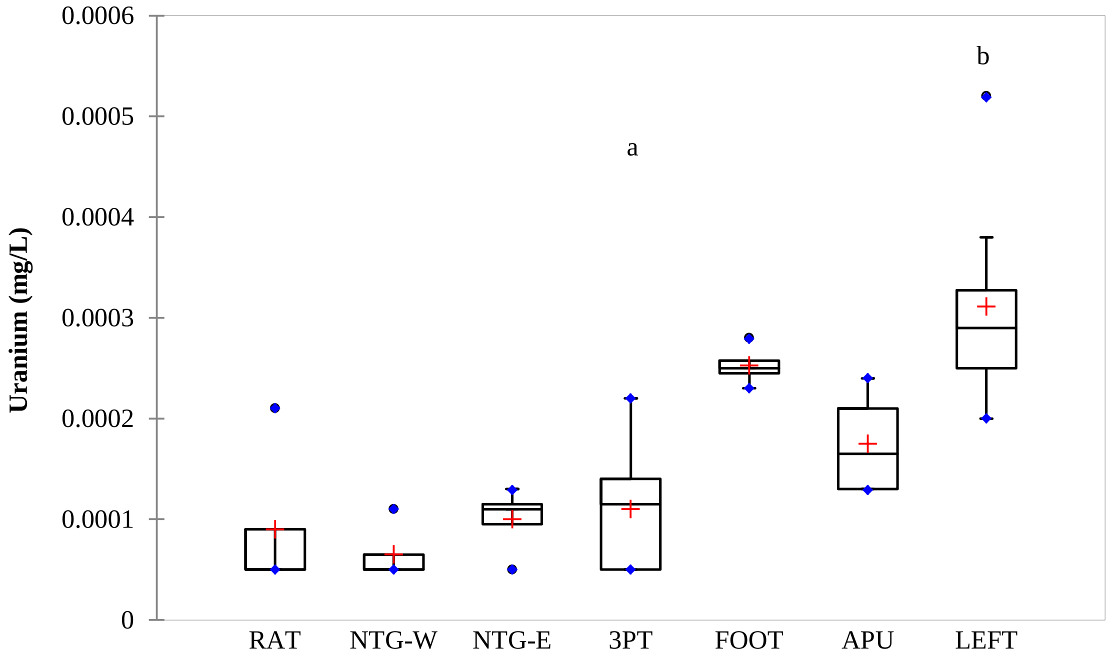
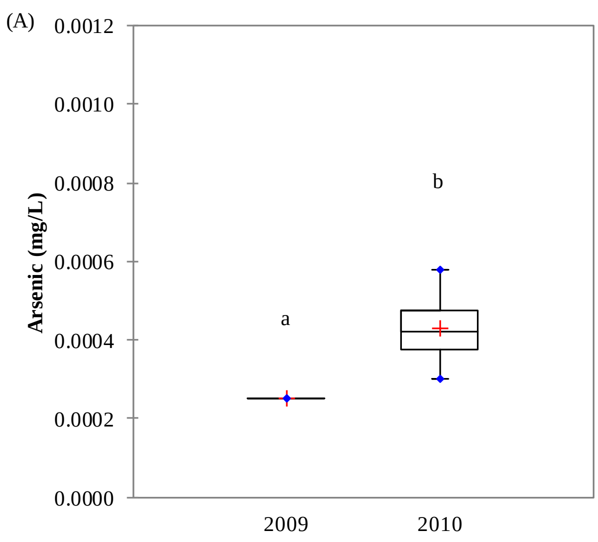


Figure 5.5.4-114. Uranium measured in the Churchill River Diversion Region: 2009-2010. Statistically significant spatial differences are denoted with different superscripts.



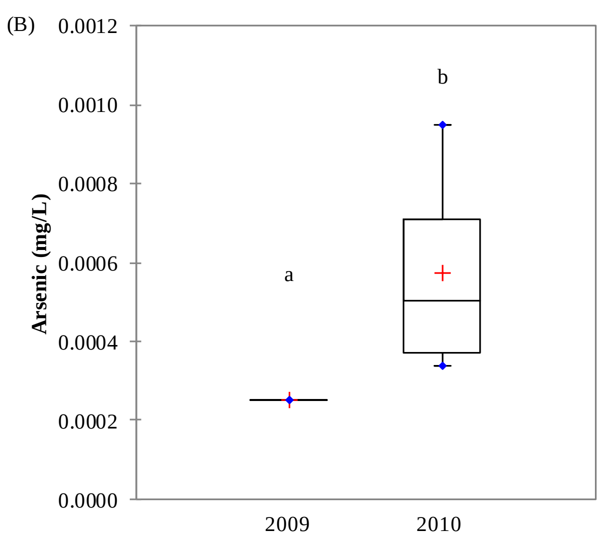


Figure 5.5.4-115. Arsenic in the Churchill River Diversion Region by year: (A) Threepoint Lake and (B) Leftrook Lake. Statistically significant differences are denoted with different superscripts.

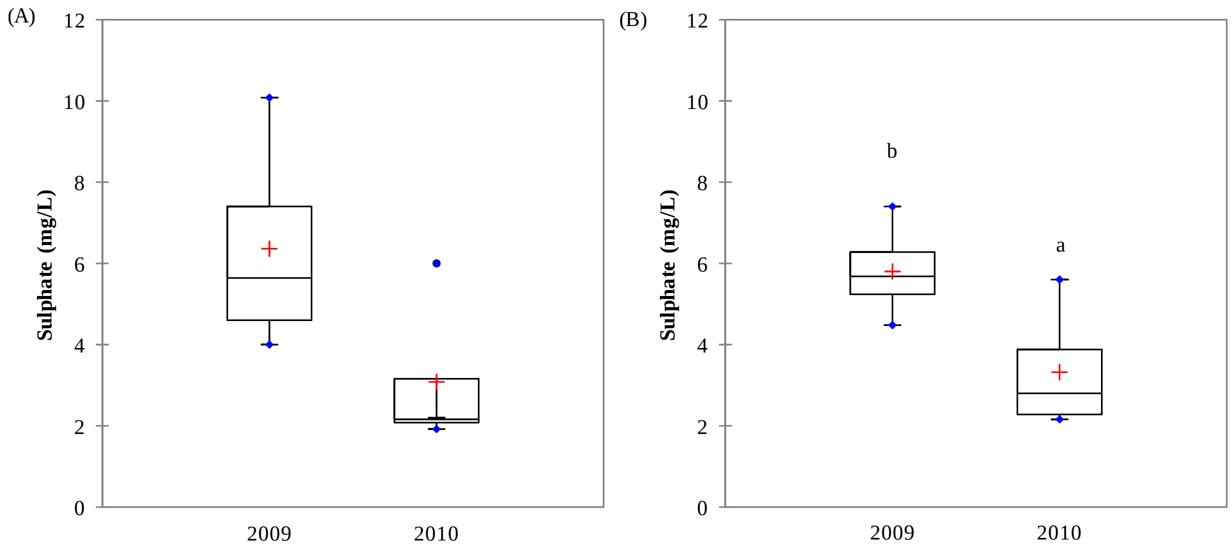


Figure 5.5.4-116. Sulphate concentrations measured in Leftrook Lake by year. Statistically significant differences are denoted with different superscripts.

5.5.5 Phytoplankton

The following provides an overview of phytoplankton monitoring results for the Churchill River Diversion Region over the three years of CAMPP. Sampling in the region was initiated in 2009 and sampling sites and periods were consistent the water quality monitoring program. Waterbodies sampled annually included Threepoint Lake and an off-system lake (Leftrook Lake; Figure 5.5.4-1). Water quality and phytoplankton were also monitored at five rotational sites: Notigi Lake (East and West areas), and Apussigamasi Lake in 2009/2010; and Rat and Footprint lakes in 2010/2011. Sampling times relative to air temperature are presented in Figure 5.5.4-2.

Chlorophyll *a* was measured at all sites and sampling times in conjunction with the water quality sampling program. Data are therefore sufficient for statistical analysis of temporal and spatial variability of this parameter; however, as only two years of data are available statistical differences between seasons could not be analysed.

Phytoplankton biomass and taxonomic composition were measured in Threepoint, Leftrook, Notigi-West, Notigi-East, and Apussigamasi lakes in 2009/2010 and in Rat and Footprint lakes in 2010/2011. Due to limited data, phytoplankton biomass, composition and community metrics were not assessed statistically; analyses will be conducted in the future when additional data are available.

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L in samples collected from Leftrook Lake in fall 2009 and summer and fall 2010. These samples were therefore analysed for microcystin-LR (an algal toxin) and phytoplankton biomass and composition as part of the bloom monitoring.

5.5.5.1 Chlorophyll a

Over the two years of CAMPP sampling in the Churchill River Diversion Region, chlorophyll *a* concentrations were relatively low; concentrations were less than 2 µg/L during the ice-cover season and ranged up to 16.1 µg/L during the open water seasons (Figures 5.5.5-1 and 5.5.5-2). Concentrations at the on-system sites were generally lower than those measured in the off-system waterbody (Leftrook Lake), particularly during summer and fall.

5.5.5.2 Taxonomic Composition and Biomass

Phytoplankton biomass measured during the open-water season varied between the seven waterbodies in the Churchill River Diversion Region. The most notable difference was the higher biomass measured in Footprint Lake and the off-system lake (Leftrook Lake) in summer and fall, relative to Rat, Notigi-East, Notigi-West, Threepoint, and Apussigamasi lakes (Figure 5.5.5-3). This suggests that productivity at Footprint Lake (which is off the main flow of the Rat/Burntwood River system) may be more similar to the off-system site than the other on-system sites. However, as Footprint and Rat lakes were sampled in 2010 and the other waterbodies were sampled in 2009, any differences may reflect temporal and not spatial differences.

Phytoplankton communities varied between the waterbodies in the region, particularly between Rat Lake and the other waterbodies (Figure 5.5.5-4). The phytoplankton assemblage at Rat Lake was consistently dominated by cryptophytes with diatoms or blue green algae comprising most of the remaining community. In contrast, the phytoplankton community at all other waterbodies was composed to varying degrees of diatoms, blue-green algae, chrysophytes, cryptophytes and green algae with diatoms consistently dominating the phytoplankton community in the spring. Rat Lake was sampled in a different year than the majority of waterbodies and relative differences may reflect temporal rather than spatial variability. However, it is of note that the community composition of this lake differed from Footprint Lake which was sampled in the same year.

Metrics describing the phytoplankton community were calculated on a seasonal basis and are presented in Table 5.5.5-1. Similar to community composition, community metrics differed between Rat Lake and other lakes in the region. Richness, evenness, and diversity indices were lower in Rat Lake, including Footprint Lake which was sampled in the same year. Community metrics were also somewhat lower for the phytoplankton assemblage in Apussigamasi Lake compared to other waterbodies sampled in 2009 (i.e., Notigi, Threepoint and Leftrook lakes).

5.5.5.3 Bloom Monitoring

Chlorophyll *a* concentrations exceeded the bloom monitoring trigger of 10 µg/L in Leftrook Lake in fall 2009, and summer and fall 2010. Total biomass measured in these samples was moderately high during all periods (8,141 mg/m^3, 15,238 mg/m^3, and 12,989 mg/m^3, respectively). The phytoplankton community was dominated by diatoms in fall 2009 (Figure 5.5.5-4) and by blue-green algae during both periods in 2010 (Figure 5.5.5-5).

5.5.5.4 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 affect production of microcystins.

Anabaena and *Aphanizomenon* were identified in samples collected in every waterbody in the region. Additionally, *Microcystis* was identified in Leftrook Lake and *Planktothrix*/*Oscillatoria* was present in all lakes excepting Footprint and Rat lakes.

During the two years of study in the Churchill River Diversion Region, microcystin-LR was analysed on three occasions when chlorophyll *a* results were near to or in excess of 10 µg/L (i.e., the threshold for microcystin-LR analysis). All of these samples were collected in Leftrook Lake (fall 2009 and summer and fall 2010) but microcystin-LR was not detected (<0.2 µg/L) in any of the samples.

5.5.5.5 Trophic Status

Based on mean open-water chlorophyll *a* concentrations, Rat, Notigi Lake-West, and Threepoint lakes are classified as oligotrophic and Notigi Lake-East, Footprint, Apussigamasi, and Leftrook lakes are categorized as mesotrophic (Table 5.5.4-3).

5.5.5.6 Seasonal Variability

Based on qualitative observations, chlorophyll *a* concentrations measured during the ice-cover season were lower than those measured during the open-water season, regardless of the sampling location (Figure 5.5.5-1 and 5.5.5-2). Statistical differences will be assessed in the future when additional data are acquired for these waterbodies.

5.5.5.7 Spatial Comparisons

Mean annual chlorophyll *a* concentrations were not significantly different between the annual waterbodies (Threepoint and Leftrook lakes) in the Churchill River Diversion Region (Figure 5.5.5-6).

5.5.5.8 Temporal Variability

Comparisons between sampling years for the two annual waterbodies (Threepoint and Leftrook lakes) revealed that there were no significant differences in chlorophyll *a* concentrations over the monitoring period (Figure 5.5.5-7).

Table 5.5.5-1. Phytoplankton community metrics calculated for the seven waterbodies in the Churchill River Diversion Region.

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 $E^{H`}/S$
Rat Lake	Spring	14	0.47	0.13	1.10	0.42	3.00	0.21
	Summer	12	0.22	0.11	0.58	0.23	1.79	0.15
	Fall	16	0.51	0.13	1.08	0.39	2.94	0.18
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
Footprint Lake	Spring	25	0.82	0.22	2.03	0.63	7.63	0.31
	Summer	33	0.86	0.21	2.39	0.68	10.96	0.33
	Fall	23	0.56	0.10	1.37	0.44	3.92	0.17
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 2009	29	0.88	0.28	2.49	0.74	12.10	0.42
	Summer 2009	32	0.85	0.21	2.41	0.70	11.15	0.35
	Fall 2009	32	0.28	0.04	0.83	0.24	2.28	0.07
	Summer 2010	39	0.88	0.21	2.45	0.67	11.60	0.30
	Fall 2010	36	0.82	0.15	2.14	0.60	8.54	0.24

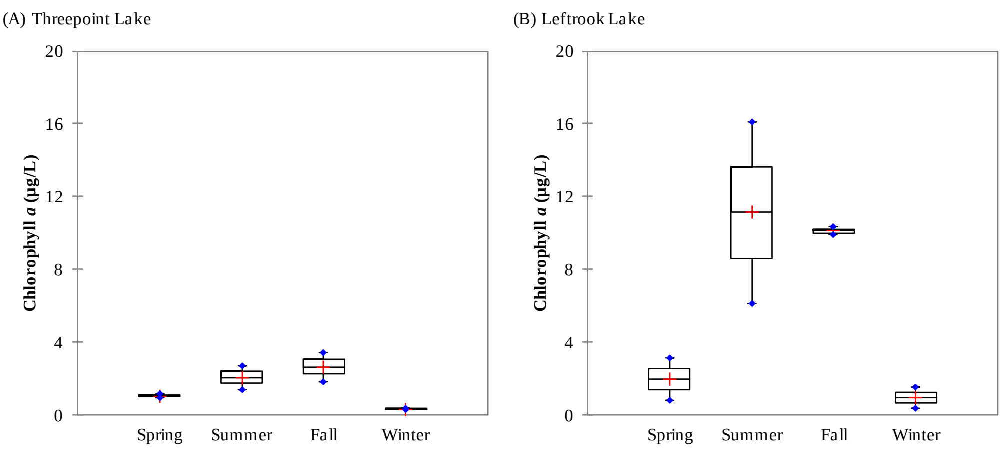


Figure 5.5.5-1. Chlorophyll *a* concentrations measured at the annual waterbodies in the Churchill River Diversion Region, 2009-2010.

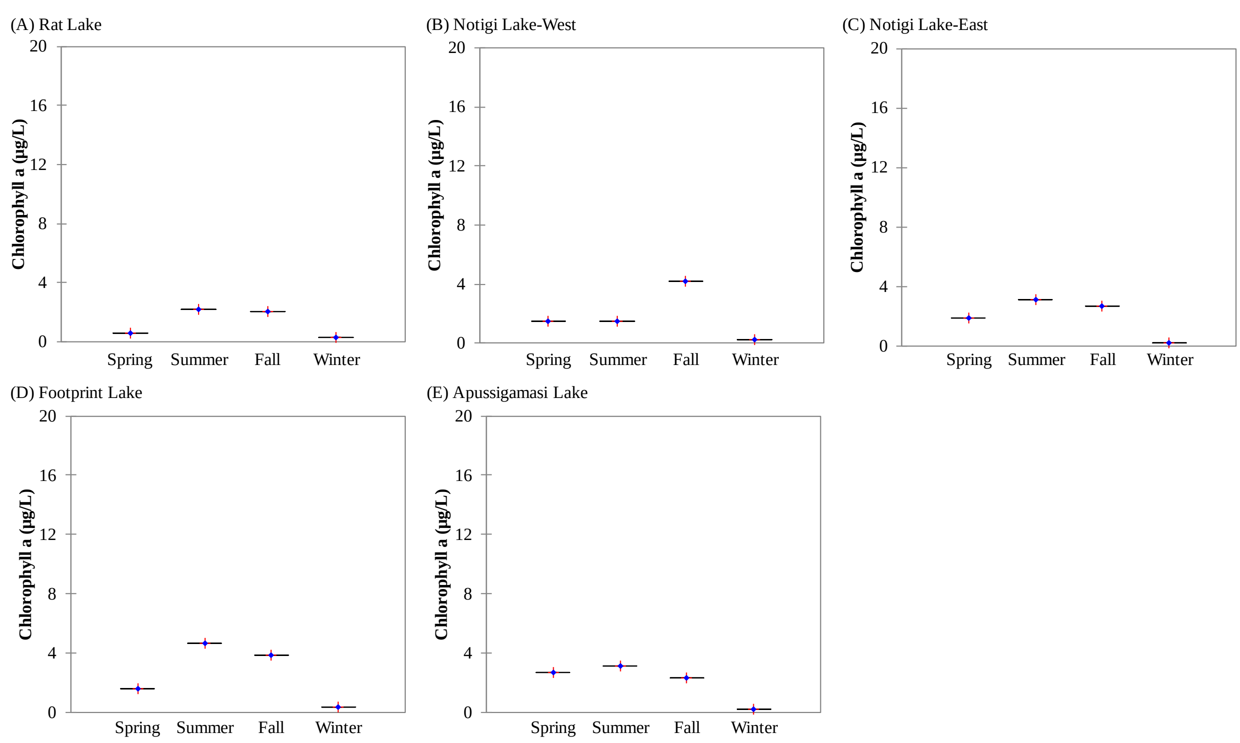


Figure 5.5.5-2. Chlorophyll *a* concentrations measured at the rotational waterbodies in the Churchill River Diversion Region, 2009 (Notigi Lake and Apussigamasi Lake) and 2010 (Rat and Footprint lakes).

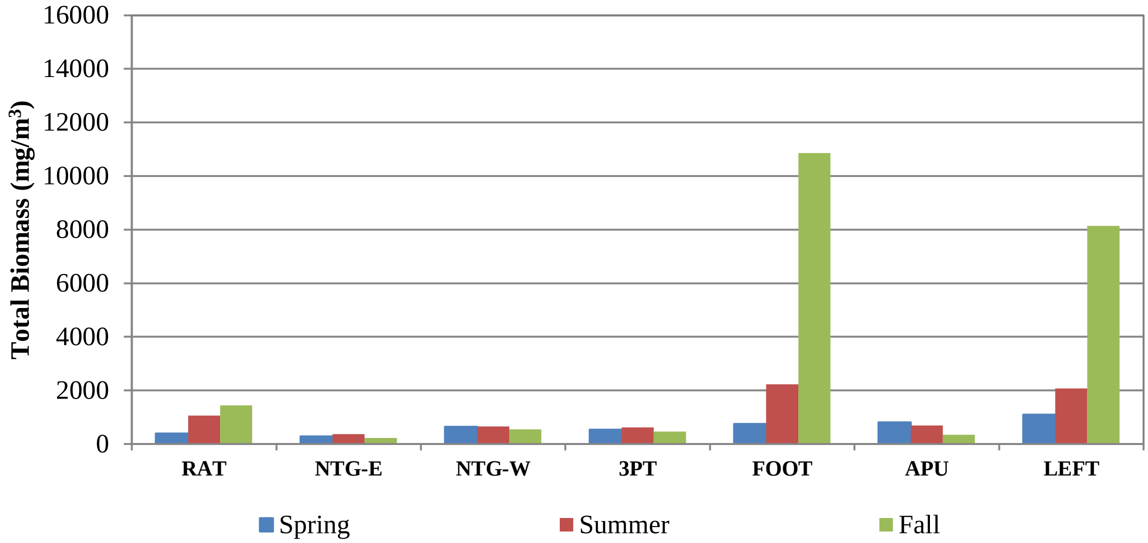


Figure 5.5.5-3. Phytoplankton biomass measured in the Churchill River Diversion Region during the open-water seasons of 2009 (Notigi, Threepoint, Apussigamasi, and Leftrook lakes) and 2010 (Rat and Footprint lakes).

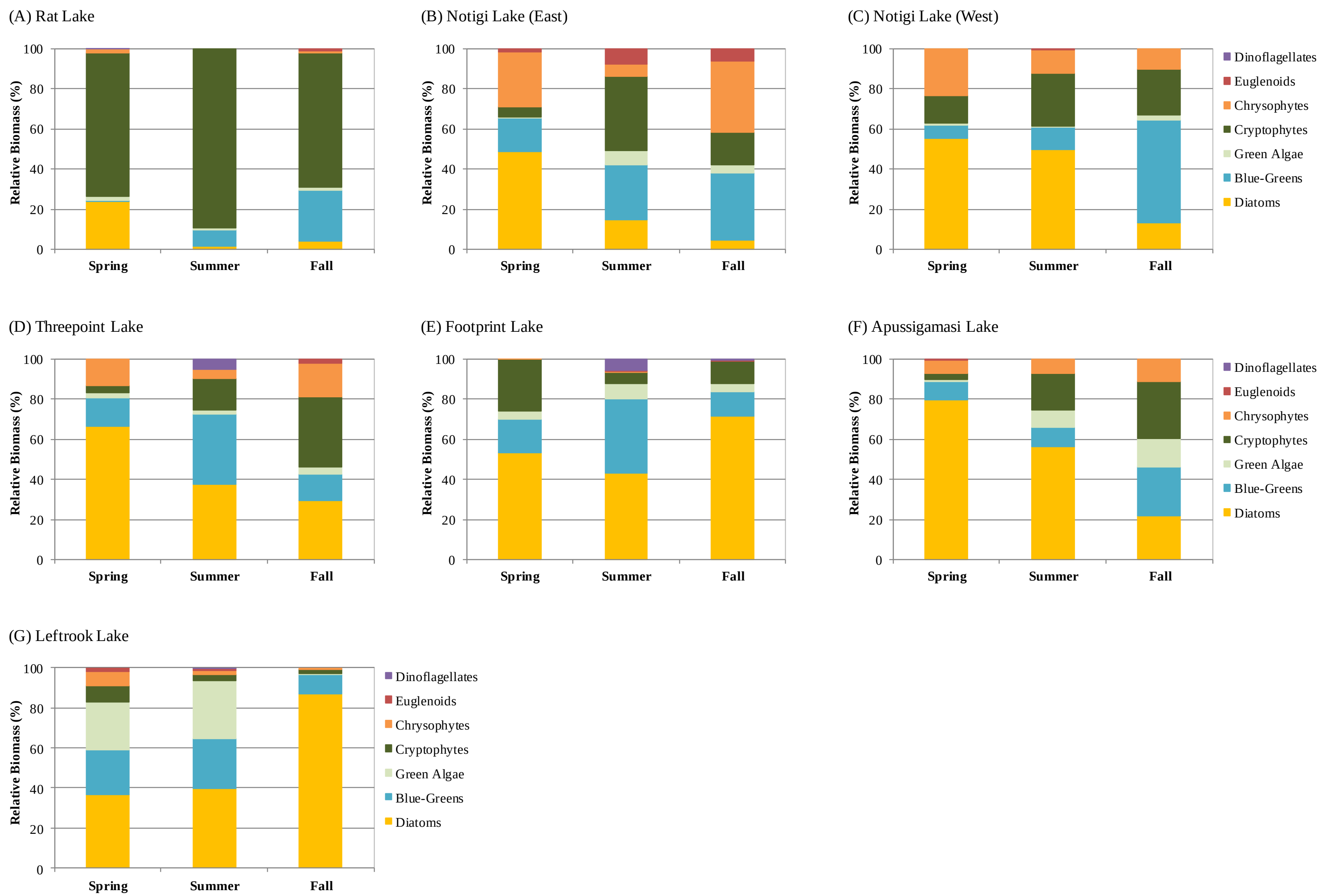


Figure 5.5.5-4. Phytoplankton community composition in the Churchill River Diversion Region by season, as measured during the open-water seasons of 2009 (Notigi, Threepoint, Apussigamasi, and Leftrook lakes) and 2010 (Rat and Footprint lakes).

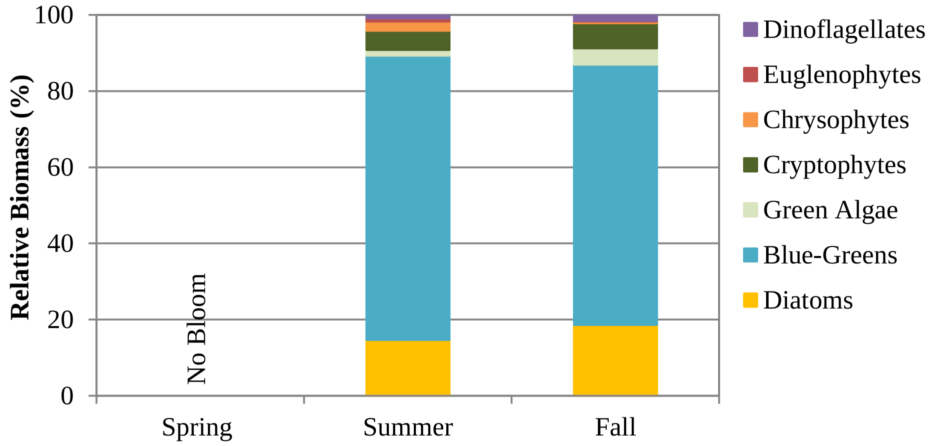


Figure 5.5.5-5. Phytoplankton community composition in Leftrook Lake in 2010.

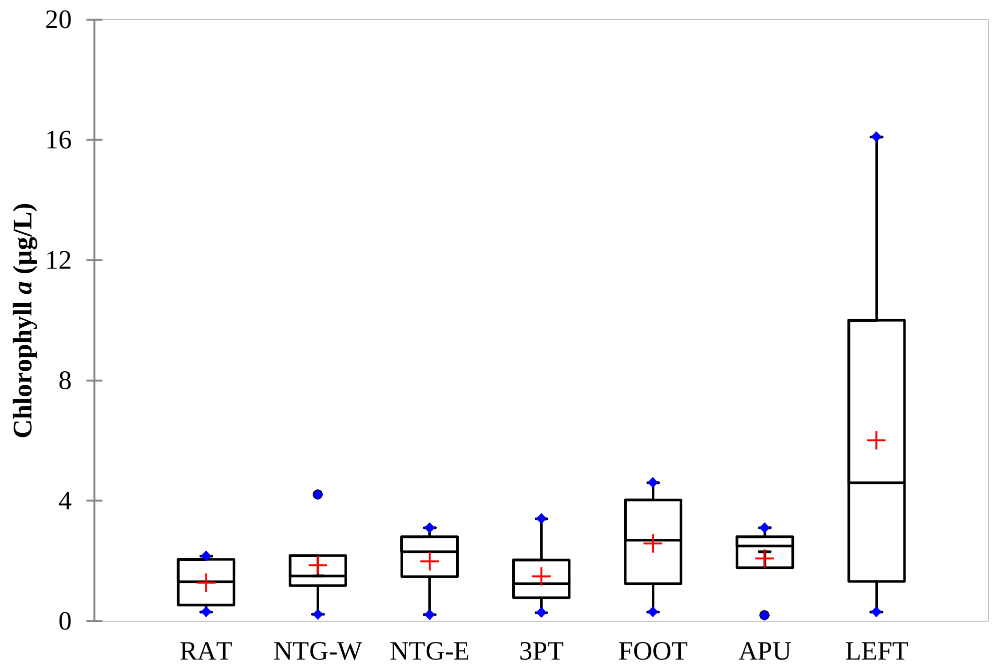


Figure 5.5.5-6. Chlorophyll *a* concentrations measured in the Churchill River Diversion, 2009-2010.

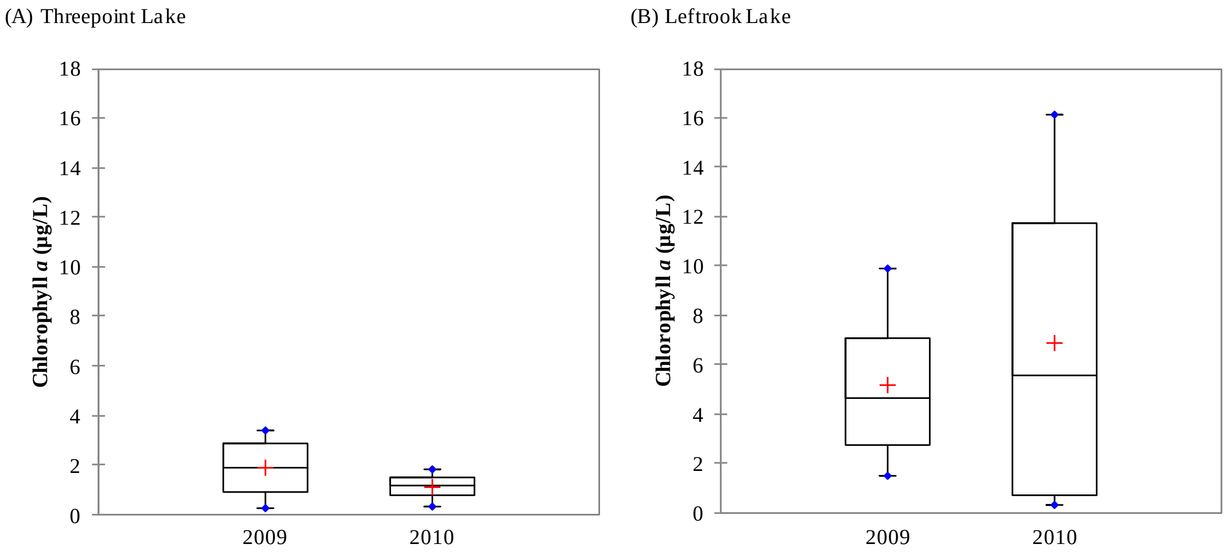


Figure 5.5.5-7. Chlorophyll *a* concentrations measured at the annual waterbodies in the Churchill River Diversion Region by year.

5.5.6 Benthic Macroinvertebrates

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled over the three year CAMPP program in the Churchill River Diversion Region (Figure 5.5.6-1); no waterbodies were sampled in 2008. In 2009, BMI samples were collected in the on-system lakes Notigi, Threepoint, and Apussigamasi, and in the off-system lake Leftrook. Threepoint and Leftrook lakes are sampled annually, and Notigi and Apussigamasi lakes are sampled on a rotational basis (i.e., once every three years). In 2010, samples were collected in the on-system lakes Rat, Threepoint, and Footprint, and the off-system waterbody, Leftrook Lake. Rat and Footprint lakes are sampled on a rotational basis. Near and offshore habitat polygons were sampled in all waterbodies. BMI sampling was conducted in mid- to late-August.

BMI are described for waterbodies located in the Churchill River Diversion Region, including results of statistical analyses to evaluate spatial and temporal differences. In 2010, the sampling design was modified to incorporate kicknet sampling at all nearshore sites (intermittently wetted aquatic habitat). For this reason, a three year synthesis of data for the predominantly wetted nearshore habitat was not possible and the 2010 nearshore data were described separately. The sampling design for the offshore habitat was comparable among years and, as such, offshore data was summarized for 2009 and 2010 for all waterbodies.

The primary objective of spatial comparisons (i.e., comparison between waterbodies) was to evaluate whether the BMI community differ between on-system sites. Comparisons were also made between the on-system waterbodies and the off-system waterbody. The BMI community would be expected to differ between on- and off-system waterbodies due to fundamental, inherent differences associated with the watersheds and waterbodies. The objective of the comparisons between the on- and off-system waterbodies was to formally identify differences between these areas to assist with interpretation of results of CAMP as the program continues.

Temporal comparisons were undertaken for each waterbody sampled annually in order to provide a preliminary assessment of temporal variability. As additional data are acquired, more formal trend analyses will be undertaken to evaluate potential longer-term changes.

5.5.6.1 Supporting Environmental Variables

Supporting environmental variables (biophysical) were measured in the field at nearshore and offshore polygons in each waterbody, and included water depth, water temperature, water velocity, Secchi depth, substrate type, type of riparian vegetation, and algal presence (Table 5.5.6-1). Benthic sediment samples were collected from BMI sampling sites and analyzed for particle size analysis (PSA) and total organic carbon (TOC). The nearshore habitat of Leftrook

Lake (2010) consisted of mainly large, hard substrate (boulder and gravel); as such sediment samples were not collected for PSA and TOC analysis. In 2010, relative benchmarks were established along the shore at each waterbody to record the current water level and high water mark at the time of sampling.

Intermittently wetted nearshore (2010) water depths ranged from 0.5 m (Leftrook Lake) to 0.8 m (Rat Lake). In the predominantly wetted nearshore habitat (2009), mean water depths ranged from 2.8 m (Notigi Lake) to 4.5 m (Leftrook Lake) (Table 5.5.6-1). Mean water depths within the offshore habitat (2009 to 2010) varied considerably, with values ranging between 4.5 m (Threepoint Lake) and 14.2 m (Notigi Lake) (Table 5.5.6-1).

Sediment composition (PSA) in the intermittently wetted and predominantly wetted nearshore habitats consisted of mainly clay and silt (Figures 5.5.6-2 and 5.5.6-3). At most nearshore sites, clay and silt were in comparable proportion, except at Apussigamasi and Leftrook lakes which were comprised predominantly of silt; and Rat Lake which was dominated by clay (Figures 5.5.6-2 and 5.5.6-3). Similar to the nearshore, many offshore sites comprised of mainly silt and clay in a similar fraction (Figure 5.5.6-4). Rat and Notigi lakes were dominated by clay and Footprint Lake contained an equivalent amount of sand, silt, and clay (Figure 5.5.6-4).

In the intermittently wetted nearshore habitat, TOC values ranged from 0.7% (Threepoint Lake) to 7.8% (Rat Lake) (Figure 5.5.6-2). Predominantly wetted nearshore sediment resulted in mean TOC values ranging between 0.9% (Apussigamasi Lake) and 12.6% (Notigi Lake) (Figure 5.5.6-3). In the offshore habitat, mean TOC ranged from 0.7% (Apussigamasi Lake) to 5.1% (Leftrook Lake) (Figure 5.5.6-4).

5.5.6.2 Species Composition, Distribution, and Relative Abundance

Rat Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Rat Lake was 243 individuals (Table 5.5.6-4; Figure 5.5.6-5). Insects and non-insects were equally represented within the BMI community (Figure 5.5.6-6). Non-insects mainly consisted of Amphipoda (scuds) followed by Oligochaeta (aquatic worms); Bivalvia (clams) and small numbers of Gastropoda (snails) were also present (Figure 5.5.6-7). Insects mainly consisted of Hemiptera (true bugs), followed by Chironomidae (midges); small numbers of Ephemeroptera (mayflies) and Trichoptera (caddisflies) were also present (Figure 5.5.6-7). Total mean BMI density for collected in offshore grab samples (n=5; 2010) was 124 individuals/m^2 (Table 5.5.6-3; Figure 5.5.6-8). Insects dominated the BMI community and consisted of only two major taxa, Chironomidae and Ephemeroptera (Figures 5.5.6-9 and 5.5.6-10). Of the non-insects, Oligochaeta, Bivalvia, and Amphipoda were present (Figure 5.5.6-10).

Total EPT (abundance of Ephemeroptera, Plecoptera, and Trichoptera) comprised 7% and 30% of the mean BMI total in the intermittently wetted nearshore and offshore habitats, respectively (Tables 5.5.6-2 and 5.5.6-3; Figures 5.5.6-11 and 5.5.6-12). Of the EPT, mayflies were most abundant in both habitat types (Tables 5.5.6-2 and 5.5.6-3). In the nearshore, Baetidae (unidentified and *Callibaetis* sp.) were most abundant (Table 5.5.6-2). In the offshore habitat, Ephemeridae *(Hexagenia* sp., burrowing mayfly) was the only mayfly genera present (Table 5.5.6-3). Neither Plecoptera nor Trichoptera were present in the offshore habitat. Mean EPT:C (ratio of EPT to Chironomidae) was 1.04 in the intermittently wetted nearshore, indicating a balanced community in nearshore (Table 5.5.6-2). Within the offshore, mean EPT:C was 0.13, indicating a chironomid-dominant community (Table 5.5.6-3).

Eight out of 30 BMI families (Hill's effective and taxonomic richness) collected in the intermittently wetted nearshore contributed to the overall composition; mainly, Hempitera (Corixidae), Amphipoda (Hyalellidae), Oligochaeta, and Chironomidae (Table 5.5.6-2). Mean taxonomic richness in the nearshore was 18 families (Figure 5.5.6-13). In the offshore, 2 out of 5 families dominated the community (Chironomidae and Ephemeridae) (Table 5.5.6-3). Mean taxa richness in the offshore habitat was only two families (Figure 5.5.6-14). Mean Simpson's diversity index was 0.80 in the intermittently wetted nearshore and 0.33 in the offshore (Figures 5.5.6-15 and 5.5.6-16). Mean evenness values (Simpson's equitability) were 0.23 in the nearshore and 0.69 in the offshore (Figures 5.5.6-15 and 5.5.6-16).

<u>Notigi Lake</u>

Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of Notigi Lake was 684 invertebrates/m^2 (Table 5.5.6-4; Figure 5.5.6-17). Non-insects dominated the BMI community, mainly consisting of Oligochaeta and Bivalvia (Figures 5.5.6-18 and 5.5.6-19). Of the insects, Chironomidae were dominant, followed by Ephemeroptera (Figures 5.5.6-18 and 5.5.6-19). Mean total density for BMI collected in offshore grab samples (n=15; 2009) was 517 individuals/m^2 (Table 5.5.6-3; Figure 5.5.6-8). Non-insects dominated the offshore BMI community, predominantly consisting of Oligochaeta (Figures 5.5.6-9 and 5.5.6-10). Chironomidae was dominant within the insects (Figures 5.5.6-9 and 5.5.6-10).

Mean EPT abundance comprised 8% of the total number of macroinvertebrates collected in the nearshore; mayflies were the only group of the EPT present (Table 5.5.6-4; Figure 5.5.6-20). *Hexagenia* sp. (Ephemeridae) was most abundant mayfly, although small numbers of *Caenis* sp.

were also present (Table 5.5.6-4). Mean EPT:C was 0.34, indicating a chironomid-dominated community (Table 5.5.6-4). No EPT were collected in offshore samples (Figure 5.5.6-12).

Three of the 13 families (Hill's effective and taxonomic richness) identified in the nearshore dominated the BMI community (namely, Oligochaeta, Chironomidae, and Pisidiidae) (Table 5.5.6-4). Mean taxa richness in the nearshore was 3 families (Figure 5.5.6-21). Two of the 5 taxa identified in the offshore were proportionally most abundant (most notably, Oligochaeta) (Table 5.5.6-3). Mean taxonomic richness was 2 families (Figure 5.5.6-14). Mean diversity index (Simpson's) was 0.51 in the nearshore and 0.31 in the offshore habitat (Figures 5.5.6-22 and 5.5.6-16). Mean evenness values (Simpson's) were 0.74 and 0.80 in the near and offshore, respectively (Figures 5.5.6-22 and 5.5.6-16).

Threepoint Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat was 46 individuals (Table 5.5.6-2; Figure 5.5.6-5). Insects dominated the BMI community and mostly consisted of Corixidae and Chironomidae (Figures 5.5.6-6 and 5.5.6-7). Non-insects mainly comprised of Gastropoda, Oligochaeta, Amphipoda, and Bivalvia (Figures 5.5.6-6 and 5.5.6-7). Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of Threepoint Lake was 886 invertebrates/m^2 (Table 5.5.6-4; Figure 5.5.6-17). Non-insects dominated the community, consisting mainly of Amphipoda, followed by Bivalvia; insects mainly consisted of Ephemeroptera and Chironomidae (Figures 5.5.6-18 and 5.5.6-19). Mean total density for BMI collected in the offshore habitat (n=20; 2009 to 2010) was 493 individuals/m^2 (Table 5.5.6-3; Figure 5.5.6-8). Non-insects dominated the community, consisting mainly of Amphipoda and Bivalvia (Figures 5.5.6-9 and 5.5.6-10). Of the insects collected in the offshore habitat, Chironomidae and Ephemeroptera were most abundant (Figures 5.5.6-9 and 5.5.6-10).

In nearshore kicknet samples, EPT comprised 6% of the total BMI, mostly consisting of mayflies (only *Hexagenia* sp.; Ephemeridae) (Table 5.5.6-2; Figure 5.5.6-11). Plecoptera was not collected in the nearshore (neither grabs nor kicknet); and a small number of Trichoptera (<1%) were collected (Table 5.5.6-2). Mean total EPT comprised 17% of the total BMI community in the predominantly wetted nearshore habitat and comprised mainly of mayflies (Table 5.5.6-2; Figure 5.5.6-20). Ephemeroptera were solely represented by *Hexagenia* sp. (Table 5.5.6-2). EPT in the offshore habitat made up 12% of the mean macroinvertebrate abundance in the offshore, mayflies were singly represented by *Hexagenia* sp. (Table 5.5.6-3; Figure 5.5.6-12). No Plecoptera were collected in offshore samples; and Trichoptera (2%) was comprised of Leptoceridae, Polycentropodidae and Phrygaenidae (Table 5.5.6-3). Mean EPT:C was 1.38 predominantly wetted nearshore and 0.58 intermittently wetted nearshore habitats (Tables 5.5.6-

2 and 5.5.6-4). The ratio values indicated an EPT-dominant community for grab samples and a chironomid-dominant for kicknet samples. Mean EPT:C was 0.53 in the offshore grab, indicating a chironomid-dominated community with respect to EPT and chironomid abundances (Table 5.5.6-3).

Total taxonomic richness in the intermittently wetted nearshore habitat was 20, with six families making up the majority of the BMI community (most notably, Corixidae) (Hill's effective and taxonomic richness; Table 5.5.6-2). Mean taxa richness in the nearshore was 12 families (Figure 5.5.6-13). Three out of 9 macroinvertebrate families were prominent in grab samples collected in the predominantly wetted nearshore (most notably, Haustoriidae, Amphipoda) (Table 5.5.6-4). Mean taxa richness for the nearshore was 4 families (Figure 5.5.6-21). Three of 13 families identified dominated the offshore (most notably, Haustoriidae and Pisidiidae) (Table 5.5.6-3). Mean taxa richness was 4 families (Figure 5.5.6-14). Mean Simpson's diversity index was 0.50 in the predominantly wetted nearshore and 0.66 in the intermittently wetted nearshore habitat (Figures 5.5.22- and 5.5.6-15). In the predominantly and intermittently wetted nearshore habitats, mean Simpson's evenness values were 0.52 and 0.38, respectively (Figures 5.5.22- and 5.5.6-15). In the offshore, evenness was 0.65 (Figure 5.5.6-16).

Footprint Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Footprint Lake was 35 individuals (Table 5.5.6-2; Figure 5.5.6-5). Insects dominated the community and consisted predominantly of Hemiptera, though Chironomidae, Ephemeroptera and Coleoptera were also abundant (Figures 5.5.6-6 and 5.5.6-7). Non-insects consisted of mainly Amphipoda; followed by Oligochaeta, Gastropoda, and Bivalvia (Figure 5.5.6-7). Mean density of BMI collected in offshore habitat grab samples (n=5; 2010) was 678 individuals/m^2 (Figure 5.5.6-8). Insects dominated the offshore community, the majority of which were Diptera (namely, Chaoboridae and Chironomidae) (Figures 5.5.6-9 and 5.5.6-10). Of the non-insects, Amphipoda was proportionately most abundant; relatively small numbers of Bivalvia and Oligochaeta were also found (Figures 5.5.6-9 and 5.5.6-10).

Mean EPT comprised 5% of the mean BMI abundance in both the intermittently wetted nearshore and offshore habitats (Figures 5.5.6-11 and 5.5.6-12). Mayflies predominated, the majority of which were *Hexagenia* sp. (Ephemeridae) (Tables 5.5.6-2 and 5.5.6-3). A small number of caddisflies (Trichoptera) were identified in nearshore samples, and no plecopterans were found in either habitat (Tables 5.5.6-2 and 5.5.6-3). Mean EPT:C ratios were 0.42 and 0.41 in intermittently wetted nearshore and offshore habitats (respectively) indicating that chironomid were more prevalent than EPT (Tables 5.5.6-2 and 5.5.6-3).

Total richness was greater in the intermittently wetted nearshore than in the offshore habitat, though only 4 of 19 families (Hill's effective richness) identified from nearshore was most abundant (Tables 5.5.6-2 and 5.5.6-3). In the offshore, 4 of 7 families were proportionately abundant (notably, Chaoboridae, Chironomidae, and Haustoriidae) (Table 5.5.6-3). Mean taxonomic richness was 9 families in the intermittently wetted nearshore and 6 families in the offshore (Figures 5.5.6-13 and 5.5.6-14). Mean Simpson's diversity was 0.68 in the nearshore and 0.65 in the offshore (Figures 5.5.6-15 and 5.5.6-16). Mean Simpson's equitability was 0.49 in the intermittently wetted nearshore and 0.46 in the offshore (Figures 5.5.6-15 and 5.5.6-16).

Apussigamasi Lake

Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of Apussigamasi Lake was 594 individuals/m^2 (Table 5.5.6-4; Figure 5.5.6-17). Overall, non-insects were present in slightly higher proportions than the insects and mainly consisted of Amphipoda (Haustoriidae), although smaller numbers of Bivalvia, Oligochaeta, and Gastropoda were also present (Figures 5.5.6-18 and 5.5.6-19). Insects consisted mainly of Ephemeroptera (Ephemeridae) and Chironomidae; Trichoptera were also present (Figures 5.5.6-18 and 5.5.6-19). Mean total density of BMI collected in offshore grab samples (n=15; 2009) was 1,728 individuals/m^2 (Table 5.5.6-3; Figure 5.5.6-8). Similar to the nearshore, non-insects dominated the community; Amphipoda (Haustoriidae) and Bivalvia (Pisidiidae) were proportionately most abundant, and smaller numbers of Oligochaeta were also present (Figures 5.5.6-9 and 5.5.6-10). Of the insects, Chironomidae was the most abundant; Ephemeroptera, and Trichoptera were also present (Figures 5.5.6-9 and 5.5.6-10).

Mean EPT was greater in the nearshore (22%) than the offshore (4%), due to the larger abundance of Ephemeroptera (Tables 5.5.6-3 and 5.5.6-4; Figures 5.5.6-20 and 5.5.6-12). Ephemeroptera was represented solely by *Hexagenia* sp. (Ephemeridae) (Tables 5.5.6-3 and 5.5.6-4). In both nearshore and offshore habitats, no Plecoptera were present and Trichoptera was represented by Leptoceridae. The mean ratio of EPT to Chironomidae in the nearshore (0.74) and offshore (0.41) habitat polygons indicated a leaning towards a chironomid-dominant with respect to EPT and Chironomidae abundance (Tables 5.5.6-3 and 5.5.6-4).

Total taxa richness was similar in both nearshore (11 families) and offshore (8 families) habitats (Tables 5.5.6-3 and 5.5.6-4).). Both habitats had a mean of 4 families (Figures 5.5.6-21 and 5.5.6-14). Three of the total numbers of families identified were most abundant (Hill's effective richness) (Tables 5.5.6-3 and 5.5.6-4). Mean Simpson's diversity index indicated was 0.59 in the nearshore and 0.46 in the offshore (Figures 5.5.6- 16 and 5.5.6-22). Mean Simpson's evenness was 0.71 in the nearshore and 0.45 in the offshore (Figures 5.5.6- 16 and 5.5.6-22).

Leftrook Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat was 151 individuals (Table 5.5.6-2; Figure 5.5.6-5). Non-insects dominated the community and were comprised mainly of Amphipoda and Oligochaeta and smaller numbers of Bivalvia and Gastropoda (Figures 5.5.6-6 and 5.5.6-7). Of the insects, Trichoptera, Chironomidae, and Ephemeroptera were most abundant (Figures 5.5.6-6 and 5.5.6-7). Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of Leftrook Lake was 3,431 individuals/m^2 (Table 5.5.6-4; Figure 5.5.6-17). Insects and non-insects were similarly represented within the community (Figure 5.5.6-18). Non-insects mainly consisted of Bivalvia and a smaller number of Oligochaeta and Gastropoda (Figure 5.5.6-19). Insects were represented predominantly by Chironomidae; though a smaller abundance of Ephemeroptera was also present (Figure 5.5.6-19). Mean BMI density collected in offshore benthic grab samples (n=20; 2009 to 2010) in was 3,173 individuals/m^2 (Table 5.5.6-3; Figure 5.5.6-8). Non-insects were proportionately more abundant than insects, consisting predominantly of Bivalvia, with smaller numbers of Oligochaeta, Gastropoda and Amphipoda (Figures 5.5.6-9 and 5.5.6-10). Insects consisted mainly of Chironomidae (Figures 5.5.6-9 and 5.5.6-10).

Mean EPT of nearshore kicknet samples was 11% of the mean BMI abundance, and Trichoptera was the predominant group (Figure 5.5.6-11). Helicopsychidae, Lepidostomatidae, Leptoceridae, and Limnephilidae were the main caddisfly families identified. *Stenonema* sp. (Heptageniidae) was the dominant mayfly genus; *Caenis* sp. (Caenidae) was also present in smaller numbers (Table 5.5.6-2). Mean EPT comprised 6% and 1% of the mean BMI community in predominantly wetted nearshore and offshore grab samples (Tables 5.5.6-3 and 5.5.6-4; Figures 5.5.6-20 and 5.5.6-12). Mayflies were the only EPT group present with *Hexagenia* sp. (Ephemeridae) as the single genus (Tables 5.5.6-3 and 5.5.6-4). Mean EPT:C ratio in the nearshore kicknet samples was 2.79, indicating an EPT-dominated community with respect to chironomid abundance (Table 5.5.6-2).EPT:C was 0.17 in the nearshore and 0.01 and offshore grab samples, indicating chironomid-dominated with respect to EPT abundance (Tables 5.5.6-3 to 5.5.6-4).

In the intermittently wetted nearshore habitat, 7 of 22 families identified dominated (most notably, Hyalellidae, Amphipoda) (Table 5.5.6-2; Figure 5.5.6-13). Taxonomic richness was similar in both predominantly wetted nearshore and offshore grab samples (Tables 5.5.6-3 and 5.5.6-4). Mean taxonomic richness was 4 families for both habitat types (Figures 5.5.6-21 and 5.5.6-14). Three families dominated were predominant in both habitat types, with Pisidiidae (Gastropoda) and Chironomidae being the most notable (Hill’s effective richness) (Tables 5.5.6-

3 and 5.5.6-4). Simpson's diversity values were 0.63 in the nearshore grab samples and 0.58 in the offshore (Figures 5.5.6-22 and 5.5.6-16). In the intermittently wetted nearshore habitat, diversity was 0.71 and evenness was 0.27 (Figure 5.5.6-15).Simpson's equitability values were 0.58 in the predominantly wetted nearshore and 0.52 in the offshore habitats (Figures 5.5.6-22 and 5.5.6-16).

5.5.6.3 Spatial Comparisons

Differences in BMI abundance and richness metrics for the nearshore habitat of Threepoint (on-system) and Leftrook (off-system) lakes were detected. While the statistical analysis only incorporated one year of data (2010), it appears that total numbers of macroinvertebrates, non-insects, oligochaetes, amphipods, bivalves, trichopterans, EPT, and EPT:C varied between sites (Figures 5.5.6-5 to 5.5.6-7, 5.5.6-11). Differences in taxonomic richness were also found (Figure 5.5.6-13, 15). For each of these measures, Threepoint Lake appears to be significantly lower than Leftrook Lake. Similar trends resulted for the comparison of BMI measures for the nearshore data collected in 2009 (Figures 5.5.6-17 to 5.5.6-22). Differences were detected in the total numbers of macroinvertebrates, non-insects, amphipods, bivalves, insects, chironomids, where Threepoint Lake appears to be significantly lower than Leftrook Lake, except for amphipods.

Differences in the offshore BMI abundance and richness metrics of Threepoint (on-system) and Leftrook (off-system) lakes were also detected. While the statistical analysis only incorporated two years of data (2009 and 2010), it appears that total numbers of macroinvertebrates, non-insects, oligochaetes, amphipods, bivalves, insects, chironomids, empheropterans, and EPT varied between waterbodies (Figures 5.5.6-8 to 5.5.6-10, 5.5.6-12). Except for amphipods, ephemeropterans, and EPT, each of these measures were significantly lower in Threepoint Lake (Figures 5.5.6-14 and 5.5.6-16). Statistical differences will be re-assessed in the future when additional data are acquired for these waterbodies.

Future evaluations of spatial variability or trends will be undertaken when additional data are acquired for the region.

5.5.6.4 Temporal Variability

Preliminary power analysis of the initial CAMPP study design (implemented in 2008 and 2009) showed that the BMI community metrics differed considerably among samples within the same habitat type and the delineation between nearshore and offshore polygon locations was sometimes indistinct. The inherent variablilty of this data made it difficult to explain and relate "significant" results with confidence to other components of CAMPP (e.g., hydrology and water quality).

The initial BMI study design was refined and implemented in the 2010 field season. The study design was changed with respect to site selection within nearshore and offshore polygons, and nearshore sampling methods. The objective of the refined BMI program was to minimize the inherent variability and increase the power of the BMI data to detect statistically significant variabililty or trends over time. As additional data are acquired for the region under the refined program, analyses will be undertaken to evaluate potential long-term changes in BMI community metrics and to link significant trends to the other CAMP components.

Temporal differences in BMI abundance and richness metrics for the offshore habitat of Threepoint Lake were detected (Figures 5.5.6-23 to 5.5.6-28). While the statistical analysis only incorporated two years of data (2009 and 2010), it appears that total numbers of macroinvertebrates, non-insects, oligochaetes, amphipods, bivalves, gastropods, trichopterans, EPT, and EPT:C varied between years (Figures 5.5.6-23 to 5.5.6-26). Differences in taxonomic richness, Shannon-Weaver index and Hill's effective richness were also found (Figures 5.5.6-27 to 5.5.6-28). For each of these measures, 2009 appears to be significantly lower than 2010.

Temporal differences in BMI abundance and richness metrics for the offshore habitat of Leftrook Lake were detected (Figures 5.5.6-29 to 5.5.6-34). While the statistical analysis only incorporated two years of data (2009 and 2010), it appears that total numbers of oligochaetes, amphipods, gastropods, insects, chironomids, ephemeropterans, EPT and EPT:C varied between years (Figures 5.5.6-29 to 5.5.6-32). Differences in taxonomic richness, Simpson's diversity index, and Simpson's, Shannon's, and Hill's evenness values were also found (Figures 5.5.6-33 to 5.5.6-34). Except for amphipods, gastropods, ephemeropterans, EPT, and EPT:C, each of these measures were significantly lower in 2010.

Table 5.5.6-1. Habitat and physical characteristics recorded at benthic macroinvertebrate sites in the Churchill River Diversion Region for CAMPP, 2009 to 2010.

Waterbody	Habitat Type	No. of Samples (n)	Water Depth Mean (m)	Water Depth Min (m)	Water Depth Max (m)	Mean Water Velocity (m/sec)	Mean Secchi 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 5.5.6-1. continued.

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 Depth (m)	Water Temperature (ºC)	Predominant Substrate	Riparian Vegetation	Canopy Cover (%)	Algae
Rat Lake (2010)	Nearshore	5	0.8	0.7	0.9	0.02	0.29	16.0	woody debris	grass, coniferous	0-24	attached
	Offshore	5	7.6	6.8	8.6	0.02	0.42	16.0	clay, organic matter	--	--	--
Threepoint Lake (2010)	Nearshore	5	0.7	0.6	0.7	0.00	0.34	13.0	clay, organic matter	grass, mixed forest	0-24	--
	Offshore	5	4.8	4.5	5.2	0.00	0.25	13.0	clay, sand	--	--	--
Footprint Lake (2010)	Nearshore	5	0.6	0.5	0.8	0.00	0.29	16.0	clay, organic matter	grass, coniferous	0-24	--
	Offshore	5	6.4	6.1	6.7	0.00	0.86	16.0	clay, silt	--	--	--
Leftrook Lake (2010)	Nearshore	5	0.5	0.4	0.6	0.01	0.53	14.0	boulder, gravel	shrub, coniferous	0-24	attached
	Offshore	5	7.9	7.7	8.1	0.02	1.07	15.0	clay	--	--	--

Table 5.5.6-2. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate nearshore kicknet samples collected in the Churchill River Diversion Region for CAMPP, 2010.

