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Seasonal nitrate dynamics in an agriculturally influenced New Hampshire headwater stream

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SEASONAL NITRATE DYNAMICS IN AN AGRICULTURALLY INFLUENCED NEW HAMPSHIRE HEADWATER STREAM

BY

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ABSTRACT

SEASONAL NITRATE DYNAMICS IN AN AGRICULTURALLY INFLUENCED NEW HAMPSHIRE HEADWATER STREAM

by

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University of New Hampshire, May, 2010

Nitrate (NO_3^-) uptake and denitrification in small headwater streams can have significant implications for downstream water quality. I measured seasonal NO_3^- uptake and longitudinal patterns in potential sediment denitrification in a New Hampshire agriculturally influenced stream during 2009. NO_3^- uptake was measured through short-term NO_3^- enrichments and potential denitrification was measured using the Chloramphenicol-amended acetylene-inhibition method. NO_3^- was taken up in autumn but not in spring or summer. In autumn, on average 87% of the daily NO_3^- load was taken up and a maximum of 4% was removed via denitrification. Results suggest that, in this stream, carbon availability from leaf fall drives NO_3^- uptake primarily via heterotrophic assimilation. This study helps to better characterize controls on NO_3^- uptake and denitrification in New England, where few such studies have been conducted on agricultural streams, and where seasons are pronounced.

INTRODUCTION

Human activities have nearly doubled the amount of reactive nitrogen, including nitrate (NO_3^-) and ammonium (NH_4^+), in ecosystems since the industrial revolution (Galloway et al. 1995, Smil 2001). Nitrogen (N) is an essential nutrient for biological growth. However, chronic N loading to aquatic ecosystems from sources such as manure, fertilizer applications and sewage effluent can alter species composition and lead to water quality impairments such as eutrophication (Paul and Meyer 2001). Characterized by increased productivity, algal blooms, and anoxia, eutrophication leads to decreased biodiversity and potential fish kills (Carpenter et al. 1998, Diaz and Rosenberg 2008). Additionally, NO_3^- is a federally listed drinking water contaminant and can cause methemoglobinemia (blue baby syndrome) in infants (Knobeloch et al. 2000). Currently, N is one of the leading causes of water quality impairment in the U.S., with agriculturally-influenced waters making up a significant portion of cases (Birgand et al. 2005).

Headwater streams are important N cycling pathways, linking terrestrial ecosystems to larger rivers, lakes and estuaries. Once N enters a stream it can cycle between organic (e.g. amines, proteins) and inorganic (e.g. NO_3^-, NH_4^+) forms as it moves downstream; a process known as nutrient spiraling (Webster and Patten 1979, Newbold et al. 1981- Figure 1). NO_3^- can be taken up via autotrophic (e.g. algal and plant) and heterotrophic (microbial) assimilation, reduced to NH_4^+ via dissimilatory nitrate reduction to ammonium (DNRA), or emitted into the atmosphere in gaseous forms through denitrification (Webster and Valett 2006). Because NO_3^- does not sorb well to sediments (Hedin et al. 1998), if it is not taken up it is typically transported farther downstream.

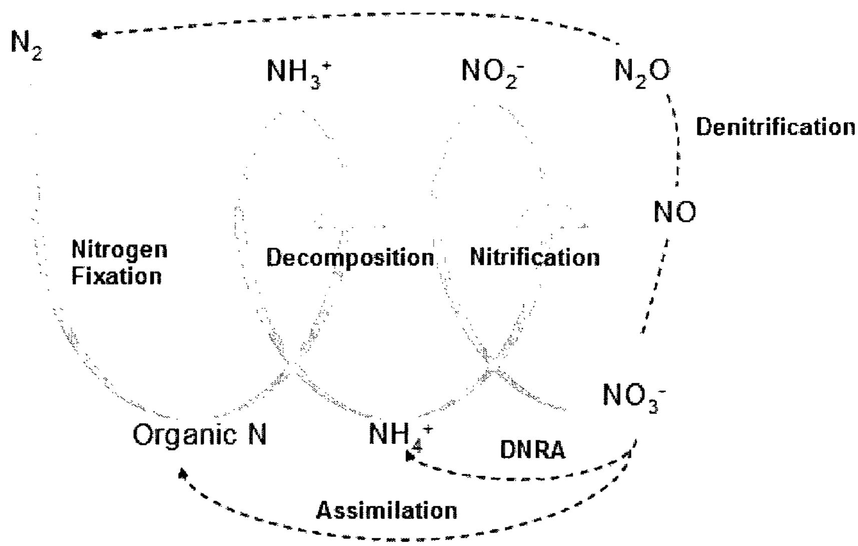

Figure 1. Conceptual diagram illustrating the nitrogen cycle and spiraling. Nitrogen gas (N_2) is converted to organic N and ammonia (NH_3^+) through nitrogen fixation. During decomposition organic N is converted to NH_3^+ and then NH_4^+. Nitrification is the conversion of NH_4^+ to nitrite (NO_2^-) and NO_3^-. NO_3^- can then be converted to gaseous forms of N (nitric oxide (NO), nitrous oxide (N_2O) and nitrogen gas (N_2)) and emitted into the atmosphere.

The pathway NO_3^- takes in headwater streams can determine its impact on larger downstream waterbodies. Assimilatory uptake is considered a temporary NO_3^- removal pathway because it will eventually return to the water column through mineralization. DNRA is also only a temporary removal pathway and actually converts the NO_3^- back into a more biologically available form of N. In contrast, denitrification permanently removes N from the water column, which minimizes downstream export and potential eutrophication in larger waterbodies.

Denitrification, the reduction of NO_3^- to gaseous forms including nitric oxide- NO, nitrous oxide- N_2O, and nitrogen gas- N_2, occurs when denitrifying microbes use NO_3^- as an electron acceptor in the absence of oxygen[i]. In order for denitrification to occur there must be denitrifying microbes present, low oxygen conditions (<0.2 mg O_2 L^{-1}), and available NO_3^- and carbon (Seitzinger et al. 2006). Sediment composition and depth

[i] Reaction: $CH_2O + (0.8)NO_3^- + (0.8)H^+ \rightarrow CO_2 + (0.4)N_2 + (1.4)H_2O$ (Hedin et al. 1998).

affect denitrification rates due to these factors. For example, sediment with higher organic matter content may exhibit higher rates of denitrification due to enhanced carbon availability (Seitzinger et al. 2006). In surface waters, denitrification is greatest in the top 5 cm of underlying anoxic sediment, which receives NO_3^- from the water column (Inwood et al. 2007). Overall rates of denitrification show high spatial and temporal variability, sometimes differing by orders of magnitude in adjacent locales or within a few hours (Inwood et al. 2005, Groffman et al. 2006). Despite this variability, quantifying rates of denitrification is key to minimizing the impacts of NO_3^- on downstream waterbodies since it is the only pathway that permanently removes N.

Stream NO_3^- uptake is often estimated by conducting ^{15}N- isotope additions (Hall et al. 2009), or non-isotopic NO_3^- additions (Dodds et al. 2002, Payn et al. 2005) and measuring downstream NO_3^- attenuation. NO_3^- additions are significantly less expensive than ^{15}N- isotope additions, and are a common approach to measuring uptake. However, increasing ambient stream NO_3^- can lead to a fertilization effect, potentially overestimating NO_3^- uptake (Dodds et al. 2002).

NO_3^- uptake can be described with several parameters including uptake length, uptake rate and uptake velocity (Stream Solute Workshop 1990). Uptake length is the average distance NO_3^- travels downstream before being removed from the water column. Stream discharge can influence uptake length so it is not often used in cross-site comparisons. More commonly, uptake rate is used, which adjusts for stream size. Uptake velocity accounts for stream NO_3^- concentration and is defined as the speed at which NO_3^- moves toward the benthos. Similar metrics are used to characterize stream denitrification (see Methods for further description).

NO_3^- uptake and rates of denitrification vary and are influenced by physiochemical (e.g. temperature, oxygen availability), hydrological (e.g. stream size and discharge), and watershed characteristics (e.g. land use). Smaller, headwater streams with high width to depth ratios often have greater uptake rates because the N has more contact with the benthos (Peterson et al. 2001, Wollheim et al. 2001, Ensign and Doyle 2006). Additionally, higher discharge may lower rates of denitrification due to increased oxygen availability (Hill and Lymburner 1998). Warmer temperatures, greater light availability, higher rates of primary production and longer growing seasons may increase uptake (Fenn et al. 1998, Alexander et al. 2000, Dodds et al. 2002, Ensign and Doyle 2006).

Previous NO_3^- uptake and denitrification studies have found that streams overwhelmed with NO_3^- inputs can reach saturation, when inputs exceed the amount of NO_3^- removed from the water column (Dodds et al. 2002, Mulholland et al. 2008). N-saturation is indicated by a negative or asymptotic (e.g. Michaelis-Menten) relationship between stream NO_3^- and uptake rate and uptake velocity (Stream Solute Workshop 1990, Mulholland et al. 2004). The point at which NO_3^- uptake no longer increases proportionately with ambient NO_3^- is referred to as the point of saturation (Dodds et al. 2002). Results from the LINX II project, a series of NO_3^- uptake experiments conducted on 72 streams in eight biomes, indicate that as NO_3^- concentrations increase, uptake velocity and denitrification decrease (Hall et al. 2009, Mulholland et al. 2009). This phenomenon leads to greater downstream NO_3^- export and potential water quality impairments (Mulholland et al. 2008).

Despite evidence that NO_3^- uptake and denitrification are dependent on factors that are temporally and spatially variant, the majority of NO_3^- uptake studies have been based on results from NO_3^- enrichments typically performed once, during peak growing seasons in spring and summer (Mulholland 2004, Hall et al. 2009). Few studies have examined seasonal differences in NO_3^- uptake (Simon et al. 2005, Hoellein et al. 2007, Arango et al. 2008). Additionally, only a few NO_3^- uptake and denitrification studies have been carried out in agriculturally influenced streams in New England (Hall et al. 2009).

This study attempts to help fill these gaps and better understand the importance of seasonality on NO_3^- uptake in New Hampshire, where seasons are pronounced.

The objectives of this study were to measure seasonal differences in NO_3^- uptake and longitudinal patterns in potential sediment denitrification at Burley-Demeritt Creek, an agriculturally influenced headwater stream at the University of New Hampshire Organic Dairy Research Farm in Lee, New Hampshire. The study was conducted during a one year period in 2009. NO_3^- uptake was measured using standard short-term NO_3^- additions. Potential sediment denitrification was measured through Denitrification Enzyme Assays (DEA) using the Chloramphenicol-amended acetylene-inhibition method (Groffman et al. 1999). I hypothesized that NO_3^- uptake would be greatest in spring coinciding with low canopy cover and peak biological activity, and in autumn, when heterotrophic metabolism increases with leaf litter inputs and greater light availability. I also hypothesized that potential sediment denitrification rates would be low, with higher rates occurring upstream where organic matter is the dominant substrate.

Burley-Demeritt Creek receives N-rich runoff from pastures and from a small, intermittent tributary draining the pastures. The creek flows into the Lamprey River, a municipal drinking water supply, which discharges into Great Bay Estuary, an N-impaired estuarine ecosystem (Piscataqua Region Estuaries Partnership 2009). Estuaries are typically N-limited (Vitousek and Howarth 1991) and high N-loading to these ecosystems can lead to eutrophication and loss of eel grass and other aquatic plant and animal species. In Great Bay Estuary, N concentrations have increased nearly 60% since the late 1980s, threatening the estuarine ecosystem (Castro and Driscoll 2002, Piscataqua Region Estuaries Partnership 2009). Understanding seasonal differences in NO_3^- uptake and denitrification at Burley-Demeritt Creek will assist agricultural planners as they work to minimize their environmental impact on the Lamprey River and Great Bay Estuary.

CHAPTER I

METHODS

Site Description

Burley-Demeritt Creek (BDC) is at the University of New Hampshire Organic Dairy Research Farm in Lee, New Hampshire (Figure 2). The first-order stream is approximately 30 m above sea level, with a slope of 0.76% and drains a wetland. A forested riparian buffer between the creek and pastures ranges from approximately 50 m upstream to 1000 m downstream. Riparian vegetation is dominated by eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), red maple (*Acer rubrum*), and northern red oak (*Quercus rubra*). Specific stream and watershed characteristics are in Table 1. Soil within BDC is predominantly clay, however the top 5-10 cm of underlying sediment is silt (near the Lamprey River junction), sandy/cobble (between BDC-100 and BDC-350), and predominantly organic matter (upstream from BDC-350). Station names indicate the distance (m) upstream from the Lamprey River junction. There are very few macrophytes in the stream and minimal algal growth was only observed on two sample collection dates in early spring. A small intermittent tributary draining cow pastures enters BDC from the west approximately 380 m upstream from the Lamprey River junction. The tributary has no riparian forested buffer.

Figure 1. Burley-Demeritt Creek site map. Sample stations indicate the distance (m) upstream from the Lamprey River Junction.

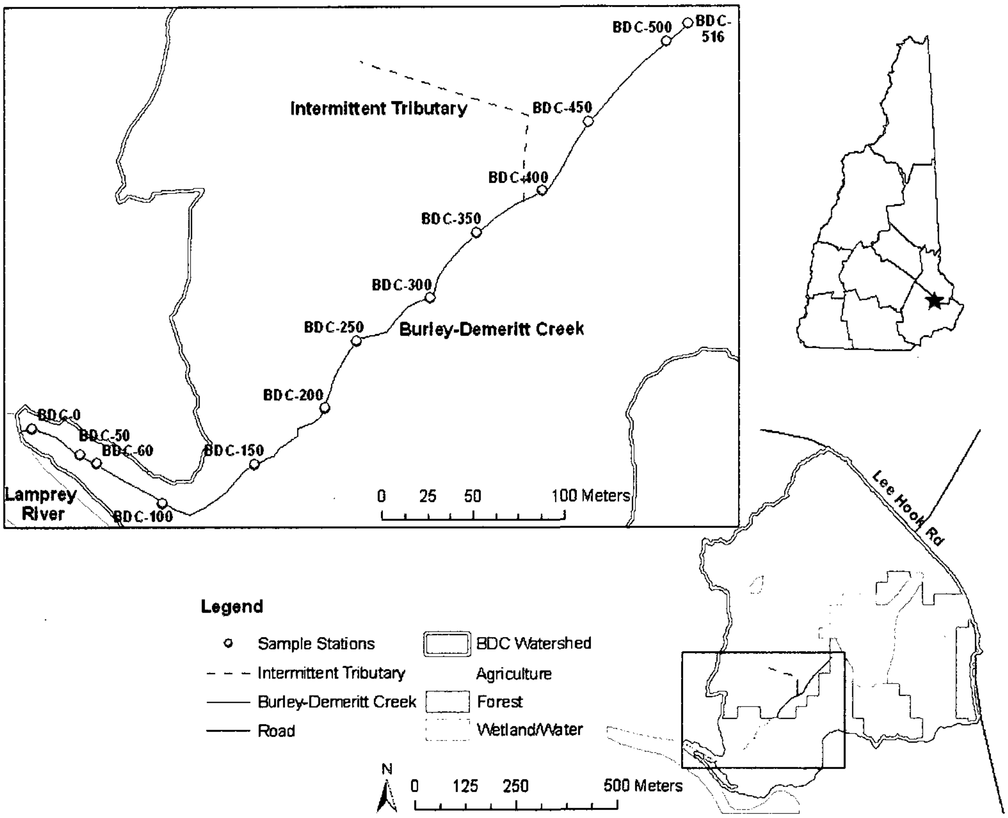

Table 1. Watershed and stream reach characteristics.

Parameter	Value
Latitude (N)	43.09247
Longitude (W)	-70.99199
Reach Length (m)	516
Watershed Area (acres)	317
% Agricultural	60.4
% Forested	30.3
% Wetland	8.8
% Water	0.6
% Developed	0.003

Mean air temperature ranges from -6.6 ˚C in January to 21.1 ˚C in July and mean annual precipitation is 95.5 cm (NRCC 2009)[ii]. June and July of the 2009 study period were exceptionally wet, with precipitation amounts that were nearly 50% greater than the thirty year average (NWS 2008)[iii]. When the Lamprey River rises after large rain events, it often floods up to BDC-150, taking several days to recover to base flow.

Monthly Sampling and NO_3^- Additions

Stream Water Sampling

Water samples were collected monthly (January, February, and December) and bi-monthly (March-November) during 2009. Samples were taken approximately every 50 m of stream reach starting at the Lamprey River junction (BDC-0) to 516 m upstream (BDC-516). The tributary was also sampled if there was measureable flow, as well as any groundwater seepage along BDC at the surface water interface. Stream water was collected with 60 ml plastic syringes and filtered in the field through pre-combusted (450 ˚C for 4 hr) glass fiber filters (Whatman GF/F) into acid-washed high density polyethylene (HDPE) bottles. Prior to collection, the syringe and bottle were rinsed three times with sample water. Temperature, conductivity, specific conductivity, dissolved oxygen (DO- % and mg L^{-1}), and pH were measured at each site using a multiparameter water quality sensor (YSI 556). All samples were frozen until analysis.

Stream Discharge

Stream discharge was measured by an on-site removable six inch v-notch aluminum weir downstream from BDC-300, installed in August, 2009. The average of hourly discharge measurements recorded by the weir was used to estimate stream

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[ii] Based on 30 year average (1971-2000) from data collected in Concord, NH.

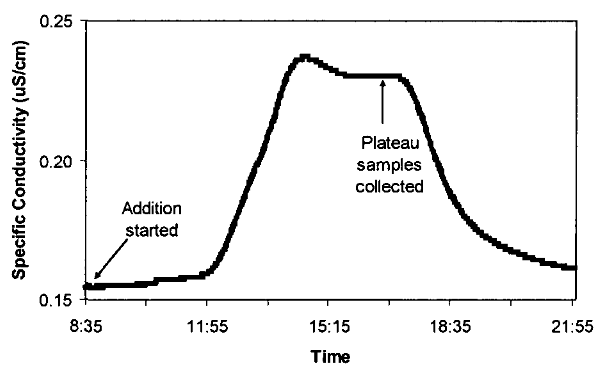
[iii] Based on 30 year average (1971-2000).

discharge on sample days. On all addition dates, discharge was quantified using NaBr (see calculations below).

NO_3^- Additions

To measure NO_3^- uptake, short-term (≤ 5 hr depending on stream discharge) $NaNO_3$, NaBr, and NaCl additions were conducted on April 16th (before leaf out), July 13th (full canopy cover), October 6th (before leaf fall), October 17th and 26th (during leaf fall), and November 22nd (after leaf fall) in 2009. To understand NO_3^- uptake at ambient NO_3^- concentrations, a tracer only (NaBr and NaCl) addition was conducted on August 16th. NaCl was used as a tracer to readily evaluate solute mixing and transit time as indicated by a rise and plateau in specific conductivity at the sampling point farthest downstream (Figure 3). Because of the low ambient Br^- concentrations, NaBr was used as a tracer to quantify stream discharge and hydrologic dilution. NO_3^- uptake was measured through the downstream attenuation of NO_3^-. Target enrichments for NO_3^-, Br^- and Cl^- were 1 mg N L^{-1}, 2.5 mg Br^- L^{-1}, and 20 mg Cl^- L^{-1}, respectively. The amount of solute added to reach these target enrichments was dependent on stream discharge (measured the day before using a Marsh-McBirney flow meter or the weir) and background stream solute concentration (estimated based on average values from most recent sampling).

Figure 3. Stream solute mixing diagram. Specific conductivity measurements demonstrating stream water and solute mixing during the August 6th addition.



Using a peristaltic pump (Masterflex E/S portable sampler), the NO_3^- and tracer solution was pumped at a constant rate into a turbulent area of the stream upstream from the tributary. Multiparameter YSI water quality meters recorded specific conductivity at various stations and at the bottom of the reach (BDC-60 unless stream flow was low in which case BDC-125 was used as the downstream station). BDC-60 was chosen because it was upstream from a small organic dam. Stream samples were collected at six to 12 stations downstream from where thorough mixing was reached. Specific conductivity measurements indicated that tracers were thoroughly mixed in the stream by BDC-350. For each addition, samples were collected before the addition to determine background NO_3^- concentrations, at plateau (to measure decay rate), and 24 hours after the addition (to measure recovery). The pump was turned off after the plateau samples were collected. Stream wetted width was measured approximately every 50 m.

Water Chemistry Analysis

All stream water samples were analyzed at the University of New Hampshire Water Quality Analysis Laboratory. NH_4^+ and PO_4^{3-} were analyzed by robotic automated colorimetry (Westco Smartchem), cations (Na^+, K^+, Mg^+, Ca^+) and anions (NO_3^-, Cl^-, Br^-, SO_4^{2-}) by ion chromatography (Dionex Model), and dissolved organic carbon (DOC) and total dissolved nitrogen (TDN) by high temperature catalytic oxidation (Shimadzu TOC-V).

Potential Sediment Denitrification

Sediment Sample Collection

Sediment samples were collected at BDC-60, BDC-300 and BDC-500 to characterize potential denitrification rates in the stream reach. Samples were collected on May 13th, July 2nd and October 18th, 2009. 15 cm^3 of sediment was collected from the top ~5 cm of sediment at six locations (in a zigzag pattern) at each station, using a cutoff plastic syringe. Samples were placed into pre-weighed glass Mason jars and covered with 10 ml stream water filtered through Whatman GF/F to prevent the sediment from drying out. All jars were sealed with tops fitted with butyl septa. At the same time sediments were collected, 3 L stream water was also collected in acid-washed and stream water rinsed high density polyethylene bottles for use in the Denitrification Enzyme Assay (DEA) method.

Denitrification Enzyme Assays

Sediment denitrification potential was measured through Chloramphenicol-amended acetylene-inhibition DEA (Tiedje et al. 1989, Groffman et al. 1999). DEA's were conducted on May 11th, July 2nd, and October 18th, 2009. After sample collection, stream water (3 L) was filtered through Whatman GF/F and amended with NO_3^- and dextrose (to ensure NO_3^- and carbon would not be limiting), and Chloramphenicol. Chloramphenicol limits further microbial growth by preventing production of the nitrate reductase enzyme (Tiedje et al. 1989). Target concentrations for NO_3^-, dextrose and Chloramphenicol were 100 mg N L^{-1}, 40 mg L^{-1}, and 10 mg L^{-1}, respectively. The un-capped sample jars, solution, and equipment were placed overnight in an anaerobic chamber.

The following morning, after anoxia had been reached, 75 ml of the NO_3^-, dextrose and Chloramphenicol solution were added to each jar. The jars were then quickly capped and removed from the anaerobic chamber. Using a gas-tight plastic syringe, 10 ml acetylene purified with sulfuric acid was injected into each jar through the butyl septa. The purpose of the acetylene was to inhibit the conversion of N_2O to N_2 gas, which is difficult to measure due to its ubiquity in the atmosphere. Five ml gas was sampled from each jar with a syringe, 30 and 90 minutes after the acetylene had been injected. To replace the removed gas from the headspace, 5 ml helium was immediately injected into each jar. Gas samples were analyzed for N_2O with a HP 5890 Series II gas chromatograph, using N_2O standards of 0.1, 1, and 10 parts per million by volume (ppmv) N_2O.

To determine sediment dry weight and headspace volume, the jars with sediment and solution were weighed, filled to the top with DI water, re-weighed, and placed in a drying oven for several days. The samples were then re-weighed, placed in an oven at 550 °C for four hours, and again re-weighed to determine ash-free dry mass (AFDM).

Calculations and Statistical Analyses

All statistical analyses were performed using SPSS 17.0, with a significance level of $\alpha=0.05$. Seasons were designated as: winter (Jan-Feb, Dec), spring (Mar-May), summer (Jun-Aug), and autumn (Sep-Nov).

Stream Chemistry

Monthly and seasonal differences in stream water chemistry were determined through ANOVA and post hoc Tukey tests. To more accurately represent average stream chemistry, samples from stations BDC-50 to BDC-500 were used in analyses and included bi-monthly samples and pre-addition samples only. Pearson correlations were run between NO_3^- and parameters that were determined to potentially influence NO_3^-, including stream temperature, DO, DOC, NH_4^+, PO_4^{3-}, and stream discharge. Stream discharge measurements were taken from the weir unless the samples were taken on an addition date, in which case NaBr was used to measure discharge (see "NO_3^- Uptake" section for calculations).

NO_3^- Uptake

Natural hydrologic dilution and temporary storage of NaBr was calculated by dividing the plateau NaBr concentration at each station by the plateau NaBr at BDC-350 (first station downstream from injection where solute was thoroughly mixed). Stream discharge (Q) was calculated for each station using the formula (Stream Solute Workshop, 1990):

$$Q = \frac{(C_1 - C_b) * Q_1}{(C_p - C_b)}$$

where C_1 is the NaBr drip concentration, C_b is the pre-injection stream NaBr concentration, Q_1 is the pump rate, and C_p is the plateau NaBr concentration. Specific discharge was calculated by dividing stream discharge by the average wetted width of the stream.

A linear regression of concentration versus distance was performed using log-transformed NO_3^- concentration corrected for dilution, dispersion and station-specific background NO_3^- concentrations. The negative slope of the regression line is the uptake rate coefficient (*k*), the inverse of which is uptake length (S_w). Areal NO_3^- uptake rate (U), was calculated using the equation (Newbold et al. 1981, Stream Solute Workshop 1990):

$$U = \frac{F}{S_w * w}$$

where F is the NO_3^- flux calculated using average discharge and average pre-injection NO_3^-, and w is calculated as the average stream wetted width. Areal uptake rate was compared with the NO_3^- flux to determine the percent NO_3^- removal. If the areal uptake rate was higher than the actual NO_3^- flux at the time of the addition, it was assumed that 100% of the NO_3^- was taken up. NO_3^- uptake velocity (V_f) was calculated with the equation (Stream Solute Workshop 1990):

$$V_f = \frac{Q * k}{w}$$

Pearson correlations were run between uptake length, uptake rate and uptake velocity, and water characteristics and chemistry data that were thought to potentially influence uptake, including discharge, specific discharge, DO (mg L^{-1}), stream temperature, % N-enrichment (the amount of N added to the stream relative to background concentration), DOC, NH_4^+, and PO_4^{3-}. For additions where NO_3^- uptake was not statistically significant, uptake rate and uptake velocity were assumed to be zero and uptake length was omitted from statistical analyses. ANOVA and post-hoc Tukey tests were used to determine significant differences between downstream NO_3^- decline slopes.

A power analysis was conducted for additions where a decline in NO_3^- was not statistically significant. The purpose of the analysis was to test the ability of the methods to reject the null hypothesis of no NO_3^- uptake, and determine the minimum uptake length at which a decline in NO_3^- would be statistically detectable. Regressions were plotted using the log-transformed NO_3^- concentration at each station. The residuals were assumed to be normally distributed. Simulations were conducted on 1,000 hypothetical data sets with similar residual variance but different slopes from the actual NO_3^- values collected in the field. These simulations were used to determine the slope, and therefore uptake length, at which the variance would be too high to detect NO_3^- uptake.

Denitrification Enzyme Assays

The concentration of N_2O in the headspace of each sample at 30 and 90 minutes was calculated with the equation (Holland et al. 1999):

$$C_m = \frac{C_y * M * P}{R * T}$$

where C_m is the concentration of N_2O in µg N_2O-N L^{-1}, C_y is the concentration of N_2O in ppmv, M is the molecular weight of N_2O (28 µg N_2O-N L^{-1}), P is the barometric pressure within the anaerobic chamber (atm), R is the universal gas constant (0.0821 L atm K $mole^{-1}$), and T is the temperature within the anaerobic chamber (˚C).

Potential sediment denitrification rates were calculated for both the dry mass and ash free dry mass of sediments with the equation (Groffman et al. 1999):

$$DR = \frac{(C_{90} * H) - (C_{30} * H)}{D * T}$$

where DR is the rate of sediment denitrification (µg N g soil hr^{-1}), C_{90} is the concentration of N_2O at 90 minutes, C_{30} is the N_2O concentration at 30 minutes, H is headspace volume in the Mason jar, D is either the sediment dry mass or ash free dry mass (organic matter weight) depending on the desired calculation, and T is the duration of the incubation. The percent organic content for each sample was determined by dividing DM by AFDM and multiplying by 100.

Areal denitrification rates (U_{den}) were calculated by correcting DR for average sediment AFDM for each sample station and average stream area (length=516 m, width=1.1 m) based on measurements from each NO_3^- addition. The total mass of sediment at BDC was calculated assuming denitrification was occurring in the top 5 cm of underlying sediment only. U_{den} was divided by stream NO_3^- flux to produce $V_{f\text{-}den}$, or the velocity at which NO_3^- enters the benthos via denitrification (Royer et al. 2004, Arango et al. 2008).

ANOVA and post-hoc Tukey tests were used to determine significant differences among stations and seasons. If no there were no significant differences, denitrification results were pooled for all analyses.

CHAPTER II

RESULTS

Stream Chemistry

Stream temperature and DO followed seasonal patterns, with higher stream temperatures in summer and autumn coinciding with low DO. The creek was covered in ice January through March, and in December, 2009 (Table 2). Mean stream temperature ranged from 0-16 °C, and mean DO ranged from 4.3 to 15.1 mg O_2 L^{-1}.

Table 2. BDC seasonal stream chemistry (mean ± standard error) in 2009. Values calculated using samples BDC-50 to BDC-500 only.

Variable	Units	Winter (Jan-Feb, Dec)	Spring (Mar-May)	Summer (Jun-Aug)	Autumn (Sep-Nov)
Stream Temp.	(°C)	0.10 ± 0.15	5.62 ± 0.63	15.2 ± 0.14	7.76 ± 0.47
DO	(mg L^{-1})	14.46 ± 0.37	9.75 ± 0.34	9.18 ± 0.27	8.84 ± 0.35
NO_3^-	(mg N L^{-1})	1.34 ± 0.11	0.85 ± 0.06	0.78 ± 0.05	0.99 ± 0.06
DOC	(mg C L^{-1})	5.33 ± 0.20	6.79 ± 0.33	10.78 ± 0.40	10.97 ± 0.27
NH_4^+	(mg N L^{-1})	0.02 ± 0.001	0.06 ± 0.008	0.07 ± 0.005	0.02 ± 0.002
PO_4^{3-}	(mg P L^{-1})	0.03 ± 0.001	0.08 ± 0.006	0.16 ± 0.006	0.12 ± 0.004

Daily mean NO_3^- concentrations for sites BDC-50 to BDC-500 were variable throughout the year ranging from 0.3 to 2.4 mg N L^{-1} (Figure 4). The highest concentrations were in September, though three-month seasonal averages indicated higher overall NO_3^- in winter (Table 2). DOC in autumn was higher than winter and spring concentrations ($p < 0.001$), with mean DOC ranging from 4.2 to 15.6 mg C L^{-1} (Figure 4 and Table 2). NO_3^- and DOC were negatively correlated ($p < 0.001$, r^2=0.31- Figure 5). There was no correlation between NO_3^- and NH_4^+. Concentrations of NH_4^+ and

PO_4^{3-} were low, with daily means ranging from <0.01 to 0.15 mg N L^{-1}, and 0.02 to 0.22 mg P L^{-1}, respectively. Concentrations for both NH_4^+ and PO_4^{3-} were lowest in winter and highest in summer.

Figure 4. Mean monthly stream NO_3^- and DOC (+ standard error) for stations BDC-50 to BDC-500. Error bars are on all points but may not be visible if too small. Sampling was conducted once during Jan, Feb, and Dec, and at least twice for all other months.

