Manitoba/Manitoba Hydro
Coordinated Aquatic Monitoring Pilot Program (CAMPP):
Three Year Summary Report (2008-2010) - Volume 7

Results of the Three Year Program

Section 5.6: Upper Nelson River Region

VOLUME 7

SECTION 5.6: UPPER NELSON RIVER REGION

Reference listing:

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TABLE OF CONTENTS

Page 5.6-x

LIST OF TABLES

Page 5.6-x

LIST OF FIGURES

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

Page 5.6-x

5.6 UPPER NELSON RIVER REGION

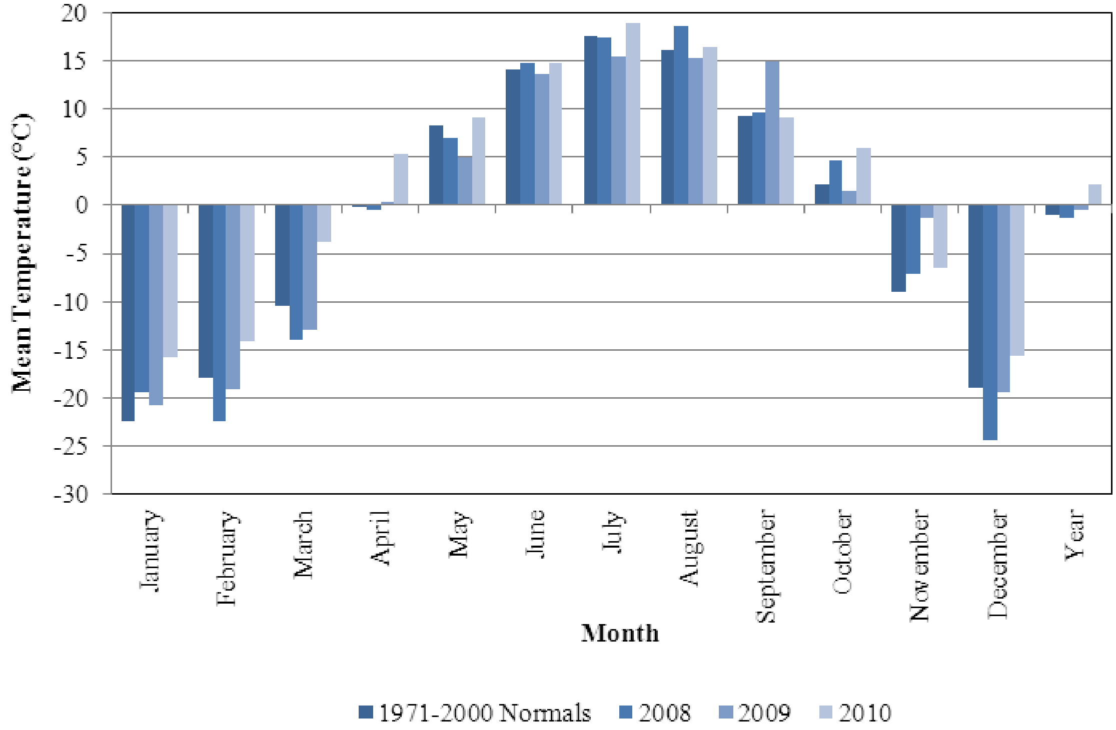
The following presents the results of the Coordinated Aquatic Monitoring Pilot Program (CAMPP) conducted over the period of 2008/2009 through 2010/2011 in the Upper Nelson River Region.

5.6.1 Climate

The mean annual temperature measured at Norway House in 2008 and 2009 was similar to the mean annual temperature normal but mean temperature was slightly warmer in 2010 (Figure 5.6.1-1). Mean monthly temperatures were also similar to the 1971-2000 temperature normals in 2008 and 2009 but were generally higher in 2010. Exceptions included January 2008, September 2009, and November 2009, when temperatures were consistently warmer (3 °C, 5.8°C, and 7.5 °C, respectively), and February, March and December 2008, and May 2009 when temperatures were noticeably colder (4.6 °C, 3.5°C, 5.4 °C, and 3.3 °C, respectively) than the normals. Temperatures were either similar to (August and September), or warmer than, the normal in 2010. The months of January through April were notably warmer than the normal for those months and the annual mean temperature was nearly 4 ^{o}C higher than the normal for this station in 2010.

Total monthly precipitation at Norway House is typically highest over the period of June through September and this pattern was observed in 2008, 2009, and 2010 (Figure 5.6.1-1). However, precipitation levels were notably higher than the normal in June 2010, July 2008 and 2009, and August 2010; within each year, the monthly maximum total precipitation occurred in July 2008 (206 mm), July 2009 (175 mm), and August 2010 (163 mm). Overall annual precipitation was very similar to the annual normal in 2008 and 2009, and slightly higher in 2010.

(A)



(B)

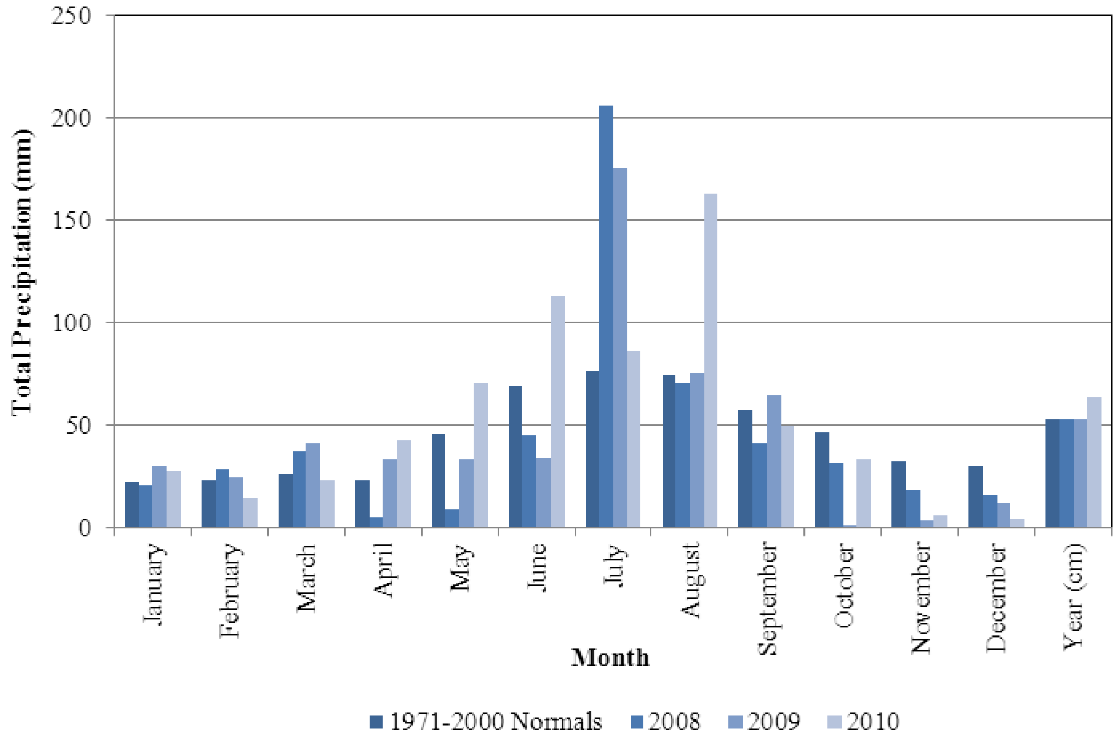


Figure 5.6.1-1. Monthly mean air temperature (A) and monthly total precipitation (B) for 2008-2010 compared to climate normals (1971-2000), Norway House, MB.

5.6.2 Hydrology

The majority of Lake Winnipeg's discharge flows through the upper Nelson River's West Channel, which is regulated by operations at the Jenpeg Generating Station (GS) for power production purposes and for flood and drought support on Lake Winnipeg. The East Channel is un-regulated and accounts for roughly 15 percent of the total flow. CAMPP monitoring occurs on Playgreen Lake, which is the first lake downstream from Lake Winnipeg, and on Little Playgreen Lake, downstream from Playgreen Lake on the upper Nelson River's East Channel. Monitoring also occurs on Cross Lake, which is directly downstream from the Jenpeg GS, and at two off-system lakes - Walker Lake which flows to the west basin of Cross Lake and Setting Lake. Although considered off-system, Walker Lake water levels are periodically affected by levels at Cross Lake when water levels exceed about 207.6 m. Flows for this region are monitored at the Kelsey GS.

upper Nelson River flows at the Kelsey GS between 2008 and 2010 were generally above the upper quartile due to above average precipitation which led to high inflows and lake levels on Lake Winnipeg. As a result, discharge out of Lake Winnipeg was maximized during portions of 2008, 2009, and 2010. Flows reached record highs in early-July 2009 and again from October to the end of the year in 2010. The exceptions to the high flow trend included a period from May to June in 2008 and May to July in 2010 where below average snowpack led to below average early summer flows (Figure 5.6.2-1). Flows were well above average, reaching record highs for most of January through March 2011.

Playgreen Lake water levels were near or above the upper quartile level for most of 2009 and 2010, reaching record highs for parts of September through to the end of the year in 2010 (Figure 5.6.2-2). Levels remained at near record high from January through March in 2011. Little Playgreen Lake followed the same trend as Playgreen Lake in 2010 with levels near the upper quartile for most of the year and then rising above the upper quartile for the last few months of the year (Figure 5.6.2-3). Water levels were well above the upper quartile in Little Playgreen Lake from January through March 2011.

Cross Lake water levels were above the upper quartile for most of 2008 to 2010, falling below the average only in the month of May 2010 and reaching record high levels for October through December 2010 (Figure 5.6.2-4). Water levels remained at near record highs from January through March 2011.

In 2010, Walker Lake water levels were above average from January until the end of April and then dropped to the lower quartile for May and June. Levels then rose steadily until October and reached record high levels from mid-October to the end of the year (Figure 5.6.2-5). High

Walker Lake levels were partially influenced by a backwater effect due to very high levels on Cross Lake from late-June until the end of 2010. Water levels remained at near record highs from January through March 2011.

As part of the CAMPP program, a water level gauge was established on Setting Lake in late 2008. Water levels were very similar from January to early-May in 2009 and 2010. Levels then rose to a peak in August of 2009, while the peak occurred much later in October of 2010. 2010 water levels were higher in November and December than the two previous year of available record (Figure 5.6.2-6). There are little data available for early 2011 but available data indicate that levels were higher than in the two previous years from January through March.

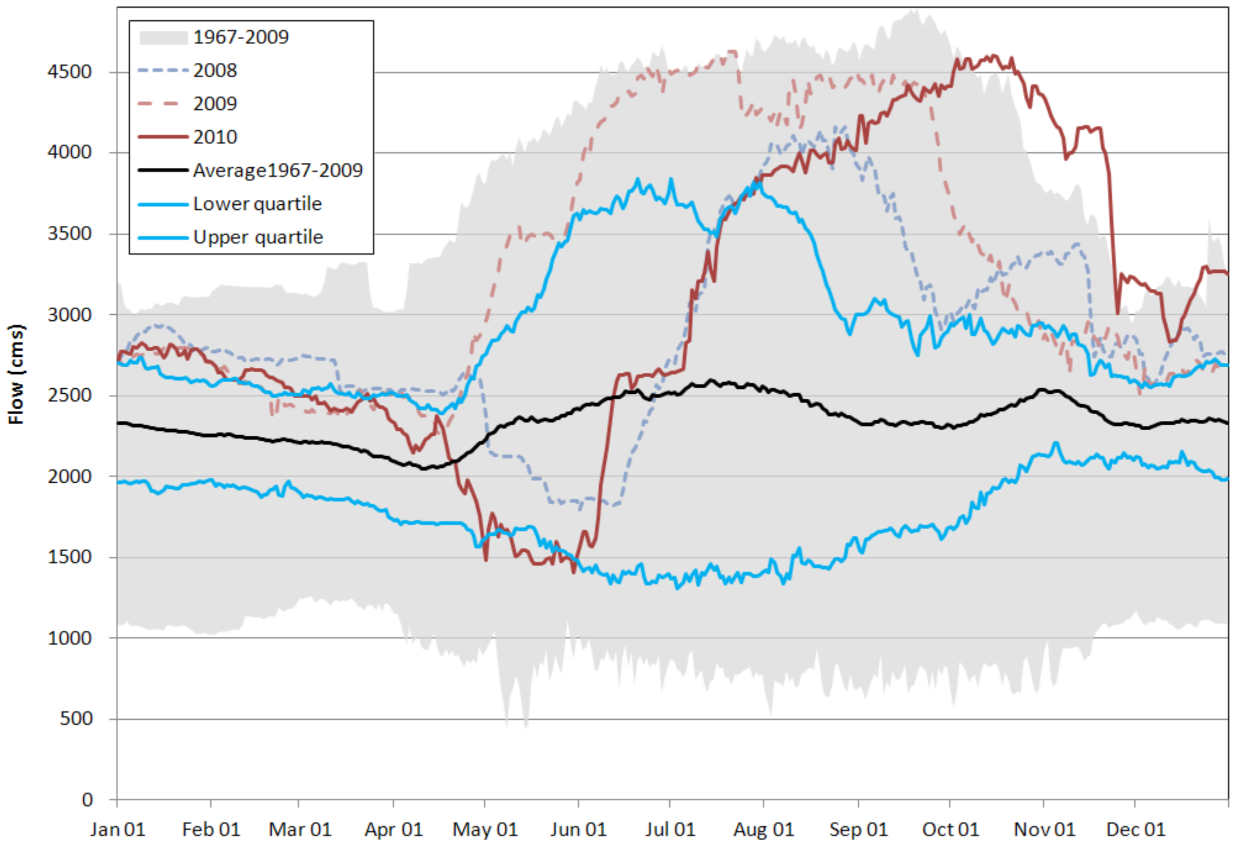


Figure 5.6.2-1. 2008-2010 Kelsey Generating Station outflow.

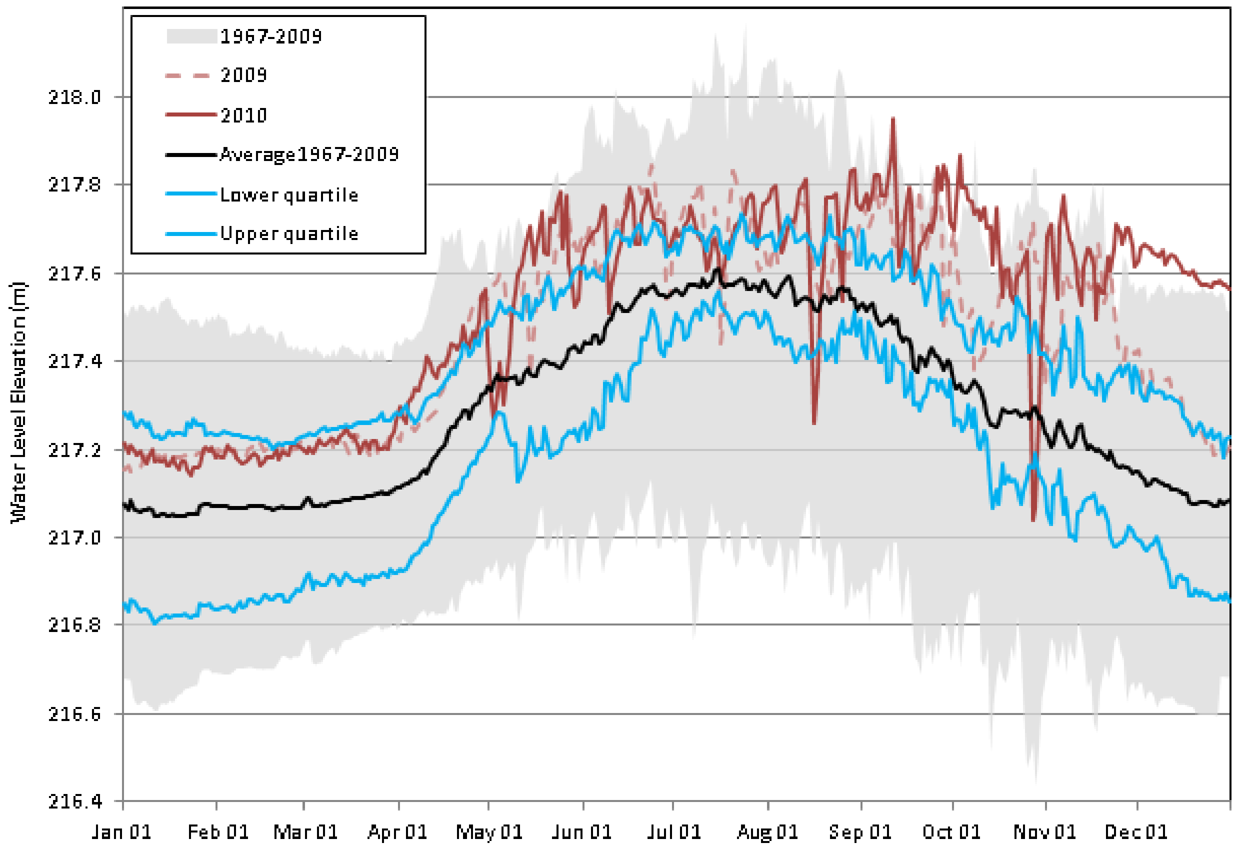


Figure 5.6.2-2. 2009-2010 Playgreen Lake (05UB005) water level elevation.

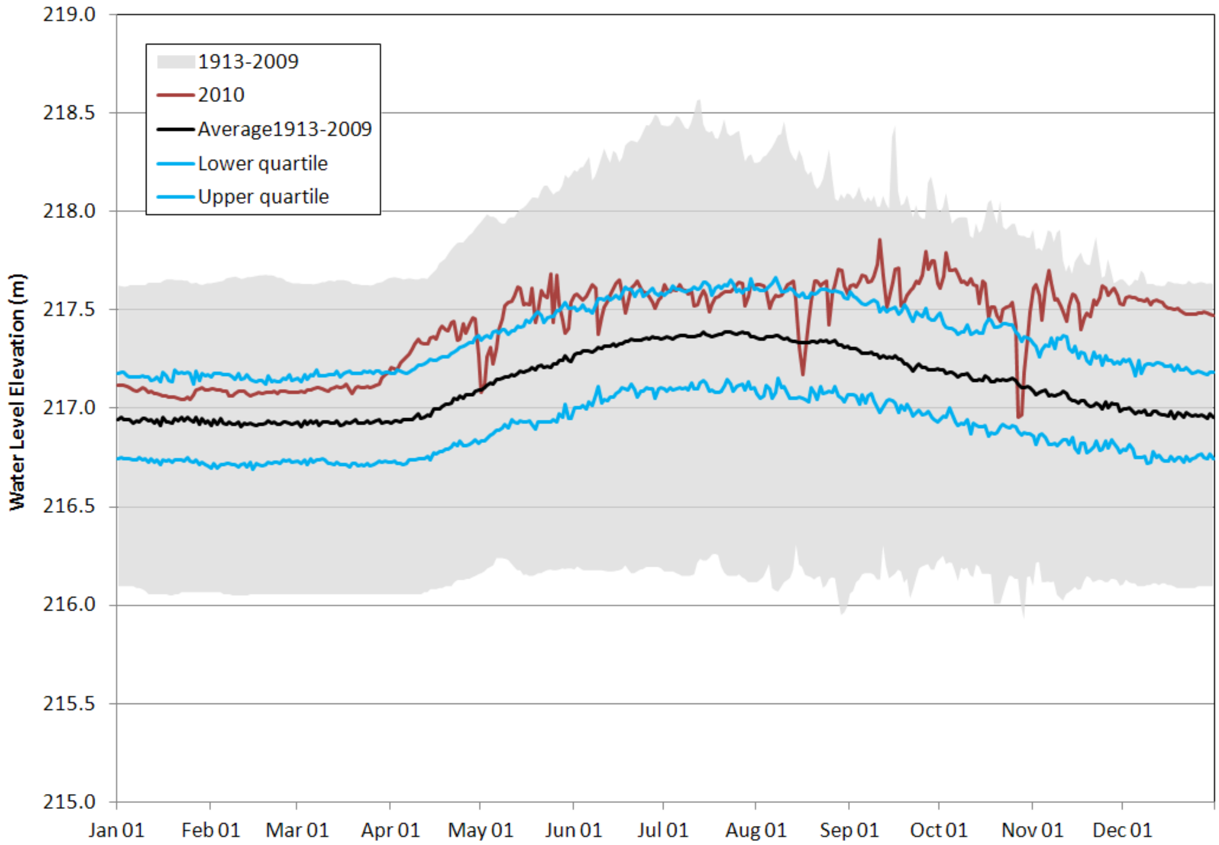


Figure 5.6.2-3. 2010 Little Playgreen Lake (05UB001) water level elevation.

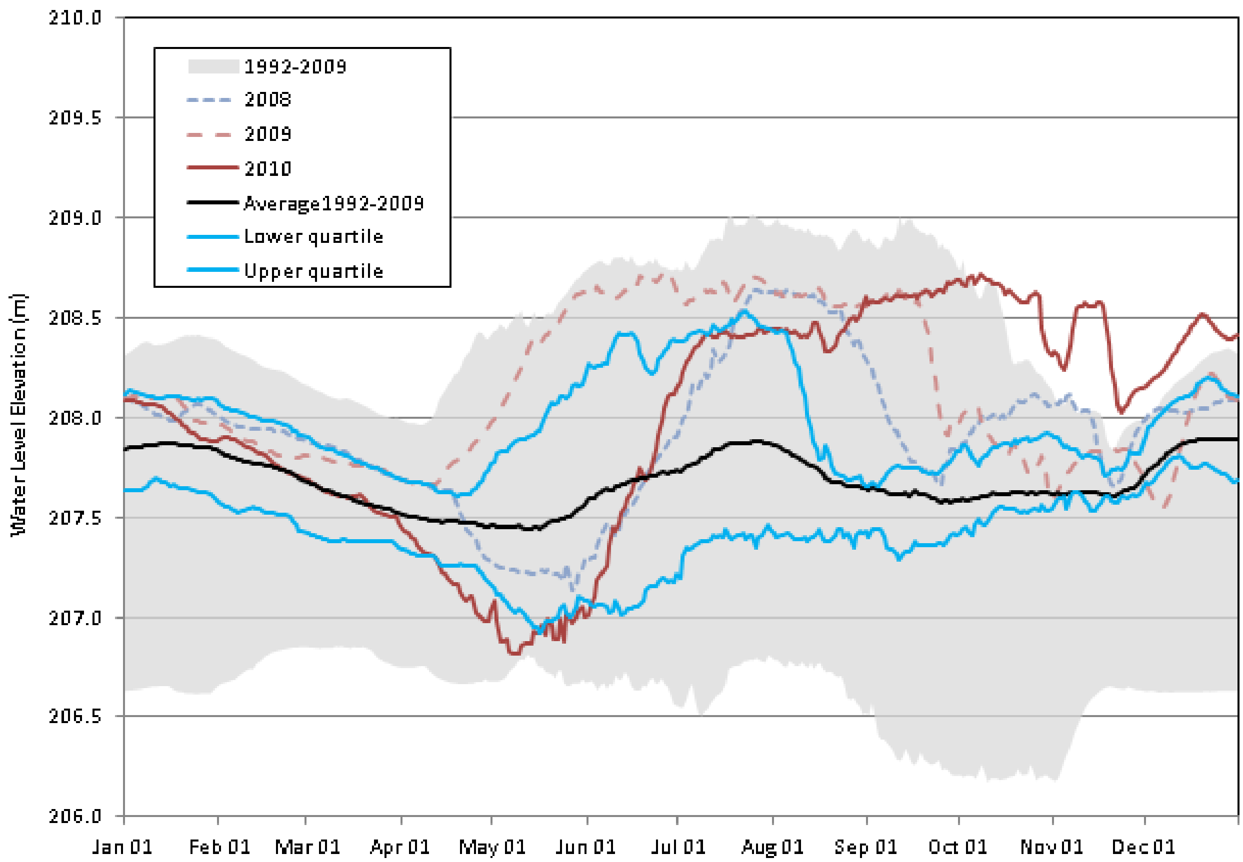


Figure 5.6.2-4. 2008-2010 Cross Lake (05UD001) water level elevation.

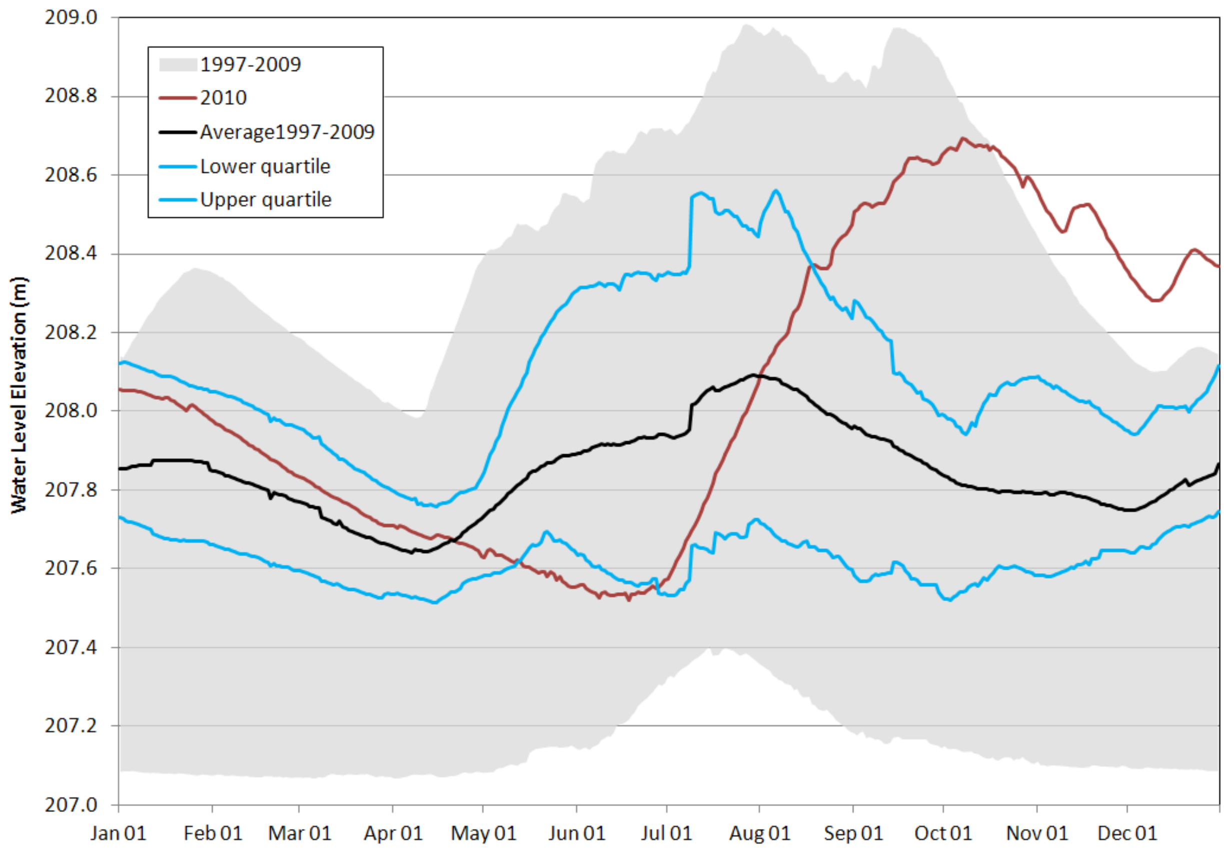


Figure 5.6.2-5. 2010 Walker Lake (05UD704) water level elevation.

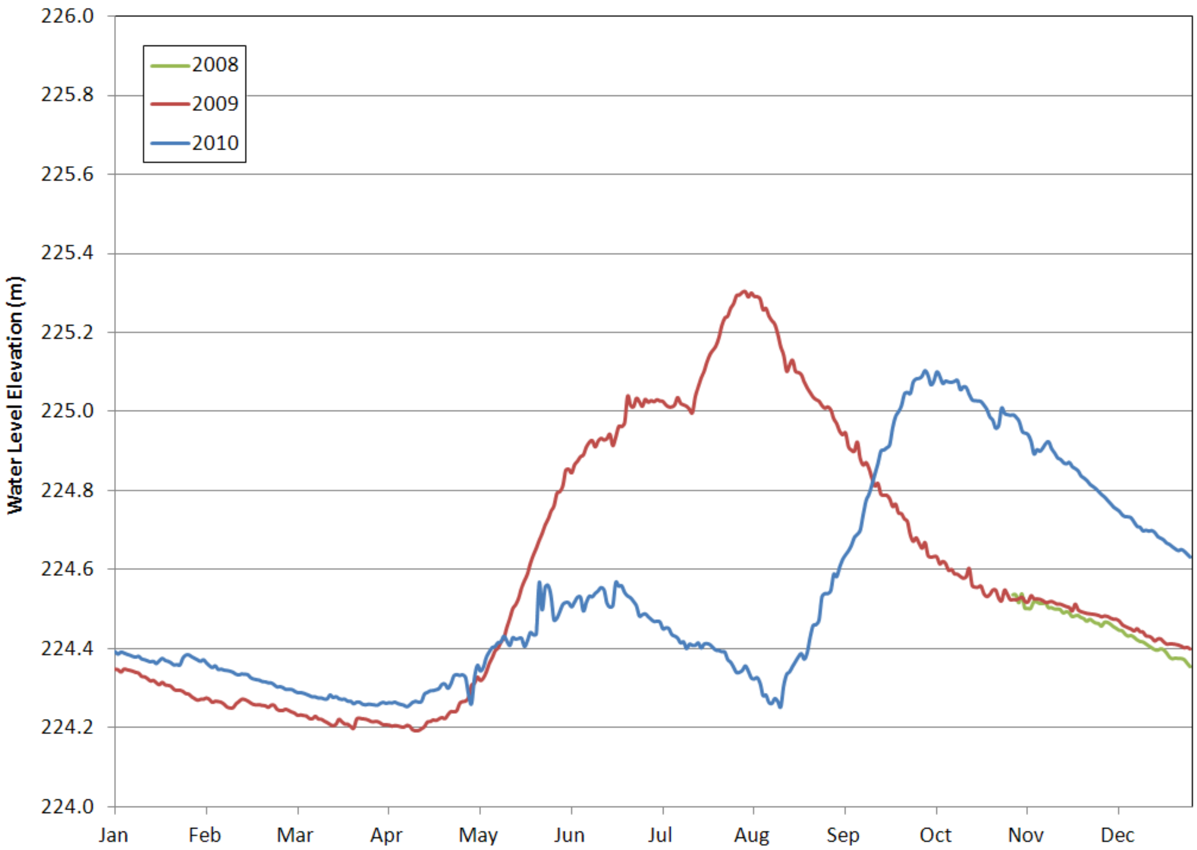


Figure 5.6.2-6. 2008-2010 Setting Lake (05TC701) water level elevation.

5.6.3 Aquatic Habitat

Aquatic habitat surveys were not conducted in the Upper Nelson River Region in years 1 to 3 of CAMPP.

5.6.4 Water Quality

The following provides an overview of water quality conditions measured over the three years of CAMPP in the Upper Nelson River Region. Waterbodies sampled annually included one on-system waterbody (Cross Lake) and one off-system waterbody (Setting Lake). Water quality was also measured at two on-system rotational sites (Playgreen Lake in 2009/2010 and Little Playgreen Lake in 2010/2011) and one off-system site (Walker Lake in 2010/2011; Figure 5.6.4-1). Sampling dates and mean daily air temperatures are presented in Figure 5.6.4-2.

Water quality is described below for waterbodies located on the upper Nelson River (on-system waterbodies) and Setting and Walker lakes (off-system waterbodies), 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.

The primary objective of spatial comparisons (i.e., comparison between waterbodies) made in this report was to evaluate whether water quality conditions differ between on-system sites. Comparisons were also made between the on-system waterbodies and the off-system waterbodies, though 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 (i.e., Cross and Setting lakes) in order to provide a preliminary assessment of temporal variability. As additional data are acquired, more formal trend analyses may be undertaken to evaluate potential longer-term changes.

Results of water quality monitoring conducted under CAMPP in the Upper Nelson River 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 three years of data collected under CAMPP, they do not address historical conditions in the waterbodies.

5.6.4.1 Overview

Water quality of the upper Nelson River waterbodies monitored under CAMPP can be generally described as moderately nutrient-rich to nutrient-rich, slightly alkaline, moderately hard to hard, and typically well-oxygenated. Playgreen, Little Playgreen, and Cross lakes did not stratify and maintained DO concentrations above MWQSOGs for PAL in the open-water season (MWS 2011). DO concentrations measured near the bottom of the water column did not meet some MWQSOGs for PAL in the winter of 2009 in Cross Lake. Waterbodies sampled on the upper Nelson River are classified as meso-eutrophic to eutrophic on the basis of total phosphorus (TP) concentrations, and mesotrophic to eutrophic on the basis of chlorophyll *a* and total nitrogen (TN) concentrations (open-water season data).

Other than DO, most routine water quality parameters (e.g., pH) and metals/major ions were within the MWQSOGs for PAL in waterbodies on the upper Nelson River system. Exceptions were restricted to aluminum, iron, and TP in lakes located along the main flow of the Nelson River (i.e., Playgreen, Little Playgreen, and Cross lakes; i.e., “mainstem lakes”). TP concentrations exceeded the Manitoba narrative nutrient guideline for lakes, reservoirs, and ponds in 75% or more of the samples collected in Playgreen, Little Playgreen, and Cross lakes. Available data indicate that TP concentrations are higher in Playgreen and Little Playgreen lakes than other lakes sampled in the Upper Nelson River Region.

As expected, water quality of Walker and Setting lakes (off-system lakes) differed from water quality of the mainstem Nelson River lakes. Setting Lake thermally stratified during some open-water seasons and experienced DO depletion across depth with concentrations dropping below MWQSOGs for PAL in winter and some summers. Weak stratification occurred in spring 2010 in Walker Lake and DO concentrations measured near the bottom of the water column did not meet some MWQSOGs for PAL in the winter of 2011 (the only year Walker Lake was monitored). Both Setting and Walker lakes are softer, clearer, more dilute (i.e., lower levels of conductivity), and slightly less phosphorus-rich than lakes on the main flow of the upper Nelson River. The lakes differed however with respect to colour; Setting Lake is more, and Walker Lake is less, coloured than lakes on the Nelson River. In addition, a number of metals were present in lower concentrations in Setting and Walker lakes compared to the 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. However, most of the seasonal differences were observed for Setting Lake. 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 in Setting Lake. While not statistically significant, the same general pattern occurred for Cross Lake. Other statistical differences included lower TSS in winter in both Cross and Setting lakes.

There were few and inconsistent differences in water quality conditions between the three sampling years within the annual waterbodies indicating that water quality conditions in the Upper Nelson River Region remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. Water levels were relatively high on Cross Lake when monitoring occurred in the open-water seasons of 2008-2010 and evaluations of potential relationships between water levels and water quality will be undertaken in the future with acquisition of additional data under a range of flow conditions. Due to the lack of historical water level data and data for the 2008 sampling year, consideration of the relationship between water levels and water quality on Setting Lake was not possible. Future evaluations of temporal variability or trends in water quality will be undertaken when additional data are acquired for the region.

5.6.4.2 Limnology and In Situ Variables

Water temperatures were generally near zero degrees Celsius in the ice-cover season and ranged up to approximately 23 ^{o}C over the study period in waterbodies of the Upper Nelson River Region. The annual mean air temperatures at Norway House were similar to the 1971-2000 normal in 2008 and 2009 and above normal in 2010 (Figure 5.6.1-1).

Upper Nelson River

Playgreen, Little Playgreen, and Cross lakes did not thermally stratify during the period of study (Figures 5.6.4-3 to 5.6.4-5). DO was similar across depth in Playgreen Lake across the sampling periods (Figure 5.6.4-6) but decreased with depth in Cross Lake in the winters of 2008/2009 and 2010/2011 (Figure 5.6.4-7) and in Little Playgreen Lake in winter 2010/2011 (Figure 5.6.4-8). DO was consistently above the MWQSOGs for PAL in each lake in the open-water season, but was below the PAL objective for the protection of early life stages of cold-water species (9.5 mg/L) in the ice-cover season in Cross Lake in 2008/2009.

Other *in situ* variables including specific conductance (Figures 5.6.4-9 to 5.6.4-11), pH (Figures 5.6.4-12 to 5.6.4-14), and turbidity (Figures 5.6.4-15 to 5.6.4-17) were generally similar across depth in each of the waterbodies. The exception occurred for turbidity which notably increased across depth in spring and summer 2008 and spring 2010 in Cross Lake (Figure 5.6.4-17). Secchi disk depths were quite variable in Cross Lake between sampling periods and years (Figure 5.6.4-18) but were similar to Secchi disk depths measured in Playgreen and Little Playgreen lakes (Figure 5.6.4-19).

Off-system Waterbodies: Setting and Walker Lakes

Limnological conditions of Setting and Walker lakes differ from lakes located along the upper Nelson River. Walker Lake was stratified in spring 2010, but stratification had broken down by the summer sampling period (Figure 5.6.4-20). Setting Lake was thermally stratified in the spring of each year as well as the summers of 2008 and 2009 (Figure 5.6.4-21; note that *in situ* measurements were not collected in fall 2009). Temperature increased with depth in winter but the lakes were not stratified.

Similar to observations on Cross Lake, DO decreased with depth in Walker (Figure 5.6.4-22) and Setting (Figure 5.6.4-23) lakes in winter and was below the PAL objective for cold-water species in each winter of monitoring. Unlike waterbodies on the upper Nelson River system, DO concentrations were also below MWQSOGs for the protection of cool-water and cold-water aquatic life (6.0 and 6.5 mg/L, respectively) in Setting Lake at depth in the summers of 2008 and 2009 (Figure 5.6.4-23).

Specific conductance (Figures 5.6.4-24 and 25) and pH (Figures 5.6.4-26 and 27) were generally similar across depth in Walker and Setting lakes. Turbidity was also relatively consistent across depth in Walker Lake (Figure 5.6.4-28) but increased across depth during some sampling periods in Setting Lake (Figures 5.6.4-29). Secchi disk depth was relatively consistent across sampling periods for both Walker and Setting lakes and across years for Setting Lake (Figures 5.6.4-30 and 5.6.4-31). However, the mean Secchi disk depth was higher in Walker and Setting lakes than lakes on the upper Nelson River (Figure 5.6.4-32).

Seasonal Differences

Of the *in situ* water quality variables measured under CAMPP in the Upper Nelson River Region, Secchi disk depth (Figure 5.6.4-33), oxidation-reduction potential (ORP; Figure 5.6.4-34), and pH (Figure 5.6.4-35) did not differ significantly across the sampling periods in Cross or Setting lakes. Although *in situ* turbidity (Figure 5.6.4-36) was highest and Secchi disk depth (Figure 5.6.4-33) was lowest in spring in Cross Lake, no statistical differences between seasons were observed.

Specific conductance (Figure 5.6.4-37) and DO (Figure 5.64.-38) were significantly higher in winter in Setting Lake. Although not statistically significant, mean DO concentrations were also highest in winter in Cross Lake (Figure 5.6.4-38). It is common for DO concentrations to be highest in winter due to the higher inherent capacity of water to hold more DO at lower water temperatures.

Spatial Comparisons

Statistical comparisons between Cross Lake and Setting Lake revealed significant differences for several *in situ* variables; statistical comparisons were not conducted for other waterbodies in the region as they were only sampled in one year. Setting Lake was clearer (as indicated by higher Secchi disk depths and lower turbidity; Figures 5.6.4-39 and 5.6.4-40) and had a lower conductivity (Figure 5.6.4-41) than Cross Lake. Due to differences in the size and characteristics of the drainage basins, clearer and more dilute conditions on Setting Lake are not unexpected.

While statistical analyses did not incorporate Playgreen, Little Playgreen, or Walker lakes due to limited data (i.e., only one year of data), some variables qualitatively indicated differences between Walker Lake and the other lakes on the upper Nelson River. Specifically, similar to Setting Lake, Walker Lake appears to have a higher water clarity and lower conductivity (Figures 5.6.4-39 to 5.6.4-41). Statistical differences will be re-assessed in the future when additional data are acquired.

Temporal Comparisons

Only one (Secchi disk depth) *in situ* water quality variable monitored in Cross and Setting lakes was 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. Secchi disk depth was significantly lower in 2009 than either

2008 or 2010 in Setting Lake, but no differences were found for Cross Lake (Figure 5.6.4-42). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.6.4.3 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.

Upper Nelson River

All measurements of laboratory pH (Figure 5.6.4-43; MWQSOG: 6.5-9), ammonia (Figure 5.6.4-44; MWQSOGs vary with pH and temperature), and nitrate/nitrite (Figure 5.6.4-45; MWQSOG: 2.93 mg N/L) were within MWQSOGs for PAL at all sites and sampling times in lakes along the upper Nelson River. Conversely, 75-100% of samples collected in Playgreen, Little Playgreen, and Cross lakes exceeded the Manitoba narrative guideline for TP for lakes, reservoirs and ponds (0.025 mg/L; Figure 5.6.4-46). Acid sensitivity of lakes on the upper Nelson River is classified as least to low based on pH, calcium, and total alkalinity and moderate based on TDS (Table 5.6.4-1).

On average, TP was composed of approximately equal proportions of dissolved and particulate fractions in Playgreen, Little Playgreen, and Cross lakes (Figure 5.6.4-47); however, there was considerable variability in the partitioning of phosphorus between dissolved and particulate forms across the sampling periods. In general, dissolved phosphorus (DP) comprised a relatively higher fraction of TP in the ice-cover season. TN (Figure 5.6.4-48) was overwhelmingly dominated by organic nitrogen and the dissolved inorganic nitrogen (DIN) pool contained more nitrate/nitrite than ammonia in the lakes on the upper Nelson River (Figure 5.6.4-49). Molar TN:TP ratios indicate that each of the lakes were, on average, phosphorus-limited and ratios increased in the order of Playgreen, Little Playgreen, and Cross lakes (Figure 5.6.4-50), concurrent with decreases in TP concentrations (Figure 5.6.4-46). However, nutrient ratios varied considerably between sampling periods.

Off-system Waterbodies: Walker and Setting Lakes

Like lakes on the upper Nelson River, pH (Figure 5.6.4-43; MWQSOG: 6.5-9), ammonia (Figure 5.6.4-44; MWQSOGs vary with pH and temperature), and nitrate/nitrite (Figure 5.6.4-45; MWQSOG: 2.93 mg N/L) were within MWQSOGs for PAL in Walker and Setting lakes and acid sensitivity of both off-system lakes ranged from least to moderate (Table 5.6.4-1). Conversely, a lower percentage of samples collected at Walker (50%) and Setting (25%) lakes exceeded the Manitoba narrative guideline for TP for lakes, reservoirs and ponds (0.025 mg/L; Figure 5.6.4-46) than lakes located on the upper Nelson River.

The composition of TN and TP in Walker and Setting lakes was relatively similar to that observed in lakes on the upper Nelson River. Specifically, TP was, on average, composed approximately equally of dissolved and particulate forms (Figure 5.6.4-47), while TN was dominated by organic nitrogen (Figure 5.6.4-49). Ammonia and nitrate/nitrite were, on average, roughly equal in Walker Lake, whereas nitrate/nitrite was present in higher concentrations than ammonia in Setting Lake (Figure 5.6.4-49). Like on-system lakes, TN:TP ratios (Figure 5.6.4-50) indicate phosphorus limitation during most periods in the off-system lakes. Ratios were, however, higher than lakes on the upper Nelson River.

Water samples collected at depth (1 m above the sediment-water interface) in Setting Lake during periods of thermal stratification (Figure 5.6.4-21) indicated that DIN, nitrate/nitrite (Figure 5.6.4-51) and DP (Figure 5.6.4-52) were higher at depth than near the surface. However, review of *in situ* and laboratory water quality data for the summer 2009 sampling period suggests that the water sampler may have hit bottom (i.e., TSS and particulates were notably elevated in the bottom sample but *in situ* turbidity was not) which may have contributed to elevated total particular phosphorus (TPP), TP, and TN concentrations observed in that sample (Figure 5.6.4-52).

<u>Seasonal Differences</u>

A number of seasonal differences were noted for routine water quality variables in Cross and Setting Lakes over the three-year period, though differences were not always consistent between these two lakes (Figures 5.6.4-53 to 5.6.4-61). Nearly all seasonal differences were related to the ice-cover season, when nitrate/nitrite (Figure 5.6.4-53) and DIN (Figure 5.6.4-54) were higher, and chlorophyll *a* (Figure 5.6.4-55) and TSS (Figure 5.6.4-56) were lower, relative to one or more of the other sampling periods. Higher concentrations of bioavailable forms of nutrients (e.g., DIN) and lower concentrations of chlorophyll *a* are common in the ice-cover season due to lower algal abundance under reduced light and water temperatures. The highest number of parameters exhibiting seasonal differences occurred for Setting Lake.

Ammonia, total Kjeldahl nitrogen (TKN), TPP, DP, dissolved organic carbon (DOC), total organic carbon (TOC), TDS, turbidity, true colour, and pH, did not differ significantly across the sampling periods in either Cross or Setting lakes.

Spatial Comparisons

Statistical comparisons between Cross Lake and the annual off-system waterbody (Setting Lake) revealed significant differences for several routine laboratory variables (Figures 5.6.4-62 to 5.6.4-70). Setting Lake was softer (Figure 5.6.4-62), clearer (as indicated by lower turbidity and TSS; Figures 5.6.4-63 and 5.6.4-64), more dilute (i.e., lower conductivity and TDS; Figures 5.6.4-65 and 5.6.4-66), and contained higher concentrations of DOC (Figure 5.6.4-67) and TOC, a higher TOC:ON ratio (Figure 5.6.4-68), and lower concentrations of total inorganic carbon (Figure 5.6.4-69) and alkalinity (Figures 5.6.4-70 and 5.6.4-71) than Cross Lake. Due to differences in the drainage basins and lake characteristics, differences in water quality between the sites are not unexpected. Statistical differences will be re-assessed in the future when additional data are acquired for this region.

Temporal Comparisons

Only one water quality variable (ammonia) exhibited statistically significant interannual differences in Cross Lake; ammonia was higher in 2010 than 2008 or 2009 (Figure 5.6.4-72). No significant interannual differences were observed for Setting Lake. Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.6.4.4 Trophic Status

Upper Nelson River

Waterbodies located on the upper Nelson River ranged from meso-eutrophic (Cross Lake) to eutrophic (Playgreen and Little Playgreen lakes) on the basis of mean open-water season TP concentrations (Table 5.6.4-2). Application of the Organization for Economic Cooperation and Development (OECD 1982) trophic categorization schemes for lakes based on chlorophyll *a* indicates a eutrophic status for Cross Lake but mesotrophic status for Playgreen and Little Playgreen lakes (based on the mean of the open-water seasons; Table 5.6.4-3). Application of the Nürnberg (1996) trophic classification scheme for lakes based on TN indicates on average, Playgreen and Cross lakes were mesotrophic and Little Playgreen Lake was eutrophic (Table 5.6.4-4.). Neither TP nor TN were significantly related to chlorophyll *a* in Cross Lake, suggesting other factors may be important in governing phytoplankton production (Figure 5.6.4-73), though the lack of a correlation may reflect the relatively limited number of data points.

Off-system Waterbodies: Walker and Setting Lakes

Based on mean open-water season concentrations, the trophic status of Walker and Setting lakes was meso-eutrophic based on TP (Table 5.6.4-2), nd mesotrophic on the basis of chlorophyll *a*

(Table 5.6.4-3) and TN (Table 5.6.4-4). Like Cross Lake, neither TP nor TN was significantly correlated with chlorophyll *a* in Setting Lake (Figure 5.6.4-74).

5.6.4.5 *Escherichia coli*

Upper Nelson River

E. coli was detected in some samples collected from Playgreen, Little Playgreen, and Cross lakes and the frequency of detection decreased from Playgreen Lake downstream (Table 5.6.4-5). However, concentrations (when detected) were low (< 5 colony forming units [CFU]/100 mL). All measurements were well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

Off-system Waterbodies: Walker and Setting Lakes

E. coli was detected in 25% of samples collected from Setting Lake over the period of 2008-2010, but concentrations were very low when detected (the maximum detected concentration was at the analytical detection limit of 1 CFU/100 mL; Table 5.6.4-5). *E. coli* was not detected in samples collected from Walker Lake in 2010/2011.

5.6.4.6 Metals and Major Ions

Upper Nelson River

The dominant cation in the lakes along the upper Nelson River is calcium, followed by sodium (Figure 5.6.4-75). Water hardness in lakes located along the main flow of the Nelson River was hard to moderately hard (Figure 5.6.4-76).

Chloride concentrations in Playgreen (mean 16.7 mg/L), Little Playgreen (mean 23.2 mg/L), and Cross (mean 17.2 mg/l) lakes (Figure 5.6.4-77) were on the lower range of those reported for the central and western regions of Canada (< 1 mg/L to approximately 500 mg/L; Canadian Council of Resource and Environment Ministers [CCREM] 1987), and were all well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations averaged less than 35 mg/L in Playgreen, Little Playgreen, and Cross lakes (Figure 5.6.4-77), and fell on the lower range of concentrations reported across Canada (< 1 mg/L to approximately 3,000 mg/L; CCREM 1987). While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment (BCMOE) guidelines which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013).

Of the 38 metals/metalloids measured in the Upper Nelson River Region, only six were never detected (beryllium, bismuth, mercury, selenium, silver, and tellurium; Table 5.6.4-6). Metals that were consistently detected in upper Nelson River lakes included: aluminum; arsenic; barium; calcium; copper; iron; magnesium; manganese; molybdenum; potassium; rubidium; sodium; strontium; and uranium. Other metals were detected at varying frequencies, although antimony, cesium, nickel, thallium, tungsten, zinc, and zirconium were detected in less than 30% of samples collected from lakes along the upper Nelson River.

Most metals were present in concentrations below the MWQSOGs for PAL at all sites and sampling times in the upper Nelson River waterbodies; the exceptions included aluminum and iron (Table 5.6.4-7). All samples collected in Playgreen and Little Playgreen lakes, and the majority (92%) from Cross Lake, exceeded the PAL guideline for aluminum (0.1 mg/L; Figure 5.6.4-78). Iron exceeded the PAL guideline (0.3 mg/L) in 25% of samples from Playgreen Lake, 50% of samples from Little Playgreen Lake, and 33% of samples from Cross Lake (Figure 5.6.4-79).

The analytical detection limits (DLs) for mercury varied over the study period and were typically above the current MWQSOG PAL guideline (0.000026 mg/L). Therefore comparison of analytical results to the PAL guideline could not be undertaken for all samples. Considering only the results of analyses where the analytical detection limit was sufficiently low to facilitate this comparison, all measurements from the upper Nelson River sites were below the current MWQSOG PAL.

Off-system Waterbodies: Walker and Setting Lakes

Like the upper Nelson River waterbodies, the dominant cation in Walker and Setting lakes is calcium (Figure 5.6.4-75). Conversely, magnesium was the second-most dominant cation in the off-system lakes. Hardness measurements indicate that waters are softer (i.e., moderately soft/hard) than lakes on the upper Nelson River (Figure 5.6.4-76). Chloride concentrations are low in Walker (mean 1.2 mg/L) and Setting (i.e., < 4 mg/L; Figure 5.6.4-77) lakes, and well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 15 mg/L in both lakes (Figure 5.6.4-77) and fell on the lower range of concentrations reported across Canada (CCREM 1987) and were well below the BCMOE PAL guidelines (Meays and Nordin 2013).

Of the 38 metals/metalloids measured in the off-system lakes, 10 were never detected (beryllium, bismuth, cesium, mercury, selenium, tellurium, thallium, thorium, zinc, and zirconium; Table 5.6.4-6). In addition, chromium, cobalt, silver, tin, and tungsten were not detected in Walker Lake. Metals that were consistently detected in both lakes included: arsenic; barium; calcium;

iron; magnesium; manganese; potassium; rubidium; silicon; sodium; and strontium;. The remaining metals were detected at varying frequencies, although antimony, boron, cobalt, lead, nickel, silver, tin, and tungsten were detected in less than 30% of samples collected in both waterbodies.

Samples collected from Walker Lake were consistently within MWQSOG PAL guidelines for the metals measured (Table 5.6.4-7). With the exception of aluminum and silver, metals were present in concentrations below the MWQSOGs for PAL in surface samples collected from Setting Lake (Table 5.6.4-7). The majority (83%) of samples exceeded the PAL guideline for aluminum (0.1 mg/L; Figure 5.6.4-76) and one sample was at the PAL guideline for silver (0.001 mg/L; Table 5.6.4-7). The analytical DL for silver (0.0001 mg/L) was at the PAL guideline and this exceedance should be interpreted with caution; measurements that are at or near analytical detection limits are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the DL. Mercury was not detected in the three samples where mercury was analysed using a DL lower than the current PAL guideline (0.000026 mg/L) in Setting Lake.

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 in Setting Lake in summer 2008 and spring and summer 2009 (Figure 5.6.4-80), when the lake was thermally stratified (Figure 5.6.4-21). Aluminum exceeded the MWQSOG PAL in these bottom samples but also exceeded the PAL guideline in the surface grabs collected concurrently (Figure 5.6.4-80). The iron concentration in the bottom sample collected in summer 2009 also exceeded the PAL guideline (0.3 mg/L; Figure 5.6.4-80). Concentrations of these and other metals were notably higher in the bottom sample collected in summer 2009, however, as previously noted, it is suspected that this sample was contaminated by resuspended sediments. These three metals are commonly elevated in freshwater ecosystems at depth under stratification and/or low DO concentrations.

Seasonal Variability

With the exception of strontium, metals did not significantly vary across the sampling seasons in Cross or Setting lakes over the three year monitoring period. Strontium was significantly higher in winter in Setting Lake but no significant differences were noted in Cross Lake (Figure 5.6.4-81).

Spatial Comparisons

A number of metals and major ions differed significantly between Cross and Setting lakes over the three year monitoring period. In all instances, significant differences indicated lower concentrations of metals or major ions in Setting Lake; these parameters included aluminum (Figure 5.6.4-78), arsenic (Figure 5.6.4-82), barium (Figure 5.6.4-83), calcium (Figure 5.6.4-75), chloride (Figure 5.6.4-77), copper (Figure 5.6.4-84), iron (Figure 5.6.4-79), magnesium (Figure 5.6.4-75), manganese (Figure 5.6.4-85), potassium (Figure 5.6.4-75), sodium (Figure 5.6.4-75), strontium (Figure 5.6.4-86), sulphate (Figure 5.6.4-77), uranium (Figure 5.6.4-87), and vanadium (Figure 5.6.4-88). Setting Lake was also softer than Cross Lake (Figure 5.6.4-76).

While statistical analyses did not incorporate other waterbodies in the Upper Nelson River Region due to limited data (i.e., one year of data), concentrations of metals and major ions measured in Walker Lake were qualitatively more similar to Setting Lake than lakes on the main flow of the upper Nelson River (Figures 5.6.4-75 to 5.6.4-79 and 5.6.4-82 to 5.6.4-88). Statistical differences will be re-assessed in the future when additional data are acquired for this region.

Temporal Comparisons

Statistical comparisons between sampling years for annual waterbodies (i.e., Cross and Setting lakes) revealed significant differences for only three metals (Figures 5.6.4-89 to 5.6.4-91). These differences were:

- cadmium was higher in 2008 than either 2009 or 2010 in Setting Lake (Figure 5.6.4-89);
- chromium was higher in 2008 than 2010 in Setting Lake (Figure 5.6.4-90);
- chromium was higher in 2008 than either 2009 or 2010 in Cross Lake (Figure 5.6.4-90); and,
- sulphate was higher in 2009 than either 2008 or 2010 in Setting Lake (Figure 5.6.4-91).

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

Table 5.6.4-1. Saffran and Trew (1996) categorization of acid sensitivity of aquatic ecosystems and sensitivity ranking for the Upper Nelson River Region.

Parameter	Units	Acid Sensitivity								
		High	Moderate	Low	Least	Playgreen Lake	Little Playgreen Lake	Cross Lake	Walker Lake	Setting Lake
pH	-	<6.5	6.6-7.0	7.1-7.5	>7.5	Least	Least	Least	Least	Least
Total Alkalinity (as $CaCO_3$)	mg/L	0-10	11-20	21-40	>40	Least	Least	Least	Least	Least
Calcium	mg/L	0-4	5-8	9-25	>25	Least	Least	Least	Low	Low
Total Dissolved Solids	mg/L	0-50	51-200	201-500	>500	Moderate	Moderate	Moderate	Moderate	Moderate

Table 5.6.4-2. Total phosphorus concentrations (open-water season and annual means) measured in the Upper Nelson River Region and CCME (1999; updated to 2013) trophic categorization: 2008/2009-2010/2011.

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	
Playgreen Lake	Open-water season					0.041		2009
	Annual					0.041		2009/2010
Little Playgreen Lake	Open-water season					0.041		2010
	Annual					0.042		2010/2011
Cross Lake	Open-water season					0.037		2008
	Annual				0.032			2008/2009
	Open-water season				0.031			2009
	Annual					0.053		2009/2010
	Open-water season				0.030			2010
	Annual				0.035			2010/2011
	Open-water season				0.033			2008-2010
	Annual					0.040		2008/2009-2010/2011
Walker Lake	Open-water season				0.029			2010
	Annual				0.025			2010/2011
Setting Lake	Open-water season			0.017				2008
	Annual			0.018				2008/2009
	Open-water season				0.021			2009
	Annual					0.040		2009/2010
	Open-water season				0.028			2010
	Annual				0.024			2010/2011
	Open-water season				0.022			2008-2010
	Annual				0.027			2008/2009-2010/2011

Table 5.6.4-3. Chlorophyll *a* concentrations (open-water season and annual means) measured in the Upper Nelson River Region and the OECD (1982) trophic categorization scheme for lakes: 2008/2009-2010/2011.

Waterbody	Period	Lake Trophic Status Based on Chlorophyll *a* (µg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic	
		-	<2.5	2.5 - 8	-	8 - 25	> 25	
Playgreen Lake	Open-water season			7.33				2009
	Annual			5.83				2009/2010
Little Playgreen Lake	Open-water season			4.06				2010
	Annual			3.57				2010/2011
Cross Lake	Open-water season					17.33		2008
	Annual					13.25		2008/2009
	Open-water season			5.47				2009
	Annual			4.27				2009/2010
	Open-water season			4.08				2010
	Annual			3.59				2010/2011
	Open-water season					8.96		2008-2010
	Annual			7.04				2008/2009-2010-2011
Walker Lake	Open-water season			4.73				2010
	Annual			3.84				2010/2011
Setting Lake	Open-water season			4.67				2008
	Annual			3.75				2008/2009
	Open-water season			4.47				2009
	Annual			3.42				2009/2010
	Open-water season			3.32				2010
	Annual			2.82				2010/2011
	Open-water season			4.15				2008-2010
	Annual			3.33				2008/2009-2010-2011

Table 5.6.4-4. Total nitrogen concentrations (open-water season and annual means) measured in the Upper Nelson River Region and comparison to a trophic categorization scheme (Nürnberg 1996) for lakes: 2008/2009-2010/2011.

Waterbody	Period	Lake Trophic Status Based on Total Nitrogen (mg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hypereutrophic	
		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2	
Playgreen Lake	Open-water season			0.42				2009
	Annual			0.45				2009/2010
Little Playgreen Lake	Open-water season					0.71		2010
	Annual					0.66		2010/2011
Cross Lake	Open-water season					0.67		2008
	Annual					0.70		2008/2009
	Open-water season			0.42				2009
	Annual			0.48				2009/2010
	Open-water season			0.60				2010
	Annual			0.60				2010/2011
	Open-water season			0.57				2008-2010
	Annual			0.59				2008/2009-2010-2011
Walker Lake	Open-water season			0.57				2010
	Annual			0.55				2010/2011
Setting Lake	Open-water season			0.54				2008
	Annual			0.56				2008/2009
	Open-water season			0.46				2009
	Annual			0.53				2009/2010
	Open-water season			0.52				2010
	Annual			0.54				2010/2011
	Open-water season			0.51				2008-2010
	Annual			0.54				2008/2009-2010-2011

Table 5.6.4-5. Detection frequency and summary statistics for *E. coli* (CFU/100 mL) measured in the Upper Nelson River Region.

Waterbody	Sample Years	# Detected	n	% Detected	Mean	Median	Max
Playgreen Lake	2009	2	4	50	1	1	3
Little Playgreen Lake	2010	1	4	25	<1	<1	1
Cross Lake	2008-2010	1	12	8	<1	<1	1
Walker Lake	2010	0	4	0	<1	<1	<1
Setting Lake	2008-2010	3	12	25	<1	<1	1

Table 5.6.4-6. Frequency of detection of metals and major ions measured in the Upper Nelson River Region: 2008-2010. Values in bold indicate annual sites where detection frequencies ≥30%.

Waterbody	Sample Years		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Dissolved Chloride	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Playgreen Lake	2009	# Detected	**4**	1	**4**	**4**	0	0	1	1	**4**	0	**4**	0	**3**	**4**	**4**	0	0	**4**	**4**	0	**4**
		n	**4**	4	**4**	**4**	4	4	4	4	**4**	4	**4**	4	**4**	**4**	**4**	4	0	**4**	**4**	4	**4**
		% Detected	**100**	25	**100**	**100**	0	0	25	25	**100**	0	**100**	0	**75**	**100**	**100**	0	0	**100**	**100**	0	**100**
Little Playgreen Lake	2010	# Detected	**4**	4	**4**	**4**	4	4	**4**	**4**	**4**	4	**4**	4	4	**4**	**4**	**4**	**4**	**4**	**4**	4	**4**
		n	**4**	0	**4**	**4**	0	0	**4**	**2**	**4**	0	**4**	0	0	**4**	**4**	**4**	**4**	**4**	**4**	0	**4**
		% Detected	**100**	0	**100**	**100**	0	0	**100**	**50**	**100**	0	**100**	0	0	**100**	**100**	**100**	**100**	**100**	**100**	0	**100**
Cross Lake	2008-2010	# Detected	**12**	2	**12**	**12**	0	0	**6**	**4**	**12**	1	**12**	**5**	**6**	**12**	**12**	**5**	**4**	**12**	**12**	0	**12**
		n	**12**	12	**12**	**12**	12	12	**12**	**12**	**12**	12	**12**	**12**	**12**	**12**	**12**	**12**	**4**	**12**	**12**	12	**12**
		% Detected	**100**	17	**100**	**100**	0	0	**50**	**33**	**100**	8	**100**	**42**	**50**	**100**	**100**	**42**	**100**	**100**	**100**	0	**100**
Walker Lake	2010	# Detected	**2**	1	**4**	**4**	0	0	0	**2**	**4**	0	**4**	0	0	**2**	**4**	1	1	**4**	**4**	0	**2**
		n	**4**	4	**4**	**4**	4	4	4	**4**	**4**	4	**4**	4	4	**4**	**4**	4	4	**4**	**4**	4	**4**
		% Detected	**50**	25	**100**	**100**	0	0	0	**50**	**100**	0	**100**	0	0	**50**	**100**	25	25	**100**	**100**	0	**50**
Setting Lake	2008-2010	# Detected	**12**	1	**12**	**12**	0	0	1	**5**	**12**	0	**12**	**6**	2	**11**	**12**	2	**4**	**12**	**12**	0	**12**
		n	**12**	12	**12**	**12**	12	12	12	**12**	**12**	12	**12**	**12**	12	**12**	**12**	12	**4**	**12**	**12**	12	**12**
		% Detected	**100**	8	**100**	**100**	0	0	8	**42**	**100**	0	**100**	**50**	17	**92**	**100**	17	**100**	**100**	**100**	0	**100**

Table 5.6.4-6. continued.

Waterbody	Sample Years		Nickel	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Dissolved Sulphate	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Playgreen Lake	2009	# Detected	1	**4**	**4**	0	-	0	**4**	**4**	**4**	0	1	0	0	**4**	1	**4**	**4**	0	0
		n	4	**4**	**4**	4	0	4	**4**	**4**	**4**	4	4	0	4	**4**	4	**4**	**4**	4	4
		% Detected	25	**100**	**100**	0	-	0	**100**	**100**	**100**	0	25	-	0	**100**	25	**100**	**100**	0	0
Little Playgreen Lake	2010	# Detected	0	**4**	**4**	0	**4**	0	**4**	**4**	**4**	0	0	**4**	0	**4**	0	**4**	**4**	0	1
		n	4	**4**	**4**	4	**4**	4	**4**	**4**	**4**	4	4	**4**	4	**4**	4	**4**	**4**	4	4
		% Detected	0	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	**100**	0	**100**	0	**100**	**100**	0	25
Cross Lake	2008-2010	# Detected	3	**12**	**12**	0	**4**	0	**12**	**12**	**12**	0	1	**2**	**4**	**11**	1	**12**	**11**	1	3
		n	12	**12**	**12**	12	**4**	12	**12**	**12**	**12**	12	12	**4**	**12**	**12**	12	**12**	**12**	12	12
		% Detected	25	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	8	**50**	**33**	**92**	8	**100**	**92**	8	25
Walker Lake	2010	# Detected	0	**4**	**4**	0	**4**	0	**4**	**4**	**4**	0	0	0	0	**2**	0	1	**2**	0	0
		n	4	**4**	**4**	4	**4**	4	**4**	**4**	**4**	4	4	4	4	**4**	4	4	**4**	4	4
		% Detected	0	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	0	0	**50**	0	25	**50**	0	0
Setting Lake	2008-2010	# Detected	1	**12**	**12**	0	**4**	1	**12**	**12**	**12**	0	0	0	3	**12**	1	**4**	**5**	0	0
		n	12	**12**	**12**	12	**4**	12	**12**	**12**	**12**	12	12	4	12	**12**	12	**12**	**12**	12	12
		% Detected	8	**100**	**100**	0	**100**	8	**100**	**100**	**100**	0	0	0	25	**100**	8	**33**	**42**	0	0

Table 5.6.4-7. Frequency of exceedances of MWQSOGs for PAL for metals measured in the Upper Nelson River 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	0.00021-0.00034	0.0639-0.111	0.0068-0.0121	0.3	0.00200-0.00468	0.000026	0.073	0.038-0.067	0.001	0.0001	0.0008	0.015	0.088-0.155
Playgreen Lake	2009	n	**4**	4	4	4	4	4	**4**	4	3	4	4	4	4	4	4	4
		# Exceedances	**4**	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**25**	0	0	0	0	0	0	0	0	0
Little Playgreen Lake	2010	n	**4**	4	4	4	4	4	**4**	4	0	4	4	4	4	4	4	4
		# Exceedances	**4**	0	0	0	0	0	**2**	0	-	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**50**	0	-	0	0	0	0	0	0	0
Cross Lake	2008-2010	n	**12**	12	12	12	12	12	**12**	12	3	12	12	12	12	12	12	12
		# Exceedances	**11**	0	0	0	0	0	**4**	0	0	0	0	0	0	0	0	0
		% Exceedances	**92**	0	0	0	0	0	**33**	0	0	0	0	0	0	0	0	0
Walker Lake	2010	n	4	4	4	4	4	4	4	4	0	4	4	4	4	4	4	4
		# 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
Setting Lake	2008-2010	n	**12**	12	12	12	12	12	12	12	3	12	12	12	**12**	12	12	12
		# Exceedances	**10**	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0
		% Exceedances	**83**	0	0	0	0	0	0	0	0	0	0	0	**8**	0	0	0

[1] Includes samples analysed at an analytical detection limit lower than the PAL guideline (i.e., <0.000026 mg/L).

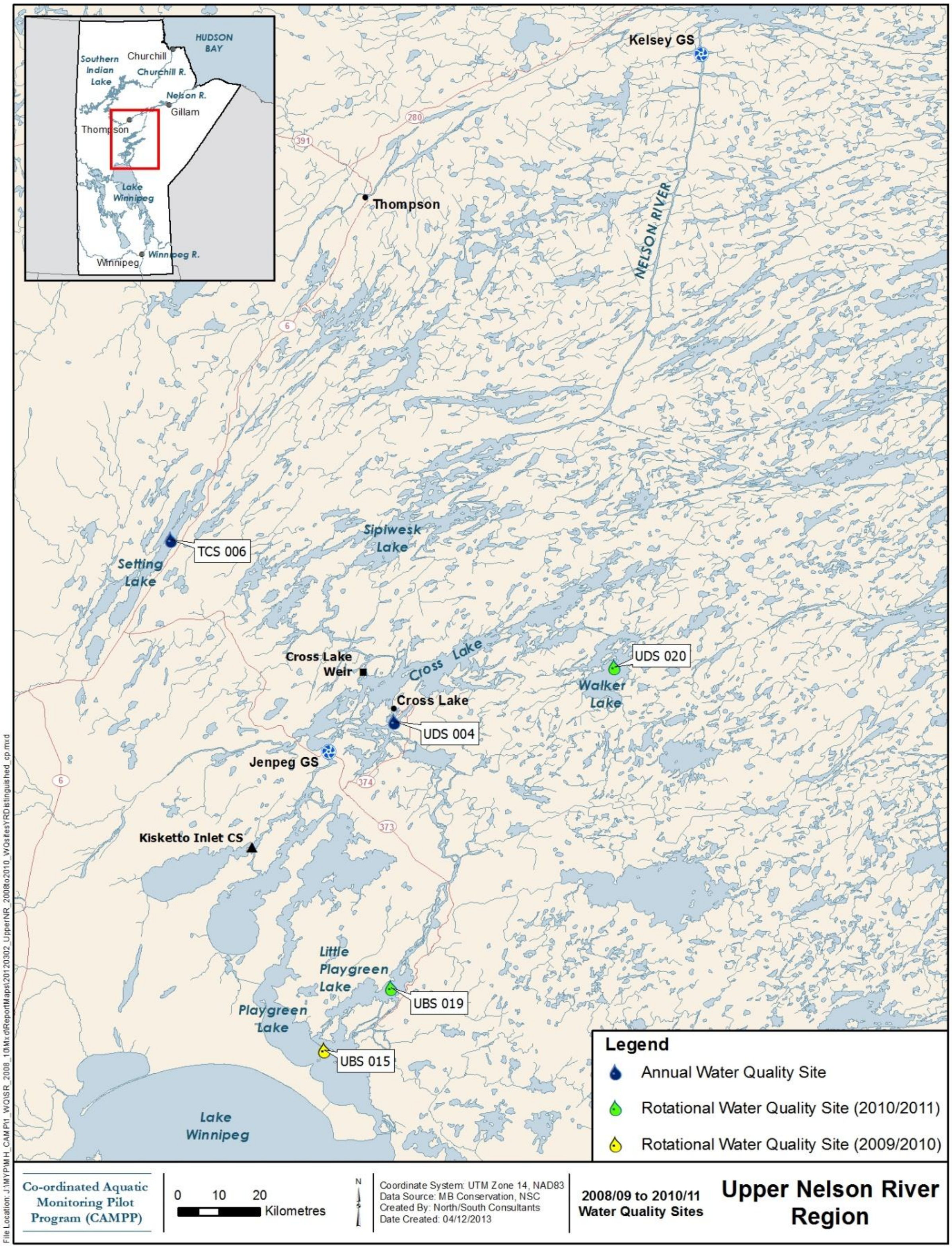


Figure 5.6.4-1. Water quality and phytoplankton monitoring sites in the Upper Nelson River Region.

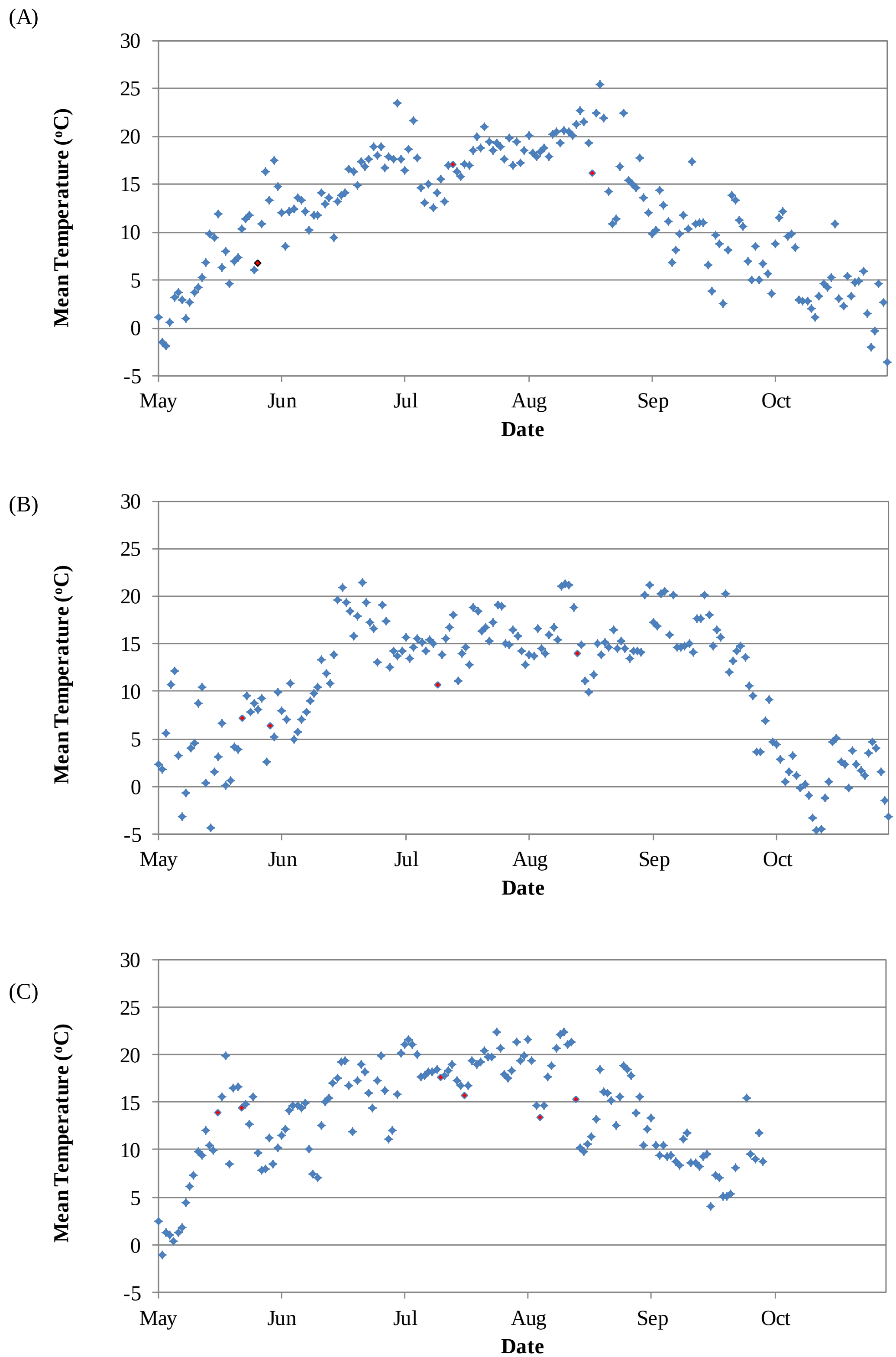


Figure 5.6.4-2. Mean daily air temperature and water quality sampling dates (indicated in red) for the Upper Nelson River Region: (A) 2008; (B) 2009; and (C) 2010.

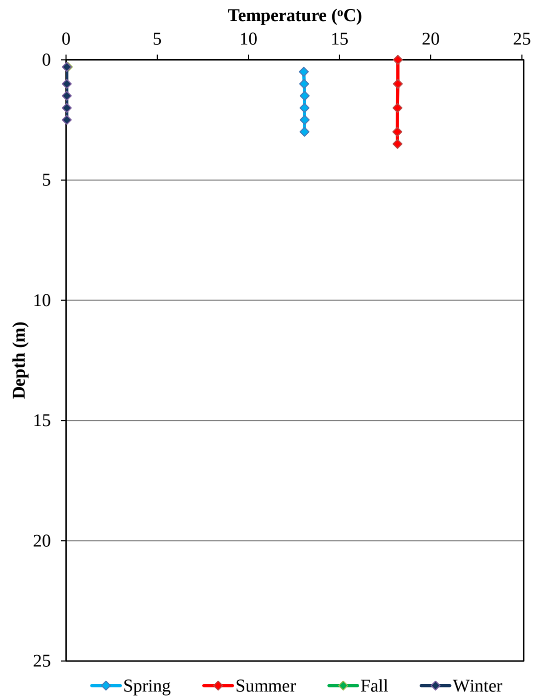


Figure 5.6.4-3. Water temperature profiles measured in Playgreen Lake: 2009/2010.

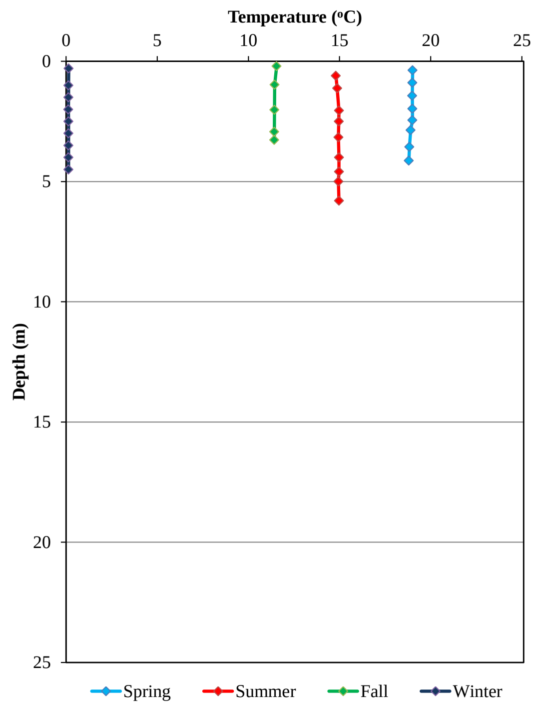


Figure 5.6.4-4. Water temperature profiles measured in Little Playgreen Lake: 2010/2011.

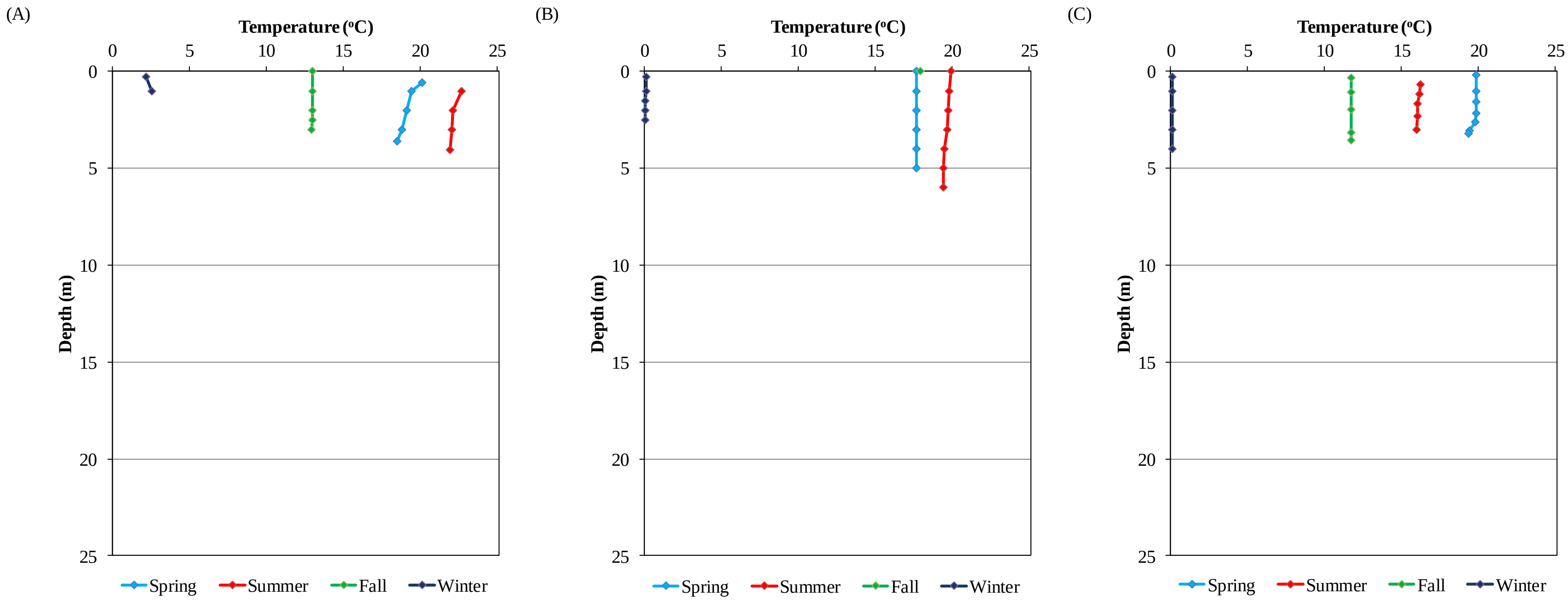


Figure 5.6.4-5. Water temperature profiles measured in Cross Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

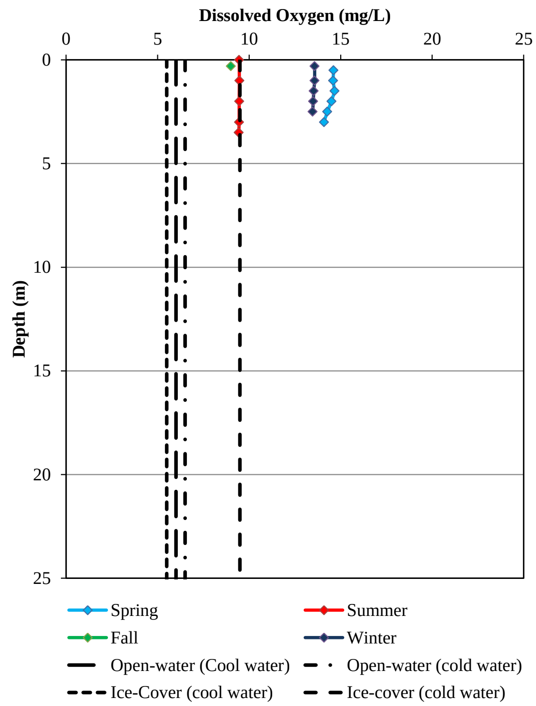


Figure 5.6.4-6. Dissolved oxygen depth profiles measured in Playgreen Lake 2009/2010.

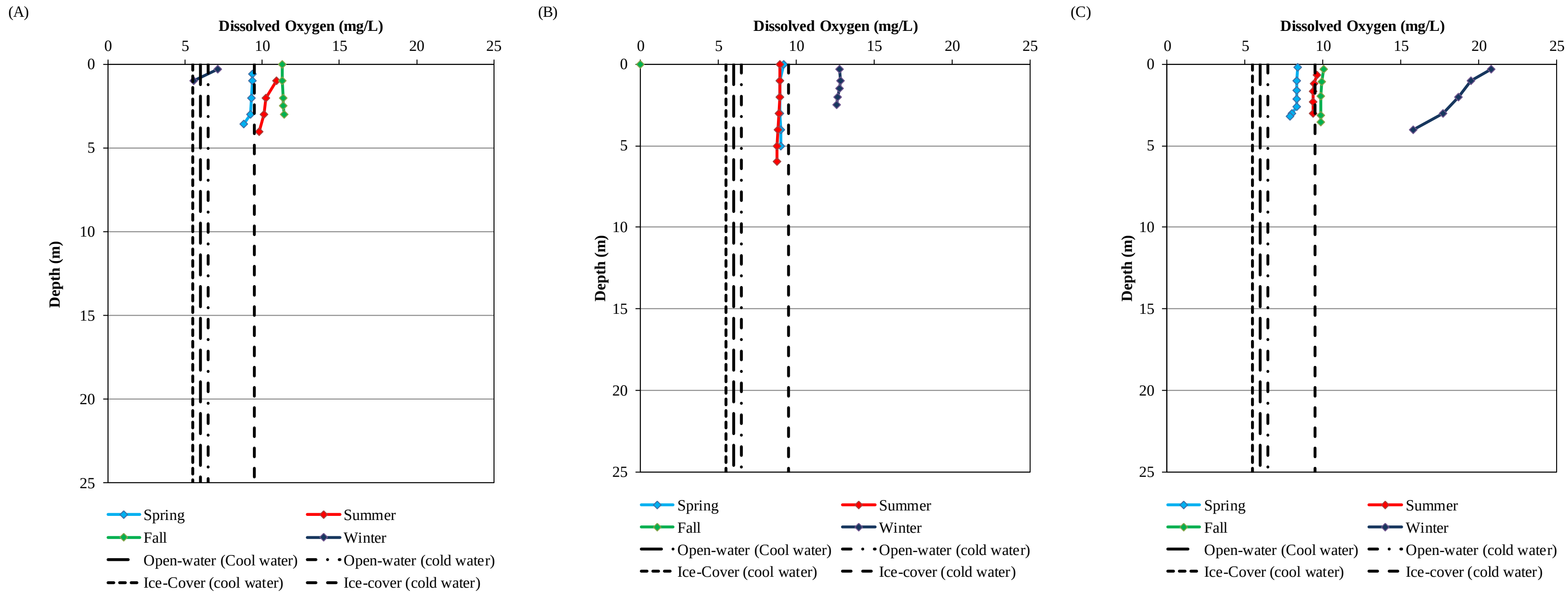


Figure 5.6.4-7. Dissolved oxygen depth profiles measured in Cross Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

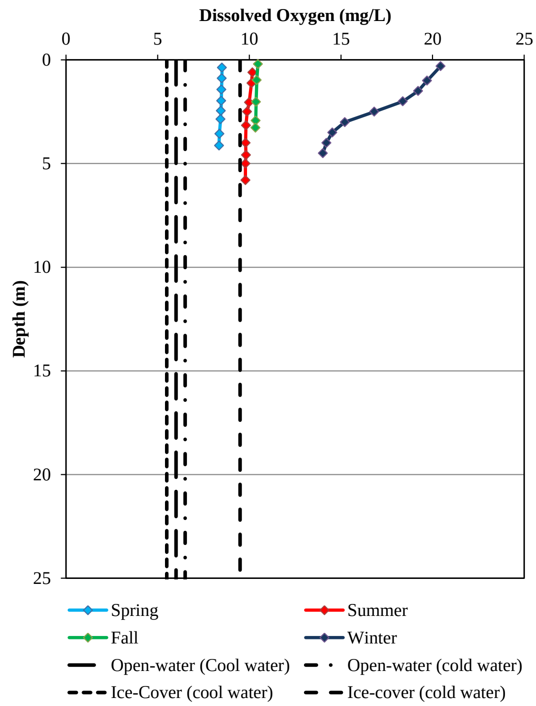


Figure 5.6.4-8. Dissolved oxygen depth profiles measured in Little Playgreen Lake 2010/2011.

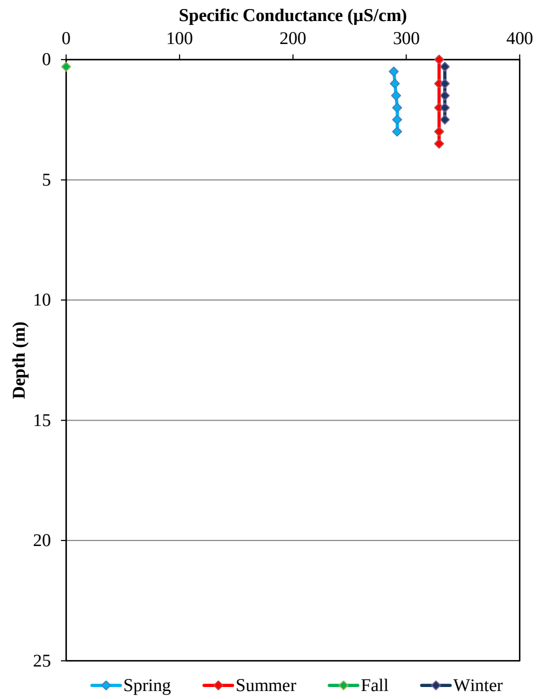


Figure 5.6.4-9. Specific conductance depth profiles measured in Playgreen Lake: 2009/2010.

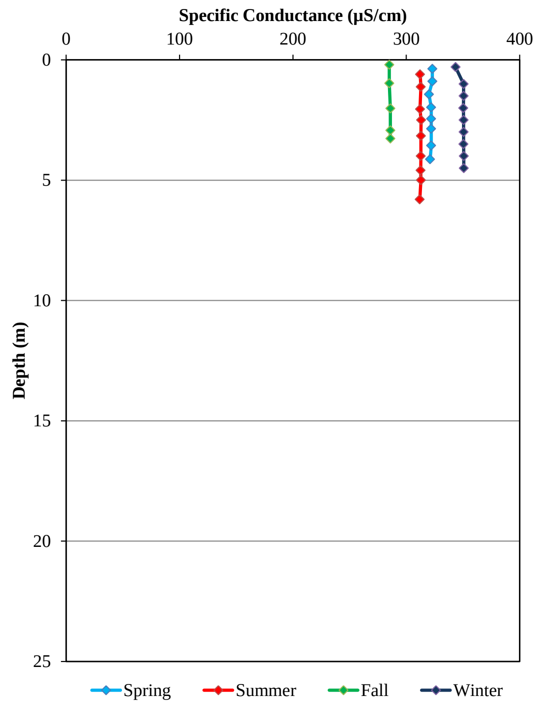


Figure 5.6.4-10. Specific conductance depth profiles measured in Little Playgreen Lake: 2010/2011.

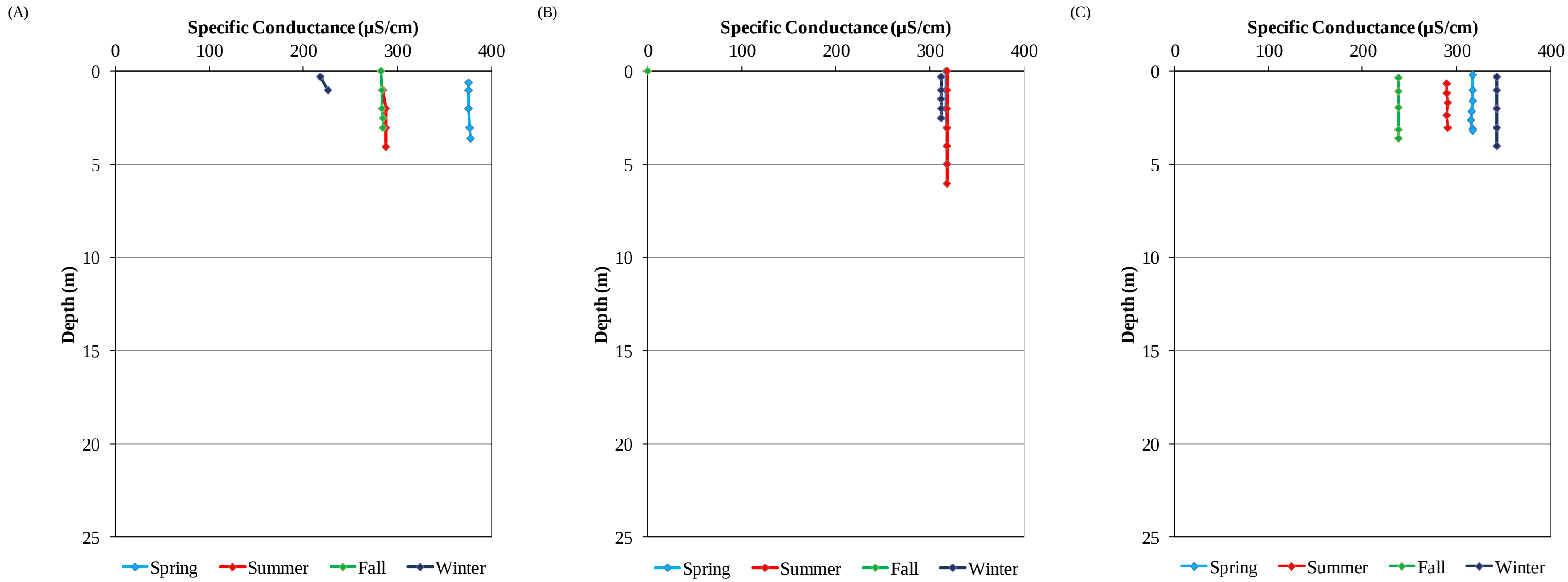


Figure 5.6.4-11. Specific conductance depth profiles measured in Cross Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

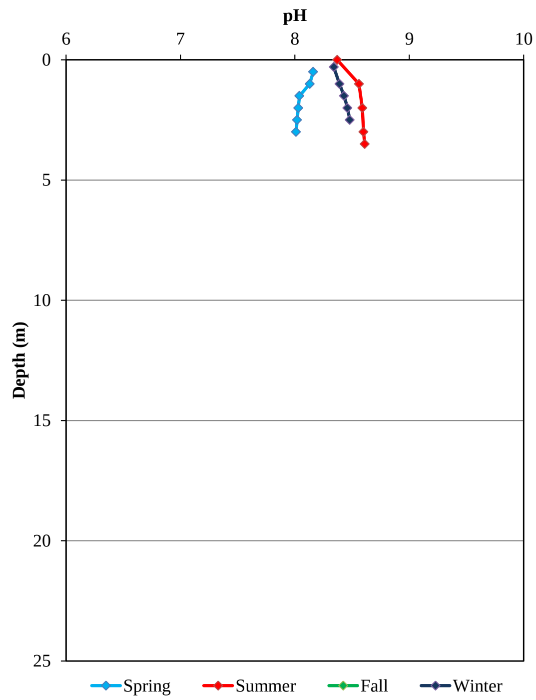


Figure 5.6.4-12. pH depth profiles measured in Playgreen Lake: 2009/2010.

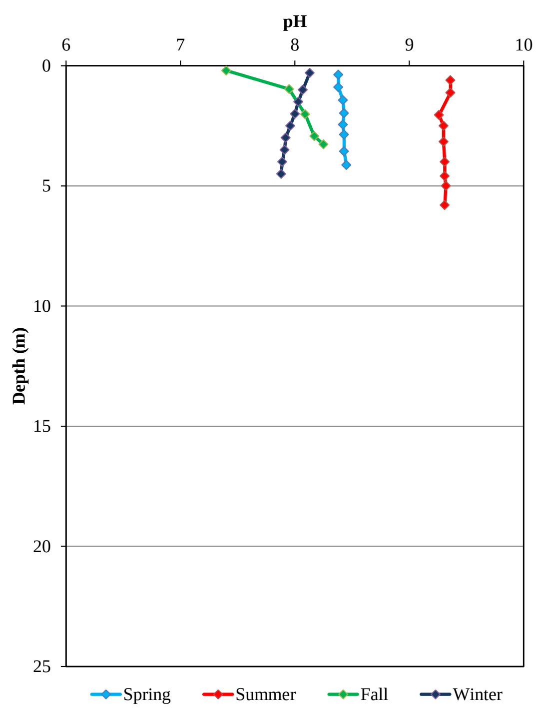


Figure 5.6.4-13. pH depth profiles measured in Little Playgreen Lake: 2010/2011.