Waterbody and Habitat	Rat Lake Nearshore (2010)							Threepoint Lake Nearshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	5	--	--	--	--	--	--	5	--	--	--	--	--	--
Water Depth (m)	--	0.8	0.08	0.04	0.8	0.7	0.9	--	0.7	0.07	0.03	0.7	0.6	0.7
Abundance (no. per kicknet)														
Total Invertebrates	--	243	101.4	45.3	243	139	395	--	46	29.2	13.1	45	11	80
Non-Insecta	51	124	42.1	18.8	126	79	190	21	10	7.7	3.4	9	4	23
Oligochaeta	15	37	28.0	12.5	23	15	82	3	2	1.2	0.5	1	1	4
Amphipoda	27	66	19.6	8.8	62	44	92	5	2	2.6	1.2	1	0	7
Bivalvia	8	18	24.8	11.1	13	1	61	3	1	0.9	0.4	2	0	2
Gastropoda	1	2	2.7	1.2	1	0	7	10	5	3.7	1.7	5	1	10
Insecta	49	119	61.8	27.6	117	42	205	79	36	25.6	11.4	35	7	66
Chironomidae	13	32	26.1	11.7	34	6	69	16	8	11.7	5.2	3	1	28
Ephemeroptera	5	12	3.5	1.5	13	6	15	5	2	4.1	1.8	1	0	10
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	2	5	1.9	0.8	6	2	7	1	0	0.4	0.2	0	0	1
EPT	7	17	5.2	2.3	18	8	22	6	3	4	2	1	0	11
EPT to Chironomidae Ratio	--	1.04	1.121	0.501	0.64	0.28	3.00	--	0.58	0.802	0.359	0.33	0.08	2.00
Genus analysis of Ephemeroptera	Baetidae: unidentified + *Callibaetis*	--	--	--	--	--	--	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	30	18	3.6	1.6	17	15	24	20	12	2.4	1.1	11	9	15
Simpson's Diversity Index	--	0.80	0.058	0.026	0.83	0.73	0.85	--	0.66	0.300	0.134	0.83	0.19	0.89
Evenness (Simpson's Equitability)	--	0.23	0.039	0.018	0.21	0.19	0.28	--	0.38	0.241	0.108	0.48	0.11	0.65
Shannon-Weaver Index	--	2.04	0.252	0.113	2.13	1.77	2.36	--	1.58	0.711	0.318	1.89	0.53	2.35
Evenness (Shannon’s Equitability)	--	0.65	0.048	0.022	0.68	0.58	0.69	--	0.61	0.261	0.117	0.79	0.22	0.80
Hill's Effective Richness	--	8	2.0	0.9	8	6	11	--	6	3.4	1.5	7	2	10
Evenness (Hill's)	--	0.34	0.041	0.019	0.33	0.28	0.39	--	0.43	0.217	0.097	0.55	0.15	0.61

Table 5.5.6-2. continued.

Waterbody and Habitat	Footprint Lake Nearshore (2010)							Leftrook Lake Nearshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	5	--	--	--	--	--	--	5	--	--	--	--	--	--
Water Depth (m)	--	0.6	0.11	0.05	0.7	0.5	0.8	--	0.5	0.08	0.03	0.5	0.4	0.6
Abundance (no. per kicknet)														
Total Invertebrates	--	35	38.6	17.3	21	7	103	--	151	78.1	34.9	167	36	226
Non-Insecta	35	12	5.9	2.6	14	4	18	80	122	67.8	30.3	128	24	192
Oligochaeta	8	3	2.6	1.2	2	0	7	12	18	10.4	4.6	17	8	33
Amphipoda	23	8	4.4	2.0	10	3	13	55	83	63.3	28.3	80	4	151
Bivalvia	1	0	0.5	0.2	0	0	1	6	9	7.9	3.5	6	3	23
Gastropoda	2	1	0.8	0.4	0	0	2	3	5	3.8	1.7	3	1	10
Insecta	65	23	40.4	18.1	4	2	95	20	29	11.5	5.1	34	12	39
Chironomidae	7	3	1.7	0.7	3	1	5	5	7	4.0	1.8	6	3	13
Ephemeroptera	5	2	3.6	1.6	0	0	8	4	6	6.1	2.7	2	1	13
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	1	0	0.3	0.1	0	0	1	8	12	5.6	2.5	11	4	19
EPT	5	2	4	2	0	0	9	11	17	9	4	20	6	27
EPT to Chironomidae Ratio	--	0.42	0.742	0.332	0.11	0.00	1.73	--	2.79	1.744	0.780	2.13	1.58	5.86
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	Heptageniidae: *Stenomena*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	19	9	3.3	1.5	8	7	15	22	17	1.5	0.7	17	14	18
Simpson's Diversity Index	--	0.68	0.182	0.081	0.71	0.41	0.91	--	0.71	0.160	0.072	0.74	0.54	0.92
Evenness (Simpson's Equitability)	--	0.49	0.512	0.229	0.32	0.09	1.39	--	0.27	0.223	0.100	0.20	0.11	0.66
Shannon-Weaver Index	--	1.46	0.260	0.116	1.51	1.12	1.77	--	1.86	0.451	0.202	1.94	1.37	2.52
Evenness (Shannon's Equitability)	--	0.63	0.165	0.074	0.63	0.39	0.85	--	0.64	0.148	0.066	0.66	0.49	0.85
Hill's Effective Richness	--	4	1.1	0.5	5	3	6	--	7	3.3	1.5	7	4	12
Evenness (Hill's)	--	0.45	0.199	0.089	0.45	0.17	0.73	--	0.37	0.170	0.076	0.37	0.23	0.65

Table 5.5.6.3. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate offshore grab samples collected in the Churchill River Diversion Region for CAMPP, 2009 to 2010.

Waterbody and Habitat	Rat Lake Offshore (2010)							Notigi Lake Offshore (2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	5	--	--	--	--	--	--	15	--	--	--	--	--	--
Water Depth (m)	--	7.6	0.77	0.34	7.4	6.8	8.6		14.2	1.03	0.27	14.6	11.9	15.7
Abundance (no. per m^2)														
Total Invertebrates	--	124	229.6	102.7	29	0	534	--	517	710.4	183.4	303	0	2813
Non-Insecta	12	14	25.0	11.2	0	0	58	83	427	628.7	162.3	173	0	2381
Oligochaeta	5	6	12.9	5.8	0	0	29	72	372	607.0	156.7	87	0	2207
Amphipoda	2	3	6.5	2.9	0	0	14	9	49	108.4	28.0	0	0	390
Bivalvia	5	6	7.9	3.5	0	0	14	1	6	15.2	3.9	0	0	43
Gastropoda	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Insecta	88	110	205.5	91.9	14	0	476	17	89	127.2	32.8	43	0	433
Chironomidae	58	72	122.0	54.6	14	0	289	17	87	128.8	33.3	43	0	433
Ephemeroptera	30	38	83.9	37.5	0	0	188	0	0	0.0	0.0	0	0	0
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
EPT	30	38	83.9	37.5	0	0	188	0	0	0.0	0.0	0	0	0
EPT to Chironomidae Ratio	--	0.13	0.291	0.130	0.00	0.00	0.65	--	0.00	0.000	0.000	0.00	0.00	0.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	--	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	1	--	--	--	--	--	--	1	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	2	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	5	2	1.9	0.9	1	0	5	5	2	0.9	0.2	2	0	3
Simpson's Diversity Index	--	0.33	0.306	0.137	0.45	0.00	0.66	--	0.31	0.249	0.064	0.37	0.00	0.72
Evenness (Simpson's Equitability)	--	0.69	0.443	0.198	0.91	0.00	1.04	--	0.80	0.301	0.078	0.96	0.00	1.02
Shannon-Weaver Index	--	0.52	0.539	0.241	0.64	0.00	1.28	--	0.49	0.409	0.106	0.64	0.00	1.33
Evenness (Shannon’s Equitability)	--	0.53	0.492	0.220	0.72	0.00	1.00	--	0.55	0.436	0.113	0.55	0.00	1.00
Hill's Effective Richness	--	2	1.1	0.5	2	1	4	--	2	0.8	0.2	2	1	4
Evenness (Hill's)	--	0.71	0.430	0.192	0.94	0.00	1.00	--	0.84	0.279	0.072	0.98	0.00	1.00

Table 5.5.6-3. continued.

Waterbody and Habitat	Threepoint Lake Offshore (2009 to 2010)							Footprint Lake Offshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	20	--	--	--	--	--	--	5	--	--	--	--	--	--
Water Depth (m)	--	4.5	0.22	0.05	4.5	4.2	5.2	--	6.4	0.22	0.10	6.3	6.1	6.7
Abundance (no. per m^2)														
Total Invertebrates	--	493	658.8	147.3	238	0	2092	--	678	230.6	103.1	592	505	1082
Non-Insecta	69	339	526.1	117.6	151	0	1832	--	118	63.2	28.3	115	29	202
Oligochaeta	1	6	14.4	3.2	0	0	43	--	3	6.5	2.9	0	0	14
Amphipoda	33	164	208.8	46.7	108	0	736	--	101	57.7	25.8	87	29	173
Bivalvia	33	164	336.9	75.3	22	0	1226	--	14	14.4	6.5	14	0	29
Gastropoda	1	3	7.5	1.7	0	0	29	--	0	0.0	0.0	0	0	0
Insecta	31	154	212.7	47.6	87	0	952	--	560	186.3	83.3	491	404	880
Chironomidae	17	82	123.9	27.7	50	0	563	--	136	67.4	30.1	144	43	231
Ephemeroptera	10	50	73.0	16.3	14	0	260	--	32	15.8	7.1	29	14	58
Plecoptera	0	0	0.0	0.0	0	0	0	--	0	0.0	0.0	0	0	0
Trichoptera	2	10	26.5	5.9	0	0	87	--	0	0.0	0.0	0	0	0
EPT	12	60	81.2	18.2	29	0	260	--	32	15.8	7.1	29	14	58
EPT to Chironomidae Ratio	--	0.53	0.875	0.196	0.00	0.00	3.25	--	0.41	0.521	0.233	0.20	0.06	1.33
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	3	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	4	2.9	0.6	3	0	11	7	6	0.5	0.2	6	5	6
Simpson's Diversity Index	--	0.50	0.273	0.061	0.57	0.00	0.76	--	0.65	0.124	0.055	0.61	0.51	0.81
Evenness (Simpson's Equitability)	--	0.65	0.377	0.084	0.80	0.00	1.02	--	0.46	0.183	0.082	0.43	0.26	0.75
Shannon-Weaver Index	--	0.90	0.561	0.125	1.02	0.00	1.64	--	1.39	0.297	0.133	1.24	1.11	1.77
Evenness (Shannon's Equitability)	--	0.69	0.380	0.085	0.88	0.00	1.00	--	0.72	0.142	0.063	0.69	0.53	0.91
Hill's Effective Richness	--	3	1.4	0.3	3	1	5	--	4	1.3	0.6	3	3	6
Evenness (Hill's)	--	0.70	0.365	0.082	0.87	0.00	1.00	--	0.60	0.168	0.075	0.58	0.38	0.84

Table 5.5.6-3. continued.

Waterbody and Habitat	Apussigamasi Lake Offshore (2009)							Leftrook Lake Offshore (2009 to 2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	20	--	--	--	--	--	--
Water Depth (m)	--	5.8	0.61	0.16	5.6	5.1	6.9	--	8.8	0.91	0.20	8.4	7.7	10.8
Abundance (no. per m^2)														
Total Invertebrates	--	1728	774.5	200.0	1515	909	3506	--	3173	1237.6	276.7	3253	1169	5324
Non-Insecta	87	1506	786.1	203.0	1298	649	3506	68	2169	1021.0	228.3	2121	476	3939
Oligochaeta	0	3	11.2	2.9	0	0	43	13	412	251.4	56.2	390	72	822
Amphipoda	55	955	343.7	88.7	952	346	1515	0	5	12.6	2.8	0	0	43
Bivalvia	32	545	865.9	223.6	216	43	3160	55	1736	921.5	206.0	1616	303	3463
Gastropoda	0	0	0.0	0.0	0	0	0	0	12	18.3	4.1	0	0	43
Insecta	13	222	134.8	34.8	260	0	433	32	1004	452.4	101.2	974	346	1991
Chironomidae	9	153	100.7	26.0	130	0	346	31	991	446.1	99.7	974	332	1948
Ephemeroptera	3	58	50.9	13.1	43	0	130	0	12	22.6	5.0	0	0	87
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	6	15.2	3.9	0	0	43	0	0	0.0	0.0	0	0	0
EPT	4	63	51	13	43	0	130	0	12	22.6	5.0	0	0	87
EPT to Chironomidae Ratio	--	0.41	0.401	0.104	0.25	0.00	1.00	--	0.01	0.021	0.005	0.00	0.00	0.06
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	4	1.1	0.3	4	2	6	10	4	1.5	0.3	4	3	8
Simpson's Diversity Index	--	0.46	0.129	0.033	0.51	0.18	0.66	--	0.58	0.091	0.020	0.59	0.42	0.72
Evenness (Simpson's Equitability)	--	0.45	0.139	0.036	0.41	0.29	0.71	--	0.52	0.184	0.041	0.52	0.18	0.90
Shannon-Weaver Index	--	0.91	0.272	0.070	0.98	0.32	1.30	--	1.11	0.153	0.034	1.07	0.89	1.38
Evenness (Shannon’s Equitability)	--	0.61	0.103	0.027	0.61	0.40	0.81	--	0.70	0.137	0.031	0.70	0.43	0.96
Hill's Effective Richness	--	3	0.6	0.2	3	1	4	--	3	0.5	0.1	3	2	4
Evenness (Hill's)	--	0.57	0.124	0.032	0.55	0.44	0.79	--	0.63	0.170	0.038	0.64	0.27	0.95

Table 5.5.6-4. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate nearshore grab samples collected in the Churchill River Diversion Region for CAMPP, 2009.

Waterbody and Habitat	Notigi Lake Nearshore (2009)							Threepoint Lake Nearshore (2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	15	--	--	--	--	--	--
Water Depth (m)	--	2.8	1.09	0.28	2.7	0.8	4.2	--	3.3	0.87	0.22	3.5	0.3	3.8
Abundance (no. per m^2)														
Total Invertebrates	--	684	1038.0	268.0	346	0	4069	--	886	598.1	154.4	909	0	2121
Non-Insecta	61	416	751.1	193.9	130	0	2813	71	632	504.4	130.2	563	0	1731
Oligochaeta	43	294	742.2	191.6	0	0	2770	1	12	34.6	8.9	0	0	130
Amphipoda	1	9	24.3	6.3	0	0	87	50	441	476.2	122.9	303	0	1688
Bivalvia	11	78	105.0	27.1	43	0	346	20	173	174.7	45.1	130	0	649
Gastropoda	1	9	24.3	6.3	0	0	87	0	3	11.2	2.9	0	0	43
Insecta	39	268	336.1	86.8	216	0	1255	29	254	227.2	58.7	173	0	866
Chironomidae	29	196	336.4	86.9	87	0	1255	10	89	77.5	20.0	87	0	260
Ephemeroptera	8	58	79.6	20.5	43	0	216	17	150	181.3	46.8	130	0	693
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
EPT	8	58	79.6	20.5	43	0	216	17	150	181.3	46.8	130	0	693
EPT to Chironomidae Ratio	--	0.34	0.703	0.182	0.00	0.00	2.50	--	1.38	1.655	0.427	1.00	0.00	5.33
Genus analysis of Ephemeroptera	2 spp. (DOM: *Hexagenia*)	--	--	--	--	--	--	1 sp. (*Hexagenia*)	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	1	--	--	--	--	--	--	2	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	3	2.0	0.5	3	0	8	9	4	1.8	0.5	4	0	6
Simpson's Diversity Index	--	0.51	0.312	0.080	0.53	0.00	0.85	--	0.50	0.244	0.063	0.57	0.00	0.76
Evenness (Simpson's Equitability)	--	0.74	0.280	0.072	0.77	0.00	1.02	--	0.52	0.271	0.070	0.54	0.00	0.83
Shannon-Weaver Index	--	1.00	0.700	0.181	0.90	0.00	2.07	--	0.96	0.481	0.124	1.09	0.00	1.53
Evenness (Shannon’s Equitability)	--	0.68	0.381	0.098	0.83	0.00	1.00	--	0.65	0.297	0.077	0.69	0.00	0.92
Hill's Effective Richness	--	3	2.2	0.6	2	1	8	--	3	1.1	0.3	3	1	5
Evenness (Hill's)	--	0.80	0.265	0.069	0.87	0.00	1.00	--	0.62	0.290	0.075	0.67	0.00	0.90

Table 5.5.6-4. continued.

Waterbody and Habitat	Apussagamasi Lake Nearshore (2009)							Leftrook Lake Nearshore (2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	15	--	--	--	--	--	--
Water Depth (m)	--	4.5	0.14	0.04	4.5	4.1	4.7	--	4.5	0.50	0.13	4.6	2.8	4.9
Abundance (no. per m^2)														
Total Invertebrates	--	594	411.1	106.1	563	43	1342	--	3431	1980.2	511.3	2943	563	7185
Non-Insecta	59	349	272.5	70.4	346	0	822	53	1835	1364.1	352.2	1515	130	4588
Oligochaeta	2	14	26.7	6.9	0	0	87	2	69	109.5	28.3	0	0	346
Amphipoda	46	274	230.6	59.5	216	0	736	0	0	0.0	0.0	0	0	0
Bivalvia	8	49	60.9	15.7	0	0	173	51	1740	1284.4	331.6	1472	0	4328
Gastropoda	0	3	11.2	2.9	0	0	43	1	17	31.9	8.2	0	0	87
Insecta	41	245	156.6	40.4	216	43	563	47	1596	748.4	193.2	1385	433	3506
Chironomidae	17	104	92.3	23.8	87	0	303	40	1379	720.0	185.9	1169	433	3289
Ephemeroptera	20	118	110.3	28.5	87	0	390	6	211	157.6	40.7	216	0	606
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	2	12	19.8	5.1	0	0	43	0	0	0.0	0.0	0	0	0
EPT	22	130	115.7	29.9	130	0	390	6	211	157.6	40.7	216	0	606
EPT to Chironomidae Ratio	--	0.74	0.793	0.205	0.60	0.00	2.00	--	0.17	0.149	0.039	0.12	0.00	0.47
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)	--	--	--	--	--	--	1 sp. (*Hexagenia*)	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	4	1.6	0.4	4	1	6	8	4	1.1	0.3	4	2	6
Simpson's Diversity Index	--	0.59	0.200	0.052	0.63	0.00	0.80	--	0.63	0.065	0.017	0.64	0.52	0.72
Evenness (Simpson's Equitability)	--	0.71	0.181	0.047	0.67	0.45	1.01	--	0.58	0.163	0.042	0.52	0.37	0.90
Shannon-Weaver Index	--	1.14	0.485	0.125	1.24	0.00	1.81	--	1.19	0.132	0.034	1.21	0.93	1.37
Evenness (Shannon's Equitability)	--	0.79	0.233	0.060	0.84	0.00	1.00	--	0.75	0.103	0.027	0.70	0.63	0.96
Hill's Effective Richness	--	3	1.4	0.4	3	1	6	--	3	0.4	0.1	3	3	4
Evenness (Hill's)	--	0.81	0.127	0.033	0.80	0.61	1.00	--	0.68	0.135	0.035	0.64	0.52	0.95

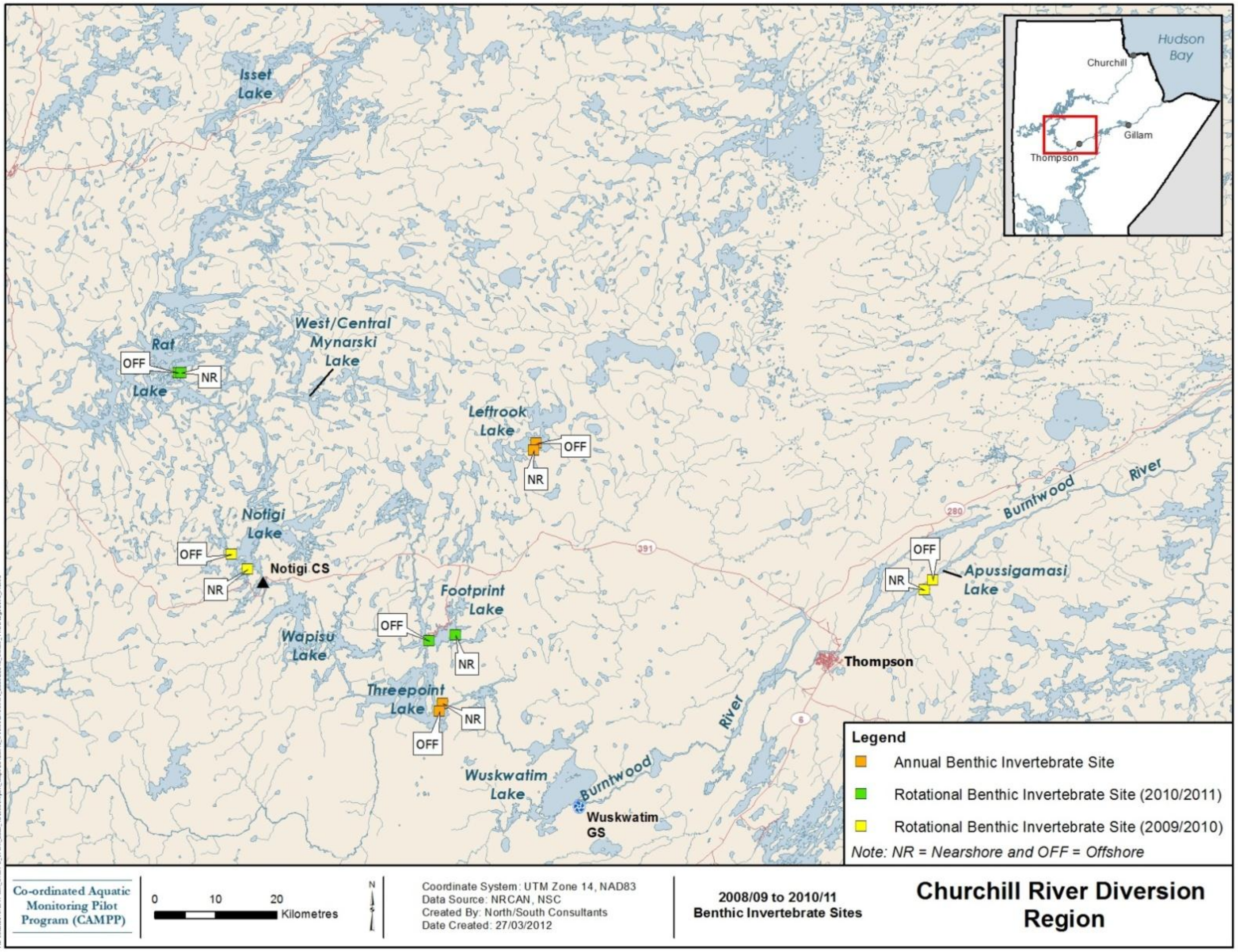


Figure 5.5.6-1. Benthic invertebrate sampling sites located in CAMPP waterbodies in the Churchill River Diversion Region, 2009 to 2010.

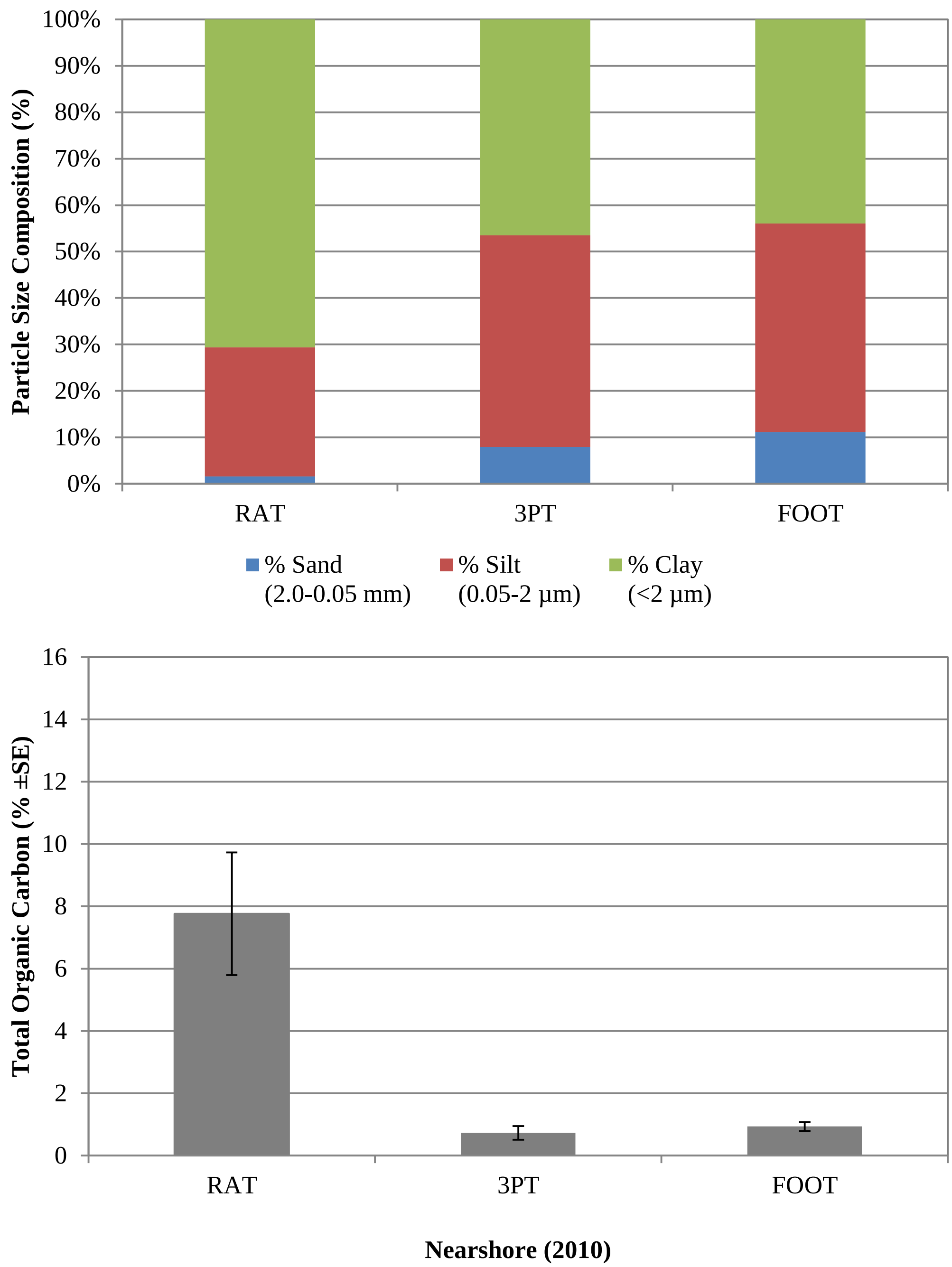


Figure 5.5.6-2. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with nearshore invertebrate kicknet sampling in the Churchill River Diversion Region for CAMPP, 2010.

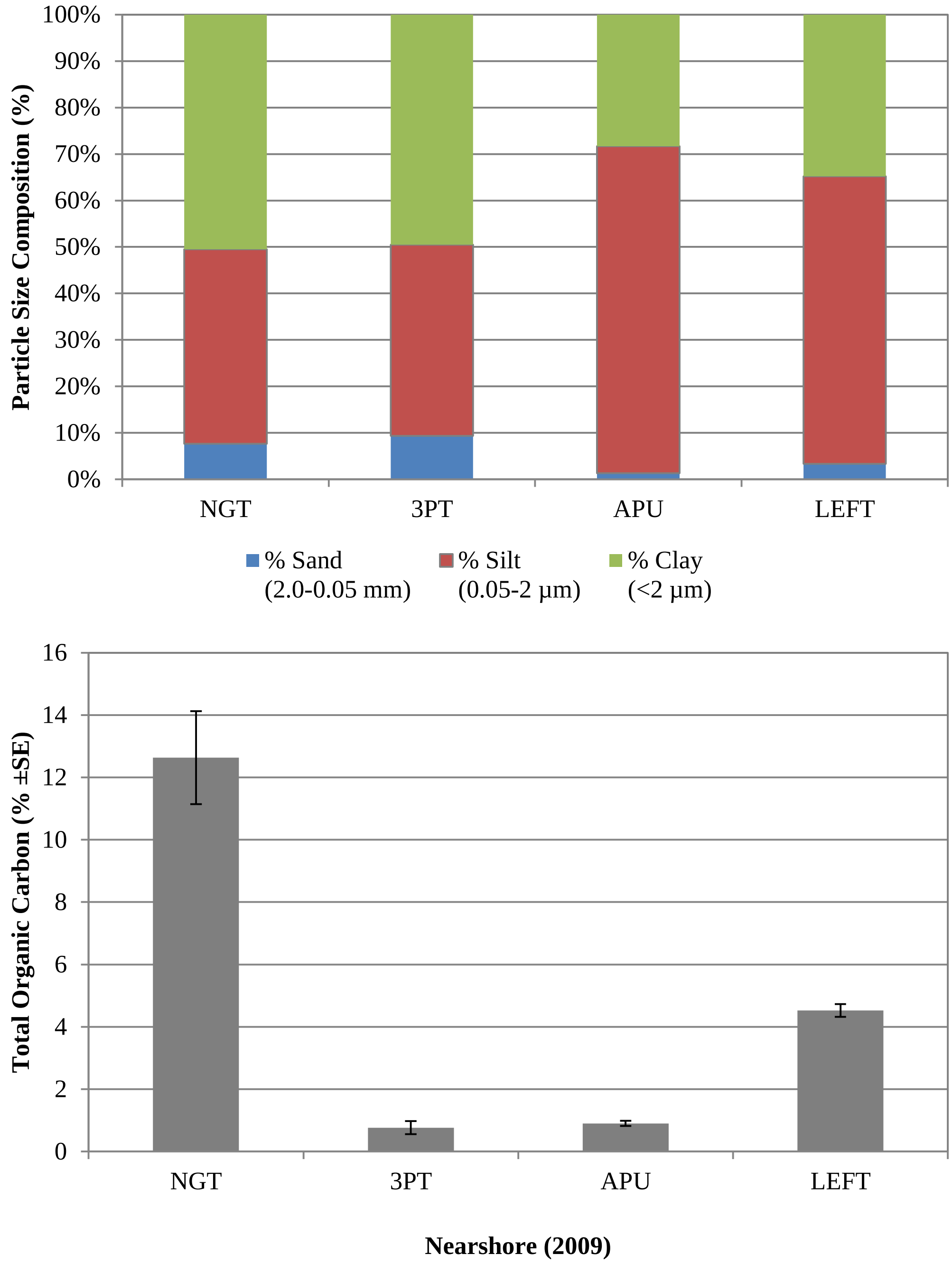


Figure 5.5.6-3. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with nearshore invertebrate grab sampling in the Churchill River Diversion Region for CAMPP, 2009.

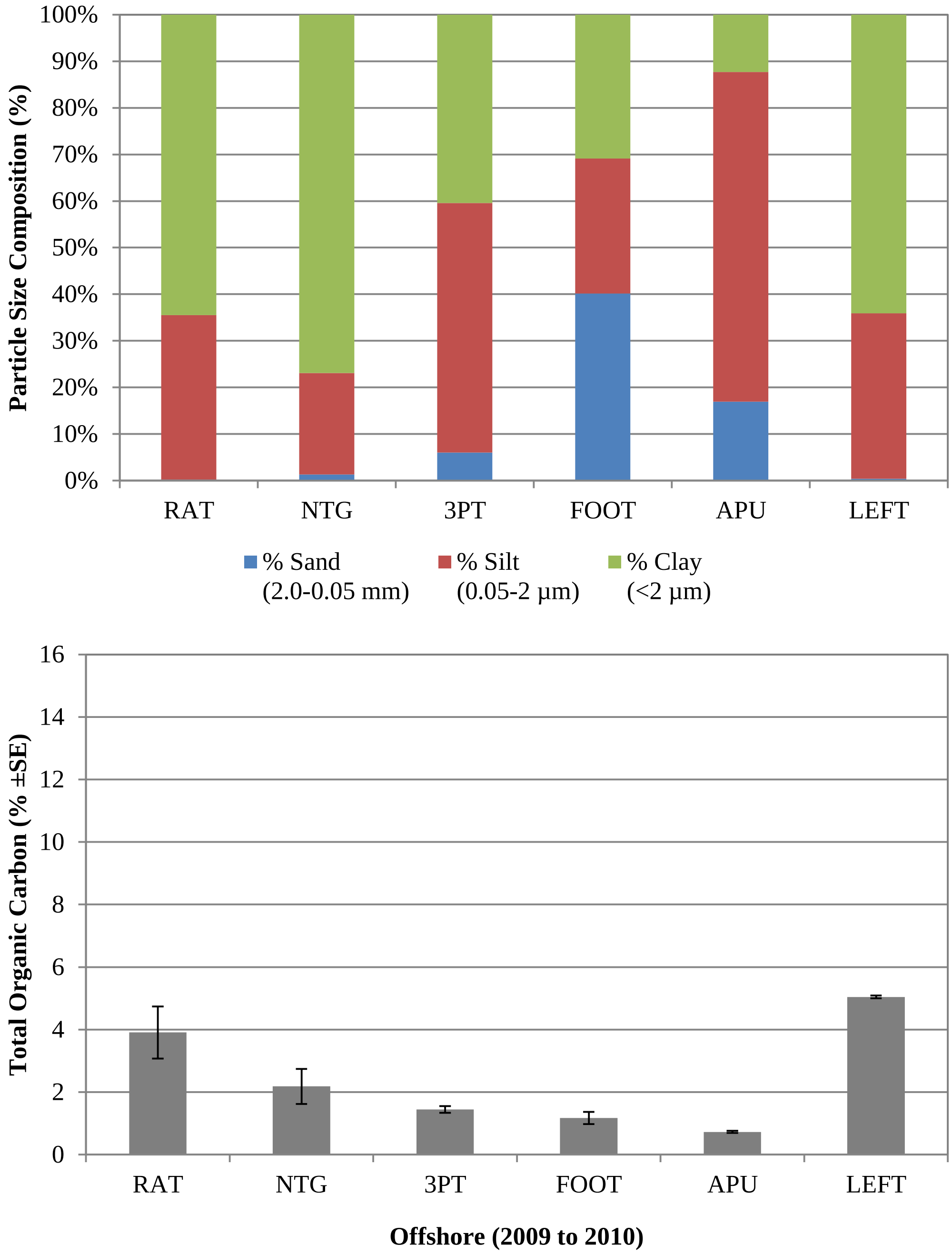
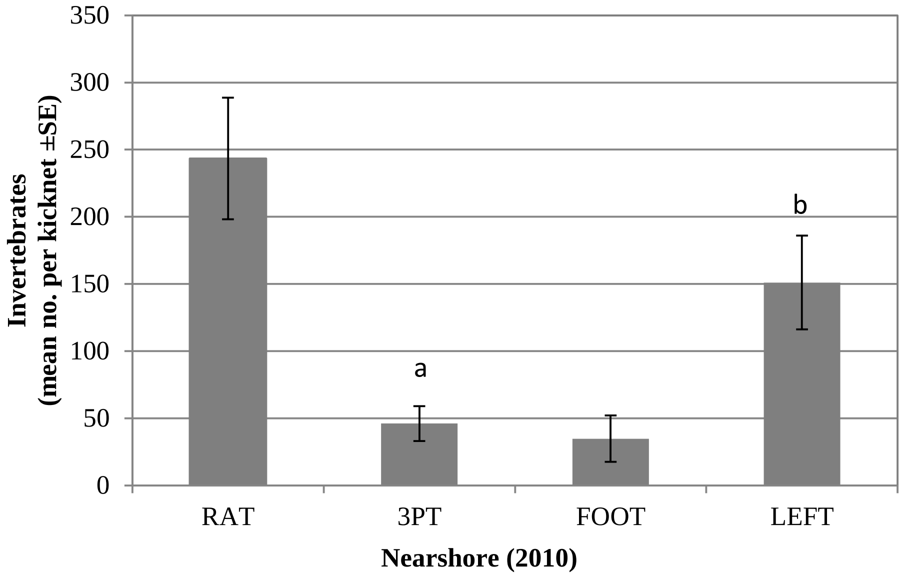
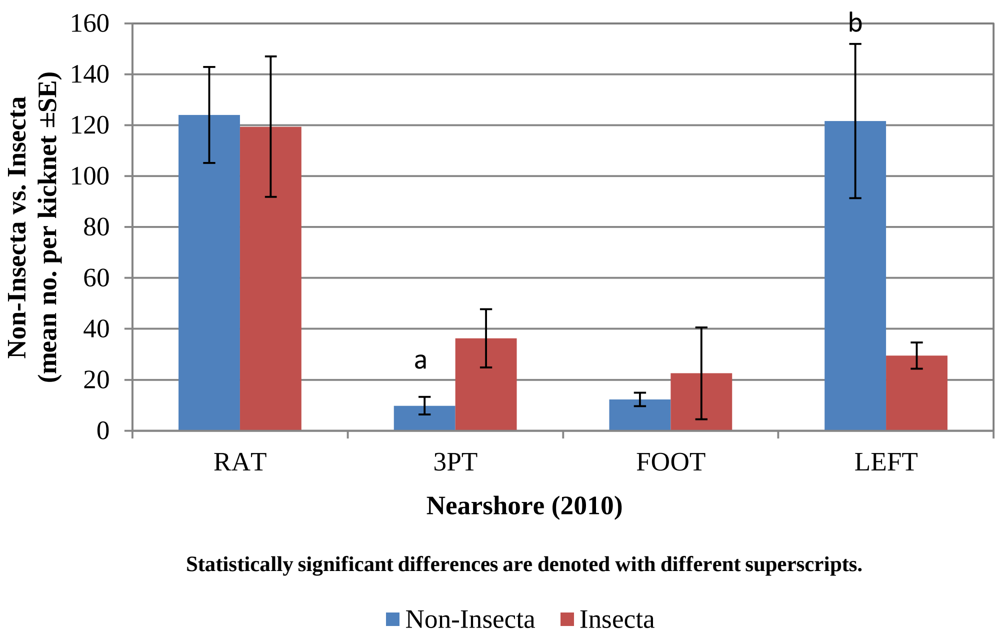


Figure 5.5.6-4. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with offshore invertebrate grab sampling in the Churchill River Diversion Region for CAMPP, 2009 to 2010.



Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-5. Abundances of benthic invertebrates (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2010.



Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-6. Abundances of non-insects and insects (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2010.

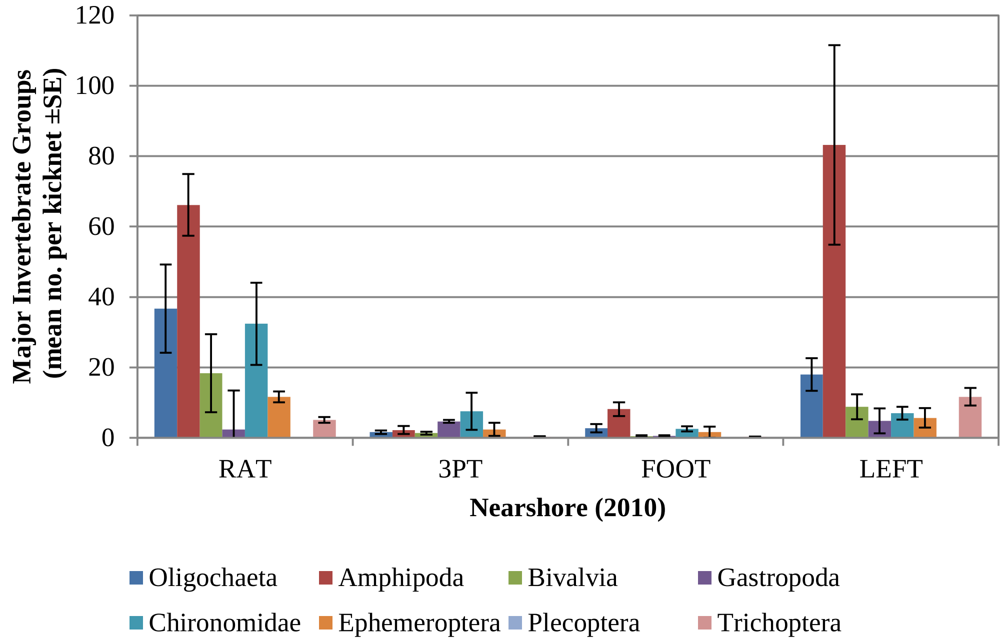


Figure 5.5.6-7. Abundances of the major invertebrate groups (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2010.

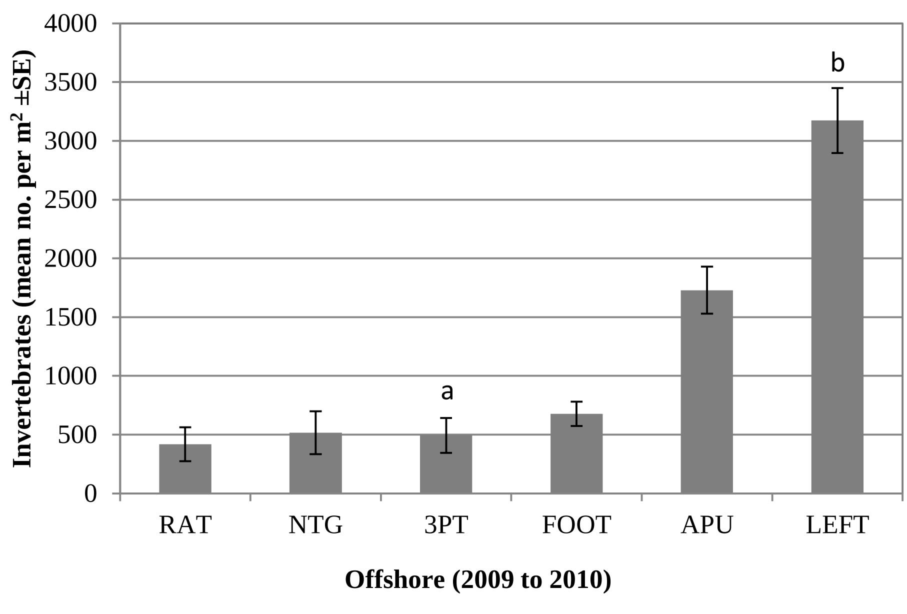


Figure 5.5.6-8. Abundances of benthic invertebrates (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009 to 2010.

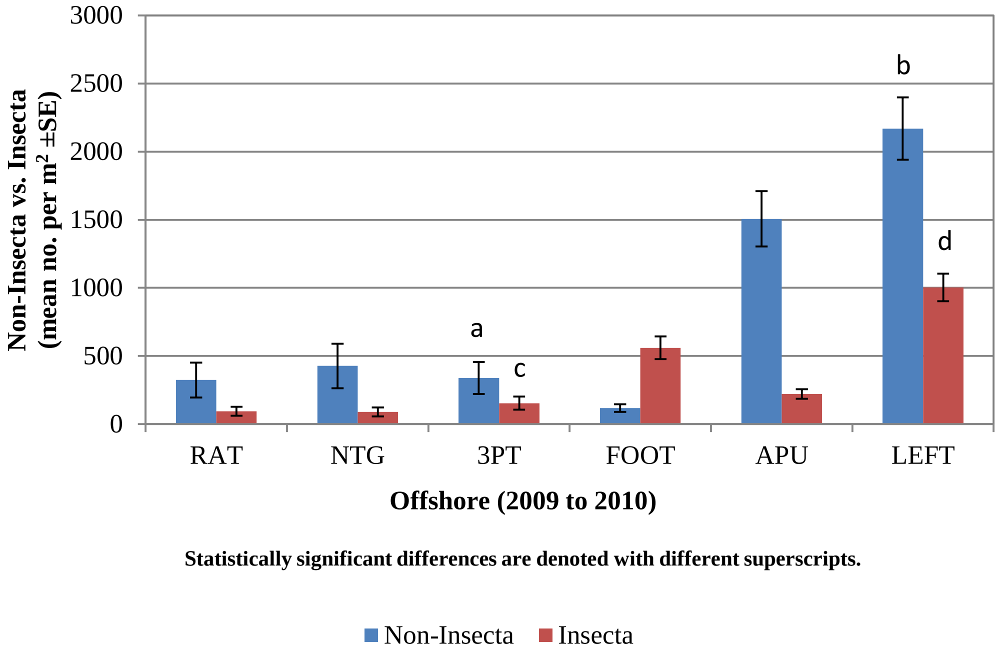


Figure 5.5.6-9. Abundances of non-insects and insects (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies within the Churchill River Diversion Region, 2009 to 2010.

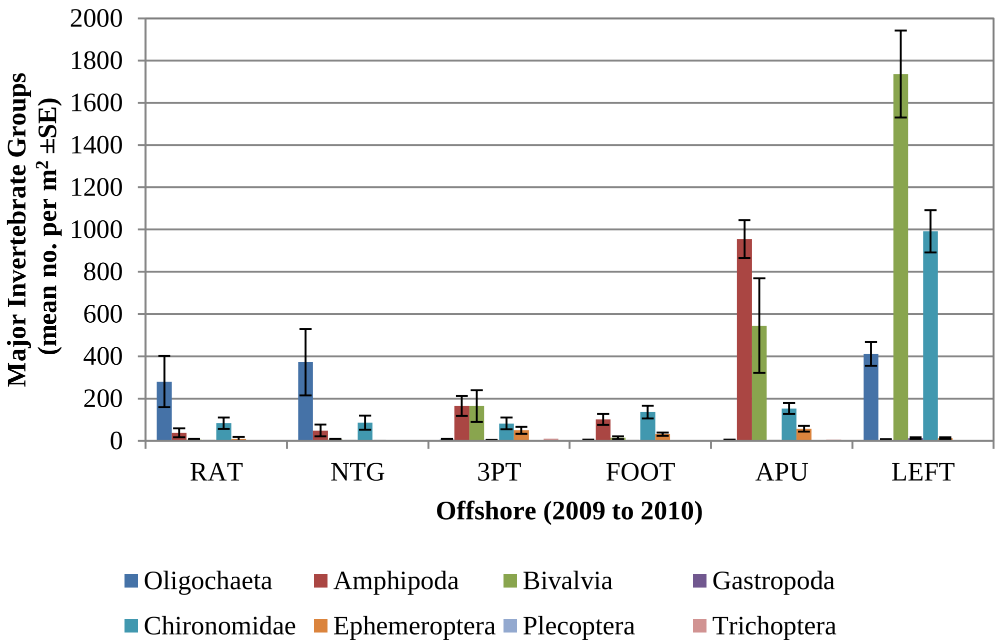
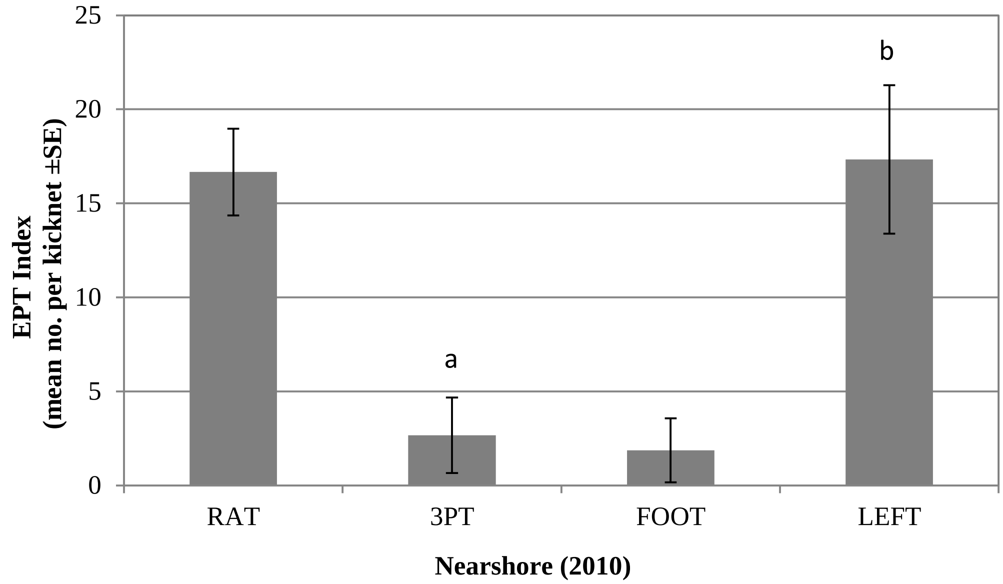
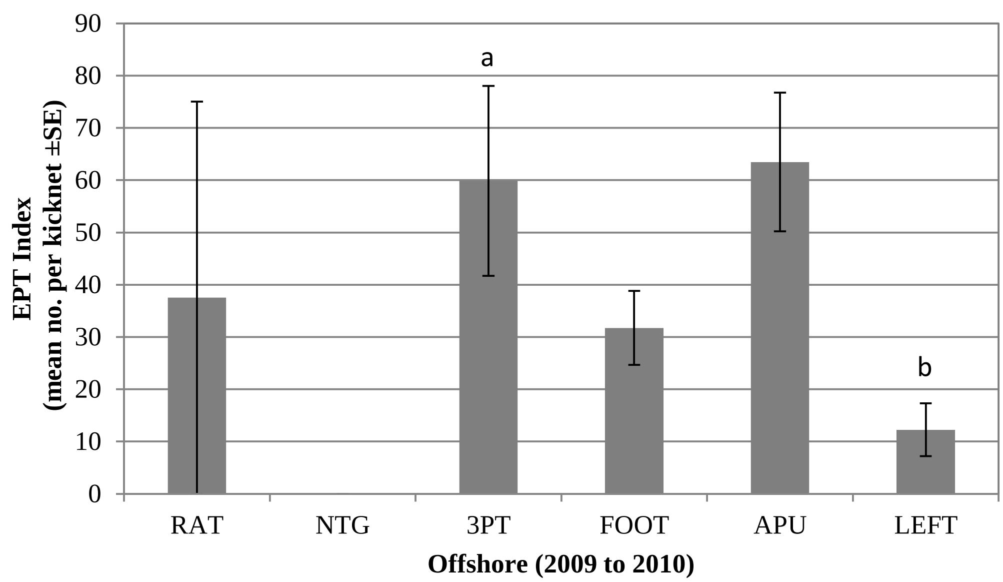


Figure 5.5.6-10. Abundances of the major invertebrate groups (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009 to 2010.



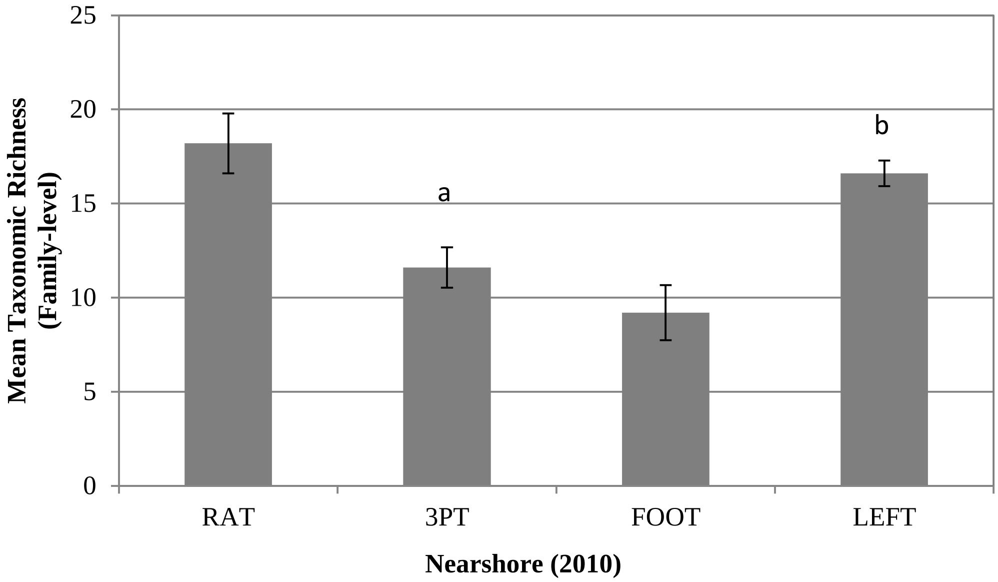
Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-11. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from nearshore kicknet samples in CAMPP waterbodies in the Churchill River Diversion Region, 2010.



Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-12. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from offshore grab samples in CAMPP waterbodies in the Churchill River Diversion Region, 2009 to 2010.



Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-13. Taxa richness (mean no. of families) from benthic invertebrate kicknet samples collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2010.

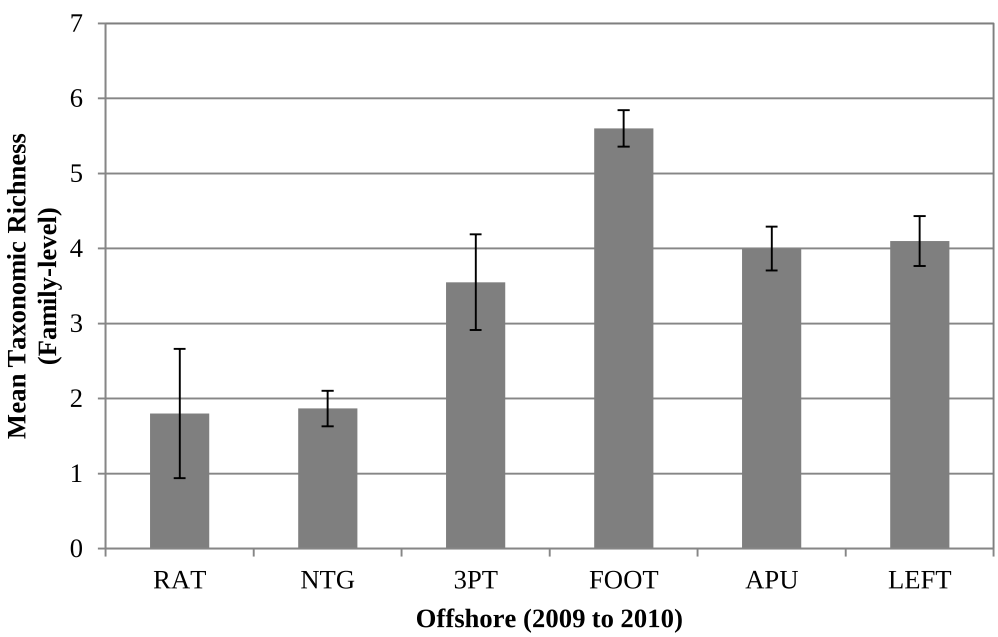


Figure 5.5.6-14. Taxa richness (mean no. of families) from benthic invertebrate grab samples collected in the offshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009 to 2010.

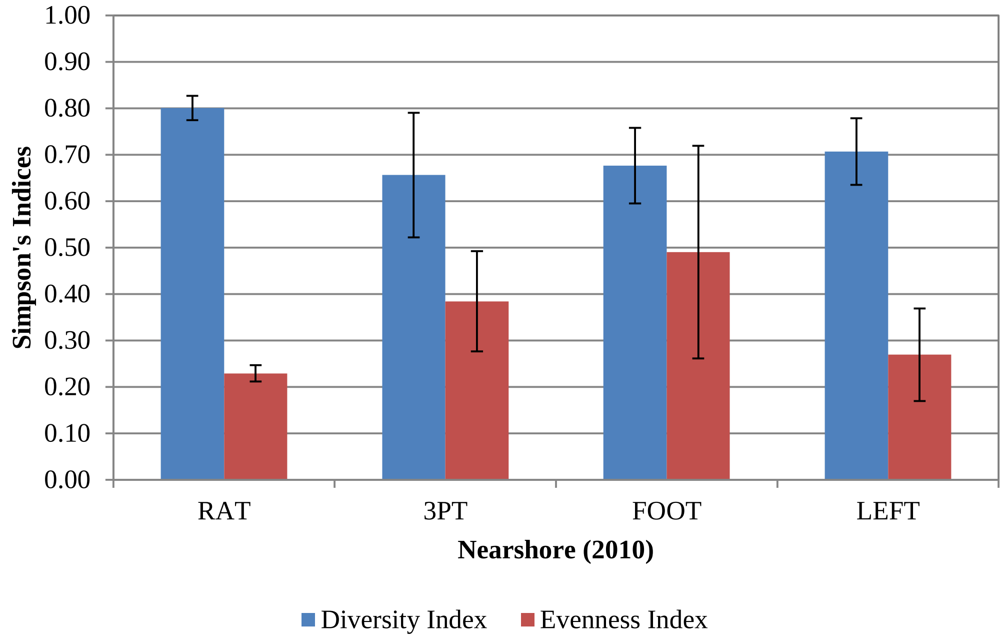


Figure 5.5.6-15. Diversity and evenness (Simpson's) indices calculated from nearshore kicknet samples of CAMPP waterbodies in the Churchill River Diversion Region, 2010.