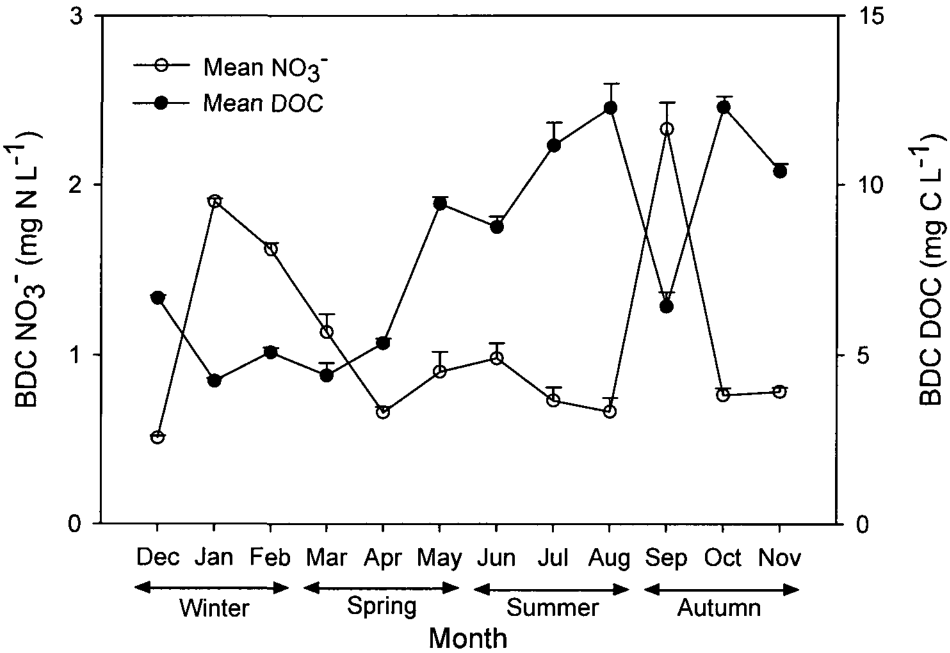
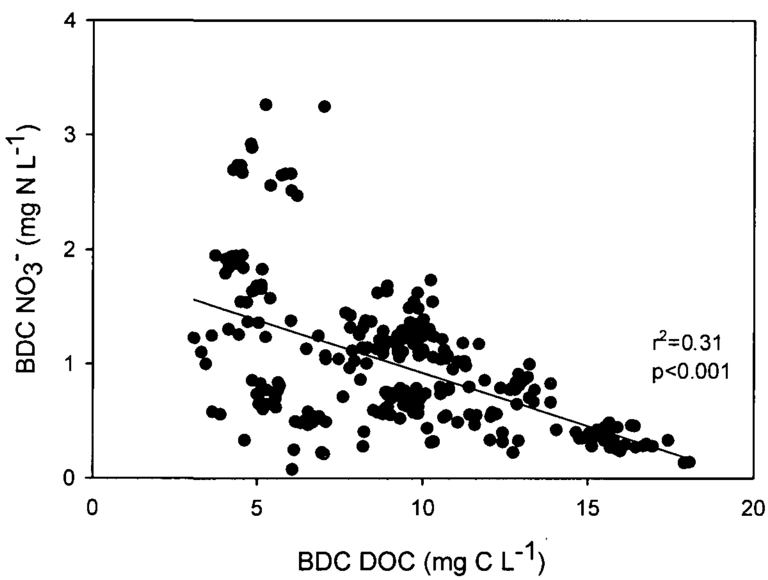
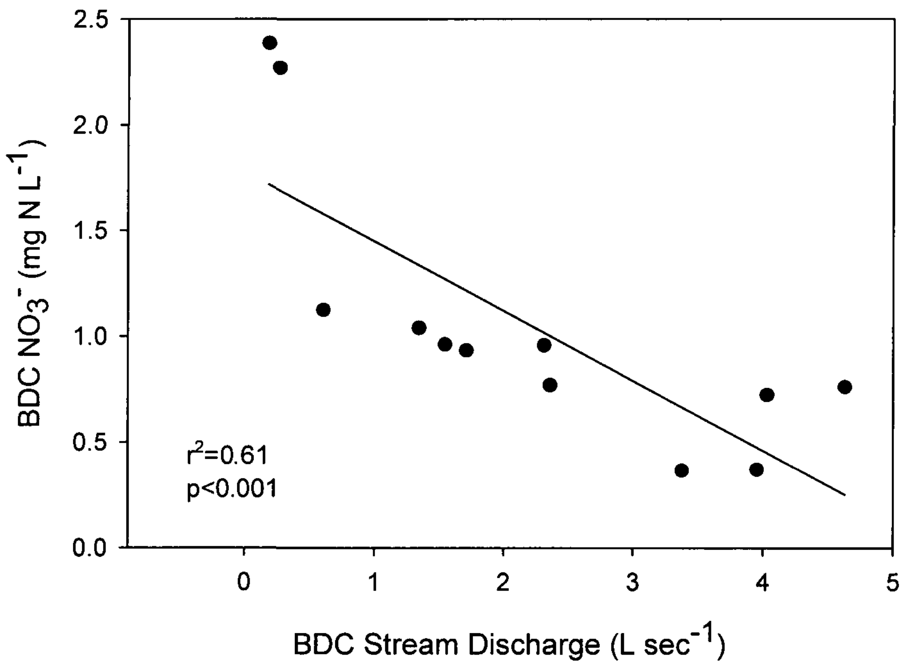


Figure 5. NO_3^- and DOC concentrations from bi-monthly and pre-addition samples at BDC. n=278 representing sample stations BDC-50 through BDC-500.



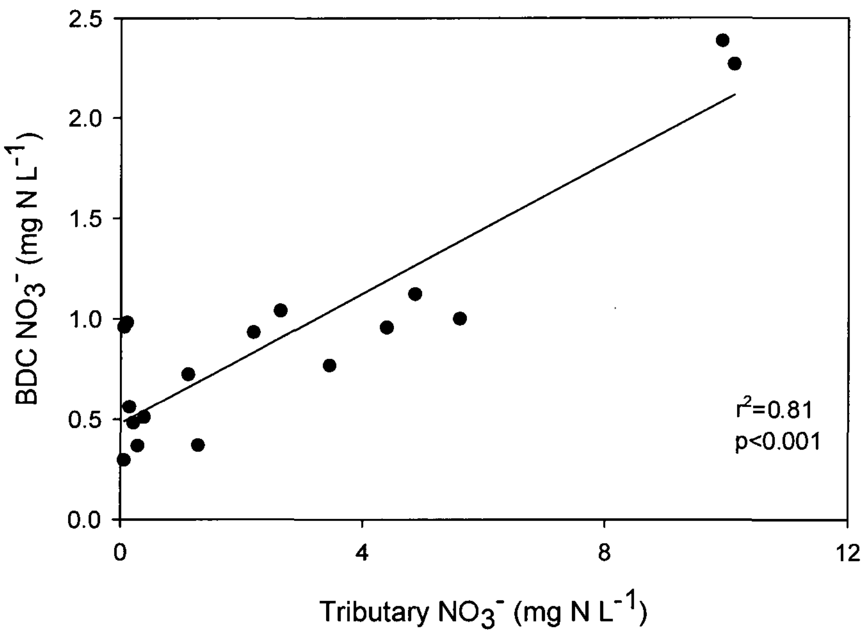
Stream NO_3^- was inversely related to stream discharge (p< 0.001, r^2= 0.61- Figure 6). Discharge ranged from 0.2 to 4.6 L sec^{-1} with lowest flows in September and early October, coinciding with high NO_3^-.

Figure 6. BDC mean daily NO_3^- (BDC-50 to BDC-500) and stream discharge from bi-monthly and pre-addition samples. Discharge measurements were from the weir unless on an addition date, in which case NaBr was used to measure flow. Measurements from the December sampling were not included due to the influence of ice on the weir.



Stream NO_3^- was positively correlated with tributary NO_3^- (p< 0.001, r^2= 0.81- Figure 7). BDC NO_3^- was typically highest at the tributary junction and declined downstream towards the Lamprey River. Tributary NO_3^- was temporally variable, ranging from <0.01 to 10.1 mg N L^{-1} within a five-hour time frame on the August 6th sampling, for example.

Figure 7. Mean daily BDC (BDC-50 to BDC-500) and tributary NO_3^- from bi-monthly and pre-addition samples. Tributary samples only taken during measurable flow.



There were no statistical differences between the slope of the ambient NO_3^- decline downstream[iv] and season. There was no relationship between ambient NO_3^- and DOC concentrations, though ambient NO_3^- slope was strongly correlated with stream discharge (p= 0.006, r^2= 0.54).

<u>NO_3^- Uptake</u>

NO_3^- uptake was statistically significant for all autumn additions, but not during the spring or summer additions (Figure 8). For the autumn additions mean uptake length (S_w) was 509 m, uptake velocity (V_f) was 0.36 mm min^{-1}, and uptake rate (U) was 317 ug N m^{-2} min^{-1} (Table 3). Measured uptake was greatest during the October 17th addition,

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[iv] NO_3. concentrations declined downstream from the tributary on all dates except for 5/27/09 when there was a slight increase in concentration and the slope was positive.

when discharge, specific discharge, and N-enrichment were lower and background stream NO_3^- concentrations were higher than the other autumn additions.

Figure 8. Downstream patterns in NO_3^- during all additions. NO_3^- attenuation was only statistically significant during the autumn additions ($p<0.001$).

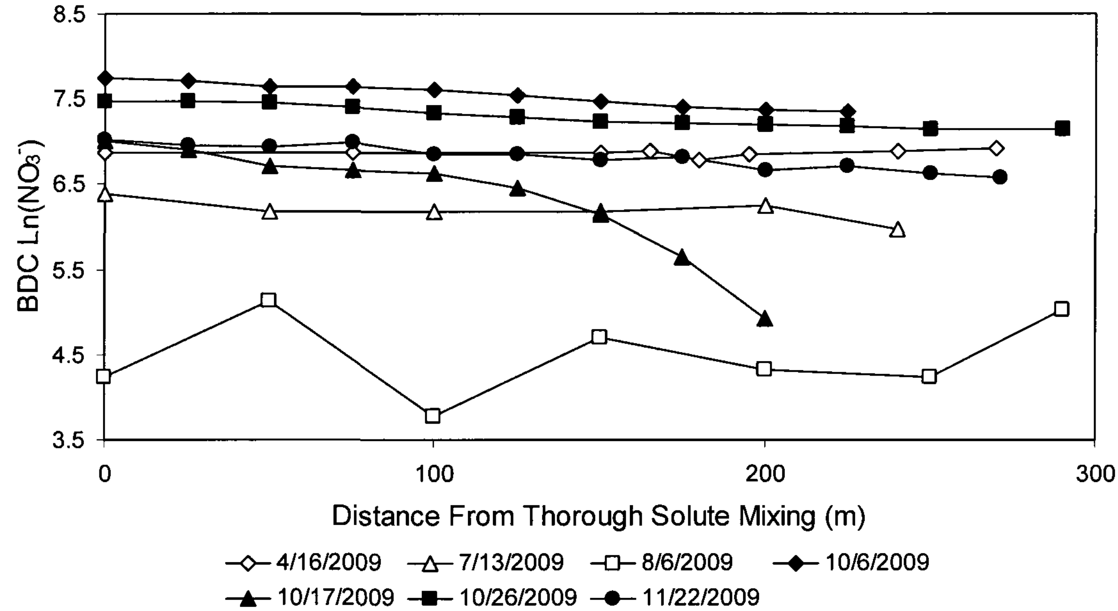
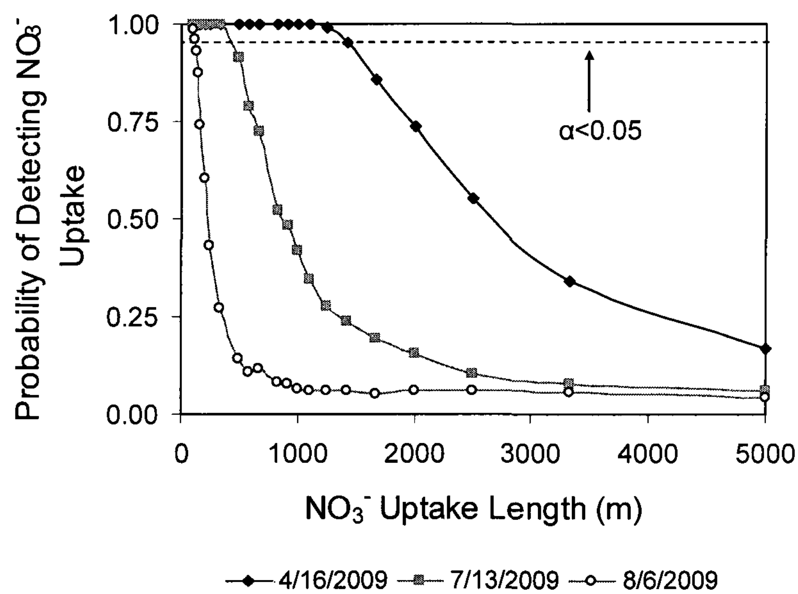


Table 3. NO_3^- uptake and denitrification measurements as well as stream characteristics for all addition dates. -- signifies non-detectable uptake length because the p value > 0.05. N-enrichment represents the percent increase in N from each addition relative to ambient concentration. N-enrichment was not consistent due to changes in stream discharge. Note that August 6th was a conservative tracer only addition and no NO_3^- was added.

Parameter	Unit	4/16/09	7/13/09	8/6/09	10/6/09	10/17/09	10/26/09	11/22/09
p value		0.667	0.091	0.722	<0.001	<0.001	<0.001	<0.001
S_w	(m)	--	--	--	534	111	752	640
U	(ug N m^{-2} min^{-1})	0	0	0	208	712	114	233
V_f	(mm min^{-1})	0	0	0	0.25	0.60	0.29	0.31
$V_{f\text{-}den}$	(mm min^{-1})	0	0	0	0.009	0.006	0.019	0.010
Total NO_3^- Uptake	(%)	0	0	0	96.6	100.0	68.6	80.6
NO_3^- Removed via Denitrification	(%)	0	0	0	3.4	1.0	6.3	3.1
N-Enrichment	(%)	103	31	0	138	55	281	104
Discharge	(L s^{-1})	4.6	2.3	1.4	2.4	1.3	4.0	4.0
Spec. Discharge	(L sec^{-1} m^{-1})	4.2	2.2	1.6	2.2	1.1	3.7	3.4

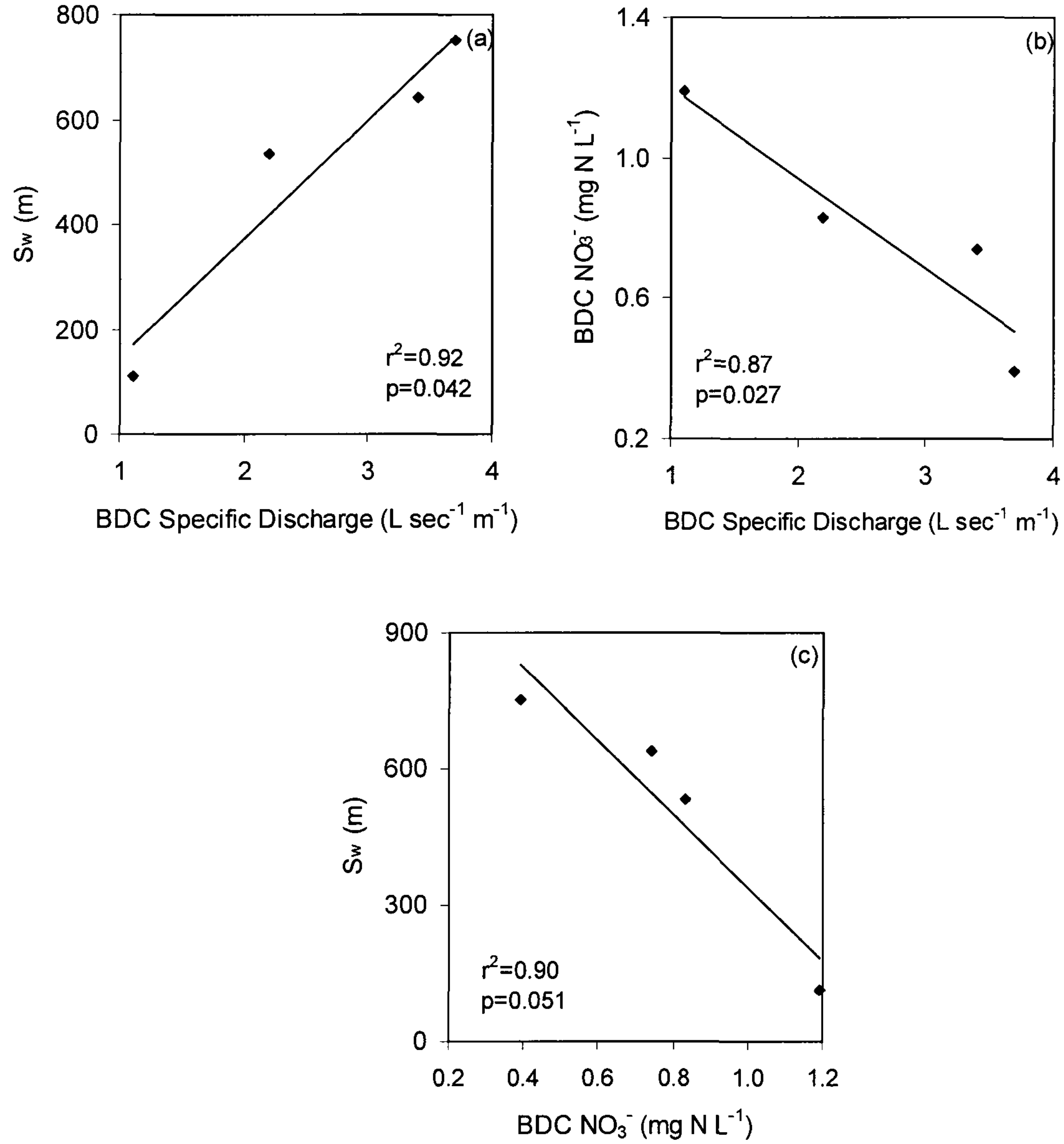
Simulations were conducted to test the statistical power of the methods to detect a downstream decline in NO_3^- on the dates when uptake was not detected (Figure 9). For the April addition, there was a 95% chance of detecting uptake if the uptake length was less than 1,430 m, indicating that actual uptake length on that date was greater than 1,430 m. The point of rejection was 500 m and 110 m for the July and August additions, respectively.

Figure 9. Results from the power analysis conducted to determine the minimum uptake length detectable based on the variance of data from the spring and summer additions.



NO_3^- uptake length and discharge were positively related, though the trend was not statistically significant (*p*=0.067). Specific discharge was positively correlated with uptake length (*p*=0.042, r^2=0.92- Figure 10a) and negatively correlated with background stream NO_3^- (*p*=0.027, r^2=0.87- Figure 10b). Wetted width was similar for all addition dates, ranging from 0.9 to 1.2 m, and specific discharge ranged from 1.1 to 4.2 L sec^{-1} m^{-1}. NO_3^- uptake length had a weak negative correlation with ambient stream NO_3^- (*p*=0.051, r^2=0.90- Figure 10c).

Figure 10a-c. Relationships between specific discharge, NO_3^- uptake length and background stream NO_3^-.



There was no correlation between N-enrichment and uptake length (p=0.224), uptake rate (p=0.940), or uptake velocity (p=0.540). N-enrichment varied considerably between additions due to changes in stream flow and background NO_3^- concentration (Table 3).

Other chemical characteristics that could potentially influence uptake were DOC, stream temperature, DO, NH_4^+, and PO_4^{3-} (Table 4). There was no correlation between DOC and any of the uptake measurements, though DOC was significantly higher (p<0.001) on the October 6th and 26th addition dates. When uptake was compared to the other chemical characteristics there were no statistically significant correlations.

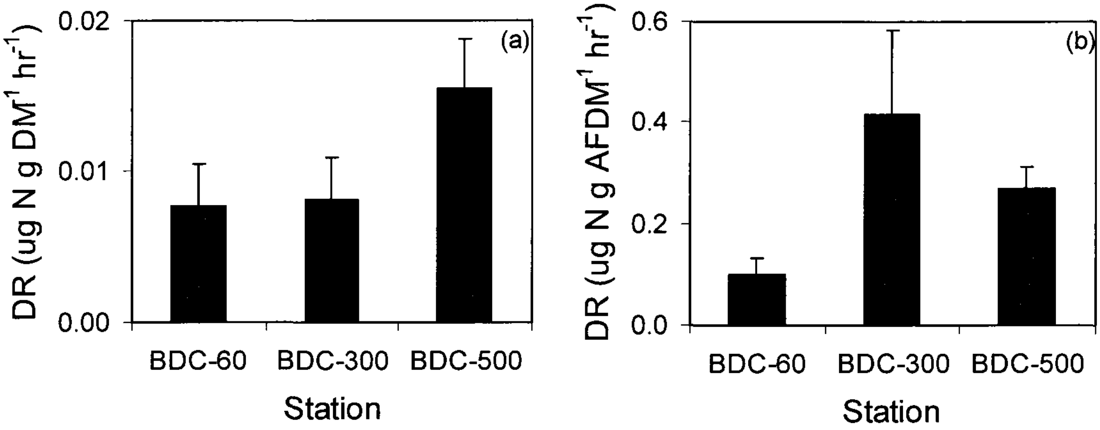
Table 4. Mean stream chemistry data ± standard error for each addition. Values are from pre-addition samples.

Date	DO ($mg\ O_2\ L^{-1}$)	Stream Temp. (°C)	DOC ($mg\ C\ L^{-1}$)	NO_3^- ($mg\ N\ L^{-1}$)	NH_4^+ ($mg\ N\ L^{-1}$)	PO_4^{3-} ($mg\ P\ L^{-1}$)
4/16/09	12.3 ± 0.29	3.0 ± 0.06	5.2 ± 0.10	0.8 ± 0.02	0.02 ± 0.002	0.04 ± 0.002
7/13/09	8.8 ± 0.33	14.7 ± 0.06	7.4 ± 0.55	1.0 ± 0.09	0.06 ± 0.009	0.15 ± 0.011
8/6/09	8.7 ± 0.20	16.3 ± 0.11	9.3 ± 0.24	1.0 ± 0.09	0.11 ± 0.017	0.19 ± 0.010
10/6/09	6.0 ± 0.25	9.8 ± 0.03	12.8 ± 0.23	0.8 ± 0.05	0.02 ± 0.009	0.19 ± 0.005
10/17/09	10.0 ± 0.47	3.2 ± 0.05	9.5 ± 0.32	1.2 ± 0.05	0.004 ± 0.001	0.10 ± 0.005
10/26/09	9.6 ± 0.37	6.2 ± 0.03	15.6 ± 0.17	0.4 ± 0.02	0.004 ± 0.000	0.13 ± 0.004
11/22/09	13.4 ± 0.54	3.0 ± 0.02	9.9 ± 0.17	0.7 ± 0.01	0.03 ± 0.002	0.06 ± 0.002

Potential Sediment Denitrification

Potential sediment denitrification rates ranged from <0.001 to 0.048 ug N g DM^{-1} hr^{-1} or 0.01 to 1.93 ug N g $AFDM^{-1}$ hr^{-1} (Figure 11). Overall, rates were variable even within the same site, differing by an order of magnitude. There were no statistically significant differences in potential denitrification rates between seasons or stations. The percent organic content at each site was 7.2%, 3.0%, and 7.4% at BDC-60, BDC-300 and BDC-500, respectively.

Figure 11a-b. Mean (+ standard error) potential sediment denitrification rates (DR) at each sample station for dry mass (DM) and ash free dry mass (AFDM)sediment.



Areal denitrification rates (U_{den}) were calculated using pooled data, and assuming a sediment depth of 5 cm, where denitrification was most likely to occur. Areal rates were: 4.9, 12.2, and 14.9 mg N m^{-2} day^{-1} for BDC-60, BDC-300 and BDC-500, respectively. Denitrification velocity ($V_{f\text{-}den}$) ranged from 0.006 to 0.01 mm min^{-1} (Table 3).

Fate of NO_3^- in BDC

Mean NO_3^- uptake rate at BDC in autumn was 316.7 mg N m^{-2} day^{-1}. When compared to average NO_3^- flux this accounted for approximately 87%[v] removal of NO_3^--N from BDC. When comparing areal denitrification with areal NO_3^- uptake, denitrification accounted for 3.6% of stream NO_3^- removal over the 516 m reach (Table 3, Figure 12a-d). Because there was no significant NO_3^- uptake in spring or summer, it was assumed that there was no uptake or denitrification occurring and therefore 100% of the NO_3^- flux was discharged to the Lamprey River.

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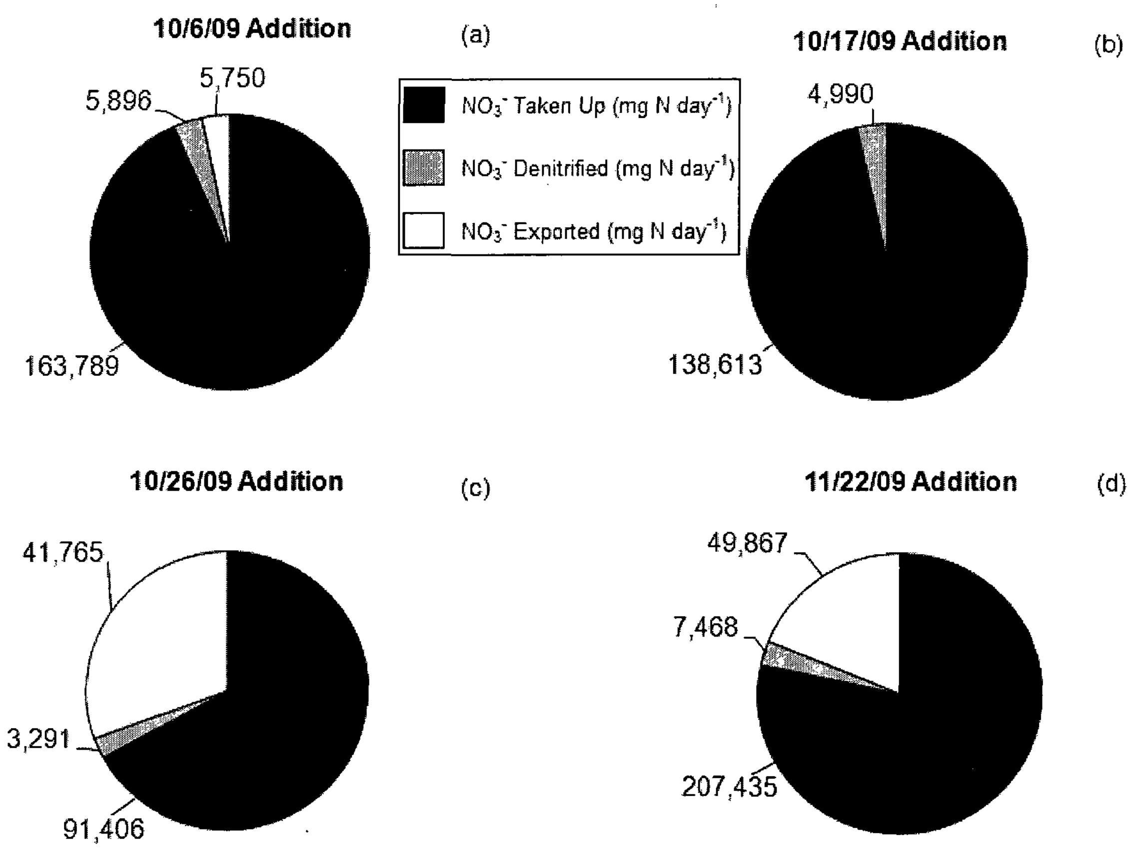
[v] When comparing areal uptake rate with actual NO_3^- flux, on 10/17/09 the percent NO_3^- removal was over 100%. For that date it was assumed that 100% of the NO_3^- was removed. See Methods.

Figure 12a-d. Fate of NO_3^- during the autumn additions. Assumes 3.6% of NO_3^- load removed via denitrification.



CHAPTER III

DISCUSSION

Patterns in Ambient Stream NO_3^-

Stream NO_3^- concentration is influenced by watershed land use, with generally higher concentrations in agriculturally influenced streams compared to forested streams. NO_3^- in BDC ranged from 0.3 to 2.4 mg N L^{-1}, which, when compared to other published values, was higher than streams classified as forested (Mulholland et al. 2004), but significantly lower than agricultural streams, where NO_3^- concentrations as high as 12.6 mg N L^{-1} have been reported (Royer et al. 2004). Unlike most agricultural streams which are often ditches flowing through pastures, BDC has a large forested riparian area that likely reduces N-loading. Based on longitudinal patterns in NO_3^- concentrations, the intermittent, non-buffered tributary draining the cow pastures seems to be the primary source of NO_3^- in BDC. The temporal variability in tributary NO_3^- was likely linked to groundwater mixing, dilution during high discharge, and proximity of the dairy cows to the tributary.

Background NO_3^- concentration declined downstream from the tributary junction on all sampling dates except for one. Most of the measurable decline in background NO_3^- can be attributed to natural hydrologic dilution from surface runoff or groundwater, or from uptake, which, based on the NO_3^- additions, was not occurring in spring or summer. Because NO_3^- was only taken up in autumn, and because of the strong negative correlation between NO_3^- and DOC, I would have expected steeper NO_3^- slopes in autumn when DOC was high. However, there were no seasonal differences in slope and there was no correlation between NO_3^- slope and DOC. The data suggest that stream discharge had the greatest overall impact on the slope of the NO_3^- decline, as well as other NO_3^- dynamics including background NO_3^- concentration, and NO_3^- uptake length.

Spring and Summer NO_3^- Additions

The lack of measurable NO_3^- uptake in the spring and summer at BDC was unusual when compared to other studies. Other published seasonal NO_3^- uptake studies have found that, not only is NO_3^- taken up throughout the year, but rates are highest in spring and summer (Simon et al. 2005, Hoellein et al. 2007). Out of all the published studies on NO_3^- uptake, few found no significant NO_3^- uptake when only NO_3^- was added (Richey et al. 1985, Hall and Tank 2003). Based on the power analysis, NO_3^- uptake could not be detected if uptake length was greater than approximately 1400 m for the spring addition. Despite this limitation, BDC is only 516 m in length so even if longer uptake lengths could be detected, this would still indicate that, on average, NO_3^- is not being taken up prior to discharging into the Lamprey River. The power of detecting NO_3^- uptake during the summer and spring additions was limited by shallow NO_3^- decline slopes and high variance.

Research conducted on floodplain NO_3^- dynamics at BDC in 2009 supports the finding of no NO_3^- uptake in spring or summer (Galvin 2010). Galvin (2010) measured ground and surface water in BDC during flooding events in the spring (March, April) and summer (May, July) and found that, during flooding events, NH_4^+ and DOC were taken up, but that NO_3^- removal was minimal and only occurred after prolonged periods of inundation in the spring.

NO_3^- values were variable during the spring and summer additions and appeared to slightly increase downstream. This increase is unlikely due to groundwater input, which contains little NO_3^- (Galvin 2010), but may be explained by nitrification (the conversion of NH_4^+ to NO_3^-). BDC drains a wetland, where low DO concentrations would inhibit nitrification. As DO concentrations increase downstream, as evidenced by field measurements (see Appendix), a portion of the NH_4^+ is likely nitrified. Additionally, downstream from BDC-300 the stream has more riffles which introduce oxygen into the system, therefore further oxidizing NH_4^+. The occurrence of nitrification in BDC may be supported by the downstream decline in NH_4^+ observed on all sample dates except for four, one of which was the spring addition. However, further experiments such as NH_4^+ additions are necessary to quantify nitrification rates in BDC.

While NH_4^+ concentrations were low, the availability of NH_4^+ in BDC may have inhibited NO_3^- uptake. NH_4^+ is more easily assimilated than NO_3^- and sorbs well to sediments (Hedin et al. 1998, Peterson et al. 2001). Therefore, if sufficient NH_4^+ is available, it would likely be taken up prior to NO_3^-. In LINX I (similar to LINX II though NH_4^+ additions were conducted in 12 streams), despite higher NO_3^- than NH_4^+ concentrations, NO_3^- uptake lengths were ten times greater than those for NH_4^+ (Peterson et al. 2001).