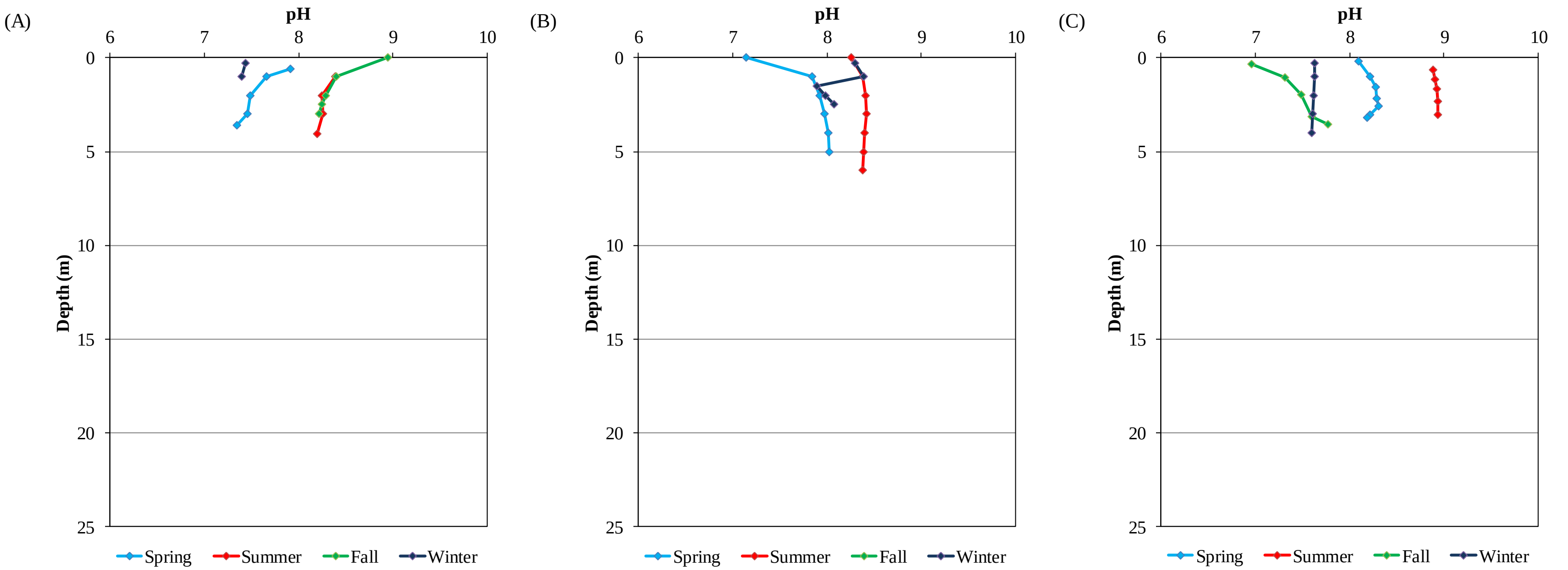


Figure 5.6.4-14. pH depth profiles measured in Cross Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

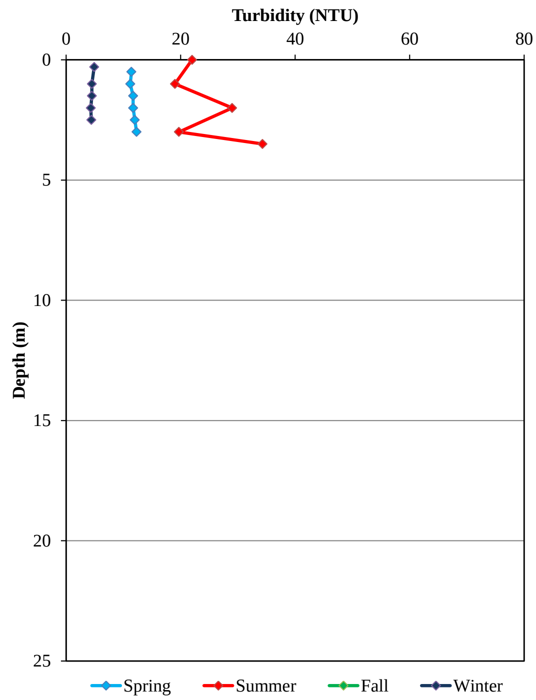


Figure 5.6.4-15. Turbidity depth profiles measured in Playgreen Lake: 2009/2010.

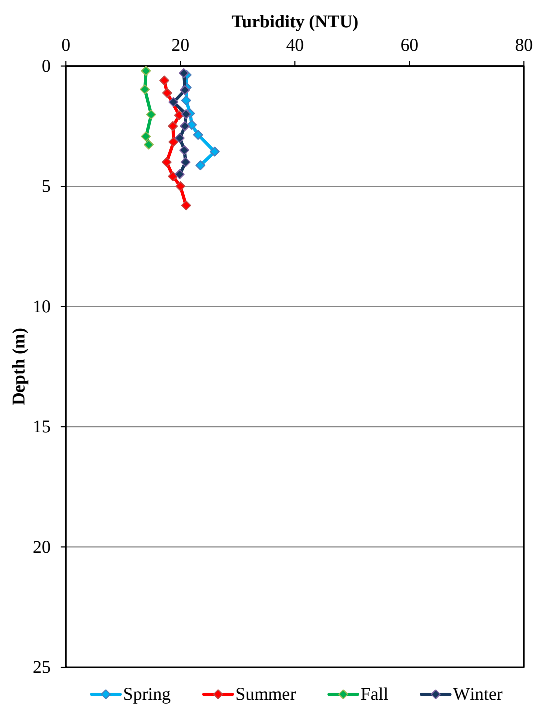


Figure 5.6.4-16. Turbidity depth profiles measured in Little Playgreen Lake: 2010/2011.

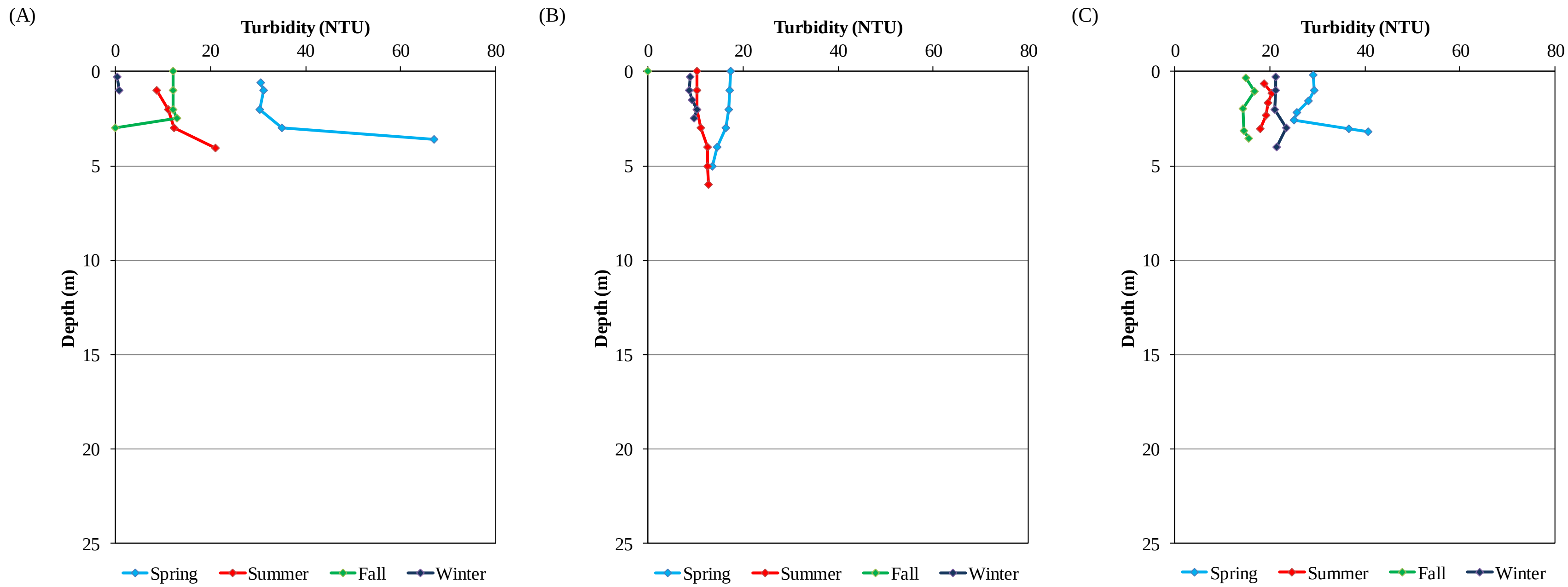


Figure 5.6.4-17. Turbidity depth profiles measured in Cross Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

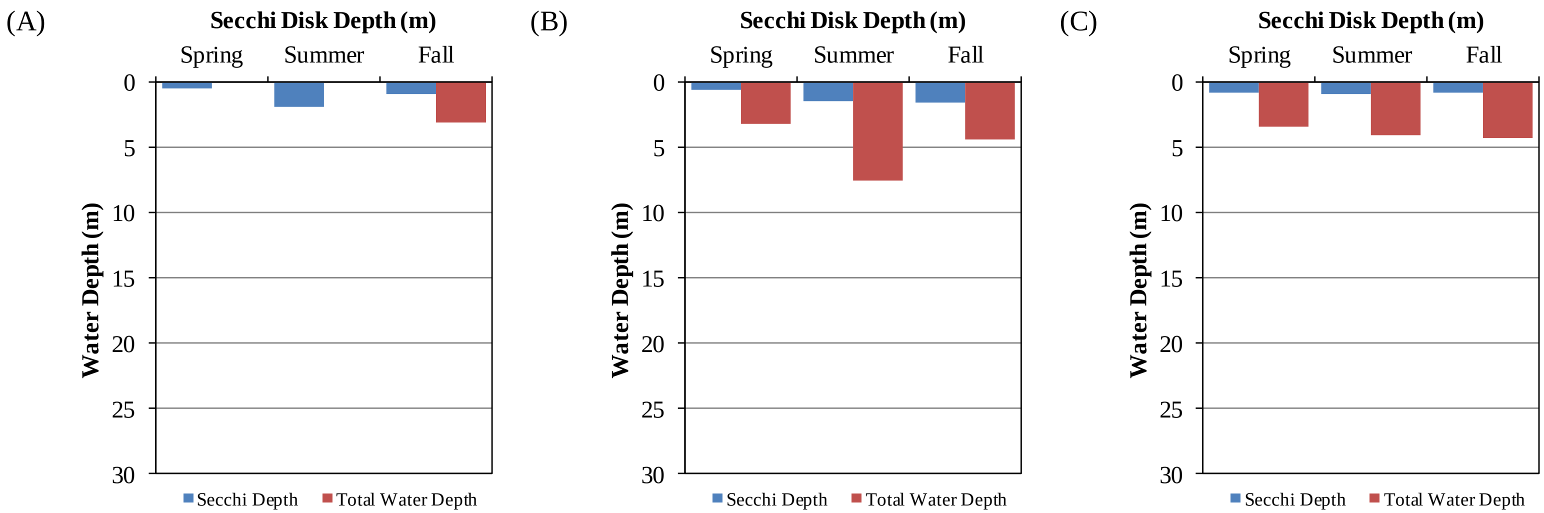


Figure 5.6.4-18. Secchi disk depths measured in Cross Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

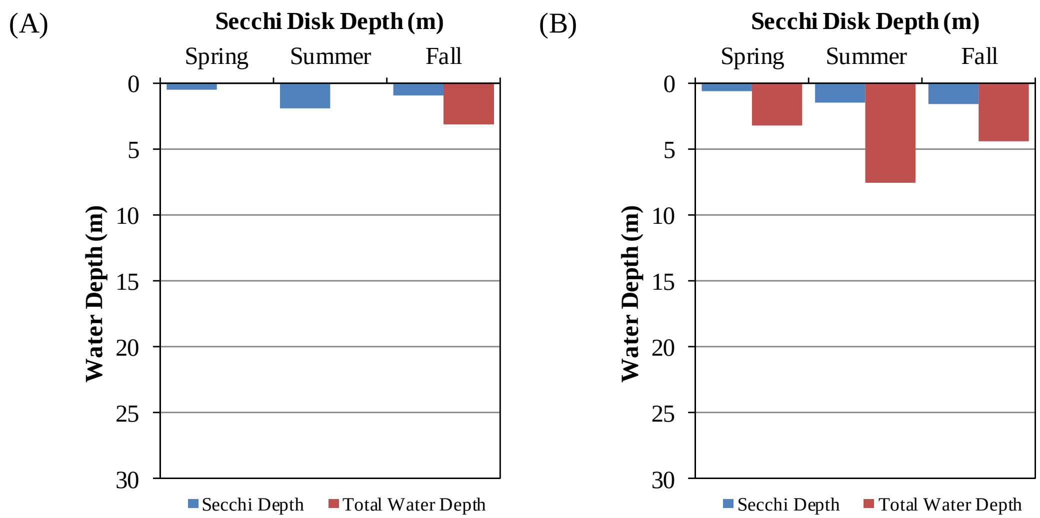


Figure 5.6.4-19. Secchi disk depths measured in: (A) Playgreen Lake (2009/2010); and (B) Little Playgreen Lake (2010/2011).

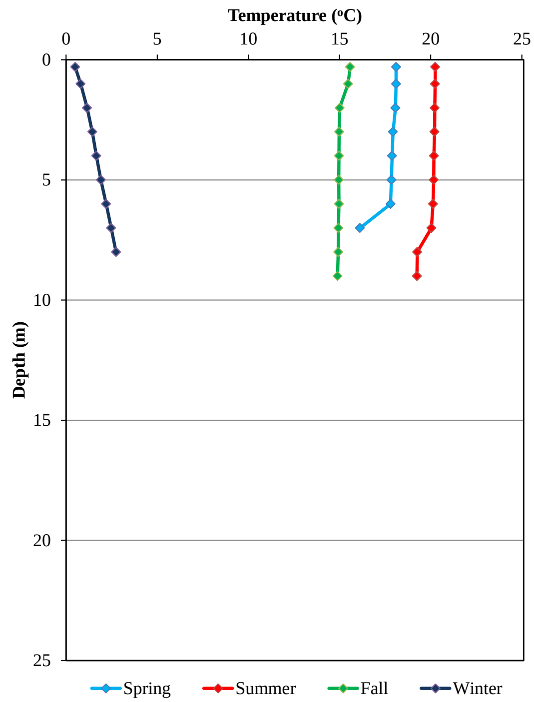


Figure 5.6.4-20. Water temperature profiles measured in Walker Lake: 2010/2011.

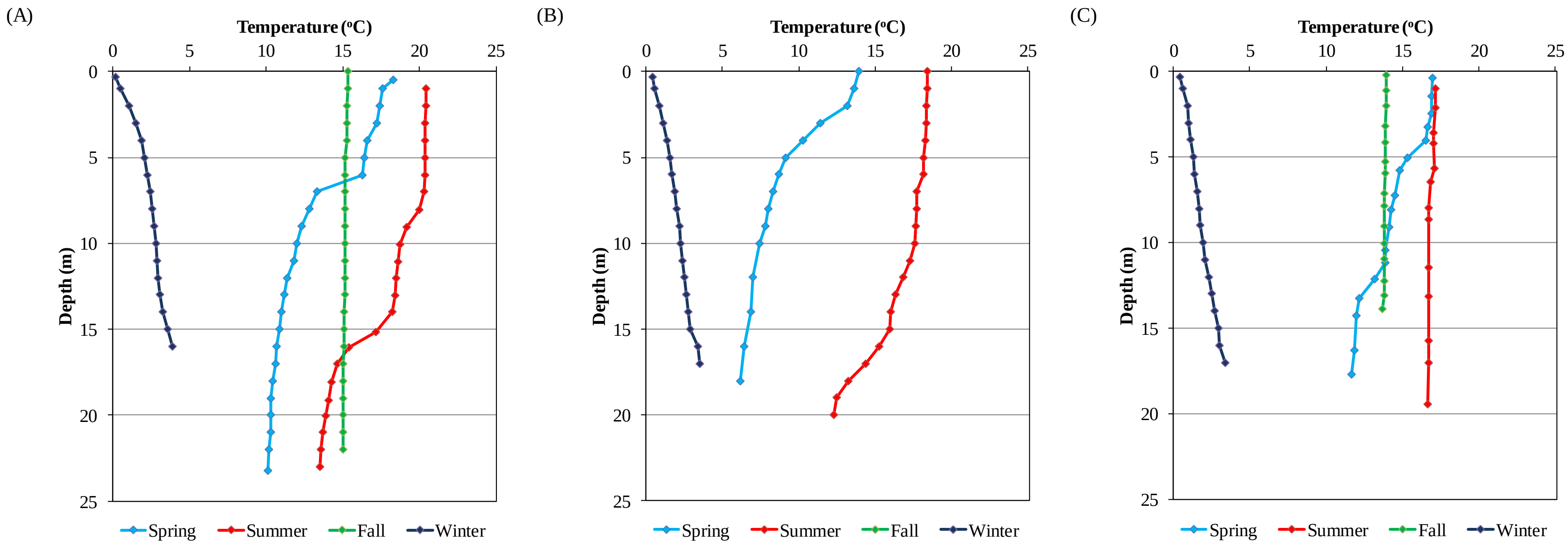


Figure 5.6.4-21. Water temperature depth profiles measured in Setting Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

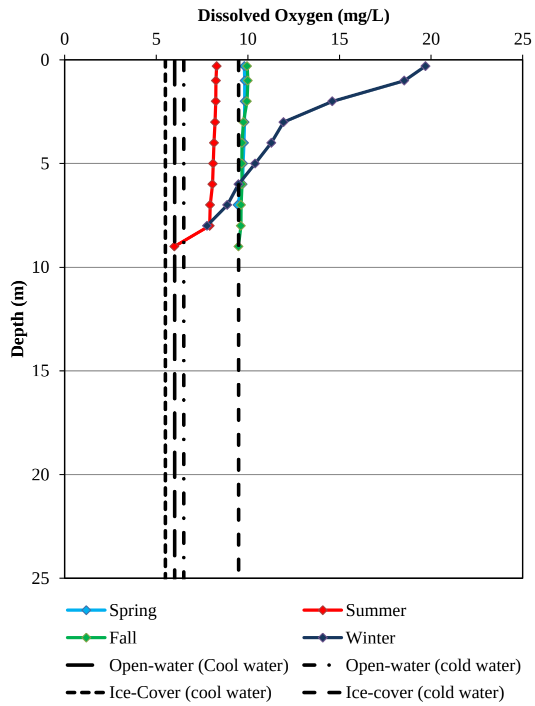


Figure 5.6.4-22. Dissolved oxygen depth profiles measured in Walker Lake 2010/2011.

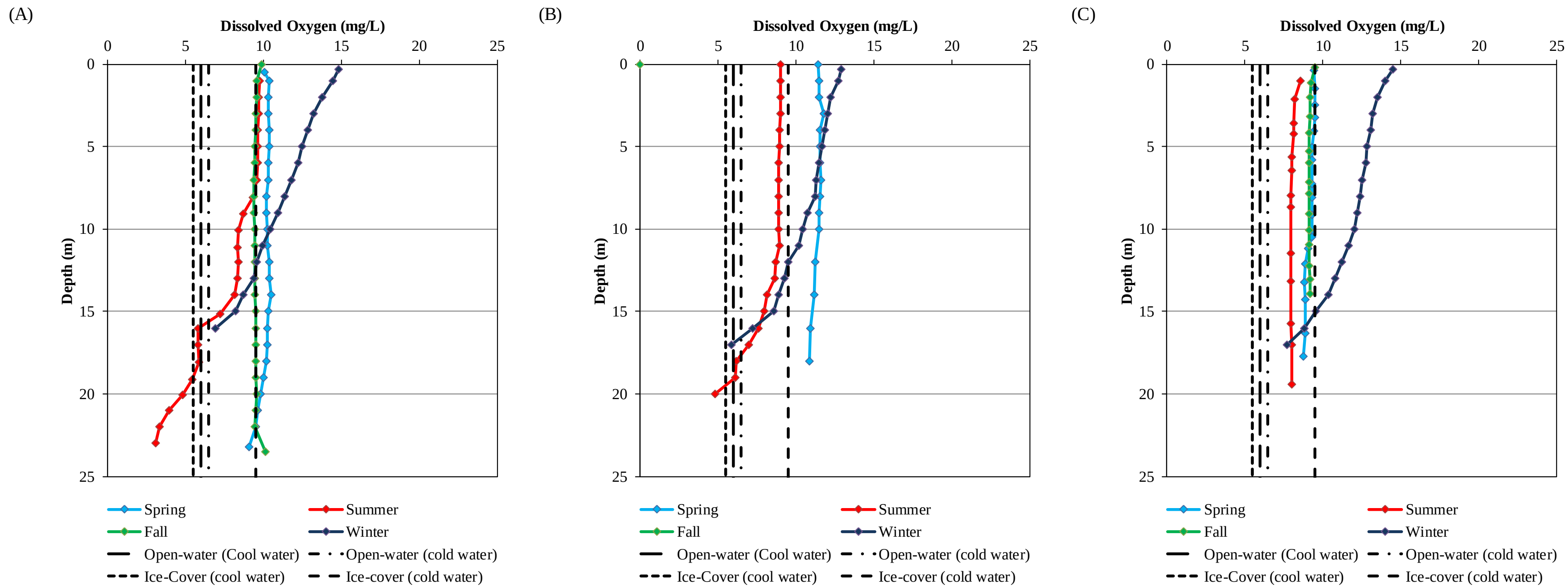


Figure 5.6.4-23. Dissolved oxygen depth profiles measured in Setting Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

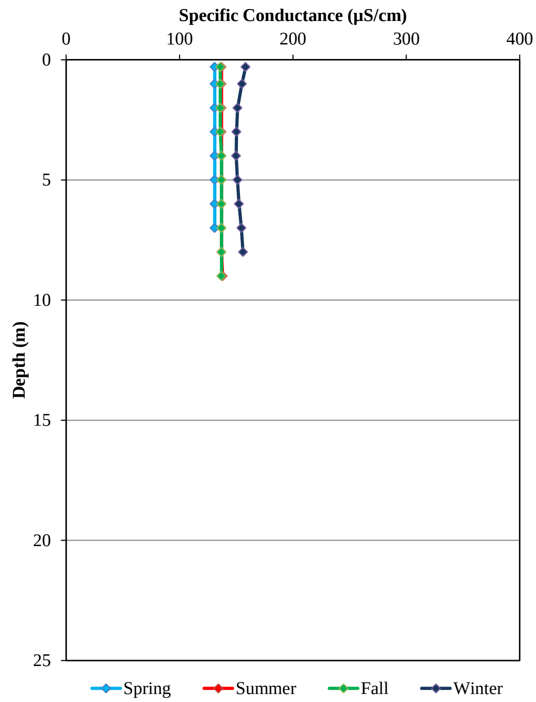


Figure 5.6.4-24. Specific conductance depth profiles measured in Walker Lake 2010/2011.

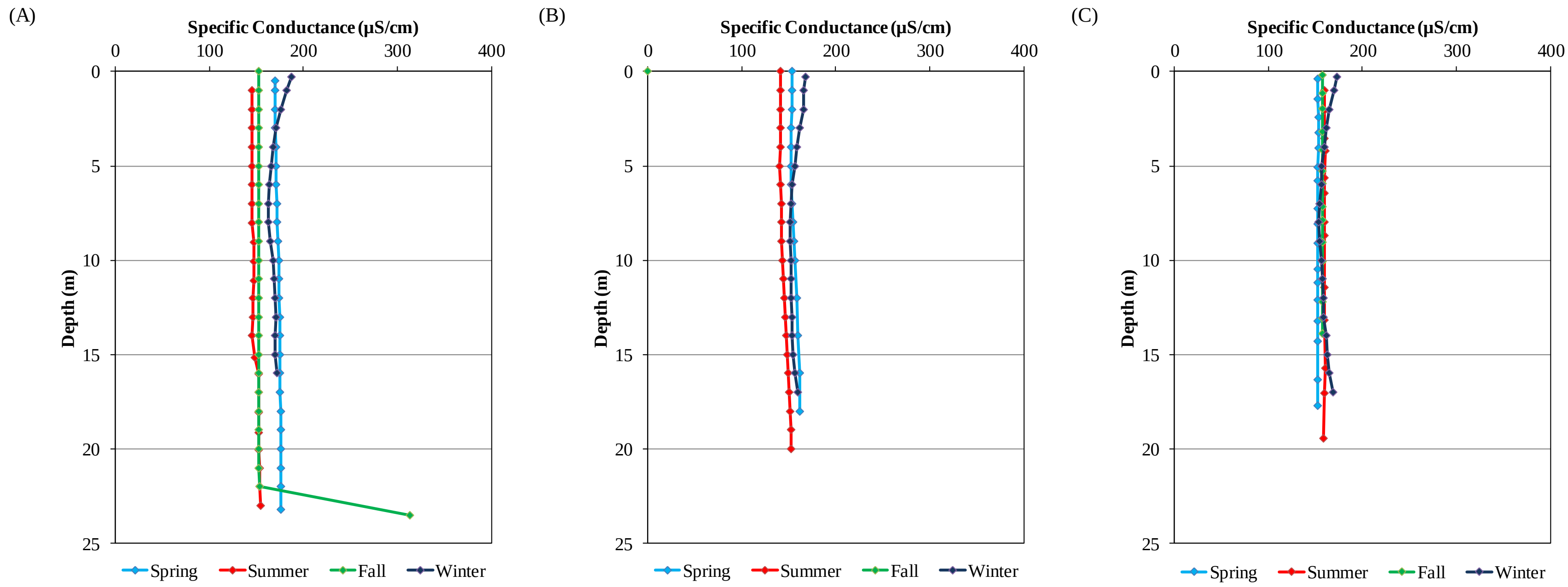


Figure 5.6.4-25. Specific conductance depth profiles measured in Setting Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

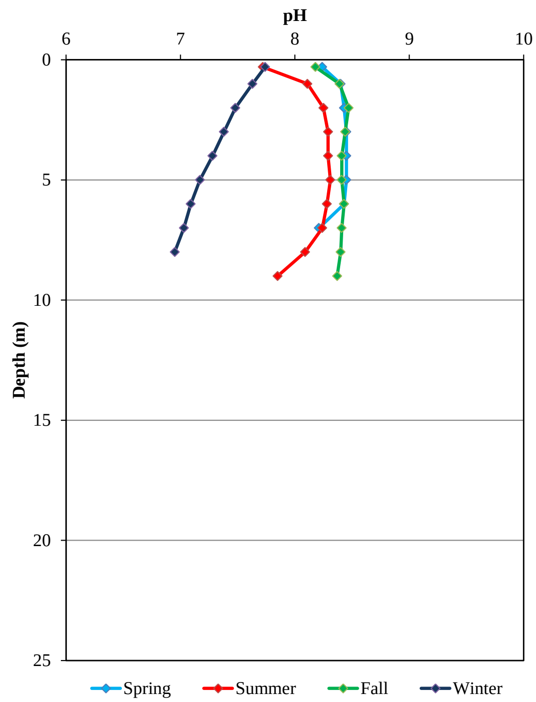


Figure 5.6.4-26. pH depth profiles measured in Walker Lake 2010/2011.

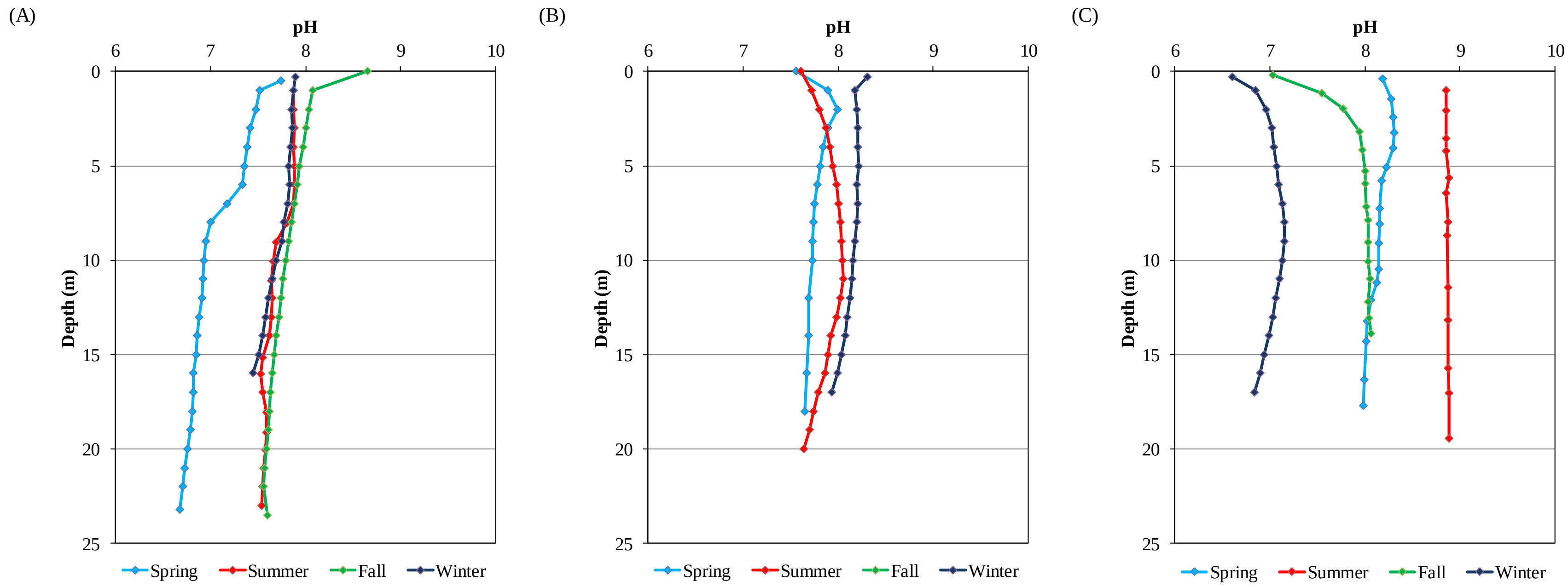


Figure 5.6.4-27. pH depth profiles measured in Setting Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

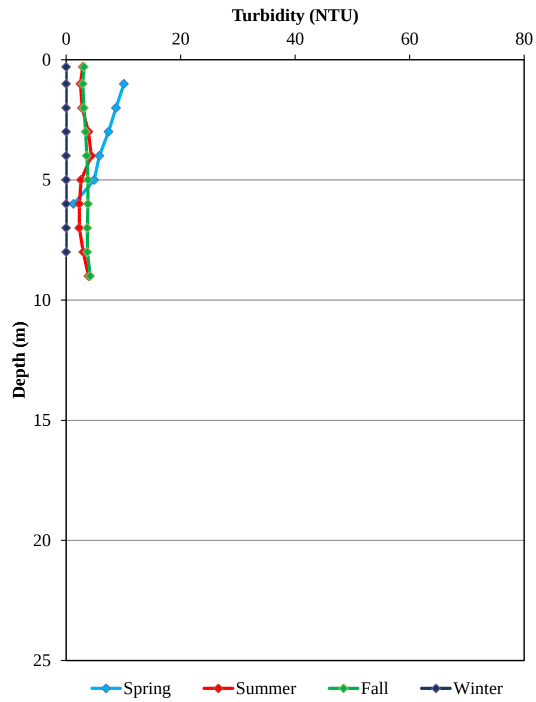


Figure 5.6.4-28. Turbidity depth profiles measured in Walker Lake 2010/2011.

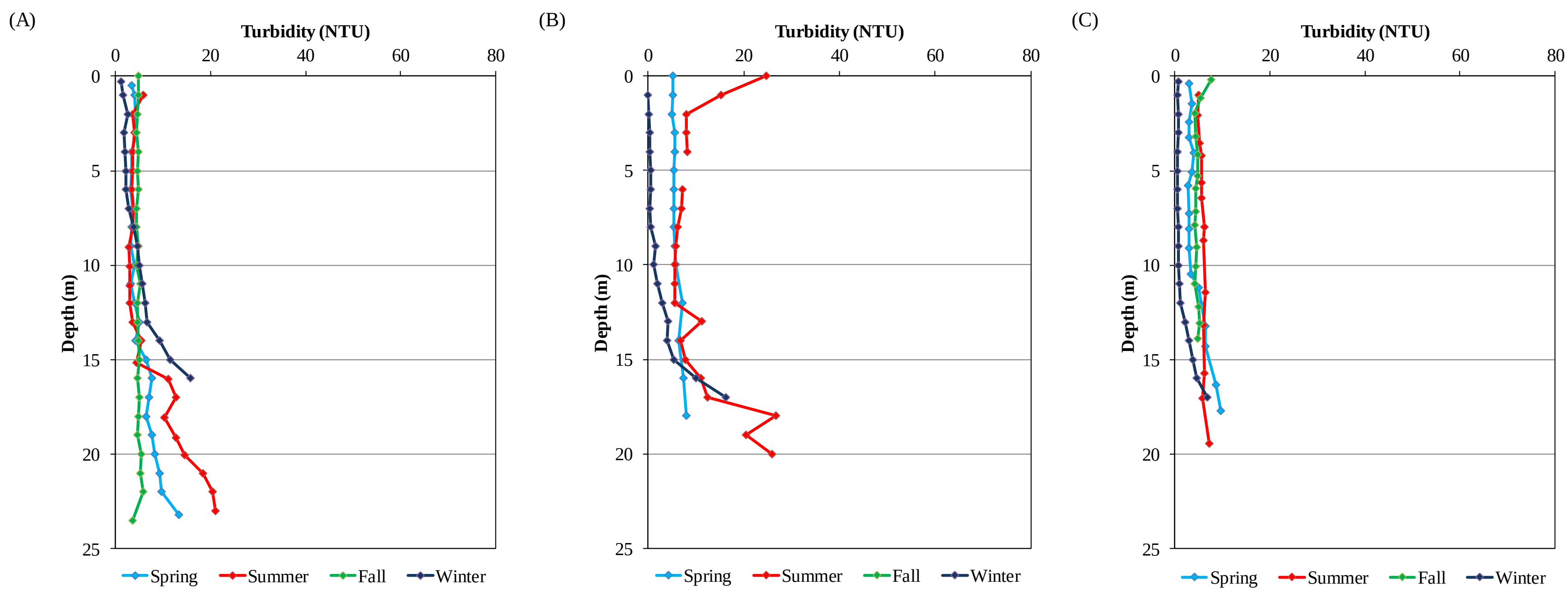


Figure 5.6.4-29. Turbidity depth profiles measured in Setting Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

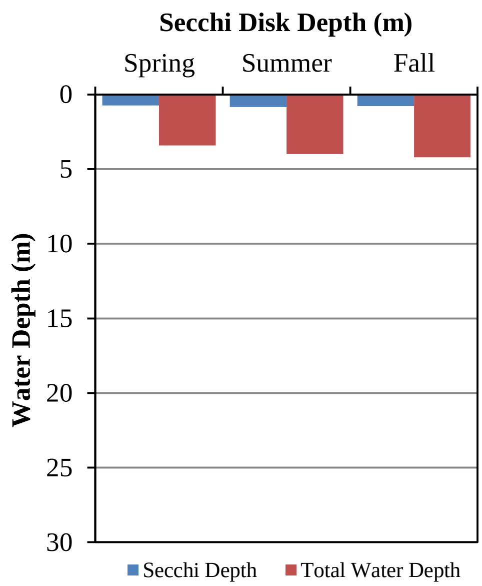


Figure 5.6.4-30. Secchi disk depths measured in Walker Lake (2010/2011).

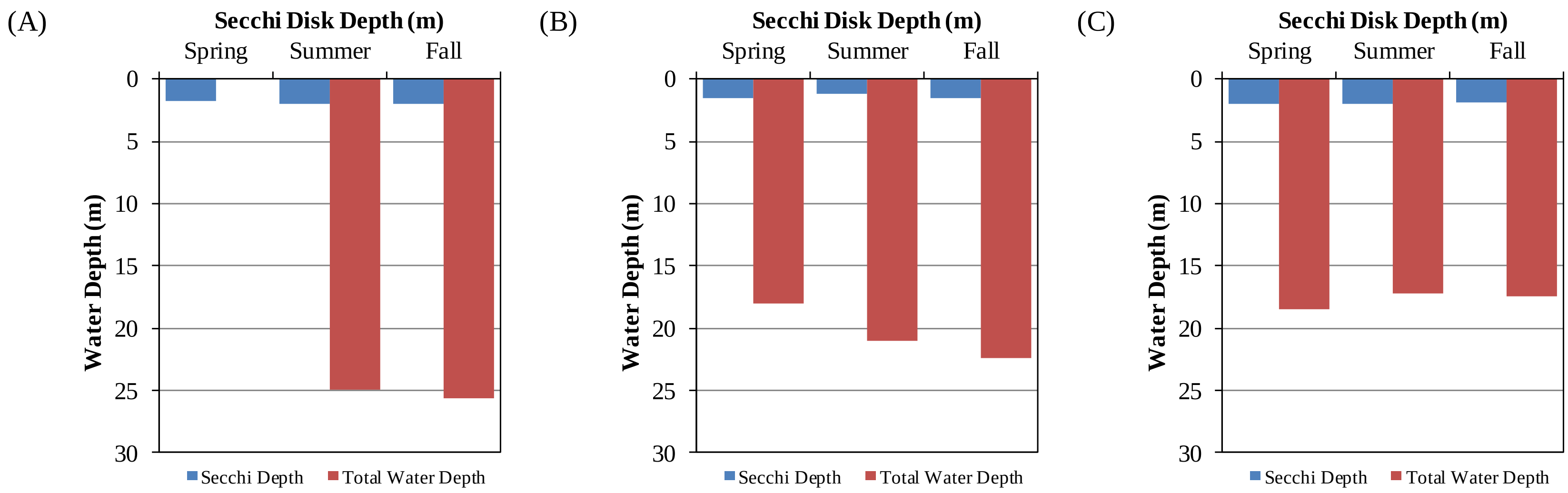


Figure 5.6.4-31. Secchi disk depths measured in Setting Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

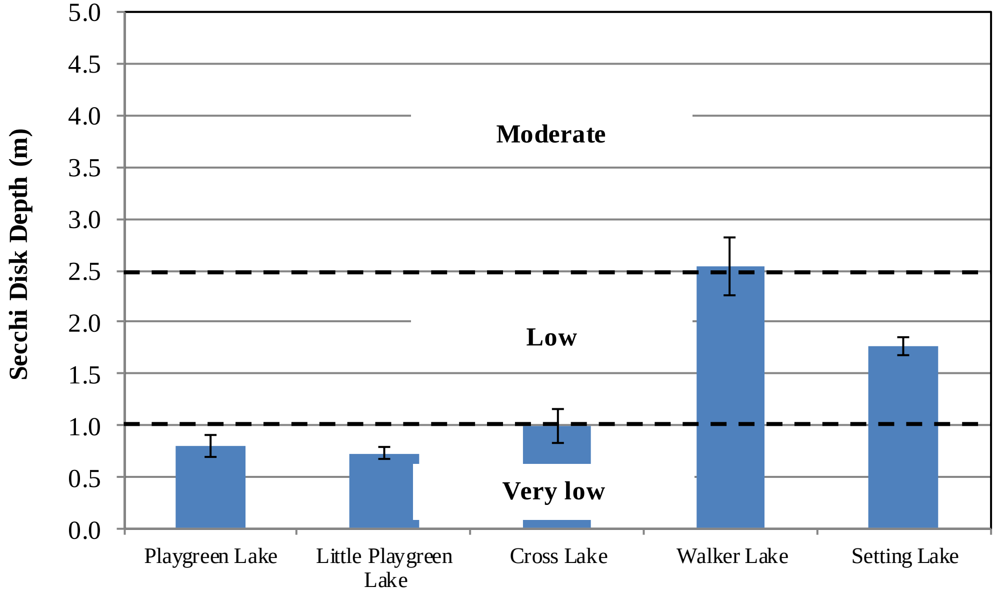


Figure 5.6.4-32. Mean±SE Secchi disk depths measured in the open-water seasons in lakes of the Upper Nelson River Region. Water clarity categories are those applied by the Swedish EPA (2000).

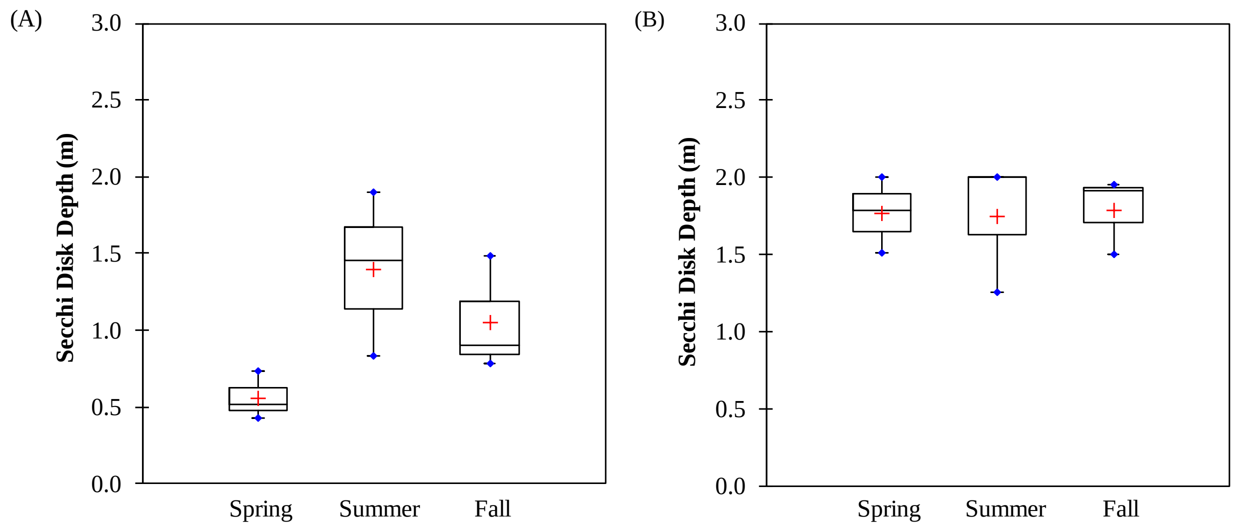


Figure 5.6.4-33. Secchi disk depth in the Upper Nelson River Region by season (open-water season only): (A) Cross Lake; and (B) Setting Lake. There were no significant differences between seasons.

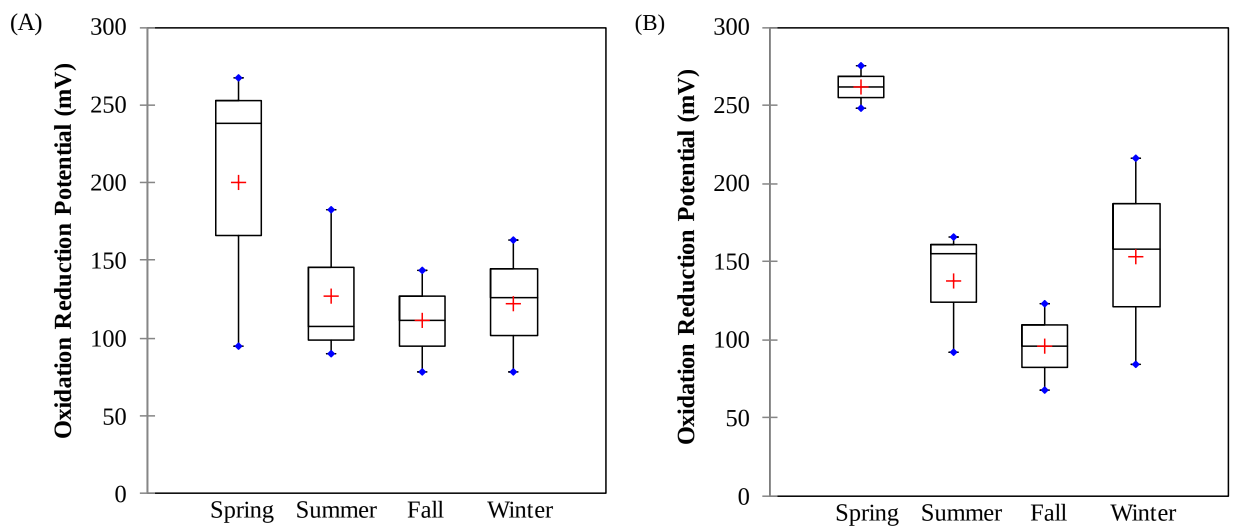


Figure 5.6.4-34. Oxidation-reduction potential in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. There were no significant differences between seasons.

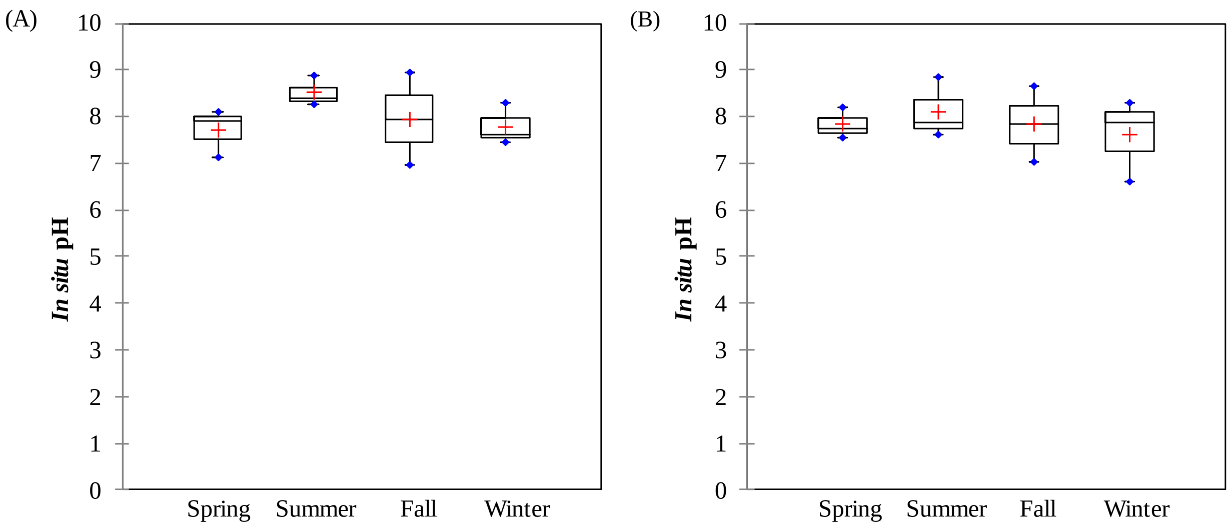


Figure 5.6.4-35. *In situ* pH in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. There were no significant differences between seasons.

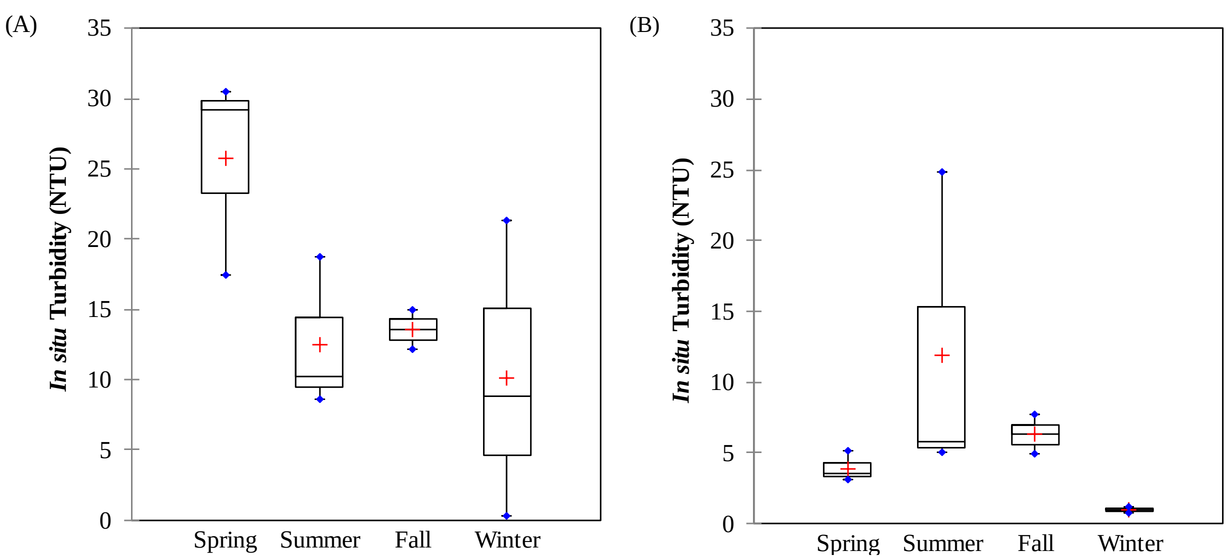


Figure 5.6.4-36. *In situ* turbidity in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. There were no significant differences between seasons.

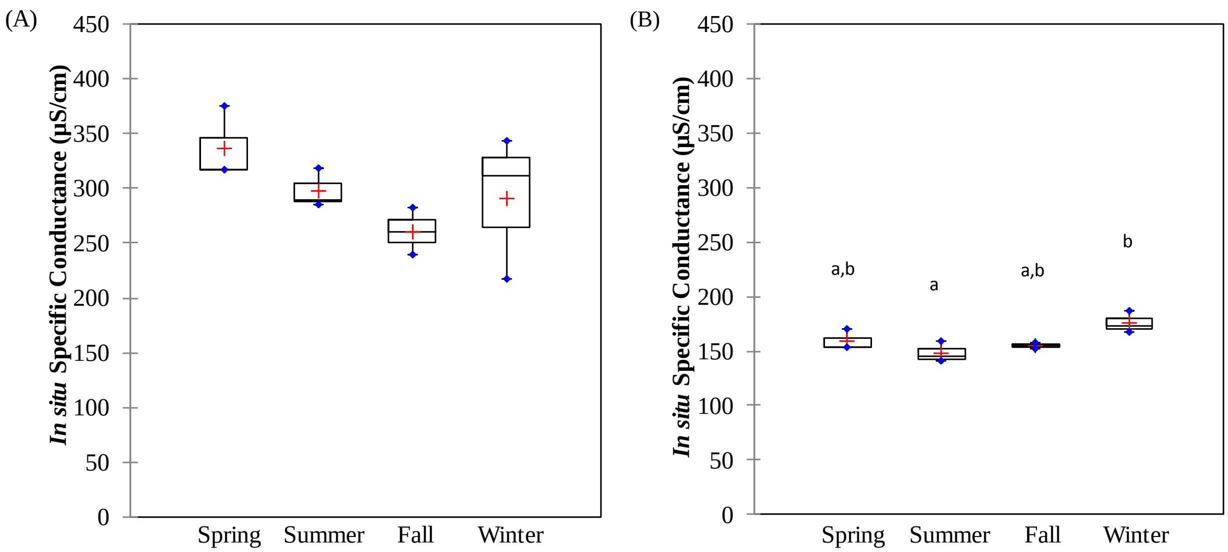


Figure 5.6.4-37. *In situ* specific conductance in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

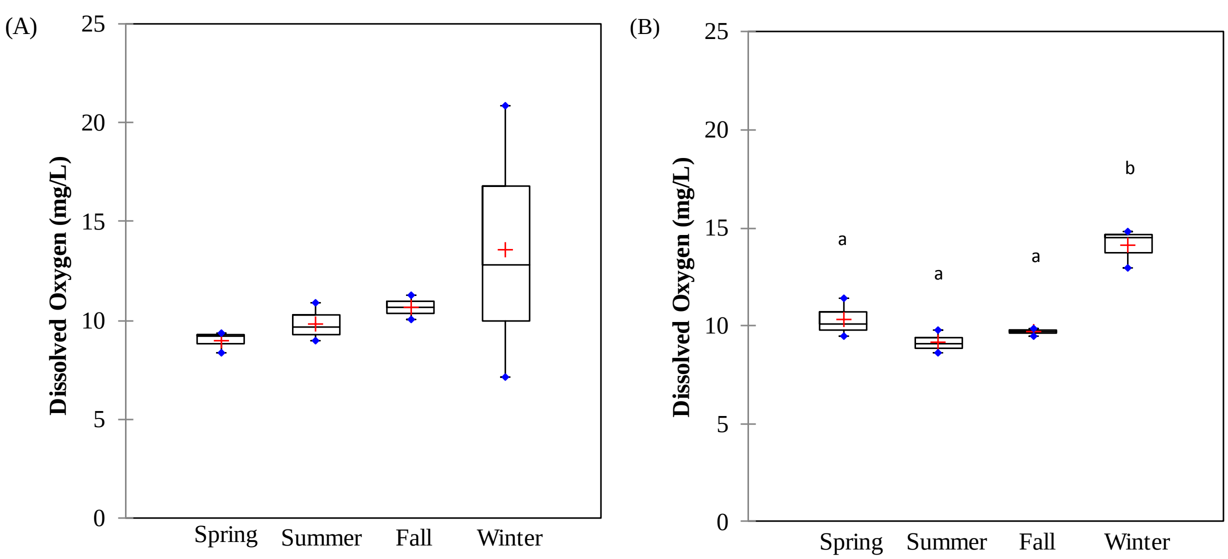


Figure 5.6.4-38. Dissolved oxygen in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

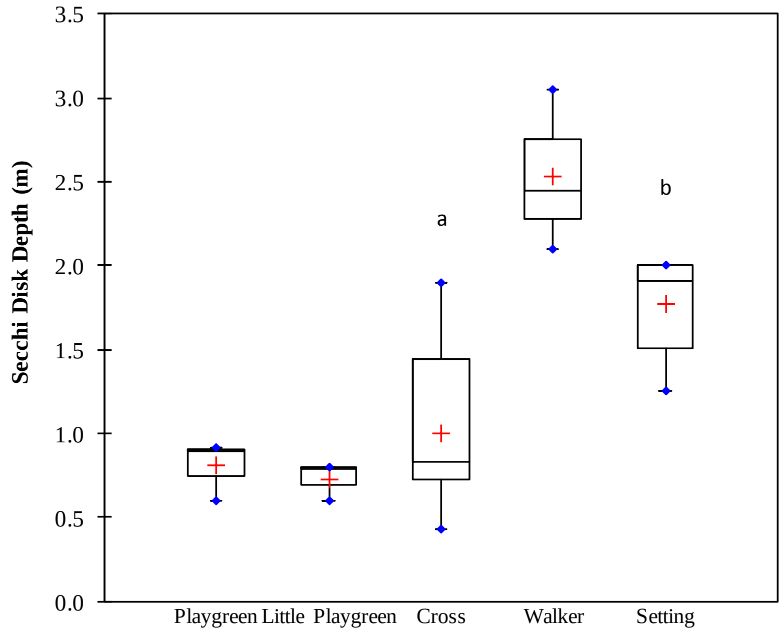


Figure 5.6.4-39. Secchi disk depths (open-water season only) in lakes of the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

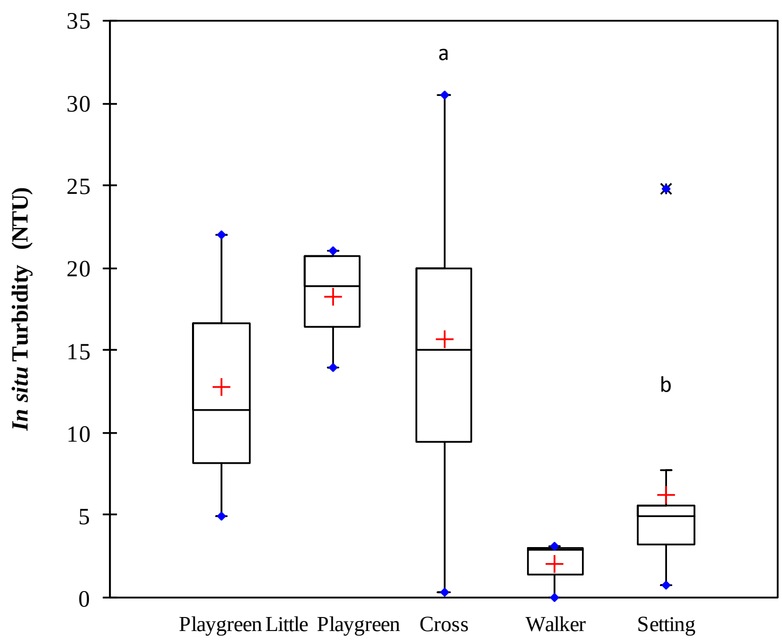


Figure 5.6.4-40. *In situ* turbidity in lakes of the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

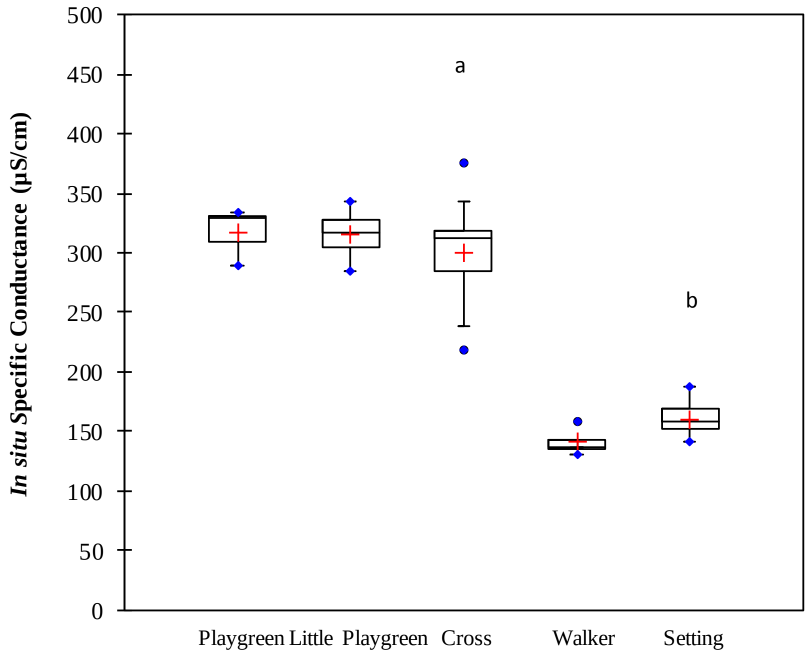


Figure 5.6.4-41. *In situ* specific conductance in lakes of the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

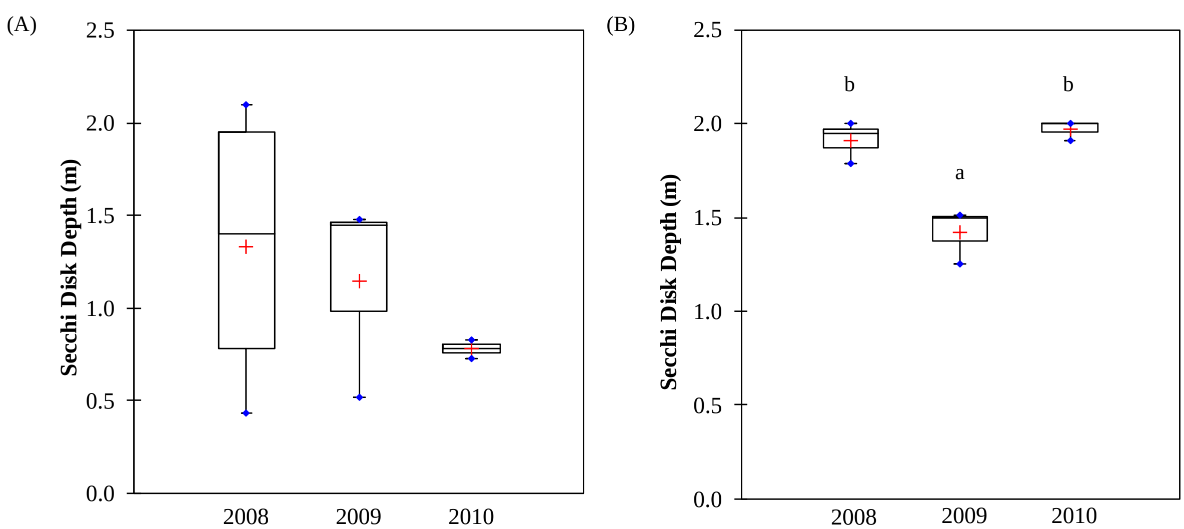


Figure 5.6.4-42. Secchi disk depth measured in (A) Cross Lake and (B) Setting Lake by year. Statistically significant differences are denoted with different superscripts.

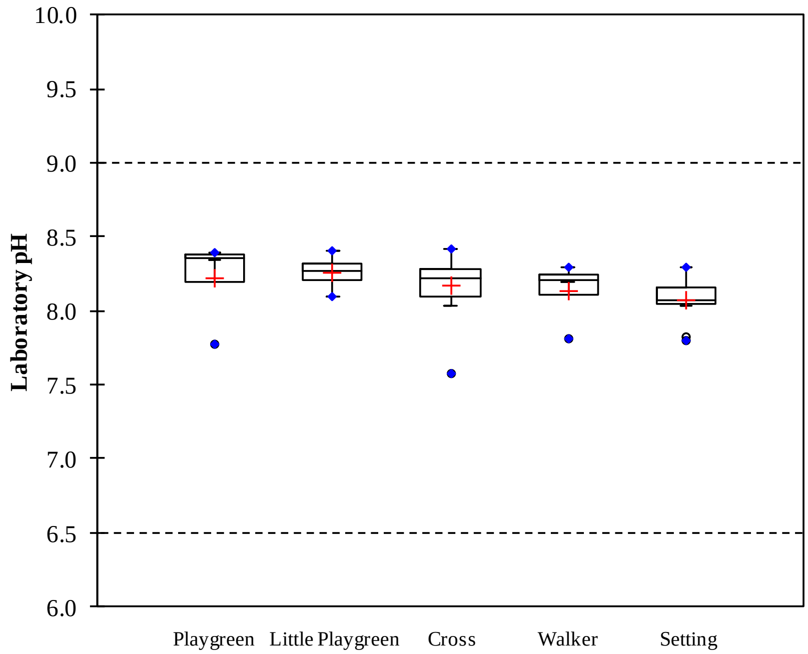


Figure 5.6.4-43. Laboratory pH in lakes of the Upper Nelson River Region: 2008-2010. There were no significant differences between annual waterbodies. Area between the dashed lines indicates the MWQSOG PAL guideline (6.5-9).

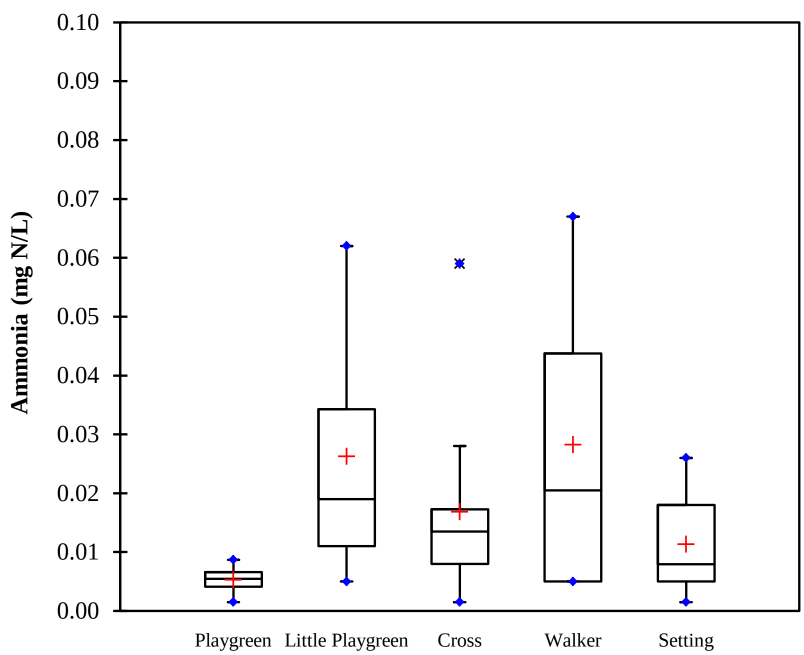


Figure 5.6.4-44. Ammonia in lakes of the Upper Nelson River Region: 2008-2010. There were no significant differences between annual waterbodies. The most stringent site-specific PAL objective is 0.7 mg N/L.

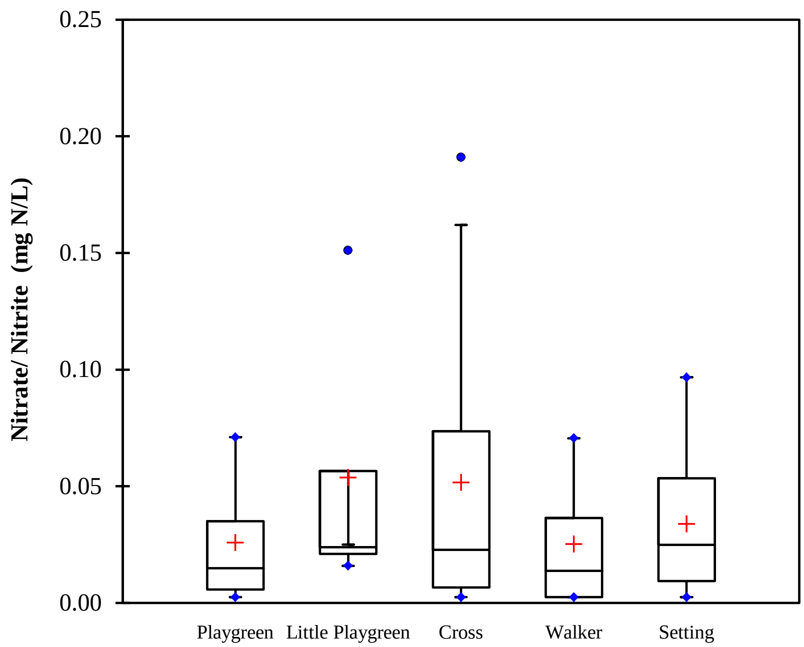


Figure 5.6.4-45. Nitrate/nitrite in lakes of the Upper Nelson River Region: 2008-2010. There were no significant differences between annual waterbodies. The MWQSOG PAL guideline is 2.93 mg N/L.

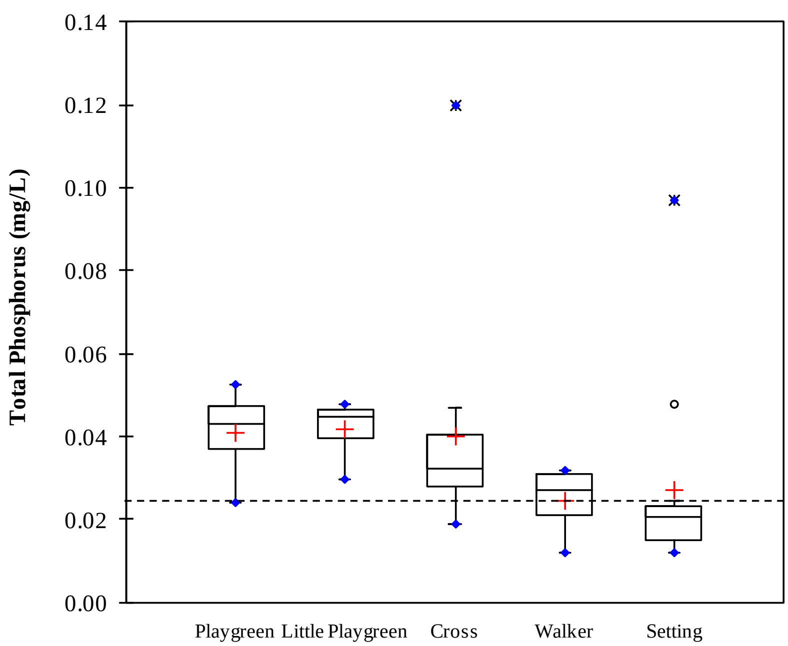


Figure 5.6.4-46. Total phosphorus in lakes of the Upper Nelson River Region: 2008-2010. There were no significant differences between annual waterbodies. The dashed line represents the Manitoba narrative guideline for lakes, ponds, and reservoirs.

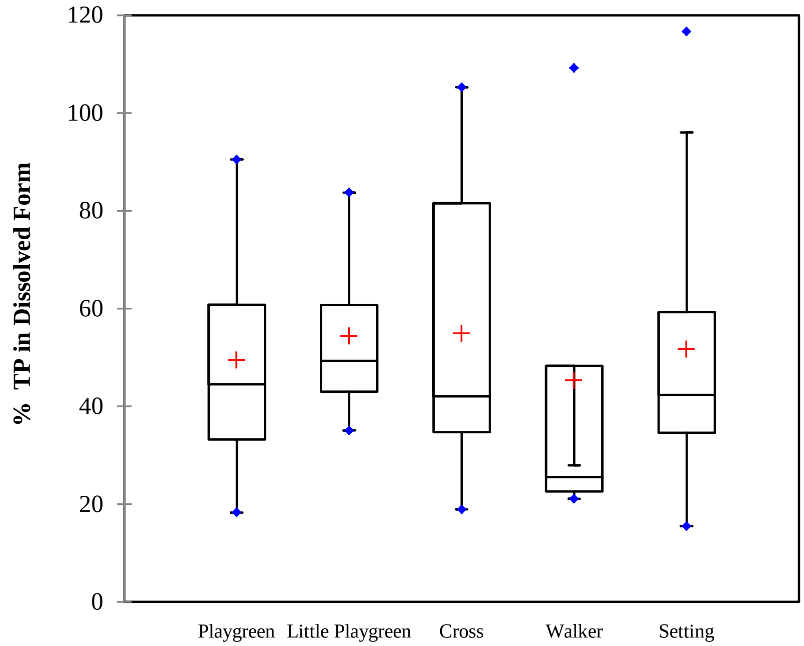


Figure 5.6.4-47. Fraction of total phosphorus in dissolved form in the Upper Nelson River Region.

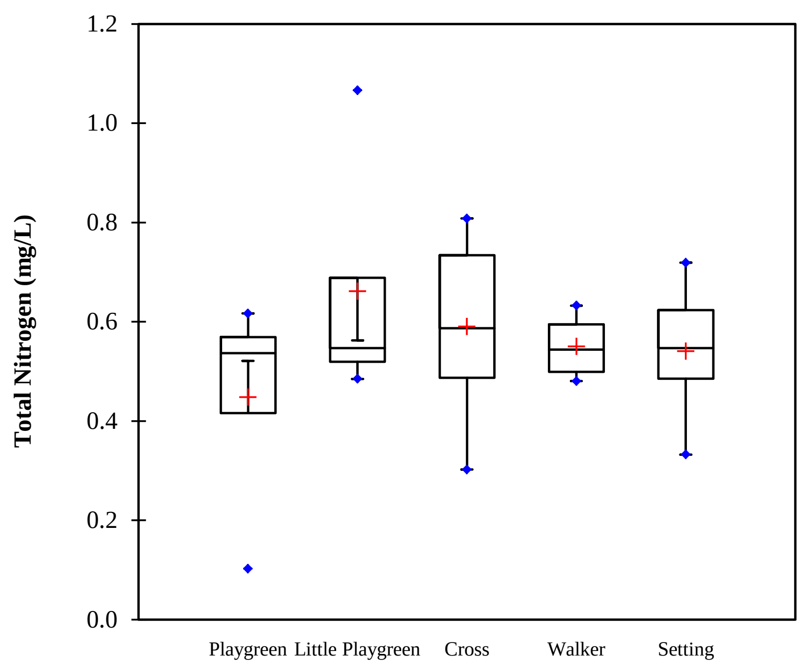


Figure 5.6.4-48. Total nitrogen in lakes of the Upper Nelson River Region: 2008-2010. There were no significant differences between annual waterbodies. .

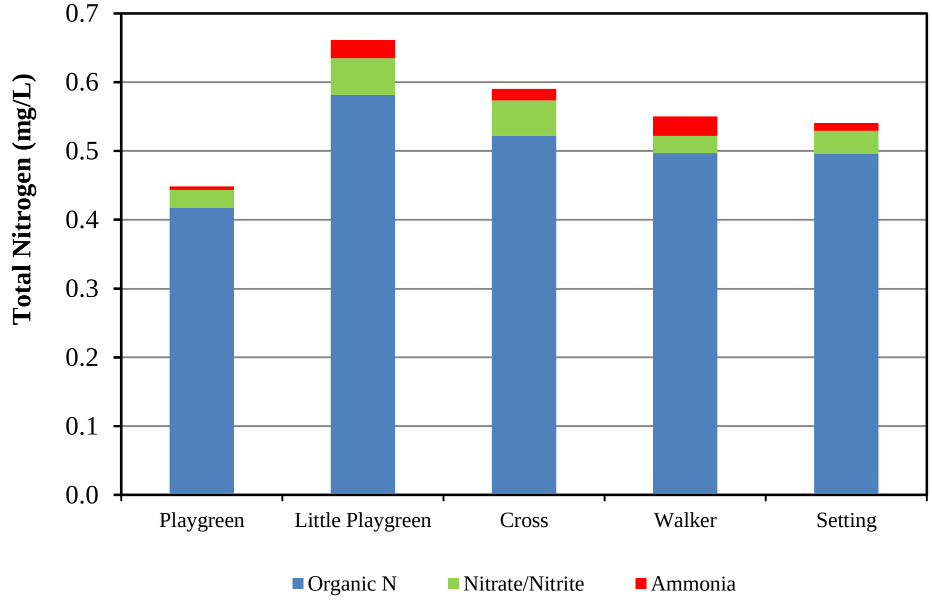


Figure 5.6.4-49. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Upper Nelson River Region.

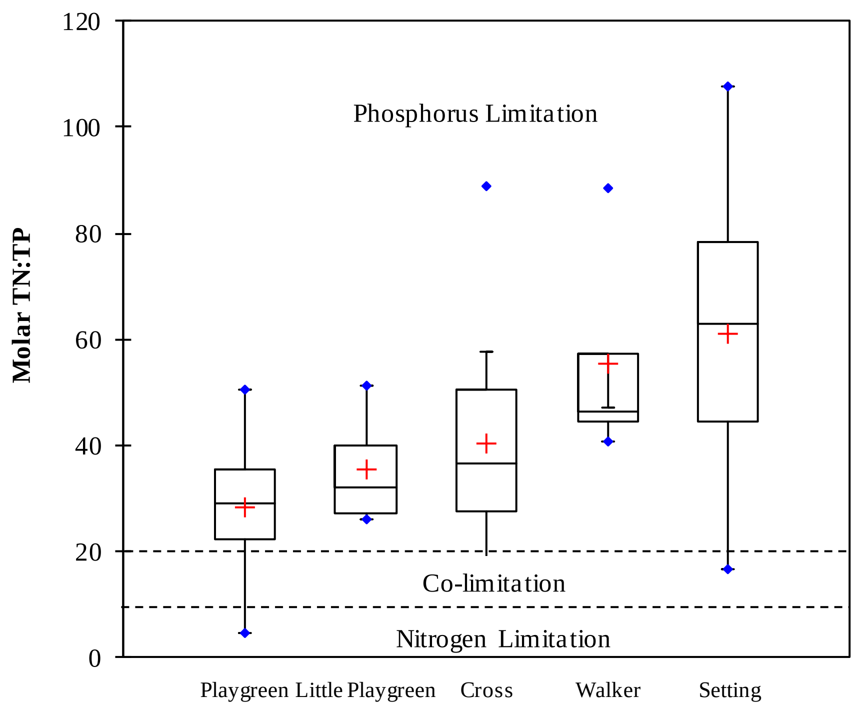


Figure 5.6.4-50. Total nitrogen to total phosphorus molar ratios in the Upper Nelson River Region.

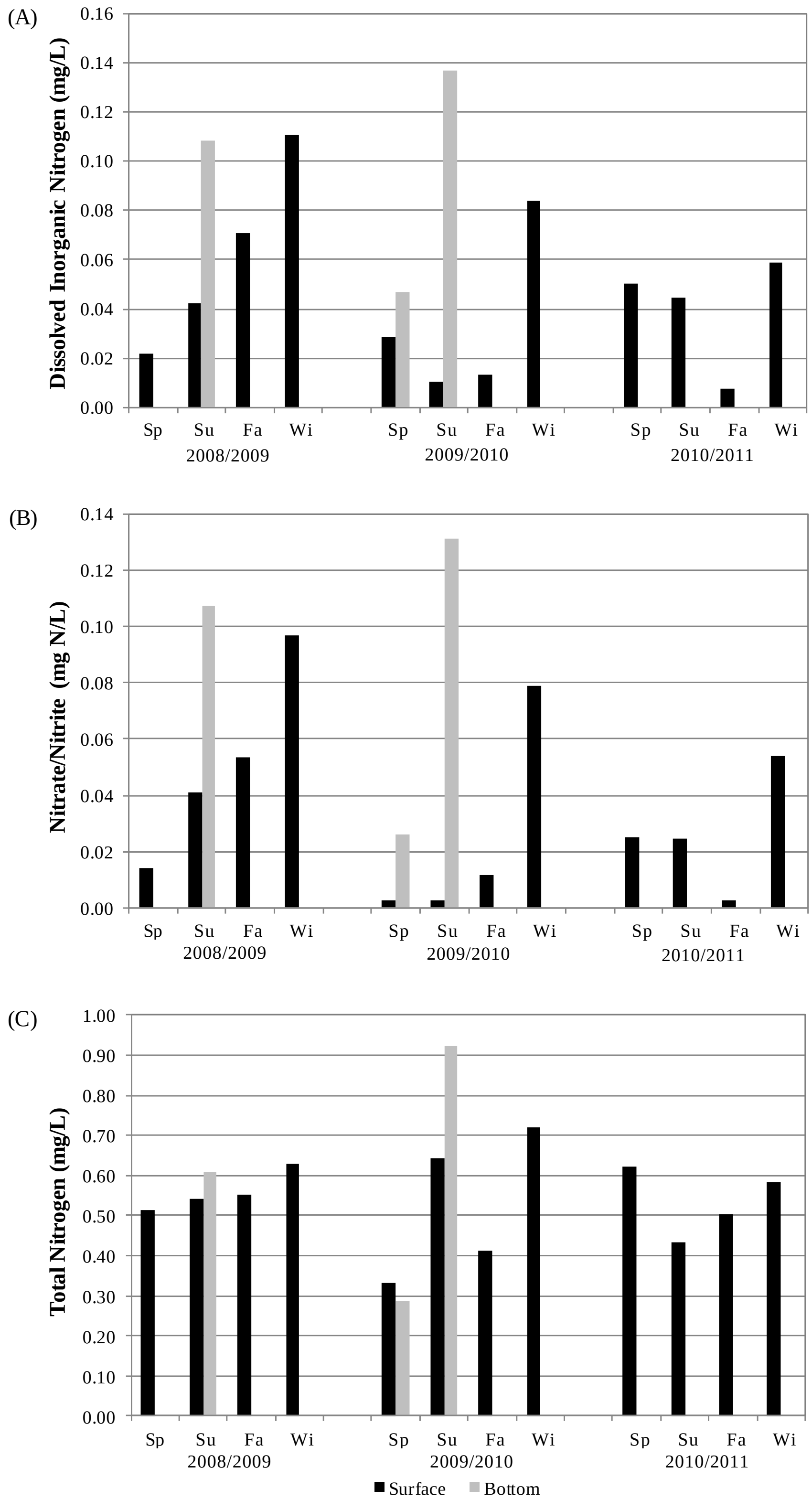


Figure 5.6.4-51. Dissolved inorganic nitrogen (DIN; A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Setting Lake, 2008/2009-2010/2011.

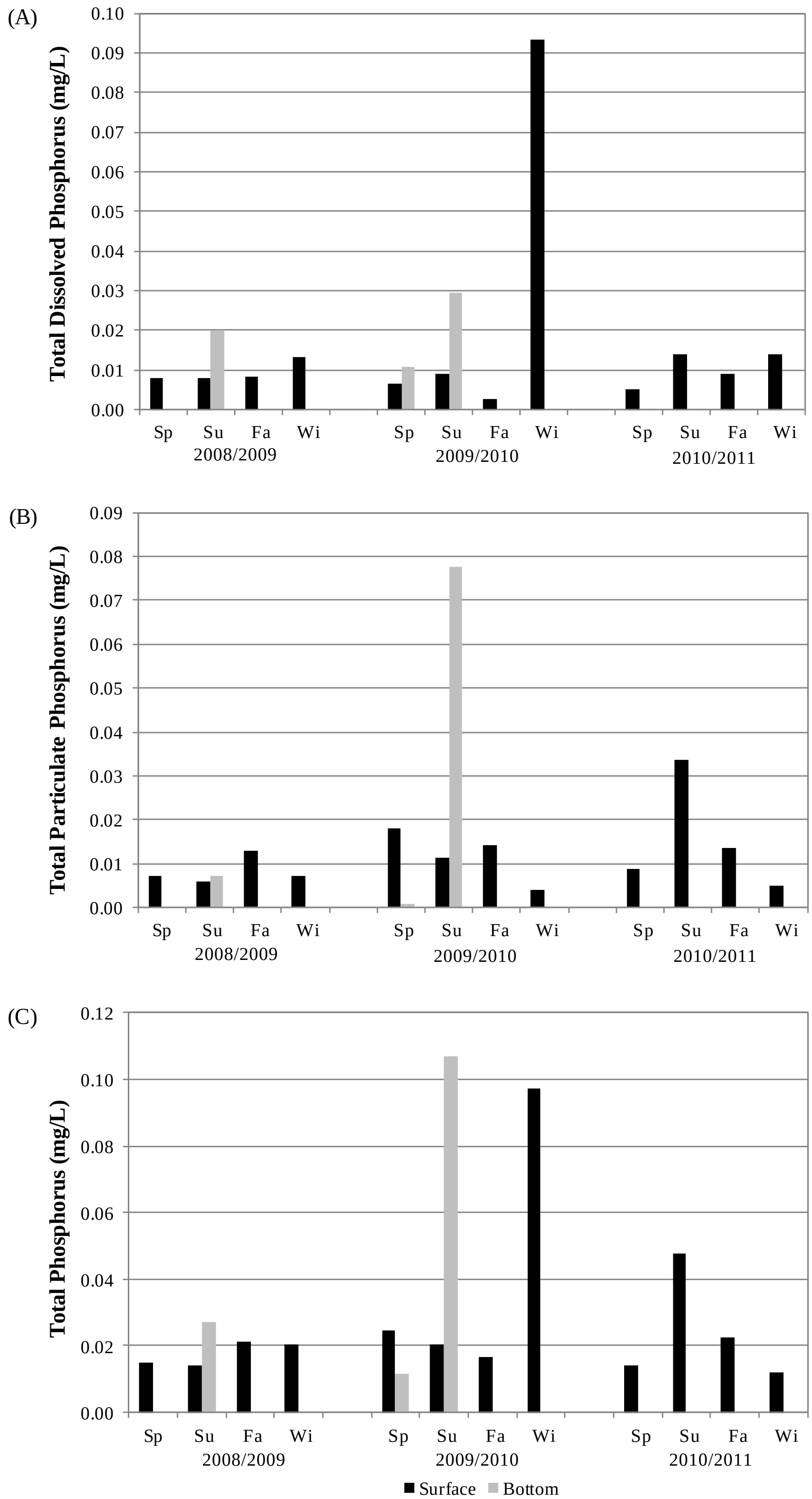


Figure 5.6.4-52. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Setting Lake, 2008/2009-2010/2011.

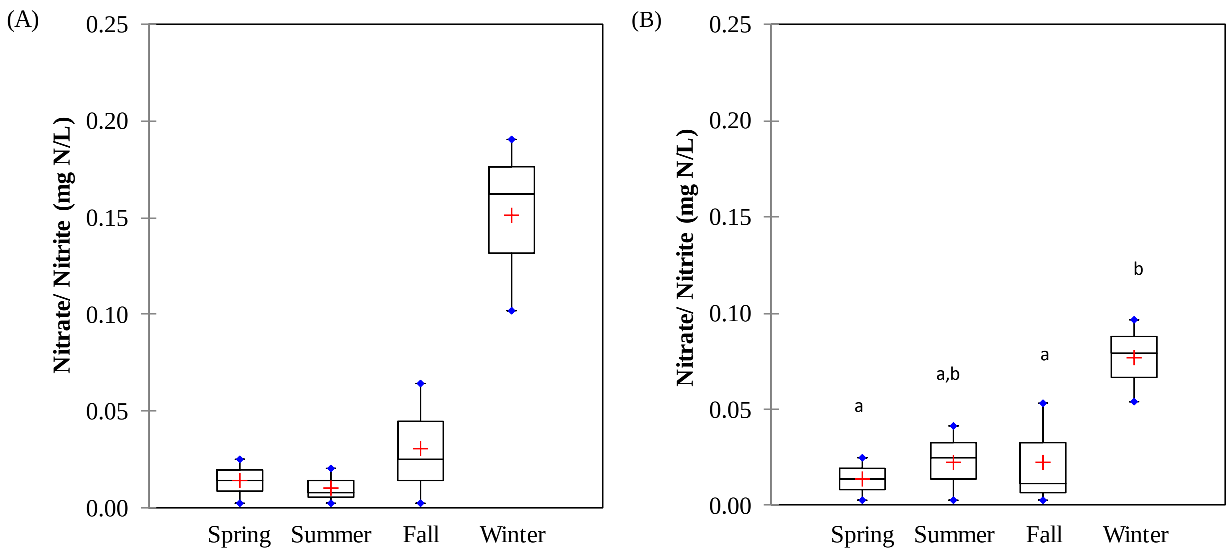


Figure 5.6.4-53. Nitrate/nitrite in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

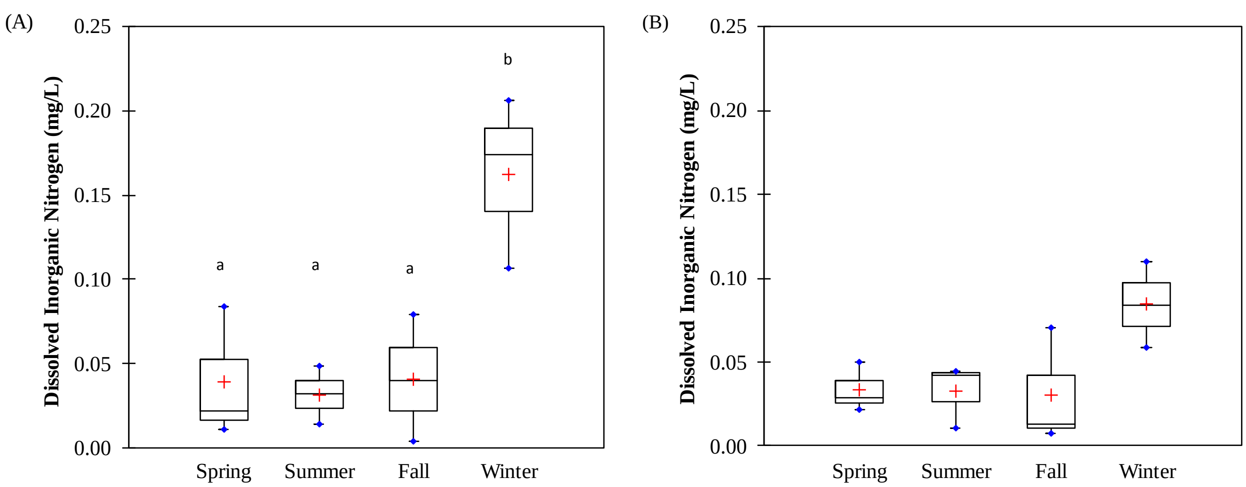


Figure 5.6.4-54. Dissolved inorganic nitrogen in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

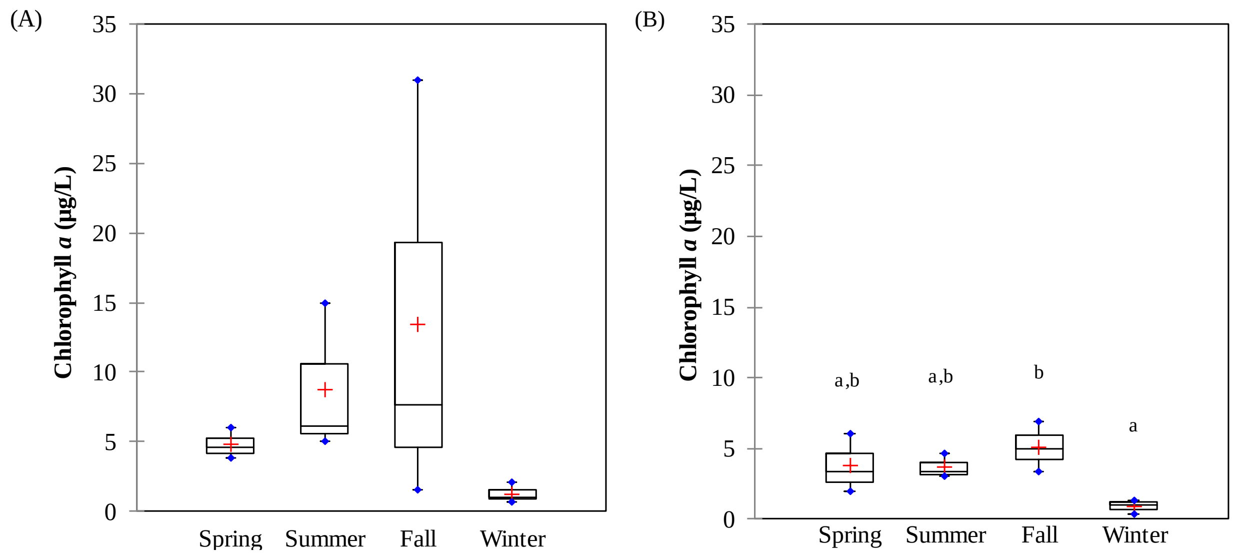


Figure 5.6.4-55. Chlorophyll *a* in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

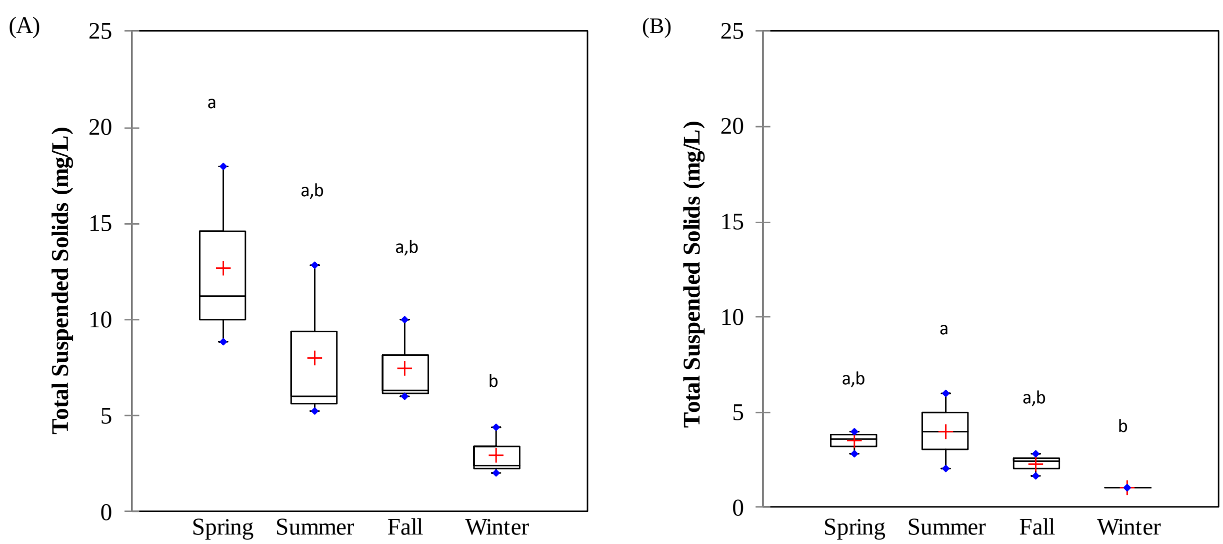


Figure 5.6.4-56. Total suspended solids in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

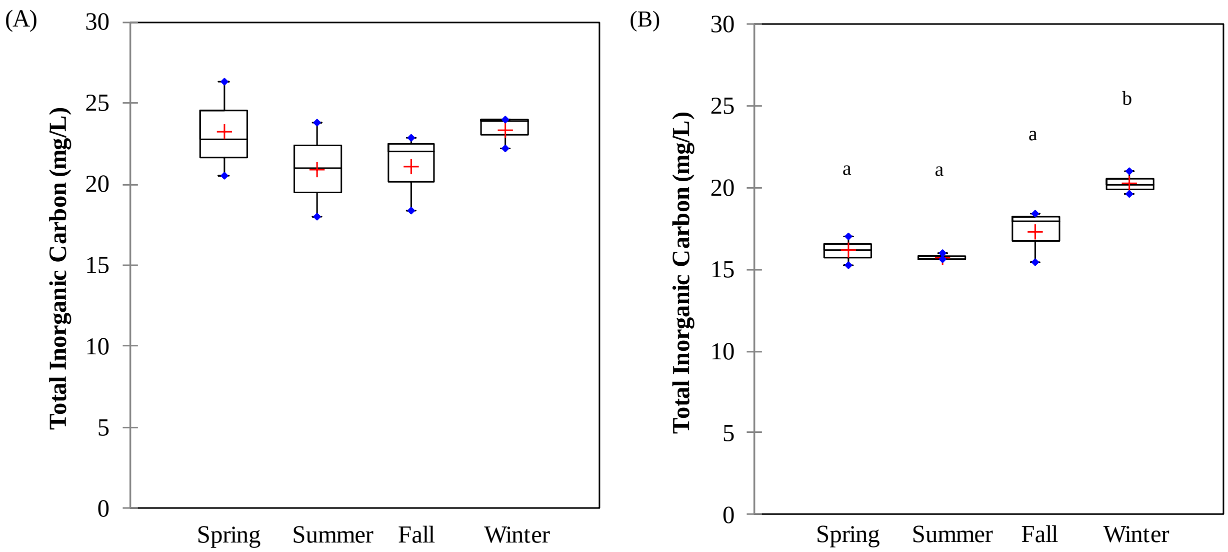


Figure 5.6.4-57. Total inorganic carbon in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

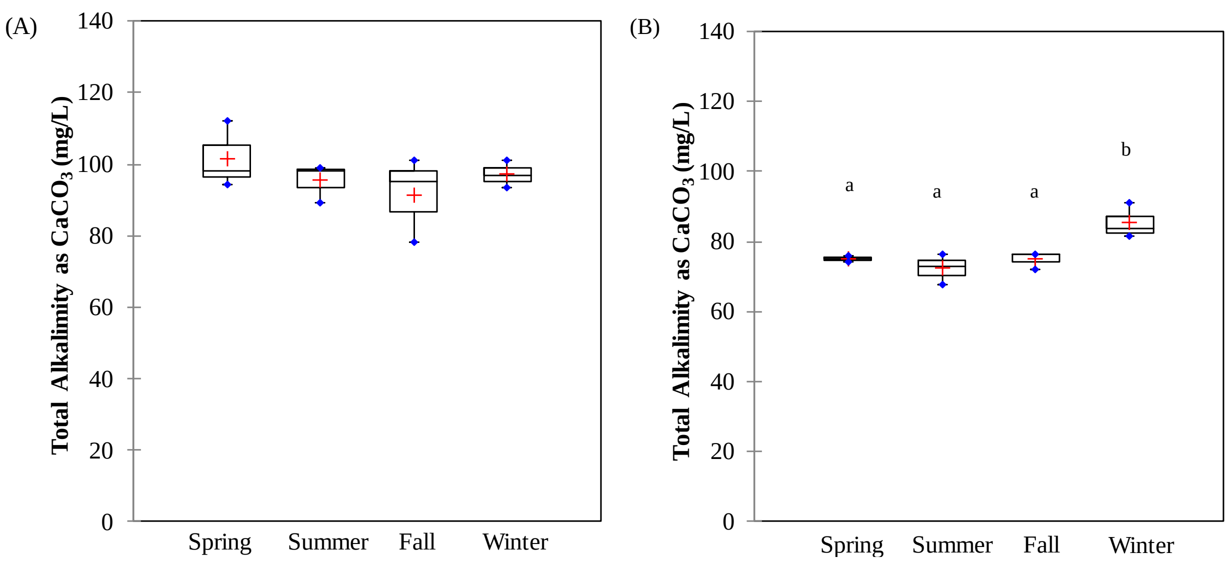


Figure 5.6.4-58. Total alkalinity in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

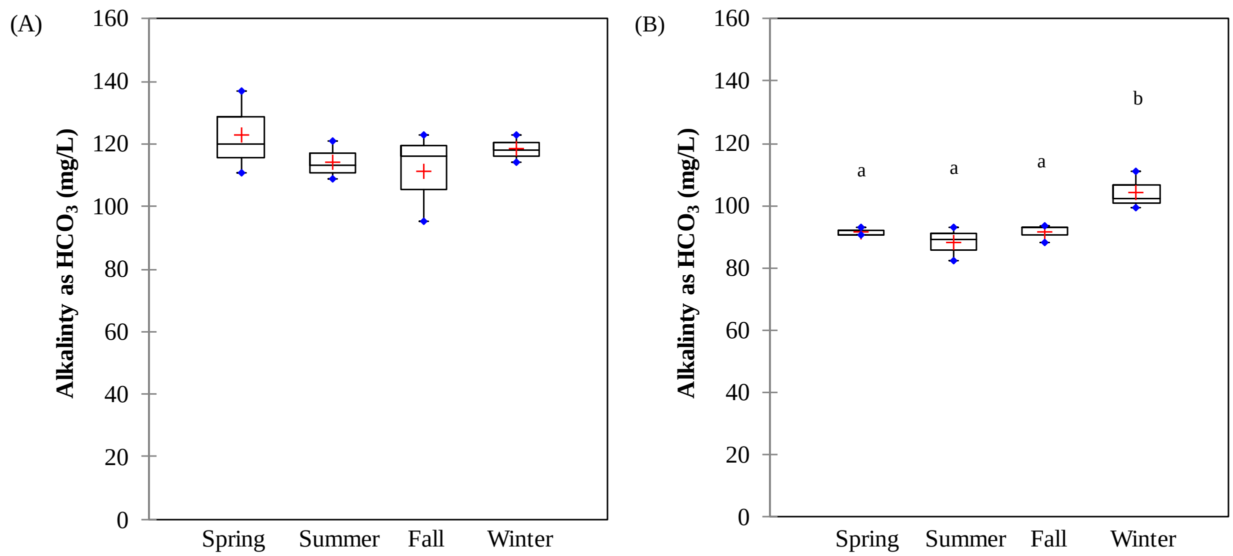


Figure 5.6.4-59. Alkalinity as HCO_3 in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

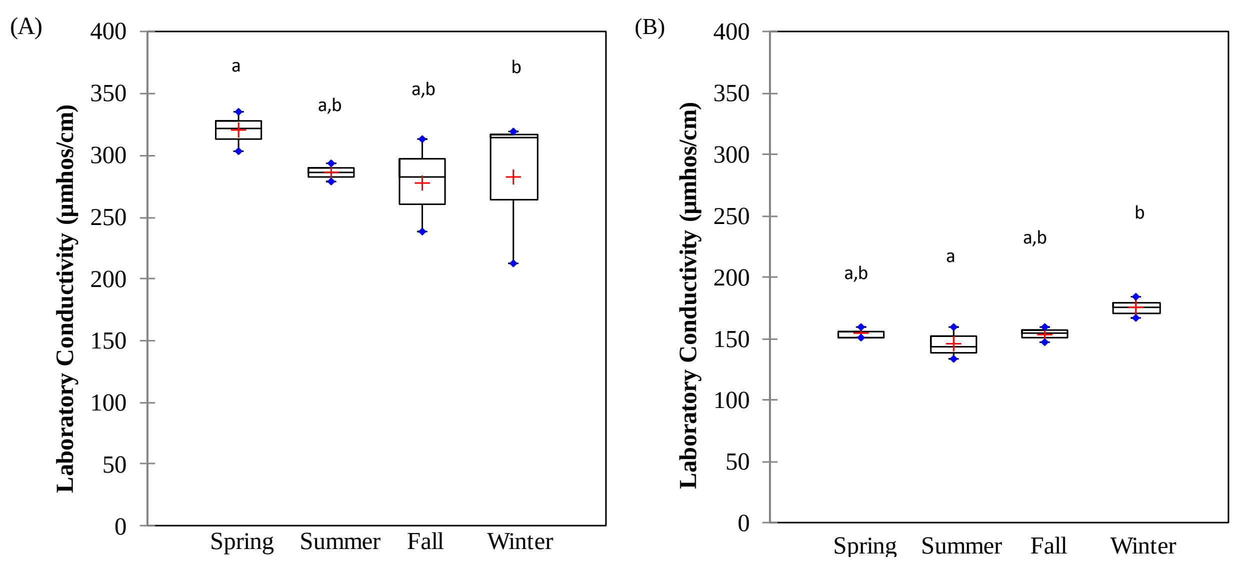


Figure 5.6.4-60. Laboratory conductivity in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

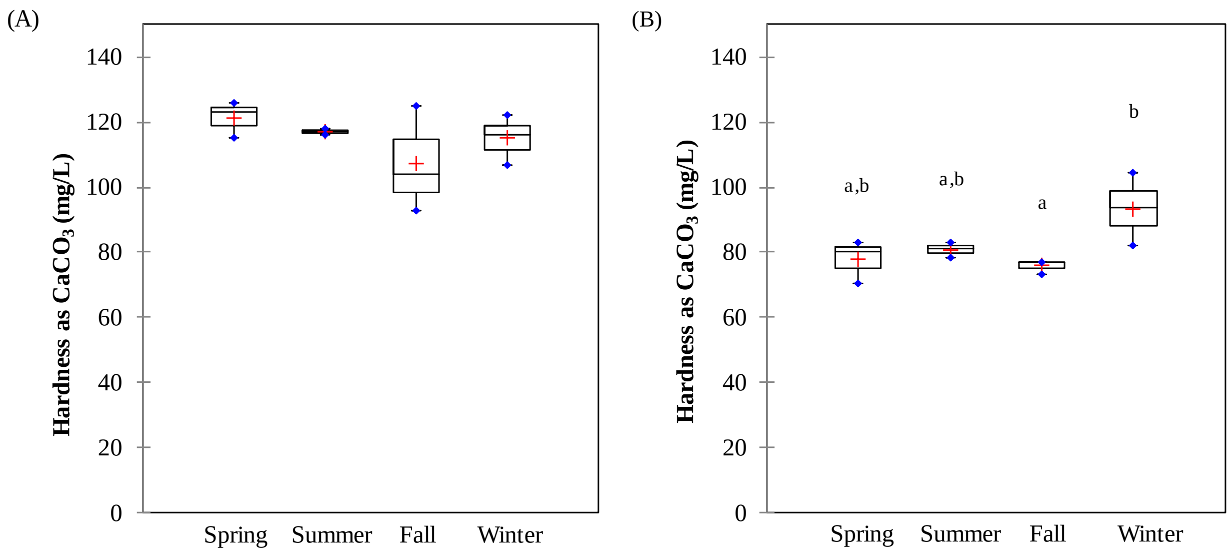


Figure 5.6.4-61. Hardness in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts.

