AVISTA CORPORATION

COEUR D'ALENE RESERVATION

2011 WATER QUALITY MONITORING

ANNUAL SUMMARY REPORT

4(E) CONDITION NO. 5

SPOKANE RIVER HYDROELECTRIC PROJECT
FERC PROJECT NO. 2545

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1.0 INTRODUCTION

1.1 Background

On June 18, 2009, the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license (License) for the Spokane River Hydroelectric Project (Spokane River Project), FERC Project No. 2545 for a 50-year term (FERC, 2009). The License includes the Post Falls Hydroelectric Development (HED) in Idaho as a component of the Spokane River Project.

The Post Falls HED includes three dams located on the Spokane River approximately nine miles downstream from the outlet of Coeur d'Alene Lake. Coeur d’Alene Lake is a natural lake created by a channel restriction at the outlet, with the outlet serving as the headwaters of the Spokane River. The Post Falls HED’s Project boundary encompasses Coeur d’Alene Lake, Spokane River upstream of the Post Falls Dams, and the lower reaches of the St. Joe, Coeur d’Alene and St. Maries rivers to the normal full pool water elevation of 2,128 feet.

1.2 License Requirements

Ordering Paragraph G of Avista’s Spokane River Project License incorporated the U.S. Department of Interior’s (Interior’s) January 27, 2009 Federal Power Act 4(e) Conditions (Conditions). The Conditions can be found in Appendix D of the License. Condition No. 5 of Appendix D of the License regarding Water Quality Standards and Water Quality Monitoring (Condition 5) required Avista to complete a Coeur d’Alene Indian Reservation Water Quality Monitoring Plan (WQMP), in collaboration with the Coeur d’Alene Tribe (Tribe), within one year of License issuance (June 18, 2010). Interior and FERC subsequently approved the WQMP, which includes the following:

- Monitor water quality at the five sites (C5, C6, RL1, BL1, and SJ1) identified by Interior, or agreed to by Avista and the Tribe and approved by Interior;
- Conduct continuous temperature, specific conductance, pH, and dissolved oxygen (DO), at the specified sites annually from June through November;
- Develop profiles of water column conditions for temperature, specific conductance, pH, and DO at all sites annually at least twice monthly during the monitoring period;
- Collect profiles throughout the water column to characterize physical/chemical conditions in the euphotic zone and lower hypolimnion and to define the depth and magnitude of the thermocline;
- Follow specified methods for collecting water samples at each site;
- Use appropriate quality assurance and quality control measures for specified parameters and corresponding detection limits:
- Collect one phytoplankton subsample per month from the euphotic zone at all sites;

- Maintain data in an electronic database or spreadsheet, and provide reports; and
- Provide data within 30 working days after collection or laboratory analysis and promptly respond to requests for additional information.

2.0 DATA COLLECTION

Avista contracted with the Tribe to implement the WQMP during the June through November 2011 monitoring season and to conduct water quality monitoring at the five sites identified in Part A(1)(a-e) of Condition 5 (Table 1). These sites include C5 (Coeur d'Alene Lake), C6 (Chatcolet Lake), SJ1 (Lower St. Joe River), BL1 (Benewah Lake) and RL1 (Round Lake).

Figure 1 displays the location of the Coeur d'Alene Reservation Boundary and Figure 2 shows the locations of the five monitoring sites within the southern portion of Coeur d'Alene Lake and the St. Joe River.

2.1 In-Situ Profile Monitoring

In accordance with the WQMP, the Tribe, on behalf of Avista, conducted in-situ profile monitoring twice a month, at each of the five sites from June through November, with the exception of sites BL1 and RL1. These shallow sites, BL1 and RL1, were not sampled in November due to low lake levels which did not allow for boat passage.

The Tribe collected in-situ profiles from the lake surface to the lake bottom using a Hydrolab® DS5 multi-probe which created depth-profiles for the parameters identified in the WQMP. These parameters included water temperature, pH, specific conductance, depth, photosynthetic active radiation, dissolved oxygen (percent saturation and concentration), and relative fluorescence (chlorophyll-a). The Hydrolab DS5 multi-probe sensors were calibrated prior to each day's monitoring and dissolved oxygen was calibrated at the sample sites. Table 2 summarizes the dates the profiles were collected. The in-situ profile results are summarized by site in Section 4.1 through 4.5, and the full profile results are summarized in a database, which is available upon request.

2.2 Continuous Monitoring

The WQMP indicates continuous monitoring of temperature, specific conductance, pH, and dissolved oxygen (percent saturation and concentration) would be collected using a YSI 6600V2-4M buoy (multi-probe system) at each site, June through November, on a revolving five-year cycle. The Tribe conducted continuous monitoring during the 2011 season from June 30 through November 30 at Site C5. The continuous monitoring profile results are summarized by site in Section 4.1 through 4.5, and the full continuous monitoring profile results are summarized in a database which is available upon request.

2.3 Water Sample Collection

2.3.1 Sample Depths

The WQMP indicated water samples would be collected for nutrients at each of the five sites (Table 1 and Figure 2) once per month from June through November on an annual basis, for the term of the License. During monthly sampling, at each of the five sites, water samples are collected from the following depths as indicated in Part A(5) of Condition 5:

- Euphotic zone composite (defined as 3-5 evenly spaced samples taken from 0.5 m below the surface to the depth to which 1% of incident solar radiation at the surface penetrates, composited in a churn splitter, and from which subsamples are withdrawn for laboratory analysis). This depth will be referred to as the "photic zone" in the remainder of the report;
- One meter above the lake bottom. This depth will be referred to as "bottom" in the remainder of the report; and
- At Site C5 only (part of A(1)(a) of Condition 5), in the zone of maximum chlorophyll fluorescence.

2.3.2 Nutrient Sampling

The WQMP further indicates the water samples collected at each of the five monitoring locations at the depths previously identified will be analyzed for the following nutrients as defined in Part A(6)(a-g) of Condition 5: total Nitrogen; nitrite (NO_2) + nitrate (NO_3) Nitrogen; ammonia nitrogen (NH_3); total Phosphorus; dissolved Phosphorus; ortho Phosphorus; and chlorophyll *a* (in the euphotic composite and zone of maximum chlorophyll fluorescence samples). In accordance with the WQMP, the Tshimakain Creek Labs (formerly Spokane Tribal Laboratory), a certified laboratory, analyzed the water quality samples for the constituents and method detection limits identified in Table 3 of the WQMP.

During the 2011 monitoring program water samples were collected from sampling sites BL1, RL1, C5, C6, and SJ1 for the nutrients previously identified. Table 3 summarizes the dates monitoring was conducted. A summary of the QA/QC results are presented in Section 3.0 and the *in-situ* profile and analytical results are included in Section 4.0.

2.3.3 Phytoplankton Sampling

Also, Part A(7) of Condition 5 indicates one phytoplankton sample will be collected per month, June through November, from the euphotic zone composite in accordance with Part A(5)(a) of Condition 5 at each of the five monitoring locations previously identified. The Tribe sub-contracted with Advanced Eco-Solutions, a certified laboratory, to analyze subsamples for taxa present (identified to species level whenever possible), cell counts and biovolume for samples collected at the five sites from June through November, with the exception of sites BL1 and RL1.

These shallow sites, BL1 and RL1, were not sampled in November due to low lake levels which did not allow for boat passage.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

3.1 QA/QC Methods

Equipment blanks were prepared prior to the first sampling date following the methods described in section 2.3.4.1 of the WQMP. During the sampling season on June 14 and August 17 field blanks were prepared following the methods described in section 2.3.4.1 of the WQMP.

3.2 QA/QC Results

For the equipment blanks, results for all nutrients and chlorophyll *a* were below minimum reporting limits (MRL), indicating cleaning methods effectively eliminated contamination of water samples from the Van Dorn sampler and the churn splitter.

Field blanks were prepared on June 14 and August 17, and on each date one nutrient constituent was above the MRL. In both cases, as described below, the positive detection was at such a low concentration that it could not have cross-contaminated samples from different sites.

On June 14, Total Kjeldahl nitrogen (TKN) from a churn splitter blank was 60 µg/L, 10 µg/L above the 50 µg/L MRL. This 10 µg/L difference was not significant because the blank was prepared after sampling SJ1 and prior to sampling BL1. BL1 had a photic zone TKN result of 160 µg/L and a bottom result of 210 µg/L, well above the 60 µg/L blank. On August 17, orthophosphorus from a churn splitter blank was 2 µg/L, which was 1 µg/L above the 1 µg/L MRL. This 1 µg/L difference was not significant because all orthophosphorus results from C6 and C5 on that date were greater than or equal to 8 µg/L.

4.0 RESULTS AND DISCUSSION

The following sections 4.1 through 4.5 consist of the combined results and discussion for each of the five sample sites described in Table 1. Table 4 demonstrates compliance of the 2011 monitoring activities with the requirements identified in the 4(e) Condition No. 5 and the Coeur d'Alene Reservation Water Quality Monitoring Plan.

With regard to the Tribe's Water Quality Standards for Approved Surface Waters of the Coeur d'Alene Tribe (Tribe 2010), dissolved oxygen, temperature, and pH are the only constituents with quantitative standards monitored under this sampling program. The variable, pH was not exceeded at any site during the 2011 sampling season. For each site, dissolved oxygen concentrations were compared to the Tribe's dissolved oxygen standard of greater than 8.0 mg/L in the hypolimnion at depths greater than 8 meters. Temperature, like dissolved oxygen, is a depth dependant water quality standard. As such, the dissolved oxygen and temperature standard is not applicable to sites BL1 and RL1, as they are less then 8 meters in depth. The Tribe's temperature standard is based on a 7 day average and C5 is the only site where the attainment of the temperature standard could be evaluated. As the buoy monitoring system is rotated annually to each site, the Tribe will build a data set which should allow it to assess the relationship between single temperature sampling events (every two weeks) and 7 day average temperatures within the hypolimnion.

The format and sequence of figures for each site are consistent between sites. Figure 3 presents the water quality and water column profile sample dates in relation to the St Joe River hydrograph and Coeur d'Alene Lake elevation. The first profile sampling (June 7) and water quality sampling (June 14) were taken during the regression of the hydrograph at a lake elevation 2.7 and 1.9 feet, respectively, above the summer full pool elevation of 2128 feet. The remaining sample dates encompassed lake summer pool elevations through drawdown elevations. As noted previously, the shallow sites BL1 and RL1 were not sampled in November due to low lake levels which did not allow for boat passage. These sites were last sampled on October 25.

4.1 Lower St. Joe River (SJ1)

On June 14, water temperature at the St. Joe River sampling site (SJ1) was an isothermal 7.2°C top to bottom. One month later on July 18, the river remained isothermal but had warmed to 14.0 °C at the surface and 13.6°C near the bottom at 21 meters. The river at SJ1 was warmest during late August through early September. On August 18, the surface water warmed to 19.3°C and maintained 18.8°C throughout the water column to the bottom at 21 meters (Figure 4A). From September 13 to September 28, the river cooled an average 2.5°C throughout the water column (Figure 5A). On November 29, the water column was isothermal at 1.6°C (Figure 6A) having cooled an average 14.2°C during the two-month time period from September 28 through November 29. SJ1 did not maintain a stable stratified condition, therefore the temperature standard could not be applied.

Dissolved oxygen at SJ1 averaged 11.3 mg/L (99% saturation) throughout the water column on June 14. The dissolved oxygen concentration remained high throughout the summer and ranged from 8.6 to 8.3 mg/L (102.5 to 97.2%) throughout the water column on August 18 (Figure 4B). The lowest dissolved oxygen saturation value at SJ1 was 87.9% (7.5 mg/L) at 5 meters on September 13. Dissolved oxygen concentrations remained high throughout the lake drawdown period. From September 28 through November 29, lowest dissolved oxygen values ranged from 8.4 mg/L (92.8%) to 11.9 mg/L (94.6%), (Figures 5B and 6B). Throughout the monitoring season, there were no exceedances of the dissolved oxygen standard at SJ1.

Total Kjeldahl nitrogen (TKN) dynamics at SJ1 were highly variable throughout the season with little difference between the photic zone and bottom (Figure 7A). The geometric mean for TKN in the photic zone was 86.7 µg/L compared to 85.5 µg/L from bottom samples. Dissolved inorganic nitrogen (DIN) was peaked on July 18, at 89 µg/L and quickly declined to near or below the 20 µg/L minimum reporting limit (MRL) (Figure 7B). DIN from bottom samples increased later in the season peaking at 55 µg/L on November 29 (Figure 7B).

Total phosphorus in the photic zone peaked on July 18 at 17 µg/L and declined throughout the summer to a low of 8.5 µg/L on October 11 (Figure 7C). Total phosphorus from the bottom displayed similar dynamics and concentration as in the photic zone (Figure 7C). The geometric mean for total phosphorus in the photic zone was 12.8 µg/L compared to 13.1 µg/L from the bottom. Orthophosphorus dynamics from the photic zone and bottom were very similar with concentrations from the bottom only slightly higher (Figure 7D). The geometric mean for orthophosphorus was 9.0 µg/L from the photic zone and 9.4 µg/L from the bottom.

Chlorophyll *a* concentration was very low throughout the sampling season with the maximum value of 1.2 µg/L on October 11 (Figure 7E). Phytoplankton biovolume at SJ1 was the lowest of the five sites with a season mean of 0.10 mm^3/L. Phytoplankton biovolume gradually increased throughout the summer reaching a maximum of 0.12 mm^3/L on September 13 (Figure 7F). Generally, small diatoms (bacillariophyceae) and small flagellates (chrysophyceae and cryptophyceae) dominate the composition of phytoplankton at SJ1 (Figure 28).

4.2 Benewah Lake (BL1)

On June 14, water temperature at the Benewah Lake sampling site (BL1) was 14.5°C near the surface and 7.9°C at the bottom (Figure 8A). As the summer progressed, temperature profiles revealed weak thermal stratification at times. However, BL1 is only six meters deep which inhibits the development of a stable thermocline because the surface water warms, and is then wind-mixed to the bottom. The warmest temperature measured at BL1 was on July 18, when the near the surface (0.5 meters) was 22.4°C, with a gradual temperature decrease to 14°C at the bottom (Figure 9A). On September 13, the temperature at BL1 was near isothermal with a surface temperature of 19.8°C and a bottom temperature of 18.4°C (Figure 10A). On October 25, the water column was near isothermal at 10.5 to 10.0°C from top to bottom, (Figure 11A), having cooled 9.0°C over a near six-week period from September 13 to October 25.

Dissolved oxygen at the shallow, macrophyte-dominated BL1 was highly variable. As early as June 14 there was a pronounced dissolved oxygen decline with the surface concentration at 9.8 mg/L (103.2% saturation) and 6.7 mg/L (59.3%) near the bottom at 6 meters (Figure 8B). During the summer, high photosynthetic rates from the large standing crop of macrophytes and phytoplankton produced supersaturated dissolved oxygen conditions. On July 19, the range of dissolved oxygen was 10.5 mg/L (114%) to 12.2 mg/L (141%) in the water column (Figure 9B). This trend of high dissolved oxygen concentration continued as the entire water column was greater than 9.5 mg/L and the range of dissolved oxygen saturation was 103% to 140% on August 3. However, by August 18, the dissolved oxygen concentration declined in the deeper waters at BL1 to as low as 2.8 mg/L (32%). On September 13 the upper two meters were greater than (>) 100% saturated, but anoxic conditions existed as dissolved oxygen concentration declined to 0.0 mg/L at 4.5 meters (Figure 10B). By September 28, dissolved oxygen concentrations in the deeper water increased to 4.7 mg/L (52%), but remained relatively low through October 12 when the water column ranged from 5.6 to 6.0 mg/L (58% to 64%). The increasing dissolved oxygen concentration trend continued through October 11, when the range throughout the water column was 7.8 mg/L at the surface and 7.5 mg/L at the bottom (Figure 11B).

Total Kjeldahl nitrogen (TKN) at BL1 increased significantly throughout the season with little difference between the photic zone and bottom (Figure 12A). The geometric mean for TKN in the photic zone was 281.7 and 280.6 µg/L from bottom samples. Relative to TKN, dissolved inorganic nitrogen (DIN) was low throughout most of the summer, but spiked on October 12, at 194 and 190 µg/L in the photic zone and bottom respectively (Figure 12B). Ammonia accounted for 95% of the DIN on October 12, at 180 and 184 µg/L in the photic zone and bottom respectively. The spike in ammonia was most likely from the decomposition of the large macrophyte standing crop at BL1.

Total phosphorus increased significantly throughout the season with little difference between the photic zone and bottom (Figure 12C). Total phosphorus was highest on October 12, at 52 µg/L in the photic zone and 46 µg/L on bottom (Figure 12C). The geometric mean for total phosphorus in the photic zone was 27.1 µg/L compared to 26.8 µg/L from the bottom. Orthophosphorus dynamics from the photic zone and bottom were similar with a spike on October 12 (Figure 12D). The geometric mean for orthophosphorus was 8.8 µg/L from the photic zone and 8.7 µg/L from the bottom. Similar to the October 12 ammonia spike, the increased orthophosphorus was most likely from the decomposition of the large macrophyte standing crop at BL1.