Precipitation, light availability and stream DOC concentrations may have also influenced NO_3^- uptake in spring and summer. In summer 2009, there was an unusually large amount of precipitation, leading to higher stream flows. These higher flows may have scoured autotrophs and heterotrophs from the surface, inhibiting NO_3^- uptake. During spring, DOC was lower and light availability was higher than during both summer additions. In the summer months, the increase in DOC may be explained by increased microbial activity in the upstream wetland, organic matter breakdown, and thus DOC export to BDC. It is possible that NO_3^- uptake in spring was limited by the lack of DOC, and in summer, uptake was limited by reduced light availability.

Influence of NO_3^- Concentration on Uptake

Stream NO_3^- concentration can significantly impact NO_3^- uptake. Because of the link between stream NO_3^- concentrations and uptake, there are inherent short-falls in bulk additions, which can have a fertilization effect leading to an overestimation of uptake length and underestimation of uptake rate (Dodds et al. 2002). When using bulk additions, uptake can best be estimated by conducting multiple enrichments within a short time frame (Payn et al. 2005). In October three additions were performed with varying N-enrichments (range= 55% to 280% increase in N), though stream temperature, ambient NO_3^- and discharge varied considerably between each addition. While there was an apparent positive relationship (though not statistically significant) between N-enrichment and uptake length, because of the differences in stream chemistry it is not possible to attribute any differences to N-enrichment alone.

At BDC, stream NO_3^- was not a strong predictor of uptake rate or uptake velocity. If BDC were N-saturated I would have expected to see a negative or Michaelis-Menten relationship between stream NO_3^- and uptake rate and uptake velocity (Stream Solute Workshop 1990, O'Brien et al. 2007). It is possible that the range of NO_3^- values in BDC (0.4 to 1.2 mg N L^{-1}) was not great enough to detect a relationship. For example, Arango et al. (2008) found a Michaelis-Menten relationship between uptake rate and ambient NO_3^-, and their stream NO_3^- values ranged from 0.01 to 17.4 mg N L^{-1}. Simon et al. (2005) detected a strong negative relationship between uptake velocity and ambient NO_3^-, which ranged from 0.001 to 0.013 mg N L^{-1}, though they conducted 12 additions. With the relatively small range of NO_3^- concentrations at BDC I may have needed to conduct more than seven additions to detect a relationship.

Background stream NO_3^- appeared to predict uptake length, though the negative relationship was contrary to what has been found in other studies (Peterson et al. 2001, Grimm et al. 2005, O'Brien et al. 2007, Mulholland et al. 2008). The negative relationship was either another indication that BDC is not N-saturated, or was simply an indirect effect of the influence of discharge on both stream ambient NO_3^- and uptake length. Higher specific discharge was correlated with lower background NO_3^- and longer uptake lengths, thus explaining the apparent correlation between long uptake lengths and low background NO_3^- concentrations. Therefore, it appears that specific discharge more strongly predicts uptake length than background stream NO_3^- concentrations.

Autumn NO_3^- Additions

When comparing the autumn NO_3^- uptake velocity, or the demand for NO_3^-, to published literature values, it is apparent that NO_3^- removal at BDC is less efficient than some forested, headwater streams (Hoellein et al. 2007), though significantly more efficient than most agricultural reaches (Birgand et al. 2005- Table 5). Uptake efficiency at BDC was within the range of values found in the LINX II project (Mulholland et al. 2008).

The discrepancy between NO_3^- uptake at BDC and other agricultural streams can be attributed to basic stream characteristics. Unlike BDC, typical agricultural reaches are un-buffered ditches draining pastures and crop fields. The lack of canopy cover, and therefore higher light availability and stream temperatures often leads to significantly higher ambient NO_3^- concentrations and rates of primary production (Bernot et al. 2006). Additionally, because these ditches are designed to quickly divert water away from fields, stream flow is often higher, resulting in reduced NO_3^- contact with the benthos. At BDC, the large forested riparian buffer significantly reduces NO_3^- loading and provides shade, reducing stream temperature and light availability. At BDC there is little aquatic plant or algal growth, which is an indication of low primary productivity. Because agricultural streams often receive high loads of NO_3^-, these systems can become N-saturated, resulting in reduced NO_3^- uptake efficiency (Birgand et al. 2005, Bernot et al. 2006, Mulholland et al. 2008).

Table 5. Comparison of NO_3^- uptake measurements from BDC and from other published studies. Where possible, the range of values was given, otherwise the mean value was provided. * is the inter-quartile range rather than the full range. -- signifies that the data was not reported. Methods: 1=NO_3^- addition; 2=^{15}N addition.

Stream Type	Location	S_w (m)	U (ug N m^{-2} min^{-1})	V_f (mm min^{-1})	Method	NO_3^- (mg N L^{-1})	Q (L sec^{-1})	Reference
Agricultural, 1st order	Lee, NH	111-752	114-712	0.25-0.60	1	0.4-1.2	1-4	This study-autumn only
Mixed, 1st order	North America, Puerto Rico	20-18,332	0.3-7,594	0.02-17.9	2	<0.01-21.2	0.2-267.9	Hall et al. 2009
Mixed, 1st order	Various	101-478	5.8-19.1*	0.8-4.2	1, 2	--	--	Ensign and Doyle 2006
Urban, 1st order	Baltimore, MD	356-1341	150-1050	0.08-0.34	1	0.5-1.8	2-5	Klocker et al. 2009
Grassland, 1st order	South Island, New Zealand	57-704	2-39	1.10-12.40	1, 2	0.003-0.005	15-23	Simon et al. 2005
Agricultural	Various	--	243-868	0.05-0.17	Various	--	--	Birgand et al. 2005
Forested, 1st order	Untonagon River basin, MI	348-556	472-1213	2.70-7.56	1	0.3	40-68	Hoellein et al. 2007

One of the primary differences between the autumn additions and the April and July additions at BDC was carbon availability, potentially indicating carbon-limitation. Carbon inputs to streams from leaf-fall in autumn are a significant energy source and can be responsible for as much as 11% of the total annual respiration in headwater streams in New England (McDowell and Fisher 1976). For two of the autumn additions DOC was twice as high as in the April and July additions. Of the autumn additions the October 17th and November 22nd additions had the highest uptake velocity and uptake rate, shortest uptake length, and lowest DOC. The lower DOC may be an indication of higher heterotrophic carbon uptake and autotrophic carbon-fixation, resulting in higher NO_3^- uptake due to C:N stoichiometry (Hall and Tank 2003). Tank and Webster (1998) note that heterotrophic activity is often carbon-limited and is therefore higher in autumn during leaf fall.

Carbon-limitation of NO_3^- uptake at BDC is further suggested by the inverse relationship between stream DOC and NO_3^- throughout 2009. This relationship has also been documented in other New England streams (Goodale et al. 2005), and in experimental additions of leaf litter and labile DOC (Hedin et al. 1998, Bernhardt and Likens 2002). This inverse relationship not only highlights the importance of available carbon in NO_3^- uptake, but also demonstrates that changes in DOC availability can impact NO_3^- uptake (Goodale et al. 2005).

While leaf-litter provides a carbon source to the stream, leaf-fall also corresponds to increased light availability to the stream. Autotrophic demand plays a key role in NO_3^- uptake and is often light-limited (Mulholland et al. 2008). The dense canopy cover at BDC during the summer may have inhibited autotrophic activity. It is unlikely that light-limitation influenced biological activity in April because the addition was conducted prior to leaf-out.

Potential Sediment Denitrification Rates

Sediment denitrification rates in this study were likely overestimates of actual rates in the field because they were measured under non-limiting conditions (i.e. anoxia, sufficient NO_3^- and carbon). As predicted, DM denitrification rates were highest at BDC-500 where the underlying stream sediment was predominantly organic matter, and the percent organic content was highest (7.4%). When expressed as AFDM, however, denitrification rates were highest at BDC-300. AFDM at BDC-300 likely primarily represents microbial organic content since the sediment is predominantly inorganic material (Inwood et al. 2007). In contrast, the organic content at BDC-500 and BDC-60 is high and therefore AFDM most likely includes both microbial organic content and organic matter. Despite the apparent differences in denitrification rates, there were no statistical differences between sites, likely a result of high variance which is typical in denitrification studies (Groffman et al. 2006, Seitzinger et al. 2006).

Overall, potential denitrification rates for both DM and AFDM sediment and areal denitrification were within the range of published values (Table 6). Denitrification velocity was also within the range of values found in headwater agricultural streams (Royer et al. 2004).

Table 6. Comparison of sediment denitrification rates and areal sediment denitrification at BDC and in published studies. DM= dry mass sediment and AFDM= ash free dry mass sediment. U_{den} is areal denitrification. ** signifies that the data were extrapolated from figures. -- signifies that the data was not provided. All U_{den} values are for DM sediment only. Methods: 1= Denitrification Enzyme Assay (DEA- NO_3^-, dextrose, Chloramphenicol, acetylene (C_2H_2)); 2= DEA (Chloramphenicol, C_2H_2); 3= ^{15}N addition; 4= DEA (Chloramphenicol, C_2H_2, glucose).

Stream Type	Location	Sediment	Denitrification Rate (ug N g soil^{-1} hr^{-1})	U_{den} (mg N m^{-2} day^{-1})	Method	Reference
Agricultural, 1st order	Lee, NH	DM	<0.01-0.05	--	1	This study
Urban, 1st order	Baltimore, MD	DM	<0.01-0.07		1	Klocker et al. 2009
Forested, agricultural, urban, 1st order	Kalamazoo River basin, MI	DM	0.1-1.0*		2	Inwood et al. 2005
Forested, 1st order	Walker Branch, TN	AFDM	--	3.9	3	Mulholland et al. 2004
Agricultural, 1st order	Lee, NH	AFDM	0.01-1.93	4.9 -14.9	1	This study
Agricultural 1st order	Sangamon, Embarras, and Kaskaskia Rivers, IL	AFDM	0.20- 24.82	0.2 - 360.0	2	Royer et al. 2004
Forested, agricultural, urban, 1st order	Kalamazoo River basin, MI	AFDM	3-18*	0.7 - 15.6	2	Inwood et al. 2005
Forested, 1st order	North America, Puerto Rico	AFDM	11.8	2	4	Findlay et al. In press
Agricultural, 1st order			107.0	5.4		
Urban, 1st order			94.2	6.1		

At BDC a maximum of 4% of the daily NO_3^- load over the 516 m reach was removed via denitrification. Actual removal is likely lower, where the sediments may not be completely anoxic and carbon may be limiting, which is often the case with denitrification (Seitzinger et al. 2006). As reviewed by Bernot and Dodds (2005), denitrification typically accounts for 1-20% of NO_3^- removal in streams. More recently the LINX II experiments demonstrated that on average, denitrification is responsible for 16% of NO_3^- removal in small streams (Mulholland et al. 2009).

Conclusions

The results of this study suggest that NO_3^- is only taken up in autumn during leaf fall, and denitrification is responsible for a small portion of NO_3^- removal. Overall the stream appears to be co-limited by light and carbon availability, since uptake was only detected in autumn, when both were highest. There are several pathways in which NO_3^- can be removed from the water column (burial, DNRA, denitrification, autotrophic and heterotrophic assimilation). Based on the NO_3^- additions and denitrification assays as well as chemistry data collected throughout the year it is apparent that heterotrophic assimilation most likely dominates NO_3^- uptake at BDC, while the other pathways are negligible.

First, NO_3^- does not sorb well to sediments so burial is likely not responsible for a significant portion of NO_3^- removal. Second, DNRA, the conversion of NO_3^- back to NH_4^+, is likely minimal if occurring at all because it is most common in systems with low NO_3^- and high carbon availability (Tiedje 1988), which is not characteristic of BDC. Third, based on my measurements of potential denitrification, this pathway is responsible for a very small portion of NO_3^- removal. Fourth, autotrophic assimilation is likely low because the creek supports very few rooted aquatic plants, and algae were only observed in small sections of the creek on two occasions in spring. Additionally, the lack of measurable NO_3^- uptake during the spring addition, when light availability was high and autotrophic activity would presumably also have been high, suggests little influence of autotrophic assimilation on NO_3^- uptake. Finally, heterotrophic activity is often carbon limited (Tank and Webster 1998) and given that NO_3^- was only taken up in autumn during leaf fall, this is most likely the dominant form of NO_3^- removal in BDC.

This study highlights the importance of further research on seasonal differences in NO_3^- uptake in headwater streams. NO_3^- dynamics at BDC are influenced by factors that vary temporally (e.g. stream discharge, carbon availability) and therefore uptake and denitrification exhibit seasonal variation. On average, 87% of the daily NO_3^- load was taken up in autumn whereas NO_3^- uptake was not detectable in spring or summer. More research in this area will enable scientists to further understand what drives NO_3^- uptake, especially in areas like New England where seasons are pronounced.

Because NO_3^- uptake is minimal in BDC for the majority of the year, it is imperative that agricultural planners work to minimize NO_3^- loading into BDC. Since a primary source of NO_3^- to BDC appears to be the tributary, N-loading may be minimized by either creating a vegetative buffer or minimizing contact of cows with the tributary. The results of this study have implications for Great Bay Estuary, an estuary that has recently been listed as N-impaired, and the Lamprey River, the local drinking water supply.

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APPENDIX

Table 7. BDC stream chemistry data for bi-monthly samples. -- signifies that the data was not collected.

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
84657	BDC-0	1/23/2009	4.28	75	142	12.88	88.3	0.52
84658	BDC-50	1/23/2009	3.95	85	159	14.67	101.4	0.33
84659	BDC-100	1/23/2009	4.23	85	161	15.29	105.1	0.12
84660	BDC-150	1/23/2009	4.72	83	157	15.44	106.4	0.24
84661	BDC-200	1/23/2009	4.99	86	164	15.33	105.1	0.05
84662	BDC-250	1/23/2009	5.12	87	166	14.52	99.8	0.12
84663	BDC-300	1/23/2009	5.18	86	165	13.46	92.2	0.02
84664	BDC-350	1/23/2009	5.12	89	170	13.25	91.2	0.11
84665	BDC-400	1/23/2009	5.35	80	154	12.20	83.5	0.02
84666	BDC-450	1/23/2009	5.24	85	163	11.76	80.7	0.04
84667	BDC-500	1/23/2009	5.29	82	157	9.82	67.2	0.02
85557	BDC-0	2/17/2009	4.43	72	136	--	--	0.23
85558	BDC-50	2/17/2009	4.19	89	169	15.05	103.0	0.02
85559	BDC-100	2/17/2009	4.17	91	173	16.31	112.2	0.15
85560	BDC-150	2/17/2009	4.01	93	178	16.81	115.6	0.09
85561	BDC-200	2/17/2009	4.06	96	183	16.22	111.5	0.08
85562	BDC-250	2/17/2009	3.91	97	184	16.04	110.2	0.11
85563	BDC-300	2/17/2009	3.82	98	186	15.7	108.3	0.16
85564	BDC-350	2/17/2009	3.82	100	189	14.16	97.5	0.30
85565	BDC-400	2/17/2009	3.74	89	170	14.84	101.8	0.05
85566	BDC-450	2/17/2009	3.73	81	154	13.66	94.1	0.07
85567	BDC-500	2/17/2009	3.67	92	175	12.13	83.6	0.18

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm[c])	DO (mg/L)	DO (%)	Stream Temp. (˚C)
85815	BDC-0	3/13/2009	4.25	9	16	4.25	47.7	0.04
85816	BDC-50	3/13/2009	4.12	6	12	4.12	41.3	0.03
85817	BDC-100	3/13/2009	4.59	10	20	4.59	68.6	0.03
85818	BDC-150	3/13/2009	4.61	23	43	4.61	75.3	0.03
85819	BDC-200	3/13/2009	4.63	40	76	4.63	79.8	0.04
85820	BDC-250	3/13/2009	4.39	51	97	11.4	78.5	0.06
85821	BDC-300	3/13/2009	4.60	57	108	11.2	77.0	0.07
85822	BDC-350	3/13/2009	4.65	66	125	7.21	49.6	0.10
85823	BDC-400	3/13/2009	4.63	62	119	6.73	46.2	0.03
85824	BDC-450	3/13/2009	4.78	70	135	5.60	38.3	0.02
85825	BDC-500	3/13/2009	4.91	72	138	5.23	36.1	0.05
85826	BDC-516	3/13/2009	4.24	11	21	5.28	36.6	0.13
86926	BDC-0	4/8/2009	6.50	42	65	9.16	74.2	6.17
86927	BDC-50	4/8/2009	6.43	37	58	9.54	76.6	5.95
86928	BDC-100	4/8/2009	6.47	43	70	9.60	74.5	4.53
86929	BDC-150	4/8/2009	6.69	39	66	11.20	84.2	3.19
86930	BDC-200	4/8/2009	6.80	48	83	11.96	88.9	2.98
86931	BDC-250	4/8/2009	6.71	49	84	11.86	88.2	3.01
86932	BDC-300	4/8/2009	6.76	49	85	11.70	87.3	3.03
86933	BDC-350	4/8/2009	6.72	50	86	10.78	80.2	3.05
86934	BDC-400	4/8/2009	6.72	46	79	10.22	76.6	3.31
86935	BDC-450	4/8/2009	6.57	48	82	9.80	73.6	3.36
86936	BDC-500	4/8/2009	6.45	47	80	9.23	69.4	3.44
86937	BDC-516	4/8/2009	6.47	46	79	8.91	67.1	3.51
86938	BDC-Trib	4/8/2009	7.05	42	76	12.17	87.6	1.76
88023	BDC-0	5/12/2009	5.60	95	135	10.57	92.1	9.29
88024	BDC-50	5/12/2009	6.20	101	145	10.11	87.5	9.09
88025	BDC-100	5/12/2009	7.34	110	155	11.15	98.4	9.80
88026	BDC-150	5/12/2009	7.34	111	157	11.24	99.0	9.75

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
88027	BDC-200	5/12/2009	7.46	116	163	10.77	95.1	9.83
88028	BDC-250	5/12/2009	7.37	102	142	10.79	96.0	10.13
88029	BDC-300	5/12/2009	7.34	120	166	10.12	90.5	10.39
88030	BDC-350	5/12/2009	7.25	123	167	9.58	87.4	11.22
88031	BDC-400	5/12/2009	7.19	116	155	9.05	83.7	11.83
88032	BDC-450	5/12/2009	7.01	117	155	8.76	81.4	12.03
88033	BDC-500	5/12/2009	6.93	122	159	7.22	68.2	12.82
88034	BDC-516	5/12/2009	6.99	137	177	7.65	73.1	13.11
88035	BDC-Trib	5/12/2009	7.28	123	170	10.59	94.9	10.47
88137	BDC-0	5/27/2009	7.08	99	139	9.52	84.6	10.14
88138	BDC-50	5/27/2009	7.05	111	154	9.68	86.5	10.31
88139	BDC-100	5/27/2009	7.00	112	155	10.44	93.3	10.34
88140	BDC-150	5/27/2009	7.21	82	113	10.86	97.0	10.32
88141	BDC-200	5/27/2009	7.29	115	160	10.61	94.8	10.32
88142	BDC-250	5/27/2009	7.26	114	163	10.46	93.6	10.24
88143	BDC-300	5/27/2009	7.26	113	158	9.96	88.4	10.30
88144	BDC-350	5/27/2009	7.19	113	156	9.01	81	10.54
88145	BDC-400	5/27/2009	7.20	106	143	9.92	89.5	10.84
88146	BDC-450	5/27/2009	7.11	104	142	8.94	81	10.99
88147	BDC-500	5/27/2009	6.95	111	139	7.03	64.1	11.20
88148	BDC-516	5/27/2009	6.85	115	153	6.62	60.6	11.37
88217	BDC-0	6/2/2009	6.95	110	143	8.09	77	12.89
88218	BDC-50	6/2/2009	7.31	128	160	9.94	97.4	14.36
88219	BDC-100	6/2/2009	7.24	129	161	9.15	89.7	14.43
88220	BDC-150	6/2/2009	7.47	132	166	9.40	97.1	14.46
88221	BDC-200	6/2/2009	7.50	134	167	9.06	89.3	14.60
88222	BDC-250	6/2/2009	7.40	136	170	9.49	93.3	14.56
88223	BDC-300	6/2/2009	7.36	137	171	8.92	87.7	14.53
88224	BDC-350	6/2/2009	7.29	140	173	8.40	84.0	15.08

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^{c})	DO (mg/L)	DO (%)	Stream Temp. (˚C)
88225	BDC-400	6/2/2009	7.26	118	143	8.48	85.8	15.84
88226	BDC-450	6/2/2009	7.11	118	142	7.54	76.7	16.16
88227	BDC-500	6/2/2009	6.81	116	138	5.54	56.9	16.50
88228	BDC-516	6/2/2009	6.68	124	147	5.41	56.3	16.75
88659	BDC-0	6/18/2009	7.38	69	85	12.24	121.4	15.27
88660	BDC-50	6/18/2009	7.43	99	127	12.19	116.7	13.53
88661	BDC-100	6/18/2009	7.78	121	158	13.71	129.6	12.72
88662	BDC-150	6/18/2009	8.02	125	163	15.53	146.4	12.69
88663	BDC-200	6/18/2009	8.17	127	165	14.75	139.3	12.68
88664	BDC-250	6/18/2009	8.17	129	169	14.75	139.2	12.67
88665	BDC-300	6/18/2009	8.20	116	152	13.39	123.8	12.69
88666	BDC-350	6/18/2009	8.19	131	170	12.79	121.4	12.92
88667	BDC-400	6/18/2009	8.16	112	143	12.59	120.9	13.50
88668	BDC-450	6/18/2009	7.93	111	141	11.46	110.4	13.68
88669	BDC-500	6/18/2009	7.95	112	143	8.26	80.7	13.73
88670	BDC-516	6/18/2009	7.88	118	150	6.83	66.0	13.76
89046	BDC-0	7/8/2009	8.27	139	156	9.15	90.7	14.93
89047	BDC-50	7/8/2009	8.00	147	181	8.96	89.3	15.16
89048	BDC-100	7/8/2009	8.08	158	184	9.10	90.7	15.20
89049	BDC-150	7/8/2009	8.20	152	184	9.06	90.3	15.24
89050	BDC-200	7/8/2009	8.17	162	189	8.63	86.1	15.29
89051	BDC-250	7/8/2009	7.94	154	175	8.85	89.0	15.33
89052	BDC-300	7/8/2009	7.80	170	195	7.87	78.1	15.36
89053	BDC-350	7/8/2009	7.81	164	201	6.7	67.1	15.42
89054	BDC-400	7/8/2009	7.82	148	174	7.16	66.0	15.09
89055	BDC-450	7/8/2009	7.67	140	179	6.64	57.1	15.07
89056	BDC-500	7/8/2009	7.74	148	184	5.74	55.2	15.07
89057	BDC-516	7/8/2009	7.79	136	172	5.57	71.3	15.15
89058	BDC-Trib	7/8/2009	7.75	236	281	4.8	49.3	16.55

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm[c])	DO (mg/L)	DO (%)	Stream Temp. (˚C)
89386	BDC-0	7/20/2009	7.17	96	124	6.67	63.8	13.24
89387	BDC-50	7/20/2009	7.27	140	170	8.57	86.1	15.62
89388	BDC-100	7/20/2009	7.40	142	173	8.5	85.4	15.58
89389	BDC-150	7/20/2009	7.46	143	175	8.7	87.4	15.53
89390	BDC-200	7/20/2009	7.50	145	177	7.93	79.3	15.52
89391	BDC-250	7/20/2009	7.42	144	176	8.3	83.3	15.54
89392	BDC-300	7/20/2009	7.32	148	180	7.53	75.5	15.49
89393	BDC-350	7/20/2009	7.35	151	183	7.37	74.4	15.84
89394	BDC-400	7/20/2009	7.33	131	155	7.07	72.2	16.76
89395	BDC-450	7/20/2009	7.11	131	154	6.38	65.9	16.93
89396	BDC-500	7/20/2009	6.94	132	155	3.63	37.6	17.08
89397	BDC-516	7/20/2009	6.89	144	169	3.59	37.2	17.14
89398	BDC-Trib	7/20/2009	7.29	272	350	7.2	69.0	13.29
90491	BDC-0	8/30/2009	6.85	89	107	12	129.0	16.44
90492	BDC-50	8/30/2009	7.25	107	130	11.59	116.4	16.55
90493	BDC-100	8/30/2009	7.34	107	128	11.2	112.6	15.65
90494	BDC-150	8/30/2009	7.29	117	129	10.92	110.0	15.71
90495	BDC-200	8/30/2009	7.35	116	137	10.49	106.0	15.81
90496	BDC-250	8/30/2009	7.11	109	132	10.12	102.2	15.81
90497	BDC-300	8/30/2009	7.07	127	155	9.81	97.2	15.87
90498	BDC-350	8/30/2009	6.91	122	143	8.93	90.4	15.96
90499	BDC-400	8/30/2009	6.75	106	127	8.85	90.5	16.37
90500	BDC-450	8/30/2009	6.58	107	128	8.13	83.3	16.45
90501	BDC-500	8/30/2009	6.57	114	136	7.71	79.2	16.58
90502	BDC-516	8/30/2009	6.58	133	159	6.74	69.0	16.44
90503	BDC-Trib	8/30/2009	6.72	106	135	8.01	81.6	16.28
90726	BDC-0	9/9/2009	6.94	167	211	28.74	--	14.12
90727	BDC-50	9/9/2009	6.94	171	215	10.45	102.2	14.24
90728	BDC-100	9/9/2009	7.11	175	220	10.81	105.3	14.15

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
90729	BDC-150	9/9/2009	7.40	174	220	12.33	170.1	14.13
90730	BDC-200	9/9/2009	7.36	174	220	9.56	93.0	14.04
90731	BDC-250	9/9/2009	7.33	178	226	10.77	103.6	13.82
90732	BDC-300	9/9/2009	7.24	179	229	9.03	86.8	13.53
90733	BDC-350	9/9/2009	7.24	181	231	10.44	100.6	13.64
90734	BDC-400	9/9/2009	7.51	155	195	9.45	92.8	14.46
90735	BDC-450	9/9/2009	7.20	154	193	8.51	83.6	14.47
90736	BDC-500	9/9/2009	6.99	156	195	5.32	52.3	14.49
90737	BDC-516	9/9/2009	6.90	170	212	5.82	57.8	14.55
90738	BDC-Trib	9/9/2009	7.24	224	293	10.84	101.8	12.60
90897	BDC-0	9/23/2009	6.72	170	217	9.71	94.2	13.90
90898	BDC-50	9/23/2009	6.76	186	236	8.72	84.3	13.83
90899	BDC-100	9/23/2009	6.74	189	241	8.30	80.0	13.68
90900	BDC-150	9/23/2009	6.73	187	240	9.25	89.0	13.55
90901	BDC-200	9/23/2009	6.48	188	244	6.17	58.8	13.06
90902	BDC-250	9/23/2009	6.63	187	239	8.37	80.4	13.56
90903	BDC-300	9/23/2009	6.51	189	243	7.75	74.2	13.37
90904	BDC-350	9/23/2009	6.50	194	248	7.51	72.2	13.55
90905	BDC-400	9/23/2009	6.57	164	203	8.21	80.6	14.51
90906	BDC-450	9/23/2009	6.46	112	140	7.67	75.3	14.53
90907	BDC-500	9/23/2009	6.37	177	216	4.77	46.8	14.55
90908	BDC-516	9/23/2009	6.35	154	208	4.3	42.3	14.54
91033	BDC-0	10/2/2009	7.38	136	205	4.98	41.1	7.30
91034	BDC-30	10/2/2009	7.46	139	210	4.96	41.2	7.23
91035	BDC-60	10/2/2009	7.44	121	182	4.96	41.2	7.29
91036	BDC-100	10/2/2009	7.47	139	210	5.04	42.1	7.28
91037	BDC-150	10/2/2009	7.48	140	211	4.97	41.2	7.30
91038	BDC-200	10/2/2009	7.46	140	212	5.62	46.6	7.27
91039	BDC-250	10/2/2009	7.25	131	198	4.57	37.9	7.27

UNH ID	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
91040	BDC-300	10/2/2009	7.16	144	216	4.17	34.8	7.39
91041	BDC-350	10/2/2009	7.08	145	218	3.85	32.1	7.46
91042	BDC-400	10/2/2009	7.08	117	178	2.97	24.2	7.08
91043	BDC-450	10/2/2009	7.04	123	186	2.68	22.4	7.31
91044	BDC-500	10/2/2009	6.93	123	184	4.79	40.0	7.52
91045	BDC-505	10/2/2009	6.88	127	191	4.78	40.0	7.61
91046	BDC-510	10/2/2009	6.81	126	188	4.74	39.7	7.64
91047	BDC-516	10/2/2009	6.78	127	189	4.57	38.5	7.80
91048	BDC-Trib	10/2/2009	7.29	121	184	6.13	50.5	6.98
92383	BDC-0	12/11/2009	6.83	57	107	25.09	85.8	0.28
92384	BDC-50	12/11/2009	6.68	57	108	18.94	--	0.10
92385	BDC-100	12/11/2009	6.75	57	108	17.34	--	0.09
92386	BDC-150	12/11/2009	6.67	53	102	17.17	--	0.10
92387	BDC-200	12/11/2009	6.72	61	116	15.60	--	0.01
92388	BDC-250	12/11/2009	6.75	61	116	14.43	--	0.06
92389	BDC-300	12/11/2009	6.72	61	117	13.88	--	0.10
92390	BDC-350	12/11/2009	6.75	62	118	12.51	--	0.20
92391	BDC-400	12/11/2009	6.72	58	111	12.18	--	0.02
92392	BDC-450	12/11/2009	6.53	59	112	14.20	--	0.05
92393	BDC-500	12/11/2009	6.56	60	115	10.75	--	0.12
92394	BDC-516	12/11/2009	6.50	71	136	10.41	--	0.08
92395	BDC-Trib	12/11/2009	6.75	65	122	13.48	--	0.45

Table 8. BDC stream chemistry data for samples collected during additions. -- signifies that the data was not collected.