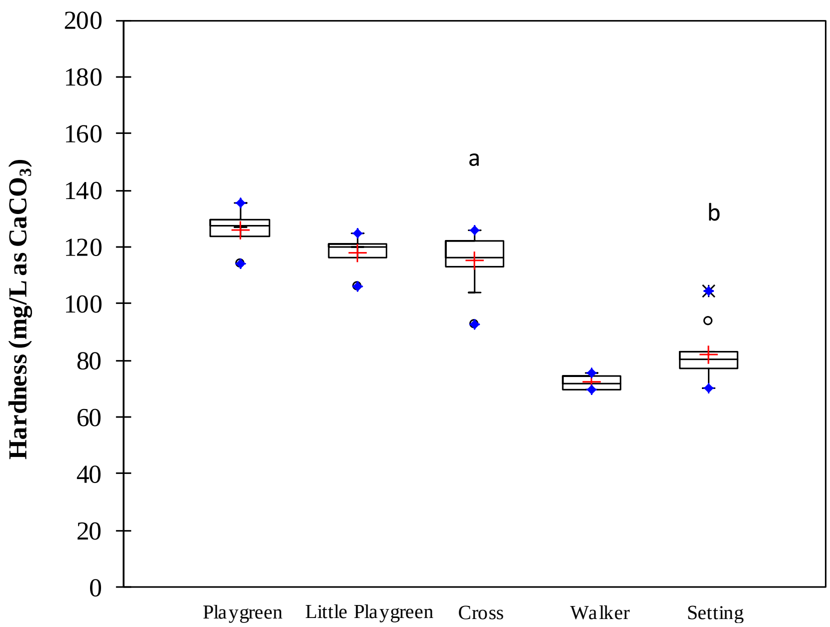


Figure 5.6.4-62. Hardness in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

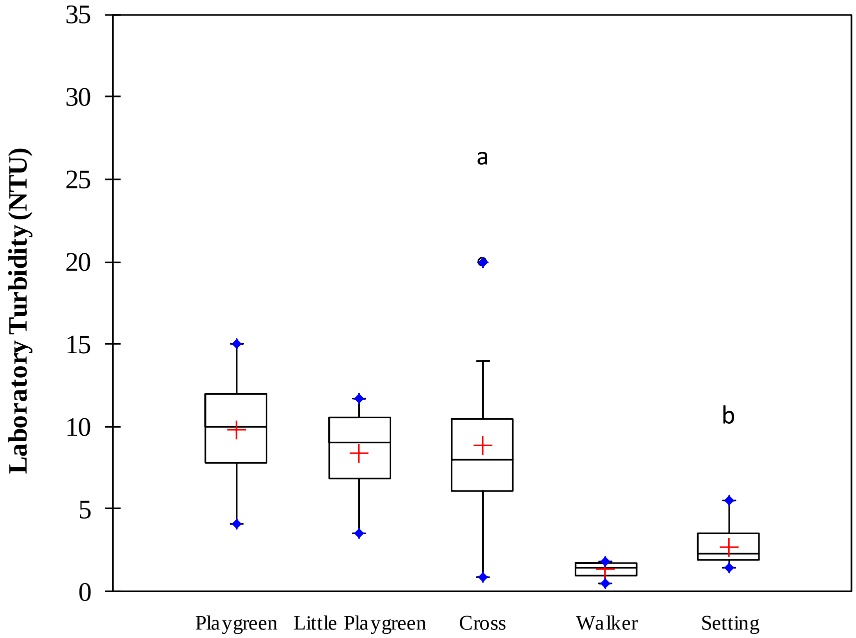


Figure 5.6.4-63. Laboratory turbidity in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

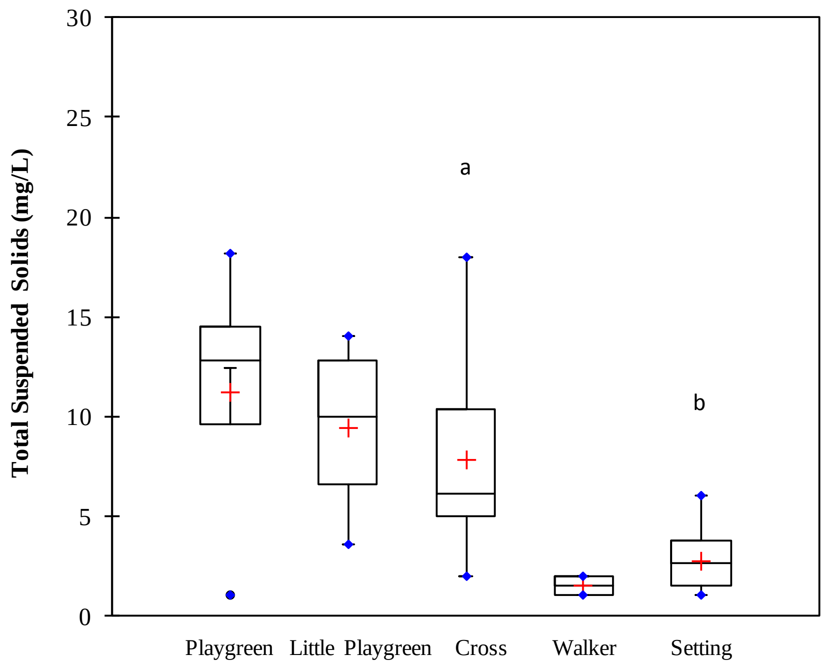


Figure 5.6.4-64. Total suspended solids in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

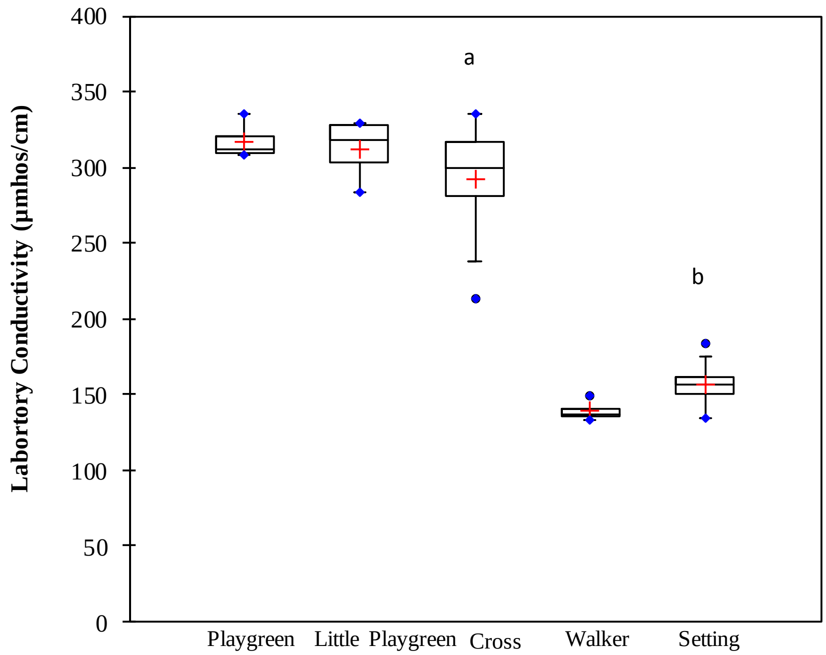


Figure 5.6.4-65. Laboratory conductivity in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

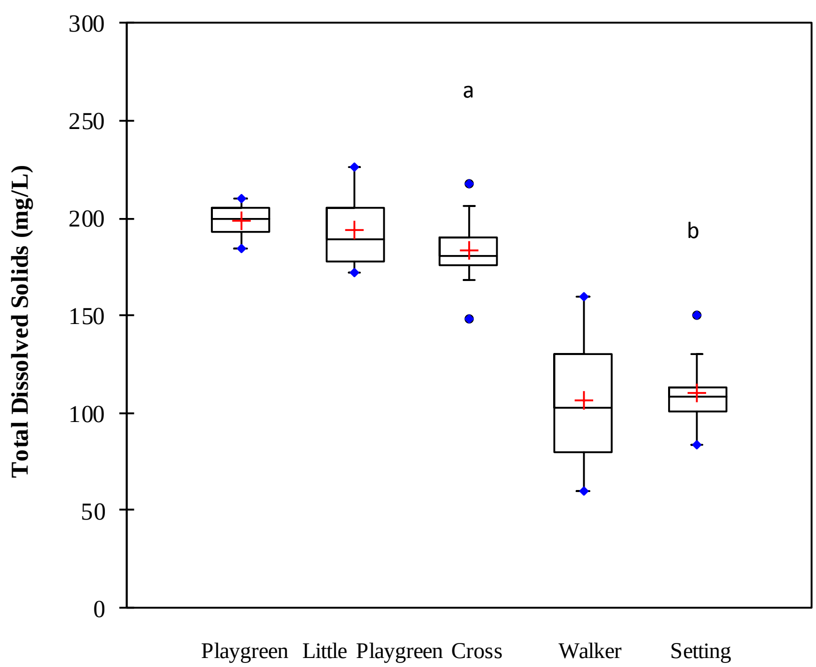


Figure 5.6.4-66. Total dissolved solids in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

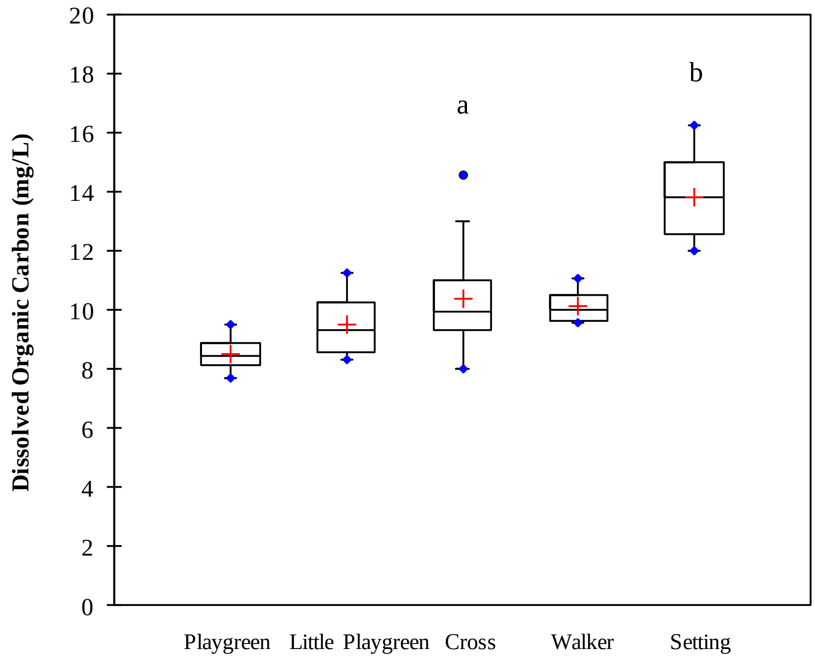


Figure 5.6.4-67. Dissolved organic carbon in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

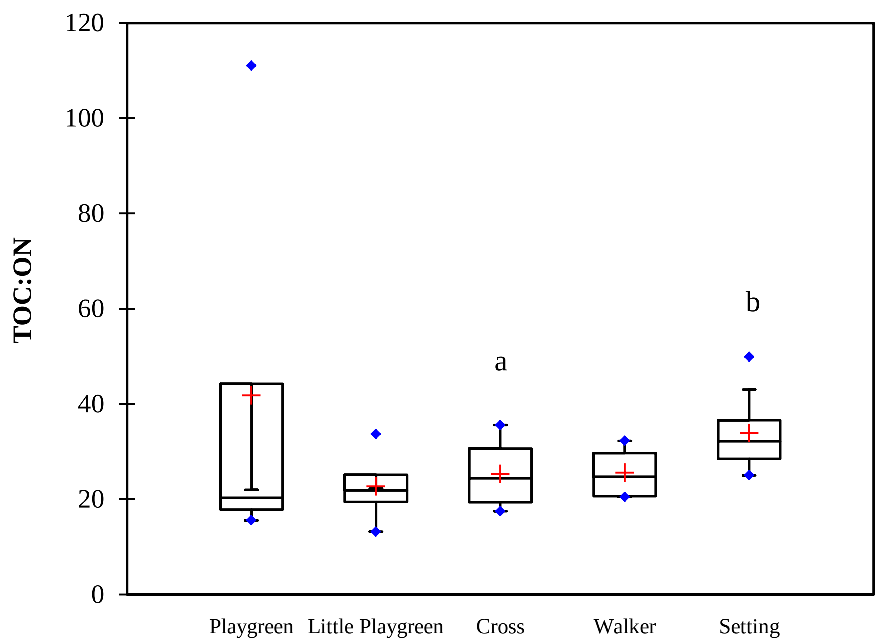


Figure 5.6.4-68. TOC:ON ratios in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

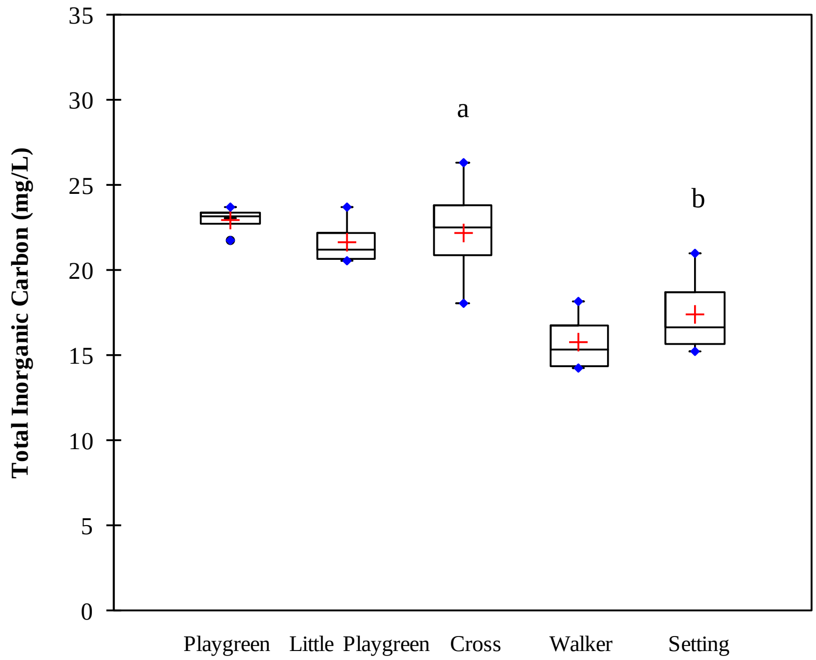


Figure 5.6.4-69. Total inorganic carbon in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

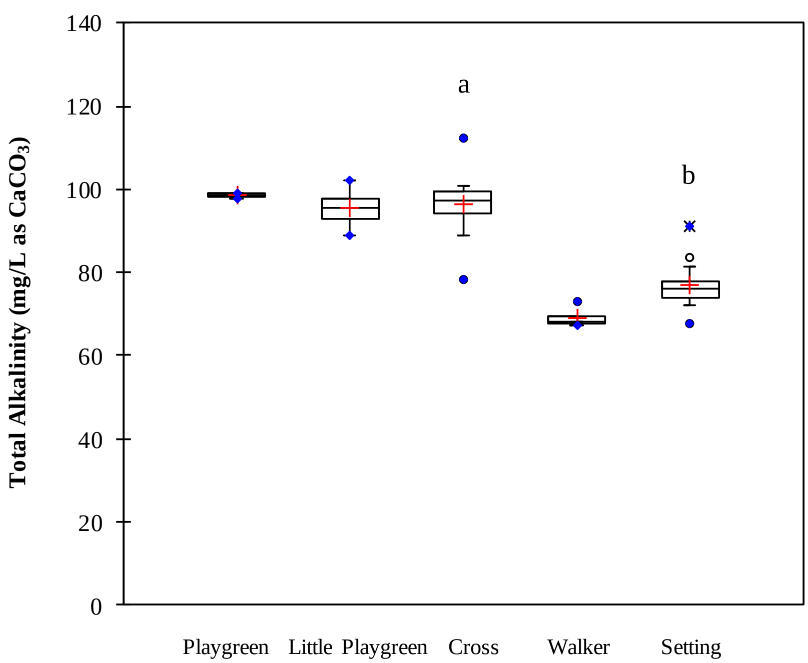


Figure 5.6.4-70. Total alkalinity in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

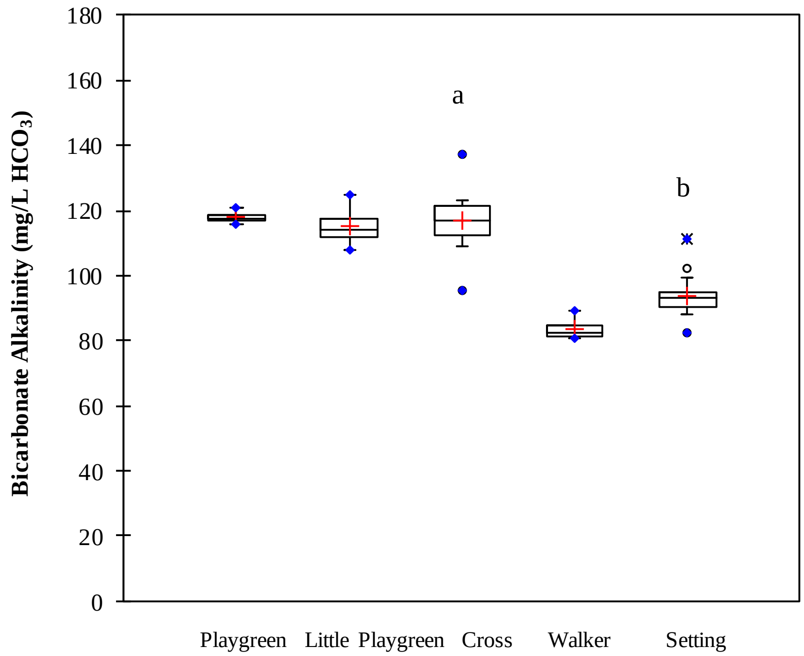


Figure 5.6.4-71. Bicarbonate alkalinity in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

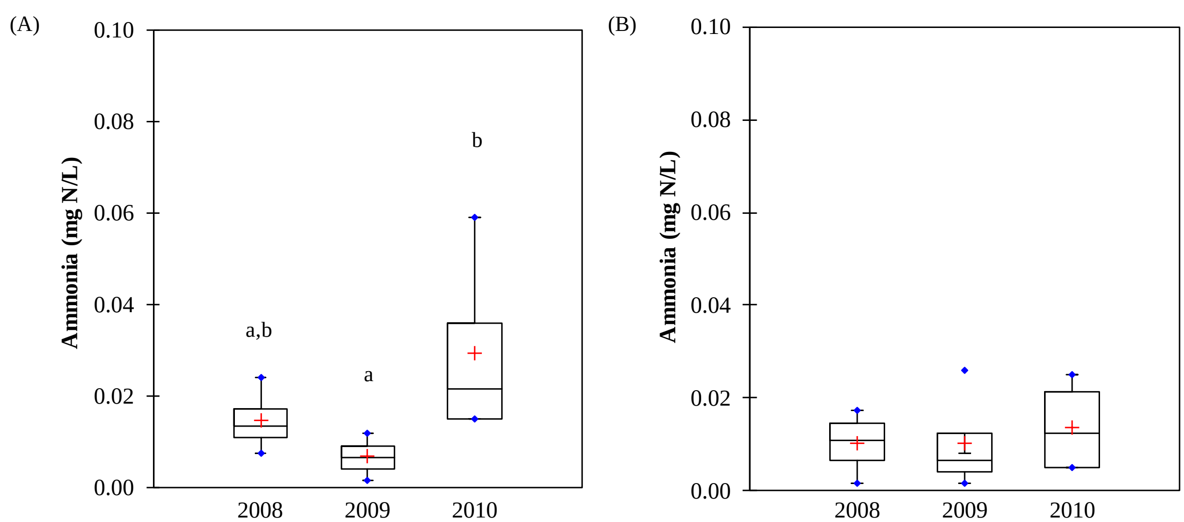


Figure 5.6.4-72. Ammonia measured in (A) Cross Lake and (B) Setting Lake by year. Statistically significant differences are denoted with different superscripts.

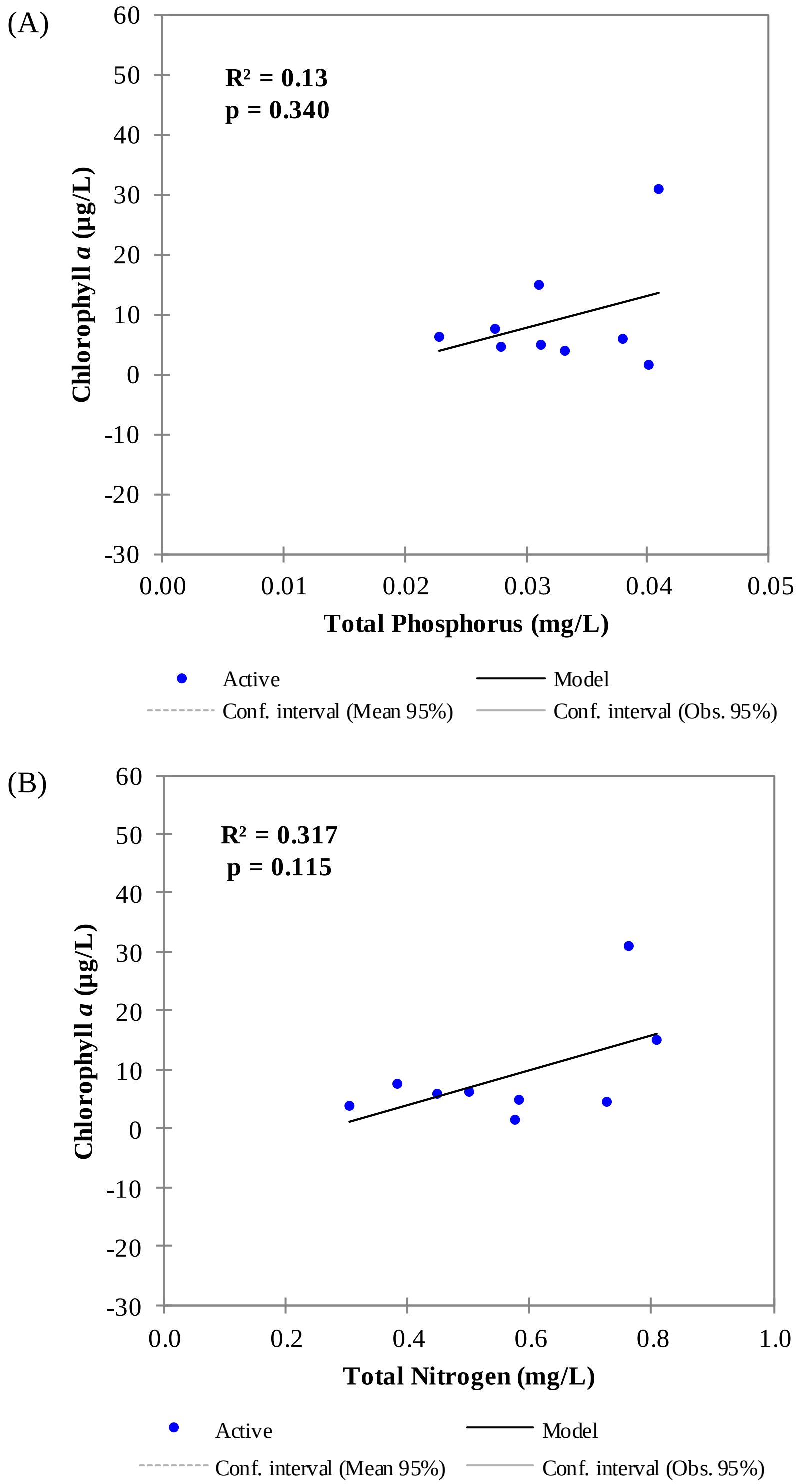


Figure 5.6.4-73. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Cross Lake: open-water seasons 2008-2010.

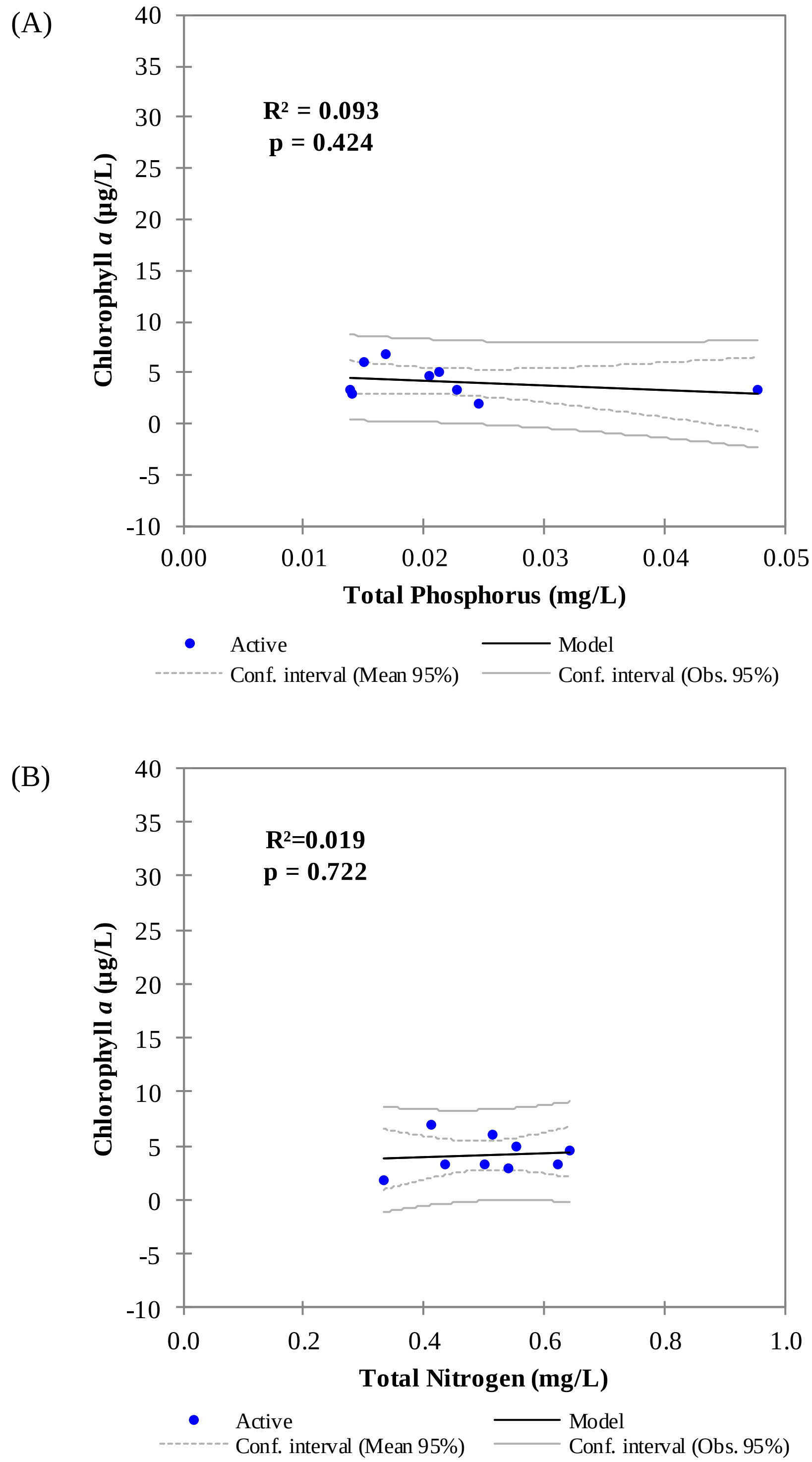


Figure 5.6.4-74. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Setting Lake: open-water seasons 2008-2010.

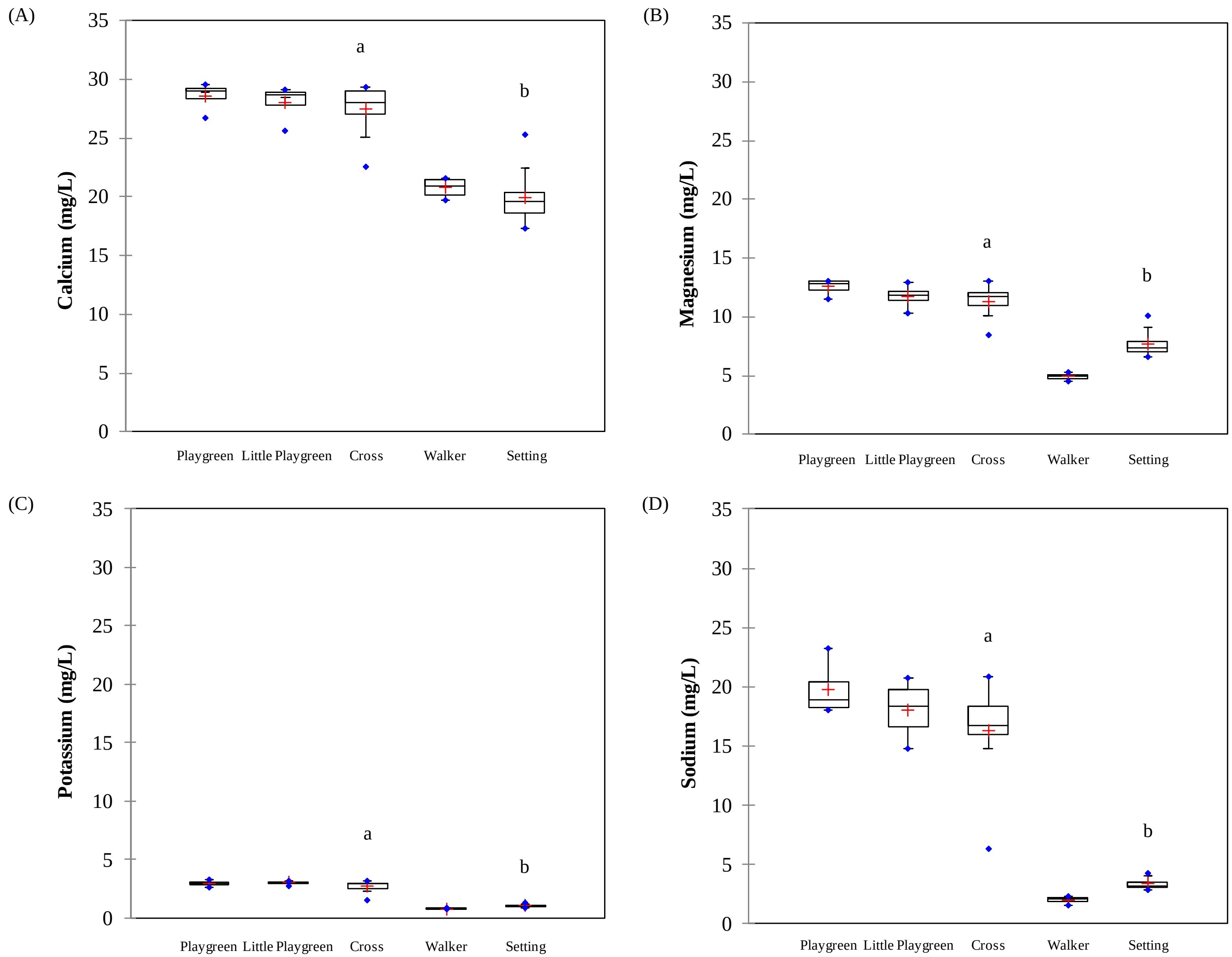


Figure 5.6.4-75. Concentrations of (A) calcium, (B) magnesium, (C) potassium, and (D) sodium measured in the Upper Nelson River Region by waterbody. Statistically significant differences are denoted with different superscripts.

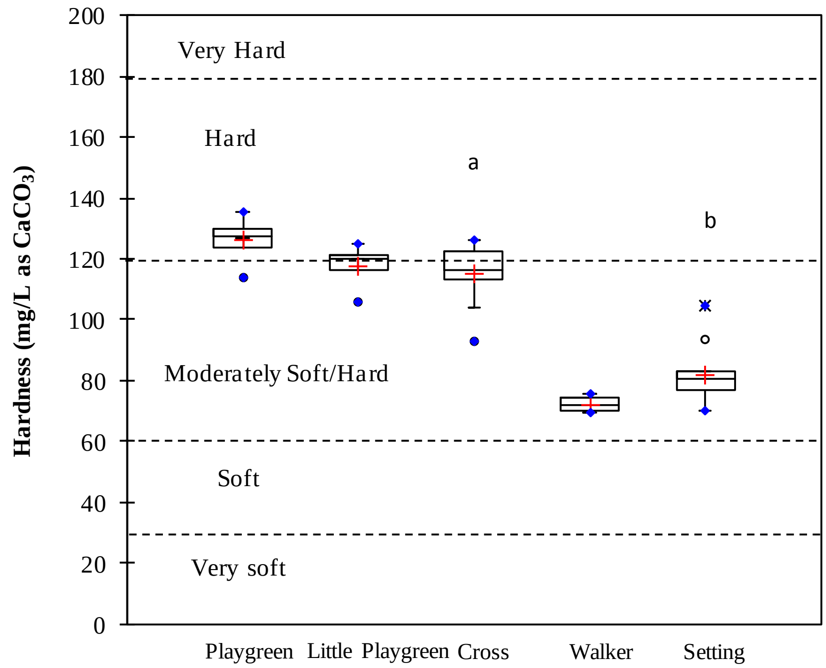


Figure 5.6.4-76. Water hardness measured in the Upper Nelson River Region by waterbody. Statistically significant differences are denoted with different superscripts.

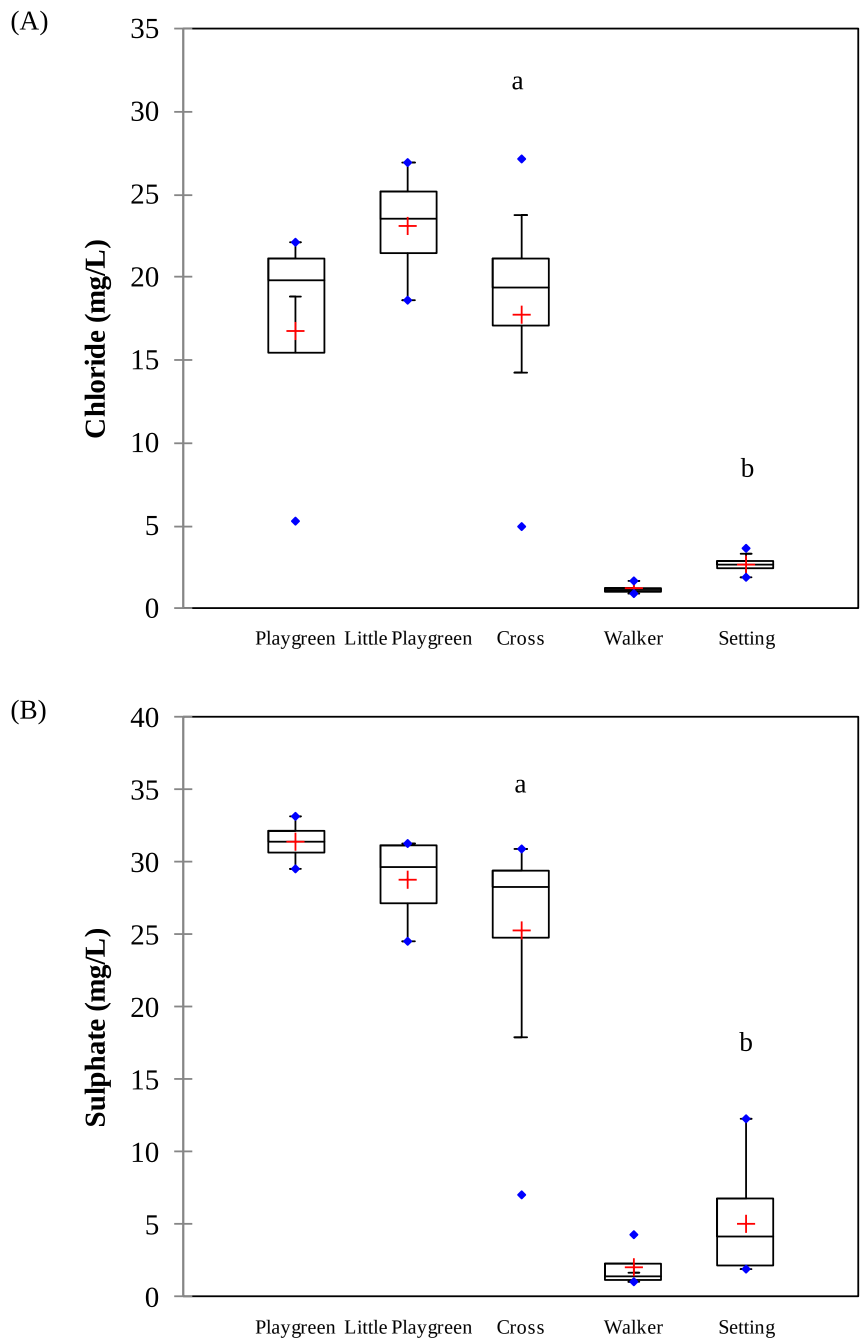


Figure 5.6.4-77. Concentrations of (A) chloride and (B) sulphate measured in the Upper Nelson River Region by waterbody. Statistically significant differences are denoted with different superscripts. All chloride measurements were below the MWQSOG PAL of 120 mg/L.

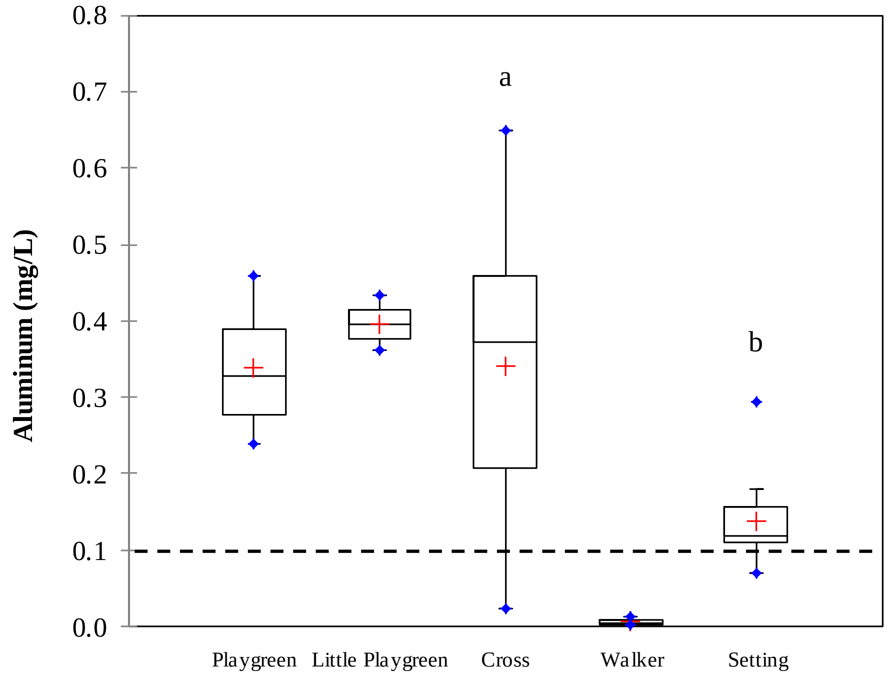


Figure 5.6.4-78. Aluminum in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts. The dashed line represents the Manitoba PAL guideline.

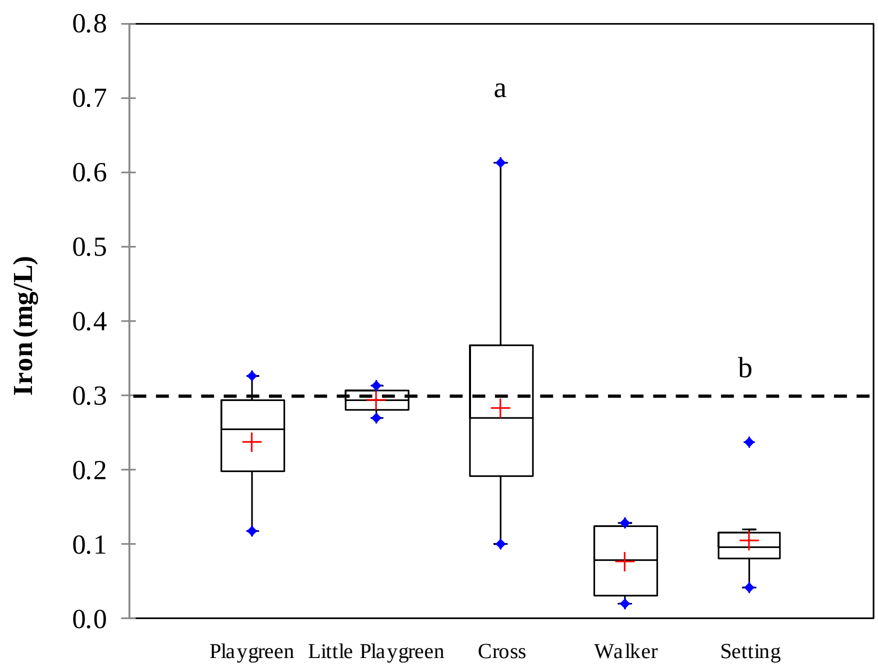


Figure 5.6.4-79. Iron in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts. The dashed line represents the Manitoba PAL guideline.

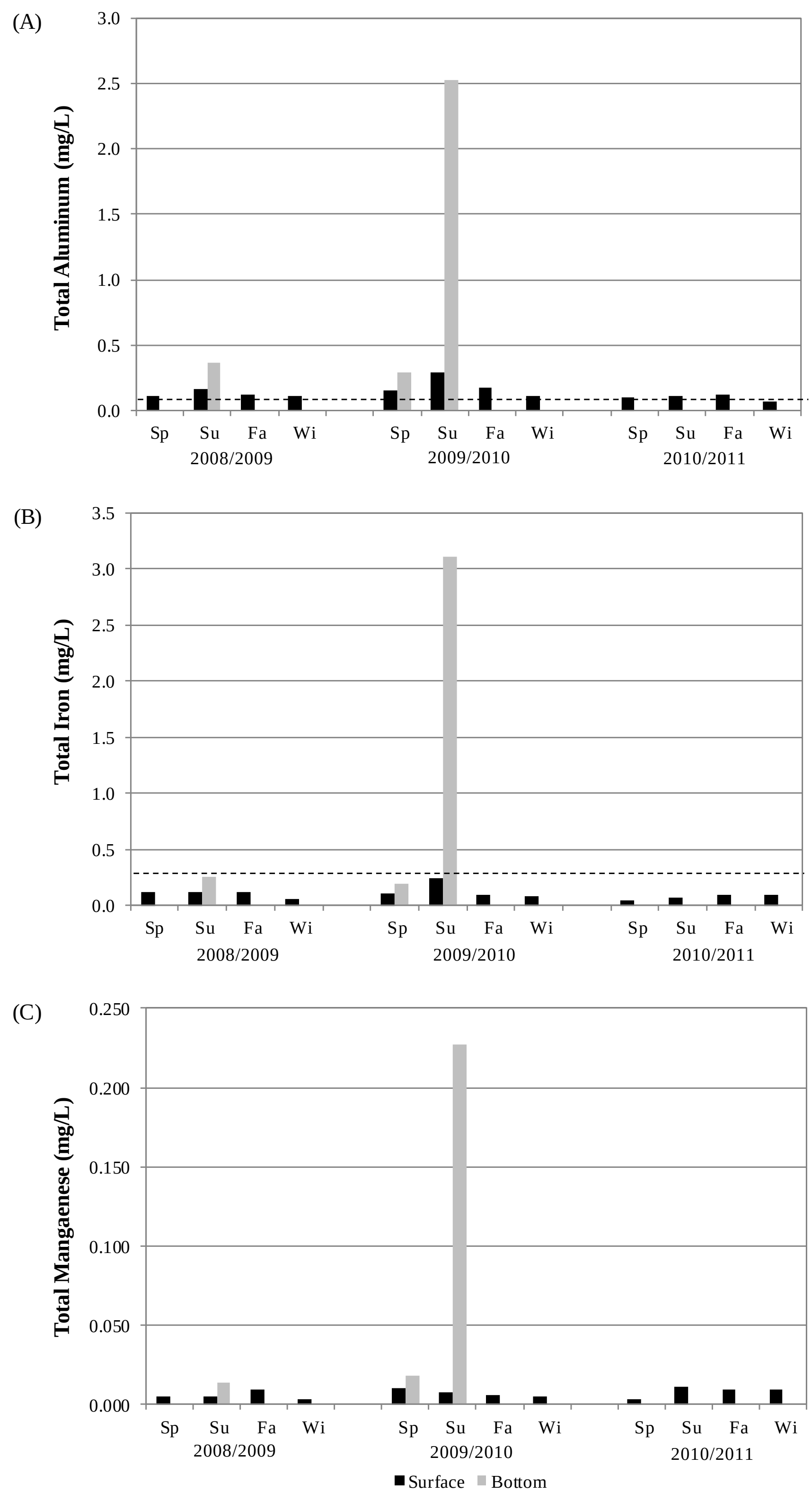


Figure 5.6.4-80. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Setting Lake, 2008/2009-2010/2011. The black dashed line indicates the MWQSOG for PAL for aluminum and iron.

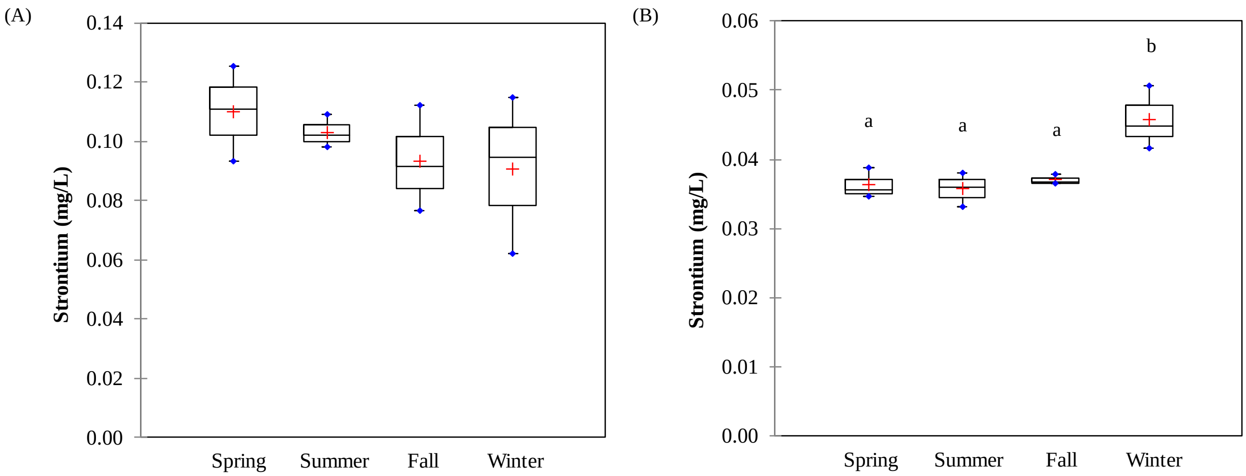


Figure 5.6.4-81. Strontium in the Upper Nelson River Region by season: (A) Cross Lake; and (B) Setting Lake. Statistically significant seasonal differences are denoted with different superscripts. Note the difference in scales between sites.

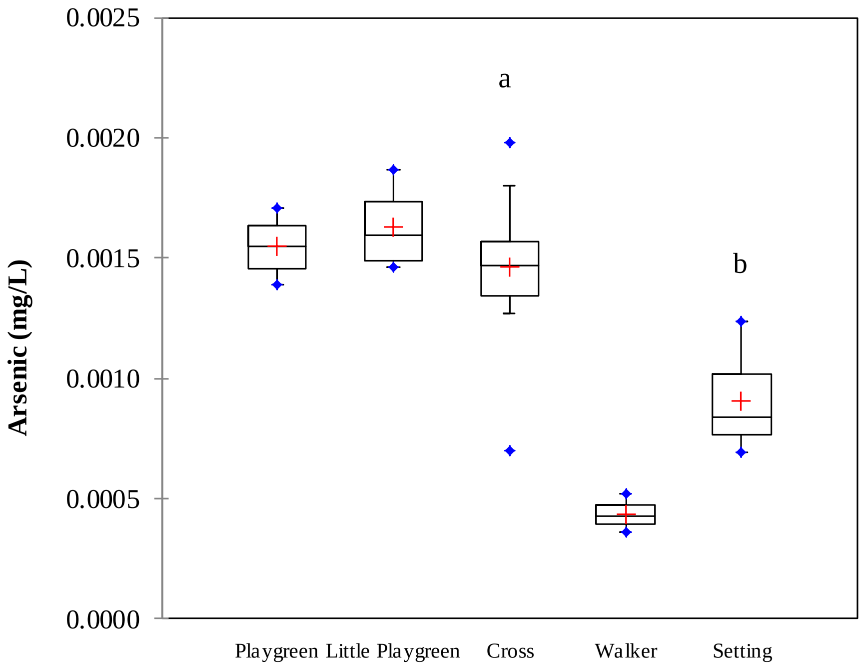


Figure 5.6.4-82. Arsenic in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

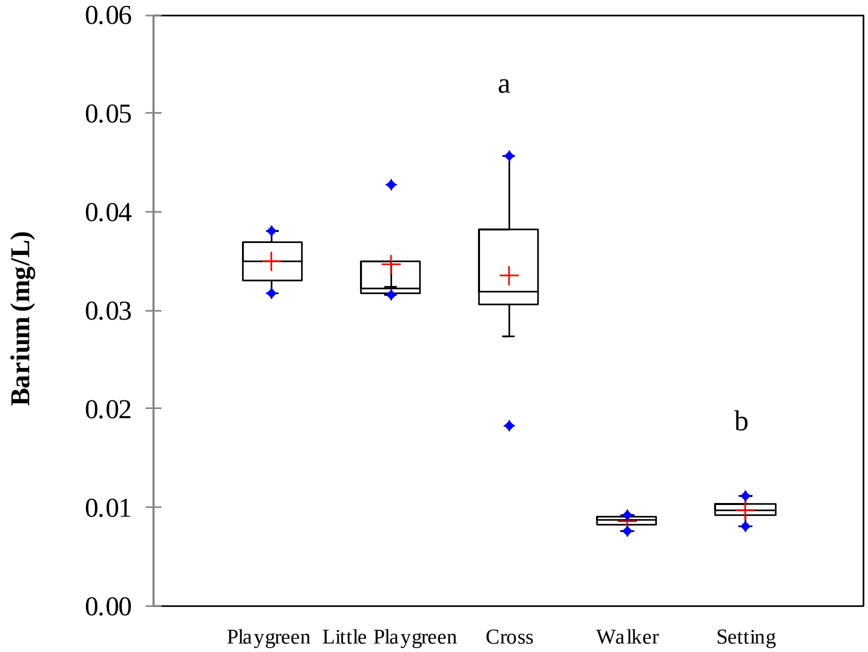


Figure 5.6.4-83. Barium in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

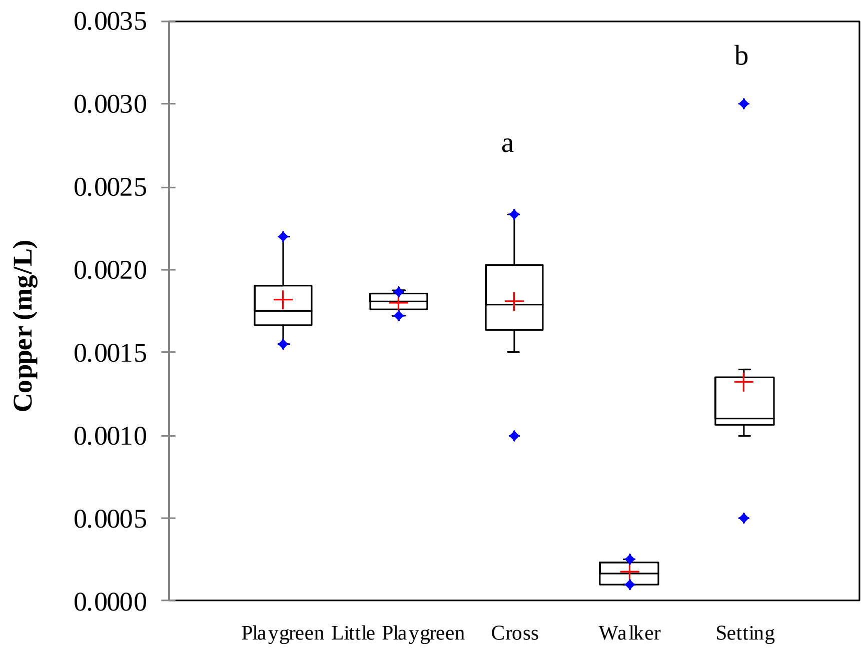


Figure 5.6.4-84. Copper in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

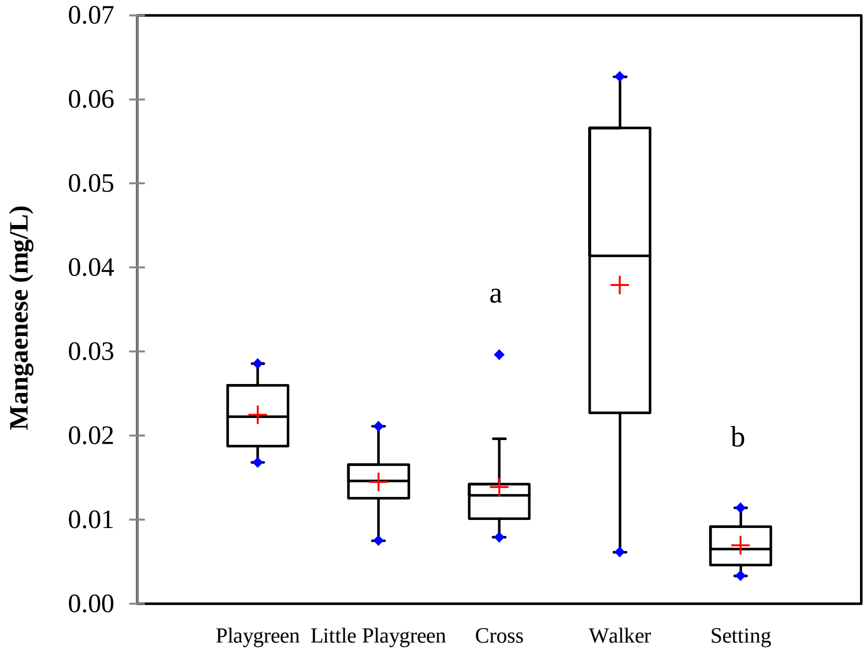


Figure 5.6.4-85. Manganese in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

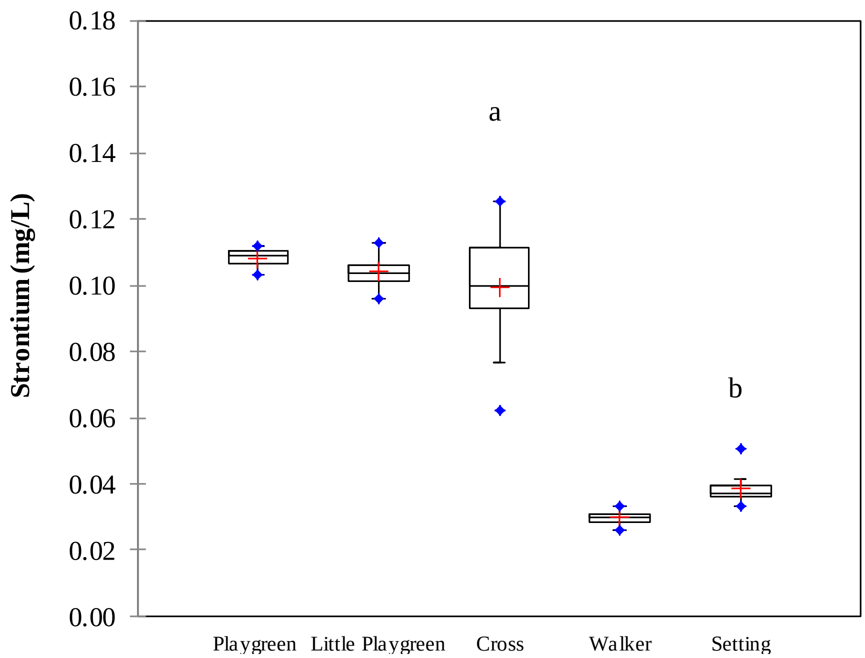


Figure 5.6.4-86. Strontium in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

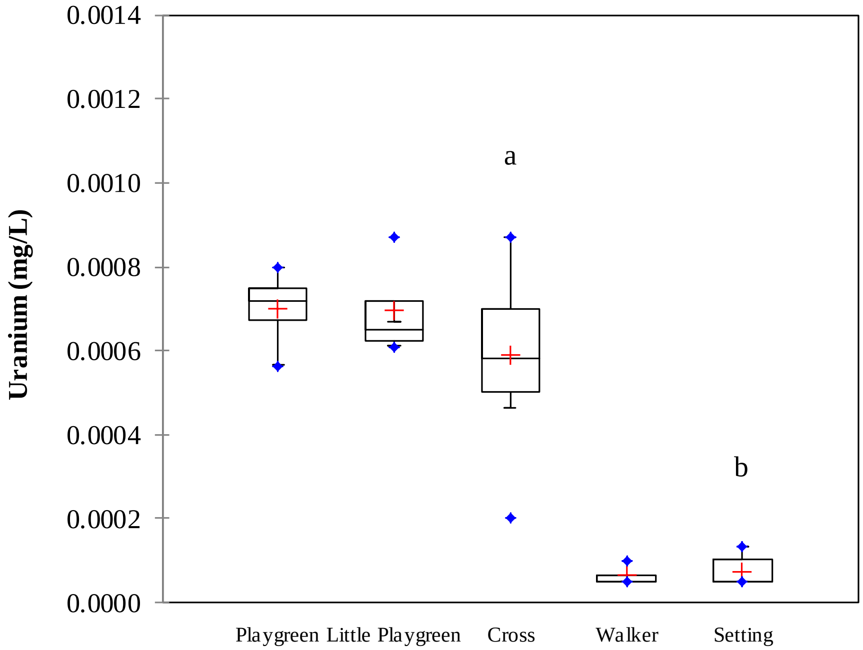


Figure 5.6.4-87. Uranium in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

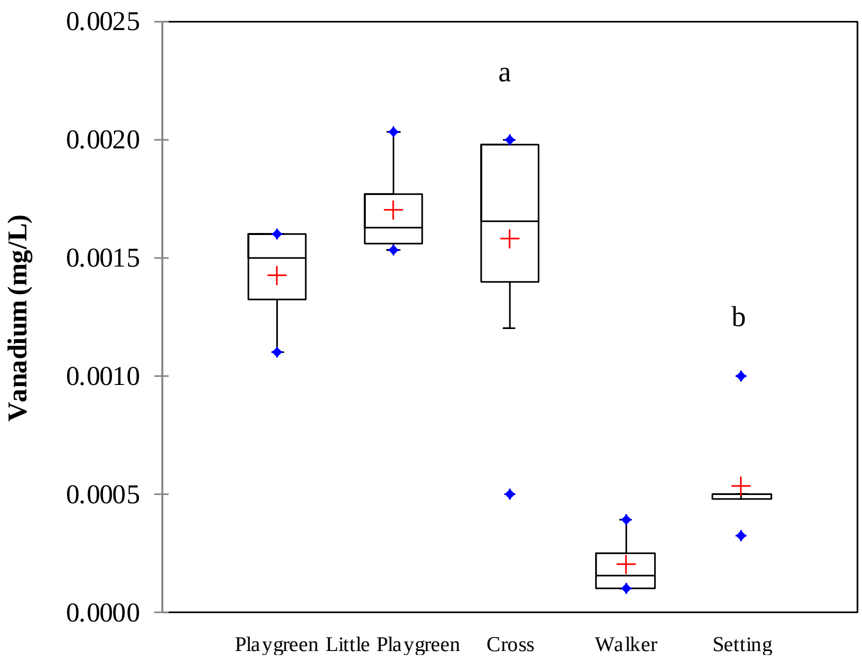


Figure 5.6.4-88. Vanadium in the Upper Nelson River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

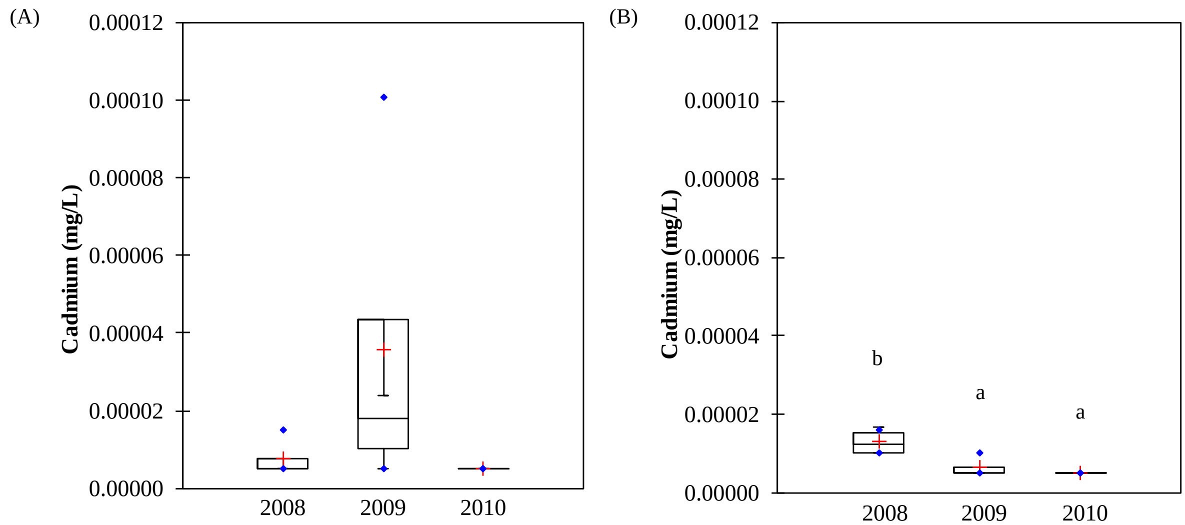


Figure 5.6.4-89. Cadmium measured in (A) Cross Lake and (B) Setting Lake by year. Statistically significant differences are denoted with different superscripts.

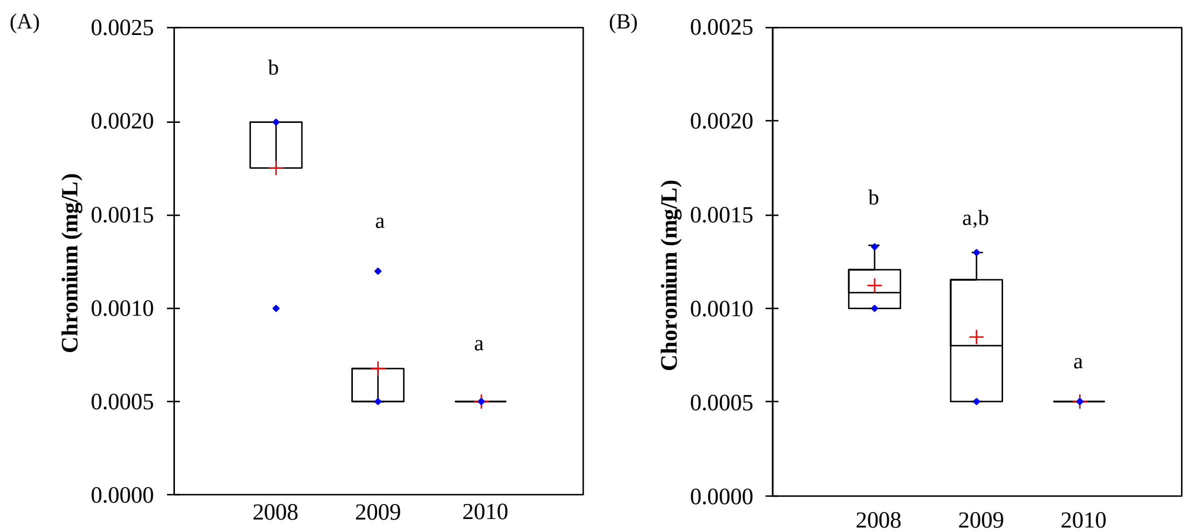


Figure 5.6.4-90. Chromium measured in (A) Cross Lake and (B) Setting Lake by year. Statistically significant differences are denoted with different superscripts.

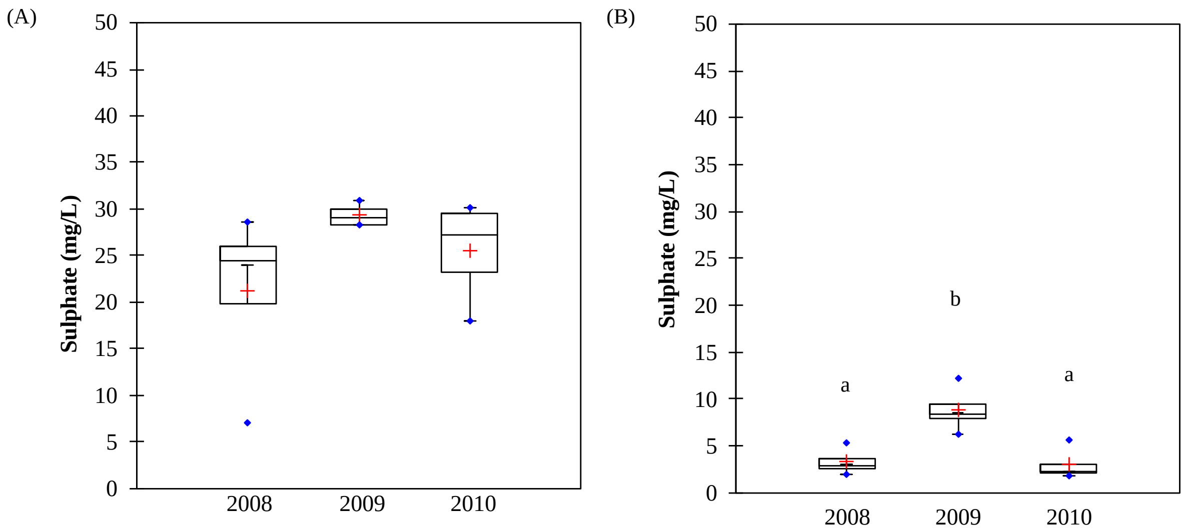


Figure 5.6.4-91. Sulphate measured in (A) Cross Lake and (B) Setting Lake by year. Statistically significant differences are denoted with different superscripts.

5.6.5 Phytoplankton

The following provides an overview of phytoplankton monitoring results for the Upper Nelson River Region over the three years of CAMPP. Sampling sites and times were consistent with the water quality monitoring program and included annual monitoring at one on-system waterbody (Cross Lake) and one off-system waterbody (Setting Lake). Water quality and phytoplankton were also monitored at two on-system rotational waterbodies (Playgreen and Little Playgreen lakes in 2009/2010 and 2010/2011, respectively); and, one off-system rotational waterbody (Walker Lake in 2010/2011; Figure 5.6.4-1). Sampling times relative to air temperature are presented in Figure 5.6.4-2.

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.

Phytoplankton biomass and taxonomic composition were measured in Playgreen Lake in 2009/2010, and Little Playgreen and Walker lakes in 2010/2011. Assemblages at Cross and Setting lakes were evaluated in both 2009/2010 and 2010/2011. Chlorophyll *a* samples collected from Cross Lake in summer and fall 2008 and in Playgreen Lake in fall 2009 exceeded the bloom monitoring trigger of 10 µg/L; therefore, phytoplankton biomass and taxonomic composition, and microcystin-LR (an algal toxin) were also analysed during those periods in these samples.

5.6.5.1 Chlorophyll a

Over the three years of CAMPP, chlorophyll *a* concentrations were generally low to moderate in the Upper Nelson River Region. Chlorophyll *a* was less than 3 µg/L in the ice cover season and generally ranged up to 15.0 µg/L in the open-water season; however, one extreme value of 31.0 µg/L was measured in Cross Lake in fall 2010 (Figure 5.6.5-1). Concentrations were generally similar among sites, although chlorophyll *a* in Cross Lake was more variable in summer and fall.

5.6.5.2 Taxonomic Composition and Biomass

Phytoplankton biomass measured during the open-water season varied between the five waterbodies in the Upper Nelson River Region. The most notable difference was the higher biomass measured at Walker Lake relative to Playgreen, Little Playgreen, Cross, and Setting lakes (Figure 5.6.5-2). Biomass varied little between the sampling periods at all lakes excepting Walker Lake where biomass was substantively higher in fall than earlier in the year.

Phytoplankton communities within the region were composed of varying combinations of diatoms, blue-green algae, cryptophytes, green algae and crysophytes with no one group dominating consistently at any waterbody; other algal groups typically comprised a very small component of the phytoplankton community. At Playgreen and Walker lakes diatoms and/or blue-greens dominated the phytoplankton community in 2009 and 2010, respectively; but, at Little Playgreen, Cross and Setting lakes diatoms, blue-greens and/or cryptophytes dominated in the year(s) sampled. It is noted that phytoplankton community composition was measured in different years in some of the waterbodies and results may not be directly comparable.

Metrics describing the phytoplankton community were calculated on a seasonal basis and are presented in Table 5.5.5-1. The community metrics exhibited relatively high variability at each site and no spatial trends in the diversity or evenness of the assemblages were readily apparent (Figure 5.6.5-4).

5.6.5.3 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L in Cross Lake during summer and fall 2008 and in Playgreen Lake in fall 2009. Total biomass measured in these samples was moderate in Cross Lake in summer (8,107 mg/m^3) and fall (6,127 mg/m^3) but was relatively low in Playgreen Lake (1,762 mg/m^3). The phytoplankton community in Cross Lake was dominated by blue-green algae during both blooms (Figure 5.6.5-5), whereas Playgreen Lake was dominated by diatoms during the fall bloom event (Figure 5.6.5-3).

5.6.5.4 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 to affect production of microcystins. *Anabaena* and *Aphanizomenon* were identified in samples collected from every waterbody in the region. Additionally, *Planktothrix/Oscillatoria* was found in Cross, Playgreen, and Setting lakes and *Microcystis* was present in Walker Lake.

During the Pilot Program, microcystin-LR was analysed on two occasions when chlorophyll *a* results exceeded 10 µg/L (i.e., the threshold for microcystin-LR analysis). Microcystin-LR was not detected (<0.2 µg/L) in summer or fall 2008 in Cross Lake or in fall 2009 in Playgreen Lake.

5.6.5.5 Trophic Status

Based on mean open-water chlorophyll *a* concentrations, Playgreen, Little Playgreen, Walker, and Setting lakes are classified as mesotrophic and Cross Lake is categorized as eutrophic (Table 5.6.4-3).

5.6.5.6 Seasonal Variability

Chlorophyll *a* concentrations measured during the ice-cover season were generally lower than those measured during the open-water season, regardless of the sampling location. At Setting Lake, winter chlorophyll *a* concentrations were significantly lower than those measured during fall (Figure 5.6.5-1). Due to limited data, phytoplankton biomass, composition, and community metrics were not assessed statistically; analyses will be conducted in future when additional data are collected.

5.6.5.7 Spatial Comparisons

Mean annual chlorophyll *a* concentrations were not significantly different between Cross and Setting lakes (i.e., the annual waterbodies), nor were there qualitative differences observed between the five waterbodies in the Upper Nelson River Region (Figure 5.6.5-6). Total biomass, all community metrics (Figure 5.6.5-4), and the relative abundance of most major taxa (Figure 5.6.5-7) were also statistically similar between Cross and Setting lakes from 2009 to 2010; the exception was that the relative biomass of blue-green algae was significantly higher in Setting Lake compared to Cross Lake (Figure 5.6.5-7).

5.6.5.8 Temporal Variability

Comparisons between sampling years for the two annual waterbodies revealed that there were no significant differences in chlorophyll *a* concentrations over the monitoring period (Figure 5.6.5-8). Similarly, total phytoplankton biomass was not significantly different between years (2009 versus 2010) at either Cross or Setting lakes. Although there were no differences in chlorophyll *a* or total phytoplankton biomass, significant differences in the community composition were observed in these lakes. Diatoms and chrysophytes formed a significantly higher proportion of the mean open-water community at Cross Lake in 2009 than in 2010 (Figure 5.6.5-9); and, the relative biomass of blue-green algae at Setting Lake was significantly higher in 2010 compared to 2009. Additionally, heterogeneity (Figure 5.6.5-10), evenness (Figures 5.6.5-11), and species effective richness (Figure 5.6.5-12) were higher in 2009 compared to 2010 at Cross Lake; and, heterogeneity was higher at Setting Lake in 2010 than 2009.

Table 5.6.5-1. Diversity, evenness, heterogeneity, and effective richness of the phytoplankton communities in the five waterbodies in the Upper Nelson River 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 ($E^{H`}/S$)
Playgreen Lake	Spring	18	0.78	0.25	1.87	0.65	6.48	0.36
	Summer	13	0.81	0.41	1.91	0.75	6.78	0.52
	Fall	19	0.75	0.21	1.77	0.60	5.84	0.31
Little Playgreen Lake	Spring	25	0.75	0.16	1.87	0.58	6.49	0.26
	Summer	21	0.76	0.20	1.88	0.62	6.54	0.31
	Fall	25	0.62	0.11	1.36	0.42	3.91	0.16
Cross Lake	Summer 2008	26	0.36	0.06	0.90	0.28	2.45	0.09
	Fall 2008	24	0.52	0.09	1.24	0.39	3.44	0.14
	Spring[1]	37	0.85	0.25	2.20	0.63	9.75	0.32
	Summer[1]	20	0.78	0.26	2.04	0.68	8.12	0.41
	Fall[1]	30	0.61	0.17	1.60	0.50	5.92	0.24
Walker Lake	Spring	39	0.71	0.09	1.92	0.53	6.85	0.18
	Summer	51	0.82	0.11	2.50	0.64	12.19	0.24
	Fall	35	0.61	0.07	1.39	0.39	4.00	0.11
Setting Lake[1]	Spring	27	0.83	0.26	2.35	0.72	11.22	0.40
	Summer	29	0.82	0.23	2.24	0.67	10.36	0.35
	Fall	22	0.79	0.23	2.08	0.68	8.03	0.38

[1]Data from Cross and Setting lakes are each means of data collected in 2009 and 2010

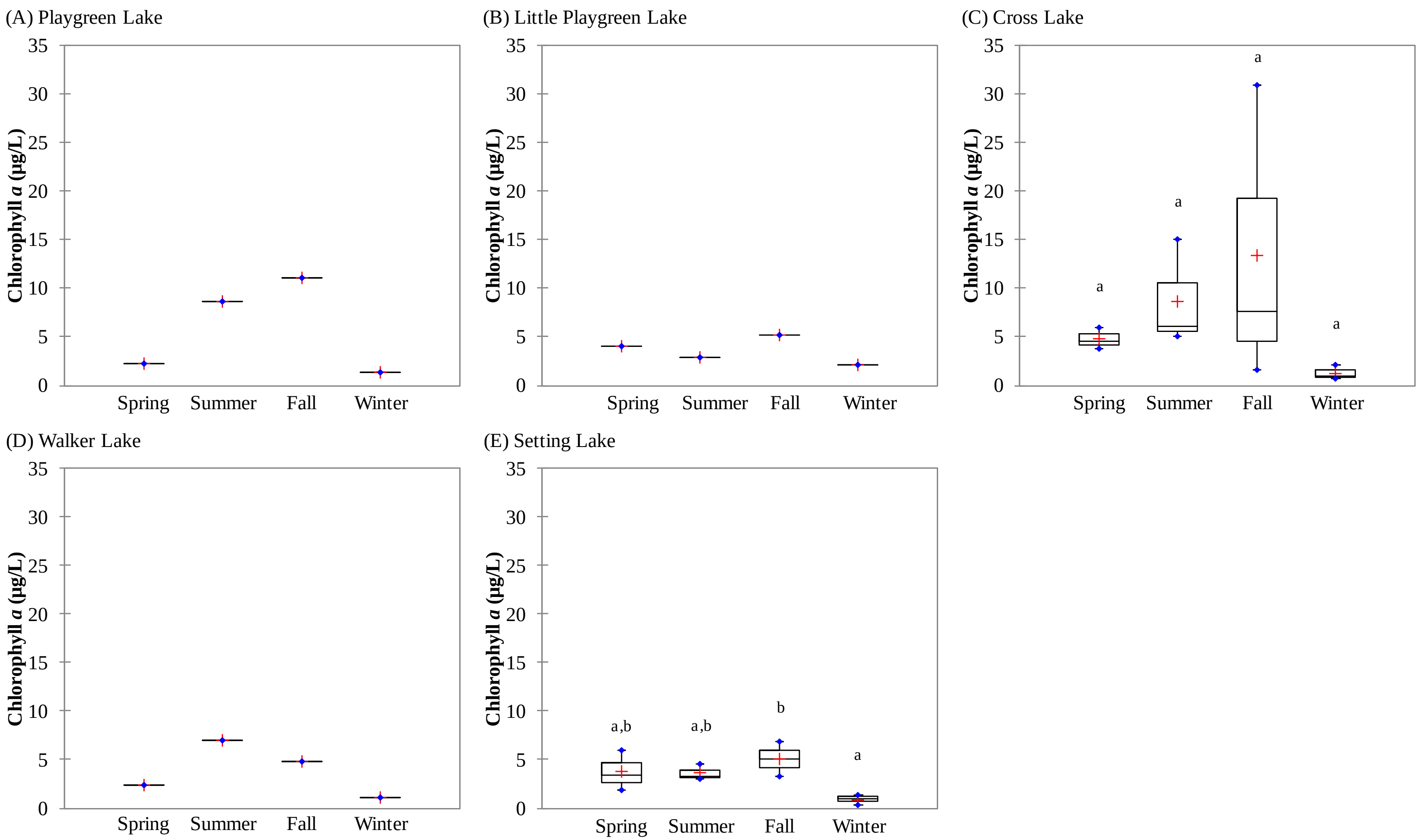


Figure 5.6.5-1. Chlorophyll *a* concentrations measured in the Upper Nelson River Region, 2008-2010 (Cross and Setting lakes), 2009 (Playgreen Lake), and 2010 (Little Playgreen and Walker lakes). Statistically significant differences within each lake are denoted with different superscripts.

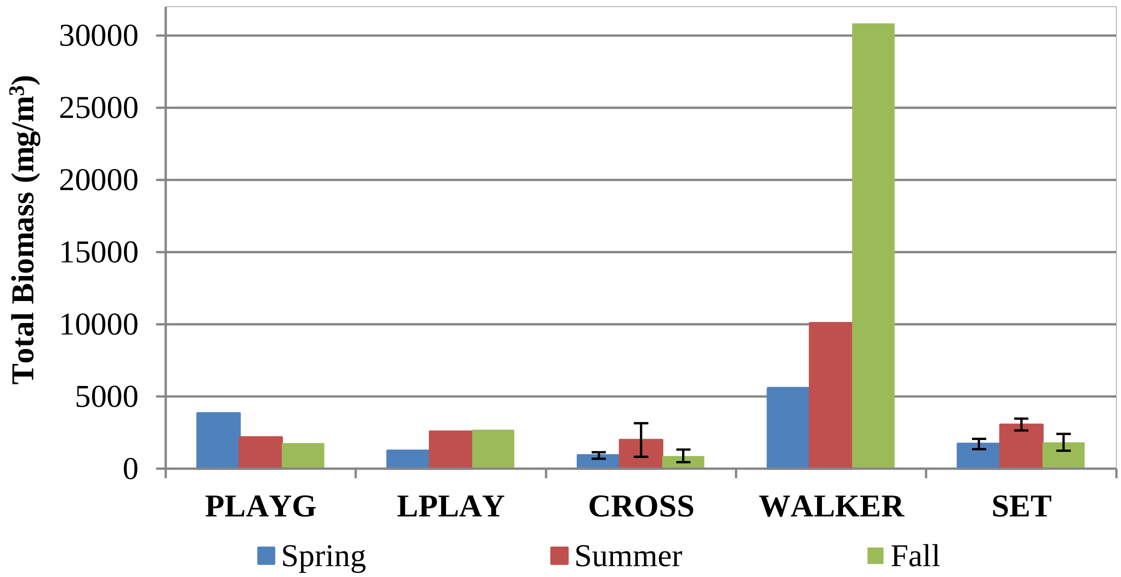


Figure 5.6.5-2. Phytoplankton biomass measured in the Upper Nelson River Region during the open-water seasons 2009 (Playgreen, Cross, and Setting lakes) and 2010 (Little Playgreen, Cross, Walker, and Setting lakes).

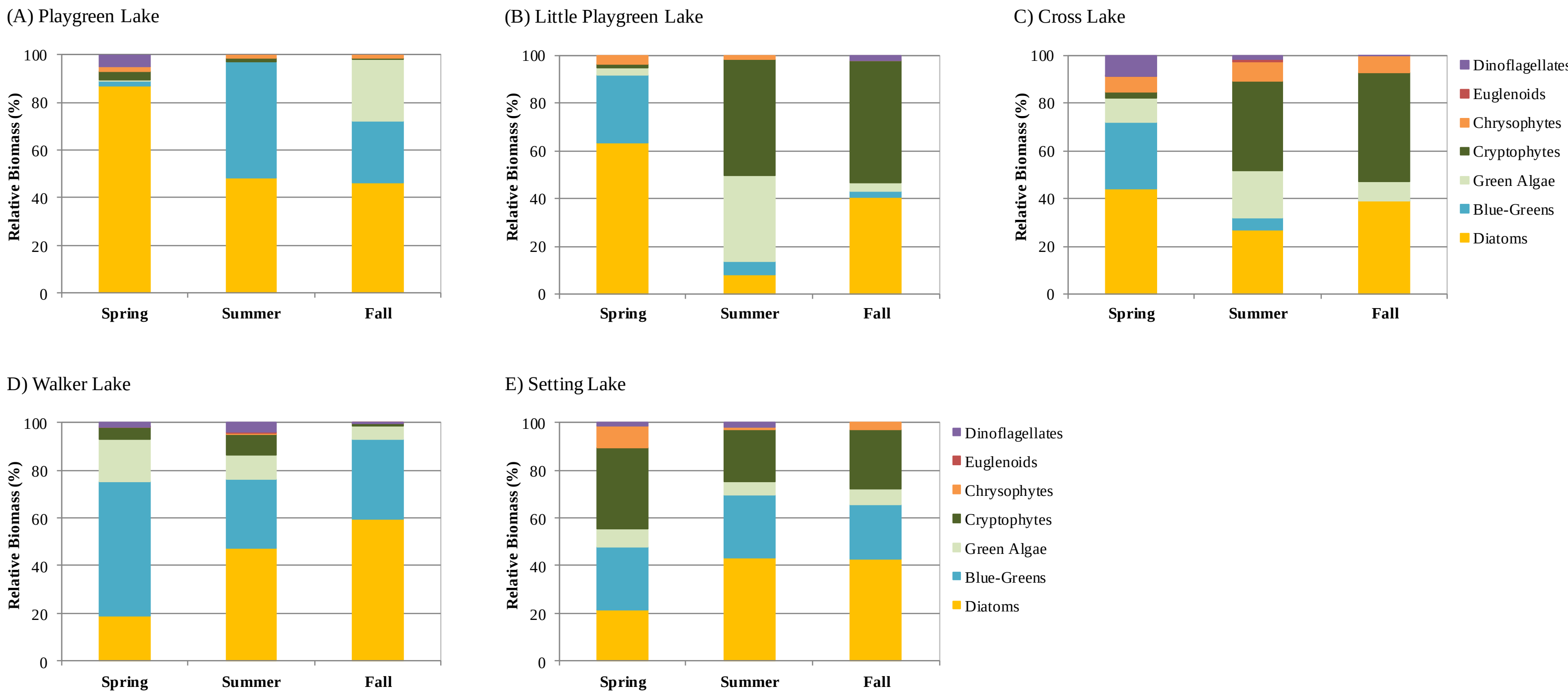


Figure 5.6.5-3. Phytoplankton community composition in the Upper Nelson River Region by season, as measured during the open-water seasons 2009 (Playgreen Lake), 2010 (Little Playgreen and Walker lakes), or 2009 and 2010 combined (Cross and Setting lakes).

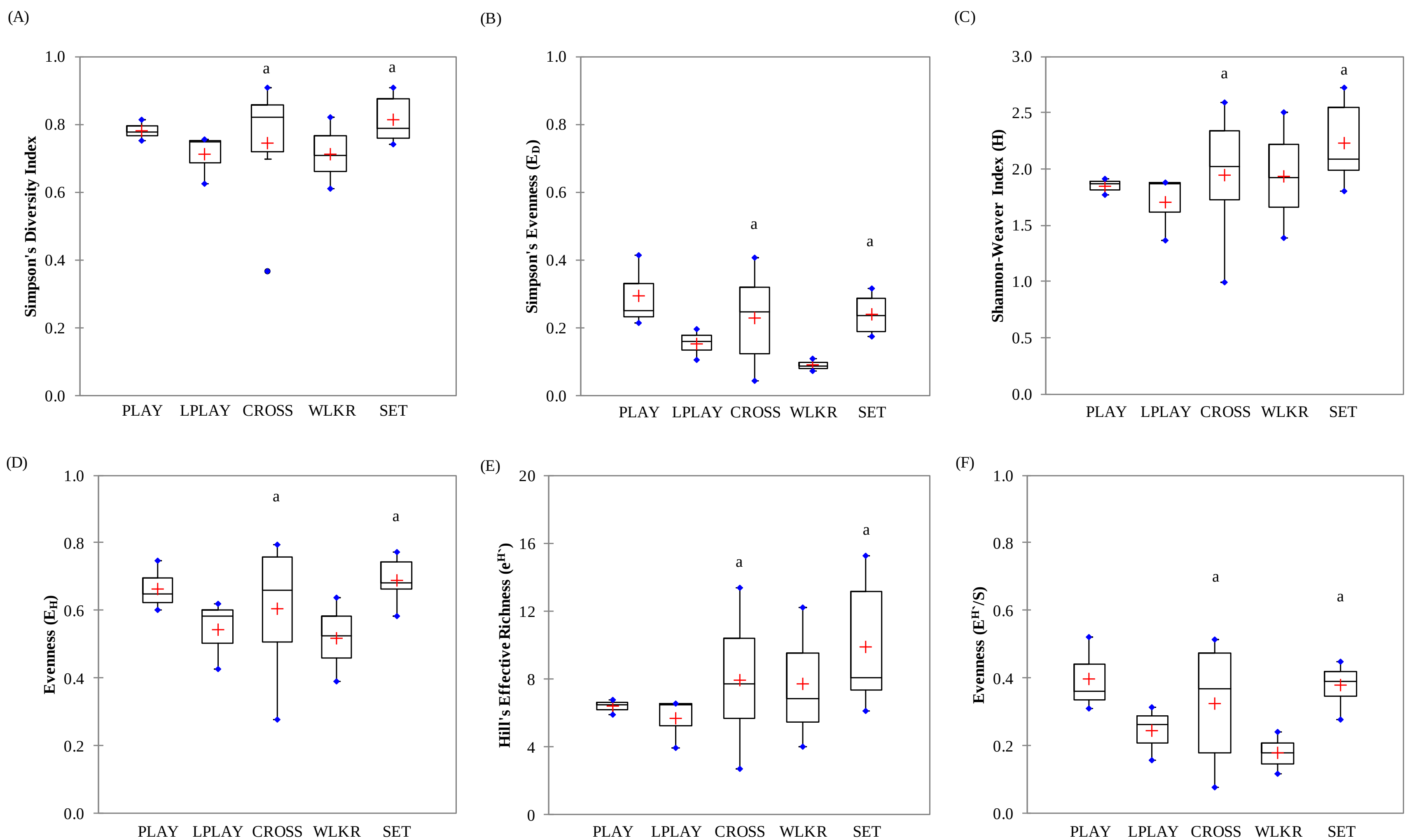


Figure 5.6.5-4. Diversity, evenness, heterogeneity, and effective richness of the phytoplankton communities in the Upper Nelson River Region, as measured during the open-water seasons of 2009 (Playgreen, Cross, and Setting lakes) and 2010 (Little Playgreen, Cross, Walker, and Setting lakes). There were no statistically significant spatial differences between the annual waterbodies, as denoted by the superscripts.