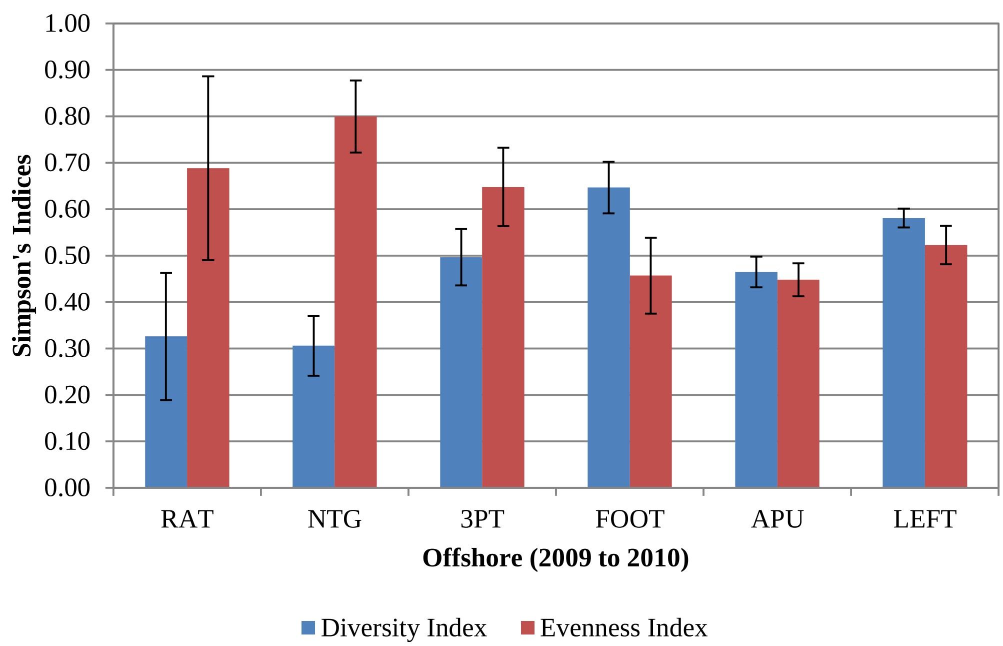
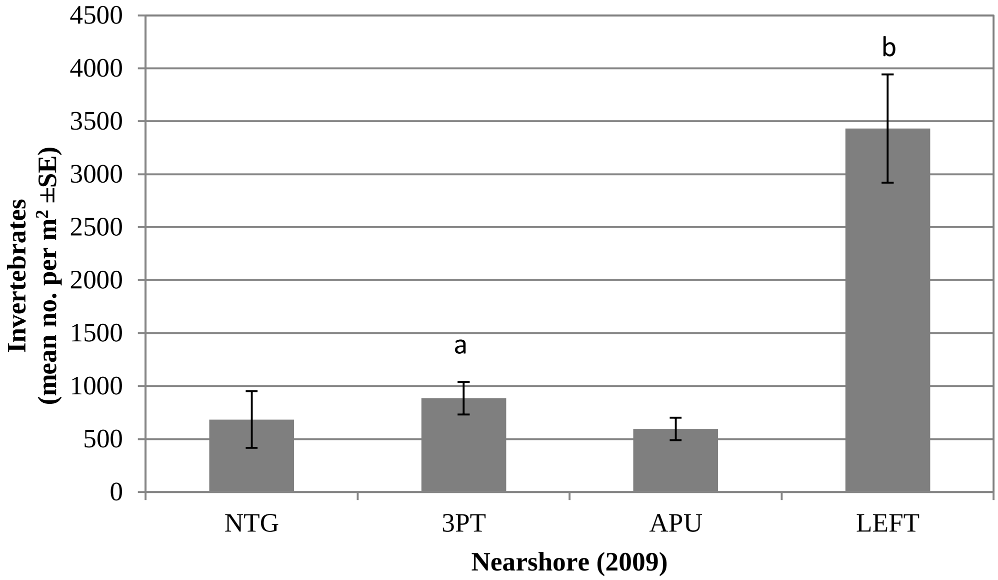
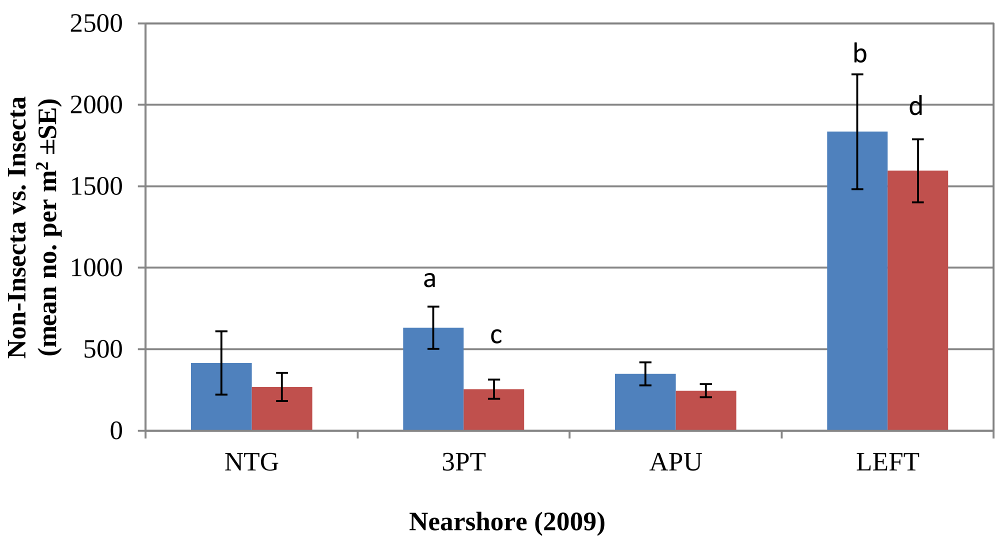


Figure 5.5.6-16. Diversity and evenness (Simpson's) indices calculated from offshore grab samples of CAMPP waterbodies within the Churchill River Diversion Region, 2009 to 2010.



Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-17. Abundances of benthic invertebrates (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009.



Statistically significant differences are denoted with different superscripts.

Figure 5.5.6-18. Abundances of non-insects and insects (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009.

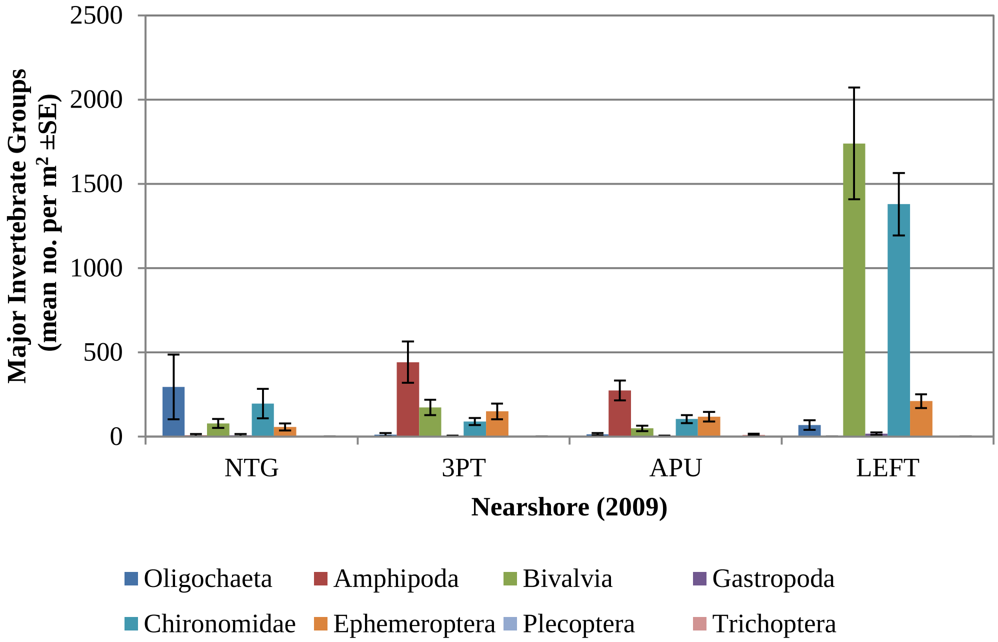


Figure 5.5.6-19. Abundances of the major invertebrate groups (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009.

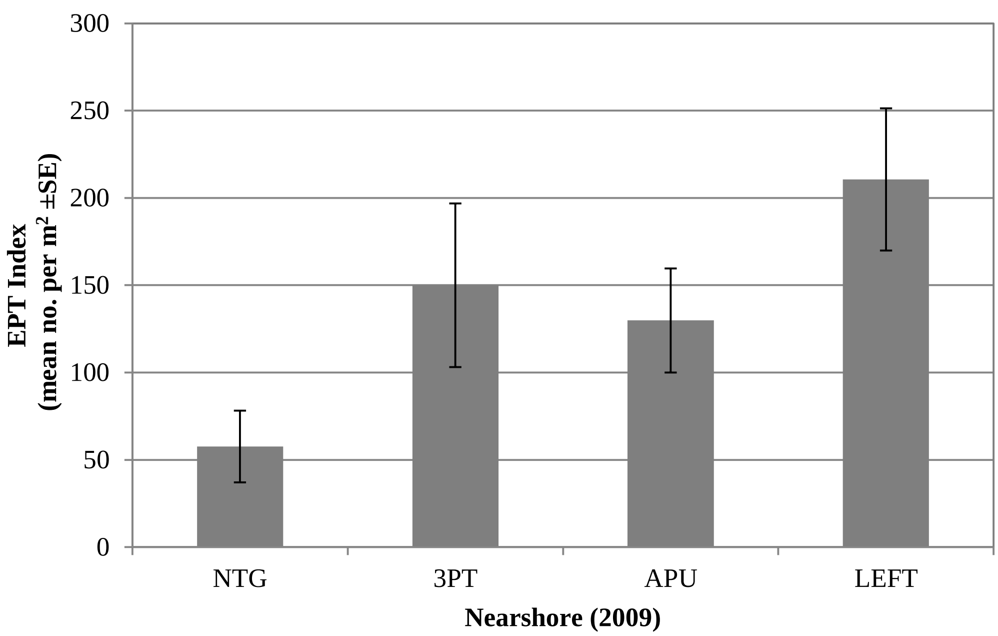


Figure 5.5.6-20. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from nearshore grab samples in CAMPP waterbodies in the Churchill River Diversion Region, 2009.

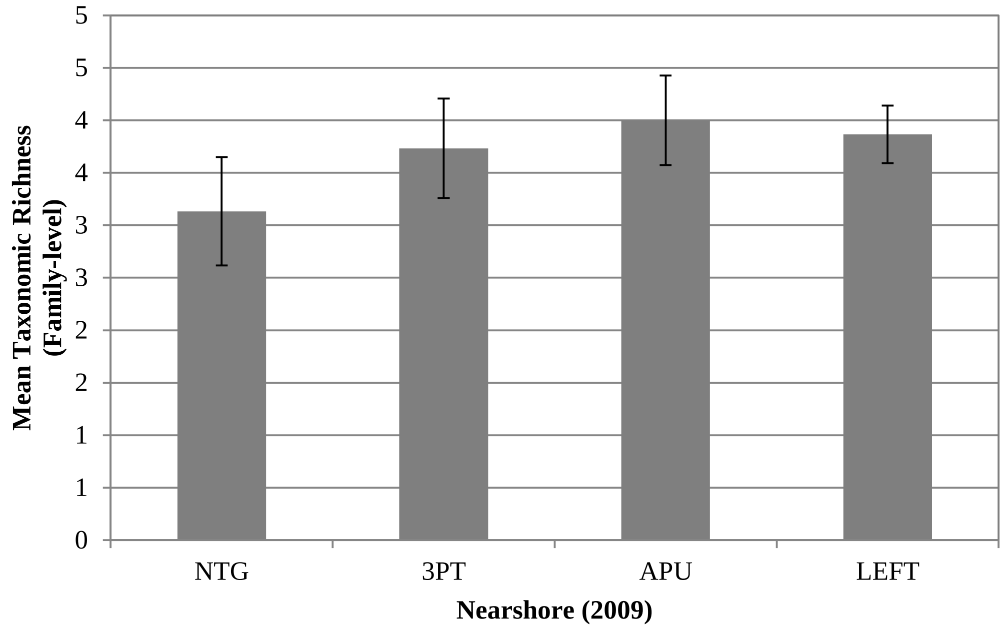


Figure 5.5.6-21. Taxa richness (mean no. of families) from benthic invertebrate grab samples collected in the nearshore habitat of CAMPP waterbodies in the Churchill River Diversion Region, 2009.

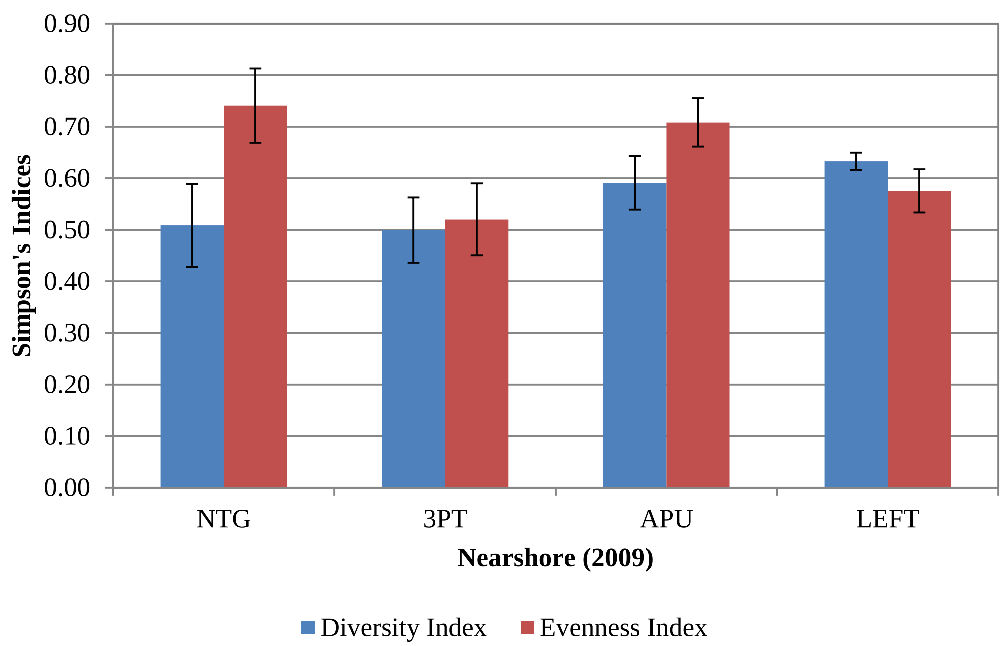


Figure 5.5.6-22. Diversity and evenness (Simpson's) indices calculated from nearshore grab samples from CAMPP waterbodies in the Churchill River Diversion Region, 2009.

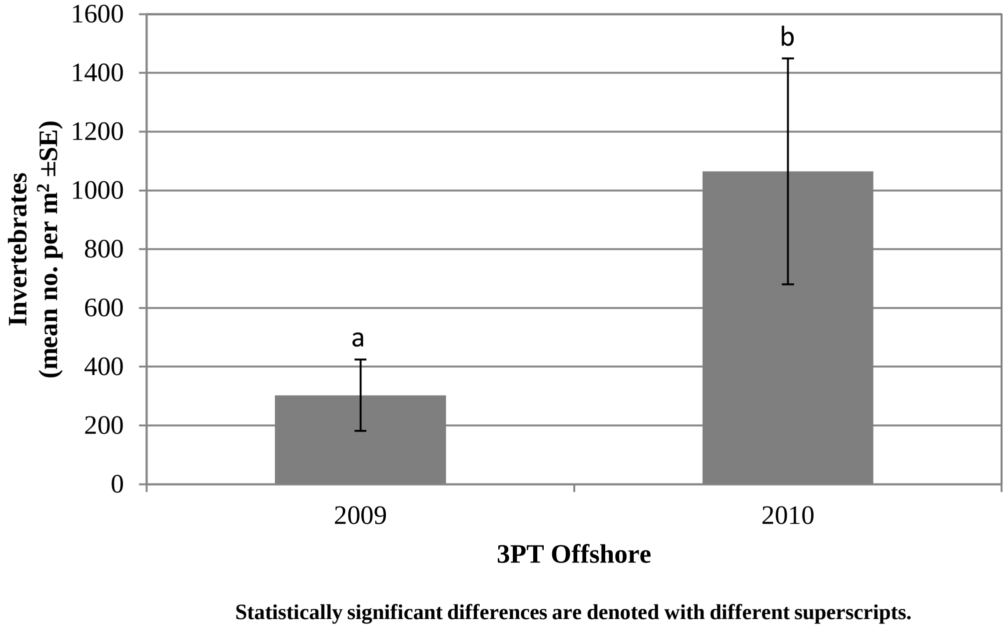


Figure 5.5.6-23. Temporal comparison of benthic invertebrate abundances (no. per $m^2 \pm$ SE) collected in the offshore habitat of Threepoint Lake, 2009 and 2010.

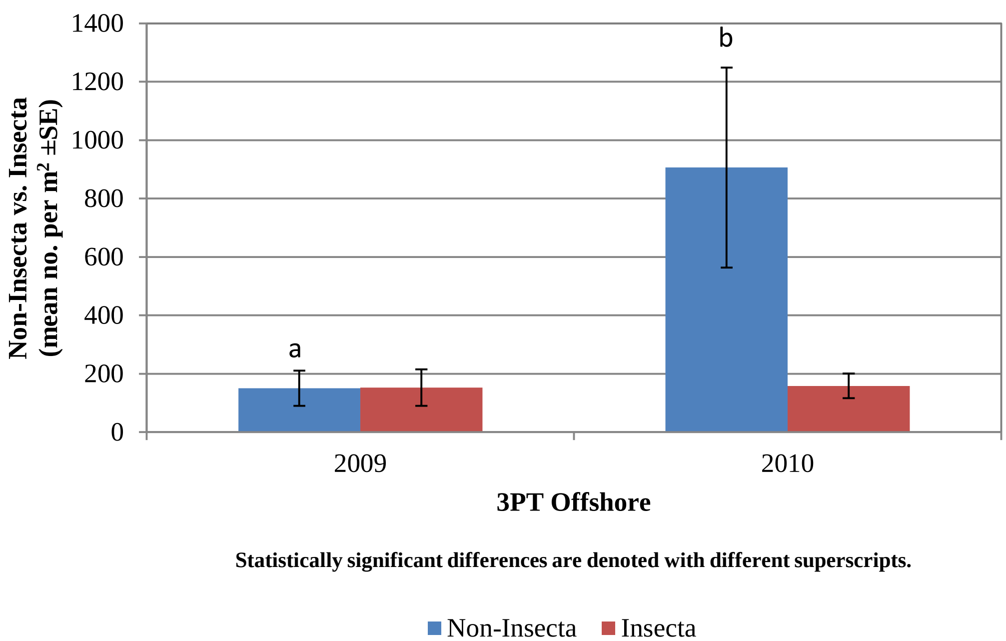


Figure 5.5.6-24. Temporal comparison of non-insect and insect abundances (no. per $m^2 \pm$ SE) collected in the offshore habitat of Threepoint Lake, 2009 and 2010.

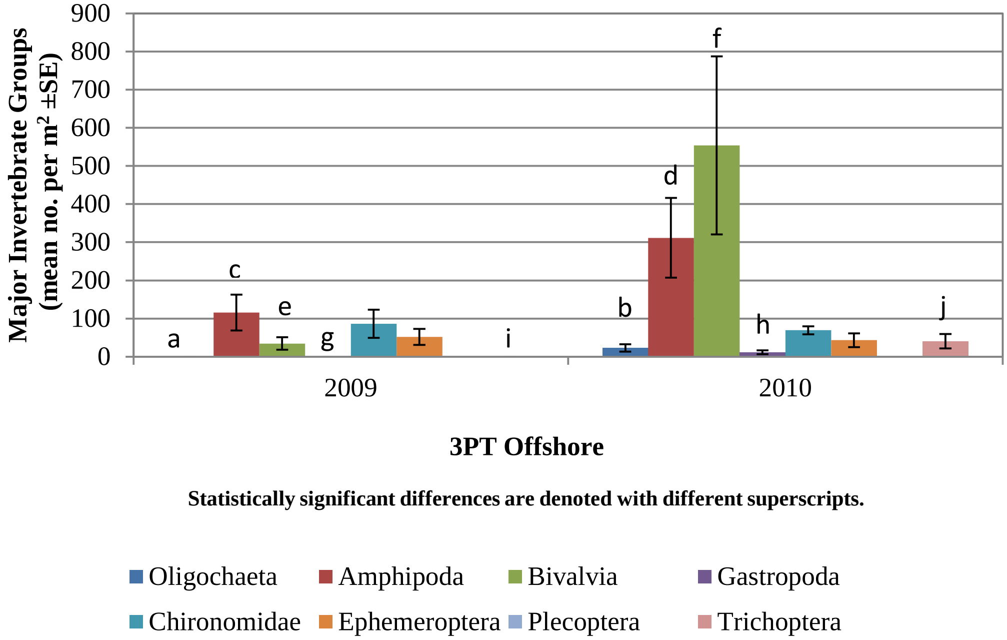


Figure 5.5.6-25 Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the offshore habitat of Threepoint Lake, 2009 and 2010.

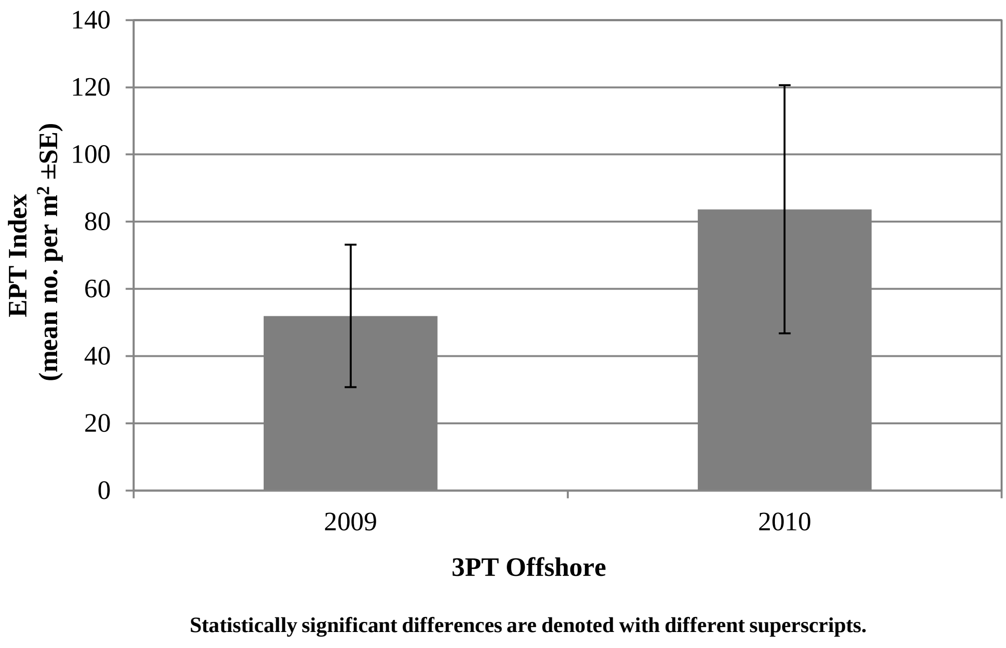


Figure 5.5.6-26 Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of offshore grab samples from Threepoint Lake, 2009 and 2010.

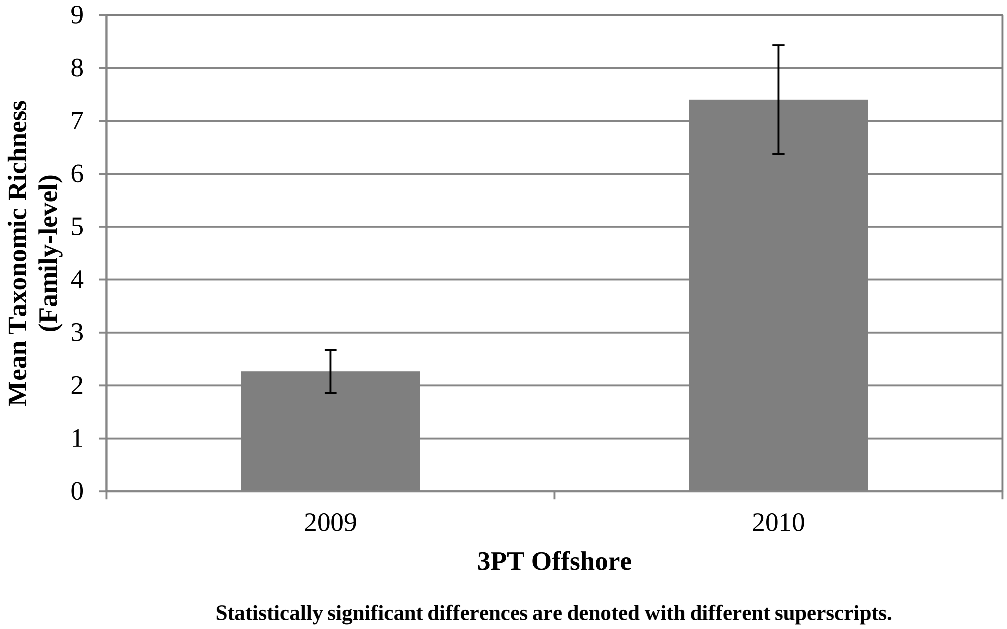


Figure 5.5.6-27 Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of offshore grab samples from Threepoint Lake, 2009 and 2010.

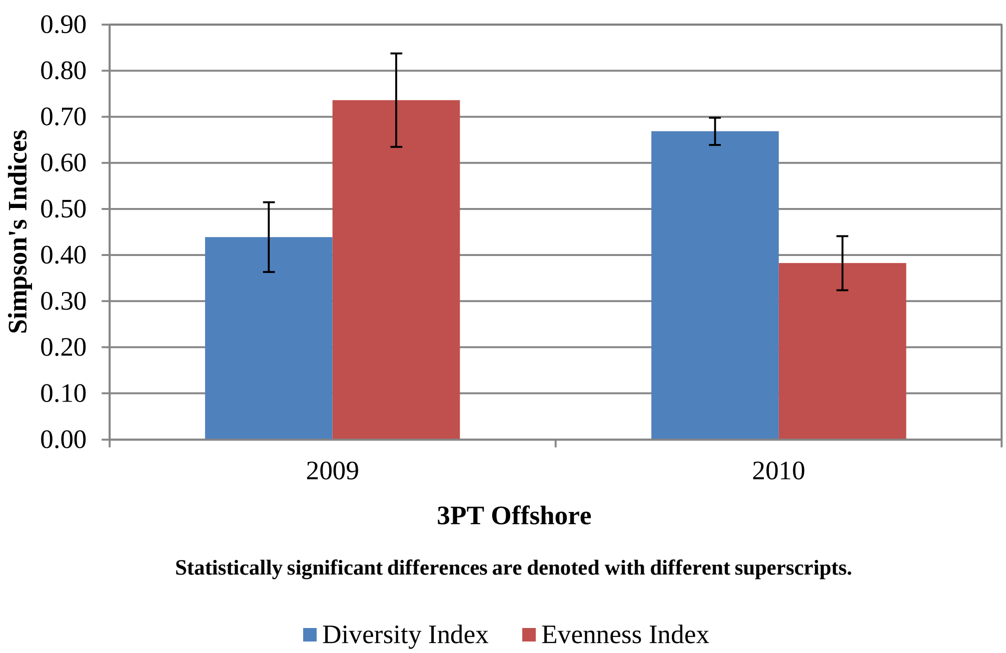


Figure 5.5.6-28 Temporal comparison of diversity and evenness (Simpson's) indices of offshore grab samples from Threepoint Lake, 2009 and 2010.

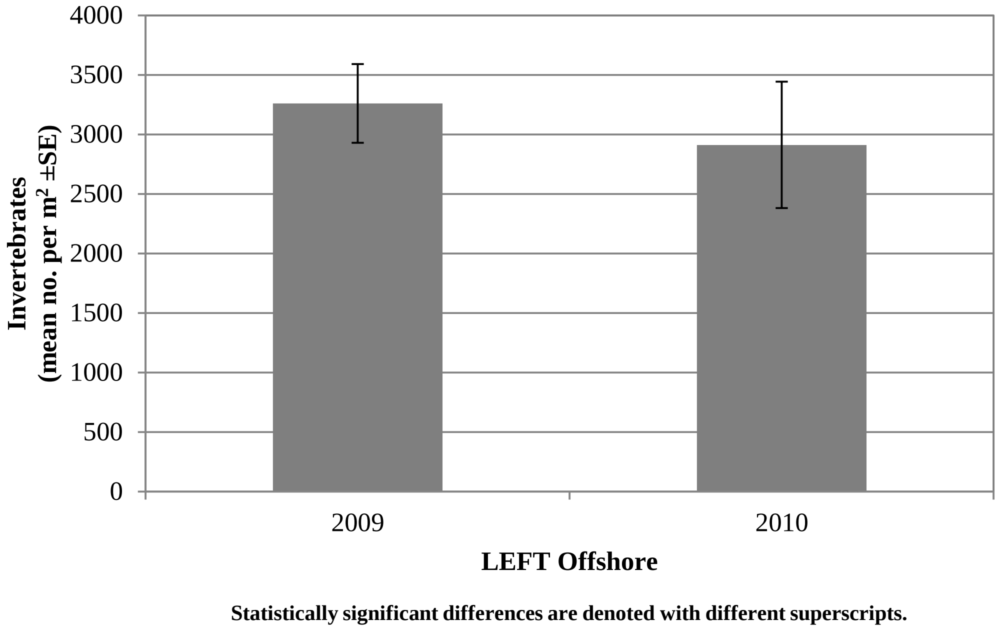


Figure 5.5.6-29 Temporal comparison of benthic invertebrate abundances (no. per m^2 ± SE) collected in the offshore habitat of Leftrook Lake, 2009 and 2010.

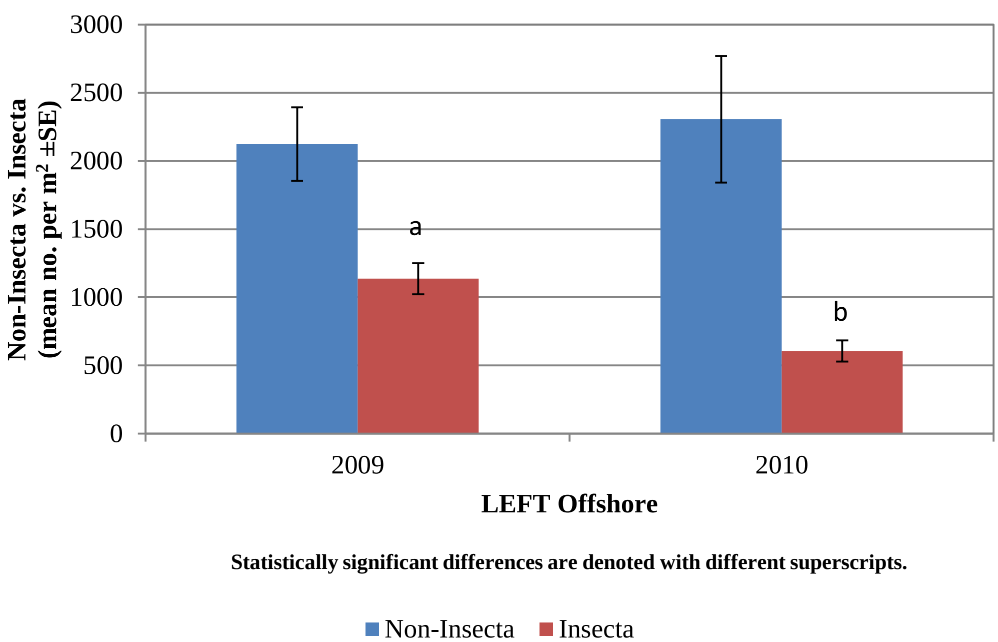


Figure 5.5.6-30 Temporal comparison of non-insect and insect abundances (no. per m^2 ± SE) collected in the offshore habitat of Leftrook Lake, 2009 and 2010.

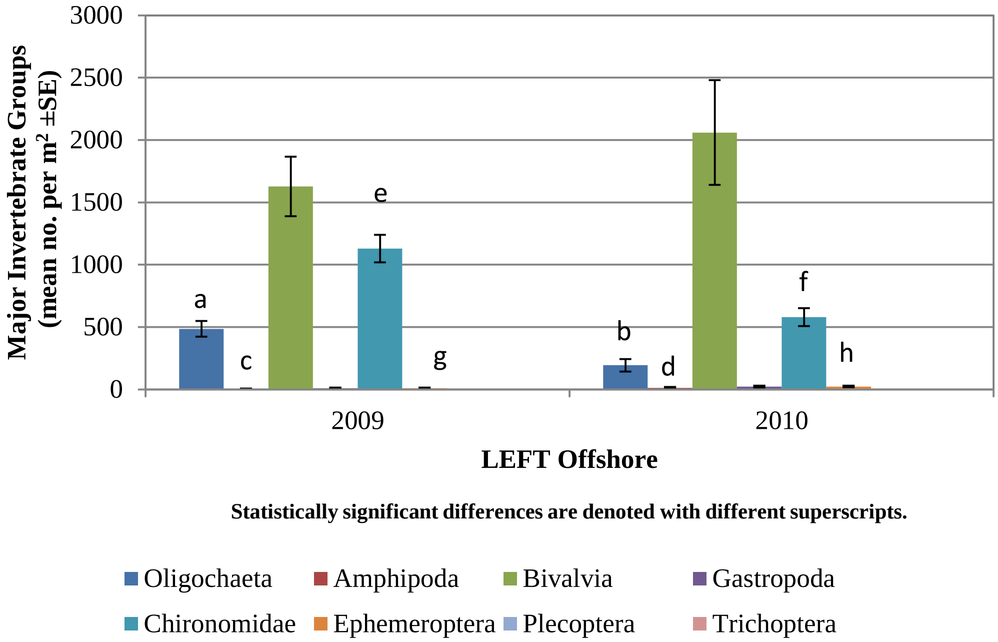


Figure 5.5.6-31 Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the offshore habitat of Leftrook Lake, 2009 and 2010.

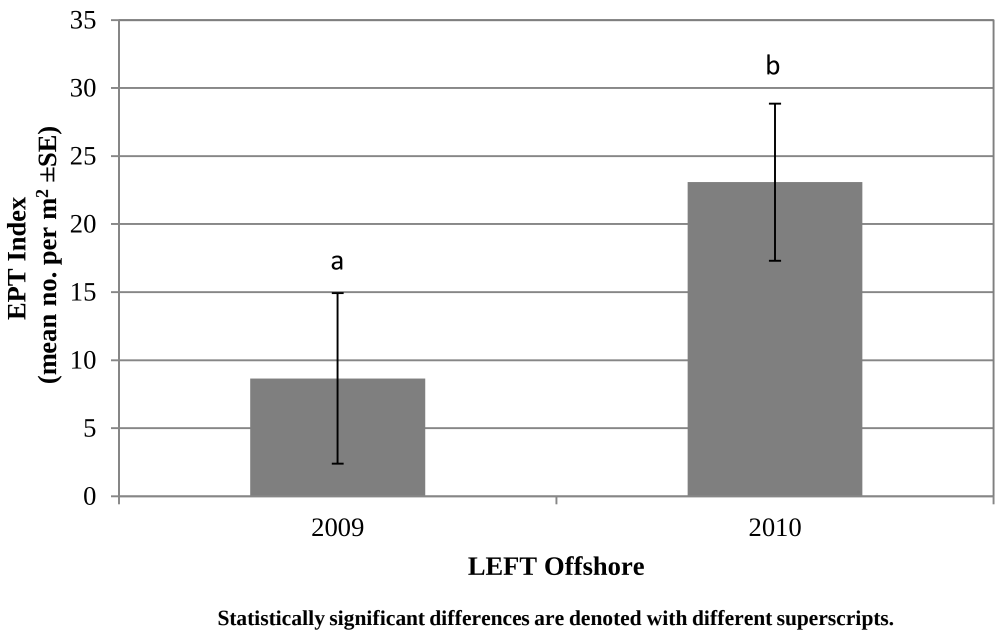


Figure 5.5.6-32 Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of offshore grab samples from Leftrook Lake, 2009 and 2010.

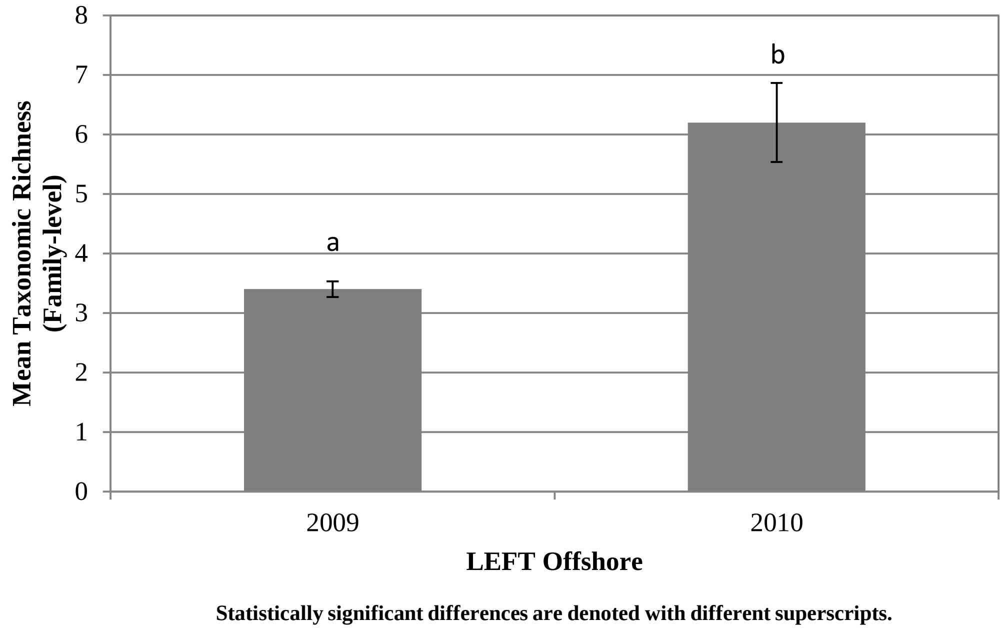


Figure 5.5.6-33 Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of offshore grab samples from Leftrook Lake, 2009 and 2010.

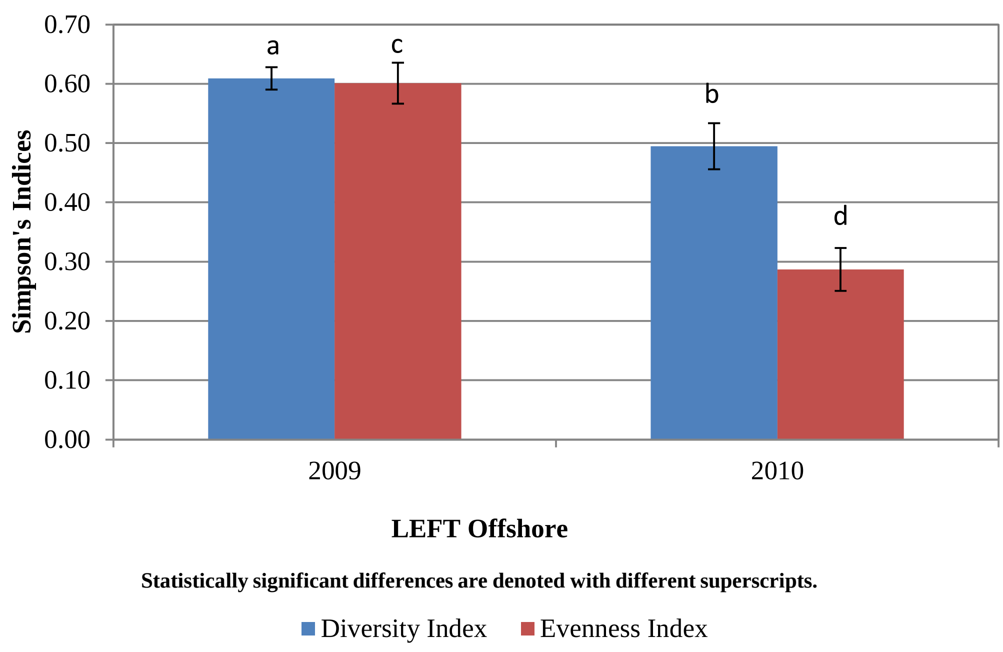


Figure 5.5.6-34 Temporal comparison of diversity and evenness (Simpson's) indices of offshore grab samples from Leftrook Lake, 2009 and 2010.

5.5.7 Fish Communities

5.5.7.1 Overview

The following provides an overview of the fish communities present in six waterbodies within the Churchill River Diversion Region as part of CAMPP conducted in 2009 and 2010. Waterbodies sampled annually included one on-system waterbody (Threepoint Lake) and one off-system waterbody (Leftrook Lake). The fish communities of four on-system waterbodies were sampled only once in this period, as part of the planned three year rotational program. Notigi Lake and Apussigamasi Lake were sampled in 2009 while Rat Lake and Footprint Lake were sampled in 2010.

Gill netting, utilizing both standard gang and small mesh gill nets, was conducted at pre-established sites in each waterbody and these were generally consistently sampled in each of the years of study. Individual fish from each site were separated by species, measured and weighed with the exception that in some cases (particularly with respect to small-bodied fish species), bulk weights were taken.

Overall, the fish assemblage as captured by standard gang index gill nets in the four most upstream on-system lakes in the region was similar and dominated by White Sucker (*Catostomus commersoni*), Northern Pike (*Esox lucius*) and Walleye (*Sander vitreus*) with Sauger (*Sander canadensis*) and Cisco (*Coregonus artedi*) also common. In Apussigamasi Lake the fish assemblage was more diverse and dominated by Walleye, Sauger, White Sucker and Lake Whitefish (*Coregonus clupeaformis*). In Leftrook Lake (off-system), the fish assemblage was less diverse than other waterbodies in the region and was dominated by White Sucker, Walleye, Lake Whitefish and Northern Pike.

On-system waterbodies were found to be generally similar with respect to species composition, total CPUE/BPUE and size and condition with some notable exceptions which may usually be attributable to small sample size, individual site attributes and/or the capture of large-bodied fish in small mesh index gill nets. There was a notable lack of Lake Whitefish from most of the on-system waterbodies with very few individuals captured; the exceptions were Apussigamasi Lake and the off-system Leftrook Lake. The fish community of Leftrook Lake was found to have a similar species assemblage to the on-system lakes with the exception that Sauger was not present in the catch. In Leftrook Lake, CPUE values for White Sucker, Lake Whitefish and Walleye were higher than those for the on-system waterbodies.

Year-class strength for Northern Pike and Lake Whitefish was not consistent across all waterbodies in the region although there was some overlap. For Walleye, most waterbodies including the off-system lake had strong year-classes in 2001 and, to a lesser extent, 2002. Three of the on-system lakes (Notigi Lake, Threepoint Lake, and Footprint Lake) appeared to have poor year-classes for Walleye from 1997 to 2000. Apussigamasi Lake showed a similar result (to a lesser extent), however Leftrook Lake did not.

The incidence rate for deformities, erosion, lesions and tumours in species of management interest generally was similar for all waterbodies in the region (i.e., 1.3 – 1.5%) with the exception of Apussigamasi Lake which had an incidence rate of 3.3%.

Temporal CPUE comparisons were undertaken for the two waterbodies sampled in both 2009 and 2010 (i.e., Threepoint Lake and Leftrook Lake). In both waterbodies, CPUE was higher in 2009 than in 2010 for the standard gang index gillnet catch and, in the case of Threepoint Lake, the value was almost double. CPUE for the small mesh index gill nets was also higher in 2009 than in 2010 for Threepoint Lake but Leftrook Lake showed the opposite, i.e., CPUE was higher in 2010 than in 2009. As additional data are acquired, more formal trend analysis will be undertaken to evaluate potential long-term changes.

With respect to the Index of Biological Integrity, computed scores were similar for all waterbodies in the region, with Notigi Lake having the lowest score and Apussigamasi Lake the highest.

5.5.7.2 Gill netting

In the Churchill River Diversion Region, Rat Lake was sampled with standard gang index gill nets at nine sites in mid-July of 2010 (Table 5.5.7-1, Figure 5.5.7-1) while Notigi Lake was sampled at 10 sites in mid-August of 2009 (Table 5.5.7-1, Figure 5.5.7-2). In Threepoint Lake, standard gang index gill nets were set in mid- to late August of both 2009 and 2010 at nine sites (Table 5.5.7-1, Figure 5.5.7-3). Footprint Lake was sampled with standard gang index gill nets at nine sites in mid-August, 2010 and Apussigamasi Lake was sampled at nine sties in late August/early September, 2009 (Table 5.5.7-1, Figures 5.5.7-4 and 5.5.7-5). Leftrook Lake was sampled at nine sites in late July of both 2009 and 2010 (Table 5.5.7-1, Figure 5.5.7-6).

Small mesh index gill nets were attached to the smallest mesh end of the standard gang index gill nets at three of 10 sites in Notigi Lake and at three of 9 sites in each of Rat Lake, Threepoint Lake, Footprint Lake, Apussigamasi Lake and Leftrook Lake (Table 5.5.7-1, Figures 5.5.7-1, 5.5.7-2, 5.5.7-3, 5.5.7-4, 5.5.7-5 and 5.5.7-6). In Threepoint Lake, all three small mesh sampling sites differed from 2009 to 2010, however all sites in Leftrook Lake were consistent from 2009 to 2010.

5.5.7.3 Species Composition

A comprehensive list of all fish species captured, including common and scientific names, family, and identification code, for all Churchill River Diversion Region waterbodies is provided in Table 5.5.7-2.

Rat Lake

In 2010, a total of 195 fish (128,053 g) representing nine species were captured in standard gang index gill nets set in Rat Lake (Tables 5.5.7-3 and 5.5.7-4). The most common species captured in standard gang index gill nets was Cisco (relative abundance = 29.2%) and the next three most common species were White Sucker (23.6%), Sauger (14.4%), and Walleye (11.3%) (Table 5.5.7-3; Figure 5.5.7-7). White Sucker accounted for the highest value (proportion of total biomass = 39.5%), followed by Cisco (25.5%) (Table 5.5.7-4).

For the small mesh index gill nets, a total of 59 fish representing eight species were captured (Table 5.5.7-5). The biomass for 58 of these was 4,221 g (Table 5.5.7-6). Emerald Shiner (*Notropis atherinoides*) was the most common species at 57.6% (Table 5.5.7-5, Figure 5.5.7-7). Cisco (10.2%) and Walleye (10.2%) were also relatively common. Emerald Shiner accounted for the highest proportion of total small-bodied fish species biomass (3.0%), followed by Yellow Perch (*Perca flavescens*) (0.5%) (Table 5.5.7-6).

Notigi Lake

In 2009, a total of 344 fish (253,804 g) representing nine species were captured in standard gang index gill nets set in Notigi Lake (Tables 5.5.7-3 and 5.5.7-4). The most common species captured in standard gang index gill nets was White Sucker (50.6%) followed by Northern Pike (16.3%) and Walleye (12.8%) (Table 5.5.7-3; Figure 5.5.7-8). Among individual species, White Sucker accounted for the majority of the total biomass (63.1%), followed by Walleye (10.7%) and Northern Pike (10.2%) (Table 5.5.7-5).

For the small mesh index gill nets, a total of 111 fish (11,550 g) representing eight species were captured (Tables 5.5.7-4 and 5.5.7-6). Yellow Perch was the most common small-bodied fish species at 28.8% followed by Spottail Shiner (*Notropis hudsonius*) (20.7%) (Table 5.5.7-5; Figure 5.5.7-8). For small-bodied fish species from the small mesh index gillnet catch, Yellow Perch accounted for the highest proportion of total biomass (4.1%) followed by Spottail Shiner (1.0%) (Table 5.5.7-6).

Threepoint Lake

A total of 674 fish (463,985 g) representing 10 species were captured in standard gang index gill nets set in Threepoint Lake in 2009 and 2010 (Tables 5.5.7-3 and 5.5.7-4). The same species were captured in both years. The most common species captured in standard gang index gill nets in 2009 and 2010 combined was White Sucker (32.8%) followed by Walleye (29.1%) (Table 5.5.7-3; Figure 5.5.7-9). For 2009 and 2010 combined, the two most common fish species captured in standard gang index gill nets also had the highest proportion of total biomass values, i.e., White Sucker (50.6%), followed by Walleye (21.5%) (Table 5.5.7-4).

For the small mesh index gill nets, a total of 475 fish (8,723 g) representing seven species were captured (Table 5.5.7-5 and 5.5.7-6). In the small mesh index gillnet catch, Spottail Shiner was the most common species captured in 2009 and 2010 combined (49.1%) followed by Emerald Shiner (28.2%) (Table 5.5.7-5; Figure 5.5.7-9). For small-bodied fish species from the small mesh index gillnet catch, Spottail Shiner accounted for the highest proportion of total biomass (13.2%), followed by Emerald Shiner (5.1%) (Table 5.5.7-6).

Footprint Lake

In 2010, a total of 480 fish (295,481 g) representing nine species were captured in standard gang index gill nets set in Footprint Lake (Tables 5.5.7-3 and 5.5.7-4). The most common species captured in standard gang index gill nets was Walleye (37.9%) followed by White Sucker (32.3%) (Table 5.5.7-3; Figure 5.5.7-10). White Sucker accounted for the highest proportion of total biomass (51.3%), followed by Walleye (28.4%) (Table 5.5.7-4).

For the small mesh index gill nets, a total of 72 fish (7,647 g) representing eight species were captured (Tables 5.5.7-5 and 5.5.7-6). Walleye was the most common species at 38.9%, followed by Spottail Shiner (27.8%) (Table 5.5.7-4; Figure 5.5.7-10). For small-bodied fish species from the small mesh index gillnet catch, Spottail Shiner accounted for the highest proportion of total biomass (1.6%) (Table 5.5.7-6).

Apussigamasi Lake

In 2009, a total of 465 fish (375,593 g) representing 12 species were captured in standard gang index gill nets set in Apussigamasi Lake (Tables 5.5.7-3 and 5.5.7-4). The most common species captured in standard gang index gill nets was Walleye (35.5%) followed by Sauger (17.2%) and White Sucker (16.6%) (Table 5.5.7-3; Figure 5.5.7-11). Walleye accounted for the highest proportion of total biomass (26.1%), followed by White Sucker (21.1%), Lake Whitefish (18.3%) and Northern Pike (18.1%) (Table 5.5.7-4).

For the small mesh index gill nets, a total of 136 fish (18,786 g) representing nine species were captured (Tables 5.5.7-5 and 5.5.7-6). Sauger was the most common species at 39.7%, followed by Spottail Shiner (20.6%), Walleye (13.2%) and Troutperch (*Percopsis omiscomaycus*) (12.5%) (Table 5.5.7-4; Figure 5.5.7-11). For small-bodied fish species from the small mesh index gillnet catch, Spottail Shiner (0.7%) and Troutperch (0.7%) accounted for the highest proportion of total biomass (Table 5.5.7-6).

Leftrook Lake

A total of 1,527 fish representing seven species were captured in standard gang index gill nets set in Leftrook Lake in 2009 and 2010 (Table 5.5.7-3). The biomass of 1,525 of these fish was 1,155,075 g) (Table 5.5.7-4). The most common species captured in standard gang index gill nets in 2009 and 2010 combined was White Sucker (35.8%) followed by Walleye (26.7%) (Table 5.5.7-3; Figure 5.5.7-12). White Sucker accounted for the majority of the total biomass (43.7%), followed by Lake Whitefish (23.0%) and Walleye (17.8%) (Table 5.5.7-4).

For the small mesh index gill nets, a total of 735 fish (77,635 g) representing 10 species were captured (Tables 5.5.7-4 and 5.5.7-6). In the small mesh index gillnet catch, Spottail Shiner was the most common species captured in in 2009 and 2010 combined (28.0%) followed by Walleye (26.7%) and Emerald Shiner (22.6%) (Table 5.5.7-4; Figure 5.5.7-12). For small-bodied fish from the small mesh index gillnet catch, Spottail Shiner accounted for the highest proportion of total biomass (1.3%) (Table 5.5.7-6).

5.5.7.4 Catch Per Unit of Effort (CPUE)/Biomass Per Unit of Effort (BPUE)

Rat Lake

The total CPUE (all species) for the 2010 standard gang index gillnet catch in Rat Lake was 22.9 fish/100 m of net/24 h with a corresponding BPUE value of 14,628 g/100 m of net/24 h (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE values were recorded for Cisco (7.8) and White Sucker (4.7) (Table 5.5.7-7, Figure 5.5.7-15). Corresponding BPUE values for the same species were also the highest of all species captured but followed a different order; i.e., White Sucker (5,131) followed by Cisco (4,381) (Table 5.5.7-8, Figure 5.5.7-16).

For the small mesh index gill nets the total CPUE (n=59) and BPUE (n=58) values for all species were 27.7 fish/30 m of net/24 h and 2,111 g/30 m of net/24 h, respectively (Tables 5.5.7-9 and 5.5.7-10, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE values were recorded for Emerald Shiner (16.3) followed by Walleye (3.1) (Table 5.5.7-9, Figure 5.5.7-15).

With respect to small-bodied fish only, BPUE values were highest for Emerald Shiner (60) followed by Yellow Perch (10) (Table 5.5.7-10, Figure 5.5.7-16).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets in 2010 are provided in Figures 5.5.7-17 and 5.5.7-18, respectively. Northern Pike was captured at all sampling sites in Rat Lake except Site GN-01 while Lake Whitefish were only captured at three out of the nine sites. Walleye was captured at all sites except two. The CPUE and BPUE values for Northern Pike, Lake Whitefish and Walleye were fairly consistent among sites, although the CPUE and BPUE values for all fish combined were somewhat variable between sites.

Notigi Lake

The total CPUE (all species) for the 2009 standard gang index gillnet catch in Notigi Lake was 32.7 fish with a corresponding BPUE value of 24,296 g (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-13 and 5.5.7-14). The highest CPUE and BPUE values for the 2009 standard gang index gillnet catch in Notigi Lake were recorded for White Sucker (16.7 fish, 15,431 g), Walleye (4.3 fish, 2,650 g) and Northern Pike (5.3 fish, 2,443 g) (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-15, and 5.5.7-16).

For the small mesh index gill nets the total CPUE and BPUE values for all species were 37.6 fish and 3,909 g respectively (Tables 5.5.7-9 and 5.5.7-10, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE values were recorded for Yellow Perch (10.8) followed by Walleye (9.5) and Spottail Shiner (7.8) (Tables 8.7.3-9 and 8.7.3-10, Figure 5.5.7-15). With respect to small-bodied fish only, the BPUE value was highest for Yellow Perch (159), followed by Spottail Shiner (39) (Table 5.5.7-10, Figure 5.5.7-16).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets in 2010 are provided in Figures 5.5.7-19 and 5.5.7-20, respectively. Northern pike were captured at seven of ten sites; Lake Whitefish were captured at only one site while Walleye were captured at around half of the sites. The CPUE and BPUE for Northern Pike and Walleye were similar among sites while the CPUE and BPUE values for all fish combined varied considerably.

Threepoint Lake

The total overall CPUE (all species) for the 2009 and 2010 combined standard gang index gillnet catch in Threepoint Lake was 27.6 fish with a corresponding BPUE value of 19,182 g (Tables 5.5.7-7 and 5.5.7-8). The CPUE (BPUE) values were 36.0 fish (24,610 g) in 2009 while in 2010 these values were 19.2 fish (13,753 g) (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-13 and 5.5.7-

14). The highest individual species' overall CPUE/BPUE values for the standard gang index gillnet catch in Threepoint Lake were recorded for White Sucker (9.8 fish, 10,405 g) followed by Walleye (7.1 fish, 3,688 g) (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-15 and 5.5.7-16).

For the small mesh index gill nets the total CPUE and BPUE values for all species were 57.8 fish and 1,373 g respectively (Tables 5.5.7-9 and 5.5.7-10). The lower total CPUE (BPUE) values (all fish) were recorded in 2010 at 43.4 (1,143) while the 2009 values were 72.3 (1,602 g) (Tables 5.5.7-9 and 5.5.7-10, Figures 5.5.7-13 and 5.5.7-14). The highest overall CPUE values were recorded for Spottail Shiner (24.1), followed by Emerald Shiner (15.1) (Table 5.5.7-9, Figure 5.5.7-15). With respect to small-bodied fish only, BPUE values were also highest for Spottail Shiner (129) followed by Emerald Shiner (46) (Table 5.5.7-10, Figure 5.5.7-16).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets in 2009 and 2010 are provided in Figures 8.7.3-21 and 8.7.3-22 respectively. Northern Pike and Walleye were captured at nearly all sampling sites in Threepoint Lake. Lake Whitefish were captured at approximately half of the sites. The CPUE and BPUE values for Northern Pike, Walleye and Lake Whitefish were fairly consistent among sites; one site for Walleye (GN-13) showed variability between sampling years. CPUE and BPUE values for all fish combined were somewhat similar between sites, however, these values were found to vary considerably between sampling years for some sites.

Footprint Lake

The total CPUE (all species) for the 2010 standard gang index gillnet catch in Footprint Lake was 42.1 fish with a corresponding BPUE value of 26,529 g (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-13 and 5.5.7-14). The highest CPUE values for the 2010 standard gang index gillnet catch in Footprint Lake were recorded for Walleye (15.0) and White Sucker (14.6) (Table 5.5.7-7, Figure 5.5.7-15). Corresponding BPUE values for the same species were also the highest of all species captured but followed a different order; i.e., White Sucker (14,230), Walleye (6,992) (Table 5.5.7-8, Figure 5.5.7-16).

For the small mesh index gill nets the total CPUE and BPUE values for all species were 24.8 fish and 2,626 g respectively (Tables 5.5.7-9 and 5.5.7-10, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE values were recorded for Walleye (9.6) followed by Spottail Shiner (6.9) (Table 5.5.7-9, Figure 5.5.7-15). With respect to small-bodied fish only, BPUE values were highest for Spottail Shiner (41) followed by Emerald Shiner (6) and Troutperch (4) (Table 5.5.7-10, Figure 5.5.7-16).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets in 2010 are provided in Figures 5.5.7-23 and 5.5.7-24, respectively. Northern Pike and Walleye were captured at most sites while Lake Whitefish were captured at only two sites. The CPUE and BPUE values for both Northern Pike and Walleye were similar among sites while the CPUE and BPUE values for all fish combined varied among sites.

Apussigamasi Lake

The total CPUE (all species) for the 2010 standard gang index gillnet catch in Apussigamasi Lake was 44.5 fish with a corresponding BPUE value of 36,127 g (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-13 and 5.5.7-14). The highest CPUE values for the 2009 standard gang index gillnet catch in Apussigamasi Lake were recorded for Walleye (15.6), Sauger (7.6) and White Sucker (7.5) (Table 5.5.7-7, Figure 5.5.7-15). The highest BPUE values were recorded for Walleye (9,282), White Sucker (7,709), Lake Whitefish (6,623) and Northern Pike (6,547) (Table 5.5.7-8, Figure 5.5.7-16).

For the small mesh index gill nets the total CPUE and BPUE values for all species were 42.6 fish and 5,884 g, respectively (Tables 5.5.7-9 and 5.5.7-10, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE values were recorded for Sauger (16.9) followed by Spottail Shiner (8.8) (Table 5.5.7-9, Figure 5.5.7-15). With respect to small-bodied fish only, BPUE values were highest for Troutperch (39) and Spottail Shiner (38) (Table 5.5.7-10, Figure 5.5.7-16).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets in 2010 are provided in Figures 5.5.7-25 and 5.5.7-26, respectively. Northern Pike were captured at all but one sampling site, Lake Whitefish were captured at all but two sites and Walleye were captured at all sites. The CPUE and BPUE values for Northern Pike were low for all sites, low for most sites for Lake Whitefish and low for most sites for Walleye. The CPUE and BPUE values for all fish combined varied among sites.