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
87189	Pre	BDC-0	4/16/2009	6.73	81	135	11.09	85.1	4.14

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm[c])	DO (mg/L)	DO (%)	Stream Temp. (˚C)
87190	Pre	BDC-30	4/16/2009	6.97	82	142	11.36	84.0	2.82
87191	Pre	BDC-60	4/16/2009	7.00	82	144	12.03	89.4	2.86
87192	Pre	BDC-60	4/16/2009	7.00	82	144	12.03	89.4	2.86
87193	Pre	BDC-105	4/16/2009	7.06	85	147	12.57	93.1	2.87
87194	Pre	BDC-120	4/16/2009	7.03	81	141	12.54	92.8	2.87
87195	Pre	BDC-135	4/16/2009	7.02	85	148	12.70	94.0	2.84
87196	Pre	BDC-150	4/16/2009	6.94	83	144	12.98	95.9	2.83
87197	Pre	BDC-225	4/16/2009	7.38	89	154	13.58	100.6	2.85
87198	Pre	BDC-300	4/16/2009	7.45	90	155	12.5	42.7	2.91
87199	Pre	BDC-400	4/16/2009	7.26	84	143	11.59	86.6	3.20
87200	Pre	BDC-450	4/16/2009	6.94	85	144	10.57	79.3	3.35
87201	Pre	BDC-Trib	4/16/2009	7.11	110	201	13.50	96.0	1.32
87202	Pre	BDC-Trib	4/16/2009	7.11	110	201	13.50	96.0	1.32
87203	Pre	BDC-505	4/16/2009	6.85	85	144	8.25	65.9	3.45
87204	Pre	BDC-510	4/16/2009	6.84	82	139	8.52	64.1	3.45
89140	Pre	BDC-30	7/13/2009	--	112	139	8.71	86.5	15.01
89141	Pre	BDC-60	7/13/2009	--	118	146	9.10	90.9	14.84
89142	Pre	BDC-100	7/13/2009	--	119	147	9.17	90.6	14.80
89143	Pre	BDC-150	7/13/2009	--	121	150	9.18	90.6	14.72
89144	Pre	BDC-200	7/13/2009	--	123	153	9.27	91.3	14.65
89145	Pre	BDC-250	7/13/2009	--	125	156	10.29	101.7	14.57
89146	Pre	BDC-300	7/13/2009	--	129	162	8.33	81.8	14.46
89147	Pre	BDC-400	7/13/2009	--	109	135	8.19	81.8	14.93
89148	Pre	BDC-450	7/13/2009	--	109	135	7.19	71.3	14.92
89149	Pre	BDC-505	7/13/2009	--	111	138	5.26	52.0	14.87
89150	Pre	BDC-510	7/13/2009	--	111	138	5.01	49.6	14.87
89154	Plateau	BDC-60	7/13/2009	--	150	178	8.82	91.0	16.82
89164	Plateau	BDC-300	7/13/2009	--	164	198	7.98	81.3	16.21
89179	Post	BDC-30	7/14/2009	7.15	117	141	7.84	78.8	15.73

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm[c])	DO (mg/L)	DO (%)	Stream Temp. (˚C)
89180	Post	BDC-60	7/14/2009	7.26	118	145	8.48	84.2	15.09
89181	Post	BDC-100	7/14/2009	7.45	120	148	8.54	85.0	15.18
89182	Post	BDC-150	7/14/2009	7.53	122	150	8.88	88.2	15.07
89183	Post	BDC-200	7/14/2009	7.58	124	152	8.23	82.3	15.22
89184	Post	BDC-250	7/14/2009	7.48	125	154	8.62	85.7	15.11
89185	Post	BDC-300	7/14/2009	7.38	124	154	7.94	78.8	15.00
89186	Post	BDC-400	7/14/2009	7.33	108	130	7.60	77.3	16.14
89187	Post	BDC-450	7/14/2009	7.16	108	129	7.25	73.9	16.39
89188	Post	BDC-505	7/14/2009	6.88	109	129	5.33	54.8	16.68
89189	Post	BDC-510	7/14/2009	6.91	109	130	5.02	51.6	16.6
89190	Post	BDC-Trib	7/14/2009	7.31	240	313	7.86	74.4	12.77
89827	Pre	BDC-30	8/6/2009	7.28	122	144	9.53	98.6	16.74
89828	Pre	BDC-60	8/6/2009	7.31	130	155	9.01	92.4	16.50
89829	Pre	BDC-100	8/6/2009	7.48	132	158	9.24	94.6	16.44
89830	Pre	BDC-150	8/6/2009	7.51	135	162	9.11	93.0	16.33
89831	Pre	BDC-200	8/6/2009	7.52	137	135	9.30	95.3	16.70
89832	Pre	BDC-250	8/6/2009	7.36	139	168	8.66	87.9	16.06
89833	Pre	BDC-300	8/6/2009	7.30	141	170	8.21	83.3	15.97
89834	Pre	BDC-350	8/6/2009	7.29	144	174	8.33	84.7	16.03
89835	Pre	BDC-400	8/6/2009	7.46	122	145	7.75	79.9	16.75
89839	Pre	BDC-Trib	8/6/2009	7.51	379	443	2.99	31.3	17.79
89840	Pre	BDC-Trib	8/6/2009	7.53	383	446	3.08	37.3	17.56
89841	Pre	BDC-Trib	8/6/2009	7.30	392	455	0.98	10.4	17.79
89844	Plateau	BDC-60	8/6/2009	7.38	196	222	7.93	85.4	18.95
89850	Plateau	BDC-200	8/6/2009	6.16	242	273	7.38	79.8	19.08
89862	Plateau	BDC-60	8/6/2009	7.38	210	237	7.84	85.4	19.18
89888	Post	BDC-30	8/7/2009	7.32	137	158	7.52	79.9	17.88
89889	Post	BDC-60	8/7/2009	7.34	138	160	7.66	80.6	17.81
89890	Post	BDC-100	8/7/2009	7.40	142	164	7.88	83.2	17.97

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
89891	Post	BDC-150	8/7/2009	7.46	144	167	8.09	85.6	18.06
89892	Post	BDC-200	8/7/2009	7.49	148	170	7.35	78.1	18.09
89893	Post	BDC-250	8/7/2009	7.37	150	174	7.69	81.0	17.83
89894	Post	BDC-300	8/7/2009	7.43	151	175	6.89	72.5	17.74
89895	Post	BDC-350	8/7/2009	7.34	153	175	6.86	72.8	18.21
89896	Post	BDC-400	8/7/2009	7.47	131	146	7.16	78.4	19.74
89897	Post	BDC-Trib	8/7/2009	7.54	313	372	5.87	60.6	16.79
91108	Pre	BDC-125	10/6/2009	--	101	142	6.98	61.7	9.81
91110	Pre	BDC-150	10/6/2009	--	110	154	6.91	60.9	9.81
91112	Pre	BDC-175	10/6/2009	--	113	160	7.04	62.1	9.79
91114	Pre	BDC-200	10/6/2009	--	114	161	6.63	58.4	9.77
91116	Pre	BDC-225	10/6/2009	--	115	162	6.12	53.9	9.72
91118	Pre	BDC-250	10/6/2009	--	114	162	6.11	53.8	9.69
91120	Pre	BDC-275	10/6/2009	--	108	162	5.92	52.1	9.71
91122	Pre	BDC-300	10/6/2009	--	112	158	5.9	52.0	9.77
91124	Pre	BDC-325	10/6/2009	--	112	167	5.09	44.9	9.85
91126	Pre	BDC-350	10/6/2009	--	118	165	4.94	43.8	9.93
91128	Pre	BDC-400	10/6/2009	--	101	141	4.83	42.9	10.09
91130	Pre	BDC-Trib	10/6/2009	--	159	226	5.24	47.2	10.58
91131	Plateau	BDC-125	10/6/2009	--	188	246	--	--	12.58
91140	Plateau	BDC-200	10/6/2009	--	177	233	6.12	57.4	12.52
91165	Post	BDC-125	10/7/2009	8.86	101	137	--	--	11.31
91166	Post	BDC-150	10/7/2009	8.87	102	131	--	--	11.32
91167	Post	BDC-175	10/7/2009	8.81	98	132	--	--	11.33
91168	Post	BDC-200	10/7/2009	8.85	115	130	--	--	11.35
91169	Post	BDC-225	10/7/2009	8.85	101	126	--	--	11.37
91170	Post	BDC-250	10/7/2009	8.76	112	130	--	--	11.38
91171	Post	BDC-275	10/7/2009	8.87	112	129	--	--	11.38
91172	Post	BDC-300	10/7/2009	8.75	101	136	--	--	11.43

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
91173	Post	BDC-325	10/7/2009	8.74	110	136	--	--	11.46
91174	Post	BDC-350	10/7/2009	8.73	115	136	--	--	11.44
91175	Post	BDC-400	10/7/2009	8.72	121	152	--	--	11.65
91176	Post	BDC-Trib	10/7/2009	8.67	93	125	--	--	11.33
91289	Pre	BDC-60	10/17/2009	6.16	86	149	12.57	94.1	3.03
91291	Pre	BDC-100	10/17/2009	6.00	87	150	11.46	85.2	3.02
91293	Pre	BDC-125	10/17/2009	5.98	88	151	11.59	86.3	3.05
91295	Pre	BDC-150	10/17/2009	5.88	88	151	11.81	87.9	3.10
91297	Pre	BDC-175	10/17/2009	5.95	88	152	11.57	86.3	3.15
91299	Pre	BDC-200	10/17/2009	5.93	88	151	10.49	78.7	3.30
91301	Pre	BDC-225	10/17/2009	5.89	88	151	9.85	73.7	3.18
91303	Pre	BDC-250	10/17/2009	5.85	89	152	9.49	70.8	3.16
91305	Pre	BDC-275	10/17/2009	5.58	88	151	9.27	69.3	3.20
91307	Pre	BDC-300	10/17/2009	5.83	90	154	9.12	68.3	3.29
91309	Pre	BDC-325	10/17/2009	5.86	90	155	8.52	63.7	3.26
91311	Pre	BDC-350	10/17/2009	5.85	92	156	7.45	56.1	3.47
91313	Pre	BDC-400	10/17/2009	5.73	79	138	7.23	53.4	2.81
91315	Pre	BDC-Trib	10/17/2009	6.10	129	199	8.64	70.4	6.56
91317	Plateau	BDC-125	10/17/2009	7.00	131	206	10.29	82.7	5.99
91326	Plateau	BDC-200	10/17/2009	7.25	164	259	11.28	90.2	5.79
91353	Post	BDC-60	10/18/2009	6.98	107	172	10.15	80.2	5.29
91354	Post	BDC-100	10/18/2009	7.22	105	168	9.58	75.5	5.22
91355	Post	BDC-125	10/18/2009	7.15	105	169	10.11	79.8	5.31
91356	Post	BDC-150	10/18/2009	7.05	82	139	10.52	83	5.32
91357	Post	BDC-175	10/18/2009	7.10	105	168	10.75	84.8	5.31
91358	Post	BDC-200	10/18/2009	7.13	106	170	10.09	79.7	5.31
91359	Post	BDC-225	10/18/2009	6.99	108	174	9.60	75.8	5.32
91360	Post	BDC-250	10/18/2009	6.94	109	174	9.31	73.7	5.37
91361	Post	BDC-275	10/18/2009	6.98	109	174	8.90	70.6	5.41

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
91362	Post	BDC-300	10/18/2009	7.01	110	175	9.15	72.7	5.58
91363	Post	BDC-325	10/18/2009	7.19	107	170	8.60	68.5	5.63
91364	Post	BDC-350	10/18/2009	7.00	106	167	7.76	61.9	5.79
91365	Post	BDC-400	10/18/2009	6.80	98	157	8.12	64.1	5.33
91366	Post	BDC-500	10/18/2009	6.78	100	158	5.58	44.5	5.62
91367	Post	BDC-Trib	10/18/2009	6.94	122	186	8.27	68.4	7.18
91438	Pre	BDC-60	10/26/2009	6.91	83	129	--	--	6.26
91440	Pre	BDC-100	10/26/2009	5.82	71	110	10.59	86.1	6.37
91442	Pre	BDC-125	10/26/2009	5.61	70	108	10.89	88.2	6.26
91444	Pre	BDC-150	10/26/2009	5.66	70	109	11.00	88.9	6.25
91446	Pre	BDC-175	10/26/2009	5.75	70	110	10.93	88.3	6.22
91448	Pre	BDC-200	10/26/2009	5.78	71	111	10.55	85.2	6.19
91450	Pre	BDC-225	10/26/2009	5.76	71	112	9.71	78.3	6.14
91452	Pre	BDC-250	10/26/2009	5.73	72	112	9.30	74.9	6.06
91454	Pre	BDC-275	10/26/2009	5.75	72	112	9.32	74.9	6.06
91456	Pre	BDC-300	10/26/2009	5.68	72	113	9.35	75.2	6.05
91458	Pre	BDC-325	10/26/2009	5.72	72	114	8.87	71.3	6.02
91460	Pre	BDC-350	10/26/2009	5.70	72	113	7.67	61.7	6.03
91462	Pre	BDC-400	10/26/2009	5.67	68	110	7.04	56.4	6.02
91464	Pre	BDC-Trib	10/26/2009	5.72	83	129	8.72	64.9	5.87
91466	Plateau	BDC-60	10/26/2009	7.00	127	186	9.11	77.3	8.23
91478	Plateau	BDC-175	10/26/2009	5.92	111	164	10.52	89.4	8.25
91567	Post	BDC-60	10/27/2009	7.08	76	114	7.21	59.7	7.41
91568	Post	BDC-100	10/27/2009	7.15	98	145	7.16	60.0	7.63
91569	Post	BDC-125	10/27/2009	7.17	99	148	7.36	61.6	7.66
91570	Post	BDC-150	10/27/2009	7.12	101	152	7.63	63.4	7.65
91571	Post	BDC-175	10/27/2009	7.18	102	152	7.54	63.2	7.69
91572	Post	BDC-200	10/27/2009	7.19	103	153	7.20	60.4	7.71
91573	Post	BDC-225	10/27/2009	7.17	103	154	6.85	57.7	7.78

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm^c)	DO (mg/L)	DO (%)	Stream Temp. (˚C)
91574	Post	BDC-250	10/27/2009	7.09	104	155	6.60	55.7	7.98
91575	Post	BDC-275	10/27/2009	7.10	105	156	6.60	55.8	8.04
91576	Post	BDC-300	10/27/2009	7.06	106	156	6.51	55.2	8.16
91577	Post	BDC-325	10/27/2009	7.07	107	157	6.41	54.5	8.23
91578	Post	BDC-350	10/27/2009	7.01	108	157	5.76	49.2	8.43
91579	Post	BDC-400	10/27/2009	6.96	100	146	5.63	48.1	8.52
91580	Post	BDC-Trib	10/27/2009	6.98	112	171	6.28	53.5	8.33
92048	Pre	BDC-79	11/22/2009	7.18	74	126	13.79	103.1	3.16
92050	Pre	BDC-100	11/22/2009	7.19	74	126	--	--	3.16
92052	Pre	BDC-125	11/22/2009	7.06	74	128	16.93	126.3	3.12
92054	Pre	BDC-150	11/22/2009	7.02	75	129	15.80	117.9	3.12
92056	Pre	BDC-175	11/22/2009	7.08	77	133	14.72	109.7	3.08
92058	Pre	BDC-200	11/22/2009	7.16	77	132	14.11	105.1	3.04
92060	Pre	BDC-225	11/22/2009	7.08	76	132	13.70	101.7	2.99
92062	Pre	BDC-250	11/22/2009	7.01	80	138	13.36	99.2	2.96
92064	Pre	BDC-275	11/22/2009	6.94	78	135	12.68	94.1	2.95
92066	Pre	BDC-300	11/22/2009	6.96	79	136	12.44	92.4	2.96
92068	Pre	BDC-325	11/22/2009	7.01	80	136	11.31	84.0	2.90
92070	Pre	BDC-350	11/22/2009	6.94	79	136	11.10	82.5	2.98
92072	Pre	BDC-400	11/22/2009	6.95	75	135	10.75	80.0	3.03
92074	Pre	BDC-Trib	11/22/2009	6.90	87	154	11.42	83.4	2.32
92080	Plateau	BDC-79	11/22/2009	7.28	94	153	12.41	97.3	5.06
92128	Post	BDC-79	11/24/2009	7.19	83	131	12.22	98.3	6.02
92129	Post	BDC-100	11/24/2009	7.23	84	131	12.00	96.7	6.09
92130	Post	BDC-125	11/24/2009	7.18	82	128	12.42	100.1	6.11
92131	Post	BDC-150	11/24/2009	7.21	78	122	12.31	99.1	6.11
92132	Post	BDC-175	11/24/2009	7.23	86	135	12.27	98.9	6.11
92133	Post	BDC-200	11/24/2009	7.30	79	123	11.80	95.2	6.13
92134	Post	BDC-225	11/24/2009	7.19	88	137	11.85	95.8	6.21

UNH ID	Sample Type	Station Name	Collection Date	pH	Conductivity (uS/cm)	Specific Conductivity (uS/cm[c])	DO (mg/L)	DO (%)	Stream Temp. (˚C)
92135	Post	BDC-250	11/24/2009	7.19	89	138	11.66	94.7	6.33
92136	Post	BDC-275	11/24/2009	7.17	86	133	11.49	93.2	6.35
92137	Post	BDC-300	11/24/2009	7.12	88	137	11.13	90.5	6.43
92138	Post	BDC-325	11/24/2009	7.21	90	140	10.75	87.4	6.45
92139	Post	BDC-350	11/24/2009	7.17	91	140	9.95	81.1	6.56
92140	Post	BDC-400	11/24/2009	7.12	86	133	10.27	83.6	6.46
92141	Post	BDC-Trib	11/24/2009	7.09	91	140	10.46	86.0	6.70

Table 9. Nutrient concentrations for bi-monthly samples. -- signifies that the sample was not analyzed.

UNH ID	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
84657	BDC-0	1/23/2009	4.6	1.0	0.267	0.6	0.060
84658	BDC-50	1/23/2009	4.0	2.0	0.026	1.8	0.021
84659	BDC-100	1/23/2009	4.6	2.0	0.022	1.8	0.020
84660	BDC-150	1/23/2009	4.3	2.1	0.016	1.9	0.027
84661	BDC-200	1/23/2009	4.0	2.2	0.019	1.9	0.015
84662	BDC-250	1/23/2009	4.4	2.2	0.019	1.9	0.014
84663	BDC-300	1/23/2009	3.7	2.1	0.019	1.9	0.019
84664	BDC-350	1/23/2009	4.2	2.0	0.025	1.9	0.026
84665	BDC-400	1/23/2009	4.1	2.1	0.021	1.8	0.028
84666	BDC-450	1/23/2009	4.5	2.2	0.018	2.0	0.023
84667	BDC-500	1/23/2009	4.3	2.2	0.024	1.9	0.028
85557	BDC-0	2/17/2009	4.1	1.3	0.056	1.1	0.017
85558	BDC-50	2/17/2009	6.0	1.7	0.039	1.4	0.030
85559	BDC-100	2/17/2009	4.7	1.8	0.023	1.5	0.024
85560	BDC-150	2/17/2009	4.5	1.8	0.021	1.5	0.025
85561	BDC-200	2/17/2009	4.9	1.9	0.022	1.6	0.024
85562	BDC-250	2/17/2009	4.9	1.9	0.026	1.7	0.024
85563	BDC-300	2/17/2009	5.1	2.0	0.021	1.7	0.024
85564	BDC-350	2/17/2009	5.1	2.1	0.024	1.8	0.028
85565	BDC-400	2/17/2009	5.4	1.9	0.022	1.6	0.030
85566	BDC-450	2/17/2009	5.1	1.9	0.018	1.7	0.032
85567	BDC-500	2/17/2009	5.0	1.9	0.017	1.7	0.034
85815	BDC-0	3/13/2009	3.3	0.5	0.025	0.3	0.086
85816	BDC-50	3/13/2009	7.0	0.5	0.031	0.2	0.015
85817	BDC-100	3/13/2009	3.4	0.6	0.051	1.0	0.103
85818	BDC-150	3/13/2009	3.3	0.9	0.052	1.1	0.038
85819	BDC-200	3/13/2009	4.4	1.5	0.059	1.3	0.048
85820	BDC-250	3/13/2009	3.6	0.8	0.053	1.3	0.093
85821	BDC-300	3/13/2009	3.1	0.7	0.049	1.2	0.099
85822	BDC-350	3/13/2009	4.7	1.6	0.047	1.4	0.048
85823	BDC-400	3/13/2009	5.3	1.6	0.066	1.2	0.055
85824	BDC-450	3/13/2009	4.1	1.2	0.034	1.3	0.107
85825	BDC-500	3/13/2009	5.0	1.7	0.074	1.4	0.057
85826	BDC-516	3/13/2009	5.7	2.1	0.099	1.8	0.070
86926	BDC-0	4/8/2009	5.3	0.5	0.038	0.2	0.011
86927	BDC-50	4/8/2009	6.1	0.5	0.018	0.2	0.024
86928	BDC-100	4/8/2009	6.7	0.8	0.002	0.5	0.035
86929	BDC-150	4/8/2009	6.2	0.7	0.013	0.5	0.028
86930	BDC-200	4/8/2009	5.2	0.9	0.015	0.6	0.036
86931	BDC-250	4/8/2009	5.6	0.9	0.015	0.6	0.037
86932	BDC-300	4/8/2009	5.3	0.9	0.006	0.6	0.034
86933	BDC-350	4/8/2009	5.6	1.0	0.008	0.7	0.036
86934	BDC-400	4/8/2009	3.6	0.5	0.008	0.6	0.026

UNH ID	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
86935	BDC-450	4/8/2009	5.2	0.8	0.006	0.6	0.041
86936	BDC-500	4/8/2009	5.2	0.8	0.014	0.6	0.039
86937	BDC-516	4/8/2009	5.5	1.1	0.015	0.9	0.048
86938	BDC-Trib	4/8/2009	6.4	0.6	0.022	0.1	0.010
88023	BDC-0	5/12/2009	5.4	0.3	0.021	0.1	0.006
88024	BDC-50	5/12/2009	7.0	0.5	0.029	0.2	0.065
88025	BDC-100	5/12/2009	8.6	0.9	0.037	0.6	0.099
88026	BDC-150	5/12/2009	8.5	0.9	0.031	0.6	0.086
88027	BDC-200	5/12/2009	8.9	1.0	0.032	0.6	0.096
88028	BDC-250	5/12/2009	9.0	1.0	0.040	0.6	0.097
88029	BDC-300	5/12/2009	9.4	1.0	0.042	0.6	0.102
88030	BDC-350	5/12/2009	9.5	1.0	0.047	0.6	0.104
88031	BDC-400	5/12/2009	10.3	0.7	0.047	0.3	0.123
88032	BDC-450	5/12/2009	10.3	0.8	0.045	0.3	0.116
88033	BDC-500	5/12/2009	10.3	0.7	0.045	0.3	0.116
88034	BDC-516	5/12/2009	10.4	0.8	0.044	0.4	0.130
88035	BDC-Trib	5/12/2009	9.7	0.9	0.036	0.2	0.007
88137	BDC-0	5/27/2009	8.7	2.1	0.142	1.6	0.088
88138	BDC-50	5/27/2009	8.6	2.1	0.102	1.6	0.104
88139	BDC-100	5/27/2009	8.9	2.1	0.077	1.6	0.112
88140	BDC-150	5/27/2009	8.9	2.2	0.076	1.7	0.121
88141	BDC-200	5/27/2009	9.8	2.2	0.099	1.6	0.123
88142	BDC-250	5/27/2009	10.3	2.2	0.150	1.5	0.133
88143	BDC-300	5/27/2009	9.6	2.0	0.168	1.5	0.140
88144	BDC-350	5/27/2009	9.6	2.0	0.243	1.4	0.150
88145	BDC-400	5/27/2009	10.5	1.4	0.197	0.7	0.182
88146	BDC-450	5/27/2009	10.6	1.4	0.227	0.7	0.182
88147	BDC-500	5/27/2009	10.0	1.4	0.191	0.7	0.181
88148	BDC-516	5/27/2009	9.5	1.5	0.161	1.0	0.179
88217	BDC-0	6/2/2009	8.1	1.5	0.033	1.0	0.131
88218	BDC-50	6/2/2009	8.8	1.5	0.035	1.1	0.111
88219	BDC-100	6/2/2009	9.2	1.5	0.029	1.2	0.114
88220	BDC-150	6/2/2009	8.3	1.5	0.004	1.1	0.139
88221	BDC-200	6/2/2009	7.9	1.3	0.033	1.0	0.142
88222	BDC-250	6/2/2009	8.8	1.7	0.023	1.3	0.120
88223	BDC-300	6/2/2009	9.4	1.7	0.041	1.3	0.130
88224	BDC-350	6/2/2009	7.8	1.3	0.097	1.0	0.170
88225	BDC-400	6/2/2009	11.4	1.1	0.085	0.6	0.165
88226	BDC-450	6/2/2009	11.6	1.1	0.081	0.5	0.166
88227	BDC-500	6/2/2009	10.6	1.0	0.057	0.5	0.185
88228	BDC-516	6/2/2009	11.3	1.1	0.140	0.6	0.179
88659	BDC-0	6/18/2009	6.2	0.4	0.030	0.1	0.048
88660	BDC-50	6/18/2009	6.1	0.4	0.020	0.1	0.006
88661	BDC-100	6/18/2009	6.9	1.7	0.016	1.2	0.139
88662	BDC-150	6/18/2009	7.8	2.0	0.009	1.3	0.122
88663	BDC-200	6/18/2009	8.2	2.1	0.014	1.4	0.119

UNH ID	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
88664	BDC-250	6/18/2009	8.3	2.1	0.033	1.4	0.130
88665	BDC-300	6/18/2009	7.7	1.9	0.049	1.5	0.133
88666	BDC-350	6/18/2009	7.8	1.9	0.053	1.4	0.166
88667	BDC-400	6/18/2009	9.9	1.2	0.148	0.6	0.169
88668	BDC-450	6/18/2009	8.8	1.0	0.086	0.6	0.170
88669	BDC-500	6/18/2009	9.7	1.3	0.171	0.6	0.172
88670	BDC-516	6/18/2009	9.8	1.1	0.185	0.6	0.168
88671	BDC-Trib	6/18/2009	0.8	6.9	0.011	5.6	0.001
88672	BDC-Spring	6/18/2009	12.4	1.3	0.248	0.1	0.165
89046	BDC-0	7/8/2009	5.2	0.4	0.071	0.1	0.073
89047	BDC-50	7/8/2009	15.1	1.3	0.058	0.3	0.089
89048	BDC-100	7/8/2009	15.7	1.4	0.053	0.3	0.094
89049	BDC-150	7/8/2009	16.1	1.4	0.051	0.3	0.097
89050	BDC-200	7/8/2009	16.7	1.4	0.049	0.3	0.104
89051	BDC-250	7/8/2009	16.8	1.5	0.057	0.3	0.104
89052	BDC-300	7/8/2009	17.0	1.5	0.059	0.3	0.103
89053	BDC-350	7/8/2009	17.4	1.6	0.077	0.3	0.111
89054	BDC-400	7/8/2009	8.2	0.7	0.059	0.3	0.150
89055	BDC-450	7/8/2009	12.4	1.1	0.045	0.3	0.150
89056	BDC-500	7/8/2009	12.0	1.0	0.050	0.3	0.154
89057	BDC-516	7/8/2009	11.4	1.1	0.051	0.4	0.167
89058	BDC-Trib	7/8/2009	27.4	2.4	0.182	0.1	0.042
89386	BDC-0	7/20/2009	5.1	0.5	0.038	0.2	0.012
89387	BDC-50	7/20/2009	9.9	2.1	0.037	1.1	0.181
89388	BDC-100	7/20/2009	9.9	2.2	0.091	1.3	0.190
89389	BDC-150	7/20/2009	10.0	2.1	0.055	1.2	0.196
89390	BDC-200	7/20/2009	10.2	2.1	0.037	1.3	0.206
89391	BDC-250	7/20/2009	10.3	2.1	0.023	1.2	0.198
89392	BDC-300	7/20/2009	10.6	2.2	0.084	1.2	0.217
89393	BDC-350	7/20/2009	11.2	2.2	0.169	1.2	0.214
89394	BDC-400	7/20/2009	10.1	1.1	0.040	0.4	0.259
89395	BDC-450	7/20/2009	11.6	1.4	0.088	0.5	0.281
89396	BDC-500	7/20/2009	12.4	1.5	0.104	0.4	0.280
89397	BDC-516	7/20/2009	12.0	1.5	0.160	0.6	0.257
89398	BDC-Trib	7/20/2009	32.1	2.9	0.096	0.2	0.002
89399	BDC-Trib	7/20/2009	36.1	3.0	0.166	0.0	0.001
90491	BDC-0	8/30/2009	7.5	0.5	0.034	0.2	0.026
90492	BDC-50	8/30/2009	14.6	1.0	0.030	0.4	0.168
90493	BDC-100	8/30/2009	12.9	0.9	0.023	0.3	0.231
90494	BDC-150	8/30/2009	15.0	1.1	0.037	0.4	0.164
90495	BDC-200	8/30/2009	15.3	1.1	0.041	0.4	0.173
90496	BDC-250	8/30/2009	15.5	1.1	0.058	0.5	0.176
90497	BDC-300	8/30/2009	15.6	1.1	0.051	0.4	0.178
90498	BDC-350	8/30/2009	15.6	1.2	0.055	0.5	0.177
90499	BDC-400	8/30/2009	16.4	1.0	0.100	0.3	0.203
90500	BDC-450	8/30/2009	16.0	0.9	0.102	0.2	0.197

UNH ID	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
90501	BDC-500	8/30/2009	15.9	0.9	0.103	0.3	0.194
90502	BDC-516	8/30/2009	14.7	0.9	0.089	0.3	0.195
90503	BDC-Trib	8/30/2009	17.2	1.4	0.024	0.3	0.079
90726	BDC-0	9/9/2009	5.1	2.9	0.034	2.5	0.080
90727	BDC-50	9/9/2009	5.4	2.9	0.017	2.6	0.092
90728	BDC-100	9/9/2009	6.0	3.0	0.007	2.7	0.090
90729	BDC-150	9/9/2009	5.7	2.9	0.002	2.6	0.092
90730	BDC-200	9/9/2009	5.8	3.0	0.002	2.7	0.095
90731	BDC-250	9/9/2009	6.2	3.1	0.003	2.5	0.099
90732	BDC-300	9/9/2009	6.0	3.2	0.006	2.5	0.103
90733	BDC-350	9/9/2009	7.0	3.5	0.026	3.2	0.115
90734	BDC-400	9/9/2009	9.8	1.9	0.036	1.3	0.185
90735	BDC-450	9/9/2009	9.6	1.9	0.071	1.3	0.195
90736	BDC-500	9/9/2009	9.6	1.9	0.163	1.3	0.197
90737	BDC-516	9/9/2009	9.2	2.2	0.196	1.4	0.193
90738	BDC-Trib	9/9/2009	2.0	6.3	0.003	10.1	0.004
90897	BDC-0	9/23/2009	4.0	2.6	0.033	2.5	0.062
90898	BDC-50	9/23/2009	4.3	2.8	0.022	2.7	0.067
90899	BDC-100	9/23/2009	4.4	2.8	0.010	2.7	0.073
90900	BDC-150	9/23/2009	4.5	2.8	0.007	2.7	0.077
90901	BDC-200	9/23/2009	4.5	2.8	0.014	2.7	0.074
90902	BDC-250	9/23/2009	4.8	2.9	0.014	2.9	0.073
90903	BDC-300	9/23/2009	4.8	2.9	0.021	2.9	0.079
90904	BDC-350	9/23/2009	5.2	3.3	0.025	3.3	0.088
90905	BDC-400	9/23/2009	8.4	1.8	0.039	1.4	0.151
90906	BDC-450	9/23/2009	8.1	1.7	0.072	1.3	0.159
90907	BDC-500	9/23/2009	8.2	1.7	0.132	1.3	0.164
90908	BDC-516	9/23/2009	8.5	1.8	0.167	1.3	0.166
90909	BDC-Trib	9/23/2009	0.8	6.0	0.000	9.9	0.003
91033	BDC-0	10/2/2009	9.5	1.8	0.012	1.3	0.118
91034	BDC-30	10/2/2009	8.6	1.5	0.012	1.1	0.236
91035	BDC-60	10/2/2009	9.8	1.8	0.011	1.3	0.115
91036	BDC-100	10/2/2009	8.7	1.6	0.014	1.2	0.230
91037	BDC-150	10/2/2009	9.9	1.9	0.010	1.5	0.120
91038	BDC-200	10/2/2009	9.0	1.7	0.012	1.2	0.172
91039	BDC-250	10/2/2009	9.7	2.0	0.024	1.5	0.132
91040	BDC-300	10/2/2009	9.2	1.7	0.027	1.3	0.190
91041	BDC-350	10/2/2009	10.2	2.4	0.052	1.7	0.128
91042	BDC-400	10/2/2009	12.8	1.2	0.085	0.6	0.190
91043	BDC-450	10/2/2009	8.2	0.8	0.081	0.4	0.213
91044	BDC-500	10/2/2009	11.1	1.0	0.127	0.5	0.278
91045	BDC-505	10/2/2009	12.8	1.3	0.165	0.7	0.192
91046	BDC-510	10/2/2009	13.6	1.3	0.210	0.6	0.205
91047	BDC-516	10/2/2009	14.4	1.3	0.194	0.5	0.218
91048	BDC-Trib	10/2/2009	1.9	5.6	0.000	4.9	0.006
91871	BDC-0	11/10/2009	10.6	1.7	0.021	0.9	0.047

UNH ID	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91872	BDC-50	11/10/2009	10.9	1.6	0.019	1.0	0.051
91873	BDC-100	11/10/2009	11.3	1.7	0.011	1.0	0.054
91874	BDC-150	11/10/2009	11.1	1.6	0.013	1.0	0.057
91875	BDC-200	11/10/2009	11.3	1.7	0.017	1.0	0.057
91876	BDC-250	11/10/2009	10.3	1.6	0.020	1.1	0.062
91877	BDC-300	11/10/2009	10.7	1.6	--	1.1	0.061
91878	BDC-350	11/10/2009	11.7	1.8	0.032	1.2	0.066
91879	BDC-400	11/10/2009	13.4	1.3	0.039	0.7	0.083
91880	BDC-450	11/10/2009	13.9	1.3	0.049	0.7	0.087
91881	BDC-500	11/10/2009	13.2	1.3	0.059	0.7	0.097
91882	BDC-516	11/10/2009	12.1	1.7	0.055	1.0	0.096
91883	BDC-Trib	11/10/2009	7.6	2.9	0.015	2.2	0.076
92383	BDC-0	12/11/2009	6.4	0.8	0.040	0.4	0.033
92384	BDC-50	12/11/2009	6.5	0.8	0.034	0.5	0.030
92385	BDC-100	12/11/2009	6.5	0.8	0.026	0.5	0.029
92386	BDC-150	12/11/2009	6.7	0.9	0.027	0.5	0.031
92387	BDC-200	12/11/2009	6.5	0.9	0.033	0.5	0.037
92388	BDC-250	12/11/2009	6.3	0.8	0.029	0.5	0.033
92389	BDC-300	12/11/2009	6.9	0.9	0.028	0.5	0.035
92390	BDC-350	12/11/2009	6.5	0.9	0.028	0.6	0.034
92391	BDC-400	12/11/2009	7.1	0.9	0.032	0.5	0.041
92392	BDC-450	12/11/2009	6.9	0.9	0.031	0.5	0.036
92393	BDC-500	12/11/2009	6.8	0.9	0.029	0.5	0.036
92394	BDC-516	12/11/2009	6.5	1.2	0.027	0.8	0.027
92395	BDC-Trib	12/11/2009	7.1	0.9	0.017	0.4	0.017

Table 10. Nutrient concentrations for samples collected during additions. -- signifies that the sample was not analyzed.