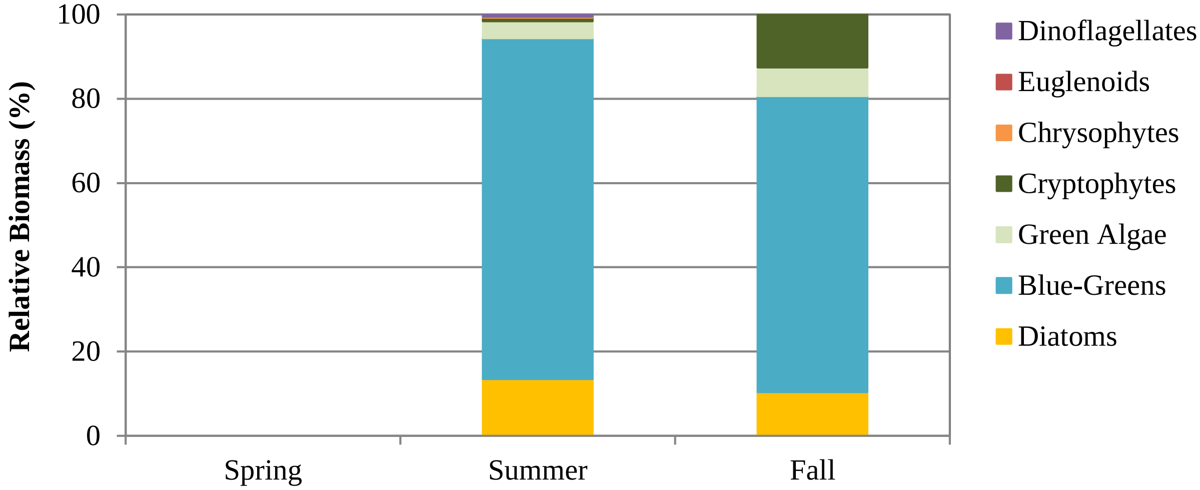


Figure 5.6.5-5. Phytoplankton biomass measured in Cross Lake during 2008.

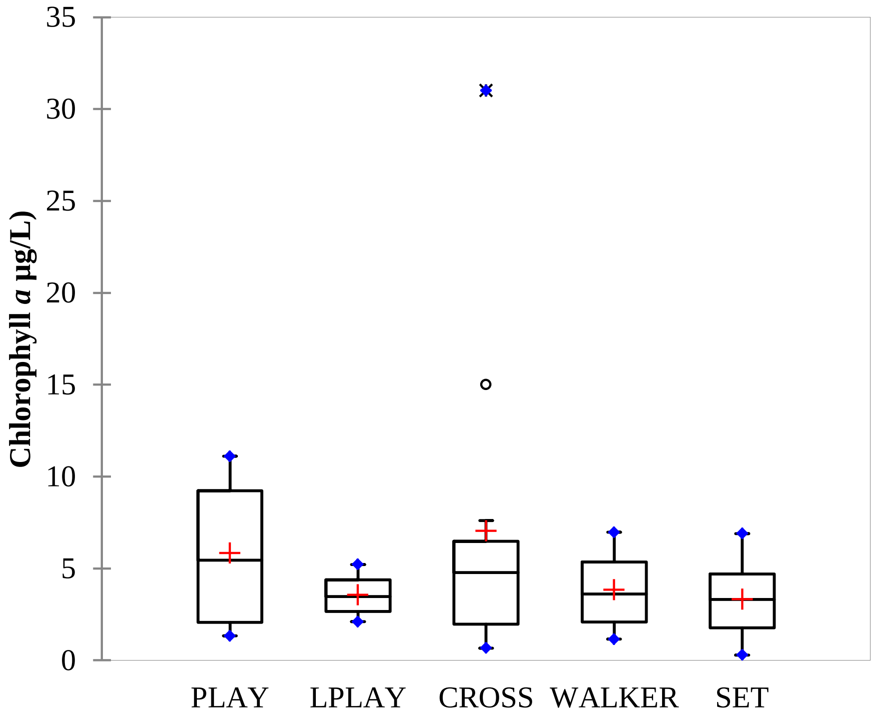


Figure 5.6.5-6. Chlorophyll *a* concentrations in the Upper Nelson River Region. There were no statistically significant spatial differences between the annual waterbodies (i.e., Cross and Setting lakes).

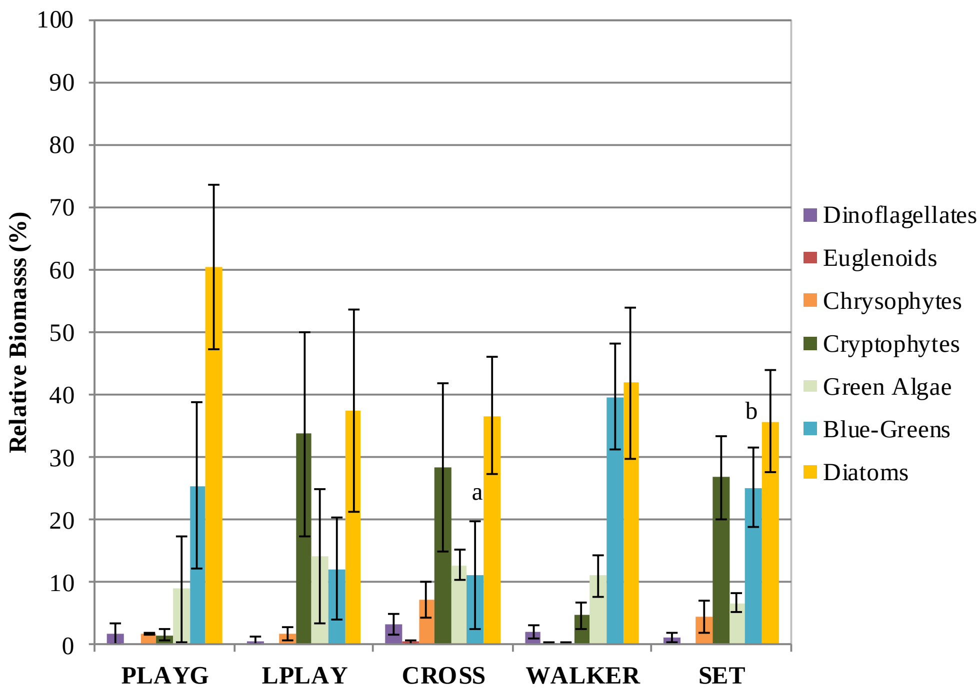


Figure 5.6.5-7. Mean phytoplankton community composition in the Upper Nelson River Region, as measured during the open-water seasons of 2009 (Playgreen, Cross, and Setting lakes) and 2010 (Little Playgreen, Cross, Walker, and Setting lakes). Statistically significant spatial differences between the annual waterbodies are denoted by different superscripts.

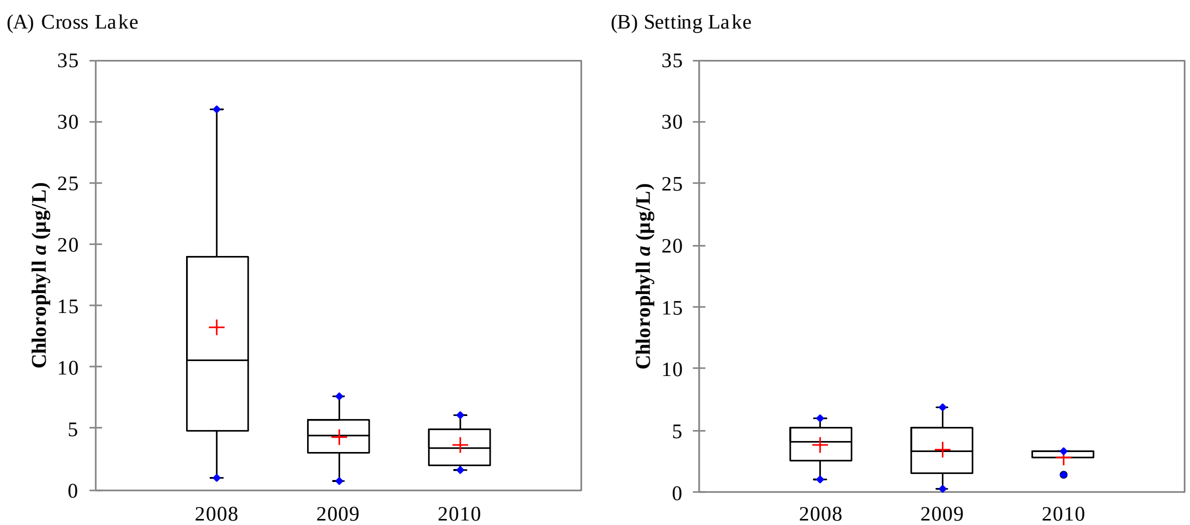


Figure 5.6.5-8. Chlorophyll *a* concentrations measured at the annual waterbodies in the Upper Nelson River Region by year. No significant statistical differences were found between years.

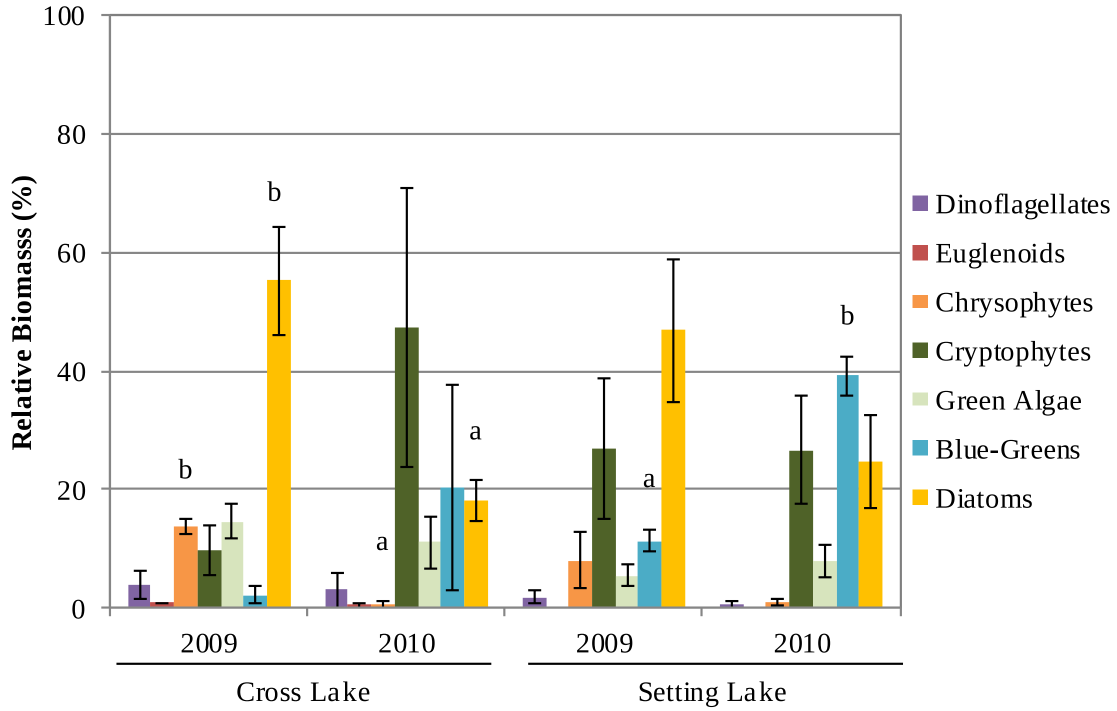


Figure 5.6.5-9. Mean open-water phytoplankton community composition in Cross and Setting lakes by year. Statistically significant temporal differences are denoted by different superscripts within each lake.

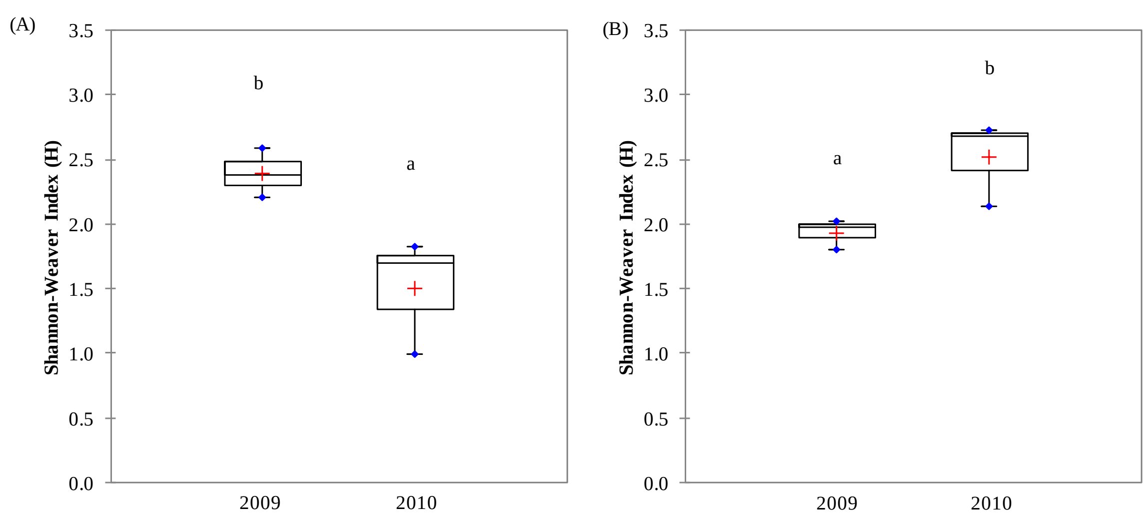


Figure 5.6.5-10. Heterogeneity of the phytoplankton communities in (A) Cross and (B) Setting lakes, as measured during the open-water seasons of 2009 and 2010. Statistically significant temporal differences are denoted by different superscripts within each lake.

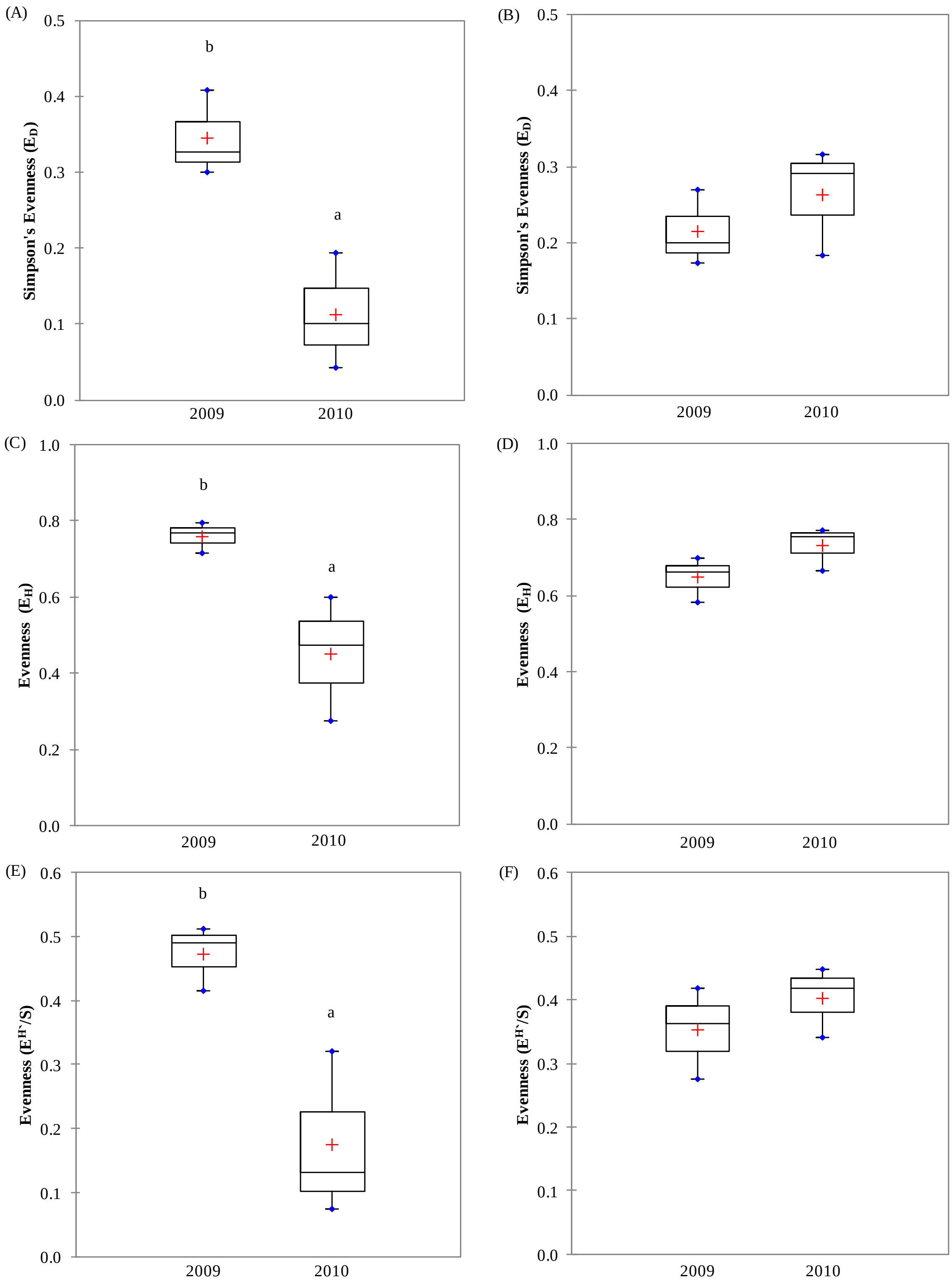


Figure 5.6.5-11. Evenness of the phytoplankton communities in (A,C and E) Cross and (B,D and F) Setting lakes, as measured during the open-water seasons of 2009 and 2010. Statistically significant temporal differences are denoted by different superscripts within each lake.

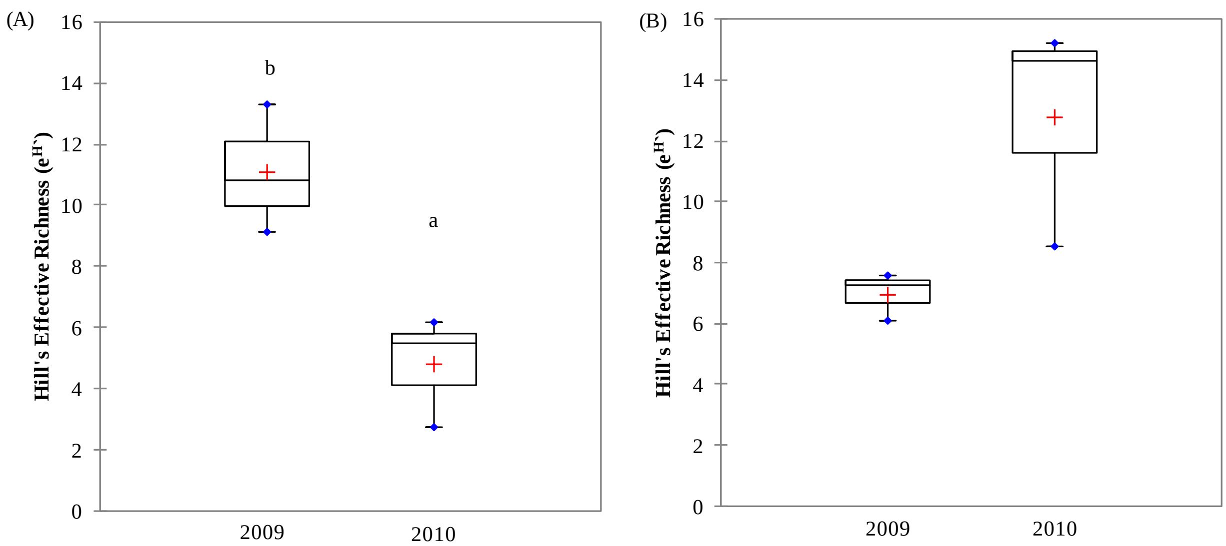


Figure 5.6.5-12. Effective richness of the phytoplankton communities in (A) Cross and (B) Setting lakes, as measured during the open-water seasons of 2009 and 2010. Statistically significant temporal differences are denoted by different superscripts within each lake.

5.6.6 Benthic Macroinvertebrates

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled over the three year CAMPP program in the Upper Nelson River Region (Figure 5.6.6-1). In 2008, BMI sampling was conducted in the on-system waterbody Cross Lake, and the off-system waterbody Setting Lake; these lakes are sampled annually. In 2009, sampling was conducted in the on-system lakes Playgreen and Cross, and at the off-system waterbody Setting Lake. Playgreen Lake is sampled on a rotational basis (i.e., once every three years). In 2010, sampling was conducted in the on-system lakes, Little Playgreen, and Cross; and in the off-system waterbodies, Setting and Walker lakes. Little Playgreen Lake and Walker Lake are sampled on a rotational basis. Nearshore and offshore habitat polygons were sampled in all waterbodies, except in 2008 where the nearshore habitat was not sampled in Setting Lake due to inability to comply with the water depth/substrate criteria within the pre-determined polygons of the initial study design. BMI sampling was conducted in late August through early September each year.

BMI are described for waterbodies in the Upper Nelson River 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 the 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 the three years and offshore data were summarized 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.

5.6.6.1 Supporting Environmental Variables

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons (where applicable) at each waterbody, and included water depth, water temperature, water velocity, Secchi depth, substrate type, type of riparian vegetation, and algal presence (Table 5.6.6-1). Benthic sediment samples were collected from BMI sampling sites and analyzed for particle size analysis (PSA) and total organic carbon (TOC). The nearshore sediment of waterbodies sampled in 2010 consisted of mainly large, hard substrate; 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.

In 2010, intermittently wetted nearshore water depths ranged from 0.7 m (Little Playgreen Lake) to 0.9 m (Cross and Walker lakes) (Table 5.6.6-1). In the predominantly wetted nearshore habitat sampled in 2008 and 2009, mean water depths ranged from 1.5 m (Playgreen Lake) to 4.0 m (Cross Lake). Mean water depths within the offshore habitat (2008 to 2010) varied between 6.0 m (Cross Lake) and 20.7 m (Setting Lake) (Table 5.6.6-1).

The intermittently wetted nearshore habitat (2010) consisted primarily of bedrock/boulder therefore no sediments were collected for PSA/TOC analysis. Nearshore benthic sediment collected in 2008 and 2009 resulted in mean TOC values ranging between 2.7% (Cross Lake) and 3.8% (Playgreen Lake) (Figure 5.6.6-2). In the offshore (2008 to 2010), mean TOC ranged from 0.81% (Playgreen Lake) to 7.3% (Walker Lake) (Figure 5.6.6-3).

Sediment composition (PSA) at the nearshore sampling sites (2008 and 2009) consisted of predominantly silt and clay; except at Playgreen Lake where clay, silt, and sand were in similar proportion (Figure 5.6.6-2). In the offshore, sediment composition varied among sites (Figure 5.6.6-3). Sediments in Playgreen Lake comprised of primarily silt and sand; Walker Lake was largely composed of sand; and Little Playgreen, Cross, and Setting lakes were mainly silt and clay.

5.6.6.2 Species Composition, Distribution, and Relative Abundance

Playgreen Lake

Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of Playgreen Lake was 6,686 individuals/m^2 (Table 5.6.6-2; Figure 5.6.6-4). Overall, insects and non-insects were comparable in terms of abundance (Figure 5.6.6-5). Insects mainly consisted of Chironomidae (midges); and small numbers of Trichoptera (caddisflies) and Ephemeroptera (mayflies) (Figure 5.6.6-6). Of the non-insects, Oligochaeta (aquatic worms) were proportionately most abundant, followed by Bivalvia (clams) and Amphipoda (scuds), and smaller numbers of Gastropoda (snails) (Figure 5.6.6-6). Mean density of BMI collected in offshore grab samples (n=15; 2009) was 6,267 individuals/m^2 (Table 5.6.6-3; Figure 5.6.6-7). Non-insects dominated the BMI community in terms of abundance, with Bivalvia being proportionately most abundant; Amphipoda, Oligochaeta, and a small number of Gastropoda were also present (Figures 5.6.6-8 and 5.6.6-9). Of the insects, Chironomidae were most dominant, followed by Ephemeroptera and Trichoptera (Figure 5.6.6-9).

Total EPT (mean abundance of Ephemeroptera, Plecoptera, and Trichoptera) comprised 2% and 12% of the mean BMI abundance in the nearshore and offshore habitats, respectively (Figures 5.6.6-10 and 5.6.6-11). Of the EPT, trichopterans and ephemeropterans were equally dominant in the nearshore habitat; while ephemeropterans were proportionately most abundant in the offshore habitat (Tables 5.6.6-2 and 5.6.6-3). Ephemeridae (*Hexagenia* sp., burrowing mayfly) was dominant in both the near and offshore grab samples (Tables 5.6.6-2 and 5.6.6-3). Mean EPT:C (ratio of EPT to Chironomidae) in the nearshore habitat was 0.05, indicating a chironomid-based community with respect to EPT abundance (Table 5.6.6-2). Mean EPT:C in the offshore was 1.18 and indicated a fairly balanced (Table 5.6.6-3).

Five of the 20 families identified in predominantly wetted nearshore habitat dominated the BMI community (most notably, Chironomidae) (Table 5.6.6-2). Mean taxa richness for the predominantly wetted habitat was 9 families (Figure 5.6.6-12). Five of the 16 families identified in the offshore were proportionately abundant (notably, Pisidiidae) (Table 5.6.6-3). Mean taxa richness for the offshore habitat was 8 families (Figure 5.6.6-13). Mean diversity (Simpson's) was 0.68 in the nearshore and 0.73 in the offshore (Figures 5.6.6-14 and 5.6.6-15). Mean evenness (Simpson's equitability) was 0.18 both habitat types (Figures 5.6.6-14 and 5.6.6-15).

Little Playgreen Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Little Playgreen Lake was 7,816 invertebrates (Table 5.6.6-4; Figure 5.6.6-16). Non-insects dominated the community and mainly consisted of Amphipoda, followed by Oligochaeta; Gastropoda, and small numbers of Bivalvia (Figures 5.6.6-17 and 5.6.6-18). Insects mainly consisted of Chironomidae; Ephemeroptera, and a small number of Trichoptera (Figure 5.6.6-18). Mean BMI density of benthic grab samples (n=5; 2010) collected in the offshore habitat was 3,916 individuals (Table 5.6.6-3; Figure 5.6.6-7). Non-insects dominated the offshore BMI community, mainly consisting of Bivalvia and relatively small numbers of Gastropoda and Amphipoda (Figures 5.6.6-8 and 5.6.6-9). Of the insects, Chironomidae dominated; and Ephemeroptera, Trichoptera were also present (Figure 5.6.6-9).

Mean EPT comprised 7% and 5% of the mean total BMI density in the nearshore and offshore, respectively (Tables 5.6.6-3 and 5.6.6-4; Figures 5.6.6-11 and 5.6.6-19). Of the EPT, Ephemeroptera was proportionately most abundant in both habitats (Tables 5.6.6-3 and 5.6.6-4). Genus analysis of the Ephemeroptera indicated that Caenidae (*Caenis* sp., small square-gilled mayfly) was the most abundant in the nearshore kicknet samples, whereas Ephemeridae (*Hexagenia* sp.) was dominant in the offshore grab samples (Tables 5.6.6-3 and 5.6.6-4). Mean EPT:C was 0.44 in the nearshore polygon habitat, and 0.32 in the offshore, indicating a chironomid-based with respect to EPT abundances (Tables 5.6.6-3 and 5.6.6-4).

Seven of the 25 families identified in the intermittently wetted nearshore habitat dominated the BMI community; most notably were Amphipoda (Hyallelidae), Chironomidae, and Oligochaeta (Table 5.6.6-4). Mean taxa richness for the nearshore was 15 families (Figure 5.6.6-20). Four of the 12 families identified in the offshore were proportionally abundant, notably Gastropoda (Pisidiidae) and Chironomidae (Table 5.6.6-3). Mean taxa richness for the offshore was 9 families (Figure 5.6.6-13). Mean diversity index was 0.78 in the nearshore and 0.55 in the offshore (Figures 5.6.6-15 and 5.6.6-21). Evenness values were 0.09 and 0.21 in the nearshore and offshore, respectively (Figures 5.6.6-15 and 5.6.6-21).

Cross Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Cross Lake was 248 individuals (Table 5.6.6-4; Figure 5.6.6-16). Insects dominated the community in abundance; the main groups were Hemiptera and Chironomidae (Figures 5.6.6-17 and 5.6.6-18). The non-insects mainly consisted of Oligochaeta and Amphipoda though Gastropoda was also present (Figure 5.6.6-18). Mean BMI density of benthic grab samples (n=30; 2008 to 2009) collected in the predominantly wetted nearshore habitat was 2,405 invertebrates/m^2 (Table 5.6.6-2; Figure 5.6.6-4). Non-insects dominated the community and mainly consisted of Bivalvia; Oligochaeta, and Amphipoda (Figures 5.6.6-5 and 5.6.6-6). Insects mainly consisted of Ephemeroptera and Chironomidae; though small numbers of Trichoptera were also present (Figure 5.6.6-6). Mean BMI density in the offshore was 1,262 individuals/m^2 (Table 5.6.6-3; Figure 5.6.6-7). Insects dominated the BMI community and mainly consisted of Ephemeroptera and Chironomidae and small numbers of Trichoptera (Figures 5.6.6-8 and 5.6.6-9). Of the non-insects, the main groups were Bivalvia; Amphipoda, and Oligochaeta (Figure 5.6.6-9).

Mean EPT comprised 15% of the total BMI community in the intermittently wetted habitat (Table 5.6.6-4; Figure 5.6.6-19). Mayflies dominated the EPT and Caenidae (*Caenis* sp.) was the dominant taxon (Table 5.6.6-4). Mean EPT comprised 23% and 52% of the mean total community in the predominantly wetted nearshore and offshore habitats, respectively; and of the

EPT, mayflies were most abundant in both habitats (Tables 5.6.6-2 and 5.6.6-3). Ephemeridae (*Hexagenia* sp.) was dominant in both near and offshore samples (Tables 5.6.6-2 and 5.6.6-3). Mean EPT:C was 0.62 in nearshore kicknet samples indicating a chironomid-dominated community with respect to EPT abundance (Table 5.6.6-4).Mean EPT: C was 5.17 in the predominantly wetted nearshore, and 3.69 in the offshore habitats; both indicating an EPT-dominated community with respect to EPT abundance (Tables 5.6.6-2 and 5.6.6-3).

Four out of the 16 families identified from the intermittently wetted habitat were predominant (notably, Corixidae and Chironomidae) (Table 5.6.6-4). Mean taxa richness was 11 families (Figure 5.6.6-20). Three out the 12 families identified in the predominantly wetted nearshore contributed to the overall BMI composition (most notably, Pisidiidae) (Table 5.6.6-2). Mean taxa richness was 5 families (Figure 5.6.6-12). Three of 11 families identified in the offshore dominated the community (most notably, Ephemeridae) (Table 5.6.6-3). Mean taxa richness was 4 families (Figure 5.6.6-13). Mean diversity in the intermittently wetted habitat was 0.50, and evenness was 0.30 (Figure 5.6.6-21). Mean diversity index was 0.48 in the predominantly wetted nearshore and 0.58 in the offshore (Figures 5.6.6-14 and 5.6.6-15). Evenness values were 0.56 and 0.66 in the nearshore and offshore, respectively (Figures 5.6.6-14 and 5.6.6-15).

Walker Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Walker Lake was 339 individuals (Table 5.6.6-4; Figure 5.6.6-16). Overall, non-insects dominated the BMI community in terms of abundance and mainly consisted of Amphipoda; Oligochaeta and small numbers of Gastropoda, and Bivalvia were also present (Figures 5.6.6-17 and 5.6.6-18). Insects consisted of Chironomidae followed by Ephemeroptera and Trichoptera (Figure 5.6.6-18). The mean BMI density collected in grab samples in the offshore habitat of Walker Lake was 1,226 individuals/m^2 (Figure 5.6.6-7). Insects dominated the community in terms of abundance, with Chironomidae being the most abundant; smaller numbers of Ephemeroptera and Trichoptera were also present (Figures 5.6.6-8 and 5.6.6-9). Of the non-insects, oligochaetes followed by bivalves were proportionately most abundant (Figure 5.6.6-9).

Total EPT comprised 13% and 2% of the mean BMI abundance in the intermittently wetted nearshore and offshore habitats, respectively, with ephemeropterans proportionately most abundant in both habitats (Tables 5.6.6-3 and 5.6.6-4; Figures 5.6.6-11 and 5.6.6-19). Caenidae (*Caenis* sp.) and unidentified genera of Leptophlebiidae were dominant in nearshore kicknet samples; Ephemeridae (*Hexagenia* sp.) was dominant in offshore grab samples (Tables 5.6.6-3 and 5.6.6-4). Mean ratio of EPT to Chironomidae in the nearshore was 0.66; and 0.03 in the offshore (Tables 5.6.6-3 and 5.6.6-4). Both indicated a chironomid-based community with respect to EPT abundance; though EPT were much less abundant in the offshore habitat.

Seven of the 33 families identified in the nearshore dominated the BMI community (notably, Hyallelidae, Chironomidae, and Oligochaeta), whereas only four of the 11 families identified in the offshore were proportionately abundant (most notably, Chironomidae) (Tables 5.6.6-3 and 5.6.6-4) Mean taxonomic richness was 20 families in the nearshore; and 6 families in the offshore habitat (Figures 5.6.6-13 and 5.6.6-20). Simpson's diversity index was 0.77 in the nearshore and 0.71 in the offshore habitat (Figures 5.6.6-15 and 5.6.6-21). Simpson's equitability was 0.25 in the nearshore and 0.07 in the offshore (Figures 5.6.6-15 and 5.6.6-21).

Setting Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Setting Lake was 331 individuals (Table 5.6.6-4; Figure 5.6.6-16). Insects were in relatively greater abundances than non-insects (Figure 5.6.6-17). Insects consisted of mainly Chironomidae, followed by Ephemeroptera and Trichoptera (Figure 5.6.6-18). Non-insects consisted of mainly Oligochaeta, followed by Amphipoda, Gastropoda and a small number of Bivalvia (Figure 5.6.6-18). Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat was 2,583 invertebrates/m^2 (Table 5.6.6-2; Figure 5.6.6-4). Non-insects dominated the community in abundance, mainly consisting of Amphipoda; Bivalvia, Oligochaeta, and small numbers of Gastropoda were also present (Figures 5.6.6-5 and 5.6.6-6). Insects mainly consisted of Chironomidae; Ephemeroptera, and a small number of Trichoptera (Figure 5.6.6-6). Mean total density for BMI collected in offshore benthic grab samples (n=33; 2008 to 2010) was 2,764 individuals/m^2 (Table 5.6.6-3; Figure 5.6.6-7). Insects dominated the offshore community, predominately consisting of Chironomidae, and small numbers of Ephemeroptera and Trichoptera (Figures 5.6.6-8 and 5.6.6-9). Of the non-insects, Oligochaeta and Bivalvia dominated, followed by Amphipoda (Figure 5.6.6-9).

Mean EPT of the intermittently wetted nearshore habitat was 26%, of which mainly consisted of Ephemeroptera (Figure 5.6.6-19). Caenidae (*Caenis* sp.) was most abundant of the mayflies (Table 5.6.6-4). Mean EPT comprised 4% and 1% of the mean BMI density within the predominantly wetted nearshore and offshore habitats, respectively (Figures 5.6.6-10 and 5.6.6-11). Ephemeroptera were most abundant and Ephemeridae (*Hexagenia* sp.) was the dominant mayfly taxon in both nearshore and offshore habitat types (Tables 5.6.6-2 and 5.6.6-3). Mean EPT: C in the intermittently wetted nearshore habitat was 1.10, indicating a balanced community with respect to EPT and Chironomidae abundance (Table 5.6.6-4).Mean EPT:C was 0.40 in the nearshore and 0.05 in the offshore habitats; both indicating a more chironomid-based community with respect to EPT abundance (Tables 5.6.6-2 and 5.6.6-3).

Twelve of 34 families identified from the intermittently wetted nearshore habitat dominated the BMI community; notably Chironomidae and followed by Oligochaeta, Amphipoda (Hyalellidae), and Ephemeroptera (Caenidae) (Table 5.6.6-4). Mean taxonomic richness was 22 families (Figure 5.6.6-20). Four of 15 families identified in the predominantly wetted nearshore habitat dominated the community, most notable was Amphipoda (Haustoriidae); mean taxa richness was 6 families (Table 5.6.6-2; Figure 5.6.6.-12). Three of the 10 families identified in the offshore habitat were proportionally abundant, most notably was Chironomidae (Table 5.6.6-3). Mean taxa richness was 4 families (Figure 5.6.6-13). Diversity and evenness values calculated from samples collected in the intermittently wetted nearshore habitat were 0.89 and 0.05, respectively (Figure 5.6.6-21).Simpson's diversity index was 0.53 in the nearshore and 0.51 in the offshore habitats (Figure 5.6.6-14 and 5.6.6-15). Simpson's evenness was 0.50 in the nearshore and 0.60 in the offshore habitats (Figure 5.6.6-14 and 5.6.6-15).

5.6.6.3 Spatial Comparisons

Spatial differences in BMI abundance and richness metrics for the intermittently wetted nearshore habitat sampled in at Cross (on-system) and Setting (off-system) lakes. Though analysis only incorporated one year of data (2010), it appears that all BMI metrics were significantly different except for abundances of macroinvertebrates, insects, chironomids, mayflies, EPT, and EPT:C (Figures 5.6.6-16 to 5.6.6-21). For each of the measures, Cross Lake appears to be significantly lower than Setting Lake, except for Simpson's evenness index.

Spatial differences in BMI abundance and richness metrics for the predominantly wetted nearshore habitat of Cross (on-system) and Setting (off-system) lakes were also detected. While the statistical analysis only incorporated two years of data (2008 to 2009), it appears that sites varied for all metrics except abundances of macroinvertebrates, non-insects, and Simpson's diversity and evenness indices (Figures 5.6.6-4 to 5.6.6-6, 5.6.6-10, 5.6.6-12, 5.6.6-14). Trends were difficult to assess, however several measures for Cross Lake appears to be significantly greater than Setting Lake (namely abundances of insects, bivalves, mayflies, and EPT).

Spatial differences in the offshore BMI abundance and richness metrics of Cross and Setting lakes were detected. Statistical analysis incorporated three years of data (2008 to 2010) and significant differences were apparent for all measures except abundances of amphipods, caddisflies, and Simpson's diversity and evenness indices (Figures 5.6.6-7 to 5.6.6-9, 5.6.6-11, 5.6.6-13, 5.6.6-15). For abundances of macroinvertebrates, non-insects, insects, bivalves, gastropods, chironomids, mayflies, and mean taxonomic richness, Cross Lake appears to be significantly lower than Setting Lake.

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

5.6.6.4 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 the BMI abundance and richness metrics for the predominantly wetted nearshore habitat of Cross Lake were detected. While statistical analysis only incorporated two years of data (2008 to 2009), it appears that total numbers of macroinvertebrates, non-insects, bivalves, chironomids, caddisflies, and EPT:C varied between years (Figures 5.6.6-22 to 5.6.6-27). For each of the measures, 2009 appears to be significantly lower than 2008. Statistical analysis for the offshore habitat of Cross Lake incorporated three years of data. Numbers of non-insects, oligochaetes, amphipods, bivalves, EPT:C, taxa richness, Simpson’s diversity and evenness indices all varied amongst sampling years (Figures 5.6.6-28 to 5.6.6-33). For many of the abundance measures, 2009 was significantly lower than both 2008 and 2010. Taxa richness and Simpson’s diversity were significantly greater in 2010 (Figures 5.6.6-21 and 5.6.6-33).

Temporal differences in BMI abundance and richness metrics for the offshore habitat of Setting Lake were detected. Statistical analysis incorporated three years of data (2008 to 2010), and it appears that most metrics were significantly different amongst sampling years except for numbers f bivalves and gastropods (Figures 5.6.6-34 to 5.6.6-39). For most measures, 2010 stood out as being significantly different from 2008 and 2009; exceptions were abundances of macroinvertebrates, insects, and Simpson’s diversity and evenness indices (Figures 5.6.6-34 to 5.6.6-36, 5.6.6-39).

Table 5.6.6-1. Habitat and physical characteristics recorded at benthic macroinvertebrate sites in the Upper Nelson River Region for CAMPP, 2008 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
Cross Lake (2008)	Nearshore	15	3.8	3.7	3.9	--	--	--	--	--	--	--
	Offshore	15	4.5	3.8	5.4	--	--	--	--	--	--	--
Setting Lake (2008)	Nearshore	--	--	--	--	--	--	--	--	--	--	--
	Offshore	13	23.9	23.3	24.5	--	--	--	--	--	--	--

Table 5.6.6-1. 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
Playgreen Lake (2009)	Nearshore	15	1.5	1.1	1.6	--	0.78	16.0	--	shrubs, mixed forest	0	--
	Offshore	15	8.6	5.1	12.6	--	1.05	16.0	--	--	--	--
Cross Lake (2009)	Nearshore	15	4.3	3.5	4.9	--	0.50	14.0	--	mixed forest, shrubs	0	--
	Offshore	15	6.9	4.8	9.1	--	0.50	16.0	--	--	--	--
Setting Lake (2009)	Nearshore	15	2.0	1.3	2.8	--	0.95	17.0	--	aquatic veg, coniferous	0	--
	Offshore	15	22.4	20.7	23.3	--	1.60	16.0	--	--	--	--

Table 5.6.6-1. continued.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(ºC)			(%)	
Little Playgreen Lake (2010)	Nearshore	5	0.7	0.5	0.9	0.00	--	16.0	bedrock, boulder	shrubs, coniferous	0-24	slime, crust, attached, filamentous
	Offshore	5	8.0	7.2	8.4	0.05	0.73	16.0	clay	--	--	--
Cross Lake (2010)	Nearshore	5	0.9	0.8	1.0	0.00	0.35	15.0	bedrock, boulder	shrubs, coniferous	0-24	slime, crust
	Offshore	5	8.0	6.5	9.5	0.12	0.35	15.0	clay, silt	--	--	--
Walker Lake (2010)	Nearshore	5	0.9	0.5	1.0	1.00	--	15.0	bedrock, cobble	shrubs, coniferous	0-24	slime, crust
	Offshore	6	7.1	5.4	8.0	1.00	1.60	15.0	silt, organic matter	--	--	--
Setting Lake (2010)	Nearshore	5	0.8	0.7	1.0	0.00	--	16.0	cobble, bedrock, boulder	coniferous	0-24	slime, crust, floating, attached
	Offshore	5	7.4	6.9	8.0	0.00	1.32	15.0	clay, silt	--	--	--

Table 5.6.6-2. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate nearshore grab samples collected in the Upper Nelson River Region for CAMPP, 2008 to 2010.

Waterbody and Habitat	Playgreen Lake Nearshore (2009)							Cross Lake Nearshore (2008 to 2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	30	--	--	--	--	--	--
Water Depth (m)	--	1.5	0.13	0.03	1.5	1.1	1.6	--	4.0	0.44	0.08	3.8	3.5	4.9
Abundance (no. per m^2)														
Total Invertebrates	--	6686	3668.3	947.2	5410	2640	14327	--	2405	2197.2	401.2	1450	519	9565
Non-Insecta	49	3264	2046.4	528.4	2337	1039	8094	67	1607	2098.9	383.2	584	87	8613
Oligochaeta	17	1111	904.9	233.6	952	43	3203	2	46	71.8	13.1	0	0	260
Amphipoda	12	782	652.6	168.5	649	43	2467	2	38	55.4	10.1	22	0	260
Bivalvia	13	860	662.7	171.1	649	87	2121	63	1519	2084.6	380.6	541	0	8483
Gastropoda	6	375	641.1	165.5	130	0	2381	0	0	0.0	0.0	0	0	0
Insecta	51	3422	2687.3	693.9	2640	995	10345	33	798	297.2	54.3	779	216	1428
Chironomidae	49	3264	2637.0	680.9	2597	866	10085	9	215	139.0	25.4	195	43	519
Ephemeroptera	1	40	91.8	23.7	0	0	346	23	560	290.0	52.9	476	0	1385
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	1	84	134.4	34.7	43	0	519	0	1	7.9	1.4	0	0	43
EPT	2	124	173.0	44.7	43	0	563	23	561	289.5	52.8	476	0	1385
EPT to Chironomidae Ratio	--	0.05	0.068	0.018	0.02	0.00	0.18	--	5.17	7.180	1.311	3.00	0.00	32.00
Genus analysis of Ephemeroptera	3 spp. (*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)	20	9	2.5	0.6	10	6	13	12	5	1.2	0.2	4	3	8
Simpson's Diversity Index	--	0.68	0.124	0.032	0.71	0.37	0.82	--	0.48	0.156	0.028	0.53	0.20	0.68
Evenness (Simpson's Equitability)	--	0.36	0.135	0.035	0.35	0.12	0.60	--	0.41	0.142	0.026	0.41	0.12	0.66
Shannon-Weaver Index	--	1.52	0.294	0.076	1.58	0.92	2.01	--	0.98	0.291	0.053	1.08	0.41	1.41
Evenness (Shannon's Equitability)	--	0.66	0.116	0.030	0.68	0.36	0.81	--	0.60	0.170	0.031	0.62	0.24	0.84
Hill's Effective Richness	--	4.73	1.341	0.346	4.87	2.52	7.45	--	3	0.7	0.1	3	2	4
Evenness (Hill's)	--	0.48	0.132	0.034	0.50	0.19	0.70	--	0.53	0.161	0.029	0.53	0.16	0.78

Table 5.6.6-2. continued.

Waterbody and Habitat	Setting Lake Nearshore (2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--
Water Depth (m)	--	2.0	0.51	0.13	2.0	1.3	2.8
Abundance (no. per m^2)							
Total Invertebrates	--	2583	1076.3	277.9	2251	952	5237
Non-Insecta	78	2023	1205.0	311.1	1904	433	4891
Oligochaeta	5	136	145.3	37.5	87	0	390
Amphipoda	65	1685	1208.5	312.0	1731	130	4285
Bivalvia	6	147	97.9	25.3	173	0	346
Gastropoda	2	43	56.7	14.6	0	0	173
Insecta	22	560	352.9	91.1	390	173	1298
Chironomidae	17	439	343.9	88.8	303	130	1169
Ephemeroptera	3	89	68.4	17.7	87	0	216
Plecoptera	0	0	0.0	0.0	0	0	0
Trichoptera	0	12	25.7	6.6	0	0	87
EPT	4	101	79.6	20.5	87	0	260
EPT to Chironomidae Ratio	--	0.40	0.499	0.129	0.22	0.00	1.67
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	15	6	2.1	0.5	6	3	10
Simpson's Diversity Index	--	0.53	0.225	0.058	0.46	0.14	0.84
Evenness (Simpson's Equitability)	--	0.36	0.135	0.035	0.33	0.18	0.67
Shannon-Weaver Index	--	1.22	0.537	0.139	1.07	0.36	2.12
Evenness (Shannon’s Equitability)	--	0.60	0.204	0.053	0.53	0.22	0.86
Hill's Effective Richness	--	3.87	2.084	0.538	2.91	1.44	8.36
Evenness (Hill's)	--	0.49	0.159	0.041	0.46	0.27	0.78

Table 5.6.6-3. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate offshore grab samples collected in the Upper Nelson River Region for CAMPP, 2008 to 2010.

Waterbody and Habitat	Playgreen Lake Offshore (2009)							Little Playgreen Lake Offshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	5	--	--	--	--	--	--
Water Depth (m)	--	8.6	2.15	0.55	8.3	5.1	12.6	--	8.0	0.53	0.24	8.4	7.2	8.4
Abundance (no. per m^2)														
Total Invertebrates	--	6267	2774.7	716.4	5410	2640	13418	--	3916	182.1	81.4	3910	3650	4141
Non-Insecta	76	4793	2645.9	683.2	4025	1991	12206	77	3024	334.4	149.6	3174	2525	3318
Oligochaeta	12	779	854.9	220.7	346	43	3030	0	0	0.0	0.0	0	0	0
Amphipoda	16	1030	783.4	202.3	1039	130	2813	3	98	78.6	35.2	72	29	202
Bivalvia	39	2453	2325.3	600.4	1991	87	10171	65	2557	295.7	132.3	2626	2236	2900
Gastropoda	0	12	30.5	7.9	0	0	87	4	153	154.9	69.3	159	0	375
Insecta	24	1474	593.1	153.1	1255	563	3030	23	892	239.3	107.0	967	548	1125
Chironomidae	12	727	350.6	90.5	736	260	1601	17	672	190.2	85.1	721	375	837
Ephemeroptera	7	453	190.0	49.1	390	173	866	4	153	54.6	24.4	130	101	231
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	5	289	394.5	101.9	130	0	1515	1	55	59.0	26.4	29	14	159
EPT	12	742	424.0	109.5	693	260	1904	5	208	64.2	28.7	216	130	289
EPT to Chironomidae Ratio	--	1.18	0.663	0.171	1.17	0.32	2.29	--	0.32	0.082	0.037	0.34	0.21	0.42
Genus analysis of Ephemeroptera	1 sp. (*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)	16	8	1.5	0.4	9	6	10	12	9	0.5	0.2	9	8	9
Simpson's Diversity Index	--	0.72	0.117	0.030	0.75	0.41	0.87	--	0.55	0.066	0.030	0.55	0.48	0.64
Evenness (Simpson's Equitability)	--	0.41	0.112	0.029	0.41	0.15	0.64	--	0.20	0.035	0.015	0.19	0.17	0.25
Shannon-Weaver Index	--	1.64	0.298	0.077	1.71	0.92	2.18	--	1.32	0.140	0.062	1.34	1.17	1.50
Evenness (Shannon’s Equitability)	--	0.72	0.115	0.030	0.73	0.38	0.88	--	0.54	0.058	0.026	0.54	0.49	0.63
Hill's Effective Richness	--	5.37	1.439	0.371	5.53	2.51	8.83	--	3.76	0.529	0.237	3.82	3.23	4.50
Evenness (Hill's)	--	0.54	0.117	0.030	0.55	0.23	0.74	--	0.34	0.049	0.022	0.32	0.29	0.41

Table 5.6.6-3. continued.

Waterbody and Habitat	Cross Lake Offshore (2008 to 2010)							Walker Lake Offshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	35	--	--	--	--	--	--	5	--	--	--	--	--	--
Water Depth (m)	--	6.0	1.77	0.30	5.6	3.8	9.5	--	7.1	1.00	0.41	7.3	5.4	8.0
Abundance (no. per m^2)														
Total Invertebrates	--	1262	602.4	101.8	1212	0	2554	--	1226	355.5	145.1	1089	923	1832
Non-Insecta	21	270	305.2	51.6	260	0	1385	19	233	156.0	63.7	202	29	476
Oligochaeta	1	13	37.3	6.3	0	0	173	11	130	139.3	56.9	94	14	390
Amphipoda	2	24	40.9	6.9	0	0	159	0	2	5.9	2.4	0	0	14
Bivalvia	18	231	306.2	51.8	130	0	1385	7	91	80.4	32.8	65	14	216
Gastropoda	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Insecta	79	991	476.2	80.5	952	0	2424	81	993	242.0	98.8	909	765	1356
Chironomidae	26	329	328.2	55.5	260	0	1904	68	830	209.4	85.5	772	649	1226
Ephemeroptera	52	650	328.1	55.5	563	0	1385	2	22	28.5	11.6	7	0	58
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	6	18.6	3.1	0	0	87	0	5	11.8	4.8	0	0	29
EPT	52	657	333.3	56.3	563	0	1385	2	26	37.0	15.1	7	0	87
EPT to Chironomidae Ratio	--	3.69	4.739	0.801	2.57	0.00	27.00	--	0.03	0.040	0.016	0.01	0.00	0.09
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	1	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	11	4	1.5	0.3	3	0	7	11	6	1.5	0.6	6	4	8
Simpson's Diversity Index	--	0.57	0.163	0.028	0.58	0.23	1.00	--	0.71	0.043	0.018	0.70	0.64	0.76
Evenness (Simpson's Equitability)	--	0.50	0.156	0.026	0.50	0.00	0.81	--	0.51	0.142	0.058	0.52	0.35	0.67
Shannon-Weaver Index	--	1.07	0.395	0.067	1.04	0.00	1.82	--	1.44	0.110	0.045	1.42	1.33	1.63
Evenness (Shannon’s Equitability)	--	0.68	0.164	0.028	0.71	0.00	0.90	--	0.75	0.070	0.029	0.75	0.66	0.82
Hill's Effective Richness	--	3	1.2	0.2	3	0	6	--	4.23	0.489	0.200	4.14	3.76	5.12
Evenness (Hill's)	--	0.62	0.160	0.027	0.62	0.00	0.89	--	0.61	0.115	0.047	0.61	0.48	0.75

Table 5.6.6-3. continued.

Waterbody and Habitat	Setting Lake Offshore (2008 to 2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	33	--	--	--	--	--	--
Water Depth (m)	--	20.7	5.75	1.00	22.6	6.9	24.5
Abundance (no. per m^2)							
Total Invertebrates	--	2764	1301.2	226.5	2366	1039	5757
Non-Insecta	35	977	564.2	98.2	736	303	2222
Oligochaeta	14	391	349.7	60.9	260	0	1298
Amphipoda	8	220	529.5	92.2	0	0	1933
Bivalvia	13	349	221.0	38.5	303	29	1039
Gastropoda	0	4	16.7	2.9	0	0	87
Insecta	64	1780	1020.1	177.6	1472	519	3895
Chironomidae	63	1729	1053.8	183.4	1472	476	3852
Ephemeroptera	1	31	85.6	14.9	0	0	404
Plecoptera	0	0	0.0	0.0	0	0	0
Trichoptera	0	4	12.6	2.2	0	0	58
EPT	1	35	96.5	16.8	0	0	462
EPT to Chironomidae Ratio	--	0.05	0.123	0.021	0.00	0.00	0.47
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	10	4	1.9	0.3	4	3	11
Simpson's Diversity Index	--	0.51	0.133	0.023	0.53	0.18	0.75
Evenness (Simpson's Equitability)	--	0.48	0.128	0.022	0.47	0.27	0.90
Shannon-Weaver Index	--	0.98	0.303	0.053	0.98	0.37	1.72
Evenness (Shannon's Equitability)	--	0.64	0.117	0.020	0.66	0.34	0.95
Hill's Effective Richness	--	3	0.9	0.2	3	1	6
Evenness (Hill's)	--	0.60	0.117	0.020	0.60	0.40	0.94

Table 5.6.6-4 Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate nearshore kicknet samples collected in the Upper Nelson River Region for CAMPP, 2010.

Waterbody and Habitat	Little Playgreen Lake Nearshore (2010)							Cross 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)	--	0.7	0.17	0.08	0.8	0.5	0.9	--	0.9	0.08	0.03	0.9	0.8	1.0
Abundance (no. per kicknet)														
Total Invertebrates	--	7816	4890.2	2187.0	6498	1207	14042	--	248	117.0	52.3	215	173	454
Non-Insecta	63	4941	3166.2	1416.0	4354	474	8962	6	15	11.9	5.3	14	2	33
Oligochaeta	21	1668	1251.5	559.7	1643	129	3477	3	6	7.5	3.4	4	0	19
Amphipoda	36	2802	2030.9	908.2	2283	176	4864	2	6	5.0	2.3	6	1	13
Bivalvia	0	2	4.8	2.1	0	0	11	0	0	0.0	0.0	0	0	0
Gastropoda	6	465	381.4	170.6	267	168	1056	1	2	1.7	0.7	1	0	4
Insecta	37	2875	1747.0	781.3	2284	733	5080	94	234	107.3	48.0	198	162	420
Chironomidae	27	2105	1468.3	656.6	1653	264	3840	36	91	116.5	52.1	35	10	288
Ephemeroptera	7	537	240.5	107.6	533	296	896	15	36	51.7	23.1	17	8	128
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	15	6.6	3.0	11	8	22	0	0	0.2	0.1	0	0	0
EPT	7	552	245.2	109.6	555	304	918	15	37	51.7	23.1	17	8	128
EPT to Chironomidae Ratio	--	0.44	0.407	0.182	0.25	0.17	1.15	--	0.62	0.475	0.212	0.48	0.08	1.35
Genus analysis of Ephemeroptera	Caenidae: *Caenis*	--	--	--	--	--	--	Caenidae: *Caenis*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	25	15	1.9	0.8	15	13	18	16	11	2.3	1.0	11	7	13
Simpson's Diversity Index	--	0.78	0.060	0.027	0.77	0.71	0.87	--	0.49	0.218	0.097	0.53	0.16	0.77
Evenness (Simpson's Equitability)	--	0.27	0.070	0.031	0.25	0.20	0.38	--	0.15	0.071	0.032	0.11	0.09	0.26
Shannon-Weaver Index	--	1.85	0.275	0.123	1.76	1.54	2.24	--	1.19	0.446	0.200	1.23	0.48	1.71
Evenness (Shannon’s Equitability)	--	0.63	0.077	0.034	0.62	0.54	0.75	--	0.43	0.153	0.068	0.45	0.19	0.60
Hill's Effective Richness	--	6.55	1.877	0.839	5.78	4.68	9.39	--	3.55	1.394	0.623	3.43	1.62	5.52
Evenness (Hill's)	--	0.35	0.074	0.033	0.34	0.28	0.47	--	0.22	0.081	0.036	0.19	0.12	0.32

Table 5.6.6-4. continued.

Waterbody and Habitat	Walker Lake Nearshore (2010)							Setting 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)	--	0.9	0.22	0.10	1.0	0.5	1.0	--	0.8	0.12	0.05	0.8	0.7	1.0
Abundance (no. per m^2)														
Total Invertebrates	--	339	336.7	150.6	177	109	928	--	331	178.3	79.7	328	105	582
Non-Insecta	66	226	288.5	129.0	123	39	731	41	136	78.9	35.3	147	50	249
Oligochaeta	19	63	51.5	23.0	45	12	133	16	51	38.0	17.0	61	6	101
Amphipoda	45	152	235.3	105.2	69	22	571	12	39	15.8	7.1	41	18	61
Bivalvia	1	2	4.2	1.9	0	0	9	5	16	16.3	7.3	12	4	44
Gastropoda	1	4	4.2	1.9	2	0	10	7	23	28.4	12.7	15	2	71
Insecta	33	113	56.1	25.1	117	54	197	59	195	101.9	45.6	181	55	333
Chironomidae	20	67	28.1	12.6	67	28	98	30	99	57.7	25.8	111	21	177
Ephemeroptera	9	30	31.1	13.9	19	6	83	17	57	45.3	20.3	39	19	120
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	4	14	4.3	1.9	15	9	19	9	30	11.4	5.1	27	14	45
EPT	13	43	34.3	15.3	27	16	101	26	87	54.4	24.3	65	33	155
EPT to Chironomidae Ratio	--	0.66	0.376	0.168	0.67	0.28	1.13	--	1.10	0.744	0.333	0.76	0.42	2.15
Genus analysis of Ephemeroptera	Caenidae: *Caenis* + Leptophlebiidae: unidentified	--	--	--	--	--	--	Caenidae: *Caenis*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	33	20	3.7	1.7	19	15	24	34	22	1.0	0.4	22	21	23
Simpson's Diversity Index	--	0.77	0.093	0.042	0.82	0.62	0.84	--	0.89	0.006	0.003	0.89	0.88	0.89
Evenness (Simpson's Equitability)	--	0.21	0.092	0.041	0.19	0.09	0.35	--	0.34	0.027	0.012	0.34	0.31	0.38
Shannon-Weaver Index	--	1.97	0.220	0.098	2.07	1.65	2.17	--	2.47	0.031	0.014	2.48	2.42	2.49
Evenness (Shannon's Equitability)	--	0.62	0.083	0.037	0.64	0.49	0.72	--	0.76	0.014	0.006	0.76	0.73	0.77
Hill's Effective Richness	--	7.28	1.498	0.670	7.94	5.20	8.72	--	11.78	0.365	0.163	11.91	11.27	12.09
Evenness (Hill's)	--	0.31	0.093	0.041	0.30	0.18	0.44	--	0.45	0.025	0.011	0.45	0.42	0.48

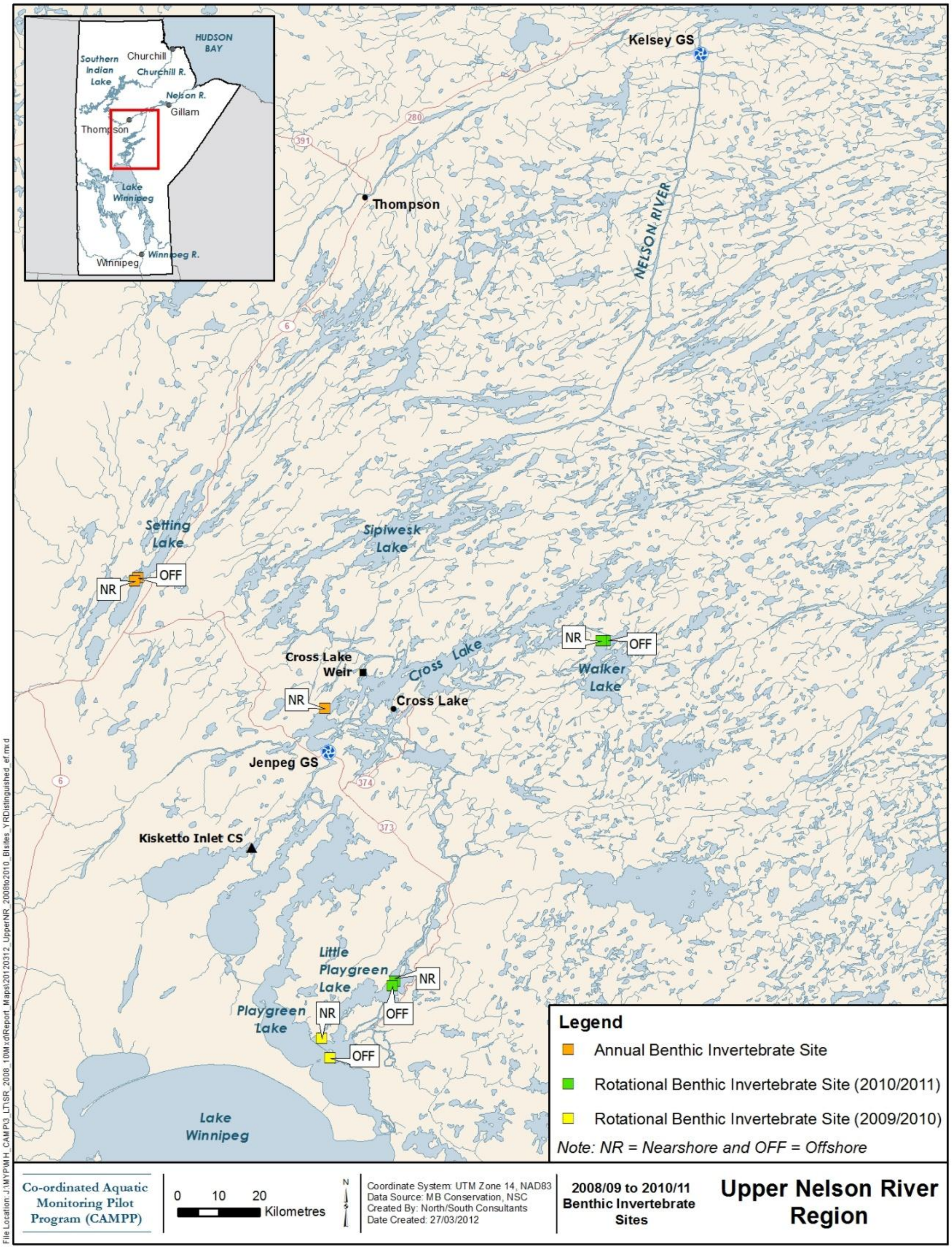


Figure 5.6.6-1. Benthic invertebrate sampling sites located in CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2010.

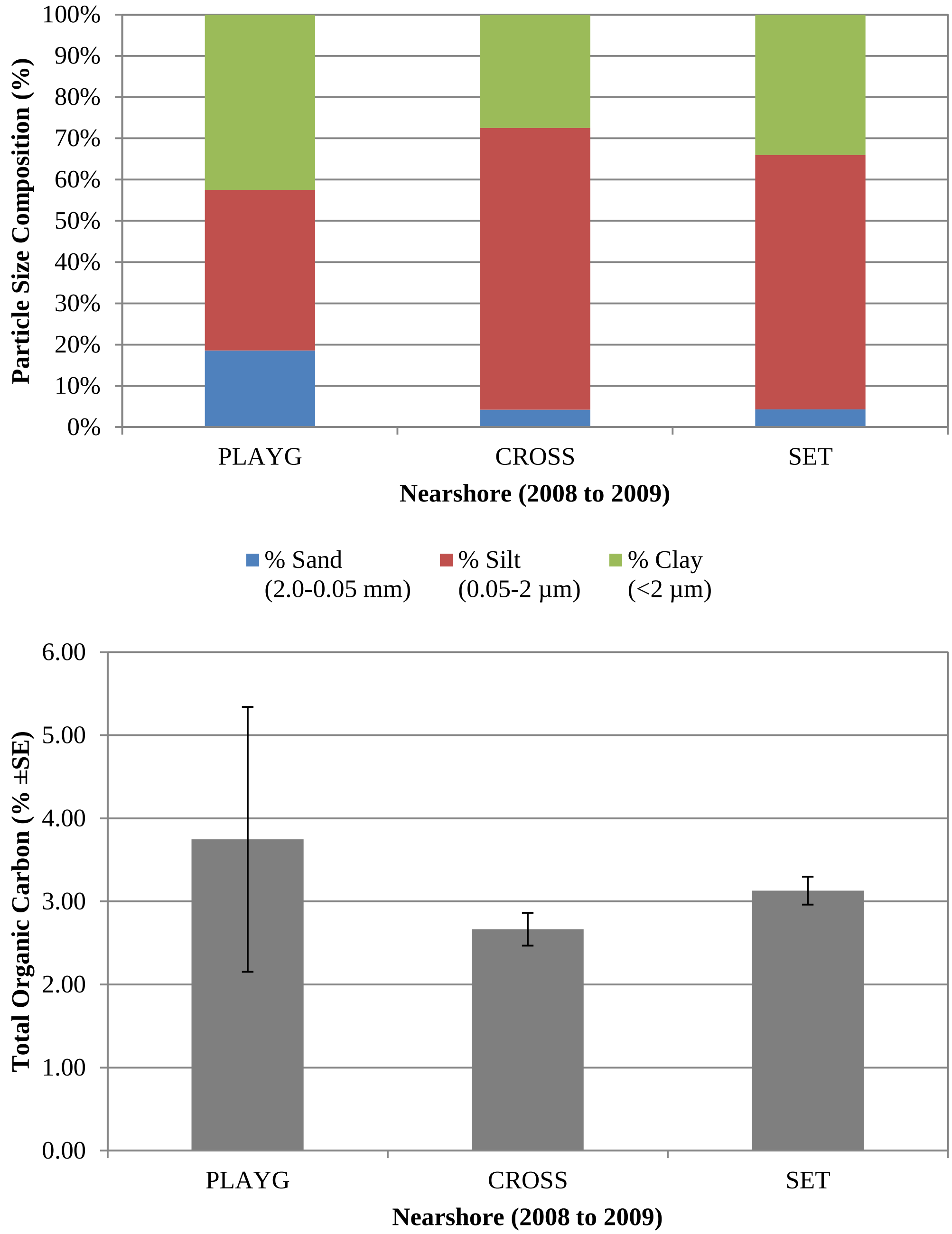


Figure 5.6.6-2. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with nearshore invertebrate sampling in the Upper Nelson River Region for CAMPP, 2008 to 2009.

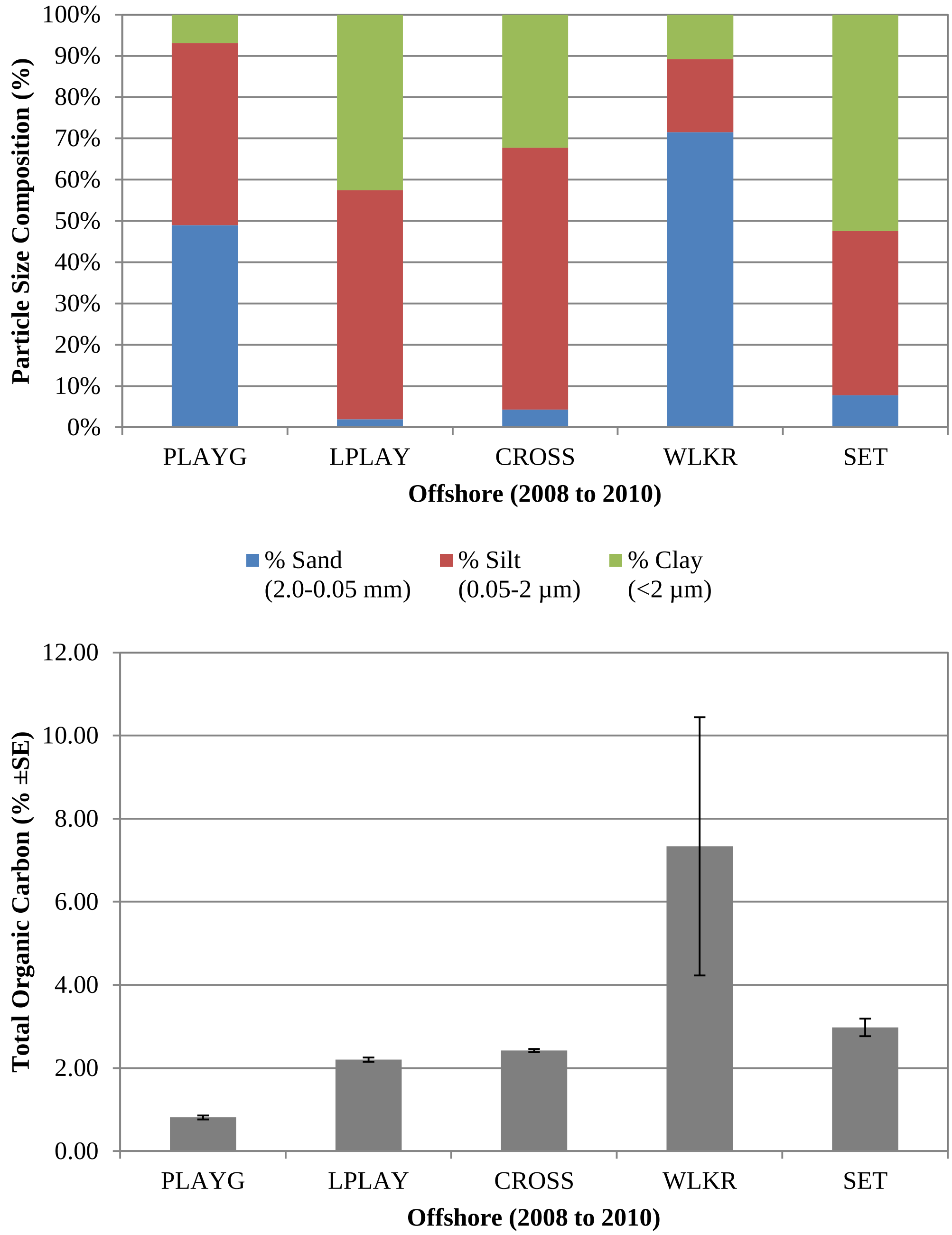


Figure 5.6.6-3. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with offshore invertebrate sampling in the Upper Nelson River Region for CAMPP, 2008 to 2010.

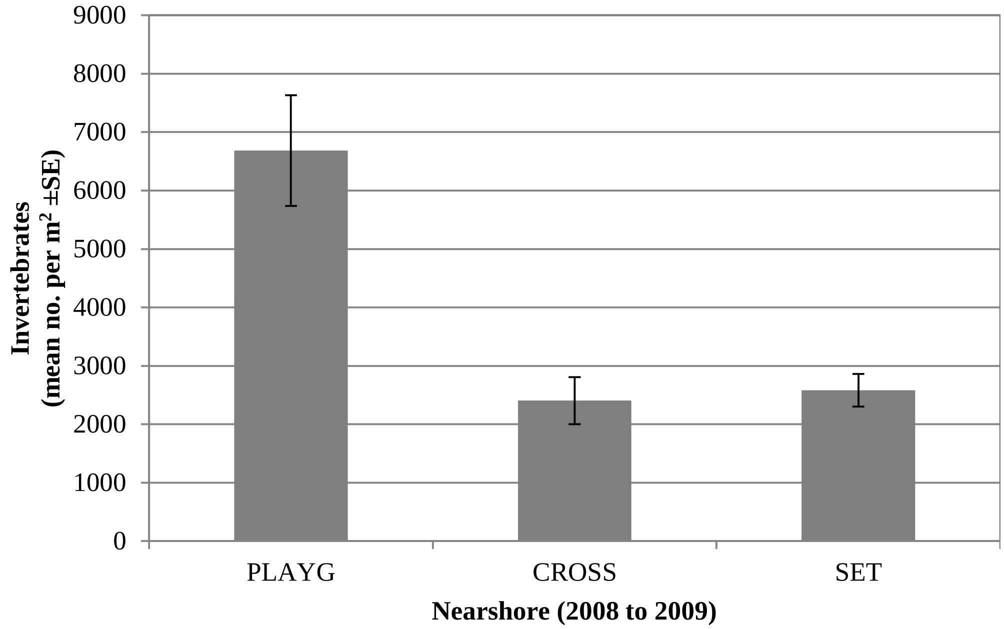


Figure 5.6.6-4. Abundances of benthic invertebrates (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2009.

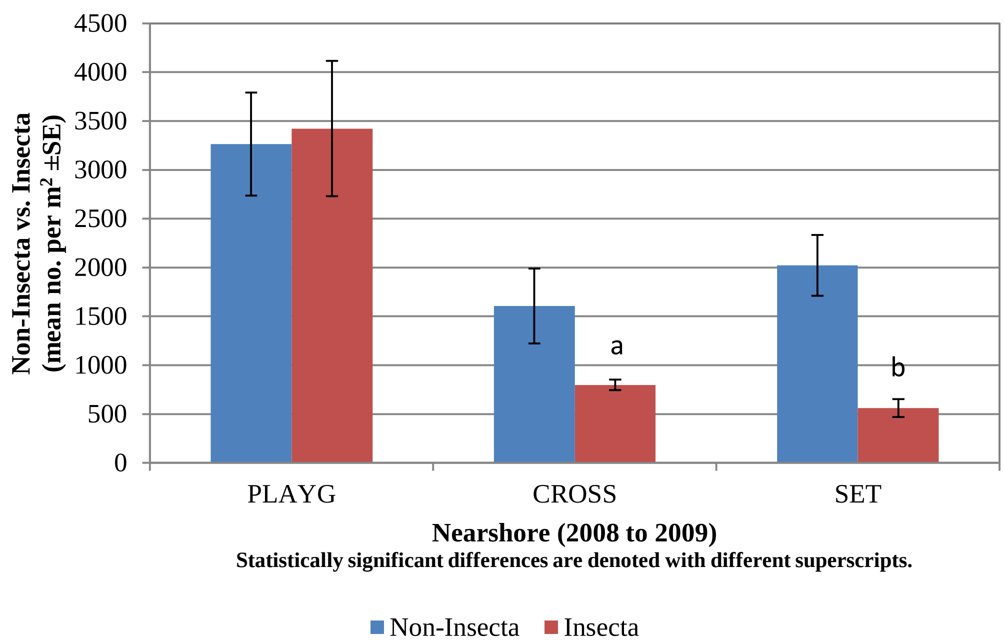


Figure 5.6.6-5. Abundances of non-insects and insects (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2009.

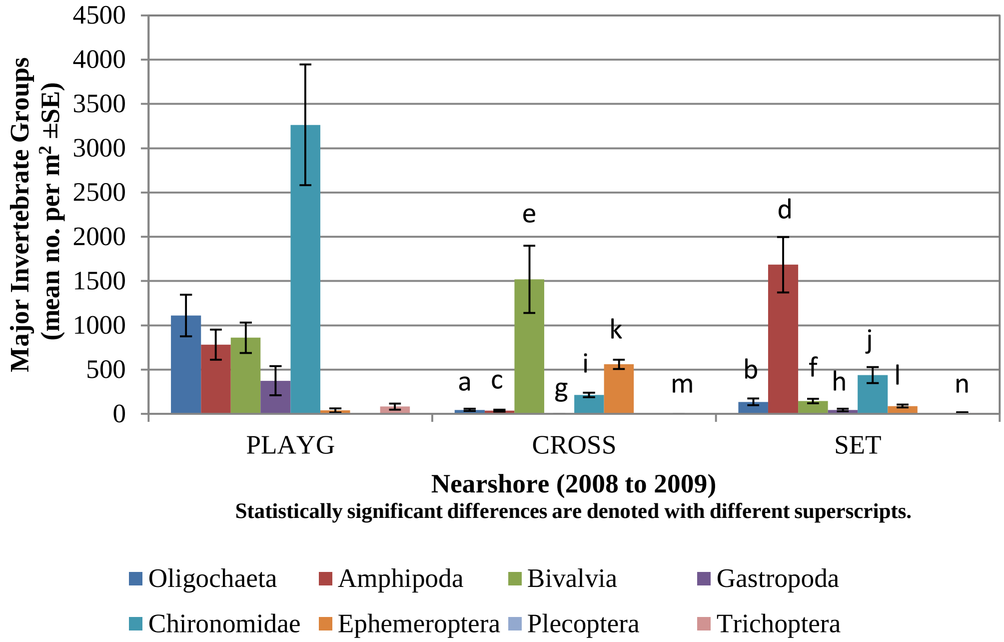


Figure 5.6.6-6. Abundances of the major invertebrate groups (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2009.

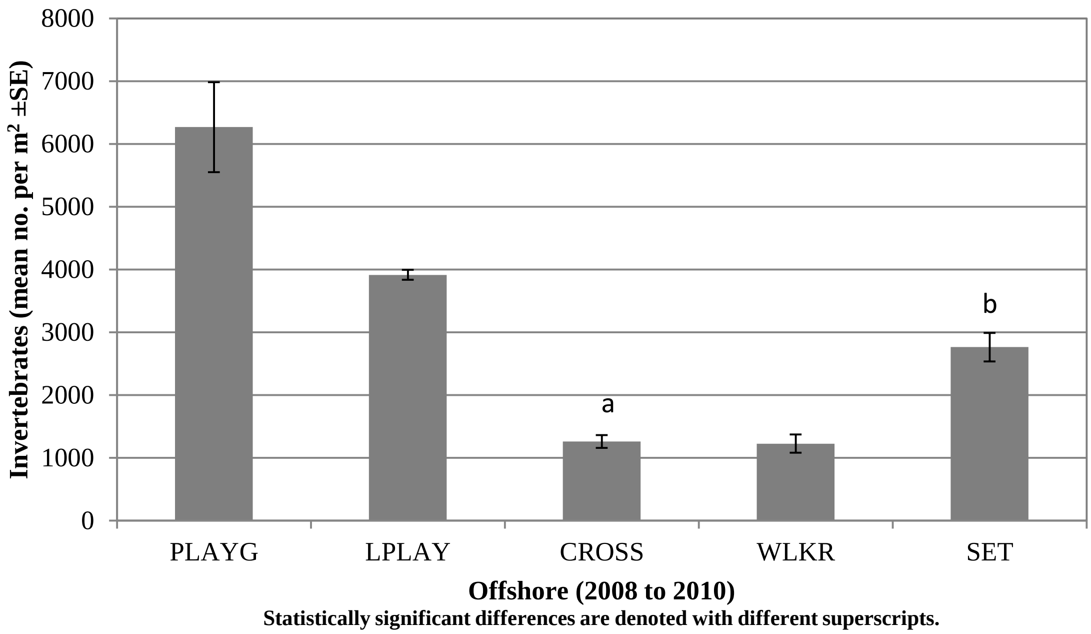


Figure 5.6.6-7. Abundances of benthic invertebrates (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2010.

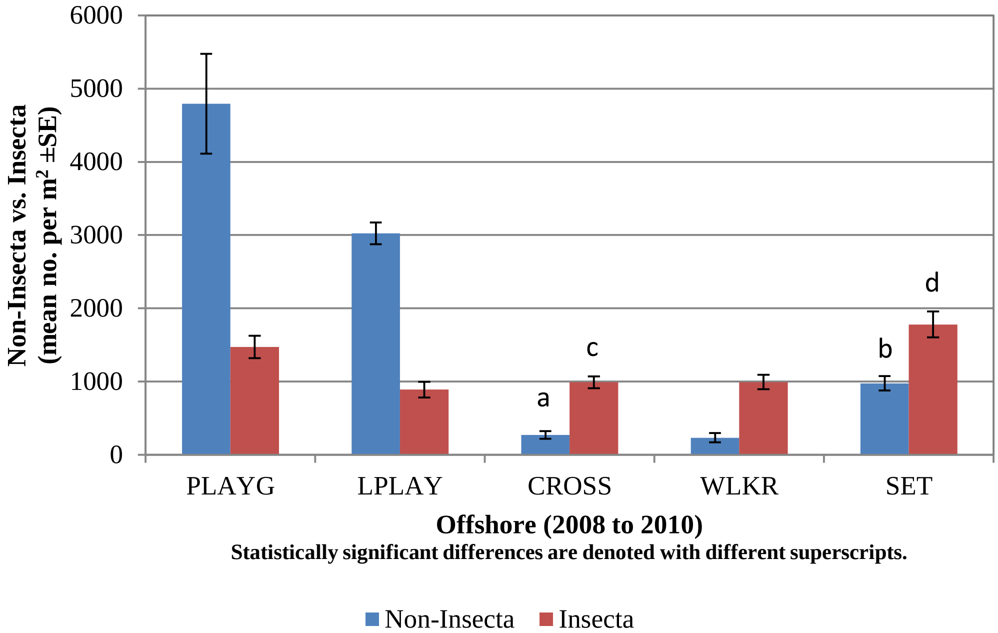


Figure 5.6.6-8. Abundances of non-insects and insects (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies within the Upper Nelson River Region, 2008 to 2010.

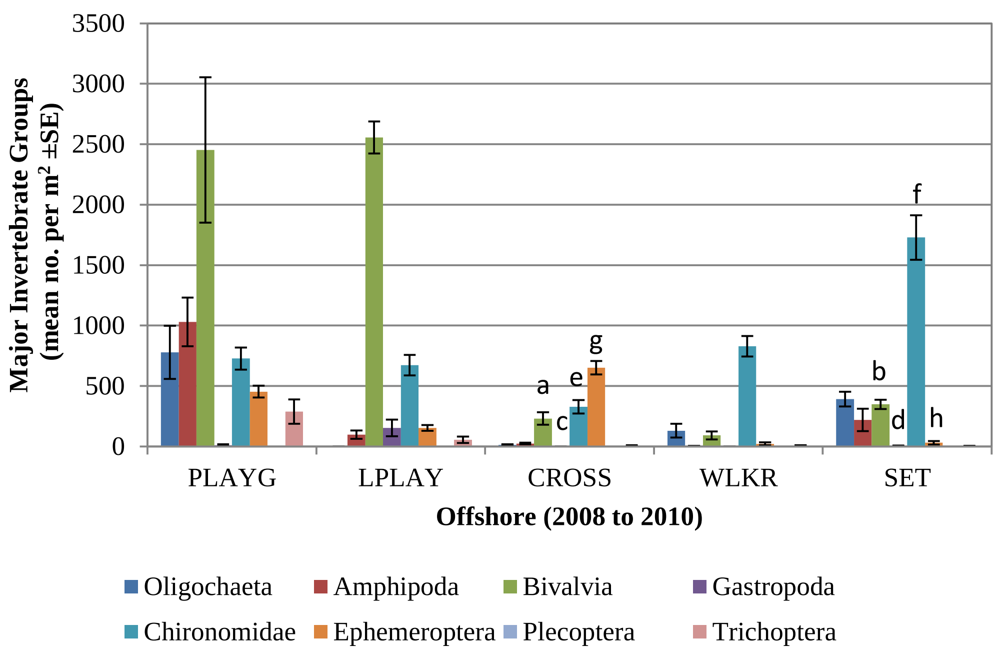


Figure 5.6.6-9. Abundances of the major invertebrate groups (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2010.

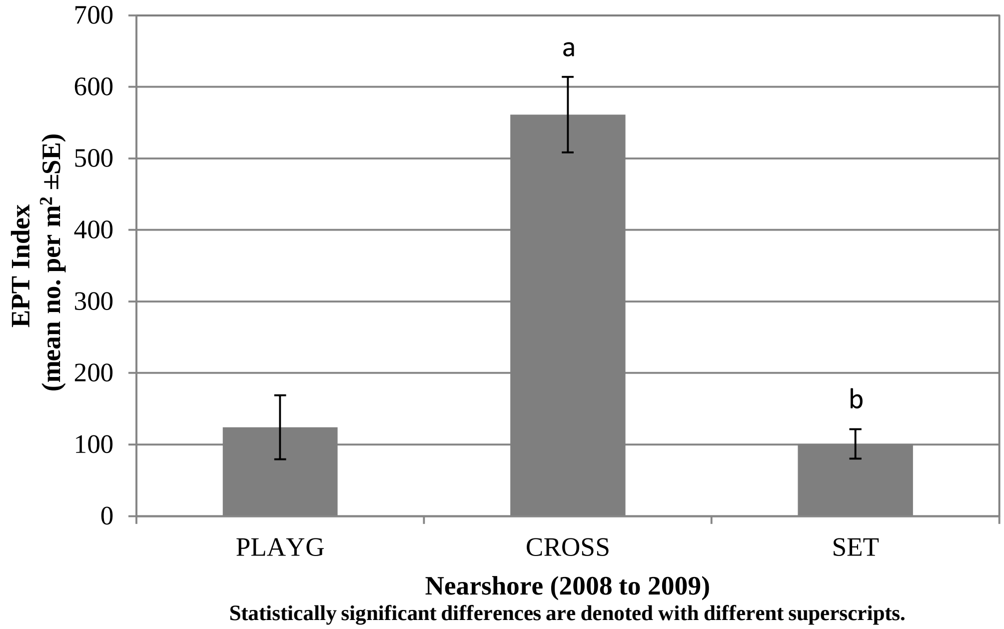


Figure 5.6.6-10. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from nearshore grab samples in CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2009.

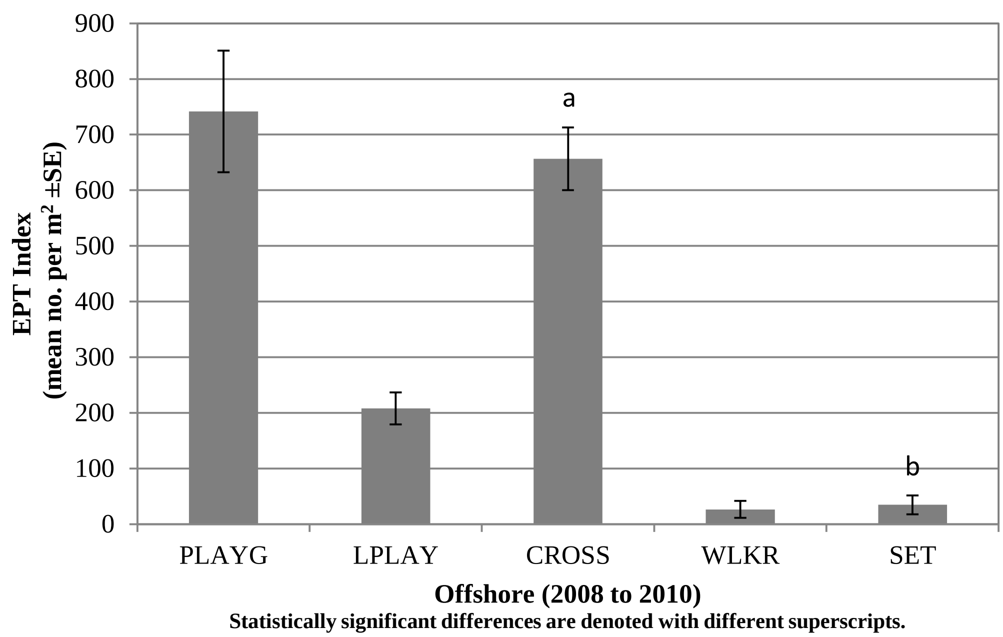


Figure 5.6.6-11. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from offshore grab samples in CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2010.

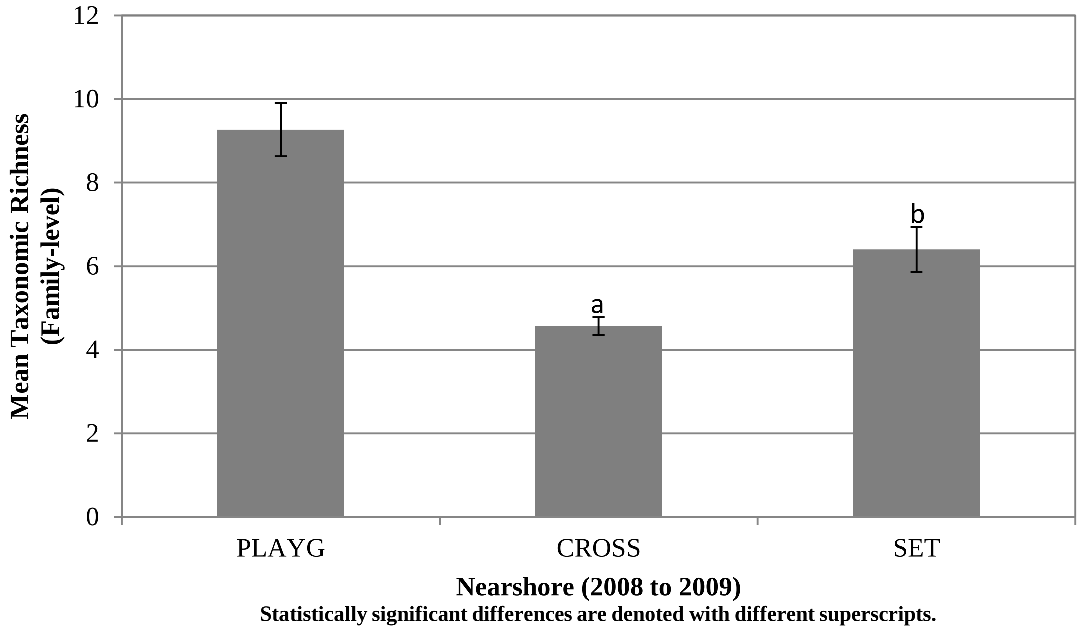


Figure 5.6.6-12. Taxa richness (mean no. of families) from benthic invertebrate grab samples collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2009.

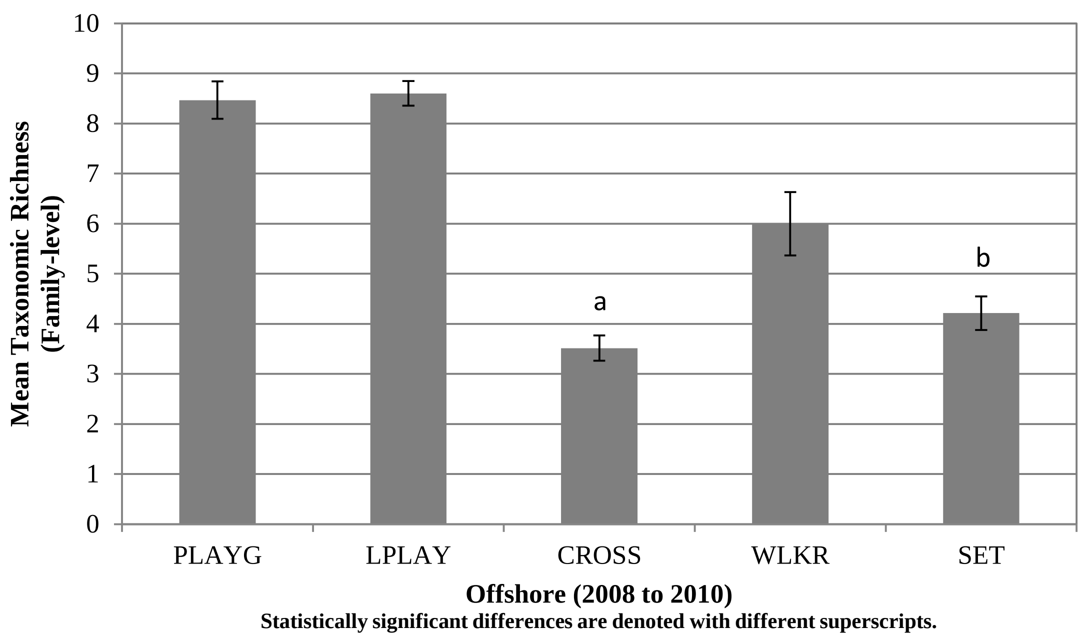


Figure 5.6.6-13. Taxa richness (mean no. of families) from benthic invertebrate grab samples collected in the offshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2009 to 2010.