Leftrook Lake

The total overall CPUE (all species) for the 2009 and 2010 standard gang index gillnet catch in Leftrook Lake was 80.8 fish (n = 1,527) with a corresponding BPUE value of 60,181 g (n = 1,525) (Tables 5.5.7-7 and 5.5.7-8). Overall CPUE and BPUE values were one-third lower in 2010 (67.1 fish, 47,352 g) than in 2009 (94.6 fish, 73,010 g) (Tables 5.5.7-7 and 5.5.7-8, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE value for the standard gang index gillnet catch (overall) in Leftrook Lake was recorded for White Sucker (29.3) followed by

Walleye (21.4) (Table 5.5.7-7, Figure 5.5.7-15). The highest BPUE values were recorded for White Sucker (27,035), Lake Whitefish (12,953) and Walleye (10,638) (Table 5.5.7-8, Figure 5.5.7-16).

For the small mesh index gill nets, the total CPUE and BPUE values for all species were 142.1 fish and 13,733 g respectively (Tables 5.5.7-9 and 5.5.7-10). The lower total CPUE value (all fish) was recorded in 2009 at 114.3 fish while the 2010 value was 169.9 fish. BPUE values for the small mesh index gillnet catch differed from that of the CPUE values, with the 2009 value (19,757) being much higher than that for 2010 (7,709) (Tables 5.5.7-9 and 5.5.7-10, Figures 5.5.7-13 and 5.5.7-14). The highest individual species' CPUE values (overall) were recorded for Emerald Shiner (41.1), followed by Walleye (35.9), Spottail Shiner (35.2) and Troutperch (20.0) (Table 5.5.7-9, Figure 5.5.7-15). With respect to small-bodied fish only, BPUE values were also highest for Spottail Shiner (165) followed by Emerald Shiner (140) and Troutperch (108) (Table 5.5.7-10, Figure 5.5.7-16).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets in 2009 and 2010 are provided in Figures 5.5.7-27 and 5.5.7-28, respectively. Northern Pike, Lake Whitefish and Walleye were captured at nine of 13 sites. The CPUE and BPUE values for Northern Pike were low and consistent both between sites and years. Lake Whitefish and Walleye had similar CPUE and BPUE values between sites with some variability between years. The CPUE and BPUE values for all species combined varied both between sites and years sampled.

5.5.7.5 Size and Condition

<u>Rat Lake</u>

Fish length, weight and condition factor data were collected and analyzed from Northern Pike, Lake Whitefish and Walleye collected from standard gang index gill nets in Rat Lake in 2010 (Tables 5.5.7-11, 5.5.7-12 and 5.5.7-13). Mean (±SD) fork lengths were as follows: Northern Pike = 426 (±127) mm; Lake Whitefish = 339 (±176) mm; Walleye = 341 (±86) mm.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.5.7-29, 5.5.7-30 and 5.5.7-31, respectively. Similarly length frequency distributions for these species are provided in Figures 5.5.7-32, 5.5.7-33, and 5.5.7-34, respectively.

Mean (±SD, where calculated) weights for Northern Pike, Lake Whitefish and Walleye were 582 g, 1,224 (±1,772) g and 445 g, respectively. Mean (±SD) condition factor for these three species were as follows: Northern Pike = 0.6 (±0.05); Lake Whitefish = 1.7 (±0.64); Walleye = 1.0 (±0.09).

Notigi Lake

Fish length, weight and condition factor data were collected and analyzed from Northern Pike, Lake Whitefish and Walleye collected from standard gang index gill nets in Notigi Lake in 2009 (Tables 5.5.7-11, 5.5.7-12 and 5.5.7-13). Mean (±SD) fork lengths were as follows: Northern Pike = 399 (±85) mm; Lake Whitefish = 478 (±25) mm; Walleye = 377 (±68) mm.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.5.7-29, 5.5.7-30 and 5.5.7-31, respectively. Similarly, length frequency distributions for these species are provided in Figures 5.5.7-32, 5.5.7-33, and 5.5.7-34, respectively.

Mean (±SD, where calculated) weights for Northern Pike, Lake Whitefish and Walleye were 446 g, 2,250 (±459) g and 503 g respectively. Mean (±SD) condition factors for these three species were as follows: Northern Pike = 0.6 (±0.09); Lake Whitefish = 2.0 (±0.18); Walleye = 1.1 (±0.12).

Threepoint Lake

Fork length, weight and condition factor data were collected and analyzed from Northern Pike, Lake Whitefish and Walleye collected from standard gang and small mesh index gill nets in Threepoint Lake during 2009 and 2010 (Tables 5.5.7-11, 5.5.7-12 and 5.5.7-13). Mean (±SD) fork lengths for Northern Pike were higher in 2010 (484 [±124] mm) compared to 2009 (412 [±99] mm). The 2009 mean (±SD) fork lengths for Lake Whitefish were somewhat lower than the 2010 values at 359 (±99) mm and 389 (±76) mm, respectively. The values for Walleye were very similar in 2009 and 2010 at 349 (±69) mm and 351 (±58) mm respectively.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.5.7-29, 5.5.7-30 and 5.5.7-31, respectively. Similarly length frequency distributions for these species are provided in Figures 5.5.7-32, 5.5.7-33, and 5.5.7-34, respectively.

Mean (±SD, where calculated) weights for Northern Pike from Threepoint Lake were much higher in 2010 (1,015 [±740] g) than in 2009 (565 g). Values for Lake Whitefish were similar for both 2009 (894 [±571] g) and 2010 (890 [±564] g) while the values for Walleye were higher in 2009 (508 g) than in 2010 (430 g).

Mean (±SD) condition factors for 2009 and 2010 were 0.7 (0.10) and 0.7 (0.13) respectively for Northern Pike; 1.6 (±0.11) and 1.4 (±0.13) respectively for Lake Whitefish; and 1.1 (±0.15) and 1.0 (±0.08) respectively for Walleye.

Footprint Lake

Fish length, weight and condition factor data were collected and analyzed from Northern Pike, Lake Whitefish and Walleye collected from standard gang index gill nets in Footprint Lake in 2010 (Tables 5.5.7-11, 5.5.7-12 and 5.5.7-13). Mean (±SD) fork lengths were as follows: Northern Pike = 435 (±110) mm; Walleye = 346 (±52) mm. No measurements of fork length were taken from two Lake Whitefish captured in the standard gang index gill nets.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.5.7-29, 5.5.7-30 and 5.5.7-31, respectively. Similarly length frequency distributions for these species are provided in Figures 5.5.7-32, 5.5.7-33, and 5.5.7-34 respectively.

Mean (±SD, where calculated) weights for Northern Pike, Lake Whitefish and Walleye were 657 (±617) g, 1,108 (±679) g and 427 g respectively. Mean (±SD) condition factor for Northern Pike and Walleye were 0.67(±0.07) and 1.1(±0.09) respectively. No condition factor was calculated for Lake Whitefish.

Apussigamasi Lake

Fish length, weight and condition factor data were collected and analyzed from Northern Pike, Lake Whitefish and Walleye collected from standard gang index gill nets in Apussigamasi Lake in 2010 (Tables 5.5.7-11, 5.5.7-12 and 5.5.7-13). Mean (±SD) fork lengths were as follows: Northern Pike = 684 (±191) mm; Lake Whitefish = 447 (±59) mm; Walleye = 364 (±63) mm.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.5.7-29, 5.5.7-30 and 5.5.7-31, respectively. Similarly length frequency distributions for these species are provided in Figures 5.5.7-32, 5.5.7-33, and 5.5.7-34, respectively.

Mean (±SD, where calculated) weights for Northern Pike, Lake Whitefish and Walleye were 2,819 (±2,078) g, 1,674 (±657) g and 573 g respectively. Mean (±SD) condition factors for these three species were as follows: Northern Pike = 0.8 (±0.09); Lake Whitefish = 1.8 (±0.18); Walleye = 1.1 (±0.10).

Leftrook Lake

Fork length, weight and condition factor data were collected and analyzed from Northern Pike, Lake Whitefish and Walleye collected from standard gang and small mesh index gill nets in Leftrook Lake during 2009 and 2010 (Tables 5.5.7-11, 5.5.7-12 and 5.5.7-13). The 2009 and 2010 mean fork lengths were similar for all three species. Mean (±SD) fork length for Northern Pike was 476 (±49) mm in 2009 compared to 467 (±47) mm in 2010; while for Lake Whitefish the values were 440 (±50) mm and 421 (±55) mm. Mean (±SD) fork lengths for Walleye from 2009 and 2010 were 359 (±43) mm and 367 (±37) mm, respectively.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.5.7-29, 5.5.7-30 and 5.5.7-31, respectively. Similarly length frequency distributions for these species are provided in Figures 5.5.7-32, 5.5.7-33, and 5.5.7-34, respectively.

Mean (±SD, where calculated) weights for both Northern Pike and Lake Whitefish from Leftrook Lake were higher in 2009 than in 2010. For Northern Pike these values were 701 (±231) g and 637 g in 2009 and 2010, respectively; while for Lake Whitefish they were 1,409 (±420) g and 1,113 (±394) g respectively for the same years. For Walleye, mean weights were similar in 2009 (426 g) and 2010 (421 g).

Condition factors for each of the three species were similar in 2009 and 2010. Mean (±SD) condition factors for 2009 and 2010 were 0.6 (±0.07) and 0.6 (±0.07) respectively for Northern Pike; 1.6 (±0.14) and 1.4 (±0.16) respectively for Lake Whitefish; and 1.0 (±0.08) and 1.0 (±0.07), respectively, for Walleye.

5.5.7.6 Age Composition

Rat Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Rat Lake during 2010. Age frequency distributions are presented by year-class cohort (Tables 5.5.7-14, 5.5.7-15 and 5.5.7-16) and by age (Tables 5.5.7-17, 5.5.7-18 and 5.5.7-19; Figures 5.5.7-35, 5.5.7-36 and 5.5.7-37). Year-classes ranged from 2000 to 2008 for Northern Pike and from 1997 to 2007 for Walleye. One individual Lake Whitefish was aged from the 2007 year-class.

The data suggest that relatively strong Northern Pike year-classes were produced in 2005 and 2007. Further, 90% of the captured Northern Pike were aged 6 or younger, with only two fish older than 7 years of age (2003 year-class) being caught. On the basis of only 16 aged walleye specimens spread over nine year-classes, there were no apparent year year-class strengths and no fish from the 2003 or 2004 year-classes were captured. Data for Lake Whitefish were not adequate to make inferences on year-class strength.

Length, weight and condition factor by age and year-class data for 2010 for Northern Pike, Lake Whitefish and Walleye are provided in Tables 5.5.7-20, 5.5.7-21 and 5.5.7-22 respectively. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.5.7-38, 5.5.7-39 and 5.5.7-40.

Notigi Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Notigi Lake during 2009. Age frequency distributions are presented by year-class cohort (Tables 5.5.7-14, 5.5.7-15 and 5.5.7-16) and age (Tables 5.5.7-17, 5.5.7-18 and 5.5.7-19; Figures 5.5.7-35, 5.5.7-36 and 5.5.7-37). Year-classes represented ranged from 2000 to 2007 for Northern Pike, from 1994 to 1996 for Lake Whitefish and from 1995 to 2005 for Walleye.

The data suggest that relatively strong Northern Pike year-classes were produced in 2005 and 2006. Walleye year-class strength peaked in 2001, and was relatively evenly distributed around 2001 from 1999 to 2004. Data for Lake Whitefish were not adequate to make inferences on year-class strength.

Length, weight and condition factor by age and year-class data for 2010 for Northern Pike, Lake Whitefish and Walleye are provided in Tables 5.5.7-20, 5.5.7-21 and 5.5.7-22, respectively. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.5.7-38, 5.5.7-39 and 5.5.7-40.

Threepoint Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Threepoint Lake during 2009 and 2010. Age frequency distributions are presented by year-class cohort (Tables 5.5.7-14, 5.5.7-15 and 5.5.7-16) and age (Tables 5.5.7-17, 5.5.7-18 and 5.5.7-19; Figures 5.5.7-35, 5.5.7-36 and 5.5.7-37). Year-classes represented ranged from 1996 to 2007 for Northern Pike, from 1979 to 2006 for Lake Whitefish and from 1989 to 2008 for Walleye.

In 2009, the modal age for Northern Pike was 4 years (2004 year-class) and the mean age was 5 years, and in 2010 these values were 5/6 years (2004/2005 year-classes) and 5 years.

The data for Walleye suggests strong cohorts in each of 1996, 2001 and 2002. For the 2009 data, the modal age for Walleye was 8 years (2001 year-class) and mean age 10 years; while for the 2010 data the modal age was 8 years (2002 year-class) and mean age 10 years. The 1999 year-class was somewhat under-represented in both the 2009 and 2010 data, as were the 1997, 1998 and 2000 year-classes in the 2010 data. Data for Lake Whitefish were not adequate to make inferences on year-class strength.

Length, weight and condition factor by age and year-class data for 2010 for Northern Pike, Lake Whitefish and Walleye are provided in Tables 5.5.7-20, 5.5.7-21 and 5.5.7-22, respectively. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.5.7-38, 5.5.7-39 and 5.5.7-40.

Footprint Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Footprint Lake during 2010. Age frequency distributions are presented by year-class cohort (Tables 5.5.7-14, 5.5.7-15 and 5.5.7-16) and by age (Tables 5.5.7-17, 5.5.7-18 and 5.5.7-19; Figures 5.5.7-35, 5.5.7-36 and 5.5.7-37). Year-classes represented ranged from 2000 to 2007 for Northern Pike, from 2003 to 2004 for Lake Whitefish and from 1992 to 2007 for Walleye.

The data suggest that relatively strong Northern Pike year-classes were produced in 2006 and 2007, and slowly declined until a maximum age of 10 years (2000 year-class) was reached. No Northern Pike younger than 3 years-of-age or older than 10 years-of-age were caught in Footprint Lake.

The strongest year-classes for Walleye were 2000 and 2001. The Walleye 1998 year-class, however was underrepresented in the data, as were the 1999 and 1997 year-classes to some extent. Data for Lake Whitefish were not adequate to make inferences on year-class strength.

Length, weight and condition factor by age and year-class data for 2010 for Northern Pike, Lake Whitefish and Walleye are provided in Tables 5.5.7-20, 5.5.7-21 and 5.5.7-22, respectively. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.5.7-38, 5.5.7-39 and 5.5.7-40.

Apussigamasi Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Apussigamasi Lake during 2009. Age frequency distributions are presented by year-class cohort (Tables 5.5.7-14, 5.5.7-15 and 5.5.7-16) and by age (Tables 5.5.7-17, 5.5.7-18 and 5.5.7-19; Figures 5.5.7-35, 5.5.7-36 and 5.5.7-37). Year-classes represented ranged from 1995 to 2007 for Northern Pike, from 1976 to 2005 for Lake Whitefish and from 1988 to 2006 for Walleye.

Data for Northern Pike and Lake Whitefish were not adequate to make inferences on year-class strength in Apussigamasi Lake. Data for Walleye suggest the modal year-class was 2001 (8 years-of-age) and mean age was 11 years (1998 year-class).

Length, weight and condition factor by age and year-class data for 2010 for Northern Pike, Lake Whitefish and Walleye are provided in Tables 5.5.7-20, 5.5.7-21 and 5.5.7-22 respectively. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.5.7-38, 5.5.7-39 and 5.5.7-40.

Leftrook Lake

Age frequency distributions were calculated for Northern Pike and Walleye captured in standard gang index gill nets in Leftrook Lake during 2009 and 2010. Age frequency distributions are presented by year-class cohort (Tables 5.5.7-14, 5.5.7-15 and 5.5.7-16) and by age (Tables 5.5.7-17, 5.5.7-18 and 5.5.7-19; Figures 5.5.7-35, 5.5.7-36 and 5.5.7-37). Year-classes represented ranged from 1997 to 2007 for Northern Pike, from 1982 to 2007 for Lake Whitefish and from 1981 to 2006 for Walleye.

These data suggest that the modal Northern Pike cohort was 2004 (age 5) in 2009 and 2005 (age 5) in 2010. The 2009 data for Lake Whitefish was bi-modal in that the 1999 (age 10) and 1994 (age 15) year-classes made-up 22.6% (11.3% and 11.3%) of the catch and represented the two strongest year-classes. Few fish belonged to year-classes in-between these two modes; no fish belonged to the 1998 year-class and the 1995-1997 year-classes only made up 6.96% of all aged Lake Whitefish.

2009 ageing data for Walleye suggested a strong 2001 cohort, while for the 2010 data, the modal year-class was 1998. Both years data demonstrated similar distributions in that they peaked (at age 8 for the 2009 data and age 11 for the 2010 data) and then slowly declined, however, the number of Walleye aged in 2009 was three times larger than that of 2010.

Length, weight and condition factor by age and year-class data for 2010 for Northern Pike, Lake Whitefish and Walleye are provided in Tables 5.5.7-20, 5.5.7-21 and 5.5.7-22 respectively. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.5.7-38, 5.5.7-39 and 5.5.7-40.

5.5.7.7 Deformities, Erosion, Lesions and Tumours (DELTs)

Rat Lake

A total of one DELT was recorded from 92 fish examined from Rat Lake in 2010 (1.1%) (Table 5.5.7-23). One deformity was observed for White Sucker out of 46 individuals examined (2.2%). No DELTs were observed for Northern Pike (n = 21), Lake Whitefish (n = 3) or Walleye (n = 22).

Notigi Lake

A total of one DELT was recorded from 278 fish examined from Notigi Lake in 2009 (0.4%) (Table 5.5.7-23). One erosion was observed to occur in White Sucker (0.6%, n = 174). Northern Pike (n = 56), Lake Whitefish (n = 4) and Walleye (n = 44) were also examined for DELTs but none were observed

Threepoint Lake

A total of four DELTs were recorded from 518 fish examined from Threepoint Lake in 2009 and 2010 (0.8%) (Table 5.5.7-23). The highest incidence rate was observed to occur in Northern Pike (1.1%, n = 90), followed by Walleye (0.5%, n = 196) and White Sucker (0.5%, n = 221). One deformity was found for each of Northern Pike, Walleye and White Sucker, and one lesion was found on White Sucker. No DELTs were observed for the 11 Lake Whitefish examined.

Footprint Lake

A total of one DELT was recorded from 381 fish examined from Footprint Lake in 2010 (0.3%) (Table 5.5.7-23). The only incidence, a lesion, was observed for a White Sucker (0.7%, n = 155). No DELTs were observed for Northern Pike (n = 42), Lake Whitefish (n = 2) and Walleye (n = 182).

Apussigamasi Lake

A total of 10 DELTs were recorded from 305 fish examined from Apussigamasi Lake in 2009 (3.3%) (Table 5.5.7-23). The highest incidence rate was observed for Northern Pike (9.1%, 22 examined), followed by Walleye (3.6%, 165 examined) and White Sucker (2.6%, 77 examined). A total of two lesions were found for Northern Pike, two lesions and four tumours for Walleye, and a deformity and an erosion for White Sucker. No DELTs were observed for 41 Lake Whitefish examined.

Leftrook Lake

A total of 20 DELTs were recorded from 1339 fish examined from Leftrook Lake in 2009 and 2010 (1.5%) (Table 5.5.7-23). The highest incidence rate was observed to occur in White Sucker (1.8%, n = 547), followed by Northern Pike (1.7%, 179 examined), Lake Whitefish (1.5%, n = 206) and Walleye (1.0%, n = 407). In total, 10 deformities were found for White Sucker, three deformities were found for each of Northern Pike and Lake Whitefish and one deformity and three tumours were found for Walleye.

5.5.7.8 Index of Biological Integrity (IBI)

Index of Biotic Integrity scores based on 11 metrics were calculated for all Churchill River Diversion Region waterbodies. Leftrook Lake was studied as an off-system waterbody. On-system IBI scores varied from 42.4 (Notigi Lake 2009) to 67.9 (Apussigamasi Lake 2009). Rat, Threepoint, and Footprint lakes had IBI values ranging from 49.8 to 52.1. Leftrook Lake had IBI scores ranging from 53.6 to 55.4 (Table 5.5.7-24 and Figure 5.5.7-41). On-system species assemblages ranged from 12 to 13, with the exception of Apussigamasi Lake which had 16 in 2009. Species assemblages ranged from nine to 10 in Leftrook Lake. All waterbodies had two or three sensitive species present with the exception of Apussigamasi Lake (n=5).

Apussigamasi Lake had the lowest proportion of tolerant species (15.1%) while Notigi Lake (39.3%) had the highest. Other on-system lakes ranged from 17.8% (Threepoint Lake 2009) to 28.3% (Footprint Lake 2010). Leftrook Lake ranged from 20.5 to 27.3%. The number of insectivore species in on-system waterbodies ranged from seven to eight with the exception of Apussigamasi Lake which had 11. Leftrook Lake had six insectivorous species.

Evenness values were lowest in Footprint Lake (5.30) and highest in Apussigamasi Lake (8.28). Leftrook Lake had similar evenness values as on-system lakes. Piscivorous species were dominant in Apussigamasi Lake (50.1%). Other on-system waterbodies either showed similar proportions of piscivorous and omnivorous species or, in the case of Rat and Notigi lakes, were predominant in omnivorous species. Insectivores were found in low proportions in Notigi, Threepoint, and Footprint lakes, but represented approximately 25% of the biomass in Rat and Apussigamasi lakes. The proportion of simple lithophilic spawners ranged from 0.48 in Threepoint Lake (2009) to 0.84 in Footprint Lake. In Leftrook Lake, this proportion ranged from 0.55 to 0.74.

CPUE values in the on-system waterbodies ranged from a low of 19.2 fish/100 m of net/24 h in Threepoint Lake in 2010 to a high of 44.5 in Apussigamasi Lake. CPUE values were higher in Leftrook Lake than in on-system waterbodies, with values of 94.6 and 67.1 fish/100 m of net24 h in 2009 and 2010, respectively. Percentage of deformities, erosion, lesions, and tumours were less than 2% in all waterbodies with the exception of Apussigamasi Lake (3.64%) in 2009.

5.5.7.9 Spatial Comparisons

Overall, the fish assemblage as captured by standard gang index gill net sets in the four most upstream on-system lakes in the Churchill River Diversion Region (i.e., Rat Lake, Notigi Lake, Threepoint Lake and Footprint Lake) was found to be dominated by White Sucker, Northern Pike and Walleye (Table 5.5.7-3). Sauger and Cisco were also generally common in these lakes. In Apussigamasi Lake (lake closest to the confluence with the Nelson River) the fish assemblage was more diverse and dominated by Walleye, Sauger, White Sucker and Lake Whitefish. In Leftrook Lake (the off-system waterbody), the fish assemblage was less diverse than other waterbodies in the region and was dominated by White Sucker, Walleye, Lake Whitefish and Northern Pike. With respect to small-bodied fish species captured in small mesh index gillnet catches, Spottail Shiner was common in all waterbodies except Rat Lake while Emerald Shiner was common in all waterbodies except Apussigamasi Lake (Table 5.5.7-5). Yellow Perch was captured in Rat Lake, Notigi Lake and Leftrook Lake but not in Threepoint Lake, Footprint Lake or Apussigamasi Lake. Troutperch was more abundant in Leftrook Lake than other waterbodies in the region.

Moving downstream on the Rat and Burntwood rivers, the species composition in Rat and Notigi lakes as captured by standard gang and small mesh index gill nets was identical and comprised of 12 species, all of which were also found in more downstream lakes in the region. The fish assemblages of Threepoint Lake (13 species) and Footprint Lake (12 species) were very similar to that of Rat and Notigi lakes, with the addition only of Shorthead Redhorse (*Moxostoma macrolepidotum*) in these lakes. Although Longnose Sucker (*Catostomus catostomus*) was missing from the catch in Footprint Lake, it is likely present in the lake since this species was captured in both upstream and downstream waterbodies in the region. By contrast, Apussigamasi Lake had a fish assemblage comprised of 16 species with three of these species (i.e., Goldeye [*Hiodon alosoides*], Mooneye [*Hiodon tergisus*], Lake Chub [*Couesius plumbeus*]) not occurring elsewhere in on-system lakes in the region. In Leftrook Lake (off-system waterbody) the fish assemblage was similar to that in the four most upstream on-system lakes in the region except that Longnose Sucker and Sauger were not captured and sculpin (*Cottus sp.)* were found to be present.

A comparison of mean CPUE values for the two annual Churchill River Diversion waterbodies and the four rotational waterbodies (two waterbodies sampled in 2009 and two waterbodies sampled in 2010) are presented in Tables 5.5.7-7 and 8.7.5-9 and Figures 5.5.7-13 and 5.5.7-15).

For the four most upstream on-system lakes in the region the CPUE values for the most common fish species were generally similar except that Cisco was notably higher in Rat Lake and Walleye was noticeably higher in Footprint Lake. In Apussigamasi Lake, the CPUE values for Lake Whitefish and Walleye were notably higher than other on-system lakes (in the case of Walleye this was true except for Footprint Lake which had a similar CPUE value). In Leftrook Lake, CPUE values for White Sucker, Lake Whitefish and Walleye were higher than those for other waterbodies in the region. Notable differences in the CPUE values for the small mesh index gill nets were evident particularly with respect to Emerald Shiner, Spottail Shiner and Walleye, all of which had higher CPUEs in Leftrook Lake than other waterbodies in the region. The CPUE for Spottail Shiner was also noticeably higher in Threepoint Lake compared to other waterbodies in the region, with the exception of Leftrook Lake.

A comparison of BPUE values for standard gang and small mesh index gillnet catches from all sampled waterbodies in the region are provided in Tables 5.5.7-8 and 5.5.7-10 and Figures 5.5.7-14 and 5.5.7-16. Generally BPUE values for all fish were comparable between sampled waterbodies. As was the case with CPUE, the BPUE value for White Sucker from the standard gang index gill nets was notably higher in Leftrook Lake than other waterbodies in the region. As well, Lake Whitefish BPUE was noticeably higher in Leftrook Lake than other waterbodies. BPUE values for all small-bodied fish from the small mesh index gill nets were generally similar for all waterbodies in the region.

Within each waterbody, site variability was examined by comparing mean CPUE values from the standard gang index gill nets for individual sites. With the exception of Rat Lake, Notigi Lake, Footprint Lake and Apussigamasi Lake, each of which only had one year of data, the two years of collected data (i.e., for Threepoint Lake and Leftrook Lake) were pooled for individual sites. Total CPUE values are presented along with values for Northern Pike, Lake Whitefish and Walleye. In Rat Lake, total CPUE values ranged from approximately 10 (Site GN-09) to nearly 45 (Site GN-01) in 2010 (Figure 5.5.7-17) while in Notigi Lake total CPUE values in 2009 ranged from approximately 5 (Site GN-09) to nearly 65 (Site GN-06) ((Figure 5.5.7-19). In Threepoint Lake total CPUE values from 2009 and 2010 ranged from less than 20 (Site GN-16) to nearly 45 (Site GN-13) (Figure 5.5.7-21). In Footprint Lake total CPUE values ranged from below 20 for Site GN-05 to nearly 80 at Site GN-14 (Figure 5.5.7-23). In Apussigamasi Lake the majority of sites had total CPUE values between 30 and 40 with an overall range of from approximately 30 at Site GN-02 to approximately 85 at Site GN-05 (Figure 5.5.7-25). In Leftrook Lake the total CPUE values ranged from approximately 50 at Site GN-11 to approximately 130 at Site GN-05 (Figure 5.5.7-27).

With respect to IBI, Notigi Lake had the lowest score (42.4) whereas Apussigamasi Lake had the highest (67.9). IBI scores were comparable, ranging from 49.8 to 52.1, for Rat, Threepoint, and Footprint lakes. Leftrook Lake had IBI scores of 55.4 and 53.6.in 2009 and 2020 respectively.

5.5.7.10 Temporal Variability

CPUE values were used to examine temporal variability within the two waterbodies for which multi-year sampling occurred, i.e., Threepoint Lake and Leftrook Lake (Table 5.5.7-7). Within Threepoint Lake, overall standard gang index gillnet CPUE varied from a low of 19.2 in 2010 when water level elevation was increasing from lower quartile values to average values to a high of 36.0 in 2009 when water levels were near the lower quartile values (see Section 5.5.2). In Leftrook Lake the overall annual CPUE was also lowest in 2010 at 67.1 and highest in 2009 at 94.6. Water level elevation data for Leftrook Lake was not available for 2009, but was available for the time period coincident with the 2010 gillnetting (see Section 5.5.2).

With respect to the catch from the small mesh index gill nets, Threepoint Lake CPUE varied from a low of 43.4 in 2010 to a high of 73.2 in 2009 (Table 5.5.7-9). Leftrook Lake, on the other hand, had a higher CPUE in 2010 (169.9) than was the case in 2009 (114.3).

The CPUE value for Threepoint Lake in 2009 was double that of the 2010 study, however all other parameters were comparable including the IBI scores. Leftrook Lake was also sampled over two seasons with similar values.

Table 5.5.7-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Churchill River Diversion Region waterbodies, 2009 - 2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Rat Lake	GN-01	14	457611	6224524	20-Jul-10	15.58	20.5	10.0	19.5
Rat Lake	GN-02	14	462567	6225347	20-Jul-10	16.27	14.5	11.5	19.5
Rat Lake	GN-03	14	461628	6224305	20-Jul-10	15.62	4.0	1.5	19.5
Rat Lake	GN-04	14	463681	6222542	21-Jul-10	23.30	8.0	6.0	18.5
Rat Lake	GN-05	14	465283	6221935	21-Jul-10	23.02	12.0	7.0	18.5
Rat Lake	GN-06	14	464403	6221796	21-Jul-10	22.42	7.0	2.5	18.5
Rat Lake	GN-07	14	463711	6225919	21-Jul-10	23.93	3.5	1.0	18.5
Rat Lake	GN-08	14	465472	6224538	22-Jul-10	22.70	6.5	1.5	18.5
Rat Lake	GN-09	14	464648	6225178	22-Jul-10	22.87	5.5	1.0	18.5
Rat Lake	SN-01	14	457611	6224524	20-Jul-10	15.58	20.5	-	19.5
Rat Lake	SN-03	14	461628	6224305	20-Jul-10	15.62	4.0	-	19.5
Rat Lake	SN-06	14	464403	6221796	21-Jul-10	22.42	7.0	-	18.5
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

Table 5.5.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
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
Threepoint Lake	GN-02	14	502095	6174452	23-Aug-10	46.88	5.8	6.3	15.0
Threepoint Lake	GN-04	14	500133	6174917	23-Aug-10	47.25	2.4	4.3	15.0
Threepoint Lake	GN-05	14	501259	6174416	23-Aug-10	46.25	5.9	5.7	15.0
Threepoint Lake	GN-06	14	503201	6169924	25-Aug-10	23.48	3.9	3.4	14.0
Threepoint Lake	GN-09	14	503842	6172984	25-Aug-10	24.45	4.4	4.5	14.0
Threepoint Lake	GN-13	14	505986	6174705	25-Aug-10	24.03	4.2	1	14.0
Threepoint Lake	GN-15	14	507251	6169354	26-Aug-10	21.10	4.7	4.7	14.0
Threepoint Lake	GN-16	14	507527	6169574	26-Aug-10	20.92	5.9	5	14.0
Threepoint Lake	GN-17	14	508559	6170496	26-Aug-10	20.97	4.3	0.7	14.0
Threepoint Lake	SN-09	14	503334	6169955	25-Aug-10	23.48	3.9	3.4	14.0
Threepoint Lake	SN-15	14	507121	6169444	26-Aug-10	21.10	4.7	4.7	14.0
Threepoint Lake	SN-16	14	507527	6169574	26-Aug-10	20.92	5.9	5	14.0

Table 5.5.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Footprint Lake	GN-02	14	511178	6187513	21-Aug-10	44.58	3.8	4.6	15.0
Footprint Lake	GN-03	14	509817	6186051	21-Aug-10	43.58	4.8	-	15.0
Footprint Lake	GN-05	14	508121	6182721	18-Aug-10	23.90	11.2	12.0	15.0
Footprint Lake	GN-06	14	509547	6181358	19-Aug-10	23.50	4.8	3.7	14.5
Footprint Lake	GN-09	14	506107	6180601	18-Aug-10	22.95	6.2	6.2	15.0
Footprint Lake	GN-11	14	504994	6179901	18-Aug-10	21.83	7.7	7.5	15.0
Footprint Lake	GN-12	14	509639	6183391	19-Aug-10	23.67	11.2	6.7	15.0
Footprint Lake	GN-13	14	505945	6189559	17-Aug-10	22.70	2.9	2.0	14.0
Footprint Lake	GN-14	14	504360	6186324	17-Aug-10	23.72	3.7	5.4	14.0
Footprint Lake	SN-06	14	509547	6181358	19-Aug-10	23.50	4.8	4.8	14.5
Footprint Lake	SN-09	14	506107	6180601	18-Aug-10	22.95	6.2	6.2	15.0
Footprint Lake	SN-14	14	504360	6186324	17-Aug-10	23.72	3.7	5	14.0
Apussigamasi Lake	GN-01	14	582102	6186932	30-Aug-09	22.50	4.3	4.2	15.0
Apussigamasi Lake	GN-02	14	582543	6186771	30-Aug-09	23.00	6.5	7.7	15.0
Apussigamasi Lake	GN-03	14	589045	6191129	31-Aug-09	25.25	4.4	6.3	15.0
Apussigamasi Lake	GN-04	14	589079	6190616	31-Aug-09	25.67	4.1	4.4	15.0
Apussigamasi Lake	GN-05	14	587271	6189353	1-Sep-09	24.25	4.2	4	16.0
Apussigamasi Lake	GN-06	14	587191	6188491	1-Sep-09	25.50	4.4	4.3	16.0
Apussigamasi Lake	GN-07	14	585096	6188941	1-Sep-09	23.25	3.9	4	16.0
Apussigamasi Lake	GN-08	14	584187	6188111	2-Sep-09	24.75	3.9	3.9	15.5
Apussigamasi Lake	GN-09	14	583994	6187194	2-Sep-09	25.75	6.3	7.4	15.5
Apussigamasi Lake	SN-03	14	589108	6191131	31-Aug-09	25.25	6.2	6.3	15.0
Apussigamasi Lake	SN-06	14	587124	6188527	1-Sep-09	25.50	4	4.2	16.0
Apussigamasi Lake	SN-09	14	583958	6187130	2-Sep-09	25.75	4.2	4	15.5

Table 5.5.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
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
Leftrook Lake	GN-01	14	525927	6216983	25-Jul-10	14.13	4.5	5.5	21.0
Leftrook Lake	GN-02	14	525506	6216031	25-Jul-10	14.68	2.5	2.0	21.0
Leftrook Lake	GN-05	14	523396	6217408	25-Jul-10	15.10	4.5	1.0	21.0
Leftrook Lake	GN-08	14	523809	6213799	26-Jul-10	27.48	5.0	7.0	21.0
Leftrook Lake	GN-09	14	521700	6213666	27-Jul-10	19.97	3.0	-	20.0
Leftrook Lake	GN-10	14	518468	6209942	27-Jul-10	20.83	5.5	5.5	20.0
Leftrook Lake	GN-11	14	519766	6209122	26-Jul-10	23.67	10.0	1.5	21.0
Leftrook Lake	GN-12	14	517109	6213471	27-Jul-10	20.82	2.0	4.0	20.0
Leftrook Lake	GN-13	14	517899	6213124	26-Jul-10	25.02	7.0	2.0	21.0
Leftrook Lake	SN-05	14	523396	6217408	25-Jul-10	15.10	4.5	-	21.0
Leftrook Lake	SN-08	14	523809	6213799	26-Jul-10	27.48	5.0	-	21.0
Leftrook Lake	SN-12	14	517109	6213471	27-Jul-10	20.82	2.0	-	20.0

Table 5.5.7-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Churchill River Diversion Region waterbodies, 2009-2010.

Family	Species	Scientific Name	ID Code	Captured in Study Area	
				2009	2010
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	+	+
Cottidae	Sculpin	*Cottus sp.*	COTT		+
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+	+
	Sauger	*Sander canadensis*	SAUG	+	+
	Walleye	*Sander vitreus*	WALL	+	+

Table 5.5.7-3. Standard gang index gillnet catch summaries from Churchill River Diversion Region waterbodies, 2009-2010.

Species	Rat L		Notigi L		Threepoint L						Footprint L		Apussigamasi L		Leftrook L					
	2010		2009		2009		2010		Overall		2010		2009		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	22	4.73	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	2	0.43	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	5.13	5	1.45	2	0.49	3	1.14	5	0.74	-	-	14	3.01	-	-	-	-	-	-
White Sucker	46	23.59	174	50.58	134	32.60	87	33.08	221	32.79	155	32.29	77	16.56	356	36.22	191	35.11	547	35.82
Shorthead Redhorse	-	-	-	-	9	2.19	1	0.38	10	1.48	1	0.21	10	2.15	-	-	-	-	-	-
Northern Pike	21	10.77	56	16.28	58	14.11	32	12.17	90	13.35	42	8.75	22	4.73	108	10.99	71	13.05	179	11.72
Cisco	57	29.23	13	3.78	7	1.70	12	4.56	19	2.82	56	11.67	15	3.23	44	4.48	73	13.42	117	7.66
Lake Whitefish	3	1.54	4	1.16	9	2.19	2	0.76	11	1.63	2	0.42	41	8.82	118	12.00	88	16.18	206	13.49
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	1.54	12	3.49	3	0.73	1	0.38	4	0.59	1	0.21	4	0.86	3	0.31	-	-	3	0.20
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	2.56	23	6.69	23	5.60	3	1.14	26	3.86	21	4.38	13	2.80	55	5.60	13	2.39	68	4.45
Sauger	28	14.36	13	3.78	61	14.84	31	11.79	92	13.65	20	4.17	80	17.20	-	-	-	-	-	-
Walleye	22	11.28	44	12.79	105	25.55	91	34.60	196	29.08	182	37.92	165	35.48	299	30.42	108	19.85	407	26.65
Total	195	100	344	100	411	100	263	100	674	100	480	100	465	100	983	100	544	100	1527	100

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

Table 5.5.7-4. Standard gang index gillnet biomass summaries from Churchill River Diversion Region waterbodies, 2009-2010 (and overall).

Species	Rat L			Notigi L			Threepoint L								
	2010			2009			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	8476	6.62	5	7280	2.87	2	4420	1.60	3	2773	1.48	5	7193	1.55
White Sucker	46	50525	39.46	174	160060	63.06	134	144360	52.25	87	90585	48.27	221	234945	50.64
Shorthead Redhorse	-	-	-	-	-	-	9	9560	3.46	1	1937	1.03	10	11497	2.48
Northern Pike	21	13679	10.68	56	25990	10.24	58	34100	12.34	32	33481	17.84	90	67581	14.57
Cisco	57	32700	25.54	13	6748	2.66	7	3440	1.24	12	5306	2.83	19	8746	1.88
Lake Whitefish	3	3672	2.87	4	9000	3.55	9	8050	2.91	2	1779	0.95	11	9829	2.12
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	2699	2.11	12	10885	4.29	3	1710	0.62	1	468	0.25	4	2178	0.47
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	502	0.39	23	3121	1.23	23	3955	1.43	3	725	0.39	26	4680	1.01
Sauger	28	4894	3.82	13	3460	1.36	61	11910	4.31	31	5793	3.09	92	17703	3.82
Walleye	22	10906	8.52	44	27260	10.74	105	54806	19.83	91	44827	23.89	196	99633	21.47
Total	195	128053	100	344	253804	100	411	276311	100	263	187674	100	674	463985	100

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

Table 5.5.7-4. continued.

Species	Footprint Lake			Apussigamasi Lake			Leftrook Lake								
	2010			2009			2009			2010			Overall		
	n	B (g)	%	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	-	-	-	14	22810	6.07	-	-	-	-	-	-	-	-	-
White Sucker	155	151643	51.32	77	79387	21.14	354	335016	44.30	191	169387	42.48	545	504403	43.67
Shorthead Redhorse	1	394	0.13	10	9883	2.63	-	-	-	-	-	-	-	-	-
Northern Pike	42	28659	9.70	22	67991	18.10	108	77250	10.21	71	45710	11.46	179	122960	10.65
Cisco	56	19529	6.61	15	6737	1.79	44	15650	2.07	73	27956	7.01	117	43606	3.78
Lake Whitefish	2	2216	0.75	41	68652	18.28	118	166970	22.08	88	97981	24.57	206	264951	22.94
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	1378	0.47	4	1435	0.38	3	1990	0.26	-	-	-	3	1990	0.17
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	21	3787	1.28	13	2658	0.71	55	10130	1.34	13	2009	0.50	68	12139	1.05
Sauger	20	3882	1.31	80	13275	3.53	-	-	-	-	-	-	-	-	-
Walleye	182	83993	28.43	165	98181	26.14	299	149290	19.74	108	55736	13.98	407	205026	17.75
Total	480	295481	100	465	375593	100	981	756296	100	544	398779	100	1525	1155075	100

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

Table 5.5.7-5. Small mesh index gillnet catch summaries from Churchill River Diversion Region waterbodies, 2009-2010.

Species	Rat L		Notigi L		Threepoint L						Footprint L		Apussigamasi L		Leftrook L					
	2010		2009		2009		2010		Overall		2010		2009		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	1	0.74	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	7	5.15	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	34	57.63	6	5.41	117	32.96	17	14.17	134	28.21	3	4.17	6	4.41	21	6.38	145	35.71	166	22.59
Spottail Shiner	4	6.78	23	20.72	187	52.68	46	38.33	233	49.05	20	27.78	28	20.59	85	25.84	121	29.80	206	28.03
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	-	1	1.39	-	-	2	0.61	2	0.49	4	0.54
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	5.08	4	3.60	5	1.41	1	0.83	6	1.26	3	4.17	3	2.21	18	5.47	8	1.97	26	3.54
Cisco	6	10.17	1	0.90	1	0.28	5	4.17	6	1.26	4	5.56	2	1.47	-	-	5	1.23	5	0.68
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1.22	-	-	4	0.54
Troutperch	2	3.39	10	9.01	10	2.82	8	6.67	18	3.79	2	2.78	17	12.50	55	16.72	56	13.79	111	15.10
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	1.72	7	0.95
Yellow Perch	2	3.39	32	28.83	-	-	-	-	-	-	-	-	-	-	1	0.30	9	2.22	10	1.36
Sauger	2	3.39	7	6.31	31	8.73	28	23.33	59	12.42	11	15.28	54	39.71	-	-	-	-	-	-
Walleye	6	10.17	28	25.23	4	1.13	15	12.50	19	4.00	28	38.89	18	13.24	143	43.47	53	13.05	196	26.67
Total	59	100	111	100	355	100	120	100	475	100	72	100	136	100	329	100	406	100	735	100

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

Table 5.5.7-6. Small mesh index gillnet biomass summaries from Churchill River Diversion Region waterbodies, 2009-2010 (and overall).

Species	Rat Lake			Notigi Lake			Threepoint Lake								
	2010			2009			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	34	125	2.96	6	25	0.22	117	370	6.52	17	77	2.51	134	447	5.12
Spottail Shiner	4	15	0.36	23	115	1.00	187	847	14.92	46	302	9.91	233	1149	13.17
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	298	7.06	4	760	6.58	5	1500	26.42	1	20	0.64	6	1520	17.42
Cisco	5	1847	43.77	1	400	3.46	1	80	1.41	5	20	0.67	6	100	1.15
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	2	10	0.23	10	40	0.35	10	100	1.76	8	44	1.44	18	144	1.65
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	20	0.48	32	470	4.07	-	-	-	-	-	-	-	-	-
Sauger	2	346	8.20	7	820	7.10	31	2180	38.40	28	1803	59.18	59	3983	45.66
Walleye	6	1559	36.94	28	8920	77.23	4	600	10.57	15	781	25.64	19	1381	15.83
Total	58	4221	100	111	11550	100	355	5677	100	120	3046	100	475	8723	100

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

Table 5.5.7-6. continued.

Species	Footprint Lake			Apussigamasi Lake			Leftrook Lake								
	2010			2009			2009			2010			Overall		
	n	B (g)	%	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	3	17	0.22	6	26	0.14	21	63	0.11	145	501	2.41	166	564	0.73
Spottail Shiner	20	120	1.57	28	122	0.65	85	373	0.66	121	598	2.88	206	971	1.25
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	53	0.69	-	-	-	2	1100	1.93	2	123	0.59	4	1223	1.58
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	923	12.07	3	2490	13.25	18	11040	19.42	8	4630	22.27	26	15670	20.18
Cisco	4	74	0.97	2	39	0.21	-	-	-	5	2175	10.46	5	2175	2.80
Lake Whitefish	-	-	-	-	-	-	4	4960	8.73	-	-	-	4	4960	6.39
Troutperch	2	13	0.16	17	123	0.65	55	264	0.46	56	354	1.70	111	618	0.80
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	7	16	0.08	7	16	0.02
Yellow Perch	-	-	-	-	-	-	1	150	0.26	9	372	1.79	10	522	0.67
Sauger	11	764	9.99	54	7585	40.38	-	-	-	-	-	-	-	-	-
Walleye	28	5683	74.32	18	6649	35.39	143	38898	68.42	53	12018	57.81	196	50916	65.58
Total	72	7647	100	136	18786	100	329	56848	100	406	20787	100	735	77635	100

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

Table 5.5.7-7. 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, 2009-2010 (and total).

Species	Rat Lake			Notigi Lake			Threepoint Lake								
	2010 (#sites=9)			2009 (#sites=10)			2009 (#sites=9)			2010 (#sites=9)			Overall (#years=2)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	1.1	2.04	5	0.5	0.79	2	0.1	0.18	3	0.2	0.39	5	0.1	0.05
White Sucker	46	4.7	4.65	174	16.7	15.18	134	12.4	6.63	87	7.1	3.57	221	9.8	2.67
Shorthead Redhorse	-	-	-	-	-	-	9	0.7	1.02	1	0.1	0.15	10	0.4	0.33
Northern Pike	21	2.3	1.47	56	5.3	5.22	58	5.0	3.33	32	2.4	1.89	90	3.7	1.28
Cisco	57	7.8	12.93	13	1.2	2.21	7	0.6	0.78	12	1.0	1.74	19	0.8	0.18
Lake Whitefish	3	0.4	0.6	4	0.4	1.17	9	0.7	0.63	2	0.1	0.30	11	0.4	0.29
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	0.4	0.66	12	1.1	2.37	3	0.3	0.45	1	0.1	0.15	4	0.2	0.13
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	0.5	0.93	23	2.1	2.91	23	2.2	3.09	3	0.2	0.30	26	1.2	1.04
Sauger	28	3.3	5.22	13	1.2	1.42	61	5.5	3.75	31	2.5	1.95	92	4.0	1.51
Walleye	22	2.5	2.34	44	4.3	5.69	105	8.5	8.58	91	5.7	3.99	196	7.1	1.40
Total	195	22.9	11.46	344	32.7	21.91	411	36.0	14.94	263	19.2	7.08	674	27.6	8.40

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught

CPUE = mean catch per unit effort (fish/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)

SD = standard deviation; SE = standard error

Table 5.5.7-7. continued.

Species	Footprint Lake			Apussigamasi Lake			Leftrook Lake								
	2010 (#sites=9)			2009 (#sites=9)			2009 (#sites=9)			2010 (#sites=9)			Overall (#years=2)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	22	2.2	3.21	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	2	0.2	0.42	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	14	1.4	1.47	-	-	-	-	-	-	-	-	-
White Sucker	155	14.6	8.67	77	7.5	4.44	356	33.8	18.09	191	24.9	19.35	547	29.3	4.45
Shorthead Redhorse	1	0.1	0.30	10	1.0	1.38	-	-	-	-	-	-	-	-	-
Northern Pike	42	4.0	3.06	22	2.1	1.32	108	10.3	3.96	71	7.6	4.56	179	9.0	1.37
Cisco	56	4.7	2.97	15	1.4	1.71	44	4.4	5.85	73	10.3	17.07	117	7.3	2.93
Lake Whitefish	2	0.2	0.39	41	4.0	4.98	118	11.4	9.60	88	8.8	15.03	206	10.1	1.31
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	0.1	0.15	4	0.4	0.66	3	0.3	0.63	-	-	-	3	0.1	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	21	1.7	2.28	13	1.2	1.14	55	5.2	6.15	13	1.8	2.76	68	3.5	1.72
Sauger	20	1.9	1.95	80	7.6	3.84	-	-	-	-	-	-	-	-	-
Walleye	182	15.0	8.52	165	15.6	13.32	299	29.1	16.50	108	13.8	7.62	407	21`.4	7.69
Total	480	42.1	17.58	465	44.5	19.68	983	94.6	27.18	544	67.1	33.42	1527	80.8	13.75

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-8. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Churchill River Diversion Region waterbodies, 2009-2010 (and overall).

Species	Rat Lake			Notigi Lake			Threepoint Lake								
	2010 (#sites=9)			2009 (#sites=10)			2009 (#sites=9)			2010 (#sites=9)			Overall (#years=2)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	10	887	1904	5	699	1183	2	215	427	3	172	348	5	193	22
White Sucker	46	5131	5456	174	15431	13053	134	13460	7919	87	7351	3279	221	10405	3055
Shorthead Redhorse	-	-	-	-	-	-	9	737	1058	1	96	287	10	416	321
Northern Pike	21	1462	1358	56	2443	2180	58	2975	2513	32	2327	2497	90	2651	324
Cisco	57	4381	7121	13	642	1267	7	314	430	12	401	689	19	357	44
Lake Whitefish	3	537	1454	4	829	2621	9	699	679	2	110	222	11	405	294
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	398	631	12	1006	2168	3	170	264	1	23	70	4	97	74
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	5	51	89	23	283	386	23	384	521	3	36	73	26	210	174
Sauger	28	571	930	13	313	367	61	1052	683	31	465	338	92	759	294
Walleye	22	1210	902	44	2650	3515	105	4603	5783	91	2773	2091	196	3688	915
Total	195	14628	7142	344	24296	14732	411	24610	9639	263	13753	5430	674	19182	5428

#sites = number of sites sampled; #years = number of years 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 (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-8. continued.

Species	Footprint Lake			Apussigamasi Lake			Leftrook Lake								
	2010 (#sites=9)			2009 (#sites=9)			2009 (#sites=9)			2010 (#sites=9)			Overall (#years=2)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	22	430	705	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	2	23	46	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	14	2263	2550	-	-	-	-	-	-	-	-	-
White Sucker	155	14230	7933	77	7709	4760	354	32172	18306	191	21898	15289	545	27035	5137
Shorthead Redhorse	1	39	116	10	973	1482	-	-	-	-	-	-	-	-	-
Northern Pike	42	2649	1806	22	6547	4748	108	7481	3160	71	4865	2798	179	6173	1308
Cisco	56	1681	1604	15	632	844	44	1472	1461	73	3855	6221	117	2664	1192
Lake Whitefish	2	225	501	41	6623	7651	118	16472	13875	88	9433	17582	206	12953	3520
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	72	216	4	137	212	3	196	456	-	-	-	3	98	98
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	21	284	359	13	250	208	55	963	1154	13	278	407	68	620	342
Sauger	20	357	324	80	1257	674	-	-	-	-	-	-	-	-	-
Walleye	182	6992	4074	165	9282	6101	299	14254	6595	108	7023	3676	407	10638	3615
Total	480	26529	12452	465	36127	11511	981	73010	22579	544	47352	23126	1525	60181	12829

#sites = number of sites sampled; #years = number of years 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 (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-9. 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, 2009-2010 (and overall).

Species	Rat Lake			Notigi Lake			Threepoint Lake								
	2010 (#sites=3)			2009 (#sites=3)			2009 (#sites=3)			2010 (#sites=3)			Overall (#years=2)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	34	16.3	22.10	6	2.1	1.77	117	23.9	21.58	17	6.3	3.53	134	15.1	8.82
Spottail Shiner	4	1.6	1.61	23	7.8	7.24	187	32.5	49.09	46	15.7	27.14	233	24.1	8.40
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	1.2	1.11	4	1.4	1.18	5	1.4	1.56	1	0.3	0.59	6	0.8	0.50
Cisco	6	2.9	2.81	1	0.4	0.61	1	0.3	0.61	5	1.9	3.29	6	1.1	0.77
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	2	0.7	1.23	10	3.4	3.59	10	2.9	2.79	8	3.0	2.86	18	3.0	0.08
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	1.0	1.77	32	10.8	15.29	-	-	-	-	-	-	-	-	-
Sauger	2	0.9	0.78	7	2.4	3.29	31	10.0	12.49	28	10.7	9.30	59	10.3	0.33
Walleye	6	3.1	5.32	28	9.5	10.93	4	1.4	2.34	15	5.5	1.18	19	3.4	2.08
Total	59	27.7	26.95	111	37.6	31.00	355	72.3	61.82	120	43.4	16.04	475	57.8	14.46

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-9. continued.

Species	Footprint Lake			Apussigamasi Lake			Leftrook Lake								
	2010 (#sites=3)			2009 (#sites=3)			2009 (#sites=3)			2010 (#sites=3)			Overall (#years=2)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Goldeye	-	-	-	1	0.3	0.54	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	7	2.2	1.96	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	3	1.0	1.75	6	1.9	2.49	21	7.3	12.63	145	74.9	122.39	166	41.1	33.78
Spottail Shiner	20	6.9	3.71	28	8.8	5.20	85	30.0	24.11	121	40.3	33.29	206	35.2	5.14
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	0.3	0.59	-	-	-	2	0.7	0.57	2	0.8	1.33	4	0.7	0.05
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	1.0	0.02	3	0.9	0.94	18	6.2	1.89	8	2.8	1.44	26	4.5	1.73
Cisco	4	1.4	1.59	2	0.6	1.09	-	-	-	5	2.4	3.45	5	1.2	1.21
Lake Whitefish	-	-	-	-	-	-	4	1.3	1.44	-	-	-	4	0.6	0.65
Troutperch	2	0.7	0.59	17	5.3	1.42	55	18.9	5.72	56	21.1	18.26	111	20.0	1.08
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	7	2.0	3.53	7	1.0	1.02
Yellow Perch	-	-	-	-	-	-	1	0.3	0.61	9	3.4	3.03	10	1.9	1.54
Sauger	11	3.8	3.67	54	16.9	5.20	-	-	-	-	-	-	-	-	-
Walleye	28	9.6	5.46	18	5.6	3.34	143	49.5	12.31	53	22.3	11.47	196	35.9	13.61
Total	72	24.8	12.57	136	42.6	5.87	329	114.3	23.83	406	169.9	132.29	735	142.1	27.82

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m/24 h) set in Churchill River Diversion Region waterbodies, 2009-2010 (and overall).

Species	Rat Lake			Notigi Lake			Threepoint Lake								
	2010 (#sites=3)			2009 (#sites=3)			2009 (#sites=3)			2010 (#sites=3)			Overall (#years=2)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	34	60	82	6	9	6	117	65	95	17	28	14	134	46	18
Spottail Shiner	4	6	7	23	39	41	187	155	201	46	103	178	233	129	26
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	142	185	4	257	226	5	467	713	1	7	12	6	237	230
Cisco	5	944	1608	1	140	243	1	28	48	5	8	13	6	18	10
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	2	3	6	10	14	12	10	28	29	8	17	16	18	22	6
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	10	18	32	159	193	-	-	-	-	-	-	-	-	-
Sauger	2	147	128	7	278	310	31	657	749	28	686	597	59	672	15
Walleye	6	799	1383	28	3014	3256	4	203	351	15	295	340	19	249	46
Total	58	2111	1521	111	3909	3588	355	1602	1662	120	1143	734	475	1373	229

#sites = number of sites sampled; #years = number of years 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 (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-10. continued.

Species	Footprint Lake			Apussigamasi Lake			Leftrook Lake								
	2010 (#sites=3)			2009 (#sites=3)			2009 (#sites=3)			2010 (#sites=3)			Overall (#years=2)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Goldeye	-	-	-	1	85	147	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	7	464	403	-	-	-	-	-	-	-	-	-
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	3	6	10	6	8	12	21	22	38	145	258	421	166	140	118
Spottail Shiner	20	41	12	28	38	24	85	131	108	121	198	176	206	165	34
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	1	18	31	-	-	-	2	359	338	2	47	82	4	203	156
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	3	315	28	3	779	867	18	3796	1797	8	1576	917	26	2686	1110
Cisco	4	26	35	2	12	21	-	-	-	5	1047	1491	5	523	523
Lake Whitefish	-	-	-	-	-	-	4	1576	2378	-	-	-	4	788	788
Troutperch	2	4	4	17	39	2	55	90	25	56	126	115	111	108	18
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sculpin	-	-	-	-	-	-	-	-	-	7	5	8	7	2	2
Yellow Perch	-	-	-	-	-	-	1	52	90	9	120	109	10	86	34
Sauger	11	263	231	54	2376	969	-	-	-	-	-	-	-	-	-
Walleye	28	1952	781	18	2083	1001	143	13731	7535	53	4332	1201	196	9031	4699
Total	72	2626	931	136	5884	2513	329	19757	6247	406	7709	2107	735	13733	6024

#sites = number of sites sampled; #years = number of years 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 (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.5.7-11. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Northern Pike captured in standard gang and small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Mesh (in)	Rat Lake			Notigi Lake			Threepoint Lake					
	2010			2009			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	16	395	71	43	365	53	48	386	82	18	404	58
3	4	440	102	12	513	68	9	527	55	9	561	118
3.75	-	-	-	1	545	-	1	675	-	3	602	70
4.25	-	-	-	-	-	-	-	-	-	2	682	71
5	1	871	-	-	-	-	-	-	-	-	-	-
Total	21	426	127	56	399	85	58	412	99	32	484	124
Weight (g)												
SM	3	99	-	4	190	-	5	300	-	1	20	-
2	16	433	249	43	331	141	48	448	450	18	463	267
3	4	562	314	12	879	426	9	1131	435	9	1615	1603
3.75	-	-	-	1	1200	-	1	2400	-	3	1593	515
4.25	-	-	-	-	-	-	-	-	-	2	2915	1039
5	1	4500	-	-	-	-	-	-	-	-	-	-
Total	24	582	-	60	446	-	63	565	-	33	1015	1136
Condition Factor (K)												
2	16	0.64	0.04	43	0.65	0.09	48	0.66	0.10	18	0.61	0.09
3	4	0.61	0.10	12	0.61	0.06	9	0.74	0.10	9	0.74	0.18
3.75	-	-	-	1	0.74	-	1	0.78	-	3	0.72	0.05
4.25	-	-	-	-	-	-	-	-	-	2	0.90	0.04
5	1	0.68	-	-	-	-	-	-	-	-	-	-
Total	21	0.64	0.05	56	0.64	0.09	58	0.68	0.10	32	0.70	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 5.5.7-11. continued.