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
87189	Pre	BDC-0	4/16/2009	3.4	0.4	0.016	0.2	0.007
87190	Pre	BDC-30	4/16/2009	5.0	0.9	0.025	0.7	0.037
87191	Pre	BDC-60	4/16/2009	5.0	0.9	0.027	0.7	0.045
87192	Pre	BDC-60	4/16/2009	5.0	0.9	0.027	0.7	0.036
87193	Pre	BDC-105	4/16/2009	5.3	0.9	0.020	0.8	0.040
87194	Pre	BDC-120	4/16/2009	5.1	1.0	0.013	0.8	0.037
87195	Pre	BDC-135	4/16/2009	5.6	1.0	0.023	0.8	0.039
87196	Pre	BDC-150	4/16/2009	5.7	1.0	0.033	0.8	0.043
87197	Pre	BDC-225	4/16/2009	5.6	1.1	0.022	0.8	0.037
87198	Pre	BDC-300	4/16/2009	4.8	1.1	0.034	0.9	0.034
87199	Pre	BDC-400	4/16/2009	5.1	0.9	0.019	0.6	0.044
87200	Pre	BDC-450	4/16/2009	5.1	0.8	0.019	0.6	0.049
87201	Pre	BDC-Trib	4/16/2009	5.8	0.9	0.104	0.4	0.006
87202	Pre	BDC-Trib	4/16/2009	6.0	0.9	0.119	0.4	0.004
87203	Pre	BDC-505	4/16/2009	5.0	0.8	0.021	0.7	0.045
87204	Pre	BDC-510	4/16/2009	4.8	0.9	0.019	0.7	0.051
87205	Plateau	BDC-0	4/16/2009	3.4	0.5	0.020	0.4	0.006
87206	Plateau	BDC-0	4/16/2009	3.4	0.4	0.013	0.3	0.013
87207	Plateau	BDC-30	4/16/2009	3.7	1.1	0.028	1.5	0.038
87208	Plateau	BDC-30	4/16/2009	4.3	1.5	0.028	1.6	0.031
87209	Plateau	BDC-60	4/16/2009	4.5	1.9	0.024	1.6	0.034
87210	Plateau	BDC-60	4/16/2009	4.7	1.8	0.022	1.6	0.031
87211	Plateau	BDC-105	4/16/2009	4.8	1.9	0.023	1.7	0.036
87212	Plateau	BDC-105	4/16/2009	4.0	1.3	0.017	1.7	0.039
87213	Plateau	BDC-120	4/16/2009	4.8	2.0	0.018	1.7	0.037
87214	Plateau	BDC-120	4/16/2009	4.9	1.9	0.016	1.7	0.034
87215	Plateau	BDC-135	4/16/2009	5.0	2.0	0.019	1.8	0.034
87216	Plateau	BDC-135	4/16/2009	4.9	2.0	0.023	1.7	0.029

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
87217	Plateau	BDC-150	4/16/2009	5.0	2.1	0.021	1.8	0.034
87218	Plateau	BDC-150	4/16/2009	4.2	1.3	0.022	1.8	0.068
87219	Plateau	BDC-225	4/16/2009	4.9	2.0	0.019	1.8	0.033
87220	Plateau	BDC-225	4/16/2009	5.0	2.1	0.018	1.8	0.030
87221	Plateau	BDC-300	4/16/2009	5.1	2.1	0.014	1.8	0.039
87222	Plateau	BDC-300	4/16/2009	5.1	2.1	0.019	1.8	0.037
87223	Plateau	BDC-400	4/16/2009	5.3	2.1	0.010	1.8	0.046
87224	Plateau	BDC-400	4/16/2009	5.2	1.7	0.010	1.8	0.045
87225	Plateau	BDC-450	4/16/2009	5.4	11.6	0.007	11.1	0.044
87226	Plateau	BDC-450	4/16/2009	4.3	1.8	0.014	3.3	0.044
87227	Plateau	BDC-Trib	4/16/2009	7.5	1.3	0.058	0.6	0.015
87228	Plateau	BDC-Trib	4/16/2009	7.8	1.3	0.062	0.6	0.011
87229	Plateau	BDC-505	4/16/2009	5.9	1.4	0.012	1.1	0.052
87230	Plateau	BDC-505	4/16/2009	5.7	1.6	0.014	1.3	0.050
87231	Plateau	BDC-510	4/16/2009	5.6	1.0	0.020	0.7	0.052
87232	Plateau	BDC-510	4/16/2009	5.5	1.0	0.013	0.7	0.048
87420	Post	BDC-0	4/17/2009	3.6	0.5	0.025	0.3	0.012
87421	Post	BDC-30	4/17/2009	5.0	1.0	0.024	0.7	0.040
87422	Post	BDC-60	4/17/2009	3.2	0.5	0.015	0.8	0.031
87423	Post	BDC-150	4/17/2009	5.0	1.0	0.015	0.8	0.033
87424	Post	BDC-225	4/17/2009	5.0	1.1	0.018	0.8	0.041
87425	Post	BDC-300	4/17/2009	5.4	1.1	0.015	0.8	--
87426	Post	BDC-Trib	4/17/2009	7.4	0.9	0.104	0.3	0.013
87427	Post	BDC-400	4/17/2009	3.5	0.5	0.036	0.4	0.130
87428	Post	BDC-450	4/17/2009	5.2	0.9	0.013	0.7	0.046
87429	Post	BDC-505	4/17/2009	5.0	0.9	0.015	0.7	0.049
87430	Post	BDC-510	4/17/2009	5.2	0.9	0.013	0.7	0.045
89140	Pre	BDC-30	7/13/2009	6.0	0.4	0.014	0.1	0.007
89141	Pre	BDC-60	7/13/2009	7.5	1.6	0.047	1.0	0.111
89142	Pre	BDC-100	7/13/2009	7.1	1.6	0.039	1.0	0.192

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
89143	Pre	BDC-150	7/13/2009	7.9	1.7	0.036	1.1	0.115
89144	Pre	BDC-200	7/13/2009	8.2	1.8	0.040	1.1	0.120
89145	Pre	BDC-250	7/13/2009	8.2	1.8	0.061	1.1	0.122
89146	Pre	BDC-300	7/13/2009	7.1	1.4	0.058	1.1	0.169
89147	Pre	BDC-400	7/13/2009	3.9	0.4	0.057	0.6	0.168
89148	Pre	BDC-450	7/13/2009	9.0	1.2	0.118	0.6	0.173
89149	Pre	BDC-505	7/13/2009	9.4	1.3	0.153	0.5	0.180
89150	Pre	BDC-510	7/13/2009	9.1	1.3	0.136	0.6	0.184
89151	Pre	BDC-Trib	7/13/2009	6.7	5.8	0.071	4.4	0.000
89152	Plateau	BDC-30	7/13/2009	6.8	0.4	0.018	0.1	0.014
89153	Plateau	BDC-30	7/13/2009	6.9	0.4	0.020	0.1	0.012
89154	Plateau	BDC-60	7/13/2009	8.6	1.9	0.038	1.3	0.083
89155	Plateau	BDC-60	7/13/2009	8.5	1.8	0.042	1.4	0.077
89156	Plateau	BDC-100	7/13/2009	9.0	1.9	0.028	1.5	0.094
89157	Plateau	BDC-100	7/13/2009	9.2	1.9	0.032	1.5	0.088
89158	Plateau	BDC-150	7/13/2009	8.8	2.0	0.027	1.6	0.087
89159	Plateau	BDC-150	7/13/2009	8.9	2.0	0.031	1.5	0.109
89160	Plateau	BDC-200	7/13/2009	8.8	2.0	0.027	1.5	0.070
89161	Plateau	BDC-200	7/13/2009	9.1	2.0	0.030	1.6	0.104
89162	Plateau	BDC-250	7/13/2009	8.6	2.1	0.044	1.6	0.095
89163	Plateau	BDC-250	7/13/2009	8.0	2.0	0.046	1.6	0.094
89164	Plateau	BDC-300	7/13/2009	8.4	2.1	0.056	1.7	0.085
89165	Plateau	BDC-300	7/13/2009	8.2	2.1	0.050	1.7	0.061
89166	Plateau	BDC-400	7/13/2009	9.9	1.7	0.044	1.2	0.148
89167	Plateau	BDC-400	7/13/2009	9.4	1.7	0.026	1.2	0.160
89168	Plateau	BDC-450	7/13/2009	9.3	1.8	0.066	1.3	0.156
89169	Plateau	BDC-450	7/13/2009	8.6	1.8	0.041	1.3	0.161
89170	Plateau	BDC-505	7/13/2009	9.1	1.1	0.103	0.6	0.174
89171	Plateau	BDC-505	7/13/2009	9.0	1.1	0.049	0.6	0.164
89172	Plateau	BDC-Trib	7/13/2009	8.8	4.6	0.068	4.0	-0.001

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
89173	Plateau	BDC-Trib	7/13/2009	6.3	3.8	0.033	4.2	0.044
89179	Post	BDC-30	7/14/2009	7.4	1.3	0.049	0.9	0.067
89180	Post	BDC-60	7/14/2009	7.2	1.6	0.047	1.3	0.097
89181	Post	BDC-100	7/14/2009	2.8	0.5	0.026	1.3	0.153
89182	Post	BDC-150	7/14/2009	7.0	1.7	0.027	1.3	0.100
89183	Post	BDC-200	7/14/2009	7.5	1.8	0.026	1.3	0.104
89184	Post	BDC-250	7/14/2009	7.1	1.8	0.039	1.4	0.103
89185	Post	BDC-300	7/14/2009	6.5	1.4	0.016	1.4	0.193
89186	Post	BDC-400	7/14/2009	5.9	0.7	0.034	0.7	0.244
89187	Post	BDC-450	7/14/2009	7.9	1.2	0.029	0.7	0.119
89188	Post	BDC-505	7/14/2009	7.8	1.0	0.017	0.6	0.138
89189	Post	BDC-510	7/14/2009	7.9	1.1	0.031	0.6	0.137
89190	Post	BDC-Trib	7/14/2009	21.1	2.5	0.127	0.8	0.001
89827	Pre	BDC-30	8/6/2009	6.8	0.4	0.005	0.1	0.015
89828	Pre	BDC-60	8/6/2009	8.3	1.4	0.060	1.0	0.155
89829	Pre	BDC-100	8/6/2009	8.6	1.5	0.055	1.1	0.158
89830	Pre	BDC-150	8/6/2009	8.8	1.5	0.048	1.1	0.166
89831	Pre	BDC-200	8/6/2009	8.8	1.6	0.067	1.2	0.173
89832	Pre	BDC-250	8/6/2009	8.7	1.6	0.126	1.2	0.181
89833	Pre	BDC-300	8/6/2009	9.3	1.6	0.125	1.1	0.183
89834	Pre	BDC-350	8/6/2009	9.7	1.7	0.170	1.2	0.198
89835	Pre	BDC-400	8/6/2009	9.8	1.1	0.149	0.6	0.234
89836	Pre	BDC-450	8/6/2009	9.9	1.1	0.144	0.6	0.237
89837	Pre	BDC-505	8/6/2009	10.7	1.1	0.197	0.5	0.239
89838	Pre	BDC-516	8/6/2009	10.6	1.1	0.225	0.6	0.273
89839	Pre	BDC-Trib	8/6/2009	39.5	4.7	3.185	0.0	0.010
89840	Pre	BDC-Trib	8/6/2009	41.2	4.8	3.098	0.1	0.012
89841	Pre	BDC-Trib	8/6/2009	42.3	4.9	3.224	0.0	0.016
89842	Plateau	BDC-30	8/6/2009	7.0	0.4	0.016	0.1	0.017
89843	Plateau	BDC-30	8/6/2009	6.9	0.4	0.015	0.1	0.016

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
89844	Plateau	BDC-60	8/6/2009	8.9	1.5	0.047	1.2	0.145
89845	Plateau	BDC-60	8/6/2009	9.1	1.5	0.048	1.1	0.146
89846	Plateau	BDC-100	8/6/2009	9.3	1.5	0.052	1.2	0.149
89847	Plateau	BDC-100	8/6/2009	9.4	1.5	0.053	1.2	0.151
89848	Plateau	BDC-150	8/6/2009	8.9	1.4	0.047	1.2	0.159
89849	Plateau	BDC-150	8/6/2009	9.4	1.6	0.047	1.2	0.159
89850	Plateau	BDC-200	8/6/2009	8.1	1.2	0.048	1.3	0.159
89851	Plateau	BDC-200	8/6/2009	7.8	1.1	0.044	1.2	0.161
89852	Plateau	BDC-250	8/6/2009	9.6	1.6	0.100	1.3	0.165
89853	Plateau	BDC-250	8/6/2009	9.6	1.7	0.099	1.2	0.166
89854	Plateau	BDC-300	8/6/2009	9.1	1.7	0.102	1.2	0.166
89855	Plateau	BDC-300	8/6/2009	9.2	1.6	0.100	1.3	0.165
89856	Plateau	BDC-350	8/6/2009	9.7	1.8	0.156	1.3	0.164
89857	Plateau	BDC-350	8/6/2009	9.8	1.7	0.165	1.3	0.183
89858	Plateau	BDC-400	8/6/2009	10.3	1.1	0.087	0.6	0.230
89859	Plateau	BDC-400	8/6/2009	10.3	1.1	0.089	0.6	0.226
89860	Plateau	BDC-Trib	8/6/2009	45.1	4.9	2.956	0.0	0.012
89861	Plateau	BDC-Trib	8/6/2009	45.4	4.8	3.073	0.0	0.007
89862	Plateau	BDC-60	8/6/2009	8.0	1.1	0.038	1.1	0.141
89863	Plateau	BDC-60	8/6/2009	9.2	1.5	0.041	1.2	0.146
89864	Plateau	BDC-100	8/6/2009	9.3	1.5	0.044	1.2	0.146
89865	Plateau	BDC-100	8/6/2009	9.4	1.5	0.036	1.2	0.149
89888	Post	BDC-30	8/7/2009	8.1	1.5	0.045	1.2	0.136
89889	Post	BDC-60	8/7/2009	8.3	1.5	0.037	1.1	0.141
89890	Post	BDC-100	8/7/2009	8.3	1.6	0.025	1.3	0.143
89891	Post	BDC-150	8/7/2009	8.5	1.6	0.021	1.3	0.150
89892	Post	BDC-200	8/7/2009	8.6	1.6	0.025	1.3	0.153
89893	Post	BDC-250	8/7/2009	8.9	1.7	0.076	1.4	0.153
89894	Post	BDC-300	8/7/2009	8.7	1.7	0.073	1.4	0.152
89895	Post	BDC-350	8/7/2009	9.5	1.8	0.160	1.4	0.168

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
89896	Post	BDC-400	8/7/2009	10.1	1.1	0.109	0.7	0.204
89897	Post	BDC-Trib	8/7/2009	36.6	3.7	2.171	0.0	0.011
89898	Post	BDC-Trib	8/7/2009	21.7	4.9	1.117	3.1	0.005
91108	Pre	BDC-125	10/6/2009	13.4	1.3	0.003	0.8	0.171
91109	Pre	BDC-125	10/6/2009	12.7	1.3	0.003	0.8	0.173
91110	Pre	BDC-150	10/6/2009	12.8	1.3	0.002	0.8	0.172
91111	Pre	BDC-150	10/6/2009	12.7	1.3	0.003	0.8	0.171
91112	Pre	BDC-175	10/6/2009	12.8	1.3	0.005	0.8	0.172
91113	Pre	BDC-175	10/6/2009	12.6	1.3	0.001	0.8	0.171
91114	Pre	BDC-200	10/6/2009	12.4	1.3	0.003	0.8	0.171
91115	Pre	BDC-200	10/6/2009	12.8	1.3	0.002	0.8	0.173
91116	Pre	BDC-225	10/6/2009	12.8	1.4	0.005	0.8	0.177
91117	Pre	BDC-225	10/6/2009	12.9	1.4	0.005	0.8	0.174
91118	Pre	BDC-250	10/6/2009	13.0	1.4	0.012	0.8	0.185
91119	Pre	BDC-250	10/6/2009	13.0	1.4	0.007	0.9	0.171
91120	Pre	BDC-275	10/6/2009	9.3	0.9	0.016	0.5	0.204
91121	Pre	BDC-275	10/6/2009	13.9	1.5	0.013	0.8	0.176
91122	Pre	BDC-300	10/6/2009	13.0	1.4	0.193	0.9	0.187
91123	Pre	BDC-300	10/6/2009	13.1	1.4	0.014	0.9	0.180
91124	Pre	BDC-325	10/6/2009	12.9	1.5	0.013	0.9	0.185
91125	Pre	BDC-325	10/6/2009	13.2	1.5	0.023	0.9	0.215
91126	Pre	BDC-350	10/6/2009	11.9	1.3	0.027	0.9	0.169
91127	Pre	BDC-350	10/6/2009	13.2	1.6	0.029	1.0	0.198
91128	Pre	BDC-400	10/6/2009	12.7	0.7	0.040	0.2	0.257
91129	Pre	BDC-400	10/6/2009	15.7	0.9	0.042	0.3	0.240
91130	Pre	BDC-Trib	10/6/2009	5.2	4.3	0.002	3.4	0.012
91131	Plateau	BDC-125	10/6/2009	12.7	3.3	0.009	2.6	0.208
91132	Plateau	BDC-125	10/6/2009	12.6	3.4	0.004	2.6	0.154
91133	Plateau	BDC-125	10/6/2009	12.8	3.4	0.004	2.6	0.152
91134	Plateau	BDC-150	10/6/2009	12.6	3.4	0.001	2.6	0.152

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91135	Plateau	BDC-150	10/6/2009	9.8	2.1	0.000	2.1	0.201
91136	Plateau	BDC-150	10/6/2009	12.5	3.3	0.000	2.6	0.154
91137	Plateau	BDC-175	10/6/2009	12.6	3.4	0.002	2.7	0.157
91138	Plateau	BDC-175	10/6/2009	12.2	3.3	0.004	2.6	0.157
91139	Plateau	BDC-175	10/6/2009	12.3	3.4	0.004	2.7	0.159
91140	Plateau	BDC-200	10/6/2009	12.4	3.5	0.005	2.7	0.156
91141	Plateau	BDC-200	10/6/2009	12.5	3.6	0.004	2.7	0.159
91142	Plateau	BDC-200	10/6/2009	12.6	3.5	0.006	2.7	0.155
91143	Plateau	BDC-225	10/6/2009	12.9	3.7	0.005	2.9	0.164
91144	Plateau	BDC-225	10/6/2009	12.7	3.6	0.006	2.8	0.160
91145	Plateau	BDC-225	10/6/2009	12.7	3.6	0.003	2.8	0.163
91146	Plateau	BDC-250	10/6/2009	12.7	3.8	0.004	3.0	0.169
91147	Plateau	BDC-250	10/6/2009	12.8	3.8	0.004	3.0	0.165
91148	Plateau	BDC-250	10/6/2009	12.9	3.8	0.010	3.0	0.163
91149	Plateau	BDC-275	10/6/2009	12.8	3.9	0.006	3.0	0.163
91150	Plateau	BDC-275	10/6/2009	12.6	3.8	0.008	3.0	0.165
91151	Plateau	BDC-275	10/6/2009	14.4	3.8	0.008	3.0	0.165
91152	Plateau	BDC-300	10/6/2009	12.0	2.3	0.016	2.2	0.212
91153	Plateau	BDC-300	10/6/2009	14.7	4.0	0.009	3.0	0.168
91154	Plateau	BDC-300	10/6/2009	13.9	3.6	0.011	2.9	0.172
91155	Plateau	BDC-325	10/6/2009	13.7	4.1	0.007	3.2	0.177
91156	Plateau	BDC-325	10/6/2009	13.2	4.1	0.009	3.1	0.183
91157	Plateau	BDC-325	10/6/2009	13.1	4.0	0.007	3.2	0.179
91158	Plateau	BDC-350	10/6/2009	14.0	4.2	0.017	3.2	0.190
91159	Plateau	BDC-350	10/6/2009	13.6	4.4	0.015	3.3	0.184
91160	Plateau	BDC-350	10/6/2009	13.7	4.4	0.017	3.4	0.190
91161	Plateau	BDC-400	10/6/2009	15.8	0.9	0.046	0.3	0.235
91162	Plateau	BDC-400	10/6/2009	15.4	0.9	0.036	0.3	0.235
91163	Plateau	BDC-400	10/6/2009	15.9	0.9	0.031	0.3	0.237
91164	Plateau	BDC-Trib	10/6/2009	4.9	4.7	0.000	3.7	0.003

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91165	Post	BDC-125	10/7/2009	17.5	1.3	0.082	0.3	0.188
91166	Post	BDC-150	10/7/2009	17.5	1.2	0.079	0.2	0.190
91167	Post	BDC-175	10/7/2009	15.3	1.1	0.070	0.2	0.245
91168	Post	BDC-200	10/7/2009	17.1	1.2	0.055	0.3	0.194
91169	Post	BDC-225	10/7/2009	17.3	1.2	0.072	0.2	0.194
91170	Post	BDC-250	10/7/2009	14.7	1.0	0.072	0.2	0.264
91171	Post	BDC-275	10/7/2009	17.2	1.1	0.079	0.2	0.196
91172	Post	BDC-300	10/7/2009	17.6	1.2	0.077	0.2	0.204
91173	Post	BDC-325	10/7/2009	18.0	1.1	0.072	0.2	0.205
91174	Post	BDC-350	10/7/2009	18.7	1.2	0.061	0.2	0.207
91175	Post	BDC-400	10/7/2009	18.5	0.8	0.018	0.2	0.226
91176	Post	BDC-Trib	10/7/2009	18.0	1.6	0.164	0.1	0.181
91289	Pre	BDC-60	10/17/2009	10.5	1.4	0.009	1.0	0.076
91290	Pre	BDC-60	10/17/2009	10.7	1.4	0.003	1.0	0.075
91291	Pre	BDC-100	10/17/2009	10.6	1.5	0.000	1.1	0.078
91292	Pre	BDC-100	10/17/2009	7.6	1.0	0.007	0.7	0.146
91293	Pre	BDC-125	10/17/2009	6.6	0.9	0.006	0.5	0.135
91294	Pre	BDC-125	10/17/2009	10.0	1.5	0.000	1.1	0.082
91295	Pre	BDC-150	10/17/2009	10.0	1.5	0.000	1.1	0.081
91296	Pre	BDC-150	10/17/2009	10.0	1.5	0.000	1.1	0.082
91297	Pre	BDC-175	10/17/2009	9.9	1.5	0.000	1.1	0.084
91298	Pre	BDC-175	10/17/2009	9.9	1.5	0.000	1.1	0.082
91299	Pre	BDC-200	10/17/2009	9.7	1.5	0.000	1.2	0.086
91300	Pre	BDC-200	10/17/2009	9.3	1.4	0.000	1.1	0.080
91301	Pre	BDC-225	10/17/2009	4.6	0.4	0.003	0.3	0.146
91302	Pre	BDC-225	10/17/2009	6.5	0.7	0.006	1.1	0.147
91303	Pre	BDC-250	10/17/2009	9.9	1.6	0.000	1.2	0.087
91304	Pre	BDC-250	10/17/2009	10.3	1.6	0.001	1.2	0.088
91305	Pre	BDC-275	10/17/2009	9.4	1.5	0.001	1.2	0.077
91306	Pre	BDC-275	10/17/2009	10.0	1.6	0.000	1.2	0.090

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91307	Pre	BDC-300	10/17/2009	10.0	1.7	0.005	1.3	0.091
91308	Pre	BDC-300	10/17/2009	9.4	1.4	0.005	1.1	0.092
91309	Pre	BDC-325	10/17/2009	9.6	1.6	0.005	1.3	0.089
91310	Pre	BDC-325	10/17/2009	8.1	1.2	0.006	0.9	0.091
91311	Pre	BDC-350	10/17/2009	10.0	1.8	0.010	1.4	0.099
91312	Pre	BDC-350	10/17/2009	9.4	1.6	0.011	1.3	0.096
91313	Pre	BDC-400	10/17/2009	12.1	1.0	0.015	0.5	0.122
91314	Pre	BDC-400	10/17/2009	12.1	1.0	0.016	0.6	0.120
91315	Pre	BDC-Trib	10/17/2009	2.0	1.1	0.004	1.0	0.077
91316	Pre	BDC-Trib	10/17/2009	3.5	4.7	0.002	4.3	0.001
91317	Plateau	BDC-125	10/17/2009	11.1	2.2	0.001	1.8	0.077
91318	Plateau	BDC-125	10/17/2009	10.2	2.1	0.000	1.8	0.075
91319	Plateau	BDC-125	10/17/2009	10.0	2.2	0.002	1.8	0.075
91320	Plateau	BDC-150	10/17/2009	9.4	2.0	0.000	1.8	0.119
91321	Plateau	BDC-150	10/17/2009	10.2	2.2	0.000	1.8	0.074
91322	Plateau	BDC-150	10/17/2009	8.9	1.7	0.000	1.4	0.072
91323	Plateau	BDC-175	10/17/2009	9.9	2.3	0.002	1.9	0.077
91324	Plateau	BDC-175	10/17/2009	10.0	2.2	0.003	1.9	0.084
91325	Plateau	BDC-175	10/17/2009	9.6	2.2	0.000	1.8	0.077
91326	Plateau	BDC-200	10/17/2009	9.5	2.3	0.000	2.0	0.078
91327	Plateau	BDC-200	10/17/2009	9.7	2.4	0.000	2.0	0.084
91328	Plateau	BDC-200	10/17/2009	9.3	2.2	0.000	1.9	0.080
91329	Plateau	BDC-225	10/17/2009	10.0	2.5	0.000	2.0	0.085
91330	Plateau	BDC-225	10/17/2009	9.8	2.4	0.000	2.1	0.081
91331	Plateau	BDC-225	10/17/2009	10.0	2.4	0.000	2.1	0.077
91332	Plateau	BDC-250	10/17/2009	11.4	3.2	0.000	2.2	0.081
91333	Plateau	BDC-250	10/17/2009	12.3	3.2	0.000	2.2	0.082
91334	Plateau	BDC-250	10/17/2009	10.7	2.5	0.000	2.2	0.082
91335	Plateau	BDC-275	10/17/2009	12.0	3.0	0.001	2.2	0.084
91336	Plateau	BDC-275	10/17/2009	11.7	2.6	0.012	1.8	0.094

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91337	Plateau	BDC-275	10/17/2009	13.0	3.0	0.001	2.2	0.081
91338	Plateau	BDC-300	10/17/2009	12.8	3.1	0.000	2.2	0.084
91339	Plateau	BDC-300	10/17/2009	12.5	3.0	0.000	2.2	0.087
91340	Plateau	BDC-300	10/17/2009	12.8	3.1	0.000	2.3	0.088
91341	Plateau	BDC-325	10/17/2009	13.3	3.2	0.000	2.3	0.085
91342	Plateau	BDC-325	10/17/2009	13.5	3.3	0.002	2.3	0.090
91343	Plateau	BDC-325	10/17/2009	13.3	3.2	0.000	2.3	0.086
91344	Plateau	BDC-350	10/17/2009	12.5	3.1	0.007	2.4	0.091
91345	Plateau	BDC-350	10/17/2009	13.4	3.3	0.012	2.4	0.093
91346	Plateau	BDC-350	10/17/2009	12.9	3.3	0.013	2.5	0.085
91347	Plateau	BDC-400	10/17/2009	15.6	1.4	0.014	0.6	0.111
91348	Plateau	BDC-400	10/17/2009	15.4	1.3	0.015	0.6	0.117
91349	Plateau	BDC-400	10/17/2009	11.8	1.0	0.032	0.5	0.198
91350	Plateau	BDC-Trib	10/17/2009	6.5	4.9	0.006	3.8	0.009
91351	Plateau	BDC-Trib	10/17/2009	6.3	4.6	0.007	3.5	0.009
91352	Plateau	BDC-Trib	10/17/2009	4.8	2.8	0.023	2.0	0.103
91353	Post	BDC-60	10/18/2009	10.0	1.6	0.007	1.1	0.069
91354	Post	BDC-100	10/18/2009	10.2	1.6	0.004	1.1	0.074
91355	Post	BDC-125	10/18/2009	9.0	1.3	0.006	0.8	0.158
91356	Post	BDC-150	10/18/2009	10.1	1.6	0.004	1.2	0.074
91357	Post	BDC-175	10/18/2009	9.8	1.6	0.005	1.2	0.074
91358	Post	BDC-200	10/18/2009	9.9	1.7	0.000	1.2	0.081
91359	Post	BDC-225	10/18/2009	9.5	1.6	0.006	1.0	0.154
91360	Post	BDC-250	10/18/2009	10.0	1.7	0.007	1.1	0.082
91361	Post	BDC-275	10/18/2009	9.4	1.6	0.004	1.3	0.082
91362	Post	BDC-300	10/18/2009	9.3	1.6	0.008	1.3	0.090
91363	Post	BDC-325	10/18/2009	9.7	1.6	0.005	1.3	0.088
91364	Post	BDC-350	10/18/2009	8.1	1.3	0.010	0.9	0.177
91365	Post	BDC-400	10/18/2009	11.4	0.9	0.008	0.6	0.120
91366	Post	BDC-500	10/18/2009	9.3	0.8	0.027	0.3	0.015