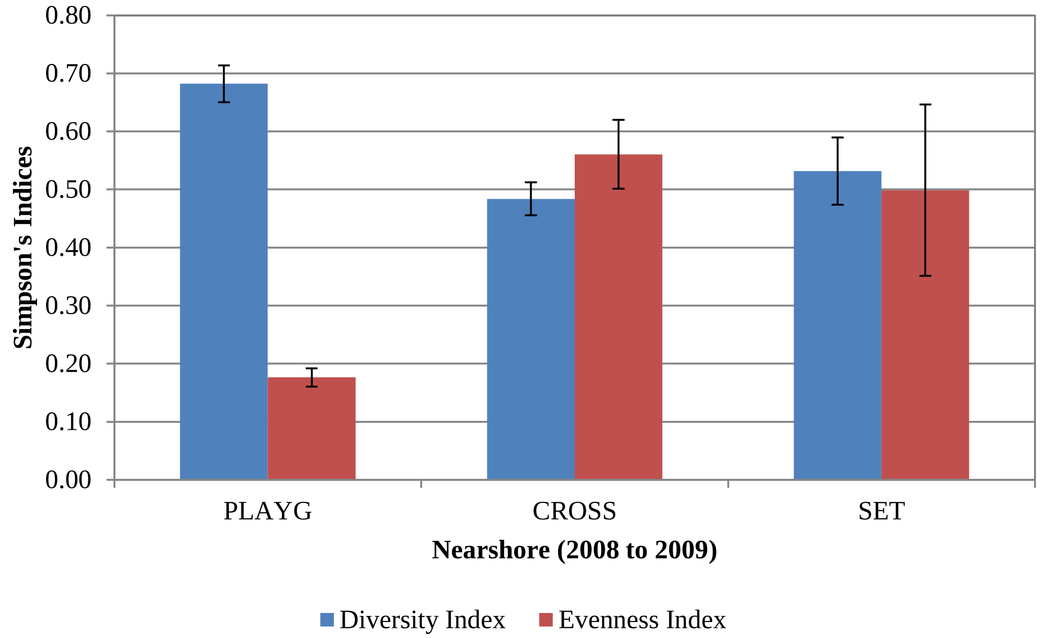


Figure 5.6.6-14. Diversity and evenness (Simpson's) indices calculated from nearshore grab samples of CAMPP waterbodies in the Upper Nelson River Region, 2008 to 2009.

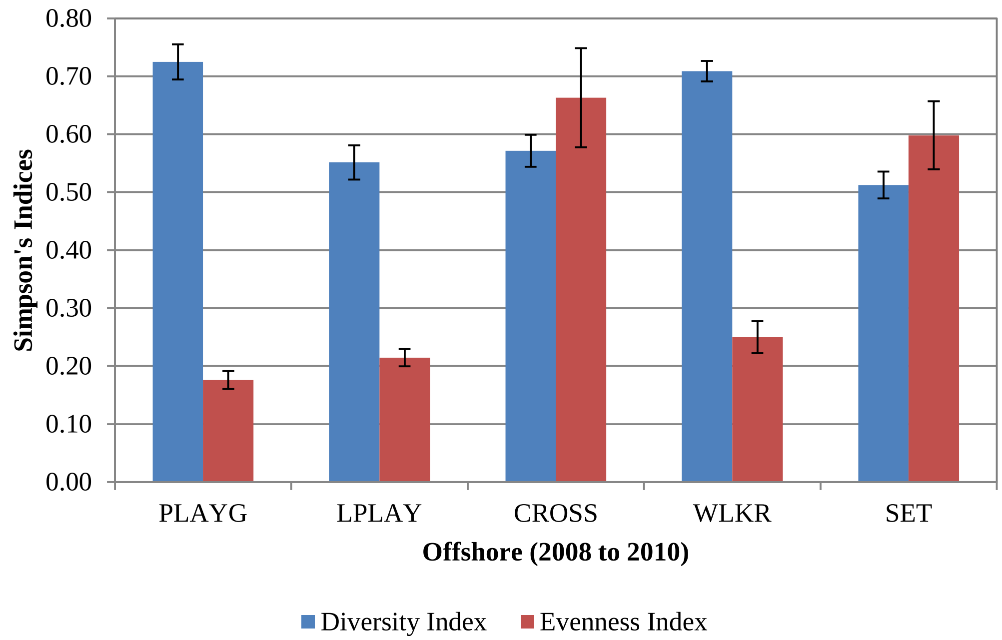


Figure 5.6.6-15. Diversity and evenness (Simpson's) indices calculated from offshore grab samples of CAMPP waterbodies within the Upper Nelson River Region, 2008 to 2010.

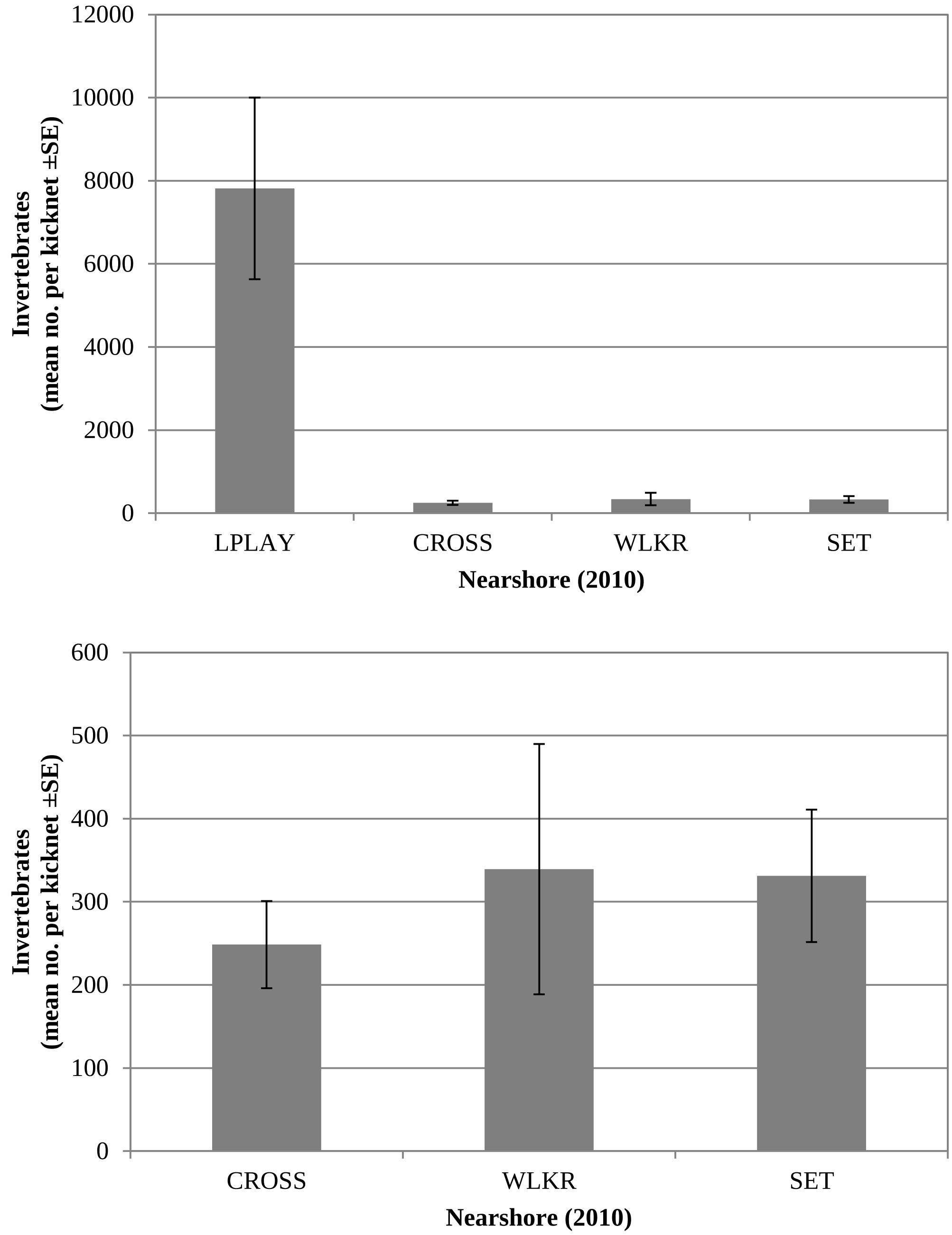
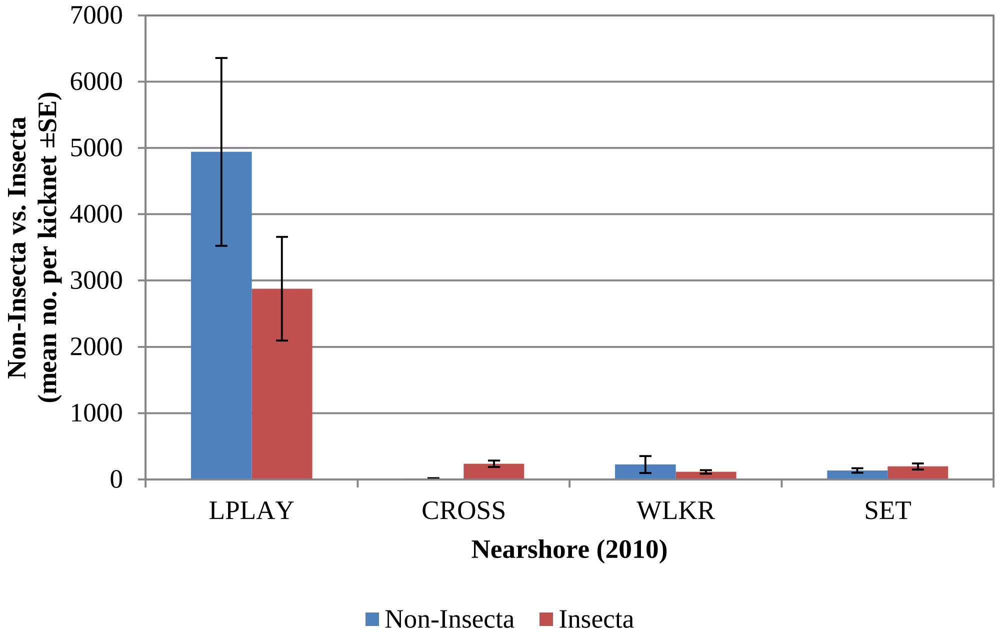


Figure 5.6.6-16. Abundances of benthic invertebrates (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2010.



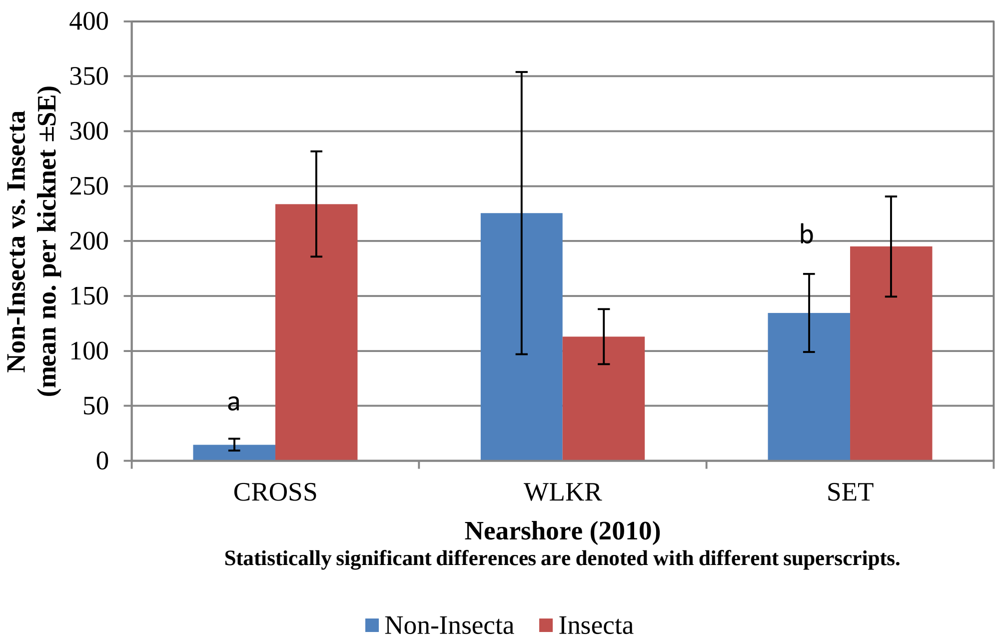


Figure 5.6.6-17. Abundances of non-insects and insects (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2010.

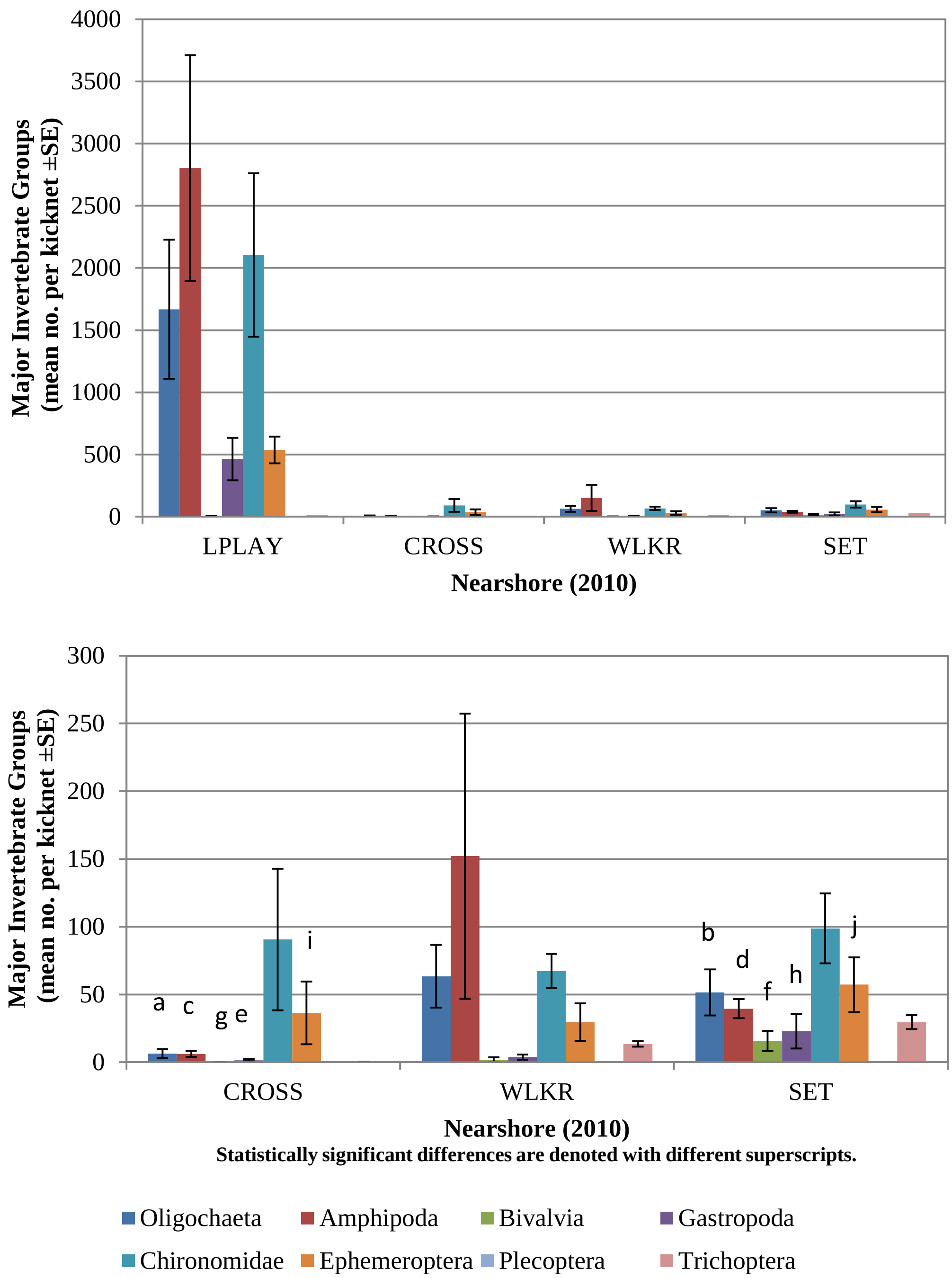
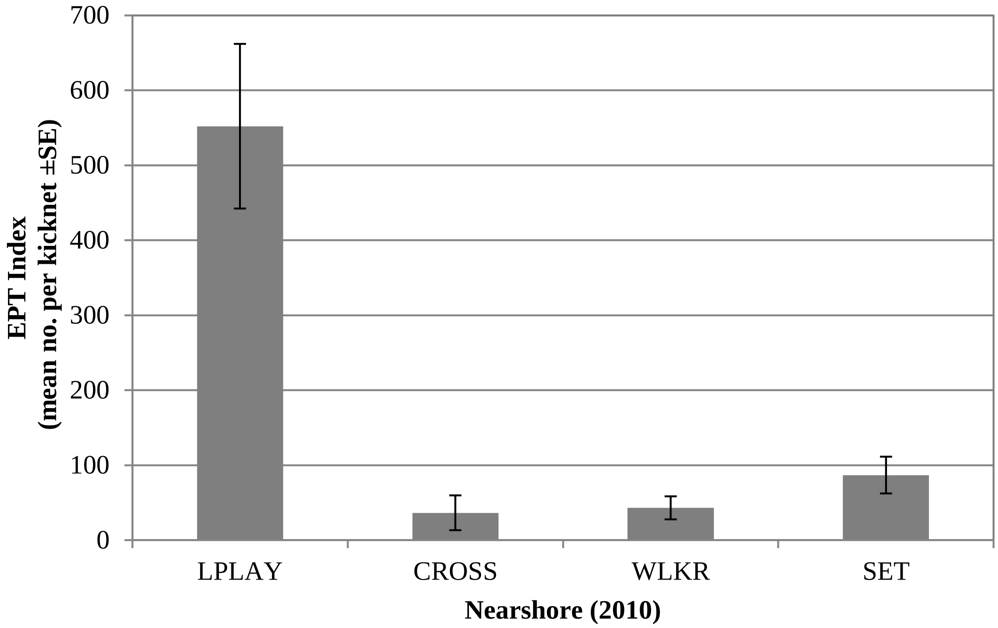


Figure 5.6.6-18. Abundances of the major invertebrate groups (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2010.



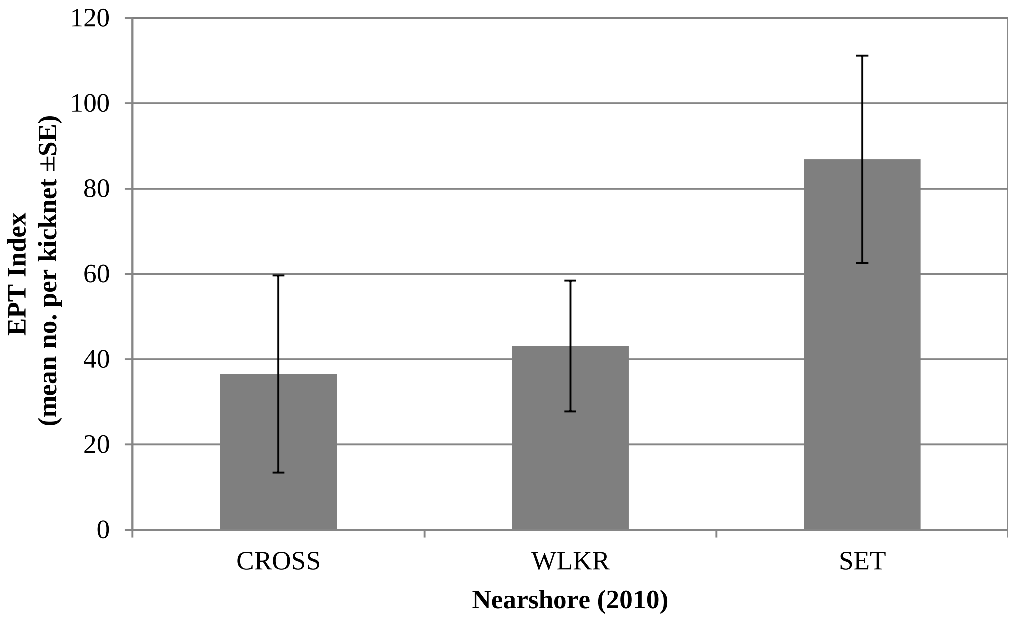


Figure 5.6.6-19. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from nearshore kicknet samples in CAMPP waterbodies in the Upper Nelson River Region, 2010.

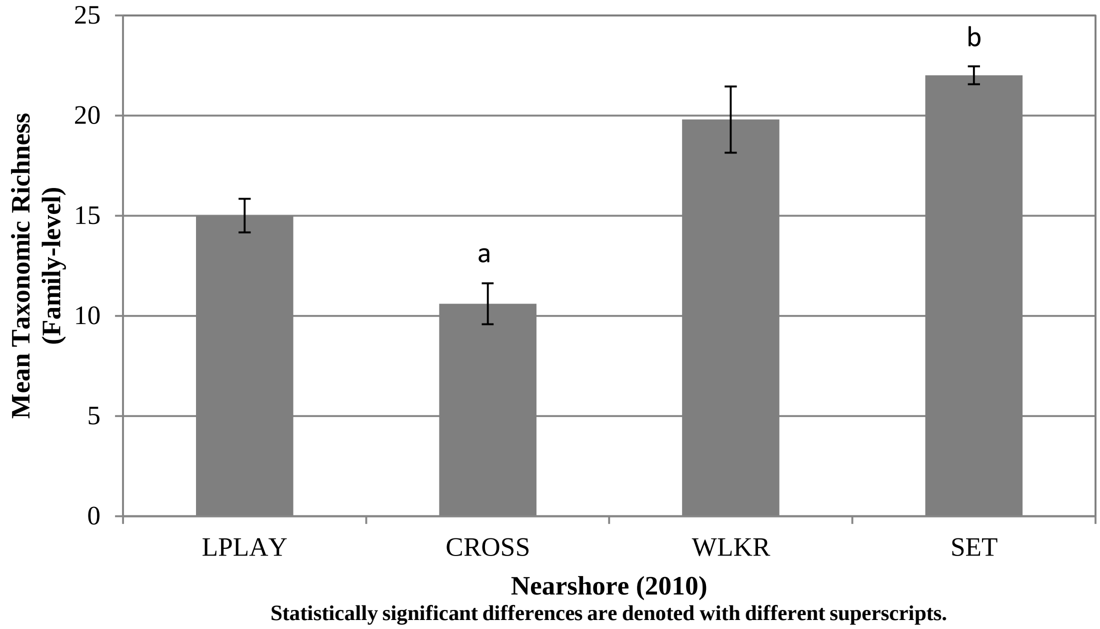


Figure 5.6.6-20. Taxa richness (mean no. of families) from benthic invertebrate kicknet samples collected in the nearshore habitat of CAMPP waterbodies in the Upper Nelson River Region, 2010.

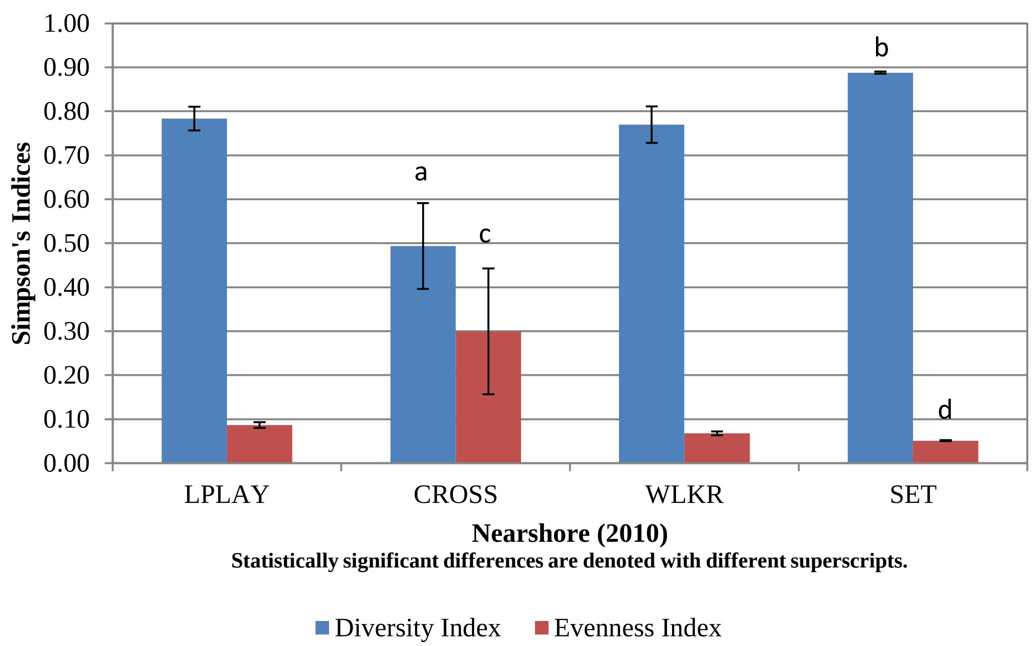


Figure 5.6.6-21. Diversity and evenness (Simpson's) indices calculated from nearshore kicknet samples of CAMPP waterbodies in the Upper Nelson River Region, 2010.

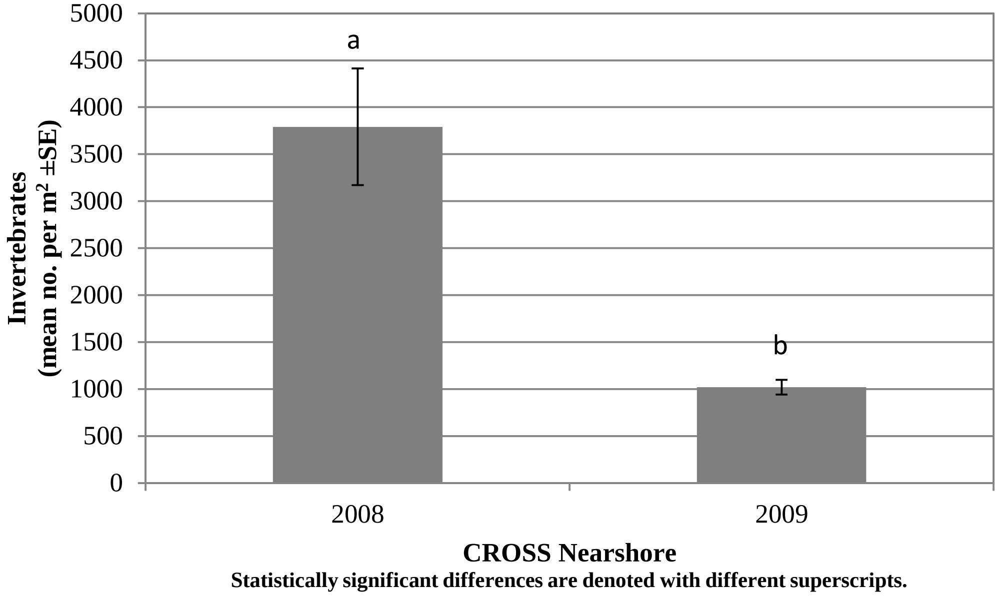


Figure 5.6.6-22. Temporal comparison of benthic invertebrate abundances (no. per m^2 ± SE) collected in the nearshore habitat of Cross Lake, 2008 to 2009.

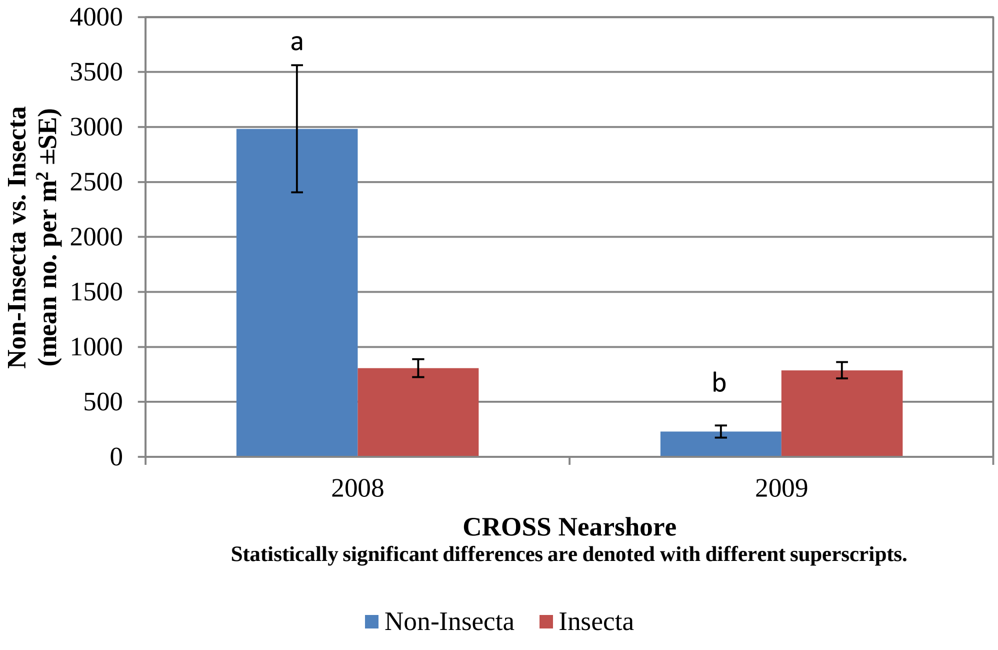


Figure 5.6.6-23. Temporal comparison of non-insect and insect abundances (no. per m^2 ± SE) collected in the nearshore habitat of Cross Lake, 2008 to 2009.

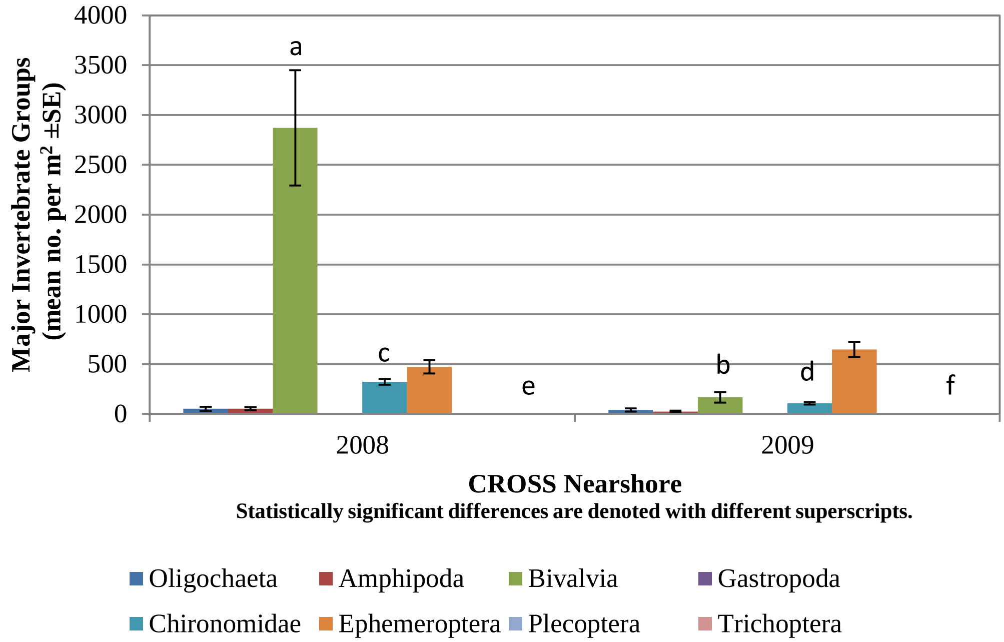


Figure 5.6.6-24. Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the nearshore habitat of Cross Lake, 2008 to 2009.

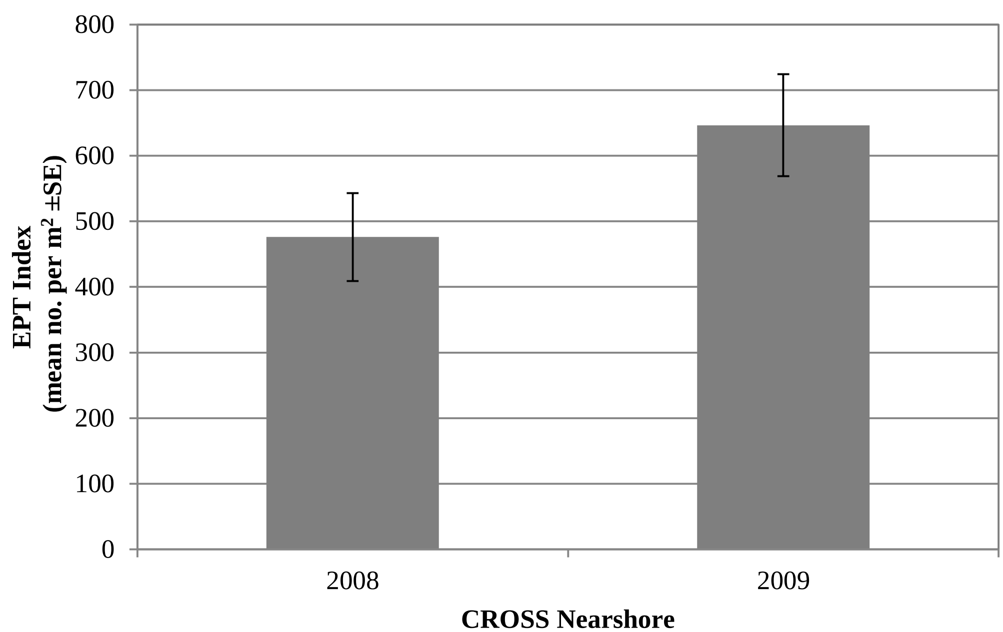


Figure 5.6.6-25. Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of nearshore grab samples from Cross Lake, 2008 to 2009.

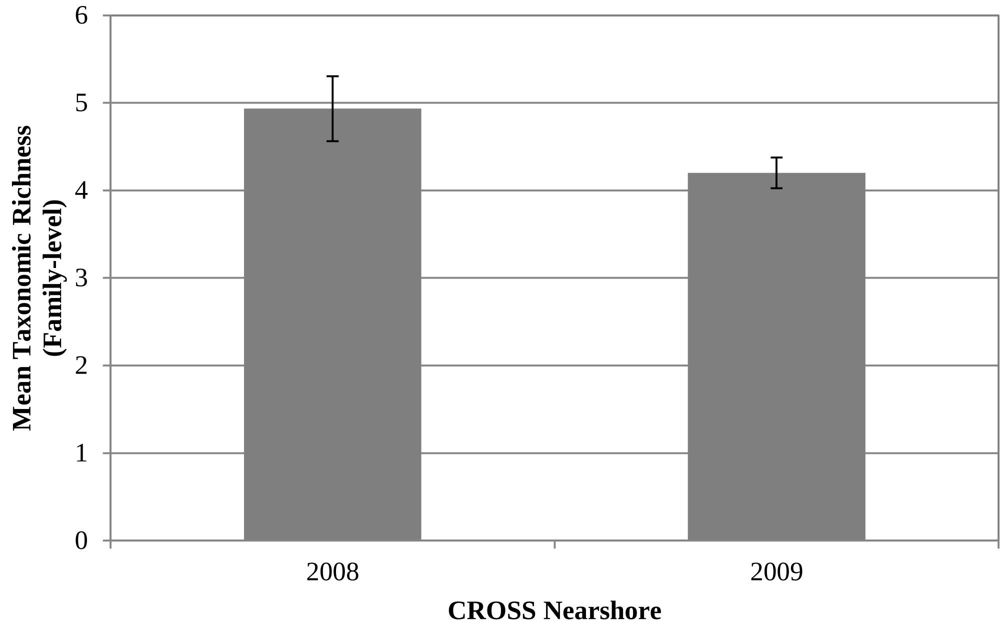


Figure 5.6.6-26. Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of nearshore grab samples from Cross Lake, 2008 to 2009.

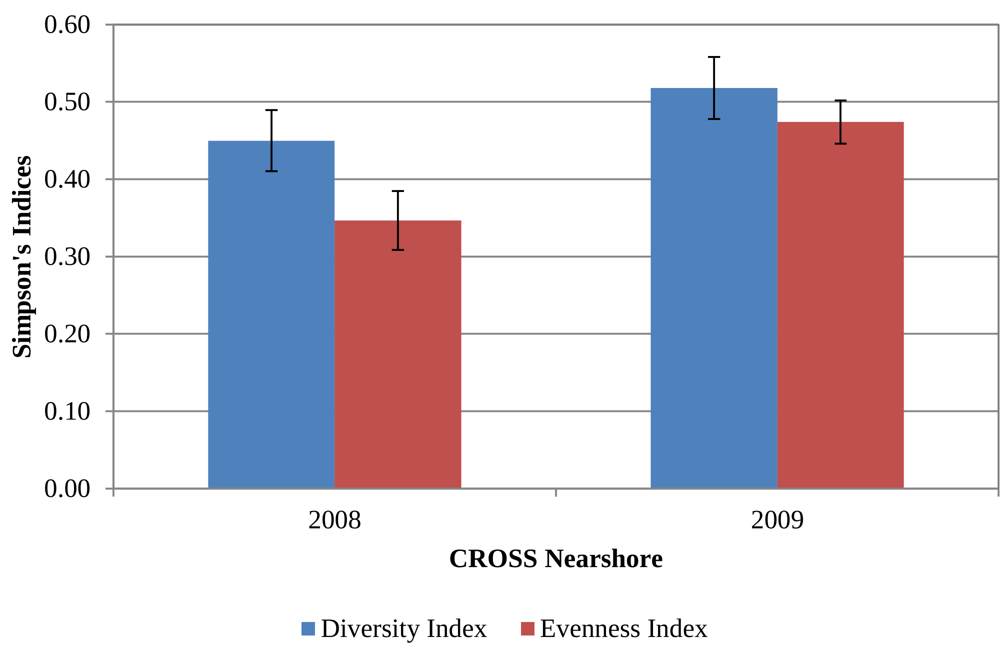


Figure 5.6.6-27. Temporal comparison of diversity and evenness (Simpson’s) indices of nearshore grab samples from Cross Lake, 2008 to 2009.

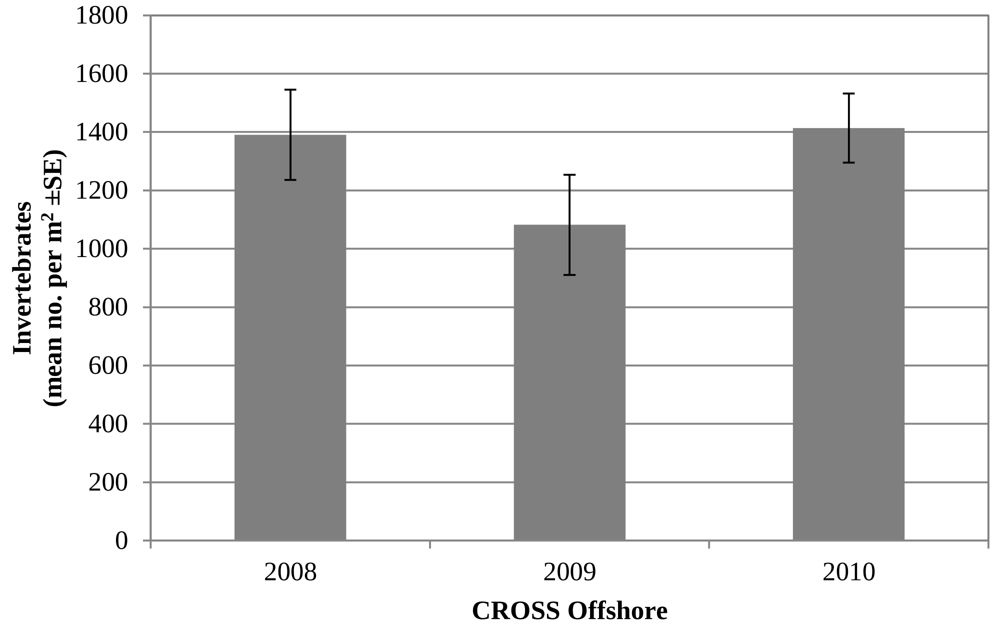


Figure 5.6.6-28. Temporal comparison of benthic invertebrate abundances (no. per $m^2 \pm$ SE) collected in the offshore habitat of Cross Lake, 2008 to 2010.

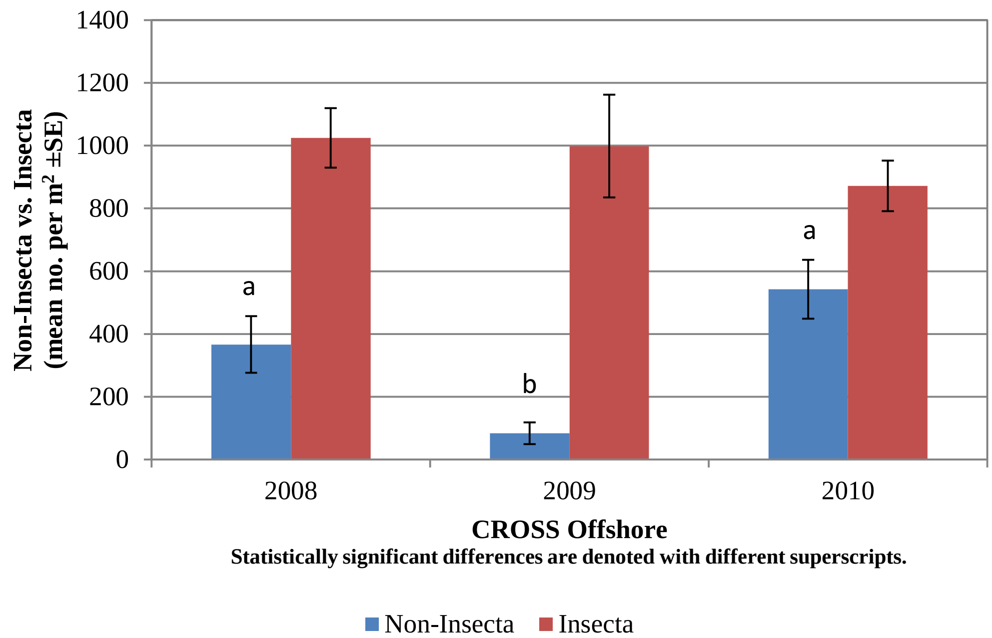


Figure 5.6.6-29. Temporal comparison of non-insect and insect abundances (no. per $m^2 \pm$ SE) collected in the offshore habitat of Cross Lake, 2008 to 2010.

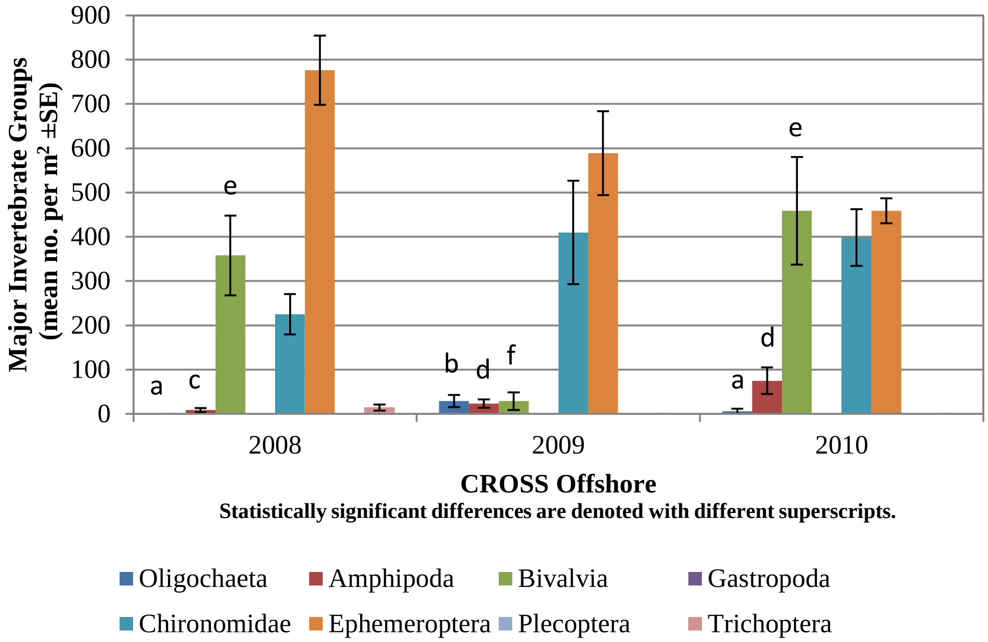


Figure 5.6.6-30. Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the offshore habitat of Cross Lake, 2008 to 2010.

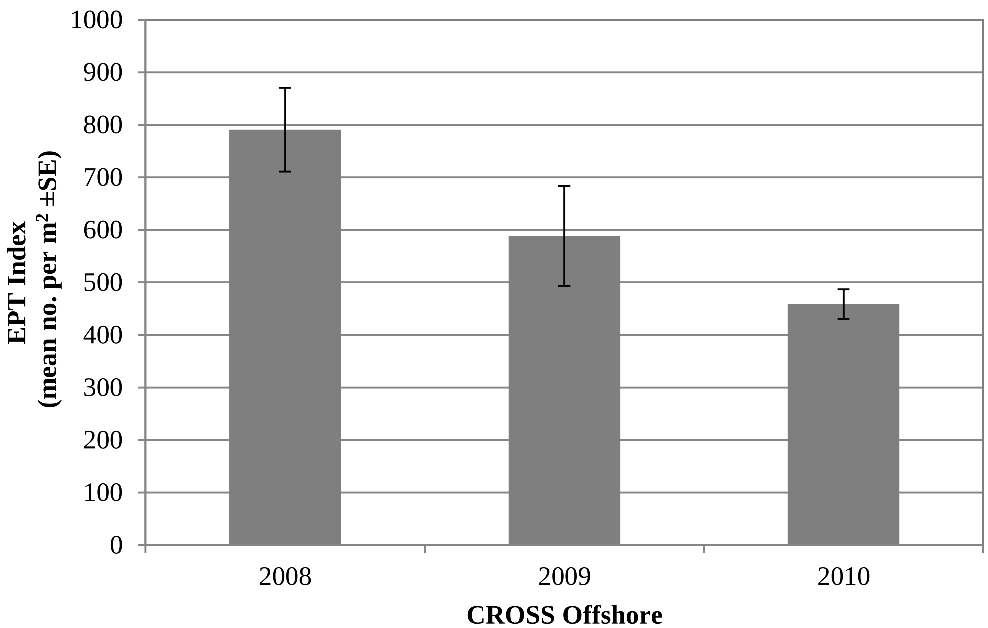


Figure 5.6.6-31. Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of offshore grab samples from Cross Lake, 2008 to 2010.

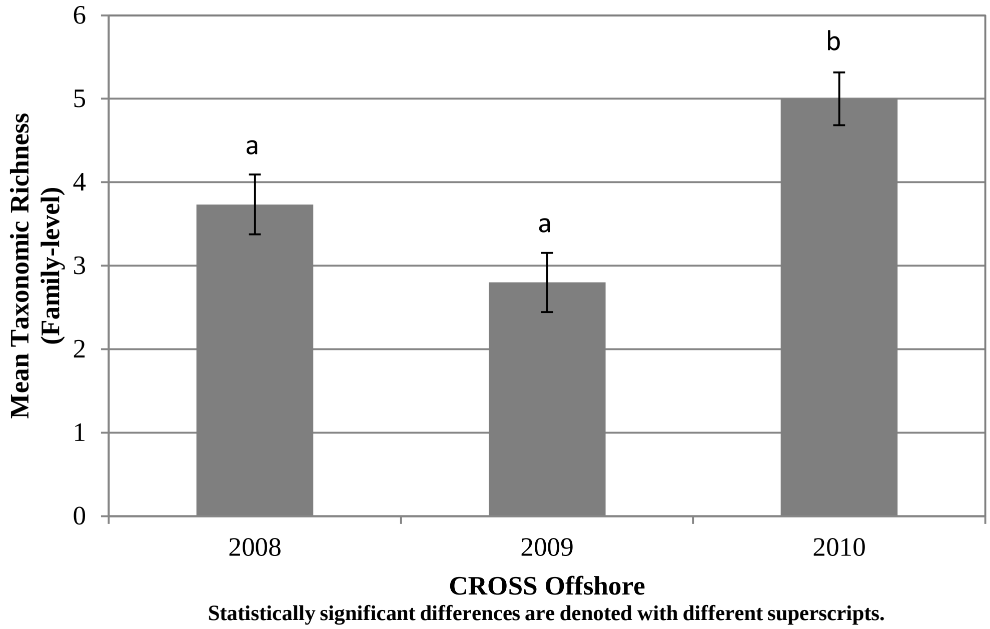


Figure 5.6.6-32. Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of offshore grab samples from Cross Lake, 2008 to 2009.

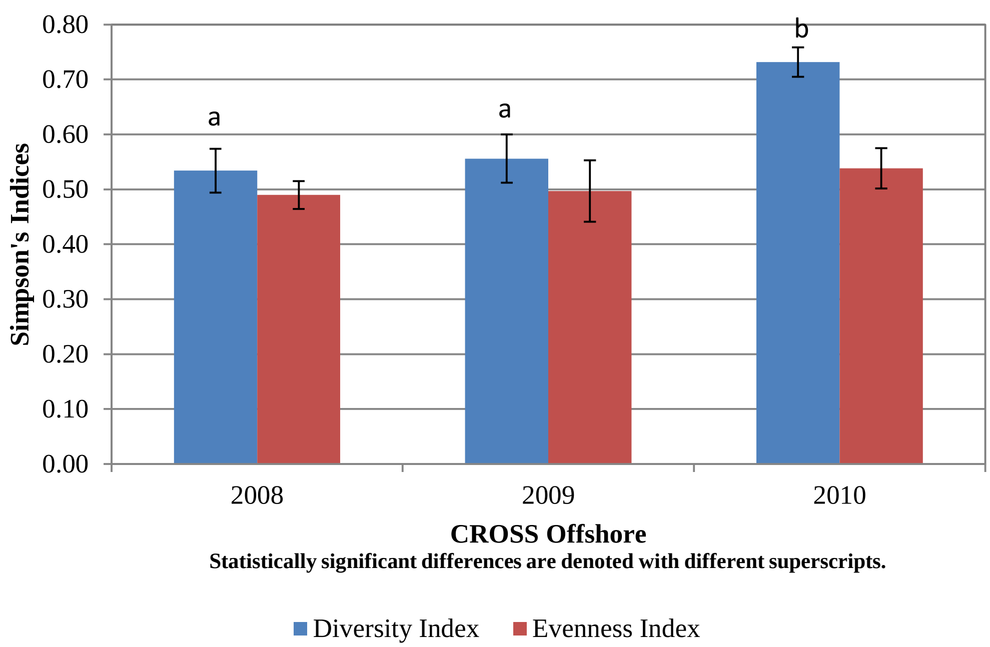


Figure 5.6.6-33. Temporal comparison of diversity and evenness (Simpson's) indices of offshore grab samples from Cross Lake, 2008 to 2010.

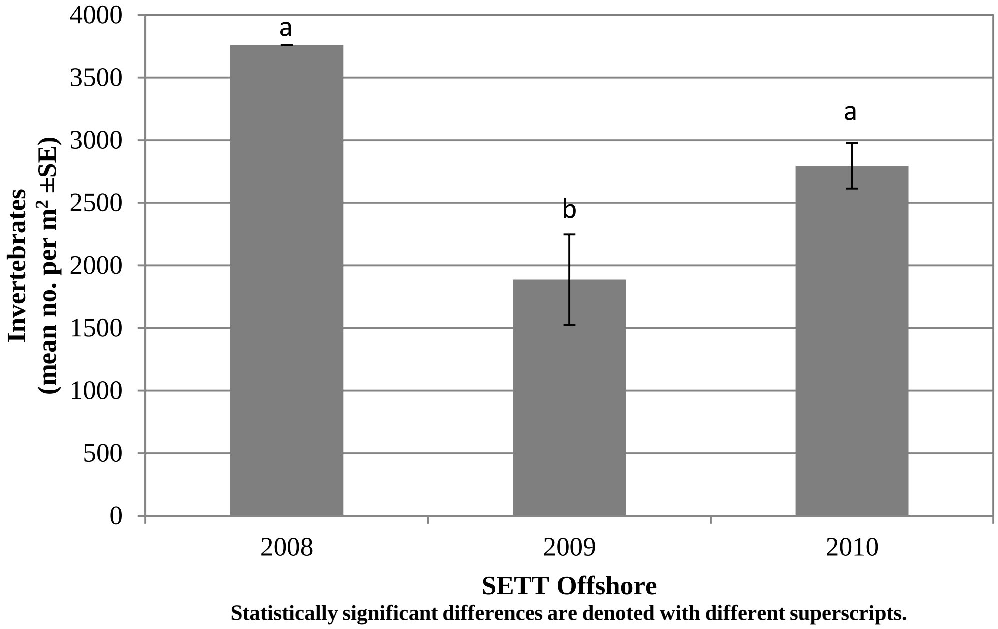


Figure 5.6.6-34. Temporal comparison of benthic invertebrate abundances (no. per m^2 ± SE) collected in the offshore habitat of Setting Lake, 2008 to 2010.

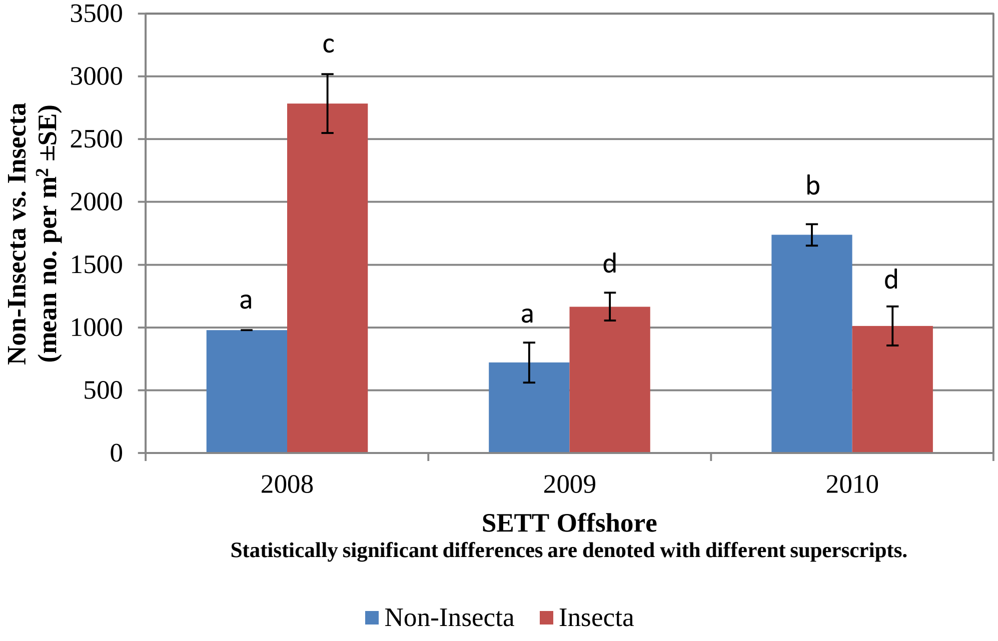


Figure 5.6.6-35. Temporal comparison of non-insect and insect abundances (no. per m^2 ± SE) collected in the offshore habitat of Setting Lake, 2008 to 2010.

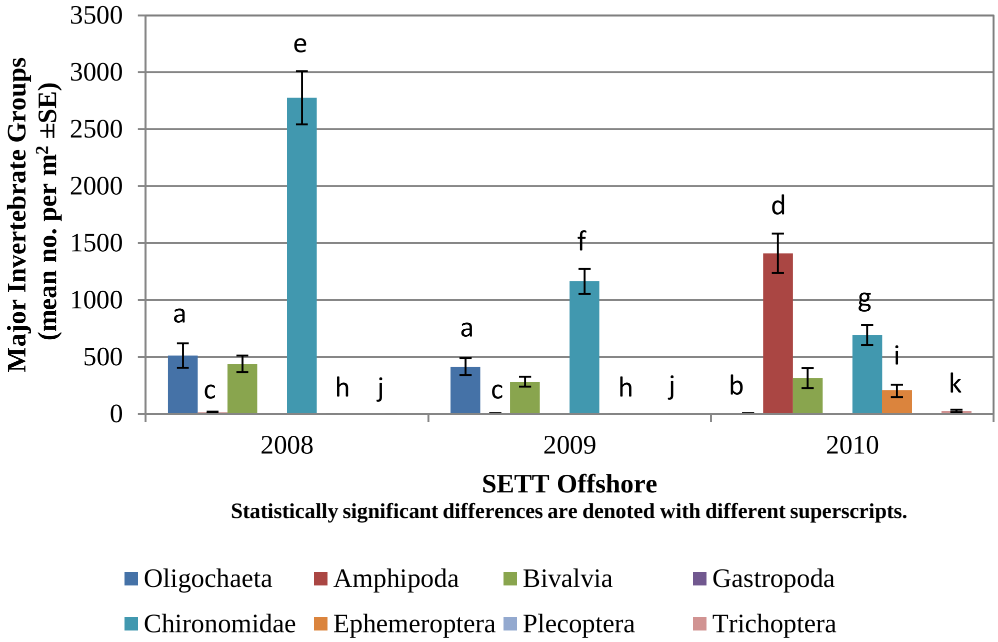


Figure 5.6.6-36. Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the offshore habitat of Setting Lake, 2008 to 2010.

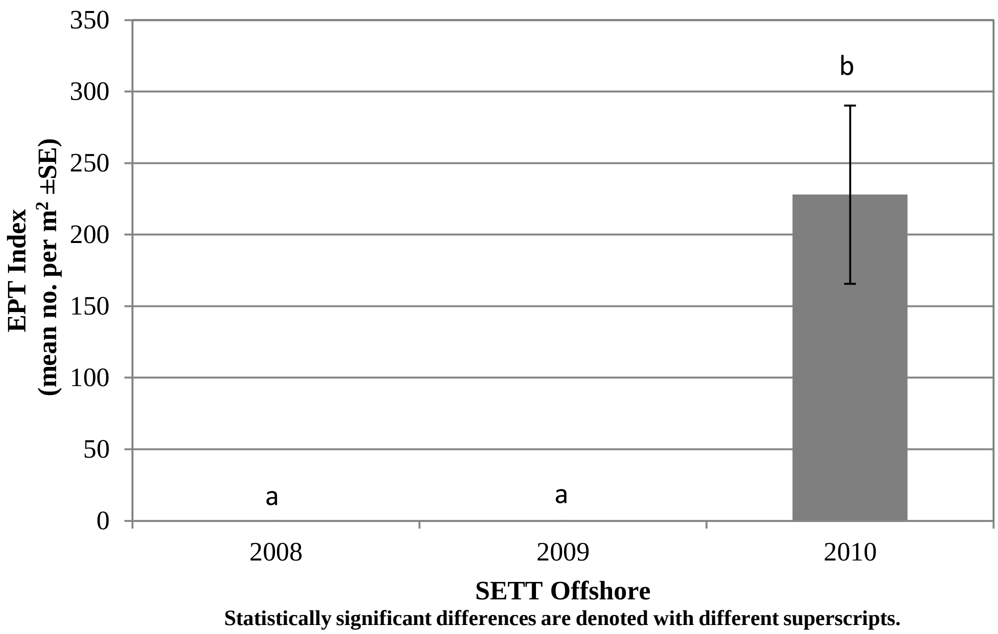


Figure 5.6.6-37. Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of offshore habitat of Setting Lake, 2008 to 2010.

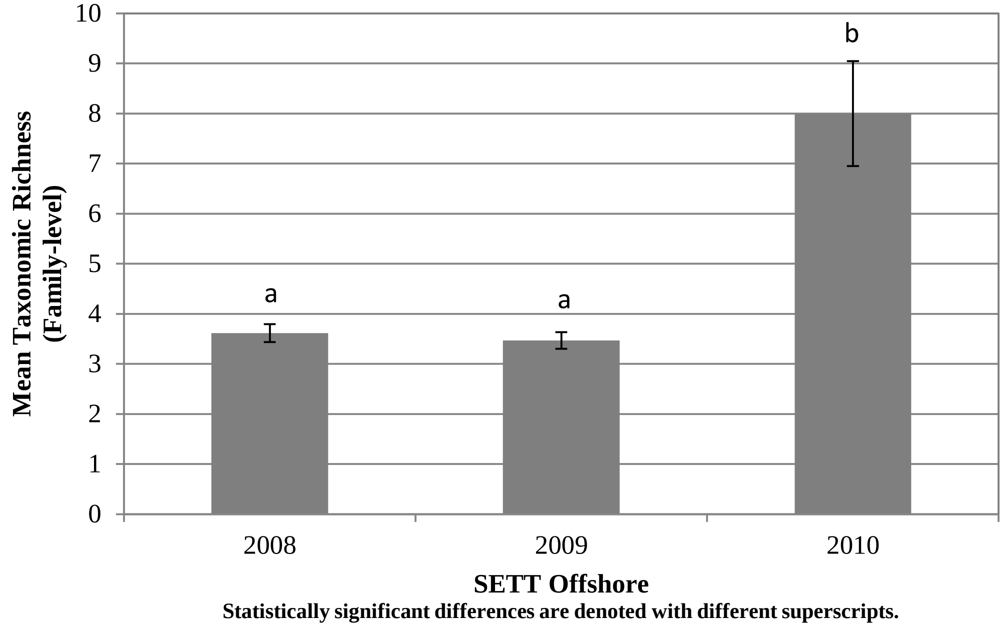


Figure 5.6.6-38. Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of offshore habitat of Setting Lake, 2008 to 2010.

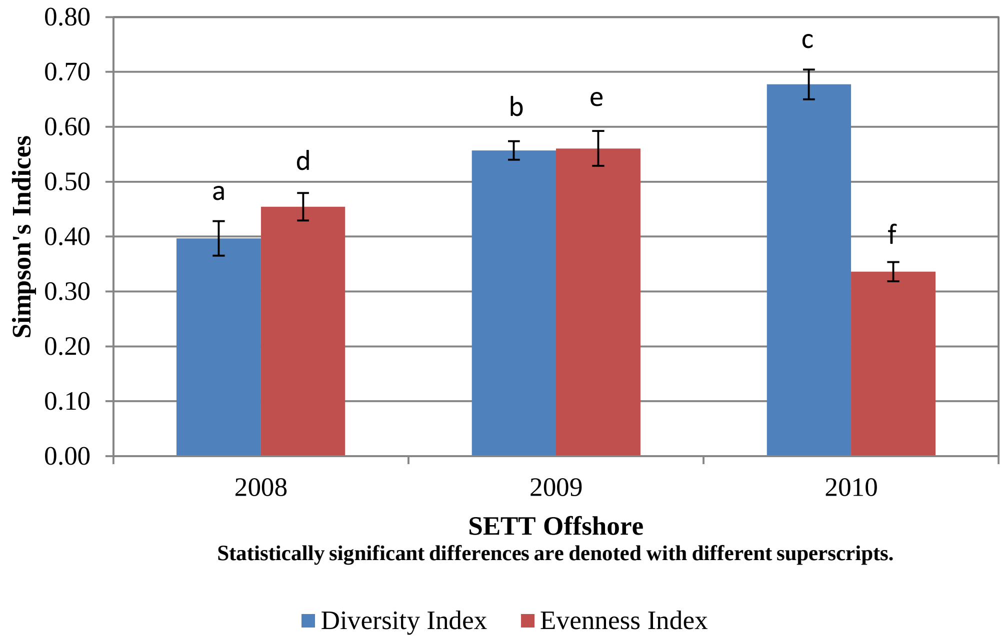


Figure 5.6.6-39. Temporal comparison of diversity and evenness (Simpson's) indices of offshore habitat of Setting Lake, 2008 to 2010.

5.6.7 Fish Communities

5.6.7.1 Overview

The following provides an overview of the fish communities present in five waterbodies within the Upper Nelson River Region sampled as part of CAMPP from 2008 to 2010. Waterbodies sampled annually included one on-system waterbody (Cross Lake) and one off-system waterbody (Setting Lake). Playgreen Lake was sampled in 2009 and 2010 because it was identified as a rotational waterbody for sampling in 2009 and also as a fish mercury sampling waterbody in 2010. In addition, the fish communities of two other rotational (sampled once every three years) waterbodies, i.e., Little Playgreen Lake (on-system) and Walker Lake (off-system) were both sampled in 2010.

Gill netting, using both standard gang and small mesh index gill nets, was conducted at a pre-determined number of sites in each waterbody and these were typically consistently fished in each of the years of study. Individual fish from each site were enumerated by species and mesh size. For selected species (i.e., Northern Pike [*Esox lucius*], Lake Whitefish [*Coregonus clupeaformis*], Sauger [*Sander canadensis*], and Walleye [*Sander vitreus*]), individual metrics were collected from all fish captured in the standard gang index gill nets. Selected metrics were also collected from Lake Sturgeon [*Acipenser fulvescens*] and White Sucker [*Catostomus commersoni*]. No individual metrics were collected from fish captured in the small mesh index gill net gangs. Metrics collected included length, weight, occurrence of deformities, erosion, lesions and tumours (DELTs), and ageing structures. The remaining species from the standard gang index gillnet catch were counted and bulk weighed to the nearest 25 g by species and mesh size. Fish from the small mesh index gill nets were not separated by mesh size, but were separated on the basis of species, counted and bulk weighed to the nearest 25 g (large bodied species) or 1 g (small bodied species).

Overall, the fish assemblage in all on-system waterbodies was found to be dominated by White Sucker and Walleye. The fish community in Setting Lake (off-system) was found to be dissimilar in some respects to that found in the on-system waterbodies. In addition to the absence of Rainbow Smelt (*Osmerus mordax*), Freshwater Drum (*Aplodinotus grunniens*) was absent from the Setting Lake catch but was captured in all on-system waterbodies. As well, Emerald Shiner (*Notropis atherinoides*) was captured in Setting Lake but was not detected elsewhere in the Region. Similarly, the other off-system waterbody, Walker Lake, lacked Rainbow Smelt and included Emerald Shiner, however, Freshwater Drum were present but in low numbers.

The annual upper Nelson River waterbodies were found to have relatively similar CPUE values for total catch. White Sucker was more abundant in Playgreen Lake and Little Playgreen Lake than in all other waterbodies. CPUE values for the small mesh index gill nets were similar with the exception of Emerald Shiner and Rainbow Smelt, both of which had much higher CPUEs in Playgreen Lake than other waterbodies in the Region.

Relatively strong Northern Pike year classes were apparent in 2004, 2005 and 2006 for all on-system waterbodies except Playgreen Lake where strong year classes were observed from 2001 to 2005. For Walleye, strong year classes in 2002 and 2003 were noted for all waterbodies in the Region except Walker Lake. In the latter case limited data precluded determination of year-class strength. Age data for Lake Whitefish were insufficient to allow year-class strength determination.

The incidence rate for deformities, erosion, lesions and tumours in species of management interest ranged from 0.8 – 2.5% in on-system waterbodies. The overall incidence rate in Setting Lake was 0.3% and for Walker Lake it was 2.1%.

Comparisons were undertaken for the three waterbodies sampled in multiple years to provide a preliminary assessment of temporal variability. All three waterbodies showed little variability in standard gang index gillnet CPUE values between years. With respect to the catch from the small mesh index gill nets, the CPUE for Playgreen Lake increased between 2009 and 2010 due to substantial increases in the number of Spottail Shiner (*Notropis hudsonius*), Rainbow Smelt, and Emerald Shiner captured. In Cross Lake there was little variability between years and in Setting Lake small mesh index gillnet CPUE fluctuated from 68.4 in 2008 to 21.1 in 2009 then increased again in 2010 to 84.4. As additional data are acquired, more formal trend analysis will be undertaken to evaluate any potential long-term changes.

Index of Biotic Integrity is one measure of overall biological condition of a waterbody. IBI scores were relatively similar for all waterbodies sampled in the region with Walker Lake having the lowest value, followed closely by Little Playgreen Lake. Playgreen Lake, Cross Lake and Setting Lake all had very similar scores suggesting that they had the healthiest overall fish community conditions of waterbodies sampled in the region.

5.6.7.2 Gill netting

Playgreen Lake was sampled with standard gang index gill nets at 17 sites in early June, 2009 and at 14 sites in late June, 2010 (Table 5.6.7-1, Figure 5.6.7-1). Little Playgreen Lake was sampled at 10 sites in mid-June, 2010 while Cross Lake was sampled at 12 sites by standard gill nets in mid- to late August in each of 2008, 2009 and 2010 (Table 5.6.7-1, Figures 5.6.7-2 and

5.6.7-3). Walker Lake was sampled at nine sites in late August, 2010 (Table 5.6.7-1, Figure 5.6.7-4). Setting Lake was sampled in each of 2008, 2009, and 2010 by standard gill net in either late August or early September at 14, 14, and 16 sites respectively (Table 5.6.7-1, Figure 5.6.7-5).

Small mesh index gill nets were attached to the smallest mesh end of the standard gill net set in Playgreen Lake at five of the 17 sites in 2009 and four of the 14 sites in 2010 in order to sample the small bodied fish community. Similarly, small mesh nets were set in three of the 10 sites in Little Playgreen Lake, four of the 12 sites in Cross Lake and three of the 9 sites in Walker Lake. In Setting Lake, four and three of the 14 sites had small mesh nets in 2008 and 2009, respectively, while four of 16 sites were sampled with small mesh nets attached in 2010.

5.6.7.3 Species Composition

A comprehensive list of all fish species captured, including common and scientific names, family, and identification code, for all Upper Nelson River Region waterbodies is provided in Table 5.6.7-2.

Playgreen Lake

A total of 2,020 fish representing 14 species were captured in standard gang index gill nets set in Playgreen Lake in 2009 and 2010 (Table 5.6.7-3). The most common species captured in standard gang index gill nets was White Sucker (42.9%) and the next three most common species were Northern Pike (13.3%), Walleye (12.8%) and Yellow Perch (*Perca flavescens*) (11.6%) (Table 5.6.7-3; Figure 5.6.7-6). The biomass of these fish (n=2,019) was 1,908,867 g (Table 5.6.7-4). White Sucker accounted for the highest proportion of total biomass (40.0%), followed by Northern Pike (35.0%) and Walleye (15.0%) (Table 5.6.7-4).

For the small mesh index gill nets, a total of 3,032 fish representing 11 species were captured (Table 5.6.7-5). Spottail Shiner was the most common species captured (60.6%) while Rainbow Smelt (18.3%) and Emerald Shiner (14.2%) were also abundant (Table 5.6.7-5, Figure 5.6.7-6). The biomass of the catch (n = 3,032) was 47,355 g (Table 5.6.7-6). For small-bodied fish species captured in the small mesh index gill net, Spottail Shiner accounted for the highest proportion of total biomass (21.8%) followed by Rainbow Smelt (13.9%) (Table 5.6.7-6).

Little Playgreen Lake

A total of 734 fish representing 11 species were captured in standard gang index gill nets set in Little Playgreen Lake in 2010 (Table 5.6.7-3). The most common species captured in standard gang index gill nets was White Sucker (relative abundance = 52.0%) followed by Northern Pike

(16.9%) and Walleye (15.4%) (Table 5.6.7-3; Figure 5.6.7-7). The biomass value of the overall catch (n = 734) was 782,659 g (Table 5.6.7-4). White Sucker accounted for the highest proportion of total biomass at 54.7%, again followed by Northern Pike (22.3%) and Walleye (14.7%) (Table 5.6.7-4).

For the small mesh index gill nets, a total of 2,719 fish representing nine species were captured (Table 5.6.7-5). Spottail Shiner was the most common species (91.8%) followed by Emerald Shiner (2.6%) and Troutperch (*Percopsis omiscomaycus*) (2.4%) (Table 5.6.7-5; Figure 5.6.7-7). The biomass value of the overall catch (n = 2,719) was 20,219 g (Table 5.6.7-6). Spottail Shiner accounted for the highest proportion of total biomass (68.0%) of all small-bodied species captured in the small mesh index gill nets (Table 5.6.7-6).

Cross Lake

For all years combined, a total of 1,420 fish representing 12 species were captured in standard gang index gill nets set in Cross Lake (Table 5.6.7-3). The number of species captured ranged from a low of nine in 2009 and 2010 to a high of 11 species in 2008. The most common species captured in standard gang index gill nets was Walleye (31.3%) followed by Northern Pike (25.9%) (Table 5.6.7-3; Figure 5.6.7-8). The biomass value of the overall catch (n = 1420) was 1,381,161 g (Table 5.6.7-4). Northern Pike had the highest biomass value accounting for 40.4% of the total biomass followed by Walleye (30.9%) (Table 5.6.7-4).

For the small mesh index gill nets for all years combined, a total of 1,494 fish representing 10 species were captured (Table 5.6.7-5). Yellow Perch was the most common species captured for all years combined (44.2%), followed by Spottail Shiner (42.0%) (Table 5.6.7-5, Figure 5.6.7-8). The biomass value of the overall catch (n = 1,494) was 32,057 g (Table 5.6.7-6). For small-bodied fish species from the small mesh index gillnet catch, Yellow Perch accounted for the highest proportion of total biomass (23.9%) of all small-bodied fish species captured in the small mesh index gillnet catch, followed by Spottail Shiner (7.2%) (Table 5.6.7-6).

Walker Lake

A total of 276 fish representing eight species were captured in standard gang index gill nets set in Walker Lake in 2010 (Table 5.6.7-3). The most common species captured in standard gang index gill nets was White Sucker (46.7%) followed by Cisco (*Coregonus artedi*) (22.8%) (Table 5.6.7-3; Figure 5.6.7-9). The biomass value of the overall catch (n = 276) was 207,023 g (Table 6.6.7-4). White Sucker accounted for the highest proportion of total biomass for fish species captured in standard gang index gill nets (63.5%), followed by Northern Pike (17.8%) (Table 5.6.7-4).

For small mesh index gill nets, a total of 165 fish representing eight species were captured (Table 5.6.7-5). Spottail Shiner was the most common species (49.1%) followed by Yellow Perch (28.5%) (Table 5.6.7-5, Figure 5.6.7-9). The biomass value of the overall catch (n = 165) was 8,070 g (Table 5.6.7-6). For small-bodied fish species from the small mesh index gillnet catch, Yellow Perch accounted for the highest proportion of total biomass (12.3%), followed by Spottail Shiner (4.9%) (Table 5.6.7-6).

Setting Lake

For all years combined, a total of 3,792 fish representing 11 species were captured in standard gang index gill nets set in Setting Lake (Table 5.6.7-3). The number of species captured ranged from a low of 10 in both 2008 and 2009 to a high of 11 species in 2010. The most common species captured in standard gang index gill nets was Cisco (24.3%), followed by Walleye (21.0%) and White Sucker (15.9%) (Table 5.6.7-3; Figure 5.6.7-10). The biomass value of the overall catch (n = 3,792) was 2,017,798 g (Table 5.6.7-4). White Sucker accounted for the highest proportion of total biomass (29.3%), followed by Walleye (19.9%), Cisco (14.8%) and Longnose Sucker (*Catostomus catostomus*) (12.9%) (Table 5.6.7-4).

For the small mesh index gill nets all years combined, a total of 690 fish representing 10 species were captured (Table 5.6.7-4). The number of species captured ranged from a low of seven in 2009 to a high of 10 species in 2008. Spottail Shiner was the most common species captured (38.7%) (Table 5.6.7-5; Figure 5.6.7-10). Sauger (21.5%) and Emerald Shiner (13.9%) were also abundant in catches for all years combined. The biomass value of the overall catch (n = 690) was 55,368 g (Table 5.6.7-6). Spottail Shiner accounted for the highest proportion of total biomass of all small-bodied fish species captured in the small mesh index gill nets (3.6%) followed by Emerald Shiner (2.1%) (Table 5.6.7-6).

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

Playgreen Lake

Mean CPUE (n = 2,020) and BPUE (n = 2,019) for the standard gang index gillnet catch in Playgreen Lake were 70.0 fish and 53,291 g, respectively (Tables 5.6.7-7 and 5.6.7-8). Overall CPUE and BPUE values were lowest in 2009 (59.6 and 44,507 g) and highest in 2010 (80.4 and 62,074 g) for the standard gang index gillnet catch in Playgreen Lake (Tables 5.6.7-7 and 5.6.7-8, Figures 5.6.7-11 and 5.6.7-12). The highest individual species' CPUE values for the standard gang index gill net catch (all years combined) in Playgreen Lake were recorded for White Sucker (31.5) (Table 5.6.7-7, Figure 5.6.7-13). The highest individual species' BPUE values for the standard gang index gillnet catch (all years combined) in Playgreen Lake were recorded for White Sucker (22,787 g) followed by Northern Pike (17,825 g) (Table 5.6.7-8, Figure 5.6.7-14).

For the small mesh index gillnet catch, the all years combined CPUE and BPUE values were 488.4 fish and 7,058 g, respectively (Tables 5.6.7-9 and 5.6.7-10). The lowest overall CPUE value was recorded in 2009 at 96.3 fish while the 2010 value was 880.5 (Table 5.6.7-9, Figure 5.6.7-11). The total BPUE values for the small mesh index gillnet catch were also higher in 2010 than 2009 at 10,338 and 6,634 g, respectively (Table 5.6.7-10, Figure 5.6.7-12). The highest CPUE and BPUE values for individual species were recorded for Spottail Shiner (302.7 fish and 1,709 g), followed by Rainbow Smelt (86.3 fish and 1,029 g) and Emerald Shiner (71.4 fish and 387 g) (Tables 5.6.7-9 and 5.6.7-10, Figures 5.6.7-13 and 5.6.7-14).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined as captured in standard gang index gill nets in 2009 and 2010 are provided in Figures 5.6.7-15 and 5.6.7-16. Northern Pike were captured at all but one site while Lake Whitefish were captured at just over half of the sites. Walleye were captured at all but two sites. The CPUE values for Northern Pike were fairly consistent between sites while BPUE values were more variable. For Lake Whitefish the CPUE and BPUE were low at all sites. Walleye CPUE and BPUE values were low at most sites; however, there were a few sites with higher values. CPUE and BPUE values for all fish combined were variable, both between sites and between years for certain sites.

Little Playgreen Lake

Total CPUE and BPUE for 734 fish of 11 species captured in standard index gill nets set in Little Playgreen Lake in 2010 was 80.3 fish and 68,579 g, respectively (Tables 5.6.7-7 and 5.6.7-8, Figures 5.6.7-11 and 5.6.7-12). The highest individual species' CPUE and BPUE values for the 2010 standard gang index gillnet catch in Little Playgreen Lake were recorded for White Sucker (42.0 fish [37,639 g]), Northern Pike (13.6 fish [15,324 g]), and Walleye (12.3 fish [10,008 g]) (Tables 5.6.7-7 and 5.6.7-8, Figures 5.6.7-13 and 5.6.7-14).

For the small mesh index gill nets, total CPUE and BPUE for 2,719 fish of nine species was 1,175.3 fish and 8,548 g (Tables 5.6.7-9 and 5.6.7-10, Figures 5.6.7-11 and 5.6.7-12). The highest individual species' CPUE value was recorded for Spottail Shiner (1078.2 fish) followed by Emerald Shiner (30.4 fish) and Troutperch (29.4 fish) (Table 5.6.7-9, Figure 5.6.7-13). The highest BPUE values for small-bodied fish species were recorded for Spottail Shiner (5,936 g) and Yellow Perch (339 g) (Table 5.6.7-10, Figure 5.6.7-14).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined as captured in standard gang index gill nets are provided in Figures 5.6.7-17 and 5.6.7-18, respectively. Walleye and Northern Pike were captured at all sampling sites in Little Playgreen Lake while Lake Whitefish was captured only at two sites. The CPUE and BPUE values for Northern Pike and Walleye were similar between sites. CPUE and BPUE values for all fish combined were also similar between sites.

Cross Lake

Total overall CPUE and BPUE for the standard gang index gillnet catch in Cross Lake was 38.1 fish and 29,597 g (Tables 5.6.7-7 and 5.6.7-8). Total CPUE and BPUE values were similar between each year of study for both the standard gang index gill net and small mesh index gillnet catches (Tables 5.6.7-7 and 5.6.7-8, Figures 5.6.7-11 and 5.6.7-12). The overall CPUE and BPUE values for the standard gang index gill net were highest in 2008 at 47.7 fish and 37,704 g and lowest in 2009 at 31.3 fish and 24,084 g. The highest individual species' CPUE values for the standard gang index gillnet catch (all years combined) in Cross Lake were recorded for Walleye (11.9 fish) and Northern Pike (9.8 fish) (Table 5.6.7-7, Figure 5.6.7-13). The highest BPUE values were recorded for Northern Pike (11,952 g) followed by Walleye (9,119 g) (Table 5.6.7-8, Figure 5.6.7-14).

Total overall CPUE and BPUE for the small mesh index gillnet catch in Cross Lake was 134.9 fish and 2,915 g (Tables 5.6.7-9 and 5.6.7-10). The CPUE and BPUE values were highest in 2008 at 155.4 fish and 3,395 g and lowest in 2009 at 112.7 fish and 2,494 g (Tables 5.6.7-9 and 5.6.7-10, Figures 5.6.7-11 and 5.6.7-12). The highest individual species' CPUE and BPUE value was recorded for Yellow Perch (59.2 fish [688 g]), followed by Spottail Shiner (57.0 fish [211 g]) (Tables 5.6.7-9 and 5.6.7-10, Figures 5.6.7-13 and 5.6.7-14).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined as captured in standard gang index gill nets in 2008, 2009 and 2010 are provided in Figures 5.6.7-19 and 5.6.7-20, respectively. Northern Pike and Walleye were captured at most sampling sites in Cross Lake. Lake Whitefish were only captured at Site GN-16. The CPUE and BPUE values for Northern Pike and Walleye were similar both between sites and between years for a given site with the exception of GN-09 which had higher values for Northern Pike. For all fish combined, CPUE values were fairly consistent between sites and years while BPUE values were more variable.

Walker Lake

Total CPUE and BPUE values for 276 fish of eight species captured in standard index gill nets set in Walker Lake in 2010 were 30.8 fish and 17,684 g (Tables 5.6.7-7 and 5.6.7-8, Figures 5.6.7-11 and 5.6.7-12).The highest CPUE values for the 2010 standard gang index gillnet catch in Walker Lake were recorded for White Sucker (14.1 fish) and Cisco (8.4 fish) (Table 5.6.7-7, Figure 5.6.7-13). The highest BPUE values were recorded for White Sucker (11,109 g) and Northern Pike (3,058 g) (Table 5.6.7-8, Figure 5.6.7-14).

For the small mesh index gill nets, total CPUE and BPUE for 165 fish of eight species was 61.7 fish and 2,773 g (Tables 5.6.7-9 and 5.6.7-10, Figures 5.6.7-11 and 5.6.7-12). The highest individual species' CPUE values were recorded for Spottail Shiner (33.8 fish) and Yellow Perch (13.4 fish) (Table 5.6.7-9, Figure 5.6.7-13). Highest BPUE values for small-bodied fish species in the small mesh index gill nets were recorded for Yellow Perch (280 g) followed by Spottail Shiner (165 g) (Table 5.6.7-10, Figure 5.6.7-14).

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 5.6.7-21 and 5.6.7-22, respectively. Northern Pike and Walleye were captured at all sampling sites in Walker Lake while Lake Whitefish was captured only at Site GN-06. The CPUE and BPUE values for Northern Pike and Walleye were similar between sites. The CPUE and BPUE values for all fish combined varied considerably between sites.

Setting Lake

Total overall CPUE and BPUE for the standard gang index gillnet catch in Setting Lake was 76.9 fish and 32,562 g (Tables 5.6.7-7 and 5.6.7-8). Total CPUE and BPUE values were similar between each of the years of study for the standard gang index gillnet catches (Tables 5.6.7-7 and 5.6.7-8, Figures 5.6.7-11 and 5.6.7-12). The overall CPUE and BPUE values for the standard gang index gill net were highest in 2010 at 83.5 fish (36,428 g) and lowest in 2009 at 67.8 fish (29,144 g). The highest individual species' overall CPUE values (all years combined) were recorded for Cisco (18.5 fish), Sauger (16.6 fish) and Walleye (15.9 fish) (Table 5.6.7-7, Figure 5.6.7-13). The highest BPUE values were recorded for White Sucker (9,729 g) followed by Walleye (6,370 g), Cisco (4,752 g) and Longnose Sucker (4,029 g) (Table 5.6.7-8, Figure 5.6.7-14).

Total overall CPUE and BPUE for the small mesh index gillnet catch in Setting Lake (all years combined) was 57.9 fish and 4,651 g (Tables 5.6.7-9 and 5.6.7-10). The CPUE and BPUE values for 2008 and 2010 were relatively similar but 2009 was noticeably lower (Tables 5.6.7-9 and

5.6.7-10, Figures 5.6.7-11 and 5.6.7-12). CPUE and BPUE values were highest in 2010 at 84.4 fish and 6,081 g and lowest in 2009 at 21.1 fish and 2,677 g. The highest individual species' overall CPUE values (all years combined) were recorded for Spottail Shiner (21.8 fish) followed by Sauger (13.1 fish) (Table 5.6.7-9, Figure 5.6.7-13). The highest individual species' BPUE values (all years combined) for small-bodied fish only were recorded for Spottail Shiner (165 g) followed by Emerald Shiner (97 g).

CPUE and BPUE by site for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets is provided in Figures 5.6.7.23 and 5.6.7.24, respectively. Northern Pike were captured at all sampling sites while Lake Whitefish were captured at 13 out of 21 sites. Walleye were captured at all but two sites. The CPUE and BPUE values for Northern Pike and Lake Whitefish were similar both between sites and between years for the same sites. CPUE and BPUE values for Walleye were more variable between sites. For all fish combined, both CPUE and BPUE values varied between sites and between years for some sites.

5.6.7.5 Size and Condition

Fish length, weight and condition factor data for Northern Pike, Lake Whitefish, and Walleye captured in Upper Nelson River Region waterbodies are presented in Tables 5.6.7-11, 5.6.7-12 and 5.6.7-13, respectively. Mean and median fork lengths of Northern Pike, Lake Whitefish, and Walleye, by waterbody, year, and mesh size, captured in Upper Nelson River Region waterbodies are presented in Figures 5.6.7-25, 5.6.7-26 and 5.6.7-27, respectively. Fork length frequency distributions for Northern Pike, Lake Whitefish, and Walleye, by waterbody and year, captured in Upper Nelson River Region waterbodies are presented in Figures 5.6.7-28, 5.6.7-29 and 5.6.7-30, respectively.

Playgreen Lake

Fork length, weight and condition factor data were collected and analyzed from 183 Northern Pike, 11 Lake Whitefish and 259 Walleye collected from standard gang and small mesh index gill nets in Playgreen Lake during 2009 and 2010 (Tables 5.6.7-11, 5.6.7-12 and 5.6.7-13). Fork lengths only were taken from an additional three Northern Pike and weights only were taken from an additional 95 Northern Pike and 21 Walleye. Mean (±SD) fork length for Northern Pike was 605 (±104) mm in 2009 compared to 667 (±105) mm in 2010. Mean fork lengths for Walleye were relatively similar in 2009 and 2010 at 413 (±64) mm and 443 (±91) mm, respectively.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.6.7-25, 5.6.7-26 and 5.6.7-27. Length frequency distributions for these species are provided in Figures 5.6.7-28, 5.6.7-29 and 5.6.7-30.

Mean weights for Northern Pike in 2009 were 3,701 g and in 2010 were 2,740 g and when combined with fork length provide a condition factor (±SD) of 0.83 (±0.08) and 0.88 (±0.08) for 2009 and 2010 respectively. The mean weights for Walleye were 983 g in 2009 and 1,212 g in 2010. Corresponding mean (±SD) condition factors were 1.29 (±0.10) and 1.34 (±0.15).

Little Playgreen Lake

Fish length, weight and condition factor data were collected and analyzed from 121 Northern Pike, 5 Lake Whitefish and 113 Walleye collected from standard gang index gill nets in Little Playgreen Lake in 2010 (Tables 5.6.7-11, 5.6.7-12 and 5.6.7-13). Fork lengths only were taken from an additional three Northern Pike and weights only were taken from an additional four Northern Pike, one Lake Whitefish and 11 Walleye. Mean (±SD) fork lengths were as follows: Northern Pike = 538 (±97) mm, Lake Whitefish = 472 (±37) mm, and Walleye = 405 (±72) mm.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.6.7-25, 5.6.7-26 and 5.6.7-27. Length frequency distributions for these species are provided in Figures 5.6.7-28, 5.6.7-29 and 5.6.7-30.

Mean (±SD, where calculated) weights for Northern Pike, Lake Whitefish and Walleye were 1,431 g, 1,596 (±899) g, and 984 g, respectively. Mean (±SD) condition factor for these three species were as follows: Northern Pike = 0.83 (±0.06), Lake Whitefish = 1.78 (±0.05), and Walleye = 1.39 (±0.12).

Cross Lake

Fish length, weight and condition factor data were collected and analyzed for 364 Northern Pike, three Lake Whitefish and 444 Walleye captured in standard gang and small mesh index gill nets from Cross Lake during 2008, 2009 and 2010 (Tables 5.6.7-11, 5.6.7-12 and 5.6.7-13). Weights only were taken from an additional 17 Northern Pike, and nine Walleye. Mean fork lengths for both species were similar from year to year. Mean (±SD) fork length for Northern Pike varied little between years and were 571 (±109) mm in 2008 compared to 556 (±111) mm in 2009 and 566 (±111) mm in 2010. Mean (±SD) fork lengths for Walleye were also similar for these three years at 416 (±60) mm, 415 (±87) and 416 (±56) mm, respectively.

The mean fork length of Northern Pike, Lake Whitefish, and Walleye captured by various mesh sizes is presented in Figures 5.6.7-25, 5.6.7-26 and 5.6.7-27. Similarly, fork length frequency distributions for Northern Pike and Walleye are provided in Figures 5.6.7-28, 5.6.7-29 and 5.6.7-30.

As was the case for fork length, mean weights for Northern Pike and Walleye from Cross Lake were relatively similar in 2008, 2009 and 2010. Mean weights for Northern Pike were 1,483 g, 1,492 g and 1,577 g respectively. Mean weights for Walleye for these three years were 956 g, 945 g and 960 g, respectively.

Mean (±SD) condition factors for Northern Pike and Walleye showed little variance from year to year. The 2008, 2009 and 2010 values, in order, were 0.74 (±0.08), 0.77 (±0.10) and 0.77 (±0.07) for Northern Pike and 1.26 (±0.14), 1.22 (±0.14) and 1.24 (±0.11) for Walleye.

Walker Lake

Fish length, weight and condition factor data were collected and analyzed from 26 Northern Pike, one Lake Whitefish and 22 Walleye collected from standard gang index gill nets in Walker Lake in 2010 (Tables 5.6.7-11, 5.6.7-12 and 5.6.7-13). Weights only were taken from an additional eight Walleye. Mean (±SD) fork lengths were 557 (±128) mm for Northern Pike and 436 (±66) mm for Walleye.

The mean fork length for Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.6.7-25, 5.6.7-26 and 5.6.7-27. Similarly length frequency distributions for these species are provided in Figures 5.6.7-28, 5.6.7-29 and 5.6.7-30 respectively.

Mean (±SD, where calculated) weights for Northern Pike and Walleye were 1,413 (±1,001) g and 1,104 g respectively. The mean (±SD) condition factor for these two species were as follows: Northern Pike = 0.70 (±0.08), Walleye = 1.14 (±0.07).

Setting Lake

Fish length, weight and condition factor data were collected and analyzed for 152 Northern Pike, 37 Lake Whitefish and 790 Walleye captured in standard gang and small mesh index gill nets from Setting Lake during 2008, 2009 and 2010 (Tables 5.6.7-11, 5.6.7-12 and 5.6.7-13). Fork lengths only were taken from an additional two Northern Pike and six Walleye and weights only were taken from an additional two Northern Pike and 63 Walleye. Mean (±SD) fork length for Northern Pike varied little between 2009 and 2010 (no fork lengths recorded in 2008) and was 498 (±89) mm in 2009 compared to 505 (±90) mm in 2009. The mean fork length for Lake Whitefish from Setting Lake decreased each year from 2008 to 2010 and was 402 (±44) mm in 2008, 369 (±81) mm in 2009 and 288 (±46) mm in 2010. The mean (±SD) fork lengths for

Walleye from Setting Lake increased from 2008 to 2009 then decreased in 2010 at 326 (±62) mm, 349 (±55) and 352 (±60) mm, respectively.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.6.7-25, 5.6.7-26 and 5.6.7-27. Fork length frequency distributions for Northern Pike, Lake Whitefish and Walleye are provided in Figures 5.6.7-28, 5.6.7-29 and 5.6.7-30.

The mean weights for Northern Pike were 2,003 g in 2008, 971 g in 2009, and 1,045 g in 2010. For Lake Whitefish mean (±SD) weights were 1,002 (±314) g in 2008, 792 (±481) g in 2009, and 357 (±166) g. Mean weights for Walleye were 451 g, 530 g and 556 g in 2008, 2009 and 2010 respectively.

Mean (±SD) condition factors for Northern Pike were 0.70 (±0.07) in 2009, and 0.73 (±0.07) in 2010. For Lake Whitefish, values were 1.49 (±0.10) in 2008, 1.38 (±0.13) in 2009 and 1.40 (±0.10) in 2010. Condition factors for Walleye were 1.09 (±0.09), 1.15 (±0.10) and 1.15 (±0.08) in 2008, 2009 and 2010 respectively.

5.6.7.6 Age Composition

Year-class and age-frequency distributions for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets in Upper Nelson River Region waterbodies are presented in Tables 5.6.7-14 – 5.6.7-16 and Tables 5.6.7-17 – 5.6.7-19, respectively. Age-frequency distributions for Northern Pike, Lake Whitefish and Walleye are also illustrated in Figures 5.6.7-31 – 5.6.7-33, respectively. Where sufficient data existed, mean fork length, weight, and condition factor, by age and year-class, for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies are presented in Tables 5.6.7-20 – 5.6.7-23. Where sufficient data existed, von Bertalanffy growth curves were produced and are presented for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies in Figures 5.6.7-34 – 5.6.7-35, respectively.

Playgreen Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Playgreen Lake during 2009 and 2010. Age frequency distributions are presented by year-class cohort (Tables 5.6.7-14, 5.6.7-15 and 5.6.7-16) and by age (Tables 5.6.7-17, 5.6.7-18 and 5.6.7-19; Figures 5.6.7-31, 5.6.7-32 and 5.6.7-33). Year-classes represented ranged from 1996 to 2008 for Northern Pike, 1992 to 2009 for Lake Whitefish and 1995 to 2008 for Walleye.

These data suggest that relatively strong Northern Pike cohorts were produced each year from 2001 to 2004. For Lake Whitefish, few individuals were captured in years other than 2009 (the 2009 cohort comprised approximately 70% of aged individuals captured). The data for Walleye suggest particularly strong cohorts in 2001, 2002 and 2005.