Chlorophyll *a* concentration at BL1 was the highest of all sample sites with a mean of 5.43 µg/L and a peak chlorophyll *a* concentration of 15 µg/L on September 13 (Figure 12E). Phytoplankton biovolume at BL1 was the highest of the five sites a season mean of 0.47 mm^3/L which nearly doubled from June 14 to July 18, then reached a maximum of 0.56 mm^3/L on September 13 (Figure 12F). Generally, larger colonial diatoms e.g., *Fragillaria crotonensis* (bacillariophyceae) and small flagellates (chrysophyceae and cryptophyceae) dominate the composition of phytoplankton at BL1 (Figure 28). However, moderate blue-green cyanobacteria (cyanophyceae) blooms persisted from August through October.

4.3 Round Lake (RL1)

Temperature dynamics at the Round Lake sampling site (RL1) were similar to Benewah Lake (BL1). RL1 is approximately a meter shallower than BL1, and also shows evidence of being wind-mixed from surface to bottom. On June 14, the water column at RL1 was near isothermal with 9.8°C at the surface and 8.6°C at the bottom. On August 3, the surface was 22.5°C gradually decreasing to 19.1°C at the bottom (Figure 13A). From September 13 to September 28 the water column at RL1 cooled 3.9°C (Figure 14A). From September 28 to October 25 the water column at RL1 cooled 5.1°C and was near isothermal with a temperature of 10.6°C near the surface and 10.1°C at the bottom (Figure 15A).

Similar to BL1, RL1 is also a shallow, macrophyte-dominated site. However, RL1 did not exhibit the same range of dissolved oxygen dynamics as BL1. In contrast to BL1, RL1did not show any form of a dissolved oxygen decline during daylight hours throughout the season. On June 14 dissolved oxygen at RL1 was >11.3 mg/L ranging from 104 to 107% saturation throughout the water column. On July 18 the entire water column was supersaturated ranging from 10.6 mg/L (120%) to 12.7 mg/L (140%). Dissolved oxygen supersaturation continued into August with even higher values than on July 18. On August 3, dissolved oxygen concentration ranged from 10.0 mg/L (125%) to 13.0 mg/L (152%) throughout the water column (Figure 13B). From August 18 through October 25, RL1 did not have dissolved oxygen concentrations at any depth below 8.2 mg/L and 92% saturation (Figure 14B and Figure 15B).

Following low concentrations in June and July, total Kjeldahl nitrogen (TKN) at RL1 increased throughout the season (Figure 16A). The geometric mean for TKN in the photic zone was 132.2 and 147.7 µg/L from bottom samples. Dissolved inorganic nitrogen (DIN) was higher in the photic zone compared to the bottom on June 14, then declined to near, or at minimum detection limits in July through September (Figure 16B). However, similar to Benewah Lake (BL1), DIN spiked on October 12, at 61 µg/L in the photic zone, and 62 µg/L at bottom (Figure 16B). Ammonia accounted for 84% of the DIN on October 12, at 51 and 52 µg/L in the photic zone and bottom respectively. As with BL1, the spike in ammonia was most likely from the decomposition of the large macrophyte standing crop at RL1.

Total phosphorus increased throughout the early summer and leveled off in September and October (Figure 16C). Total phosphorus was highest on August 18, at 28 µg/L in both photic zone, and bottom (Figure 16C). The geometric mean for total phosphorus in the photic zone was 16.9 µg/L compared to 17.7 µg/L from the bottom. Orthophosphorus dynamics from the photic zone and bottom were nearly identical with a spike on August 18, (Figure 16D). The geometric mean for orthophosphorus was 11 µg/L in the photic zone and 10.7 µg/L at the bottom.

Chlorophyll *a* concentration at RL1 was lower than at BL1 with a mean of 1.33 µg/L and a peak chlorophyll *a* concentration of 1.8 µg/L on August 18 (Figure 16E). Phytoplankton biovolume at RL1 was second lowest of the five sites with a mean phytoplankton biovolume of 0.14 mm^3/L. Phytoplankton biovolume stayed relatively low throughout the summer, but increased significantly after September 13, reaching a maximum of 0.29 mm^3/L on October, 12 (Figure 16E). The large non-colonial diatom *Pinnularia sp*. comprised 25% of the phytoplankton biovolume on October 12. Similar to BL1, but at a lower scale, blue-green cyanobacteria (cyanophyceae) blooms persisted from September through October, with *Anabaena sp.* comprising 24% of the biovolume on September 13.

4.4 Chatcolet Lake (C6)

Temperature dynamics at the Chatcolet Lake sampling site (C6) differ from BL1 and RL1 due the increased depth at C6 (Table 1). The increased depth at C6 reduces the wind-mixing effect allowing for thermal stratification which intensified throughout the summer. On June 14, the water column at C6 exhibited a gradual temperature decline with 9.8°C at the surface and 7.6°C at the bottom. Weak stratification was developing throughout July, and by August 17, a distinct metalimnion existed with a 3.2°C temperature change from 5 to 6 meters (Figure 17A). From August 17 through September 27, the epilimnion cooled and deepened from 5 meters to 8 meters with the metalimnion maintaining a 4°C temperature change from 8 to 10 meters (Figure 18A). From September 27 through October 11 thermal stratification weakened. On October 11, the water column was near isothermal with a surface temperature of 14.0°C and 13.1°C at the bottom. From October 11 to November 29, the water column cooled 10.5°C and was isothermal at 3.5°C (Figure 19A).

As described above, C6 thermally stratifies which affects dissolved oxygen dynamics. During thermally stratified periods, the warm epilimnion is wind-mixed, which replenishes the epliminion with atmospheric oxygen. Photosynthesis during daylight hours provides additional oxygen in the epilimnion. The density gradient in the metalimnion reduces mixing, and the deeper, cooler hypolimnion does not get replenished with atmospheric oxygen. As thermal stratification continues throughout the summer, oxygen in the hypolimnion is consumed by aerobic decomposition of organic matter. As this decomposition progresses throughout the summer, the dissolved oxygen in the hypolimnion decreases. In productive lakes the decomposition of large amounts of organic matter can consume all of the oxygen, creating anoxic conditions. These anoxic conditions developed in Chatcolet Lake at site C6.

On June 14 dissolved oxygen throughout the water column at C6 was >10.3 mg/L ranging from 96% to 104% saturation. On July 19, the dissolved oxygen concentration was >10.0 mg/L and >106% saturation in the shallow epilimnion. Below a weak, but deep metalimnion, dissolved oxygen concentration was decreasing and the bottom three meters were less than (<) 7.0 mg/L and <67% saturation. As thermal stratification intensified, dissolved oxygen concentrations in the hypolimnion decreased. On August 17, dissolved oxygen decreased from 8.2 mg/L at 5 meters to 1.9 mg/L near the bottom at 10.5 meters (Figure 17B). On September 14, anoxic conditions existed in the bottom 2.5 meters of water and a large dissolved oxygen gradient existed associated with the epilimnion/metalimnion interface. This large dissolved oxygen gradient strengthened, and on September 27, a 6.0 mg/L decrease in dissolved oxygen existed between 8 and 9 meters associated with a 2.2°C transition from epilimnion to metalimnion

(Figure 18A). The bottom 2.5 meters remained anoxic (Figure 18A). The cooling and deepening of the epilimnion between September 27 and October 11 allowed for deeper water column mixing and dissolved oxygen replenishment deeper at C6. On October 11, dissolved oxygen was present at all depths, but remained low at 4.3 mg/L, 46% saturation on the bottom. From October 11 through November 29, dissolved oxygen concentration increased throughout the water column, and was >11.2 mg/L, and >94% saturation from surface to bottom on November 29 (Figure 19B). At C6 the dissolved oxygen standard was exceeded sometime between July7 and July 18. Dissolved oxygen concentrations less than 8.0 mg/L existed at least through October 11. Sometime between October 11 and October 25, hypolimnetic dissolved oxygen increased above 8.0 mg/L and was no longer an exceedance of the standard.

Total Kjeldahl nitrogen (TKN) from the bottom sample spiked to 360 μg/L in July, then declined and followed an increasing trend, similar to the photic zone (Figure 20A). The geometric mean for TKN in the photic zone was 139.2 and 180.7 μg/L from bottom samples. The seasonal trend for dissolved inorganic nitrogen (DIN) differed between the photic zone and bottom. In the photic zone the DIN concentration peaked on September 14 at 43 μg/L (Figure 20B). Nitrate accounted for 77% of the DIN peak in the photic zone. The highest concentration of DIN from the bottom was on October 11 at 37 μg/L (Figure 20B). Ammonia accounted for 73% of the DIN peak from the bottom depth.

Total phosphorus was higher from the lake bottom samples compared to photic zone samples (Figure 20C). Total phosphorus at the bottom increased through the season reaching a maximum concentration of 42 μg/L on November 29 (Figure 20C). Total phosphorus was highest in the photic zone on October 11, at 22 μg/L (Figure 20C). The geometric mean for total phosphorus in the photic zone was 13.2 μg/L, and 19.2 μg/L from the bottom. Orthophosphorus dynamics from the photic zone and bottom differed with the bottom spiking at 17 μg/L on September 14 (Figure 20D). This spike in orthophosphorus coincided with the hypolimnion becoming anoxic sometime between August 17 and September 14. The geometric mean for orthophosphorus in the photic zone was 8 μg/L and 10.6 μg/L at the bottom.

Chlorophyll *a* concentration at C6 increased throughout the season and peaked at 5.9 μg/L on October 11, then declined to 3.1 μg/L on November 29 (Figure 20F). The mean for chlorophyll *a* was 2.45 μg/L. Phytoplankton biovolume at C6 was second highest of the five sites with a mean biovolume of 0.28 mm^3/L. Phytoplankton biovolume stayed relatively low from June-July, increased gradually from July through September, then significantly after September 13, reaching a maximum of 0.70 mm^3/L on October, 12 (Figure 20F). The October peak biovolume at C6 was the highest of the five sites. In July and August the cyanobacteria *Anabaena sp*. comprised as much as 29% of the phytoplankton biovolume. The colonial-filamentous diatom *Aulacoseira granulata* comprised 50% of the peak phytoplankton biovolume on October 11.

4.5 Coeur d'Alene Lake Southern Pelagic Station (C5)

On June 15, the water column at the Coeur d'Alene Lake southern pelagic sampling station (C5) was 10.1°C at surface to 7.1°C at bottom (18 meters). From June 15 to July 19 the water column at C5 began to thermally stratify as a small metalimnion developed with a 4.2°C change from 3 to 5 meters. Between July 18 and August 18, thermal stratification intensified as the epilimnion deepened from 3 meters to 6 meters (Figure 21A). Thermal stratification continued between August 18 and September 28 as the epilimnion deepened from 6 meters to 12 meters (Figure 22A). During this late-summer period, as the metalimnion deepened, the density gradient between the metalimnion and the hypolimnion weakened (Figure 22A). Thermal stratification weakened between September 28 and October 25 as the epilimnion cooled 4.6°C with only a remnant of the metalimnion existing between 13 and 15 meters on October 25. Between October 25 and November 29 the entire water column cooled 6.7°C producing near isothermal conditions with a surface temperature of 5.4°C gradually decreasing to 4.3°C at the bottom (Figure 23A). Based on the data collected by the continuous monitoring buoy system at C5, the Tribe's 7 day maximum temperature standard of 16 degrees Celsius (in the lowest 80% of the hypolimnion) was not exceeded.

On June 15, dissolved oxygen ranged from 10.6 mg/L, (105% saturation) at the surface and gradually decreased throughout the water column to 8.8 mg/L, (81%) near the bottom at 18.0 meters. Low dissolved oxygen in the hypolimnion at C5 intensified as the summer progressed, but unlike Chatcolet Lake (C6), the hypolimnion at C5 did not become anoxic. Between June 15 and July 19, dissolved oxygen in the hypolimnion decreased to 7.9 mg/L, (74%) below a weak, but deep metalimnion. From July 19 through August 18, dissolved oxygen declined to 6.7 mg/L, (65%) near the bottom at 17.0 meters (Figure 21B). From August 18 through September 28, dissolved oxygen continued to decline in the hypolimnion reaching a low for the season at 4.0 mg/L, (39%) near the bottom at 17.5 meters (Figure 22B). From September 28 through October 25, dissolved oxygen in the hypolimnion increased 4.8 mg/L, (45%). From late October through November, several high wind events in combination with water column cooling increased the wind-mixed depth, and dissolved oxygen increased significantly in the deeper water at C5. On November 29, dissolved oxygen was >10.3 mg/L, and > 91% saturation throughout the water column (Figure 23B). The buoy profiler provided continuous dissolved oxygen profiles, which allowed for the estimation of how many days the Coeur d'Alene Tribe's dissolved oxygen standard was exceeded at C5. An exceedance of the standard in the hypolimnion occurred from August 2 through November 5 for a total of 96 days.

An additional sample depth was included at C5 on sample dates 7/19, 8/17 and 9/14. This depth is defined as the depth where relative fluorescence (a surrogate for chlorophyll *a* concentration) is highest in the water column. Experience from past sampling seasons under the Coeur d'Alene Lake Management Plan (DEQ and Cd'A Tribe, 2009), indicated that during years when the maximum fluorescence value was >2x the background photic zone level, we were able to successfully sample the depth with a higher concentration of chlorophyll a. In 2011, on 7/19, 8/17 and 9/14, the fluorescence profiles identified maximums <2x, and we were unable to sample a depth that had a greater chlorophyll *a* concentration compared to the photic zone (Figure 24E). For this report, concentrations for variables sampled from the so-called "chlorophyll *a* maximum depth" are included in (Figures 24A-F), but do not represent the dynamics at the true depth where chlorophyll *a* is greatest. In future years, we will only sample at the chlorophyll a maximum depth when it meets the above 2x criteria.

Total Kjeldahl nitrogen (TKN) dynamics at C5 were highly variable throughout the season with little difference between the photic zone and bottom (Figure 24A). The geometric mean for TKN in the photic zone was 103.5 µg/L compared to 93.7 µg/L from bottom samples. Dissolved inorganic nitrogen (DIN) dynamics and concentrations differed between the photic zone and bottom (Figure 24B). The DIN maximum from bottom samples was 77 µg/L on July 19 declining to 20 µg/L on August 17 (Figure 24B). Nitrate accounted for 87% of the DIN maximum from the bottom sample on July 19. The geometric mean for DIN in the photic zone was 23.6 µg/L compared to 48.1 µg/L from bottom samples.

Total phosphorus dynamics were different between bottom samples compared to photic zone samples (Figure 24C). After an initial increase in July, total phosphorus at the bottom decreased, leveling off through the summer (Figure 24C). Total phosphorus was highest at the bottom on November 29 at 20 µg/L (Figure 24C). The geometric mean for total phosphorus in the photic zone was 11.1 µg/L compared to 12.5 µg/L from the bottom. Orthophosphorus dynamics at C5 from the photic zone and bottom were similar with the bottom exhibiting higher concentrations in the early summer (Figure 24D). Following the early summer peak, orthophosphorus decreased through the summer to season lows of 3.7 µg/L in the photic zone and 5.5 µg/L at the bottom on September 14 (Figure 24D). The geometric mean for orthophosphorus in the photic zone was 8.3 µg/L and 10.3 µg/L at the bottom.

Chlorophyll *a* concentration at C5 oscillated, exhibiting only a small range of concentration throughout the season (Figure 24E). The mean for chlorophyll *a* was 1.27 µg/L. Phytoplankton biovolume remained low and did not change from June through early August, then increased significantly to 0.23 mm3/L on September 14 (Figure 24F). Phytoplankton decreased in October, then increased to a maximum of 0.24 on November 29 (Figure 24F). Diatoms dominated the phytoplankton assemblage at C5, accounting for 50% of the season biovolume (Figure 28). The large colonial diatom, *Fragillaria crotonensis* comprised 72% of the phytoplankton biovolume on September 14.

5.0 CROSS-SITE COMPARISON

Total phosphorus (TP) concentration was highest from Benewah Lake (BL1) at 30.0±15.0 µg/L from the photic zone, and 29.0±12.7 µg/L from the bottom (Figure 25). Chatcolet Lake (C6) had the largest difference between photic zone and bottom with 13.4±5.6 µg/L and 18.8±10.0 µg/L respectively (Figure 25). This difference between photic zone and bottom is explained by the anoxic conditions that persisted in the hypolimnion at C6, releasing bound phosphorus from the sediments. Of the five sites, C5 had the lowest TP concentration in both photic zone and bottom at 11.6±2.6 µg/L and 11.8±3.7 µg/L (Figure 25).

Total Kjeldahl Nitrogen (TKN) was also highest from Benewah Lake (BL1) at 318.0±164.4 µg/L from the photic zone, and 326.0±12.7 µg/L from the bottom (Figure 26). Chatcolet Lake (C6) had the largest difference between photic zone and bottom with 134.0±52.7 µg/L and 198.0±106.9 µg/L respectively (Figure 26). As with total phosphorus, the higher concentration of TKN is explained by the anoxic conditions that persisted in the hypolimnion at C6, releasing the bound nitrogen from the sediments. Sites C5 and SJ1 had similar, low TKN in the photic zone with a mean of 98 µg/L (Figure 26).