Mesh (in)	Footprint Lake			Apussigamasi Lake			Leftrook Lake					
	2010			2009			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
2	33	391	71	7	599	221	47	459	51	38	449	48
3	6	558	71	5	765	159	57	482	31	31	488	35
3.75	2	669	44	5	619	202	3	606	59	1	521	-
4.25	1	657	-	2	744	199	1	560	-	-	-	-
5	-	-	-	3	813	41	-	-	-	1	419	-
Total	42	435	110	22	684	191	108	476	49	71	467	47
Weight (g)												
SM	3	308	32	3	830	645	18	613	166	8	579	-
2	33	429	265	7	2322	2038	47	635	173	38	569	164
3	6	1227	554	5	3976	2472	57	724	121	31	732	143
3.75	2	2465	191	5	2356	1945	3	1640	600	1	893	-
4.25	1	2200	-	2	3330	2489	1	1210	-	-	-	-
5	-	-	-	3	4473	1000	-	-	-	1	494	-
Total	45	657	617	25	2819	2078	126	701	231	79	637	-
Condition Factor (K)												
2	33	0.65	0.05	7	0.72	0.13	47	0.65	0.08	38	0.62	0.08
3	6	0.68	0.05	5	0.79	0.04	57	0.64	0.06	31	0.63	0.06
3.75	2	0.83	0.10	5	0.77	0.11	3	0.71	0.10	1	0.63	-
4.25	1	0.78	-	2	0.73	0.01	1	0.69	-	0	-	-
5	-	-	-	3	0.82	0.08	-	-	-	1	0.67	-
Total	42	0.67	0.07	22	0.80	0.09	108	0.60	0.07	71	0.60	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 5.5.7-12. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Lake Whitefish captured in standard gang and small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Mesh (in)	Rat Lake			Notigi Lake			Threepoint Lake					
	2010			2009			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
2	1	225	-	-	-	-	1	178	-	-	-	-
3	1	250	-	1	508	-	3	298	38	1	442	-
3.75	-	-	-	-	-	-	1	410	-	1	335	-
4.25	-	-	-	3	468	18	1	388	-	-	-	-
5	1	541	-				3	454	17	-	-	-
Total	3	339	176	4	478	25	9	359	99	2	389	76
Weight (g)												
SM	-	-	-	-	-		-	-	-	-	-	-
2	1	166	-	-	-	-	1	100	-	-	-	-
3	1	236	-	1	2690	-	3	437	156	1	1288	-
3.75	-	-	-	-	-	-	1	1100	-	1	491	-
4.25	-	-	-	3	2103	432	1	980	-	-	-	-
5	1	3270	-	-	-	-	3	1520	200	-	-	-
Total	3	1224	1772	4	2250	459	9	894	571	2	890	564
Condition Factor (K)												
2	1	1.46	-	-	-	-	1	1.77	-	-	-	-
3	1	1.51	-	1	2.05	-	3	1.61	0.04	1	1.49	-
3.75	-	-	-	-	-	-	1	1.60	-	1	1.31	-
4.25	-	-	-	3	2.04	0.22	1	1.68	-	-	-	-
5	1	2.07	-	-	-	-	3	1.63	0.19	-	-	-
Total	3	1.68	0.64	4	2.00	0.18	9	1.60	0.11	2	1.40	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 5.5.7-12. continued.

Mesh (in)	Footprint Lake			Apussigamasi Lake			Leftrook Lake					
	2010			2009			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length												
2	-	-	-	3	407	132	22	419	75	12	365	73
3	-	-	-	2	451	86	18	420	59	17	412	61
4	-	-	-	10	438	66	18	455	45	16	414	53
4	-	-	-	11	454	38	33	451	35	26	434	34
5	-	-	-	15	455	52	27	449	28	17	457	25
Total	-	-	-	41	447	59	118	440	50	88	421	55
Weight (g)												
SM	-	-	-	-	-	-	4	1240	-	-	-	-
2	-	-	-	3	1516	1368	22	1282	489	12	781	459
3	-	-	-	2	1735	997	18	1238	495	17	1007	420
3.75	2	1108	679	10	1637	728	18	1561	455	16	1021	354
4.25	-	-	-	11	1665	475	33	1502	374	26	1194	300
5	-	-	-	15	1731	619	27	1438	237	17	1418	235
Total	2	1108	679	41	1674	657	122	1409	420	88	1113	394
Condition Factor (K)												
2	-	-	-	3	1.74	0.29	22	1.59	0.14	12	1.40	0.24
3	-	-	-	2	1.78	0.06	18	1.57	0.17	17	1.35	0.13
3.75	-	-	-	10	1.81	0.23	18	1.60	0.13	16	1.39	0.11
4.25	-	-	-	11	1.75	0.20	33	1.61	0.11	26	1.44	0.16
5	-	-	-	15	1.77	0.12	27	1.58	0.15	17	1.48	0.15
Total	-	-	-	41	1.80	0.18	118	1.60	0.14	88	1.40	0.16

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 5.5.7-13. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Walleye captured in standard gang and small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Mesh (in)	Rat Lake			Notigi Lake			Threepoint Lake					
	2010			2009			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	9	279	93	21	346	71	39	298	63	33	311	71
3	7	383	53	15	385	50	40	369	48	53	371	33
3.75	1	412	-	4	421	43	22	401	44	5	394	10
4.25	4	382	51	4	458	40	3	414	88	-	-	-
5	1	380	-	-	-	-	1	220	-	-	-	-
Total	22	341	86	44	377	68	105	349	69	91	351	58
Weight (g)												
SM	6	260	-	28	319	-	4	150	-	15	52	-
2	9	313	426	21	497	260	39	314	194	33	363	238
3	7	602	226	15	628	265	40	593	240	53	552	173
3.75	1	754	-	4	823	222	22	725	185	5	719	86
4.25	4	627	242	4	1028	204	3	933	530	-	-	-
5	1	614	-	-	-	-	1	100	-	-	-	-
Total	28	445	-	72	503	-	109	508	-	106	430	-
Condition Factor (K)												
2	9	1.00	0.08	21	1.11	0.15	39	1.05	0.20	33	1.03	0.07
3	7	1.04	0.07	15	1.04	0.08	40	1.12	0.11	53	1.05	0.07
3.75	1	1.08	-	4	1.09	0.08	22	1.09	0.09	5	1.17	0.07
4.25	4	1.08	0.14	4	1.07	0.08	3	1.19	0.10	-	-	-
5	1	1.12	-	-	-	-	1	0.94	-	-	-	-
Total	22	1.04	0.09	44	1.08	0.12	105	1.10	0.15	91	1.05	0.08

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

Table 5.5.7-13. continued.

Mesh (in)	Footprint Lake			Apussigamasi Lake			Leftrook Lake					
	2010			2009			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	93	324	58	38	321	75	124	342	51	50	355	43
3	67	364	29	72	361	43	125	366	29	41	372	25
3.75	11	374	46	39	392	53	37	387	31	13	389	34
4.25	8	392	39	14	420	62	8	382	44	2	384	64
5	3	361	14	2	391	95	5	392	34	2	367	22
Total	182	346	52	165	364	63	299	359	43	108	367	37
Weight (g)												
SM	28	203	-	18	369	-	143	272	-	53	227	-
2	93	387	186	38	430	326	124	441	167	50	468	143
3	67	518	120	72	537	231	125	508	120	41	533	99
3.75	11	580	195	39	734	273	37	614	108	13	642	159
4.25	8	683	207	14	926	383	8	634	227	2	592	256
5	3	489	31	2	808	583	5	668	163	2	496	74
Total	210	427	-	183	573	-	442	426	-	161	421	-
Condition Factor (K)												
2	93	1.04	0.09	38	1.08	0.09	124	1.04	0.08	50	1.01	0.07
3	67	1.06	0.09	72	1.09	0.09	125	1.02	0.06	41	1.02	0.07
3.75	11	1.07	0.08	39	1.16	0.10	37	1.05	0.11	13	1.07	0.08
4.25	8	1.10	0.05	14	1.18	0.09	8	1.10	0.06	2	1.02	0.06
5	3	1.05	0.08	2	1.23	0.06	5	1.09	0.05	2	1.01	0.04
Total	182	1.10	0.09	165	1.11	0.10	299	1.03	0.08	108	1.02	0.07

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

Table 5.5.7-14. Year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Year-Class	Rat L		Notigi L		Threepoint L				Footprint L		Apussigamasi L		Leftrook L			
	2010		2009		2009		2010		2010		2009		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2008	1	4.76	-	-	-	-	1	3.13	-	-	-	-	-	-	3	4.29
2007	6	28.57	4	7.14	1	1.72	6	18.75	11	26.83	2	10.00	2	1.85	2	2.86
2006	3	14.29	18	32.14	12	20.69	5	15.63	11	26.83	1	5.00	4	3.70	15	21.43
2005	6	28.57	16	28.57	20	34.48	7	21.88	5	12.20	1	5.00	10	9.26	30	42.86
2004	3	14.29	7	12.50	6	10.34	7	21.88	4	9.76	1	5.00	31	28.70	18	25.71
2003	-	-	4	7.14	5	8.62	2	6.25	5	12.20	-	-	25	23.15	2	2.86
2002	1	4.76	1	1.79	5	8.62	1	3.13	1	2.44	4	20.00	22	20.37	-	-
2001	-	-	4	7.14	5	8.62	2	6.25	2	4.88	2	10.00	4	3.70	-	-
2000	1	4.76	2	3.57	1	1.72	1	3.13	2	4.88	3	15.00	8	7.41	-	-
1999	-	-	-	-	2	3.45	-	-	-	-	3	15.00	1	0.93	-	-
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-	-	-	1	5.00	1	0.93	-	-
1996	-	-	-	-	1	1.72	-	-	-	-	1	5.00	-	-	-	-
1995	-	-	-	-	-	-	-	-	-	-	1	5.00	-	-	-	-
Total	21	100	56	100	58	100	32	100	41	100	20	100	108	100	70	100

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

Table 5.5.7-15. Year-class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Year-Class	Rat L		Notigi L		Threepoint L				Footprint L		Apussigamasi L		Leftrook L			
	2010		2009		2009		2010		2010		2009		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2007	1	100.00	-	-	-	-	-	-	-	-	-	-	-	-	1	1.30
2006	-	-	-	-	1	11.11	-	-	-	-	-	-	4	3.48	2	2.60
2005	-	-	-	-	2	22.22	1	50.00	-	-	3	7.89	4	3.48	10	12.99
2004	-	-	-	-	-	-	-	-	1	50.00	2	5.26	-	-	6	7.79
2003	-	-	-	-	1	11.11	-	-	1	50.00	4	10.53	5	4.35	3	3.90
2002	-	-	-	-	-	-	-	-	-	-	1	2.63	5	4.35	1	1.30
2001	-	-	-	-	1	11.11	-	-	-	-	-	-	7	6.09	4	5.19
2000	-	-	-	-	1	11.11	-	-	-	-	3	7.89	10	8.70	2	2.60
1999	-	-	-	-	-	-	1	50.00	-	-	2	5.26	13	11.30	3	3.90
1998	-	-	-	-	-	-	-	-	-	-	2	5.26	-	-	4	5.19
1997	-	-	-	-	-	-	-	-	-	-	2	5.26	1	0.87	4	5.19
1996	-	-	1	25.00	-	-	-	-	-	-	1	2.63	2	1.74	2	2.60
1995	-	-	1	25.00	-	-	-	-	-	-	3	7.89	5	4.35	3	3.90
1994	-	-	2	50.00	2	22.22	-	-	-	-	2	5.26	13	11.30	4	5.19
1993	-	-	-	-	-	-	-	-	-	-	4	10.53	11	9.57	7	9.09
1992	-	-	-	-	-	-	-	-	-	-	-	-	2	1.74	5	6.49
1991	-	-	-	-	-	-	-	-	-	-	3	7.89	5	4.35	2	2.60
1990	-	-	-	-	-	-	-	-	-	-	-	-	2	1.74	4	5.19
1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.30
1988	-	-	-	-	-	-	-	-	-	-	-	-	6	5.22	2	2.60
1987	-	-	-	-	-	-	-	-	-	-	-	-	5	4.35	1	1.30
1986	-	-	-	-	-	-	-	-	-	-	-	-	5	4.35	3	3.90
1985	-	-	-	-	-	-	-	-	-	-	-	-	3	2.61	1	1.30
1984	-	-	-	-	-	-	-	-	-	-	-	-	1	0.87	1	1.30
1983	-	-	-	-	-	-	-	-	-	-	1	2.63	6	5.22	-	-
1982	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.30
1981	-	-	-	-	-	-	-	-	-	-	3	7.89	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	1	2.63	-	-	-	-
1979	-	-	-	-	1	11.11	-	-	-	-	-	-	-	-	-	-
1978	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-	1	2.63	-	-	-	-
Total	1	100	4	100	9	100	2	100	2	100	38	100	115	100	77	100

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

Table 5.5.7-16. Year-class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Year-Class	Rat L		Notigi L		Threepoint L				Footprint L		Apussigamasi L		Leftrook L			
	2010		2009		2009		2010		2010		2009		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2008	-	-	-	-	-	-	1	1.14	-	-	-	-	-	-	-	-
2007	1	6.25	-	-	-	-	2	2.27	2	1.27	-	-	-	-	-	-
2006	3	18.75	-	-	-	-	6	6.82	10	6.37	2	1.22	1	0.34	2	1.85
2005	2	12.50	3	6.98	3	3.06	6	6.82	9	5.73	7	4.27	9	3.04	2	1.85
2004	-	-	5	11.63	10	10.20	3	3.41	5	3.18	5	3.05	11	3.72	3	2.78
2003	-	-	6	13.95	6	6.12	7	7.95	14	8.92	3	1.83	3	1.01	2	1.85
2002	2	12.50	4	9.30	6	6.12	16	18.18	32	20.38	10	6.10	16	5.41	9	8.33
2001	1	6.25	9	20.93	12	12.24	9	10.23	33	21.02	25	15.24	58	19.59	9	8.33
2000	2	12.50	6	13.95	11	11.22	2	2.27	13	8.28	16	9.76	28	9.46	13	12.04
1999	3	18.75	6	13.95	3	3.06	2	2.27	5	3.18	9	5.49	26	8.78	18	16.67
1998	1	6.25	1	2.33	8	8.16	2	2.27	2	1.27	11	6.71	17	5.74	12	11.11
1997	1	6.25	1	2.33	10	10.20	2	2.27	3	1.91	14	8.54	28	9.46	7	6.48
1996	-	-	1	2.33	9	9.18	15	17.05	18	11.46	13	7.93	17	5.74	6	5.56
1995	-	-	1	2.33	7	7.14	6	6.82	7	4.46	20	12.20	16	5.41	9	8.33
1994	-	-	-	-	6	6.12	1	1.14	2	1.27	16	9.76	15	5.07	6	5.56
1993	-	-	-	-	3	3.06	-	-	1	0.64	1	0.61	14	4.73	1	0.93
1992	-	-	-	-	-	-	1	1.14	1	0.64	1	0.61	1	0.34	1	0.93
1991	-	-	-	-	-	-	3	3.41	-	-	2	1.22	4	1.35		0.00
1990	-	-	-	-	-	-	3	3.41	-	-	5	3.05	7	2.36	1	0.93
1989	-	-	-	-	4	4.08	1	1.14	-	-	3	1.83	3	1.01	3	2.78
1988	-	-	-	-	-	-	-	-	-	-	1	0.61	14	4.73	3	2.78
1987	-	-	-	-	-	-	-	-	-	-	-	-	3	1.01	1	0.93
1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-	-	1	0.34	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-	2	0.68	-	-
1982	-	-	-	-			-	-	-	-	-	-	1	0.34	-	-
1981	-	-	-	-	-	-	-	-	-	-	-	-	1	0.34	-	-
Total	16	100	43	100	98	100	88	100	157	100	164	100	296	100	108	100

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

Table 5.5.7-17. Age frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Age	Rat L		Notigi L		Threepoint L				Footprint L		Apussigamasi L		Leftrook L			
	2010		2009		2009		2010		2010		2009		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2	1	4.76	4	7.14	1	1.72	1	3.13	-	-	2	10.00	2	1.85	3	4.29
3	6	28.57	18	32.14	12	20.69	6	18.75	11	26.83	1	5.00	4	3.70	2	2.86
4	3	14.29	16	28.57	20	34.48	5	15.63	11	26.83	1	5.00	10	9.26	15	21.43
5	6	28.57	7	12.50	6	10.34	7	21.88	5	12.20	1	5.00	31	28.70	30	42.86
6	3	14.29	4	7.14	5	8.62	7	21.88	4	9.76	-	-	25	23.15	18	25.71
7	-	-	1	1.79	5	8.62	2	6.25	5	12.20	4	20.00	22	20.37	2	2.86
8	1	4.76	4	7.14	5	8.62	1	3.13	1	2.44	2	10.00	4	3.70	-	-
9	-	-	2	3.57	1	1.72	2	6.25	2	4.88	3	15.00	8	7.41	-	-
10	1	4.76	-	-	2	3.45	1	3.13	2	4.88	3	15.00	1	0.93	-	-
11	-	-	-	-		0.00	-	-	-	-	-	-		0.00	-	-
12	-	-	-	-		0.00	-	-	-	-	1	5.00	1	0.93	-	-
13	-	-	-	-	1	1.72	-	-	-	-	1	5.00	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	1	5.00	-	-	-	-
Total	21	100	56	100	58	100	32	100	41	100	20	100	108	100	70	100

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

Table 5.5.7-18. Age frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Age	Rat L		Notigi L		Threepoint L				Footprint L		Apussigamasi L		Leftrook L			
	2010		2009		2009		2010		2010		2009		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	1	100.00	-	-	1	11.11	-	-	-	-	-	-	4	3.48	1	1.30
4	-	-	-	-	2	22.22	-	-	-	-	3	7.89	4	3.48	2	2.60
5	-	-	-	-	-	-	1	50.00	-	-	2	5.26	-	-	10	12.99
6	-	-	-	-	1	11.11	-	-	1	50.00	4	10.53	5	4.35	6	7.79
7	-	-	-	-	-	-	-	-	1	50.00	1	2.63	5	4.35	3	3.90
8	-	-	-	-	1	11.11	-	-	-	-	-	-	7	6.09	1	1.30
9	-	-	-	-	1	11.11	-	-	-	-	3	7.89	10	8.70	4	5.19
10	-	-	-	-	-	-	-	-	-	-	2	5.26	13	11.30	2	2.60
11	-	-	-	-	-	-	1	50.00	-	-	2	5.26	-	-	3	3.90
12	-	-	-	-	-	-	-	-	-	-	2	5.26	1	0.87	4	5.19
13	-	-	1	25.00	-	-	-	-	-	-	1	2.63	2	1.74	4	5.19
14	-	-	1	25.00	-	-	-	-	-	-	3	7.89	5	4.35	2	2.60
15	-	-	2	50.00	2	22.22	-	-	-	-	2	5.26	13	11.30	3	3.90
16	-	-	-	-	-	-	-	-	-	-	4	10.53	11	9.57	4	5.19
17	-	-	-	-	-	-	-	-	-	-	-	-	2	1.74	7	9.09
18	-	-	-	-	-	-	-	-	-	-	3	7.89	5	4.35	5	6.49
19	-	-	-	-	-	-	-	-	-	-	-	-	2	1.74	2	2.60
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5.19
21	-	-	-	-	-	-	-	-	-	-	-	-	6	5.22	1	1.30
22	-	-	-	-	-	-	-	-	-	-	-	-	5	4.35	2	2.60
23	-	-	-	-	-	-	-	-	-	-	-	-	5	4.35	1	1.30
24	-	-	-	-	-	-	-	-	-	-	-	-	3	2.61	3	3.90
25	-	-	-	-	-	-	-	-	-	-	-	-	1	0.87	1	1.30
26	-	-	-	-	-	-	-	-	-	-	1	2.63	6	5.22	1	1.30
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	3	7.89	-	-	1	1.30
29	-	-	-	-	-	-	-	-	-	-	1	2.63	-	-	-	-
30	-	-	-	-	1	11.11	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	1	2.63	-	-	-	-
Total	1	100	4	100	9	100	2	100	2	100	38	100	115	100	77	100

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

Table 5.5.7-19. Age frequency distributions (%) for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

Age	Rat L		Notigi L		Threepoint L				Footprint L		Apussigamasi L		Leftrook L			
	2010		2009		2009		2010		2010		2009		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2	-	-	-	-	-	-	1	1.14	-	-	-	-	-	-	-	-
3	1	6.25	-	-	-	-	2	2.27	2	1.27	2	1.22	1	0.34	-	-
4	3	18.75	3	6.98	3	3.06	6	6.82	10	6.37	7	4.27	9	3.04	2	1.85
5	2	12.50	5	11.63	10	10.20	6	6.82	9	5.73	5	3.05	11	3.72	2	1.85
6	-	-	6	13.95	6	6.12	3	3.41	5	3.18	3	1.83	3	1.01	3	2.78
7	-	-	4	9.30	6	6.12	7	7.95	14	8.92	10	6.10	16	5.41	2	1.85
8	2	12.50	9	20.93	12	12.24	16	18.18	32	20.38	25	15.24	58	19.59	9	8.33
9	1	6.25	6	13.95	11	11.22	9	10.23	33	21.02	16	9.76	28	9.46	9	8.33
10	2	12.50	6	13.95	3	3.06	2	2.27	13	8.28	9	5.49	26	8.78	13	12.04
11	3	18.75	1	2.33	8	8.16	2	2.27	5	3.18	11	6.71	17	5.74	18	16.67
12	1	6.25	1	2.33	10	10.20	2	2.27	2	1.27	14	8.54	28	9.46	12	11.11
13	1	6.25	1	2.33	9	9.18	2	2.27	3	1.91	13	7.93	17	5.74	7	6.48
14	-	-	1	2.33	7	7.14	15	17.05	18	11.46	20	12.20	16	5.41	6	5.56
15	-	-	-	-	6	6.12	6	6.82	7	4.46	16	9.76	15	5.07	9	8.33
16	-	-	-	-	3	3.06	1	1.14	2	1.27	1	0.61	14	4.73	6	5.56
17	-	-	-	-	-	-	-	-	1	0.64	1	0.61	1	0.34	1	0.93
18	-	-	-	-	-	-	1	1.14	1	0.64	2	1.22	4	1.35	1	0.93
19	-	-	-	-	-	-	3	3.41	-	-	5	3.05	7	2.36	-	-
20	-	-	-	-	4	4.08	3	3.41	-	-	3	1.83	3	1.01	1	0.93
21	-	-	-	-	-	-	1	1.14	-	-	1	0.61	14	4.73	3	2.78
22	-	-	-	-	-	-	-	-	-	-	-	-	3	1.01	3	2.78
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.93
24	-	-	-	-	-	-	-	-	-	-	-	-	1	0.34	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	2	0.68	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	1	0.34	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	1	0.34	-	-
Total	16	100	43	100	98	100	88	100	157	100	164	100	296	100	108	100

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

Table 5.5.7-20. 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, 2009-2010.

Age	Rat Lake										Notigi Lake									
	2010										2009									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
2	2008	1	300	-	1	171	-	1	0.63	-	2007	4	284	19	4	150	54	4	0.65	0.22
3	2007	6	324	22	6	224	47	6	0.65	0.03	2006	18	341	27	18	266	80	18	0.65	0.10
4	2006	3	407	48	3	435	126	3	0.64	0.04	2005	16	386	31	16	378	77	16	0.65	0.06
5	2005	6	424	22	6	492	95	6	0.64	0.05	2004	7	441	49	7	539	150	7	0.62	0.05
6	2004	3	511	28	3	772	208	3	0.57	0.08	2003	4	479	30	4	623	80	4	0.57	0.04
7	2003	-	-	-	-	-	-	-	-	-	2002	1	487	-	1	770	-	1	0.67	-
8	2002	1	532	-	1	1086	-	1	0.72	-	2001	4	579	37	4	1333	396	4	0.67	0.09
9	2001	-	-	-	-	-	-	-	-	-	2000	2	559	40	2	1100	311	2	0.62	0.04
10	2000	1	871	-	1	4500	-	1	0.68	-	1999	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-
14	1996	-	-	-	-	-	-	-	-	-	1995	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation.

Table 5.5.7-20. continued.

Age	Threepoint Lake																			
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	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	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2007	1	270	-	1	100	-	1	0.51	-	2008	1	325	-	1	204	-	1	0.59	-
3	2006	12	315	27	12	228	62	12	0.72	0.10	2007	6	353	22	6	266	43	6	0.60	0.06
4	2005	20	369	31	20	322	76	20	0.63	0.07	2006	5	411	18	5	438	75	5	0.63	0.05
5	2004	6	402	23	6	403	63	6	0.62	0.06	2005	7	454	41	7	609	135	7	0.65	0.09
6	2003	5	461	30	5	658	158	5	0.67	0.10	2004	7	529	36	7	1038	282	7	0.69	0.08
7	2002	5	515	48	5	1016	533	5	0.70	0.16	2003	2	588	61	2	1657	740	2	0.79	0.12
8	2001	5	535	32	5	1176	269	5	0.76	0.07	2002	1	680	-	1	2150	-	1	0.68	-
9	2000	1	675	-	1	2400	-	1	0.78	-	2001	2	745	18	2	4000	495	2	0.97	0.05
10	1999	2	582	1	2	1425	247	2	0.73	0.13	2000	1	760	-	1	4500	-	1	1.03	-
11	1998	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1996	1	681	-	1	2910	-	1	0.92	-	1997	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation.

Table 5.5.7-20. continued.

Age	Footprint Lake 2010 Year-Class	FL (mm) n	FL (mm) Mean	FL (mm) SD	W (g) n	W (g) Mean	W (g) SD	K n	K Mean	K SD	Apussigamasi Lake 2009 Year-Class	FL (mm) n	FL (mm) Mean	FL (mm) SD	W (g) n	W (g) Mean	W (g) SD	K n	K Mean	K SD
1	2009	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2007	2	312	19	2	202	66	2	0.66	0.09
3	2007	11	338	21	11	252	53	11	0.65	0.04	2006	1	396	-	1	348	-	1	0.56	-
4	2006	11	370	42	11	336	91	11	0.66	0.06	2005	1	426	-	1	500	-	1	0.65	-
5	2005	5	445	31	5	552	94	5	0.63	0.05	2004	1	545	-	1	1100	-	1	0.68	-
6	2004	4	507	34	4	878	187	4	0.67	0.04	2003	-	-	-	-	-	-	-	-	-
7	2003	5	537	36	5	1065	291	5	0.67	0.08	2002	4	665	96	4	2290	1100	4	0.74	0.03
8	2002	1	505	-	1	871	-	1	0.68	-	2001	2	736	68	2	3225	771	2	0.80	0.03
9	2001	2	666	39	2	2310	28	2	0.80	0.15	2000	3	802	35	3	4160	763	3	0.80	0.05
10	2000	2	679	30	2	2400	283	2	0.77	0.01	1999	3	861	29	3	4993	240	3	0.78	0.05
11	1999	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	1997	1	796	-	1	4540	-	1	0.90	-
13	1997	-	-	-	-	-	-	-	-	-	1996	1	990	-	1	7880	-	1	0.81	-
14	1996	-	-	-	-	-	-	-	-	-	1995	1	838	-	1	5230	-	1	0.89	-

n = number of fish; SD = standard deviation.

Table 5.5.7-20. continued.

Age	Leftrook Lake 2009 Year-Class	FL (mm) n	FL (mm) Mean	FL (mm) SD	W (g) n	W (g) Mean	W (g) SD	K n	K Mean	K SD	2010 Year-Class	FL (mm) n	FL (mm) Mean	FL (mm) SD	W (g) n	W (g) Mean	W (g) SD	K n	K Mean	K SD
1	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2007	2	341	4	2	260	14	2	0.66	0.01	2008	3	343	24	3	269	65	3	0.66	0.04
3	2006	4	376	36	4	405	131	4	0.75	0.07	2007	2	387	59	2	405	165	2	0.68	0.03
4	2005	10	444	27	10	597	71	10	0.68	0.05	2006	15	436	32	15	536	129	15	0.64	0.07
5	2004	31	465	26	31	660	97	31	0.66	0.06	2005	30	475	22	30	652	103	30	0.61	0.08
6	2003	25	480	20	25	694	75	25	0.63	0.07	2004	18	499	30	18	772	146	18	0.61	0.04
7	2002	22	496	37	22	780	182	22	0.63	0.06	2003	2	543	3	2	927	202	2	0.58	0.11
8	2001	4	496	34	4	765	132	4	0.62	0.02	2002	-	-	-	-	-	-	-	-	-
9	2000	8	550	59	8	1164	526	8	0.66	0.09	2001	-	-	-	-	-	-	-	-	-
10	1999	1	548	-	1	790	-	1	0.48	-	2000	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
12	1997	1	562	-	1	1000	-	1	0.56	-	1998	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation

Table 5.5.7-21. 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, 2009-2010.

Age	Rat Lake										Notigi Lake									
	2010										2009									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
3	2007	1	250	-	1	236	-	1	1.51	-	2006	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	2005	-	-	-	-	-	-	-	-	-
5	2005	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-
6	2004	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-		-	-	-
7	2003	-	-	-	-	-	-	-	-	-	2002	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
11	1999	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	1996	1	450	-	1	1810	-	1	1.99	-
14	1996	-	-	-	-	-	-	-	-	-	1995	1	469	-	1	1900	-	1	1.84	-
15	1995	-	-	-	-	-	-	-	-	-	1994	2	497	16	2	2645	64	2	2.17	0.16

n = number of fish; SD = standard deviation

Table 5.5.7-21. continued.

Age	Threepoint Lake																			
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	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	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2006	1	178	-	1	100	-	1	1.77	-	2007	-	-	-	-	-	-	-	-	-
4	2005	2	279	92	2	355	65	2	1.63	0.04	2006	-	-	-	-	-	-	-	-	-
5	2004	-	-	-	-	-	-	-	-	-	2005	1	335	-	1	491	-	1	1.31	-
6	2003	1	336	-	1	600	-	1	1.58	-	2004	-	-	-	-	-	-	-	-	-
7	2002	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-	-	-	-	-
8	2001	1	388	-	1	980	-	1	1.68	-	2002	-	-	-	-	-	-	-	-	-
9	2000	1	436	-	1	1320	-	1	1.59	-	2001	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	1999	1	442		1	1288		1	1.49	-
12	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-
15	1994	2	433	32	2	1410	310	2	1.72	0.16	1995	-	-	-	-	-	-	-	-	-
16	1993	-	-	-	-	-	-	-	-	-	1994	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-
19	1990	-	-	-	-	-	-	-	-	-	1991	-	-	-	-	-	-	-	-	-
20	1989	-	-	-	-	-	-	-	-	-	1990	-	-	-	-	-	-	-	-	-
21	1988	-	-	-	-	-	-	-	-	-	1989	-	-	-	-	-	-	-	-	-
22	1987	-	-	-	-	-	-	-	-	-	1988	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	1987	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	1986	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	1985	-	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	-	-	-	1984	-	-	-	-	-	-	-	-	-
27	1982	-	-	-	-	-	-	-	-	-	1983	-	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	-	-	-	-	-	1982	-	-	-	-	-	-	-	-	-
29	1980	-	-	-	-	-	-	-	-	-	1981	-	-	-	-	-	-	-	-	-
30	1979	1	470	-	1	1520	-	1	1.46	-	1980	-	-	-	-	-	-	-	-	-
31	1978	-	-	-	-	-	-	-	-	-	1979	-	-	-	-	-	-	-	-	-
32	1977	-	-	-	-	-	-	-	-	-	1978	-	-	-	-	-	-	-	-	-
33	1976	-	-	-	-	-	-	-	-	-	1977	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation

Table 5.5.7-21. continued.

Age	Footprint Lake										Apussigamasi Lake									
	2010										2009									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	2005	3	331	58	3	647	332	3	1.66	0.15
5	2005	-	-	-	-	-	-	-	-	-	2004	2	408	32	2	1145	177	2	1.70	0.13
6	2004	-	-	-	1	628	-	-	-	-	2003	4	371	34	4	953	299	4	1.81	0.22
7	2003	-	-	-	1	1588	-	-	-	-	2002	1	402	-	1	1230	-	1	1.89	-
8	2002	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	2000	3	411	40	3	1275	379	3	1.80	0.01
10	2000	-	-	-	-	-	-	-	-	-	1999	2	457	16	2	1820	170	2	1.91	0.03
11	1999	-	-	-	-	-	-	-	-	-	1998	2	469	30	2	1765	276	2	1.71	0.06
12	1998	-	-	-	-	-	-	-	-	-	1997	2	492	47	2	2233	1071	2	1.81	0.37
13	1997	-	-	-	-	-	-	-	-	-	1996	1	513	-	1	2430	-	1	1.80	-
14	1996	-	-	-	-	-	-	-	-	-	1995	3	458	18	3	1553	155	3	1.62	0.13
15	1995	-	-	-	-	-	-	-	-	-	1994	2	445	1	2	1360	71	2	1.55	0.08
16	1994	-	-	-	-	-	-	-	-	-	1993	4	497	21	4	2428	264	4	1.98	0.17
17	1993	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	1991	3	508	38	3	2453	595	3	1.85	0.05
19	1991	-	-	-	-	-	-	-	-	-	1990	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	1989	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	1988	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	1987	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	1986	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	1985	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	1984	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	1983	1	487	-	1	1520	-	1	1.32	-
27	1983	-	-	-	-	-	-	-	-	-	1982	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-	1981	3	496	14	3	2187	234	3	1.79	0.12
29	1981	-	-	-	-	-	-	-	-	-	1980	1	466	-	1	1700	-	1	1.68	-
30	1980	-	-	-	-	-	-	-	-	-	1979	-	-	-	-	-	-	-	-	-
31	1979	-	-	-	-	-	-	-	-	-	1978	-	-	-	-	-	-	-	-	-
32	1978	-	-	-	-	-	-	-	-	-	1977	-	-	-	-	-	-	-	-	-
33	1977	-	-	-	-	-	-	-	-	-	1976	1	445	-	1	1470	-	1	1.67	-

n = number of fish; SD = standard deviation

Table 5.5.7-21. continued.

Age	Leftrook Lake																			
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	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	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2006	4	312	95	4	565	544	4	1.49	0.10	2007	1	341	-	1	529	-	1	1.33	-
4	2005	4	338	41	4	628	249	4	1.53	0.17	2006	2	297	114	2	377	392	2	1.11	0.16
5	2004	-	-	-	-	-	-	-	-	-	2005	10	349	38	10	623	227	10	1.42	0.09
6	2003	5	408	9	5	1060	82	5	1.57	0.13	2004	6	381	41	6	823	288	6	1.43	0.15
7	2002	5	396	42	5	1040	308	5	1.62	0.12	2003	3	417	15	3	1030	105	3	1.42	0.06
8	2001	7	435	11	7	1369	128	7	1.66	0.13	2002	1	415	-	1	1129	-	1	1.58	-
9	2000	10	427	21	10	1266	222	10	1.61	0.10	2001	4	439	12	4	1147	98	4	1.36	0.06
10	1999	13	438	8	13	1362	134	13	1.62	0.13	2000	2	419	12	2	1003	132	2	1.37	0.06
11	1998	-	-	-	-	-	-	-	-	-	1999	3	442	15	3	1291	121	3	1.50	0.10
12	1997	1	445	-	1	1380	-	1	1.57	-	1998	4	437	20	4	1161	83	4	1.40	0.12
13	1996	2	466	62	2	1515	587	2	1.46	0.00	1997	4	435	7	4	1086	114	4	1.32	0.12
14	1995	5	460	18	5	1526	264	5	1.57	0.23	1996	2	474	4	2	1684	62	2	1.58	0.01
15	1994	13	462	20	13	1583	254	13	1.59	0.11	1995	3	453	34	3	1499	355	3	1.61	0.38
16	1993	11	453	20	11	1510	287	11	1.60	0.11	1994	4	457	36	4	1313	280	4	1.37	0.08
17	1992	2	472	19	2	1865	290	2	1.77	0.06	1993	7	445	14	7	1354	188	7	1.54	0.22
18	1991	5	463	30	5	1696	369	5	1.69	0.07	1992	5	476	15	5	1638	121	5	1.52	0.08
19	1990	2	467	54	2	1630	523	2	1.58	0.04	1991	2	484	52	2	1531	380	2	1.35	0.09
20	1989	-	-	-	-	-	-	-	-	-	1990	4	456	19	4	1380	415	4	1.43	0.24
21	1988	6	483	20	6	1692	323	6	1.49	0.15	1989	1	450	-	1	1362	-	1	1.49	-
22	1987	5	477	22	5	1704	280	5	1.56	0.16	1988	2	470	36	2	1443	239	2	1.40	0.09
23	1986	5	473	26	5	1714	416	5	1.59	0.15	1987	1	480	-	1	1408	-	1	1.27	-
24	1985	3	481	46	3	1867	410	3	1.67	0.11	1986	3	452	9	3	1196	176	3	1.29	0.16
25	1984	1	476	-	1	2070	-	1	1.92	-	1985	1	435	-	1	1109	-	1	1.35	-
26	1983	6	467	23	6	1515	348	6	1.47	0.15	1984	1	465	-	1	1218	-	1	1.21	-
27	1982	-	-	-	-	-	-	-	-	-	1983	-	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	-	-	-	-	-	1982	1	452	-	1	967	-	1	1.05	-

n = number of fish; SD = standard deviation

Table 5.5.7-22. 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, 2009-2010.

Age	Rat Lake										Notigi Lake									
	2010										2009									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
3	2007	1	219	-	1	98	-	1	0.93	-	2006	-	-	-	-	-	-	-	-	-
4	2006	3	231	11	3	117	10	3	0.95	0.06	2005	3	246	19	3	187	31	3	1.27	0.28
5	2005	2	316	13	2	340	38	2	1.08	0.01	2004	5	293	30	5	288	50	5	1.16	0.17
6	2004	-	-	-	-	-	-	-	-	-	2003	6	347	16	6	413	59	6	0.99	0.06
7	2003	-	-	-	-	-	-	-	-	-	2002	4	365	27	4	555	147	4	1.12	0.05
8	2002	2	346	6	2	460	29	2	1.11	0.01	2001	9	405	25	9	710	136	9	1.06	0.06
9	2001	1	464	-	1	960	-	1	0.96	-	2000	6	401	36	6	702	226	6	1.06	0.07
10	2000	2	365	21	2	520	134	2	1.06	0.09	1999	6	439	32	6	918	197	6	1.07	0.04
11	1999	3	409	8	3	778	107	3	1.13	0.10	1998	1	453	-	1	900	-	1	0.97	-
12	1998	1	405	-	1	695	-	1	1.05	-	1997	1	509	-	1	1250	-	1	0.95	-
13	1997	1	501	-	1	1400	-	1	1.11	-	1996	1	451	-	1	1000	-	1	1.09	-
14	1996	-	-	-	-	-	-	-	-	-	1995	1	463	-	1	1100	-	1	1.11	-
15	1995	-	-	-	-	-	-	-	-	-	1994	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
17	1993	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-
18	1992	-	-	-	-	-	-	-	-	-	1991	-	-	-	-	-	-	-	-	-
19	1991	-	-	-	-	-	-	-	-	-	1990	-	-	-	-	-	-	-	-	-
20	1990	-	-	-	-	-	-	-	-	-	1989	-	-	-	-	-	-	-	-	-
21	1989	-	-	-	-	-	-	-	-	-	1988	-	-	-	-	-	-	-	-	-
22	1988	-	-	-	-	-	-	-	-	-	1987	-	-	-	-	-	-	-	-	-
23	1987	-	-	-	-	-	-	-	-	-	1986	-	-	-	-	-	-	-	-	-
24	1986	-	-	-	-	-	-	-	-	-	1985	-	-	-	-	-	-	-	-	-
25	1985	-	-	-	-	-	-	-	-	-	1984	-	-	-	-	-	-	-	-	-
26	1984	-	-	-	-	-	-	-	-	-	1983	-	-	-	-	-	-	-	-	-
27	1983	-	-	-	-	-	-	-	-	-	1982	-	-	-	-	-	-	-	-	-
28	1982	-	-	-	-	-	-	-	-	-	1981	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation

Table 5.5.7-22. continued.

Age	Threepoint Lake																			
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	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	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	2008	1	210	-	1	93	-	1	1.00	-
3	2006	-	-	-	-	-	-	-	-	-	2007	2	224	23	2	113	27	2	1.00	0.06
4	2005	3	240	27	3	125	48	3	0.89	0.17	2006	6	245	23	6	154	46	6	1.02	0.07
5	2004	10	230	17	10	132	45	10	1.08	0.34	2005	6	288	59	6	269	202	6	1.01	0.04
6	2003	6	274	31	6	225	113	6	1.03	0.22	2004	3	335	18	3	384	40	3	1.02	0.06
7	2002	6	337	29	6	443	117	6	1.14	0.06	2003	7	354	21	7	448	82	7	1.00	0.04
8	2001	12	317	26	12	357	114	12	1.09	0.12	2002	16	357	30	16	474	121	16	1.02	0.05
9	2000	11	339	33	11	447	147	11	1.11	0.10	2001	9	377	33	9	569	146	9	1.04	0.04
10	1999	3	354	18	3	450	56	3	1.01	0.05	2000	2	370	14	2	491	34	2	0.97	0.04
11	1998	8	372	43	8	576	210	8	1.08	0.06	1999	2	369	10	2	503	11	2	1.00	0.06
12	1997	10	397	46	10	716	292	10	1.10	0.11	1998	2	372	14	2	561	58	2	1.09	0.01
13	1996	9	398	40	9	732	204	9	1.13	0.09	1997	2	399	1	2	787	37	2	1.24	0.04
14	1995	7	408	14	7	776	91	7	1.14	0.07	1996	15	393	32	15	684	169	15	1.10	0.09
15	1994	6	409	37	6	753	225	6	1.07	0.07	1995	6	365	26	6	546	141	6	1.11	0.07
16	1993	3	425	32	3	857	215	3	1.11	0.16	1994	1	481	-	1	1256	-	1	1.13	-
17	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	1992	1	388	-	1	610	-	1	1.04	-
19	1990	-	-	-	-	-	-	-	-	-	1991	3	364	39	3	542	222	3	1.08	0.08
20	1989	4	411	32	4	753	92	4	1.10	0.19	1990	3	359	28	3	517	105	3	1.11	0.06
21	1988	-	-	-	-	-	-	-	-	-	1989	1	390	-	1	617	-	1	1.04	-
22	1987	-	-	-	-	-	-	-	-	-	1988	-	-	-	-	-	-	-	-	-
23	1986	-	-	-	-	-	-	-	-	-	1987	-	-	-	-	-	-	-	-	-
24	1985	-	-	-	-	-	-	-	-	-	1986	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	1985	-	-	-	-	-	-	-	-	-
26	1983	-	-	-	-	-	-	-	-	-	1984	-	-	-	-	-	-	-	-	-
27	1982	-	-	-	-	-	-	-	-	-	1983	-	-	-	-	-	-	-	-	-
28	1981	-	-	-	-	-	-	-	-	-	1982	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation

Table 5.5.7-22. continued.

Age	Footprint Lake 2010										Apussigamasi Lake 2009									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2009	-	-	-	-		-	-	-	-	2008	-	-	-	-		-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
3	2007	2	217	1	2	106	2	2	1.04	0.01	2006	2	209	13	2	93	25	2	1.00	0.08
4	2006	10	243	31	10	154	55	10	1.03	0.08	2005	7	238	16	7	134	25	7	0.98	0.05
5	2005	9	287	27	9	249	63	9	1.04	0.10	2004	5	241	21	5	147	43	5	1.02	0.03
6	2004	5	324	18	5	368	76	5	1.07	0.07	2003	3	355	33	3	497	121	3	1.10	0.03
7	2003	14	341	20	14	422	65	14	1.07	0.09	2002	10	317	32	10	355	85	10	1.11	0.09
8	2002	32	356	22	32	484	94	32	1.06	0.08	2001	25	330	21	25	399	92	25	1.09	0.08
9	2001	33	365	30	33	526	121	33	1.07	0.09	2000	16	354	35	16	476	150	16	1.04	0.07
10	2000	13	368	22	13	522	93	13	1.04	0.06	1999	9	373	37	9	586	202	9	1.08	0.10
11	1999	5	382	18	5	589	85	5	1.05	0.08	1998	11	363	32	11	567	177	11	1.15	0.13
12	1998	2	408	46	2	774	245	2	1.13	0.02	1997	14	413	58	14	875	396	14	1.17	0.06
13	1997	3	384	31	3	651	190	3	1.13	0.10	1996	13	404	31	13	776	238	13	1.15	0.11
14	1996	18	402	20	18	702	112	18	1.07	0.08	1995	20	399	39	20	758	217	20	1.15	0.08
15	1995	7	396	19	7	607	125	7	0.97	0.14	1994	16	404	45	16	772	277	16	1.14	0.11
16	1994	2	383	38	2	583	117	2	1.04	0.10	1993	1	345	-	1	495	-	1	1.21	-
17	1993	1	350	-	1	396	-	1	0.92	-	1992	1	396	-	1	755	-	1	1.22	-
18	1992	1	350	-	1	400	-	1	0.93	-	1991	2	398	21	2	685	35	2	1.10	0.11
19	1991	-	-	-	-	-	-	-	-	-	1990	5	400	22	5	767	130	5	1.19	0.02
20	1990	-	-	-	-	-	-	-	-	-	1989	3	471	25	3	1180	148	3	1.12	0.04
21	1989	-	-	-	-	-	-	-	-	-	1988	1	532	-	1	1890	-	1	1.26	-

n = number of fish; SD = standard deviation

Table 5.5.7-22. continued.

Age	Leftrook Lake 2009 Year-Class	FL (mm) n	FL Mean	FL SD	W (g) n	W Mean	W SD	K n	K Mean	K SD	2010 Year-Class	FL (mm) n	FL Mean	FL SD	W (g) n	W Mean	W SD	K n	K Mean	K SD
1	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2006	1	231	-	1	120	-	1	0.97	-	2007	-	-	-	-	-	-	-	-	-
4	2005	9	236	21	9	133	39	9	0.99	0.07	2006	2	216	8	2	101	6	2	1.01	0.06
5	2004	11	268	17	11	196	44	11	1.00	0.06	2005	2	308	11	2	299	31	2	1.03	0.00
6	2003	3	303	47	3	310	115	3	1.08	0.06	2004	3	289	21	3	247	57	3	1.02	0.03
7	2002	16	338	15	16	407	65	16	1.05	0.07	2003	2	329	1	2	352	37	2	0.99	0.09
8	2001	58	346	19	58	436	72	58	1.04	0.06	2002	9	360	24	9	484	103	9	1.03	0.08
9	2000	28	352	20	28	453	74	28	1.03	0.06	2001	9	350	13	9	454	57	9	1.06	0.07
10	1999	26	365	19	26	501	73	26	1.03	0.08	2000	13	356	17	13	461	90	13	1.01	0.10
11	1998	17	373	24	17	534	99	17	1.02	0.07	1999	18	361	17	18	489	67	18	1.03	0.04
12	1997	28	382	20	28	583	94	28	1.04	0.08	1998	12	384	24	12	603	118	12	1.06	0.09
13	1996	17	374	21	17	568	84	17	1.08	0.10	1997	7	386	32	7	578	138	7	1.00	0.06
14	1995	16	381	18	16	579	80	16	1.04	0.07	1996	6	386	25	6	588	95	6	1.02	0.09
15	1994	15	383	13	15	611	63	15	1.09	0.08	1995	9	394	26	9	641	135	9	1.04	0.06
16	1993	14	387	23	14	601	89	14	1.04	0.10	1994	6	384	25	6	567	106	6	0.99	0.06
17	1992	1	395	-	1	600	-	1	0.97	-	1993	1	386	-	1	637	-	1	1.11	-
18	1991	4	405	36	4	723	197	4	1.07	0.03	1992	1	424	-	1	777	-	1	1.02	-
19	1990	7	401	17	7	619	76	7	0.96	0.04	1991	-	-	-	-	-	-	-	-	-
20	1989	3	379	11	3	540	72	3	1.00	0.16	1990	1	415	-	1	621	-	1	0.87	-
21	1988	14	415	35	14	699	173	14	0.96	0.09	1989	3	394	9	3	551	81	3	0.90	0.07
22	1987	3	394	5	3	610	36	3	1.00	0.02	1988	3	400	21	3	645	94	3	1.01	0.03
23	1986	-	-	-	-	-	-	-	-	-	1987	1	410	-	1	646	-	1	0.94	-
24	1985	1	391	-	1	660	-	1	1.10	-	1986	-	-	-	-	-	-	-	-	-
25	1984	-	-	-	-	-	-	-	-	-	1985	-	-	-	-	-	-	-	-	-
26	1983	2	389	33	2	655	163	2	1.10	0.00	1984	-	-	-	-	-	-	-	-	-
27	1982	1	421	-	1	880	-	1	1.18	-	1983	-	-	-	-	-	-	-	-	-
28	1981	1	470	-	1	950	-	1	0.92	-	1982	-	-	-	-	-	-	-	-	-

n = number of fish; SD = standard deviation

Table 5.5.7-23. 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, 2009-2010.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Rat Lake											
White Sucker	1	2.17	-	-	-	-	-	-	46	1	2.17
Northern Pike	-	-	-	-	-	-	-	-	21	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	3	0	0.00
Walleye	-	-	-	-	-	-	-	-	22	0	0.00
Total	1	2.17	-	-	-	-	-	-	92	1	2.17
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
Total	-	-	1	0.57	-	-	-	-	278	1	0.57
Threepoint Lake											
White Sucker	1	0.45	-	-	1	0.45	-	-	221	2	0.90
Northern Pike	1	1.11	-	-	-	-	-	-	90	1	1.11
Lake Whitefish	-	-	-	-	-	-	-	-	11	0	0.00
Walleye	1	0.51	-	-	-	-	-	-	196	1	0.51
Total	3	2.07	-	-	1	0.45	-	-	518	4	2.52
Footprint Lake											
White Sucker	-	-	-	-	1	0.65	-	-	155	1	0.65
Northern Pike	-	-	-	-	-	-	-	-	42	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	2	0	0.00
Walleye	-	-	-	-	-	-	-	-	182	0	0.00
Total	-	-	-	-	1	0.65	-	-	381	1	0.65
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
Total	1	1.30	1	1.30	4	10.30	4	2.42	305	10	15.32
Leftrook Lake											
White Sucker	10	1.83	-	-	-	-	-	-	547	10	1.83
Northern Pike	3	1.68	-	-	-	-	-	-	179	3	1.68
Lake Whitefish	3	1.46	-	-	-	-	-	-	206	3	1.46
Walleye	1	0.25	-	-	-	-	3	0.74	407	4	0.98
Total	17	5.21	-	-	-	-	3	0.74	1339	20	5.95

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

Table 5.5.7-24. Churchill River Diversion Region Index of Biotic Integrity (IBI) values, 2009-2010.

Metric	Non standardized values							
	Rat L	Notigi L	Threepoint L		Footprint L	Apussigamasi L	Leftrook L	
	2010	2009	2009	2010	2010	2009	2009	2010
Number of species	12	12	13	13	12	16	10	9
Number of sensitive species	2	2	3	3	3	5	2	2
Proportion of tolerant individuals	22.0	39.3	17.8	23.5	28.3	15.1	27.3	20.5
Number of Insectivore species	7	7	8	8	7	11	6	6
Hill's Evenness Index	7.98	6.72	7.58	6.94	5.30	8.28	6.08	7.91
Insectivore biomass	29.4	7.5	9.4	5.3	8.6	23.9	24.5	31.4
Omnivore biomass	44.6	63.1	52.8	49.0	50.0	25.9	41.2	40.4
Piscivore biomass	26.0	29.4	37.9	45.7	41.3	50.1	34.3	28.1
Proportion lithophilic spawners	0.72	0.66	0.48	0.72	0.84	0.80	0.74	0.55
CPUE	22.9	32.7	36.0	19.2	42.1	44.5	94.6	67.1
% individuals with DELTS	0.83	0.34	0.27	1.23	0.25	3.64	1.36	1.75
	IBI Scores							
Number of species	6.0	6.0	6.5	6.5	6.0	8.0	5.0	4.5
Number of sensitive species	2.4	2.4	3.6	3.6	3.6	6.0	2.4	2.4
Proportion of tolerant individuals	6.3	3.3	7.0	6.0	5.2	7.4	5.4	6.5
Number of Insectivore species	5.3	5.3	6.0	6.0	5.3	8.3	4.5	4.5
Hill's Evenness Index	6.9	5.8	6.6	6.0	4.6	7.2	5.3	6.9
Insectivore biomass	5.3	1.4	1.7	1.0	1.6	4.3	4.4	5.7
Omnivore biomass	3.3	0.5	2.1	2.7	2.5	6.1	3.8	3.9
Piscivore biomass	2.6	2.9	3.8	4.6	4.1	5.0	3.4	2.8
Proportion lithophilic spawners	7.2	6.6	4.8	7.2	8.4	8.0	7.4	5.5
CPUE	2.3	3.3	3.6	1.9	4.2	4.5	9.5	6.7
% individuals with DELTS	4.6	4.8	4.9	4.4	4.9	3.2	4.3	4.1
Total IBI	52.1	42.4	50.5	49.8	50.3	67.9	55.4	53.6

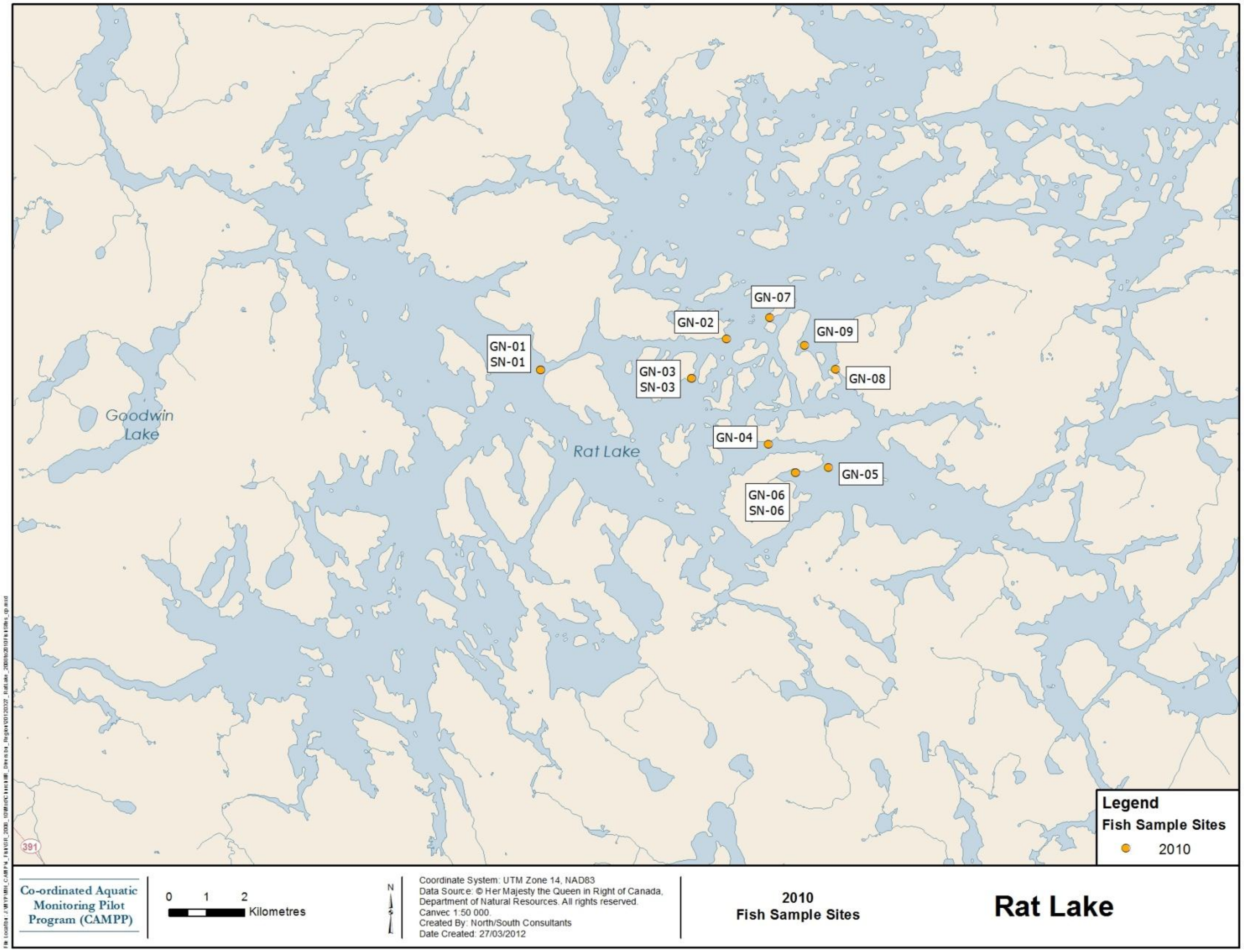


Figure 5.5.7-1. Map depicting standard gang and small mesh index gillnet sites sampled in Rat Lake, 2010.