Length, weight and condition factor by age and year class data are provided for Northern Pike, Lake Whitefish and Walleye in Tables 5.6.7-20, 5.6.7-21 and 5.6.7 -22, respectively, for each year and for all study years combined. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.6.7-34, 5.6.7-35 and 5.6.7-36.

Little Playgreen Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Little Playgreen Lake during 2010. Age frequency distributions are presented by year-class cohort (Tables 5.6.7-14, 5.6.7-15 and 5.6.7-16) and by age (Tables 5.6.7-17, 5.6.7-18 and 5.6.7-19; Figures 5.6.7-31, 5.6.7-32 and 5.6.7-33). Represented year class cohorts ranged from 1998 to 2009 for Northern Pike and 1995 to 2008 for Walleye.

The data for Northern Pike suggest relatively strong cohorts each year from 2004 to 2007 while the data for Walleye suggest that strong cohorts were produced in 2002, 2003 and 2005.

Length, weight and condition factor by age and year class data for 2010 are provided for Northern Pike, Lake Whitefish and Walleye in Tables 5.6.7-20, 5.6.7-21 and 5.6.7-22. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.6.7-34, 5.6.7-35 and 5.6.7-36.

Cross Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Cross Lake during 2008, 2009 and 2010. Age frequency distributions are presented by year-class cohort (Tables 5.6.7-14, 5.6.7-15 and 5.6.7-16) and by age (Tables 5.6.7-17, 5.6.7-18 and 5.6.7-19; Figures 5.6.7-31, 5.6.7-32 and 5.6.7-33). Year classes represented ranged from 1997 to 2008 for Northern Pike, 1998 to 2001 for Lake Whitefish and from 1998 to 2007 for Walleye.

The data suggest relatively strong Northern Pike cohorts were produced each year from 2003 to 2006 and each year class from 1997 to 2008 was represented by at least one individual. Data for Lake Whitefish are too few to draw conclusions on year class representation. For Walleye, the data for all years of sampling suggest strong year class production from 2001 to 2005.

Length, weight and condition factor by age and year class data are provided for Northern Pike, Lake Whitefish and Walleye in Tables 5.6.7-20, 5.6.7-21 and 5.6.7-22 respectively for each year and for all study years combined. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.6.7-34, 5.6.7-35 and 5.6.7-36.

Walker Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in Walker Lake during 2010. Age frequency distributions are presented by year-class cohort (Tables 5.6.7-14, 5.6.7-15 and 5.6.7-16) and by age (Tables 5.6.7-17, 5.6.7-18 and 5.6.7-19; Figures 5.6.7-31, 5.6.7-32 and 5.6.7-33). Year classes represented ranged from 1996 to 2007 for Northern Pike and from 1993 to 2004 for Walleye.

The data for Northern Pike suggest that relatively strong year classes were produced each year from 2004 to 2006. Limited data for Walleye do not provide an adequate basis for year class strength determination but all years from 1999 to 2004 except one are represented in the catch.

Length, weight and condition factor by age and year class data are provided for Northern Pike, Lake Whitefish and Walleye in Tables 5.6.7-20, 5.6.7-21 and 5.6.7-22 respectively for each year and for all study years combined. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.6.7-34, 5.6.7-35 and 5.6.7-36.

Setting Lake

Age frequency distributions were calculated for Northern Pike, Lake Whitefish and Walleye captured in standard gang index gill nets in the Setting Lake during 2008, 2009 and 2010. Age frequency distributions are presented by year-class cohort (Tables 5.6.7-14, 5.6.7-15 and 5.6.7-16) and by age (Tables 5.6.7-17, 5.6.7-18 and 5.6.7-19; Figures 5.6.7-31, 5.6.7-32 and 5.6.7-33). Year classes represented ranged from 1994 to 2009 (all years except 1995 represented) for Northern Pike, from 2000 to 2009 (all years except 2001 represented) for Lake Whitefish and 1995 to 2008 (all years represented) for Walleye.

The available data suggest that relatively strong Northern Pike cohorts were produced each year from 2003 to 2006 and that a relatively strong Lake Whitefish cohort was produced in 2007. For Walleye, the data suggest that relatively strong cohorts were produced each year from 2001 to 2003 and in 2005 and 2006.

Length, weight and condition factor by age and year class data are provided for Northern Pike, Lake Whitefish and Walleye in Tables 5.6.7-20, 5.6.7-21 and 5.6.7-22 respectively for each year and for all study years combined. Fitted typical von Bertalanffy growth curves for the same three species are provided in Figures 5.6.7-34, 5.6.7-35 and 5.6.7-36.

5.6.7.7 Deformities, Erosion, Lesions and Tumours (DELTs)

Playgreen Lake

A total of 13 DELTs were recorded from 1,568 (0.8%) fish examined from Playgreen Lake in 2009 and 2010 (Table 5.6.7-23). The highest incidence rate was observed in White Sucker (1.4%, n = 867), followed by Northern Pike (0.4%, n = 269). In total, one deformity and 11 lesions were found on White Sucker while one lesion was found on Northern Pike. Lake Whitefish (n = 38), Sauger (n = 135) and Walleye (n = 259) also were examined for DELTs but none were observed.

Little Playgreen Lake

A total of 19 DELTs were recorded from 771 (2.5%) fish examined from Little Playgreen Lake in 2010 (Table 5.6.7-23). Of species examined, the highest incidence rate was observed in White Sucker (2.6%, n = 382), followed by Northern Pike (3.0%, n = 269) and Walleye (0.9%, n = 113). In total, three deformities, six lesions and one tumour were found on White Sucker, one deformity, two erosion, four lesions and one tumour were found on Northern Pike, one deformity was found on Walleye and one lesion was found on Sauger. Lake Whitefish (n = 5) and Sauger (n = 2) also were examined for DELTs but none were observed.

Cross Lake

A total of 15 DELTs were recorded from 1,109 (1.4%) fish examined from Cross Lake in 2008, 2009 and 2010 (Table 5.6.7-23). The highest incidence rate was observed in White Sucker (2.9%, n = 205), followed by Northern Pike (1.9%, n = 368) and Walleye (0.4%, n = 445). In total, three deformities, two cases of erosion and one lesion were found on White Sucker, seven lesions were found on Northern Pike and one lesion and one tumour were found on Walleye. Lake Whitefish (n = 3) and Sauger (n = 88) also were examined for DELTs but none were observed.

Walker Lake

A total of four DELTs were recorded from 192 (2.1%) fish examined from Walker Lake in 2010 (Table 5.6.7-23). The only incidences observed were found on White Sucker (3.1%, n = 129). In total, two deformities and two lesions were found. Northern Pike (n = 26), Lake Whitefish (n = 1), Sauger (n = 14) and Walleye (n = 22) were also examined for DELTs but none were observed.

Setting Lake

A total of seven DELTs were recorded from 2,445 (0.3%) fish examined from Setting Lake in 2008, 2009 and 2010 (Table 5.6.7-23). The highest incidence rate was observed in White Sucker (0.5%, n = 601), followed by Walleye (0.4%, n = 796) and Sauger (0.1%, n = 798). In total, two deformities and one lesion were found on White Sucker, two deformities and one tumour were found on Walleye and one case of erosion was found on Sauger. Northern Pike (n = 213) and Lake Whitefish (n = 37) were also examined for DELTs but none were observed.

5.6.7.8 Index of Biotic Integrity

Index of Biotic Integrity (IBI) (Karr 1981) scores based on 11 metrics were calculated for all Upper Nelson River Region waterbodies. The Upper Nelson River Region IBI scores varied from 41.8 (Walker Lake 2010) to 64.8 (Cross Lake 2008) with the majority of scores for all waterbodies and years falling between 49 and 60 (Table 5.6.7-24 and Figure 5.6.7-37). The total number of species ranged from 11 to 16 with Walker Lake only having 11 and Playgreen Lake having 16. All waterbodies were found to have very few sensitive species present (two to four) while the proportion of tolerant species varied from approximately 10% for Cross Lake to 31% for Playgreen Lake. Setting Lake had approximately 20% tolerant species while Little Playgreen Lake had 12%. The total number of insectivore species ranged from 7 to 12 with Cross Lake having 12 in 2008 and only 7 in 2010. Little Playgreen Lake had the lowest evenness value with only three species contributing the majority of information while the rest of the waterbodies had approximately seven species contributing. Piscivore and omnivore species were found to dominate the catch in terms of biomass for all waterbodies, however in Cross Lake piscivores accounted for over 70% of the catch with omnivores contributing less than 20% and insectivores contributing 10%. The proportion of simple lithophilic spawners was low for most of the on-system waterbodies (less than 0.33) while the off-system waterbody, Setting Lake, had the highest values ranging from 0.78 to 0.88. CPUE ranged from 30.8 fish/100 m of net/24 h (Walker Lake 2010) to 83.5 fish/100 m/ 24 h (Setting Lake 2010). The percentage of deformities, erosion, lesions, and tumours was less than 3% for all waterbodies with the exception of Little Playgreen Lake in 2010 which had a value of 3.04%.

5.6.7.9 Spatial Comparisons

Overall, the fish assemblage as captured by standard gill net sets in all upper Nelson River waterbodies was found to be dominated by White Sucker and Walleye (Table 5.6.7-3). Northern Pike and Yellow Perch were also common in the upstream lakes in this Region (i.e., Playgreen, Little Playgreen and Cross lakes) but less so in lakes further downstream and off-system (i.e., Walker and Setting lakes). In Walker and Setting lakes, Cisco was more common than in upstream lakes in the system and in Setting Lake, Sauger was more common than other lakes sampled in the Region. In the small mesh index gillnet catches, Spottail Shiner was common in all lakes sampled but Yellow Perch was common only on-system and was found at a low abundance in Setting Lake. Rainbow Smelt were common in Playgreen Lake and Little Playgreen Lake, less common in Cross Lake and not detected in off-system lakes. Troutperch was common in Playgreen, Little Playgreen and Cross lakes but was rarely caught in Walker and Setting lakes.

Moving downstream on the upper Nelson River, the catch in Playgreen Lake was comprised of 14 species, of which only Quillback (*Carpoides cyprinus*) and Logperch (*Percina caprodes*) were not found in any of the other upper Nelson River waterbodies sampled. Burbot (*Lota lota*) and Longnose Sucker (*Catostomus catostomus*) were also captured in Playgreen Lake but not in other on-system lakes in the Region (both species were also captured off-system in Setting Lake). Notable absences from the catch in Playgreen Lake (species captured in other upper Nelson River waterbodies further downstream) included Goldeye (*Hiodon alosoides*), Mooneye (*Hiodon tergisus*) and Rock Bass (*Ambloplites rupestris*). The fish assemblage captured in the Little Playgreen Lake was comprised of 11 species, of which only Rock Bass was not found in any of the other Winnipeg River waterbodies sampled. Twelve species were captured in Cross Lake, of which only Mooneye and Goldeye were not found in any of the other upper Nelson River waterbodies sampled.

The fish community in Setting Lake was found to be dissimilar in some respects to those found in the Nelson River (on-system) waterbodies sampled. In particular, and in addition to the absence of Rainbow Smelt, Freshwater Drum were absent from the Setting Lake catch but was captured in all on-system lakes. As well, Emerald Shiner was captured in Setting Lake but was not detected elsewhere in the Region. The fish assemblage in Walker Lake, the other off-system waterbody, was comprised of eight species. One notable absence from the catch in Walker Lake was Shorthead Redhorse (*Moxostoma macrolepidotum*). Rainbow Smelt were also absent from the catch at Walker Lake.

A comparison of mean CPUE values for the on-system Upper Nelson River Region waterbodies are presented in Tables 5.6.7-7 and 5.6.7-9 (all fish) and Figures 5.6.7-15, 5.6.7-17, 5.6.7-19, 5.6.7-21, and 5.6.7-23 (Northern Pike, Lake Whitefish and Walleye), Figure 5.6.7-11 (all fish) and Figure 5.6.7-13 (select species). The on-system upper Nelson River waterbodies were found to have relatively similar CPUE values for many species captured in standard gang index gill nets; however, CPUE values for total catch and White Sucker were notably higher in Playgreen Lake and Little Playgreen Lake than Cross Lake. CPUE for White Sucker in Playgreen Lake and Little Playgreen Lake was higher than that in Setting Lake while total catch was similar. The

CPUE of Shorthead Redhorse was notably lower in Playgreen Lake than other lakes further downstream in the Region and was similar to that in Setting Lake. Setting Lake, the annual off-system waterbody had considerably higher CPUE values than the upper Nelson River on-system waterbodies for Cisco and Sauger. Notable differences in the CPUE values for the small mesh index gill nets were evident particularly with respect to Emerald Shiner and Rainbow Smelt, both of which had much higher CPUEs in Playgreen Lake than other waterbodies in the Region. Rainbow Smelt was absent from the catch in Setting 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 5.6.7-8 and 5.6.7-10 and Figures 5.6.7-16, 5.6.7-18, 5.6.7-20, 5.6.7-22 and 5.6.7-24 (Northern Pike, Lake Whitefish and Walleye), Figure 5.6.7-12 (all fish) and Figure 5.6.7-14 (select species). Generally BPUE values for all fish were comparable between all sampled waterbodies. As was the case with CPUE, the BPUE values for White Sucker from the standard gang index gill nets were notably higher in Playgreen Lake and Little Playgreen Lake than that in other waterbodies in the Region. Small-bodied fish species from the small mesh index gill nets were found to have generally similar BPUE values 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 Little Playgreen Lake and Walker Lake, each of which only had one year of data, the two (Playgreen Lake) or three (Cross Lake and Setting Lake) years of collected data were pooled for individual sites. Total CPUE values are presented along with values for Northern Pike, Lake Whitefish and Walleye. In Playgreen Lake, total CPUE values ranged from below 30 fish for Site GN-14 to nearly 150 for Sites GN-08 and GN-10 (Figure 5.6.7-15). Little Playgreen Lake and was found to have total CPUE values ranging from approximately 55 (Site GN-09) to nearly 100 (Site GN-03) (Figure 5.6.7-17). In Cross Lake the majority of sites had total CPUE values between 30 and 50 with an overall range from approximately 25 at Site GN-03 to approximately 60 at Site GN-19 (Figure 5.6.7-19). In Walker Lake, total CPUE values ranged from less than 10 (Site GN-08) to nearly 70 (Site GN-01) (Figure 5.6.7-21). In Setting Lake the majority of sites had total CPUE values between 60 and 100 with an overall range of approximately 50 at Site GN-21 to approximately 140 at Site GN-04 (Figure 5.6.7-23).

Index of Biological Integrity scores were similar for all waterbodies sampled in the Region with Walker Lake having the lowest value, followed closely by Little Playgreen Lake. Playgreen Lake, Cross Lake and Setting Lake all had very similar scores (approximately 60) suggesting that these waterbodies have the best overall fish community conditions based on the selected metrics. Walker Lake had the lowest biotic integrity value which was attributable to the higher proportion of tolerant individuals and omnivore biomass found within the waterbody compared to the other locations.

5.6.7.10 Temporal Variability

CPUE values were used to examine temporal variability within the three waterbodies for which multi-year sampling occurred, i.e., Playgreen Lake, Cross Lake and Setting Lake (Table 5.6.7-7). Within Playgreen Lake, overall standard gang index gillnet CPUE varied from a low of 59.6 fish in 2009 to a high of 80.4 fish in 2010 under very similar water level elevations (see Section 5.6.2). In both Cross Lake and Setting Lake the total CPUE varied little from year to year. In Cross Lake it was lowest in 2009 at 31.3 fish and highest in 2008 at 47.7 fish. As was the case in Cross Lake, the total CPUE in Setting Lake was lowest in 2009 at 67.8 fish; however, the highest total CPUE in Setting Lake was highest in 2010 (83.5 fish) rather than 2008.

With respect to the catch from the small mesh index gill nets, Playgreen Lake displayed a large variation in CPUE between 2009 (96.3 fish) and 2010 (880.5 fish) (Table 5.6.7-9). In Cross Lake there was little variability between years as CPUE varied from a low of 112.7 fish in 2009 to a high of 155.4 fish in 2008. In Setting Lake, variability between years was somewhat higher from a low of 21.1 fish in 2009 to a high of 84.4 fish in 2008.

The IBI scores for Playgreen Lake decreased from 60.2 in 2009 to 49.8 in 2010 due primarily to decreases in the evenness value, the proportion of piscivore biomass and the proportion of lithophilic spawners (Table 5.6.7-24). The Cross Lake IBI scores also decreased over the three years of monitoring, dropping from 64.8 in 2008 to 54.5 in 2010. The contributing metrics to the reduction in scores were primarily due to the total number of species, number of sensitive species and number of insectivore species. Setting Lake had relatively consistent IBI scores with the highest score occurring in 2010 due mostly to a reduction in the proportion of tolerant individual’s metric value.

Table 5.6.7-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Upper Nelson River Region waterbodies, 2008-2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Playgreen Lake	GN-01	14	570186	5961634	8-Jun-09	20.58	1.8	2.3	-
Playgreen Lake	GN-02	14	570519	5958487	8-Jun-09	20.38	3.3	5.8	-
Playgreen Lake	GN-03	14	563133	5961596	8-Jun-09	20.75	3.0	2.8	-
Playgreen Lake	GN-04	14	559008	5965489	10-Jun-09	21.83	2.8	2.6	-
Playgreen Lake	GN-05	14	559906	5969507	10-Jun-09	22.42	2.9	3.1	-
Playgreen Lake	GN-06	14	561236	5972171	10-Jun-09	22.02	2.3	2.2	-
Playgreen Lake	GN-07	14	560870	5973983	10-Jun-09	20.33	2.4	1.6	9.0
Playgreen Lake	GN-08	14	553774	5968626	9-Jun-09	23.67	2.4	2.4	7.7
Playgreen Lake	GN-09	14	553976	5972516	9-Jun-09	25.33	9.1	6.2	6.3
Playgreen Lake	GN-11	14	549032	5977904	12-Jun-09	20.38	3.1	3.4	-
Playgreen Lake	GN-13	14	546056	5985763	12-Jun-09	20.75	3.7	4.0	8.7
Playgreen Lake	GN-14	14	548927	5988295	12-Jun-09	21.50	3.1	2.8	6.9
Playgreen Lake	GN-15	14	568785	6022469	14-Jun-09	22.02	9.8	4.6	-
Playgreen Lake	GN-16	14	566413	6018228	14-Jun-09	22.42	2.7	1.2	11.2
Playgreen Lake	GN-17	14	570387	6015828	14-Jun-09	21.83	2.9	2.8	11.4
Playgreen Lake	GN-18	14	562809	6013307	14-Jun-09	22.00	4.5	3.6	9.8
Playgreen Lake	GN-19	14	546408	5976926	12-Jun-09	20.58	3.1	3.2	8.7
Playgreen Lake	SN-03	14	563133	5961596	8-Jun-09	20.75	3.0	2.8	-
Playgreen Lake	SN-04	14	559008	5965489	10-Jun-09	21.83	2.8	2.6	-
Playgreen Lake	SN-07	14	560870	5973983	10-Jun-09	20.33	2.4	1.6	9.0
Playgreen Lake	SN-13	14	546056	5985763	12-Jun-09	20.75	3.7	4.0	8.7
Playgreen Lake	SN-16	14	566413	6018228	14-Jun-09	22.42	2.7	1.2	11.2

Table 5.6.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Playgreen Lake	GN-02	14	570417	5958708	24-Jun-10	17.78	9.1	6.2	14.8
Playgreen Lake	GN-03	14	562662	5961404	24-Jun-10	21.72	2.4	1.6	14.6
Playgreen Lake	GN-04	14	559140	5965536	23-Jun-10	18.98	2.3	2.2	-
Playgreen Lake	GN-05	14	559906	5969510	23-Jun-10	17.33	3.0	2.8	-
Playgreen Lake	GN-06	14	561061	5972058	23-Jun-10	17.40	3.3	5.8	16.4
Playgreen Lake	GN-07	14	560732	5974015	23-Jun-10	18.88	1.8	2.3	17.1
Playgreen Lake	GN-09	14	553985	5972432	24-Jun-10	16.88	2.9	3.1	15.9
Playgreen Lake	GN-10	14	557002	5976770	24-Jun-10	18.08	2.8	2.6	19.2
Playgreen Lake	GN-11	14	549574	5975530	25-Jun-10	14.87	3.1	3.4	15.0
Playgreen Lake	GN-12	14	552138	5979837	25-Jun-10	16.32	3.7	4.0	16.7
Playgreen Lake	GN-13	14	546917	5984235	26-Jun-10	18.80	3.1	2.8	16.7
Playgreen Lake	GN-14	14	549205	5988070	26-Jun-10	20.33	9.8	4.6	17.9
Playgreen Lake	GN-19	14	546906	5976982	25-Jun-10	19.77	3.1	3.2	15.3
Playgreen Lake	SN-03	14	562662	5961404	24-Jun-10	21.72	2.4	1.6	14.6
Playgreen Lake	SN-05	14	559906	5969510	23-Jun-10	17.33	3.0	2.8	-
Playgreen Lake	SN-10	14	557002	5976770	24-Jun-10	18.08	2.8	2.6	19.2
Playgreen Lake	SN-12	14	552138	5979837	25-Jun-10	16.32	3.7	4.0	16.7
Little Playgreen Lake	GN-01	14	567396	5981638	10-Jun-10	19.10	2.1	2.1	13.0
Little Playgreen Lake	GN-02	14	569156	5983028	10-Jun-10	18.80	4.3	4.3	13.3
Little Playgreen Lake	GN-03	14	572141	5984818	11-Jun-10	18.43	3.4	3.4	14.7
Little Playgreen Lake	GN-04	14	572641	5986286	11-Jun-10	20.25	3.1	3.7	13.2
Little Playgreen Lake	GN-05	14	576197	5984530	12-Jun-10	18.02	2.1	3.1	15.5
Little Playgreen Lake	GN-06	14	576903	5983742	12-Jun-10	16.88	3.7	3.1	14.2
Little Playgreen Lake	GN-07	14	579112	5986714	13-Jun-10	20.17	3.7	4.6	16.7
Little Playgreen Lake	GN-08	14	581052	5987088	13-Jun-10	19.88	3.1	3.1	18.0
Little Playgreen Lake	GN-09	14	582352	5988626	14-Jun-10	21.15	2.4	3.4	15.0
Little Playgreen Lake	GN-10	14	579439	5988799	14-Jun-10	19.18	3.4	2.4	17.6
Little Playgreen Lake	SN-03	14	572141	5984818	11-Jun-10	18.43	3.4	3.4	14.7
Little Playgreen Lake	SN-06	14	576903	5983742	12-Jun-10	16.88	3.7	3.1	14.2
Little Playgreen Lake	SN-09	14	582352	5988626	14-Jun-10	21.15	2.4	3.4	15.0

Table 5.6.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Cross Lake	GN-02	14	569403	6042682	28-Aug-08	22.82	3.2	4.8	18.0
Cross Lake	GN-03	14	570180	6043795	28-Aug-08	23.00	7.5	7.0	18.0
Cross Lake	GN-04	14	569903	6043415	28-Aug-08	22.33	8.5	9.0	18.0
Cross Lake	GN-07	14	568701	6043540	29-Aug-08	20.82	5.5	10.5	18.0
Cross Lake	GN-09	14	560957	6044894	31-Aug-08	21.78	2.8	2.3	18.0
Cross Lake	GN-12	14	560284	6050197	31-Aug-08	23.00	3.0	3.0	17.0
Cross Lake	GN-13	14	562756	6052993	31-Aug-08	24.17	3.0	3.5	17.0
Cross Lake	GN-14	14	561539	6053545	31-Aug-08	24.83	4.5	4.5	17.0
Cross Lake	GN-15	14	572869	6060875	1-Sep-08	20.83	3.0	3.1	18.0
Cross Lake	GN-16	14	574822	6058884	1-Sep-08	18.85	3.4	3.8	18.0
Cross Lake	GN-19	14	591373	6066630	2-Sep-08	23.07	4.1	5.0	16.0
Cross Lake	SN-03	14	570129	6043718	28-Aug-08	23.00	8.0	7.5	18.0
Cross Lake	SN-09	14	560795	6044928	31-Aug-08	22.50	2.8	2.5	18.0
Cross Lake	SN-12	14	560306	6050151	31-Aug-08	23.00	3.0	3.0	17.0
Cross Lake	SN-15	14	573002	6060734	1-Sep-08	20.83	3.1	3.2	18.0
Cross Lake	GN-01	14	570296	6042516	20-Aug-09	21.92	8.0	6.3	16.0
Cross Lake	GN-02	14	569556	6042694	20-Aug-09	22.17	8.1	8.4	16.0
Cross Lake	GN-03	14	570218	6043637	21-Aug-09	22.50	4.8	4.2	16.0
Cross Lake	GN-04	14	569903	6043418	21-Aug-09	22.25	8.3	8.4	16.0
Cross Lake	GN-07	14	568690	6043525	21-Aug-09	22.00	8.7	6.4	16.0
Cross Lake	GN-09	14	560923	6044849	20-Aug-09	21.42	3.4	3.3	15.0
Cross Lake	GN-12	14	560286	6050175	19-Aug-09	21.08	4.7	3.3	15.0
Cross Lake	GN-13	14	562666	6053099	19-Aug-09	20.58	4.1	4.1	15.0
Cross Lake	GN-14	14	561586	6053545	19-Aug-09	20.92	4.5	4.3	15.0
Cross Lake	GN-15	14	573042	6060837	18-Aug-09	23.00	2.9	3.0	15.0
Cross Lake	GN-16	14	574695	6058819	18-Aug-09	23.92	3.4	3.5	15.0
Cross Lake	GN-19	14	591313	6066831	18-Aug-09	21.33	3.7	3.8	15.0
Cross Lake	SN-03	14	570208	6043753	21-Aug-09	22.50	5.1	4.8	16.0
Cross Lake	SN-09	14	560862	6044971	20-Aug-09	21.42	3.3	3.4	15.0
Cross Lake	SN-12	14	560110	6050155	19-Aug-09	21.08	4.7	4.7	15.0
Cross Lake	SN-15	14	573034	6060680	18-Aug-09	23.00	2.9	2.8	15.0

Table 5.6.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Cross Lake	GN-02	14	569243	6042791	20-Aug-10	19.75	5.5	7.5	18.0
Cross Lake	GN-03	14	570568	6043543	20-Aug-10	21.78	5.0	4.0	18.0
Cross Lake	GN-04	14	570035	6043309	19-Aug-10	22.58	7.5	7.0	18.0
Cross Lake	GN-07	14	568233	6043471	19-Aug-10	23.25	9.0	9.0	18.0
Cross Lake	GN-09	14	560831	6044947	19-Aug-10	22.00	3.1	3.0	15.0
Cross Lake	GN-12	14	560269	6050172	17-Aug-10	20.42	3.8	3.5	16.0
Cross Lake	GN-13	14	562518	6052908	17-Aug-10	20.83	3.0	3.5	16.0
Cross Lake	GN-14	14	561618	6053567	17-Aug-10	20.50	4.0	3.8	14.0
Cross Lake	GN-15	14	574167	6060511	18-Aug-10	21.33	3.3	3.0	14.0
Cross Lake	GN-16	14	575008	6059244	18-Aug-10	22.00	3.5	3.5	14.0
Cross Lake	GN-19	14	591299	6066715	18-Aug-10	19.42	3.5	3.5	14.0
Cross Lake	SN-03	14	570608	6043545	20-Aug-10	21.40	6.0	5.0	15.0
Cross Lake	SN-09	14	560784	6044958	19-Aug-10	21.92	3.0	3.1	15.0
Cross Lake	SN-12	14	560235	6050151	17-Aug-10	20.75	3.0	3.8	16.0
Cross Lake	SN-15	14	574150	6060526	18-Aug-10	21.17	3.0	3.3	14.0
Walker Lake	GN-01	14	630679	6070574	21-Aug-10	16.35	8.5	3.5	17.0
Walker Lake	GN-02	14	628175	6069475	21-Aug-10	16.42	5.3	5.5	17.0
Walker Lake	GN-03	14	629383	6066545	21-Aug-10	16.47	7.8	6.0	17.0
Walker Lake	GN-04	14	635001	6070392	22-Aug-10	21.58	4.2	5.0	17.5
Walker Lake	GN-05	14	635619	6073665	22-Aug-10	20.58	4.1	4.0	17.5
Walker Lake	GN-06	14	633430	6071158	22-Aug-10	20.83	8.0	5.5	17.5
Walker Lake	GN-07	14	626660	6065515	23-Aug-10	45.08	4.0	3.5	16.0
Walker Lake	GN-08	14	624877	6064758	23-Aug-10	44.50	2.5	2.5	16.0
Walker Lake	GN-09	14	630975	6065359	23-Aug-10	43.58	4.5	4.5	16.0
Walker Lake	SN-01	14	630708	6070531	21-Aug-10	16.18	9.5	8.5	17.0
Walker Lake	SN-06	14	633430	6071158	22-Aug-10	20.58	8.0	8.0	17.5
Walker Lake	SN-07	14	626692	6065507	23-Aug-10	44.92	3.8	4.0	16.0

Table 5.6.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration(h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Setting Lake	GN-02	14	514970	6078909	25-Aug-08	19.48	9.6	5.6	18.8
Setting Lake	GN-03	14	515883	6084260	25-Aug-08	22.50	10.1	5.4	-
Setting Lake	GN-05	14	518232	6087694	25-Aug-08	23.58	13.4	13.9	-
Setting Lake	GN-09	14	522935	6094349	26-Aug-08	44.88	18.7	18.7	18.6
Setting Lake	GN-10	14	524897	6098339	29-Aug-08	22.83	6.0	5.5	18.4
Setting Lake	GN-11	14	526230	6101015	28-Aug-08	24.92	5.7	5.4	18.4
Setting Lake	GN-12	14	526915	6105298	29-Aug-08	23.17	7.8	7.1	18.2
Setting Lake	GN-13	14	528077	6105706	29-Aug-08	23.08	4.6	7.2	18.6
Setting Lake	GN-14	14	530472	6105746	29-Aug-08	22.88	3.3	4.8	-
Setting Lake	GN-18	14	525449	6098280	28-Aug-08	26.00	7.1	14.1	-
Setting Lake	GN-19	14	526941	6098359	28-Aug-08	24.88	17.9	8.1	-
Setting Lake	GN-20	14	524218	6096244	28-Aug-08	23.12	11.4	14.6	-
Setting Lake	GN-21	14	519436	6088800	26-Aug-08	45.08	5.8	6.9	-
Setting Lake	SN-03	14	515883	6084260	25-Aug-08	22.50	10.1	5.4	-
Setting Lake	SN-09	14	522935	6094349	26-Aug-08	44.88	18.7	18.7	18.6
Setting Lake	SN-12	14	526915	6105298	29-Aug-08	23.17	7.8	7.1	18.2
Setting Lake	SN-20	14	524218	6096244	28-Aug-08	23.12	11.4	14.6	-
Setting Lake	GN-01	14	512135	6076808	2-Sep-09	24.50	8.4	6.1	15.0
Setting Lake	GN-02	14	514970	6078909	2-Sep-09	24.58	9.6	5.6	15.8
Setting Lake	GN-03	14	515883	6084260	3-Sep-09	24.50	10.1	5.4	16.2
Setting Lake	GN-05	14	518232	6087694	3-Sep-09	24.67	13.4	13.9	16.5
Setting Lake	GN-09	14	522935	6094348	8-Sep-09	24.67	18.7	18.7	-
Setting Lake	GN-10	14	524897	6098339	9-Sep-09	23.50	6.0	5.5	-
Setting Lake	GN-11	14	526230	6101015	10-Sep-09	25.50	5.7	5.4	-
Setting Lake	GN-12	14	526915	6105299	10-Sep-09	24.33	7.8	7.1	-
Setting Lake	GN-13	14	528078	6105706	11-Sep-09	25.00	4.6	7.2	-
Setting Lake	GN-14	14	530472	6105746	11-Sep-09	26.33	3.3	4.8	-
Setting Lake	GN-18	14	525449	6098359	9-Sep-09	25.00	7.1	14.1	-
Setting Lake	GN-19	14	526941	6098359	10-Sep-09	25.00	17.9	8.1	-
Setting Lake	GN-20	14	524218	6096244	9-Sep-09	24.50	11.4	14.6	-
Setting Lake	GN-21	14	519436	6088799	8-Sep-09	24.50	5.8	6.9	15.8
Setting Lake	SN-03	14	515883	6084260	3-Sep-09	24.50	10.1	5.4	-
Setting Lake	SN-09	14	522935	6094348	8-Sep-09	24.67	18.7	18.7	-
Setting Lake	SN-19	14	526941	6098359	10-Sep-09	25.00	17.9	8.1	-

Table 5.6.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	WaterDepth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Setting Lake	GN-01	14	512135	6076808	19-Aug-10	23.37	8.4	6.1	15.3
Setting Lake	GN-02	14	514970	6078909	19-Aug-10	24.05	9.6	5.6	16.2
Setting Lake	GN-03	14	515661	6083916	20-Aug-10	22.52	10.1	5.4	16.8
Setting Lake	GN-04	14	518124	6085573	20-Aug-10	20.85	13.4	13.9	17.2
Setting Lake	GN-05	14	518361	6087649	20-Aug-10	20.63	5.8	6.9	16.9
Setting Lake	GN-06	14	521553	6088887	20-Aug-10	23.68	18.7	18.7	17.3
Setting Lake	GN-07	14	521565	6092584	21-Aug-10	20.28	11.4	14.6	17.0
Setting Lake	GN-08	14	524308	6092935	20-Aug-10	25.22	7.1	14.1	17.4
Setting Lake	GN-09	14	523267	6094461	20-Aug-10	24.33	17.9	8.1	17.0
Setting Lake	GN-11	14	526156	6101101	30-Aug-10	21.70	7.8	7.1	15.4
Setting Lake	GN-12	14	526832	6105358	30-Aug-10	22.43	4.6	7.2	16.0
Setting Lake	GN-13	14	528021	6105429	30-Aug-10	23.28	3.3	4.8	15.8
Setting Lake	GN-15	14	529812	6102184	31-Aug-10	22.60	5.7	11.2	15.0
Setting Lake	GN-16	14	527934	6099900	31-Aug-10	21.50	11.0	10.6	15.3
Setting Lake	GN-17	14	523369	6097002	22-Aug-10	19.78	6.0	5.5	16.2
Setting Lake	GN-20	14	524089	6096322	22-Aug-10	21.43	5.7	5.4	16.6
Setting Lake	SN-03	14	515661	6083916	20-Aug-10	22.52	10.1	5.4	16.8
Setting Lake	SN-06	14	521553	6088887	20-Aug-10	23.68	18.7	18.7	17.3
Setting Lake	SN-09	14	523267	6094461	20-Aug-10	24.33	17.9	8.1	17.0
Setting Lake	SN-11	14	526156	6101101	30-Aug-10	21.70	7.8	7.1	15.4

Table 5.6.7-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Upper Nelson River Region waterbodies, 2008-2010.

Family	Species	Scientific Name	ID Code	Captured in Study Area		
				2008	2009	2010
Hiodontidae	Goldeye	*Hiodon alosoides*	GOLD		+	
	Mooneye	*Hiodon tergisus*	MOON	+		
Cyprinidae	Emerald Shiner	*Nortopis atherinoides*	EMSH	+	+	+
	Spottail Shiner	*Nortopis hudsonius*	SPSH	+	+	+
Catostomidae	Quillback	*Carpoides cyprinus*	QUIL			+
	Longnose Sucker	*Catostomus catostomus*	LNSC	+	+	+
	White Sucker	*Catostomus commersoni*	WHSC	+	+	+
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD	+	+	+
Esocidae	Northern Pike	*Esox lucius*	NRPK	+	+	+
Osmeridae	Rainbow Smelt	*Osmerus mordax*	RNSM	+	+	+
Salmonidae	Cisco	*Coregonus artedi*	CISC	+	+	+
	Lake Whitefish	*Coregonus clupeaformis*	LKWH	+	+	+
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR	+	+	+
Gadidae	Burbot	*Lota lota*	BURB	+	+	+
Cottidae	Slimy Sculpin	*Cottus cognatus*	SLSC	+	+	+
Centrarchidae	Rock Bass	*Ambloplites rupestris*	RCBS			+
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+	+	+
	Logperch	*Percina caprodes*	LGPR		+	
	Sauger	*Sander canadensis*	SAUG	+	+	+
	Walleye	*Sander vitreus*	WALL	+	+	+
Sciaenidae	Freshwater Drum	*Aplodinotus grunniens*	FRDR	+		+

Table 5.6.7-3. Standard gang index gillnet relative abundance summaries from Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake						Little Playgreen Lake		Cross Lake							
	2009		2010		Overall		2010		2008		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-	-	-	1	0.25	-	-	1	0.07
Mooneye	-	-	-	-	-	-	-	-	2	0.33	-	-	-	-	2	0.14
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	3	0.31	3	0.15	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	1	0.1	1	0.05	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	3	0.28	1	0.1	4	0.2	-	-	-	-	-	-	-	-	-	-
White Sucker	396	37.29	471	49.16	867	42.92	382	52.04	78	12.94	57	14.5	70	16.51	205	14.44
Shorthead Redhorse	5	0.47	4	0.42	9	0.45	53	7.22	40	6.63	33	8.4	28	6.6	101	7.11
Northern Pike	174	16.38	95	9.92	269	13.32	124	16.89	169	28.02	107	27.23	92	21.7	368	25.92
Rainbow Smelt	14	1.32	135	14.09	149	7.38	4	0.54	9	1.49	3	0.76	2	0.47	14	0.99
Cisco	26	2.45	22	2.3	48	2.38	1	0.14	14	2.32	5	1.27	1	0.24	20	1.41
Lake Whitefish	11	1.04	27	2.82	38	1.88	5	0.68	3	0.5	-	-	-	-	3	0.21
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	0.09	1	0.1	2	0.1	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	1	0.14	-	-	-	-	-	-	-	-
Yellow Perch	170	16.01	64	6.68	234	11.58	48	6.54	71	11.77	42	10.69	55	12.97	168	11.83
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	118	11.11	17	1.77	135	6.68	2	0.27	19	3.15	43	10.94	26	6.13	88	6.2
Walleye	144	13.56	115	12	259	12.82	113	15.4	197	32.67	102	25.95	146	34.43	445	31.34
Freshwater Drum	-	-	2	0.21	2	0.1	1	0.14	1	0.17			4	0.94	5	0.35
Total	1062	100	958	100	2020	100	734	100	603	100	393	100	424	100	1420	100

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

Table 5.6.7-3. continued.

Species	Walker Lake		Setting Lake							
	2010		2008		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	1	0.07	1	0.03
Spottail Shiner	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	101	8.05	67	5.98	76	5.36	244	6.43
White Sucker	129	46.74	214	17.07	188	16.79	199	14.03	601	15.85
Shorthead Redhorse	-	-	2	0.16	7	0.63	3	0.21	12	0.32
Northern Pike	26	9.42	59	4.70	69	6.16	85	5.99	213	5.62
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-
Cisco	63	22.83	240	19.14	235	20.98	448	31.59	923	24.34
Lake Whitefish	1	0.36	6	0.48	6	0.54	25	1.76	37	0.98
Troutperch	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	3	0.24	2	0.18	5	0.35	10	0.26
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-
Yellow Perch	20	7.25	78	6.22	43	3.84	36	2.54	157	4.14
Logperch	-	-	-	-	-	-	-	-	-	-
Sauger	14	5.07	305	24.32	229	20.45	264	18.62	798	21.04
Walleye	22	7.97	246	19.62	274	24.46	276	19.46	796	20.99
Freshwater Drum	1	0.36	-	-	-	-	-	-	-	-
Total	276	100	1254	100	1120	100	1418	100	3792	100

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

Table 5.6.7-4. Standard gang index gillnet biomass summaries from Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake									Little Playgreen Lake		
	2009			2010			Overall			2010		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	3	40	0.00	3	40	0.00	-	-	-
Quillback	-	-	-	1	1610	0.17	1	1610	0.08	-	-	-
Longnose Sucker	3	3910	0.40	1	870	0.09	4	4780	0.25	-	-	-
White Sucker	396	299770	30.51	471	462917	49.98	867	762687	39.95	382	428095	54.70
Shorthead Redhorse	5	4200	0.43	4	3540	0.38	9	7740	0.41	53	51970	6.64
Northern Pike	174	407000	41.42	95	261521	28.23	269	668521	35.02	124	174687	22.32
Rainbow Smelt	14	140	0.01	135	2050	0.22	149	2190	0.11	4	34	0.00
Cisco	26	22640	2.30	22	11860	1.28	48	34500	1.81	1	960	0.12
Lake Whitefish	11	15890	1.62	27	12450	1.34	38	28340	1.48	5	2060	0.26
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	2750	0.28	1	1950	0.21	2	4700	0.25	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	1	120	0.02
Yellow Perch	170	21629	2.20	64	10470	1.13	234	32099	1.68	48	6703	0.86
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	118	64250	6.54	17	8700	0.94	135	72950	3.82	2	1135	0.15
Walleye	144	140450	14.29	114*	145050	15.66	259	285500	14.96	113	114995	14.69
Freshwater Drum	-	-	-	2	3210	0.35	2	3210	0.17	1	1900	0.24
Total	1062	982629	100	957	926238	100	2019	1908867	100	734	782659	100

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

Table 5.6.7-4. continued.

Species	Cross Lake												Walker Lake		
	2008			2009			2010			Total			2010		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	1	390	0.10	-	-	-	1	390	0.03	-	-	-
Mooneye	2	750	0.13	-	-	-	-	-	-	2	750	0.05	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	78	79177	13.30	57	65890	17.49	70	76117	18.61	205	221184	16.01	129	131370	63.46
Shorthead Redhorse	40	35800	6.01	33	27380	7.27	28	29120	7.12	101	92300	6.68	-	-	-
Northern Pike	169	255832	42.96	107	158520	42.08	92	143800	35.16	368	558152	40.41	26	36740	17.75
Rainbow Smelt	9	63	0.01	3	33	0.01	2	18	0.00	14	114	0.01	-	-	-
Cisco	14	11625	1.95	5	6170	1.64	1	820	0.20	20	18615	1.35	63	10080	4.87
Lake Whitefish	3	4175	0.70	-	-	-	-	-	-	3	4175	0.30	1	140	0.07
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	71	8627	1.45	42	7020	1.86	55	5660	1.38	168	21307	1.54	20	1933	0.93
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	19	6536	1.10	43	13940	3.70	26	11110	2.72	88	31586	2.29	14	3580	1.73
Walleye	197	191128	32.09	102	97330	25.84	146	138940	33.97	445	427398	30.94	22	22200	10.72
Freshwater Drum	1	1800	0.30	-	-	-	4	3390	0.83	5	5190	0.38	1	980	0.47
Total	603	595513	100	287	376673	100	424	408975	100	1420	1381161	100	276	207023	100

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

Table 5.6.7-4. continued.

Species	Setting Lake											
	2008			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	1	11	0.00	1	11	0.00
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	101	104090	16.23	67	62650	10.42	76	94400	12.18	244	261140	12.94
White Sucker	214	202700	31.60	188	180890	30.08	199	208460	26.90	601	592050	29.34
Shorthead Redhorse	2	1570	0.24	7	6010	1.00	3	3120	0.40	12	10700	0.53
Northern Pike	59	52880	8.24	69	65737	10.93	85	88577	11.43	213	207195	10.27
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	240	87140	13.58	235	71950	11.96	448	138700	17.90	923	297790	14.76
Lake Whitefish	6	6010	0.94	6	4750	0.79	25	8930	1.15	37	19690	0.98
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	2270	0.35	2	970	0.16	5	3370	0.43	10	6610	0.33
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	78	13800	2.15	43	6950	1.16	36	6990	0.90	157	27740	1.37
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	305	67310	10.49	229	55250	9.19	264	71220	9.19	798	193780	9.60
Walleye	246	103742	16.17	274	146228	24.32	276	151122	19.50	796	401092	19.88
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	1254	641512	100	1120	601385	100	1418	774900	100	3792	2017798	100

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

Table 5.6.7-5. Small mesh index gillnet relative abundance summaries from Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake						Little Playgreen Lake		Cross Lake							
	2009		2010		Overall		2010		2008		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	30	7.25	400	15.28	430	14.18	71	2.61	20	3.40	17	4.09	7	1.43	44	2.95
Spottail Shiner	197	47.58	1640	62.64	1837	60.59	2496	91.80	219	37.18	170	40.87	238	48.67	627	41.97
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	2	0.48	4	0.15	6	0.20	2	0.07	9	1.53	8	1.92	-	-	17	1.14
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	5	1.21	7	0.27	12	0.40	4	0.15	8	1.36	3	0.72	2	0.41	13	0.87
Rainbow Smelt	53	12.80	503	19.21	556	18.34	21	0.77	17	2.89	11	2.64	15	3.07	43	2.88
Cisco	-	-	1	0.04	1	0.03	-	-	-	-	-	-	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	1	0.04	-	-	-	-	-	-	-	-
Troutperch	38	9.18	26	0.99	64	2.11	65	2.39	43	7.30	7	1.68	24	4.91	74	4.95
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	1.21	-	-	5	0.16	-	-	-	-	1	0.24	-	-	1	0.07
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	81	19.57	18	0.69	99	3.27	48	1.77	268	45.50	197	47.36	196	40.08	661	44.24
Logperch	1	0.24	-	-	1	0.03	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	1	0.24	5	1.02	6	0.40
Walleye	2	0.48	19	0.73	21	0.69	11	0.40	5	0.85	1	0.24	2	0.41	8	0.54
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	414	100	2618	100	3032	100	2719	100	589	100	416	100	489	100	1494	100

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

Table 5.6.7-4. continued.

Species	Walker Lake		Setting Lake							
	2010		2008		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Goldeye	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	4	2.42	43	14.01	-	-	53	16.67	96	13.91
Spottail Shiner	81	49.09	123	40.07	24	36.92	120	37.74	267	38.70
Quillback	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	1	0.33	-	-	-	-	1	0.14
White Sucker	3	1.82	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-
Northern Pike	-	-	11	3.58	2	3.08	-	-	13	1.88
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-
Cisco	8	4.85	5	1.63	6	9.23	39	12.26	50	7.25
Lake Whitefish	-	-	-	-	-	-	-	-	-	-
Troutperch	4	2.42	5	1.63	4	6.15	14	4.40	23	3.33
Burbot	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	1	0.33	-	-	2	0.63	3	0.43
Rock Bass	-	-	-	-	-	-	-	-	-	-
Yellow Perch	47	28.48	17	5.54	2	3.08	7	2.20	26	3.77
Logperch	-	-	-	-	-	-	-	-	-	-
Sauger	10	6.06	57	18.57	24	36.92	67	21.07	148	21.45
Walleye	8	4.85	44	14.33	3	4.62	16	5.03	63	9.13
Freshwater Drum	-	-	-	-	-	-	-	-	-	-
Total	165	100	307	100	65	100	318	100	690	100

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

Table 5.6.7-4. Small mesh index gillnet biomass summaries from Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake									Little Playgreen Lake		
	2009			2010			Overall			2010		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	3	143	0.88	400	2170	6.98	403	2313	4.89	71	360	1.78
Spottail Shiner	197	1059	6.51	1640	9259	29.78	1837	10318	21.79	2496	13744	67.98
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	2	39	0.24	4	360	1.16	6	399	0.84	2	311	1.54
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	5	11180	68.76	7	11940	38.40	12	23120	48.82	4	4250	21.02
Rainbow Smelt	53	452	2.78	503	6130	19.71	556	6582	13.90	21	181	0.90
Cisco	-	-	-	1	16	0.05	1	16	0.03	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	18	0.09
Troutperch	38	332	2.04	26	212	0.68	64	544	1.15	65	384	1.90
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	15	0.09	-	-	-	5	15	0.03	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	81	889	5.47	18	653	2.10	99	1542	3.26	48	794	3.92
Logperch	1	10	0.06	-	-	-	1	10	0.02	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	2	2140	13.16	19	356	1.15	21	2496	5.27	11	177	0.88
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	414	16259	100	2618	31096	100	3032	47355	100	2719	20219	100

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

Table 5.6.7-6. continued.

Species	Cross Lake												Walker Lake		
	2008			2009			2010			Overall			2010		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	20	75	0.59	17	73	0.80	7	27	0.27	44	175	0.55	4	14	0.17
Spottail Shiner	219	667	5.25	170	451	4.92	238	1184	11.63	627	2302	7.18	81	395	4.89
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	9	100	0.79	8	60	0.65	-	-	-	17	160	0.50	3	610	7.56
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	8	6713	52.81	3	4060	44.30	2	2850	28.00	13	13623	42.50	-	-	-
Rainbow Smelt	17	110	0.87	11	94	1.03	15	156	1.53	43	360	1.12	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	8	697	8.64
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	43	216	1.70	7	48	0.52	24	173	1.70	74	437	1.36	4	16	0.20
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	1	4	0.04	-	-	-	1	4	0.01	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	268	2856	22.47	197	2751	30.02	196	2060	20.24	661	7667	23.92	47	989	12.26
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	1	1610	17.57	5	1530	15.03	6	3140	9.80	10	1049	13.00
Walleye	5	1975	15.54	1	14	0.15	2	2200	21.61	8	4189	13.07	8	4300	53.28
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	589	12712	100	416	9165	100	489	10180	100	1494	32057	100	165	8070	100

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

Table 5.6.7-6. continued.

Species	Setting Lake											
	2008			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	43	900	3.79	-	-	-	53	244	1.04	96	1144	2.07
Spottail Shiner	123	1290	5.44	24	100	1.22	120	593	2.53	267	1983	3.58
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	1	10	0.04	-	-	-	-	-	-	1	10	0.02
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	11	7220	30.43	2	2620	31.83	-	-	-	13	9840	17.77
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	5	590	2.49	6	50	0.61	39	3325	14.20	50	3965	7.16
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	5	30	0.13	4	30	0.36	14	71	0.30	23	131	0.24
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	1	5	0.02	-	-	-	2	6	0.03	3	11	0.02
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	17	380	1.60	2	20	0.24	7	33	0.14	26	433	0.78
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	57	4840	20.40	24	4750	57.72	67	14073	60.11	148	23663	42.74
Walleye	44	8460	35.66	3	660	8.02	16	5069	21.65	63	14189	25.63
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	307	23725	100	65	8230	100	318	23413	100	690	55368	100

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

Table 5.6.7-5. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake									Little Playgreen Lake		
	2009 (# sites=17)			2010 (# sites=14)			Overall (# years=2)			2010 (# sites=10)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE	n	CPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	3	0.3	0.71	3	0.3	-	-	-	-
Quillback	-	-	-	1	0.1	0.34	1	0.1	-	-	-	-
Longnose Sucker	3	0.2	0.54	1	0.1	0.30	4	0.1	0.05	-	-	-
White Sucker	396	22.9	28.33	471	40.2	25.07	867	31.5	8.69	382	42.0	12.24
Shorthead Redhorse	5	0.3	0.74	4	0.3	0.52	9	0.3	0.02	53	5.7	4.14
Northern Pike	174	10.0	11.01	95	7.8	9.13	269	8.9	1.10	124	13.6	9.39
Rainbow Smelt	14	0.8	2.43	135	11.0	12.53	149	5.9	5.08	4	0.4	1.08
Cisco	26	1.5	3.71	22	1.9	4.42	48	1.7	0.22	1	0.1	0.35
Lake Whitefish	11	0.6	0.87	27	2.3	3.74	38	1.5	0.84	5	0.6	1.39
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	0.1	0.25	1	0.1	0.30	2	0.1	0.01	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	1	0.1	0.32
Yellow Perch	170	9.4	15.87	64	5.4	6.88	234	7.4	2.00	48	5.2	2.50
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	118	5.9	21.19	17	1.4	2.62	135	3.6	2.22	2	0.2	0.47
Walleye	144	8.1	14.93	115	9.4	14.37	259	8.8	0.65	113	12.3	5.91
Freshwater Drum	-	-	-	2	0.2	0.60	2	0.2	-	1	0.1	0.38
Total	1062	59.6	51.93	958	80.4	36.68	2020	70.0	10.40	734	80.3	15.13

#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 5.6.7-7. continued.

Species	Cross Lake												Walker Lake		
	2008 (# sites=12)			2009 (# sites=12)			2010 (# sites=12)			Overall (# years=3)			2010 (# sites=9)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE	n	CPUE	SD
Goldeye	-	-	-	1	0.1	0.25	-	-	-	1	0.1	-	-	-	-
Mooneye	2	0.2	0.37	-	-	-	-	-	-	2	0.2	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	78	6.2	4.93	57	4.6	6.11	70	5.8	4.23	205	5.5	0.48	129	14.1	15.25
Shorthead Redhorse	40	3.2	4.30	33	2.7	4.15	28	2.4	2.75	101	2.7	0.23	-	-	-
Northern Pike	169	13.3	6.42	107	8.5	4.97	92	7.6	6.98	368	9.8	1.76	26	2.4	1.34
Rainbow Smelt	9	0.7	1.21	3	0.2	0.83	2	0.2	0.41	14	0.4	0.16	-	-	-
Cisco	14	1.1	2.89	5	0.4	1.42	1	0.1	0.31	20	0.5	0.30	63	8.4	11.34
Lake Whitefish	3	0.3	0.96	-	-	-	-	-	-	3	0.3	-	1	0.1	0.34
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	71	5.7	5.02	42	3.4	2.25	55	4.5	5.05	168	4.5	0.69	20	1.8	1.13
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	19	1.4	3.52	43	3.4	3.41	26	2.2	2.62	88	2.3	0.57	14	1.6	2.63
Walleye	197	15.6	7.60	102	8.0	5.38	146	12.1	7.58	445	11.9	2.18	22	2.2	1.45
Freshwater Drum	1	0.1	0.28	-	-	-	4	0.3	0.86	5	0.2	0.10	1	0.1	0.43
Total	603	47.7	14.63	393	31.3	12.30	424	35.2	12.04	1420	38.1	4.93	276	30.8	23.19

#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 5.6.7-7. continued.

Species	Setting Lake											
	2008 (# sites=14)			2009 (# sites=14)			2010 (# sites=16)			Overall (# years=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	1	0.1	0.22	1	0.1	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	101	5.5	6.72	67	4.0	6.72	76	4.5	6.47	244	4.7	0.42
White Sucker	214	14.1	11.05	188	11.4	6.32	199	11.6	7.97	601	12.4	0.87
Shorthead Redhorse	2	0.1	0.33	7	0.4	0.66	3	0.2	0.51	12	0.2	0.09
Northern Pike	59	3.9	3.21	69	4.2	4.12	85	5.0	2.51	213	4.3	0.33
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	240	14.9	9.16	235	14.2	14.85	448	26.4	18.93	923	18.5	3.94
Lake Whitefish	6	0.4	0.81	6	0.4	0.83	25	1.5	2.45	37	0.8	0.38
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	0.1	0.33	2	0.1	0.31	5	0.3	0.66	10	0.2	0.06
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	78	5.0	7.54	43	2.6	2.95	36	2.1	2.21	157	3.2	0.90
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	305	20.4	38.11	229	13.9	14.36	264	15.4	13.52	798	16.6	1.97
Walleye	246	14.8	16.10	274	16.6	17.19	276	16.4	17.84	796	15.9	0.56
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	1254	79.3	40.16	1120	67.8	18.13	1418	83.5	23.52	3792	76.9	4.69

#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 5.6.7-6. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake									Little Playgreen Lake		
	2009 (# sites=17)			2010 (# sites=14)			Overall (# years=2)			2010 (# sites=10)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE	n	BPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	3	3	8	3	1	1	-	-	-
Quillback	-	-	-	1	111	417	1	56	45	-	-	-
Longnose Sucker	3	186	621	1	59	219	4	122	52	-	-	-
White Sucker	396	13932	18363	471	31641	17219	867	22787	7230	382	37639	12667
Shorthead Redhorse	5	189	492	4	230	384	9	210	17	53	4459	3069
Northern Pike	174	18544	20499	95	17106	16681	269	17825	587	124	15324	13543
Rainbow Smelt	14	7	20	135	137	221	149	72	53	4	3	7
Cisco	26	1009	2591	22	817	1658	48	913	78	1	86	271
Lake Whitefish	11	712	1096	27	839	1970	38	775	52	5	184	582
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	1	132	544	1	124	465	2	128	3	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	1	10	30
Yellow Perch	170	966	1285	64	713	850	234	840	103	48	577	356
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	118	2536	9499	17	580	997	135	1558	799	2	100	213
Walleye	144	6294	12411	114	9511	16153	258	7902	1314	113	10008	5740
Freshwater Drum	-	-	-	2	204	763	2	102	83	1	189	597
Total	1062	44507	39705	957	62074	34931	2019	53291	7172	734	68579	29566

#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 5.6.7-8. continued.

Species	Cross Lake												Walker Lake		
	2008 (# sites=12)			2009 (# sites=12)			2010 (# sites=12)			Overall (# years=3)			2010 (# sites=9)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE	n	BPUE	SD
Goldeye	-	-	-	1	23	79	-	-	-	1	8	8	-	-	-
Mooneye	2	48	112	-	-	-	-	-	-	2	16	16	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	78	5010	5133	57	4255	6863	70	4976	5304	205	4747	246	129	11109	10991
Shorthead Redhorse	40	2264	3053	33	1759	2859	28	2012	2532	101	2012	146	-	-	-
Northern Pike	169	16242	8877	107	10191	7711	92	9424	11350	368	11952	2156	26	3058	2741
Rainbow Smelt	9	4	7	3	2	7	2	1	3	14	2	1	-	-	-
Cisco	14	721	2114	5	405	1401	1	59	205	20	395	191	63	1070	1467
Lake Whitefish	3	310	1073	-	-	-	-	-	-	3	103	103	1	13	38
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	71	564	467	42	441	402	55	374	345	168	460	56	20	123	94
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	19	390	915	43	879	839	26	748	952	88	672	146	14	338	594
Walleye	197	12038	6533	102	6130	3853	146	9189	6450	445	9119	1706	22	1862	1146
Freshwater Drum	1	114	396	-	-	-	4	221	623	5	112	64	1	112	335
Total	603	37704	11015	287	24084	12043	424	27004	17374	1420	29597	4140	276	17684	12058

#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 5.6.7-8. continued.

Species	Setting Lake											
	2008 (# sites=14)			2009 (# sites=14)			2010 (# sites=16)			Overall (# years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	1	0	2	1	0	0
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	101	4525	5766	67	3024	4964	76	4538	6747	244	4029	503
White Sucker	214	10723	8702	188	8757	4934	199	9707	6836	601	9729	568
Shorthead Redhorse	2	81	206	7	296	464	3	148	414	12	175	64
Northern Pike	59	2845	3125	69	3207	2952	85	4177	2563	213	3410	398
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	240	4256	3523	235	3500	4055	448	6501	5358	923	4752	901
Lake Whitefish	6	301	705	6	236	563	25	434	735	37	323	58
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	3	79	201	2	47	128	5	158	410	10	95	33
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	78	698	936	43	333	384	36	327	300	157	453	123
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	305	3665	7575	229	2680	2964	264	3333	3277	798	3226	289
Walleye	246	4939	5217	274	7066	6849	276	7105	6974	796	6370	715
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	1254	32112	12499	1120	29144	7467	1418	36428	9470	3792	32562	2115

#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 5.6.7-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake									Little Playgreen Lake		
	2009 (# sites=5)			2010 (# sites=4)			Overall (# years=2)			2010 (# sites=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE	n	CPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	30	7.0	15.71	400	135.9	108.00	430	71.4	64.41	71	30.4	12.06
Spottail Shiner	197	46.2	103.40	1640	559.2	536.64	1837	302.7	256.50	2496	1078.2	1725.00
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	2	0.5	1.02	4	1.3	2.66	6	0.9	0.44	2	0.9	0.74
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	5	1.2	2.64	7	2.3	1.32	12	1.8	0.58	4	1.6	1.71
Rainbow Smelt	53	12.1	27.11	503	160.5	134.20	556	86.3	74.18	21	9.1	12.42
Cisco	-	-	-	1	0.3	0.56	1	0.3	-	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	0.4	0.74
Troutperch	38	8.7	19.50	26	8.5	8.08	64	8.6	0.10	65	29.4	24.70
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	1.2	2.59	-	-	-	5	1.2	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	81	18.7	41.87	18	6.0	9.32	99	12.4	6.34	48	20.6	13.22
Logperch	1	0.2	0.48	-	-	-	1	0.2	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	2	0.4	0.96	19	6.4	10.10	21	3.4	2.99	11	4.7	3.03
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	414	96.3	96.28	2618	880.5	633.91	3032	488.4	392.11	2719	1175.3	1726.08

#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 5.6.7-9. continued.

Species	Cross Lake												Walker Lake		
	2008 (# sites=4)			2009 (# sites=4)			2010 (# sites=4)			Overall (# years=3)			2010 (# sites=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE	n	CPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	20	5.3	9.30	17	4.7	5.57	7	2.0	3.97	44	4.0	1.02	4	1.6	2.69
Spottail Shiner	219	58.2	61.10	170	46.5	44.79	238	66.4	43.96	627	57.0	5.78	81	33.8	26.54
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	9	2.4	4.80	8	2.2	3.17	-	-	-	17	1.5	0.77	3	1.2	1.58
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	8	2.1	3.59	3	0.8	1.07	2	0.6	1.12	13	1.2	0.48	-	-	-
Rainbow Smelt	17	4.6	3.56	11	3.1	4.03	15	4.1	7.49	43	3.9	0.44	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	8	3.3	3.51
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	43	11.5	10.68	7	2.0	3.98	24	6.7	5.57	74	6.7	2.73	4	1.8	1.56
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	1	0.3	0.53	-	-	-	1	0.3	-	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	268	70.0	132.88	197	52.7	80.50	196	54.9	108.41	661	59.2	5.41	47	13.4	10.77
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	1	0.3	0.53	5	1.4	1.67	6	0.8	0.46	10	4.4	3.91
Walleye	5	1.4	1.06	1	0.3	0.56	2	0.6	1.13	8	0.7	0.32	8	2.3	2.34
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	589	155.4	124.75	416	112.7	114.16	489	136.6	121.37	1494	134.9	12.33	165	61.7	39.65

#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 5.6.7-9. continued.

Species	Setting Lake 2008 (# sites=4)			Setting Lake 2009 (# sites=3)			Setting Lake 2010 (# sites=4)			Setting Lake Overall (# years=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	43	9.8	9.27	-	-	-	53	14.0	24.22	96	11.9	1.70
Spottail Shiner	123	25.0	13.94	24	7.8	11.92	120	32.6	37.60	267	21.8	7.32
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	1	0.1	0.27	-	-	-	-	-	-	1	0.1	-
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	11	2.2	1.72	2	0.7	1.13	-	-	-	13	1.4	0.64
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	5	1.2	0.65	6	1.9	3.33	39	10.2	12.51	50	4.4	2.89
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	5	1.3	1.56	4	1.3	2.22	14	3.6	3.10	23	2.1	0.77
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	1	0.3	0.53	-	-	-	2	0.5	0.99	3	0.4	0.09
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	17	4.0	4.55	2	0.7	1.13	7	1.9	3.87	26	2.2	0.98
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	57	14.4	11.88	24	7.8	6.08	67	17.2	12.25	148	13.1	2.80
Walleye	44	10.0	10.62	3	1.0	1.70	16	4.4	6.02	63	5.1	2.64
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	307	68.4	27.14	65	21.1	8.91	318	84.4	63.91	690	57.9	19.00

#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 5.6.7-8. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m/24 h) set in Upper Nelson River Region waterbodies, 2008-2010 (and overall).

Species	Playgreen Lake									Little Playgreen Lake		
	2009 (# sites=5)			2010 (# sites=4)			Overall (# years=2)			2010 (# years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE	n	BPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	3	34	69	400	740	562	403	387	288	71	155	48
Spottail Shiner	197	247	453	1640	3171	3133	1837	1709	1194	2496	5936	9490
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	2	9	12	4	119	239	6	64	45	2	145	220
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	5	2639	5901	7	3940	1011	12	3289	531	4	1644	2395
Rainbow Smelt	53	103	95	503	1954	1645	556	1029	756	21	79	109
Cisco	-	-	-	1	4	9	1	2	2	-	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	-	1	8	14
Troutperch	38	76	75	26	70	81	64	73	2	65	167	54
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	5	3	6	-	-	-	5	2	1	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	81	205	346	18	219	338	99	212	6	48	339	202
Logperch	1	2	5	-	-	-	1	1	1	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	2	458	1025	19	121	178	21	290	138	11	75	41
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	414	3777	6634	2618	10338	4647	3032	7058	2679	2719	8548	6815

#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 5.6.7-10. continued.

Species	Cross Lake												Walker Lake		
	2008 (# sites=4)			2009 (# sites=4)			2010 (# sites=4)			Overall (# years=3)			2010 (# sites=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE	n	BPUE	SD
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	20	20	35	17	20	22	7	8	15	44	16	4	4	5	9
Spottail Shiner	219	177	122	170	126	192	238	329	258	627	211	61	81	165	131
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Sucker	9	27	53	8	16	23	-	-	-	17	14	8	3	210	242
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	8	1787	3170	3	1116	1367	2	799	1598	13	1234	291	-	-	-
Rainbow Smelt	17	30	24	11	26	29	15	43	81	43	33	5	-	-	-
Cisco	-	-	-	-	-	-	-	-	-	-	-	-	8	297	268
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	43	58	51	7	14	27	24	48	47	74	40	13	4	7	8
Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	-	-	-	1	1	2	-	-	-	1	0	0	-	-	-
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	268	746	1399	197	742	971	196	577	1097	661	688	55	47	280	37
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	1	429	859	5	428	750	6	286	143	10	458	397
Walleye	5	552	687	1	4	8	2	624	1247	8	393	196	8	1349	1680
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	589	3395	2895	416	2494	2760	489	2856	3190	1494	2915	262	165	2773	1902

#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 5.6.7-10. continued.

Species	Setting Lake											
	2008 (# sites=4)			2009 (# sites=3)			2010 (# sites=4)			Overall (# years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Goldeye	-	-	-	-	-	-	-	-	-	-	-	-
Mooneye	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	43	226	402	-	-	-	53	64	99	96	97	67
Spottail Shiner	123	302	424	24	33	41	120	161	186	267	165	78
Quillback	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	1	1	3	-	-	-	-	-	-	1	-	-
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	11	1425	1224	2	856	1482	-	-	-	13	760	414
Rainbow Smelt	-	-	-	-	-	-	-	-	-	-	-	-
Cisco	5	113	67	6	16	28	39	855	1129	50	328	265
Lake Whitefish	-	-	-	-	-	-	-	-	-	-	-	-
Troutperch	5	8	10	4	10	17	14	18	18	23	12	3
Burbot	-	-	-	-	-	-	-	-	-	-	-	-
Slimy Sculpin	1	1	3	-	-	-	2	1	3	3	1	0
Rock Bass	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	17	96	135	2	7	11	7	9	18	26	37	29
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	57	1280	2055	24	1542	920	67	3606	3529	148	2143	736
Walleye	44	1741	1195	3	216	373	16	1366	1821	63	1108	459
Freshwater Drum	-	-	-	-	-	-	-	-	-	-	-	-
Total	307	5194	1007	65	2677	2179	318	6081	4596	690	4651	1019

#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 5.6.7-9. 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 the Upper Nelson River Region waterbodies, 2008-2010.

Mesh (in)	Playgreen Lake						Little Playgreen Lake			Cross Lake								
	2009			2010			2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)																		
2	15	560	117	29	656	118	35	494	136	56	540	113	32	526	110	32	549	126
3	33	565	87	26	627	104	47	543	69	61	557	82	37	548	98	31	550	84
3.75	19	637	86	21	681	100	30	547	54	30	573	108	20	560	82	20	585	114
4.25	14	661	122	8	718	84	9	660	38	18	674	93	12	621	127	8	632	119
5	10	667	51	11	726	53	3	527	76	4	742	88	2	729	279	1	682	-
Total	91	605	104	95	667	105	124	538	97	169	571	109	103	556	111	92	566	111
Weight (g)																		
SM	5	2236	-	7	1706	-	4	1063	-	8	839	-	3	1353	-	2	1425	-
2	31	1649	-	28	2707	1174	34	1193	954	56	1322	845	32	1228	889	32	1479	1175
3	51	2015	-	25	2324	1212	46	1407	557	61	1343	690	39	1367	1014	31	1382	756
3.75	35	2514	-	21	2931	1391	29	1431	389	30	1551	953	22	1406	645	20	1675	967
4.25	33	2992	-	8	3294	1085	9	2361	366	18	2278	1009	12	2188	1196	8	2179	1348
5	24	2766	-	10	3203	683	3	1240	456	4	3075	1090	2	4360	4441	1	2720	-
Total	179	3701	-	99	2740	-	125	1431	-	177	1483	-	110	1492	-	94	1577	-
Condition Factor (K)																		
2	15	0.79	0.08	28	0.89	0.08	34	0.83	0.06	56	0.75	0.09	32	0.74	0.07	32	0.76	0.07
3	33	0.83	0.08	25	0.90	0.08	46	0.84	0.06	61	0.74	0.07	37	0.78	0.11	31	0.77	0.06
3.75	19	0.86	0.10	21	0.87	0.06	29	0.84	0.06	30	0.78	0.09	20	0.77	0.10	20	0.78	0.08
4.25	14	0.86	0.05	8	0.88	0.09	9	0.82	0.07	18	0.71	0.08	12	0.83	0.08	8	0.81	0.06
5	10	0.83	0.08	10	0.83	0.09	3	0.83	0.06	4	0.73	0.05	2	0.88	0.09	1	0.86	-
Total	91	0.83	0.08	92	0.88	0.08	121	0.83	0.06	169	0.74	0.08	103	0.77	0.10	92	0.77	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 5.6.7-11. continued.

Mesh (in)	Walker Lake			Setting Lake								
	2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	9	508	144	-	-	-	37	470	92	39	463	76
3	13	546	104	-	-	-	26	506	55	33	516	75
3.75	2	698	10	-	-	-	1	606	-	11	582	45
4.25	2	705	83	-	-	-	3	683	30	1	586	-
5	-	-	-	-	-	-	2	574	20	1	838	-
Total	26	557	128	-	-	-	69	498	89	85	505	90
Weight (g)												
SM	-	-	-	11	656	-	2	1310	-	-	-	-
2	9	1109	821	31	600	-	37	840	696	38	775	394
3	13	1248	967	22	1123	-	25	915	303	33	1073	705
3.75	2	2565	346	2	1405	-	1	1760	-	11	1532	712
4.25	2	2705	1068	3	1247	-	3	2077	548	1	1430	-
5	-	-	-	1	3010	-	2	1200	71	1	4660	-
Total	26	1413	1001	70	2003	-	70	971	-	84	1045	739
Condition Factor (K)												
2	9	0.71	0.11	-	-	-	37	0.71	0.06	38	0.73	0.07
3	13	0.68	0.05	-	-	-	25	0.70	0.07	33	0.72	0.07
3.75	2	0.75	0.07	-	-	-	1	0.79	-	11	0.74	0.12
4.25	2	0.75	0.04	-	-	-	3	0.64	0.10	1	0.71	-
5	-	-	-	-	-	-	2	0.64	0.10	1	0.79	-
Total	26	0.70	0.08	-	-	-	68	0.70	0.07	84	0.73	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 5.6.7-10. 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 the Upper Nelson River Region from 2008-2010.

Mesh	Playgreen Lake						Little Playgreen Lake			Cross Lake								
(in)	2009			2010			2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)																		
2	2	386	187	18	191	8	-	-	-	-	-	-	-	-	-	-	-	-
3	1	274	-	2	247	78	-	-	-	1	418	-	-	-	-	-	-	-
3.75	3	419	47	-	-	-	2	443	10	2	410	8	-	-	-	-	-	-
4.25	1	478	-	4	457	65	1	458	-	-	-	-	-	-	-	-	-	-
5	4	476	40	3	421	47	2	508	28	-	-	-	-	-	-	-	-	-
Total	11	426	91	27	260	115	5	472	37	3	412	7	-	-	-	-	-	-
Weight (g)																		
SM	-	-	-	-	-	-	1	18	-	-	-	-	-	-	-	-	-	-
2	2	1215	-	18	96	15	-	-	-	-	-	-	-	-	-	-	-	-
3	1	260	-	2	250	226	-	-	-	1	1500	-	-	-	-	-	-	-
3.75	3	1200	448	-	-	-	2	1555	134	2	1338	88	-	-	-	-	-	-
4.25	1	1940	-	4	1680	616	1	1650	-	-	-	-	-	-	-	-	-	-
5	4	1915	450	3	1170	291	2	2400	481	-	-	-	-	-	-	-	-	-
Total	11	1445	-	27	461	659	6	1596	899	3	1392	113	-	-	-	-	-	-
Condition Factor (K)																		
2	2	1.52	0.08	18	1.37	0.15	-	-	-	-	-	-	-	-	-	-	-	-
3	1	1.26	-	2	1.38	0.16	-	-	-	1	2.05	-	-	-	-	-	-	-
3.75	3	1.59	0.07	-	-	-	2	1.79	0.04	2	1.95	0.24	-	-	-	-	-	-
4.25	1	1.78	-	4	1.71	0.2	1	1.72	-	-	-	-	-	-	-	-	-	-
5	4	1.76	0.14	3	1.56	0.13	2	1.82	0.06	-	-	-	-	-	-	-	-	-
Total	11	1.63	0.18	27	1.44	0.2	5	1.78	0.05	3	1.98	0.18	-	-	-	-	-	-

Table 5.6.7-12. continued.

Mesh (in)	Walker Lake 2010			Setting Lake 2008			Setting Lake 2009			Setting Lake 2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	1	221	-	-	-	-	1	254	-	11	256	42
3	-	-	-	1	316	-	1	298	-	10	306	22
3.75	-	-	-	-	-	-	3	395	14	3	308	11
4.25	-	-	-	2	411	13	-	-	-	1	396	-
5	-	-	-	3	424	16	1	478	-	-	-	-
Total	1	-	-	6	402	44	6	369	81	25	288	46
Weight (g)												
SM	1	140	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	1	210	-	11	250	115
3	-	-	-	1	420	-	1	350	-	10	408	82
3.75	-	-	-	-	-	-	3	897	208	3	397	42
4.25	-	-	-	2	1060	170	-	-	-	1	910	-
5	-	-	-	3	1157	155	1	1500	-	-	-	-
Total	1	-	-	6	1002	314	6	792	481	25	357	166
Condition Factor (K)												
2	1	1.3	-	-	-	-	1	1.28	-	11	1.4	0.08
3	-	-	-	1	1.33	-	1	1.32	-	10	1.41	0.13
3.75	-	-	-	-	-	-	3	1.44	0.18	3	1.35	0.07
4.25	-	-	-	2	1.52	0.1	-	-	-	1	1.47	-
5	-	-	-	3	1.51	0.06	1	1.37	-	-	-	-
Total	1	-	-	6	1.49	0.1	6	1.38	0.13	25	1.4	0.1

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

Table 5.6.7-11. 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 the Upper Nelson River Region from 2008-2010.

Mesh (in)	Playgreen Lake						Little Playgreen Lake			Cross Lake								
	2009			2010			2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)																		
2	13	320	92	9	340	80	14	308	83	30	351	79	18	351	68	26	399	67
3	34	391	54	30	454	142	25	367	67	57	412	55	35	424	120	34	389	48
3.75	34	412	54	41	429	47	34	409	35	56	430	40	15	404	36	56	415	40
4.25	45	436	41	21	454	38	19	451	29	50	443	39	32	443	49	22	461	58
5	18	468	18	14	506	51	21	466	43	4	458	29	2	481	14	7	467	52
Total	144	413	64	115	443	91	113	405	72	197	416	60	102	415	87	145	416	56
Weight (g)																		
SM	2	1070	-	19	19	-	11	16	-	5	395	-	1	14	-	2	1100	-
2	13	503	387	9	583	434	14	493	438	30	604	359	18	582	345	27	816	471
3	34	785	311	30	1322	1143	25	745	423	57	925	310	35	1015	876	34	765	325
3.75	34	987	480	41	1122	416	34	966	256	56	1039	279	15	821	232	56	925	289
4.25	45	1098	303	21	1326	386	19	1323	249	50	1138	249	32	1135	375	22	1344	725
5	18	1347	161	14	1878	485	21	1499	415	4	1288	120	2	1360	127	7	1363	363
Total	146	983	-	134	1212	-	124	984	-	202	956	-	103	945	613	148	960	-
Condition Factor (K)																		
2	13	1.27	0.10	9	1.23	0.13	14	1.31	0.15	30	1.18	0.13	18	1.20	0.12	26	1.18	0.10
3	34	1.25	0.08	30	1.26	0.21	25	1.36	0.10	57	1.25	0.13	35	1.19	0.16	34	1.23	0.11
3.75	34	1.33	0.11	41	1.36	0.10	34	1.39	0.12	56	1.27	0.14	15	1.21	0.16	56	1.26	0.10
4.25	45	1.29	0.10	21	1.39	0.10	19	1.42	0.11	50	1.29	0.15	32	1.25	0.10	22	1.29	0.12
5	18	1.31	0.09	14	1.42	0.10	21	1.45	0.12	4	1.35	0.18	2	1.22	0.00	7	1.30	0.04
Total	144	1.29	0.10	115	1.34	0.15	113	1.39	0.12	197	1.26	0.14	102	1.22	0.14	145	1.24	0.11

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

Table 5.6.7-13. continued.

Mesh (in)	Walker Lake			Setting Lake								
	2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	3	419	52	146	300	59	110	313	56	116	320	63
3	7	381	57	75	360	39	99	365	34	111	367	42
3.75	8	463	47	15	369	66	52	389	41	33	401	27
4.25	1	455	-	7	377	36	12	387	48	13	371	70
5	3	502	73	3	404	48	1	352	-	3	444	56
Total	22	436	66	246	326	62	274	349	55	276	352	60
Weight (g)												
SM	8	538	-	44	192	-	3	220	-	16	317	-
2	3	910	358	146	327	201	108	369	204	115	419	232
3	7	666	301	74	534	145	99	576	167	109	588	195
3.75	8	1135	391	15	621	214	52	733	188	33	769	164
4.25	1	1100	-	7	629	149	12	718	220	13	676	358
5	3	1543	660	3	773	307	1	520	-	3	1070	541
Total	30	1104	-	289	451	-	275	530	-	289	556	-
Condition Factor (K)												
2	3	1.18	0.15	146	1.07	0.09	108	1.12	0.11	115	1.15	0.09
3	7	1.13	0.05	74	1.11	0.08	99	1.15	0.07	109	1.14	0.08
3.75	8	1.12	0.06	15	1.14	0.07	52	1.20	0.09	33	1.18	0.08
4.25	1	1.17	-	7	1.16	0.10	12	1.19	0.08	13	1.20	0.05
5	3	1.18	0.03	3	1.13	0.12	1	1.19	-	3	1.15	0.14
Total	22	1.14	0.07	245	1.09	0.09	272	1.15	0.10	273	1.15	0.08

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

Table 5.6.7-12. Year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

Year-Class	Northern Pike																			
	PLAY				LPLAY		CROSS						WLKR		SET					
	2009		2010		2010		2008		2009		2010		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2009	-	-	-	-	1	0.81	-	-	-	-	-	-	-	-	-	-	-	-	1	1.18
2008	-	-	1	1.09	6	4.84	-	-	-	-	1	1.14	-	-	-	-	-	-	5	5.88
2007	-	-	6	6.52	17	13.71	1	1.32	2	1.94	11	12.50	3	11.54	-	-	1	1.45	4	4.71
2006	5	5.49	5	5.43	18	14.52	1	1.32	17	16.50	15	17.05	4	15.38	-	-	-	-	17	20.00
2005	5	5.49	15	16.30	35	28.23	22	28.95	25	24.27	26	29.55	6	23.08	-	-	11	15.94	18	21.18
2004	18	19.78	13	14.13	14	11.29	19	25.00	23	22.33	18	20.45	5	19.23	-	-	14	20.29	19	22.35
2003	14	15.38	8	8.70	6	4.84	10	13.16	16	15.53	10	11.36	3	11.54	-	-	17	24.64	8	9.41
2002	19	20.88	12	13.04	7	5.65	10	13.16	8	7.77	4	4.55	3	11.54	-	-	8	11.59	5	5.88
2001	13	14.29	11	11.96	8	6.45	7	9.21	5	4.85	-	-	-	-	-	-	6	8.70	4	4.71
2000	6	6.59	13	14.13	5	4.03	4	5.26	3	2.91	1	1.14	-	-	-	-	4	5.80	3	3.53
1999	5	5.49	4	4.35	6	4.84	1	1.32	2	1.94	1	1.14	1	3.85	-	-	2	2.90	1	1.18
1998	2	2.20	4	4.35	1	0.81	1	1.32	-	-	-	-	-	-	-	-	1	1.45	-	-
1997	3	3.30	-	-	-	-	-	-	2	1.94	1	1.14	-	-	-	-	2	2.90	-	-
1996	1	1.10	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	2	2.90	-	-
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.45	-	-
Total	91	100	92	100	124	100	76	100	103	100	88	100	26	100	-	-	69	100	85	100

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

Table 5.6.7-13. Year-class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

Year-Class	Lake Whitefish																			
	PLAYG				LPLAY		CROSS						WLKR		SET					
	2009		2010		2010		2008		2009		2010		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2009	-	-	18	69.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4.00
2008	-	-	1	3.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	20.00
2007	-	-	2	7.69	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	18	72.00
2006	2	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	1	4.00
2005	-	-	-	-	1	20.00	-	-	-	-	-	-	1	100.00	-	-	1	20.00	-	-
2004	1	10.00	2	7.69	2	40.00	-	-	-	-	-	-	-	-	-	-	1	20.00	-	-
2003	1	10.00	-	-	-	-	-	-	-	-	-	-	-	-	2	40.00	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	40.00	1	20.00	-	-
2001	-	-	-	-	-	-	2	66.67	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	1	33.33	-	-	-	-	-	-	-	-	-	-	-	-
1997	-	-	-	-	1	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	1	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	2	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	3	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	-	-	3	11.54	1	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10	100	26	100	5	100	3	100	-	-	-	-	1	100	5	100	5	100	25	100

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

Table 5.6.7-14. Year-class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

Year-Class	Walleye																					
	PLAYG				LPLAY		CROSS						WLKR		SET					
	2009		2010		2010		2008		2009		2010		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	1	0.88	6	5.56	-	-	-	-	-	-	-	-	-	-	-	-	12	4.38
2007	3	2.11	5	4.39	5	4.63	-	-	1	1.03	2	1.38	-	-	2	0.82	5	1.83	15	5.47
2006	6	4.23	20	17.54	12	11.11	-	-	3	3.09	8	5.52	-	-	16	6.58	14	5.13	19	6.93
2005	30	21.13	45	39.47	17	15.74	1	2.08	13	13.40	26	17.93	-	-	45	18.52	59	21.61	81	29.56
2004	5	3.52	10	8.77	1	0.93	2	4.17	10	10.31	46	31.72	2	9.09	12	4.94	12	4.40	11	4.01
2003	2	1.41	6	5.26	24	22.22	2	4.17	13	13.40	18	12.41	2	9.09	44	18.11	56	20.51	32	11.68
2002	62	43.66	12	10.53	26	24.07	25	52.08	20	20.62	7	4.83	2	9.09	77	31.69	96	35.16	80	29.20
2001	25	17.61	15	13.16	7	6.48	18	37.50	30	30.93	12	8.28	4	18.18	42	17.28	25	9.16	19	6.93
2000	3	2.11	-	-	-	-	-	-	5	5.15	22	15.17	3	13.64	2	0.82	3	1.10	2	0.73
1999	3	2.11	-	-	-	-	-	-	-	-	2	1.38	3	13.64	-	-	1	0.37	2	0.73
1998	1	0.70	-	-	-	-	-	-	2	2.06	1	0.69	-	-	2	0.82	-	-	-	-
1997	-	-	-	-	3	2.78	-	-	-	-	-	-	2	9.09	1	0.41	-	-	1	0.36
1996	-	-	-	-	6	5.56	-	-	-	-	-	-	3	13.64	-	-	1	0.37	-	-
1995	2	1.41	-	-	1	0.93	-	-	-	-	-	-	-	-	-	-	1	0.37	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	-	-	-	-	-	1	4.55	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	1	0.69	-	-	-	-	-	-	-	-
Total	142	100	114	100	108	100	48	100	97	100	145	100	22	100	243	100	273	100	274	100

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

Table 5.6.7-15. Age frequency distributions (%) for Northern Pike captured in standard gang index gill net sets in Upper Nelson River Region waterbodies, 2008-2010.

Age	Northern Pike																			
	Playgreen L				Little Playgreen L		Cross L						Walker L		Setting L					
	2009		2010		2010		2008		2009		2010		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	-	-	-	-	1	0.81	1	1.32	-	-	-	-	-	-	-	-	-	-	1	1.18
2	-	-	1	1.09	6	4.84	1	1.32	2	1.94	1	1.14	-	-	-	-	1	1.45	5	5.88
3	5	5.49	6	6.52	17	13.71	22	28.95	17	16.50	11	12.50	3	11.54	-	-	-	-	4	4.71
4	5	5.49	5	5.43	18	14.52	19	25.00	25	24.27	15	17.05	4	15.38	-	-	11	15.94	17	20.00
5	18	19.78	15	16.30	35	28.23	10	13.16	23	22.33	26	29.55	6	23.08	-	-	14	20.29	18	21.18
6	14	15.38	13	14.13	14	11.29	10	13.16	16	15.53	18	20.45	5	19.23	-	-	17	24.64	19	22.35
7	19	20.88	8	8.70	6	4.84	7	9.21	8	7.77	10	11.36	3	11.54	-	-	8	11.59	8	9.41
8	13	14.29	12	13.04	7	5.65	4	5.26	5	4.85	4	4.55	3	11.54	-	-	6	8.70	5	5.88
9	6	6.59	11	11.96	8	6.45	1	1.32	3	2.91	-	-	-	-	-	-	4	5.80	4	4.71
10	5	5.49	13	14.13	5	4.03	1	1.32	2	1.94	1	1.14	-	-	-	-	2	2.90	3	3.53
11	2	2.20	4	4.35	6	4.84	-	-	-	-	1	1.14	1	3.85	-	-	1	1.45	1	1.18
12	3	3.30	4	4.35	1	0.81	-	-	2	1.94	-	-	-	-	-	-	2	2.90	-	-
13	1	1.10	-	-	-	-	-	-	-	-	1	1.14	-	-	-	-	2	2.90	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.45	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	91	100	92	100	124	100	76	100	103	100	88	100	26	100	-	-	69	100	85	100

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

Table 5.6.7-16. Age frequency distributions (%) for Lake Whitefish captured in standard gang index gill net sets in Upper Nelson River Region waterbodies, 2008-2010.

Age	Lake Whitefish																							
	Playgreen L				Little Playgreen L		Cross L						Walker L		Setting L					
	2009		2010		2010		2008		2009		2010		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	-	-	18	69.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4.00
2	-	-	1	3.85	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	5	20.00
3	2	20.00	2	7.69	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	18	72.00
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	1	4.00
5	1	10.00	-	-	1	20.00	-	-	-	-	-	-	1	100.00	2	40.00	1	20.00	-	-
6	1	10.00	2	7.69	2	40.00	-	-	-	-	-	-	-	-	2	40.00	-	-	-	-
7	-	-	-	-	-	-	2	66.67	-	-	-	-	-	-	-	-	1	20.00	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20.00	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	1	33.33	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1	10.00	-	-	1	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	2	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	3	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	3	11.54	1	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10	100	26	100	5	100	3	100	-	-	-	-	1	100	5	100	5	100	25	100

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

Table 5.6.7-17. Age frequency distributions (%) for Walleye captured in standard gang index gill net sets in Upper Nelson River Region waterbodies, 2008-2010.

Age	Walleye																					
	Playgreen L				Little Playgreen L		Cross L						Walker L		Setting L					
	2009		2010		2010		2008		2009		2010		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.82	-	-	-	-
2	3	2.11	1	0.88	6	5.56	-	-	1	1.03	-	-	-	-	16	6.58	5	1.83	12	4.38
3	6	4.23	5	4.39	5	4.63	1	2.08	3	3.09	2	1.38	-	-	45	18.52	14	5.13	15	5.47
4	30	21.13	20	17.54	12	11.11	2	4.17	13	13.40	8	5.52	-	-	12	4.94	59	21.61	19	6.93
5	5	3.52	45	39.47	17	15.74	2	4.17	10	10.31	26	17.93	-	-	44	18.11	12	4.40	81	29.56
6	2	1.41	10	8.77	1	0.93	25	52.08	13	13.40	46	31.72	2	9.09	77	31.69	56	20.51	11	4.01
7	62	43.66	6	5.26	24	22.22	18	37.50	20	20.62	18	12.41	2	9.09	42	17.28	96	35.16	32	11.68
8	25	17.61	12	10.53	26	24.07	-	-	30	30.93	7	4.83	2	9.09	2	0.82	25	9.16	80	29.20
9	3	2.11	15	13.16	7	6.48	-	-	5	5.15	12	8.28	4	18.18	-	-	3	1.10	19	6.93
10	3	2.11	-	-	-	-	-	-	-	-	22	15.17	3	13.64	2	0.82	1	0.37	2	0.73
11	1	0.70	-	-	-	-	-	-	2	2.06	2	1.38	3	13.64	1	0.41	-	-	2	0.73
12	-	-	-	-	-	-	-	-	-	-	1	0.69	-	-	-	-	-	-	-	-
13	-	-	-	-	3	2.78	-	-	-	-	-	-	2	9.09	-	-	1	0.37	1	0.36
14	2	1.41	-	-	6	5.56	-	-	-	-	-	-	3	13.64	-	-	1	0.37	-	-
15	-	-	-	-	1	0.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	1	4.55	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	142	100	114	100	108	100	48	100	97	100	145	100	22	100	243	100	273	100	274	100

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

Table 5.6.7-18. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

Age	Playgreen Lake																				Little Playgreen Lake									
	2009										2010										2010									
	Year-Class	FL (mm)			W (g)			K			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		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-	2009	1	258	-	1	140	-	1	0.82	-
2	2007	-	-	-	-	-	-	-	-	-	2008	1	354	-	1	420	-	1	0.95	-	2008	6	327	46	6	312	136	6	0.85	0.05
3	2006	5	406	81	5	594	283	5	0.83	0.10	2007	6	498	36	6	1122	242	6	0.90	0.06	2007	17	451	52	17	792	251	17	0.83	0.06
4	2005	5	492	73	5	1016	457	5	0.81	0.02	2006	5	548	25	5	1576	93	5	0.96	0.10	2006	18	497	46	16	1083	295	16	0.84	0.05
5	2004	18	539	60	18	1329	350	18	0.84	0.11	2005	15	603	69	14	2054	706	14	0.89	0.05	2005	35	542	52	35	1365	420	35	0.84	0.05
6	2003	14	603	39	14	1829	304	14	0.83	0.06	2004	13	643	65	13	2287	660	13	0.84	0.06	2004	14	605	56	13	1864	511	13	0.81	0.07
7	2002	19	637	64	19	2196	898	19	0.81	0.08	2003	8	694	65	8	2826	717	8	0.83	0.04	2003	6	606	70	6	1960	652	6	0.86	0.05
8	2001	13	649	103	13	2529	1108	13	0.87	0.09	2002	12	712	44	11	2974	419	11	0.84	0.09	2002	7	615	32	7	1967	323	7	0.84	0.07
9	2000	6	663	51	6	2465	704	6	0.83	0.09	2001	11	719	84	11	3342	975	11	0.88	0.08	2001	8	574	24	8	1624	223	8	0.86	0.07
10	1999	5	724	114	5	3370	1726	5	0.83	0.06	2000	14	736	97	14	3693	1282	14	0.89	0.10	2000	5	610	26	5	1832	375	5	0.80	0.11
11	1998	2	684	28	2	2770	325	2	0.87	0.01	1999	4	765	119	3	4553	2432	3	0.89	0.04	1999	6	698	101	6	2827	1139	6	0.80	0.05
12	1997	3	707	31	3	2963	294	3	0.84	0.06	1998	4	716	113	4	3158	1195	4	0.84	0.08	1998	1	688	-	1	2320	-	1	0.71	-
13	1996	1	838	-	1	5040	-	1	0.86	-	1997	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7-20. continued.

Age	Cross Lake																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			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		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2007	1	223	-	1	82	-	1	0.74	-	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2006	1	362	-	1	300	-	1	0.63	-	2007	2	370	40	2	375	120	2	0.73	0.00	2008	1	274	-	1	160	-	1	0.78	-
3	2005	22	505	46	22	1057	291	22	0.80	0.09	2006	17	457	51	17	728	196	17	0.75	0.07	2007	11	451	35	11	716	203	11	0.76	0.06
4	2004	19	522	41	19	1113	294	19	0.77	0.07	2005	25	508	59	25	1030	349	25	0.76	0.09	2006	15	484	62	15	889	349	15	0.75	0.07
5	2003	10	606	57	10	1715	484	10	0.76	0.06	2004	23	555	42	23	1356	391	23	0.77	0.09	2005	26	564	55	26	1407	463	26	0.76	0.06
6	2002	10	631	77	10	1960	672	10	0.76	0.07	2003	16	580	45	16	1500	471	16	0.75	0.11	2004	18	601	64	18	1768	542	18	0.80	0.08
7	2001	7	707	74	7	2557	804	7	0.69	0.08	2002	8	619	114	8	2096	1057	8	0.84	0.18	2003	10	615	59	10	1901	532	10	0.80	0.07
8	2000	4	722	64	4	2725	1008	4	0.70	0.06	2001	5	657	120	5	2522	1155	5	0.82	0.04	2002	4	767	124	4	3420	1440	4	0.73	0.05
9	1999	1	855	-	1	4500	-	1	0.72	-	2000	3	783	42	3	3750	541	3	0.78	0.03	2001	-	-	-	-	-	-	-	-	-
10	1998	1	996	-	1	5600	-	1	0.57	-	1999	2	835	16	2	4460	707	2	0.77	0.08	2000	1	912	-	1	5420	-	1	0.71	-
11	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-	1999	1	807	-	1	3620	-	1	0.69	-
12	1996	-	-	-	-	-	-	-	-	-	1997	2	865	87	2	5960	2178	2	0.90	0.06	1998	-	-	-	-	-	-	-	-	-
13	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-	1997	1	902	-	1	6320	-	1	0.86	-

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

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

Table 5.6.7-20. continued.