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91367	Post	BDC-Trib	10/18/2009	6.6	3.5	0.008	3.1	0.113
91438	Pre	BDC-60	10/26/2009	15.6	0.8	0.007	0.3	0.115
91439	Pre	BDC-60	10/26/2009	15.6	0.8	0.005	0.3	0.117
91440	Pre	BDC-100	10/26/2009	15.5	0.8	0.005	0.3	0.118
91441	Pre	BDC-100	10/26/2009	15.8	0.8	0.004	0.3	0.117
91442	Pre	BDC-125	10/26/2009	14.7	0.9	0.000	0.4	0.127
91443	Pre	BDC-125	10/26/2009	14.8	0.9	0.000	0.3	0.121
91444	Pre	BDC-150	10/26/2009	15.1	0.9	0.003	0.4	0.123
91445	Pre	BDC-150	10/26/2009	15.0	0.9	0.003	0.4	0.117
91446	Pre	BDC-175	10/26/2009	15.0	0.9	0.002	0.4	0.118
91447	Pre	BDC-175	10/26/2009	15.1	0.9	0.005	0.4	0.118
91448	Pre	BDC-200	10/26/2009	15.1	0.9	0.004	0.4	0.123
91449	Pre	BDC-200	10/26/2009	15.3	0.9	0.003	0.4	0.121
91450	Pre	BDC-225	10/26/2009	15.4	0.9	0.001	0.4	0.125
91451	Pre	BDC-225	10/26/2009	15.5	0.9	0.001	0.4	0.126
91452	Pre	BDC-250	10/26/2009	15.6	0.9	0.006	0.4	0.129
91453	Pre	BDC-250	10/26/2009	15.3	1.0	0.002	0.4	0.130
91454	Pre	BDC-275	10/26/2009	15.5	1.0	0.001	0.4	0.129
91455	Pre	BDC-275	10/26/2009	14.1	0.9	0.010	0.4	0.185
91456	Pre	BDC-300	10/26/2009	15.5	0.9	0.006	0.4	0.131
91457	Pre	BDC-300	10/26/2009	15.5	0.9	0.006	0.4	0.129
91458	Pre	BDC-325	10/26/2009	15.7	0.9	0.007	0.4	0.138
91459	Pre	BDC-325	10/26/2009	15.9	0.9	0.002	0.4	0.133
91460	Pre	BDC-350	10/26/2009	16.4	0.9	0.001	0.5	0.138
91461	Pre	BDC-350	10/26/2009	16.3	0.9	0.004	0.5	0.136
91462	Pre	BDC-400	10/26/2009	18.1	0.6	0.002	0.1	0.163
91463	Pre	BDC-400	10/26/2009	17.9	0.6	0.007	0.1	0.199
91464	Pre	BDC-Trib	10/26/2009	10.5	1.8	0.005	1.3	0.032
91465	Pre	BDC-Trib	10/26/2009	10.0	1.9	0.012	1.3	0.030
91466	Plateau	BDC-60	10/26/2009	14.6	2.1	0.000	1.7	0.103

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91467	Plateau	BDC-60	10/26/2009	14.6	2.1	0.002	1.7	0.098
91468	Plateau	BDC-60	10/26/2009	14.6	2.1	0.001	1.7	0.101
91469	Plateau	BDC-100	10/26/2009	14.3	2.1	0.000	1.7	0.094
91470	Plateau	BDC-100	10/26/2009	14.2	2.1	0.001	1.7	0.106
91471	Plateau	BDC-100	10/26/2009	14.4	2.1	0.000	1.7	0.092
91472	Plateau	BDC-125	10/26/2009	14.5	2.1	0.001	1.8	0.104
91473	Plateau	BDC-125	10/26/2009	14.5	2.1	0.001	1.8	0.104
91474	Plateau	BDC-125	10/26/2009	14.4	2.1	0.001	1.8	0.104
91475	Plateau	BDC-150	10/26/2009	14.7	2.1	0.001	1.8	0.111
91476	Plateau	BDC-150	10/26/2009	14.2	2.1	0.001	1.8	0.108
91477	Plateau	BDC-150	10/26/2009	14.6	2.1	0.001	1.8	0.105
91478	Plateau	BDC-175	10/26/2009	14.5	2.1	0.002	1.8	0.109
91479	Plateau	BDC-175	10/26/2009	14.6	2.1	0.003	1.8	0.108
91480	Plateau	BDC-175	10/26/2009	14.4	2.2	0.010	1.8	0.184
91481	Plateau	BDC-200	10/26/2009	14.4	2.2	0.003	1.8	0.113
91482	Plateau	BDC-200	10/26/2009	14.6	2.2	0.004	1.8	0.113
91483	Plateau	BDC-200	10/26/2009	14.2	2.2	0.007	1.8	0.176
91484	Plateau	BDC-225	10/26/2009	14.3	2.2	0.002	1.9	0.110
91485	Plateau	BDC-225	10/26/2009	14.8	2.2	0.006	1.9	0.112
91486	Plateau	BDC-225	10/26/2009	14.6	2.3	0.006	1.9	0.113
91487	Plateau	BDC-250	10/26/2009	14.7	2.3	0.012	2.0	0.184
91488	Plateau	BDC-250	10/26/2009	14.4	2.3	0.007	2.0	0.122
91489	Plateau	BDC-250	10/26/2009	14.8	2.3	0.005	2.0	0.114
91490	Plateau	BDC-275	10/26/2009	15.0	2.4	0.006	2.1	0.120
91491	Plateau	BDC-275	10/26/2009	15.0	2.5	0.005	2.1	0.117
91492	Plateau	BDC-275	10/26/2009	15.1	2.5	0.006	2.1	0.116
91493	Plateau	BDC-300	10/26/2009	15.1	2.5	0.007	2.2	0.121
91494	Plateau	BDC-300	10/26/2009	15.3	2.6	0.007	2.2	0.121
91495	Plateau	BDC-300	10/26/2009	14.8	2.5	0.008	2.2	0.124
91496	Plateau	BDC-325	10/26/2009	15.1	2.9	0.006	2.2	0.125

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
91497	Plateau	BDC-325	10/26/2009	14.1	2.7	0.009	2.2	0.173
91498	Plateau	BDC-325	10/26/2009	15.3	2.9	0.004	2.2	0.129
91499	Plateau	BDC-350	10/26/2009	15.6	2.9	0.005	2.2	0.129
91500	Plateau	BDC-350	10/26/2009	15.2	2.9	0.008	2.2	0.131
91501	Plateau	BDC-350	10/26/2009	15.5	2.8	0.008	2.2	0.127
91502	Plateau	BDC-400	10/26/2009	16.7	0.7	0.007	0.1	0.149
91503	Plateau	BDC-400	10/26/2009	16.9	0.7	0.007	0.2	0.156
91504	Plateau	BDC-400	10/26/2009	17.0	0.7	0.006	0.1	0.151
91505	Plateau	BDC-Trib	10/26/2009	10.0	2.1	0.009	1.3	0.023
91506	Plateau	BDC-Trib	10/26/2009	9.1	1.9	0.018	1.3	0.089
91507	Plateau	BDC-Trib	10/26/2009	9.7	2.1	0.010	1.3	0.024
91508	Plateau	BDC-Trib	10/26/2009	5.1	0.2	0.006	0.1	0.009
91567	Post	BDC-60	10/27/2009	11.8	1.1	0.012	0.6	0.084
91568	Post	BDC-100	10/27/2009	11.9	1.1	0.018	0.6	0.092
91569	Post	BDC-125	10/27/2009	11.8	1.2	0.010	0.6	0.090
91570	Post	BDC-150	10/27/2009	12.0	1.2	0.010	0.6	0.093
91571	Post	BDC-175	10/27/2009	12.1	1.1	0.010	0.7	0.091
91572	Post	BDC-200	10/27/2009	12.1	1.2	0.010	0.7	0.095
91573	Post	BDC-225	10/27/2009	12.2	1.2	0.011	0.7	0.097
91574	Post	BDC-250	10/27/2009	12.3	1.2	0.017	0.7	0.101
91575	Post	BDC-275	10/27/2009	11.9	1.2	0.024	0.7	0.138
91576	Post	BDC-300	10/27/2009	12.3	1.3	0.015	0.7	0.102
91577	Post	BDC-325	10/27/2009	12.6	1.3	0.015	0.7	0.103
91578	Post	BDC-350	10/27/2009	12.6	1.3	0.019	0.8	0.108
91579	Post	BDC-400	10/27/2009	14.1	0.8	0.021	0.3	0.138
91580	Post	BDC-Trib	10/27/2009	8.7	2.4	0.010	1.7	0.025
92048	Pre	BDC-79	11/22/2009	9.4	1.1	0.048	0.7	0.050
92049	Pre	BDC-79	11/22/2009	9.9	1.1	0.031	0.7	0.050
92050	Pre	BDC-100	11/22/2009	9.6	1.1	0.026	0.7	0.051
92051	Pre	BDC-100	11/22/2009	9.4	1.1	0.027	0.7	0.051

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
92052	Pre	BDC-125	11/22/2009	9.9	1.1	0.024	0.7	0.047
92053	Pre	BDC-125	11/22/2009	9.8	1.1	0.026	0.7	0.050
92054	Pre	BDC-150	11/22/2009	9.6	1.1	0.026	0.7	0.050
92055	Pre	BDC-150	11/22/2009	9.1	1.1	0.023	0.7	0.049
92056	Pre	BDC-175	11/22/2009	9.8	1.1	0.020	0.7	0.051
92057	Pre	BDC-175	11/22/2009	10.1	1.1	0.022	0.7	0.050
92058	Pre	BDC-200	11/22/2009	9.3	1.2	0.025	0.7	0.053
92059	Pre	BDC-200	11/22/2009	8.9	1.1	0.025	0.8	0.052
92060	Pre	BDC-225	11/22/2009	8.9	1.2	0.028	0.8	0.051
92061	Pre	BDC-225	11/22/2009	8.9	1.2	0.028	0.7	0.054
92062	Pre	BDC-250	11/22/2009	9.3	1.2	0.028	0.8	0.055
92063	Pre	BDC-250	11/22/2009	9.5	1.1	0.031	0.8	0.054
92064	Pre	BDC-275	11/22/2009	9.3	1.2	0.029	0.8	0.055
92065	Pre	BDC-275	11/22/2009	9.1	1.2	0.029	0.7	0.055
92066	Pre	BDC-300	11/22/2009	9.8	1.2	0.031	0.8	0.101
92067	Pre	BDC-300	11/22/2009	10.8	1.3	0.029	0.8	0.053
92068	Pre	BDC-325	11/22/2009	9.3	1.2	0.031	0.8	0.055
92069	Pre	BDC-325	11/22/2009	10.5	1.3	0.032	0.8	0.055
92070	Pre	BDC-350	11/22/2009	11.4	1.3	0.033	0.8	0.060
92071	Pre	BDC-350	11/22/2009	10.8	1.2	0.036	0.8	0.059
92072	Pre	BDC-400	11/22/2009	12.2	1.0	0.040	0.6	0.062
92073	Pre	BDC-400	11/22/2009	11.6	1.0	0.059	0.6	0.060
92074	Pre	BDC-Trib	11/22/2009	8.4	1.7	0.024	1.1	0.074
92075	Pre	BDC-Trib	11/22/2009	7.8	1.8	0.009	1.1	0.017
92076	Pre	BDC-GW-Weir	11/22/2009	9.8	1.3	0.033	0.8	0.055
92077	Pre	BDC-GW-Weir	11/22/2009	9.9	1.2	0.030	0.8	0.048
92078	Pre	BDC-Trib	11/22/2009	4.4	0.2	0.001	0.3	0.002
92080	Plateau	BDC-79	11/22/2009	9.1	2.1	0.019	1.6	0.045
92081	Plateau	BDC-79	11/22/2009	9.3	1.9	0.020	1.6	0.045
92082	Plateau	BDC-79	11/22/2009	9.8	2.1	0.021	1.6	0.050

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
92083	Plateau	BDC-100	11/22/2009	9.7	2.2	0.019	1.6	0.046
92084	Plateau	BDC-100	11/22/2009	9.5	2.0	0.022	1.6	0.046
92085	Plateau	BDC-100	11/22/2009	9.5	2.2	0.018	1.6	0.045
92086	Plateau	BDC-125	11/22/2009	9.8	2.2	0.021	1.7	0.048
92087	Plateau	BDC-125	11/22/2009	10.2	2.3	0.019	1.7	0.059
92088	Plateau	BDC-125	11/22/2009	10.0	2.3	0.019	1.7	0.046
92089	Plateau	BDC-150	11/22/2009	10.2	2.3	0.017	1.7	0.048
92090	Plateau	BDC-150	11/22/2009	9.8	2.3	0.020	1.6	0.050
92091	Plateau	BDC-150	11/22/2009	10.2	2.3	0.018	1.8	0.050
92092	Plateau	BDC-175	11/22/2009	10.2	2.3	0.020	1.8	0.051
92093	Plateau	BDC-175	11/22/2009	10.0	2.3	0.017	1.7	0.047
92094	Plateau	BDC-175	11/22/2009	8.3	1.9	0.019	1.7	0.049
92095	Plateau	BDC-200	11/22/2009	9.7	2.3	0.017	1.7	0.038
92096	Plateau	BDC-200	11/22/2009	9.6	2.3	0.018	1.7	0.048
92097	Plateau	BDC-200	11/22/2009	10.1	2.4	0.026	1.7	0.049
92098	Plateau	BDC-225	11/22/2009	10.1	2.5	0.022	1.7	0.049
92099	Plateau	BDC-225	11/22/2009	10.3	2.6	0.020	1.7	0.048
92100	Plateau	BDC-225	11/22/2009	10.0	2.5	0.020	1.8	0.048
92101	Plateau	BDC-250	11/22/2009	10.4	2.6	0.021	1.8	0.052
92102	Plateau	BDC-250	11/22/2009	10.7	2.6	0.016	1.8	0.051
92103	Plateau	BDC-250	11/22/2009	10.5	2.5	0.021	1.4	0.046
92104	Plateau	BDC-275	11/22/2009	10.5	2.7	0.026	1.8	0.050
92105	Plateau	BDC-275	11/22/2009	10.5	2.6	0.028	1.9	0.050
92106	Plateau	BDC-275	11/22/2009	10.8	2.6	0.031	1.9	0.053
92107	Plateau	BDC-300	11/22/2009	9.5	2.1	0.033	1.8	0.053
92108	Plateau	BDC-300	11/22/2009	10.6	2.2	0.033	1.8	0.064
92109	Plateau	BDC-300	11/22/2009	11.5	2.4	0.030	1.8	0.053
92110	Plateau	BDC-325	11/22/2009	12.3	2.5	0.035	1.9	0.054
92111	Plateau	BDC-325	11/22/2009	12.6	2.6	0.029	1.8	0.055
92112	Plateau	BDC-325	11/22/2009	12.2	2.5	0.033	1.8	0.054

UNH ID	Sample Type	Station Name	Collection Date	DOC (mg C/L)	TDN (mg N/L)	NH_4^+ (mg N/L)	NO_3^- (mg N/L)	PO_4^{3-} (mg P/L)
92113	Plateau	BDC-350	11/22/2009	12.2	2.5	0.034	1.9	0.055
92114	Plateau	BDC-350	11/22/2009	12.5	2.5	0.036	1.9	0.055
92115	Plateau	BDC-350	11/22/2009	12.1	2.5	0.033	1.9	0.054
92116	Plateau	BDC-400	11/22/2009	13.8	1.4	0.077	0.9	0.064
92117	Plateau	BDC-400	11/22/2009	13.3	1.1	0.046	0.6	0.063
92118	Plateau	BDC-400	11/22/2009	13.6	1.1	0.045	0.6	0.064
92119	Plateau	BDC-Trib	11/22/2009	10.6	1.5	0.010	1.0	0.022
92120	Plateau	BDC-Trib	11/22/2009	10.4	1.7	0.009	1.0	0.021
92121	Plateau	BDC-Trib	11/22/2009	8.3	1.4	0.010	1.0	0.019
92128	Post	BDC-79	11/24/2009	9.7	1.3	0.047	0.9	0.047
92129	Post	BDC-100	11/24/2009	10.8	1.4	0.028	0.9	0.046
92130	Post	BDC-125	11/24/2009	10.5	1.4	0.024	0.9	0.046
92131	Post	BDC-150	11/24/2009	10.7	1.4	0.030	0.9	0.048
92132	Post	BDC-175	11/24/2009	10.5	1.4	0.025	0.9	0.047
92133	Post	BDC-200	11/24/2009	10.5	1.4	0.029	0.9	--
92134	Post	BDC-225	11/24/2009	11.5	1.5	0.027	1.0	--
92135	Post	BDC-250	11/24/2009	10.2	1.4	0.030	1.0	--
92136	Post	BDC-275	11/24/2009	10.7	1.5	0.029	0.9	--
92137	Post	BDC-300	11/24/2009	10.4	1.5	0.031	0.9	--
92138	Post	BDC-325	11/24/2009	11.0	1.5	0.032	1.0	--
92139	Post	BDC-350	11/24/2009	11.2	1.6	0.038	1.0	--
92140	Post	BDC-400	11/24/2009	11.0	1.1	0.040	0.7	--
92141	Post	BDC-Trib	11/24/2009	7.1	1.5	0.015	1.2	--

Table 11. Anion and cation water chemistry data for bi-monthly samples. -- signifies that the sample was not analyzed.

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
84657	BDC-0	1/23/2009	20.5	0.0	3.2	12.2	2.5	2.0	10.1
84658	BDC-50	1/23/2009	17.1	0.0	5.6	7.9	6.1	4.0	20.9

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
84659	BDC-100	1/23/2009	17.2	0.0	5.7	7.9	6.3	4.1	21.4
84660	BDC-150	1/23/2009	17.7	0.0	5.8	8.1	6.4	4.1	21.5
84661	BDC-200	1/23/2009	18.2	0.0	5.9	8.4	6.6	4.2	22.0
84662	BDC-250	1/23/2009	18.2	0.0	5.9	8.2	6.6	4.2	22.2
84663	BDC-300	1/23/2009	18.1	0.0	5.9	8.2	6.6	4.2	22.4
84664	BDC-350	1/23/2009	18.0	0.0	5.7	8.0	6.5	4.1	20.5
84665	BDC-400	1/23/2009	17.9	0.0	5.9	7.8	6.8	3.9	20.0
84666	BDC-450	1/23/2009	18.5	0.0	5.9	7.9	7.0	4.0	20.7
84667	BDC-500	1/23/2009	18.9	0.0	5.9	8.0	7.2	4.1	20.9
85557	BDC-0	2/17/2009	16.0	0.0	3.8	9.0	4.6	2.8	16.1
85558	BDC-50	2/17/2009	14.5	0.0	4.5	7.5	6.1	3.6	20.2
85559	BDC-100	2/17/2009	14.5	0.0	4.6	7.3	6.1	3.6	21.4
85560	BDC-150	2/17/2009	14.5	0.0	4.6	7.2	6.1	3.6	21.3
85561	BDC-200	2/17/2009	15.4	0.0	4.8	7.6	6.4	3.8	22.4
85562	BDC-250	2/17/2009	15.3	0.0	4.8	7.5	6.4	3.8	22.2
85563	BDC-300	2/17/2009	15.5	0.0	4.9	7.6	6.5	3.8	22.6
85564	BDC-350	2/17/2009	16.0	0.0	5.0	7.7	6.5	3.9	22.9
85565	BDC-400	2/17/2009	15.5	0.0	4.8	7.3	6.7	3.5	20.4
85566	BDC-450	2/17/2009	16.1	0.0	4.8	7.4	6.8	3.5	20.7
85567	BDC-500	2/17/2009	16.2	0.0	4.8	7.4	6.9	3.5	20.3
85815	BDC-0	3/13/2009	20.2	0.0	2.1	12.7	1.4	1.2	8.4
85816	BDC-50	3/13/2009	4.4	0.0	1.9	3.1	1.2	0.9	5.9
85817	BDC-100	3/13/2009	10.9	0.0	3.2	7.0	4.2	2.4	15.3
85818	BDC-150	3/13/2009	9.8	0.1	3.4	6.1	4.4	2.5	16.0
85819	BDC-200	3/13/2009	11.0	0.0	3.7	6.7	5.0	2.8	18.1
85820	BDC-250	3/13/2009	12.3	0.0	3.7	7.6	4.9	2.8	17.8
85821	BDC-300	3/13/2009	12.0	0.0	3.6	7.5	4.9	2.8	17.9
85822	BDC-350	3/13/2009	11.5	0.0	3.8	6.9	5.1	2.9	18.8
85823	BDC-400	3/13/2009	11.3	0.0	3.7	6.8	5.1	2.7	17.0
85824	BDC-450	3/13/2009	13.2	0.0	3.9	8.0	5.4	2.8	17.9

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
85825	BDC-500	3/13/2009	12.0	0.0	3.8	7.1	5.5	2.7	17.6
85826	BDC-516	3/13/2009	12.5	0.0	3.8	5.7	6.7	2.8	17.2
86926	BDC-0	4/8/2009	14.6	0.0	1.7	9.2	1.5	1.1	7.5
86927	BDC-50	4/8/2009	12.6	0.0	1.8	8.1	2.1	1.3	9.0
86928	BDC-100	4/8/2009	8.8	0.0	2.4	6.0	3.8	2.2	15.6
86929	BDC-150	4/8/2009	9.0	0.0	2.4	6.1	3.5	2.2	15.4
86930	BDC-200	4/8/2009	10.6	0.0	2.6	7.0	4.1	2.6	21.9
86931	BDC-250	4/8/2009	10.9	0.0	2.6	7.1	4.2	2.6	22.1
86932	BDC-300	4/8/2009	11.0	0.0	2.6	7.1	4.2	2.6	22.9
86933	BDC-350	4/8/2009	11.4	0.0	2.7	7.2	4.2	2.6	19.7
86934	BDC-400	4/8/2009	11.0	0.0	2.7	7.2	4.1	2.3	17.3
86935	BDC-450	4/8/2009	11.8	0.0	2.6	7.4	4.5	2.4	19.0
86936	BDC-500	4/8/2009	11.9	0.0	2.7	7.6	4.4	2.3	18.5
86937	BDC-516	4/8/2009	12.5	0.0	2.9	5.6	7.0	2.7	22.3
86938	BDC-Trib	4/8/2009	7.7	0.0	1.4	6.3	3.8	4.4	20.7
88023	BDC-0	5/12/2009	20.2	0.1	1.6	12.8	1.0	1.1	5.6
88024	BDC-50	5/12/2009	19.9	0.1	2.0	13.0	2.5	1.9	10.3
88025	BDC-100	5/12/2009	13.1	0.1	2.9	7.5	6.1	3.6	17.8
88026	BDC-150	5/12/2009	13.4	0.1	3.0	7.6	6.3	3.6	16.2
88027	BDC-200	5/12/2009	13.8	0.1	3.0	7.7	6.5	3.7	17.9
88028	BDC-250	5/12/2009	14.0	0.1	2.9	7.8	6.7	3.8	16.5
88029	BDC-300	5/12/2009	14.3	0.1	3.0	7.9	6.8	3.8	17.0
88030	BDC-350	5/12/2009	14.5	0.0	3.0	7.9	6.9	3.9	19.7
88031	BDC-400	5/12/2009	14.4	0.1	2.6	7.8	7.1	3.6	18.4
88032	BDC-450	5/12/2009	14.5	0.1	2.5	7.8	7.2	3.6	15.8
88033	BDC-500	5/12/2009	14.7	0.0	2.6	7.8	7.3	3.7	16.1
88034	BDC-516	5/12/2009	18.1	0.0	2.7	8.5	9.0	4.3	18.1
88035	BDC-Trib	5/12/2009	4.1	0.0	0.7	5.4	1.0	5.9	10.5
88137	BDC-0	5/27/2009	13.2	0.0	4.4	8.5	5.6	3.1	21.8
88138	BDC-50	5/27/2009	14.6	0.0	4.7	8.9	5.6	3.2	22.9

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
88139	BDC-100	5/27/2009	13.5	0.0	4.5	8.2	5.6	3.1	23.0
88140	BDC-150	5/27/2009	13.9	0.0	4.6	8.3	5.8	3.2	23.7
88141	BDC-200	5/27/2009	13.9	0.0	4.4	8.4	5.8	3.1	23.6
88142	BDC-250	5/27/2009	13.8	0.1	4.2	8.2	5.7	3.1	23.8
88143	BDC-300	5/27/2009	14.2	0.0	4.2	8.1	5.7	3.1	23.5
88144	BDC-350	5/27/2009	14.8	0.0	4.1	8.0	5.6	3.2	23.3
88145	BDC-400	5/27/2009	13.8	0.0	3.0	7.4	5.3	2.9	19.8
88146	BDC-450	5/27/2009	14.2	0.0	3.2	7.5	5.3	3.0	20.7
88147	BDC-500	5/27/2009	14.9	0.0	3.2	8.1	5.2	3.0	20.1
88148	BDC-516	5/27/2009	17.9	0.0	3.8	8.1	6.1	3.5	24.0
88217	BDC-0	6/2/2009	14.1	0.0	3.6	9.3	4.9	2.7	19.2
88218	BDC-50	6/2/2009	13.9	0.0	3.7	7.9	5.1	2.8	20.4
88219	BDC-100	6/2/2009	12.6	0.0	3.8	8.2	5.1	2.8	20.6
88220	BDC-150	6/2/2009	14.0	0.0	3.8	9.0	5.0	2.8	20.6
88221	BDC-200	6/2/2009	13.0	0.0	3.4	8.2	4.4	2.4	19.8
88222	BDC-250	6/2/2009	13.2	0.0	4.0	8.1	5.4	2.9	22.1
88223	BDC-300	6/2/2009	13.3	0.0	4.1	8.0	5.4	2.9	22.1
88224	BDC-350	6/2/2009	16.3	0.0	3.1	7.7	4.0	2.2	18.9
88225	BDC-400	6/2/2009	12.0	0.0	2.8	7.2	5.0	2.6	17.8
88226	BDC-450	6/2/2009	12.0	0.0	2.8	7.2	5.0	2.6	17.6
88227	BDC-500	6/2/2009	13.6	0.0	2.8	8.2	4.6	2.4	16.2
88228	BDC-516	6/2/2009	12.9	0.0	2.9	7.4	5.0	2.6	17.4
88659	BDC-0	6/18/2009	14.9	0.0	1.4	11.3	1.0	0.8	4.5
88660	BDC-50	6/18/2009	14.4	0.0	1.4	11.0	1.0	0.8	4.7
88661	BDC-100	6/18/2009	12.1	0.0	4.0	8.3	5.1	3.0	22.1
88662	BDC-150	6/18/2009	12.5	0.0	4.2	8.4	5.2	3.1	23.4
88663	BDC-200	6/18/2009	12.7	0.0	4.2	8.5	5.4	3.1	24.0
88664	BDC-250	6/18/2009	13.0	0.0	4.3	8.1	5.1	3.0	23.3
88665	BDC-300	6/18/2009	13.3	0.2	4.4	8.6	5.4	3.1	24.6
88666	BDC-350	6/18/2009	13.8	0.0	4.3	8.2	5.1	3.0	23.5

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
88667	BDC-400	6/18/2009	12.3	0.0	3.1	7.8	4.9	2.8	20.1
88668	BDC-450	6/18/2009	12.0	0.0	3.1	7.7	4.9	2.8	20.0
88669	BDC-500	6/18/2009	12.4	0.0	3.2	7.7	4.9	2.8	20.0
88670	BDC-516	6/18/2009	11.8	0.0	3.1	7.5	4.6	2.6	18.9
88671	BDC-Trib	6/18/2009	22.6	0.0	11.1	13.1	8.1	5.3	52.3
88672	BDC-Spring	6/18/2009	2.0	0.0	1.7	4.1	7.1	3.2	7.9
89046	BDC-0	7/8/2009	19.4	0.0	1.5	12.8	2.0	1.6	8.4
89047	BDC-50	7/8/2009	12.9	0.0	1.5	7.8	8.9	5.0	23.4
89048	BDC-100	7/8/2009	12.7	0.0	1.6	7.5	8.7	5.1	22.0
89049	BDC-150	7/8/2009	12.9	0.0	1.5	7.8	9.4	5.2	23.9
89050	BDC-200	7/8/2009	13.5	0.0	1.5	7.8	9.3	5.4	23.2
89051	BDC-250	7/8/2009	13.7	0.0	1.6	8.2	10.1	5.4	25.0
89052	BDC-300	7/8/2009	13.8	0.0	1.5	8.0	9.7	5.6	23.5
89053	BDC-350	7/8/2009	14.1	0.0	1.6	8.1	9.8	5.6	23.5
89054	BDC-400	7/8/2009	13.7	0.0	1.9	7.8	7.1	3.9	18.9
89055	BDC-450	7/8/2009	14.9	0.0	2.0	8.5	7.4	3.9	20.6
89056	BDC-500	7/8/2009	14.9	0.0	1.9	--	--	--	--
89057	BDC-516	7/8/2009	19.0	0.0	2.2	8.1	10.7	4.7	26.1
89058	BDC-Trib	7/8/2009	15.0	0.0	0.3	8.5	18.1	9.4	33.5
89386	BDC-0	7/20/2009	21.1	0.0	1.7	13.8	1.5	1.5	7.9
89387	BDC-50	7/20/2009	14.0	0.1	3.3	8.9	7.2	4.2	26.5
89388	BDC-100	7/20/2009	15.6	0.1	3.7	8.9	7.5	4.3	27.3
89389	BDC-150	7/20/2009	15.8	0.0	3.8	9.0	7.5	4.4	27.9
89390	BDC-200	7/20/2009	15.9	0.0	3.7	9.0	7.5	4.4	28.2
89391	BDC-250	7/20/2009	15.9	0.1	3.7	9.0	7.5	4.5	28.4
89392	BDC-300	7/20/2009	16.1	0.1	3.8	9.0	7.5	4.6	28.9
89393	BDC-350	7/20/2009	16.4	0.0	3.7	9.0	7.5	4.8	28.8
89394	BDC-400	7/20/2009	14.1	0.0	2.6	7.6	6.4	4.0	23.2
89395	BDC-450	7/20/2009	15.4	0.1	2.7	8.3	7.0	3.8	23.9
89396	BDC-500	7/20/2009	14.7	0.0	3.0	8.3	6.9	3.5	22.0

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
89397	BDC-516	7/20/2009	18.7	0.1	2.9	8.3	7.5	4.4	26.7
89398	BDC-Trib	7/20/2009	13.4	0.2	0.6	9.3	11.9	15.9	48.0
89399	BDC-Trib	7/20/2009	12.4	0.1	0.2	9.1	11.9	16.1	46.7
90491	BDC-0	8/30/2009	18.0	0.0	1.7	11.7	2.1	1.3	7.3
90492	BDC-50	8/30/2009	11.5	0.0	2.1	6.5	6.5	2.8	16.7
90493	BDC-100	8/30/2009	17.2	0.0	2.0	10.1	5.2	2.5	15.1
90494	BDC-150	8/30/2009	11.3	0.0	2.0	6.5	6.6	2.8	16.8
90495	BDC-200	8/30/2009	12.0	0.0	2.1	6.7	6.8	2.9	17.5
90496	BDC-250	8/30/2009	12.1	0.0	2.1	6.7	6.8	2.9	17.7
90497	BDC-300	8/30/2009	12.0	0.0	2.1	6.7	6.8	2.9	17.6
90498	BDC-350	8/30/2009	12.5	0.0	2.2	6.8	6.8	3.0	18.2
90499	BDC-400	8/30/2009	12.0	0.0	1.8	6.5	6.4	2.8	17.2
90500	BDC-450	8/30/2009	12.2	0.0	1.8	6.4	6.2	2.8	17.2
90501	BDC-500	8/30/2009	12.0	0.0	1.7	6.4	6.2	2.8	17.3
90502	BDC-516	8/30/2009	17.2	0.0	1.7	6.9	8.1	3.5	20.8
90503	BDC-Trib	8/30/2009	10.4	0.0	1.3	7.4	10.0	2.5	12.9
90726	BDC-0	9/9/2009	19.1	0.0	6.7	10.4	7.2	4.7	32.9
90727	BDC-50	9/9/2009	19.3	0.0	6.7	10.8	7.5	4.9	34.0
90728	BDC-100	9/9/2009	20.3	0.0	6.9	10.7	7.6	4.9	35.3
90729	BDC-150	9/9/2009	20.0	0.0	6.7	10.8	7.6	4.8	34.2
90730	BDC-200	9/9/2009	20.3	0.0	6.6	10.7	7.6	4.8	34.4
90731	BDC-250	9/9/2009	19.1	0.0	6.5	9.7	7.0	4.5	34.7
90732	BDC-300	9/9/2009	19.5	0.0	6.4	9.8	7.0	4.7	36.3
90733	BDC-350	9/9/2009	23.5	0.0	6.7	11.0	7.9	5.3	34.7
90734	BDC-400	9/9/2009	22.6	0.0	4.3	9.3	7.4	4.8	30.8
90735	BDC-450	9/9/2009	22.8	0.0	4.3	8.8	7.0	4.5	28.6
90736	BDC-500	9/9/2009	22.7	0.0	4.2	9.2	7.4	4.7	30.6
90737	BDC-516	9/9/2009	26.1	0.0	4.6	9.3	7.8	5.1	31.9
90738	BDC-Trib	9/9/2009	24.9	0.0	10.5	12.3	8.0	5.6	34.9
90897	BDC-0	9/23/2009	22.2	0.0	7.3	10.9	7.8	5.1	36.8