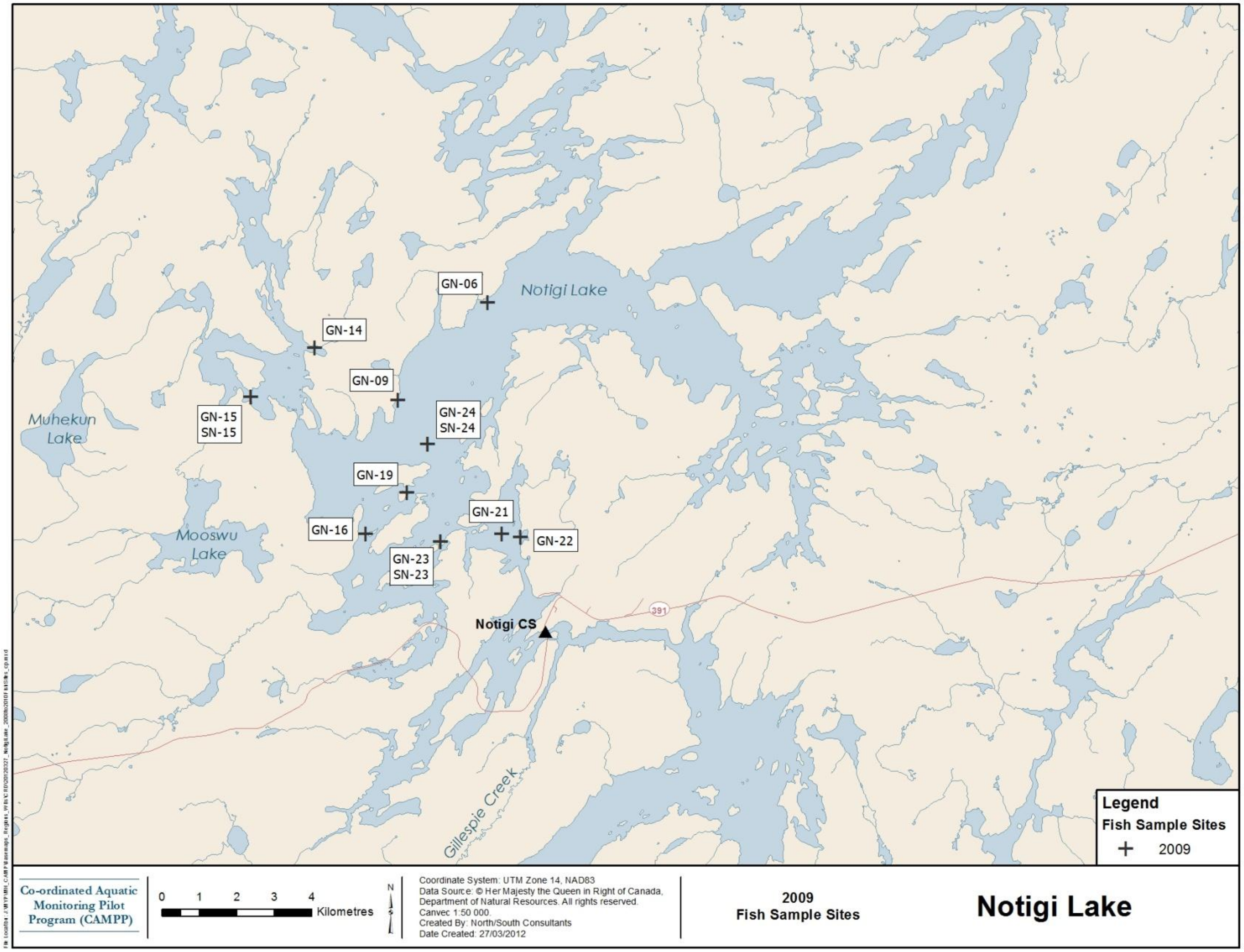


Figure 5.5.7-2 Map depicting standard gang and small mesh index gillnet sites sampled in Notigi Lake, 2009.

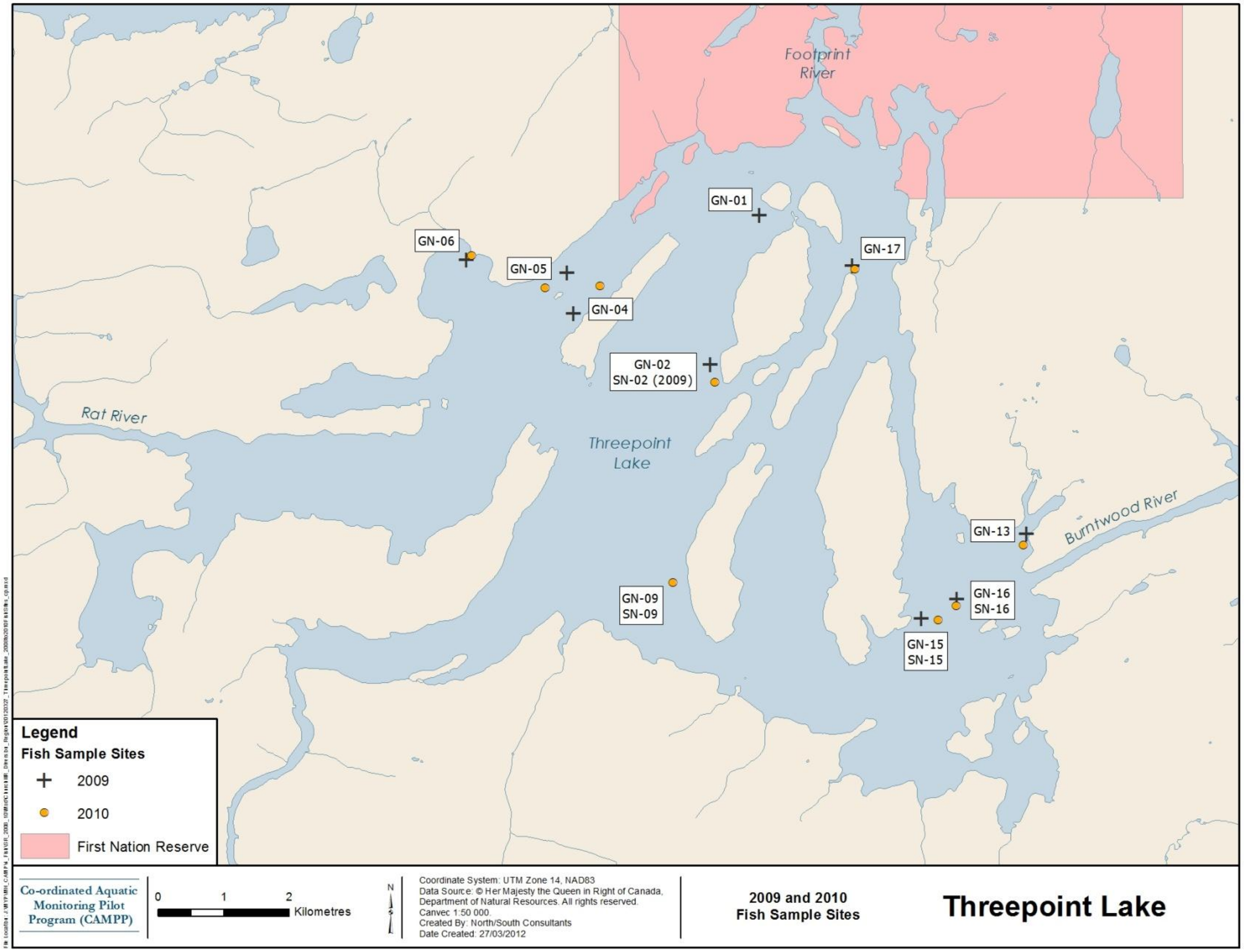


Figure 5.5.7-3 Map depicting standard gang and small mesh index gillnet sites sampled in Threepoint Lake, 2009-2010.

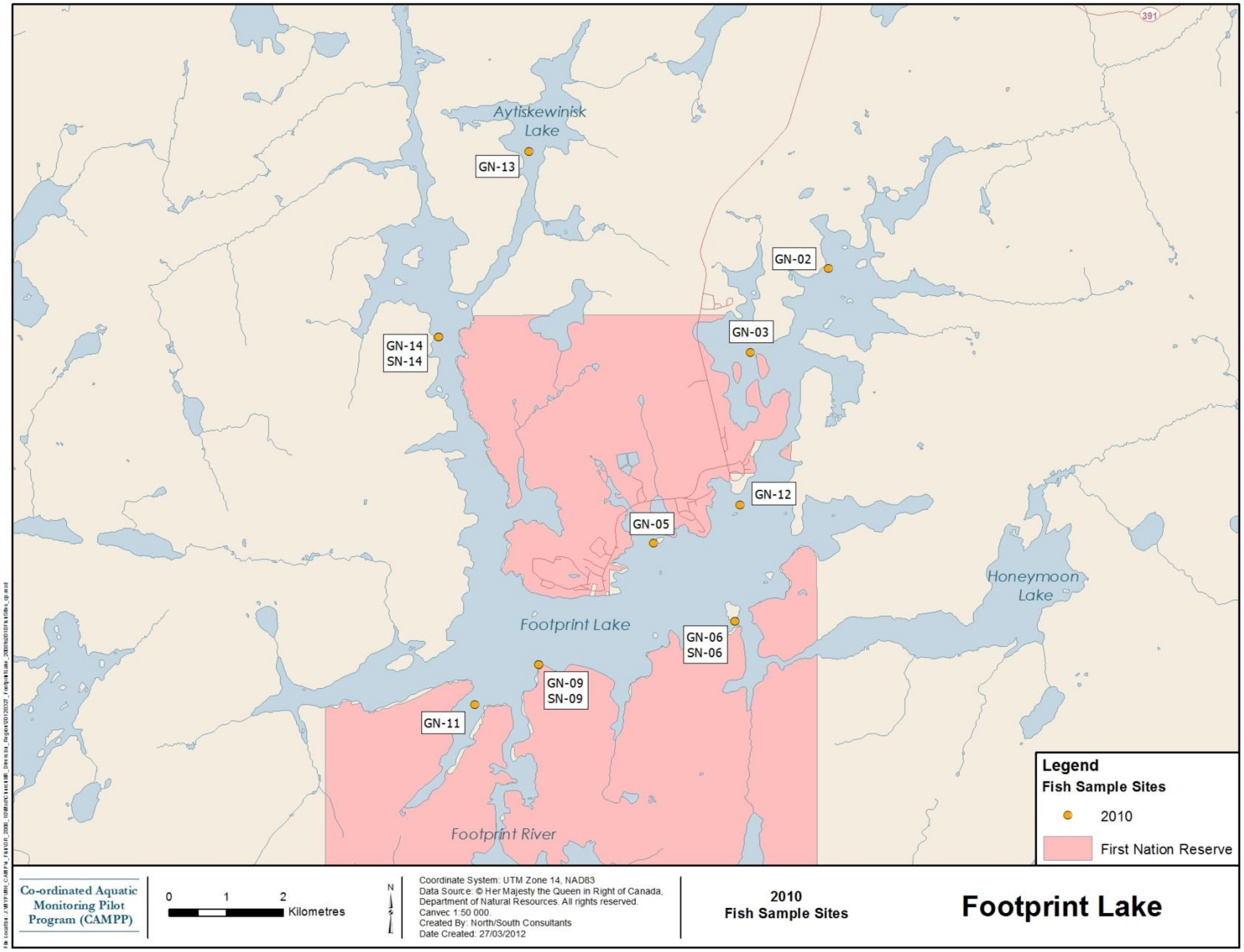


Figure 5.5.7-4 Map depicting standard gang and small mesh index gillnet sites sampled in Footprint Lake, 2010.

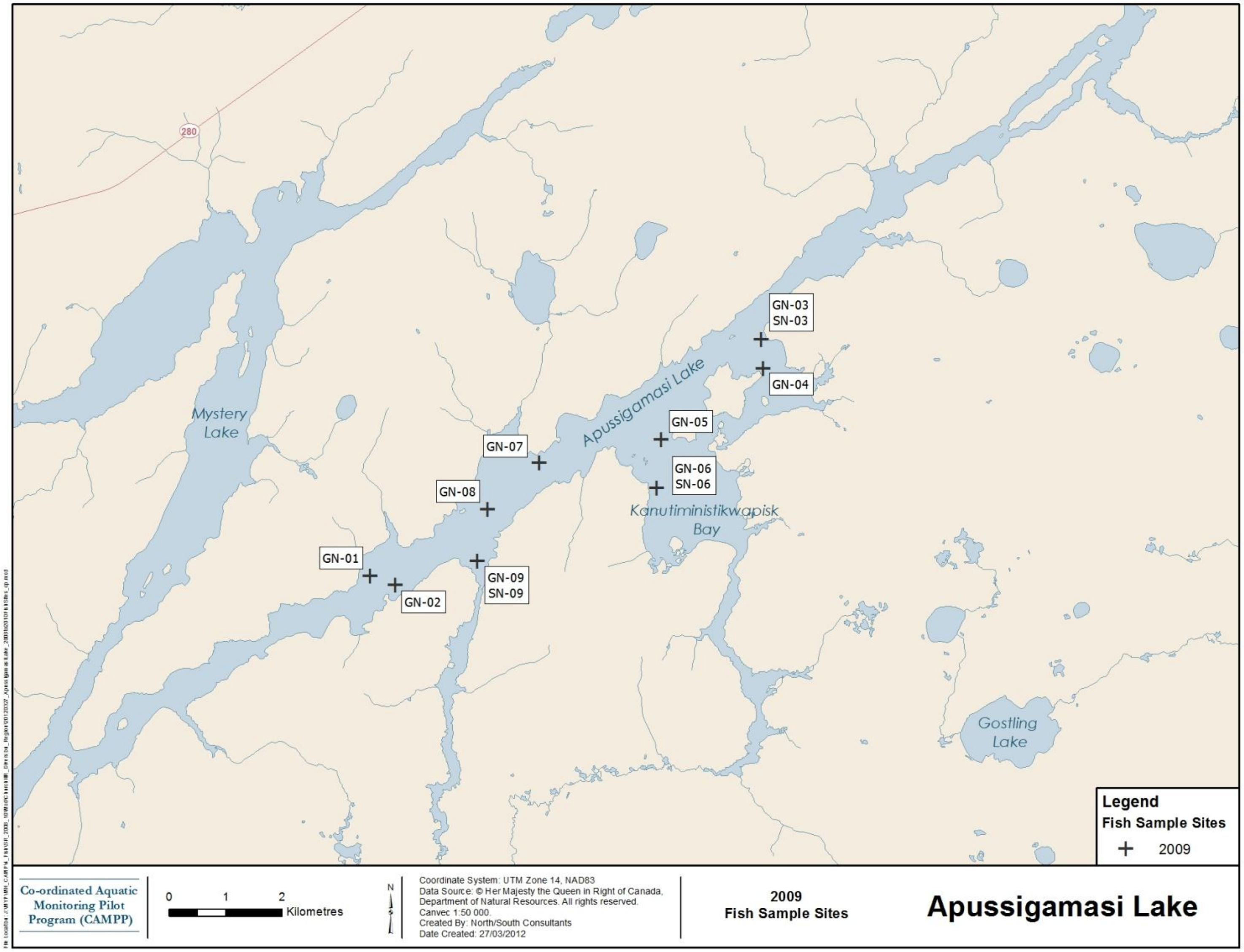


Figure 5.5.7-5 Map depicting standard gang and small mesh index gillnet sites sampled in Apussigamasi Lake, 2009.

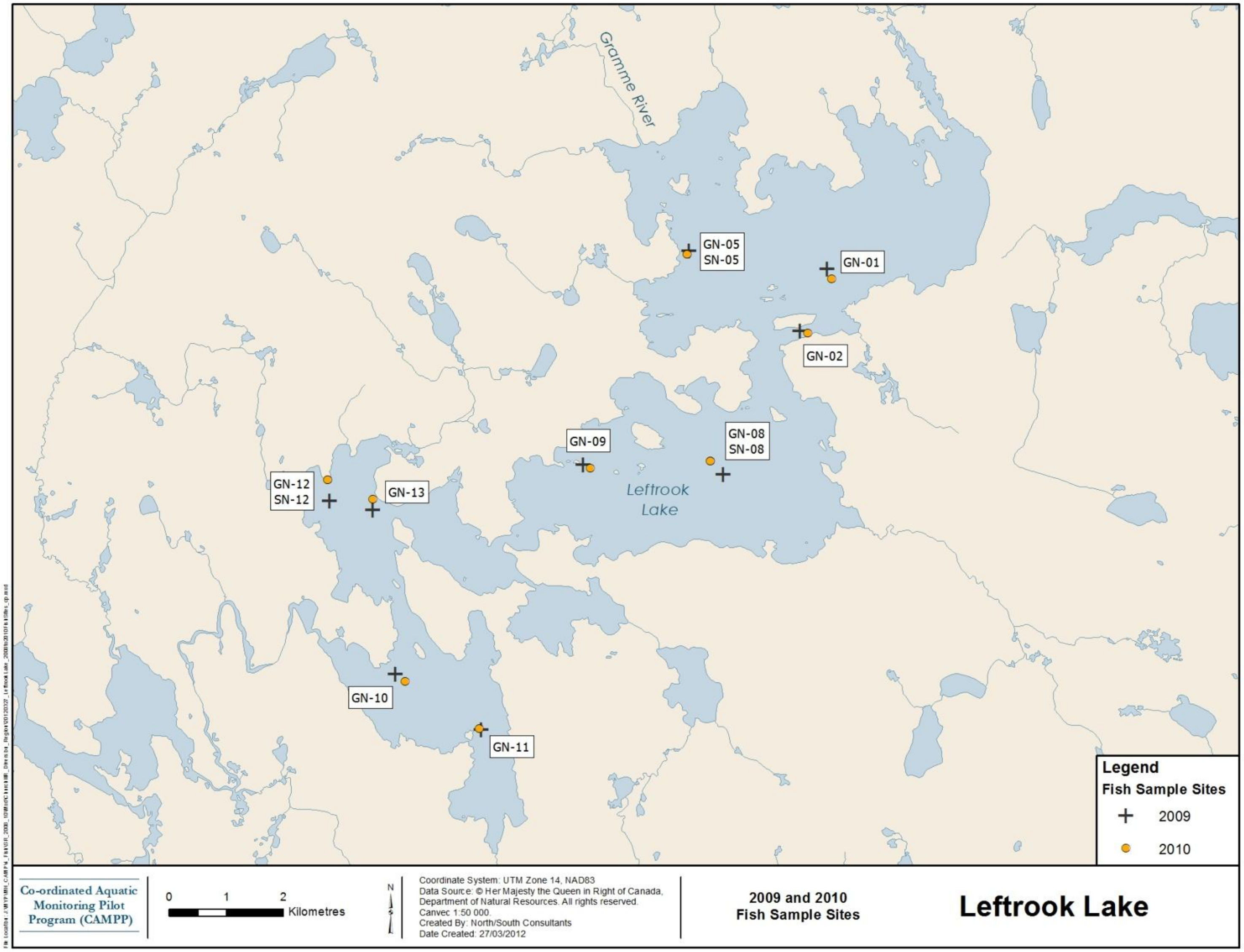


Figure 5.5.7-6 Map depicting standard gang and small mesh index gillnet sites sampled in Leftrook Lake, 2009-2010.

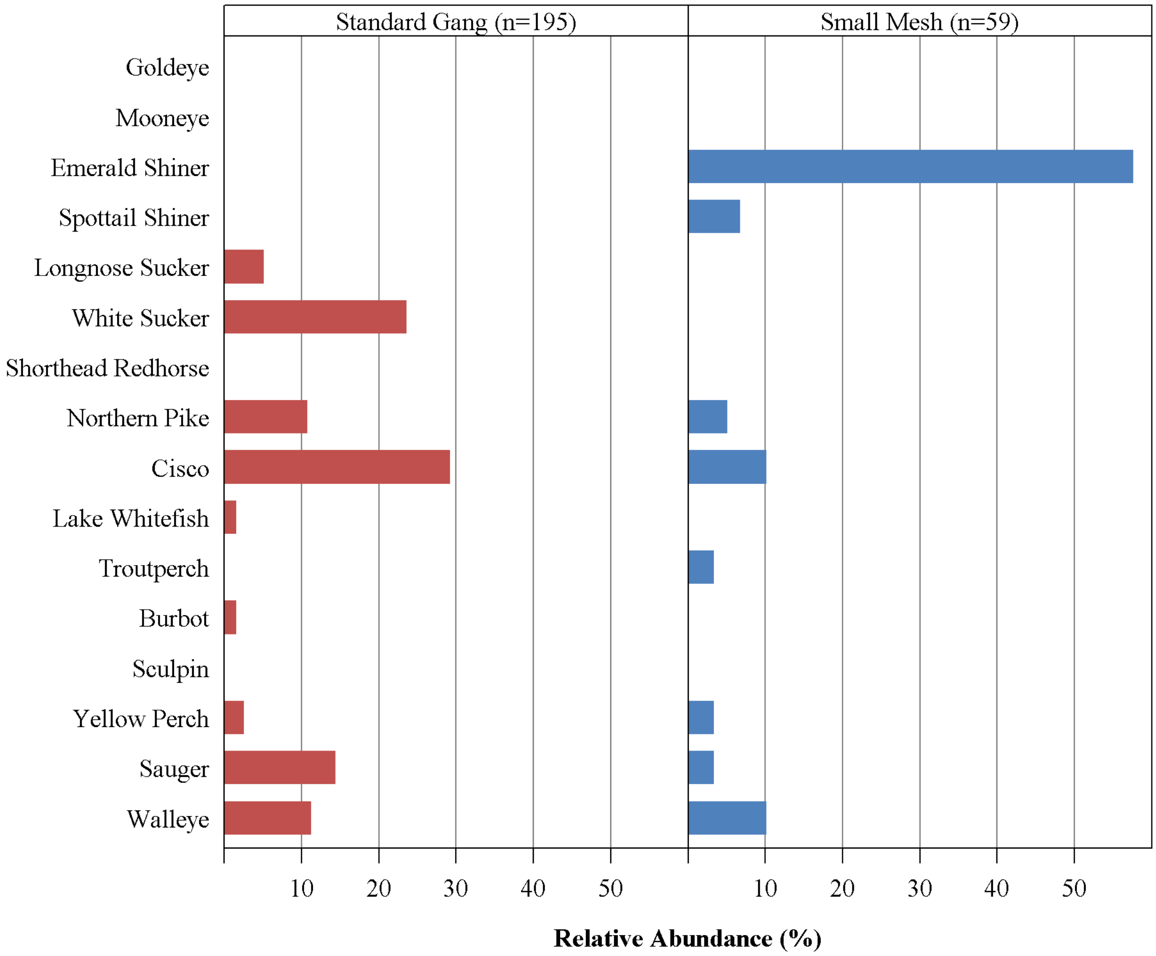


Figure 5.5.7-7. Relative abundance (%) distribution for fish species captured in CAMPP standard gang and small mesh index gill nets set in Rat Lake, 2010.

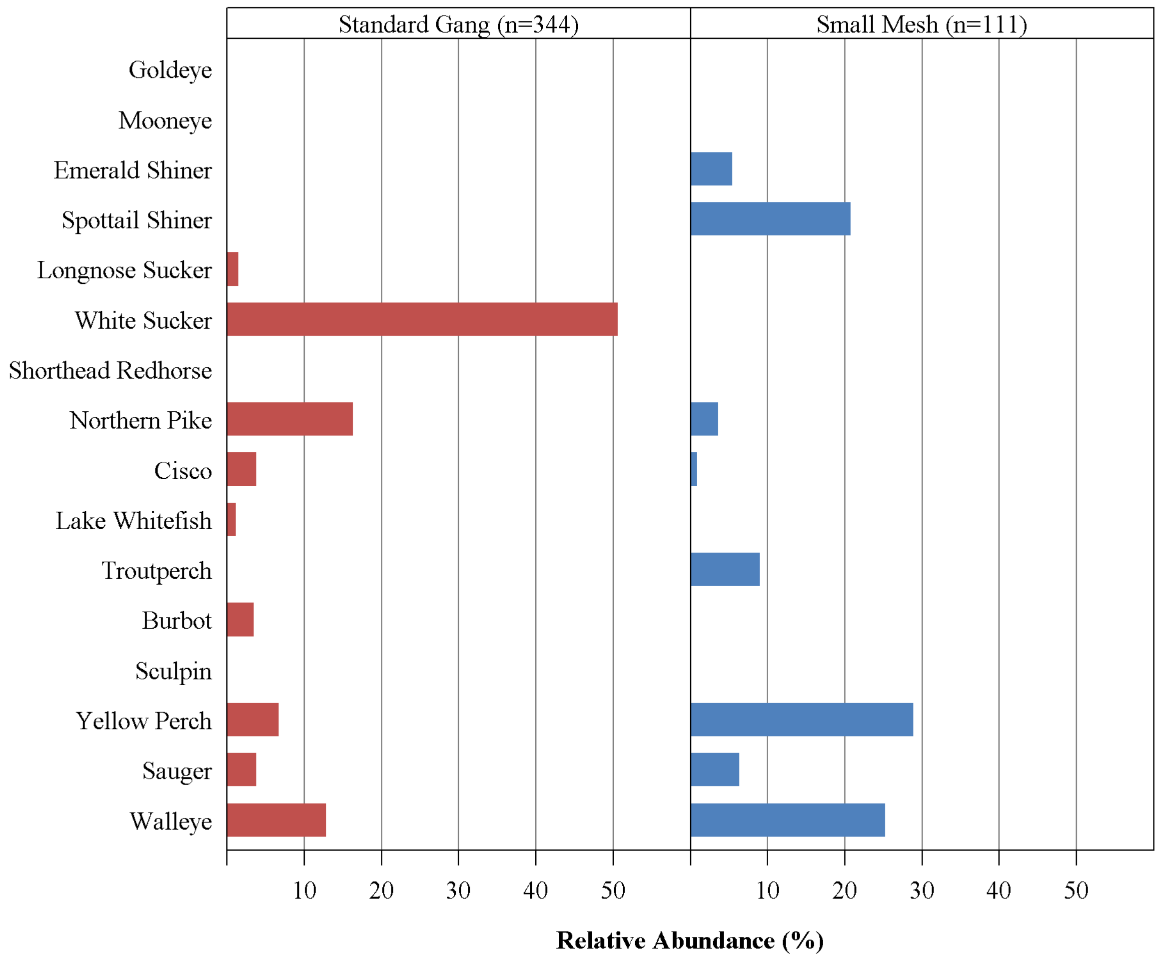


Figure 5.5.7-8. Relative abundance (%) distribution for fish species captured in CAMPP standard gang and small mesh index gill nets set in Notigi Lake, 2009.

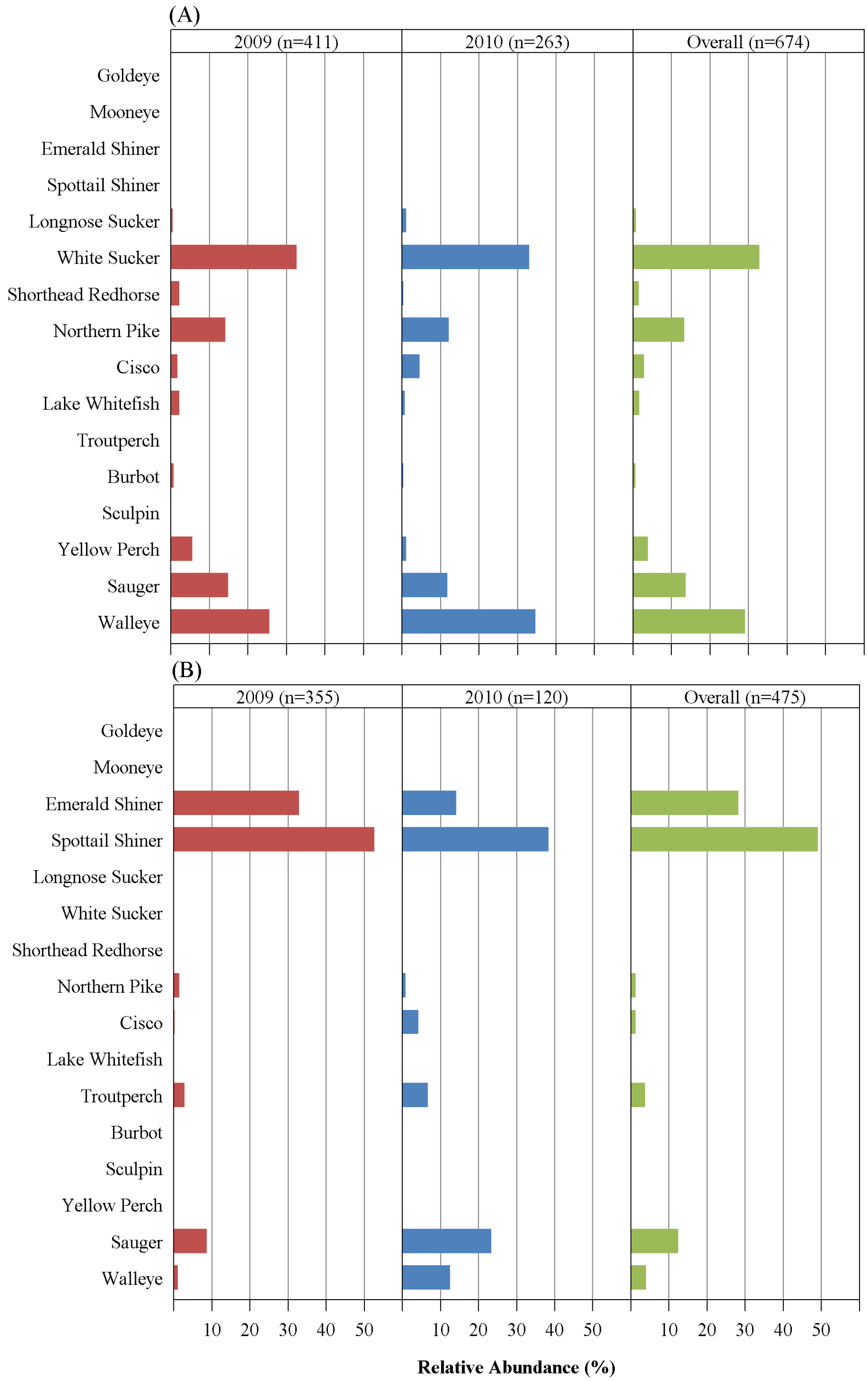


Figure 5.5.7-9. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Threepoint Lake, 2009-2010 (and overall).

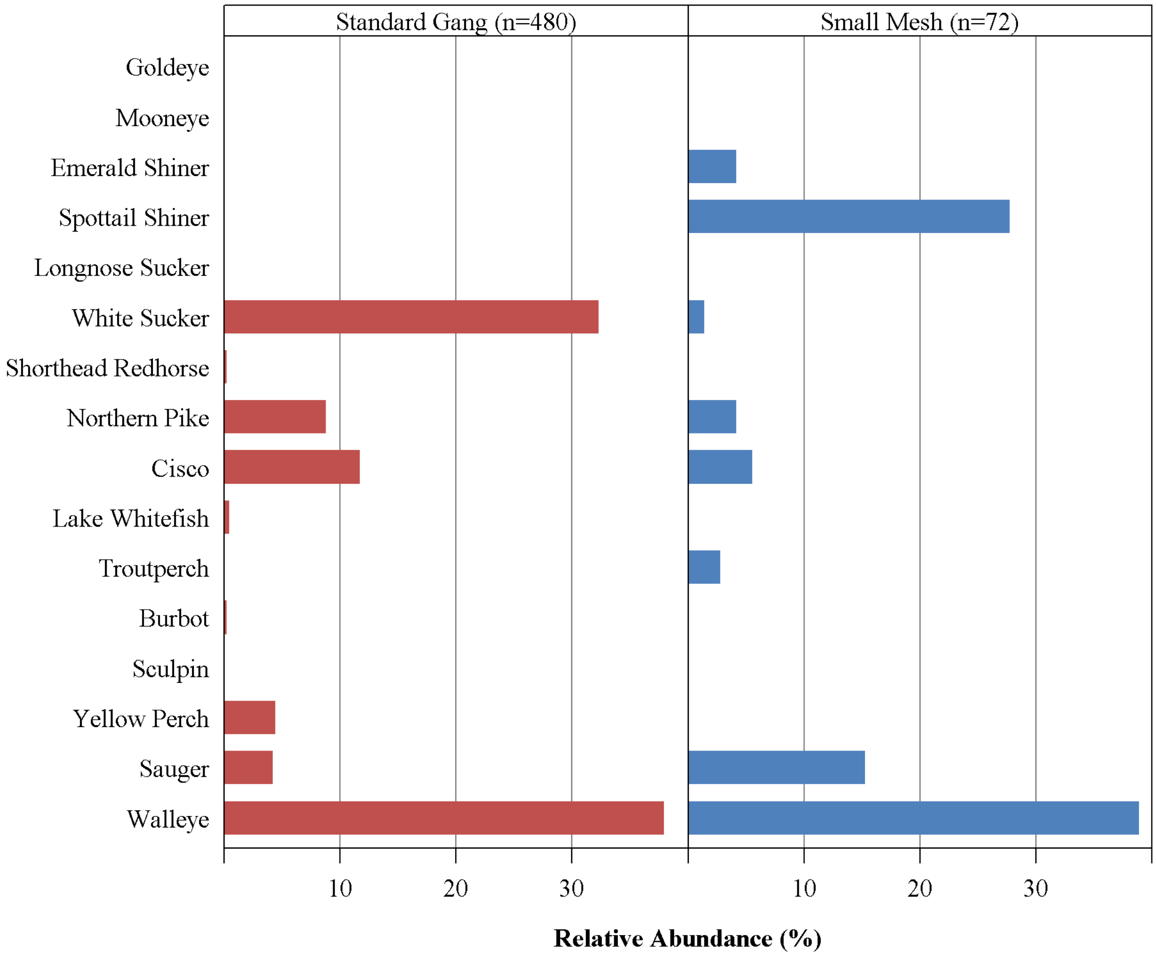


Figure 5.5.7-10. Relative abundance (%) distribution for fish species captured in CAMPP standard gang and small mesh gill nets set in Footprint Lake, 2010.

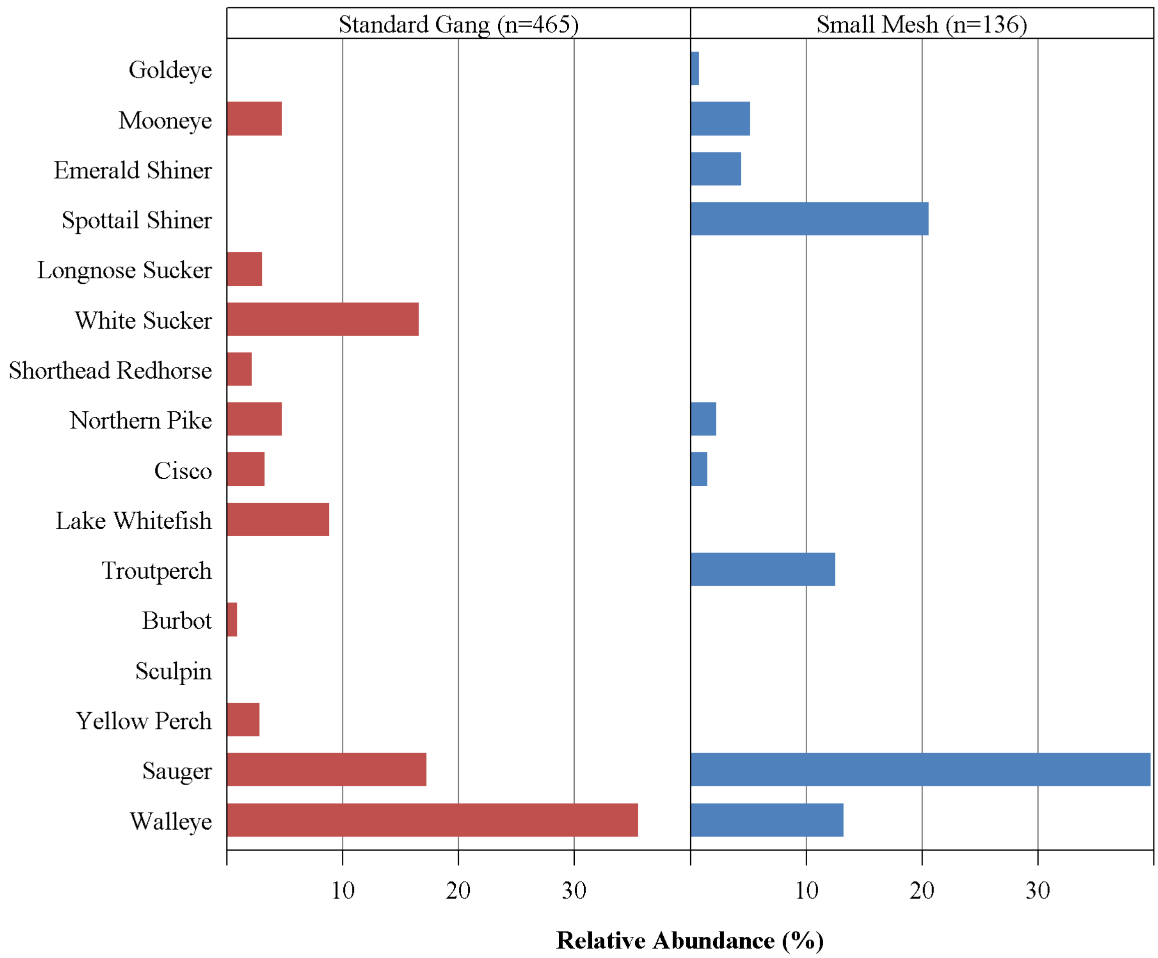


Figure 5.5.7-11. Relative abundance (%) distribution for fish species captured in CAMPP standard gang index and small mesh index gill nets set in Apussigamasi Lake, 2009.

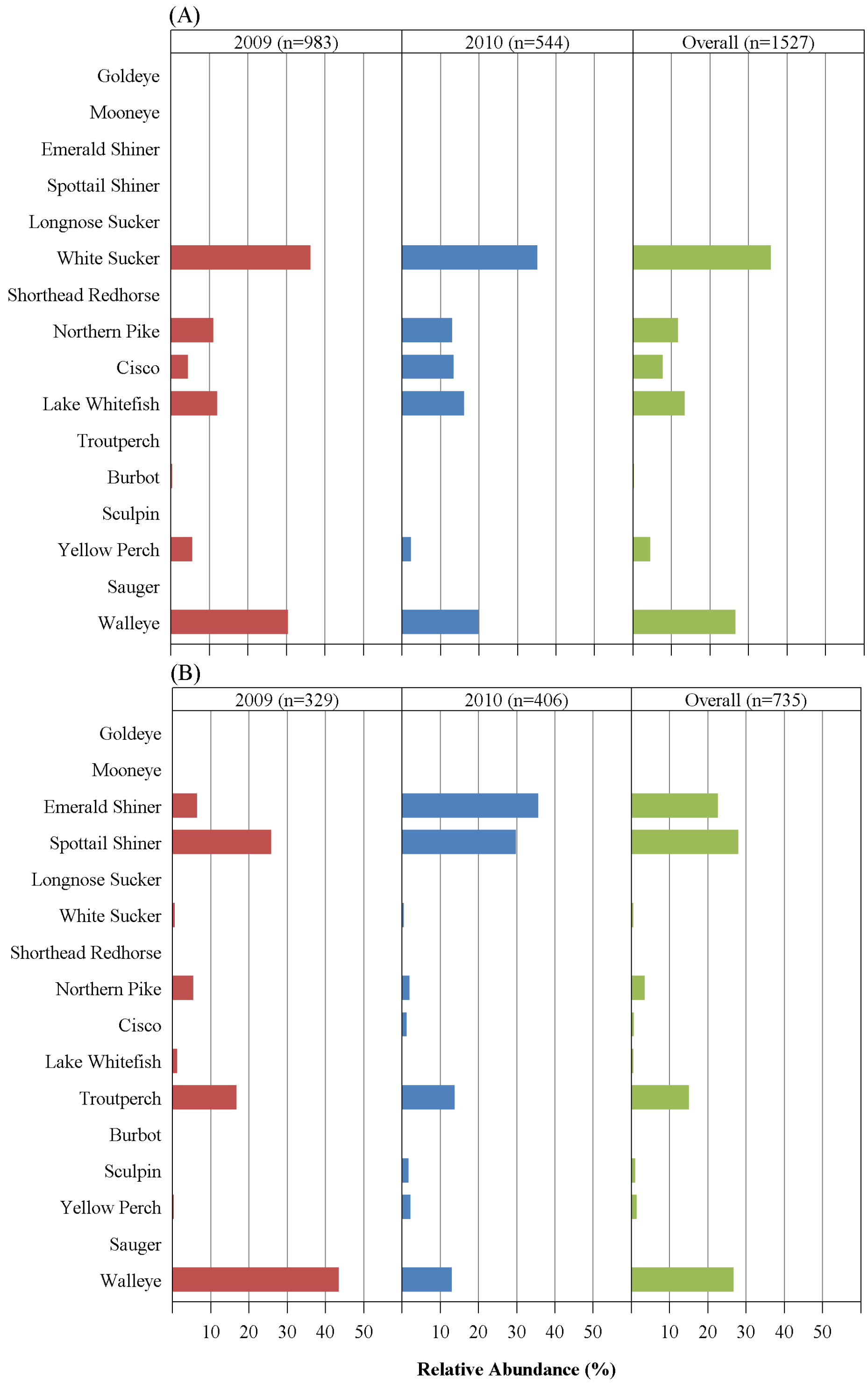


Figure 5.5.7-12. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Leftrook Lake, 2009-2010 (and overall).

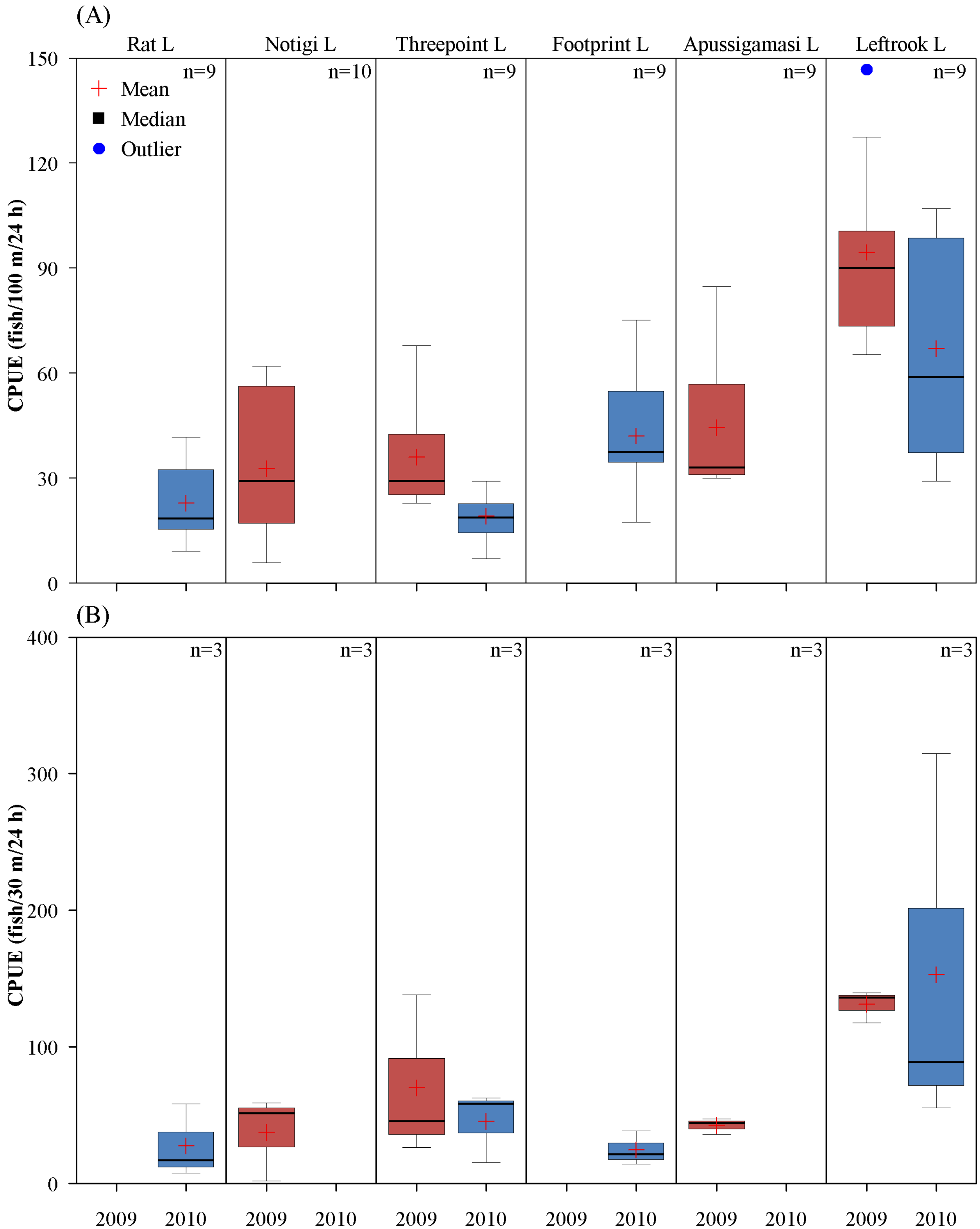


Figure 5.5.7-13. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

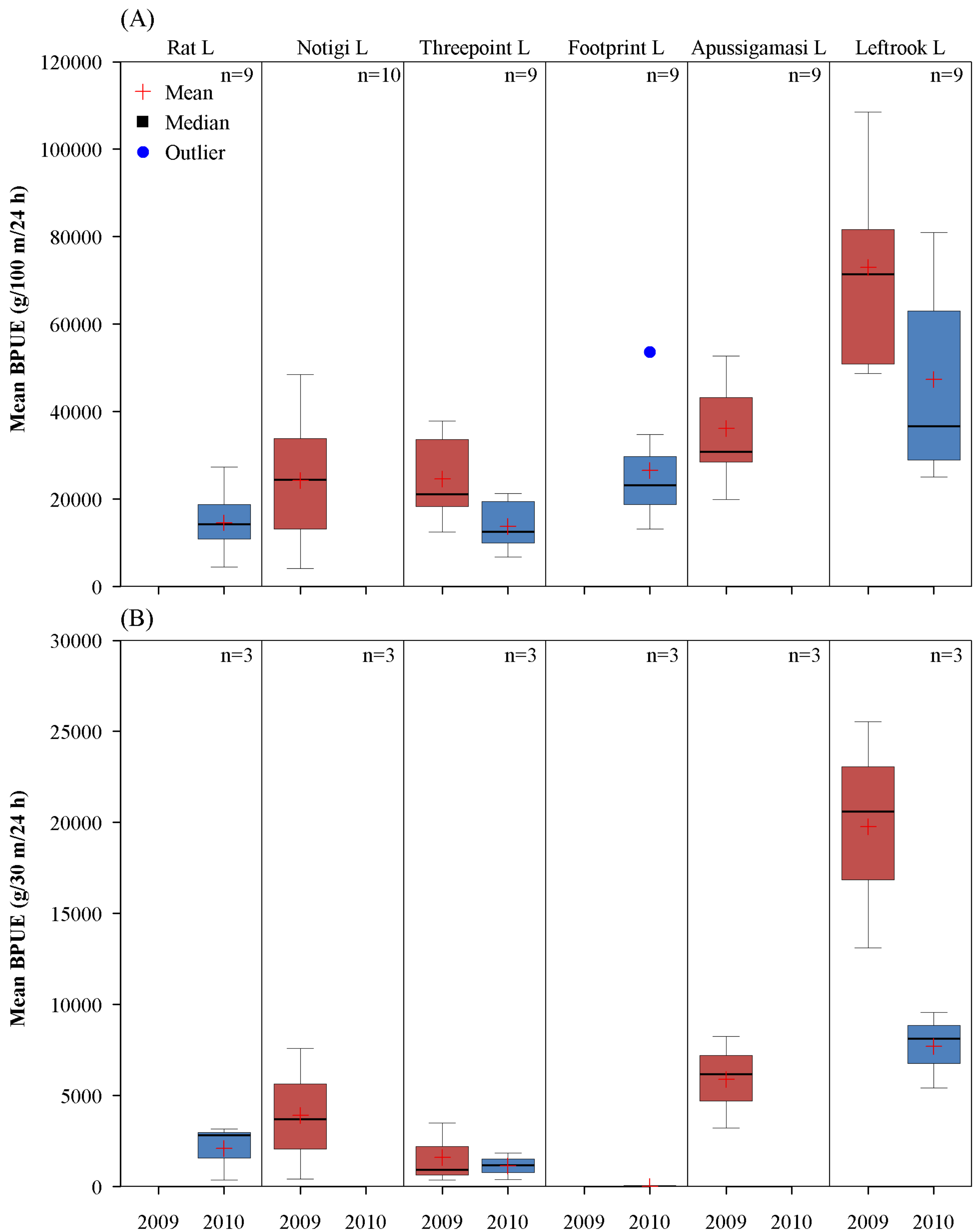


Figure 5.5.7-14. Mean and median (range) total BPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion Region waterbodies 2009-2010.

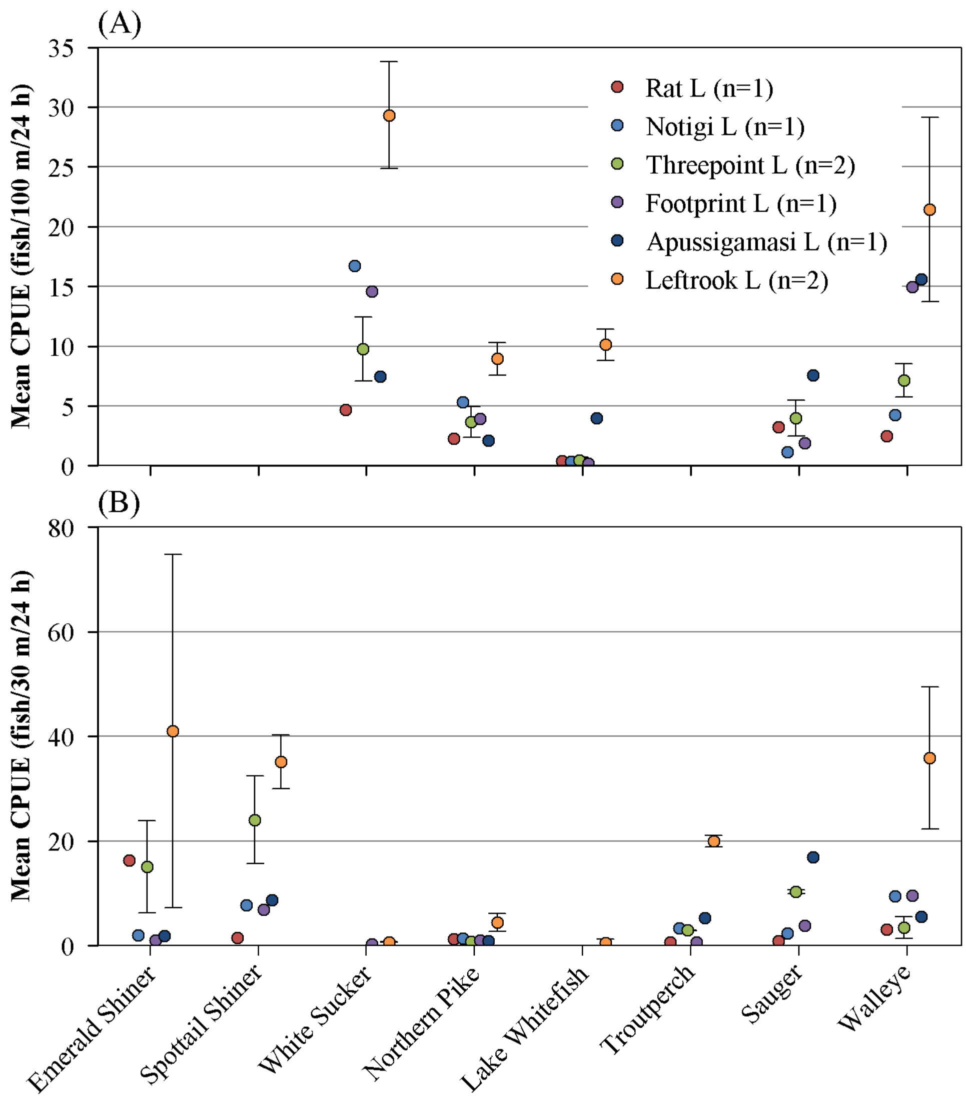


Figure 5.5.7-15. Mean (SE) overall CPUE per year calculated for a subset of fish species captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

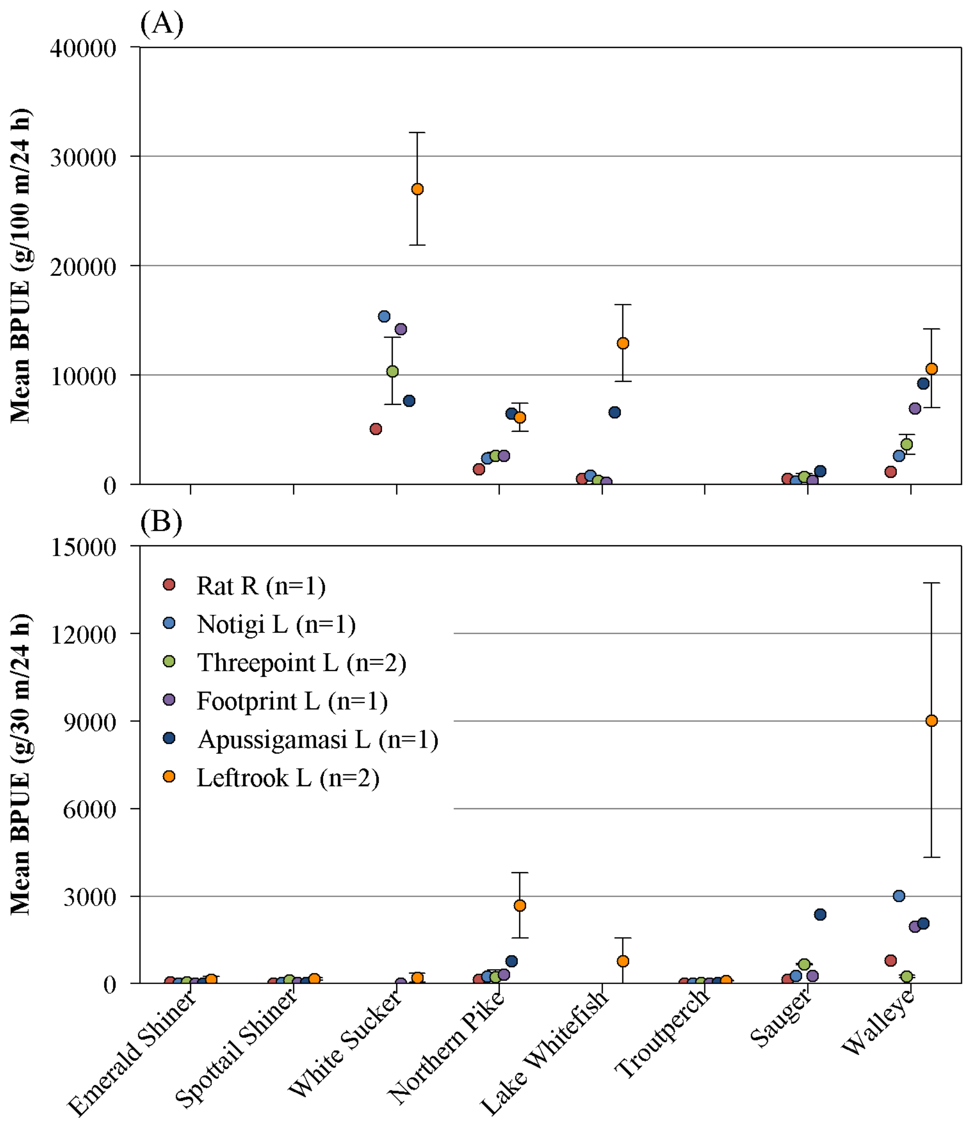


Figure 5.5.7-16. Mean (SE) overall BPUE per year calculated for a subset of fish species captured in (A) standard gang and (B) small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

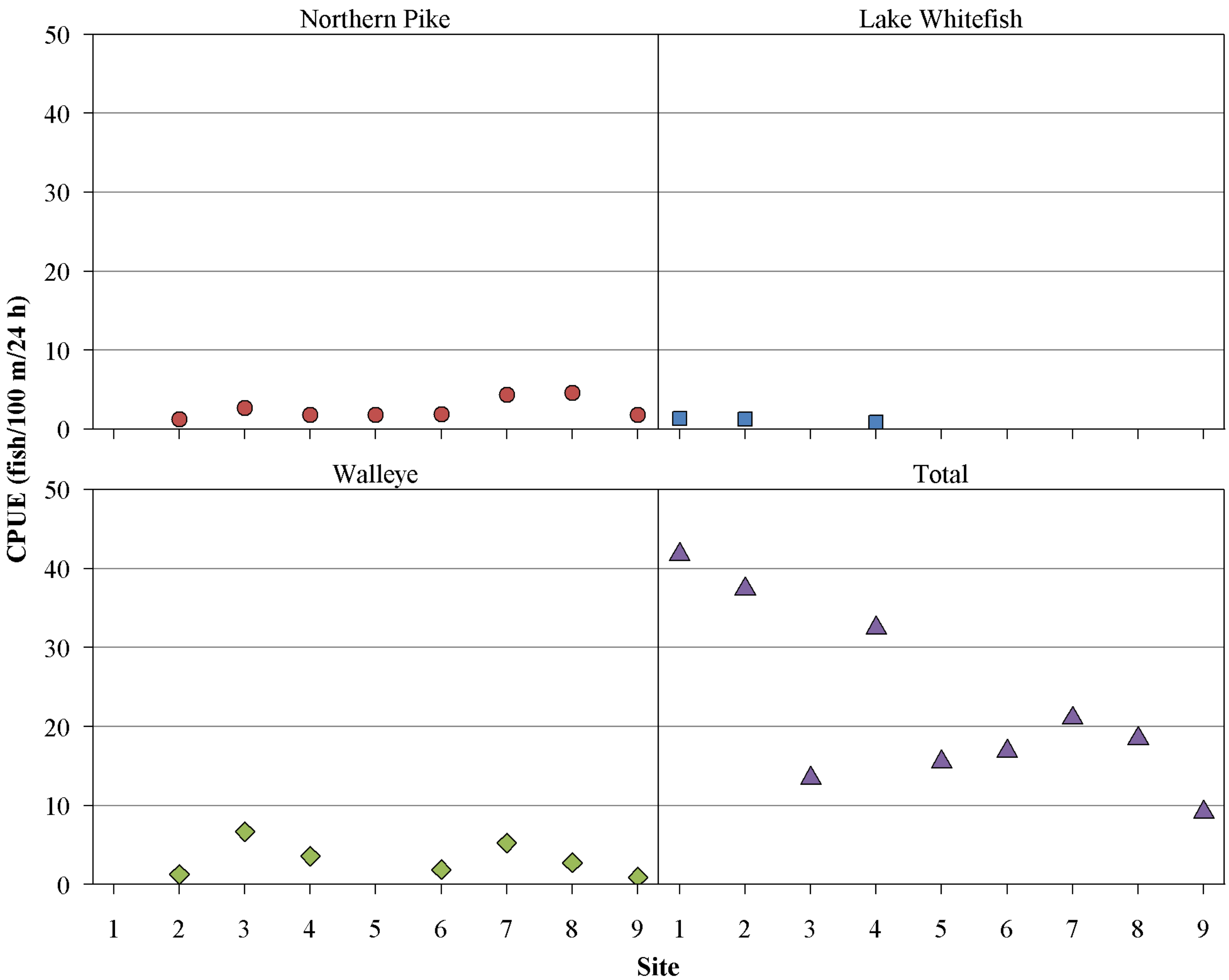


Figure 5.5.7-17. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye, and Total CPUE summarized by standard gang index gill net sites surveyed in Rat Lake, 2010.