The shallow-macrophyte dominated site BL1 exhibited four times the chlorophyll *a* concentration and phytoplankton biovolume compared to RL1, a similar shallow site with a large macrophyte standing crop (Figure 27). Both BL1 and RL1 had significant cyanobacteria (blue-green) blooms in the summer and early fall, with cyanobacteria comprising the highest percentage of biovolume at BL1 (Figure 28). The pelagic Chatcolet Lake site (C6) was twice as productive as the Coeur d'Alene Lake southern pelagic sampling station (C5), (Figure 27). Large colonial diatoms and small flagellated chrysophytes and cryptophytes dominated the phytoplankton composition at C5 (Figure 28).

A cross-site comparison was not completed for DO and temperature as the data for these parameters consists of profiles which could not be compared between sites, however were summarized for each specific site.

6.0 PROPOSED CHANGES FROM PRIOR YEAR AIR

Avista and the Tribe do not anticipate any changes to the proposed 2012 water quality monitoring activities stated in the Interior-approved 2011 Annual Implementation Report. The 2011 Annual Implementation Report was submitted to FERC for approval on December 14, 2011.

7.0 REFERENCES

Avista and the Coeur d’Alene Tribe. 2010. Coeur d’Alene Reservation Water Quality Monitoring Plan. June 14.

Coeur d’Alene Tribe’s Lake Management Department. 2010. Water Quality Standards for Approved Surface Waters of the Coeur d’Alene Tribe. Prepared for: The United State’s Environmental Protection Agencey (Region 10).

FERC. 2010. Order Approving Water Quality Monitoring Plan Under Paragraph G. October 15.

FERC. 2009. Order Issuing New License and Approving Annual Charges For Use of Reservation Lands. Project Nos. 2545-091 and 12606-000. June 18.

IDEQ and C’dA Tribe. 2009b. Coeur d’Alene Lake Management Plan, 2009. Idaho Department of Environmental Quality, Coeur d’Alene Idaho, and Coeur d’Alene Tribe, Plummer, Idaho.

TABLES

Table 1. Description and coordinates of water quality sampling site locations per Part A(1)(a-e) of Condition 5.

Site Code	Site Name & Location	Total Depth (meters)*	Site Latitude	Site Longitude
C5	Coeur d'Alene Lake mid-lake between Browns Point and north-end of Shingle Bay (near Chippy Point), south of Harrison, ID (referred to as C5)	17	N47° 25' 15.927"	W116° 45' 30.509"
C6	Chatcolet Lake Chatcolet Lake in the central portion of the deepest area, 0.4 miles northwest of Rocky Point near Plummer, ID (referred to as C6)	11	N47° 21' 30.272"	W116° 44' 54.080"
BL1	Benewah Lake East of Chatcolet Lake, south of St Joe River (referred to as BL1)	3	W116° 41' 42.743"	N47° 21' 17.551"
SJ1	Lower St. Joe River the "60-foot deep hole" in the sharp bend upstream of USGS gage 12415140, St. Joe River near Chatcolet, Idaho and ~1 km downstream of USGS gage 12415135 at Ramsdell (referred to as SJ1)	18	N47° 21' 27.906"	W116° 41' 10.986"
RL1	Round Lake East of Chatcolet Lake, north of St Joe River (referred to as RL1)	3	N 47° 21' 48.925"	W116° 43' 35.865"

*** At full summer pool, lake surface elevation 2128 feet.**

Table 2. Dates the in-situ profile monitoring was completed during the 2011, June through November monitoring season.

	In-Situ Profile Monitoring Sites				
	SJ1	BL1	RL1	C5	C6
Monitoring Dates	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
	6/14/2011	6/14/2011	6/14/2011	6/15/2011	6/15/2011
	7/7/2011	7/7/2011	7/7/2011	7/7/2011	7/7/2011
	7/18/2011	7/18/2011	7/18/2011	7/19/2011	7/19/2011
	8/3/2011	8/3/2011	8/3/2011	8/3/2011	8/3/2011
	8/18/2011	8/18/2011	8/18/2011	8/17/2011	8/17/2011
	9/13/2011	9/13/2011	9/13/2011	9/14/2011	9/14/2011
	9/28/2011	9/28/2011	9/28/2011	9/28/2011	9/28/2011
	10/11/2011	10/12/2011	10/12/2011	10/11/2011	10/11/2011
	10/25/2011	10/25/2011	10/25/2011	10/25/2011	10/25/2011
	11/8/2011	No sample*	No sample*	11/8/2011	11/8/2011
	11/29/2011	No sample*	No sample*	11/29/2011	11/29/2011

***No Sample collected at the sites were inaccessible.**

Table 3. Dates the water quality sampling was completed during the 2011, June through November monitoring season.

	Water Quality Sampling Sites				
	SJ1	BL1	RL1	C5	C6
Monitoring Dates	6/14/2011	6/14/2011	6/14/2011	6/15/2011	6/15/2011
	7/18/2011	7/18/2011	7/18/2011	7/19/2011	7/19/2011
	8/18/2011	8/18/2011	8/18/2011	8/17/2011	8/17/2011
	9/13/2011	9/13/2011	9/13/2011	9/14/2011	9/14/2011
	10/11/2011	10/12/2011	10/12/2011	10/11/2011	10/11/2011
	11/29/2011	No sample*	No sample*	11/29/2011	11/29/2011

***No Sample collected at sites were inaccessible.**

Table 4. Compliance of 2011 monitoring activities with the requirements identified in the 4(e) Condition No. 5 and the Coeur d'Alene Reservation Water Quality Monitoring Plan.

<table>
<tr><th colspan="2" rowspan="2"></th><th>Sampling Completed per 4(e) Condition[1]</th><th>Within Tribal Water Quality Standards[2]</th><th>Sampling Completed per 4(e) Condition[1]</th><th>Within Tribal Water Quality Standards[2]</th><th>Sampling Completed per 4(e) Condition[1]</th><th>Within Tribal Water Quality Standards[2]</th><th>Sampling Completed per 4(e) Condition[1]</th><th>Within Tribal Water Quality Standards[2]</th><th>Sampling Completed per 4(e) Condition[1]</th><th>Within Tribal Water Quality Standards[2]</th></tr>
<tr><th colspan="2">C5</th><th colspan="2">C6</th><th colspan="2">BL1</th><th colspan="2">SJ1</th><th colspan="2">RL1</th></tr>
<tr><td rowspan="6">In-Situ Profiles</td><td>pH</td><td rowspan="14">Yes</td><td>Yes</td><td rowspan="14">Yes</td><td>Yes</td><td rowspan="14">Yes</td><td>Yes</td><td rowspan="14">Yes, with one exception[5]</td><td>Yes</td><td rowspan="14">Yes, with one exception[5]</td><td>Yes</td></tr>
<tr><td>Dissolved Oxygen (mg/L)</td><td>No[3]</td><td>No[3]</td><td rowspan="2">NA[4]</td><td>Yes</td><td rowspan="2">NA[4]</td></tr>
<tr><td>Water Temperature (°C)</td><td>Yes[6]</td><td>Yes[7]</td><td>NA[8]</td></tr>
<tr><td>Specific Conductance (µS/cm)</td><td rowspan="11">No Quantitative Standard</td><td rowspan="11">No Quantitative Standard</td><td rowspan="11">No Quantitative Standard</td><td rowspan="11">No Quantitative Standard</td><td rowspan="11">No Quantitative Standard</td></tr>
<tr><td>Photosynthetic Active Radiation (µE/s/m²)</td></tr>
<tr><td>Relative Fluorescence (Chlorophyll a) (Volts)</td></tr>
<tr><td rowspan="8">Nutrient Monitoring</td><td>Chlorophyll-a</td></tr>
<tr><td>Ammonia as N</td></tr>
<tr><td>Nitrate as N</td></tr>
<tr><td>Nitrite as N</td></tr>
<tr><td>Total Kjeldahl Nitrogen</td></tr>
<tr><td>Total Phosphorus</td></tr>
<tr><td>Total Dissolved Phosphorus</td></tr>
<tr><td>Ortho-phosphate as P</td></tr>
</table>

Notes:

(1) Sampling completed in accordance with the requirements identified in 4(e) Condition 5 No. and the Coeur d'Alene Reservation Water Quality Monitoring Plan.

(2) Dissolved oxygen, temperature and pH are the only constituents with quantitative standards monitored under the Coeur d'Alene Reservation Water Quality Monitoring Program.

(3) See text of report for specific dates of exceedances.

(4) The dissolved oxygen and temperature standard is not applicable to sites BL1 and RL1 as they are less then 8 meters in depth.

(5) During the November sampling event, sampling was not completed at sites BL1 and RL1 as low lake levels rendered the sites inaccessible.

(6) 7 day average temperature ≤ 16° C in water deeper than 12 meters

(7) Temperature standard attainment based on limited data, 7day avg temp not fully established

(8) SJ1 did not maintain a stable stratified condition, therefore the temperature standard could not be applied.

FIGURES

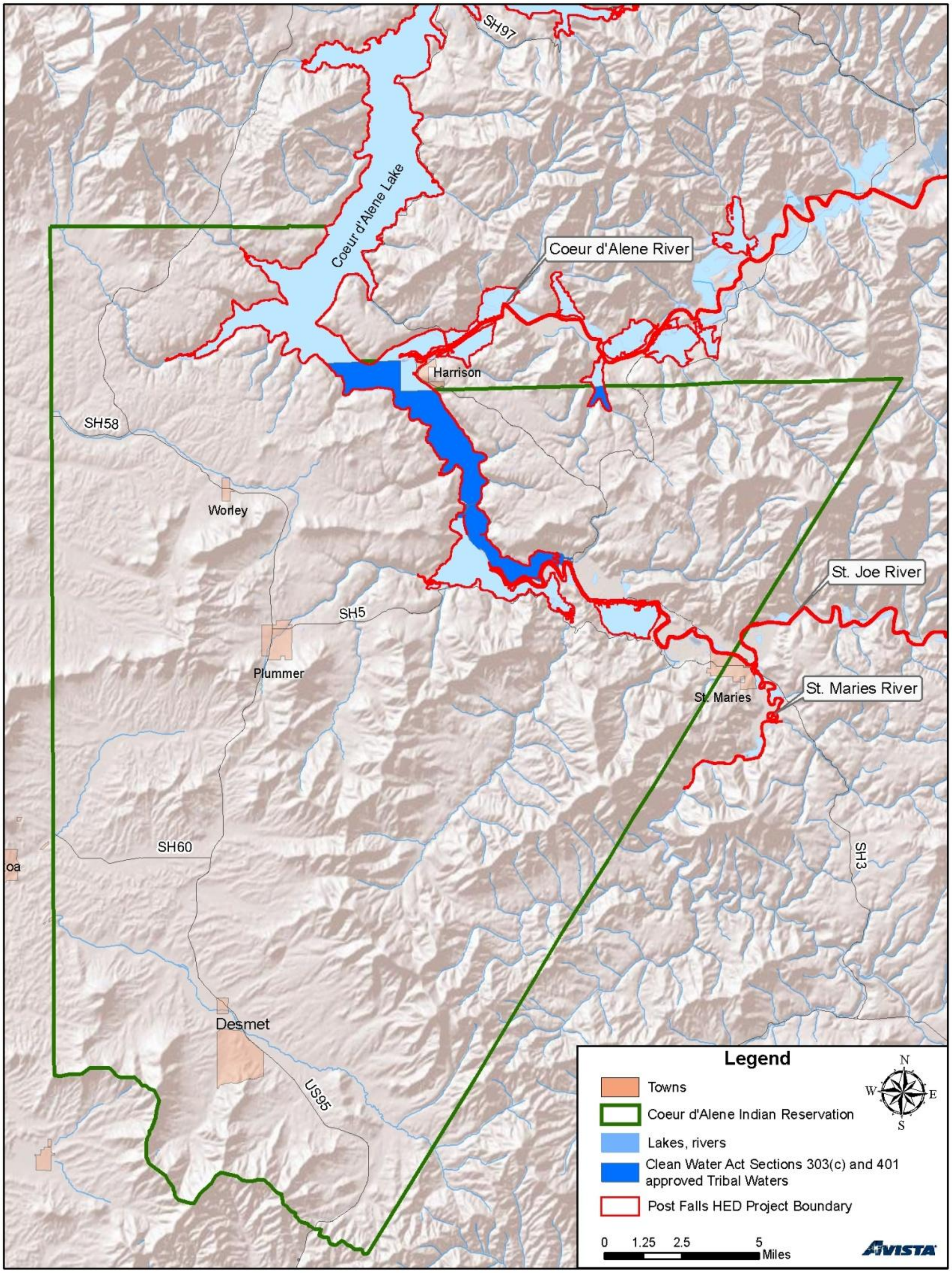

Figure 1. Current Exterior Boundaries of the Coeur d'Alene Indian Reservation.

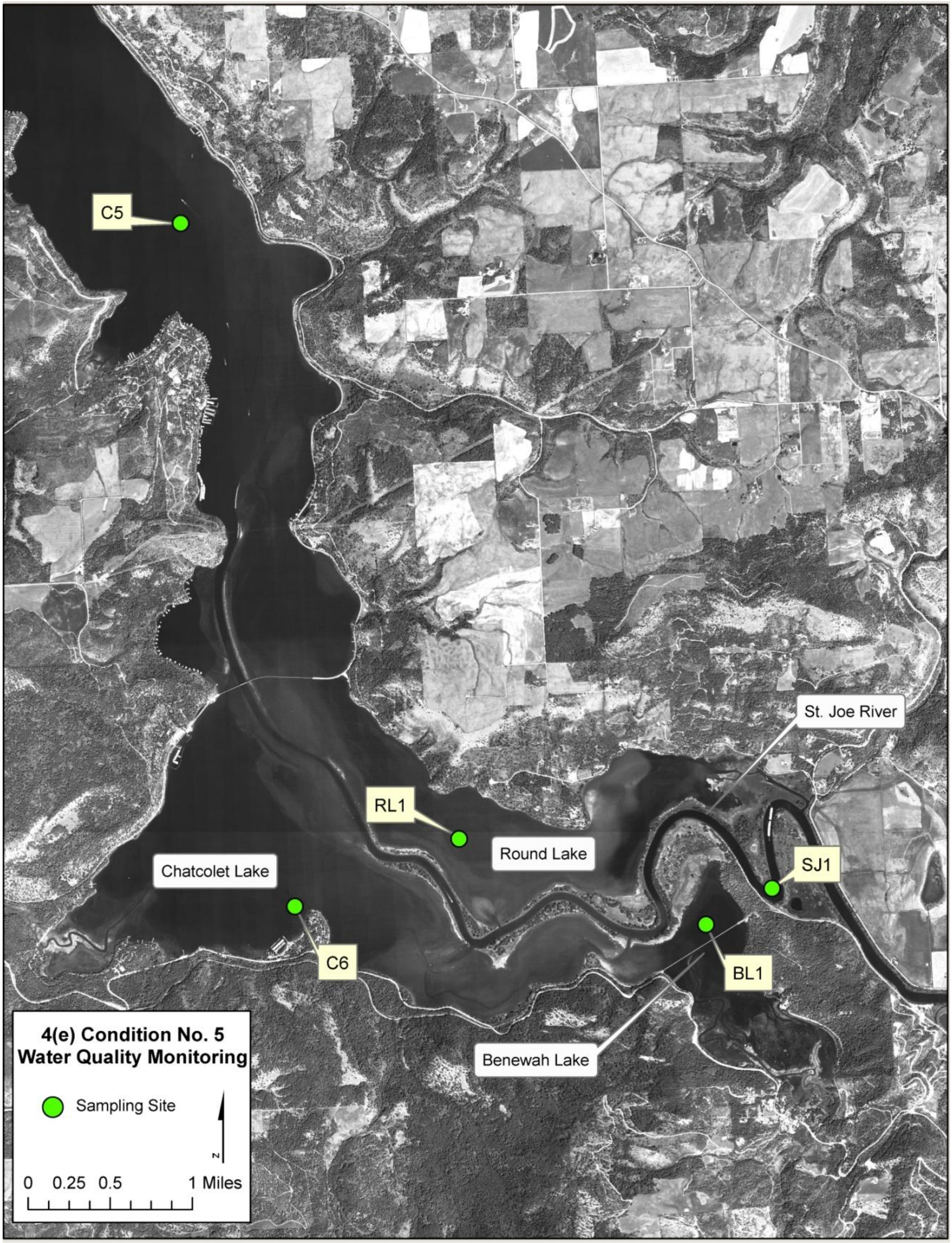

Figure 2. Map of sampling sites located in Coeur d'Alene Lake and the St. Joe River.