Age	Walker Lake										Setting Lake									
	2010										2008									
	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	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-
3	2007	3	359	103	3	360	230	3	0.72	0.11	2005	-	-	-	-	-	-	-	-	-
4	2006	4	433	38	4	568	83	4	0.70	0.09	2004	-	-	-	-	-	-	-	-	-
5	2005	6	556	35	6	1147	298	6	0.66	0.07	2003	-	-	-	-	-	-	-	-	-
6	2004	5	545	11	5	1138	58	5	0.71	0.04	2002	-	-	-	-	-	-	-	-	-
7	2003	3	671	48	3	2167	732	3	0.70	0.11	2001	-	-	-	-	-	-	-	-	-
8	2002	3	667	21	3	2200	522	3	0.73	0.12	2000	-	-	-	-	-	-	-	-	-
9	2001	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
10	2000	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
11	1999	1	764	-	1	3460	-	1	0.78	-	1997	-	-	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-
13	1997	-	-	-	-	-	-	-	-	-	1995	-	-	-	-	-	-	-	-	-
14	1996	1	831	-	1	4260	-	1	0.74	-	1994	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7-20. continued.

Age	Setting 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	1	290	-	1	180	-	1	0.74	-
2	2007	1	324	-	1	260	-	1	0.76	-	2008	5	372	9	5	382	18	5	0.74	0.05
3	2006	-	-	-	-	-	-	-	-	-	2007	4	415	33	4	568	71	4	0.80	0.11
4	2005	11	434	64	11	572	231	11	0.68	0.06	2006	17	463	44	17	729	202	17	0.73	0.06
5	2004	14	467	44	14	748	199	14	0.72	0.07	2005	18	506	65	18	975	354	18	0.72	0.05
6	2003	17	485	64	16	798	386	16	0.68	0.06	2004	19	514	47	19	1001	279	19	0.72	0.07
7	2002	8	511	43	8	921	152	8	0.69	0.08	2003	8	547	48	7	1279	361	7	0.72	0.05
8	2001	6	486	67	6	882	361	6	0.74	0.07	2002	5	612	139	5	1876	1620	5	0.69	0.08
9	2000	4	573	115	4	1328	589	4	0.69	0.11	2001	4	660	124	4	2705	1714	4	0.83	0.18
10	1999	2	637	21	2	1910	325	2	0.74	0.05	2000	3	559	24	3	1227	188	3	0.70	0.02
11	1998	1	560	-	1	1250	-	1	0.71	-	1999	1	620	-	1	1650	-	1	0.69	-
12	1997	2	609	69	2	1625	389	2	0.72	0.07	1998	-	-	-	-	-	-	-	-	-
13	1996	2	663	78	2	2060	863	2	0.69	0.05	1997	-	-	-	-	-	-	-	-	-
14	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-
15	1994	1	788	-	1	4150	-	1	0.85	-	1995	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7-19. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

Age	Playgreen Lake																				Little Playgreen Lake									
	2009										2010										2010									
	Year-Class	FL (mm)			W (g)			K			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		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	2009	18	191	8	18	96	15	18	1.36	0.15	2009	-	-	-	-	-	-	-	-	-
2	2007	-	-	-	-	-	-	-	-	-	2008	1	302	-	1	410	-	1	1.49	-	2008	-	-	-	-	-	-	-	-	-
3	2006	2	330	79	2	565	431	2	1.39	0.18	2007	2	382	17	2	925	106	2	1.66	0.04	2007	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-
5	2004	1	418	-	1	1370	-	1	1.88	-	2005	-	-	-	-	-	-	-	-	-	2005	1	436	-	1	1460	-	1	1.76	-
6	2003	1	398	-	1	1020	-	1	1.62	-	2004	2	419	13	2	1310	99	2	1.79	0.30	2004	2	454	6	2	1650	0	2	1.77	0.06
7	2002	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-	-	-	-	-
8	2001	-	-	-	-	-	-	-	-	-	2002	-	-	-	-	-	-	-	-	-	2002	-	-	-	-	-	-	-	-	-
9	2000	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-
10	1999	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-
11	1998	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1996	1	508	-	1	2470	-	1	1.88	-	1997	-	-	-	-	-	-	-	-	-	1997	1	528	-	1	2740	-	1	1.86	-
14	1995	2	475	4	2	1825	163	2	1.71	0.11	1996	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-
15	1994	-	-	-	-	-	-	-	-	-	1995	-	-	-	-	-	-	-	-	-	1995	-	-	-	-	-	-	-	-	-
16	1993	3	498	17	3	2003	164	3	1.62	0.06	1994	-	-	-	-	-	-	-	-	-	1994	-	-	-	-	-	-	-	-	-
17	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
18	1991	-	-	-	-	-	-	-	-	-	1992	3	496	30	3	1920	490	3	1.55	0.13	1992	1	488	-	1	2060	-	1	1.77	-

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

Table 5.6.7-21. continued.

Age	Cross Lake																												
	2008										2009										2010								
	Year-Class	FL (mm)			W (g)			K			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		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
4	2004	-	-	-	-	-	-	-	-	-	2005	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-
5	2003	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-	2005	-	-	-	-	-	-	-	-	-
6	2002	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-
7	2001	2	417	2	2	1388	159	2	1.92	0.19	2002	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-	-	-	-	-
8	2000	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-	2002	-	-	-	-	-	-	-	-	-
9	1999	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-
10	1998	1	404	-	1	1400	-	1	2.12	-	1999	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7- 21. continued.

Age	Walker 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	Setting Lake 2008 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	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
2	2008	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-
3	2007	-	-	-	-	-	-	-	-	-	2005	-	-	-	-	-	-	-	-	-
4	2006	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-
5	2005	1	221	-	1	140	-	1	1.30	-	2003	2	415	7	2	1090	127	2	1.52	0.10
6	2004	-	-	-	-	-	-	-	-	-	2002	2	431	16	2	1235	106	2	1.55	0.04
7	2003	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-
8	2002	-	-	-	-	-	-	-	-	-	2000	1	402	-	1	940	-	1	1.45	-

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

Table 5.6.7-21. continued.

Age	Setting 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	1	188	-	1	100	-	1	1.50	-
2	2007	1	298	-	1	350	-	1	1.32	-	2008	5	232	8	5	176	18	5	1.41	0.09
3	2006	1	382	-	1	730	-	1	1.31	-	2007	18	303	22	18	391	77	18	1.39	0.11
4	2005	1	394	-	1	830	-	1	1.36	-	2006	1	396	-	1	910	-	1	1.47	-
5	2004	1	410	-	1	1130	-	1	1.64	-	2005	-	-	-	-	-	-	-	-	-
6	2003	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-
7	2002	1	478	-	1	1500	-	1	1.37	-	2003	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7-20. Mean fork length- (mm), weight- (g) and condition factor- (K) at-age for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

Age	Playgreen Lake																				Little Playgreen Lake									
	2009										2010										2010									
	Year-Class	FL (mm)			W (g)			K			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		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-		
2	2007	3	202	13	3	110	10	3	1.34	0.1	2008	1	228	-	1	130	-	1	1.10	-	2008	6	227	9	6	140	21	6	1.19	0.05
3	2006	6	289	27	6	320	71	6	1.30	0.07	2007	5	314	60	5	414	288	5	1.19	0.11	2007	5	290	12	5	310	43	5	1.27	0.05
4	2005	30	355	20	30	589	131	30	1.30	0.10	2006	20	374	20	20	710	122	20	1.34	0.08	2006	12	348	22	12	599	122	12	1.40	0.10
5	2004	5	360	21	5	616	83	5	1.31	0.06	2005	45	423	29	45	1064	239	45	1.38	0.12	2005	17	386	48	17	823	290	17	1.37	0.10
6	2003	2	459	27	2	1360	127	2	1.41	0.11	2004	10	480	96	10	1487	656	10	1.34	0.20	2004	1	392	-	1	920	-	1	1.53	-
7	2002	62	443	29	62	1134	242	62	1.29	0.09	2003	6	493	134	6	1512	929	6	1.16	0.25	2003	24	430	36	24	1144	317	24	1.41	0.11
8	2001	25	447	24	25	1139	196	25	1.26	0.08	2002	12	528	101	12	1984	884	12	1.33	0.19	2002	26	441	36	26	1219	306	26	1.40	0.12
9	2000	3	479	15	3	1410	62	3	1.28	0.07	2001	15	538	89	15	2135	906	15	1.34	0.16	2001	7	466	51	7	1503	562	7	1.43	0.15
10	1999	3	454	29	3	1130	193	3	1.21	0.16	2000	-	-	-	-	-	-	-	-	-	2000	-	-	-	-	-	-	-	-	-
11	1998	1	476	-	1	1430	-	1	1.33	-	1999	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-	1997	3	449	13	3	1330	122	3	1.46	0.0
14	1995	2	553	44	2	2590	764	2	1.51	0.1	1996	-	-	-	-	-	-	-	-	-	1996	6	480	23	6	1583	335	6	1.41	0.1
15	1994	-	-	-	-	-	-	-	-	-	1995	-	-	-	-	-	-	-	-	-	1995	1	494	-	1	2020	-	1	1.68	-

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

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

Table 5.6.7-22. continued.

Age	Cross Lake																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			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		n	Mean	SD	n	Mean	SD	n	Mean	SD
1	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-	2009	-	-	-	-	-	-	-	-	-
2	2006	-	-	-	-	-	-	-	-	-	2007	1	332	-	1	270	-	1	0.74	-	2008	-	-	-	-	-	-	-	-	-
3	2005	1	343	-	1	475	-	1	1.18	-	2006	3	285	22	3	290	72	3	1.23	0.08	2007	2	313	1	2	340	28	2	1.11	0.08
4	2004	2	353	28	2	550	141	2	1.24	0.02	2005	13	338	37	13	476	170	13	1.18	0.13	2006	8	346	40	8	529	168	8	1.22	0.07
5	2003	2	392	49	2	750	354	2	1.19	0.13	2004	10	349	42	10	543	200	10	1.23	0.14	2005	25	368	33	26	616	186	25	1.21	0.11
6	2002	25	425	28	25	1007	220	25	1.29	0.14	2003	13	413	79	13	904	465	13	1.23	0.13	2004	46	403	29	46	823	212	46	1.23	0.10
7	2001	18	441	28	18	1143	224	18	1.32	0.11	2002	20	431	33	20	997	216	20	1.23	0.09	2003	18	425	39	18	1004	329	18	1.27	0.10
8	2000	-	-	-	-	-	-	-	-	-	2001	30	448	31	30	1143	262	30	1.26	0.10	2002	7	449	33	7	1164	265	7	1.27	0.09
9	1999	-	-	-	-	-	-	-	-	-	2000	5	482	31	5	1430	375	5	1.25	0.07	2001	12	456	41	12	1287	387	12	1.32	0.1
10	1998	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-	2000	22	470	33	22	1307	285	22	1.25	0.1
11	1997	-	-	-	-	-	-	-	-	-	1998	2	817	13	2	4090	1032	2	0.75	0.2	1999	2	488	107	2	1635	997	2	1.32	0.0
12	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-	1998	1	469	-	1	1460	-	1	1.42	-
24	1984	-	-	-	-	-	-	-	-	-	1985	-	-	-	-	-	-	-	-	-	1986	1	671	-	1	4220	-	1	1.40	-

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

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

Table 5.6.7-22. continued.

Age	Walker Lake 2010										Setting Lake 2008									
	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	-	-	-	-	-	-	-	-	-	2007	2	144	14	2	30	14	2	0.97	0.19
2	2008	-	-	-	-	-	-	-	-	-	2006	16	228	16	16	119	27	16	1.00	0.06
3	2007	-	-	-	-	-	-	-	-	-	2005	45	251	19	45	164	41	45	1.03	0.10
4	2006	-	-	-	-	-	-	-	-	-	2004	12	284	32	12	262	123	12	1.09	0.11
5	2005	-	-	-	-	-	-	-	-	-	2003	44	333	28	43	411	107	43	1.09	0.05
6	2004	2	313	23	2	330	42	2	1.08	0.10	2002	77	365	27	77	553	138	77	1.12	0.07
7	2003	2	363	1	2	525	35	2	1.10	0.06	2001	42	380	31	42	628	156	42	1.13	0.10
8	2002	2	468	18	2	1200	141	2	1.17	0.00	2000	2	379	4	2	635	7	2	1.17	0.03
9	2001	4	410	22	4	830	183	4	1.19	0.1	1999	-	-	-	-	-	-	-	-	-
10	2000	3	442	27	3	990	157	3	1.14	0.1	1998	2	394	20	2	740	99	2	1.21	0.02
11	1999	3	442	21	3	1027	140	3	1.18	0.0	1997	1	400	-	-	-	-	-	-	-
12	1998	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-
13	1997	2	509	105	2	1630	933	2	1.18	0.0	1995	-	-	-	-	-	-	-	-	-
14	1996	3	505	49	3	1460	513	3	1.10	0.0	1994	-	-	-	-	-	-	-	-	-
15	1995	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
16	1994	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-
17	1993	1	472	-	1	1080	-	1	1.03	-	1991	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7-22. continued.

Age	Setting 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	5	196	18	5	84	34	5	1.07	0.2	2008	12	219	13	12	123	17	12	1.18	0.13
3	2006	14	258	13	14	186	44	14	1.08	0.1	2007	15	253	24	15	190	54	15	1.16	0.10
4	2005	59	300	28	58	295	73	58	1.09	0.09	2006	19	302	42	18	326	115	18	1.08	0.06
5	2004	12	307	30	12	325	112	12	1.09	0.08	2005	81	331	35	81	428	148	81	1.14	0.07
6	2003	56	362	32	56	571	156	56	1.18	0.06	2004	11	356	29	10	498	109	10	1.12	0.06
7	2002	96	386	30	95	687	164	95	1.18	0.08	2003	32	378	24	32	648	140	32	1.19	0.08
8	2001	25	394	25	25	730	129	25	1.19	0.08	2002	81	397	32	80	739	192	80	1.16	0.08
9	2000	3	399	3	3	750	50	3	1.18	0.08	2001	19	402	32	19	760	169	19	1.15	0.08
10	1999	1	378	-	1	640	-	1	1.18	-	2000	2	412	17	2	840	85	2	1.20	0.03
11	1998	-	-	-	-	-	-	-	-	-	1999	2	404	31	2	745	134	2	1.13	0.1
12	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1996	1	382	-	1	650	-	1	1.17	-	1997	1	504	-	1	1680	-	1	1.31	-
14	1995	1	434	-	1	940	-	1	1.15	-	1996	-	-	-	-	-	-	-	-	-

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

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

Table 5.6.7-21. Deformities, erosion, lesions, and tumours (DELTs) on select fish species captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

	Deformities		Erosion		Lesions		Tumours		Total		
	n	%	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTs}	$\%_{DELTs}$
Playgreen Lake											
White Sucker	1	0.12	-	-	11	1.27	-	-	867	12	1.38
Northern Pike	-	-	-	-	1	0.37	-	-	269	1	0.37
Lake Whitefish	-	-	-	-	-	-	-	-	38	0	0.00
Sauger	-	-	-	-	-	-	-	-	135	0	0.00
Walleye	-	-	-	-	-	-	-	-	259	0	0.00
Little Playgreen Lake											
White Sucker	3	0.79	-	-	6	1.57	1	0.26	382	10	2.62
Northern Pike	1	0.37	2	0.74	4	1.49	1	0.37	269	8	2.97
Lake Whitefish	-	-	-	-	-	-	-	-	5	0	0.00
Sauger	-	-	-	-	-	-	-	-	2	0	0.00
Walleye	1	0.88	-	-	-	-	-	-	113	1	0.88
Cross Lake											
White Sucker	3	1.46	2	0.98	1	0.49	-	-	205	6	2.93
Northern Pike	7	1.90	-	-	-	-	-	-	368	7	1.90
Lake Whitefish	-	-	-	-	-	-	-	-	3	0	0.00
Sauger	-	-	-	-	-	-	-	-	88	0	0.00
Walleye	-	-	-	-	1	0.22	1	0.22	445	2	0.45
Walker Lake											
White Sucker	2	1.55	-	-	2	1.55	-	-	129	4	3.10
Northern Pike	-	-	-	-	-	-	-	-	26	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	1	0	0.00
Sauger	-	-	-	-	-	-	-	-	14	0	0.00
Walleye	-	-	-	-	-	-	-	-	22	0	0.00
Setting Lake											
White Sucker	2	0.33	-	-	1	0.17	-	-	601	3	0.50
Northern Pike	-	-	-	-	-	-	-	-	213	0	0.00
Lake Whitefish	-	-	-	-	-	-	-	-	37	0	0.00
Sauger	-	-	1	0.13	-	-	-	-	798	1	0.13
Walleye	2	0.25	-	-	-	-	1	0.13	796	3	0.38

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 5.6.7-24. Upper Nelson River Region Index of Biotic Integrity (IBI) values, 2008-2010.

Metric	Playgreen L		Little Playgreen L	Cross L			Walker L	Setting L		
	2009	2010	2010	2008	2009	2010	2010	2008	2009	2010
Non standardized values										
Number of species	16	16	14	16	13	12	11	14	12	14
Number of sensitive species	3	3	4	4	3	2	2	2	2	2
Proportion of tolerant individuals	31.7	31.2	11.9	10.2	9.8	10.0	30.2	20.2	21.5	15.8
Number of Insectivore species	11	9	8	12	8	7	7	9	7	9
Hill's Evenness Index	8.11	5.15	2.99	6.91	7.05	6.63	6.51	7.90	6.73	7.58
Insectivore biomass	6.7	5.7	10.7	10.3	11.2	10.1	7.1	16.8	14.8	20.4
Omnivore biomass	30.4	48.7	53.0	15.9	17.0	18.2	61.4	46.1	40.2	38.0
Piscivore biomass	62.9	45.5	36.3	73.9	71.8	71.7	31.6	37.0	45.0	41.6
Proportion lithophilic spawners	0.48	0.19	0.17	0.33	0.31	0.30	0.59	0.78	0.88	0.82
CPUE	59.6	80.4	80.3	47.7	31.3	35.2	30.8	79.3	67.8	83.5
% individuals with DELTS	0.00	1.79	3.04	2.34	0.65	2.10	2.08	0.00	0.00	0.82
IBI Scores										
Number of species	8.0	8.0	7.0	8.0	6.5	6.0	5.5	7.0	6.0	7.0
Number of sensitive species	3.6	3.6	4.8	4.8	3.6	2.4	2.4	2.4	2.4	2.4
Proportion of tolerant species	4.6	4.7	8.0	8.3	8.3	8.3	4.9	6.6	6.3	7.3
Number of Insectivore species	8.3	6.8	6.0	9.0	6.0	5.3	5.3	6.8	5.3	6.8
Hill's Evenness Index	7.1	4.5	2.6	6.0	6.1	5.8	5.7	6.9	5.9	6.6
Insectivore biomass	1.2	1.0	1.9	1.8	2.0	1.8	1.3	3.0	2.7	3.7
Omnivore biomass	5.4	2.7	2.1	7.6	7.4	7.3	0.8	3.1	4.0	4.3
Piscivore biomass	6.3	4.6	3.6	7.4	7.2	7.2	3.2	3.7	4.5	4.2
Proportion lithophilic spawners	4.8	1.9	1.7	3.3	3.1	3.0	5.9	7.8	8.8	8.2
CPUE	6.0	8.0	8.0	4.8	3.1	3.5	3.1	7.9	6.8	8.4
% individuals with DELTS	5.0	4.1	3.5	3.8	4.7	4.0	4.0	5.0	5.0	4.6
Total IBI	60.2	49.8	49.2	64.8	58.1	54.5	41.8	60.2	57.6	63.3

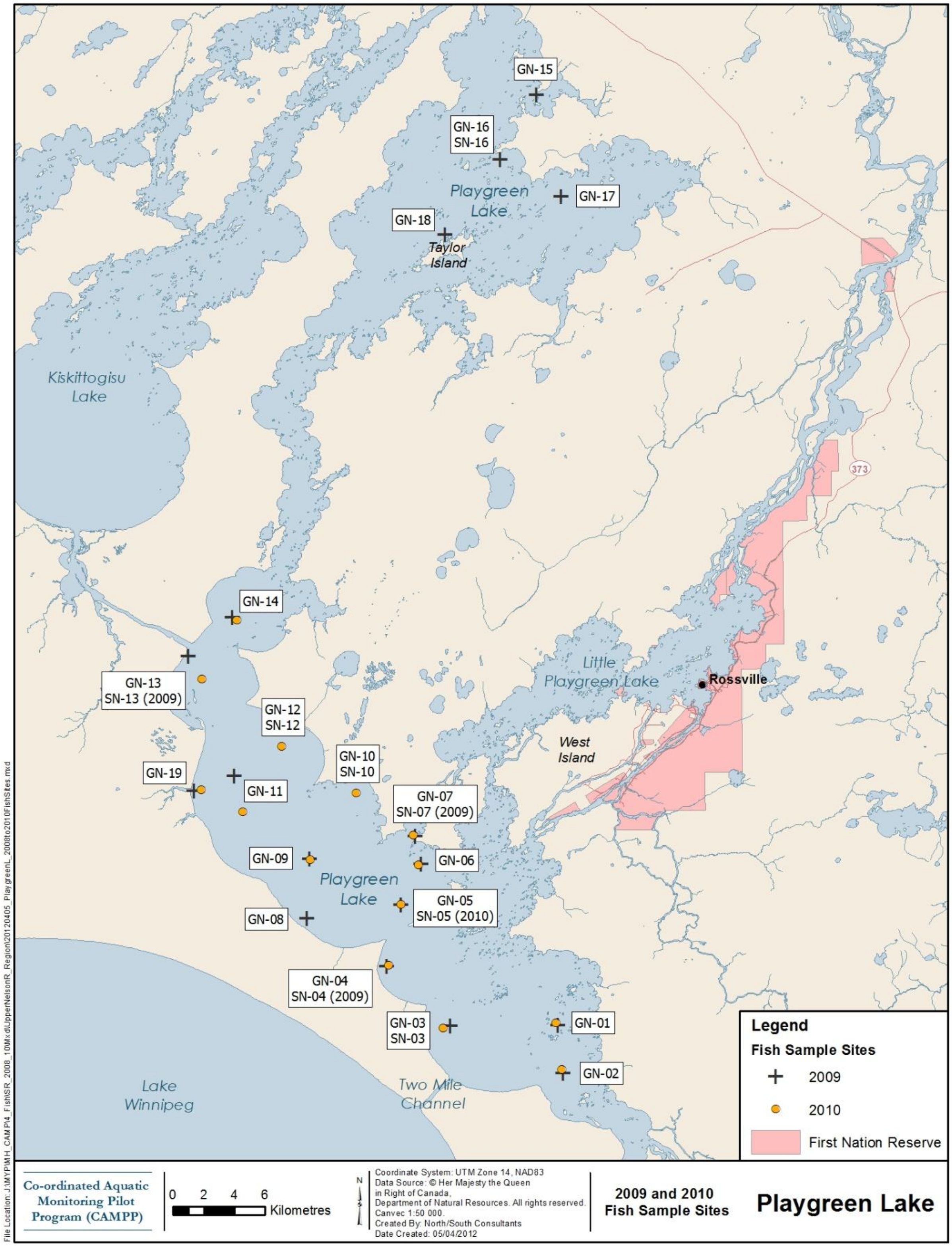


Figure 5.6.7-1. Map depicting standard gang and small mesh index gillnet sites sampled in Playgreen Lake, 2009-2010.

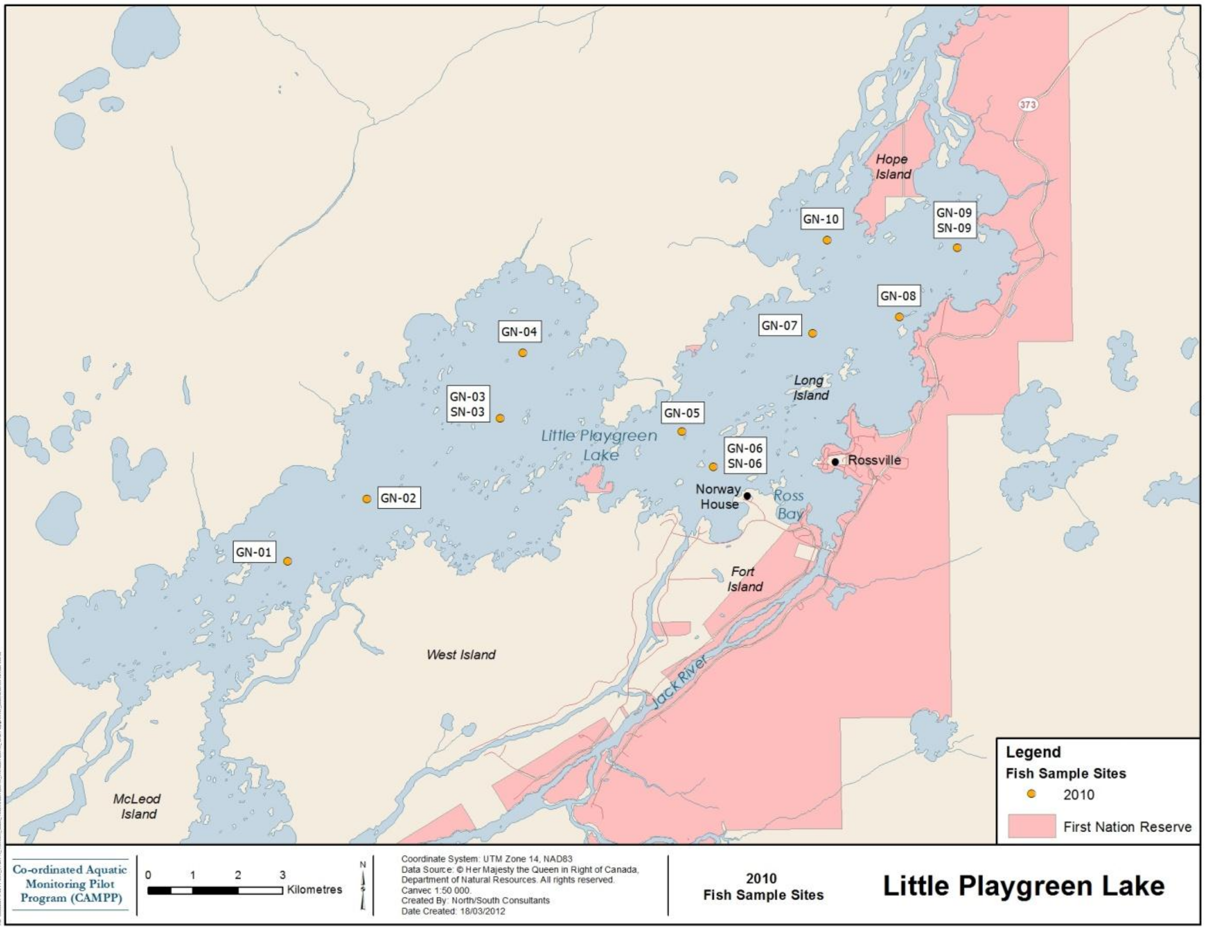


Figure 5.6.7-2. Map depicting standard gang and small mesh index gillnet sites sampled in Little Playgreen Lake, 2010.

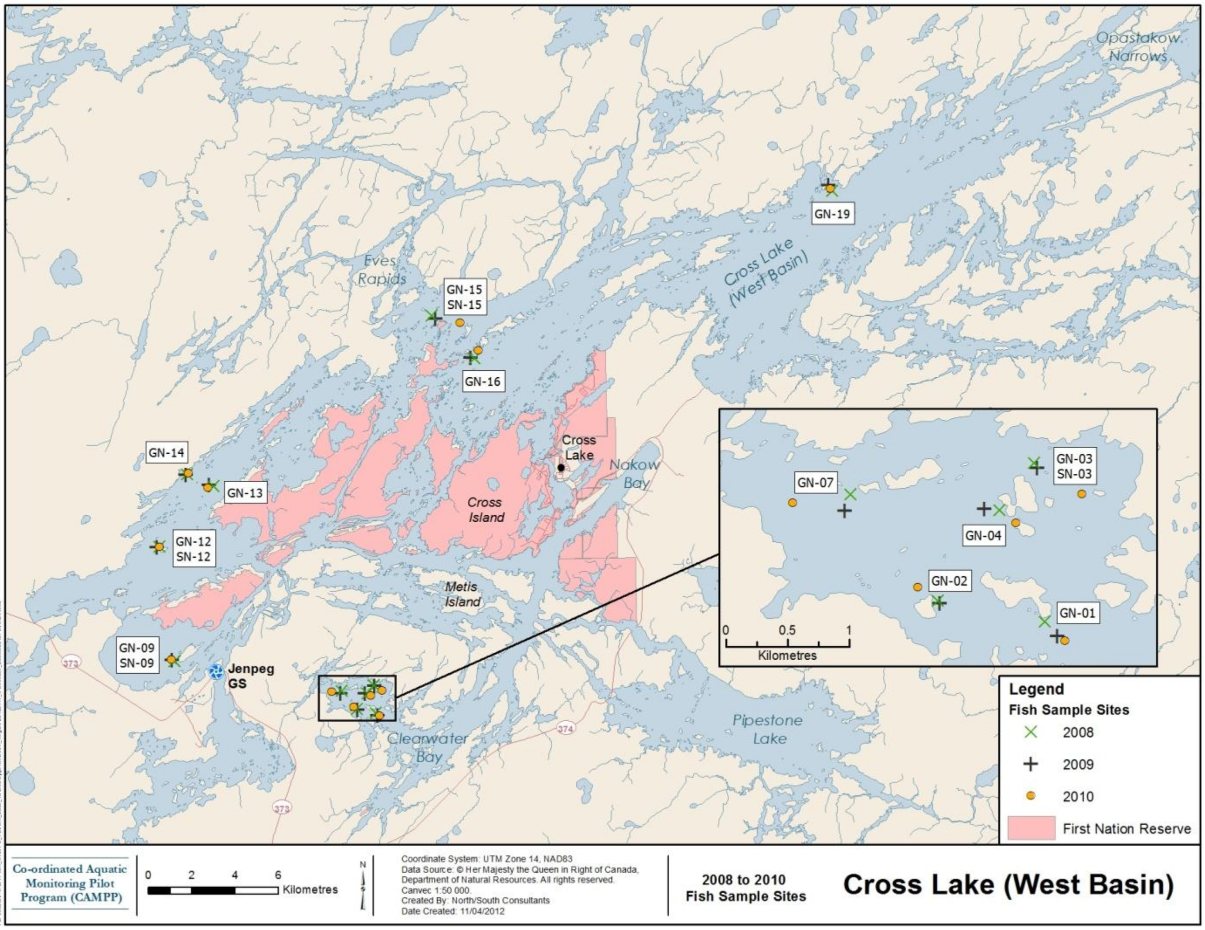


Figure 5.6.7-3. Map depicting standard gang and small mesh index gillnet sites sampled in Cross Lake, 2008-2010.

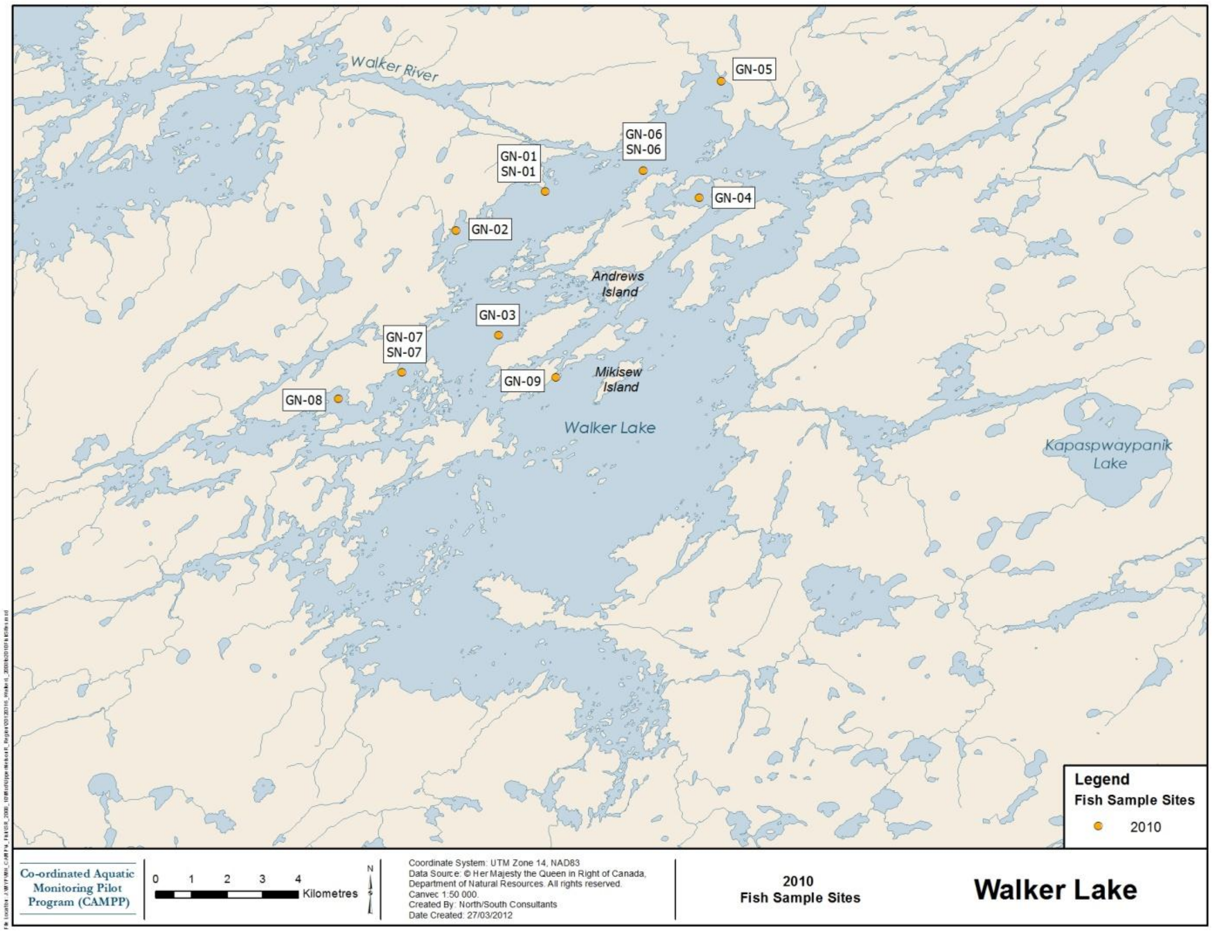


Figure 5.6.7-4. Map depicting standard gang and small mesh index gillnet sites sampled in Walker Lake, 2010.

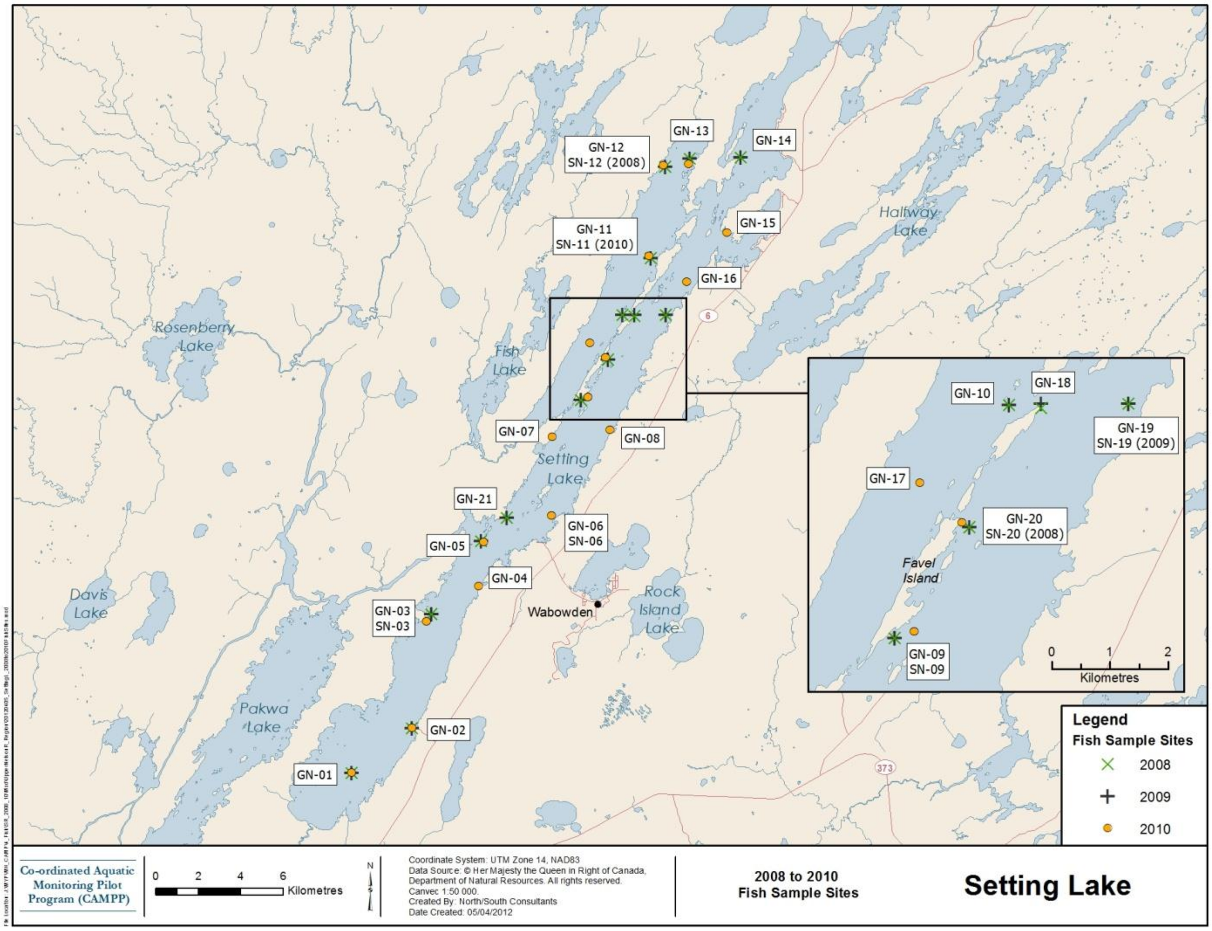


Figure 5.6.7-5. Map depicting standard gang and small mesh index gillnet sites sampled in Setting Lake, 2008-2010.

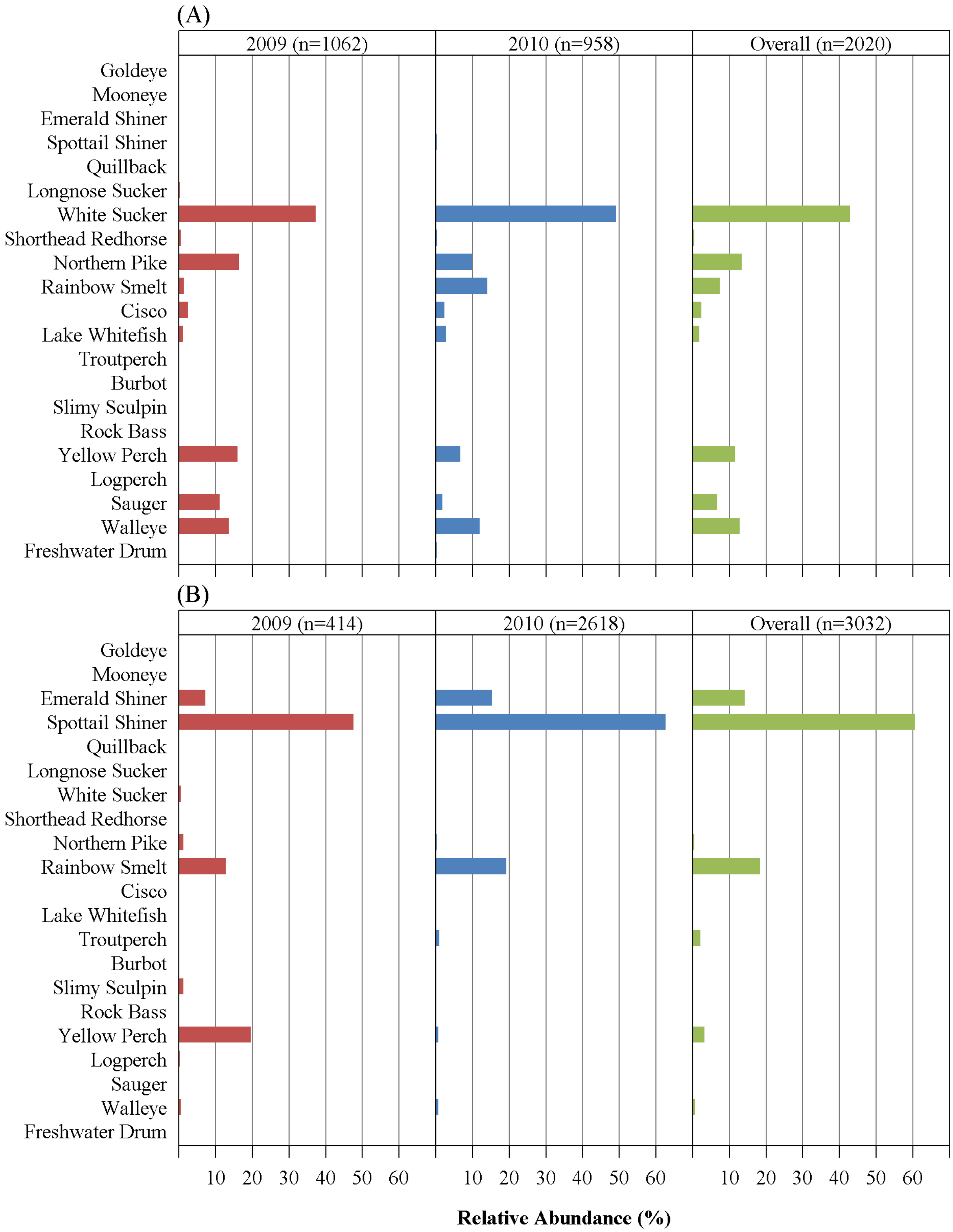


Figure 5.6.7-6. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Playgreen Lake, 2009-2010 (and overall).

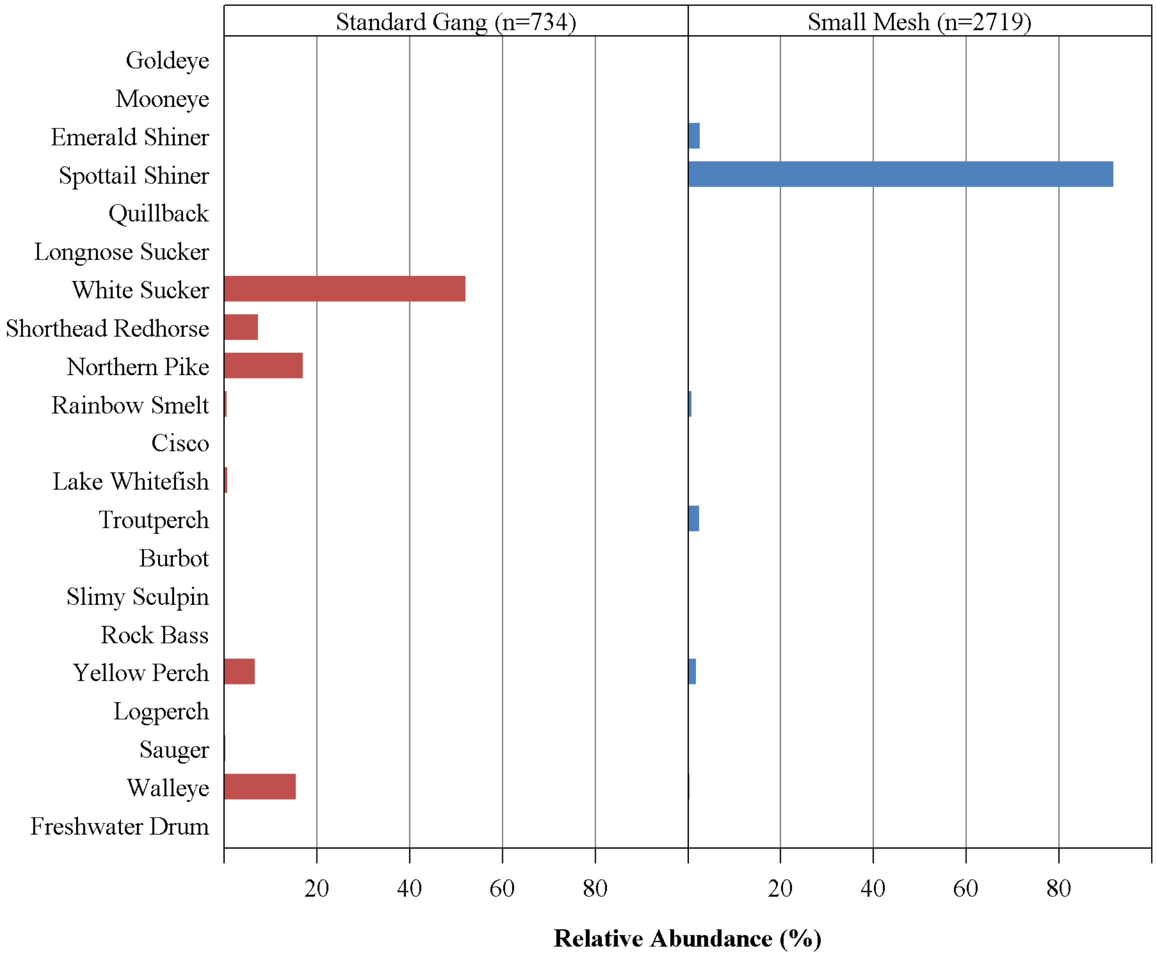


Figure 5.6.7-7. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Little Playgreen Lake, 2010.

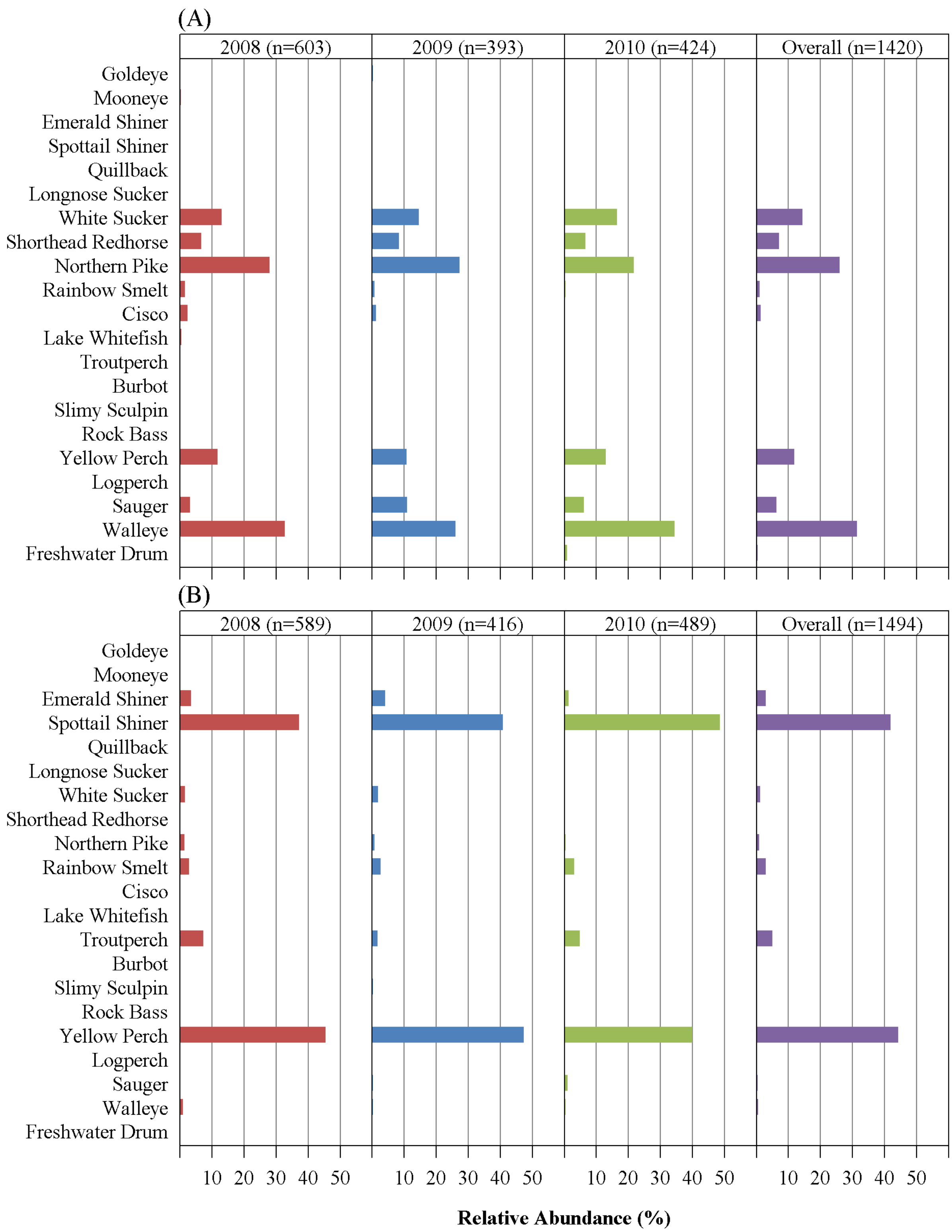


Figure 5.6.7-8. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Cross Lake, 2008-2010 (and overall).

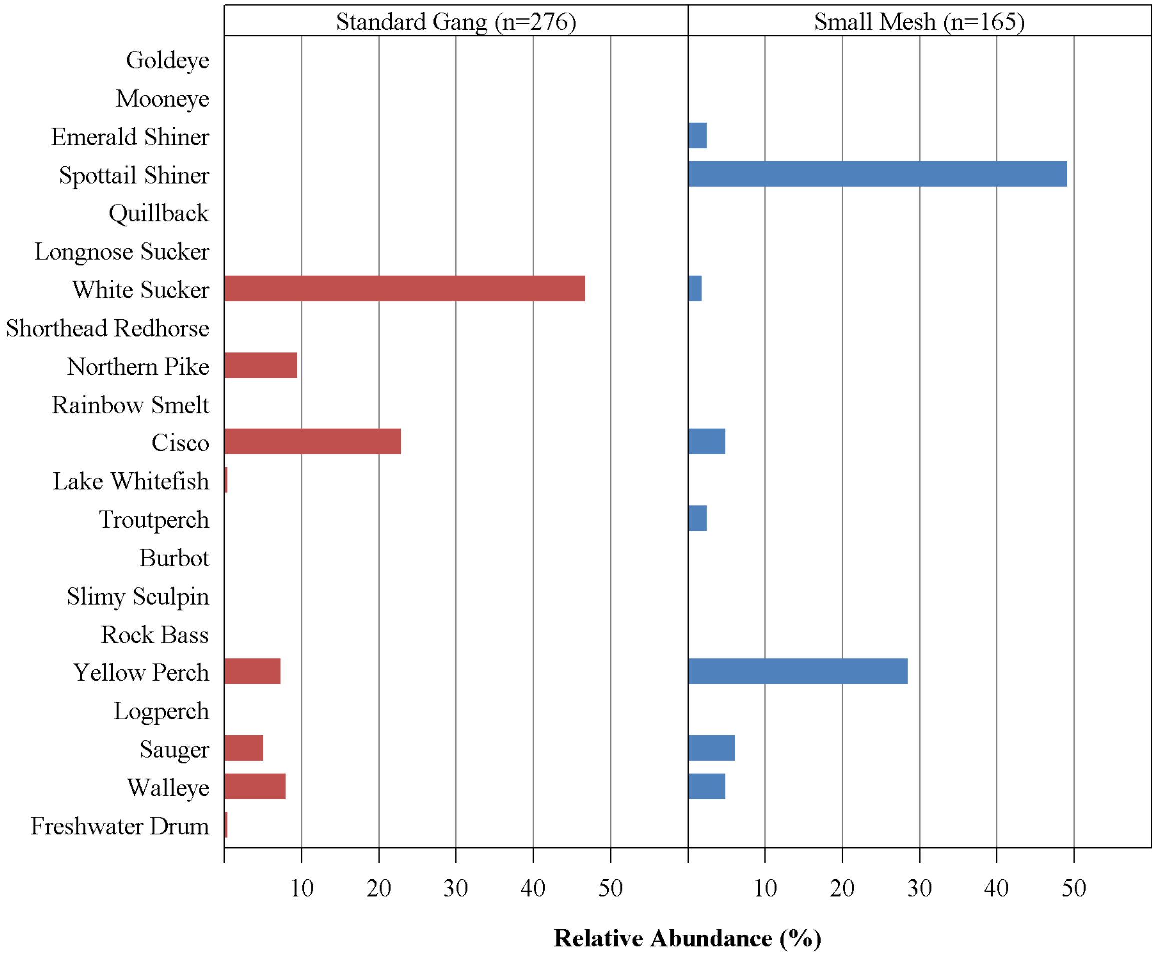


Figure 5.6.7-9. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set in Walker Lake, 2010.

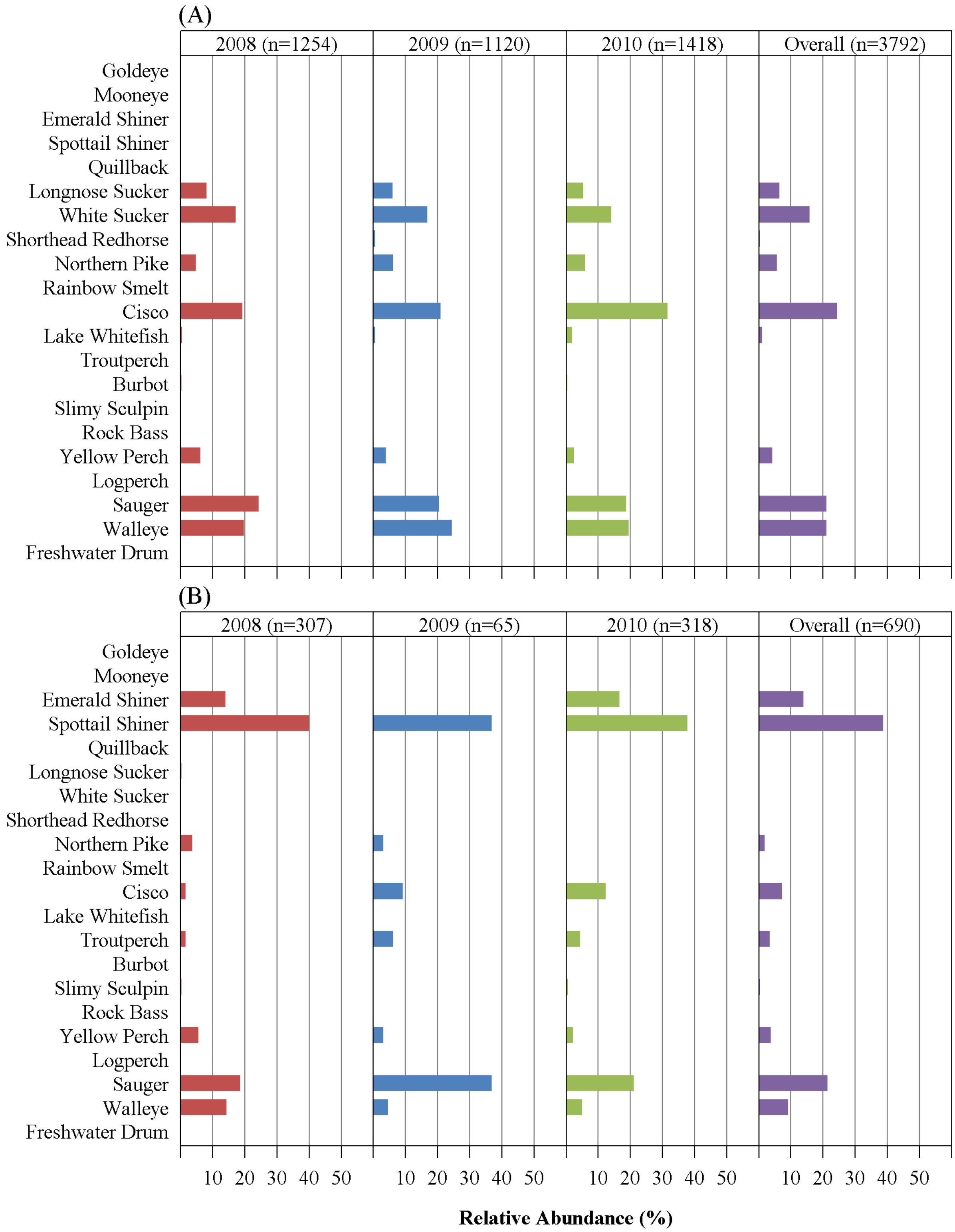


Figure 5.6.7-10. Relative abundance (%) distribution for fish species captured in (A) standard gang and (B) small mesh index gill nets set in Setting Lake, 2008-2010 (and overall).

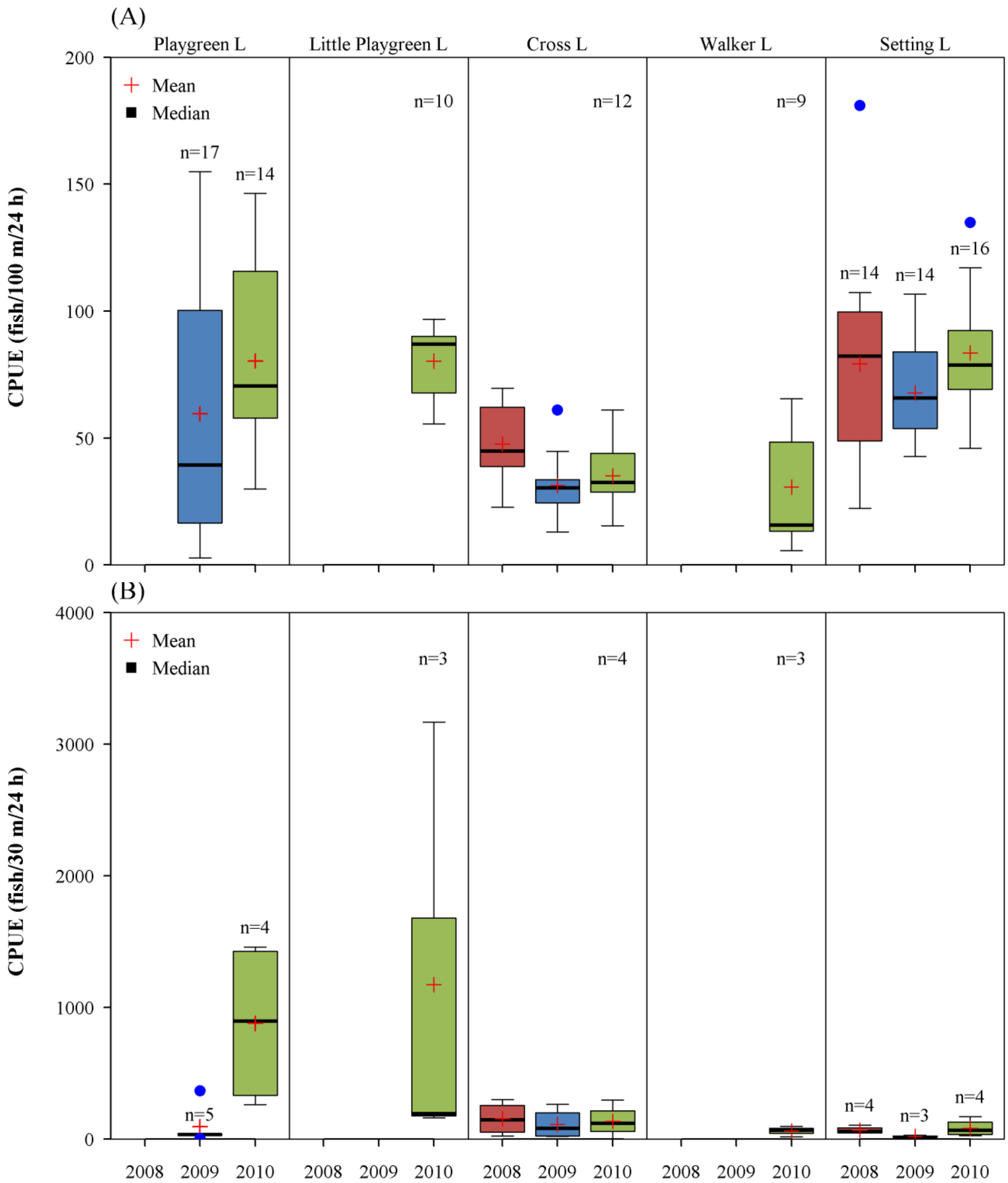


Figure 5.6.7-11. Mean and median (range) total CPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

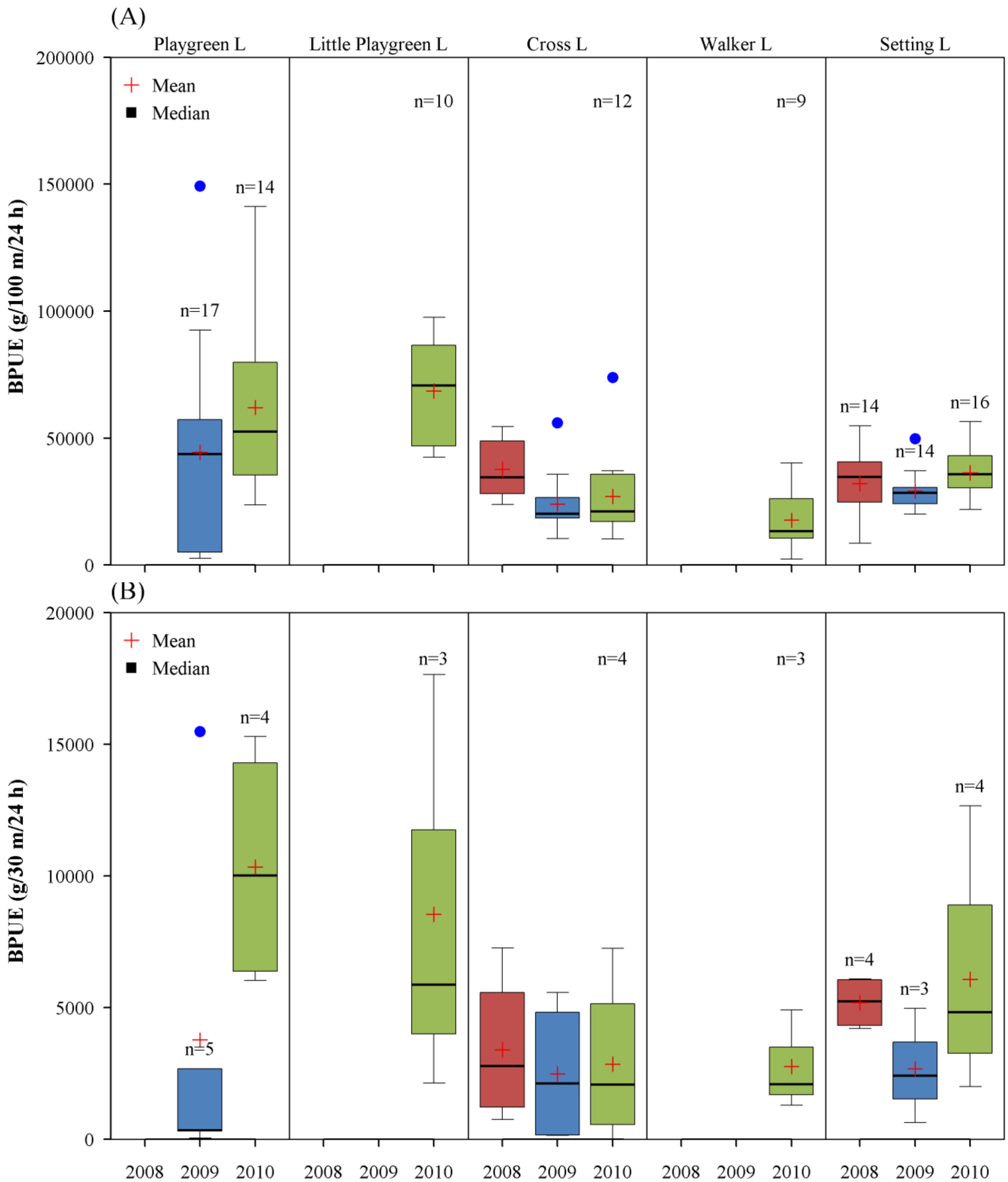


Figure 5.6.7-12. Mean and median (range) total BPUE per site calculated for fish captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

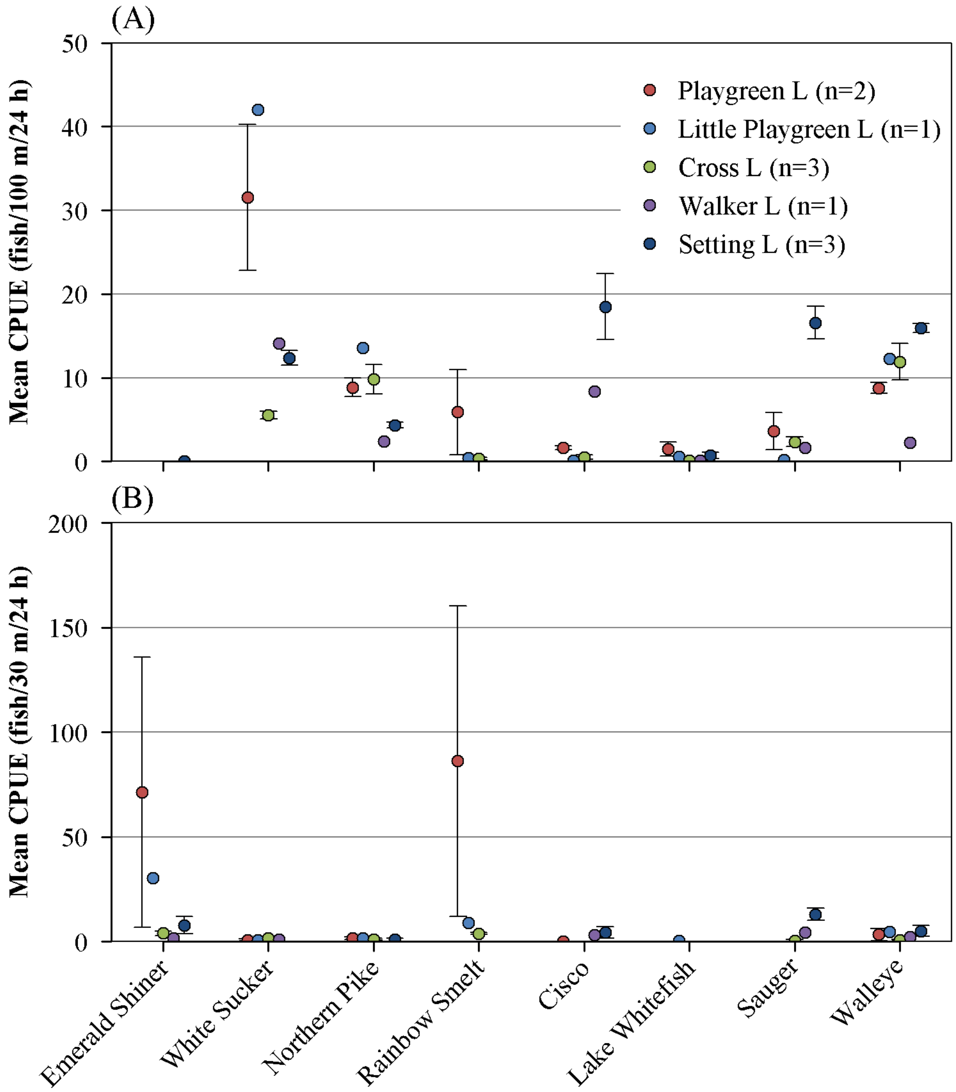


Figure 5.6.7-13. Mean (SE) CPUE for select species captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

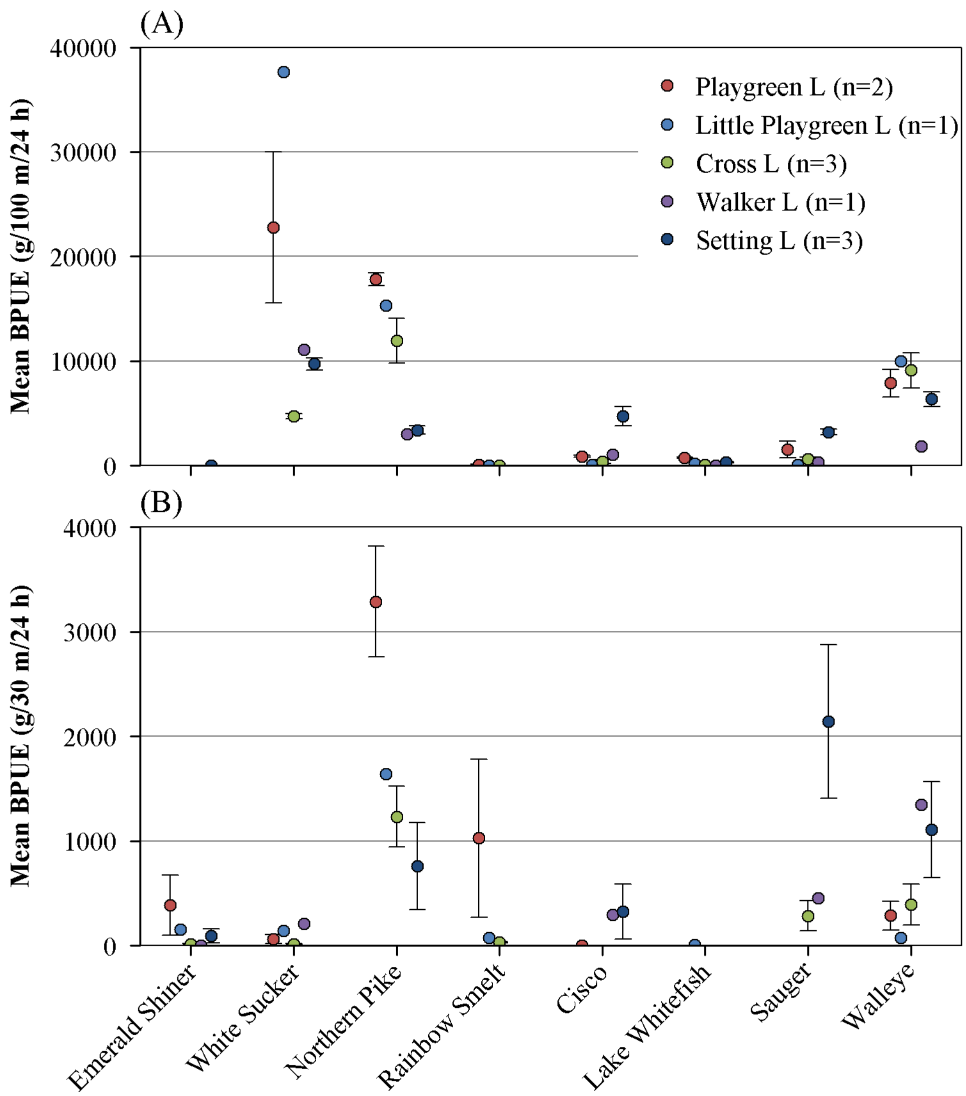


Figure 5.6.7-14. Mean (SE) BPUE for select species captured in (A) standard gang and (B) small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

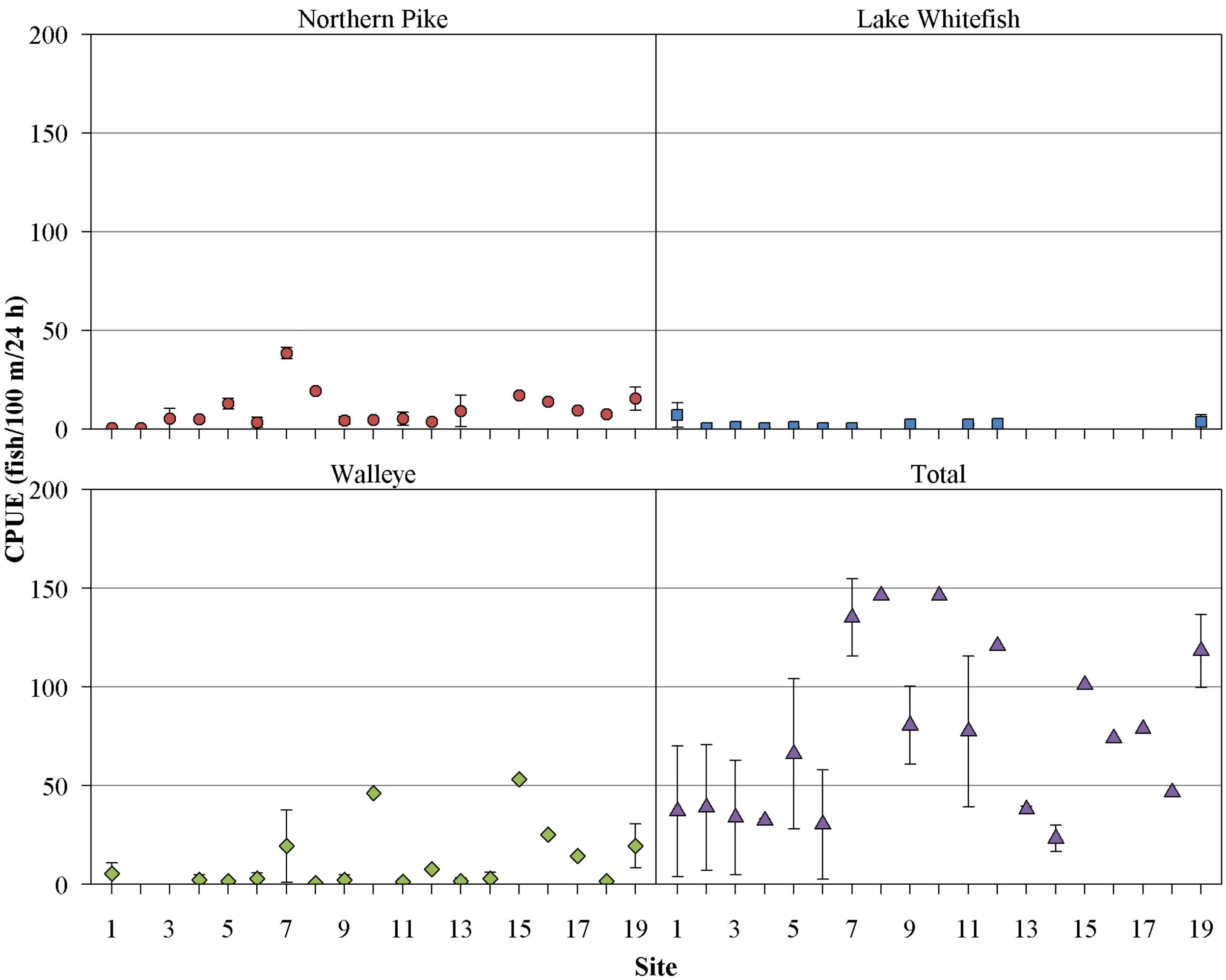


Figure 5.6.7-15. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Playgreen Lake, 2009-2010.

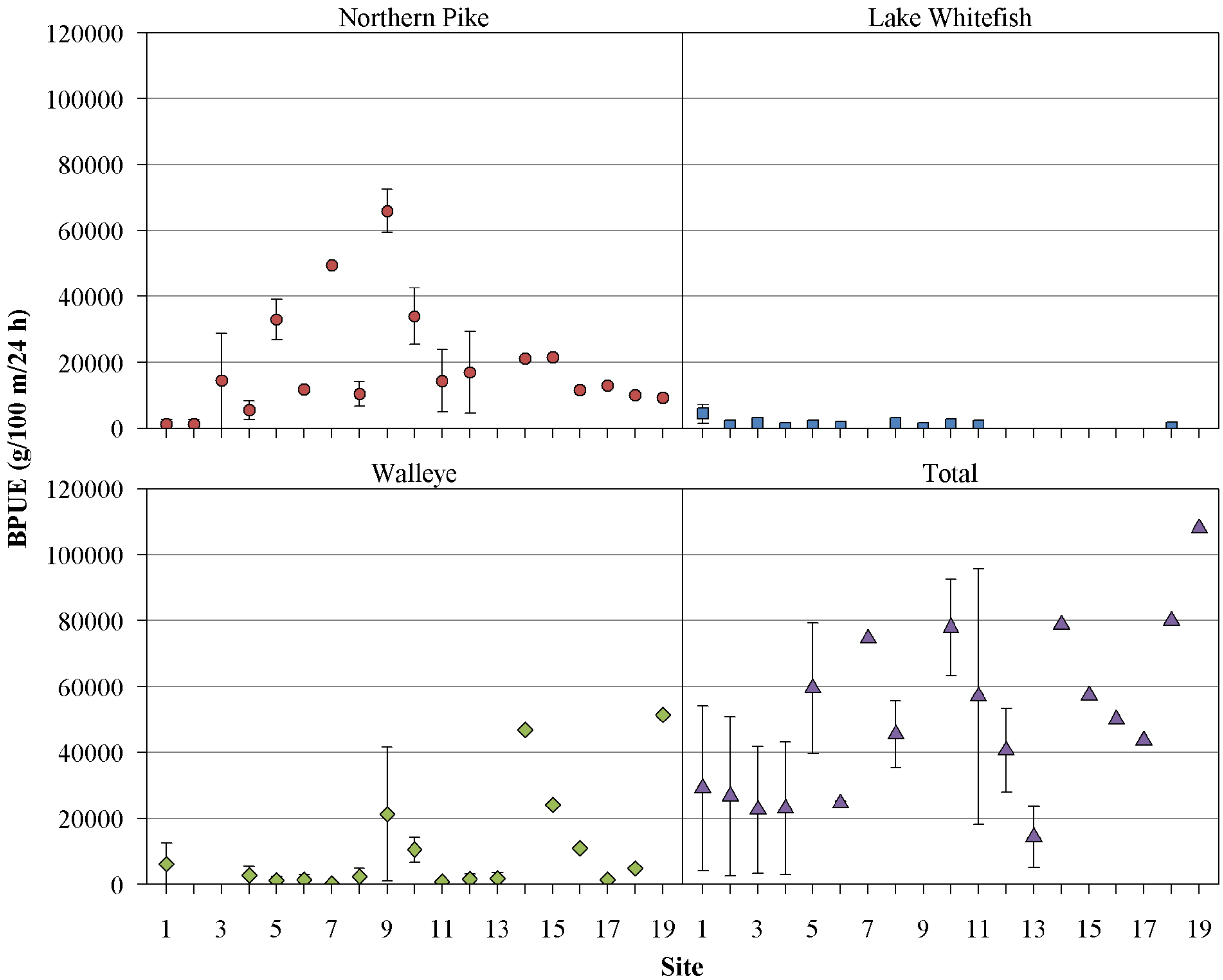


Figure 5.6.7-16. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Playgreen Lake, 2009-2010.

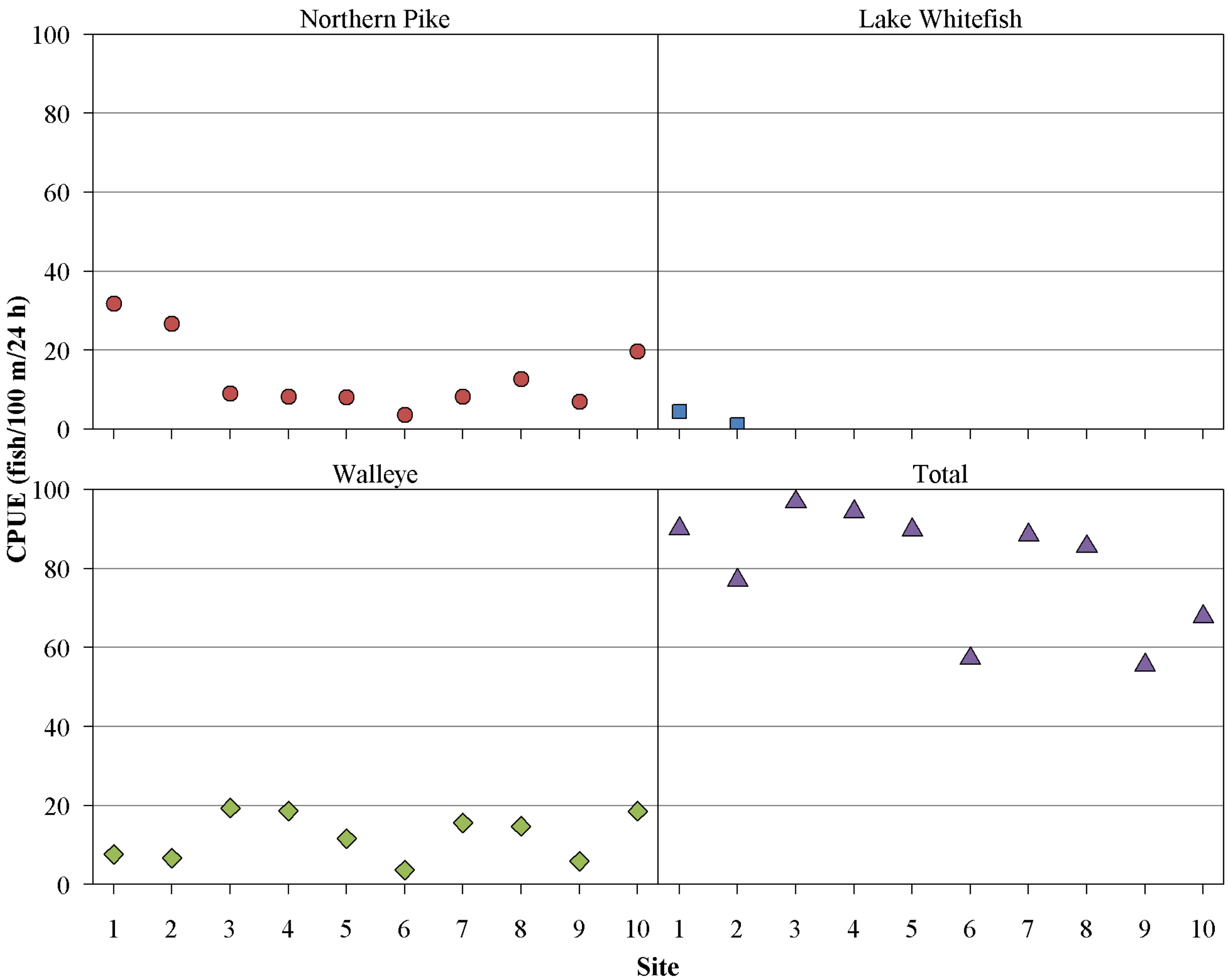


Figure 5.6.7-17. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Little Playgreen Lake, 2010.

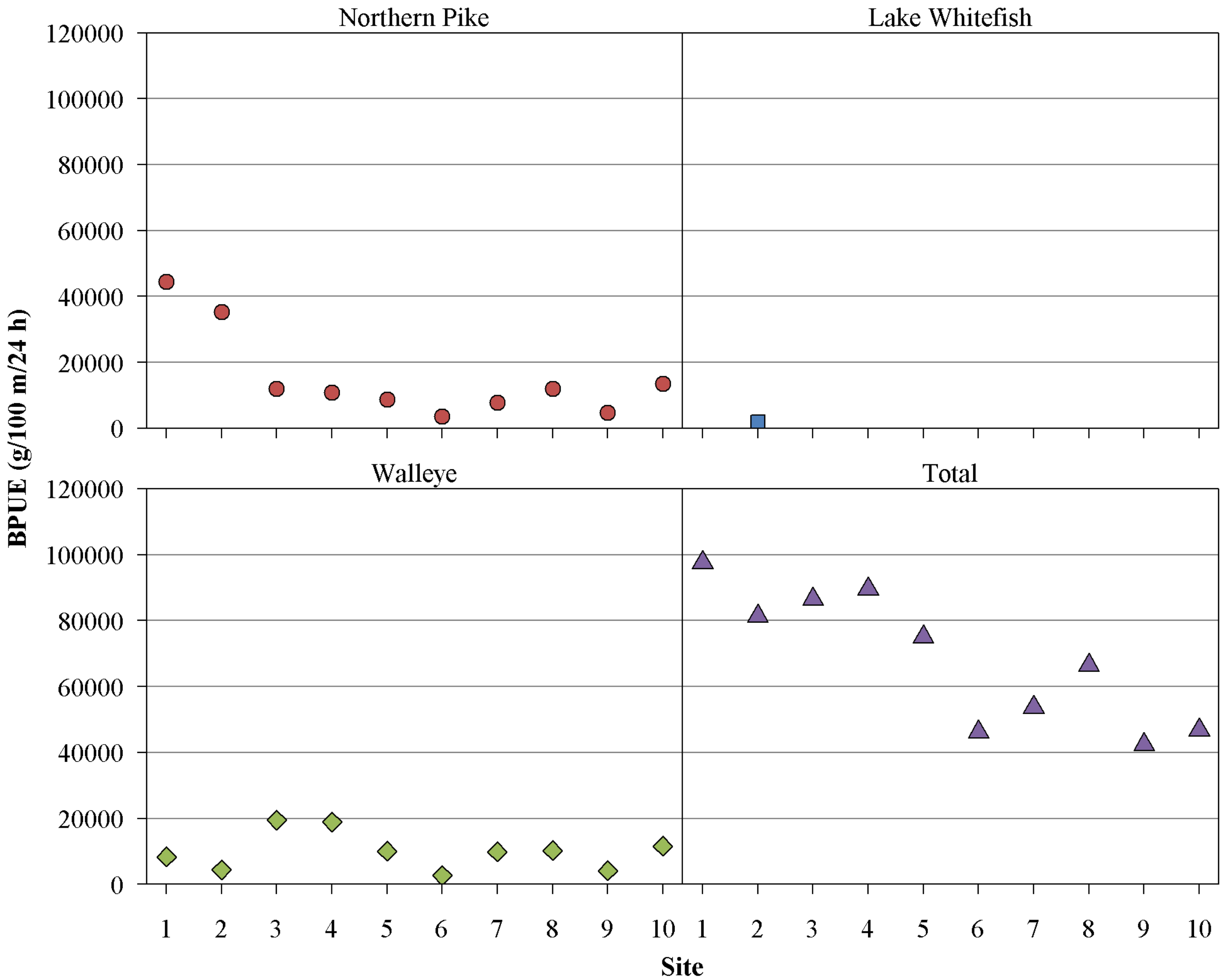


Figure 5.6.7-18. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Little Playgreen Lake, 2010.

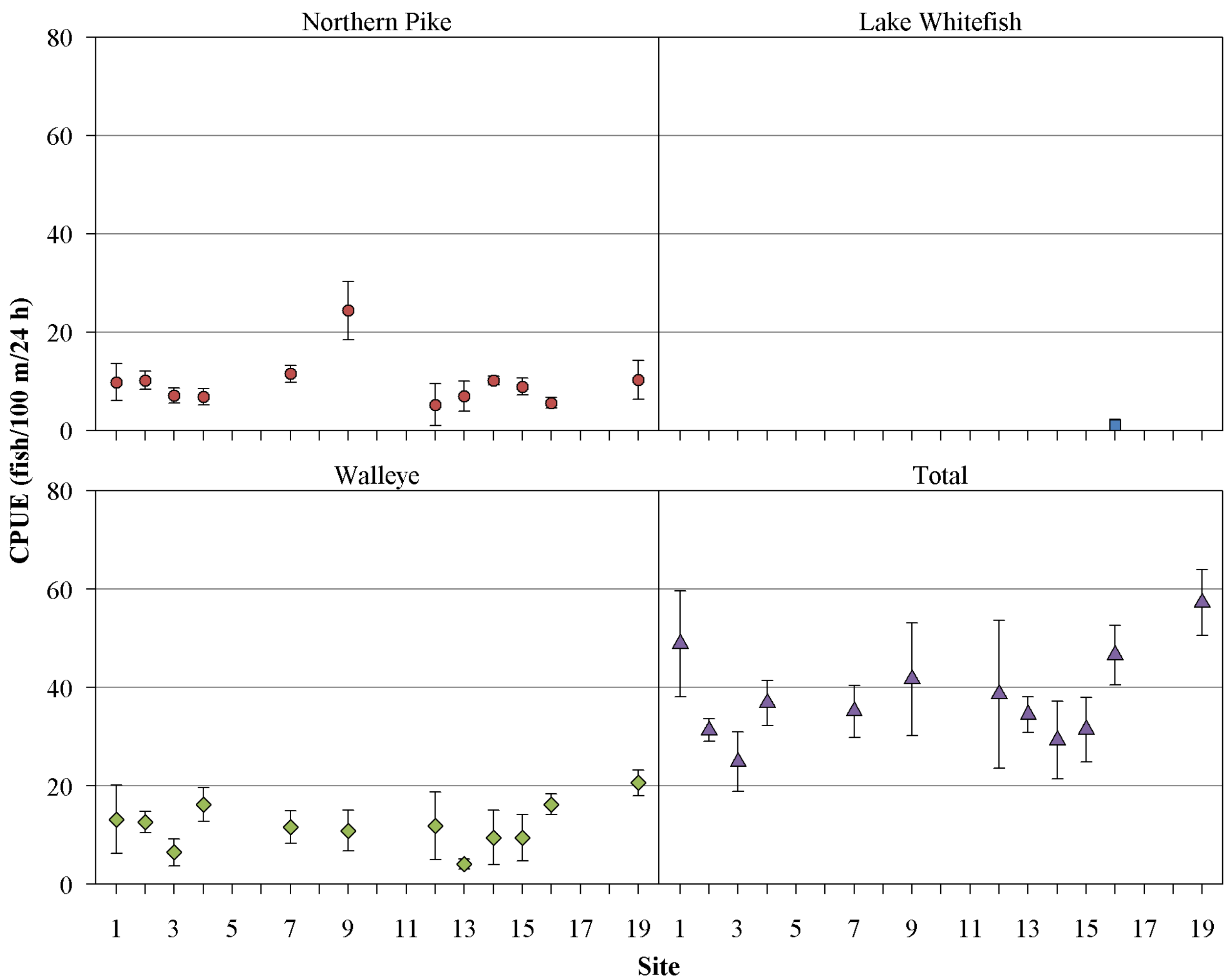


Figure 5.6.7-19. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Cross Lake, 2008-2010.

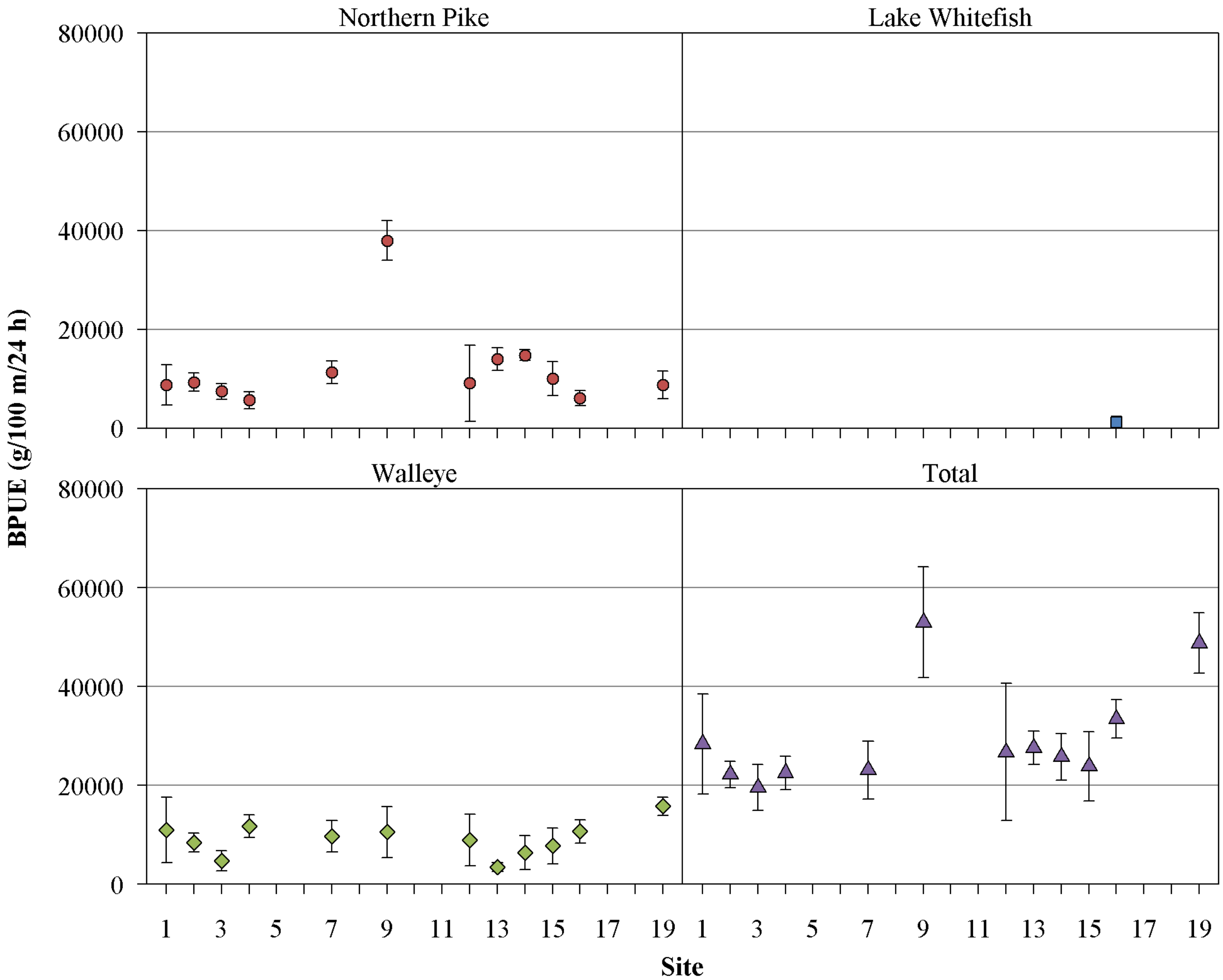


Figure 5.6.7-20. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Cross Lake, 2008-2010.