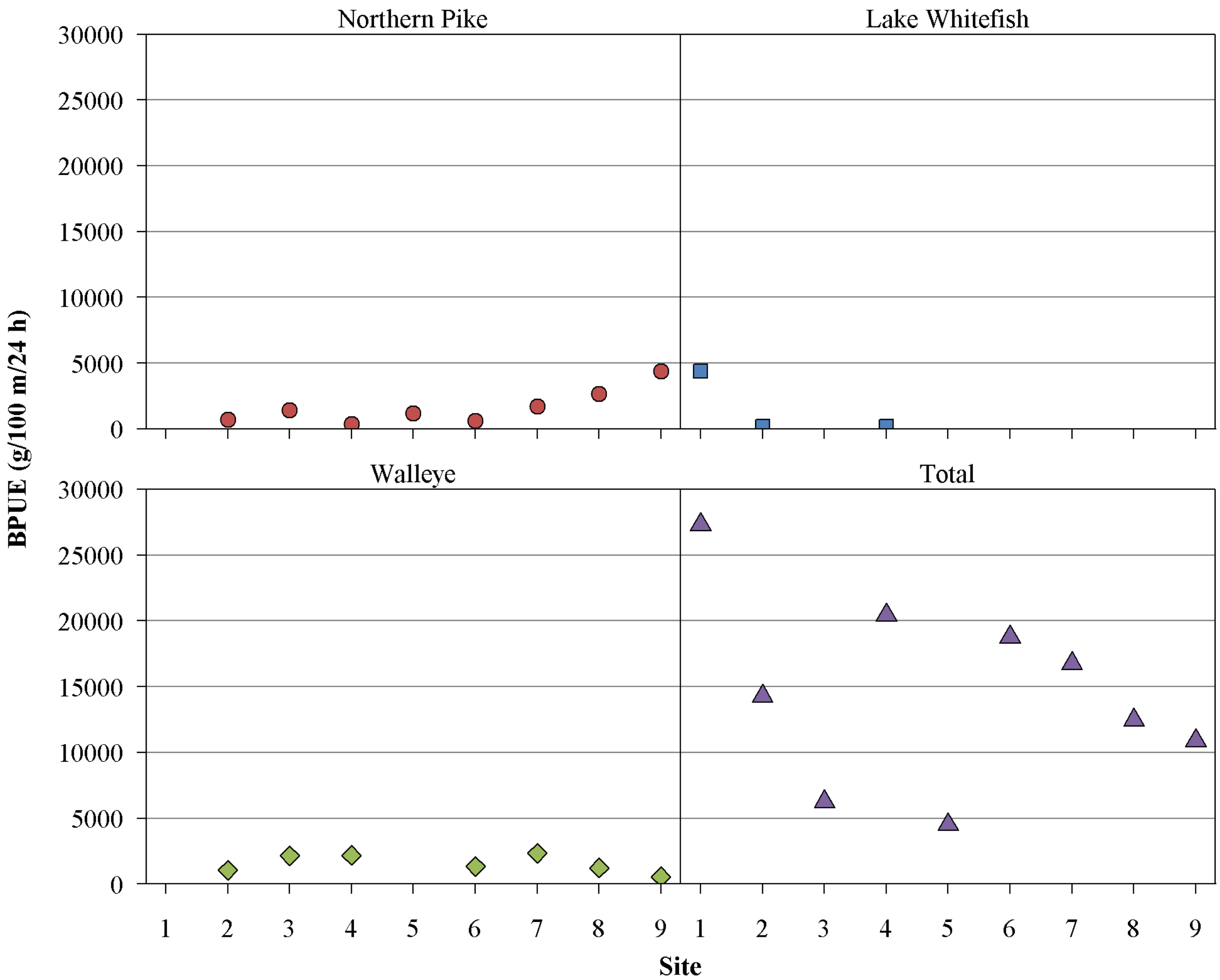


Figure 5.5.7-18. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye and Total BPUE summarized by standard gang index gill net sites surveyed in Rat Lake, 2010.

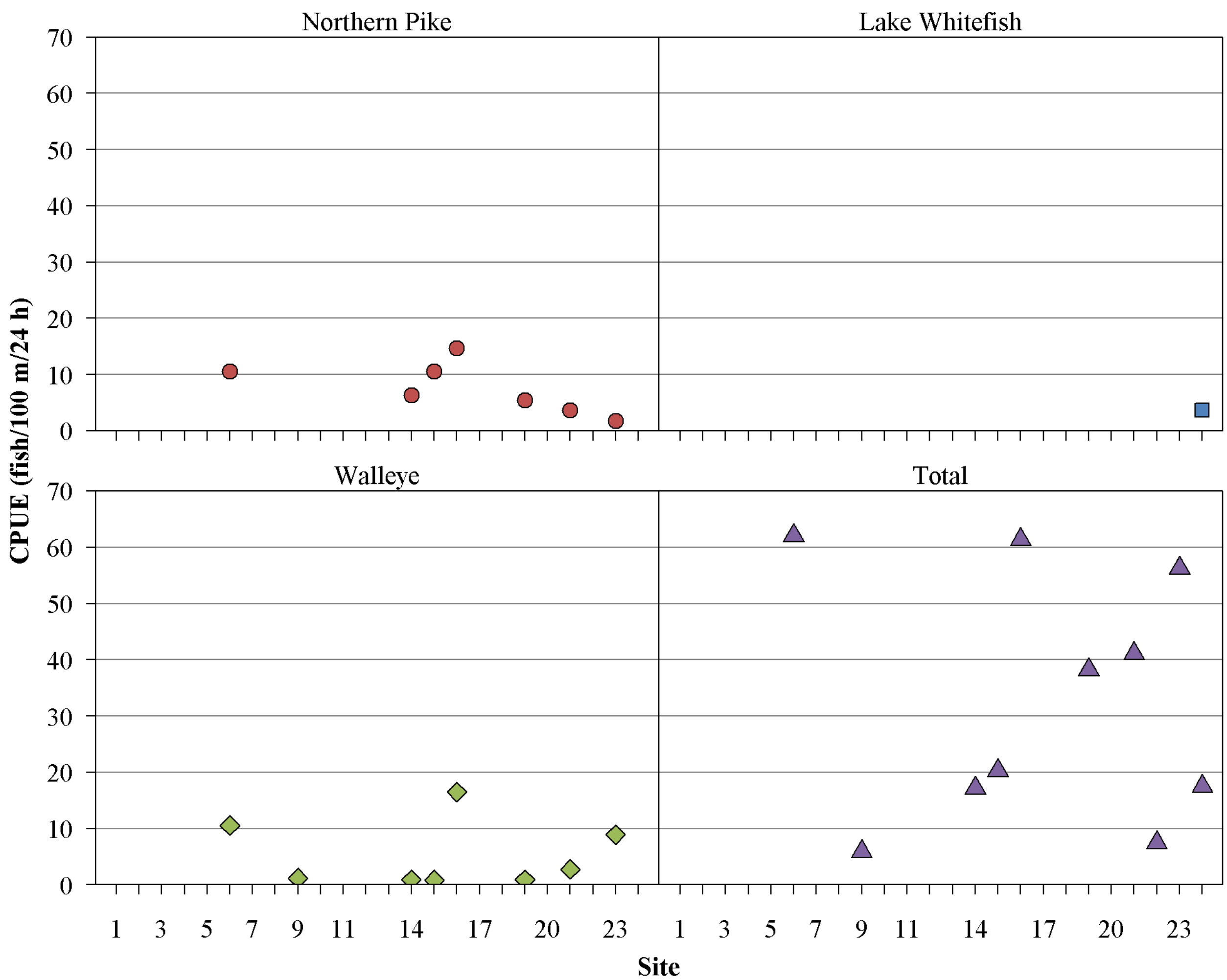


Figure 5.5.7-19. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye, and Total CPUE summarized by standard gang index gill net sites surveyed in Notigi Lake, 2009.

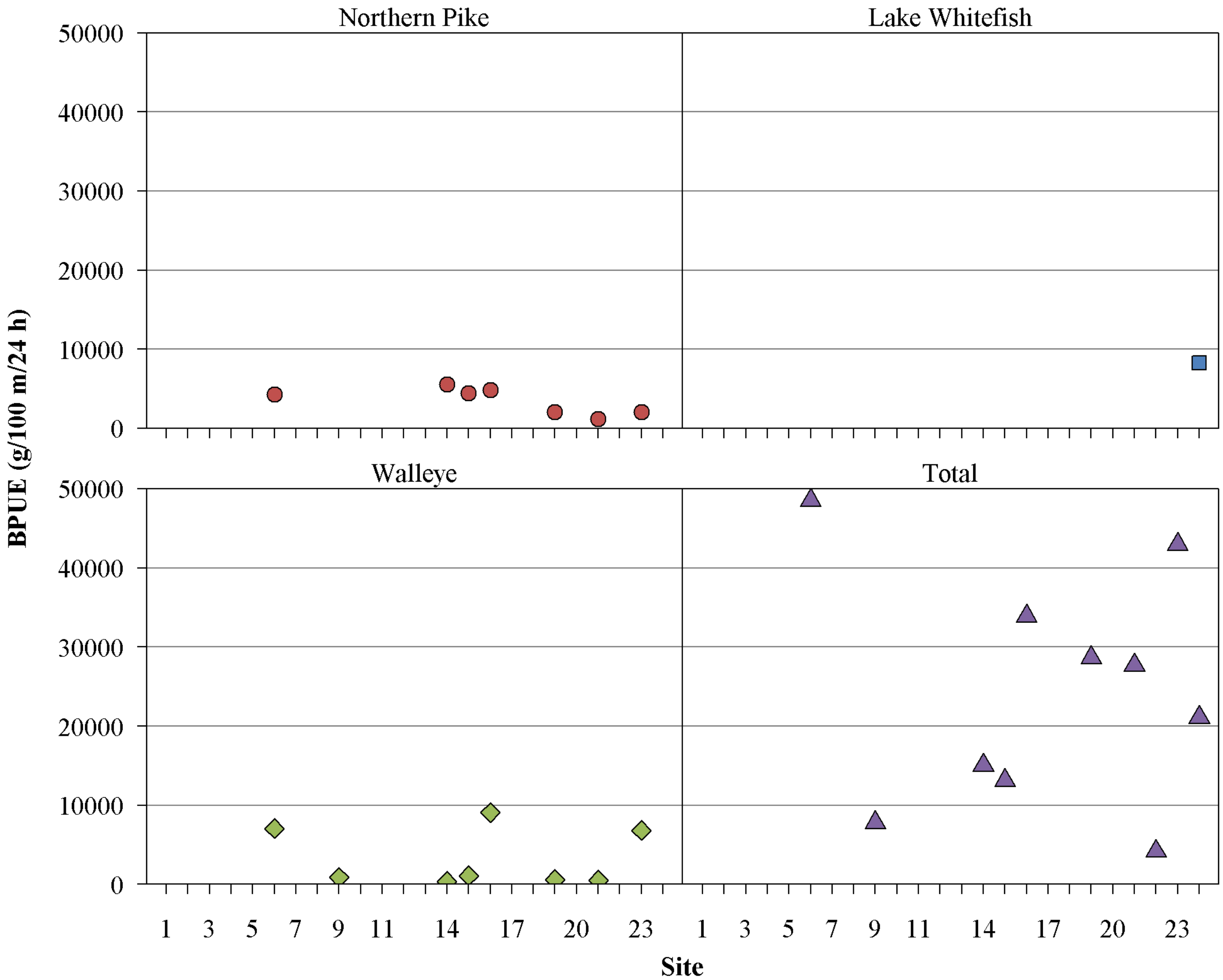


Figure 5.5.7-20. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye and Total BPUE summarized by standard gang index gill net sites surveyed in Notigi Lake, 2009.

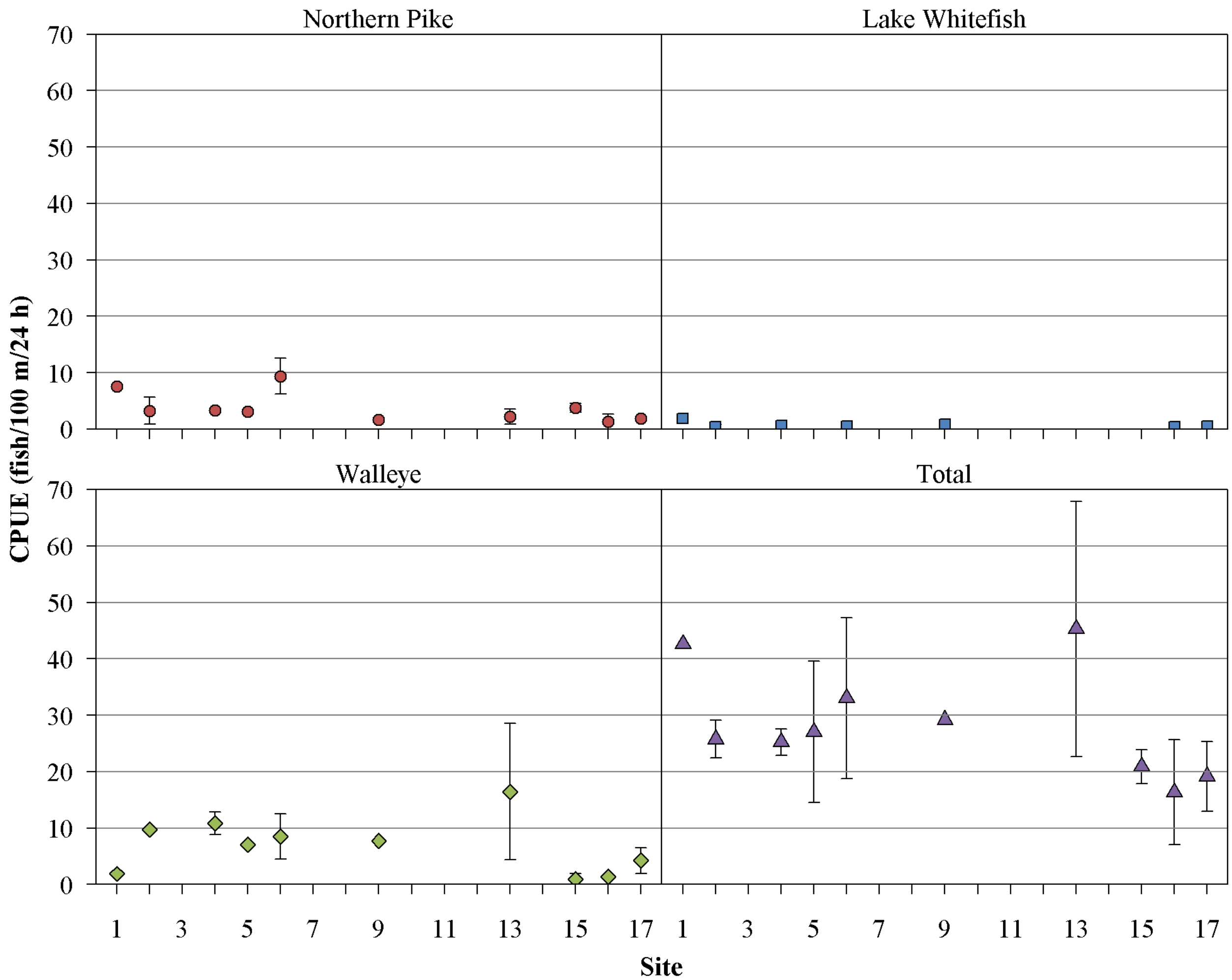


Figure 5.5.7-21. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye, and Total CPUE summarized by standard gang index gill net sites surveyed in Threepoint Lake, 2009-2010.

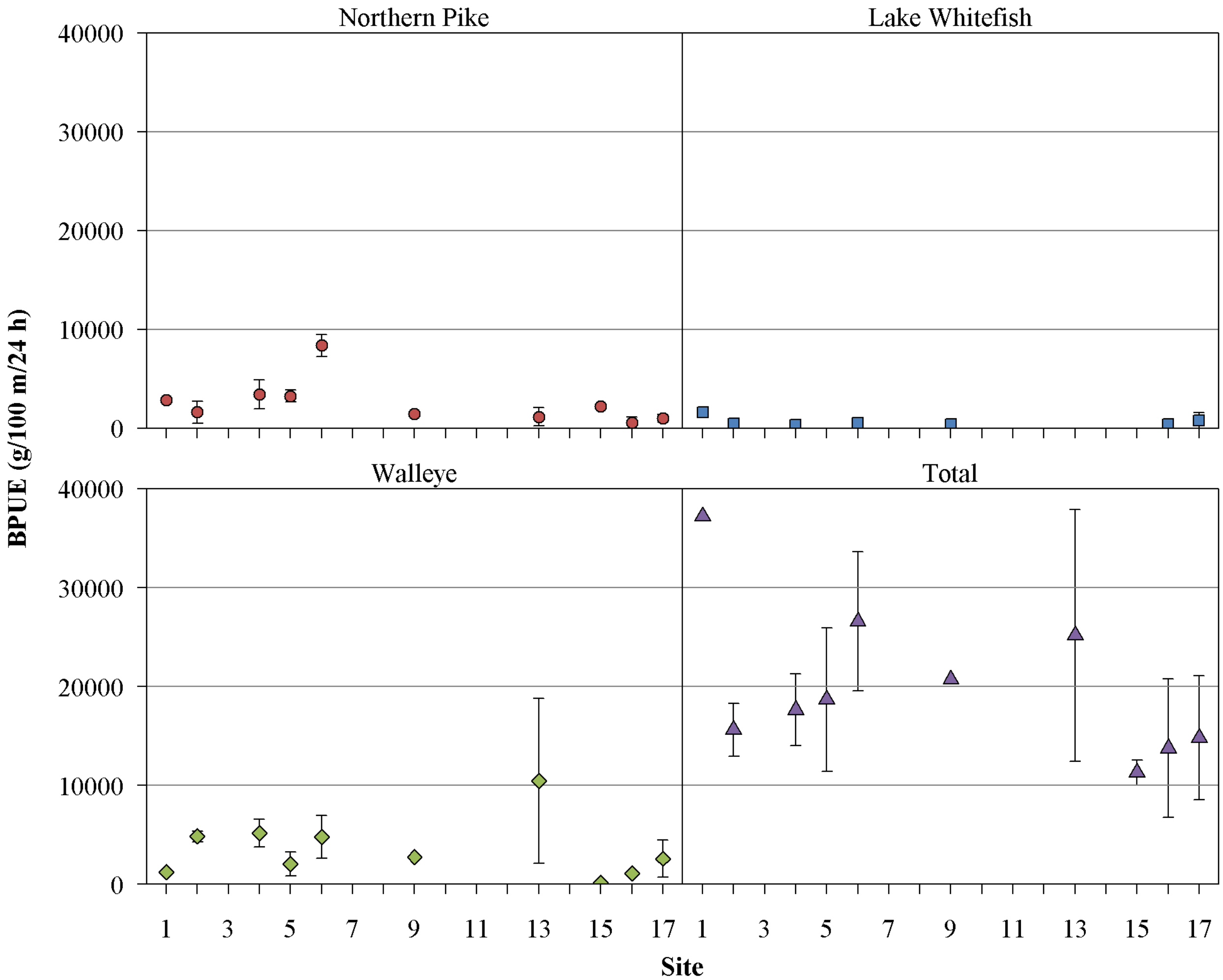


Figure 5.5.7-22. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye and Total BPUE summarized by standard gang index gill net sites surveyed in Threepoint Lake, 2009-2010.

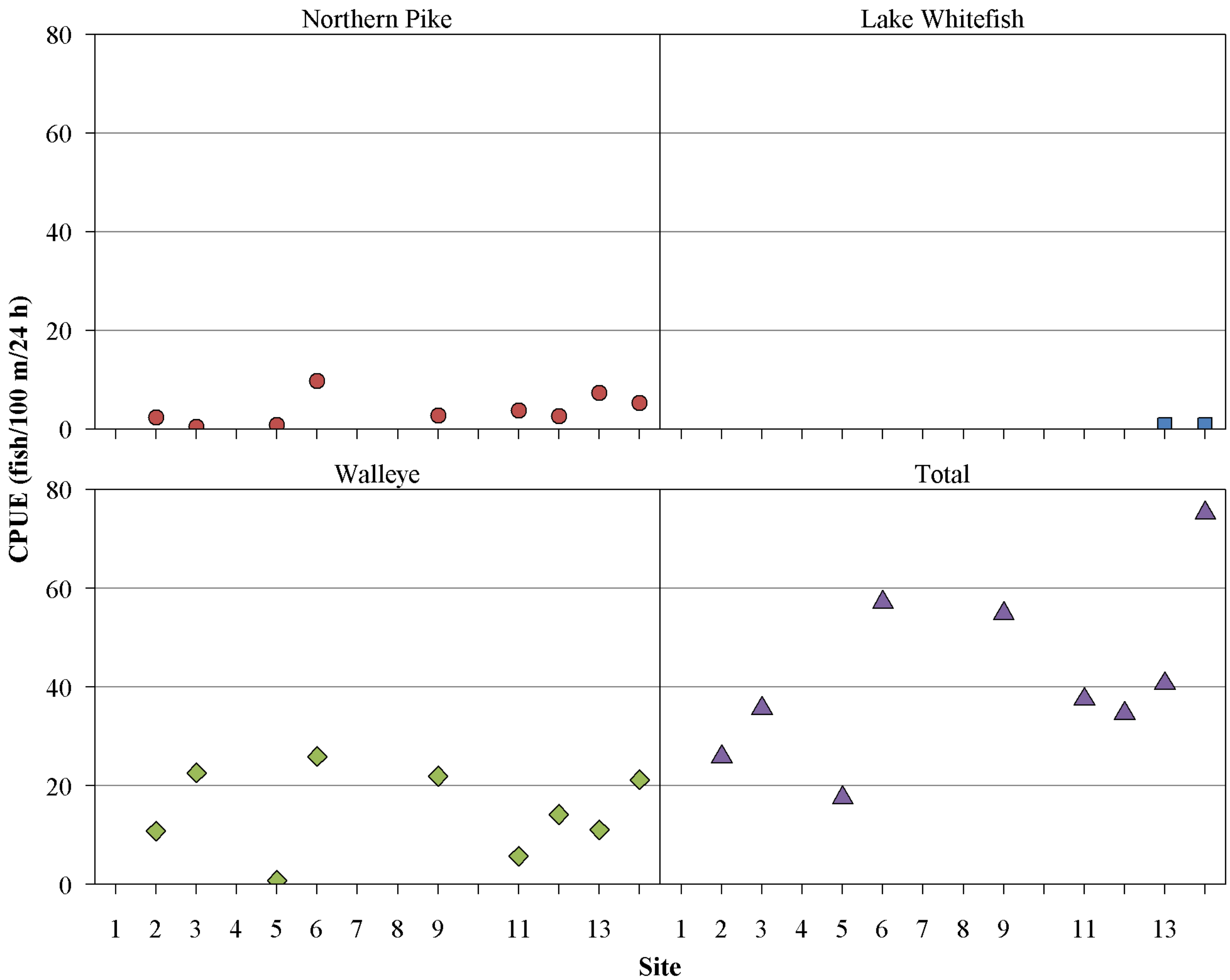


Figure 5.5.7-23. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye, and Total CPUE summarized by standard gang index gill net sites surveyed in Footprint Lake, 2010.

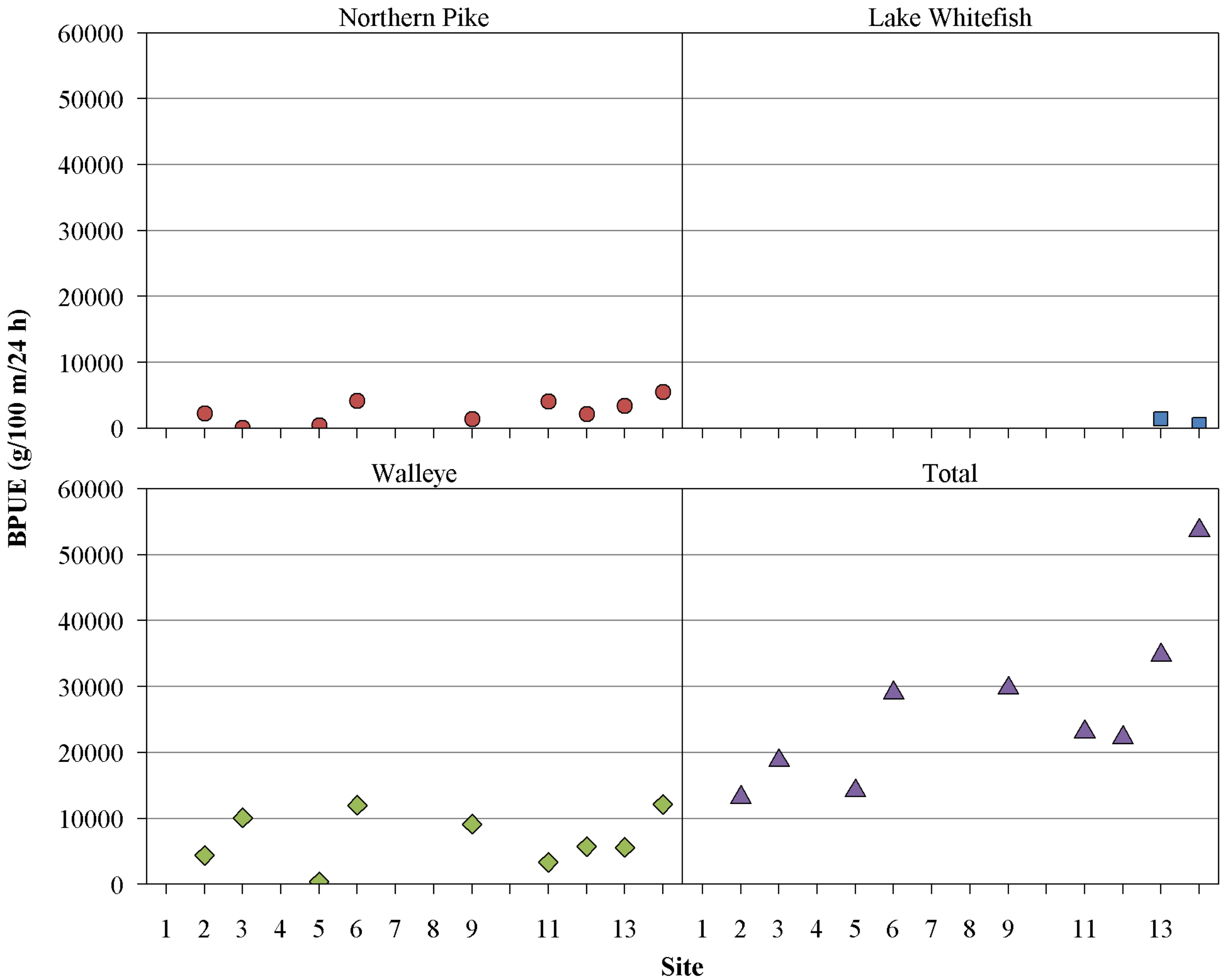


Figure 5.5.7-24. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye and Total BPUE summarized by standard gang index gill net sites surveyed in Footprint Lake, 2010.

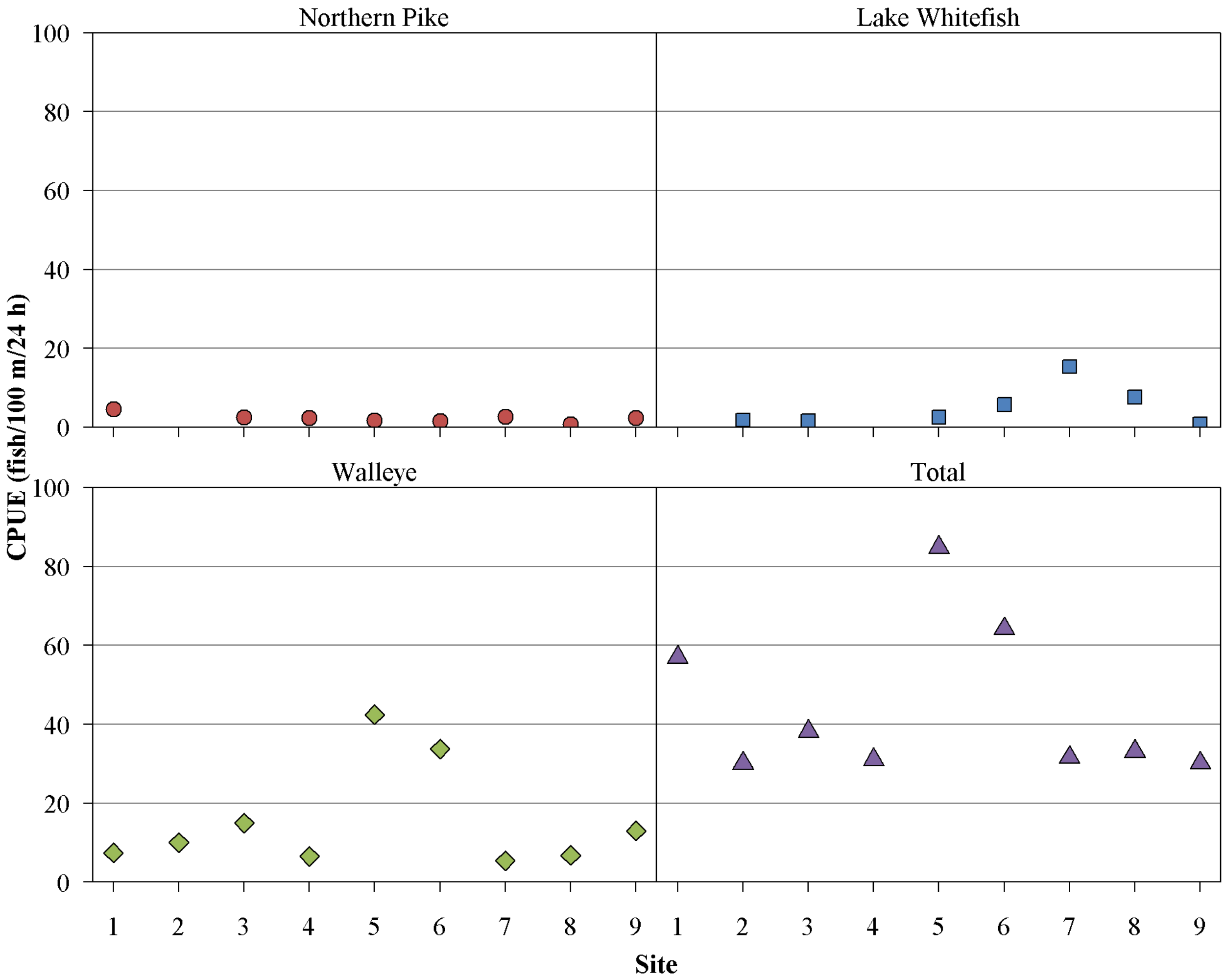


Figure 5.5.7-25. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye, and Total CPUE summarized by standard gang index gill net sites surveyed in Apussigamasi Lake, 2009.

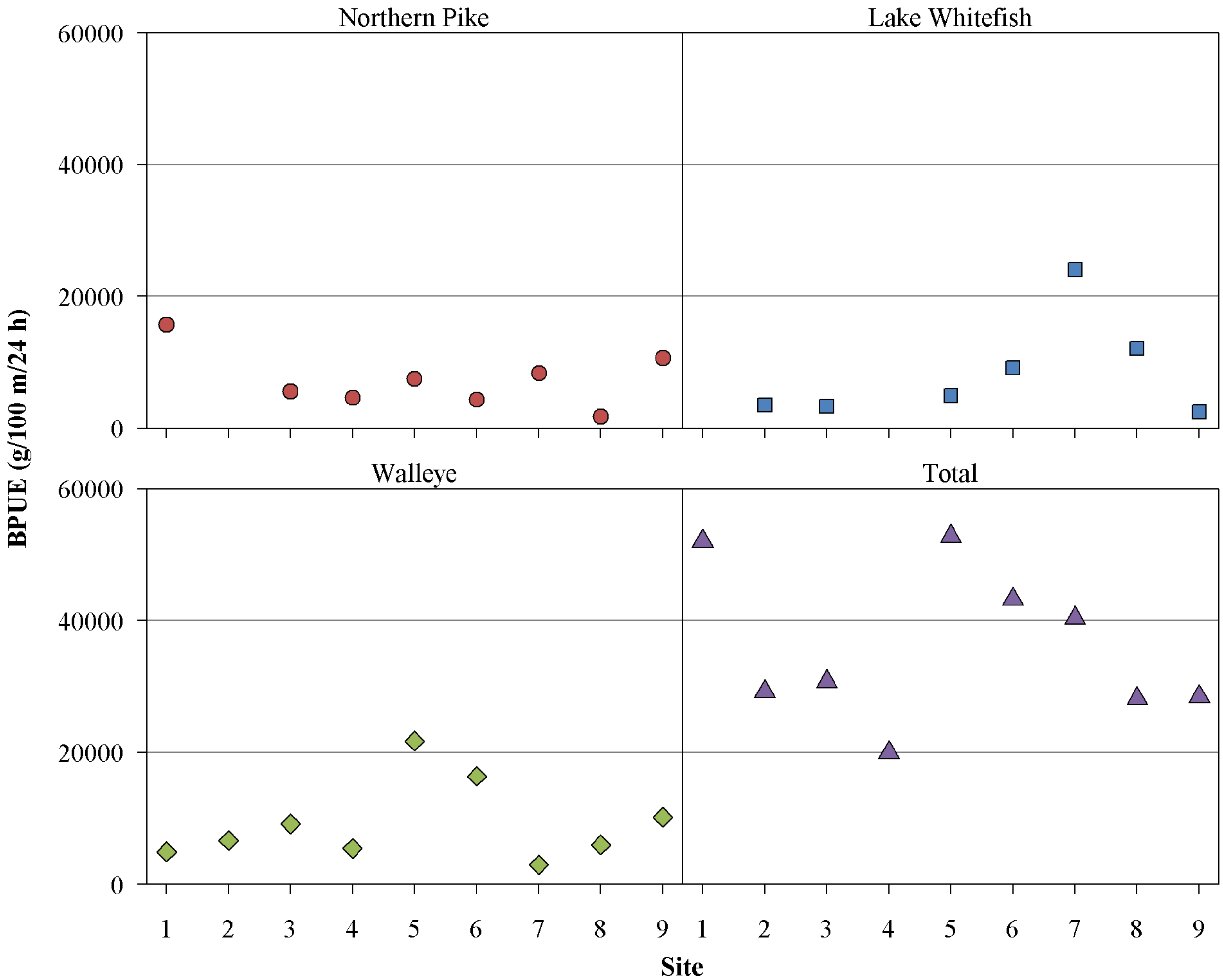


Figure 5.5.7-26. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye and Total BPUE summarized by standard gang index gill net sites surveyed in Apussigamasi, 2009.

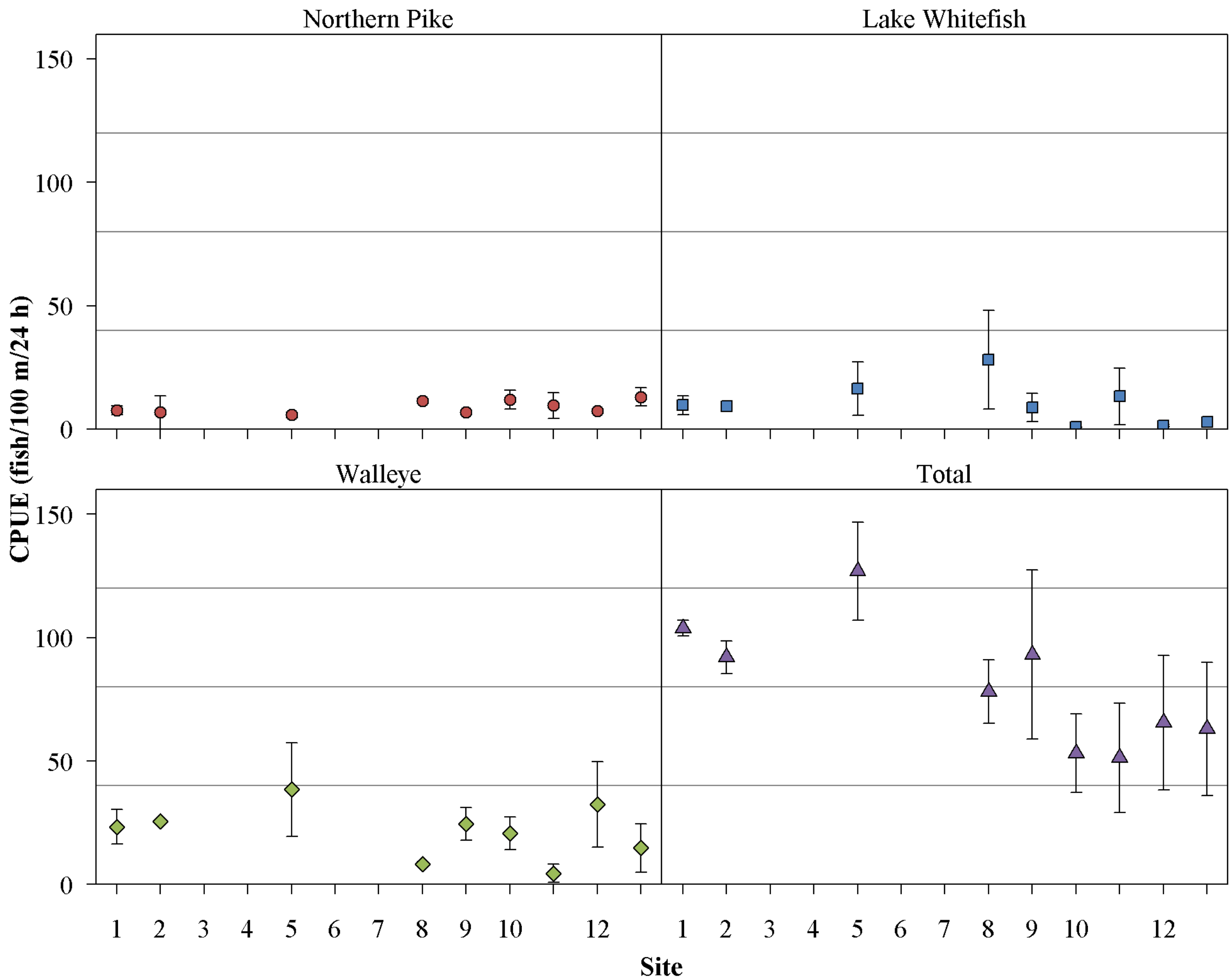


Figure 5.5.7-27. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye, and Total CPUE summarized by standard gang index gill net sites surveyed in Leftrook Lake, 2009-2010.

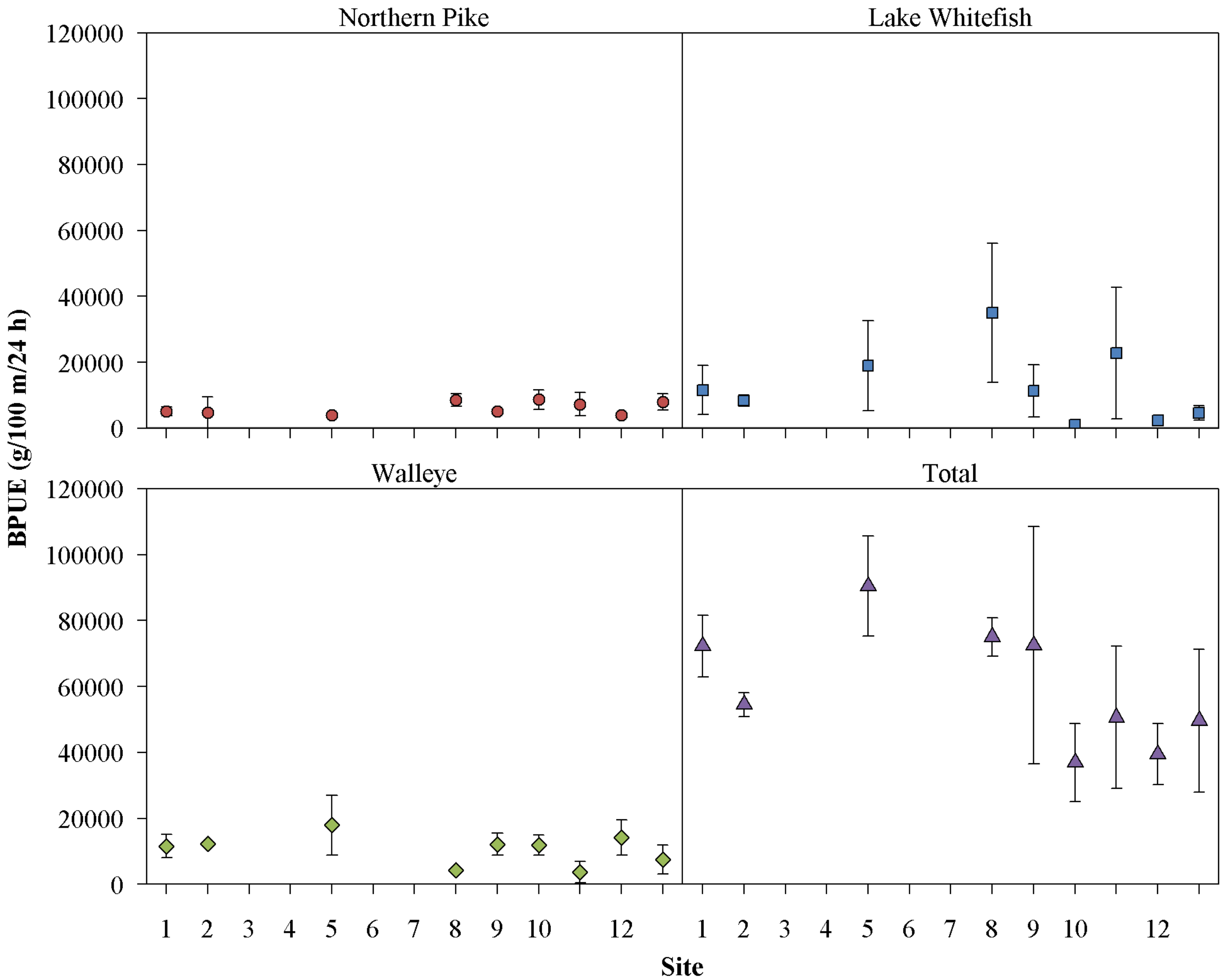


Figure 5.5.7-28. Mean (SE) overall Northern Pike, Lake Whitefish, Walleye and Total BPUE summarized by standard gang index gill net sites surveyed in Leftrook Lake, 2009-2010.

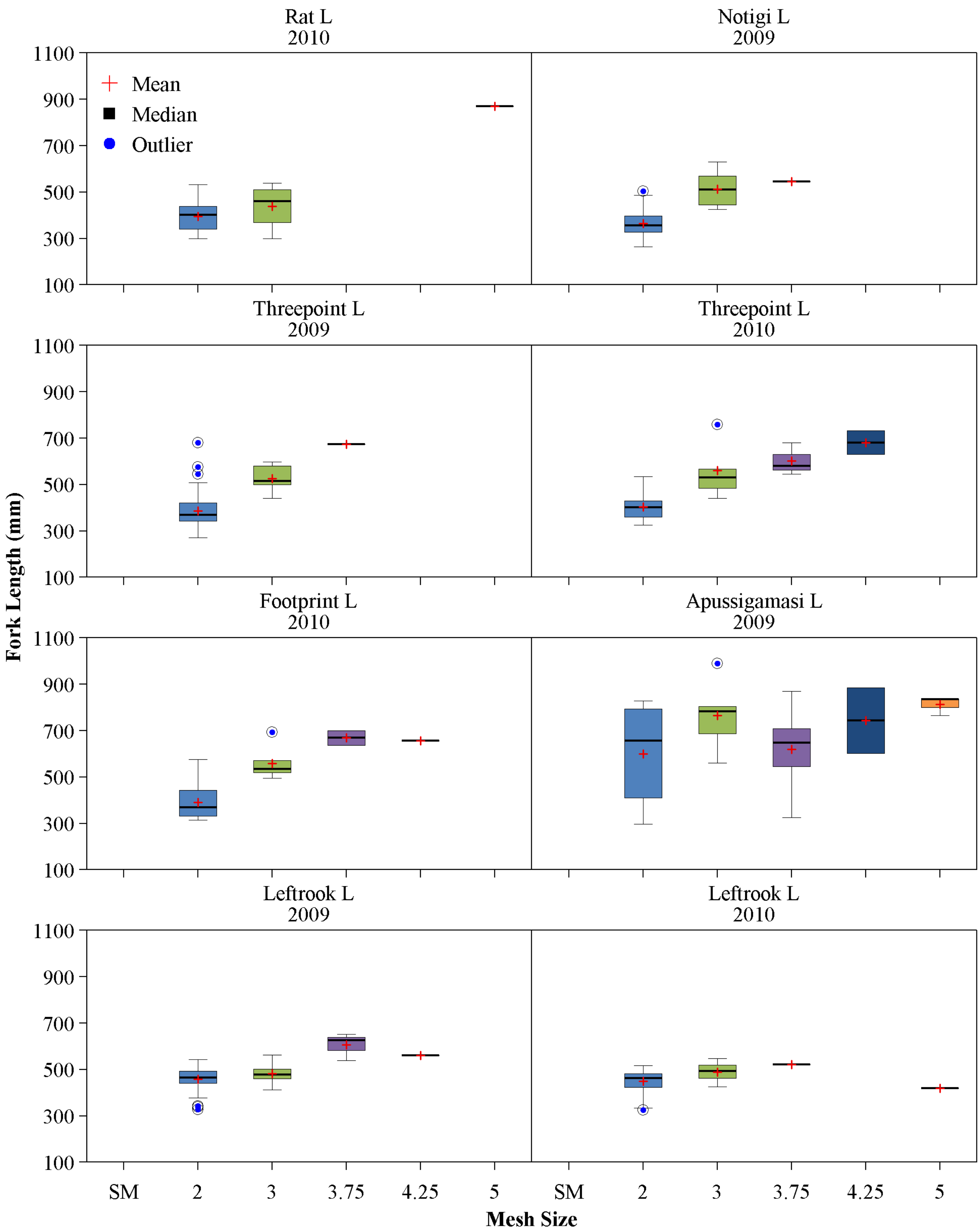


Figure 5.5.7-29. Mean and median (range) fork length (mm) per mesh size calculated for Northern Pike captured in standard gang and small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

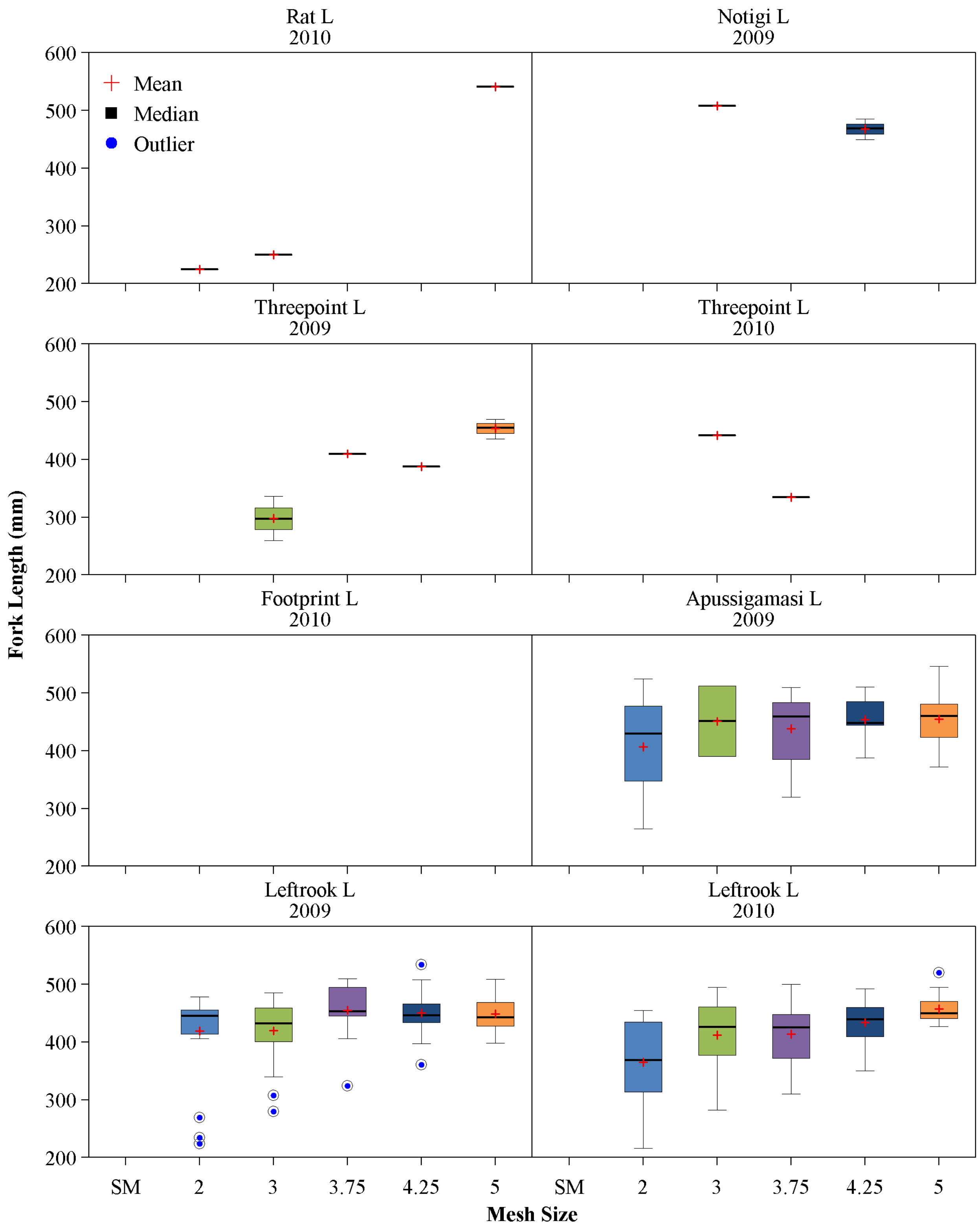


Figure 5.5.7-30. Mean and median (range) fork length (mm) per mesh size calculated for Lake Whitefish captured in standard gang and small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

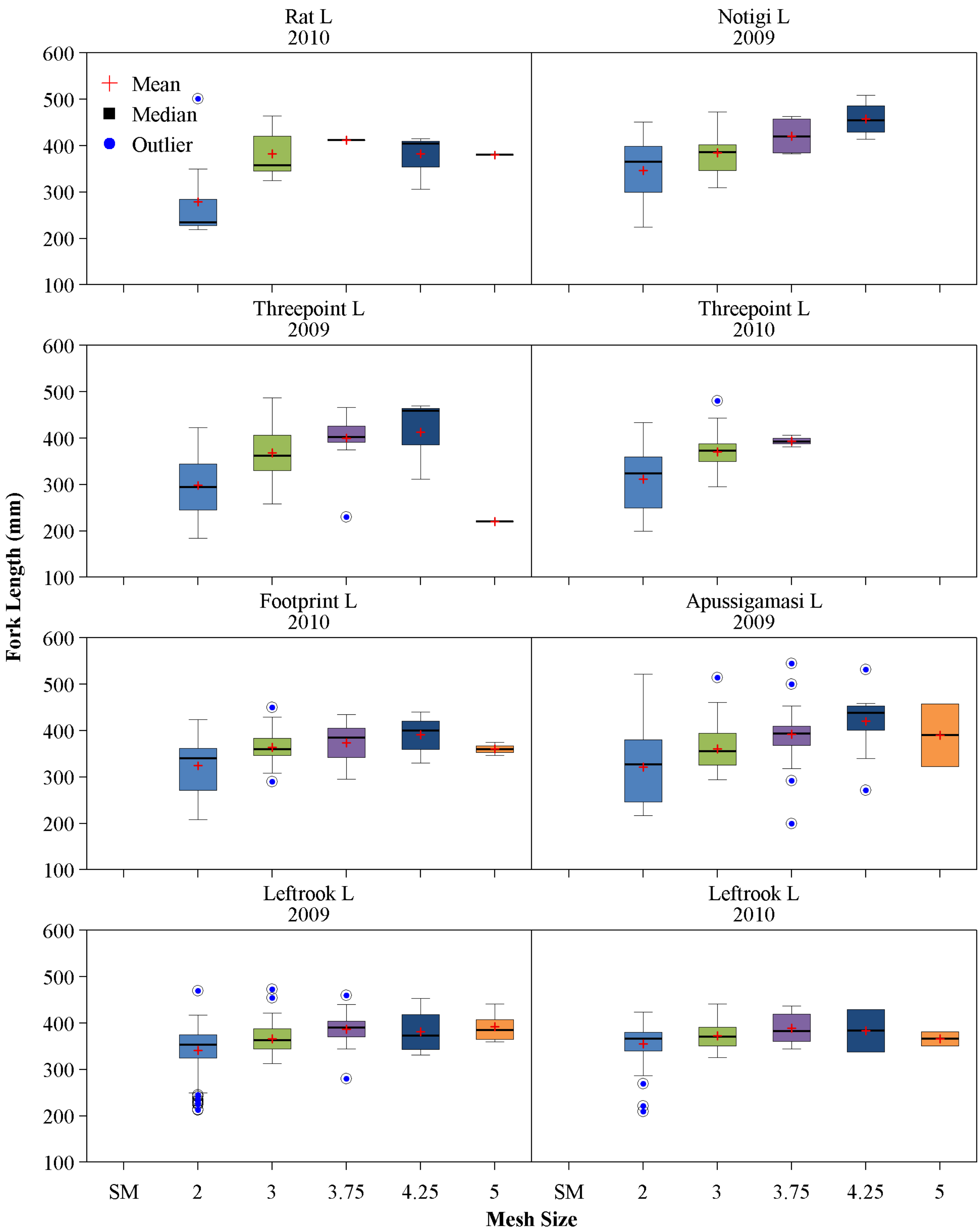


Figure 5.5.7-31. Mean and median (range) fork length (mm) per mesh size calculated for Walleye captured in standard gang and small mesh index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010.

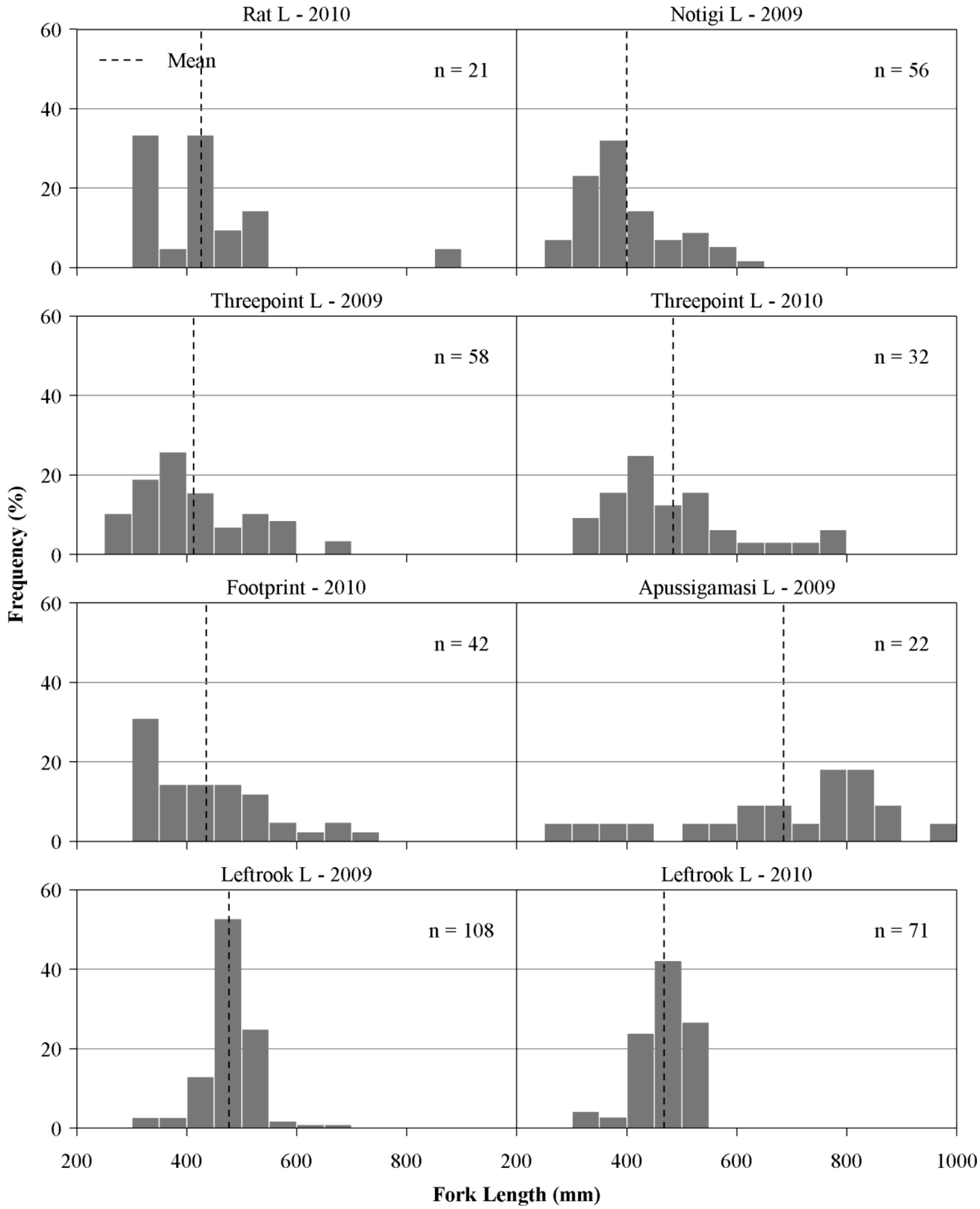


Figure 5.5.7-32. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion waterbodies, 2009-2010.