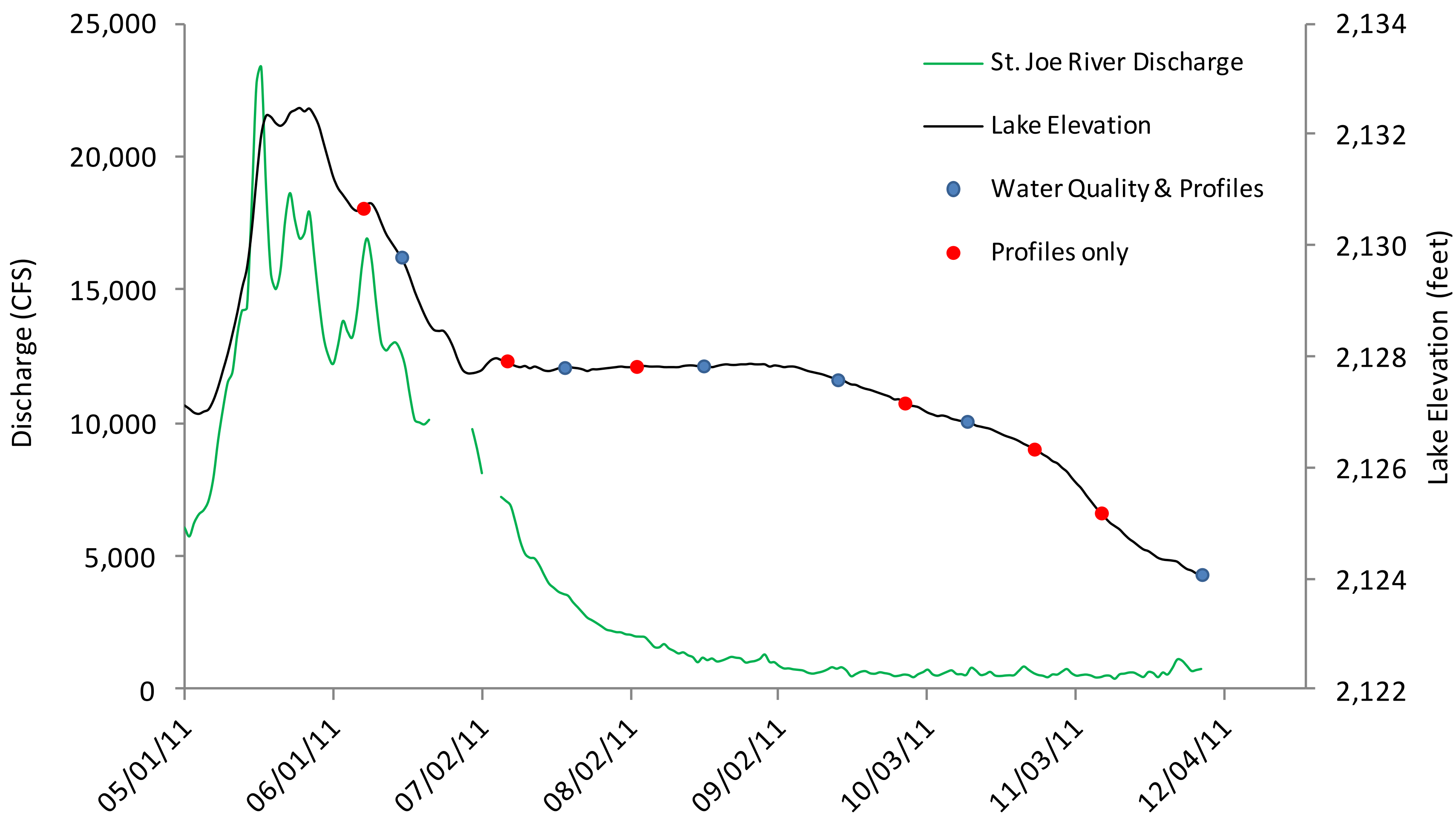

Figure 3. Discharge of lower St. Joe River (USGS gage #12415135) and elevation of Coeur d'Alene Lake (USGS gage #12415500) relative to water quality and water column profile sample dates in 2011.

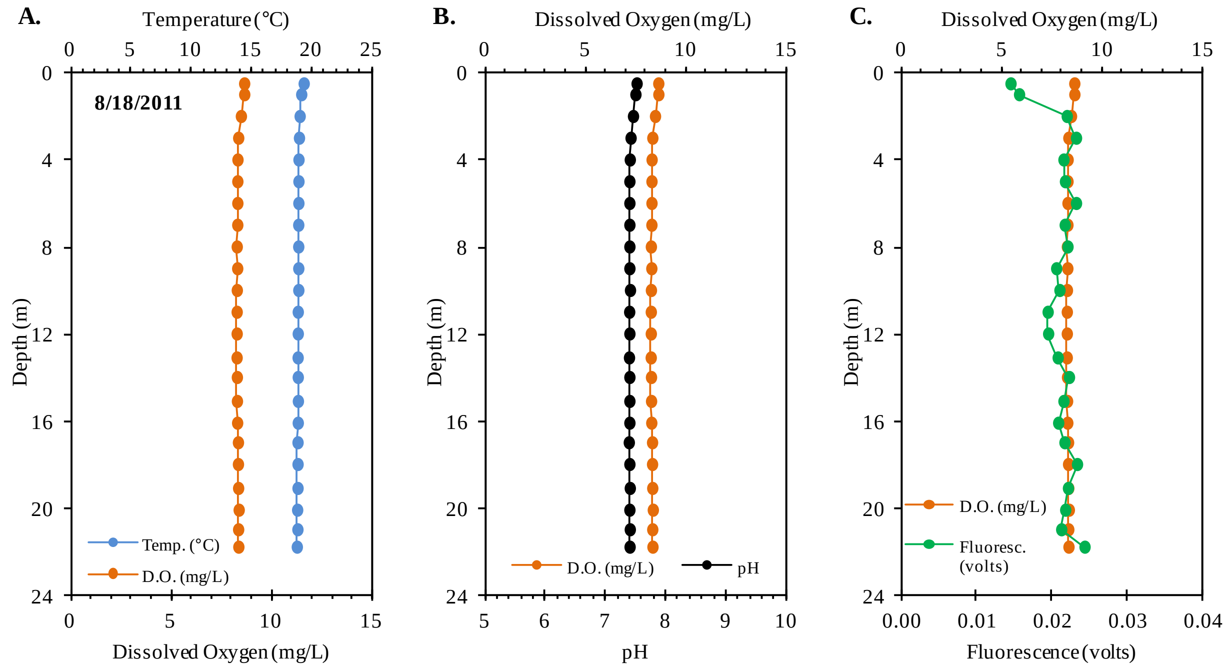

Figure 4. Temperature, dissolved oxygen, pH and relative fluorescence profiles from the lower St. Joe River (SJ1) taken on August 18, 2011.

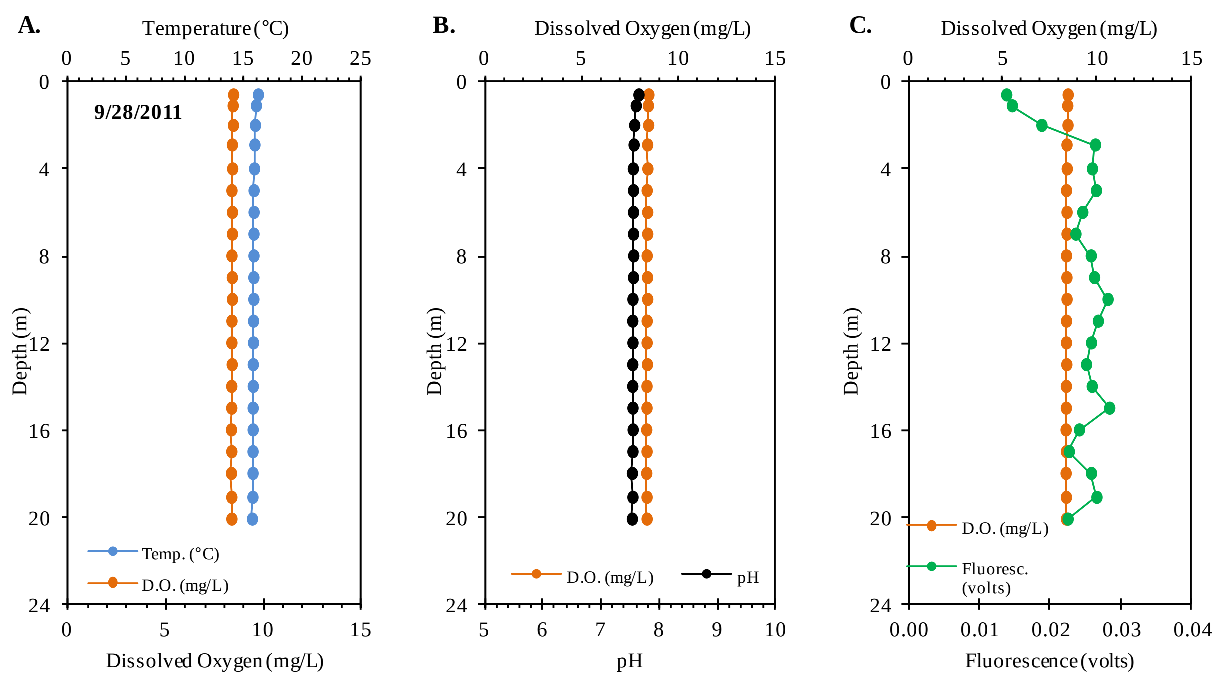

Figure 5. Temperature, dissolved oxygen, pH and relative fluorescence profiles from the lower St. Joe River (SJ1) taken on September 28, 2011.

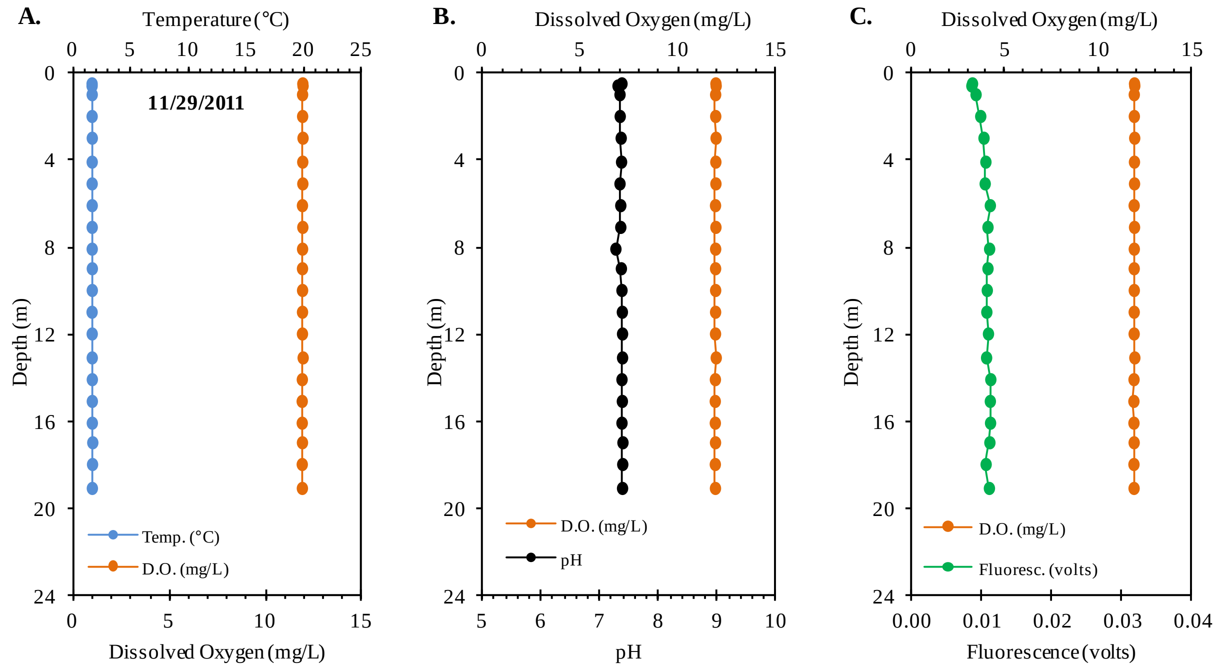

Figure 6. Temperature, dissolved oxygen, pH and relative fluorescence profiles from the lower St. Joe River (SJ1) taken on November 29, 2011.

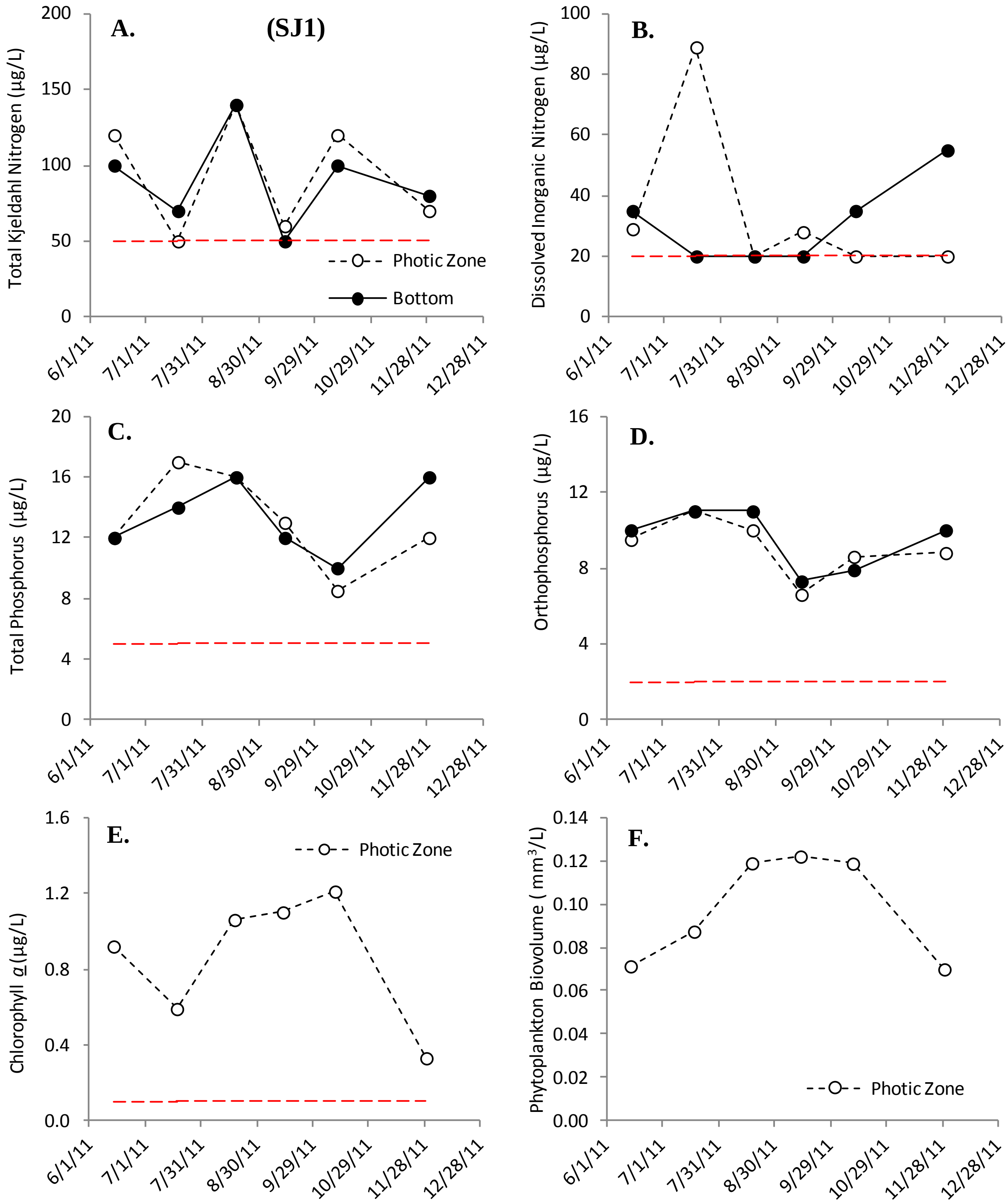

Figure 7. Nitrogen, phosphorus and phytoplankton dynamics from the photic zone and bottom collected from the lower St. Joe River (SJ1) in 2011. Red dashed line is the minimum reporting limit (MRL) for each analyte.