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
90898	BDC-50	9/23/2009	23.0	0.0	7.5	11.1	8.0	5.2	38.2
90899	BDC-100	9/23/2009	23.2	0.0	7.3	11.0	8.0	5.2	38.3
90900	BDC-150	9/23/2009	23.3	0.0	7.3	11.1	8.0	5.2	38.3
90901	BDC-200	9/23/2009	23.1	0.0	7.2	11.0	8.0	5.2	38.3
90902	BDC-250	9/23/2009	24.2	0.0	7.2	11.1	8.0	5.3	38.8
90903	BDC-300	9/23/2009	24.0	0.0	7.1	11.0	8.0	5.3	38.9
90904	BDC-350	9/23/2009	26.0	0.0	7.1	11.2	8.1	5.5	40.1
90905	BDC-400	9/23/2009	26.4	0.0	4.7	9.6	7.9	5.1	32.4
90906	BDC-450	9/23/2009	25.8	0.0	4.7	9.6	7.9	5.1	32.6
90907	BDC-500	9/23/2009	26.2	0.0	4.7	9.6	7.9	5.1	32.9
90908	BDC-516	9/23/2009	26.1	0.0	4.8	9.6	7.9	5.1	32.9
90909	BDC-Trib	9/23/2009	22.7	0.0	10.6	12.4	8.1	5.8	50.4
91033	BDC-0	10/2/2009	18.7	0.0	4.6	9.3	7.2	4.5	31.1
91034	BDC-30	10/2/2009	19.3	0.0	4.0	10.1	5.7	3.9	28.9
91035	BDC-60	10/2/2009	19.4	0.0	4.7	9.4	7.4	4.7	32.4
91036	BDC-100	10/2/2009	20.7	0.0	4.4	11.1	6.4	4.3	30.6
91037	BDC-150	10/2/2009	19.6	0.0	4.8	9.3	7.4	4.7	32.7
91038	BDC-200	10/2/2009	19.3	0.0	4.3	9.9	6.5	4.2	31.5
91039	BDC-250	10/2/2009	20.0	0.0	4.9	9.4	7.4	4.7	33.6
91040	BDC-300	10/2/2009	18.8	0.0	4.3	9.6	6.2	4.1	32.1
91041	BDC-350	10/2/2009	20.9	0.0	5.1	9.6	7.6	4.8	34.5
91042	BDC-400	10/2/2009	20.0	0.0	3.0	8.4	7.4	4.4	27.8
91043	BDC-450	10/2/2009	16.5	0.0	2.1	8.2	4.5	3.0	19.8
91044	BDC-500	10/2/2009	18.2	0.0	2.5	9.0	5.3	3.5	25.3
91045	BDC-505	10/2/2009	20.4	0.0	3.1	8.4	7.3	4.4	28.1
91046	BDC-510	10/2/2009	18.8	0.0	2.9	8.1	7.1	4.2	27.1
91047	BDC-516	10/2/2009	17.4	0.0	2.6	7.9	6.7	4.0	25.9
91048	BDC-Trib	10/2/2009	21.2	0.0	10.3	12.1	7.7	5.7	41.0
91871	BDC-0	11/10/2009	18.6	0.1	4.4	9.2	7.7	4.0	25.4
91872	BDC-50	11/10/2009	18.8	0.0	4.5	9.1	7.8	4.1	26.0

UNH ID	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
91873	BDC-100	11/10/2009	18.9	0.0	4.5	9.1	7.9	4.2	26.4
91874	BDC-150	11/10/2009	19.1	0.0	4.5	9.2	8.0	4.2	26.6
91875	BDC-200	11/10/2009	19.3	0.0	4.5	9.2	8.1	4.2	26.9
91876	BDC-250	11/10/2009	19.5	0.1	4.5	9.3	8.1	4.3	27.1
91877	BDC-300	11/10/2009	19.6	0.1	4.5	9.3	8.2	4.3	27.2
91878	BDC-350	11/10/2009	20.2	0.0	4.6	9.3	8.3	4.3	27.7
91879	BDC-400	11/10/2009	20.4	0.0	3.8	8.8	8.5	4.1	25.0
91880	BDC-450	11/10/2009	20.5	0.0	3.9	8.9	8.5	4.2	25.0
91881	BDC-500	11/10/2009	20.8	0.0	3.9	8.9	8.6	4.2	25.2
91882	BDC-516	11/10/2009	26.6	0.0	4.5	9.5	10.3	4.9	29.6
91883	BDC-Trib	11/10/2009	14.8	0.0	5.2	9.7	7.3	4.3	29.5
92383	BDC-0	12/11/2009	10.8	0.0	3.0	6.7	4.5	2.7	11.9
92384	BDC-50	12/11/2009	10.9	0.0	3.1	6.8	4.5	2.7	12.6
92385	BDC-100	12/11/2009	11.0	0.0	3.1	6.7	4.6	2.8	12.9
92386	BDC-150	12/11/2009	11.2	0.0	3.2	6.8	4.7	2.8	13.3
92387	BDC-200	12/11/2009	14.1	0.0	3.2	9.5	4.7	2.8	12.8
92388	BDC-250	12/11/2009	10.9	0.0	3.0	6.6	4.6	2.7	13.8
92389	BDC-300	12/11/2009	12.1	0.0	3.3	7.2	5.0	3.0	14.4
92390	BDC-350	12/11/2009	12.4	0.0	3.4	7.4	5.1	3.0	14.2
92391	BDC-400	12/11/2009	12.7	0.0	3.3	7.2	5.0	2.8	13.2
92392	BDC-450	12/11/2009	13.3	0.0	3.4	7.4	5.1	2.9	13.9
92393	BDC-500	12/11/2009	13.4	0.0	3.5	7.3	5.2	2.9	14.2
92394	BDC-516	12/11/2009	17.1	0.0	3.9	6.7	6.9	3.2	15.7
92395	BDC-Trib	12/11/2009	9.7	0.0	2.5	7.1	5.9	3.6	14.4

Table 12. Anion and cation water chemistry data for samples collected during additions. -- signifies that the sample was not analyzed.

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
87189	Pre	BDC-0	4/16/2009	19.3	0.0	2.5	13.4	1.4	1.1	8.2

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
87190	Pre	BDC-30	4/16/2009	10.0	0.1	3.9	6.4	4.4	2.3	16.6
87191	Pre	BDC-60	4/16/2009	9.7	0.0	3.8	6.3	4.3	2.3	17.2
87192	Pre	BDC-60	4/16/2009	9.9	0.1	3.8	6.3	4.4	2.3	16.8
87193	Pre	BDC-105	4/16/2009	10.2	0.2	4.0	6.5	4.5	2.3	17.0
87194	Pre	BDC-120	4/16/2009	10.5	0.0	4.0	6.6	4.6	2.3	17.1
87195	Pre	BDC-135	4/16/2009	10.6	0.0	4.0	6.6	4.6	2.4	17.6
87196	Pre	BDC-150	4/16/2009	10.7	0.2	4.1	6.8	4.7	2.4	17.5
87197	Pre	BDC-225	4/16/2009	11.0	0.1	4.2	6.8	4.8	2.4	18.1
87198	Pre	BDC-300	4/16/2009	11.3	0.0	4.2	7.0	4.9	2.5	18.6
87199	Pre	BDC-400	4/16/2009	11.0	0.1	3.9	6.4	4.9	2.3	16.0
87200	Pre	BDC-450	4/16/2009	11.3	0.0	3.9	6.6	5.0	2.3	16.1
87201	Pre	BDC-Trib	4/16/2009	7.5	0.1	1.4	7.5	4.1	5.5	31.4
87202	Pre	BDC-Trib	4/16/2009	7.5	0.0	1.4	7.4	4.1	5.5	31.3
87203	Pre	BDC-505	4/16/2009	13.6	0.0	3.9	6.3	5.7	2.9	19.3
87204	Pre	BDC-510	4/16/2009	13.6	0.0	3.8	6.3	5.7	2.9	19.0
87205	Plateau	BDC-0	4/16/2009	23.0	0.5	2.5	14.2	1.5	1.5	10.3
87206	Plateau	BDC-0	4/16/2009	23.5	0.3	2.4	14.3	1.4	1.4	9.7
87207	Plateau	BDC-30	4/16/2009	20.1	1.9	3.8	13.1	4.9	2.8	19.7
87208	Plateau	BDC-30	4/16/2009	19.9	1.8	3.7	13.1	4.9	2.8	19.3
87209	Plateau	BDC-60	4/16/2009	20.6	2.0	3.8	13.5	4.9	2.8	19.4
87210	Plateau	BDC-60	4/16/2009	20.7	2.1	3.9	13.4	4.9	2.8	19.6
87211	Plateau	BDC-105	4/16/2009	21.6	2.2	3.9	14.1	5.1	2.8	19.8
87212	Plateau	BDC-105	4/16/2009	21.8	2.1	3.9	14.1	5.1	2.8	19.8
87213	Plateau	BDC-120	4/16/2009	21.9	2.1	3.9	14.2	5.1	2.8	20.0
87214	Plateau	BDC-120	4/16/2009	21.5	2.1	4.0	14.2	5.1	2.9	20.4
87215	Plateau	BDC-135	4/16/2009	22.2	2.3	4.1	14.3	5.2	2.8	20.2
87216	Plateau	BDC-135	4/16/2009	21.9	2.1	3.9	14.3	5.2	2.8	20.0
87217	Plateau	BDC-150	4/16/2009	22.2	2.1	4.0	14.5	5.2	2.9	20.1
87218	Plateau	BDC-150	4/16/2009	22.0	2.2	4.0	14.5	5.2	2.9	20.4
87219	Plateau	BDC-225	4/16/2009	22.3	2.2	4.0	14.9	5.4	2.9	20.7

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
87220	Plateau	BDC-225	4/16/2009	22.8	2.1	4.1	14.8	5.4	2.9	20.9
87221	Plateau	BDC-300	4/16/2009	23.1	2.1	4.1	15.2	5.4	3.0	21.3
87222	Plateau	BDC-300	4/16/2009	23.3	2.2	4.1	15.0	5.4	2.9	21.1
87223	Plateau	BDC-400	4/16/2009	25.2	2.5	4.0	16.6	5.5	2.7	18.9
87224	Plateau	BDC-400	4/16/2009	25.0	2.4	3.9	16.4	5.4	2.7	18.6
87225	Plateau	BDC-450	4/16/2009	124.6	10.4	3.9	98.1	5.9	2.9	19.3
87226	Plateau	BDC-450	4/16/2009	40.7	4.3	3.8	29.9	5.6	2.7	18.4
87227	Plateau	BDC-Trib	4/16/2009	8.3	0.2	1.9	8.0	4.7	5.0	30.8
87228	Plateau	BDC-Trib	4/16/2009	8.2	0.1	1.9	7.9	4.7	5.1	30.4
87229	Plateau	BDC-505	4/16/2009	18.6	1.1	4.0	10.1	6.2	2.9	19.7
87230	Plateau	BDC-505	4/16/2009	20.1	1.4	4.0	11.5	6.2	2.8	19.1
87231	Plateau	BDC-510	4/16/2009	14.7	0.0	4.1	6.7	6.3	2.9	19.4
87232	Plateau	BDC-510	4/16/2009	14.5	0.0	4.0	6.6	6.3	2.9	19.5
87420	Post	BDC-0	4/17/2009	19.3	0.0	2.6	13.4	1.7	1.3	9.1
87421	Post	BDC-30	4/17/2009	10.5	0.0	3.9	6.6	4.4	2.5	17.8
87422	Post	BDC-60	4/17/2009	10.3	0.0	4.0	6.5	4.5	2.4	17.4
87423	Post	BDC-150	4/17/2009	11.0	0.0	4.1	6.8	4.7	2.5	18.3
87424	Post	BDC-225	4/17/2009	11.2	0.0	4.3	6.8	4.9	2.6	18.9
87425	Post	BDC-300	4/17/2009	11.3	0.0	4.2	6.8	5.0	2.6	18.9
87426	Post	BDC-Trib	4/17/2009	5.6	0.1	1.2	7.4	4.0	5.0	25.7
87427	Post	BDC-400	4/17/2009	9.4	0.1	2.4	6.2	2.8	1.5	11.3
87428	Post	BDC-450	4/17/2009	12.9	0.2	4.1	6.6	5.2	2.3	16.6
87429	Post	BDC-505	4/17/2009	12.6	0.0	4.3	6.6	5.6	2.5	17.4
87430	Post	BDC-510	4/17/2009	12.6	0.0	4.2	6.7	5.5	2.4	17.1
89140	Pre	BDC-30	7/13/2009	16.6	0.0	1.3	12.0	1.2	1.2	6.9
89141	Pre	BDC-60	7/13/2009	12.9	0.0	3.7	8.6	6.0	4.1	25.4
89142	Pre	BDC-100	7/13/2009	14.4	0.0	3.6	9.6	5.8	4.0	24.9
89143	Pre	BDC-150	7/13/2009	13.4	0.0	3.8	8.8	6.3	4.3	26.4
89144	Pre	BDC-200	7/13/2009	13.8	0.0	3.9	8.9	6.4	4.4	27.3
89145	Pre	BDC-250	7/13/2009	14.0	0.0	3.9	9.0	6.5	4.6	27.3

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
89146	Pre	BDC-300	7/13/2009	15.3	0.0	3.8	9.9	6.2	4.5	26.4
89147	Pre	BDC-400	7/13/2009	14.4	0.0	3.0	9.1	5.7	3.4	21.9
89148	Pre	BDC-450	7/13/2009	13.4	0.0	3.1	8.4	6.0	3.6	23.0
89149	Pre	BDC-505	7/13/2009	15.7	0.0	3.0	8.7	6.2	3.7	23.5
89150	Pre	BDC-510	7/13/2009	14.7	0.0	3.0	8.7	5.9	3.5	22.6
89151	Pre	BDC-Trib	7/13/2009	20.4	0.0	7.7	12.1	10.6	11.3	53.7
89152	Plateau	BDC-30	7/13/2009	17.4	0.0	1.4	12.1	1.4	1.3	7.6
89153	Plateau	BDC-30	7/13/2009	17.4	0.0	1.4	12.0	1.4	1.3	7.8
89154	Plateau	BDC-60	7/13/2009	20.4	0.9	3.5	14.1	7.0	4.9	28.5
89155	Plateau	BDC-60	7/13/2009	20.2	1.0	3.5	14.1	6.9	4.8	28.0
89156	Plateau	BDC-100	7/13/2009	21.5	1.0	3.7	14.4	6.9	4.8	28.2
89157	Plateau	BDC-100	7/13/2009	21.7	1.1	3.7	14.5	6.8	4.8	28.4
89158	Plateau	BDC-150	7/13/2009	22.4	1.1	3.8	15.0	6.9	4.9	28.6
89159	Plateau	BDC-150	7/13/2009	22.4	1.0	3.8	15.1	6.9	4.9	28.7
89160	Plateau	BDC-200	7/13/2009	22.2	1.1	3.8	15.2	7.1	4.9	27.4
89161	Plateau	BDC-200	7/13/2009	22.8	1.1	3.8	15.2	7.1	5.1	29.0
89162	Plateau	BDC-250	7/13/2009	23.7	1.2	3.9	15.9	7.2	5.2	29.1
89163	Plateau	BDC-250	7/13/2009	23.6	1.1	3.9	15.9	7.1	5.2	28.6
89164	Plateau	BDC-300	7/13/2009	24.0	1.2	3.9	16.1	7.2	5.4	28.5
89165	Plateau	BDC-300	7/13/2009	24.0	1.2	3.9	15.7	7.0	5.1	28.2
89166	Plateau	BDC-400	7/13/2009	25.8	1.5	3.0	18.3	6.3	3.5	22.5
89167	Plateau	BDC-400	7/13/2009	26.5	1.6	3.1	17.9	6.2	3.5	22.2
89168	Plateau	BDC-450	7/13/2009	27.4	1.7	3.1	18.9	6.4	3.6	22.7
89169	Plateau	BDC-450	7/13/2009	27.1	1.7	3.1	18.5	6.3	3.5	22.6
89170	Plateau	BDC-505	7/13/2009	14.0	0.0	3.1	8.6	6.5	3.6	22.9
89171	Plateau	BDC-505	7/13/2009	13.7	0.0	3.1	8.6	6.4	3.6	22.9
89172	Plateau	BDC-Trib	7/13/2009	20.0	0.0	6.8	11.8	11.4	13.0	53.9
89173	Plateau	BDC-Trib	7/13/2009	21.7	0.0	7.7	12.7	9.7	10.6	52.8
89179	Post	BDC-30	7/14/2009	15.3	0.0	3.4	10.0	4.5	3.2	21.0
89180	Post	BDC-60	7/14/2009	13.7	0.0	4.2	9.2	5.9	4.0	26.3

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89181	Post	BDC-100	7/14/2009	14.9	0.0	4.3	9.9	5.6	3.8	25.4
89182	Post	BDC-150	7/14/2009	13.4	0.0	4.2	8.8	5.8	3.9	26.0
89183	Post	BDC-200	7/14/2009	13.8	0.0	4.5	9.3	6.0	4.1	27.3
89184	Post	BDC-250	7/14/2009	14.4	0.0	4.6	9.3	6.1	4.2	27.7
89185	Post	BDC-300	7/14/2009	15.4	0.0	4.4	10.0	5.9	4.1	26.9
89186	Post	BDC-400	7/14/2009	13.9	0.0	3.4	9.3	5.3	3.3	22.3
89187	Post	BDC-450	7/14/2009	12.9	0.0	3.5	8.6	5.7	4.1	23.6
89188	Post	BDC-505	7/14/2009	12.1	0.0	3.3	8.1	5.1	3.3	22.6
89189	Post	BDC-510	7/14/2009	12.5	0.0	3.5	8.6	5.5	3.4	22.7
89190	Post	BDC-Trib	7/14/2009	14.9	0.1	1.7	10.5	14.5	18.6	55.3
89827	Pre	BDC-30	8/6/2009	16.9	0.0	1.2	11.7	1.2	1.2	6.7
89828	Pre	BDC-60	8/6/2009	11.8	0.0	3.5	8.7	6.4	4.0	25.6
89829	Pre	BDC-100	8/6/2009	13.5	0.0	4.0	9.6	7.2	4.4	28.4
89830	Pre	BDC-150	8/6/2009	13.3	0.0	3.9	9.8	7.4	4.6	29.4
89831	Pre	BDC-200	8/6/2009	13.8	0.0	4.0	9.0	6.9	4.3	27.5
89832	Pre	BDC-250	8/6/2009	14.3	0.0	4.1	9.1	7.0	4.5	28.1
89833	Pre	BDC-300	8/6/2009	13.6	0.0	3.8	9.2	7.1	4.7	28.4
89834	Pre	BDC-350	8/6/2009	15.0	0.0	4.1	9.5	7.4	5.2	29.4
89835	Pre	BDC-400	8/6/2009	14.0	0.0	3.1	8.9	6.8	3.9	24.6
89836	Pre	BDC-450	8/6/2009	13.5	0.2	3.0	8.9	6.9	4.0	24.8
89837	Pre	BDC-505	8/6/2009	14.4	0.1	3.1	9.5	7.6	4.3	26.7
89838	Pre	BDC-516	8/6/2009	19.0	0.2	2.8	9.6	9.4	5.1	30.4
89839	Pre	BDC-Trib	8/6/2009	10.3	0.1	0.2	9.0	20.5	15.9	47.6
89840	Pre	BDC-Trib	8/6/2009	10.6	0.1	0.2	9.1	20.7	16.0	47.7
89841	Pre	BDC-Trib	8/6/2009	10.2	0.0	0.0	9.1	21.2	12.7	40.3
89842	Plateau	BDC-30	8/6/2009	16.6	0.1	1.3	12.6	1.4	1.4	7.8
89843	Plateau	BDC-30	8/6/2009	17.1	0.1	1.3	12.9	1.4	1.4	7.7
89844	Plateau	BDC-60	8/6/2009	37.6	2.7	3.9	24.9	8.0	4.8	30.5
89845	Plateau	BDC-60	8/6/2009	37.6	2.6	3.9	23.7	7.6	4.6	29.2
89846	Plateau	BDC-100	8/6/2009	45.9	3.6	4.0	30.3	8.2	4.9	31.2

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89847	Plateau	BDC-100	8/6/2009	46.2	3.6	4.0	30.5	8.2	4.9	31.2
89848	Plateau	BDC-150	8/6/2009	48.8	3.7	4.1	31.5	8.4	5.0	31.8
89849	Plateau	BDC-150	8/6/2009	47.4	3.8	4.0	31.5	8.4	5.0	31.7
89850	Plateau	BDC-200	8/6/2009	46.1	3.6	4.1	31.0	8.5	5.0	31.5
89851	Plateau	BDC-200	8/6/2009	46.2	3.6	4.1	31.1	8.5	5.1	31.9
89852	Plateau	BDC-250	8/6/2009	45.7	3.5	4.1	31.3	8.5	5.0	30.8
89853	Plateau	BDC-250	8/6/2009	45.1	3.4	4.1	31.1	8.5	5.3	31.0
89854	Plateau	BDC-300	8/6/2009	46.1	3.5	4.2	31.7	8.5	5.5	31.9
89855	Plateau	BDC-300	8/6/2009	46.1	3.4	4.2	31.7	8.5	5.5	31.9
89856	Plateau	BDC-350	8/6/2009	49.3	3.8	4.1	33.7	8.6	6.0	31.9
89857	Plateau	BDC-350	8/6/2009	49.4	3.9	4.1	33.9	8.4	5.8	31.0
89858	Plateau	BDC-400	8/6/2009	14.1	0.0	3.1	9.7	7.6	4.1	25.5
89859	Plateau	BDC-400	8/6/2009	13.6	0.0	3.1	9.6	7.7	4.2	25.9
89860	Plateau	BDC-Trib	8/6/2009	18.5	1.2	0.1	15.9	20.9	15.6	44.5
89861	Plateau	BDC-Trib	8/6/2009	17.4	1.2	0.1	14.6	20.8	15.8	43.9
89862	Plateau	BDC-60	8/6/2009	43.0	3.3	3.8	28.7	8.0	4.8	30.4
89863	Plateau	BDC-60	8/6/2009	43.3	3.4	3.8	29.0	8.1	4.8	30.7
89864	Plateau	BDC-100	8/6/2009	43.5	3.3	4.0	14.6	4.1	4.8	30.8
89865	Plateau	BDC-100	8/6/2009	43.1	3.3	3.9	29.3	8.2	4.8	30.7
89888	Post	BDC-30	8/7/2009	14.1	0.0	4.2	10.1	7.2	4.4	28.6
89889	Post	BDC-60	8/7/2009	13.5	0.0	3.9	10.3	7.3	4.5	29.2
89890	Post	BDC-100	8/7/2009	14.7	0.1	4.3	10.2	7.5	4.5	29.8
89891	Post	BDC-150	8/7/2009	15.1	0.2	4.4	10.5	7.7	4.7	30.6
89892	Post	BDC-200	8/7/2009	15.2	0.2	4.5	10.5	7.9	4.8	31.4
89893	Post	BDC-250	8/7/2009	15.2	0.0	4.4	10.5	8.0	4.9	31.8
89894	Post	BDC-300	8/7/2009	15.2	0.0	4.5	10.5	7.9	5.0	31.4
89895	Post	BDC-350	8/7/2009	15.4	0.0	4.5	10.6	8.3	5.7	32.2
89896	Post	BDC-400	8/7/2009	13.6	0.1	3.3	9.7	7.4	4.1	25.6
89897	Post	BDC-Trib	8/7/2009	10.4	0.2	0.1	9.1	18.0	14.7	49.4
89898	Post	BDC-Trib	8/7/2009	17.4	0.2	5.9	12.2	14.6	13.7	59.5

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91108	Pre	BDC-125	10/6/2009	18.4	0.0	3.4	8.7	7.9	4.2	28.6
91109	Pre	BDC-125	10/6/2009	18.4	0.0	3.5	8.8	7.9	4.3	28.8
91110	Pre	BDC-150	10/6/2009	18.5	0.0	3.4	8.8	7.9	4.3	28.8
91111	Pre	BDC-150	10/6/2009	18.4	0.0	3.3	8.7	7.9	4.3	28.8
91112	Pre	BDC-175	10/6/2009	20.2	0.0	3.4	10.0	7.9	4.3	29.0
91113	Pre	BDC-175	10/6/2009	18.3	0.0	3.4	8.8	7.9	4.3	28.9
91114	Pre	BDC-200	10/6/2009	18.4	0.0	3.4	8.8	7.9	4.3	29.1
91115	Pre	BDC-200	10/6/2009	18.4	0.0	3.5	8.8	7.9	4.3	29.1
91116	Pre	BDC-225	10/6/2009	18.9	0.0	3.4	8.9	8.0	4.3	29.3
91117	Pre	BDC-225	10/6/2009	18.6	0.0	3.6	8.8	7.8	4.3	29.3
91118	Pre	BDC-250	10/6/2009	18.7	0.0	3.5	8.7	7.9	4.3	29.4
91119	Pre	BDC-250	10/6/2009	18.8	0.0	3.5	8.7	7.9	4.3	29.3
91120	Pre	BDC-275	10/6/2009	11.7	0.0	2.3	5.3	4.6	2.8	23.2
91121	Pre	BDC-275	10/6/2009	18.9	0.0	3.5	8.8	7.9	4.3	29.4
91122	Pre	BDC-300	10/6/2009	18.8	0.0	3.5	8.9	7.8	4.3	29.5
91123	Pre	BDC-300	10/6/2009	18.7	0.0	3.5	8.7	7.8	4.3	29.5
91124	Pre	BDC-325	10/6/2009	18.8	0.0	3.5	8.7	7.8	4.3	29.7
91125	Pre	BDC-325	10/6/2009	18.8	0.0	3.5	8.8	7.9	4.3	29.8
91126	Pre	BDC-350	10/6/2009	17.7	0.0	3.0	9.0	7.9	4.1	27.2
91127	Pre	BDC-350	10/6/2009	19.2	0.0	3.7	8.8	7.9	4.4	30.1
91128	Pre	BDC-400	10/6/2009	12.4	0.0	1.5	5.2	4.9	2.9	21.9
91129	Pre	BDC-400	10/6/2009	18.6	0.0	2.3	7.9	7.8	4.1	25.8
91130	Pre	BDC-Trib	10/6/2009	19.5	0.0	8.0	11.2	7.6	5.0	40.9
91131	Plateau	BDC-125	10/6/2009	37.8	2.8	3.5	25.0	8.3	4.4	30.0
91132	Plateau	BDC-125	10/6/2009	37.7	2.8	3.6	24.9	8.3	4.4	30.1
91133	Plateau	BDC-125	10/6/2009	37.8	2.8	3.6	24.9	8.3	4.4	30.1
91134	Plateau	BDC-150	10/6/2009	38.1	2.9	3.6	25.2	8.3	4.4	30.0
91135	Plateau	BDC-150	10/6/2009	30.3	2.3	2.9	20.4	6.6	3.7	28.7
91136	Plateau	BDC-150	10/6/2009	37.9	2.8	3.6	25.2	8.3	4.4	30.1
91137	Plateau	BDC-175	10/6/2009	38.8	3.0	3.6	26.0	8.3	4.4	30.1

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91138	Plateau	BDC-175	10/6/2009	38.6	2.7	3.6	26.0	8.3	4.3	28.9
91139	Plateau	BDC-175	10/6/2009	38.6	2.8	3.6	26.0	8.3	4.4	30.2
91140	Plateau	BDC-200	10/6/2009	39.4	3.0	3.6	26.8	8.3	4.4	30.2
91141	Plateau	BDC-200	10/6/2009	39.4	3.0	3.5	26.8	8.3	4.4	30.0
91142	Plateau	BDC-200	10/6/2009	39.4	3.0	3.6	26.8	8.3	4.4	30.0
91143	Plateau	BDC-225	10/6/2009	40.7	3.2	3.6	28.0	8.3	4.4	30.3
91144	Plateau	BDC-225	10/6/2009	40.6	3.2	3.6	28.1	8.3	4.4	30.2
91145	Plateau	BDC-225	10/6/2009	40.5	3.1	3.6	28.0	8.3	4.4	30.2
91146	Plateau	BDC-250	10/6/2009	41.7	3.3	3.6	29.2	8.2	4.4	30.2
91147	Plateau	BDC-250	10/6/2009	41.7	3.3	3.6	29.2	8.2	4.4	30.3
91148	Plateau	BDC-250	10/6/2009	41.7	3.3	3.6	29.3	8.3	4.4	30.3
91149	Plateau	BDC-275	10/6/2009	41.9	3.4	3.7	29.5	8.2	4.3	30.1
91150	Plateau	BDC-275	10/6/2009	43.0	3.3	3.6	29.5	8.2	4.4	30.3
91151	Plateau	BDC-275	10/6/2009	41.9	3.3	3.6	29.5	8.2	4.3	30.2
91152	Plateau	BDC-300	10/6/2009	30.8	2.4	2.9	22.2	6.0	3.4	28.4
91153	Plateau	BDC-300	10/6/2009	42.1	3.4	3.6	29.7	8.2	4.3	30.2
91154	Plateau	BDC-300	10/6/2009	39.7	3.2	3.5	28.1	7.7	4.1	29.8
91155	Plateau	BDC-325	10/6/2009	43.4	3.5	3.6	30.7	8.2	4.4	30.3
91156	Plateau	BDC-325	10/6/2009	43.1	3.5	3.6	30.5	8.2	4.3	30.1
91157	Plateau	BDC-325	10/6/2009	43.4	3.6	3.6	30.6	8.2	4.3	30.1
91158	Plateau	BDC-350	10/6/2009	44.1	3.6	3.6	31.3	8.1	4.3	30.0
91159	Plateau	BDC-350	10/6/2009	45.1	3.8	3.6	32.1	8.2	4.4	30.2
91160	Plateau	BDC-350	10/6/2009	45.1	3.8	3.7	32.1	8.2	4.3	30.2
91161	Plateau	BDC-400	10/6/2009	18.7	0.0	2.3	8.0	7.9	4.0	25.9
91162	Plateau	BDC-400	10/6/2009	19.0	0.0	2.3	8.1	7.9	4.0	25.8
91163	Plateau	BDC-400	10/6/2009	18.9	0.0	2.3	8.1	8.0	4.0	26.0
91164	Plateau	BDC-Trib	10/6/2009	19.7	0.0	8.3	11.5	7.5	5.0	42.6
91165	Post	BDC-125	10/7/2009	17.9	0.0	2.2	7.0	11.3	3.5	18.5
91166	Post	BDC-150	10/7/2009	18.0	0.0	2.2	7.0	11.4	3.5	18.7
91167	Post	BDC-175	10/7/2009	30.8	0.0	2.1	11.6	8.6	3.0	16.5