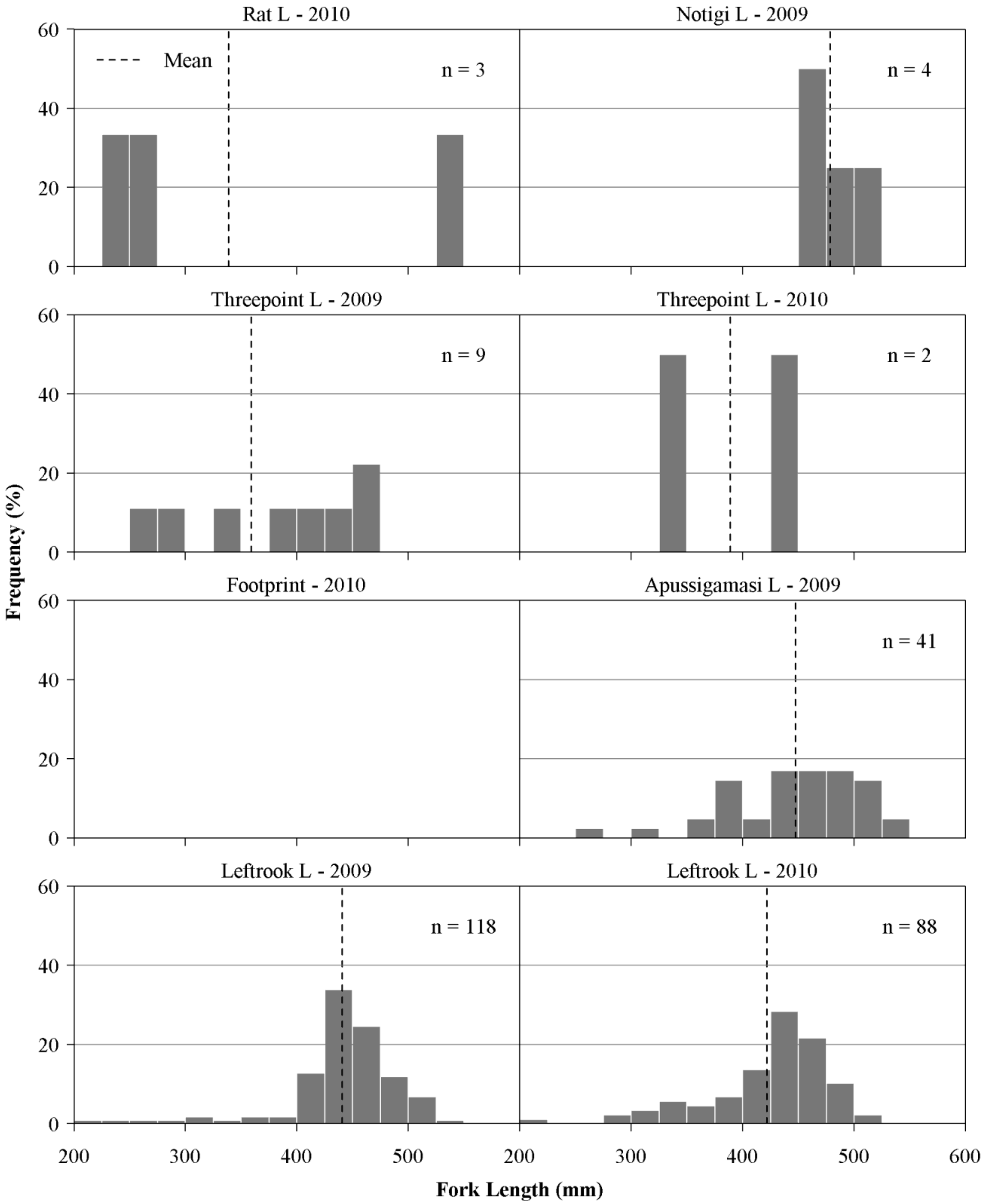


Figure 5.5.7-33. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion waterbodies, 2009-2010.

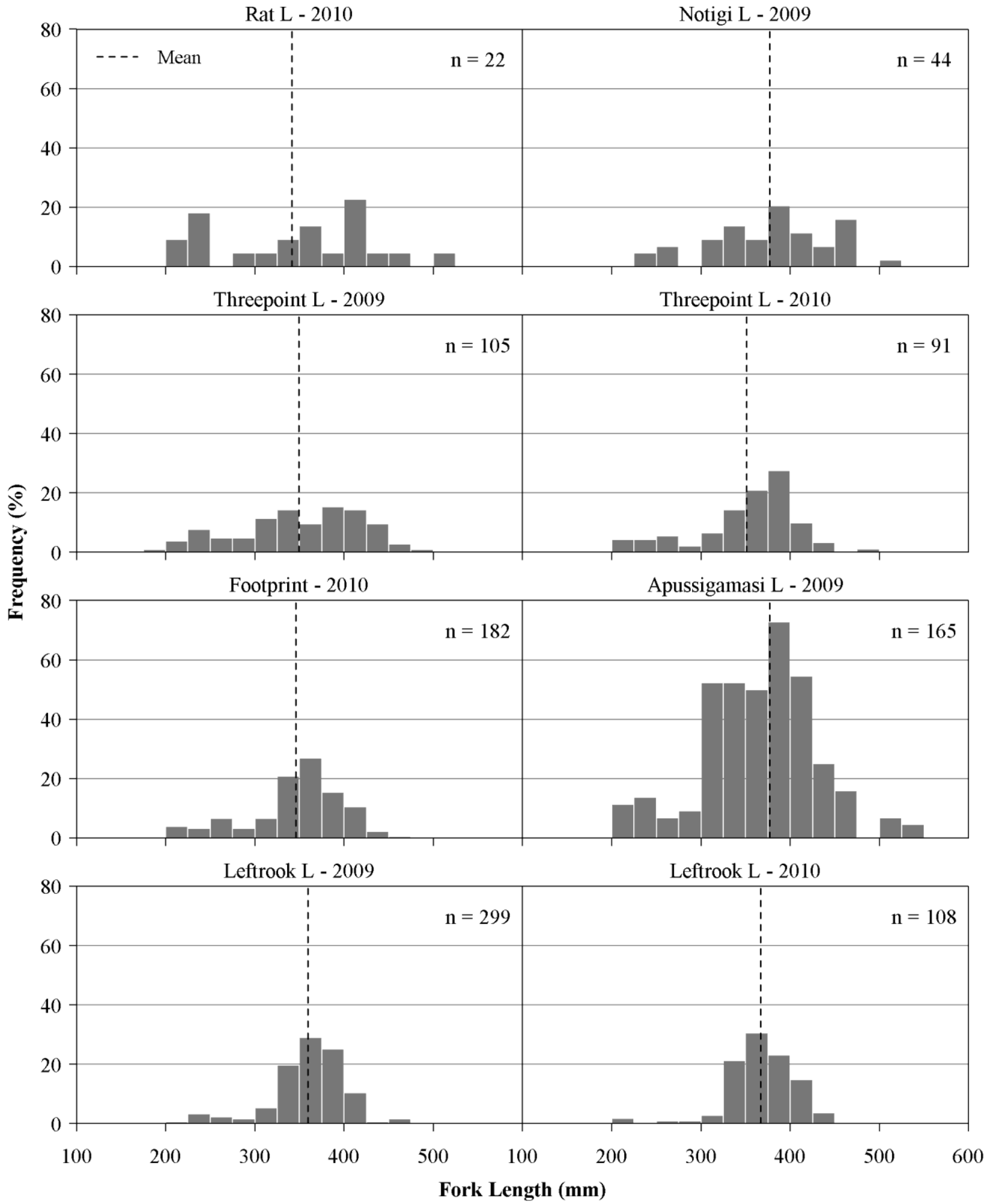


Figure 5.5.7-34. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Churchill River Diversion waterbodies, 2009-2010.

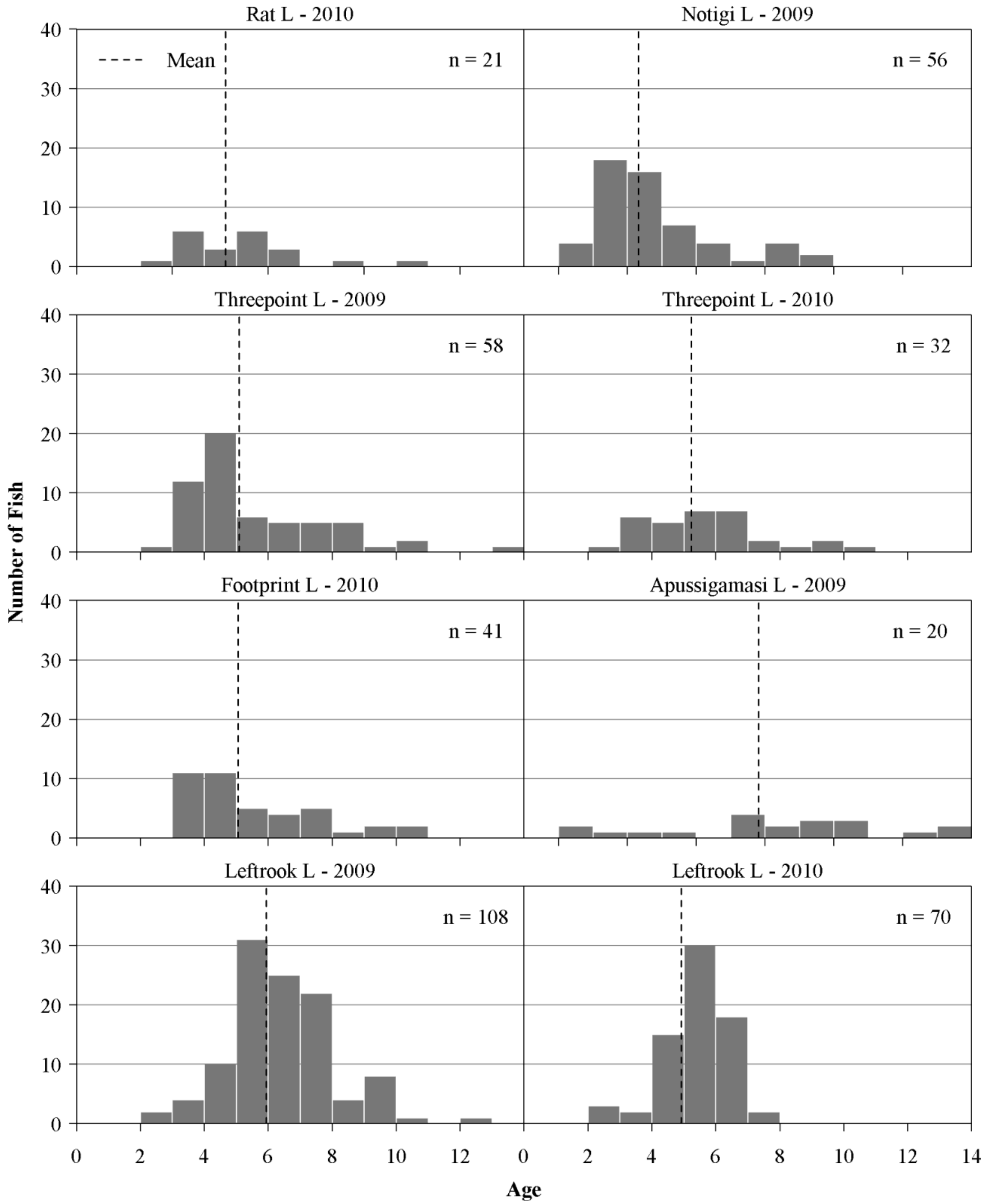


Figure 5.5.7-35. Catch-at-age plots for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion waterbodies, 2009-2010.

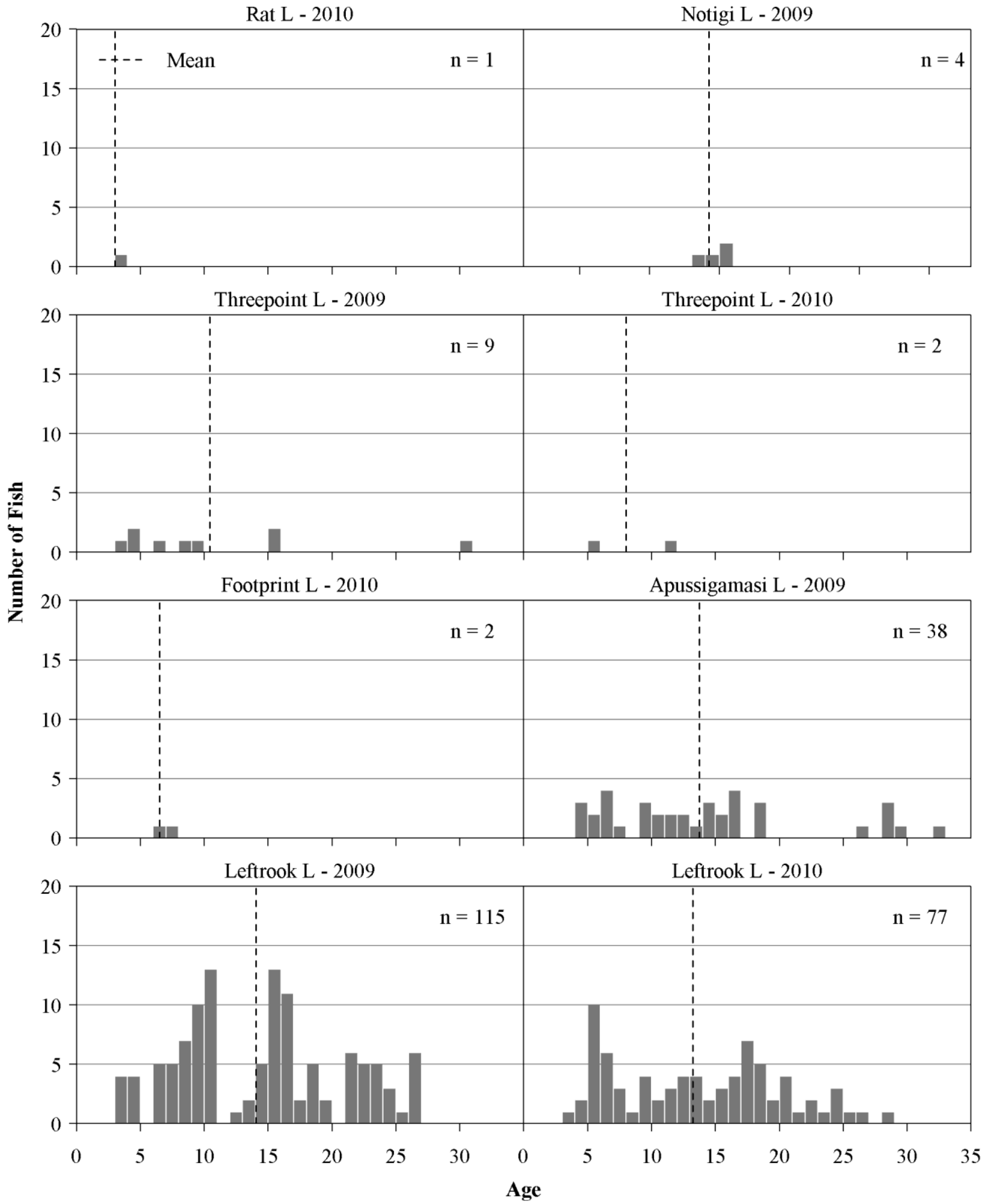


Figure 5.5.7-36. Catch-at-age plots for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion waterbodies, 2009-2010.

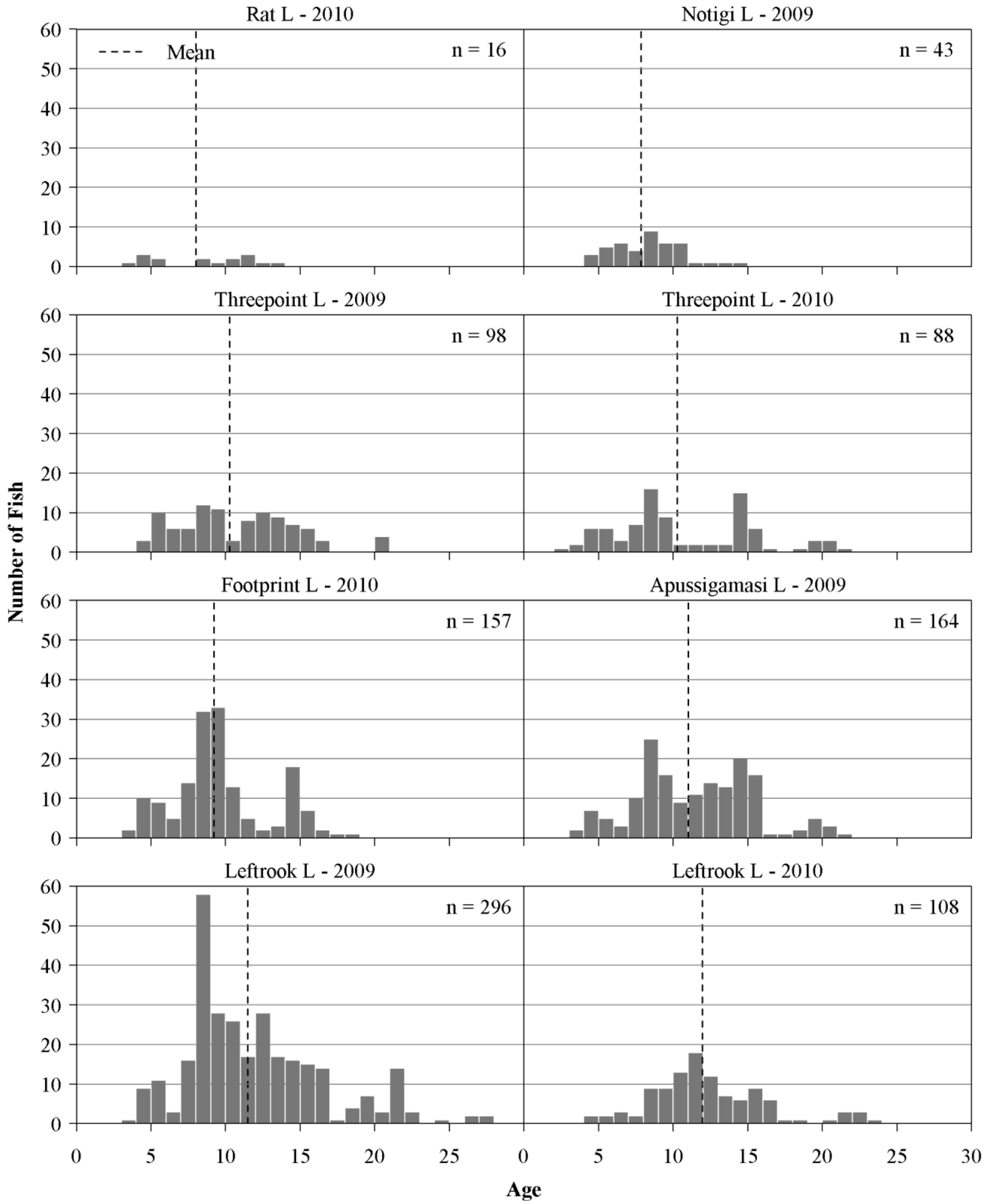


Figure 5.5.7-37. Catch-at-age plots for Walleye captured in standard gang index gill nets set in Churchill River Diversion waterbodies, 2009-2010.

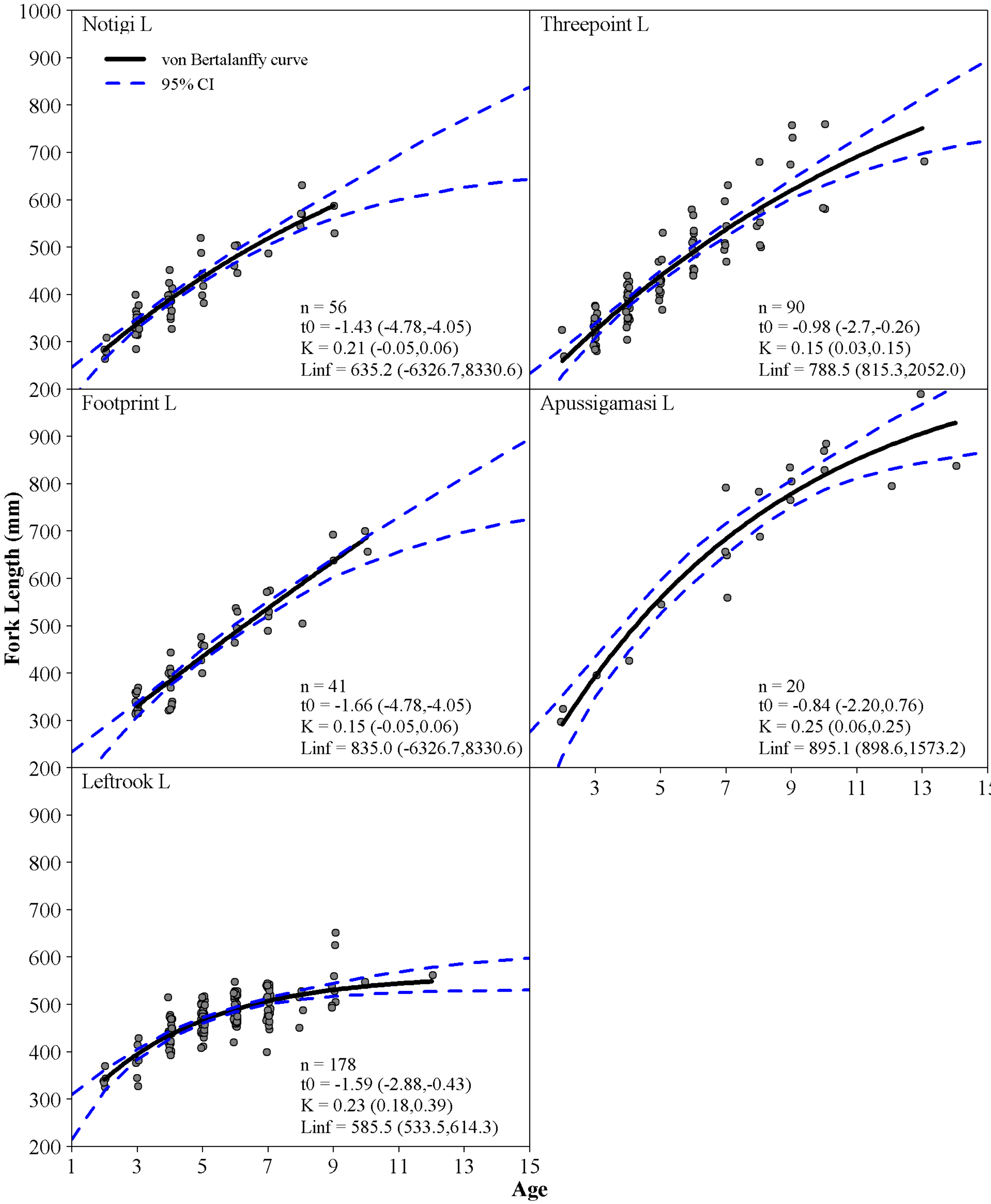


Figure 5.5.7-38. Fitted typical von Bertalanffy growth models for Northern Pike captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

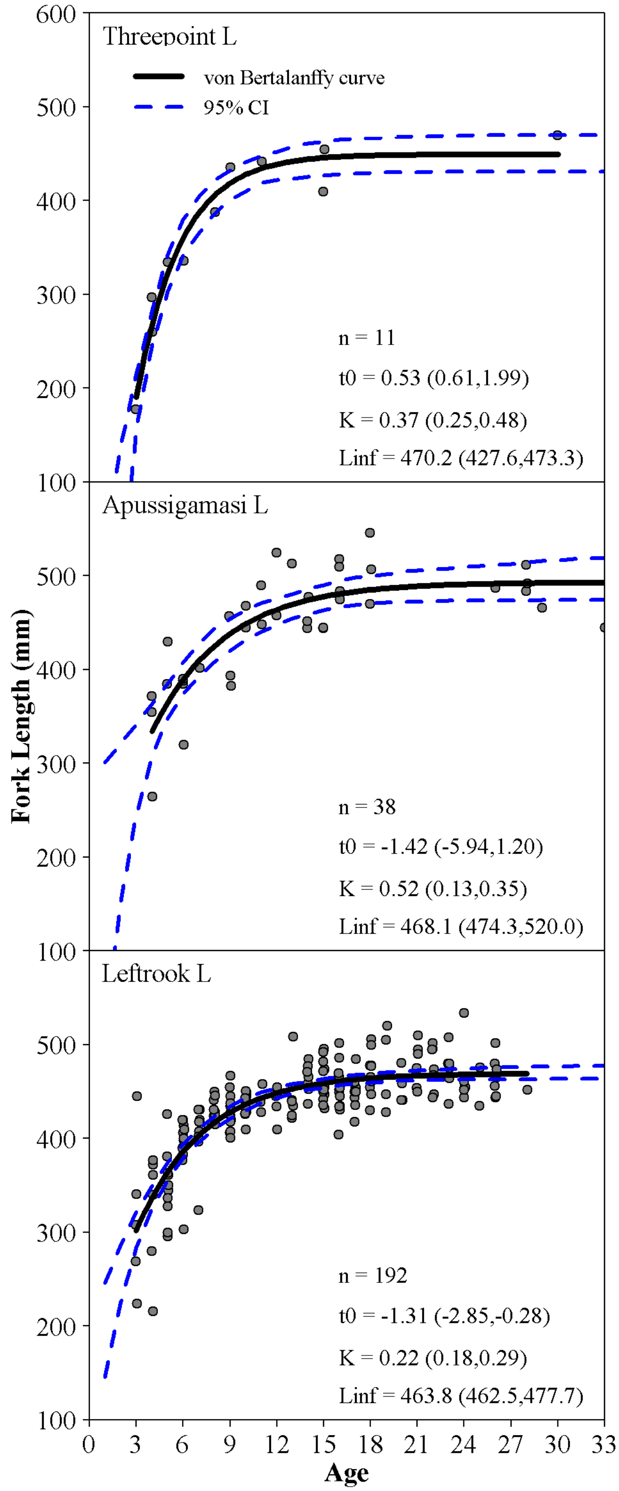


Figure 5.5.7-39. Fitted typical von Bertalanffy growth models for Lake Whitefish captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

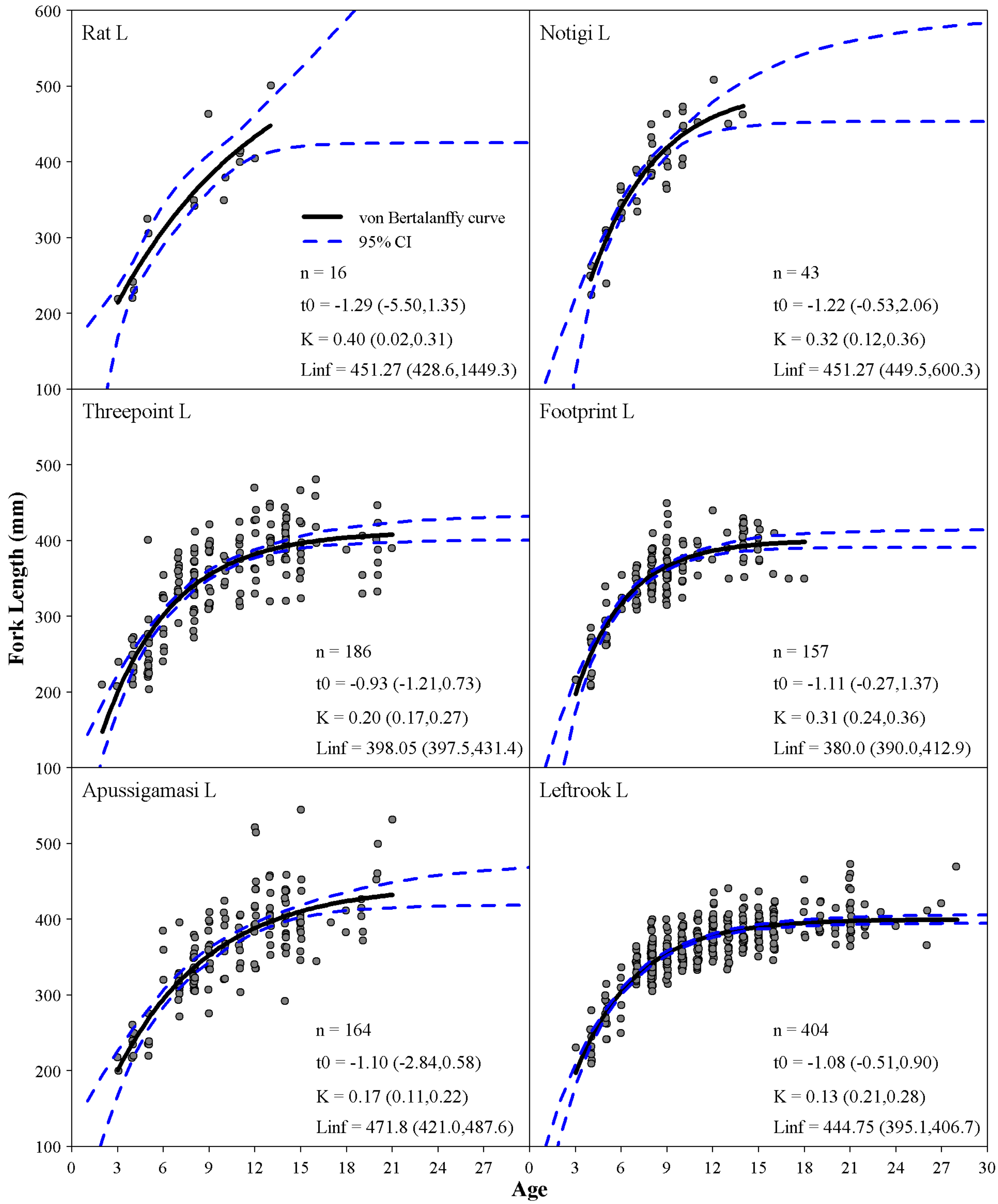


Figure 5.5.7-40. Fitted typical von Bertalanffy growth models for Walleye captured in standard gang index gill nets set in Churchill River Diversion Region waterbodies, 2009-2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

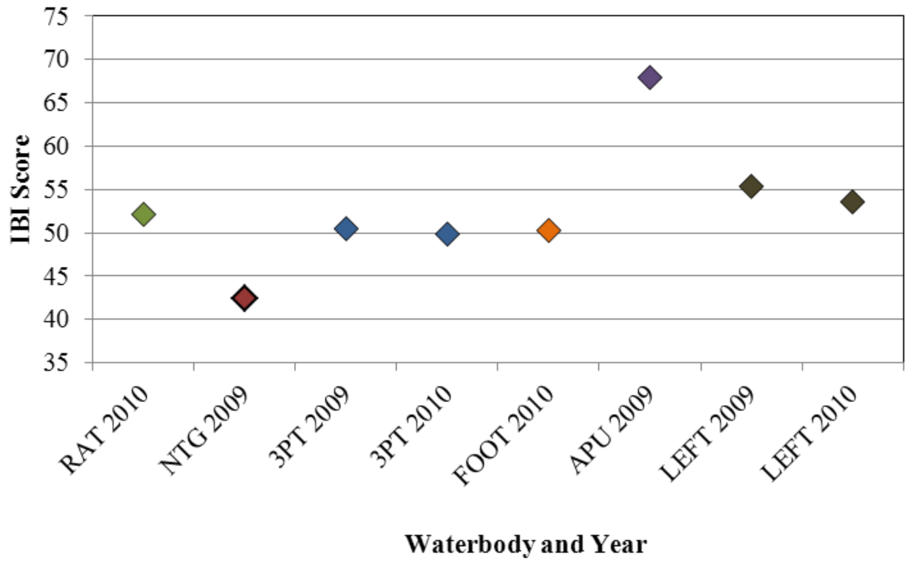


Figure 5.5.7-41. Scatter plot of yearly IBI scores for Churchill River Diversion Region for waterbodies, 2009-2010.

5.5.8 Fish Mercury

The following provides an overview of the results of fish mercury monitoring conducted in the Churchill River Diversion (CRD) Region under CAMPP. Waterbodies sampled included Rat Lake (Figure 5.5.8-1), Threepoint Lake (Figure 5.5.8-2), and an off-system waterbody - Leftrook Lake (Figure 5.5.8-3). Fish mercury samples were collected from all three waterbodies in 2010. Details of sampling locations, times, and methodology are provided in Appendix 1.

5.5.8.1 Species comparisons

A total of 231 fish were analyzed for mercury from the CRD Region in 2010 (Table 5.5.8-1). One-year old Yellow Perch were only captured from Leftrook Lake (n=3), and were aged as 1+ years with a mean length of 78 mm (Table 5.5.8-2). Only low numbers of Lake Whitefish were obtained from Rat (n = 3) and Threepoint (n = 2) lakes. Numbers of Northern Pike and Walleye were close to or at the target sample size of 36 fish from Threepoint and Leftrook lakes, but lower numbers were obtained from Rat Lake (Table 5.5.8-1).

Mercury concentration and fish length were significantly positively correlated for all species where more than three samples were obtained (Figure 5.5.8-4), indicating that length-standardization of concentrations was necessary for comparative purposes. With the exception of Lake Whitefish from Leftrook Lake, length-standardized concentrations differed substantially from arithmetic concentrations due to lower mean fish sizes relative to the standard length of each species (Table 5.5.8-2).

Arithmetic mean mercury concentrations in Northern Pike and Walleye were similar to or higher than in Lake Whitefish in each of the waterbodies (Table 5.5.8-1). In addition, concentrations were significantly higher in Northern Pike and Walleye than in Yellow Perch for Leftrook Lake.

5.5.8.2 Comparison to consumption guidelines

Length-standardized concentrations of mercury in Northern Pike and Walleye from Rat and Threepoint lakes were above 0.5 parts per million (ppm; Table 5.5.8-1), the Health Canada standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b) and the Manitoba aquatic life tissue residue guideline for human consumers (Manitoba Water Stewardship [MWS] 2011). With 0.39 ppm mercury, Northern Pike from Leftrook Lake had an intermediate concentration, whereas, at 0.2 ppm, Walleye contained a lower concentration; 0.2 ppm is coomonly accepted as the safe consumption limit for people eating large quantities of fish domestically (see section 4.8.2.3). Mean concentrations in Lake Whitefish were well below 0.2 ppm.

Based on individual concentrations, 92-100% of Northern Pike and Walleye analysed from Rat and Threepoint lakes exceeded the 0.2 ppm guideline and approximately 40% of individuals of these species also contained mercury concentrations in excess of the 0.5 ppm standard (Figure 5.5.8-4). In contrast, none of the Northern Pike or Walleye from Leftrook Lake had concentrations higher than 0.5 ppm, although most (58-67%) exceeded 0.2 ppm. Mercury concentrations were notably lower in Lake Whitefish and Yellow Perch from the CRD Region and none had concentrations above 0.2 ppm. In addition, mercury concentrations of most fish from the CRD Region were substantially higher than the Canadian Council of Ministers of the Environment (CCME) and Manitoba tissue residue guidelines of 0.033 ppm of methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; updated to 2013; MWS 2011); exceptions included 13 Lake Whitefish, almost exclusively from Leftrook Lake, and two Yellow Perch from Leftrook Lake. While CAMPP monitors for total mercury rather than methylmercury in fish muscle, the vast majority of mercury in fish muscle is in the form of methylmercury (see section 4.8.2.3) and comparison to these guidelines is conservative.

5.5.8.3 Spatial comparisons

Length-standardized concentrations of mercury in Northern Pike and Walleye from Rat and Threepoint lakes were similar, and both were significantly higher than their conspecifics from Leftrook Lake (Figure 5.5.8-5). The same pattern appeared to exist for mercury concentrations in Lake Whitefish, but smaller sample sizes from Rat and Threepoint Lake precluded a meaningful statistical comparison.

Table 5.5.8-1. Arithmetic mean (± standard error, SE) and length-standardized (± 95% confidence limit, CL) mercury concentrations (ppm) in Lake Whitefish, Northern Pike, Walleye, and Yellow Perch captured in the Churchill River Diversion Region in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Rat L	Northern Pike	22	0.450[b]	0.065	0.655	0.539 - 0.796
	Walleye	25	0.492[b]	0.030	0.566	0.517 - 0.621
	Lake Whitefish	3	0.063[a]	0.037	-*	0.000 - 0.174
	Yellow Perch	0	-	-	-	-
Threepoint L	Northern Pike	32	0.502[b]	0.039	0.591	0.527 - 0.663
	Walleye	36	0.510[b]	0.036	0.577	0.495 - 0.673
	Lake Whitefish	2	0.082[a]	0.040	-*	0.000 - 0.202
	Yellow Perch	0	-	-	-	-
Leftrook L	Northern Pike	36	0.247[b]	0.017	0.392	0.317 - 0.484
	Walleye	36	0.220[b]	0.017	0.255	0.216 - 0.301
	Lake Whitefish	36	0.044[a]	0.004	0.026	0.022 - 0.031
	Yellow Perch	3	0.029[a]	0.007	-*	0.008 - 0.050

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

Note: Different superscripts indicate significant differences between species within a waterbody. For significant differences between standardized means (i.e., within species between waterbodies) see Figure 5.5.8-5.

Table 5.5.8-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from the Churchill River Diversion Region in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Rat L	Northern Pike	22	421.2 ± 26.8	632.1 ± 191.9	0.64 ± 0.01	4.6 ± 0.4
	Walleye [a]	25	342.6 ± 16.5	495.4 ± 65.4	1.04 ± 0.02	8.0 ± 0.8
	Lake Whitefish	3	338.7 ± 101.4	1224.0 ± 102.3	1.68 ± 0.19	-
	Yellow Perch	0	-	-	-	-
Threepoint L	Northern Pike	32	483.9 ± 21.8	1046.3 ± 201.6	0.69 ± 0.02	5.2 ± 0.3
	Walleye	36	358.3 ± 8.7	511.5 ± 34.3	1.04 ± 0.01	11.0 ± 0.8
	Lake Whitefish	2	388.5 ± 53.5	889.5 ± 398.5	1.40 ± 0.09	8.0 ± 3.0
	Yellow Perch	0	-	-	-	-
Leftrook L	Northern Pike	36	469.8 ± 7.4	645.1 ± 28.3	0.61 ± 0.01	5.1 ± 0.2
	Walleye	36	352.9 ± 0.6	462.6 ± 18.6	1.02 ± 0.01	11.1 ± 0.6
	Lake Whitefish [b]	36	418.2 ± 10.5	1099.1 ± 74.2	1.41 ± 0.02	13.8 ± 1.2
	Yellow Perch	3	78.3 ± 4.4	6.9 ± 1.1	1.42 ± 0.13	1.0 ± 0.0

[a]n = 16 for age; [b]n = 30 for age

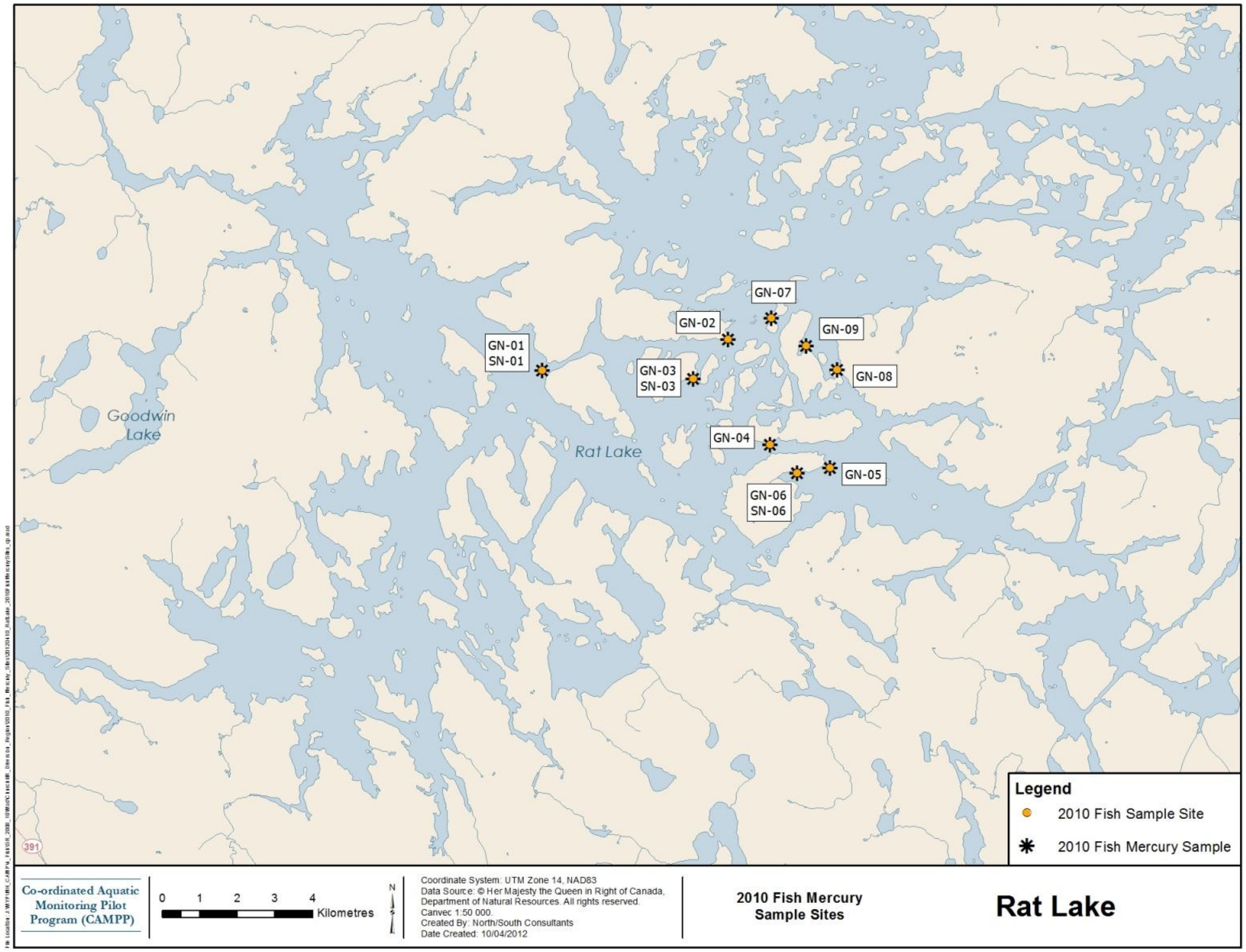


Figure 5.5.8-1. Fish sampling sites in Rat Lake, indicating those sites where fish were collected for mercury analysis.

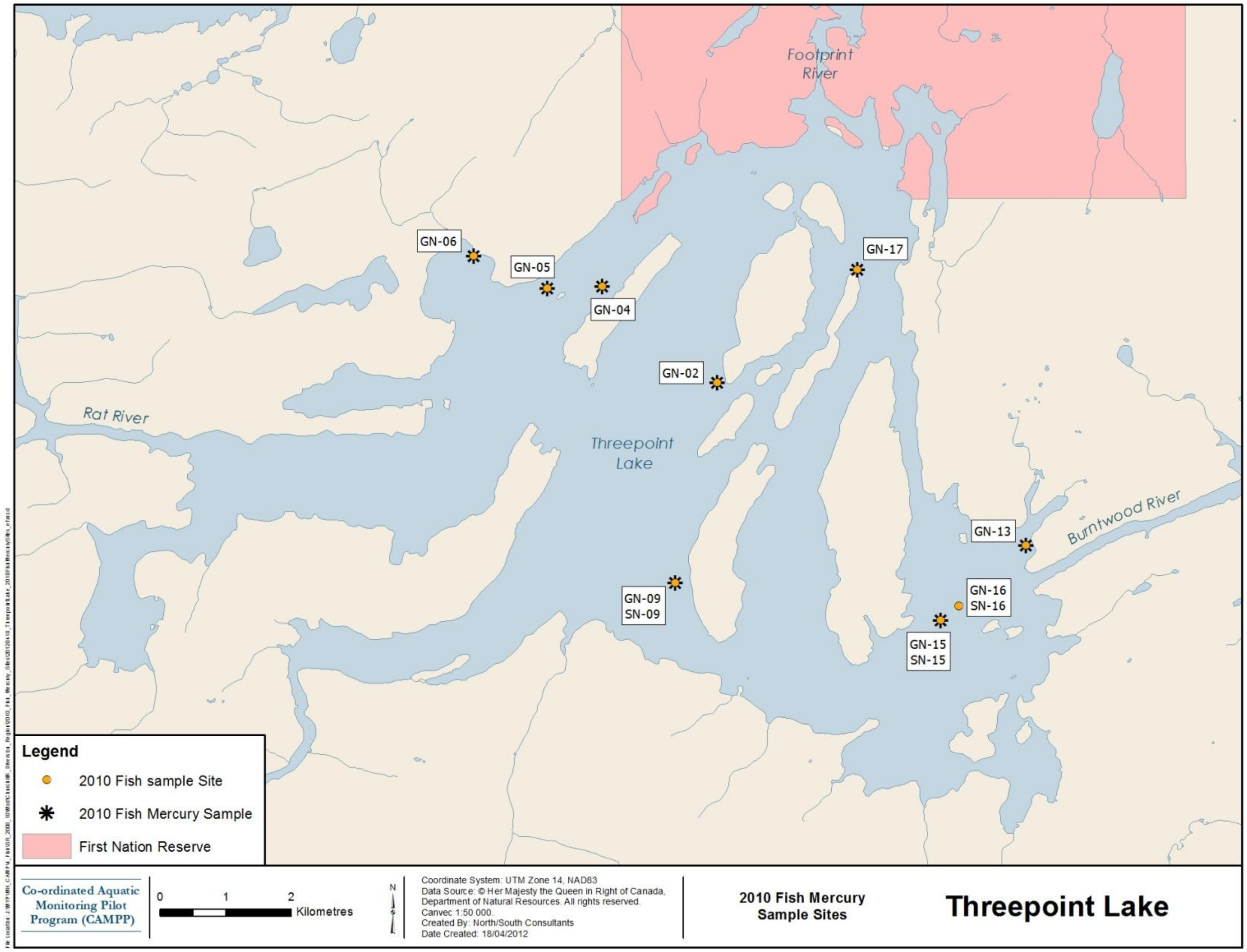


Figure 5.5.8-2. Fish sampling sites in Threepoint Lake, indicating those sites where fish were collected for mercury analysis.

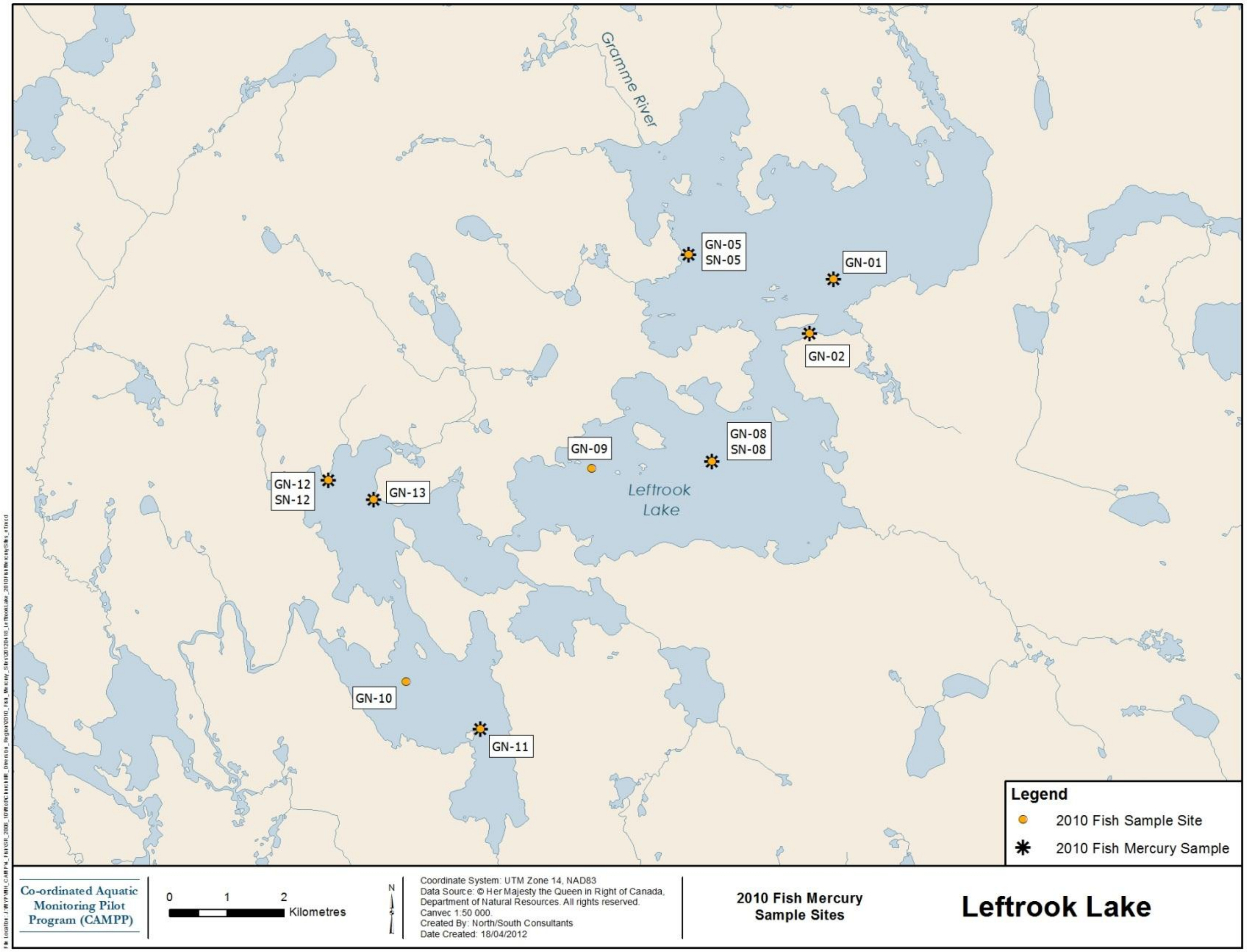


Figure 5.5.8-3. Fish sampling sites in Leftrook Lake, indicating those sites where fish were collected for mercury analysis.

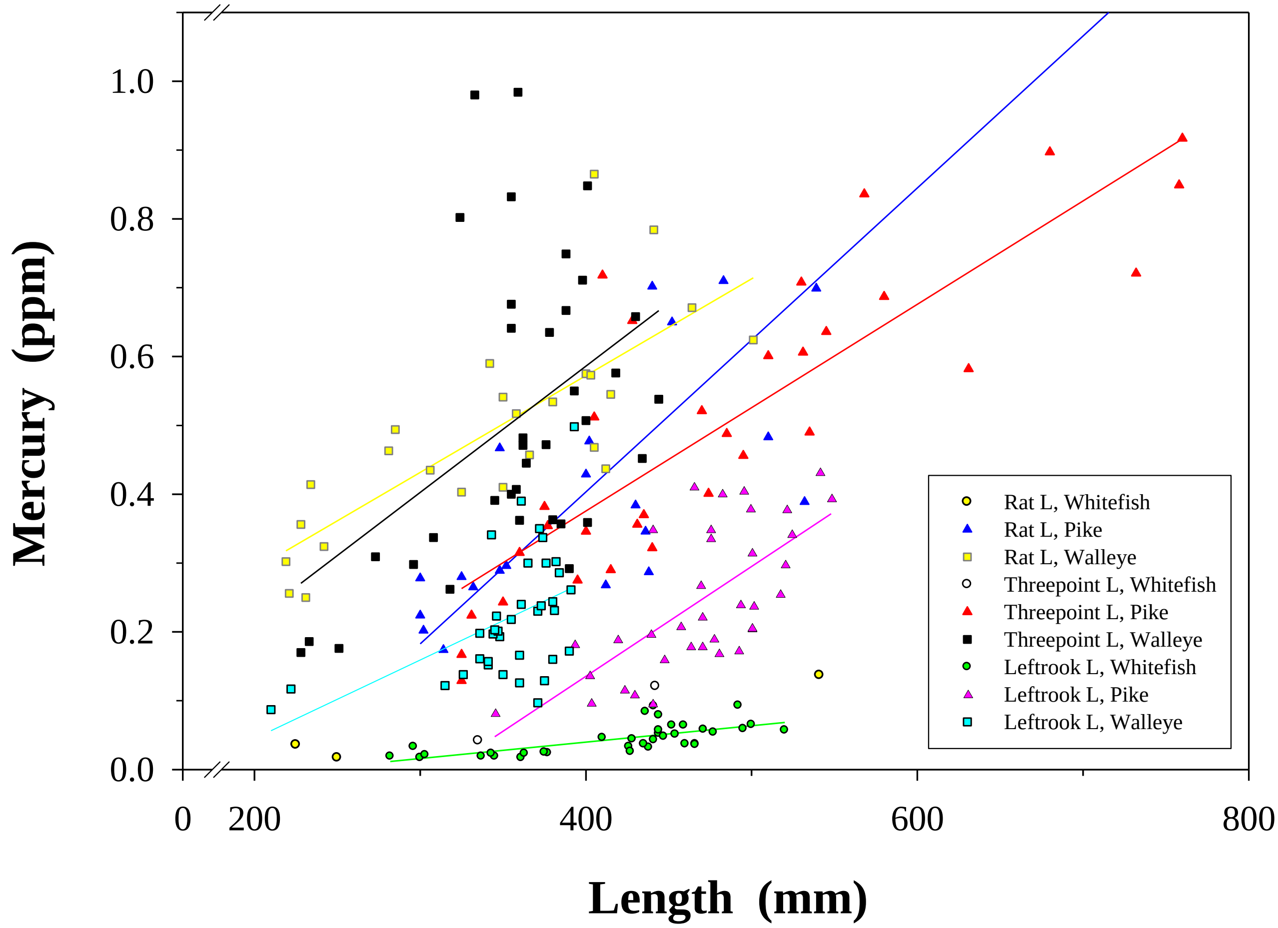


Figure 5.5.8-4. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from the Churchill River Diversion Region in 2010. Significant linear regression lines are shown. One Northern Pike from Rat Lake with a mercury concentration of 1.61 ppm and a length of 871 mm is not shown but is included in the analysis.

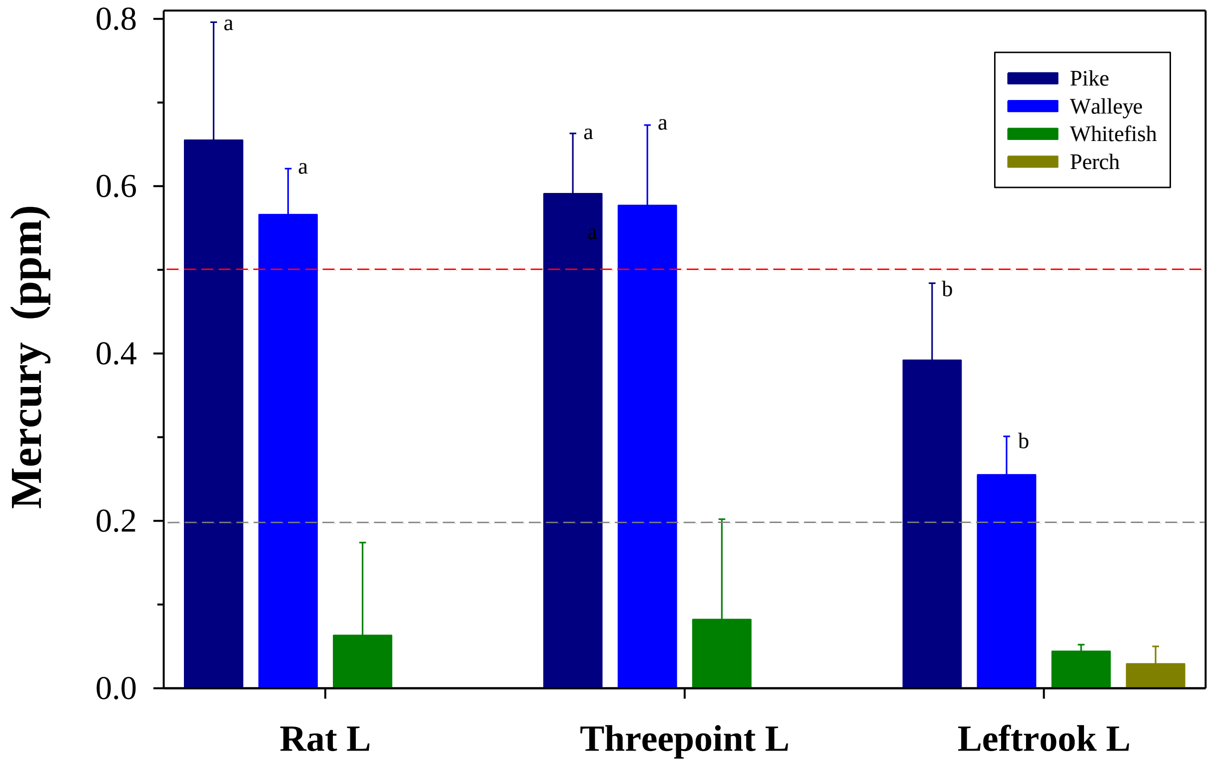


Figure 5.5.8-5. Length-standardized mean (+95% CL) muscle mercury concentrations of Northern Pike and Walleye, and arithmetic mean (+95% CL) concentrations of Lake Whitefish and Yellow Perch captured in the Churchill River Diversion Region in 2010. Means with different superscripts indicate a significant difference between waterbodies within species. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.