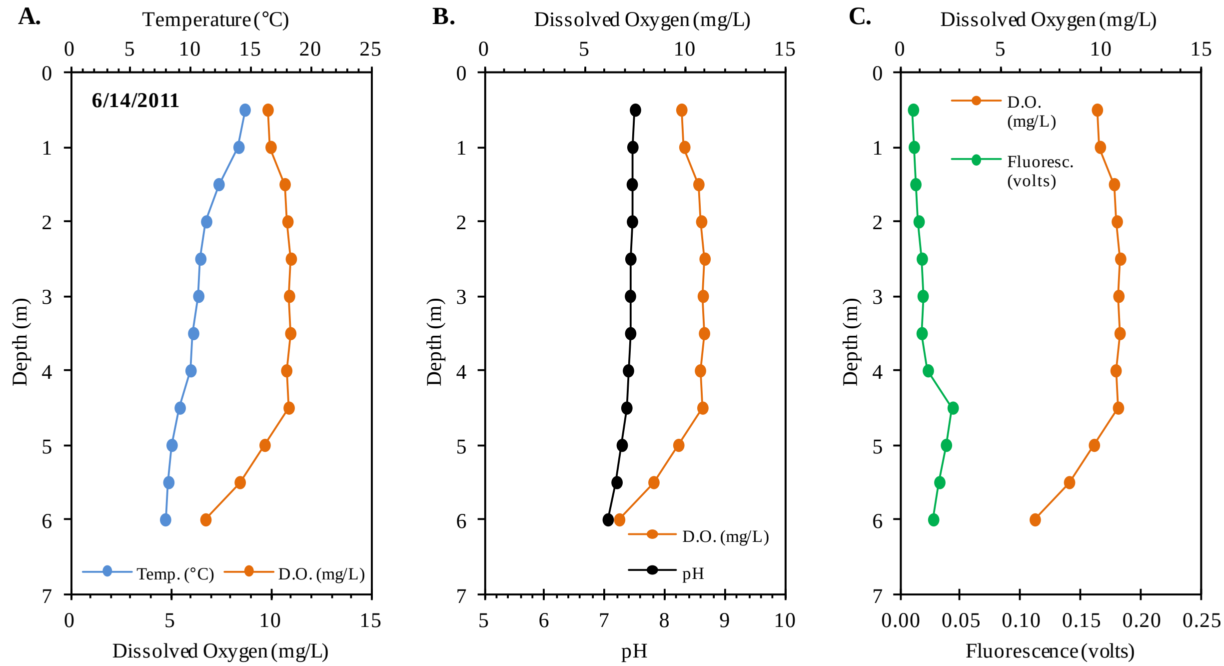

Figure 8. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Benewah Lake (BL1) taken on June 14, 2011.

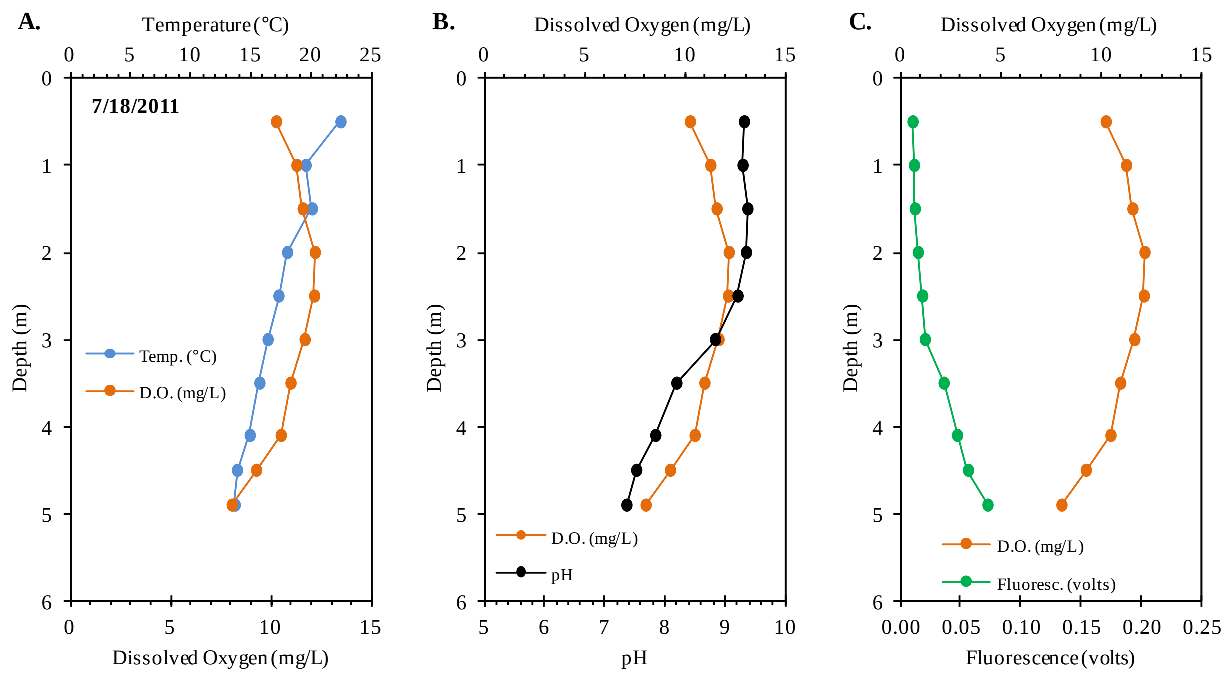

Figure 9. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Benewah Lake (BL1) taken on July 18, 2011.

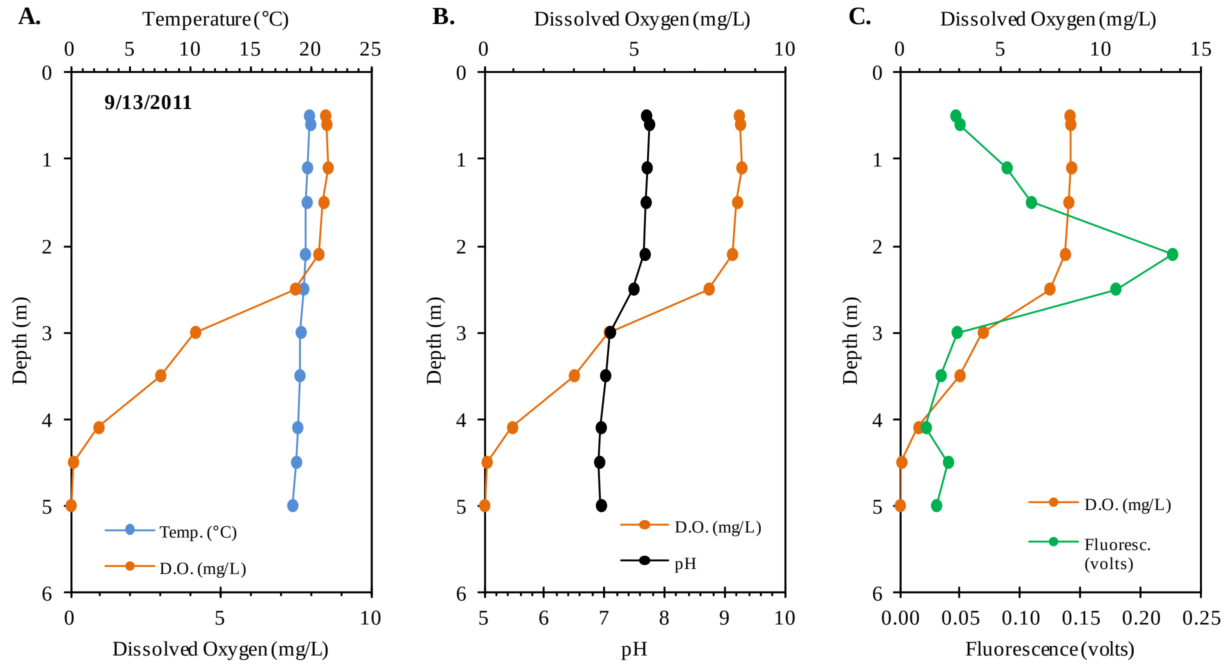

Figure 10. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Benewah Lake (BL1) taken on September 13, 2011.

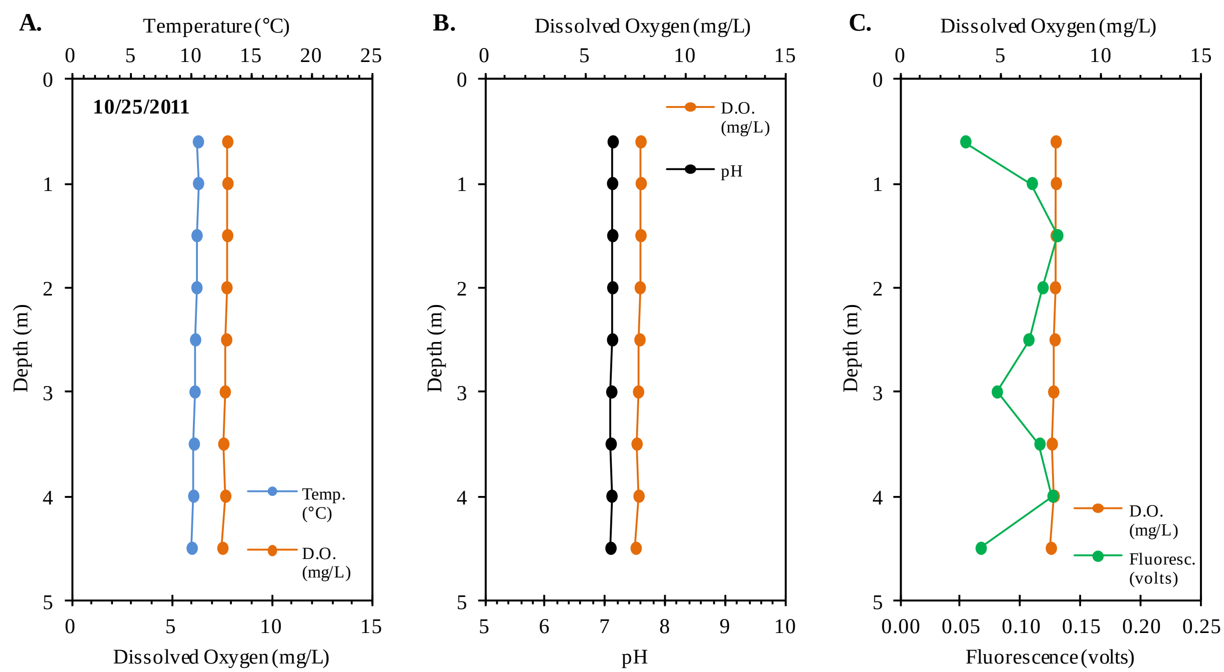

Figure 11. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Benewah Lake (BL1) taken on October 25, 2011.

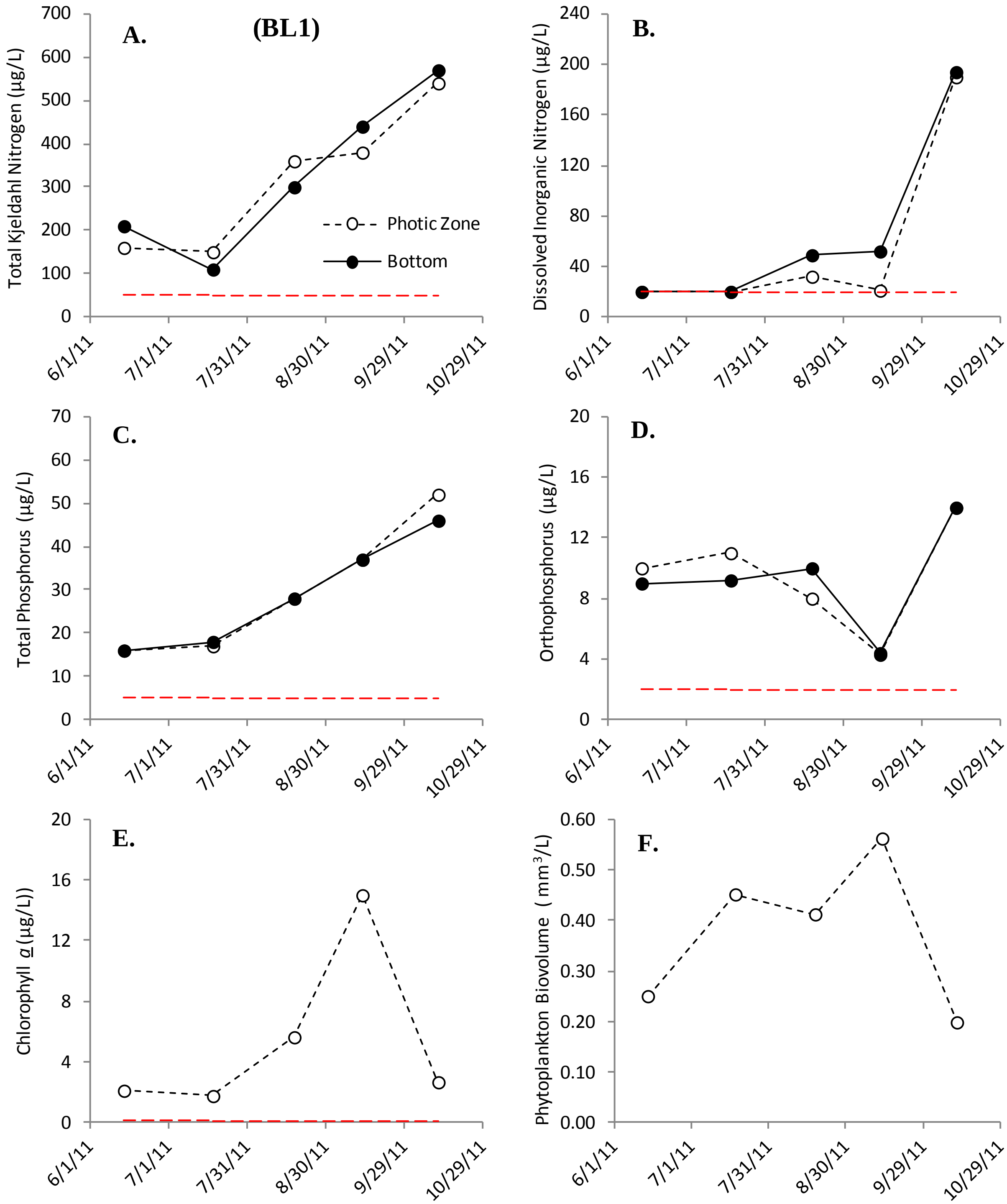

Figure 12. Nitrogen, phosphorus and phytoplankton dynamics from the photic zone and bottom collected from Benewah Lake (BL1) in 2011. Red dashed line is the minimum reporting limit (MRL) for each analyte.

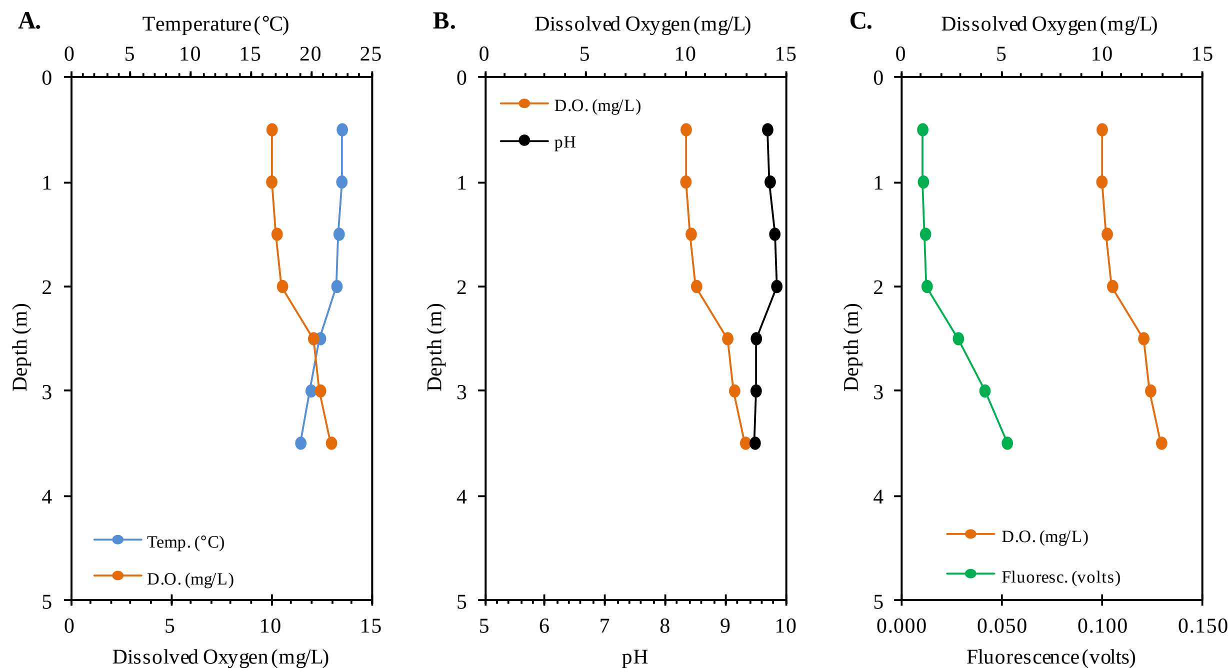

Figure 13. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Round Lake (RL1) taken on August 3, 2011.