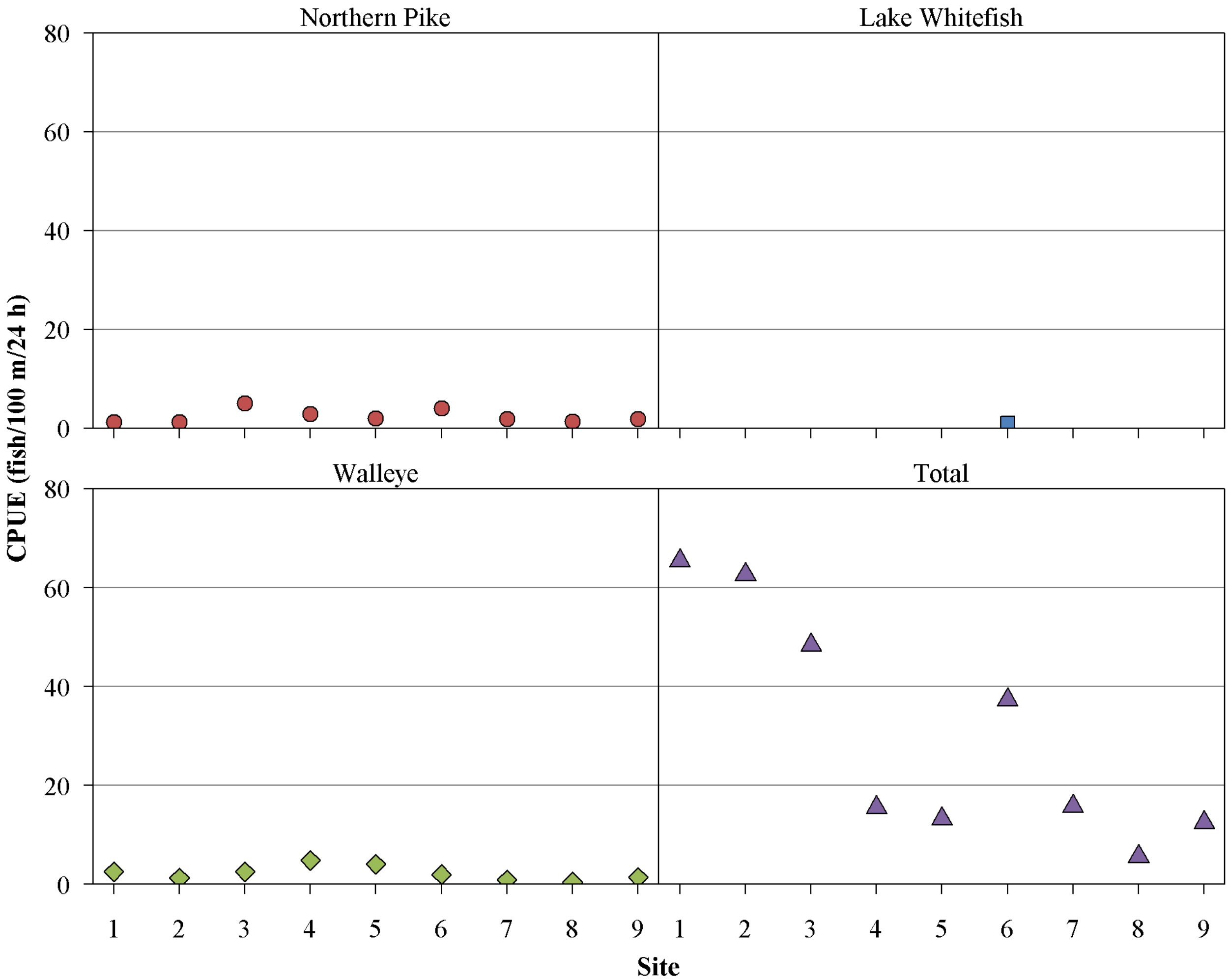


Figure 5.6.7-21. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Walker Lake, 2010.

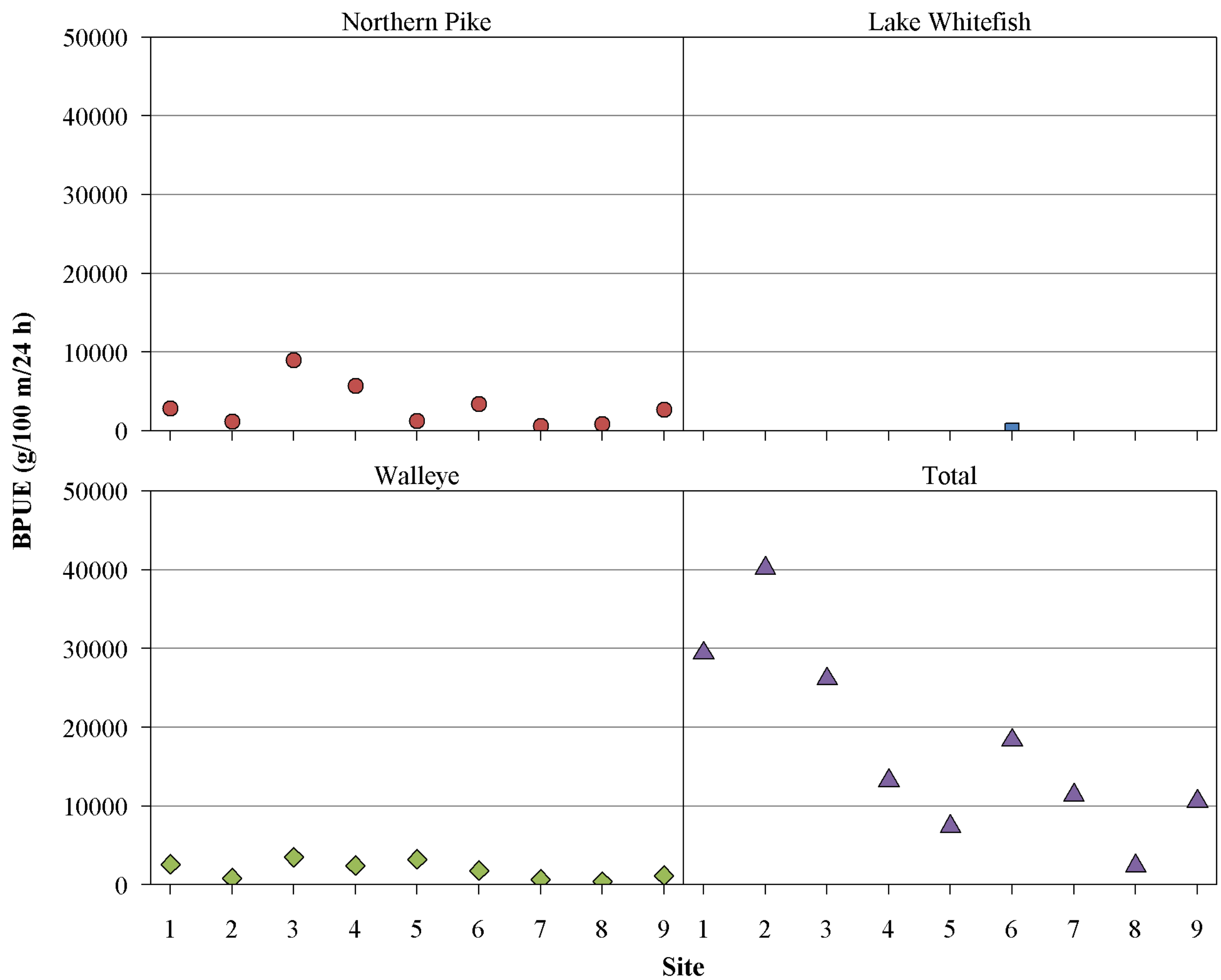


Figure 5.6.7-22. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Walker Lake, 2010.

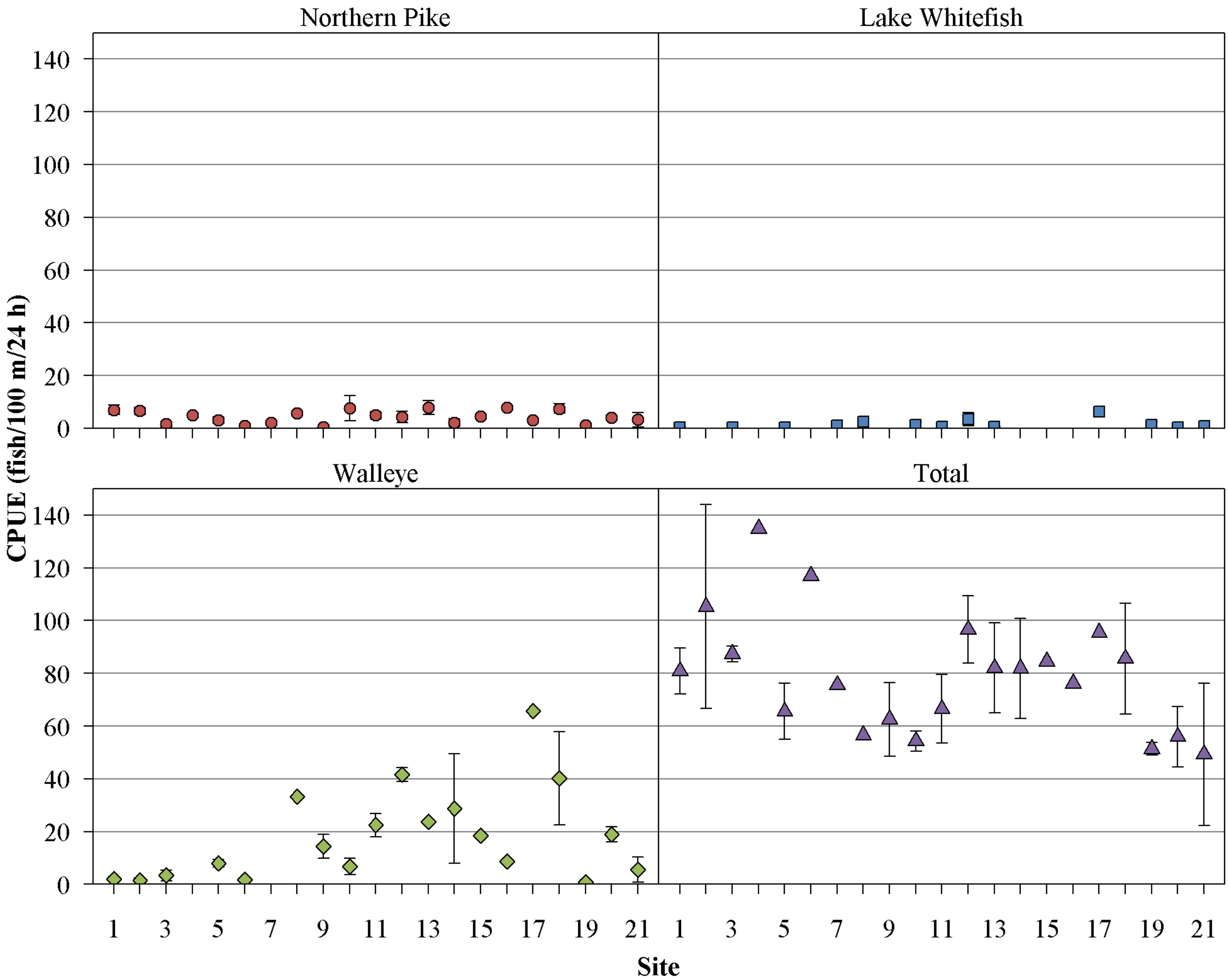


Figure 5.6.7-23. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Setting Lake, 2008-2010.

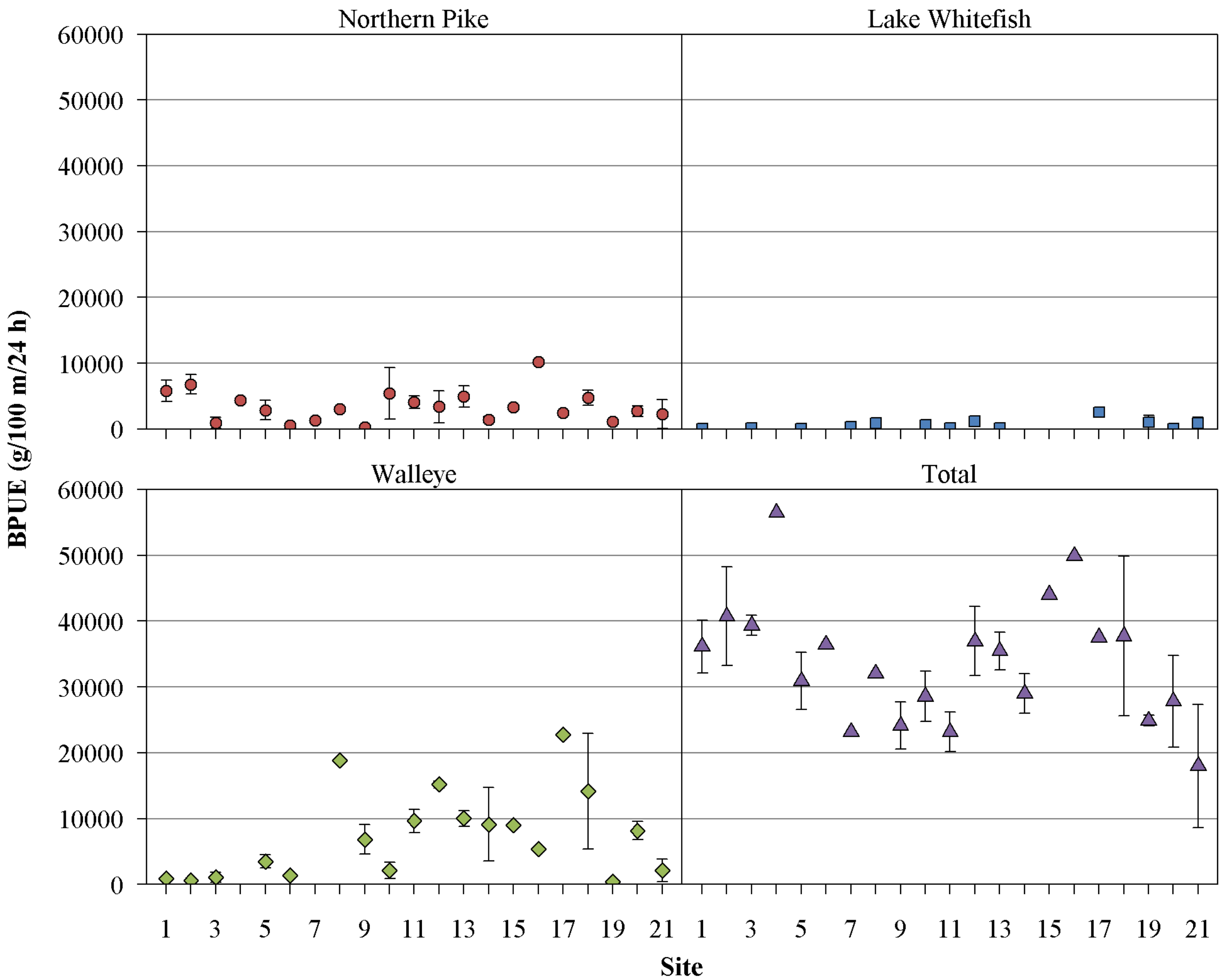


Figure 5.6.7-24. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Setting Lake, 2008-2010.

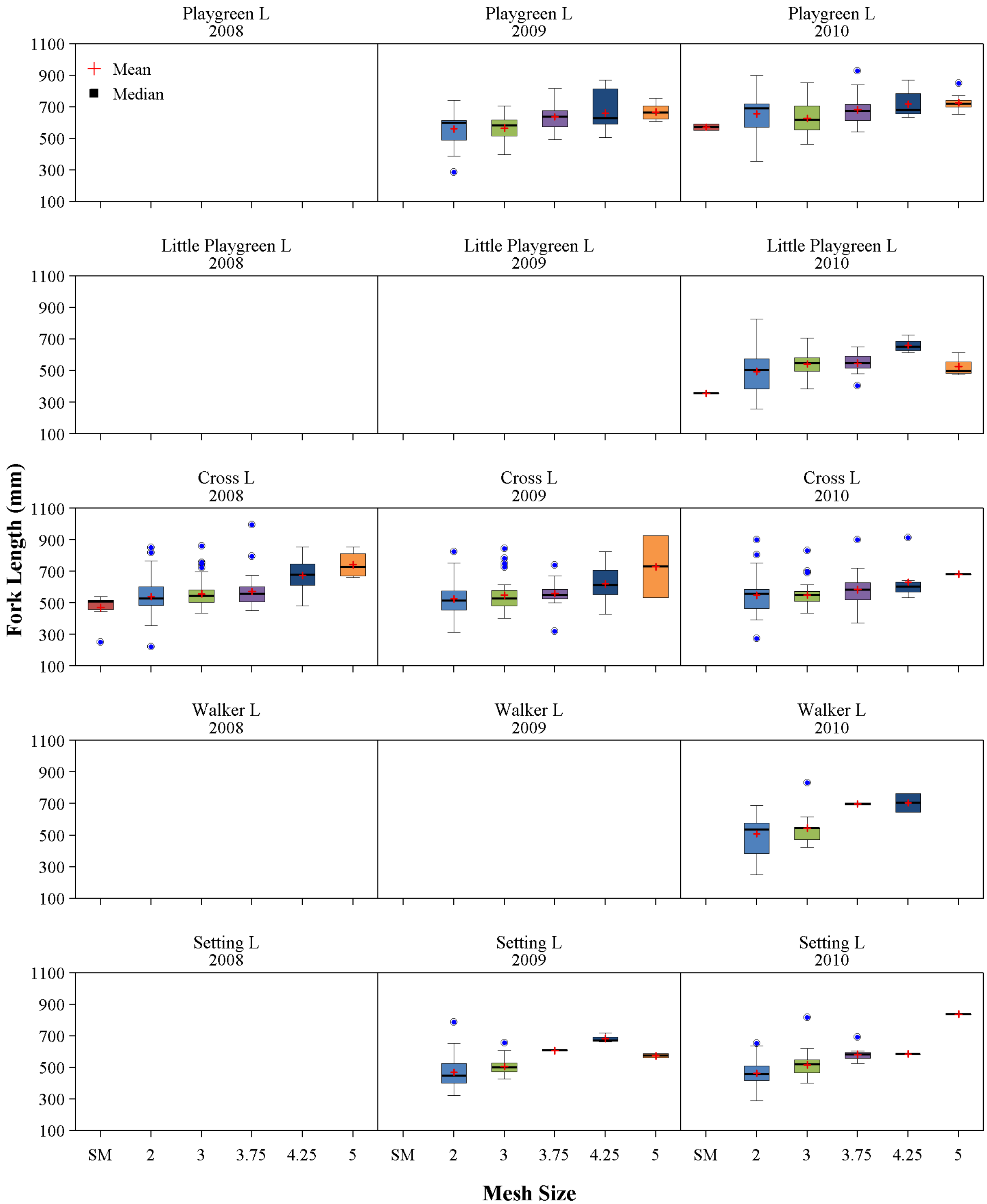


Figure 5.6.7-25. Mean and median (range) fork length (mm) per mesh size calculated for Northern Pike captured in standard gang and small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

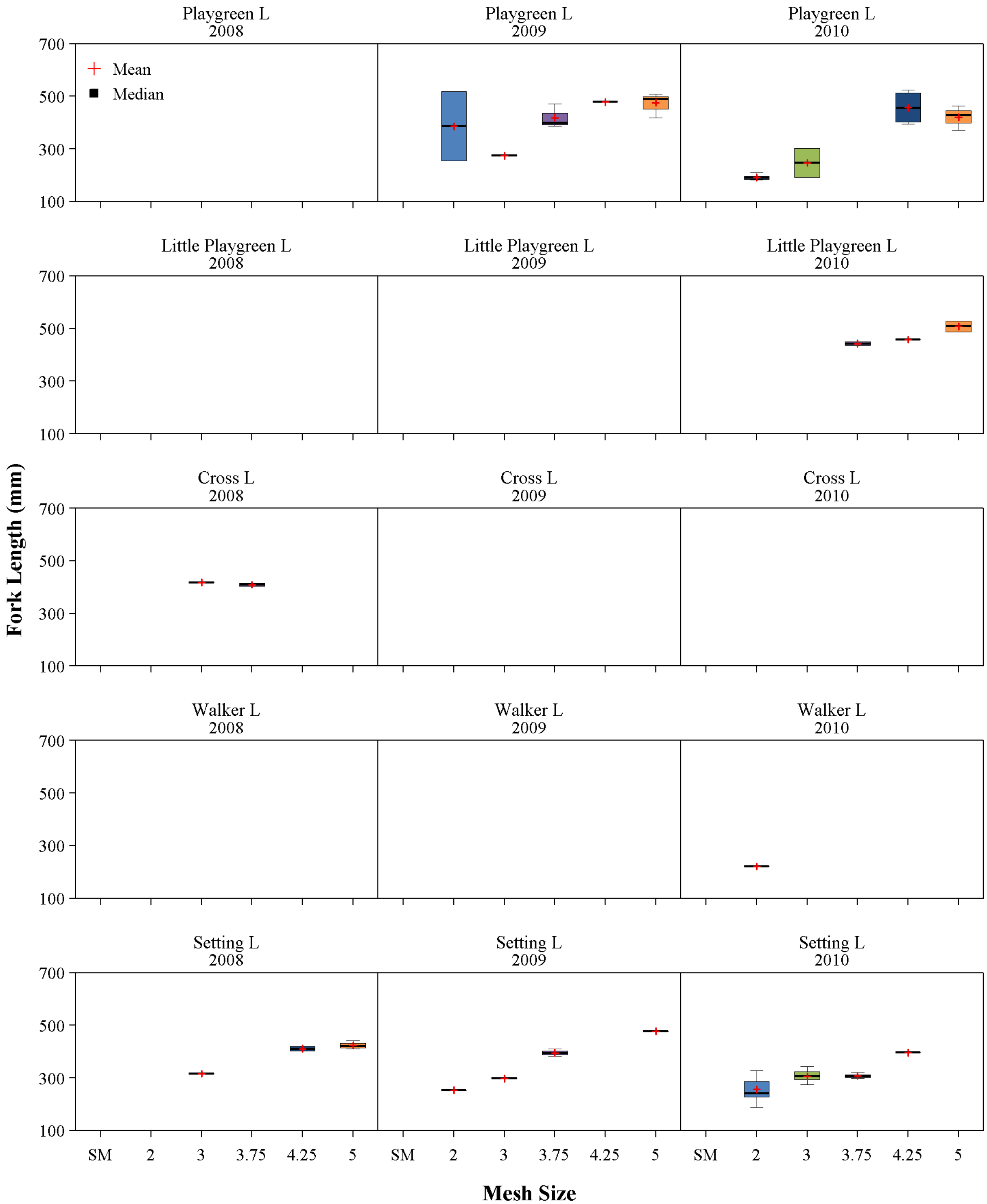


Figure 5.6.7-26. Mean and median (range) fork length (mm) per mesh size calculated for Lake Whitefish captured in standard gang and small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

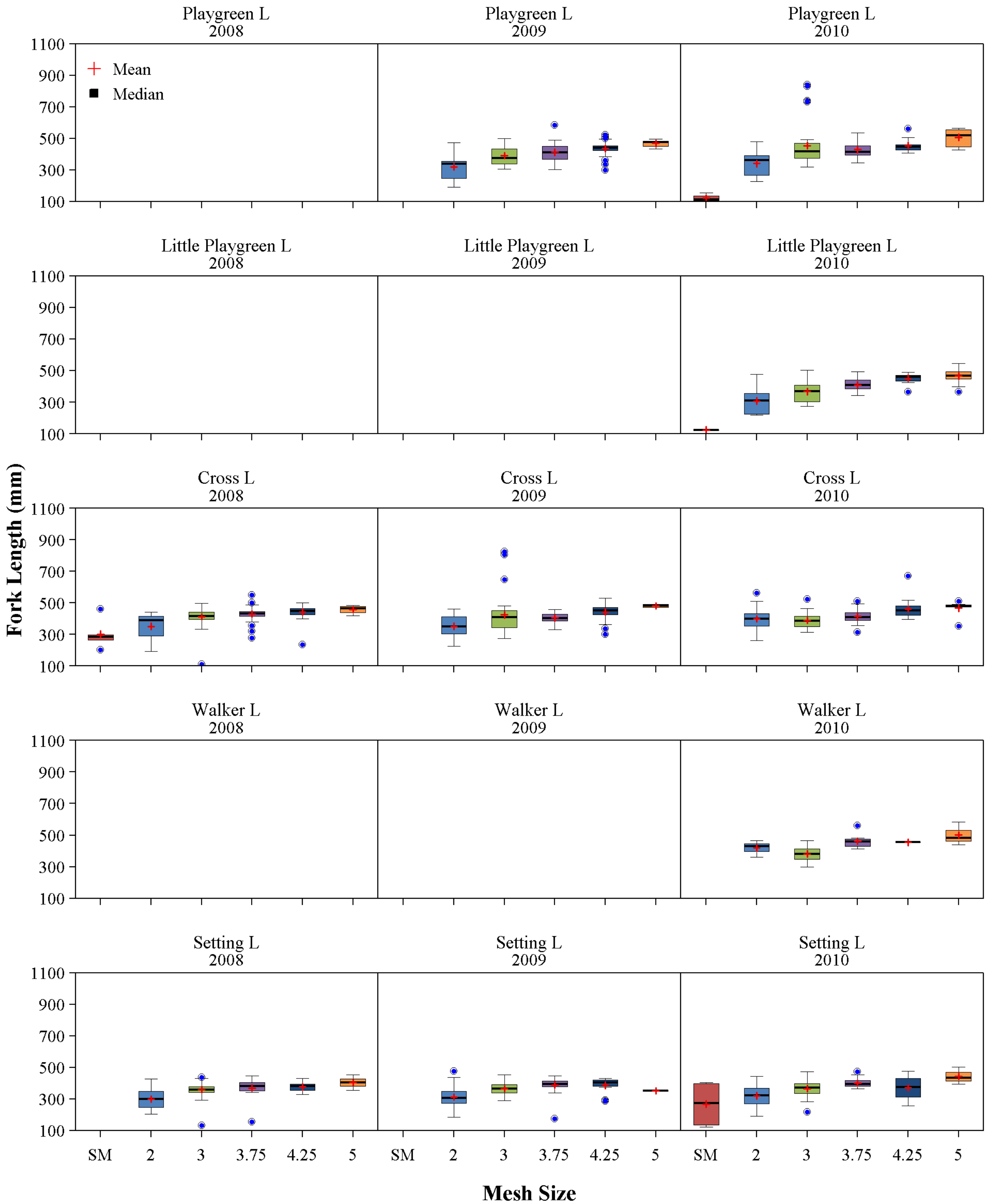


Figure 5.6.7-27. Mean and median (range) fork length (mm) per mesh size calculated for Walleye captured in standard gang and small mesh index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

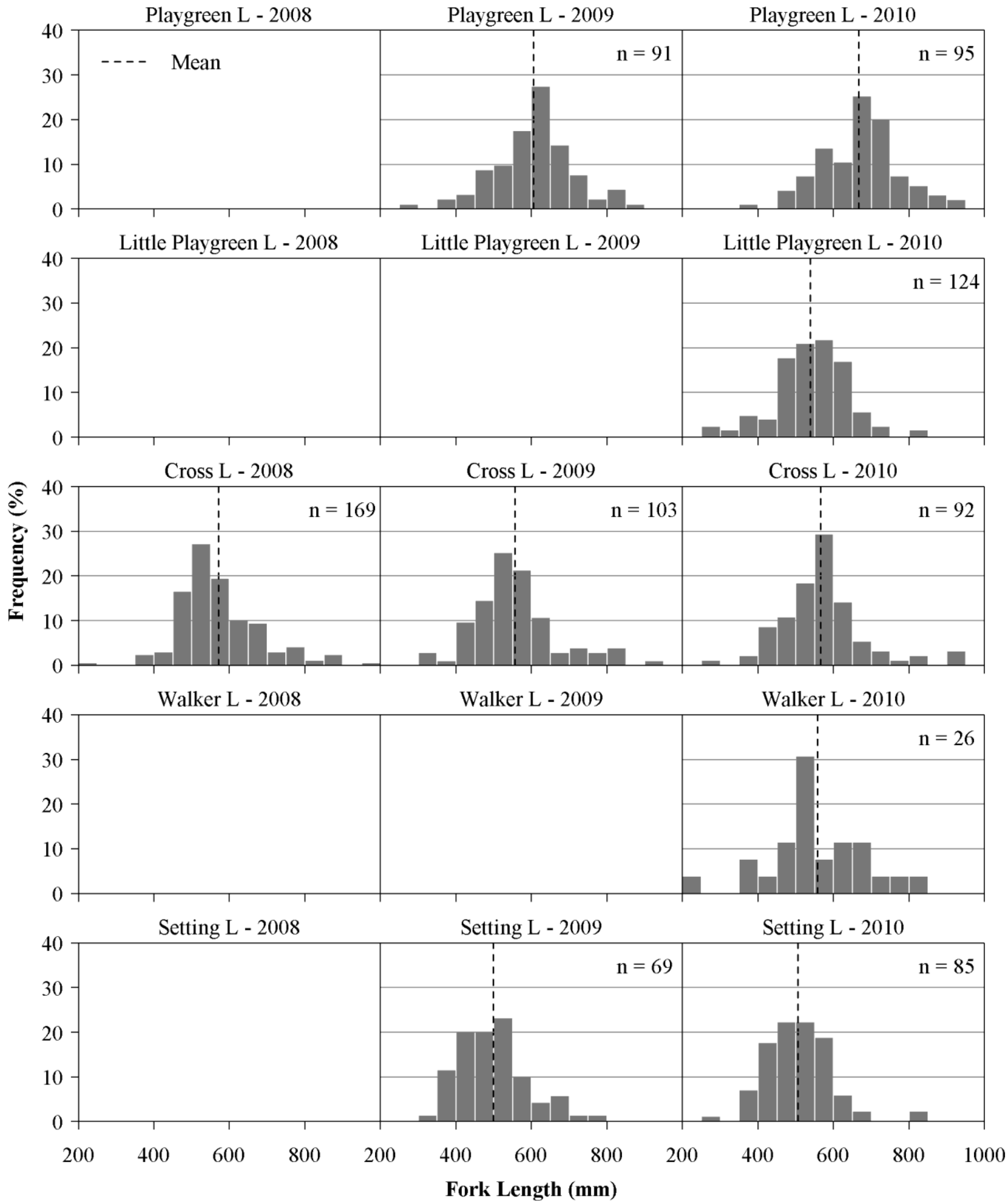


Figure 5.6.7-28. Fork length frequency histograms for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

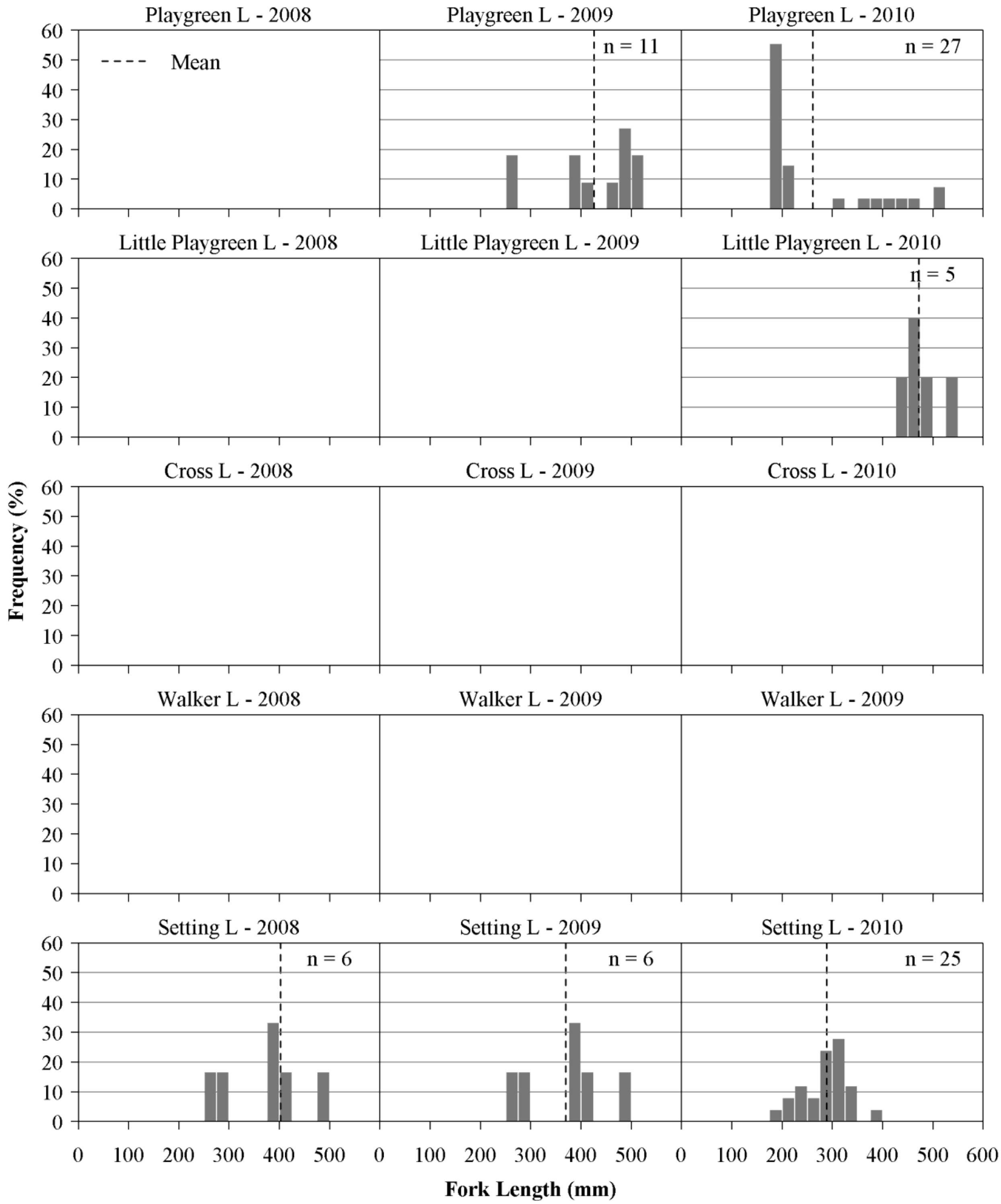


Figure 5.6.7-29. Fork length frequency histograms for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

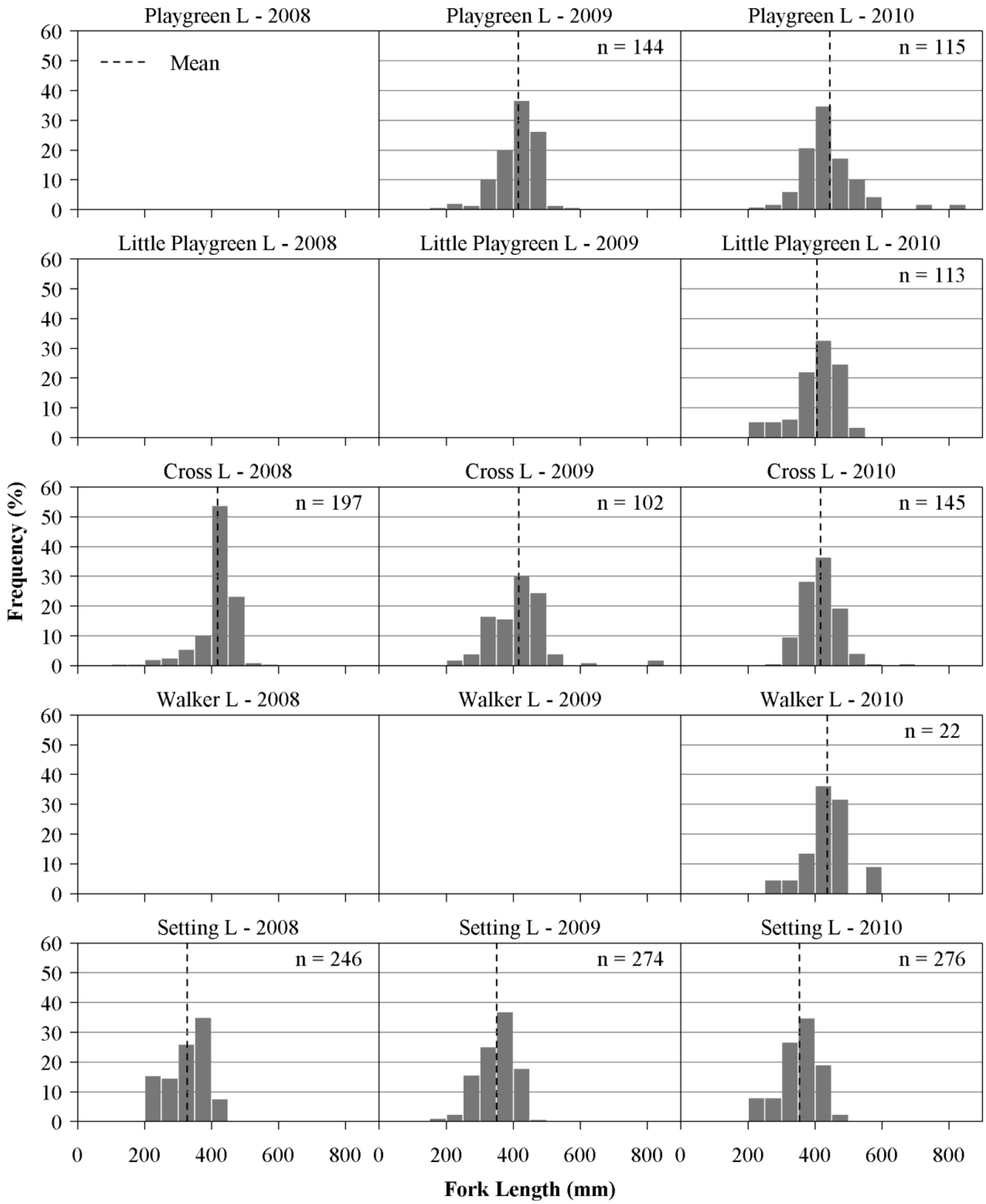


Figure 5.6.7-30. Fork length frequency histograms for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

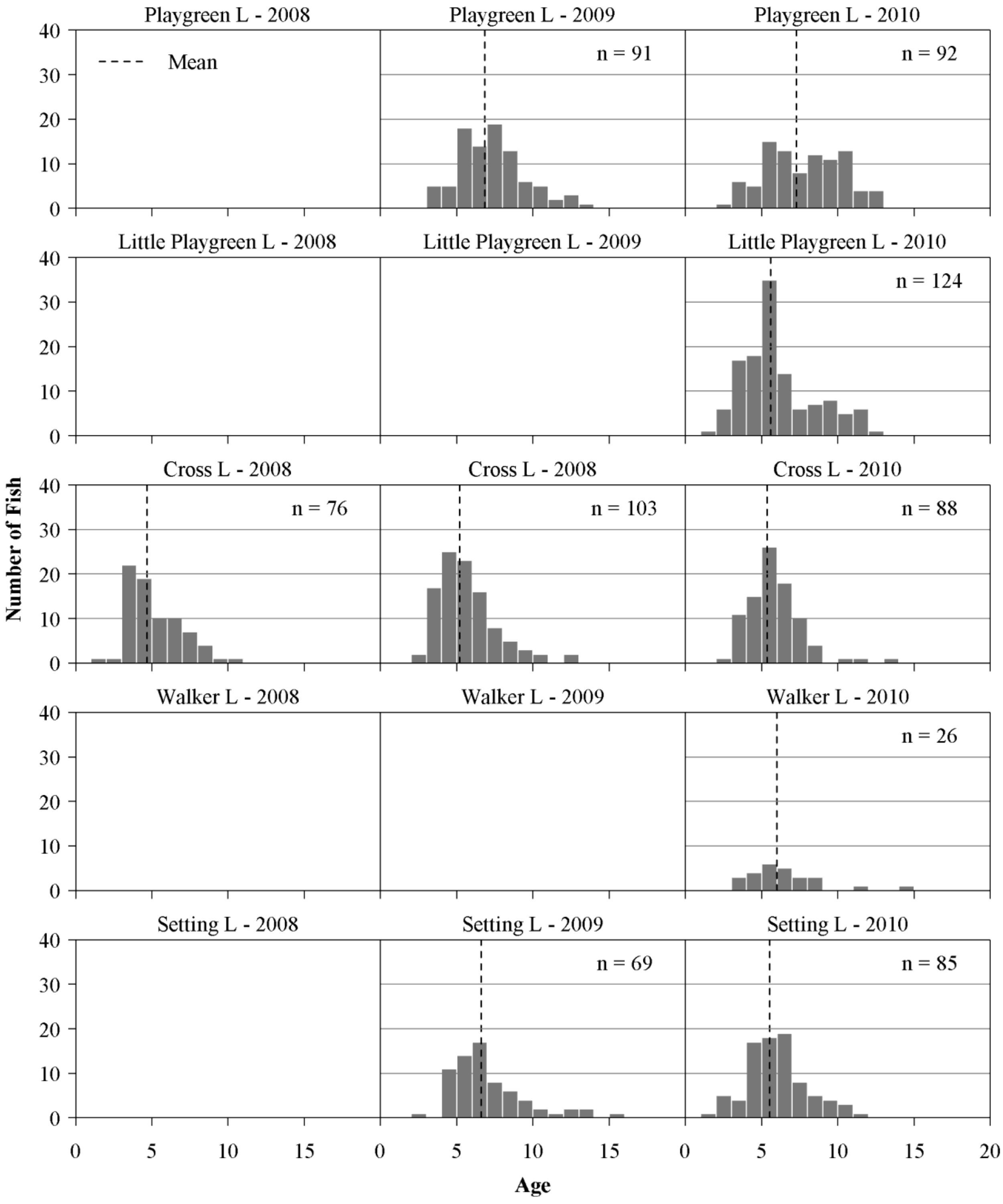


Figure 5.6.7-31. Catch-at-age plots for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

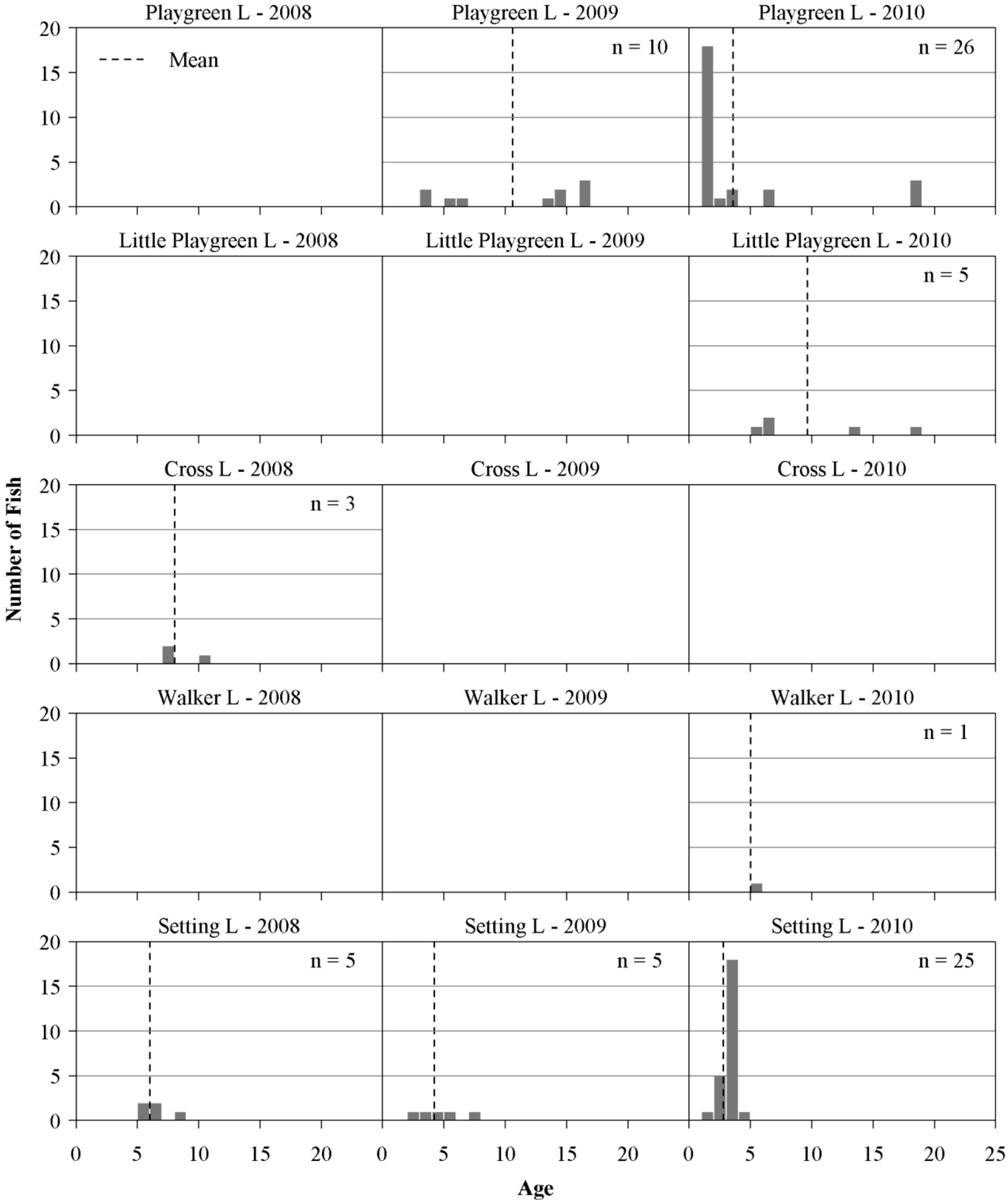


Figure 5.6.7-32. Catch-at-age plots for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

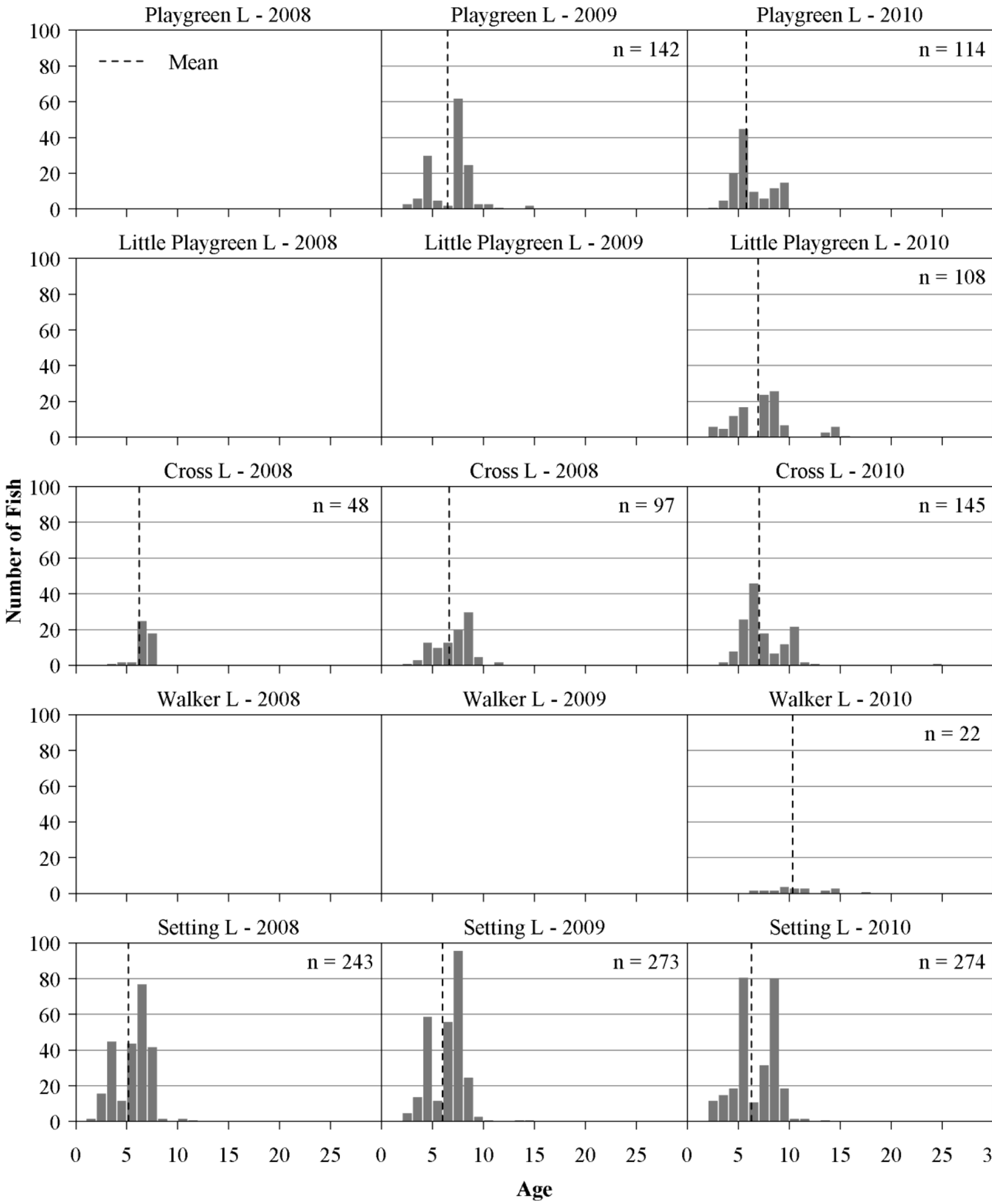


Figure 5.6.7-33. Catch-at-age plots for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010.

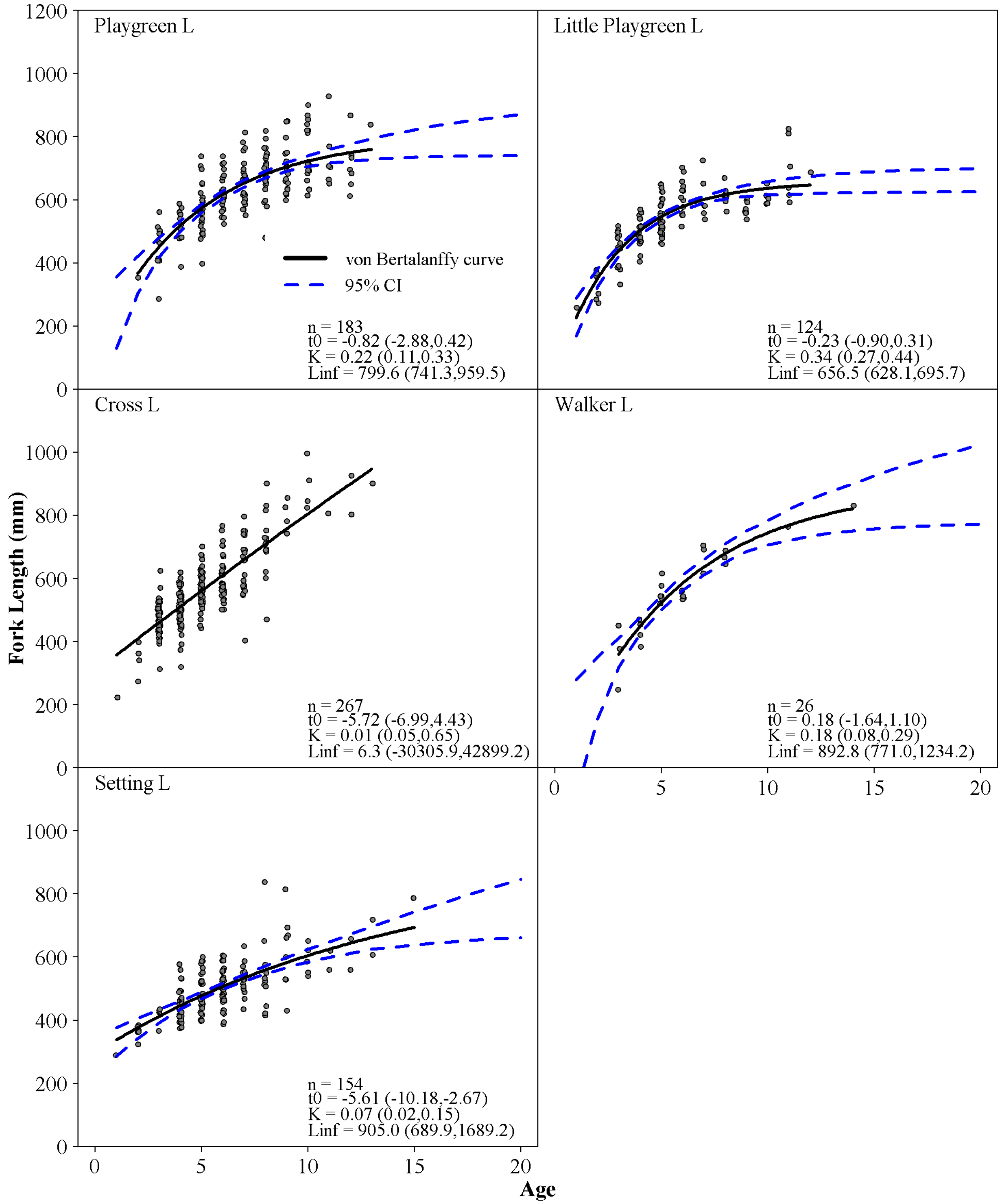


Figure 5.6.7-34. Fitted typical von Bertalanffy growth model for Northern Pike captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

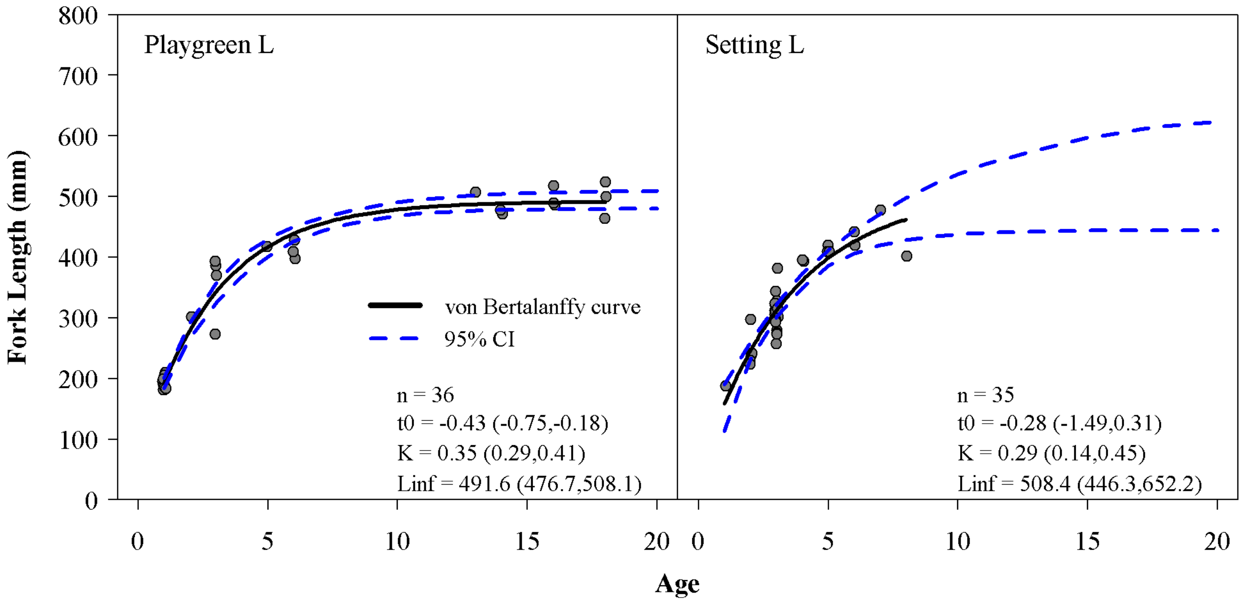


Figure 5.6.7-35. Fitted typical von Bertalanffy growth models for Lake Whitefish captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

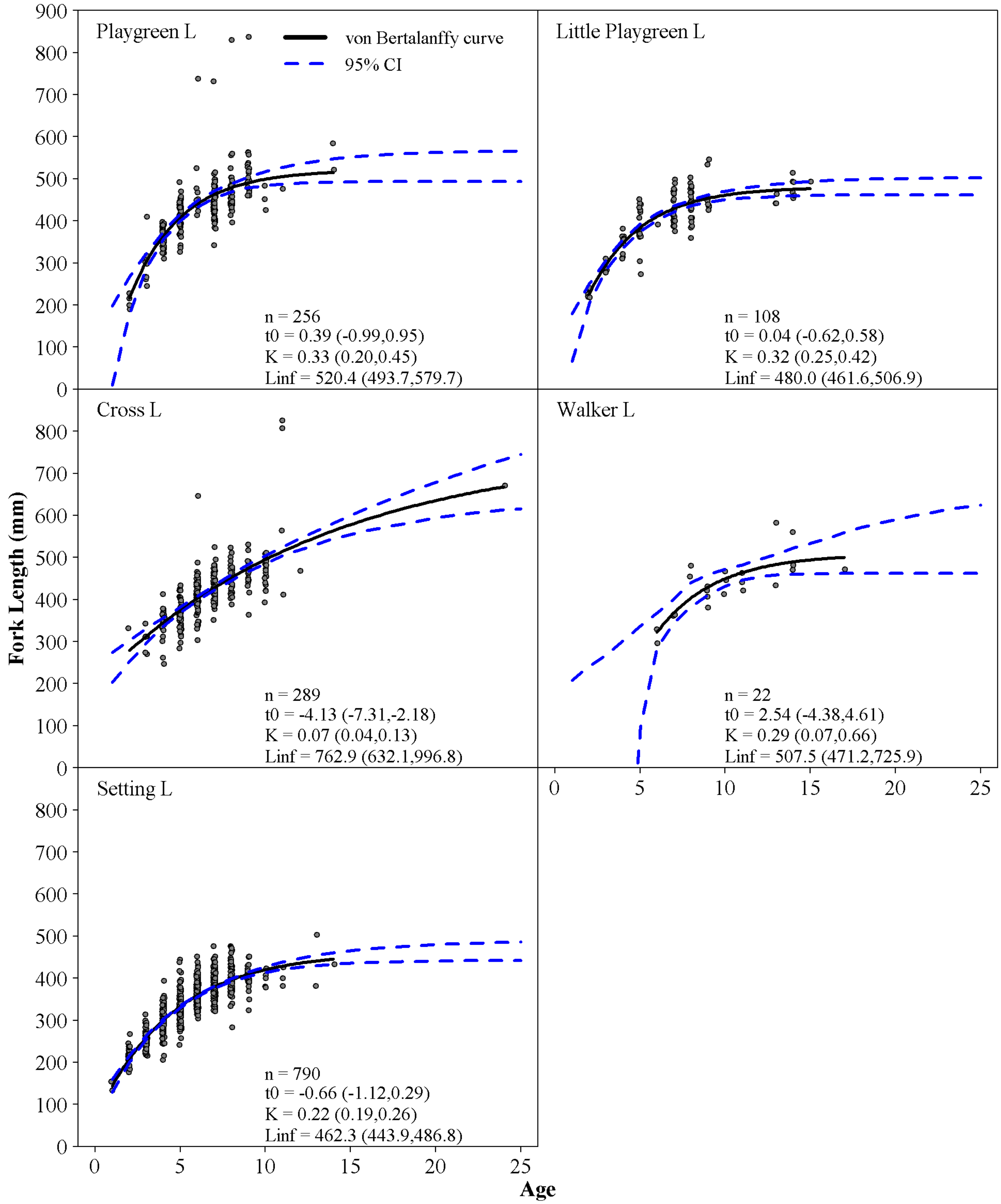


Figure 5.6.7-36. Fitted typical von Bertalanffy growth models for Walleye captured in standard gang index gill nets set in Upper Nelson River Region waterbodies, 2008-2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

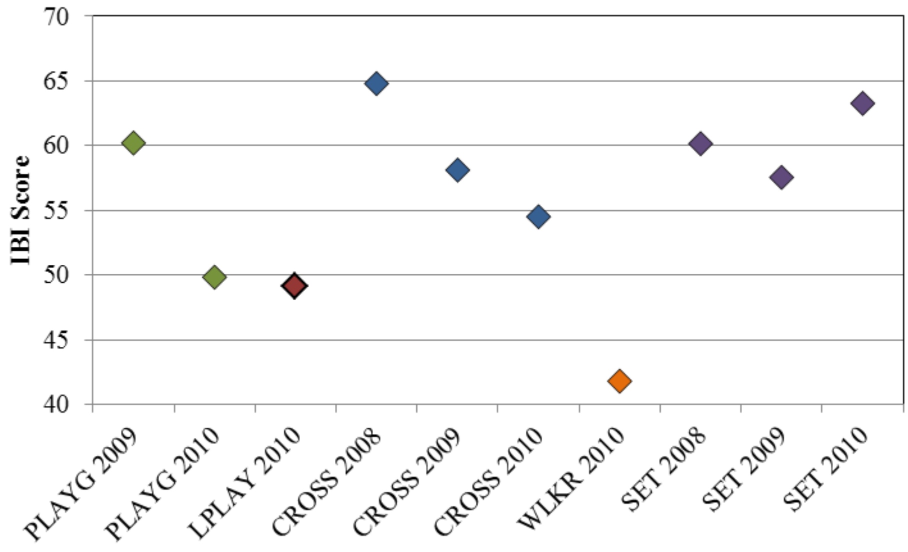


Figure 5.6.7-37. Scatter plot of yearly IBI scores for Upper Nelson River Region waterbodies, 2008-2010.

5.6.8 Fish Mercury

The following provides an overview of the results of fish mercury monitoring conducted in the Upper Nelson River Region under CAMPP. Waterbodies sampled included Playgreen Lake (Figure 5.6.8-1), Little Playgreen Lake (Figure 5.6.8-2), Cross Lake (Figure 5.6.8-3), and an off-system waterbody - Setting Lake (Figure 5.6.8-4). Fish mercury samples were collected from all four waterbodies in 2010. Details of sampling locations, times, and methodology are provided in Appendix 1.

5.6.8.1 Species comparisons

A total of 390 fish collected from the Upper Nelson River Region in 2010 were analyzed for mercury (Table 5.6.8-1). Numbers of Northern Pike and Walleye captured from each waterbody were at or near the target sample size of 36 fish (Table 5.6.8-1). Lake Whitefish were obtained for mercury analysis from all waterbodies except Cross Lake, although numbers were much (Little Playgreen Lake) or moderately (Playgreen and Setting lakes) below the target of 36 fish (Table 5.6.8-1). One-year old Yellow Perch were captured in Little Playgreen Lake, Cross Lake and Setting Lake, though the numbers of fish retained for mercury analysis from Little Playgreen and Setting lakes were approximately half the target sample size of 25 fish. No Yellow Perch were captured from Playgreen Lake. Ages of Yellow Perch were only determined for fish collected from Cross Lake, indicating a mean of 1.2 years and an average length of 84 mm (Table 5.6.8-2).

With the exception of Lake Whitefish from Setting Lake, mercury concentration and fish length were significantly positively correlated for Lake Whitefish, Northern Pike, and Walleye from all waterbodies (Figures 5.6.8-5 and 5.6.8-6), indicating that length-standardization of mercury concentrations was necessary for comparative purposes. In contrast, the correlation between mercury concentrations and fish length for Yellow Perch from Cross Lake was not significant, and, while significant, the relationship for Setting Lake was negative ($p<0.01$; see Figure 6.6-1). The Yellow Perch from Setting Lake measured only 64 mm on average, and their length-standardized concentration was less than 0.01 parts per million (ppm) - several times lower than the arithmetic mean mercury concentration.

Length-standardized mercury concentrations of Northern Pike and Walleye from all waterbodies except Setting Lake were lower than the corresponding arithmetic mean concentrations (Table 5.6.8-1). This difference reflects the higher mean lengths for these two species relative to the standard lengths of 550 mm and 400 mm, respectively (Table 5.6.8-2). Arithmetic mean mercury concentrations in Northern Pike were 45% higher than in Walleye from Setting Lake, though no statistically significant differences were noted between these species for any waterbody (Table

5.6.8-1). Mean arithmetic mercury concentrations were several fold higher in both piscivorous species compared to Lake Whitefish and Yellow Perch, and these differences were always significant (Table 5.6.8-1).

5.6.8.2 Comparison to consumption guidelines

Length-standardized concentrations for all species captured in the Upper Nelson River Region were substantially below 0.5 ppm (Table 5.6.8-1; Figure 5.6.8-7), 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 a mean concentration of 0.39 ppm, only Northern Pike from Setting Lake substantially exceeded 0.2 ppm, a level commonly accepted as a safe consumption limit for people eating large quantities of fish domestically (see section 4.8.2.3). Length-standardized concentrations of mercury in Northern Pike from Little Playgreen and Playgreen lakes, and Walleye from Little Playgreen and Setting lakes marginally exceeded the 0.2 ppm guideline. The length-standardized concentration measured in Walleye from Playgreen Lake (0.16 ppm) was slightly below this guideline value and all length-standardized means for Lake Whitefish and Yellow Perch were substantially below 0.2 ppm (Table 5.6.8-1).

Based on individual concentrations, only 12 Pike and four Walleye, and no Lake Whitefish or Yellow Perch, contained mercury in excess of 0.5 ppm. Of those individuals with concentrations in excess of this guideline, more than half were captured in the off-system lake (Setting Lake). Approximately 55% of the piscivores captured in the Upper Nelson River Region had mercury concentrations above 0.2 ppm, but concentrations measured in all Lake Whitefish and Yellow Perch were within this guideline value.

The majority of Yellow Perch (92%) and a smaller proportion of Lake Whitefish (21%) analysed from the Region contained total mercury concentrations above 0.033 ppm - the Canadian Council of Ministers of the Environment (CCME) and Manitoba tissue residue guideline for methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; updated to 2013; MWS 2011). In addition, concentrations measured in all Northern Pike and Walleye were above this guideline. 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.

5.6.8.3 Spatial comparisons

The length-standardized mercury concentration in Northern Pike from Setting Lake was significantly higher compared to conspecifics from the other three waterbodies sampled in the

Upper Nelson River Region (Figure 5.6.8-7). The same pattern existed for Walleye, except that the mean difference in mercury concentrations in Walleye from Setting and Little Playgreen lakes was not significant. The arithmetic mean mercury concentration of Yellow Perch from Cross Lake was significantly higher compared to the standardized concentration in conspecifics from Setting Lake, but no other differences were observed between waterbodies for this species. Length-standardized mercury concentrations in Lake Whitefish were not significantly different between waterbodies sampled in the Upper Nelson River Region (Figure 5.6.8-7).

Table 5.6.8-1. Arithmetic mean (± standard error, SE) and length-standardized (± 95% confidence limit, CL) mercury concentrations (ppm) for Lake Whitefish, Northern Pike, Walleye, and Yellow Perch captured in the Upper Nelson River Region in 2010.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Playgreen Lake	Northern Pike	36	0.242[b]	0.011	0.215	0.197 - 0.234
	Walleye	36	0.181[b]	0.017	0.156	0.137 - 0.178
	Lake Whitefish	27	0.018[a]	0.003	0.024	0.019 - 0.030
	Yellow Perch	0	-	-	-	-
Little Playgreen Lake	Northern Pike	35	0.227[b]	0.013	0.214	0.196 - 0.235
	Walleye	36	0.265[b]	0.020	0.231	0.199 - 0.269
	Lake Whitefish	5	0.058[a]	0.015	-*	0.017 - 0.099
	Yellow Perch	10	0.052[a]	0.010	-*	0.029 - 0.075
Cross Lake	Northern Pike	36	0.233[b]	0.026	0.187	0.159 - 0.219
	Walleye	36	0.202[b]	0.021	0.149	0.130 - 0.170
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	25	0.075[a]	0.003	-*	0.069 - 0.081
Setting Lake	Northern Pike	36	0.391[b]	0.048	0.392	0.332 - 0.463
	Walleye	35	0.269[b]	0.021	0.277	0.243 - 0.315
	Lake Whitefish	24	0.025[a]	0.001	-*	0.023 - 0.028
	Yellow Perch	13	0.054[a]	0.005	0.009	0.003 - 0.028

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

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 5.6.8-7.

Table 5.6.8-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from the Upper Nelson River Region in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Playgreen Lake	Northern Pike [a]	36	614.1 ± 18.5	2239.4 ± 212.6	0.89 ± 0.01	6.4 ± 0.5
	Walleye [b]	36	412.1 ± 19.1	1171.8 ± 112.2	1.35 ± 0.02	6.1 ± 0.3
	Lake Whitefish [c]	27	260.1 ± 22.1	461.1 ± 126.9	1.44 ± 0.04	3.5 ± 1.1
	Yellow Perch	0	-	-	-	-
Little Playgreen Lake	Northern Pike	35	560.9 ± 17.9	1646.9 ± 137.9	0.86 ± 0.01	5.8 ± 0.4
	Walleye [d]	36	409.6 ± 12.9	1077.2 ± 80.5	1.41 ± 0.02	6.9 ± 0.5
	Lake Whitefish	5	472.0 ± 16.4	1942.0 ± 229.0	1.79 ± 0.02	9.6 ± 2.5
	Yellow Perch	10	166.0 ± 2.3	83.0 ± 5.6	1.80 ± 0.07	-
Cross Lake	Northern Pike [e]	36	588.9 ± 23.2	1835.0 ± 226.3	0.77 ± 0.01	5.5 ± 0.4
	Walleye	36	427.5 ± 11.5	1093.1 ± 113.1	1.28 ± 0.02	7.3 ± 0.6
	Lake Whitefish	0	-	-	-	-
	Yellow Perch	25	84.0 ± 1.0	6.7 ± 0.2	1.13 ± 0.02	1.2 ± 0.1
Setting Lake	Northern Pike	36	514.3 ± 17.1	1123.6 ± 141.4	0.73 ± 0.02	5.9 ± 0.4
	Walleye	36	376.4 ± 11.4	677.8 ± 49.6	1.16 ± 0.01	5.9 ± 0.4
	Lake Whitefish	24	286.6 ± 9.4	354.2 ± 34.4	1.41 ± 0.02	2.8 ± 0.1
	Yellow Perch	13	64.3 ± 1.0	3.1 ± 0.2	1.15 ± 0.04	-

[a] n = 34 for age; [b] n = 32 for age; [c] n = 26 for age; [d] n = 33 for age; [e] n = 34 for age

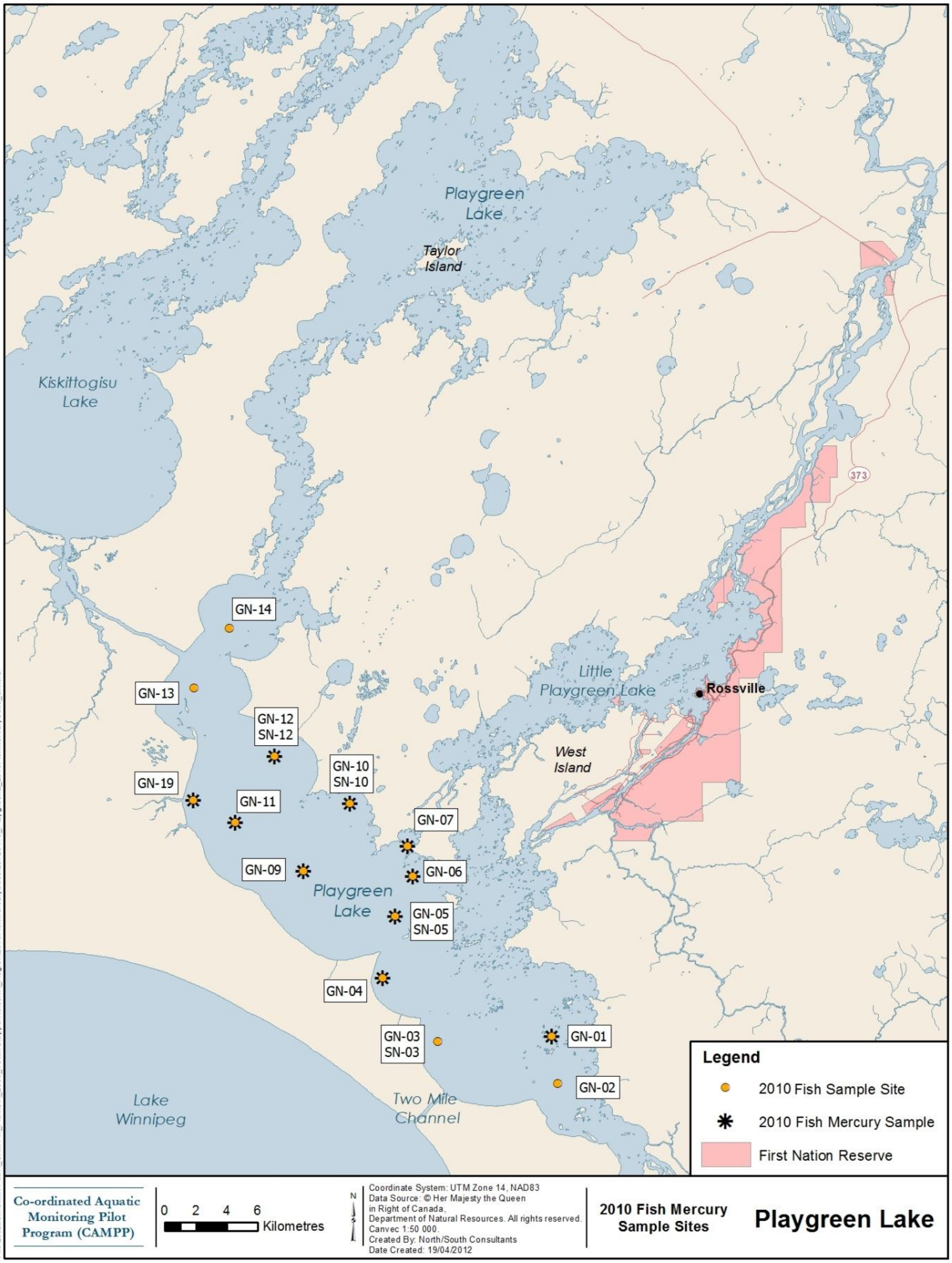


Figure 5.6.8-1. Fish sampling sites in Playgreen Lake, indicating those sites where fish were collected for mercury analysis.

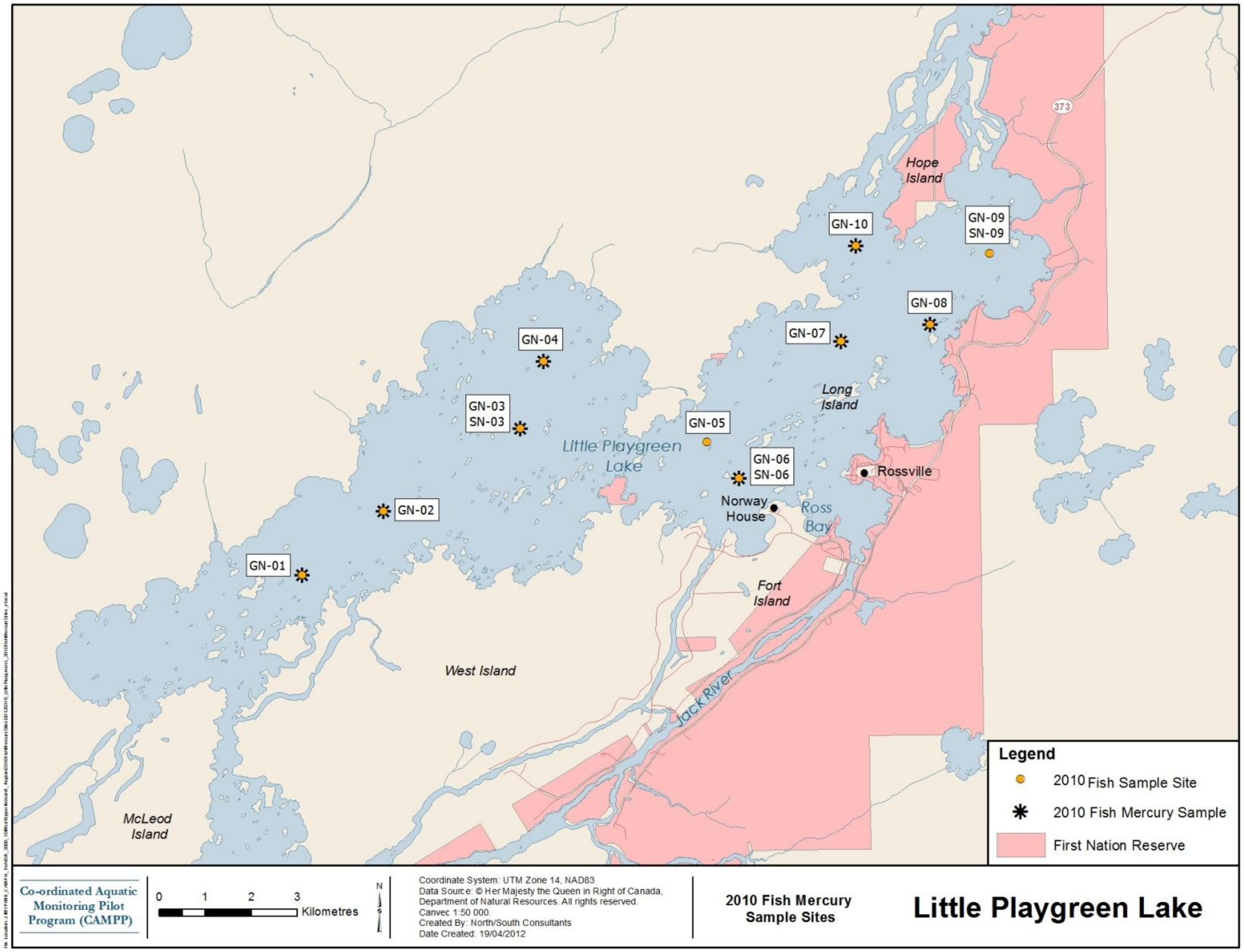


Figure 5.6.8-2. Fish sampling sites in Little Playgreen Lake, indicating those sites where fish were collected for mercury analysis.

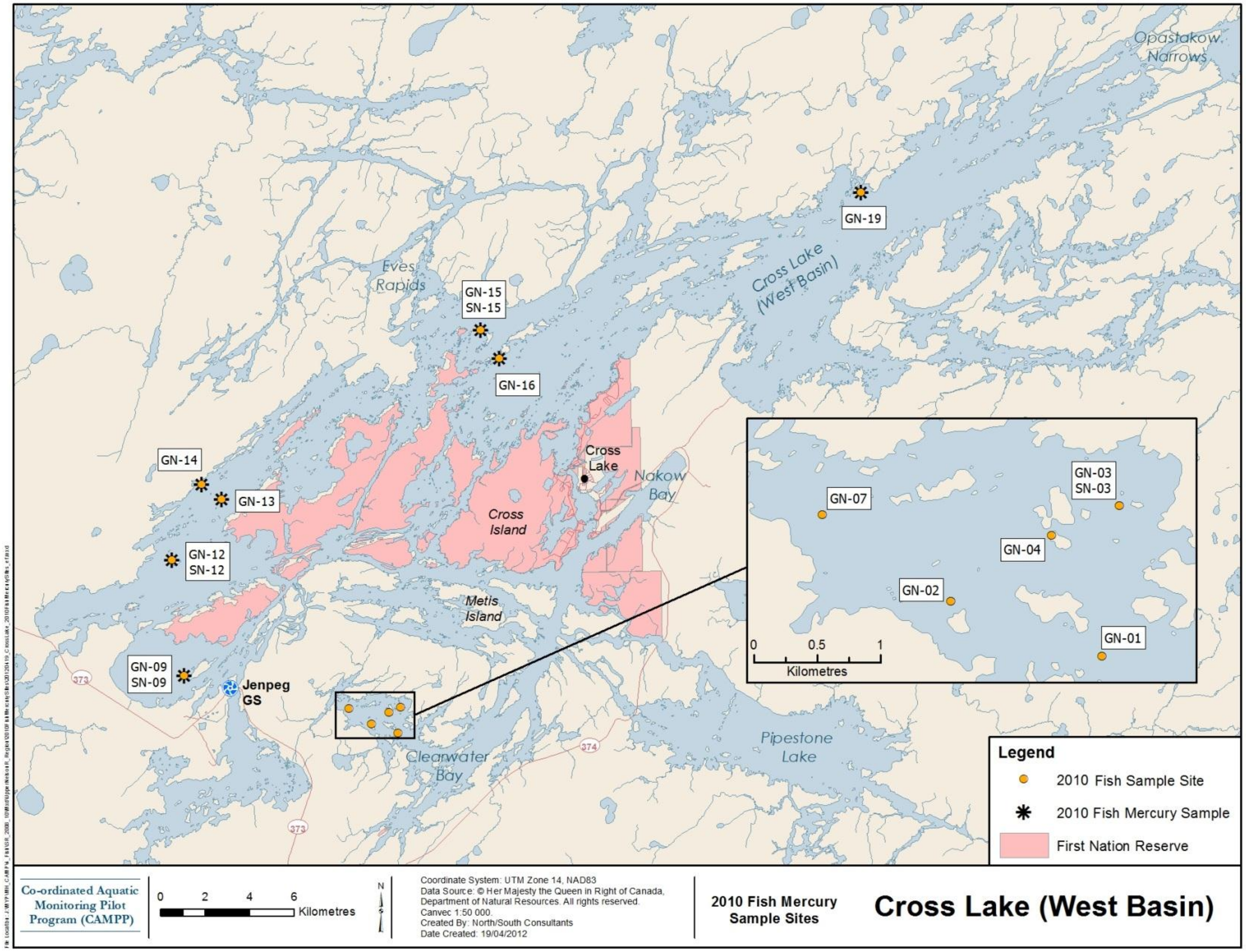


Figure 5.6.8-3. Fish sampling sites in Cross Lake, indicating those sites where fish were collected for mercury analysis.

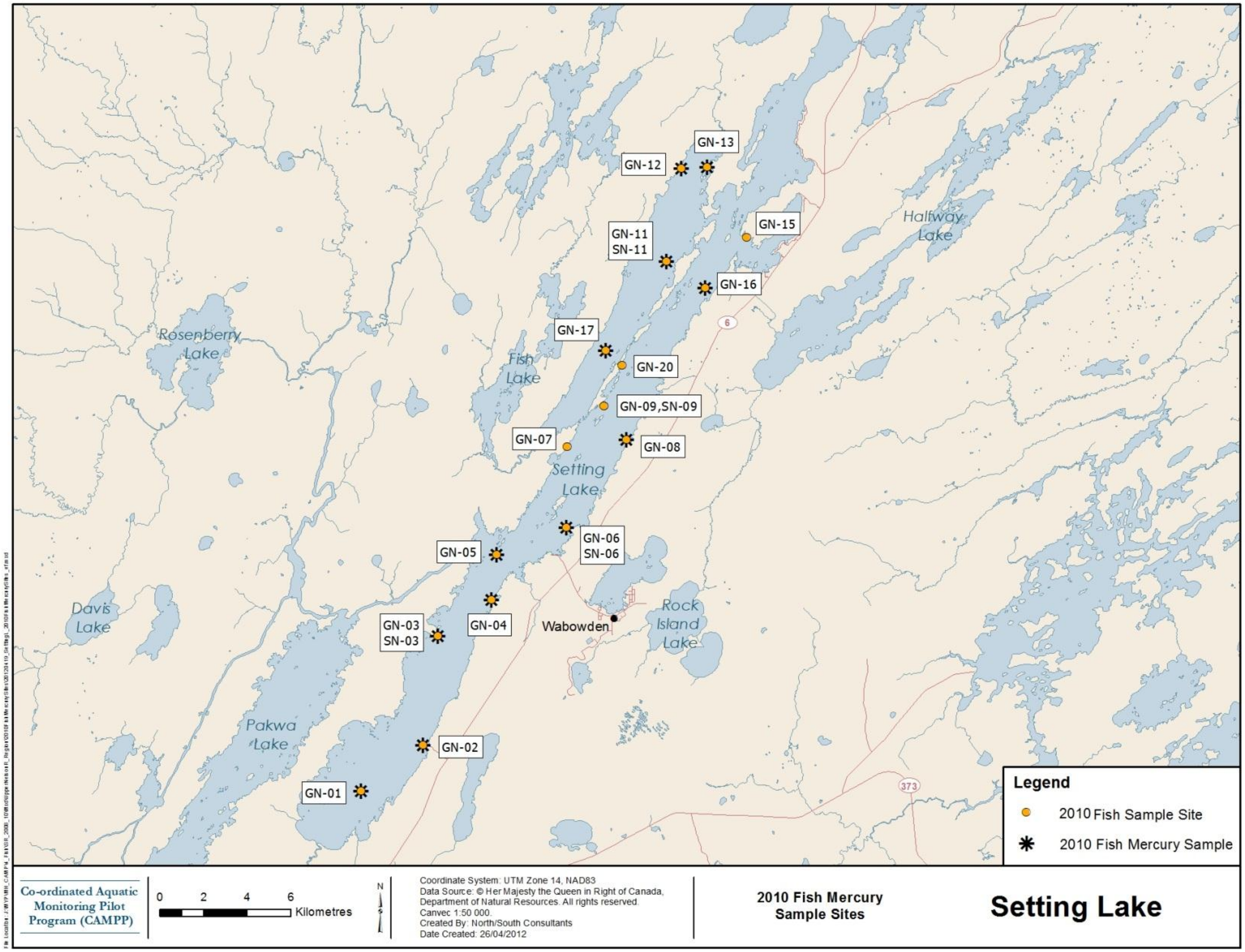


Figure 5.6.8-4. Fish sampling sites in Setting Lake, indicating those sites where fish were collected for mercury analysis.

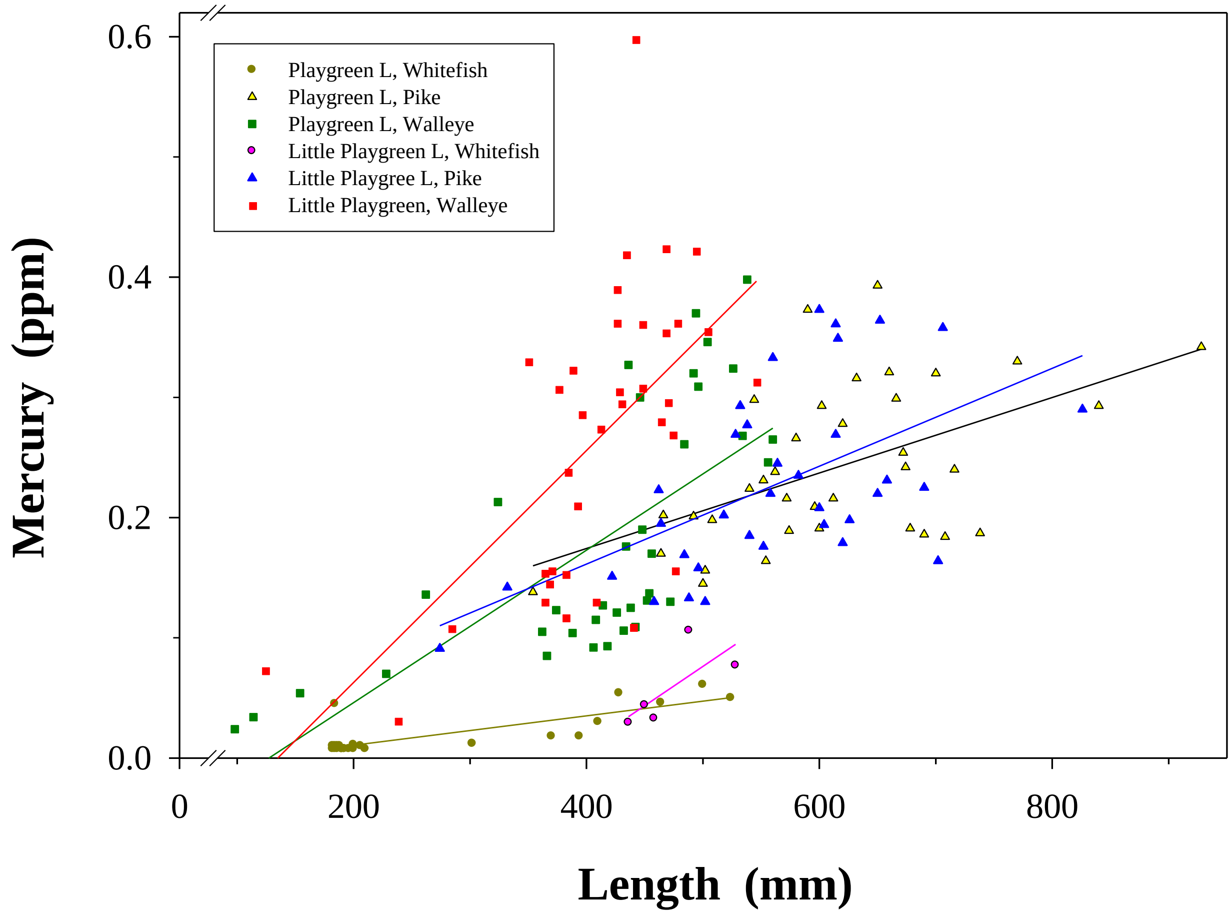


Figure 5.6.8-5. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Playgreen and Little Playgreen lakes in 2010. Significant linear regression lines are shown.

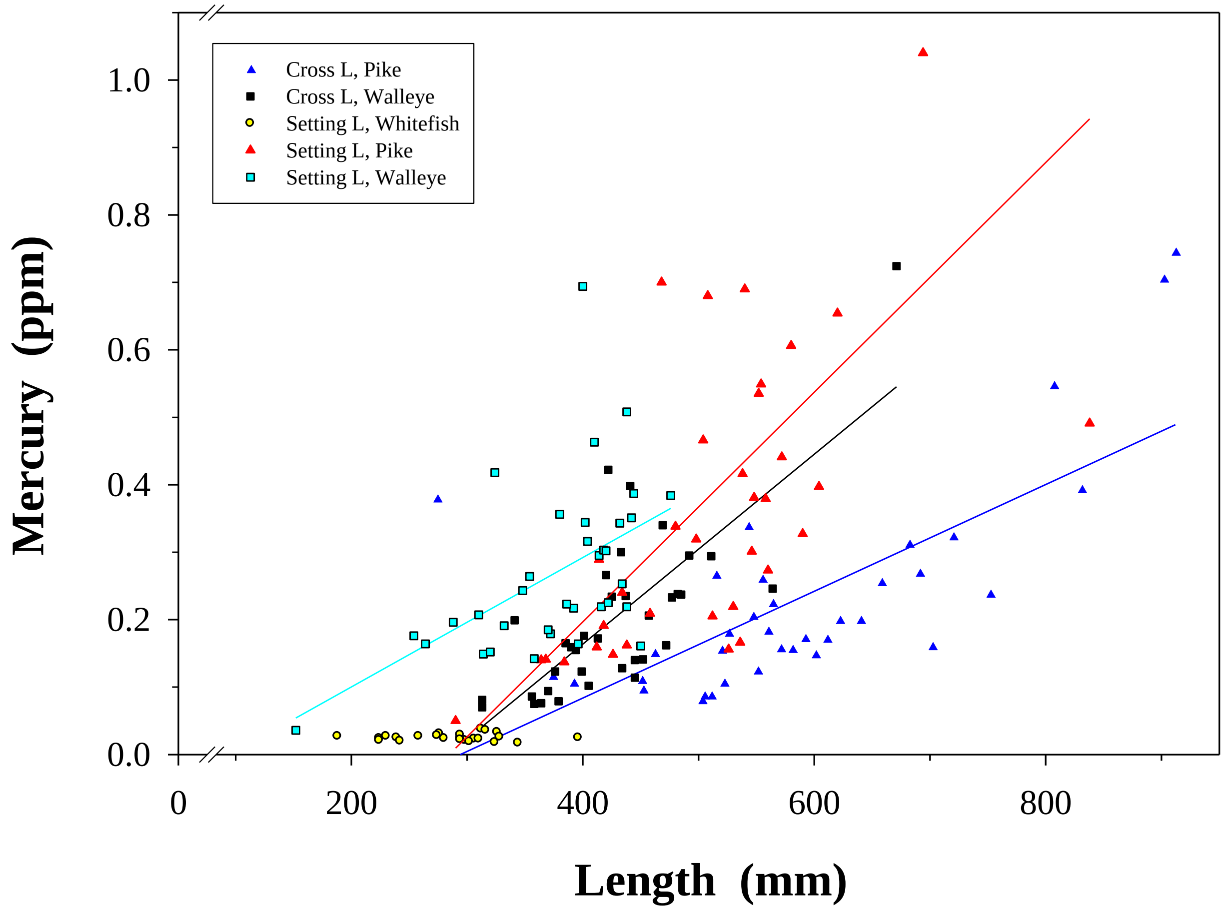


Figure 5.6.8-6. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Cross and Setting lakes in 2010. Significant linear regression lines are shown. One Northern Pike from Setting Lake with a mercury concentration of 1.49 ppm and a length of 652 mm is not shown but is included in the analysis.

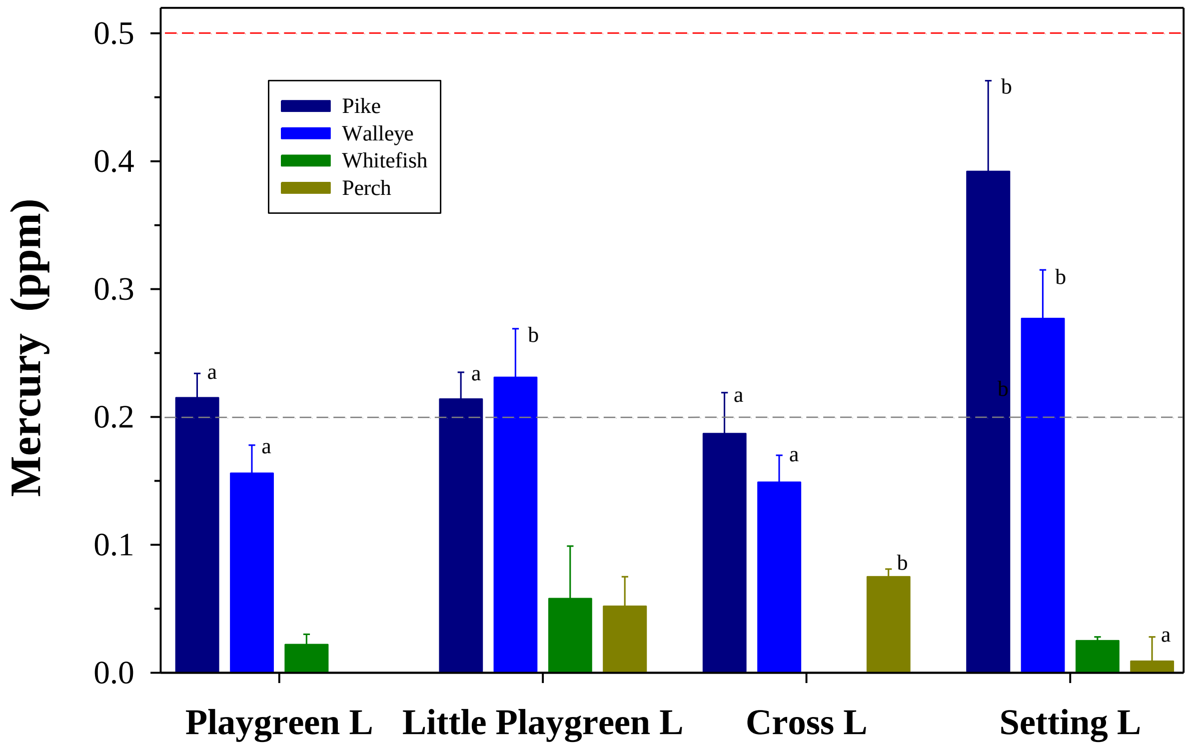


Figure 5.6.8-7: Mean (+95% CL) mercury concentrations of Lake Whitefish, Northern Pike, and Walleye captured in the Upper Nelson River Region in 2010. Means are length-standardized except for Lake Whitefish from little Playgreen and Setting lakes and Yellow Perch from Little Playgreen and Cross lakes, which are shown as arithmetic means. 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.