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
91168	Post	BDC-200	10/7/2009	18.3	0.0	2.2	7.2	11.8	3.6	19.0
91169	Post	BDC-225	10/7/2009	18.4	0.0	2.1	7.2	12.0	3.6	19.1
91170	Post	BDC-250	10/7/2009	27.6	0.0	2.0	11.7	8.1	2.9	16.1
91171	Post	BDC-275	10/7/2009	18.9	0.0	2.1	7.3	12.5	3.6	18.8
91172	Post	BDC-300	10/7/2009	19.3	0.0	2.1	7.5	12.8	3.6	18.8
91173	Post	BDC-325	10/7/2009	19.5	0.0	2.2	7.5	13.2	3.7	18.9
91174	Post	BDC-350	10/7/2009	19.6	0.0	2.2	7.6	13.3	3.6	18.7
91175	Post	BDC-400	10/7/2009	22.4	0.0	2.3	8.0	13.2	4.0	20.9
91176	Post	BDC-Trib	10/7/2009	13.9	0.0	1.5	6.4	12.8	2.6	11.9
91289	Pre	BDC-60	10/17/2009	22.4	0.0	4.3	9.4	8.2	4.5	28.3
91290	Pre	BDC-60	10/17/2009	21.3	0.0	4.4	9.4	8.2	4.6	28.7
91291	Pre	BDC-100	10/17/2009	20.9	0.0	4.4	9.4	8.2	4.6	28.9
91292	Pre	BDC-100	10/17/2009	26.6	0.0	3.3	12.4	5.2	3.1	20.7
91293	Pre	BDC-125	10/17/2009	12.5	0.0	2.6	6.2	3.7	2.6	17.8
91294	Pre	BDC-125	10/17/2009	21.1	0.0	4.4	9.4	8.3	4.6	28.9
91295	Pre	BDC-150	10/17/2009	21.2	0.0	4.4	9.4	8.3	4.6	29.0
91296	Pre	BDC-150	10/17/2009	21.1	0.0	4.4	9.4	8.3	4.6	29.0
91297	Pre	BDC-175	10/17/2009	20.9	0.0	4.4	9.3	8.3	4.6	29.0
91298	Pre	BDC-175	10/17/2009	21.2	0.0	4.5	9.5	8.3	4.6	28.9
91299	Pre	BDC-200	10/17/2009	21.3	0.0	4.5	9.4	8.3	4.6	29.2
91300	Pre	BDC-200	10/17/2009	19.7	0.0	4.2	8.8	7.7	4.4	27.8
91301	Pre	BDC-225	10/17/2009	8.7	0.0	1.6	4.5	2.4	1.5	14.5
91302	Pre	BDC-225	10/17/2009	22.8	0.0	4.3	10.8	7.9	4.4	27.7
91303	Pre	BDC-250	10/17/2009	21.4	0.0	4.5	9.4	8.4	4.7	29.5
91304	Pre	BDC-250	10/17/2009	21.5	0.0	4.5	9.5	8.4	4.7	29.5
91305	Pre	BDC-275	10/17/2009	20.8	0.0	4.3	9.2	8.1	4.5	28.8
91306	Pre	BDC-275	10/17/2009	21.5	0.0	4.5	9.5	8.4	4.7	29.7
91307	Pre	BDC-300	10/17/2009	21.6	0.0	4.5	9.5	8.4	4.7	29.7
91308	Pre	BDC-300	10/17/2009	18.9	0.0	4.1	8.4	7.3	4.2	28.7
91309	Pre	BDC-325	10/17/2009	21.2	0.0	4.4	9.1	8.1	4.6	29.6

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
91310	Pre	BDC-325	10/17/2009	14.9	0.0	3.1	6.6	5.7	3.3	22.7
91311	Pre	BDC-350	10/17/2009	22.2	0.0	4.5	9.5	8.5	4.8	30.1
91312	Pre	BDC-350	10/17/2009	20.5	0.0	4.2	8.8	7.8	4.4	28.9
91313	Pre	BDC-400	10/17/2009	21.9	0.0	3.2	8.7	8.5	4.4	25.5
91314	Pre	BDC-400	10/17/2009	22.3	0.0	3.2	8.8	8.5	4.5	25.8
91315	Pre	BDC-Trib	10/17/2009	13.2	0.0	2.7	8.4	2.1	1.7	15.6
91316	Pre	BDC-Trib	10/17/2009	19.6	0.0	8.2	11.4	7.7	5.2	31.4
91317	Plateau	BDC-125	10/17/2009	33.5	1.4	4.5	17.7	8.5	4.7	29.6
91318	Plateau	BDC-125	10/17/2009	33.6	1.3	4.5	17.8	8.5	4.7	29.5
91319	Plateau	BDC-125	10/17/2009	33.6	1.3	4.5	17.8	8.5	4.7	29.5
91320	Plateau	BDC-150	10/17/2009	34.8	1.4	4.5	18.5	8.6	4.7	29.7
91321	Plateau	BDC-150	10/17/2009	34.5	1.3	4.5	18.5	8.6	4.7	29.7
91322	Plateau	BDC-150	10/17/2009	27.0	1.1	3.6	14.7	6.8	3.8	26.4
91323	Plateau	BDC-175	10/17/2009	35.4	1.5	4.5	19.2	8.5	4.7	29.7
91324	Plateau	BDC-175	10/17/2009	35.5	1.5	4.4	19.4	8.4	4.6	29.3
91325	Plateau	BDC-175	10/17/2009	34.3	1.4	4.3	18.7	8.3	4.5	28.8
91326	Plateau	BDC-200	10/17/2009	36.6	1.6	4.5	20.1	8.5	4.7	29.6
91327	Plateau	BDC-200	10/17/2009	36.6	1.6	4.5	20.2	8.5	4.7	29.7
91328	Plateau	BDC-200	10/17/2009	34.5	1.5	4.2	19.1	8.1	4.4	28.3
91329	Plateau	BDC-225	10/17/2009	37.8	1.5	4.6	21.2	8.7	4.7	29.9
91330	Plateau	BDC-225	10/17/2009	37.7	1.7	4.5	21.0	8.5	4.7	29.7
91331	Plateau	BDC-225	10/17/2009	37.8	1.7	4.5	21.0	8.5	4.7	30.0
91332	Plateau	BDC-250	10/17/2009	38.8	1.9	4.5	22.0	8.5	4.7	29.9
91333	Plateau	BDC-250	10/17/2009	39.0	1.8	4.5	22.1	8.5	4.7	29.9
91334	Plateau	BDC-250	10/17/2009	38.8	1.8	4.5	22.0	8.5	4.7	29.9
91335	Plateau	BDC-275	10/17/2009	39.6	1.8	4.6	22.6	8.5	4.7	30.0
91336	Plateau	BDC-275	10/17/2009	32.9	1.8	3.8	19.3	6.9	3.9	27.1
91337	Plateau	BDC-275	10/17/2009	39.6	1.8	4.5	22.5	8.5	4.7	29.8
91338	Plateau	BDC-300	10/17/2009	39.8	1.8	4.5	22.9	8.5	4.7	29.9
91339	Plateau	BDC-300	10/17/2009	39.9	1.8	4.5	22.9	8.4	4.7	29.8

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91340	Plateau	BDC-300	10/17/2009	39.9	1.8	4.5	23.0	8.4	4.7	29.9
91341	Plateau	BDC-325	10/17/2009	41.6	1.9	4.5	24.0	8.5	4.7	30.0
91342	Plateau	BDC-325	10/17/2009	41.8	2.0	4.4	24.0	8.5	4.7	29.8
91343	Plateau	BDC-325	10/17/2009	41.7	2.0	4.5	23.9	8.5	4.7	30.0
91344	Plateau	BDC-350	10/17/2009	42.8	2.0	4.5	24.7	8.5	4.7	30.0
91345	Plateau	BDC-350	10/17/2009	42.4	2.1	4.5	24.4	8.4	4.6	29.5
91346	Plateau	BDC-350	10/17/2009	42.8	2.1	4.5	24.7	8.4	4.6	29.2
91347	Plateau	BDC-400	10/17/2009	22.2	0.0	3.3	8.7	8.5	4.4	25.5
91348	Plateau	BDC-400	10/17/2009	22.1	0.0	3.2	8.8	8.4	4.3	25.5
91349	Plateau	BDC-400	10/17/2009	21.6	0.0	2.9	9.3	7.5	3.9	23.0
91350	Plateau	BDC-Trib	10/17/2009	18.6	0.0	7.2	11.0	7.9	4.9	37.9
91351	Plateau	BDC-Trib	10/17/2009	18.0	0.0	7.0	10.7	7.4	4.7	32.0
91352	Plateau	BDC-Trib	10/17/2009	20.4	0.0	4.9	11.3	4.6	3.2	27.4
91353	Post	BDC-60	10/18/2009	21.1	0.0	4.5	9.9	8.0	4.5	28.4
91354	Post	BDC-100	10/18/2009	20.9	0.1	4.5	9.5	8.1	4.5	28.9
91355	Post	BDC-125	10/18/2009	23.7	0.0	3.6	13.3	5.7	3.5	24.0
91356	Post	BDC-150	10/18/2009	20.8	0.0	4.4	9.4	8.1	4.5	28.6
91357	Post	BDC-175	10/18/2009	21.0	0.0	4.5	9.4	8.2	4.5	28.7
91358	Post	BDC-200	10/18/2009	21.1	0.0	4.5	9.5	8.3	4.5	27.8
91359	Post	BDC-225	10/18/2009	23.5	0.0	4.2	12.2	6.9	4.1	28.9
91360	Post	BDC-250	10/18/2009	18.7	0.0	3.9	8.4	7.3	4.0	25.4
91361	Post	BDC-275	10/18/2009	21.2	0.0	4.6	9.5	8.3	4.6	29.2
91362	Post	BDC-300	10/18/2009	21.2	0.0	4.5	9.4	8.3	4.6	28.8
91363	Post	BDC-325	10/18/2009	21.7	0.1	4.5	9.4	8.4	4.6	29.1
91364	Post	BDC-350	10/18/2009	23.4	0.0	3.5	12.6	5.9	3.5	24.7
91365	Post	BDC-400	10/18/2009	21.7	0.0	3.3	8.6	8.5	4.3	25.6
91366	Post	BDC-500	10/18/2009	19.3	0.1	2.3	10.2	4.5	2.8	19.4
91367	Post	BDC-Trib	10/18/2009	17.8	0.0	6.2	10.3	7.7	4.6	27.2
91438	Pre	BDC-60	10/26/2009	16.7	0.0	2.4	8.1	7.9	3.5	19.3
91439	Pre	BDC-60	10/26/2009	15.4	0.0	2.5	7.5	7.8	3.5	19.6

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91440	Pre	BDC-100	10/26/2009	15.4	0.0	2.5	7.5	7.8	3.5	19.7
91441	Pre	BDC-100	10/26/2009	16.7	0.0	2.5	7.5	7.8	3.5	19.8
91442	Pre	BDC-125	10/26/2009	15.4	0.0	2.6	7.5	7.9	3.5	19.4
91443	Pre	BDC-125	10/26/2009	15.8	0.0	2.6	7.5	7.9	3.5	19.5
91444	Pre	BDC-150	10/26/2009	16.2	0.0	2.6	7.5	7.9	3.5	19.6
91445	Pre	BDC-150	10/26/2009	15.5	0.0	2.6	7.5	7.9	3.5	19.6
91446	Pre	BDC-175	10/26/2009	15.6	0.0	2.6	7.5	7.9	3.6	19.9
91447	Pre	BDC-175	10/26/2009	16.0	0.0	2.6	7.5	7.9	3.6	19.9
91448	Pre	BDC-200	10/26/2009	15.9	0.0	2.6	7.6	8.0	3.6	20.0
91449	Pre	BDC-200	10/26/2009	15.9	0.0	2.6	7.6	8.0	3.6	20.1
91450	Pre	BDC-225	10/26/2009	15.8	0.0	2.6	7.6	8.0	3.6	20.2
91451	Pre	BDC-225	10/26/2009	15.8	0.0	2.6	7.6	8.0	3.6	20.2
91452	Pre	BDC-250	10/26/2009	15.9	0.0	2.6	7.6	8.0	3.6	20.3
91453	Pre	BDC-250	10/26/2009	15.9	0.0	2.6	7.6	8.1	3.6	20.2
91454	Pre	BDC-275	10/26/2009	16.1	0.0	2.6	7.7	8.1	3.7	20.5
91455	Pre	BDC-275	10/26/2009	16.6	0.0	2.6	7.6	8.1	3.7	20.5
91456	Pre	BDC-300	10/26/2009	16.2	0.0	2.7	7.7	8.1	3.7	20.6
91457	Pre	BDC-300	10/26/2009	16.3	0.0	2.7	7.7	8.1	3.7	20.7
91458	Pre	BDC-325	10/26/2009	16.6	0.0	2.6	7.7	8.1	3.7	20.7
91459	Pre	BDC-325	10/26/2009	16.6	0.0	2.6	7.7	8.2	3.7	20.7
91460	Pre	BDC-350	10/26/2009	16.5	0.0	2.6	7.7	8.1	3.7	20.7
91461	Pre	BDC-350	10/26/2009	16.7	0.0	2.6	7.7	8.1	3.7	20.7
91462	Pre	BDC-400	10/26/2009	16.5	0.0	2.1	7.3	8.0	3.6	19.3
91463	Pre	BDC-400	10/26/2009	16.4	0.0	2.0	7.2	7.9	3.5	19.3
91464	Pre	BDC-Trib	10/26/2009	15.4	0.0	2.9	9.0	9.0	3.9	22.8
91465	Pre	BDC-Trib	10/26/2009	14.6	0.0	2.9	9.0	9.0	4.0	22.9
91466	Plateau	BDC-60	10/26/2009	33.4	2.8	2.6	21.6	8.0	3.7	20.9
91467	Plateau	BDC-60	10/26/2009	33.5	2.8	2.6	21.7	8.0	3.7	20.9
91468	Plateau	BDC-60	10/26/2009	33.6	2.8	2.6	21.7	8.0	3.7	20.7
91469	Plateau	BDC-100	10/26/2009	34.0	2.8	2.6	22.1	8.0	3.7	20.9

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91470	Plateau	BDC-100	10/26/2009	33.9	2.8	2.6	22.0	8.0	3.7	20.9
91471	Plateau	BDC-100	10/26/2009	33.9	2.8	2.6	22.0	8.0	3.7	21.0
91472	Plateau	BDC-125	10/26/2009	34.8	2.9	2.7	22.2	8.1	3.7	20.7
91473	Plateau	BDC-125	10/26/2009	34.9	2.9	2.7	22.2	8.1	3.7	20.7
91474	Plateau	BDC-125	10/26/2009	34.9	2.9	2.7	22.2	8.1	3.7	20.6
91475	Plateau	BDC-150	10/26/2009	35.0	2.9	2.7	22.3	8.1	3.7	20.7
91476	Plateau	BDC-150	10/26/2009	35.1	2.9	2.7	22.3	8.1	3.7	20.7
91477	Plateau	BDC-150	10/26/2009	35.1	2.9	2.7	22.3	8.1	3.7	20.7
91478	Plateau	BDC-175	10/26/2009	35.6	3.0	2.7	22.8	8.1	3.7	21.0
91479	Plateau	BDC-175	10/26/2009	35.7	3.0	2.8	22.7	8.1	3.7	21.0
91480	Plateau	BDC-175	10/26/2009	35.5	3.0	2.7	22.7	8.1	3.7	21.0
91481	Plateau	BDC-200	10/26/2009	36.1	3.0	2.7	23.2	8.2	3.7	21.1
91482	Plateau	BDC-200	10/26/2009	36.2	3.1	2.7	23.2	8.2	3.7	21.1
91483	Plateau	BDC-200	10/26/2009	36.2	3.1	2.7	23.2	8.2	3.7	21.0
91484	Plateau	BDC-225	10/26/2009	36.9	3.1	2.7	23.8	8.2	3.7	21.1
91485	Plateau	BDC-225	10/26/2009	37.1	3.1	2.8	23.9	8.2	3.7	21.0
91486	Plateau	BDC-225	10/26/2009	37.2	3.2	2.7	24.0	8.2	3.7	21.1
91487	Plateau	BDC-250	10/26/2009	37.9	3.3	2.7	24.7	8.2	3.7	21.2
91488	Plateau	BDC-250	10/26/2009	38.1	3.3	2.7	24.8	8.2	3.7	21.1
91489	Plateau	BDC-250	10/26/2009	38.0	3.3	2.7	24.7	8.2	3.7	21.2
91490	Plateau	BDC-275	10/26/2009	39.1	3.5	2.8	25.6	8.2	3.8	21.3
91491	Plateau	BDC-275	10/26/2009	39.0	3.4	2.8	25.5	8.2	3.7	21.3
91492	Plateau	BDC-275	10/26/2009	39.0	3.4	2.7	25.6	8.2	3.7	21.3
91493	Plateau	BDC-300	10/26/2009	40.1	3.6	2.8	26.5	8.3	3.8	21.4
91494	Plateau	BDC-300	10/26/2009	40.1	3.6	2.8	26.4	8.3	3.7	21.3
91495	Plateau	BDC-300	10/26/2009	40.1	3.6	2.8	26.4	8.3	3.8	21.4
91496	Plateau	BDC-325	10/26/2009	40.6	3.6	2.7	26.7	8.3	3.8	21.3
91497	Plateau	BDC-325	10/26/2009	40.8	3.7	2.7	26.9	8.4	3.8	21.4
91498	Plateau	BDC-325	10/26/2009	40.8	3.7	2.7	26.9	8.3	3.8	21.4
91499	Plateau	BDC-350	10/26/2009	40.6	3.6	2.7	26.8	8.3	3.8	21.2

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
91500	Plateau	BDC-350	10/26/2009	40.8	3.6	2.7	26.9	8.3	3.8	21.3
91501	Plateau	BDC-350	10/26/2009	40.8	3.6	2.7	26.9	8.3	3.8	21.3
91502	Plateau	BDC-400	10/26/2009	16.9	0.0	2.2	7.4	8.1	3.6	19.7
91503	Plateau	BDC-400	10/26/2009	17.2	0.0	2.2	7.6	8.2	3.6	19.8
91504	Plateau	BDC-400	10/26/2009	16.9	0.0	2.2	7.4	8.2	3.6	19.7
91505	Plateau	BDC-Trib	10/26/2009	14.6	0.0	3.1	9.0	9.0	4.0	22.8
91506	Plateau	BDC-Trib	10/26/2009	15.0	0.0	3.1	9.0	9.0	4.0	22.8
91507	Plateau	BDC-Trib	10/26/2009	14.9	0.0	3.1	9.1	9.0	3.9	22.7
91508	Plateau	BDC-Trib	10/26/2009	4.9	0.1	1.6	3.2	1.7	0.8	2.8
91567	Post	BDC-60	10/27/2009	17.4	0.0	3.2	8.5	7.9	3.9	22.9
91568	Post	BDC-100	10/27/2009	17.5	0.0	3.2	8.4	7.9	3.9	23.1
91569	Post	BDC-125	10/27/2009	17.5	0.0	3.2	8.5	8.0	3.9	23.3
91570	Post	BDC-150	10/27/2009	17.5	0.0	3.2	8.5	8.0	3.9	23.3
91571	Post	BDC-175	10/27/2009	17.7	0.0	3.2	8.5	8.1	4.0	23.5
91572	Post	BDC-200	10/27/2009	17.8	0.0	3.2	8.5	8.1	4.0	23.8
91573	Post	BDC-225	10/27/2009	17.9	0.0	3.2	8.6	8.1	4.0	23.8
91574	Post	BDC-250	10/27/2009	18.0	0.0	3.2	8.5	8.1	4.0	24.0
91575	Post	BDC-275	10/27/2009	18.1	0.0	3.3	8.6	8.2	4.0	24.2
91576	Post	BDC-300	10/27/2009	18.2	0.0	3.3	8.6	8.2	4.0	24.3
91577	Post	BDC-325	10/27/2009	18.4	0.0	3.2	8.6	8.3	4.1	24.2
91578	Post	BDC-350	10/27/2009	18.6	0.0	3.2	8.6	8.3	4.1	24.4
91579	Post	BDC-400	10/27/2009	18.8	0.0	2.6	8.1	8.3	3.9	22.3
91580	Post	BDC-Trib	10/27/2009	15.3	0.0	3.6	9.4	8.4	4.2	26.1
92048	Pre	BDC-79	11/22/2009	14.4	0.0	3.5	--	--	--	--
92049	Pre	BDC-79	11/22/2009	14.4	0.0	3.5	--	--	--	--
92050	Pre	BDC-100	11/22/2009	14.2	0.0	3.5	--	--	--	--
92051	Pre	BDC-100	11/22/2009	14.3	0.0	3.5	--	--	--	--
92052	Pre	BDC-125	11/22/2009	14.5	0.0	3.5	--	--	--	--
92053	Pre	BDC-125	11/22/2009	14.4	0.0	3.5	--	--	--	--
92054	Pre	BDC-150	11/22/2009	14.5	0.0	3.5	--	--	--	--

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
92055	Pre	BDC-150	11/22/2009	14.5	0.0	3.5	--	--	--	--
92056	Pre	BDC-175	11/22/2009	14.5	0.0	3.5	--	--	--	--
92057	Pre	BDC-175	11/22/2009	14.7	0.0	3.5	--	--	--	--
92058	Pre	BDC-200	11/22/2009	14.9	0.0	3.6	--	--	--	--
92059	Pre	BDC-200	11/22/2009	14.9	0.0	3.6	--	--	--	--
92060	Pre	BDC-225	11/22/2009	15.0	0.0	3.6	--	--	--	--
92061	Pre	BDC-225	11/22/2009	15.0	0.0	3.6	--	--	--	--
92062	Pre	BDC-250	11/22/2009	15.1	0.0	3.6	--	--	--	--
92063	Pre	BDC-250	11/22/2009	15.1	0.0	3.6	--	--	--	--
92064	Pre	BDC-275	11/22/2009	15.2	0.0	3.6	--	--	--	--
92065	Pre	BDC-275	11/22/2009	15.2	0.0	3.6	--	--	--	--
92066	Pre	BDC-300	11/22/2009	15.4	0.0	3.6	--	--	--	--
92067	Pre	BDC-300	11/22/2009	15.4	0.0	3.7	--	--	--	--
92068	Pre	BDC-325	11/22/2009	15.5	0.0	3.6	--	--	--	--
92069	Pre	BDC-325	11/22/2009	15.5	0.0	3.7	--	--	--	--
92070	Pre	BDC-350	11/22/2009	15.6	0.0	3.6	--	--	--	--
92071	Pre	BDC-350	11/22/2009	15.6	0.0	3.6	--	--	--	--
92072	Pre	BDC-400	11/22/2009	16.0	0.0	3.4	--	--	--	--
92073	Pre	BDC-400	11/22/2009	15.7	0.0	3.4	--	--	--	--
92074	Pre	BDC-Trib	11/22/2009	13.7	0.0	3.2	--	--	--	--
92075	Pre	BDC-Trib	11/22/2009	13.4	0.0	3.2	--	--	--	--
92076	Pre	BDC-GW-Weir	11/22/2009	15.2	0.0	3.6	--	--	--	--
92077	Pre	BDC-GW-Weir	11/22/2009	15.2	0.0	3.6	--	--	--	--
92078	Pre	BDC-Trib	11/22/2009	8.3	0.0	2.1	--	--	--	--
92080	Plateau	BDC-79	11/22/2009	22.2	1.7	3.5	--	--	--	--
92081	Plateau	BDC-79	11/22/2009	22.3	1.8	3.6	--	--	--	--
92082	Plateau	BDC-79	11/22/2009	22.4	1.8	3.6	--	--	--	--
92083	Plateau	BDC-100	11/22/2009	22.4	1.8	3.5	--	--	--	--

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
92084	Plateau	BDC-100	11/22/2009	22.4	1.8	3.6	--	--	--	--
92085	Plateau	BDC-100	11/22/2009	22.6	1.8	3.5	--	--	--	--
92086	Plateau	BDC-125	11/22/2009	22.7	1.9	3.6	--	--	--	--
92087	Plateau	BDC-125	11/22/2009	22.7	1.9	3.6	--	--	--	--
92088	Plateau	BDC-125	11/22/2009	22.7	1.9	3.5	--	--	--	--
92089	Plateau	BDC-150	11/22/2009	22.9	1.9	3.6	--	--	--	--
92090	Plateau	BDC-150	11/22/2009	22.8	1.7	3.6	--	--	--	--
92091	Plateau	BDC-150	11/22/2009	22.9	2.2	3.6	--	--	--	--
92092	Plateau	BDC-175	11/22/2009	23.3	2.1	3.6	--	--	--	--
92093	Plateau	BDC-175	11/22/2009	23.3	2.0	3.6	--	--	--	--
92094	Plateau	BDC-175	11/22/2009	23.3	2.1	3.6	--	--	--	--
92095	Plateau	BDC-200	11/22/2009	23.5	2.0	3.6	--	--	--	--
92096	Plateau	BDC-200	11/22/2009	23.5	2.0	3.6	--	--	--	--
92097	Plateau	BDC-200	11/22/2009	23.5	2.1	3.6	--	--	--	--
92098	Plateau	BDC-225	11/22/2009	23.8	2.1	3.6	--	--	--	--
92099	Plateau	BDC-225	11/22/2009	23.8	2.1	3.6	--	--	--	--
92100	Plateau	BDC-225	11/22/2009	23.9	2.2	3.6	--	--	--	--
92101	Plateau	BDC-250	11/22/2009	23.9	2.1	3.6	--	--	--	--
92102	Plateau	BDC-250	11/22/2009	23.9	2.2	3.6	--	--	--	--
92103	Plateau	BDC-250	11/22/2009	20.1	1.1	3.8	--	--	--	--
92104	Plateau	BDC-275	11/22/2009	24.2	2.2	3.7	--	--	--	--
92105	Plateau	BDC-275	11/22/2009	24.3	2.3	3.6	--	--	--	--
92106	Plateau	BDC-275	11/22/2009	24.3	2.2	3.7	--	--	--	--
92107	Plateau	BDC-300	11/22/2009	24.4	2.3	3.7	--	--	--	--
92108	Plateau	BDC-300	11/22/2009	24.4	2.2	3.6	--	--	--	--
92109	Plateau	BDC-300	11/22/2009	24.4	2.3	3.7	--	--	--	--
92110	Plateau	BDC-325	11/22/2009	24.8	2.3	3.6	--	--	--	--
92111	Plateau	BDC-325	11/22/2009	24.8	2.3	3.6	--	--	--	--
92112	Plateau	BDC-325	11/22/2009	24.8	2.2	3.6	--	--	--	--
92113	Plateau	BDC-350	11/22/2009	24.9	2.3	3.6	--	--	--	--

UNH ID	Sample Type	Station Name	Collection Date	Cl^- (mg Cl/L)	Br^- (mg Br/L)	SO_4^{2-} (mg S/L)	Na (mg Na/L)	K (mg K/L)	Mg (mg Mg/L)	Ca (mg Ca/L)
92114	Plateau	BDC-350	11/22/2009	24.8	2.3	3.6	--	--	--	--
92115	Plateau	BDC-350	11/22/2009	24.8	2.4	3.6	--	--	--	--
92116	Plateau	BDC-400	11/22/2009	14.6	0.0	3.5	--	--	--	--
92117	Plateau	BDC-400	11/22/2009	15.8	0.0	3.4	--	--	--	--
92118	Plateau	BDC-400	11/22/2009	15.8	0.0	3.5	--	--	--	--
92119	Plateau	BDC-Trib	11/22/2009	13.2	0.0	3.0	--	--	--	--
92120	Plateau	BDC-Trib	11/22/2009	13.2	0.0	2.9	--	--	--	--
92121	Plateau	BDC-Trib	11/22/2009	13.2	0.0	3.0	--	--	--	--
92128	Post	BDC-79	11/24/2009	15.3	0.0	3.8	--	--	--	--
92129	Post	BDC-100	11/24/2009	15.2	0.0	3.8	--	--	--	--
92130	Post	BDC-125	11/24/2009	15.4	0.0	3.9	--	--	--	--
92131	Post	BDC-150	11/24/2009	15.5	0.0	3.9	--	--	--	--
92132	Post	BDC-175	11/24/2009	15.6	0.0	3.9	--	--	--	--
92133	Post	BDC-200	11/24/2009	15.8	0.0	3.9	--	--	--	--
92134	Post	BDC-225	11/24/2009	16.0	0.0	4.0	--	--	--	--
92135	Post	BDC-250	11/24/2009	16.0	0.0	3.9	--	--	--	--
92136	Post	BDC-275	11/24/2009	16.1	0.0	4.0	--	--	--	--
92137	Post	BDC-300	11/24/2009	16.2	0.0	4.0	--	--	--	--
92138	Post	BDC-325	11/24/2009	16.4	0.0	4.0	--	--	--	--
92139	Post	BDC-350	11/24/2009	16.6	0.0	4.0	--	--	--	--
92140	Post	BDC-400	11/24/2009	16.8	0.0	3.7	--	--	--	--
92141	Post	BDC-Trib	11/24/2009	13.0	0.0	3.6	--	--	--	--

Table 13. Denitrification rates for all stations and replicates for dry mass (DM) and ash free dry mass (AFDM).

Season	Station	Jar #	DR (ug N/g DM/hour	DR (ug N/ g AFDW/hr)
5/11/2009	BDC-60	4	0.001	0.012
5/11/2009	BDC-60	92	0.034	0.311
5/11/2009	BDC-60	22	0.015	0.358
5/11/2009	BDC-60	2	0.001	0.016
5/11/2009	BDC-300	44	0.002	0.177
5/11/2009	BDC-300	19	0.012	0.942
5/11/2009	BDC-300	56	0.028	0.955
5/11/2009	BDC-300	55	0.006	0.298
5/11/2009	BDC-300	27	0.025	1.926
5/11/2009	BDC-300	85	0.001	0.028
5/11/2009	BDC-500	48	0.030	0.523
5/11/2009	BDC-500	95	0.005	0.103
5/11/2009	BDC-500	13	0.006	0.231
5/11/2009	BDC-500	57	0.022	0.321
5/11/2009	BDC-500	29	0.048	0.531
7/2/2009	BDC-60	57	0.002	0.018
7/2/2009	BDC-60	2	0.005	0.044
7/2/2009	BDC-60	90	0.003	0.036
7/2/2009	BDC-60	19	0.015	0.072
7/2/2009	BDC-60	4	0.009	0.081
7/2/2009	BDC-300	43	0.002	0.082
7/2/2009	BDC-300	46	0.000	0.010
7/2/2009	BDC-300	44	0.002	0.046
7/2/2009	BDC-300	18	0.003	0.050
7/2/2009	BDC-500	88	0.000	0.222
7/2/2009	BDC-500	61	0.014	0.245
7/2/2009	BDC-500	3	0.029	0.212
7/2/2009	BDC-500	22	0.005	0.331
7/2/2009	BDC-500	17	0.008	0.595
10/18/2009	BDC-60	44	0.002	0.09
10/18/2009	BDC-60	13	0.003	0.05
10/18/2009	BDC-60	11	0.002	0.09
10/18/2009	BDC-300	27	0.001	0.04
10/18/2009	BDC-300	48	0.015	0.41
10/18/2009	BDC-500	57	0.007	0.05
10/18/2009	BDC-500	61	0.016	0.29
10/18/2009	BDC-500	88	0.006	0.13
10/18/2009	BDC-500	17	0.013	0.07
10/18/2009	BDC-500	18	0.023	0.19