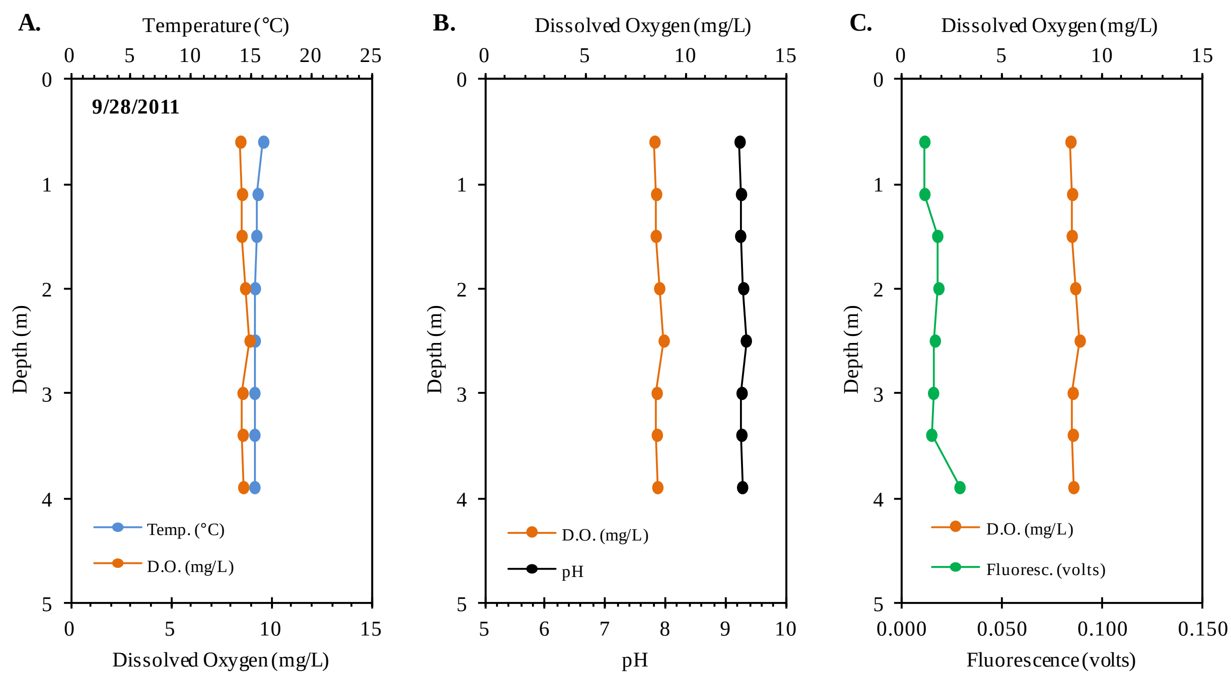

Figure 14. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Round Lake (RL1) taken on September 28, 2011.

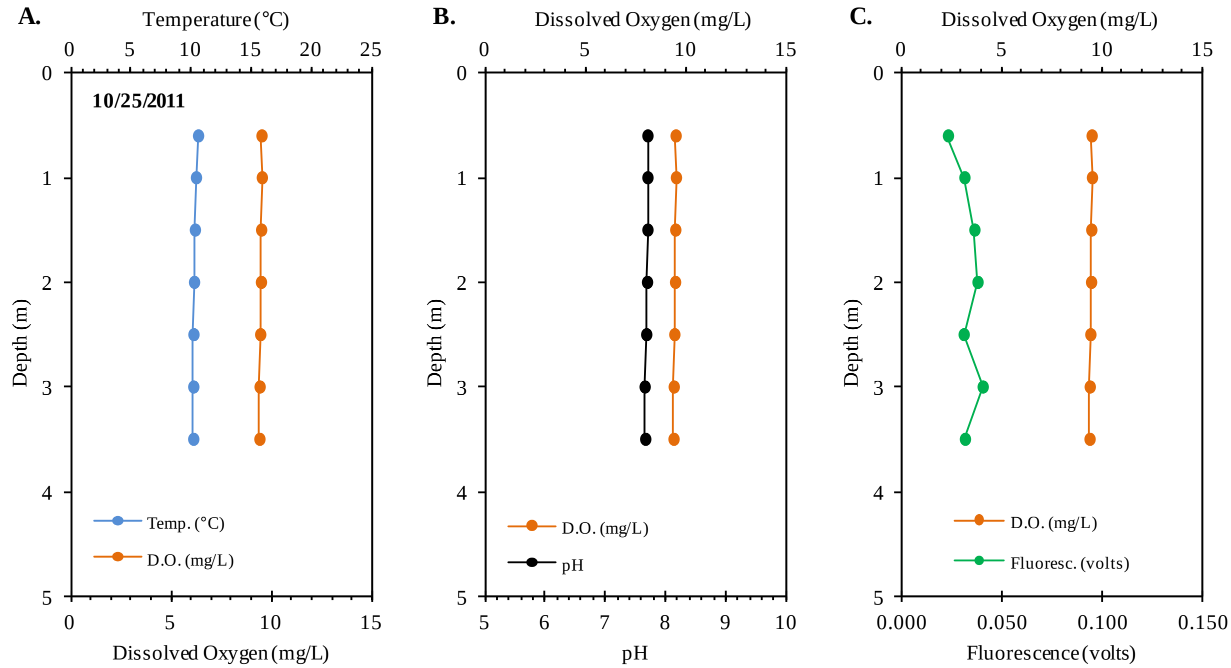

Figure 15. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Round Lake (RL1) taken on October 25, 2011.

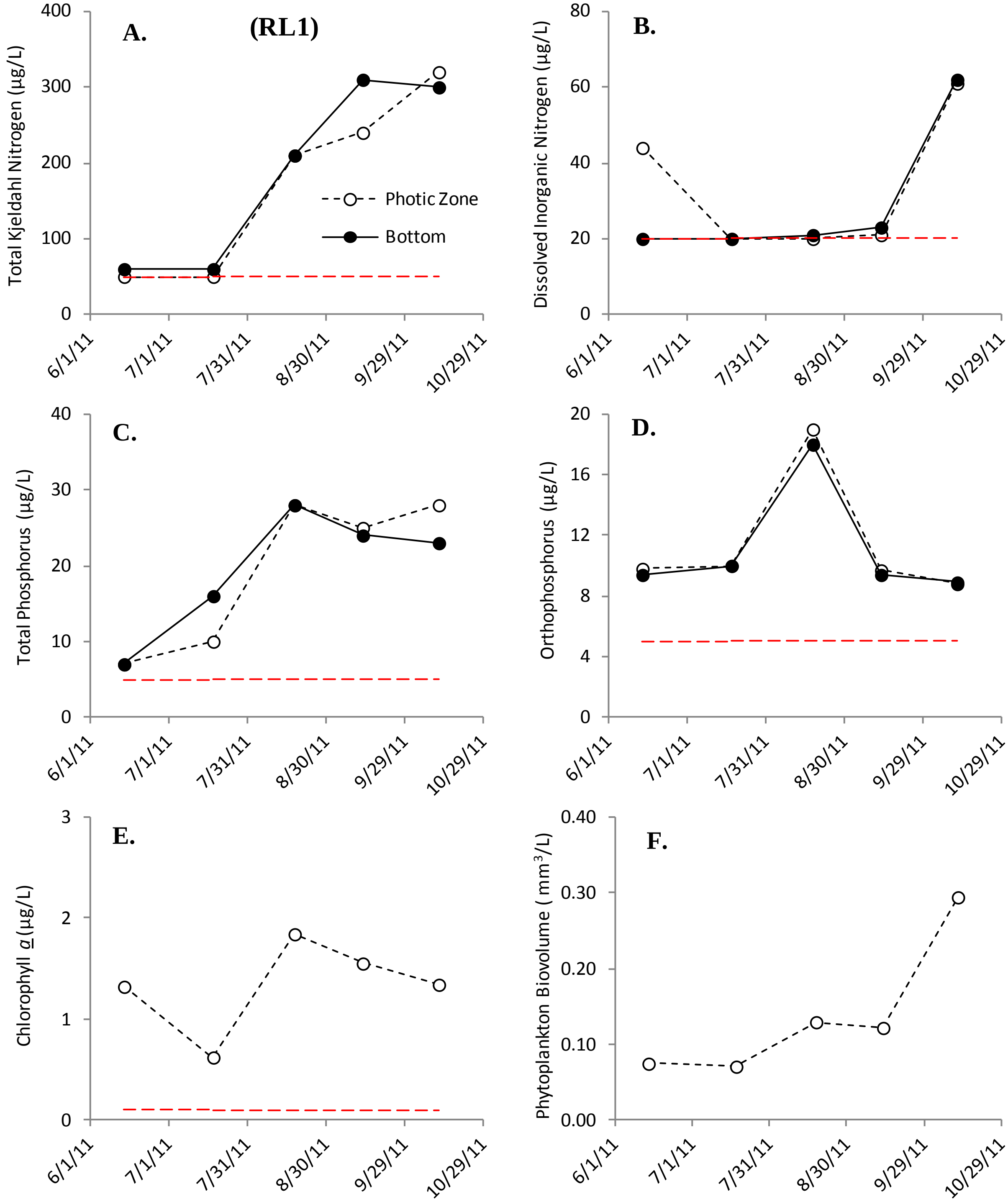

Figure 16. Nitrogen, phosphorus and phytoplankton dynamics from the photic zone and bottom collected from Round Lake (RL1) in 2011. Red dashed line is the minimum reporting limit (MRL) for each analyte.

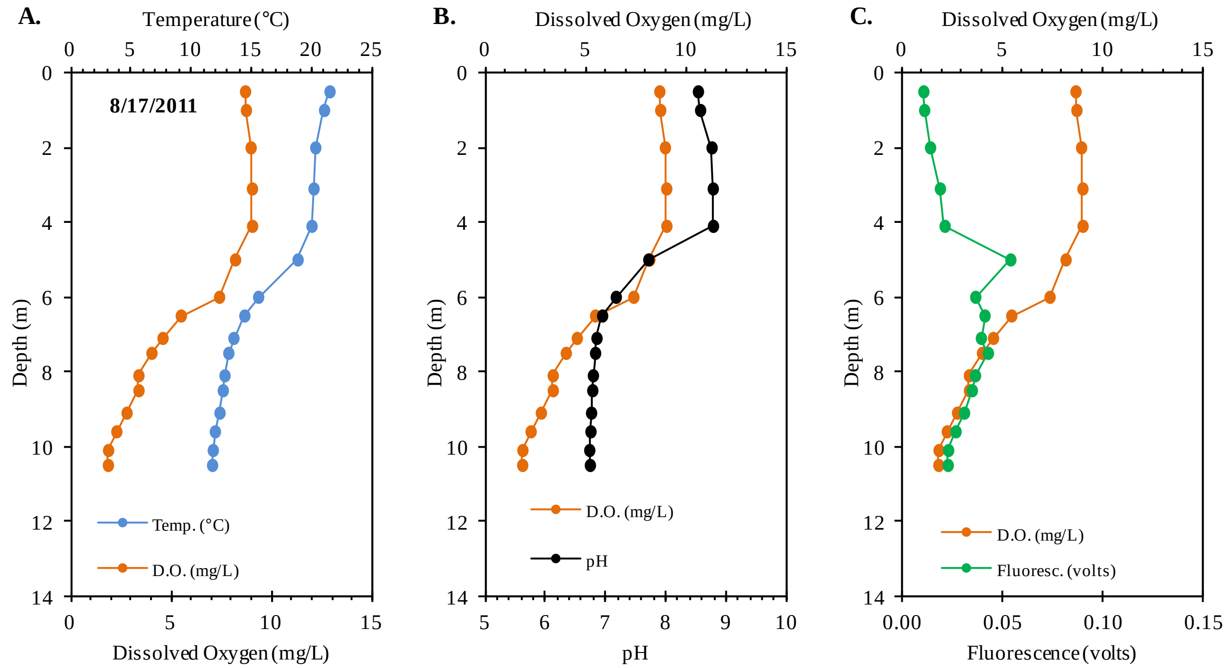

Figure 17. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Chatcolet Lake (C6) taken on August 17, 2011.

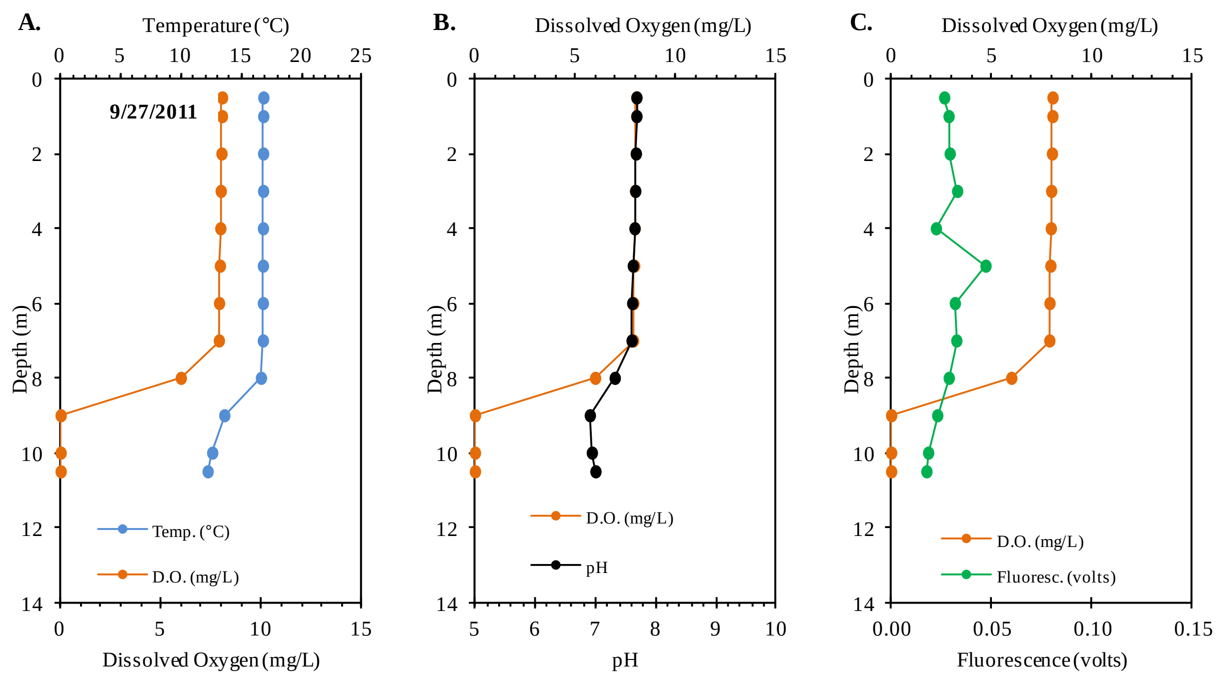

Figure 18. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Chatcolet Lake (C6) taken on September 27, 2011.

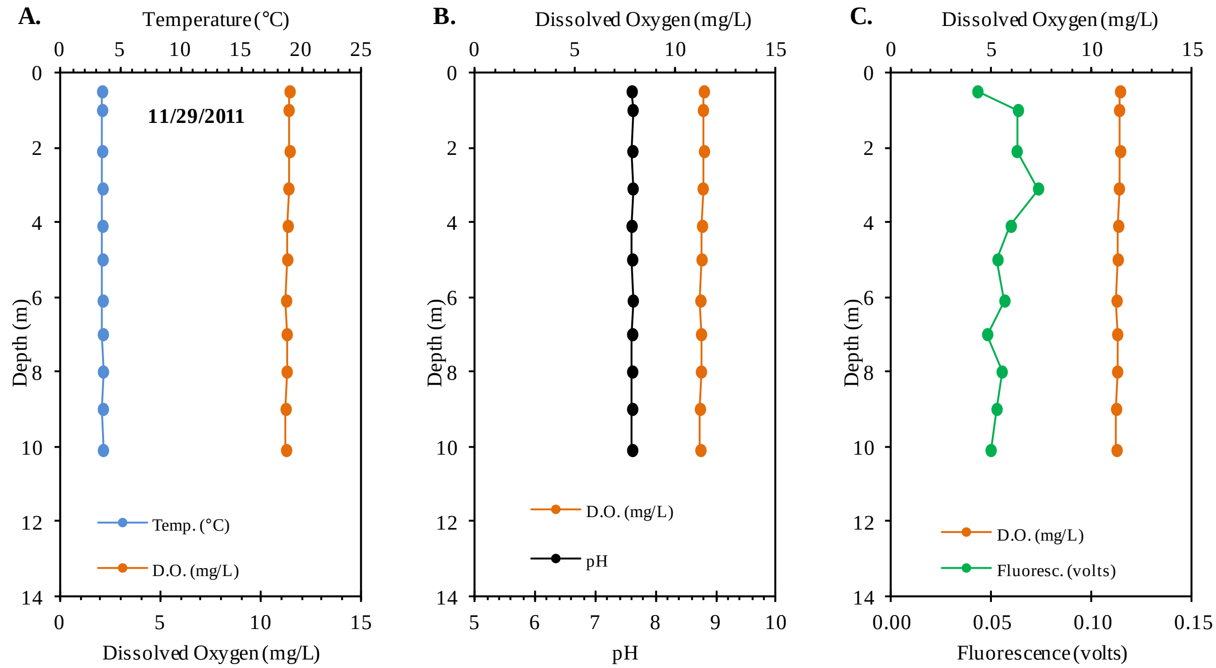

Figure 19. Temperature, dissolved oxygen, pH and relative fluorescence profiles from Chatcolet Lake (C6) taken on November 29, 2011.

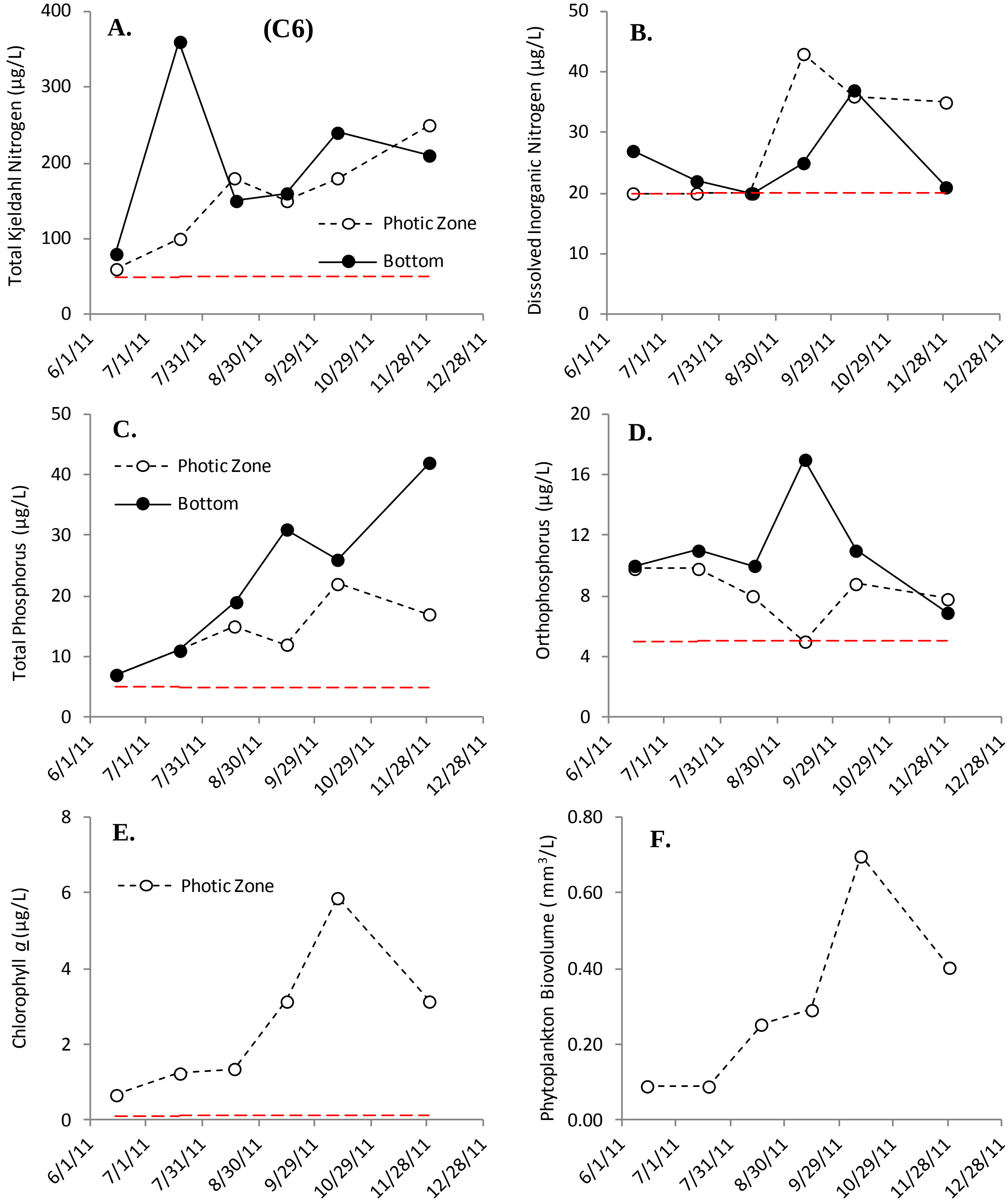

Figure 20. Nitrogen, phosphorus and phytoplankton dynamics from the photic zone and bottom collected from Chatcolet Lake (C6) in 2011. Red dashed line is the minimum reporting limit (MRL) for each analyte.

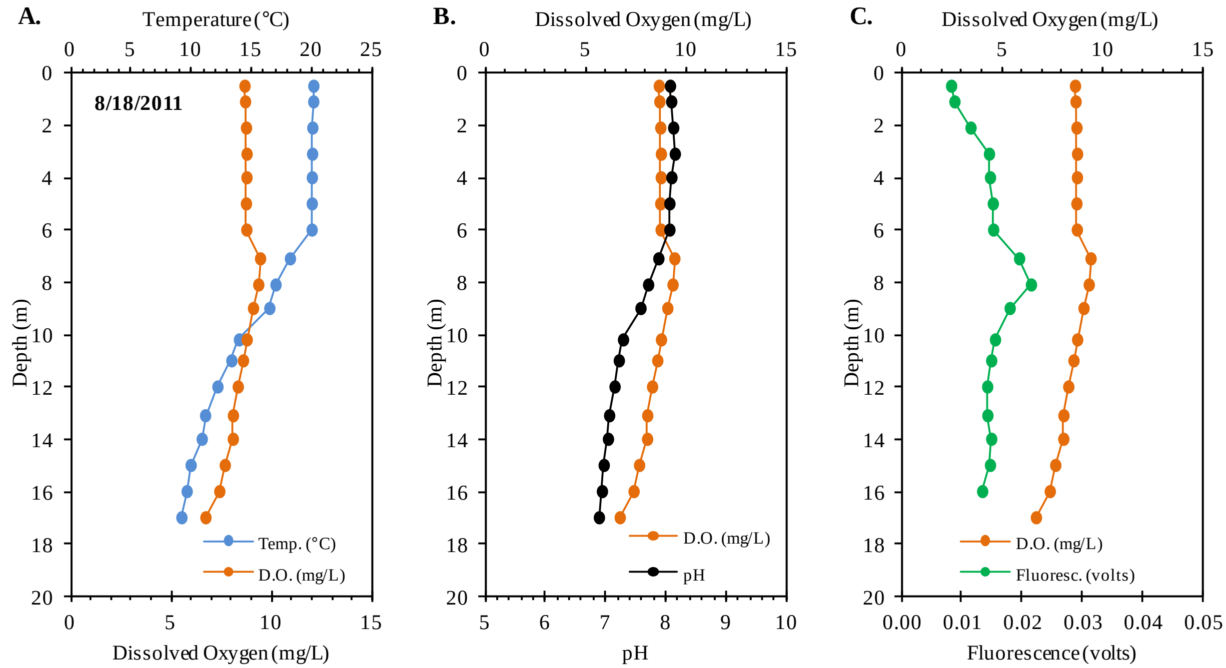

Figure 21. Temperature, dissolved oxygen, pH and relative fluorescence profiles from the Coeur d'Alene Lake southern pelagic site (C5) taken on August 18, 2011.

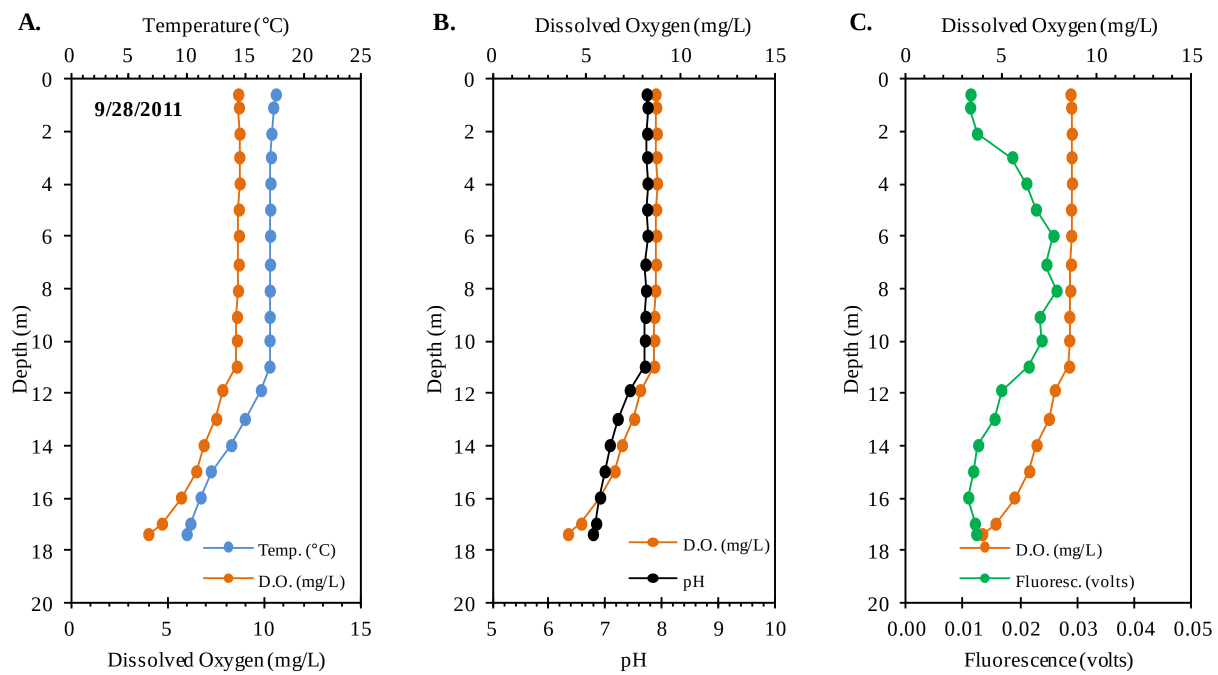

Figure 22. Temperature, dissolved oxygen, pH and relative fluorescence profiles from the Coeur d'Alene Lake southern pelagic site (C5) taken on September 29, 2011.

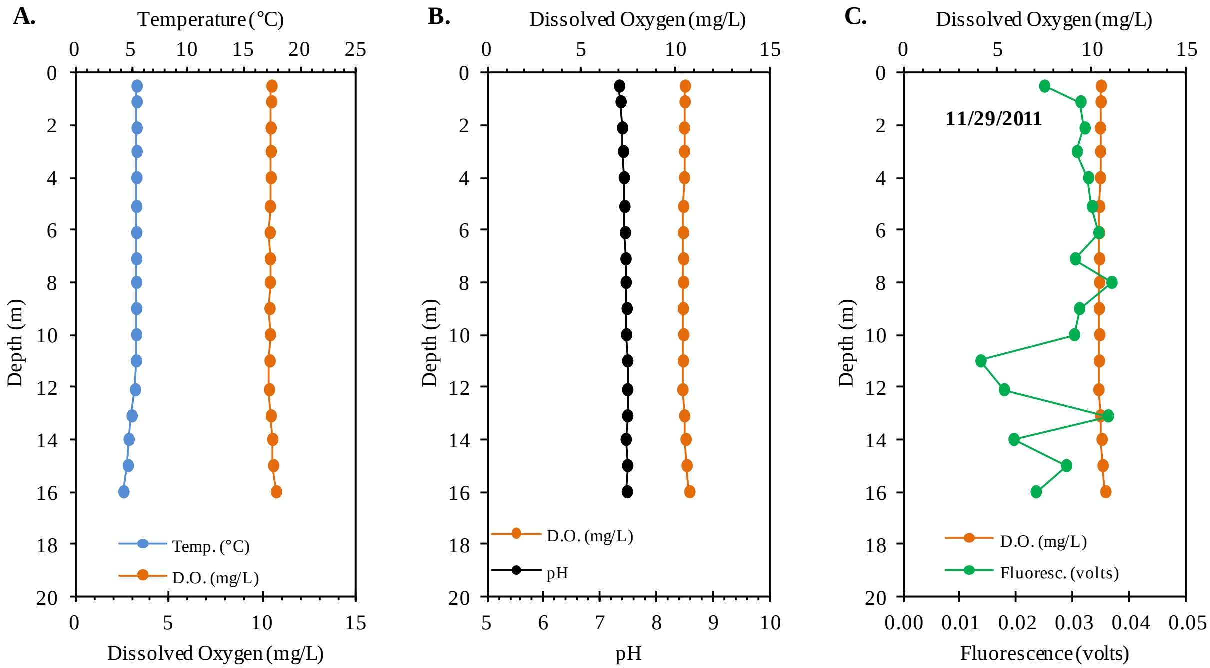

Figure 23. Temperature, dissolved oxygen, pH and relative fluorescence profiles from the Coeur d'Alene Lake southern pelagic site (C5) taken on November 29, 2011.

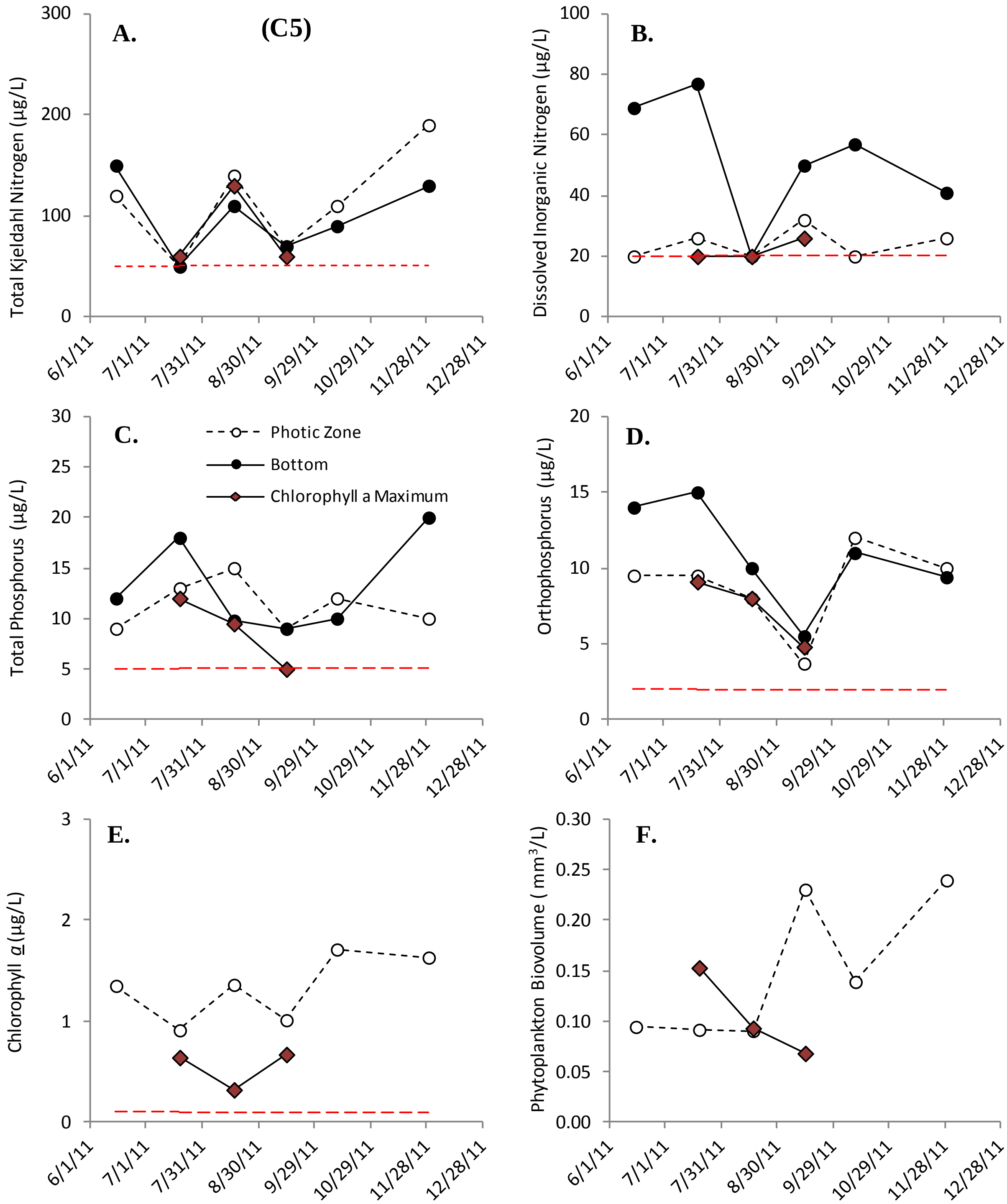

Figure 24. Nitrogen, phosphorus and phytoplankton dynamics from the photic zone, zone of chlorophyll a maximum and bottom collected from Coeur d'Alene Lake southern pelagic site (C5). Red dashed line is the minimum reporting limit (MRL) for each analyte.

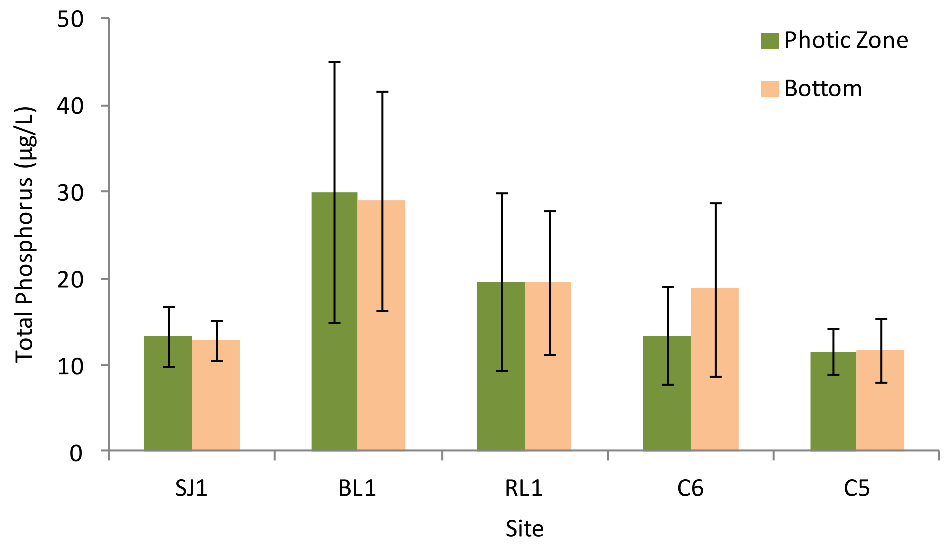

Figure 25. Total Phosphorus comparison from photic zone and bottom depths for the five sample sites, from June through October (mean ± 1 SD, n=5).

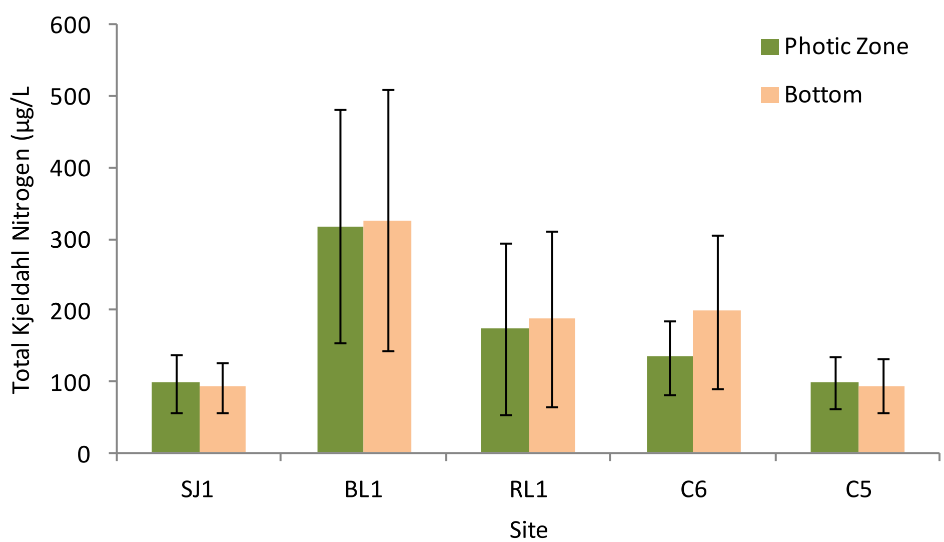

Figure 26. Total Kjeldahl Nitrogen from photic zone and bottom depths for the five sample sites, from June through October (mean ± 1 SD, n=5).

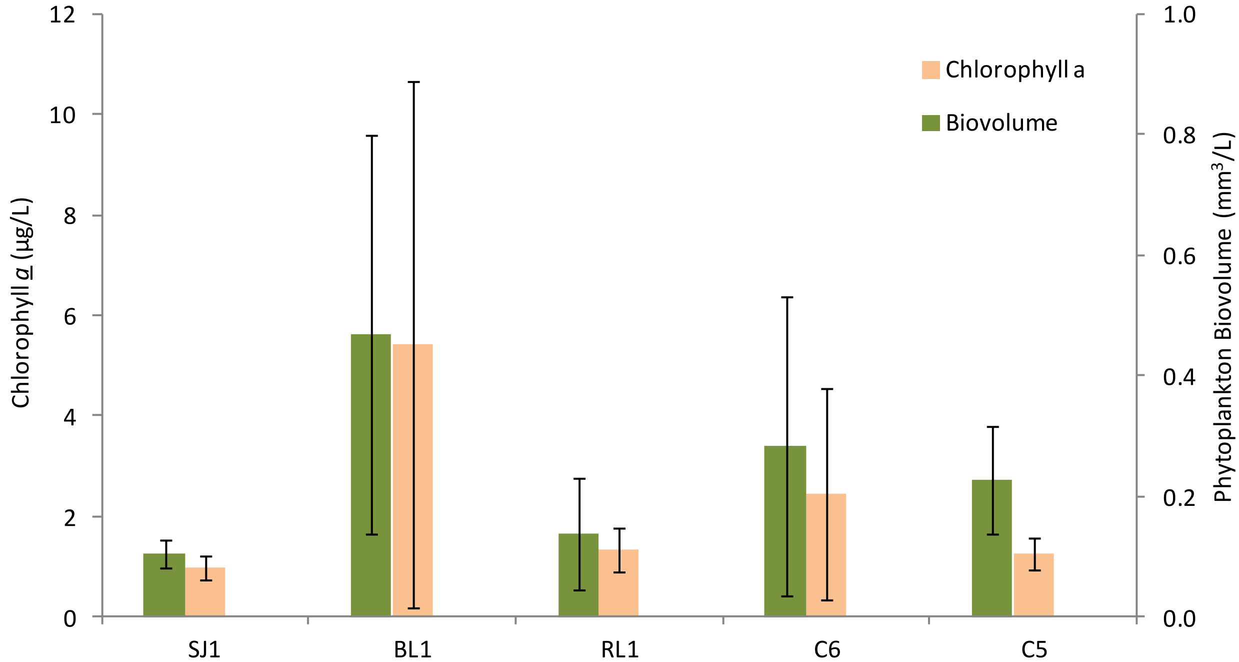

Figure 27. Chlorophyll *a* and phytoplankton biovolume in the photic zone at five sample sites, from June through October (mean ± 1 SD, n=5).

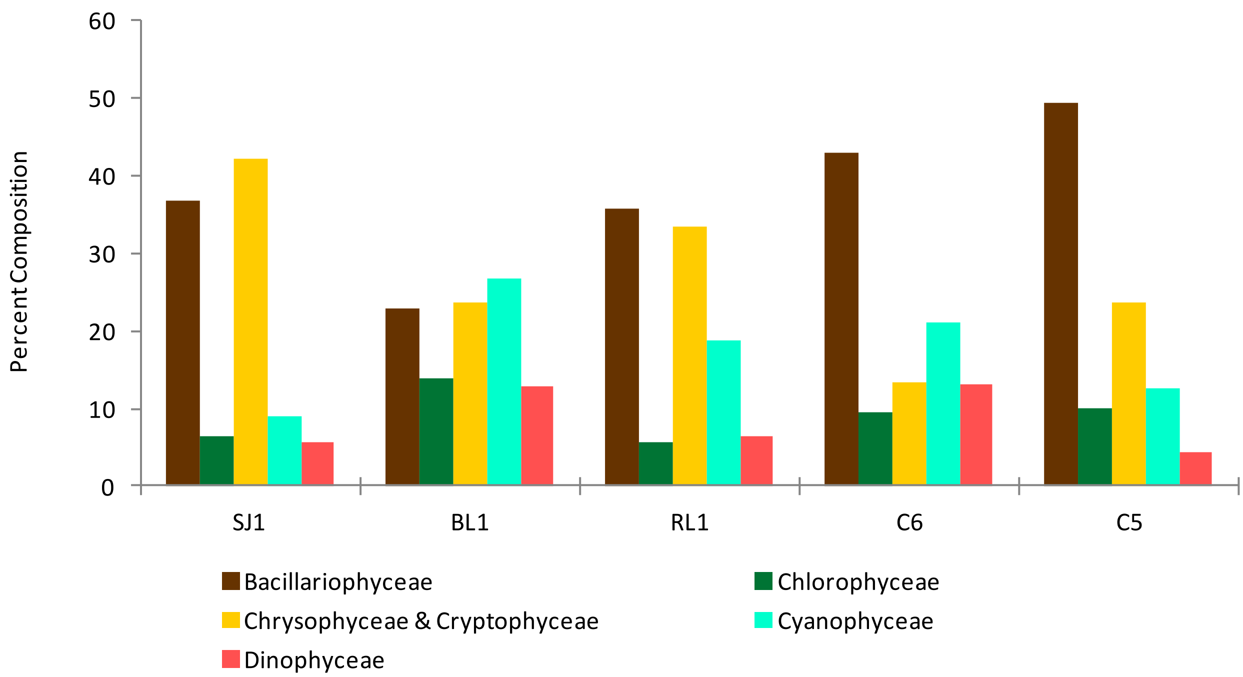

Figure 28. Phytoplankton and cyanobacteria percent composition based on biovolume of the major classes sampled at the five sites, from June through October.

APPENDICES

Appendix A

Correspondence with Interior

AVISTA

February 28, 2012

Stanley M. Speaks, Regional Director
Bureau of Indian Affairs
911 NE 11th Avenue, Suite 2
Portland, OR 97232

Subject: Spokane River Hydroelectric Project, FERC Project No. 2545
Submittal of the Coeur d'Alene Reservation 2011 Water Quality Monitoring Annual Summary Report

Dear Mr. Speaks:

Ordering Paragraph G of the Spokane River Hydroelectric Project License (Federal Energy Regulatory Commission Project No. 2545) incorporated the U.S. Department of Interior's January 27, 2009 Federal Power Act 4(e) Conditions as Appendix D. In accordance with Appendix D, Condition No. 5, Avista completed a Coeur d'Alene Indian Reservation Water Quality Monitoring Plan (WQMP), which Interior and FERC approved in 2010.

In accordance with the WQMP, Avista conducted the first full season of water quality monitoring in 2011. The enclosed Water Quality Annual Summary Report (ASR) summarizes the work that was completed in 2011. Avista is required to submit the ASR to Interior by March 1st and to FERC by April 1st on an annual basis.

If you have any questions regarding the Water Quality Annual Summary Report, feel free to call me at (509) 495-4998 or Meghan Lunney at (509) 495-4643.

Sincerely,

Meghan Lunney

for Elvin "Speed" Fitzhugh
Spokane River License Manager

Enclosure

cc: Bob Dach, BIA Portland
Phillip Cernera, Coeur d'Alene Tribe
Scott Fields, Coeur d'Alene Tribe

Lunney, Meghan

From:	Dach, Robert [Robert.Dach@bia.gov]
Sent:	Monday, March 26, 2012 7:38 PM
To:	Lunney, Meghan
Cc:	'sfields@cdatribe-nsn.gov'; Fitzhugh, Speed (Elvin); 'philc@cdatribe-nsn.gov'
Subject:	Re: Coeur d'Alene Reservation 2011 Annual Water Quality and Aquatic Weed Summary Reports

Thanks for these responses - BIA approves the modified document. If an approval letter is preferred, I can provide one next week. Thanks for your help!

From: Lunney, Meghan [mailto:Meghan.Lunney@avistacorp.com]
Sent: Monday, March 26, 2012 04:26 PM
To: Dach, Robert
Cc: Scott Fields <sfields@cdatribe-nsn.gov>; Fitzhugh, Speed (Elvin) <SpeedElvin.Fitzhugh@avistacorp.com>; Phil Cernera <philc@cdatribe-nsn.gov>
Subject: FW: Coeur d'Alene Reservation 2011 Annual Water Quality and Aquatic Weed Summary Reports

Bob,
Scott Fields, Water Quality Manager of the Coeur d'Alene Tribe, provided responses to your questions pertaining to your review of the 2011 Water Quality Annual Summery Report (see responses below, in red). We have revised sections of the 2011 Water Quality Annual Summary Report to address your third question, which incorporates the Coeur d'Alene Tribe's temperature standard. The revisions are included as track changes in the attached word document (Section 4.0 on pages 4-5, Section 4.1 on page 5, and Section 4.5 on page 11) and in the attached Revised Table 4 (see areas highlighted in gray).

If these responses and edits work for you, we will file the 2011 Water Quality Annual Summary Report with FERC.

Thanks!

Meghan Lunney
Aquatic Resource Specialist
Avista Utilities
(509) 495-4643

From: Dach, Robert [mailto:Robert.Dach@bia.gov]
Sent: Wednesday, March 21, 2012 12:50 PM
To: Lunney, Meghan; Phil Cernera
Cc: Fitzhugh, Speed (Elvin); Armes, David; Scott Fields; Dave Lamb; Dale Chess; Goloborodko, Yelena
Subject: RE: Coeur d'Alene Reservation 2011 Annual Water Quality and Aquatic Weed Summary Reports

Hi Meghan and Phil,

I've finished my review of the Water Quality monitoring report – it looks really good, thanks for all of your work! I've only got 3 small questions, that may or may not result in edits to the report:

- Is there any way to present a year-to-year comparison of data – I'm thinking in a figure? I'm not entirely sure how you would do this or which parameters would be important, but I'm trying to identify anomalies in the data by looking at prior year's information. Is this a valuable exercise?

Yes it is a valuable exercise. Beginning with next year's report (2012 Annual Report), we will include a figure for each site that presents a standard box plot with outliers for the nutrients (forms of nitrogen and phosphorus) chlorophyll *a*, and major phytoplankton classes by year. This will provide a graphical, yearly, side-by-side comparison of each variable. In the future we will be developing a more statistically robust analysis to compare years.

- Regarding the location of BL1 and RL2, is their depth a concern and would we be benefited by moving them into deeper water?

  BL1 and RL1 are samples sites in Benewah Lake (BL1) and Round Lake (RL1). These lakes were separated from Chatcolet Lake in the summer prior to the operation of Post Falls Dam. The sample sites were chosen because they are examples of the shallow habitats that are maintained by the operation of Post Falls Dam. The sample sites are located in the deepest part of both lakes.
- I find it curious that the tribe doesn't have a temperature standard, is there a reason for that Phil?

  Temperature like dissolved oxygen is a depth dependant water quality standard. The actual standard is described below:

  > "Temperature. From June 1, through September 30, The 7-day average of the daily maximum temperatures within the hypolimnion is not to exceed 16° C from June 1 to September 30.
  >
  > In thermally stratified TAS waters the hypolimnetic temperature shall be determined by natural conditions as defined in Chapter 4, (a), (ii), (A) of these standards. In TAS waters greater than 15 meters this standard applies to the bottom 80 percent of the lake water column present below the metalimnion. In TAS waters less than 15 meters and greater than 8 meters this standard applies to only the bottom 50 percent of the water column present below the metalimnion. TAS waters exhibiting total water column depths less than 8 meters are not expected to maintain a stable stratified condition and are therefore exempt from this standard"

  The Tribe's temperature standard is based on a 7 day average, C5 is the only site where the attainment of the temperature standard could be evaluated. Based on the data collected by the continuous monitoring buoy system the 7 day maximum temperature of 16 degrees Celsius (in the lowest 80% of the hypolimnion) was not exceeded. As the buoy monitoring system is rotated annually to each site the Tribe will build a data set which should allow it to assess the relationship between single temperature sampling events (every two weeks) and 7 day average temperatures within the hypolimnion at each site which in-turn will allow the tribe to utilize single data points to determine if possible temperature violations are occurring.

Also, I know Avista's responsibility is to (in general) have the data collected – but can you remind me again how the data will inform actions to address violations of the tribe's standards?

How the finding of violations are used in the re-licensing process: As Tribal Lake water quality data is collected and a robust data set is developed the Tribe will begin to have the data and tools necessary to evaluate how Avista's operations of Coeur d'Alene Lake are contributing to observed violations of Tribal water quality standards. Until such time that a sufficient data set is developed the Tribe will simply track violations as they occur and assess if trends of violations are related to project operations or other factors influencing the Lake.

Bob Dach
National Hydropower Program Manager
Bureau of Indian Affairs
911 NE 11th Ave.
Portland, OR 97232

503-231-6711

From: Lunney, Meghan [mailto:Meghan.Lunney@avistacorp.com]
Sent: Tuesday, February 28, 2012 4:56 PM

To: Dach, Robert
Cc: Fitzhugh, Speed (Elvin); Phil Cernera; Armes, David; Scott Fields; Dave Lamb; Dale Chess; Goloborodko, Yelena
Subject: Coeur d'Alene Reservation 2011 Annual Water Quality and Aquatic Weed Summary Reports
Importance: High

Bob,
In Speed's absence I've attached the Coeur d'Alene Reservation 2011 Water Quality Annual Summary Report and the 2011 Aquatic Weed Annual Summary Report for your review. Both the word version of the text and a pdf of the entire report are included. Avista is required to submit both reports to Interior by March 1st and to FERC by April 1st on an annual basis. We have also placed paper copies in the mail to Stanley Speaks, BIA's Regional Director. If you have any questions or wish to discuss the activities that Avista and the Coeur d'Alene Tribe conducted last year please feel free to call me or Speed. Speed will be back in the office this Thursday.

Thanks!

Meghan Lunney
Aquatic Resource Specialist
Avista Utilities
(509) 495-4643